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CONFIDENTIAL REPORT ON

Canada Creosote Site - North Bow Human Health Risk Assessment

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REPORT

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EXECUTIVE SUMMARY

Golder Associates Ltd. (Golder) was retained by Alberta Environment (AENV) to prepare a human health risk assessment (HHRA) for a primarily residential area of Calgary, Alberta, located north of the Bow River and former Canada Creosote site, henceforth referred to as the "North Bow Site" or "Site". The HHRA is required to evaluate creosote-related contamination that has migrated from the Canada Creosote Site, located south of the Bow River, the North Bow Site area. Wood-preserving operations historically took place on the Canada Creosote Site and involved the use of tars, creosote, petroleum oils and pentachlorophenol. The project study area is between 15th Street NW to 19th Street NW (east to west) and between Westmount Blvd. NW and Westmount Road NW (south to north).

Purpose and Scope

The purpose of this project is to assess the potential risk to human health associated with possible exposure to subsurface contamination originating from the Canada Creosote Site (primarily creosote) by residents and utility workers in the North Bow Site. The primary exposure pathway of concern for the Site is soil vapour intrusion into buildings and utility trenches. Previous assessments have identified creosote-related impacts to the north of the Bow River between approximately 14th Street and 19th Street. Historical creosote impacts present at the Site consist of dense non-aqueous phase liquid (DNAPL) and light non-aqueous phase liquid (LNAPL) and dissolved chemicals in groundwater (referred to as the "dissolved plume"). The extents of the DNAPL, LNAPL and dissolved plume have not been delineated by this HHRA.

An initial HHRA was completed in 1993 for the Site by O'Connor Associates Environmental Inc. (O'Connor). An updated risk assessment has been commissioned by AENV because of the new guidelines, toxicity values and risk guidance that have been developed since 1993, and because the contamination distribution at the Site may have changed since the time the O'Connor assessment was completed.

The scope of work for this project consists of a review of background information, preparation of a Phase I Environmental Site Assessment (ESA), a site investigation program consisting primarily of groundwater and soil vapour characterization completed on public lands, development of a conceptual site model (CSM), and completion of a HHRA, comprised of a Problem Formulation and preliminary quantitative assessment of potential exposure and risk for relevant pathways.

Phase 1 ESA

The purpose of the Phase I ESA was to summarize information on the potential presence and extent of contamination and to guide the design of the site investigation program at the Site. The Phase I ESA is documented in a separate report (Golder, 2011a), but the key findings of this study and issues of potential environmental concern identified are summarized below:

- The former Canada Creosote site, located south of the Bow River, which was used for wood treating operations, and other nearby industrial land uses. Chemicals of potential concern for this site include tars, creosote, petroleum oils and pentachlorophenol.
- The Firehall/EMS Station, located at the northeast corner of Memorial Drive and 19th Street NW, was previously designated as an area of potential concern and a Phase II ESA was completed at this site by others. No specific chemicals of potential concern were identified with the use of this site as a firehall/EMS station.

- The HiHo service station, located at 2001 Bowness Rd NW (west of study area), has been a service station from 1946 to the present. No subsurface information was available for this site. Chemicals of potential concern for this site include petroleum hydrocarbons.
- Former fuel service station and mechanical repair shop, located at 1610 Westmount Rd NW, 1601 Kensington Rd NW and 99 – 14th Street NW (there are multiple historic addresses for this site), which operated from 1954 to 1991. Chemicals of potential concern for this site include petroleum hydrocarbons.

Historical Information Review and Initial Conceptual Site Model (CSM)

A comprehensive review of available historical information was completed to guide the development of an initial conceptual site model (CSM) and preparation of a sampling plan. The CSM included consideration of contamination source zones and subsurface transport of chemicals from source zones, and in particular, the potential for migration of soil vapour into buildings.

The historical review indicated known areas with creosote-related NAPL impacts including:

(i) Along Broadview Road NW near 18th Street NW, where creosote-related contamination (both LNAPL and DNAPL) was encountered during excavation in 1991 for water main construction, and where a follow-up investigation indicated evidence of NAPL in a soil core,

(ii) At the CBC site, where DNAPL was encountered in three wells completed in the bedrock during a 2006 investigation, and

(iii) Along Memorial Drive, where a 1992 investigation indicated DNAPL was encountered in a well located approximately 110 m west of 17th Street NW; creosote staining was also observed at other boreholes in fracture zones at depths of 1 m to 5 m below the soil/bedrock interface.

Previous evaluations hypothesized that the migration pathways for DNAPL are complex, and that DNAPL may have migrated from the Canada Creosote site to the North Bow area either on top of the bedrock surface or through fractures within the bedrock. With respect to the potential for volatilization, a key factor is the distribution of NAPL source zones relative to the water table, and consequently seasonal water table fluctuations are important to consider because greater volatilization will occur if water table is close to or below NAPL zones. Within the vadose zone, the potential for aerobic biodegradation and attenuation of creosote-related vapours is a key consideration.

Field Investigation Approach and Methods

The field investigation approach was to choose sampling locations in areas of known creosote impact based on historical information, and to then move outward from these areas in an approximate grid pattern. Sample locations were chosen along the edges of roads and property lines, as access permitted. The investigation program consisted primarily of characterization of shallow groundwater and soil vapour quality near to the water table given the focus on the soil vapour intrusion pathway. Given this focus, the scope of work for this project did not include a detailed hydrogeological assessment nor delineation of DNAPL or the dissolved phase groundwater plume, and only a limited number of investigation locations were completed to evaluate deeper subsurface conditions. The investigation was limited to residential areas and did not include the CBC site where there are known creosote impacts (outside of the scope of this assessment).

The field investigation program, conducted in February and March 2011, included the drilling of nineteen boreholes, most of which were completed as dual-purpose groundwater and soil vapour monitoring wells (*i.e.*, screened across the water table), and installation of additional depth discrete soil vapour probes at nine locations. In addition, deeper monitoring wells (screened below the water table) were installed at three locations. Groundwater and soil vapour samples were screened in the field for indicators of potential impact (hydrocarbon vapours and fixed gases), and samples from select locations were submitted for laboratory analysis of a wide range of organic chemicals potentially associated with creosote impacts. The analysis of soil samples was limited to physical parameters.

Site Stratigraphy, Field Observations, and Hydrogeology

The shallow soil stratigraphy at the Site was generally comprised of sandy silt to silty sand, underlain by sand and gravel to sand, which in turn is underlain by clayey silt (encountered at a few borehole locations only). Siltstone bedrock was encountered in three boreholes at depths between 3.7 m and 6.5 m below ground surface. A creosote-like sheen on soil was encountered during the drilling of two boreholes along Broadview Road NW near 18th Street NW. Creosote-odours were noted during drilling at several other locations. Monitoring of wells for separate-phase product indicated a LNAPL sheen at one well along Broadview Road NW near 18th Street NW. The field soil vapour monitoring conducted in early March indicated elevated oxygen concentrations in soil near atmospheric levels (*i.e.*, conditions conducive for aerobic biodegradation), and relatively low combustible vapour, organic vapour, carbon dioxide and methane concentrations.

The nearest surface water body is the Bow River located approximately 45 m south of the Site. The depth to groundwater across the Site was measured between 2.59 and 3.77 m below ground surface on February 28, 2011. Groundwater depth data from select wells indicate a rise in the water table of approximately 0.6 m between early December 2010 and mid February 2011. Between mid February and early March 2011, there was a slight decline in the water table of a few centimetres. Bow River water levels for a gauging station approximately 3 kilometres downstream of the Site indicate the river water level rose rapidly by over 0.7 m in early December 2010, which is inferred to be the cause of the increase in the groundwater level observed between early December 2010 and February 2011. The potentiometric (groundwater) elevations suggest that the direction of shallow groundwater flow in late February was to the north in the west area of the Site, but possibly was to the south to southwest in the east area of the Site. Further monitoring is proposed to better understand groundwater level fluctuations and flow.

Groundwater and Soil Vapour Chemistry

The groundwater monitoring data when compared to the Alberta Tier 1 Guidelines indicated that the CWS PHC (Canada Wide Standard – Petroleum Hydrocarbon Compound) F2 fraction, naphthalene, and chloroform concentrations exceeded the guidelines for the inhalation pathway (*i.e.*, indoor soil vapour intrusion). The maximum groundwater concentrations of select analytes commonly associated with creosote impacts were a benzene concentration of 0.039 mg/L, naphthalene concentration of 2.6 mg/L, and PHC fraction F2 concentration of 4.7 mg/L, respectively. There are no Alberta Tier 1 Guidelines for soil vapour; however, soil vapour is considered through the human health risk assessment described below. The maximum soil vapour concentrations of select analytes commonly associated with creosote impacts were a benzene concentration of 14.6 $\mu g/m^3$, naphthalene concentration of 58 $\mu g/m^3$, and PHC fraction F1 and F2 concentrations of 3,700 $\mu g/m^3$ and 8,100 $\mu g/m^3$, respectively.

Updated Conceptual Site Model

An updated CSM was developed based on the results of the 2011 site investigation, and is summarized below.

- Canada Creosote is the only significant source of soil vapour contamination in the North Bow area.
- The Site is geologically complex, consisting of primarily coarse-grained unconsolidated deposits underlain by fractured bedrock. The contamination source distribution (both NAPL and dissolved phase) is also inferred to be complex and spatially variable.
- The depth to bedrock at wells drilled in 2011 was 3.7 m below ground surface near Broadview Road NW and 18th Street NW, and 6.5 m below ground surface along Memorial Drive. The historical investigations indicated a depth to bedrock of 5 m or greater at investigation locations.
- There is evidence of creosote impacts in bedrock and soil above bedrock at two 2011 wells along Broadview Road NW near 18th Street NW. One of the 2011 wells is a short distance further west than the previous historical locations where NAPL was encountered. At one location, a creosote-like LNAPL sheen was encountered at the water table.
- The depth to the water table in late February and early March 2011 was sufficiently high such that the NAPL source zones appeared to be submerged below the water table. The implications of this are described below. The results of groundwater monitoring indicated elevated and spatially variable concentrations of naphthalene and CWS PHC F2 fraction in wells along Broadview Road NW in the general area of 18th Street NW that were consistent with locations of monitoring wells with observed creosote impacts. Other Site wells had lower but detectable naphthalene concentrations.
- The results of the soil vapour monitoring indicated elevated oxygen concentrations near to atmospheric levels indicating a well-oxygenated vadose zone (*i.e.,* conditions conducive for aerobic biodegradation), and relatively low carbon dioxide, methane and combustible vapour concentrations.
- The primary chemicals of potential concern are vapour-phase analytes commonly associated with creosote, which include BTEX, naphthalene, F1 and F2. However, the concentrations of these compounds were relatively low compared to other sites where much higher soil vapour concentrations have been measured near to creosote-impacted soil. Note that as part of the human health risk assessment a broad list of analytes were evaluated.
- Testing of soil vapour for a large list of the PIANO (paraffins, isoparaffins, aromatics, naphthenes, and olefins) compounds did not reveal other compounds of significant potential concern based on qualitative comparisons and the human health risk assessment.
- The shallow groundwater and deep soil vapour concentrations were not well correlated but soil vapour concentrations of naphthalene and xylenes were somewhat higher in areas with elevated groundwater concentrations of these parameters. However, the measured soil vapour concentrations were much lower (generally one to three orders of magnitude) than the concentrations predicted using the Henry's Law constant, which has also been commonly observed at other sites with dissolved hydrocarbon impacts and where aerobic biodegradation occurs.

The relatively low soil vapour concentrations that were measured in March 2011 represent a relatively weak source consistent with a dissolved phase source and a water table that was sufficiently high such that the NAPL source zones were likely submerged below the water table. For such sources, aerobic biodegradation is expected to result in relatively rapid attenuation of the vapours for the chemicals of potential concern identified above. The elevated oxygen concentrations and somewhat elevated carbon dioxide concentrations (carbon dioxide is produced from aerobic biodegradation) are indicators that aerobic biodegradation is occurring within the vadose zone and is resulting in attenuation of creosote vapour concentrations.

A potentially important finding is that the groundwater elevations during the soil vapour investigation in March 2011 were relatively high, which appears to be a result of the water levels in the Bow River. The water levels may be even higher in late spring due to spring runoff and consequent rise in the Bow River, but may be lower in late summer based on 2010 Bow River water level trends. Of significance is that the depth to groundwater in late February 2011 at the borehole with the shallowest depth to bedrock (3.7 m below ground surface) was approximately 0.5 m less than the depth to the bedrock surface at this location. If the groundwater level were to decline to below the bedrock surface, there may be greater potential for contaminants within bedrock to volatilize and consequently greater potential for elevated soil vapour concentrations. The potential significance of water table fluctuations is not known, but additional monitoring of water levels and soil vapour concentrations is recommended, as discussed below.

Human Health Risk Assessment

The human health risk assessment applied a soil vapour attenuation factor (indoor air concentration divided by the soil vapour concentration) of 0.01 consistent with AENV policy to predict indoor vapour concentrations in residential single-family or duplex houses, which are assumed to have basement or crawlspace construction of typical depth for residential houses, but that do not include a sump for pumping of groundwater (the attenuation factor assumption should be reviewed and updated as warranted based on proposed additional monitoring). The results of the human health risk assessment indicate that the predicted risks for residents were found to be negligible based on the soil vapour measurements collected on-Site. Potential risks to construction workers involved in subsurface activities exposed to groundwater and trench air were above target risk levels for benzene, benzo(a)pyrene equivalents, chloroform, ethylbenzene, naphthalene, 1,2,4-trimethylbenzene and CWS PHC F2.

Recommendations

The 2011 investigation provides important information on the nature and distribution of contamination sources, the shallow dissolved groundwater plume, and soil vapour concentrations in the North Bow area. Nevertheless, there are data gaps that remain that are recommended to be addressed through further monitoring at the Site. Further work is needed to develop the details of the possible additional monitoring program; the objective here is to provide recommendations at a high level for initial consideration, as summarized below.

- It is recommended that additional boreholes and monitoring wells be constructed to assess the depth to bedrock and characterize contamination source (NAPL) zones, focussing on the area with the shallowest bedrock observed during the 2011 field program (along Broadview Road NW), but moving outward from this area, as warranted.
- Based on the results of the above bedrock characterization, a focussed likely limited scope supplementary soil vapour probe installation program is recommended.

- Regular monitoring (or download and analysis of data) of Bow River levels and groundwater levels is recommended.
- An additional monitoring event is recommended when the groundwater levels are lower (likely late summer), which should include collection and analysis of soil vapour samples from existing and new probes, and analysis of groundwater from select monitoring wells.

On the basis of the additional data obtained, the human health risk assessment should be updated, and possible requirements for further assessment and risk management measures for possible mitigation of soil vapour intrusion should be evaluated.

Groundwater monitoring indicates impact to groundwaters and concentrations of select analytes above Alberta Tier 1 Guidelines for potable water use at several monitoring wells. Drinking water is not currently consumed on-Site as the area is municipally serviced; however, administrative controls or covenants may need to be put in place to prevent hypothetical future groundwater consumption.

A detailed health and safety plan should be developed for construction workers who undertake subsurface activities at the Site involving excavation of trenches or any excavation that is deeper than typical shallow excavation for single-family or duplex residential houses. Possible risk management and health and safety requirements should be reviewed and updated as warranted based on proposed additional monitoring. The use of personal protective equipment and regular monitoring of trench air quality will be required to reduce worker exposure to volatile substances. Air monitoring results should be compared to applicable regulatory standards or limits including Alberta Occupational Exposure Limits.

Risk management measures should be implemented to minimize the potential for permeation or intrusion of contaminants into water mains. Such measures could include the removal of contamination from trench corridors and/or use of pipe system materials that are resistant to creosote contamination.

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LIST OF ACRONYMS

AB	Alberta
AENV	Alberta Environment
ACH	air change per hour
API	American Petroleum Institute
BAF	bioaccumulation factor
BC MoE	British Columbia Ministry of Environment
bgs	below ground surface
BW	body weight
BTEX	benzene, toluene, ethylbenzene and xylenes
CALA	Canadian Association for Laboratory Accreditation Inc. (CALA)
CAEAL	Canadian Association for Environmental Analytical Laboratories (replaced by CALA)
carcinogenic	cancer-causing chemical
CBC	Canadian Broadcasting Corporation
CCME	Canadian Council of Ministers of the Environment
CH_4	methane
CO_2	carbon dioxide
COPC	contaminant of potential concern
CPPI	Canadian Petroleum Products Institute
CPR	Canadian Pacific Railway
CSM	conceptual site model
CWS-PHC	Canadian Wide Standards - Petroleum Hydrocarbon Compounds (CCME guidance)
DF	difference factor
DNAPL	dense non-aqueous phase liquid (more dense than water)
DUA	domestic use aquifer
EMS	Emergency Medical Services
ESA	Environmental Site Assessment
F1	Petroleum Hydrocarbons in the carbon range of C6-10 (CCME)
F2	Petroleum Hydrocarbons in the carbon range of C11-16 (CCME)
FWAL	freshwater aquatic life
GC	gas chromatography
GPS	Global Positioning System
g/g	gram per gram
HHRA	Human Health Risk Assessment
HQ	hazard quotient
IARC	International Agency for Research on Cancer
ILCR	Incremental Lifetime Cancer Risk
IRIS	Integrated Risk Information System
LCS	laboratory control sample
LNAPL	light non-aqueous phase liquid (less dense than water)
MDL	Method Detection Limit
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
NELAP	National Environmental Laboratory Accreditation Program
O_2	oxygen
PAH	polycyclic aromatic hydrocarbons
PCP	pentachlorophenol
PHC	Petroleum hydrocarbon
PIANO	paraffins, isoparaffins, aromatics, naphthenes, and olefins
PID	photo ionization detector
PQRA	Preliminary Quantitative Risk Assessment
ppm	parts per million (Equivalent to mg/Kg or mg/L)

PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
QC	quality control
QRA	Quantitative Risk Assessment
RfD	Reference Dose
RFP	Request for Proposal
RL	reporting limit
RPD	relative percent difference
RsC	Risk-specific Concentration
RTK	Real Time Kinematic
SABCS	Science Advisory Board for Contaminated Sites (British Columbia)
SCN	Sample Control Number
SS-HASP	Site-Specific Health and Safety Plan
TCDD	2,3,7,8-tetrachloro-dibenzo(p)dioxin
TOC	total organic carbon
TRC	Toxicology Research Centre
TRV	toxicity reference value
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
μg/L	micrograms per litre (Water)
$\mu g/m^3$	micrograms per metre cubed
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Alberta Environment (AENV) to prepare a human health risk assessment (HHRA) for a primarily residential area of Calgary, Alberta, located north of the Bow River and the former Canada Creosote Site (Figure 1), henceforth referred to as the "North Bow Site" or "Site". The HHRA is required to evaluate creosote-related contamination that has migrated from the Canada Creosote site, located south of the Bow River, to the North Bow Site area. Wood-preserving operations historically took place on the Canada Creosote Site and involved the use of tars, creosote, petroleum oils and pentachlorophenol.

The purpose of this project is to assess possible human health risk associated with potential exposure to subsurface contamination originally from the Canada Creosote site (primarily creosote) by residents and utility workers at the North Bow Site. The primary exposure pathway of concern for the Site is soil vapour intrusion into buildings and utility trenches. Previous assessments have identified creosote-related impacts to the north of the Bow River between approximately 14th Street and 19th Street. Creosote impacts that are present at the Site consist of dense non-aqueous phase liquid (DNAPL) and light non-aqueous phase liquid (LNAPL) and dissolved chemicals in groundwater. The distribution of the DNAPL, LNAPL and dissolved plume have not been delineated by this HHRA.

The project study area is between 15th Street NW to 19th Street NW (east to west) and between Westmount Boulevard NW and Westmount Road NW (south to north). The Site is primarily developed with single-family homes, streets and alley ways. There are also two churches, two parks, and properties occupied by the Canadian Broadcasting Corporation (CBC) Calgary Radio and Television, the Bow Valley Lawn Bowling Club, and Firehall and Emergency Medical Services (EMS) Station #6. The Site is approximately 650 m long and 350 m wide.

An initial HHRA was completed in 1993 for the Site by O'Connor Associates Environmental Inc. (O'Connor 1993). This updated risk assessment has been commissioned by AENV as a result of new guidelines, toxicity values and risk guidance that have been developed since 1993, and because the contamination distribution at the Site may have changed since the time the O'Connor assessment was completed. The scope of work for this project consists of a review of background information, preparation of a Phase I Environmental Site Assessment (ESA), a site investigation program consisting primarily of groundwater and soil vapour characterization completed on public lands, development of a conceptual site model (CSM), and completion of a HHRA, comprised of a Problem Formulation and preliminary quantitative assessment of potential exposure and risk for relevant pathways.

The purpose of the Phase I ESA was to summarize information on the potential presence and extent of contamination and to guide the design of the site investigation program at the Site. The Phase I ESA is documented in a separate report (Golder, 2011a) with a summary provided in this report. The field investigation approach was to choose sampling locations in areas of known or likely creosote impact based on historical information, and to then move outward from these areas in an approximate grid pattern. Sample locations were chosen along the edges of roads and property lines, within the City of Calgary owned lands, as access permitted. The investigation program consisted primarily of characterization of shallow groundwater and soil vapour quality near to the water table given the focus on the soil vapour intrusion pathway. Given this focus, the scope of work for this project did not include a detailed hydrogeological assessment nor delineation of DNAPL,

LNAPL or the dissolved phase groundwater plume, and the work only included a limited number of investigation locations to evaluate deeper subsurface conditions.

This report is structured as follows:

- Section 2 presents an overview of the regulatory framework;
- Section 3 presents a review of background information;
- Section 4 presents an summary of the Phase I ESA prepared for this project;
- Section 5 presents an initial conceptual site model (CSM) based on historical information;
- Section 6 describes the field program approach, rationale, scope and methods;
- Section 7 presents the results of the quality assurance/quality control (QA/QC) program;
- Section 8 presents the results of the field investigation;
- Section 9 presents the human health risk assessment; and,
- Section 10 provides conclusions and recommendations.

Golder's proposal for this project was dated September 3, 2010, and was prepared in response to AENV RFP #AENV-EMSR-110107. Authorization to proceed with the work was provided by AENV in November 2010.

2.0 REGULATORY FRAMEWORK

Under the current Alberta regulatory regime as defined through the AENV Alberta Tier 1 Soil and Groundwater Remediation Guidelines - December 2010 (AB Tier 1 Guidelines) and AENV Alberta Tier 2 Soil and Groundwater Remediation Guidelines - December 2010 (AB Tier 2 Guidelines), there are three approaches available for the assessment, management and remediation of contaminated sites. The three approaches are:

1) Tier 1 – Generic remediation guidelines;

2) Tier 2 – Site-specific remediation guidelines based on the modification of Tier 1 Guidelines; and

3) Exposure Control – Risk management through exposure barriers or administrative controls based on site-specific risk assessment.

Tier 1, Tier 2 and Exposure Control are each intended to provide an equivalent level of human health and ecological protection. However, regulatory closure is only available for sites managed to achieve Tier 1 and Tier 2 remediation guidelines. Regulatory closure means that no conditions are imposed on the use of the site, within a given land use. On-going risk management and/or land use restrictions apply to sites managed under an Exposure Control scenario.

As part of the AB Tier 1 and Tier 2 Guideline approach, soil and groundwater guideline values are calculated for five types of land use: natural areas, agricultural, residential/parkland, commercial, and industrial. Land use determination is based on the most sensitive land use applicable to the site, or within 30 m of the site. Furthermore, soil grain size is also considered when comparing soil and groundwater quality data to Guidelines and when assessing contaminant groundwater transport. The AB Tier 1 and Tier 2 Guidelines calculate separate guideline values for coarse-grained soils (median grain size > 75 µm) and fine-grained soils (median grain size < 75 µm). The selection of appropriate guidelines is based on the soil type that controls contaminant migration at the site. Land use assessment and soil texture characterization is required to select the most appropriate AB Tier 1 or Tier 2 Guidelines for a given site.

2.1 Tier 1 Guidelines

The AB Tier 1 Guidelines are generic; that is, they are developed to protect sites at the more sensitive end of the land use range and can be used at most sites without any modification. The AB Tier 1 Guidelines are protective of both human and ecological receptors, and consider potential use of groundwater for potable purposes and protection of aquatic life. The Tier 1 Guidelines do not allow for the elimination of pathways or receptors. This can only be done under a Tier 2 Guideline approach.

The AB Tier 1 Guidelines are often used for the initial screening assessment of soil and groundwater environmental quality. If measured concentrations exceed the AB Tier 1 Guidelines, then a Tier 2 or Exposure Control approach may be necessary.

2.2 Tier 2 Guidelines

There may be site-specific circumstances that make the application of the AB Tier 1 Guidelines unnecessarily conservative in terms of potential human and ecological exposure, or that make the assumptions incorporated in the models underlying Tier 1 invalid. Under such circumstances, a Tier 2 approach may be necessary. There are three options for determination of guidelines under the Tier 2 approach:

1) Modifying the Tier 1 Guidelines by exclusion of exposure pathways and receptors that are not operable at the site;

2) Adjusting the Tier 1 Guidelines using site-specific values for certain modelling parameters determined from detailed site assessment data; and

3) Site-specific risk assessment.

Within the Tier 2 approach, exposure pathways for the protection of a Domestic Use Aquifer (DUA) or potable groundwater source, surface water supporting freshwater aquatic life (FWAL) and surface water used for wildlife watering may be excluded if not applicable. For all applications, the potential for future use of a surface water body must be considered regardless of current use. Similarly, where an aquifer is defined as a DUA or can be pursued for irrigation in agricultural land, the Tier 1 guideline for groundwater applies at any point in the aquifer, regardless of current water use.

The elimination of the DUA pathway under Tier 2 requires the completion of specific intrusive hydrogeological studies involving advancement of boreholes installed with monitoring wells and hydraulic conductivity testing. The FWAL pathway may be eliminated for petroleum hydrocarbon contaminants if the 100 year flood area of the surface water body is not within 300 m down-gradient, or 100 m up-gradient of a source of impact.

2.3 Exposure Control – Risk Management

Exposure Control relies on ongoing risk management to control risks to human and ecological receptors. This management option is generally used when it is not practical to achieve Tier 1 or Tier 2 Guidelines. While this option is available for management of risk at contaminated sites, it is not eligible for regulatory closure and AENV may require the implementation of on-going risk management and/or land use restrictions, or until such time as concentrations have decreased below AB Tier 1 or 2 Guidelines.

2.4 Application of the Alberta Environment Guidelines

The AB Tier 1 Guidelines were derived using relatively conservative parameters and assumptions, corresponding to defined generic exposure scenarios and five generic land use categories. As such, they are intended and expected to be protective of human health and the environment in the large majority of cases. However, there may be situations in which AB Tier 1 Guidelines are not applicable, either where conditions violate one or more assumptions underlying the modeling used in the guideline derivation, or where actual exposure conditions or receptors at a site are more sensitive than those considered in the development of the generic exposure scenario. Conditions where the guidelines are not applicable include the following:

- Contaminants present within 30 cm of a building foundation;
- Unusual structural building features;
- Groundwater flow to stagnant waterbodies;
- Groundwater within 10 m of a surface waterbody;
- Very coarse textured materials;
- Fractured bedrock;

- Contamination source length greater than 10 m (unless source volume is less than 300 m^3); and
- When inorganic contaminants occur in organic soils.

The AB Tier 1 Guidelines describe the assumptions for coarse-grained setting as follows:

"Groundwater velocity is a function of both hydraulic conductivity and hydraulic gradient and are assumed to be $1x10^{-5}$ m/s and 0.028 m/m, respectively, for Tier 1 Guideline derivation. The resulting Darcy groundwater velocity is 3 x 10^{-7} m/s. The rate of vapour transport through coarse soil is largely governed by vapour permeability, which is assumed to be $6x10^{-8}$ cm^2 for Tier 1 guideline derivation."

A soil-air permeability of $6x10^{-8}$ cm^2 (*i.e.*, approximately 6 Darcies) is representative of a fine to medium sand. As described in Section 7 of this report, the unsaturated zone soils at the Site include sand and gravel deposits, underlain by bedrock that includes fractures. While the AB Tier 1 Guidelines would likely not be applicable based on the above definition, for completeness, groundwater chemistry data has in this report been compared to the AB Tier 1 Guidelines for residential land use.

In Alberta, there are currently no remediation guidelines for evaluating the significance of measured soil vapour concentrations (*i.e.*, the AB Tier 1 Guidelines are limited to soil and groundwater). In the absence of soil vapour guidelines, Alberta Environment indicates that the Technical Guidance No.4 developed by the BC Ministry of Environment (MoE) (BC MoE, 2010) and/or draft Health Canada Vapour Intrusion Guidance may be used as a starting point for conducting a preliminary screening assessment of potential risks (Mr. Norman Sawatsky, Alberta Environment, personnel communication, May 31, 2011).

For the purposes of assessing soil and groundwater quality at the Site, the elimination of the drinking water / DUA pathway under Tier 2, and Exposure Control approaches were not considered at this time given the requirement to complete hydrogeological studies and/or to obtain stakeholder and AENV's acceptance of a proposed Exposure Control approach.

Grain-size analysis was conducted on four soil samples collected during the HHRA. The results indicated that the percentage of soil particle size less than 0.075 mm (the threshold for fine-grained soil) was between 31% and 89%, and was greater than 50% for three of four samples, indicating one sample was classified as coarse-grained and three soil samples were classified as fine-grained (Table 1). However, based on visual observation, the majority of the unsaturated soil was inferred to be coarse-grained.

The current City of Calgary land use designation for the Site is R-C2, Residential-Contextual One/Two Dwelling. Consequently, residential/parkland land use is considered applicable to the Site.

The nearest surface water possibly capable of sustaining aquatic life is the Bow River located approximately 45 m south of the Site. Therefore, the FWAL pathway cannot be eliminated under a Tier 2 guideline approach.

Based on the Site's land use designation and soil type, the applicable guidelines are the AB Tier 1 Guidelines based residential/parkland land use for the most stringent between fine- or coarse-grained soil guidelines.

3.0 REVIEW OF BACKGROUND INFORMATION

To develop an understanding of site conditions, Golder completed a preliminary review of documents listed in Table 2. The list in Table 2 was developed from information obtained from Alberta Environment, Golder files for work conducted for AENV or the City of Calgary, and reports listed in Keystone (2003). A brief summary of key information obtained from these documents is presented below.

3.1 Canada Creosote Site Field Investigation (1990)

The former Canada Creosote Site is located adjacent to the south bank of the Bow River and covered an area of 18 hectares. Wood-preserving operations historically took place on the site and involved the use of tars, creosote, petroleum oils and pentachlorophenol. Both DNAPL and LNAPL were found to be present at the Canada Creosote Site.

The former Canada Creosote Site is bounded to the north by the Bow River, to the east by 16th Street SW, to the south by 9th Avenue SW and the Canadian Pacific Railway (CPR) rail-line, and to the west by the City of Calgary snow dump area.

The former Canada Creosote plant was constructed on a flood plain terrace of the Bow River. Sediments deposited in the floodplain consist of fluvial channel gravels and sands. From place-to-place, the fluvial channel gravels and sands are overlain by silts that were deposited as overbank deposits during periods of flooding of the Bow River. Bedrock beneath the fluvial channel gravels and sands consists of the Paskapoo and Porcupine Hills Formations, which are thickly bedded; calcareous, cherty sandstone; siltstone and mudstone; minor conglomerate; thin limestone, coal and tuff beds. The upper portions of these formations have been eroded by river action prior to and during deposition of the fluvial channel gravels and sands.

Environmental reports prepared for the site indicate that a pool of DNAPL (creosote and related compounds) was encountered beneath the site and that the DNAPL body extended out beneath the Bow River. In addition to the denser-than-water creosote, localized areas of LNAPL with creosote-like characteristics were encountered as indicated by separate-phase product encountered in monitoring wells. Pentachlorophenol (PCP) contamination was also found in soil and groundwater at the site.

3.2 Broadview Utility Excavation Monitoring (1991)

The first documented discovery of creosote north of the Bow River was in 1991 where creosote was encountered in open excavations when the City of Calgary was performing a waterworks construction project on Broadview Road NW (Figure 2). Golder (1991) was retained to conduct monitoring and sampling activities. The findings of this work are summarized as follows:

- The depth to the base of the trench was generally between 4.5 and 6 m below ground surface;
- Groundwater seepage was observed below about 2.5 m depth below ground surface;
- Creosote was first encountered on June 3, 1991, at STN +96 to STN 1+05 (the station numbers refer to metres measured west from the fire hydrant at the corner of Broadview Road NW and 17th Street);
- Liquid creosote was observed to be migrating into the base of the excavation from the north side wall between STN 1+75 and STN2+05; LNAPL in the form of a sheen entered the excavation from the south wall; creosote contamination appeared continuous in this interval;

- Creosote odours were detected at STN 2+80; creosote stained soil was observed at STN 2+85 at the base of the excavation; further excavation was temporarily ceased at this location;
- The soil stratigraphy encountered during excavation, in sequence from ground surface, generally consisted of topsoil, silty sand fill, gravelly sand to sand, and sand and gravel. Clayey till was also observed over a portion of the excavated trench length;
- Shale bedrock was encountered at 5.7 m (STN 2+60) and 5 m (STN 2+85) below ground surface;
- A section of the 150 mm diameter PVC water main was replaced with "yellow-jacket" steel pipe; and
- Approximately 880 tonnes of fill that was suspected to be contaminated was disposed of off-site at a licensed landfill.

A creosote-impacted sample analyzed for polycyclic aromatic hydrocarbons (PAHs) as part of the monitoring program indicated naphthalene (130,000 ppm), 1-methyl naphthalene (570,000 ppm) and 2-methyl naphthalene (360,000 ppm) concentrations were highly elevated, while concentrations of other PAHs were at least an order-of-magnitude lower. The results of analysis of a groundwater sample indicated that the naphthalene (53 ppm), 1-methyl naphthalene (62 ppm) and 2-methyl naphthalene (42 ppm) concentrations were elevated together with the C1-anthracene (77 ppm) and fluorene (61 ppm) concentrations. Relatively lower concentrations of benzene (0.025 ppm), toluene (0.2 ppm), ethylbenzene (0.17 ppm) and xylenes (0.72 ppm) were also measured.

3.3 North Bow Phase I ESA (1991)

Keystone (1991) completed a Phase I ESA for the North Bow area in September 1991 as a follow-up assessment to the Golder (1991) monitoring program. The study area was between the Bow River and Bowness Road NW, and between 17th and 19th Street NW. The Phase I ESA indicated a high probability that chemicals from the Canada Creosote Site had impacted this area, and also identified gasoline service stations and dry cleaners (locations not specified, but identified as general concerns) as potential sources of chemicals of concern.

3.4 Memorial Drive Geotechnical Field Investigation (1992)

In 1992, Golder conducted an investigation with dual objectives of providing data on the presence of DNAPL and potential migration pathways, and geotechnical information for remediation design purposes (Golder, 1992). The investigation included 29 boreholes drilled long Memorial Drive between 22nd Street West and 13th Street West and a geophysical survey along Memorial Drive to identify possibly low areas in the bedrock surface that could represent channels for potential migration of creosote to the north.

The geologic profile at boreholes generally consisted of topsoil, underlain by sandy gravel, and sand and gravel deposits, underlain by glacial till at selected boreholes, which in turn was underlain by bedrock. The descriptions in the borehole logs indicate that the bedrock surface slopes downward towards the northeast. Fine sand and/or silt layers were encountered at most boreholes excluding AC-92-03 (between 16th and 17th Street) and AC-92-04 (just west of 19th Street West). At wells along Memorial Drive:

- LNAPL was observed as an oily film on the water level probe in wells AC-92-03, AC-92-04S, AC-92-05, AC-92-06, AC-92-7 and AC-92-16; and
- DNAPL was encountered in well AC-92-06R at thicknesses of up to 8.46 m.

During drilling, creosote staining was visible in the bedrock fracture zone at depths of 1 to 5 m below the soil/bedrock interface, at boreholes AC-92-4, 5 and 6. The field observations are summarized in Figure 2.

3.5 North Bow Site Field Investigation and Risk Assessment (1993)

In 1993, O'Connor Associates Environmental, Inc. conducted an investigation in the North Bow area between the Bow River and Bowness Road NW and 17th Street NW and 19th Street NW (O'Connor, 1993). Eleven boreholes completed as groundwater and soil vapour monitoring wells were installed.

The soil profile at borehole locations in Broadview Road NW generally consisted of gravel fill overlying sand and gravel extending to the bedrock surface, which was encountered at approximately 5 m below grade. Silt fill was encountered beneath the gravel fill at one location. The soil profile at boreholes beside Memorial Drive NW was generally comprised of silt and sand topsoil overlying silt, sand, gravel and cobble materials. Bedrock was encountered at approximately 8 m below grade. The average moisture content in soil samples from the vadose zone was 8 percent, while the average total organic carbon content was 0.55 percent.

The average depth to the water table was approximately 3.5 m below grade in March and May 1991, and 4.3 m below grade in August and October 1992. Along Broadview Road NW, the shallow groundwater flow direction was stated to be north to northwest on August 21, 1992 and October 7, 1992. Along Memorial Drive, the shallow groundwater flow direction on these dates was towards the south to southeast (*i.e.*, toward the Bow River). No explanation was provided in the report for the apparent divergent groundwater flow directions.

DNAPL was not observed in any piezometers installed by O'Connor in the North Bow area. DNAPL was encountered during drilling BH-1 in Broadview Road, at a location where DNAPL had been observed during the water line trench excavation (between STN 1+75 and 2+05). No DNAPL or creosote staining was noted in wells along Memorial Drive, although most wells were shallow and only three wells extended to bedrock (but did not penetrate the bedrock for any significant distance). The maximum headspace vapour concentration in soil samples measured by a combustible gas detector was 170 ppm. The maximum well headspace concentration measured by a combustible gas detector was 12% of the lower explosive limit (the report did not indicate what gas the detector was calibrated to).

Groundwater samples were analyzed for PAHs, U.S. EPA priority pollutant volatiles, phenols/chlorophenols and total purgeable and extractable hydrocarbons. Soil vapour samples were analyzed for the distribution of hydrocarbon constituents (GC scan), target U.S. EPA volatiles, PAHs, chlorophenols and non-target compounds. Based on a review by the Toxicology Research Centre (TRC) of the University of Saskatchewan, a short-list of detected compounds of toxicological concern were identified for inclusion in the risk assessment, as follows: benzene, benzo (a) anthracene, carbon disulphide, chloroform, dichloromethane, n-hexane, naphthalene, pentachlorophenol, tetrachloroethylene, xylene and 2,3,7,8-tetrachloro-dibenzo(p)dioxin (TCDD). The results of groundwater and soil vapour analyses are presented in Tables 3 and 4, respectively. The four compounds with the highest soil vapour concentrations were methylene chloride (72,000 µg/m^3), limonene (17,100 µg/m^3), C4 alkyl benzenes (4,400 µg/m^3) and xylenes (4,100 µg/m^3). Methylene chloride and limonene are chemicals that would not be expected to be associated with creosote.

The indoor air concentrations were predicted using a proprietary one-dimensional vapour intrusion model developed by O'Connor using measured groundwater and soil vapour concentrations. The O'Connor model is similar to the Johnson and Ettinger (1991) model. The vapour attenuation factors for the modeling are not

reported in detail except as reference made that the vapour attenuation factor predicted by the O'Connor model ($1x10^{-4}$) compared favourably to the attenuation factor predicted by the Johnson and Ettinger model.

The predicted maximum compound-specific incremental cancer risk was $1x10^{-6}$, based on a concentration of chloroform measured in the soil vapour. The predicted maximum non-cancer hazard quotient was $2.4x10^{-2}$, based on the concentration of naphthalene in the groundwater. The risk assessment concluded that the incremental human health risks associated with measured concentrations were not considered to be significant.

3.6 Former Service Station #4-14th Street

A Shell service station was formerly located at #4-14th Street northeast of the Site. An initial soil vapour survey suggested the presence of contamination at the site. Site remediation at the former service station included removal of 1,500 m^3 soil in 1990 and 150 m^3 in 1995. Follow-up sampling indicated no remaining hydrocarbon impacts and that the site "achieved Level II coarse-grained risk management criteria for inhalation" (see Table 2). A follow-up environmental site assessment conducted in 1997 indicated that soil and groundwater concentrations were below guidelines applicable at the time.

3.7 Keystone Compilation Report (2003)

The Keystone (2003) compilation report was written to attain a better understanding of the stratigraphic, hydrogeological, and physiological setting in which creosote was found. In addition, potential conceptual models to explain creosote migration from the hypothesized source of the creosote contamination, the former Canada Creosote Site, to the North Bow area were provided. The geology of North Bow area was characterized as follows:

- Sand and gravel fill, underlain by
- Sand, underlain by
- Sand and gravel, underlain by
- Weathered bedrock, underlain by
- Interbedded shale and sandstone bedrock.

A distinct clay layer was observed on the north bank of the Bow River that appeared to start approximately 90 m west of 17th Street NW and extend to approximately 16th Street NW and possibly further east. The shale and sandstone bedrock surface was generally 7 m to 10 m bgs on the south bank and generally 7 m to 8.5 m bgs on the north bank. There was limited piezometric data, but Keystone anticipated that shallow groundwater in the North Bow area flows south toward the Bow River, but near to the river takes on a southeast direction matching the gradient of the river.

The ground surface topography of the former Canada Creosote Site was described as relatively flat with a relief of less than 3 m across the site. The ground surface on the north side of the Bow River was also relatively flat. There were no morphological indications of potential preferential pathways for creosote migration such as channels visible at surface. The bedrock surface generally sloped downward towards the north to northeast, although bedrock depressions were encountered at boreholes on the Canada Creosote Site, and from

geophysics were inferred to be present elsewhere. The bedrock depressions may have a north-south orientation.

The chemistry of samples analyzed from wells north and south of the Bow River indicated variability with respect to the chemical signature, but overall, a similar range of compounds representative of creosote were detected. There was greater variability in PCP concentrations, possibly due to fractionation of PCP that may have occurred during migration to the north.

Two models for the migration of creosote from the former Canada Creosote Site to the North Bow area were presented. The first model hypothesized gravity flow of creosote DNAPL on top of the northward sloping bedrock surface. The second model hypothesized creosote DNAPL migration through fractures in bedrock driven by the head of creosote in pools present in bedrock depression(s) on the former Canada Creosote Site. Keystone indicated that further investigation is required to test these hypotheses.

3.8 1724 Westmount Blvd. NW (CBC Site)

A Phase I ESA was completed in 2005 by Jacques Whitford for the CBC building site located at 1724 Westmount Boulevard NW (Jacques Whitford, 2005). The Phase I ESA concluded that based on the highly permeable soils in the area of the CBC site and northerly direction of regional groundwater flow (*i.e.*, towards the CBC site), land use south represents a potential environmental concern to the CBC site. The land uses identified were the storage and handling of wood-preserving chemicals (*e.g.*, constituents including naphthalene, PCP, creosote and metals) at the former wood treatment and lumber manufacturing plants and the storage and handling of hydrocarbons at the former and current oil refineries, service stations, and bus terminal.

Jacques Whitford completed a Phase II ESA in July 2006 (Jacques Whitford, 2006). The findings of this study are summarized as follows (monitoring well location plans are provided in Appendix A):

- The soil stratigraphy consisted of sand and gravel, underlain by clay at approximately 6 m depth below ground surface, and siltstone bedrock at 7.2 m to 9.2 m depth;
- Fourteen monitoring wells were installed at the CBC site;
- The depth to the water table was 3.4 m to 4.1 m below ground surface on April 18, 2006; the groundwater levels were considered “high” due to the high water level in the Bow River; on April 18, 2006, the geodetic elevation of water in the Bow River near the site was 1047.01 m, while the average elevation of the water table on the site was 1046.66 m;
- The interpreted shallow groundwater flow direction was to the northeast;
- Six wells (MW2A-7A) had well screens that straddled the water table [and therefore potentially could be utilized for the purposes of monitoring soil vapour for this HHRA, subject to quality control testing to ensure well seals are not leaking];
- Creosote DNAPL was encountered in the eastern part of the CBC site at well MW1B at 9.3 m depth below ground surface, and in the central part of the site at MW3B at 5.2 m depth, and at MW6B at 3.9 m depth;
- The maximum thickness of DNAPL in wells was 5.2 m at MW6B;

- Volatile organic compound concentrations of soil vapour samples from well headspaces measured with a photoionization detector (PID) ranged from non-detect concentrations to 118 ppm (maximum concentration at MW6B);
- No laboratory testing of soil vapour samples were conducted; and
- Elevated concentrations of PAH, petroleum hydrocarbon and phenolic compounds were measured in groundwater.

The maximum BTEX concentrations were measured at well MW7B where the benzene concentration was equal to 0.096 mg/L, the toluene concentration was 0.407 mg/L, the ethylbenzene concentration was 0.207 mg/L and the xylenes concentration was 1 mg/L.

The individual PAH compound with the highest concentration was naphthalene; the highest concentration was measured at well MW1A, where the concentration was 25.6 mg/L, followed by MW1B, where the concentration was 22.6 mg/L. The next highest naphthalene concentration, 5.7 mg/L, was measured at MW7B, followed by 2.6 mg/L measured at MW2B. In general, higher naphthalene concentrations were measured in wells along the west and south sides of the CBC site (compared to other parts of the site), and in the deeper rather than shallower well pairs.

A quantitative risk assessment (QRA) was completed in 2007 by Jacques Whitford (Jacques Whitford, 2007). The soil vapour intrusion pathway was the only exposure pathway retained for quantitative analysis. The chemicals retained for the risk assessment were F2 and naphthalene for soil, and F2, selected PAHs expressed as toxicity equivalence (TEQ) to benzo(a)pyrene, anthracene and pyrene for groundwater. The soil vapour concentrations were estimated from soil and groundwater concentrations using a partitioning model (no soil vapour monitoring was conducted). The Johnson and Ettinger model was used to predict indoor vapour concentrations using parameters considered representative of a 2-storey cinderblock building with concrete slab-on-grade foundation. Indoor air monitoring was also conducted in the building. The results of this assessment indicated that the predicted human health risks were within acceptable limits.

3.9 1928 and 1940 Westmount Blvd. NW (EMS No. 6 Site)

A Phase II ESA of the Emergency Medical Services (EMS) Station No. 6 located at 1928 and 1940 Westmount Blvd. NW was completed in 2007 by UMA Engineering Ltd. (UMA, 2007). The findings of this study are summarized as follows (monitoring well location plans are provided in Appendix A):

- The soil stratigraphy consisted of sand & gravel, underlain by clay and siltstone bedrock at an approximate depth of 7 m bgs;
- Three monitoring wells were installed at the EMS site;
- The depth to the water table was approximately 4 m bgs in September 2007; the water table was above the top of the screen at MW7-01 and just below the top of the screen at wells MW07-2 and 3 (and therefore these wells are unlikely to be suitable for soil vapour sampling for this HHRA);
- No measureable LNAPL or DNAPL was encountered in wells but sheens were detected in two wells (MW7-02 & 03) along the west boundary of the EMS site; borehole logs also indicated a sheen was observed on gravel at these locations;

- There were elevated naphthalene concentrations in groundwater at MW07-01 (2.3 mg/L), MW07-02 (3.7 mg/L) and MW07-03 (7.4 mg/L); the benzene concentrations were non-detect at all three wells, but toluene, ethylbenzene and xylenes were detected at wells MW07-02 and MW07-03. The maximum individual BTEX concentration was measured for xylenes (0.139 mg/L at MW07-03); and
- No soil vapour testing was conducted at the site.

A site-specific risk assessment of indoor air was conducted by UMA in 2007 (UMA, 2007). The findings of this risk assessment were as follows:

- Two indoor air samples were obtained from the EMS building;
- Air samples were collected for BTEX and naphthalene analyses using carbotrap sorbent tubes;
- Individual BTEX concentrations in indoor air ranged from 0.1 to 4.3 µg/m^3, naphthalene concentrations were less than detection limit (0.7 µg/m^3); and
- Based on the measured indoor air concentrations, the predicted health risks were considered acceptable.

3.10 Review of Utilities

Information on subsurface utilities obtained from the City of Calgary is provided in Appendix B. The utilities shown on the City plans include storm sewers, sanitary sewers, water mains and gas lines that are located within streets and alley ways (not all utilities are shown on these plans). Not shown on plans are utility connections to individual buildings. The depths to pipe inverts vary between approximately 1.2 m and 4.5 m below ground surface. Along Broadview Road NW, the depth to the water main invert is as deep as 4.5 m between 18th and 19th Avenue SW. As subsequently discussed in this report, utilities may influence migration of contamination at the Site.

3.11 Groundwater Levels

Historical groundwater levels for the Site are available for several of the above previous site investigations, as summarized in Table 5.

3.12 Regional Geology and Water Well Database Review

The regional geology consists of fluvial channel gravel (*i.e.*, sand and gravel underlying in descending order by clay and siltstone) of the Post-Glacial Undivided Formation (Alberta Research Council, 1986).

A search of the Alberta Environment (AENV) Groundwater Information Centre database did not indicate any wells to be present on the Site. However, during the Site visit, ten environmental groundwater monitoring wells were observed on the CBC property (four wells could not be located). An additional four environmental groundwater monitoring wells were observed on the Firehall/EMS Station #6 property.

The AENV Information Centre database indicated that there were 12 water well records on file for the area within 500 m of the Site. In addition, eight environmental groundwater monitoring wells were observed on properties located approximately 65 m northeast of the Site. The monitoring wells observed to the northeast are inferred to be associated with a former service station at this location. A summary of the water wells located within 1 km of the North Bow Site is presented in Appendix C.

4.0 SUMMARY OF PHASE I ESA

As part of this HHRA, Golder was retained by AENV to conduct a Phase I ESA of the North Bow Site (the "Site"). The Phase 1 ESA is documented in a separate report prepared by Golder (2011a). At the time of the Phase I ESA, the Site was primarily developed with single-family homes, various streets, alley ways, two churches, two parks, the Canadian Broadcasting Corporation (CBC) Calgary Radio and Television, the Bow Valley Lawn Bowling Club and Firehall/EMS Station #6. .

The scope of the Phase I ESA was limited to identifying potential environmental concerns associated with potential soil and groundwater contamination by visual examination of surface features and operating practices, and from available documented information sources. During the Site visit none of the buildings or privately-owned properties on the Site were accessed, and no owners were interviewed. The key findings of the Phase I ESA are as follows:

- The Site was developed with a mixture of single-family residential properties, agricultural land and vacant/undeveloped land prior to at least 1911. The Site continued being developed with single-family residential houses over the years, while the CBC and Firehall/EMS Station #6 were constructed in the 1960s. The Site has since remained mainly residential with some properties redeveloped with new homes. Previous documents relating to the Firehall/EMS Station indicated the presence of creosote-related contamination inferred to be from the Canada Creosote Site, but no obvious impacts from possible Firehall/EMS-related activities. No issues of potential significant environmental concern were identified in association with other current and historical land uses at the Site.
- Surrounding properties to the east, north and west were mainly developed with residential homes prior to at least 1911. Commercial businesses have been present since prior to 1911 along 14th Street NW and Kensington Road NW, located approximately 90 m east and 50 m north of the Site, respectively. The properties adjacent south of the Site were undeveloped/vacant land until the construction of Westmount Boulevard NW and Memorial Drive NW in the 1950s.
- The area located approximately 150 m south of the Site and across the Bow River extending from approximately 19th Street SW to 14th Street SW and from 9th Avenue SW to the river has been occupied by various businesses of concern including: the City Incinerator, the Municipal Paving Department, the Calgary Paving Co. Ltd, River Side Lumber Co. Ltd., Great West Distributors Ltd., Canada Creosote/Domtar Creosote Plant as well as other light industrial and industrial activities (the Canada Creosote property). These former businesses were noted to have used, manufactured and/or stored various types of chemical substances including hydrocarbons, tar and creosote. Numerous reports were reviewed in connection with known subsurface impacts in this area; as well, as reports relating to impacts on the CBC and EMS properties suspected to be linked with historic activities at the Canada Creosote Site. Based on reviewed information pertaining to this area, its activities and impacts on the CBC property, it is considered to represent an issue of potential environmental concern.
- The property located at 2001 Bowness Road NW has been occupied by HiHo service station from 1946 to the present. This business is approximately 15 m west of the Site and was present at the time of the Phase I ESA site visit. A review of documentation on the HiHo service station site provided by AENV indicated no investigation results were available. Based on the distance between the Site and this service

station and the number of years it has been present, it is considered to represent a potential issue of environmental concern for the Site.

- At the time of the Site visit, eight monitoring wells were noted on the property located approximately 65 m northeast of the Site and across Westmount Rd NW. The property was developed with a single-storey building occupied by Lindal show homes, a two-storey multi-tenant commercial building and associated parking. This property is suspected to have changed municipal addresses over time including 1610 Westmount Rd NW, 1601 Kensington Rd NW and 99 – 14th Street NW. Various businesses of potential environmental concern are believed to have operated on this property in the past, including a mechanical repair shop and a fuel service station from 1954 to 1991. Based on the distance between the Site and this property and the presence of a historic service station, it is considered to represent a potential issue of environmental concern to the Site.
- The Phase I ESA concluded that historic businesses of potential environmental concern were identified in the general vicinity of the Site, and that a Human Health Risk Assessment is being conducted for the Site in order to better assess the potential risk to human health.

5.0 INITIAL CONCEPTUAL SITE MODEL AND SAMPLING PLAN

To guide the development of a sampling plan, an initial conceptual site model (CSM) was formulated that integrated information from the Phase I ESA and review of historical reports (refer to section 3) on the contamination source and distribution, hydrogeological conditions, unsaturated soil properties, subsurface utilities, general building characteristics, surface cover, drainage, climate and other factors that could influence soil vapour intrusion into the building.

5.1 Contamination Source Areas

Known areas with historic creosote-related NAPL impacts include:

- Along Broadview Road NW, creosote-related contamination was encountered during excavation for construction of a water main, both east and west of 18th Street NW; LNAPL was observed as a sheen on seepage water entering the excavation at depths inferred between 2.5 and 3 m below ground surface and DNAPL was observed entering the base of the excavation at depths that were on the order of 5 m below ground surface (detailed information on depths was not provided in historical reports);
- At the CBC site, DNAPL was encountered in three wells completed within the bedrock where the depth to the top surface of the DNAPL in wells ranged from 3.9 m to 9.3 m depth below ground surface; and
- Along Memorial Drive, DNAPL was encountered at one well approximately half-way between 17th Street NW and a line extending south from 18th Street NW. Creosote staining was observed in fracture zones at depths of 1 m to 5 m below the soil-bedrock interface at several other boreholes along Memorial Drive.

The migration pathways for DNAPL are complex, and Keystone (2003) hypothesized that DNAPL may have migrated and possibly is continuing to migrate either on top of the bedrock surface or through fractures within the bedrock. The depth to bedrock based on historical information in areas where boreholes were completed within the North Bow Site area appears to be shallowest along Broadview Road NW near 18th Street NW where the depth at one location was approximately 5 m bgs. At the CBC and EMS sites, the depth to bedrock was approximately 7 m bgs. Variable thicknesses of DNAPL, which were up to approximately 8.5 m thick, were measured in three wells at the CBC site and one well along Memorial Drive. The thickness of DNAPL in a well does not reflect the thickness of DNAPL within the formation and is inferred to be highly exaggerated compared to the depth intervals that likely contain DNAPL within the bedrock. Although analysis of DNAPL migration is beyond the scope of this HHRA, the DNAPL in the bedrock may be under pressure and thus when a well penetrates DNAPL-containing fractures in the bedrock, the DNAPL pushes up in the well and partially fills the well. In the area of the CBC site, the bedrock appears to be overlain by clay, which may act as a confining unit that influences fluid pressures within the bedrock.

The historical testing of groundwater for dissolved-phase impacts was conducted at the CBC site, the EMS site, and at a limited number of wells along Broadview Road NW and Memorial Drive NW. Focusing on naphthalene as an indicator of creosote impacts, the highest dissolved naphthalene concentration (53 mg/L) was measured in groundwater from the unconsolidated soil deposits along Broadview Road NW where DNAPL impacts had been historically observed. The maximum naphthalene concentration at the CBC site was 26 mg/L, while at the EMS site, the maximum naphthalene concentration was 7.4 mg/L. For the CBC site, a comparison of the groundwater analysis results from shallow wells completed in unconsolidated deposits and deeper wells completed in the bedrock indicated that the deeper of the well pairs tended to exhibit higher naphthalene concentrations than the

shallower well pair. Based on the historical data, the DNAPL source and dissolved phase plume have not been delineated.

The picture that emerges with respect to the creosote contamination in areas previously investigated is a highly variable DNAPL source found within bedrock fractures below portions of the Site, and that appears to be present above the bedrock in an area along Broadview Road NW. The dissolved groundwater plume is also variable with large differences in concentrations observed over short distances. The historical data indicates uncertainty in the direction of groundwater flow, which appears could be both to the north or south depending on river stage, season and location on the Site. The direction of groundwater flow will influence the migration of the dissolved groundwater plume.

5.2 Potential for Volatilization and Soil Vapour Fate and Transport Processes

An understanding of the contamination source is important because of the implications for volatilization and the potential for soil vapour intrusion. The greatest potential for volatilization exists where NAPL is present above the water table. The available historical information indicates that the depth to groundwater ranges between approximately 3.4 m to 4.3 m; for this depth range the known NAPL zones based on historical information would appear to be below the water table. When NAPL is below the water table, chemicals must diffuse upward through water within the saturated zone and capillary fringe before there is the potential for volatilization to the soil vapour phase. For a dissolved phase source, there is less potential for volatilization compared to a NAPL source above the water table given that chemicals must again diffuse through the capillary fringe. This conceptual model is described in greater detail in guidance prepared by Golder for the Science Advisory Board for Contaminated Sites (SABCS) of British Columbia (Golder, 2011b) and other research publications (*e.g.*, Golder, 2008a). When developing the CSM, possible seasonal fluctuations in the water table should be considered.

Within the vadose zone, the main processes affecting migration of creosote-related soil vapours are chemical diffusion and aerobic biodegradation, although sorption of chemicals into naturally-occurring organic carbon may also influence soil vapour transport. Soil gas advection may be a significant process close to buildings due to building pressures, which can be positive or negative, depending on building properties and weather.

The soil lithology within the vadose zone at the Site is variable, but based on historical information generally consists of near-surface topsoil and fill deposits, underlain by interlayered native deposits consisting of sand and gravel, sand and silty sand. At the CBC site, the vadose zone soils appear to be generally finer-grained than those observed to the west and consist primarily of sandy silt with variable gravel content.

5.3 Aerobic Biodegradation

For NAPL sources submerged below the water table or dissolved groundwater sources, the near-water table soil vapour concentrations will tend to be low to moderate and aerobic biodegradation typically results in relatively rapid attenuation of hydrocarbon vapour concentrations to non-significant concentrations. This CSM is supported through observations at other creosote or coal-tar sites (*e.g.*, Hers *et al.*, 2010) and extensive research at petroleum hydrocarbon sites (Ostendorf and Kampbell, 1991; Ririe and Sweeney, 1995; Ririe *et al.*, 1998; Ostendorf *et al.*, 2000; Hers *et al.*, 2000; Roggemans *et al.*, 2002; Sanders and Hers, 2006; Davis *et al.*, 2009; Patterson and Davis, 2009). When evaluating aerobic biodegradation, the CSM should consider the

potential for a capping effect where oxygen recharge to the subsurface is reduced through foundation slabs or paved surfaces. It is noted that while oxygen migration through concrete or asphalt is slower than through soil, it will occur. Excluding the CBC and EMS sites, buildings at the site are detached houses with relatively extensive landscaped areas. There is a low potential for a significant capping effect and thus oxygen recharge is unlikely to be significantly limited. Frost and snow cover have also been identified as possibly reducing oxygen recharge, and was evaluated as part of an in-progess research project conducted by Golder, but this effect was not observed at a research site in Saskatchewan during winter conditions (Hers *et al.*, 2011c).

The CSM should also consider the potential for generation of methane and carbon dioxide (biogenic gases) under anaerobic conditions either within creosote NAPL source zones or naturally-occurring organic deposits (*e.g.*, peat bogs). Biogenic gases are important to evaluate from a safety hazard standpoint (*e.g.*, explosicity and asphyxiation) and methane when oxidized represents an oxygen sink or demand. The potential for biogenic gas generation will strongly depend on the size of the NAPL source zone and potential for anaerobic conditions to develop. Given that the NAPL at the Site has migrated several hundred metres within bedrock fractures or on top of bedrock surface troughs, there may be insufficient mass of NAPL for anaerobic conditions to develop from this factor alone.

5.4 Building Properties

The characteristics of the buildings are also potentially important in situations where soil vapour is able to migrate to the underside of the building (*i.e.*, in cases were soil vapour is not attenuated in the vadose zone). The CSM described above suggests that there may be significant aerobic biodegradation, which may prevent upward soil vapour migration toward houses from occurring. The key process potentially affecting soil vapour intrusion is soil gas advection. During the heating season, houses tend to be depressurized due to the stack effect (warm air rising in the house) and possibly due to furnace operation. Depressurization represents the driving gradient for soil gas advection into a building. The soil-air permeability and properties of the building foundation (*e.g.*, cracks, drains, sumps, and other openings) also influence soil gas advection. Other building related factors that potentially affect soil vapour intrusion include the type of foundation (*e.g.*, basement, crawlspace, or slab-at-grade), depth to the base of foundation below ground surface, size and height of the building, and building ventilation.

5.5 Preferential Pathways

Utility corridors backfilled with coarse-grained soil can in some instances be preferential pathways for transport of DNAPL or groundwater with dissolved impacts below the water table, or soil vapour above the water table. The potential for preferential DNAPL migration will depend on the conductivity of the utility corridor backfill to DNAPL flow compared to that of the native soils. At the Site, the vadose zone soils are generally coarse-grained, which would reduce the potential for preferential DNAPL migration along utilities.

Above the water table, preferential migration of soil vapour along utility backfill may be limited because there is likely little difference in the soil-air permeability of the coarse-grained native soil and utility backfill. In addition, if there were to be enhanced potential for hydrocarbon vapour migration, the same enhanced potential would also apply to oxygen transport, which would promote aerobic biodegradation. Therefore, based on the initial CSM, utilities are considered unlikely to represent significant preferential pathways for soil vapour transport at the Site.

6.0 FIELD PROGRAM APPROACH, RATIONALE, SCOPE, AND METHODS

The field program approach, rationale, scope and methods are described in the following sections. The field program was completed between January and March 2011, and consisted of drilling of boreholes, installation of monitoring wells, collection and analysis of soil, groundwater, soil vapour samples, and monitoring of water table elevations and non-aqueous phase liquids (NAPL) thicknesses.

6.1 Sampling Approach and Rationale

The overall approach for the sampling program was to provide soil vapour data that could be used for risk assessment purposes. Specific program design objectives included providing additional information that would: help define contamination source zones (but not necessary delineate sources, which was beyond the scope of this assessment) and soil vapour concentrations near to source zones; and assist in evaluation of attenuation of soil vapour concentrations away from source zones, and the potential for aerobic biodegradation.

Another focus of the sampling program was to provide data on shallow groundwater concentrations and "deep" soil vapour concentrations at the same location, to enable evaluation of contamination sources and the potential for volatilization of contaminants in groundwater to soil vapour. This was achieved through installation of a dual-purpose groundwater and soil vapour monitoring well screened across the water table, and additionally, a separate "deep" soil vapour probe at approximate half of these locations. Given that the distribution of the creosote source zones was not well defined, an approximate grid-based sampling design was employed for the shallow groundwater and "deep" soil vapour program. However, the selection of specific sampling locations also targeted areas where there were historical indications of creosote product along Broadview Road NW and Memorial Drive. As subsequently described in the report, some of the sampling locations had to be moved because of the presence of buried or overhead utilities and other access constraints and thus could not in all cases be optimally located. The spacing of dual-purpose groundwater and soil vapour wells ranges from approximately 30 m to 120 m.

At select additional locations, a second deeper groundwater monitoring well with one or two shallow soil vapour probes was installed next to the first shallow well location. The locations with additional "deep" wells and probes were chosen based on an inferred potential for encountering contamination from field screening results.

The field program was implemented in two stages where an initial number of probes were installed on a grid pattern and where several additional "data fill-in" sampling probes were installed based on the field screening results for the initial set of probes.

6.2 Field Program Scope

The field program was conducted between February 11 and March 15, 2011 by Golder personnel. The scope of work included the following:

- Locating underground utilities;
- Drilling of nineteen boreholes, most of which were completed as dual-purpose groundwater and soil vapour monitoring wells (*i.e.*, screened across the water table). At nine of the borehole locations, soil vapour probes were also installed within the vadose zone above the water table;

- Collecting soil samples and conducting field headspace vapour tests as qualitative indicators of volatile or semi-volatile organic chemicals;
- Analyzing soil samples for soil moisture content, total organic carbon and grain size;
- Measuring the depth to static groundwater levels, and NAPL, if present, in the monitoring wells;
- Collecting soil vapour samples for field testing of combustible gas concentrations, organic vapour concentrations, and fixed gases (methane, oxygen and carbon dioxide);
- Collecting groundwater samples for laboratory analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX), petroleum hydrocarbon (PHC) fractions F1 to F2, polycyclic aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs); and
- Collecting soil vapour samples for laboratory analysis of BTEX, PHC fractions F1 to F2 and aromatic and aliphatic sub-fractions, VOCs, and selected PAHs and other semi-volatiles (detailed list and methods described below).

6.3 Field Program Methods

6.3.1 Health and Safety Plan

A Site-Specific Health and Safety Plan (SS-HASP) was developed, reviewed, and approved prior to the start of work. A major component of the SS-HASP was the identification of potential health and safety hazards associated with conditions and scheduled activities within the project area and implementation of the controls necessary to minimize the risk to people. All Golder staff and subcontractors working on the Site read, signed, and complied with the SS-HASP throughout the course of the project.

6.3.2 Drilling and Soil Sampling

The drilling program was conducted from February 14 to 18, 2011 by Ms. Julie Burghardt and Ms. Niki Baumann of Golder Associates. Most boreholes were located as originally planned, although the locations of a few boreholes had to be adjusted in the field due to presence of buried and overhead utilities and access constraints. A total of 19 boreholes were advanced on the Site and each was completed as either a groundwater monitoring well (if screened below the water table) or dual-purpose groundwater and soil vapour monitoring well. The boreholes were advanced to depths of 4.5 m bgs to 7.6 m bgs. The borehole and monitoring well locations are presented on Figure 3.

Prior to the commencement of the subsurface work, all proposed borehole and monitoring well locations were marked in the field by Golder personnel. The underground utilities were cleared by Alberta One Call and Canadian Locators, Inc. a utility locator contractor on February 11, 2011.

Boreholes were advanced using a Mini-Sonic Drill Rig operated by Boart Longyear. Soil samples were collected at approximate 0.7 m intervals, when lithology changed or when obvious indicators of impact were encountered. The soil samples were logged using a modified version of the Unified Soil Classification System (USCS) Standard Practices for Description.

Each soil sample was placed into a re-sealable plastic bag for measurement of the headspace vapour concentration. The headspace vapour measurements were made using a RKI Eagle 2 detector, which provides for organic vapour concentrations, as measured by a photoionization detector (PID) (10.6 eV lamp), and combustible gas concentrations, as measured by a platinum sensor. The results of the headspace vapour testing can be found on the Record of Monitoring Well Logs in Appendix D.

Soil samples selected for tests of physical properties and total organic carbon content were chosen on the basis of providing for spatial coverage across the Site. Eight soil samples were submitted for analysis of soil moisture content and total organic carbon analysis. Four representative soil samples were submitted for grain size distribution analysis and one composite soil sample was submitted for waste characterization for disposal of drill cuttings. All soil samples were given unique identification numbers, logged onto formal chain-of-custody forms, and transported on ice to Maxxam Analytics, Inc. (Maxxam) of Calgary, Alberta.

The soil cuttings from the boreholes were placed in 205 L steel drums for temporary storage on-Site. The drums were subsequently picked up and transported for off-site disposal by Hazco Environmental Services of Calgary, Alberta.

6.3.3 Monitoring Well/Soil Vapour Probe Construction

The monitoring well installation was completed in conjunction with the soil vapour probes, with construction details provided on the Record of Monitoring Well Logs provided in Appendix D. The dual-purpose groundwater and soil vapour monitoring wells were constructed using 25 mm (1 inch) diameter PVC pipe with a No. 10 slot screen that straddled the water table of the unconfined water-bearing coarse-grained soil unit. A sand pack of 10/20 environmental grade filter sand was placed to approximately 0.1 m above the well screen. Fine bentonite chips were placed above the sand pack to the ground surface following standard well construction procedures. The bentonite was hydrated by periodically pouring potable water down the borehole during the bentonite backfilling process. The monitoring wells were completed with a flush-mount protective metal casing. Monitoring wells were assembled without the use of glues or solvents that might compromise the quality of water or soil vapour samples.

At three locations, deeper monitoring wells were also installed and were screened below the water table either within the unconsolidated soil or bedrock. The deeper wells are identified as “A” wells, while shallower dual-purpose wells are identified as “B” wells.

The 25-mm diameter dual purpose installation was of sufficient size for groundwater sampling, but also sufficiently small to avoid large soil vapour purge volumes. Depending on the location, the well screen generally extended from between a few centimetres above to approximately a metre above the water table, as measured on February 28, 2011, with the exception of the deep monitoring wells.

One or two soil vapour probes were installed in nine of the same boreholes used for installation of groundwater/soil vapour monitoring wells. In the case of soil vapour probes, a minimum 0.3 m-thick hydrated bentonite seal was placed above and below each of the soil probes, which were imbedded in a 0.3 m-thick sand pack. Single depth probes were installed in MW10-1, MW10-5, MW10-6, MW10-11, MW10-16 and MW10-18. Two probes were installed at multiple depths in MW10-3B, MW10-7B and MW10-9B. At the multi-depth clusters, shallow and deep probes were installed in the same borehole. The deeper probe was generally installed at least

0.5 m above the estimated water table elevation. In the locations where two nested probes were installed, the shallow probe was located approximately 0.8 to 0.9 m above the deep probe.

At all but two locations, soil vapour probes were constructed of Geoprobe AT stainless steel implants, which are 0.15 m long and 1.3 cm in diameter. At two locations (MW10-16 and MW10-18), soil vapour probes supplied by Oak Environmental, which are 0.05 m long and 1 cm in diameter, were installed. Teflon (6 mm diameter) tubing was used in the construction the soil vapour implants. Recent research indicates other tubing types, including Nylaflow, may result in poor recovery for compounds such as naphthalene (Hayes *et al*., 2008).

Wells and probes were completed with a valve that remained closed except when soil vapour samples were obtained. Following installation, probes were left to equilibrate over a minimum time period of at least one week prior to groundwater and soil vapour sampling.

6.3.4 Groundwater Sampling and Field Monitoring

Groundwater level monitoring was completed on February 28, 2011, and groundwater sampling was conducted on March 1 and 2, 2011 by Mr. Jeremy Zemek and Mr. Dwayne Lafreniere of Golder Associates. Newly installed wells MW10-5, MW10-12 and MW10-14 did not contain any groundwater, or insufficient groundwater, during the course of the field program; and thus could not be sampled.

The groundwater level and presence/absence of NAPL were measured using an electronic water/interface level probe. The results of the groundwater levels and field screening are presented in Tables 6 and 7. In order to prevent potential cross-contamination, the probe was washed with laboratory-grade detergent and rinsed with de-ionized water between monitoring points. The well headspace was monitored for combustible gases and organic vapours during groundwater sampling using the RKI Eagle 2, with results presented in Appendix E. More comprehensive soil vapour monitoring was subsequently conducted, as described below.

The ground elevation and the top of PVC pipe elevation of the new monitoring wells were surveyed by using a Real Time Kinematic (RTK) satellite navigation system. RTK is a global position system (GPS) system, which achieves +/-2 cm accuracy by transmitting corrections from a known base location to a mobile rover unit. The RTK rover unit is used as a traditional survey instrument, recording single survey points. Elevations are provided with water elevation data in Table 6.

The monitoring wells were developed by removing at least 10 well volumes of water or until the water became relatively clear using dedicated Waterra™ tubing equipped with a foot valve. The monitoring wells were subsequently purged of at least three well volumes prior to groundwater sample collection. Sampling was conducted using dedicated bailers. During purging, groundwater field parameters (temperature, pH, electrical conductivity, oxidation reduction potential, and dissolved oxygen) were measured using a YSI digital mutimeter (refer to Table 6). Groundwater samples were collected in laboratory-supplied sample bottles and preserved in the field, as required.

Immediately upon collecting the samples, the sample bottles were placed into a chilled cooler pending laboratory analysis. Sixteen groundwater samples (plus one rinsate and two duplicate samples) were submitted to the laboratory for analysis of BTEX, PHC fractions F1 to F2, and PAHs. Six groundwater samples (plus one rinsate sample) were submitted for analysis of VOCs. The samples were submitted to Maxxam of Calgary, Alberta for chemical analysis. The results of groundwater chemical analyses are presented in Tables 8 and 9, while quality assurance/quality control test results are presented in Table 10.

The purge water recovered from the wells was placed in a 205 L steel drum for temporary storage on-Site, and subsequently removed and disposed of off-site by Hazco Environmental Services.

6.3.5 Soil Vapour Sampling and Field Monitoring

Soil vapour sampling was completed on March 8, 9, 10 11, 14 and 15, 2011 by Ms. Niki Baumann of Golder Associates. The procedures documented in Golder's best practice manual for soil vapour characterization prepared for the SABCS (Golder, 2011) and sampling guidance developed by Golder for Health Canada (Golder, 2008b) were followed. Golder's soil vapour sampling kit was used for sample collection. In summary, the following protocol was followed:

- Probe equilibration (one week minimum);
- Probe performance check (flow and vacuum);
- Leak tracer test using helium;
- Field screening for fixed gases (oxygen, carbon dioxide and methane) and organic vapours (see description below); and
- Purging and collection of soil vapour samples for laboratory analysis.

The probe performance check consisted of measurement of soil gas flow rate and vacuum (Table 11). The sampling flow rate was measured using an inline Bios® Defender 510-M primary flow meter. Vacuum measurements were taken using Dwyer® Magnehelic diaphragm pressure gauges. The measured vacuums ranged from <0.1 inch H_20 to 10.7 inch H_20, for soil gas flow rates between 1.1 L/min and 1.5 L/min. It is noted that lower soil gas flow rates than those used for the probe performance test were used for soil gas sampling. The wide range in the measured vacuum reflects the variability in the soil-air permeability, which is expected based on the variability observed in the soil types at the Site. There were two probes (MW10-7B well, MW10-9B deep probe) where no measurements were obtained due to slowly rising vacuums that were greater than approximately 25 inch H_20. The results suggest that these two probes were located within or close to the capillary fringe or were plugged.

Leak tracer tests were conducted at the majority of the soil vapour well/probe locations to determine if ambient air was penetrating the ground surface (*e.g.*, along the outside of the probe) and mixing with soil vapours during sampling, also known as short-circuiting, or if the valve was leaking. Leak tracer testing was conducted concurrent with purging and field screening of the soil gas wells/probes. A 5 L plastic bucket was used as a shroud. The shroud was placed over the well/probe and valve and filled with a minimum of 32 % helium during the well/probe purging. The well/probe was purged and the helium concentration in the Tedlar bag was measured using a Dielectric® MGD-2002 helium detector.

To assess the results of the leak test, the percent leakage was calculated, as the helium concentration measured in the soil gas sample divided by the helium concentration beneath the shroud (multiplied by 100). Guidance documents indicate that leakage is of potential significant concern when the Leakage exceeds 1 to 10% (ITRC, 2007; Golder, 2008b). The measured Leakage ranged from zero to 2.4 % (Table 11). The Leakage was between 1 % and 2.4 % in three of 16 samples, and below 1 % in 13 samples. The leak testing results indicate minor leakage for a few samples but are considered within acceptable limits. Almost all well/probe

locations were subject to leak testing and thus it is inferred that the other probes installed by similar methods during the field program are of similar integrity.

Prior to collection of the soil vapour samples for laboratory analyses, soil vapour probes were purged of air using a SKC® pump set to a flow rate of between approximately 1.3 L/min to 1.5 L/min. Approximately three probe volumes of air were purged from each probe, although in a few probes, up to five probe volumes were removed. Soil vapour samples were obtained using a SKC® Vac-U-Chamber™ and 1-litre SKC Tedlar® bag to eliminate cross-contamination from soil gas passing through a pump. To minimize cross-contamination of the field screening samples, dedicated 6 mm-diameter Teflon tubing was used to connect the probe valve to the soil vapour screening equipment. Highly chemical resistant, re-usable, 6 mm-diameter Teflon® tubing and stainless steel connections were used with the soil vapour sampling kit, which included the SKC Vac-U-Chamber, pressure gauges, and flow meter. During the purging process, soil vapour samples were sequentially obtained after approximately 1, 2 and 3 probe volumes. The soil vapour samples were screened in the field using a RKI Eagle detector for the following parameters: organic vapours, as measured by a PID, combustible gases, by a platinum sensor, oxygen (O_2), methane (CH_4), by an infrared detector, and carbon dioxide (CO_2). The sequential purge results are presented in Table 12 while soil vapour concentrations measured at the end of the purging process are presented in Table 11.

The sequential purge data generally indicated either relatively consistent concentrations or a slight decline in concentrations during purging, particularly for wells screened across the water table. The purging data illustrates the importance of adequately purging wells screened across the water table because concentrations in stagnant air can be biased high from chemicals volatilizing from groundwater into the well. The field screening data is discussed further in the results section below.

Following field screening, the probe valve was closed and the probe was left to stand for approximately five minutes prior to sample collection. During this time the vacuum dissipated. Soil vapour samples were collected from each of the well and probe locations using new tubing. The samples were collected using sorbent tubes supplied by the laboratory. The sampling duration was 15 minutes while the average flow rate ranged between 197 and 218 ml/min. The flow rate was measured during the entire sampling process. Quality control testing consisted of the collection of two sorbents tubes in series from two locations, distributed-pair duplicate samples from two locations, and a trip blank from one location. The distributed-pair duplicates, obtained in parallel with a laboratory-supplied splitter, utilized different flow rates, with one sample collected at approximately 200 ml/min and the other at approximately 70 ml/min. Thirty-one sorbent tube samples were shipped to CARO Analytical Services of Richmond, BC for analyses by U.S. EPA Method TO-17. CARO analyzed samples for a wide range of volatile compounds including creosote-related compounds, petroleum hydrocarbons and halogenated solvents.

A soil vapour sample from MW10-7B-well could not be collected due to the water table being above the well screen. A sample from MW10-9B–deep probe could not be collected due to extremely low flow conditions (possibly due to probe damage) and high vacuum readings observed during sample collection. However, a sample was collected from MW10-9B–shallow probe located approximately 0.8 m above this location (within the same borehole). At this depth, field measurements were considered of acceptable quality and a sample was submitted for chemical analysis.

Four soil vapour samples were collected using 6-Litre Summa® canisters with flow restrictors set to collect an approximate 1-hour sample at a flow rate of 200 ml/min. The Summa™ canisters were connected directly to the dedicated valves on the soil vapour probes using new 6-mm diameter Teflon tubing. Initial and final canister vacuums were recorded using the vacuum gauge supplied by the laboratory. The Summa® canisters were shipped to TestAmerica of Austin, Texas for analysis by U.S. EPA Method TO-15 for an extended PIANO (paraffins, isoparaffins, aromatics, naphthenes, and olefins) list of compounds.

The results of soil vapour chemical analyses are presented in Table 13 and Appendix F, while QA/QC results are presented in Table 14.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

To ensure that the sampling and analytical data were interpretable, meaningful and reproducible, Golder staff followed a program-specific QA/QC protocol. This involved adhering to QA/QC measures in both the collection (field program) and analysis (laboratory) of samples. The following discussion provides a summary of the QA/QC measures implemented by Golder during the field program and the results of testing of QC samples.

7.1 Field Sampling QC Measures

Quality Control (QC) measures used in the collection, preservation and shipment of samples included the following:

- Sampling methods were consistent with established Golder protocols and provincial/federal requirements;
- Field notes were recorded during all stages of the investigation;
- Sample depths were measured in the field and recorded in field notes, and monitoring well locations were surveyed by Golder field staff using a calibrated GPS unit following completion;
- Soil samples were obtained using clean stainless steel sampling spoons. To minimize the potential for cross-contamination of samples, all equipment was washed with laboratory grade detergent between each sampling event and rinsed with distilled water. Field staff wore disposable nitrile gloves to minimize the potential for cross-contamination of samples;
- Groundwater samples were collected using dedicated tubing and bailers. Field staff wore disposable nitrile gloves to minimize the potential for cross-contamination of samples;
- Chain-of-custody procedures were followed during sampling events. Copies of the chain-of-custody forms are provided in Appendix F;
- Samples were given a unique sample control number (SCN), which was used for identification. Samples were submitted to the laboratory under chain-of-custody protocols using forms that did not identify the sampling locations, expected concentrations, or QA/QC samples, such as field duplicate samples; and
- The samples were stored on ice in coolers prior to submission to the analytical laboratory; appropriately completed chain-of-custody forms accompanied the submissions and the samples were received at the laboratory at a storage temperature of 5°C.

Additional QA/QC measures taken for collection of soil vapour samples were:

- Field instruments were calibrated daily and/or bump-tested;
- New Teflon tubing was used for each sampling event to avoid cross contamination;
- The sampling flow rate and vacuum was checked for each probe (*e.g.*, to check whether there were blockages);
- Tedlar™ bags were used for collecting soil vapour samples for field screening;
- A leak tracer tests were performed as described above;
- The probes were completed with valves, which were shut when the probe was not sampled;

- The flow rates during sorbent tube sampling were measured and sampling durations were accurately recorded;
- All sampling materials were stored away from potential sources of contamination;
- Sorbent tubes were transported to CARO in a chilled cooler; and
- The vacuums in the canisters were measured using a vacuum gauge that was part of the regulator supplied by TestAmerica;

The vacuums in the canisters were measured before and after sampling in the field, and by the laboratory upon receipt by the laboratory. The vacuum measurements in the four canisters were as follows:

- Field measurements prior to sampling: 24 to 27 inches Hg; and
- Field measurements after sampling: 4 to 6 inches Hg.

At sea level, a complete vacuum is 29.9 inches Hg. At higher elevations, the measured vacuum will decrease on the order of 1 inch Hg per 1,000 feet elevation gain. Based on the elevation of Calgary, for a complete vacuum approximately 27 inches would be measured. Vacuums prior to sampling of 24 to 27 inches Hg are considered acceptable.

7.2 Groundwater Field QC Tests

Groundwater field QC test samples were used to assess the reliability of field sampling procedures, and consisted of analysis of field duplicates to evaluate the reproducibility or precision of the sampling methodology, and analysis of field rinsate samples to evaluate the effectiveness of field cleaning procedures. The rinsate sample was prepared by pouring organic free water over an interface probe that had been decontaminated following Golder's standard procedure. The results of groundwater duplicate analyses are provided in Table 10 while copies of the Laboratory Certificates of Analysis are provided in Appendix F.

The measure of the reproducibility or precision of the data is quantified by calculating the Relative Percent Difference (RPD) of duplicate sample concentrations. The RPD is calculated as follows:

$$(\text{absolute}\left(\frac{\text{x1} - \text{x2}}{\text{average}\ (\text{x1}, \text{x2})}\right)) \times\ 100$$

Where: x1 is the original sample result and;

x2 is the blind field duplicate result.

Variability in field duplicate concentrations is caused by small scale heterogeneity in the sample matrix, variability in field sample collection and handling, and variability in laboratory sample preparation and analysis. As sample concentrations decrease and approach the detection limit, the precision generally decreases. For duplicate concentrations that were greater than five times the reporting limit (RL), the RPD quality objective was 20%. When the concentrations were less than five times the RL, RPDs were not calculated. RPD values greater than the above objectives suggest variability has been introduced through the sample matrix, collection, sampling handling, and/or sample analysis.

The RPD quality objectives for duplicates analyses were met for the majority of the duplicate samples. The analysis of groundwater from MW10-6 indicated the RPD objective was exceeded for five PAH compounds, as follows: acenaphthylene – 53% (RPD), benzo[g,h,i]perylene – 60%, dibenz[a,h]anthracene – 46%, indeno[1,2,3-cd]pyrene – 55% and perylene – 38%. Groundwater analysis from MW10-7B indicated RPD values over the quality objective for three compounds: naphthalene – 42%, total xylenes – 36% and PHC fraction F2 – 67%.

To further investigate the raised RPDs, the sampling methodology was reviewed. The samples were collected in accordance with Golder standard field procedures, were submitted in appropriate laboratory-supplied bottles, and were analyzed within the specified hold times. Golder reviewed Maxxam's QA/QC report, which did not identify issues of concern. The field staff responsible for the groundwater sampling (as corroborated by field notes) indicated that the groundwater samples from MW10-6 and MW19-7B contained relatively significant amounts of sediment. It is possible that the sediment may have contributed to the variability due to heterogeneity caused by sorption of chemicals to sediment. Based on this information, there may be slightly greater uncertainty associated with groundwater quality data for the above analytes, and analytical results that are close to regulatory limits should be interpreted with caution. However, the conclusions of the report are considered unaffected by the quality control results.

One rinsate blank sample was collected during the monitoring event. The rinsate blank was submitted for analysis of BTEX, PHC fractions F1 and F2, PAHs and VOC's to evaluate the potential for cross-contamination during transport of samples. Analytical results for the rinsate blank indicated that all of the analyzed parameter concentrations were less than the laboratory RL, and indicated that cross-contamination of samples during transport was unlikely.

7.3 Groundwater Laboratory QC Tests

Maxxam analyzed groundwater samples for this investigation. Maxxam is certified by the Canadian Association for Laboratory Accreditation Inc. (CALA) for the analytical methods used for this program. Internal quality control data provided by Maxxam (Appendix F) were reviewed with the goal of determining whether internal laboratory Data Quality Objectives were generally met with respect to the following QC tests:

- Samples analyzed within holding times;
- Laboratory duplicates or replicates;
- Method blanks, which should indicate concentrations below the detection limits for the specific analyses;
- Analysis of reference samples, including standard reference materials, spikes and/or control samples; and
- Reported concentrations should not exceed the instrument calibration range.

The laboratory method blank analysis results were used to detect interferences or impurities introduced by the laboratory equipment, reagents, or solvents. Surrogate recovery is used for organics by spiking samples with known quantities of surrogate chemicals which have similar chemical properties to the parameters being analyzed. The reported recovery provides an indication of the analytical method accuracy for that sample. Matrix spikes were conducted by adding known concentrations of the analyte of interest to a sample to evaluate the effects of the sample matrix on the analytical method. The analysis of selected samples in duplicate is used to evaluate the reproducibility of the analytical method.

The results of the laboratory QA/QC report for the groundwater analysis indicated that the RPD for benzo[b&j]fluoranthene (43%) exceeded the quality control limit of 40%. The spike recovery data indicate that the recoveries for 1,2,3-trichlorobenzene and 1,2,4-trichlorobenzene (63% and 67%, respectively) were outside of the quality control range of 70 to 130%. All other spike recoveries, blank concentrations and RPDs were within the laboratory's quality control limits.

From the information provided in the QA/QC analyses, the precision and accuracy of the laboratory data is considered acceptable for the purposes of this investigation program.

7.4 Soil Vapour Field QC Tests

Soil vapour QC tests samples are used to assess the reliability of field sampling procedures, and consisted of analysis of distributed-pair duplicate sorbent tubes, sorbent tubes in series and a trip blank to evaluate the reproducibility or precision of the sampling methodology. The results of the soil vapour duplicate analyses are provided in Table 13 while copies of the Laboratory Certificates of Analysis are provided in Appendix F.

The distributed-pair duplicates, obtained in parallel with a laboratory-supplied splitter, utilized different flow rates, with one sample collected at approximately 200 ml/min and the other at approximately 70 ml/min. The sorbent tubes in series were collected using a sampling flow rate of 200 ml/min. The transport blank was a tube that remaining unopened but that was stored with other tubes used to collect samples. All samples were submitted blind to the laboratory.

As described earlier, the measure of the reproducibility or precision of the data is quantified by calculating the RPD of duplicate sample concentrations.

Where the concentration of a given parameter was less than five times the analytical method detection limit (MDL) or reporting limit (RL), the results are less precise and a RPD was not calculated. For parameters with concentrations less than five times the MDL or RL, the difference factor (DF) was calculated, which is the absolute difference between the two sample concentrations.

For soil vapour samples, the target RPD is less than 50 percent (%) and the target DF is less than 2. A RPD greater than 50 % for soil vapour is not uncommon and may reflect a combination of sampling variability, which could include variability in sampling flow rates between the two samples, variable sorption to sampling materials, analytical variability, and other factors. Values exceeding the target values were justified, on a case-by-case basis, as applicable.

The results of the distributed-pair analysis indicated that for one set of duplicates, the tube with the slower sampling rate had higher concentrations than the tube with the faster sampling rate, while for the other set of duplicates, the opposite trend was observed. While the sample set is small, the flow rate did not appear to affect the test results.

The RPD values for distributed-pair samples for the MW10-6 well were between 0 % and 55 %, excluding methylene chloride, for which the RPD was 98 %. Methylene chloride is a common laboratory solvent. All but two RPDs were below 50 % for these duplicate samples. For the MW10-20 well distributed pairs, the concentrations of many analytes were below the reporting limit in both samples, and RPDs or DFs could only be calculated for a few analytes. The RPDs ranged from 17 % to 82 %, and the DFs ranged from 2.4 to 3.5. The

50 % threshold for RPD was exceeded for only two hydrocarbon fractions, and all the DFs were calculated for hydrocarbon fractions (*i.e.*, there were no individual constituents where DFs were applicable).

The results of analysis of tubes in series indicates that there were no individual constituents (excluding hydrocarbon fractions) with detections in the second tube (*i.e.*, all concentrations were below the detection limit) indicating breakthrough did not occur. Concentrations of most analytes were relatively low and close to the reporting limit. The transport blank indicated no detections for individual constituents. For the CCME hydrocarbon fractions, there were detections measured in the second sorbent tube, and the ratio of the concentration in the second tube to the first tube was above 25 % for some fractions. The threshold for breakthrough is typically considered to range from 10 % to 25 %. For hydrocarbon fractions, the mass of nC6-nC8 (non-aromatic) detected was 0.54 μg, which was slightly above the detection limit of 0.5 μg. The mass of nC6-nC8 (total) detected was 0.5 μg, which was at the detection limit. CARO was requested to review the quality control results and their response included in Appendix F. Upon further analysis, CARO concluded that breakthrough was considered unlikely, and that because hydrocarbon fraction concentrations in series tubes were low and near to the detection limit, a reliable determination of concentrations was not possible due to an inability to statistically quantify concentrations. CARO indicated in the future that detection limits for hydrocarbon fraction analyses would likely be raised.

Although not conclusive, there appears to be the potential for breakthrough for some CCME hydrocarbon fractions at low concentrations, although as indicated by CARO, there is greater uncertainty in the data at lower concentrations near to the reporting limit. The QA/QC results for all individual constituent were acceptable. The greater uncertainty in the CCME hydrocarbon fraction results is not considered to affect the conclusions of this report.

7.5 Soil Vapour Laboratory QC Tests

CARO and TestAmerica analysed samples for this investigation. CARO is certified by the Canadian Association for Laboratory Accreditation Inc. (CALA) and TestAmerica is certified by the National Environmental Laboratory Accreditation Program (NELAP) for the analytical methods used for this program. Internal quality control data provided by CARO and TestAmerica (Appendix F) were reviewed with the goal of determining whether internal laboratory Data Quality Objectives were generally met with respect to the following QC tests:

- Samples analyzed within holding times;
- Laboratory duplicates or replicates;
- Method blanks, which should indicate concentrations below the detection limits for the specific analyses;
- Analysis of reference samples, including standard reference materials, surrogates, spikes and/or control samples; and
- Reported concentrations should not exceed the instrument calibration range.

The analytical report by CARO (Appendix F) indicates that concentrations in method blanks were below the reporting limit (RL). The results of laboratory duplicate analysis were in almost all cases within the laboratory quality control limit of 25 % to 30 %. The results of analysis of laboratory control samples (LCS) indicate

recoveries were in almost cases within the laboratory quality control limits (typically 70 % to 130 %), and when outside these limits were only marginally so.

The analytical report by TestAmerica indicates that there were detections of several compounds in the method blanks analyzed, with included trichlorobenzene (0.73 $\mu g/m^3$) and naphthalene (0.66 $\mu g/m^3$) indicating uncertainty in the results at low concentrations. However, given the low concentrations measured and for the purposes of soil vapour analysis, these concentrations do not affect the conclusions of the study. The results of analysis of LCS and calibration check samples indicate recoveries were in almost all cases within the laboratory quality control limits (typically 70% to 13 % or 50% to 150% depending on the compound). The surrogate recoveries ranged from 55% to 127%, but for most compounds and tests ranged between approximately 80% and 110%. From the information provided in the QA/QC analyses, the precision and accuracy of the laboratory data is considered acceptable for the purposes of this investigation program.

7.6 QA/QC Summary

On the basis of the results of the QA/QC program, the precision and accuracy of the laboratory data are considered acceptable for the purposes of the investigation program. The results of the analysis of CCME soil vapour hydrocarbon fractions suggest the possibility of breakthrough for select fractions, but at the concentrations measured, this determination is uncertain. The results of duplicate analyses indicate acceptable data precision.

8.0 RESULTS

8.1 Physical Characteristics of the Site

8.1.1 Site Stratigraphy

The shallow soil stratigraphy at the Site was generally comprised of the following units in sequence from ground surface:

- Topsoil, underlain by
- Sandy silt to silty sand, underlain by
- Sand and gravel to sand, with occasional sandy silt interbeds, underlain by
- Clayey silt, which was only encountered at a few borehole locations.

There was a greater thickness of the finer-grained sandy silt to silty sand unit in the central area of the Site (near boreholes MW10-09A/B, MW10-22 and MW10-20). Siltstone bedrock was encountered in three boreholes at depths that were 3.7 m bgs (MW10-7A), 3.9 m bgs (MW10-7B), and 6.5 m bgs (MW10-3A). Most boreholes were drilled to 4.5 m to 4.6 m depth bgs.

Details of the soil conditions encountered in the boreholes are presented on the Record of Monitoring Well logs included in Appendix D.

8.1.2 Field Soil Headspace Concentrations and Observations

The field bag headspace concentrations are included on the Record of Monitoring Well logs in Appendix D. The field bag headspace concentrations measured during drilling using a PID ranged from 0 to 4 ppm. The combustible gas headspace concentrations measured during drilling ranged from 0 to 9,050 ppm. Based on a qualitative comparison, there was a poor correlation between combustible gas concentrations and odours and sheens, and between combustible gas concentrations and soil vapour probes with elevated volatile concentrations. Combustible gas concentrations are not considered a reliable indicator of potential contamination in soil.

A creosote-like sheen on soil was encountered at the following borehole locations:

- MW10-6 (4 to 4.5 m); and
- MW-7A/B (3.4 to 4.0 m).

A creosote-like odour was encountered at the following borehole locations:

- MW10-6 (4 to 4.5 m);
- MW-7A/B (2.4 to 7.6 m);
- MW10-10 (2.4 to 4.6 m); and
- MW10-16 (1.8 to 2.4 m).

A slight creosote-like odour was encountered at the following borehole locations:

- MW10-3A/B (1.8 to 4.6 m);
- MW10-5 (3.5 to 4.5 m);
- MW10-11 (2.4 to 4.6 m);
- MW10-14 (1.8 to 4.6 m);
- MW10-15 (2.7 to 3.7 m);
- MW10-16 (1.5 to 1.8 m, 2.4 to 3.3 m);
- MW10-18 (1.2 to 4 m); and
- MW10-20 (3.0 to 4.6 m).

No creosote odours were noted when drilling boreholes MW10-1, MW10-2, MW10-9A/9B, MW10-12 and MW10-22. A slight "chemical" odour was observed in MW10-2 and MW10-12.

8.1.3 Site Hydrogeology

The Site topography is relatively flat and there are no nearby upland areas. The nearest surface water body is the Bow River located approximately 45 m south of the Site.

Groundwater elevation data are summarized in Tables 6 and 7. The depth to groundwater across the Site was measured between 2.590 and 3.774 m bgs on February 28, 2011. Well MW10-05 had a very limited quantity of groundwater and wells MW10-12 and MW10-14 were dry on February 28, 2011. At select wells on the EMS and CBC site, multiple water level monitoring events were conducted between December 2010 and March 2011. The available data as shown on Figure 4 indicates a rise in the water table of approximately 0.6 m between early December 2010 and mid February 2011. Between mid February and early March 2011, there was a slight decline in the water table of a few centimetres.

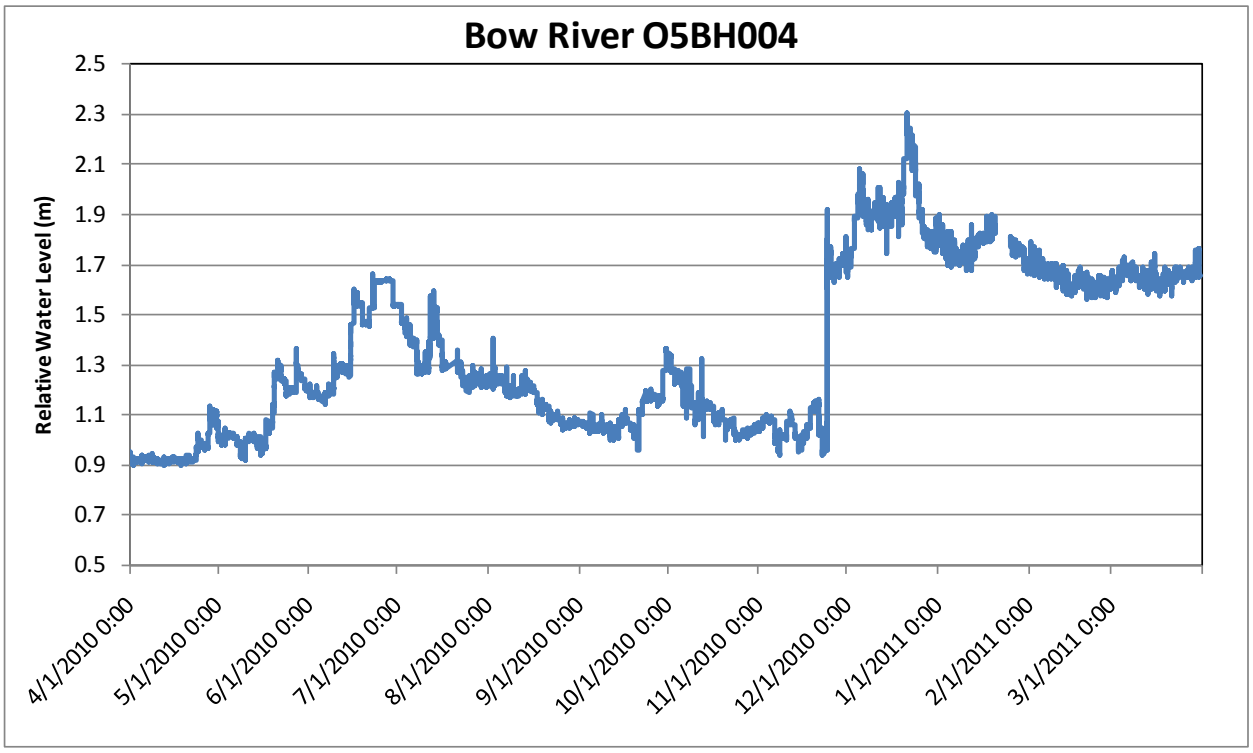

Figure 4. Bow River Water Levels (5th Ave SE and Memorial Drive)
(add 1038.03 m to obtain Geodetic Survey of Canada datum)

Water level elevations in the Bow River were not obtained as part of this HHRA. However, Bow River water levels are available for a gauging station at 5th Avenue SE and Memorial Drive (51°03'00''N, 114°03"05"W), which is approximately 3 kilometres downstream of the Site (Figure 4). The water level rose by over 0.7 m in early December 2010, which is inferred to be the cause of the increase in the groundwater level observed between early December 2010 and February 2011. Prior to December 2010, the pattern observed was a rise in the river water level in May and June, followed by a slow decline to a low in September, with a slight increase in early October.

The potentiometric elevations, contours and shallow groundwater flow direction are shown on Figure 5. West of 17th Street NW, the shallow groundwater flow direction is towards the north. This suggests water from the Bow River is moving onto the Site. East of 17th Street NW, the shallow groundwater flow direction appears to be toward the south to southeast although there are a limited number of wells in this area. The apparent change in groundwater flow direction is unusual although a possible cause may be the transition from coarser-grained soil deposits above the bedrock in the western area of the Site to the finer-grained soil deposits observed in the area of 17th Street SE and at the CBC site, which may act to limit inflow from the Bow River in this area. Another possible cause, although there was no visual evidence, could be a change in the river stage adjacent to the Site, which could affect losses of water to north of the river. Groundwater flow directions may also locally be affected by buried utilities and infrastructure.

8.1.4 Weather Data

Daily minimum and maximum temperatures and daily precipitation data were obtained from Environment Canada for the Calgary International Airport, Alberta (Figure 6). Hourly temperature and barometric pressure data for the period of March 8 to 12, 2011, which corresponded to time period over which soil vapour samples were collected, were also obtained from Calgary International Airport weather station (Figure 7). The weather at the time of sampling is unlikely to have affected the results of the sampling.

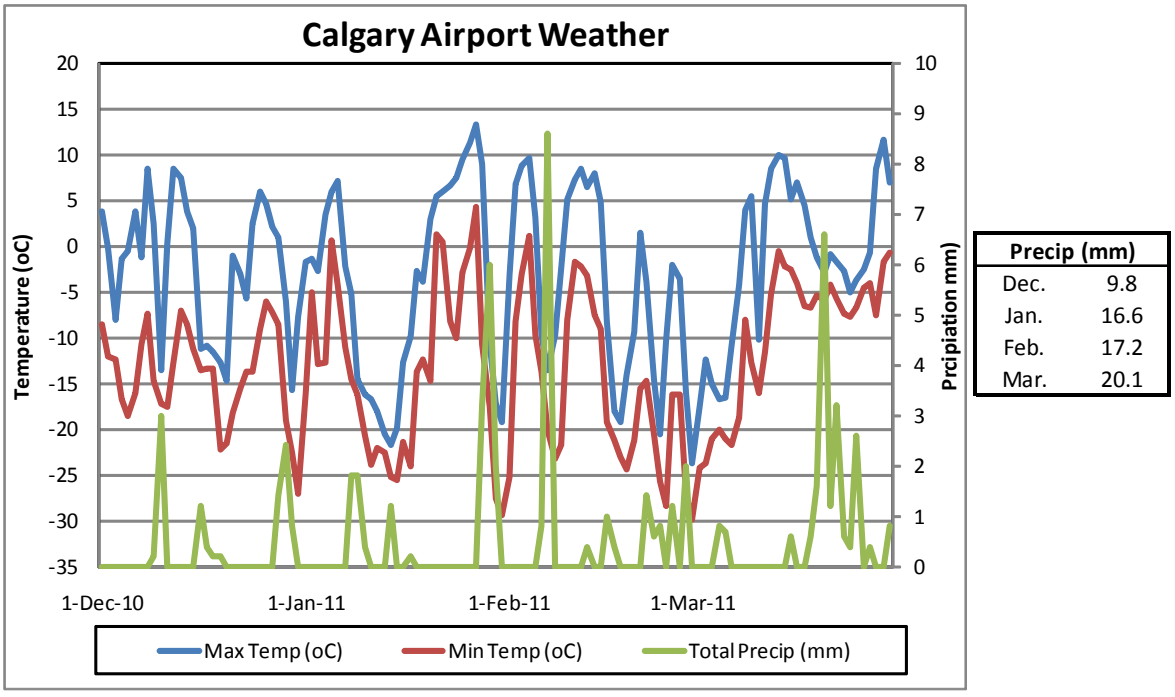

Figure 6. Calgary Daily Weather Data December 2010 to March 2011

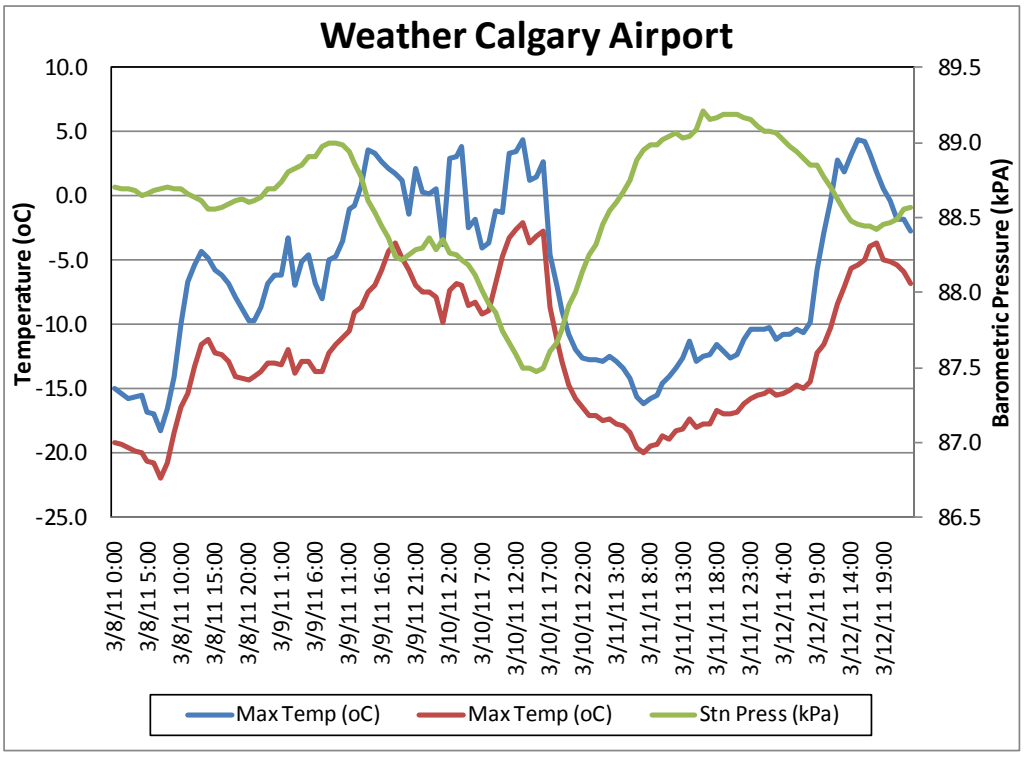

Figure 7. Calgary Hourly Weather Data March 8 to 12, 2011

8.2 Analytical Results

8.2.1 Soil Analyses

The soil analytical results are presented in Table 1. Laboratory analytical reports are included as Appendix F.

8.2.1.1 Soil Moisture Content, Total Organic Carbon and Grain Size

Eight samples were analysed for soil moisture and total organic carbon (TOC). Gravimetric soil moisture content in analyzed samples ranged from 2.4 % to 18 % (Table 1). The TOC concentrations were all above the laboratory detection limit and ranged from a low of 0.0008 g/g at MW10-6-S4 (sand and gravel) to a high of 0.017 g/g at MW10-11-S2 (fine sand). Four samples were submitted for grain size analysis. Three of the four samples were classified as fine-grained soil and one sample was classified as coarse-grained soil. However, based on visual observation, the majority of the unsaturated soil was inferred to be coarse-grained.

8.2.2 Groundwater Analyses

The field-measured parameters are presented in Table 6. The groundwater analytical results are presented in Tables 8 and 9. Laboratory analytical reports are included in Appendix F.

8.2.2.1 Field Parameters

On February 28, 2011, the groundwater pH values were between 7.07 and 8.47. These values were within the AB Tier 1 Guidelines of 6 to 8.5. The electrical conductivity values ranged from 238 µS/cm to 958 µS/cm (Micro Siemens per centimetre). Dissolved oxygen ranged between 4.51 mg/L and 11.2 mg/L.

The monitoring of wells with an interface probe indicated no NAPL was encountered with the exception of well MW10-6 where a LNAPL sheen on the water table was observed. The sheen had an odour characteristics of creosote.

During groundwater sample collection, an initial screening of well headspace concentrations was conducted, with results presented in Appendix E. The organic vapour concentrations, as measured by a PID, ranged from 0 ppm to 4.0 ppm with the highest concentration measured in well MW10-7B. Combustible gas concentrations ranged from 0 to 940 ppm with the highest concentration measured in MW10-6.

Additional field testing of soil vapour was conducted between March 8 and March 14, 2011 with results presented in Tables 11 and 12. The sequential purge data (Table 12) generally indicated either relatively consistent concentrations or a slight decline in concentrations during purging, particularly for wells screened across the water table. At MW10-6 well, the oxygen concentration after the first purge volume was 18.8%, which increased to 20.9% after five purge volumes. There was a corresponding decrease in the organic vapour and combustible gas concentrations during the purging process. The soil vapour concentrations at the end of the purging process (Table 11) are summarized as follows:

- The minimum oxygen concentration was 19.3% (MW10-3B);
- The maximum carbon dioxide concentration was 1.1% (MW10-3B);
- The maximum organic vapour (PID) concentration was 2 ppm (MW10-6); and
- The maximum combustible gas concentration was 420 ppm (MW10-3B).

The results indicate a well oxygenated vadose zone, with relatively low organic vapour and combustible gas concentrations, at the well/probe locations monitored.

8.2.2.2 Dissolved Petroleum Hydrocarbons

Analytical results indicated that the concentrations of benzene, ethylbenzene and PHC fraction F2 in MW10-7A were above the most stringent AB Tier 1 Guidelines with concentrations of 0.039, 0.081 and 4.7 mg/L, respectively. The guidelines for benzene, ethylbenzene and PHC fraction F2 are 0.005, 0.0024 and 1.1 mg/L, respectively. The PHC fraction F2 concentration was also over the AB Tier 1 Guideline in well MW10-6 with a value of 3.0 mg/L.

When compared to potential AB Tier 2 Guidelines for the inhalation pathway, the F2 groundwater concentration exceeded the guideline at wells MW10-6 and MW10-7A.

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8.2.2.3 PAHs

The individual PAH compound with the highest concentration was naphthalene (2.6 mg/L) followed by phenanthrene (0.015 mg/L), which were measured at well MW10-7A (deep well). The highest PAH concentrations were measured at MW10-7A and MW10-6.

The results of the PAH analysis indicate all but two wells had at least one PAH compound concentration that exceeded the most stringent AB Tier 1 Guidelines. The only wells without any exceedances for PAHs were wells MW10-2 and MW10-15.

The wells with the highest PAH concentrations were MW10-6, MW10-7A and MW10-7B. The analytes with the most frequent exceedances of the most stringent AB Tier 1 Guidelines were fluoranthene, naphthalene, phenanthrene and pyrene. When compared to potential AB Tier 2 Guidelines for the inhalation pathway, only the naphthalene concentration (2.6 mg/L) exceeded the guideline (0.6 mg/L) at well MW10-7A.

8.2.2.4 VOCs

The only VOC parameter that exceeded the AB Tier 1 Guideline (0.0018 mg/L) was chloroform at wells MW10-1, MW10-3A, MW10-7A and MW10-9B, where concentrations were 0.0019, 0.0027, 0.0051 and 0.0041 mg/L, respectively. The chloroform concentration exceeded the potential AB Tier 2 Guideline for the inhalation pathway at two locations, MW-7A and MW10-9B.

8.2.3 Soil Vapour Analyses

The soil vapour samples were tested for a total of 115 VOCs by U.S. EPA Method TO-17 by CARO and 165 VOCs by U.S. EPA Method TO-15 by TestAmerica (with some overlap) consisting of a wide range of volatile compounds. The TO-15 analysis by TestAmerica was for the PIANO (paraffins, isoparaffins, aromatics, naphthenes, and olefins) list of compounds.

The results of analysis for a subset of compounds commonly associated with creosote, which are BTEX, F1, F2 and naphthalene, are presented in Table 13. The maximum benzene, ethylbenzene, toluene and xylenes concentrations in soil vapour were 14.6 $\mu g/m^3$ (MW10-1 well), 44 $\mu g/m^3$ (MW10-9B well), 610 $\mu g/m^3$ (MW10-9B well) and 250 $\mu g/m^3$ (MW10-9B well), respectively. The maximum F1 and F2 concentrations in soil vapour were 3,700 $\mu g/m^3$ (MW10-9B well) and 8,100 $\mu g/m^3$ (MW10-6 deep probe), respectively. The maximum naphthalene concentration in soil vapour was 58 $\mu g/m^3$ (MW10-6). The highest BTEX concentrations were encountered at probes MW10-5, MW10-6, MW10-7B and MW10-9B, while the highest F1 and F2 concentrations were encountered at probes MW10-3B, MW10-5 and MW-6. However, the F1 and F2 concentrations were only slightly lower at many other probe locations.

The results of the complete CARO and TestAmerica analysis are presented in Appendix E. The analytes with the highest concentrations were methanol (4,430 $\mu g/m^3$), ethane (2,250 $\mu g/m^3$), propane (1,350 $\mu g/m^3$), propylene (919 $\mu g/m^3$), ethene (812 $\mu g/m^3$), toluene (610 $\mu g/m^3$), 1-butene/isobutene (598 $\mu g/m^3$), alpha-pinene (577 $\mu g/m^3$), and butane (514 $\mu g/m^3$). There were other VOCs detected at lower concentrations below 500 $\mu g/m^3$. In general, slightly higher concentrations were measured from the TO-15 canister analysis compared to the TO-17 sorbent analysis. However, the two different types of samples were collected several days apart, which may have contributed to the variability observed.

8.3 Discussion

8.3.1.1 Soil Moisture Content, Total Organic Carbon and Grain Size

The soil moisture content, total organic content (TOC) and grain size testing indicate variable conditions consistent with variability observed in the soil lithology. The moisture content or water-filled porosity of the soil will affect the effective diffusivity of soil for diffusive chemical transport, which will decrease as the moisture content increases.

The TOC values across the Site ranged from 0.0008 to 0.017 g/g. The organic carbon is correlated to absorption of contaminants into organic carbon. A higher TOC value implies that the soil will have a greater sorptive capacity.

8.3.1.2 Groundwater Quality

When compared to potential AB Tier 2 Guidelines for the inhalation pathway, the F2 groundwater concentration exceeded the guideline at wells MW10-6 and MW10-7A, and the naphthalene concentration exceeded the guideline at well MW10-7A.

The elevated naphthalene, phenanthrene and F2 concentrations in groundwater are consistent with a creosote source. The highest PAH concentrations were measured at MW10-7A and MW10-6, which is consistent with observations of creosote-like sheens and odours at these monitoring well locations. The PAH concentrations were higher in the MW-7A, the well completed in the bedrock, compared to well MW-7B, the well completed within the unconsolidated deposits. This suggests a contamination source within the bedrock.

To provide for spatial presentation of the dissolved groundwater plume, the concentrations of F1 and F2 are shown on Figure 8, naphthalene concentrations are shown on Figure 9 while total xylenes are shown on Figure 10. The F1 and F2 concentration map shows that the highest concentrations were measured at wells along Broadview Road NW between 17th Street NW and 19th Street NW. The trend for naphthalene is similar with the highest concentrations measured at wells MW-7A/B and MW10-6. While naphthalene concentrations were much lower outside of these wells, almost all wells had naphthalene detections indicating widespread low concentration impacts at the Site area wells. The total xylene concentrations showed similar spatial trends but were at non-detect concentrations at a greater frequency of wells.

The chloroform concentrations also exceeded the potential AB Tier 2 Guideline for the inhalation pathway. The highest chloroform concentration was measured in well MW10-7A, which was the well with the highest concentrations of creosote-related compounds. The association may be fortuitous as chloroform is not commonly associated with creosote impacts, but is detected in groundwater and soil vapour at sites where there are leaking water mains or where chlorinated tap water is used for watering lawns or washing cars.

8.3.1.3 Soil Vapour

To provide for a spatial presentation of the soil vapour concentrations, the concentrations of F1 and F2 are shown on Figure 11, naphthalene concentrations are shown on Figure 12, and total xylenes concentrations are shown on Figure 13 (the maximum concentration at each location is plotted). The F1 and F2 concentration map shows that similar concentrations were measured in different areas of the site with slightly higher concentrations measured at MW10-6 (along Broadview Road NW), MW10-3B (Memorial Drive at west side of Site area) and MW10-5 (Memorial Drive near east side of Site area). The naphthalene concentration map shows that the highest concentrations were measured at wells/probes along Broadview Road NW between 17th Street NW and

19th Street NW consistent with historical and recent observations of creosote impacts, although concentrations measured were relatively low. The total xylene concentrations showed somewhat different spatial trends with the highest concentrations measured near the centre of the Site at MW10-9B and slightly lower concentrations measured at probes/wells in areas of creosote impact to the west. A similar trend was observed for toluene and ethylbenzene (Table 13). The vertical concentration trends were evaluated at monitoring locations with multiple depth probes with results presented in Appendix G. Typically, the highest naphthalene, F1 and F2 soil vapour concentrations were measured in the deeper soil vapour probe.

To further evaluate the relationship between groundwater and soil vapour, the measured soil vapour concentration was compared to the soil vapour concentration predicted from the measured groundwater concentration according to the Henry's Law Constant partitioning calculation. For locations with a deep and shallow monitoring well, the groundwater results for the shallow well were used. The partitioning model assumes equilibrium conditions and no soil vapour concentration attenuation. The results, presented in Table 15, indicate that the measured soil vapour concentrations were significantly lower (generally one to three orders-of-magnitude) than the predicted concentrations. The results are consistent with measurements at other hydrocarbon-impacted sites where significant concentration attenuation is typically observed within the capillary fringe and deep vadose zone due to a relatively slow rate of chemical diffusion through the capillary fringe and aerobic biodegradation (see references in Section 5.3).

The soil vapour was analyzed for an extended analyte list to evaluate whether there were significantly elevated concentrations of compounds beyond common parameters (*e.g.*, BTEX, naphthalene) associated with creosote. As indicated in Section 8.2.3, in addition to compounds commonly associated with creosote such as BTEX and naphthalene, there were other VOCs measured in soil vapour mostly at relatively low concentrations. Methanol, for which the highest concentration was measured, is a common laboratory solvent. Ethane and propane are light molecular weight hydrocarbons that are present at low levels in biogenic gas generated from the breakdown of organic matter and that are also present at low levels in natural gas. Ethene may be a breakdown product of other higher molecular weight compounds. Detection of light molecular weight compounds at low concentrations in soil vapour is relatively common.

A comparison of soil vapour concentrations measured in 1993 by O'Conner (Table 5) and 2011 (Table 13) for select compounds indicates lower concentrations in 2011. For example, the maximum soil vapour naphthalene concentration in 1993 was 2,400 $\mu g/m^3$ compared to 58 $\mu g/m^3$ in 2011, while the maximum benzene concentration was 600 $\mu g/m^3$ in 1993 compared to 15 $\mu g/m^3$ in 2011. The reason for the large difference is not known, but may be related to groundwater levels, as discussed below.

8.4 Updated Conceptual Site Model

An updated CSM was developed based on the results of the 2011 site investigation. There is evidence of creosote impacts in bedrock and soil above bedrock at two monitoring wells along Broadview Road NW (MW10-6 and MW10-7A/B), which is generally consistent with the area with historical indications of NAPL (Figure 3). However, well MW10-6 is a short distance further west than the previous historical locations where NAPL was encountered. At well MW10-6, a creosote-like LNAPL sheen was encountered at the water table. The depth to bedrock was 3.7 m bgs at well MW10-7A near 18th Street NW and Broadview Road NW, and 6.5 m bgs at well MW10-3A along Memorial Drive. The historical investigations indicated a depth to bedrock of 5 m or greater.

The results of groundwater monitoring indicated elevated concentrations of naphthalene and CCME F2 fraction in wells along Broadview Road NW in the general area of 18th Street NW that were consistent with locations of monitoring wells with observed creosote impacts. Other Site wells had significantly lower but detectable naphthalene concentrations. The results of the soil vapour monitoring indicated elevated oxygen concentrations near to atmospheric levels indicating a well-oxygenated vadose zone, and relatively low carbon dioxide, methane and combustible vapour concentrations. The concentrations of analytes commonly associated with creosote, such as BTEX, F1 and F2 were relatively low compared to other sites where higher soil vapour concentrations have been measured near to creosote-impacted soil. In addition, testing of soil vapour for a large list of the PIANO (paraffins, isoparaffins, aromatics, naphthenes, and olefins) compounds did not reveal other compounds of significant potential concern based on qualitative comparisons and the human health risk assessment. The depth to the water table was sufficiently high such that the NAPL source zones appeared to be submerged in early March 2011, which is consistent with a relatively weak vapour source and low soil vapour concentrations. The elevated oxygen concentrations and somewhat elevated carbon dioxide concentrations suggest that aerobic biodegradation is a process that further reduces the concentrations of creosote-related vapours to relatively low levels.

A potentially important finding is that the groundwater elevations during the soil vapour investigation in March 2011 were relatively high, which appears to be a result of the water levels in the Bow River. The water levels may be even higher in late spring due to spring runoff and consequent rise in the Bow River, but may be lower in late summer based on 2010 Bow River water level trends (refer to Figure 4). Of significance is that the depth to groundwater in late February 2011 at MW10-7A (the borehole with the shallowest depth to bedrock of 3.7 m below ground surface) was approximately 0.5 m less than the depth to the bedrock surface at this location. If the groundwater level were to decline to below the bedrock surface, there may be greater potential for contaminants within bedrock to volatilize and consequently greater potential for elevated soil vapour concentrations. The potential significance of water table fluctuations is not known, but additional monitoring of water levels and soil vapour concentrations is recommended, as discussed below.

9.0 HUMAN HEALTH RISK ASSESSMENT

9.1 Overview of the Risk Assessment Process

Risk assessment is the process used to evaluate the likelihood that adverse biological effects may occur or are occurring as the result of exposure to one or more stressors. Risk assessment provides a framework for integrating and presenting scientific data and conclusions about:

- Source of contaminants of potential concern (COPCs; what contaminants are present?);
- Pathways (how do the COPCs exert an adverse influence on receptors?);
- Receptors (which human populations are affected by the COPCs?); and
- Exposure (how much of the COPC does the receptor encounter?)

A risk cannot occur unless a COPC, pathway, receptor occur in the same place at the same time.

The human health risk assessment includes the following components:

- Problem Formulation - The following tasks were conducted as part of the Problem Formulation:
  - Compile and review the data collected to date;
  - Develop a CSM to illustrate site conditions;
  - Conduct data screening to identify COPCs;
  - Identify receptors of potential concern; and
  - Identify potential exposure pathways.
- Data Gap Assessment – The Data Gap Assessment was conducted to identify outstanding data needs for the risk assessment.
- Toxicity Assessment – The Toxicity Assessment involved the selection of regulatory toxicological benchmarks for the COPCs utilizing the hierarchy of regulatory sources provided by AENV.
- Exposure Assessment – The exposure assessment involved the calculation of exposure doses for human receptors for various potential exposure pathways identified in the Problem Formulation (*i.e.,* inhalation of vapours).
- Risk Characterization – The Risk Characterization involved the comparison of the estimated dose (exposure assessment) with the regulatory toxicological benchmark (toxicity assessment), to determine potential for adverse health risks. The Risk Characterization component also included the identification and discussion of the significance of areas of uncertainty (Uncertainty Analysis) and an indication as to how these uncertainties were treated within the risk assessment.

The methods used to complete the HHRA were in accordance with approaches recommended by regulatory agencies such as Alberta Environment (2010a, b) and Health Canada (2009a,b,c).

9.2 Problem Formulation

9.2.1 Overview of Problem Formulation

The Problem Formulation is conducted to understand: (1) what potentially harmful substances (*i.e.*, contaminants present at concentrations in excess of generic screening criteria) are present at the site; (2) how human receptors may use the site; and (3) the pathways of contact that are possible between the receptors and these substances. The COPCs, site users and corresponding exposure pathways are examined in detail to identify "reasonably anticipated" exposure pathways that contribute to potential risk.

The following components are typically used to generate a conceptual exposure model:

- Assessment of current and future land use conditions;
- Identification of potential current and future site users;
- Identification of substances located on-site in concentrations that exceed appropriate generic screening levels;
- Identification of the media in which COPCs are located (*i.e.*, soil, groundwater, and air); and
- Identification of routes by which site users may come into contact with COPCs.

After careful evaluation of the "reasonably anticipated" exposure pathways, it is possible to identify whether scenarios exist that could pose a risk. If a potentially unacceptable risk scenario is identified, then a more detailed examination or quantitative risk assessment of the site is warranted. A more detailed examination of the site involves conducting the remaining quantitative stages of the risk assessment (exposure and toxicity assessments and risk characterization).

9.2.2 Site Use

The Site is primarily a residential area located between 15th Street NW to 19th Street NW (east to west) and between Westmount Blvd. NW and Westmount Road NW (south to north). The Site is developed with single-family homes, streets and alley ways. There are also two churches, two parks, and properties occupied by the CBC Calgary Radio and Television, the Bow Valley Lawn Bowling Club, and Firehall and Emergency Medical Services (EMS) Station #6. The Site is used for residential and commercial purposes. Construction workers could be on-site for relatively short periods of time for construction activities such as utility installation or home construction.

The Site is serviced with municipal water supplied from the City of Calgary. Water supplied to the Site is assumed to be used for domestic and/or office purposes only. Domestic wastewaters generated at the Site are discharged directly to the municipal sanitary sewer system. No process-related wastewaters are expected to be generated by the types of residential, institutional and commercial activities observed on Site.

Storm water flows to overland to grassed areas infiltrating the subsurface or overland into municipal storm water catch basins located in the paved roads running through and adjacent to the Site.

9.2.3 Land Use and Identification of Potential Human Receptors

As discussed in Section 9.2.2, the Site is a residential neighbourhood containing several commercial properties. The land use and activities in the area are not expected to change in the foreseeable future. Based on this information, the following receptors were considered for current/future scenario for this assessment:

- Residential receptors (adults and toddlers);
- Commercial workers (adults); and
- Construction workers (adults).

9.2.4 Chemicals of Potential Concern (COPCs)

9.2.4.1 Data Set

Although historical data are available for this Site, only soil vapour and groundwater data collected in 2011 for the purposes of the risk assessment were utilized as they reflect the most current site conditions. The historic data were reviewed and used to plan the site investigation conducted to support this risk assessment.

9.2.4.2 Screening Criteria

9.2.4.2.1 Soil Vapour

In Alberta, there are currently no remediation guidelines for evaluating the significance of measured soil vapour concentrations (*i.e.*, the AB Tier 1 guidelines are limited to soil and groundwater). In the absence of soil vapour guidelines, site-specific soil vapour screening criteria were developed following the methodology outlined in AB Tier 1 Guideline (AENV 2010a) and the CCME Canada-Wide Standard for Petroleum Hydrocarbon Compounds (CWS-PHC) in Soil User Guidance (January 2008), as follows:

For parameters that are non-carcinogens and have RfC values under AB Tier 1 Guidelines:

$$Csv = \frac{(RfC - Ca)(SAF)(BAF)}{(ET)(AF)}$$

For parameters that are carcinogens and have risk specific concentrations (RsC) under AB Tier 1 Guidelines:

$$Csv = \frac{(RsC)(BAF)}{(ET)(AF)}$$

where:
Csv = site-specific soil vapour screening criteria (µg/m^3)
RfC = reference air concentration (µg/m^3); also referred to as tolerable concentration
RsC = risk specific concentration
Ca = background indoor/outdoor air concentration (µg/m^3)
SAF = soil vapour allocation factor (unitless)

BAF = biodegradation adjustment factor (10, if eligible; 1, if not eligible, assumed to be not eligible for all compounds)
ET = Exposure term (unitless)
AF = attenuation factor between soil vapour and indoor air (unitless)

For SAF and Ca, the values in Table C-9 of the AB Tier 1 Guidelines (AENV 2010a) were used. Although the AB Tier 1 Guidelines guidance (AENV 2010a) allows for the use of soil allocation factors greater than 0.2 for some substances (generally petroleum hydrocarbon associated contaminants), in order to account for the many different chemicals identified and the possibility of not accounting for additive effects of substances acting on the same toxicological endpoints, a SAF of 0.2 was conservatively used for screening purposes.

The attenuation factor used was 0.01 for subslab soil vapour to indoor air based on recent work conducted by AENV (Personal Communication, 2011). The selection of attenuation factor of 0.01 is conservative as it does not take into account the distance between the buildings and the source as there is uncertainty with respect to the depths of basements relative to the water table; as a result the "de minimus" subslab indoor air attenuation factor was utilized. Similarly, the biodegradation adjustment factor (BAF) was assumed to be 1.0 for all chemicals (no adjustment). For RfCs for non carcinogens, the tolerable concentration values in Table C-9 of the AB Tier 1 Guidelines (AENV 2010a) were used. For carcinogenic parameters, the RsC was calculated using the following equation:

$$RsC = \frac{ILCR}{UR}$$

where:
ILCR = Incremental lifetime cancer risk (unitless)
UR = Inhalation unit risk $(\mu g/m^3)^{-1}$

Although an ILCR of $1x10^{-5}$ is provided as the target risk level in the AB Tier 2 Soil and Groundwater Remediation Guidelines (AENV 2010b), in order to account for the many different chemicals identified and the possibility of not accounting for additive effects of substances acting on the same toxicological endpoints an ILCR of $1x10^{-6}$ was conservatively used for screening purposes. For the UR, the Inhalation UR values in Table C-9 of the AB Tier 1 Guidelines (AENV 2010a) were used.

For select chemical parameters where toxicity reference values (TRVs) were not available, and elevated concentrations were measured, TRVs were obtained from the Health Canada (2009b), USEPA IRIS database (USEPA 2011a) or USEPA Regional Screening Levels (USEPA 2011b).

(AB Tier 1 Guidelines (AENV 2010a) were used to screen groundwater to identify COPCs for the construction worker exposure scenario. The lowest of the AB Tier 1 Guidelines matrix components (*i.e.*, potable water use, vapour inhalation, ecological soil contact and protection of aquatic life) were used for screening purposes. The COPCs identified were then screened again to determine those which were based on protection of human health (*i.e.*, potable water use, vapour inhalation). Potable water was conservatively included in the screening to be consistent with the AB Tier 1 guidance; however, Site groundwater is not currently being consumed and it is unlikely that it will be consumed in the future.

Municipal water in Calgary is sourced from the Bow River, which supplies the Bearspaw Water Treatment Plant and the Elbow River/Glenmore Reservoir, which is the supply for the Glenmore Water Treatment Plant. Although, the Bearspaw Plant supplies most of the water to the north sector of the city and the Glenmore plant supplies the south, a transmission line connects the water supplies from the two plants for purpose of supply reliability (The City of Calgary 2011).

9.2.4.3 Results of Screening

9.2.4.3.1 Soil Vapour

All volatile substances that were detected in groundwater, soil vapour and measured indoor air were retained as COPCs (CCME 2008) and site-specific screening criteria were developed for each of these substances for which inhalation TRVs are available (See Section 9.2.4.2.1).

As discussed above, the maximum soil vapour concentrations were compared to the site-specific screening criteria to identify COPCs to retain for risk assessment. Maximum concentrations of 1,3-butadiene, chloroform and naphthalene in soil vapour exceeded site-specific screening criteria. In addition, maximum concentrations of acetaldehyde, benzene, hexachlorobutadiene, methanol, 1,2,4-trimethylbenzene, C10-C12 aliphatics and C12-C16 aliphatics (CCME PHC F2) were detected at a ratio of greater than 0.1 times the site-specific soil vapour criteria and these COPCs were also conservatively retained for assessment to prevent the possible elimination of chemicals that might act synergistically on the same toxicological endpoint.

For residential and commercial exposures, screening was conducted using soil vapour measurements as they are more representative of exposure conditions than soil vapour concentrations predicted using vapour intrusion modelling from groundwater. Site-specific screening criteria and screened soil vapour data are presented in Appendix H. A summary of the results of the soil vapour data screening are presented in Table 16.

Table 16: Summary of Soil Vapour Screening

Parameter	Site-specific Soil Vapour Screening Criteria ($\mu g/m^3$)	Maximum Measured Soil Vapour Concentration	Ratio of Measured Soil Vapour Concentration to Site-specific Screening Criteria	Retained for Risk Assessment[1]
Units	α = 0.01	$\mu g/m^3$	-	-
Petroleum Hydrocarbons				
nC6-nC8 (aliphatic)	3.66E+05	1700	0.0046	No
nC8-nC10 (aromatic)	3.25E+03	320	0.0984	No
nC8-nC10 (aliphatic)	1.92E+04	1900	0.0988	No
nC10-nC12 (aromatic)	4.00E+03	180	0.0450	No
nC10-nC12 (aliphatic)	2.00E+04	4200	0.2100	Yes
nC12-nC16 (aliphatic)	2.00E+04	3500	0.1750	Yes

Parameter	Site-specific Soil Vapour Screening Criteria (µg/m^3)	Maximum Measured Soil Vapour Concentration	Ratio of Measured Soil Vapour Concentration to Site-specific Screening Criteria	Retained for Risk Assessment[1]
Volatile Organic Compounds				
Acetaldehyde	4.55E+01	19.4	0.4268	Yes
Acetone	6.20E+05	37	0.0001	No
Acetonitrile	1.20E+03	0.207	0.0002	No
Benzene	3.03E+01	14.6	0.4818	Yes
Butadiene (1,3-)	3.33E+00	30.7	9.2100	Yes
Carbon disulfide	1.40E+04	53.3	0.0038	No
Carbon tetrachloride	6.67E+00	0.52	0.0780	No
Chlorodifluoromethane	1.00E+06	0.628	6.3E-07	No
Chloroform	4.35E+00	25.6	5.8880	Yes
Chloromethane	1.80E+03	1.7	0.0009	No
Cumene	2.00E+04	27.4	0.0014	No
Cyclohexane	1.20E+05	38.3	0.0003	No
Dichloroethene (1,2-), trans	1.20E+03	4.55	0.0038	No
Ethylbenzene	1.99E+04	44	0.0022	No
Hexachlorobutadiene	4.55E+00	0.5	0.1100	Yes
Hexane (n-)	1.40E+04	121	0.0086	No
Isopropyl alcohol	1.40E+05	4	2.9E-05	No
Methanol	4.32E+04	4430	0.1025	Yes
Methyl ethyl ketone	1.00E+05	20	0.0002	No
Methyl isobutyl ketone	6.00E+04	1.52	2.5E-05	No
Methyl methacrylate	1.04E+03	4.1	0.0039	No
Methylene chloride	4.35E+03	22	0.0051	No
Naphthalene	4.10E+01	58	1.4146	Yes
Nonane (n-)	4.00E+03	13.9	0.0035	No
Pentane (n-)	2.00E+04	436	0.0218	No

Parameter	Site-specific Soil Vapour Screening Criteria (µg/m^3)	Maximum Measured Soil Vapour Concentration	Ratio of Measured Soil Vapour Concentration to Site-specific Screening Criteria	Retained for Risk Assessment[1]
Propylbenzene (n-)	2.00E+04	13	0.0007	No
Propylene	6.00E+04	919	0.0153	No
Styrene	1.83E+03	0.409	0.0002	No
Tetrachloroethene	7.20E+03	228	0.0317	No
Toluene	7.51E+04	610	0.0081	No
Trichlorobenzene (1,2,4-)	1.04E+02	0.86	0.0083	No
Trichloroethene	1.64E+02	4.42	0.0270	No
Trichlorofluoromethane	1.40E+04	3.1	0.0002	No
Trichlorotrifluoroethane (1,1,2-)	6.00E+05	0.684	1.1E-06	No
Trimethylbenzene (1,2,4-)	1.40E+02	61	0.4357	Yes
Vinyl chloride	1.14E+01	0.214	0.0188	No
Xylene (m- & p-)	2.00E+03	42.4	0.0212	No
Xylene (o-)	2.00E+03	53.8	0.0269	No
Xylenes (total)	3.56E+03	250	0.0702	No

Notes:
[1]Contaminants of Potential Concern were conservatively retained for risk assessment if the measured ratio of soil vapour concentrations versus the site-specific soil vapour screening criteria is greater than 0.1. A ratio greater than 0.1 was included as a screening criterion to prevent screening out of COPCs which may act on the same toxicological endpoint.
"-" - not applicable
µg/m^3 - micrograms per cubic metre
Shaded boxes – COPC retained for risk assessment

9.2.4.3.2 Groundwater

Contaminants of potential concern that were identified in groundwater include naphthalene and CCME PHC F2 based on the inhalation pathway and naphthalene, CCME benzo(a)pyrene equivalents, CCME PHC F2, ethylbenzene, and benzene based on hypothetical potable water consumption.

As noted above, soil vapour measurements were used to identify COPCs for residential/commercial receptors as they are more representative of exposure conditions than soil vapour concentrations predicted using vapour intrusion modelling from groundwater. However, the impacted groundwater could pose a potential health risk for construction workers and the COPCs identified above were retained for the assessment of health risks to construction workers in excavation trenches. Screened groundwater data are presented in Appendix H.

9.2.5 Identification of Operable Exposure Pathways

Exposure pathways that were retained for the HHRA are listed below.

- Inhalation of vapours in indoor air resulting from vapour intrusion into the building from soil or groundwater by residents or commercial workers;
- Inhalation of vapours in outdoor air in a trench by construction workers;
- Direct contact (incidental ingestion, dermal contact and inhalation of dust) with soil by construction workers; and
- Direct contact (incidental ingestion and dermal contact) with groundwater or dissolved phase product by construction workers.

Other exposure pathways which were considered but not retained for further assessment include the following:

- Inhalation of vapours in outdoor air resulting from vapour intrusion from soil or groundwater for residents/commercial workers was not retained for further assessment as indoor air is a more conservative surrogate for the estimation of risk as significant dilution is expected outdoors;
- Inhalation of vapours in outdoor air resulting from vapour intrusion from soil or groundwater for maintenance workers was not retained for further assessment as the resident/commercial worker assessment was considered a conservative surrogate for intermittent outdoor exposure because it is expected to be much less than a continuous indoor air exposure. The more significant outdoor air exposure is the exposure of construction workers with trench air present in subsurface excavations which was retained for further assessment; and
- Ingestion of groundwater for potable purposes by residents, commercial workers or construction workers as potable water is provided by the City of Calgary.

In addition to the pathways identified above, the permeation of chemicals via water and sewage pipes was also considered from the aspects of preferential pathways and the potential for the damage to occur to these utilities. Unlike the other pathways, this pathway could not be assessed quantitatively; however, a qualitative assessment of permeation of chemicals in utility pipes is presented in Appendix I.

9.2.6 Problem Formulation Checklist

A problem formulation checklist is provided in Table 17 below (as per Health Canada 2009a), and summarizes the Problem Formulation for the Site (*i.e.*, the land use, receptors and operable/inoperable exposure pathways).

Table 17 - Problem Formulation Checklist

Land Uses (check [√] as appropriate)		Receptor Group(s) (check [√] as appropriate)		Critical Receptors (check [√] as appropriate)		Exposure Pathways (check [√] as appropriate)						
	[√]		[√]		[√]	Soil ingestion	Soil dermal absorption	Particulate inhalation	Indoor vapour inhalation	Outdoor vapour inhalation	Ingestion of contaminated groundwater	Dermal Contact groundwater
Agricultural		General public	√	Infant								
Residential	√	Employees	√	Toddler	√				√			
Commercial with daycare [1]		Canadian First Nation communities	√	Child	√				√			
Commercial without daycare	√	Other (specify)		Adult	√				√			
Industrial		Other (specify)		Maintenance Worker								
Recreational, (such as urban park)		Other (specify)		Commercial Worker	√				√			
				Construction Worker	√					√[1]	√	√

Notes: [1]Trench air was conservatively modelled for the trench worker.

9.3 Exposure Assessment

9.3.1 Characterization of Potential Receptors, Exposure Frequency and Duration

Receptor characteristics used to evaluate potential exposure from soil at the Site are presented in Tables 18 (residents) and 19 (construction workers). To evaluate the potential exposure of current/future recreational users, the toddler (*i.e.*, ages 7 months to 4 years) was selected for the assessment of non-carcinogens, while an adult (*i.*e., age >20 years) was selected for exposure to carcinogens. The toddler was selected to for the assessment of non-carcinogens, as this is the age category which has the greatest exposure to body weight ratio and thus the highest risk estimates. Residents were conservatively used to assess indoor air exposures to commercial workers as the greater relative exposure for residents to indoor air is considered to be protective of the exposure for a commercial worker or church attendee.

Table 18: Human Receptor Characteristics (Residents)

Parameters	Current/Future Recreational Scenario	
	Toddler Resident (7 months – 4 years)	**Adult Resident (>20 years)**
Body weight (kg)	16.5	70.7
Inhalation rate (m^3/day)	9.3	15.8
Time spent indoors (hours/day)	N/A	N/A
Time spent outdoors (hours /day)	22.5	22.5
Days per week exposed (days)	1.5	1.5
Weeks per year exposed (weeks)	52	52
Total years exposed to site (years)	4.5	60
Years for carcinogen amortization (years)	N/A	60

Notes:
Receptor characteristics are from Health Canada (2009a), unless otherwise noted.
N/A – not applicable

Table 19: Human Receptor Characteristics (Construction Worker)

Parameters	Construction Worker (>20 yr)
Body weight (kg)	70.7
Inhalation rate (m^3/day)	23.7[c]
Soil intake (mg/day)	100
Skin surface area Exposed (cm^2)[b]	890 (hands) 2500 (arms)
Hours per day exposed (hr/day)	10
Days per week exposed (days)	5
Weeks per year exposed (weeks)	48
Total years exposed to Site (yrs)	60
Years for carcinogen amortization (yrs)	60

Notes:

[a]Receptor characteristics are taken from Alberta Environment (AENV, 2010a) or Health Canada (2009a), unless otherwise noted.

[b]Soil exposure to legs not considered in the model as construction workers are inferred to be wearing clothing appropriate to prevent leg-skin contact with groundwater.

[c]The inhalation rate for construction workers is based on 10 h x 1.4 m^3/hr (Health Canada, 2009a) construction worker + 14 h x 16.6[m^3/day]/24h /day (Health Canada, 2009a) adult rate. This calculation reflects the higher inhalation rate for a construction worker while actively working on Site and the lower inhalation rate typical of the adult population when not present at work.

9.3.2 Exposure Concentrations

Maximum measured soil vapour and groundwater (construction worker only) concentrations of COPCs were used in the human health risk assessment (Table 17 for soil vapour and Appendix H for groundwater).

9.3.3 Environmental Fate Modeling

Soil vapour data were available, and therefore exposure concentrations for the inhalation of the indoor air for residents and commercial workers were calculated based on maximum soil vapour concentrations and the “de minimus” AENV attenuation factor (indoor air concentration divided by the soil vapour concentration) of 0.01 for subslab to indoor air vapour intrusion, using the *Health Canada Spreadsheet Tool for Preliminary Quantitative Risk Assessment* (Health Canada, 2008). This factor (0.01) is considered an appropriate factor for estimation of indoor vapour concentrations for single-family and duplex houses with typical depth basements or crawlspaces because of the relatively close proximity (i.e., possibly within a metre in some cases) of the soil vapour probes to the lowest point of house. The attenuation factor assumes that there is not a sump in the basement for the pumping of groundwater.

Construction workers were inferred to be exposed to soil vapours while working in a potential future trench at the Site. To evaluate soil vapours to which such workers may be exposed, groundwater data was used to predict air concentrations in a construction trench using the Virginia Department of Environmental Quality (VDEQ) Trench Model (VDEQ 2007). For the purposes of modeling, the trench was considered to be 0.9 m deep, 0.9 m wide,

and spanned the length of the Site (330 m). The version of the Virginia Trench Model selected was that for groundwater that is less than 15 feet (4.6 m) deep. Parameters considered in the model include volatile parameters detected in groundwater monitoring wells located on-Site.

9.3.4 Exposure Equations

For the risk assessment, exposure estimates were calculated for each exposure pathway retained for assessment. Exposure equations were obtained from Health Canada (2009a), and the *Health Canada Spreadsheet Tool for Preliminary Quantitative Risk Assessment* (Health Canada 2008) was used for modelling.

Equations used to estimate exposure doses are listed below and calculated exposure doses are provided by receptor type in Appendix J. Sample calculations are also provided in Appendix J.

Inhalation of Contaminant Vapours Dose Rate

$$DR_v = \frac{C_A \times IR_A \times RAF_{inh} \times D_1 \times D_2 \times D_3 \times D_4}{BW \times LE}$$

Where:
DRV = dose rate from inhalation of COPC in soil vapour (mg/kg bw-day)
IR_A = inhalation rate ($m^{3/}$hour)
CA = COPC concentration in air (mg/m^3)
RAF_{inh} = bioavailability via inhalation (unitless)
D_1= hours per day exposed (hours/day)
D_2= days per week exposed /7 days
D_3= weeks per year exposed /52 weeks
D_4= total years exposed to Site (for carcinogens only)
BW = body weight (kg)
LE = life expectancy (years) (for carcinogens only)

The Virginia Department of Environmental Quality Trench Model (Virginia Trench Model) was utilized to model vapour exposure from groundwater to construction workers in a trench (VDEQ 2007). For groundwater depths less than 15 feet (4.6 m), the Virginia Trench Model utilizes default mass transfer coefficient from chemicals in water phase to air phase. The air concentration in the trench is then predicted using the configuration of trench and air exchange rate.

Air Concentration in Trench

$$C_{trench} = C_{gw} \times VF$$

Where:
C_{trench} = concentration of COPC in air in trench ($\mu g/m^3$)
C_{gw} = concentration of COPC in groundwater (µg/L)
VF = volatilization factor (L/m^3)

Volatilization Factor (depth to groundwater is less than or equal to 15 feet)

$$VF = \frac{\left(H_i \times D_{air} \times {AC_{vad}}^{3.33} \times A \times F \times 10^{-3} \times 10^{4} \times 3600\right)}{\left(R \times T \times L_d \times ACH \times V \times {Por_{vad}}^{2}\right)}$$

Where:
VF = Volatilization factor (L/m^3)
H_i = Henry's Law Constant for COPC (atm-m^3/mol)
D_{air} = Diffusion coefficient in air (cm^2/s)
AC_{vad} = Volumetric air content in vadose zone soil (cm^3/cm^3)
A = Area of the trench (m^2)
F = Fraction of floor through which COPC can enter (unitless)
R = Ideal gas constant (atm-m^3/mole-°K)
T = Average system absolute temperature (°K)
Ld = Distance between trench bottom and groundwater (cm)
ACH = Air changes per hour (h^{-1})
V = Volume of trench (m^3)
Por_{vad} = Total soil porosity in the vadose zone (cm^3/cm^3)
10^{-3} = Conversion factor (L/cm^3)
104 = Conversion factor (cm^2/m^2)
3600 = Conversion factor (s/hr)

Distance Between Trench Bottom and Groundwater (Ld; cm)

$$L_d = L_{gw} - D_{trench}$$

Where:
L_d = distance between trench bottom and groundwater (cm)
L_{gw} = depth to groundwater (cm)
D_{trench} = depth of trench (cm)

9.4 Toxicity Assessment

9.4.1 Contaminant Classification

Several organizations have developed classification systems based on the carcinogenic properties of chemicals. The classification systems for Health Canada (2009b), the International Agency for Research on Cancer (IARC 2010) and the US EPA Integrated Risk Information System (IRIS) database (US EPA 2011a) are presented in Table 20.

Table 20: Carcinogen Classification Systems used by Health Canada and US EPA

Health Canada[a]	IARC[b]	US EPA[c]	Description
Group I	Group 1	Group A	Human carcinogen
Group II	Group 2A	Group B	Probable human carcinogen
		Group B1	Limited human evidence available
		Group B2	Inadequate human evidence, sufficient animal evidence
Group III	Group 2B	Group C	Possible human carcinogen
Group IV	Group 3	Group D	Unclassifiable as to human carcinogenicity/ Unlikely to be a carcinogen (Health Canada only)
Group V	Group 4	Group E	Probably not carcinogenic to humans
Group VI	-	-	Unclassifiable as to human carcinogenicity

Notes:
a) Health Canada 2009b
b) IARC 2010
c) US EPA 2011a

The carcinogenicity classification for COPCs is provided in Table 21 below:

Table 21: COPC Carcinogen Classification

	Health Canada[1]	IARC[2]	US EPA[3]	Assessed as a Carcinogen?
Acetaldehyde	N/C	2B	B2	Yes
Benzene	Group I	Group 1	Group A	Yes
1,3-Butadiene	N/C	Group 1	Group B2	Yes
Chloroform	N/C	Group 2B	Group B2	Yes
Hexachlorobutadiene	N/C	Group 3	Group C	Yes
Methanol	N/C	N/C	N/C	No
Naphthalene	N/C	Group 2B	N/C (formerly Group C)	No
1,2,4-Trimethylbenzene	N/C	N/C	N/C	No
CCME PHC F2	N/C	N/C	N/C	No

Notes:
N/C – not classified
1. Health Canada 2009b
2. IARC 2010
3. US EPA 2011a

Acetaldehyde, benzene, 1,3-butadiene, chloroform and hexachlorobutadiene (through the inhalation pathway) were assessed as carcinogens (*i.e.*, non-threshold acting chemicals), whereas the remaining COPCs were assessed as non-carcinogens (*i.e.*, threshold acting chemicals). Naphthalene was not assessed as a carcinogen because a carcinogenic TRV is not available.

9.4.2 Toxicity Reference Values (TRVs)

Toxicity assessment involves identification of the potentially toxic effects of chemicals and determination of the amount of chemicals that people can be exposed to without experiencing adverse health effects. The toxicity assessment provides the basis for evaluating what is an acceptable exposure and what level of exposure may adversely affect people's health. The toxicity assessment provides a measure of the potential for adverse effects to carcinogenic (non-threshold) and non-carcinogenic (threshold) chemicals.

For threshold contaminants, an exposure limit or reference dose and the exposure from the Site are expressed as mg of contaminant per kg of body weight per day (mg/kg bw-day). For non-threshold chemicals, the TRV is expressed as a slope factor. The slope factor converts the estimated dose rate over a lifetime of exposure to incremental risk of developing cancer.

Toxicity reference values were selected preferentially from Alberta Environment (AENV 2010a) and Health Canada (2009b). Where an Alberta Environment value was not available, Health Canada (2009b), US EPA IRIS database (US EPA 2011a) or US EPA RSL (US EPA 2011b) values were used.

A summary of the RfDs, unit risks and slope factors, carcinogenicity classification and target organs used in this assessment are provided in Appendix K. Toxicity profiles for contaminants of potential concern, outlining pharmacokinetics, toxicity, carcinogenicity classification and toxicity-based reference values selected for use in the HHRA, are compiled in Appendix K.

9.5 Risk Characterization

For a threshold acting chemical, the risk characterization is expressed as a hazard quotient, such that hazard quotient = (estimated exposure)/(reference dose). The hazard quotients for a COPC associated with the different pathways of exposure are added to determine the potential risk associated with total exposure to a chemical. In addition, hazard quotients calculated for different COPCs are summed if they have the same mode(s) of action on a target organ. Alberta Environment (2010b) considers risk for non-carcinogens negligible if the exposure dose does not exceed the tolerable daily intake specified by Health Canada or other appropriate regulatory agency and also includes background exposure. As there is limited background information for many of the substances measured in soil vapour in this assessment, an HQ of 0.2 was considered negligible for substances other than CWS PHC fractions, following Health Canada (2009a). The recent CWS PHC were derived using a soil allocation factor of 0.5 for CWS PHC F1 and F2 because they are not typically present in food or consumer products (CCME 2008). Based on this recent guidance by CCME (2008), it is considered reasonable to adopt an acceptable threshold level of 0.5 for CWS PHC F1 and F2. Due to the conservative nature of the assumptions, HQs greater than 0.2 or 0.5 does not necessarily mean risks are unacceptable; however, it would indicate that further assessment may be required.

For a non-threshold acting chemical, the incremental lifetime cancer risk (ILCR) for the Site is calculated as the (predicted exposure) x (slope factor). Alberta Environment considers the acceptable ILCR to be one in one hundred thousand (1×10^{-5}) (AENV 2010b). An ILCR of greater than 1×10^{-5} is indicative of a potential health concern that should be more closely examined. An ILCR of less than 1×10^{-5} is considered essentially negligible (AENV 2010b).

9.5.1 Results

Health risks were evaluated for potential human receptors at the Site. A summary of risk estimates for COPCs for each of the receptors are summarized in Tables 22 (residents) and 23 (construction workers). Risks were not summarized by target organ/critical effect(s) as none of the COPCs were found to act on the same toxicological endpoints/organ systems (Appendix K). Calculated exposure doses (i.e., PQRA model output) are provided by receptor type in Appendix J. Sample calculations were also conducted manually to provide an additional check for the model calculations and are also included in Appendix J.

Table 22: Risk Estimates for Exposure to COPCs at the Site for Residents

COPC	Toddler Resident	Adult Resident
	Hazard Quotient	ILCR
Volatile Organic Compounds		
Acetaldehyde	2.2E-02	4.3E-07
1,3-Butadiene	1.5E-01	9.2E-06
Chloroform	5.7E-03	5.9E-06
1,3-Hexachlrorobutadiene	N/A	1.1E-07
Methanol	2.0E-02	N/A
1,2,4-Trimethylbenzene	8.7E-02	N/A
BTEX		
Benzene	N/A	4.8E-07
Polycyclic Aromatic Hydrocarbons		
Naphthalene	1.9E-01	N/A
Petroleum Hydrocarbons		
CWS PHC F2	9.0E-02	N/A

Notes:
CWS PHC – Canada-wide Standard for Petroleum Hydrocarbons
N/A - not applicable

Table 23: Risk Estimates for Exposure to COPCs at the Site for Construction Workers

COPC	Construction Worker	
	Hazard Quotient	ILCR
Volatile Organic Compounds		
Benzo(a)pyrene Equivalency*	N/A	**2.7E-02**
Chloroform	**5.9E-01**	**6.0E-04**
1,2,4-Trimethylbenzene	**1.8E+01**	N/A
BTEX		
Benzene	N/A	**8.5E-04**
Ethylbenzene	**4.6E-01**	N/A
Polycyclic Aromatic Hydrocarbons		
Naphthalene	**3.9E+03**	N/A
Petroleum Hydrocarbons		
CWS PHC F2	**2.0E+01**	N/A

Notes:
*Modelled as Benzo(a)pyrene
CWS PHC – Canada-wide Standard for Petroleum Hydrocarbons
N/A – not applicable
Bold and underlined values indicate an exceedance of the threshold for acceptable risk (hazard quotient = 0.2 except for CWS PHC [HQ =0.5] for non-carcinogens and ILCR (incremental lifetime cancer risk) = 1.0E-05)

The human health risk assessment evaluated potential risks for current and future users at the Site. The assessment did not identify unacceptable risks to residents (and by default commercial workers who would be less exposed than residents). Unacceptable risks were identified for construction workers in a trench exposed to outdoor air under the current/future scenario. A detailed description of hazard quotients and ILCR values that exceed target risk levels (HQ = 0.2 [or 0.5 for CWS PHC F2]; ILCR = 1.0E-05) are summarized below for the construction worker scenario.

- **Benzene**: an ILCR of 8.5E-4 was calculated for the trench construction worker. The risk estimate was driven by the vapour inhalation exposure pathway.
- **Benzo(a)pyrene Equivalency**: an ILCR of 2.7E-2 was calculated for the trench construction worker. The risk estimate was driven by dermal contact with groundwater pathway.
- **Chloroform:** an HQ of 0.59 and an ILCR of 6.0E-4 calculated for the trench construction worker. The risk estimate was driven by the vapour inhalation exposure pathway.
- **Ethylbenzene**: an HQ of 0.46 was calculated for the trench construction worker. The risk estimate was driven by the vapour inhalation exposure pathway.
- **Naphthalene**: an HQ of 3,900 was calculated for the trench construction worker. The risk estimate was driven by the vapour inhalation exposure pathway.
- **1,2,4-Trimethylbenzene**: an HQ of 18 was calculated for the trench construction worker. The risk estimate was driven by the vapour inhalation exposure pathway.
- **CWS PHC F2**: an HQ of 20 was calculated for the trench construction worker. The risk estimate was driven by the vapour inhalation exposure pathway.

9.5.2 Uncertainty Evaluation

This assessment of potential risk to receptors on the Site was evaluated using generally conservative assumptions. Table 24 below outlines the sources of uncertainty for the human health risk assessment.

Table 24: Evaluation of Uncertainty in the Human Health Risk Assessment

Assumption	Uncertainty	Under/ Overestimate of Risk	Rationale
Exposure Assumptions			
Likelihood that site characterization was able to capture maximum contaminant concentrations	Moderate	Under/ overestimate	The current investigation targeted areas of potential contamination; however, it is possible that there are other locations on the Site with higher concentrations of certain COPCs. Therefore, risk could be under or overestimated.
Use of maximum concentrations of contaminants in soil to estimate risks	Moderate	Overestimate	Maximum concentrations are likely to overestimate risks.

Assumption	Uncertainty	Under/ Overestimate of Risk	Rationale
Use of vapour attenuation factor of 0.01 for prediction of indoor air concentrations	Moderate to high	Most likely overestimate	An attenuation factor of 0.01 is considered a relatively conservative factor for subslab soil vapour samples (*i.e.*, obtained directly below the foundation). The soil vapour samples were obtained beside houses at elevations that were likely below the base of the foundation. The 0.01 factor does not account for vapour attenuation in soil between the probe and building, and therefore is most likely conservative because of attenuation processes such as diffusion and aerobic biodegradation. Lateral variability in soil vapour concentrations is expected and this will contribute to the uncertainty in prediction of indoor air concentrations.
Assessment was based on a single monitoring event	Moderate	Underestimate or Overestimate	Generally, it is preferred to have at least two monitoring events which reflect seasonal differences.
Body weights, inhalation rates, skin surface area	Low	Neutral	Based on average Canadian exposure characteristics (Health Canada 2009a).
Exposure assumptions	Low	Neutral	Based on average Canadian exposure characteristics (Health Canada 2009a).
Toxicity Assessment			
Multiple contaminants were detected for which toxicity reference values are not available	Moderate	Underestimate	Multiple contaminants were detected in soil vapour for which toxicity reference values or surrogates with toxicity reference values are unavailable and as a result, screening criteria could not be developed for them in the risk assessment. This could result in an underestimate of risk.
Toxicity reference values (non-carcinogens)	Low (based on humans) to high (based on animals)	Overestimate	Toxicity data are based on sensitive endpoints. Uncertainty and safety factors are applied to account for inter and intra species variability.
Toxicity reference values (carcinogens)	Low (based on humans) to high (based on animals)	Overestimate	Toxicity data are based on sensitive endpoints. High dose to low dose extrapolation methods are typically conservative.

9.5.3 Human Health Risk Assessment Conclusions

The human health risk assessment evaluated potential risks for current and future users. Maximum soil vapour and groundwater concentrations were used to estimate exposure through inhalation of indoor/outdoor air and air concentrations within a trench, resulting in conservative estimates of risk.

Risks for residents were found to be negligible based on the soil vapour measurements collected on-Site. Potential risks to construction workers involved in subsurface activities exposed to groundwater and trench air were above target risk levels for benzene, benzo(a)pyrene equivalents, chloroform, ethylbenzene, naphthalene, 1,2,4-trimethylbenzene and CWS PHC F2.

Groundwater was collected primarily for purposes of delineation of the plume and concentrations in shallow groundwater at several locations are indicative of dissolved phase product. Drinking water is not currently consumed on-Site as the area is municipally serviced; however, exposure controls may need to be put in place to prevent hypothetical future groundwater consumption.

A detailed health and safety plan should be developed for construction workers who undertake subsurface activities (*i.e*., trench workers) at the Site. The use of personal protective equipment and regular monitoring of trench air quality will be required to reduce worker exposure to volatile substances. An additional round of soil vapour modelling is recommended to capture seasonal variation and confirm the results obtained in this investigation.

10.0 CONCLUSIONS AND RECOMMENDATIONS

This report presents a HHRA for a primarily residential area of Calgary, Alberta, located north of the Bow River and former Canada Creosote site, referred to as the "North Bow Site" or "Site". The HHRA is required to evaluate creosote-related contamination that has migrated from the Canada Creosote Site, located south of the Bow River, to the North Bow Site area. Wood-preserving operations historically took place on the Canada Creosote Site and involved the use of tars, creosote, petroleum oils and pentachlorophenol.

The purpose of this project is to assess the potential risk to human health associated with possible exposure to subsurface contamination from the Canada Creosote Site (primarily creosote) by residents and utility workers. The primary exposure pathway of concern for the Site is soil vapour intrusion into buildings and utility trenches. Creosote impacts that are present at the Site consist of dense non-aqueous phase liquid (DNAPL) and light non-aqueous phase liquid (LNAPL) and dissolved chemicals in groundwater (referred as the "dissolved plume"). The extents of the DNAPL, LNAPL and dissolved plume have not been delineated by this HHRA.

A Phase I ESA was completed to support the HHRA. The findings of the Phase I ESA included identification of the following issues of potential environmental concern:

- The former Canada Creosote Site, located south of the Bow River, which was used for wood treating operations, and other nearby industrial land uses. Chemicals of potential concern for this site include tars, creosote, petroleum oils and pentachlorophenol.
- Creosote-related impacts have previously been identified at the Firehall/EMS Station, located at the northeast corner of Memorial Drive and 19th Street NW. No specific chemicals of potential concern were identified with the use of this property as a firehall/EMS station.
- The HiHo service station, located at 2001 Bowness Rd NW (west of study area), has been a service station from 1946 to the present. No subsurface information was available for this site. Chemicals of potential concern for this site include petroleum hydrocarbons.
- Former fuel service station and mechanical repair shop, located at 1610 Westmount Rd NW, 1601 Kensington Rd NW and 99 – 14th Street NW (there are multiple historic addresses for this site), which operated from 1954 to 1991. Chemicals of potential concern for this site include petroleum hydrocarbons.

The 2011 field investigation approach was to choose sampling locations in areas of known creosote impact based on historical information, and to then move outward from these areas in an approximate grid pattern. The investigation program consisted primarily of characterization of shallow groundwater and soil vapour quality near to the water table given the focus on the soil vapour intrusion pathway. Given this focus, the scope of work for this project did not include a detailed hydrogeological assessment nor delineation of DNAPL or the dissolved phase groundwater plume, and only a limited number of investigation locations were completed to evaluate deeper subsurface conditions. The investigation was limited to residential areas and did not include for example the CBC site where there are known creosote impacts (outside of the scope of this assessment).

The groundwater monitoring data when compared to the Alberta Tier 1 Guidelines indicated that the CWS PHC (Canada Wide Standard – Petroleum Hydrocarbon Compound) F2 fraction, naphthalene, and chloroform concentrations exceeded the guidelines for the inhalation pathway (*i.e.*, indoor soil vapour intrusion). The maximum groundwater concentrations of select analytes commonly associated with creosote impacts were a benzene concentration of 0.039 mg/L, naphthalene concentration of 2.6 mg/L, and PHC fraction F2

concentration of 4.7 mg/L, respectively. There are no Alberta Tier 1 Guidelines for soil vapour; however, soil vapour is considered through the human health risk assessment described below. The maximum soil vapour concentrations of select analytes commonly associated with creosote impacts were a benzene concentration of 14.6 μg/m^3, naphthalene concentration of 58 μg/m^3, and PHC fraction F1 and F2 concentrations of 3,700 μg/m^3 and 8,100 μg/m^3, respectively.

An updated CSM was developed based on the results of the 2011 site investigation, and is summarized below.

- Canada Creosote is the only significant source of soil vapour contamination in the North Bow area.
- The Site is geologically complex, consisting of primarily coarse-grained unconsolidated deposits underlain by fractured bedrock. The contamination source distribution (both NAPL and dissolved phase) is also inferred to be complex and spatially variable.
- The depth to bedrock at wells drilled in 2011 was 3.7 m below ground surface near Broadview Road NW and 18th Street NW, and 6.5 m below ground surface along Memorial Drive. The historical investigations indicated a depth to bedrock of 5 m or greater at investigation locations.
- There is evidence of creosote impacts in bedrock and soil above bedrock at two 2011 wells along Broadview Road NW near 18th Street NW. One of the 2011 wells is a short distance further west than the previous historical locations where NAPL was encountered. At one location, a creosote-like LNAPL sheen was encountered at the water table.
- The depth to the water table in late February and early March 2011 was sufficiently high such that the NAPL source zones appeared to be submerged below the water table (the implications of this are described below).The results of groundwater monitoring indicated elevated and spatially variable concentrations of naphthalene and CWS PHC F2 fraction in wells along Broadview Road NW in the general area of 18th Street NW that were consistent with locations of monitoring wells with observed creosote impacts. Other Site wells had lower but detectable naphthalene concentrations.
- The results of the soil vapour monitoring indicated elevated oxygen concentrations near to atmospheric levels indicating a well-oxygenated vadose zone (conditions conducive for aerobic biodegradation), and relatively low carbon dioxide, methane and combustible vapour concentrations.
- The primary chemicals of potential concern are vapour-phase analytes commonly associated with creosote, which include BTEX, naphthalene, F1 and F2 (note that as part of the human health risk assessment a broad list of analytes were evaluated). However, the concentrations of these compounds were relatively low compared to other sites where much higher soil vapour concentrations have been measured near to creosote-impacted soil.
- Testing of soil vapour for a large list of the PIANO (paraffins, isoparaffins, aromatics, naphthenes, and olefins) compounds did not reveal other compounds of significant potential concern based on qualitative comparisons and the human health risk assessment.
- The shallow groundwater and deep soil vapour concentrations were not well correlated but soil vapour concentrations of naphthalene and xylenes were somewhat higher in areas with elevated groundwater concentrations of these parameters. However, the measured soil vapour concentrations were much lower (generally one to three orders of magnitude) than the concentrations predicted using the Henry's Law

constant, which has also been commonly observed at other sites with dissolved hydrocarbon impacts and where aerobic biodegradation occurs.

The relatively low soil vapour concentrations that were measured in March 2011 represent a relatively weak source consistent with a dissolved phase source and a water table that was sufficiently high such that the NAPL source zones were likely submerged below the water table. For such sources, aerobic biodegradation is expected to result in relatively rapid attenuation of the vapours for the chemicals of potential concern identified above. The elevated oxygen concentrations and somewhat elevated carbon dioxide concentrations (carbon dioxide is produced from aerobic biodegradation) are indicators that aerobic biodegradation is occurring within the vadose zone and is resulting in attenuation of creosote vapour concentrations.

A potentially important finding is that the groundwater elevations during the soil vapour investigation in March 2011 were relatively high, which appears to be a result of the water levels in the Bow River. The water levels may be even higher in late spring due to spring runoff and consequent rise in the Bow River, but may be lower in late summer based on 2010 Bow River water level trends. Of significance is that the depth to groundwater in late February 2011 at the borehole with the shallowest depth to bedrock (3.7 m below ground surface) was approximately 0.5 m less than the depth to the bedrock surface at this location. If the groundwater level were to decline to below the bedrock surface, there may be greater potential for contaminants within bedrock to volatilize and consequently greater potential for elevated soil vapour concentrations. The potential significance of water table fluctuations is not known, but additional monitoring of water levels and soil vapour concentrations is recommended, as discussed below.

The human health risk assessment applied a soil vapour attenuation factor (indoor air concentration divided by the soil vapour concentration) of 0.01 consistent with AENV policy to predict indoor vapour concentrations in residential single-family or duplex houses, which are assumed to have basement or crawlspace construction of typical depth for residential houses, but that do not include a sump for pumping of groundwater (the attenuation factor assumption should be reviewed and updated as warranted based on proposed additional monitoring). The results of the human health risk assessment indicate that the predicted risks for residents were found to be negligible based on the soil vapour measurements collected on-Site. Potential risks to construction workers involved in subsurface activities exposed to groundwater and trench air were above target risk levels for benzene, benzo(a)pyrene equivalents, chloroform, ethylbenzene, naphthalene, 1,2,4-trimethylbenzene and CWS PHC F2.

The 2011 investigation provides important information on the nature and distribution of contamination sources, the shallow dissolved groundwater plume, and soil vapour concentrations in the North Bow area. Nevertheless, there are data gaps that remain that are recommended to be addressed through further monitoring at the Site. Further work is needed to develop the details of the possible additional monitoring program; the objective here is to provide recommendations at a high level for initial consideration, as summarized below.

- It is recommended that additional boreholes and monitoring wells be constructed to assess the depth to bedrock and characterize contamination source (NAPL) zones, focussing on the area with the shallowest bedrock observed during the 2011 field program (along Broadview Road NW), but moving outward from this area, as warranted.
- Based on the results of the above bedrock characterization, a focussed likely limited scope supplementary soil vapour probe installation program is recommended.

- Regular monitoring (or download and analysis of data) of Bow River levels and groundwater levels is recommended.
- An additional monitoring event is recommended when the groundwater levels are lower (likely late summer), which should include collection and analysis of soil vapour samples from existing and new probes, and analysis of groundwater from select monitoring wells.

On the basis of the additional data obtained, the human health risk assessment should be updated, and possible requirements for further assessment and risk management measures for possible mitigation of soil vapour intrusion should be evaluated.

Groundwater monitoring indicates impact to groundwaters and concentrations of select analytes above Alberta Tier 1 Guidelines for potable water use at several monitoring wells. Drinking water is not currently consumed on-Site as the area is municipally serviced; however, administrative controls or covenants may need to be put in place to prevent hypothetical future groundwater consumption.

A detailed health and safety plan should be developed for construction workers who undertake subsurface activities at the Site involving excavation of trenches or any excavation that is deeper than typical shallow excavation for single-family or duplex residential houses (possible risk management and health and safety requirements should be reviewed and updated as warranted based on proposed additional monitoring). The use of personal protective equipment and regular monitoring of trench air quality will be required to reduce worker exposure to volatile substances. Air monitoring results should be compared to applicable regulatory standards or limits including Alberta Occupational Exposure Limits.

Risk management measures should be implemented to minimize the potential for permeation or intrusion of contaminants into water mains. Such measures could include the removal of contamination from trench corridors and/or use of pipe system materials that are resistant to creosote contamination.

11.0 REPORT LIMITATIONS

This report has been prepared for the exclusive use of Alberta Environment. The report, which specifically includes all tables, figures and appendices, is based on data and information collected during the site investigation activities conducted by Golder Associates Ltd., and is based solely on the conditions of the Site at the time of the field investigations, supplemented by historical information and data obtained by Golder Associates Ltd. as described in this report.

The assessment of environmental conditions and possible hazards at this Site has been made using the results of chemical analysis of groundwater and soil vapour samples collected from a limited number of locations. The site conditions between sampling locations have been inferred based on conditions observed. Subsurface conditions may vary from these sample locations. Additional study, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of study. However, it is never possible, even with exhaustive sampling and testing, to dismiss the possibility that part of a site may be contaminated and remain undetected.

The services performed as described in this report were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

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

The content of this report is based on information collected during the sampling dates mentioned in the report, our present understanding of the site conditions, and our professional judgement in light of such information at the time of this report. This report provides a professional opinion and, therefore, no warranty is expressed, implied, or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statutes are subject to change.

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this report, and to provide amendments as required

12.0 CLOSURE

We trust that this report meets your current needs. If you have any questions or concerns, please do not hesitate to contact David Simpson at (403) 216 8936.

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TABLES

Table 1: Summary of Physical Properties Soil Testing Results
Canada Creosote Site - North Bow
Human Health Risk Assessment

Sample ID	MW10-6 S4	MW10-7A S4	MW10-22 S4	MW10-11 S2	MW10-15 S1	MW10-9-A S5	MW10-1 S3	MW10-2 S6
Sample Depth (m bgs)	**4.0 - 4.5**	**3.7 - 4.0**	**3.0 - 3.4**	**0.9 - 1.5**	**0.9 - 1.2**	**5.5 - 5.8**	**1.5 - 2.5**	**4.0 - 4.5**
Sample Collection Date	**2/15/2011**	**2/15/2011**	**2/17/2011**	**2/16/2011**	**2/17/2011**	**2/18/2011**	**2/14/2011**	**2/14/2011**
Moisture Content (%)[1]	12	11	18	8.1	9.3	13	2.4	9.7
Sieve - Pan (<0.075 mm)	11	52	59	NA	NA	69	NA	NA
Sieve - #200 (>0.075 mm)	89	48	41	NA	NA	31	NA	NA
Grain Size	COARSE	FINE	FINE	NA	NA	FINE	NA	NA
Total Organic Carbon (C)	0.08	0.64	0.69	1.7	0.66	0.33	0.2	0.14

Notes:

m bgs - metres below ground surface.

All units in percentage (%) unless otherwise noted

Table to be read in conjunction with accompanying report.

NA - Not analyzed

1 - moisture content determined on weight basis (McKeague 2.411). Moisture content = (wet weight - dry weight)*100/dry weight

Table 2. Summary of Available Information

Electronic File Name	Author	Date	Site	Description
General Area Reports North of Bow River				
N/A	Golder for City of Calgary	July 1991	Broadview Road NW	"Draft Report to City of Calgary on Creosote Discovery along Broadview Rd. NW, July 1991": - Creosote first encountered June 3, 1991, at STN +96 to STN 1+05 - Liquid creosote observed to be migrating into base excavation STN 1+75 to STN2+05, from north side wall; LNAPL in form of sheen entered excavation from south wall; creosote contamination appeared continuous in this interval - Creosote odours detected at STN 2+80, creosote stained soil at STN 2+85 at base of excavation - Approximately 880 tonnes of suspected contaminated fill disposed of off-site.
N/A	Golder Associates	May 1992	Memorial Drive	Report to Acres International Ltd. on "River Engineering Investigation at Canada Creosote Site, May 1992": - Investigation involved hydrogeologic testing and analysis, monitoring of wells for LNAPL and DNAPL, and headspace vapour tests on soil and rock cores (no chemistry testing was conducted) - Monitoring wells probed for LNAPL on March 27 and April 21, 1992 - LNAPL observed as oily film on probe in wells AC-92-03, AC-92-04, AC-92-05, AC-92-06, AC-92-07 and AC-92-16 - DNAPL encountered in well AC-92-06R at thicknesses of up to 8.46 m - During drilling, creosote staining was visible in bedrock fracture zone at depths of 1 to 5 m below soil/bedrock interface, at boreholes AC-92-4, 5 and 6.
N/A	O'Connor Associates	February 1993	Bow River to Bowness Rd. NW, 17th to 19th Street NW	"North Bank Risk Assessment Canada Creosote V.1, O'Connor Associates Inc., February 1993": - 11 boreholes advanced along Broadview Rd. and Memorial Drive - Groundwater and soil vapour data collect - Detailed compositional analysis for soil vapour obtained - Vapour intrusion modeling and health risk assessment conducted - Soil profile along Broadview Rd. generally consisted of gravel fill overlying sand and gravel to bedrock surface, generally encountered at approximately 5 m bgs - Soil profile along Memorial Drive generally consisted of silt and sand topsoil overlying silt, sand, gravel and cobble materials. Bedrock was encountered at 8 m bgs

Electronic File Name	Author	Date	Site	Description
				- DNAPL observed at BH-1 (in Broadview Rd. N), no DNAPL or creosote staining noted in wells along Memorial Drive, although most wells were shallow. Only three wells extended to bedrock, but did not penetrate bedrock for any significant distance.
N/A	Keystone Environmental	September 2001	Bow River to Bowness Rd. NW, 17th to 19th Street NW	"Report of Findings of Environmental Site Assessment Phase I North Bank Westmount Generally Bound by the Bow River, 19th Street NW, Bowness Road NW and 17th Street NW"
	Golder for City of Calgary	July 1991	Broadview Road NW	"Draft Progress Report to City of Calgary on the Creosote Discovery along Broadview Rd. NW, July 1991": - Creosote first encountered June 3, 1991, at STN +96 to STN 1+05 - Liquid creosote observed to be migrating into base excavation STN 1+75 to STN2+05, from north side wall, LNAPL in form of sheen entered excavation from south wall, creosote contamination appeared continuous in this interval - Creosote odours detected at STN 2+80, creosote stained soil at STN 2+85 at base of excavation, further excavation temporarily ceased - Approximately 880 tonnes of suspected contaminated fill disposed of off-site
SCD00940-COMPILATION REPORT NORTH BOW	Keystone for City of Calgary	September 2003	North Bow	"Compilation Report North Bow, Calgary, Alberta": - Compilation available info on occurrence of suspected creosote contamination discovered in 1991 during excavation utility trenches along Broadview Road NW - In 1992, soil & bedrock boreholes and wells along Memorial Drive indicated creosote contamination detected in fractured bedrock at 1 m to 5 m depth below bedrock-soil interface in North Bow Area. - In 1993, borehole and wells installed as part of risk assessment (RA) for North Bow Area found creosote-like contamination discovered in other areas besides the utility trenches along Broadview Road NW. - Geology of North Bow Area is characterized by sand and gravel fill over sand, over sand and gravel, over weathered bedrock, over interbedded shale and sandstone bedrock. - A distinct clay layer is observed on north bank of the Bow River that appears to start ~ 90 m west of 17th Street NW and extends ~ 16th Street NW and possibly further. The clay layer does not appear to be continuous across the Bow River.

Electronic File Name	Author	Date	Site	Description
				- Shale/sandstone bedrock surface is generally 7 to 10 m bgs on south bank and generally 7 m to 8.5 m bgs on north bank. The bedrock surface is generally sloped towards the north-northeast. - In general, anticipated that the groundwater on north side of the Bow flows to the south to southwest.
April 28 2010 AENV Comments Re ARP	Warren Riley, Alberta Environment to City of Calgary	Apr 28, 2010		Proposed West Village Area Redevelopment Plan (Draft), City of Calgary, March 2010
SCD00940_ CORRESPONDENCE	Alberta Environment	N/A	N/A	Chemical Safety Data Sheets for Wood Preserving Chemicals
SCD00940_ CORRESPONDENCE _2	N/A	N/A	N/A	Label
Canada Creosote				
SCD00940_ CORRESPONDENCE _5	Alberta Environment?	1988	Canada Creosote	Industrial Waste Landfill Program HELP End Landfill Pollution – Site Investigation Requirements
SCD00940_ CORRESPONDENCE _8	Not known	Up to 1988	Canada Creosote	Aerial Photographs and Utility Clearance,
SCD00940_ CORRESPONDENCE _10	Not known	1988	Canada Creosote	Site Plans, Groundwater Contours, Slug Tests, Aerial Photographs, Analytical Testing
SCD00940_ CORRESPONDENCE _11		1988	Canada Creosote	Newspaper article
SCD00940_ CORRESPONDENCE _13		1988 & 1989	Canada Creosote	Newspaper article
SCD00940_ GROUNDWATER CHEMISTRY ANALYSIS	Not known	1988	Canada Creosote	Chemistry data
SCD00940_WELL TEST REPORT	Not known	1988	Canada Creosote	Slug test results
SCD00940_ GROUNDWATER MONITORING	Not known	1988	Canada Creosote	Hydrogeological and Chemistry Data Report including Borehole Logs

Electronic File Name	Author	Date	Site	Description
SCD00940-CORREPONDANCE_ SOIL AND GROUNDWATER QUALITY	Not known	1988	Canada Creosote	"Hydrogeological and Chemistry Data Report"
N/A (Golder library)	EMA Associates	1990	Canada Creosote	"Relative Toxicity, Bioaccumulation and Other Variables for Specific Dense Non-Aqueous Phase Liquids"
N/A (Golder library)	Golder Associates and EMA	1990	Canada Creosote	"Final Report to Alberta Environment HELP Project Preliminary Risk Assessment, Canada Creosote Site": - Soil, groundwater and DNAPL characterization, and preliminary hydrogeological and DNAPL mobility assessment completed. - All investigation locations were south of the Bow R. except 3 boreholes (GA-13, 14 and 15) advanced along the north shore (no evidence of DNAPL at these locations).
Distr Dissolved Contaminants in Bow River	G. Van der Vinne, Alberta Research Council	December 1992	Canada Creosote	"Distribution of Dissolved Contaminants in Bow River Below Canada Creosote Site" - no subsurface information
N/A (Golder library)	Al Sosiak	Feb 1998	Canada Creosote	Changes in Contaminant Levels in the Bow River Following the Installation of a Containment System at the Canada Creosote Site
1724 Westmount Blvd. N				
SCD01416-SCD PHASE 1 ESA SITE 1 CBC CALGARY	Jacques Whitford	Mar 29, 2005	1724 Westmount Blvd. NW	"Phase I Environmental Site Assessment Report Site 1 - CBC Calgary Radio & Television 1724 Westmount Boulevard NW Calgary": - Based on high permeable soils in area of Site and northerly direction of regional groundwater flow (i.e., towards the Site), the storage and handling wood preserving chemicals (e.g., constituents including naphthalene, PCP, creosote, metals) at the former wood treatment and lumber manufacturing plants and storage/handling of hydrocarbons at the former and current oil refineries, service stations, and bus terminal located south of the Site was considered to represent a potential environmental concern to the Site.

Electronic File Name	Author	Date	Site	Description
SCD01416-REPORT – SUMMARY OF INITIAL FINDINGS PHASE II ASSESSMENT	Jacques Whitford	2006	1724 Westmount Blvd. NW	"Summary of Initial Findings – Limited Phase II Environmental Site Assessment CBC Building, 1724 Westmount Boulevard NW, Calgary, Alberta": - Stratigraphy consists of sand & gravel, underlain clay at 5.8m, & siltstone bedrock at 7.1m - Two monitoring wells installed; depth to water table = 3.7m - In soil, PAH compounds at 8 to 11 m bgs exceeded CCME SQG - In groundwater, PAH and phenolic compounds exceeded CCME FAL - Creosote or coal-tar DNAPL detected in bedrock
SCD01653 - PHASE II ESA	Jacques Whitford	Jul 26, 2006	1724 Westmount Blvd. NW	"Phase II Environmental Site Assessment CBC Building, 1724 Westmount Boulevard NW, Calgary, Alberta": - Stratigraphy consists of sand & gravel, underlain clay at 6m, & siltstone bedrock at 7.2- 9.2m - 14 monitoring wells installed - Depth to water table was 3.4 to 4.1m on Apr 18, 06 (water levels considered "high" due to high water level in river) (on Apr 18, 06, geodetic elevation water Bow R. 1047.01m, groundwater on site 1046.66m) - Interpreted groundwater flow direction to the northeast - Six wells (MW2A-7A) are screened above water table - Creosote DNAPL encountered in wells at 9.3 m depth (MW1B), 5.2 depth (MW3B) and 3.9 m depth (MW6B) - Volatile headspace concentrations measured in wells ranged from non-detect to 118 ppm (MW6B) - Elevated concentrations of PAH, petroleum hydrocarbon and phenolic compounds groundwater
HHRA CALGARY CBC JAN 5 PH 3	Jacques Whitford	Jan 4, 2007	1724 Westmount Blvd.	"Human Health Risk Assessment for 1724 Westmount Blvd., Calgary, Alberta": - Qualitative risk assessment (QRA) completed - 2-storey cinderblock building with concrete slab-on-grade foundation - COPCs were BTEX, naphthalene and phenolics - Modeled indoor air using groundwater concentrations and J&E model - Also obtained indoor air samples for analysis - Predicted risks within acceptable levels
SCD01653 – COVERING LETTER	City of Calgary	January 2008	1724 Westmount Blvd. NW	Covering Letter

Electronic File Name	Author	Date	Site	Description
1928 and 1940 Westmount Blvd. N				
SCD01416-REPORT – FINAL REPORT PHASE II ESA	UMA	Dec 17, 2007	1928 and 1940 Westmount Blvd. NW	Phase II Environmental Site Assessment 1928 & 1940 Westmount Boulevard NW, Calgary, Alberta - Stratigraphy consists of sand & gravel, underlain clay and siltstone bedrock at about 7 m - Three monitoring wells installed; depth to water table ~4m, based on September 2007 groundwater levels, water table above screen at MW7-01 and just below screen at MW07-2 and 3 - No measureable LNAPL or DNAPL encountered in wells but sheens detected in two wells (MW7-02 & 03) along west boundary, logs indicate sheen on gravel - Naphthalene groundwater concentrations at MW7-02 & -03 were 3 and 7.4 mg/L, respectively, suggesting nearby NAPL, F2 and PAH concentrations in soil and groundwater at these locations exceeded applicable criteria
SCD01653 – SITE SPECIFIC RISK ASSESSMENT INDOOR AIR	UMA	Dec 13, 2007	1928 and 1940 Westmount Blvd. NW	"Site Specific Risk Assessment Indoor Air, 1928 and 1940 Westmount Blvd. NW": - Two indoor air samples collected from Emergency Services Building - Analyzed for BTEX and naphthalene using carbotrap tubes in series; individual BTEX concentrations ranged from 0.1 to 43 ug/m3, naphthalene concentrations were less than detection limit (0.7 ug/m3) - Predicted health risk acceptable
SCD01653 – EMAIL RE CHR COMMENTS ON RISK ASSESSMENT WESTMOUNT BLVD.	Denis Stefani, CHR	Apr 7, 2008	1928 and 1940 Westmount Blvd. NW	Email providing comments on UMA 2008 risk assessment. "The Exposure and Hazard Assessment are based on the assumption that indoor concentration = soil gas concentration. And, the classification of the site as coarse-grained, residential/parkland. Specific issues raised 1. Soil gas sampling protocol 2. Applicable cancer risk level 10-6 for benzene, 3. Naphthalene considered probably human carcinogen.
00080048_ CORRESPONDENCE	Alberta Environment	2003	2001 Bowness Rd. NW	Regulatory correspondence regarding UST removal, Golder proposal for Phase 1 ESA, limited information relevant to project

Electronic File Name	Author	Date	Site	Description
#4-14 Street				
00075872_ ENVIRONMENTAL ASSESSMENT	Hardy BBT	June 1990	#4-14 Street	"Environmental Assessment, #4-14 Street, NW, Calgary, Alberta"
00075872_ADDENDUM SOIL ANALYSIS TO REPORT ENVIRONMENTAL ASSESSMENT	Hardy BBT	June 1990	#4-14 Street	"Addendum to Environmental Assessment, #4-14 Street, NW, Calgary, Alberta"
00075872_ADDENDUM ENVIRONMENTAL ASSESSMENT	Hardy BBT, Alberta Environment	June 1990	#4-14 Street	"Environmental Assessment, #4-14 Street, NW, Calgary, Alberta"(updated report to above): - Shallow soil vapour survey was conducted using combustible gas detector indicated vapour concentrations between 200 and 700 ppm - Screening of groundwater wells indicated low to moderate combustible gas concentrations of up to 4% of LEL and faint gasoline odours.
00075872_ MONITORING WELL INSTALLATION	Hardy BBT	Dec 1990	#4-14 Street	"Excavation and Follow-up Groundwater Monitoring Well Installation, #4-14 Street, NW, Calgary, Alberta"
00075872_ MONITORING FOLLOW-UP WELL INSTALLATION	Hardy BBT	Dec 1990	#4-14 Street	"Excavation and Follow-up Groundwater Monitoring Well Installation, #4-14 Street, NW, Calgary, Alberta" – Same as above?
00075872_OFF SITE WATER SAMPLING	Morrow	Nov 16, 1992	#4-14 Street	"Off-Site Water Sampling at the Shell Service Station, 14th Street and Bowness Road, NW, Calgary": - Concentrations in one off-site well below detection limit
00075872_ SUPPLEMENTARY SUBSURFACE INVESTIGATION	AGRA	Nov 15, 1995	#4-14 Street	"Former Shell Canada Service Station Confirmatory Drilling Investigation, #4-14th Street NW, Calgary": - Focussed investigation - No hydrocarbon impacts
00075872_RESULTS OF EXCAVATION AND REMOVAL REMEDIATION	AGRA plus correspondence Shell, Alberta Environment	1996, 1997	#4-14 Street	Site achieved Level II coarse risk-management criteria for inhalation
00075872_PHASE II ENVIRONMENTAL SITE ASSESSMENT	J.R.Smith & Associates	April 1997	#4-14 Street	"Phase II Environmental Site Assessment, #4-14 Street N.W., Calgary, Alberta": - Multi-storey apartment with retail planned for former Shell service station site - Two boreholes conventional auger, six boreholes Becker hammer - Sandy gravel, some sand layers to 5-7 m depth, underlain by bedrock - Depth to groundwater 3.4 to 4.5 m - Soil concentrations well below applicable standards

Electronic File Name	Author	Date	Site	Description
00075872_ CORRESPONDENCE	Raynor, Alberta Environment, AGRA, Shell	April 1997	#4-14 Street	Correspondence - Investigation including shallow soil vapour survey conducted in 1990 - 1,500 m3 soil removed in 1990, 150 m3 removed in 1995 - Some groundwater sampling results
00075872_ CORRESPONDENCE	Raynor, Alberta Environment, AGRA, Shell	April 1997	#4-14 Street	Correspondence - Investigation including shallow soil vapour survey conducted in 1990 - 1,500 m3 soil removed in 1990, 150 m3 removed in 1995 - Some groundwater sampling results

Chemical	BH-1 (5.2 m) 92/02/20	BH-1 (5.2 m) 92/10/07	BH-2 (6.1 m) 92/02/20	BH-2 (6.1 m) 92/10/07	BH-8 (5.5m) 92/02/20	BH-9 (8.2m) 92/02/20	BH-9 (8.2m) 92/10/07	BH-10 (5.8m) 92/02/20
Benzene	<1	1.8	<1	2.2	<0.5	<0.5	<0.5	<0.5
Toluene	1.7	31	24	83	<1	<1	<1	<1
Ethylbenzene	1.4	80	25	96	<1	<1	<1	<1
Xylenes	47	540	200	460	<1	<1	<1	<1
Total purgeable hydrocarbons	<100	6000	<100	130	<100	<100	<100	<100
Total acid extractables	55	10	550	340	4000	340	51	250
Total base/neutral extractables	1600	260	4600	1100	310	1500	230	130
Acenaphthene	51	32	86	27	<0.05	<0.05	<0.02	<0.05
Acenaphthylene	34	1.3	59	1.1	<0.05	<0.05	<0.02	<0.05
Benzo(a)anthracene/chrysene	0.048	0.65	<0.01	4	0.35	<0.05	<0.02	<0.05
Benzo(b or k) fluoranthene	<0.01	0.25	<0.01	3.2	0.13	<0.05	<0.02	<0.05
Benzo(g,h,i)perylene	NA	<0.02	NA	1.2	0.16	<0.05	<0.02	<0.05
Benzo(a)pyrene	0.05	0.16	0.88	2	0.08	<0.05	<0.02	<0.05
Carbazole	5	3.9	32	7.3	<0.05	<0.05	<0.02	<0.05
Dibenzo(a,h)anthracene	NA	0.04	NA	<0.25	<0.05	<0.05	<0.02	<0.05
Dibenzofuran	29	7.9	47	0.33	0.06	<0.05	<0.02	<0.05
Dimethylnaphthalenes	36	16	72	0.47	0.95	26	<0.02	<0.05
Fluoranthene	NA	6.9	NA	2.3	0.28	<0.05	<0.02	<0.05
Fluorene	35	15	58	3.2	0.09	1.9	<0.02	<0.05
Indeno(1,2,3-cd)pyrene	NA	0.04	NA	0.98	<0.05	<0.05	<0.02	<0.05
Methylanthracene	4.3	0.23	27	<0.25	0.26	2.6	<0.02	<0.05
Methylnaphthalenes	250	59	710	82	0.8	28	<0.02	<0.05
Naphthalene	340	86	1900	1400	0.24	0.023	<0.02	<0.05
Phenanthrene/anthracene	20	8.8	57	6.4	0.6	1.5	<0.02	<0.05
Pyrene	NA	4.7	NA	1.8	0.3	0.36	<0.02	<0.05
4-Chloro-3-methylphenol	<0.01	<0.25	0.02	<0.25	<0.5	0.69	<0.25	<0.05
2-Chlorophenol	<0.01	<0.25	<0.01	<0.25	<0.5	<0.5	<0.25	<0.5
o-cresol	0.064	<0.25	0.13	<0.25	<0.5	<0.5	<0.25	<0.5
2,4-dichlorophenol	<0.01	<0.25	<0.01	<0.25	<0.5	<0.5	<0.25	<0.5
2,4-dimethylphenol	<0.01	<0.25	0.28	<0.25	<0.5	<0.5	<0.25	<0.5
4,6-dinitro-o-cresol	<0.01	NA	<0.01	NA	NA	NA	NA	NA
2,4-dinitrophenol	<0.01	<0.25	<0.01	<0.25	<0.5	<0.5	<0.25	<0.5
2-Methyl-4,6-dinitrophenol	NA	<0.25	NA	<0.25	<0.5	<0.5	<0.25	<0.5
2-Nitrophenol	<0.01	<0.25	<0.01	<0.25	<0.5	<0.5	<0.25	<0.5
4-Nitrophenol	<0.01	<0.25	<0.01	<0.25	<0.5	<0.5	<0.25	<0.5
Pentachlorophenol	<0.01	<0.25	3.7	<0.25	<0.5	<0.5	<0.25	<0.5
Phenol	<0.01	<0.25	0.07	<0.25	<0.5	<0.5	<0.25	<0.5
Tetrachlorophenol	<0.01	<0.25	<0.01	<0.25	<0.5	<0.5	<0.25	<0.5
Trichlorophenol	<0.01	<0.25	<0.01	<0.25	<0.5	<0.5	<0.25	<0.5

Note: All concentrations in ug/L

Chemical	BH-1 (5.2 m) 92/02/20	BH-2 (6.1 m) 92/02/20
Cyclohexane	160	210
C3 Alkyl cyclohexane	<36	<50
Methyl cyclohexane	<36	150
Ethyl cyclohexane	<36	70
2,4-dimethylhexane	<36	<50
Methyl cyclopentane	<36	<50
2-Methyl hexane	<36	<50
3-Methyl hexane	<36	<50
Ethyl methyl cyclohexane	<36	170
1-Methyl-4-(1-methylethenyl1)-cyclohexane	<36	<50
1-Propenyl cyclohexane	<36	<50
2,2-dimethyl-3-methylenebicyclo(2.2.1)heptane	<36	740
6,6-dimethyl-3-methylenebicyclo(3.1.1)heptane	<36	180
4-(1-methylethyl)-heptane	<36	<50
C3 alkyl benzenes	<36	<50
C4 alkyl benzenes	900	4400
C5 alkyl benzenes	<36	<50
C13 alkyl benzenes	43	<50
Methyl propyl benzene	220	80
Methyl propyl benzene C3 alkyl	<36	60
Dimethyl ethenyl benzene	180	490
Trimethyl benzenes	610	870
Ethyl methyl benzene	<36	2100
Diethyl benzene	36	<50
Propyl benzene	50	250
Isopropyl benzenes	660	2500
Methyl benzene propanoate	93	<50
Indene	36	<50
1-Methyl 1H-indene	57	440
2,3-Dihydro 1H-indene	390	<50
Methyl 2,3-dihydro-1H-indene	360	1800
Dimethyl-2,3-dihydro-1H-indene	<36	140
Ethyl 2,3-dihydro-1H-indene	<36	110
1H-Octahydroindene	<36	70
1,1,2-trichloro-1,2,2-trifhloroethane	93	180
Diethyl biphenyls	79	250
7-Methyl benzofuran	<36	210
Methyl decalin	110	<50
Acetone	1300	190
Ethylacetate	980	1750
Camphor	310	<50
3-Carene	<36	4000
Terpenes	<36	820
Limonene	<36	17100
Benzothiophene	<36	470
Carbon disulphide	<36	430
Unidentified	<36	160
1-Propenyl cyclohexane	<36	<50
Benzene	320	600
Bromodichloromethane	<36	<50
Bromoform	<36	<50
Bromomethane	<36	<50
Carbon tetrachloride	<36	<50
Chlorobenzene	<36	<50
Chloroethane	<36	<50
2-Chloroethylvinyl ether	<36	<50
Chloroform	400	500
Chloromethane	<36	<50
Dibromochloromethane	<36	<50
Dichlorobenzene	140	70
1,1-dichloroethane	<36	<50
1,2-dichloroethane	<36	<50
1,1-dichloroethylene	<36	<50
trans-1,2-dichloroethylene	<36	<50
1,2-dichloropropane	<36	<50
cis-1,3-dichloropropylene	<36	<50
trans-1,3-dichloropropylene	<36	<50
Ethyl benzene	<36	1700
Methylene chloride	13000	72000
1,1,2,2-tetrachloroethane	<36	<50
Tetrachloroethylene	50	320
Toluene	440	1500

Chemical	BH-1 (5.2 m) 92/02/20	BH-2 (6.1 m) 92/02/20
1,1,1-Trichloroethane	150	150
1,1,2-Trichloroethane	<36	<50
Trichloroethylene	<36	<50
Trichlorofluoromethane	<36	<50
Vinyl chloride	<36	<50
Anenaphthene	<71	<100
Acenaphythylene	<71	<100
Anthracene	<71	<100
Benzo(a)anthracene/chrysene	NA	trace
Benzo(b)fluoranthene	NA	NA
Benzo(k)fluoranthene	NA	NA
Benzo(ghi)perylene	NA	NA
Benzo(a)pyprene	NA	NA
Carbazole	NA	NA
Dibenzo(ah)anthracene	NA	NA
Dibenzofuran	NA	NA
Dimethyl naphthalene	NA	NA
Fluoranthene	43	80
Fluorene	<71	<100
Indeno(1,2,3-cd)pyrene	NA	NA
Methyl anthracene	NA	NA
Methyl naphthalene	260	760
Naphthalene	420	2400
Phenanthrene/anthracene	<71	<100
Pyrene	50	70
Chlorophenols	<140	<200
Dichlorophenols	<140	<200
Trichlorophenols	<140	850
Tetrachlorophenols	<140	<200
Pentachlorophenol	<360	<200
Xylenes	<36	4100
Pentane	260	700
Hexane	2200	4000
Heptane	<36	120
Octane	36	160
Nonane	<36	630
Decane	310	450
Undecane	220	800
Dodecane	<36	390
Tridecane	<36	<50
Tetradecane	<36	150
Pentadecane	71	140
C7 Alkanes	<36	110
C9 Alkanes	43	<50
C10 Alkanes or Cycloalkanes	100	<50
C11 Alkanes or Cycloalkanes	36	<50
C12 Alkanes or Cycloalkanes	<36	<50
C13 Alkanes	<36	130
C7 Alkene or cycloalkane	79	<50
C10 Alkene or cycloalkane	<36	<50
C9 Cycloalkane	<36	<50
C10 Cycloalkane	<36	250
C11 Cycloalkane	<36	<50
C12 Cycloalkane	43	<50
2-Methylbutane	36	1200
2,2-Dimethyl butane	<36	280
2,6-Dimethyl octane	<36	<50
2-Methylpentane	43	720
3-Methylpentane	170	650
2,3-Dimethyl pentane	<36	250
2,4-Dimethyl pentane	<36	170
Methylcyclopentane	290	640
2-Methoxy-2,2,4-trimethylpentane	64	<50
4-(1-methylethyl)-heptane	<36	<50
Butylated hydroxy toluene	<36	<50
Silanes	<36	<50
Phthalate pasticizer	<36	<50
2,2,4-Trimethylpentane	<36	<50
C10 Bicycloalkane	<36	<50
2,3,3-Trimethylpentane	<36	<50
Sum of Detected VOCs	25941	137430

Note: All concentrations in ug/m^3

Site	Well	Monitoring Date	Ground Elevation (m asl)	Elevation (toc) (m asl)	Total Depth (toc) (m)	Depth to NAPL (toc) (m)	Depth to Water (toc) (m)	Groundwater Elevation (m asl)
EMS No 6	MW07-01	2-Oct-07	1050.97	1050.97	7	nil	3.93	1046.99
	MW07-02	2-Oct-07	1051	1051	7.1	nil	3.86	1047.06
	MW07-03	2-Oct-07	1050.88	1050.88	6.9	nil	3.8	1047.01
O'Connor North Bank	BH-1	92/08/21	N/A	1049.861	N/A	nil	3.444071929	1046.42
	BH-2	92/08/21	1050.175	1050.059	N/A	nil	3.291679366	1046.77
	BH-3	92/08/21	N/A	1050.263	N/A	nil	3.236818043	1047.03
CBC Building	MW1A	28-Dec-05	N/A	1050.54	7.3	nd	3.86	1046.68
	MW1A	18-Apr-06	N/A	1050.54	7.3	nd	3.76	1046.78
	MW1B	28-Dec-05	N/A	1050.56	9.3	9.29	3.67	1046.89
	MW1B	18-Apr-06	N/A	1050.56	9.3	nd	3.68	1046.88
	MW2A	18-Apr-06	N/A	1050.46	6.1	nd	3.84	1046.62
	MW2B	18-Apr-06	N/A	1050.42	9.5	nd	3.58	1046.84
	MW3A	18-Apr-06	N/A	1050.57	6.1	nd	4.1	1046.47
	MW3B	18-Apr-06	N/A	1050.53	10.1	5.1	3.99	1046.54
	MW4A	18-Apr-06	N/A	1049.98	6.1	nd	3.38	1046.6
	MW4B	18-Apr-06	N/A	1050.01	11.3	nd	3.56	1046.45
	MW5A	18-Apr-06	N/A	1050.24	6.1	nd	3.56	1046.68
	MW5B	18-Apr-06	N/A	1050.09	10.7	nd	3.63	1046.46
	MW6A	18-Apr-06	N/A	1050.58	5.8	nd	3.89	1046.69
	MW6B	18-Apr-06	N/A	1050.51	9.1	3.91	nd	1046.6
	MW7A	18-Apr-06	N/A	1050.39	5.5	N/A	3.64	1046.75
	MW7B	18-Apr-06	N/A	1050.4	9.1	N/A	3.51	1046.89
Acres International	AC-92-01S	25-Mar-92	1052.33	N/A	N/A	N/A	N/A	1048.28
	AC-92-01S	22-Apr-92	1052.33	N/A	N/A	N/A	N/A	1048.2
	AC-92-02S	25-Mar-92	1053.9	N/A	N/A	N/A	N/A	1047.92
	AC-92-02S	22-Apr-92	1053.9	N/A	N/A	N/A	N/A	1047.91
	AC-92-03R	25-Mar-92	1051.39	N/A	N/A	N/A	N/A	1047
	AC-92-03R	22-Apr-92	1051.39	N/A	N/A	N/A	N/A	1047.18
	AC-92-03S	25-Mar-92	1051.42	N/A	N/A	N/A	N/A	1046.77
	AC-92-03S	22-Apr-92	1051.42	N/A	N/A	N/A	N/A	1047.75
	AC-92-04R	25-Mar-92	1052.45	N/A	N/A	N/A	N/A	1046.59
	AC-92-04R	22-Apr-92	1052.45	N/A	N/A	N/A	N/A	1046.57
	AC-92-05R	25-Mar-92	1051.8	N/A	N/A	N/A	N/A	1046.32
	AC-92-05R	22-Apr-92	1051.8	N/A	N/A	N/A	N/A	1046.3
	AC-92-05S	25-Mar-92	1051.82	N/A	N/A	N/A	N/A	1047.24
	AC-92-05S	22-Apr-92	1051.82	N/A	N/A	N/A	N/A	1047.21
	AC-92-06R	25-Mar-92	1052.25	N/A	N/A	N/A	N/A	1047.05
	AC-92-06R	22-Apr-92	1052.25	N/A	N/A	N/A	N/A	1046.98
	AC-92-06S	25-Mar-92	1052.24	N/A	N/A	N/A	N/A	1047.01
	AC-92-06S	22-Apr-92	1052.24	N/A	N/A	N/A	N/A	1047
	AC-92-07R	25-Mar-92	1050.02	N/A	N/A	N/A	N/A	1046.47
	AC-92-07R	22-Apr-92	1050.02	N/A	N/A	N/A	N/A	1046.45
	AC-92-07S	25-Mar-92	1050.03	N/A	N/A	N/A	N/A	1046.45
	AC-92-07S	22-Apr-92	1050.03	N/A	N/A	N/A	N/A	1046.44
	AC-92-08R	25-Mar-92	1049.96	N/A	N/A	N/A	N/A	1047.41
	AC-92-08R	22-Apr-92	1049.96	N/A	N/A	N/A	N/A	1047.5
	AC-92-09R	25-Mar-92	1050.39	N/A	N/A	N/A	N/A	1029.91
	AC-92-09R	22-Apr-92	1050.39	N/A	N/A	N/A	N/A	1034.1
	AC-92-10R	25-Mar-92	1049.2	N/A	N/A	N/A	N/A	1047.81
	AC-92-10R	22-Apr-92	1049.2	N/A	N/A	N/A	N/A	1047.63
	AC-92-10S	25-Mar-92	1049.18	N/A	N/A	N/A	N/A	1046.98
	AC-92-10S	22-Apr-92	1049.18	N/A	N/A	N/A	N/A	1046.92
	AC-92-11R	25-Mar-92	1049.42	N/A	N/A	N/A	N/A	1047.61
	AC-92-11R	22-Apr-92	1049.42	N/A	N/A	N/A	N/A	1047.44
	AC-92-11S	25-Mar-92	1049.52	N/A	N/A	N/A	N/A	1046.92
	AC-92-11S	22-Apr-92	1049.52	N/A	N/A	N/A	N/A	1046.82
	AC-92-12R	25-Mar-92	1049.47	N/A	N/A	N/A	N/A	1047.21
	AC-92-12R	22-Apr-92	1049.47	N/A	N/A	N/A	N/A	1047.22
	AC-92-12S	25-Mar-92	1049.52	N/A	N/A	N/A	N/A	1046.83
	AC-92-12S	22-Apr-92	1049.52	N/A	N/A	N/A	N/A	1046.69
	AC-92-13R	25-Mar-92	1049.53	N/A	N/A	N/A	N/A	1049.02
	AC-92-13R	22-Apr-92	1049.53	N/A	N/A	N/A	N/A	1046.92
	AC-92-13S	25-Mar-92	1049.57	N/A	N/A	N/A	N/A	1049.09
	AC-92-13S	22-Apr-92	1049.57	N/A	N/A	N/A	N/A	1046.81
	AC-92-14R	25-Mar-92	1048.09	N/A	N/A	N/A	N/A	1047.21
	AC-92-14R	22-Apr-92	1048.09	N/A	N/A	N/A	N/A	1047.19
	AC-92-14S	25-Mar-92	1048.13	N/A	N/A	N/A	N/A	1047.17
	AC-92-14S	22-Apr-92	1048.13	N/A	N/A	N/A	N/A	1047.04
	AC-92-15R	25-Mar-92	1049.6	N/A	N/A	N/A	N/A	1046.68
	AC-92-15R	22-Apr-92	1049.6	N/A	N/A	N/A	N/A	1047.13
	AC-92-15S	25-Mar-92	1049.59	N/A	N/A	N/A	N/A	1047.14
	AC-92-15S	22-Apr-92	1049.59	N/A	N/A	N/A	N/A	1047.11
	AC-92-16R	25-Mar-92	1046.75	N/A	N/A	N/A	N/A	1046.75
	AC-92-16R	22-Apr-92	1046.75	N/A	N/A	N/A	N/A	1046.75
	AC-92-16S	25-Mar-92	1046.72	N/A	N/A	N/A	N/A	1046.49
	AC-92-16S	22-Apr-92	1046.72	N/A	N/A	N/A	N/A	1046.46
	AC-92-18R	25-Mar-92	1047.08	N/A	N/A	N/A	N/A	1036.09
	AC-92-18R	22-Apr-92	1047.08	N/A	N/A	N/A	N/A	1037.86

Table 6: Summary of Field Groundwater Monitoring Results
Canada Creosote Site - North Bow
Human Health Risk Assessment

Sample ID		MW10-1	MW10-2	MW10-3A	MW10-3B	MW10-5	MW10-6	MW10-7A	MW10-7B	MW10-9A	MW10-9B	MW10-10	MW10-11	MW10-12	MW10-14	MW10-15	MW10-16	MW10-18	MW10-20	MW10-22
Date Monitored	**Units**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**
Temperature	**°C**	4.22	4.84	5.26	4.54	DRY	4.13	3.88	4.71	4.88	4.13	4.44	4.53	DRY	DRY	3.06	3.78	3.82	3.23	4.01
pH	**-**	8.47	7.94	7.93	7.83	DRY	7.61	6.52	7.42	7.76	7.71	7.54	7.90	DRY	DRY	7.56	7.07	7.09	7.14	7.26
Conductivity	**µS/cm**	958	766	806	776	DRY	644	410	326	374	393	593	588	DRY	DRY	238	401	744	401	402
Dissolved Oxygen	**mg/L**	11.21	8.51	9.87	8.76	DRY	4.51	8.85	10.09	9.50	8.90	9.19	8.51	DRY	DRY	9.67	10.05	6.81	10.00	9.58
Top of Casing Elevation	**masl**	1050.849	1050.597	1050.645	1050.430	1049.788	1050.262	1050.020	1049.898	1049.817	1049.907	1049.723	1049.464	1051.679	1050.353	1050.314	1050.085	1049.937	1049.851	1049.776
Ground Surface Elevation	**masl**	1050.892	1050.780	1050.674	1050.725	1049.930	1050.452	1050.008	1050.112	1050.008	1050.051	1049.939	1049.675	1051.888	1050.628	1050.561	1050.405	1050.093	1049.989	1050.107
Depth to Static Water Level	**mbtoc**	3.286	2.962	2.590	2.706	3.774	3.229	2.839	2.952	3.016	3.092	3.089	2.894	DRY	DRY	2.599	2.984	3.075	2.897	2.940
Depth to Static Water Level	**mbgs**	3.329	3.144	2.619	3.001	3.917	3.419	2.827	3.167	3.207	3.236	3.305	3.104	DRY	DRY	2.846	3.304	3.230	3.036	3.271
Depth to NAPL	**mbtoc**	ND	ND	ND	ND	DRY	3.228	ND	ND	ND	ND	ND	ND	DRY	DRY	ND	ND	ND	ND	ND
Total Depth	**mbtoc**	4.15	4.50	6.99	3.66	3.78	4.29	6.94	5.66	7.33	4.61	4.21	3.93	4.02	2.59	4.14	3.77	4.01	4.00	4.01
Static Water Level Elevation	**masl**	1047.563	1047.635	1048.055	1047.724	1046.014	1047.033	1047.181	1046.946	1046.801	1046.815	1046.634	1046.570	DRY	DRY	1047.715	1047.101	1046.862	1046.954	1046.836

Notes:
mbtoc - metres below top of casing
mbgs - metres below ground surface
masl - metres above sea level
NAPL - non aqueous phase liquid
ND - none detected
Table to be read in conjunction with accompanying report.
A denotes deeper well, B denotes shallow well.

Location	Well ID	Date	Depth to water (mbtoc)	Total Depth (mbtoc)	Combustible gas (ppm)	Organic vapour (ppm)	Notes
EMS	No well ID but in location of 07-01	12/6/2010	3.855	7.112	-	-	
		2/17/2011	3.41	7.055	-	-	
CBC	MW1-A	3/2/2011	3.101	7.273	75	0	
		5/9/2011	3.73	7.265	-	-	
	MW2-A	12/6/2010	3.762	5.45			
		2/17/2011	3.24	5.39			
		3/2/2011	3.282	5.454	0	0	
	MW2-B	12/6/2010	3.442	9.54			
		2/17/2011	2.79	9.48			
		3/2/2011	2.833	9.56	135	6	
	MW3-A	3/2/2011	Could not locate				
		5/9/2011	3.981	6.697	-	-	
	MW3-B	3/2/2011	Could not locate				
		5/9/2011	5.213	-	-	-	Depth to DNAPL = 5.213
	MW6-A	3/2/2011	3.428	5.704	135	0	
		5/9/2011	3.856	5.7	-	-	
	MW6-B	3/2/2011	3.169	9.504	15	0	Depth to DNAPL = 4.485
		5/9/2011	3.745	-	-	-	Depth to DNAPL = 7.61

Notes:

1. Gas concentrations in well headspace measured using RKI Eagle 2.

Organic vapour concentration measured using RKI Eagle 2 photoionization detector (PID) with 10.6 eV lamp.

2. mbtoc = depth below top of casing.

3. Could not locate other wells on CBC Site.

Table 8: Summary of Groundwater BTEX and PAH Results
Canada Creosote Site - North Bow
Human Health Risk Assessment

Sample Name Location Date QA/QC	Alberta Tier 1 Res/Prklnd most stringent of fine and coarse[1]	Alberta Tier 1 Res/Prklnd for coarse grained soil Inhalation Pathway	Alberta Tier 1 Res/Prklnd potable water use	MW10-1 3/1/2011	MW10-10 3/1/2011	MW10-11 3/1/2011	MW10-15 3/1/2011	MW10-16 3/1/2011	MW10-18 3/1/2011	MW10-2 3/1/2011	MW10-20 3/1/2011	MW10-22 3/1/2011	MW10-3A 3/1/2011	MW10-3B 3/1/2011	MW10-6 3/1/2011	DUP 2 (MW10-06) 3/1/2011 FD	MW10-7A 3/1/2011	MW10-7B 3/1/2011	DUP 1 (MW10-7B) 3/1/2011 FD	MW10-9A 3/1/2011	MW10-9B 3/1/2011
BTEX																						
Benzene	**0.005**	0.14	**0.005**	0.0007	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	**0.039**	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Toluene	0.024	74	0.024	0.0011	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	0.0017	< 0.0004	0.0011	0.0006	0.0005	0.0005	0.0083	< 0.0004	< 0.0004	0.0009	0.0015
Ethylbenzene	**0.0024**	16	**0.0024**	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	0.0005	0.0005	0.0019	0.002	**0.081**	0.0013	0.0009	< 0.0004	< 0.0004
Xylenes, Total	0.3	3.9	0.3	< 0.0008	0.0017	< 0.0008	< 0.0008	< 0.0008	< 0.0008	< 0.0008	0.0016	< 0.0008	0.0031	0.0028	0.0081	0.0085	0.14	0.0052	0.0036	< 0.0008	< 0.0008
F1 (C6-C10) - BTEX	0.81	0.81	2.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
F2 (C10-C16)	**1.1**	**1.5**	**1.1**	< 0.1	0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	**3**	**3**	**4.7**	0.6	**1.2**	< 0.1	< 0.1
PAH																						
2-Methylnaphthalene	NG	0.6[2]	0.47[2]	0.00087	0.0026	0.00032	0.00022	0.0011	0.0002	0.00011	0.00019	0.00011	0.00025	0.00028	0.23	0.21	0.066	0.059	0.075	0.00015	0.00051
Acenaphthene	**0.0058**	NGR	1.4	0.00022	0.0014	< 0.00010	< 0.00010	0.00013	0.00071	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	**0.2**	**0.18**	**0.027**	**0.056**	**0.069**	< 0.00010	0.0003
Acenaphthylene	0.046	NG	NG	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	0.0029	< 0.0050	0.0016	0.0024	0.0029	< 0.00010	< 0.00010
Acridine	NG	NG	NG	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.010	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Anthracene	**0.000012**	NGR	NGR	**0.000022**	**0.00027**	**0.000033**	**0.000015**	**0.000058**	**0.000023**	< 0.0000010	**0.00003**	< 0.000010	**0.000021**	**0.00002**	**0.063**	**0.063**	**0.0025**	**0.04**	**0.046**	**0.000036**	**0.00038**
B(a)P Equivalency	**0.00001**	NG	**0.00001**	< 0.00001	**0.00005**	**0.00006**	< 0.00001	**0.00006**	**0.00004**	< 0.00001	**0.00004**	< 0.00001	**0.00001**	**0.00001**	**0.012**	**0.011**	**0.00022**	**0.026**	**0.026**	**0.00004**	**0.00066**
Benzo(a)anthracene	**0.000018**	NG	NG	< 0.0000085	**0.000058**	**0.000042**	< 0.0000085	**0.000054**	**0.00003**	< 0.0000085	**0.000026**	< 0.0000085	0.0000095	0.000014	**0.024**	**0.024**	**0.00055**	**0.031**	**0.033**	**0.000041**	**0.00071**
Benzo(a)pyrene	**0.000015**	NG	NG	< 0.0000075	**0.000024**	**0.000038**	< 0.0000075	**0.000039**	**0.000027**	< 0.0000075	**0.000023**	< 0.0000075	< 0.0000075	< 0.0000075	**0.0065**	**0.006**	**0.00012**	**0.017**	**0.016**	**0.000024**	**0.00043**
Benzo[b,j]fluoranthene	**0.00048**	NG	NG	< 0.0000085	0.000049	0.000048	< 0.0000085	0.00006	0.000035	< 0.0000085	0.000029	< 0.0000085	0.000014	0.000016	**0.01**	**0.0075**	0.00018	**0.024**	**0.021**	0.000045	**0.00061**
Benzo[c]phenanthrene	NG	NG	NG	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.0043	< 0.0040	< 0.00015	< 0.0050	< 0.0050	< 0.000050	< 0.00010
Benzo[e]pyrene	NG	NG	NG	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	0.0048	0.0036	0.0001	0.012	0.012	< 0.000050	0.00031
Benzo[g,h,i]perylene	**0.00017**	NG	NG	< 0.0000085	0.000024	0.000031	< 0.0000085	0.000031	0.000019	< 0.0000085	0.000023	< 0.0000085	0.00002	0.0000095	**0.002**	**0.0037**	0.000044	**0.0063**	**0.0064**	0.000018	0.00015
Benzo[k]fluoranthene	**0.00048**	NG	NG	< 0.0000085	0.00002	0.000018	< 0.0000085	0.000025	0.000015	< 0.0000085	0.000014	< 0.0000085	< 0.0000085	< 0.0000085	**0.0032**	**0.004**	0.000066	**0.0073**	**0.0071**	0.000014	0.0002
Chrysene	**0.0014**	NG	NG	0.00002	0.00011	0.000067	< 0.0000085	0.000094	0.00005	< 0.0000085	0.000051	< 0.0000085	0.000051	0.000045	**0.024**	**0.02**	0.00062	**0.033**	**0.033**	0.00007	0.00074
Dibenz(a,h)anthracene	**0.00026**	NG	NG	< 0.0000075	0.0000078	0.0000085	< 0.0000075	< 0.0000075	< 0.0000075	< 0.0000075	< 0.0000075	< 0.0000075	< 0.0000075	< 0.0000075	**0.00081**	**0.0013**	0.000011	**0.0025**	**0.0024**	0.0000083	0.000056
Fluoranthene	**0.00004**	NGR	NGR	< 0.000040	**0.00066**	**0.00012**	< 0.000040	**0.00016**	**0.000091**	< 0.000040	**0.00011**	< 0.000040	**0.00018**	**0.00012**	**0.19**	**0.15**	**0.0056**	**0.13**	**0.15**	**0.00012**	**0.0022**
Fluorene	**0.003**	NGR	0.94	0.000092	0.00081	0.00011	< 0.000050	0.00018	0.0004	< 0.000050	< 0.000050	< 0.000050	0.000055	0.000076	**0.15**	**0.14**	**0.01**	**0.057**	**0.067**	0.000072	0.00028
Indeno[1,2,3-cd]pyrene	**0.00021**	NG	NG	< 0.0000085	0.000018	0.000023	< 0.0000085	0.000025	0.000016	< 0.0000085	0.000016	< 0.0000085	0.00001	< 0.0000085	**0.002**	**0.0035**	0.000035	**0.0064**	**0.0063**	0.000016	0.00015
Naphthalene	**0.0011**	**0.6**	**0.47**	**0.02**	**0.092**	0.00031	0.00023	**0.0013**	**0.0021**	< 0.00010	0.00016	**0.0011**	0.00032	0.00027	**0.77**	**0.68**	**2.6**	**0.13**	**0.2**	0.00015	**0.0012**
Perylene	NG	NG	NG	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	0.0017	< 0.0025	0.000093	0.0039	0.004	< 0.000050	0.000092
Phenanthrene	**0.0004**	NG	NG	0.00031	**0.0025**	0.00039	0.00017	**0.00063**	0.00028	0.000098	0.00025	0.000067	0.0003	0.00033	**0.44**	**0.36**	**0.015**	**0.21**	**0.27**	0.00023	**0.0019**
Pyrene	**0.000025**	NGR	0.71	**0.000035**	**0.00056**	**0.00012**	< 0.000020	**0.00017**	**0.000089**	**0.000037**	**0.00012**	**0.000033**	**0.00027**	**0.00014**	**0.15**	**0.12**	**0.0049**	**0.12**	**0.14**	**0.00015**	**0.002**
Quinoline	NG	NG	NG	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.010	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020

Notes:
All concentrations in mg/L unless otherwise noted.
1 - Alberta Tier 1 Guidelines, Residential Land Use, Most Stringent Guideline of Either Fine or Coarse Grained Soil (AENV, 2010)
2 - The guideline value is for naphthalene.
NG - No Guideline
NGR - No Guilleline Required (calculated value > solubility, or > 1,000,000 mg/L).
Bold values indicate exceedance of the lowest guideline.

Table 9: Summary of Groundwater VOCs Results
Canada Creosote Site - North Bow
Human Health Risk Assessment

Sample Name Location Date QA/QC	Tier 1 Res/Prklnd most stringent of fine and coarse	Alberta Tier 1 Res/Prklnd for coarse grained soil Inhalation Pathway	Alberta Tier 1 Res/Prklnd potable water use	MW10-1 3/1/2011	MW10-3A 3/1/2011	MW10-6 3/1/2011	MW10-7A 3/1/2011	MW10-7B 3/1/2011	MW10-9B 3/1/2011
1,1,1,2-Tetrachloroethane	NG	NG	NG	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
1,1,1-Trichloroethane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,1,2,2-Tetrachloroethane	NG	NG	NG	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
1,1,2-Trichloroethane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,1-Dichloroethane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,1-Dichloroethene	0.014	0.039	0.014	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2,3-Trichlorobenzene	0.008	0.032	0.014	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1,2,4-Trichlorobenzene	0.015	0.028	0.015	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1,2,4-Trimethylbenzene	NG	NG	NG	< 0.0005	< 0.0005	0.013	0.025	0.0032	< 0.0005
1,2-Dibromoethane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2-Dichlorobenzene	0.0007	5.4	0.003	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2-Dichloroethane	0.005	0.01	0.005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2-Dichloropropane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,3,5-Trichlorobenzene	0.014	0.015	0.014	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,3,5-Trimethylbenzene	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,3-Dichlorobenzene	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,4-Dichlorobenzene	0.001	0.22	0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bromodichloromethane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bromoform	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bromomethane	NG	NG	NG	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Carbon Tetrachloride	0.00056	0.00056	0.005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Chlorobenzene	0.0013	0.014	0.03	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Chloroethane	NG	NG	NG	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chloroform	**0.0018**	0.003	0.093	**0.0019**	**0.0027**	0.0006	**0.0051**	< 0.0005	**0.0041**
Chloromethane	NG	NG	NG	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
cis-1,2-Dichloroethene	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
cis-1,3-Dichloropropene	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dibromochloromethane	0.19	1.1	0.19	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dichloromethane	0.05	3.4	0.05	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Methyl Methacrylate	0.47	0.84	0.47	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Methyl tert-Butyl Ether	0.015	0.34	0.015	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Styrene	0.072	4.3	2.8	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Tetrachloroethene	0.03	0.11	0.03	< 0.0005	0.0006	0.0015	< 0.0005	< 0.0005	< 0.0005
trans-1,2-Dichloroethene	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
trans-1,3-Dichloropropene	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Trichloroethene	0.005	0.02	0.005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Trichlorofluoromethane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Vinyl Chloride	0.0011	0.0011	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Notes:
All concentrations in mg/L unless otherwise noted.
NG - No Guideline

Table 10: Results of Groundwater Quality Control Analysis
Canada Creosote Site - North Bow
Human Health Risk Assessment

Sample Name	MW10-6	DUP 2 (MW10-06)					MW10-7B	DUP 1 (MW10-7B)				
Location	MW10-6	MW10-6	Reporting Detection Limit	Mean	Relative Percent Difference	Difference Factor (DF)	MW10-7	MW10-7	Reporting Detection Limit	Mean	Relative Percent Difference	Difference Factor (DF)
Date	3/1/2011	3/1/2011					3/1/2011	3/1/2011				
QA/QC		FD						FD				
BTEX												
Benzene	< 0.0004	< 0.0004	0.0004	NC	NC	NC	< 0.0004	< 0.0004	0.0004	NC	NC	NC
Toluene	0.0005	0.0005	0.0004	0.0005	NA	0.00	< 0.0004	< 0.0004	0.0004	NC	NC	NC
Ethylbenzene	0.0019	0.002	0.0004	0.0020	NA	0.25	0.0013	0.0009	0.0004	0.0011	NA	1.00
Xylenes, Total	0.0081	0.0085	0.0008	0.0083	4.82%	NA	0.0052	0.0036	0.0008	0.0044	36.4%	NA
F1 (C6-C10) - BTEX	< 0.1	< 0.1	0.10	NC	NC	NC	< 0.1	< 0.1	0.1	NC	NC	NC
F2 (C10-C16)	**3**	**3**	0.10	3.0000	0.00%	NA	0.6	**1.2**	0.1	0.9000	66.7%	NA
PAH												
2-Methylnaphthalene	0.23	0.21	0.0050	0.2200	9.09%	NA	0.059	0.075	0.00010	0.0670	23.9%	NA
Acenaphthene	**0.2**	**0.18**	0.0050	0.1900	10.5%	NA	**0.056**	**0.069**	0.00010	0.0625	20.8%	NA
Acenaphthylene	0.0029	< 0.0050	0.00010	NC	NC	NC	0.0024	0.0029	0.00010	0.0027	18.9%	NA
Acridine	< 0.00020	< 0.010	0.00020	NC	NC	NC	< 0.00020	< 0.00020	0.00020	NC	NC	NC
Anthracene	**0.063**	**0.063**	0.000010	0.0630	0.00%	NA	**0.04**	**0.046**	0.000010	0.0430	14.0%	NA
B(a)P Equivalency	**0.012**	**0.011**	0.00001	0.0115	8.70%	NA	**0.026**	**0.026**	0.00001	0.0260	0.00%	NA
Benzo(a)anthracene	**0.024**	**0.024**	0.0000085	0.0240	0.00%	NA	**0.031**	**0.033**	0.0000085	0.0320	6.25%	NA
Benzo(a)pyrene	**0.0065**	**0.006**	0.0000075	0.0063	8.00%	NA	**0.017**	**0.016**	0.0000075	0.0165	6.06%	NA
Benzo[b,j]fluoranthene	**0.01**	**0.0075**	0.0000085	0.0088	28.6%	NA	**0.024**	**0.021**	0.0000085	0.0225	13.3%	NA
Benzo[c]phenanthrene	< 0.0043	< 0.0040	0.0043	NC	NC	NC	< 0.0050	< 0.0050	0.0050	NC	NC	NC
Benzo[e]pyrene	0.0048	0.0036	0.000050	0.0042	28.6%	NA	0.012	0.012	0.000050	0.0120	0.00%	NA
Benzo[g,h,i]perylene	**0.002**	**0.0037**	0.0000085	0.0029	59.6%	NA	**0.0063**	**0.0064**	0.0000085	0.0064	1.57%	NA
Benzo[k]fluoranthene	**0.0032**	**0.004**	0.0000085	0.0036	22.2%	NA	**0.0073**	**0.0071**	0.0000085	0.0072	2.78%	NA
Chrysene	**0.024**	**0.02**	0.0000085	0.0220	18.2%	NA	**0.033**	**0.033**	0.0000085	0.0330	0.00%	NA
Dibenz(a,h)anthracene	**0.00081**	**0.0013**	0.0000075	0.0011	46.4%	NA	**0.0025**	**0.0024**	0.0000075	0.0025	4.08%	NA
Fluoranthene	**0.19**	**0.15**	0.0020	0.1700	23.5%	NA	**0.13**	**0.15**	0.00080	0.1400	14.3%	NA
Fluorene	**0.15**	**0.14**	0.0025	0.1450	6.90%	NA	**0.057**	**0.067**	0.000050	0.0620	16.1%	NA
Indeno[1,2,3-cd]pyrene	**0.002**	**0.0035**	0.0000085	0.0028	54.5%	NA	**0.0064**	**0.0063**	0.0000085	0.0064	1.57%	NA
Naphthalene	**0.77**	**0.68**	0.0050	0.7250	12.4%	NA	**0.13**	**0.2**	0.0020	0.1650	42.4%	NA
Perylene	0.0017	< 0.0025	0.000050	NC	NC	NC	0.0039	0.004	0.000050	0.0040	2.53%	NA
Phenanthrene	**0.44**	**0.36**	0.0025	0.4000	20.0%	NA	**0.21**	**0.27**	0.0010	0.2400	25.0%	NA
Pyrene	**0.15**	**0.12**	0.0010	0.1350	22.2%	NA	**0.12**	**0.14**	0.00040	0.1300	15.4%	NA
Quinoline	< 0.00020	< 0.010	0.00020	NC	NC	NC	< 0.00020	< 0.00020	0.00020	NC	NC	NC

Notes:
All concentrations in mg/L unless otherwise noted.
Bold values indicate exceedance of the lowest guideline.
FD = field duplicate
QA/QC = quality assurance/quality control
NC = Not Calculated

Table 11: Field Soil Vapour Sreening and Leak Tracer Testing
March 2011
Canada Creosote Site - North Bow

Location										He Tracer Test		
	Date	Depth[4] (mbgs)	Flow (mL/min)	Vacuum ("H_2O)	PID (ppm)	Combustible Gas[1] (ppm)	CH_4 (% LEL)	CO_2 (%)	O_2 (%)	He Under Shroud (ppm)	He In Sample (ppm)	Leakage (%)
MW10-1 well	14-Mar-11	2.7-3.3	1600	10.7	0	220	-	0.2	20.7	380000	2100	0.55
MW10-1 deep probe	9-Mar-11	2.4-2.55	1500	8.3	0	75	-	0.2	20.3	-	-	-
MW10-2 well	9-Mar-11	2.5-3.1	1500	8	0	155	-	0.7	20.4	520000	6500	1.25
MW10-3B shallow probe	9-Mar-11	0.81-1.37	1500	0.6	0	240	-	0.7	20.5	380000	0	0.00
MW10-3B deep probe	9-Mar-11	1.68-2.13	1500	7	0	200	-	0.9	20.1	-	-	-
MW10-3B well	9-Mar-11	2.74-3.00	1500	6.6	0	420	-	1.1	19.3	-	-	-
MW10-5 well	11-Mar-11	2.13-3.9	1500	1.4	0	0	-	0.4	20.9	370000	125	0.03
MW10-5 deep probe	11-Mar-11	1.07-1.52	1500	1.4	0	0	-	0.1	20.9	-	-	-
MW10-6 deep probe	10-Mar-11	1.65-2.44	1500	7.3	0	55	-	0.2	20.9	-	-	-
MW10-6 well	10-Mar-11	3.04-3.42	1500	3.60	1	150	-	0.3	20.9	-	-	-
MW10-6 well	11-Mar-11	3.04-3.42	1500	NR	2	130	0	0.3	20.9	-		-
MW10-7B deep probe	10-Mar-11	1.96-2.74	1400	0.5	0	0	-	0	20.9	-	-	-
MW10-7B shallow probe	10-Mar-11	1.22-1.68	1300	NR	0	0	-	0	20.9	510000	250	0.05
MW10-7B well	10-Mar-11	3.17	-	-	-	-	-	-	-	-	-	
MW10-9B well	11-Mar-11	3.24	1100	0.6	0	30	-	0	20.9	-	-	-
MW10-9B shallow probe	11-Mar-11	1.37-1.83	1300	<0.1	0	55	-	0.1	20.9	420000	235	0.06
MW10-9B deep probe	11-Mar-11	2.29-2.74	-	-	-	-	-	-	-	-	-	
MW10-10 well	8-Mar-11	2.74-3.3	1300	0.4	0	40	-	0.1	20.9	380000	3750	0.99
MW10-11 well	8-Mar-11	2.13-3.1	1500	1.2	0	230	-	0.7	20.7	420000	200	0.05
MW10-11 deep probe	8-Mar-11	1.22-1.52	1500	3.1	0	145	-	0.1	20.9	200	0	0
MW10-12 well	11-Mar-11	3.05-4.57	1500	3.2	0	80	0	0	20.9	380000	7300	1.92
MW10-14 well	9-Mar-11	2.13-4.27	1550	10.5	0	30	-	0.6	20.2	400000	9500	2.38
MW10-15 well	9-Mar-11	2.13-2.85	1600	0.4	0	270	-	0.7	20.4	430000	825	0.19
MW10-16 deep probe	10-Mar-11	1.22-1.52	1500	<0.1	0	35	-	0.1	20.9	380000	0	0
MW10-16 well	10-Mar-11	2.13-3.3	1500	0.5	0	60	-	0.2	20.9	-	-	-
MW10-18 deep probe	10-Mar-11	1.07-1.52	1400	<0.1	0	175	-	0	20.9	-	-	-
MW10-18 well	10-Mar-11	2.13-3.2	1400	NR	0	90	-	0	20.9	410000	275	0.07
MW10-20 well	11-Mar-11	2.13-3.0	1500	NR	0	270	0	0.1	20.9	470000	0	0
MW10-22 well	9-Mar-11	2.13-3.3	1500	7.8	0	185	-	0.4	19.8	320000	0	0

Notes:

mbgs - metres below ground surface.

PID - photoionization detector

NR = No Reading

1. RKI 2 multi-gas detector was used. CH_4 measured using infrared detector.

2. Percent leakage for the Helium tracer testing was calculated as 100 times the concentration in soil gas probe divided by concentration in shroud.

3. Soil gas readings at end of purging process.

4. For wells, the base of screened interval is water table.

mple could not be collected due to excessive vacuum (possibly within capillary fringe or below water table)

Table 12: Field Soil Vapour Purging Results
Canada Creosote Site - North Bow
Human Health Risk Assessment

Well ID	Purge Volume	Combustible Gas (ppm)	CO_2 (%)	O_2 (%)	PID (ppm)	CH_4 (%LEL)
mw10-1 well	1	560	0.2	20.9	0	-
	2	290	0.2	20.9	0	-
	3	220	0.2	20.7	0	-
mw10-1 probe	1	110	0.2	20.9	0	-
	2	75	0.2	20.7	0	-
	3	75	0.2	20.3	0	-
mw10-2 well	1	60	0.7	19.2	0	-
	2	170	0.7	20.2	0	-
	3	155	0.7	20.4	0	-
mw10-3B shallow probe	1	220	0.7	20.7	0	-
	2	230	0.7	20.5	0	-
	3	240	0.7	20.5	0	-
mw10-3B Deep Probe	1	140	0.9	20.1	0	-
	2	180	0.9	20.1	0	-
	3	200	0.9	20.1	0	-
mw10-3B well	1	260	1	19.2	0	-
	2	390	1.1	19.3	0	-
	3	420	1.1	19.3	0	-
mw10-6 Probe	1	85	0	20.9	0	-
	2	60	0.2	20.9	0	-
	3	55	0.2	20.9	0	-
mw10-6 well	1	2950	0.2	18.8	6	-
	2	730	0.3	20.5	4	-
	3	310	0.2	20.9	2	-
	4	150	0.3	20.9	2	-
	5	140	0.3	20.9	1	-
mw10-7B shallow probe	1	0	0	20.9	0	-
	2	0	0	20.9	0	-
	3	0	0	20.9	0	-
mw10-7B Deep Probe	1	0	0	20.9	0	-
	2	0	0	20.9	0	-
	3	0	0	20.9	0	-
mw10-10 well	1	0	0.1	20.9	0	-
	2	35	0.1	20.9	0	-
	3	40	0.1	20.9	0	-
mw10-11 well	1	250	0.8	20.6	0	-
	2	230	0.7	20.7	0	-
	3	230	0.7	20.7	0	-
mw10-11 probe	1	-	0.4	20.9	0	-
	2	130	0.2	20.9	0	-
	3	145	0.1	20.9	0	-
mw10-14 well	1	180	0.6	20.1	0	-
	2	90	0.5	20.2	0	-
	3	80	0.6	20.2	0	-
mw10-15	1	35	0.5	20.9	0	-
	2	270	0.6	20.6	0	-
	3	270	0.7	20.4	0	-
mw10-16 well	1	55	0.1	20.9	0	-
	2	60	0.2	20.9	0	-
	3	60	0.2	20.9	0	-
mw10-16 probe	1	15	0.2	20.9	0	-
	2	40	0.2	20.9	0	-
	3	35	0.1	20.9	0	-
mw10-18 probe	1	130	0.1	20.9	0	-
	2	140	0.1	20.9	0	-
	3	175	0	20.9	0	-
	4	175	0	20.9	0	-
mw10-18 well	1	60	0	20.9	0	-
	2	80	0	20.9	0	-
	3	90	0	20.9	0	-
mw10-22	1	125	1.4	19	0	-
	2	195	0.9	19.1	0	-
	3	185	0.4	19.8	0	-
mw10-5 probe	1	0	0.1	20.9	0	-
	2	0	0.1	20.9	0	-
	3	0	0.1	20.9	0	-
mw10-5 well	1	0	0.4	20.9	0	-
	2	0	0.3	20.9	0	-
	3	0	0.4	20.9	0	-
mw10-9B well	1	30	0	20.9	0	-
	2	35	0	20.9	0	-
	3	30	0	20.9	0	-
mw10-9B shallow probe	1	30	0	20.9	0	-
	2	35	0	20.9	0	-
	3	30	0	20.9	0	-
MW 10-20 well	1	270	0.1	20.9	0	0
	2	270	0.1	20.9	0	0
	3	270	0.1	20.9	0	0
MW 10-12 well	1	90	0	20.9	0	0
	2	80	0	20.9	0	0
	3	80	0	20.9	0	0
mw10-6 well	0	240	0.2	20.9	4	0
	1	175	0.3	20.9	4	0
	2	195	0.3	20.9	2	0
	3	130	0.3	20.9	2	0

Notes:
PID - photoionization detector with 10.6 eV lamp.
RKI 2 instrument used for all gas measurements.
CH_4 measurements obtained using infrared detector.
MW10-22 values may have been influenced by instrument errors.
A denotes deeper well, B denotes shallow well.

Table 13: Soil Vapour Analytical Results
Canada Creosote Site - North Bow

Sample Location ID	MW10-1			MW10-2	MW10-3B			MW10-5		MW10-6		MW10-7B		MW10-9B		MW10-10
LAB ID	R103247-01	R103247-02	AUC0212-03	R103247-03	R103247-04	R103247-05	R103247-06	R103247-07	R103247-08	R103247-09	AUC0212-04	R103247-10	R103247-11	R103247-12	R103247-13	R103247-14
SAMPLE METHOD	Well	Deep probe	Well	Well	Shallow probe	Deep probe	Well	Well	Deep probe	Deep probe	Well	Deep probe	Shallow probe	Well	Shallow probe	Well
SAMPLE DEPTH (mbgs)	2.7-3.3	2.4-2.55	2.7-3.3	2.5-3.1	0.81-1.37	1.68-2.13	2.74-3.00	2.13-3.9	1.07-1.52	1.65-2.44	1.65-2.44	1.96-2.74	1.22-1.68		1.37-1.83	2.74-3.3
DATE SAMPLED	09-Mar-11	09-Mar-11	09-Mar-11	09-Mar-11	09-Mar-11	09-Mar-11	09-Mar-11	11-Mar-11	11-Mar-11	10-Mar-11	10-Mar-11	10-Mar-11	10-Mar-11	11-Mar-11	11-Mar-11	08-Mar-11
LABORATORY	CARO	CARO	Test America	CARO	CARO	CARO	CARO	CARO	CARO	CARO	Test America	CARO	CARO	CARO	CARO	CARO
MATRIX	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air
Benzene	3.7	5.8	14.6	0.68	2.9	3.7	2.3	0.59	0.53	2.4	1.21	0.91	0.44	0.31	0.99	0.23
Ethylbenzene	0.47	2.8	5.82	<0.31	5.5	4	7.8	5.3	9.5	25	17.7	22	25	44	3.2	4.7
Toluene	20	90	182	3.7	21	81	69	360	280	81	35.4	140	78	610	66	16
Xylenes (total)	6	16	30.3	5.2	39	31	46	33	49	110	96.1	110	130	250	18	30
nC6-nC10 (F1)	1200	1400	-	710	1500	1600	2200	2500	1900	2700	-	1600	1000	3700	760	740
nC10-nC16 (total) (F2)	840	1400	-	580	4200	5100	3000	3600	3900	8100	-	1300	540	740	590	<470
Naphthalene	<0.34	<0.32	-	<0.31	<0.32	<0.34	<0.33	2	<0.33	58	30.7	45	12	0.64	<0.33	<0.47

Notes:
All units in µg/m^3, unless otherwise noted.
mbgs - metres below ground surface.
A denotes deeper well, B denotes shallow well.

Table 13: Soil Vapour Analytical Results
Canada Creosote Site - North Bow

Sample Location ID	MW10-11		MW10-12	MW10-14	MW10-15		MW10-16		MW10-18		MW10-20	MW10-22	
LAB ID	R103247-15	R103247-16	R103247-17	R103247-18	R103247-19	AUC0212-02	R103247-20	R103247-21	R103247-22	R103247-23	R103247-24	R103247-25	AUC0212-01
SAMPLE METHOD	Deep probe	Well	Well	Well	Well	Well	Deep probe	Well	Well	Deep probe	Well	Well	Well
SAMPLE DEPTH (mbgs)	1.22-1.52	2.13-3.1	3.05-4.57	2.13-4.27	2.13-2.85	2.13-2.85	1.22-1.52	2.13-3.3	2.13-3.2	1.07-1.52	2.13-3.0	2.13-3.3	2.13-3.3
DATE SAMPLED	08-Mar-11	08-Mar-11	11-Mar-11	09-Mar-11	09-Mar-11	09-Mar-11	10-Mar-11	10-Mar-11	10-Mar-11	10-Mar-11	11-Mar-11	09-Mar-11	09-Mar-11
LABORATORY	CARO	CARO	CARO	CARO	CARO	Test America	CARO	CARO	CARO	CARO	CARO	CARO	Test America
MATRIX	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air
Benzene	<0.24	0.78	<0.17	2.5	2.6	10.9	1	1.1	0.23	0.54	0.2	1.7	2.49
Ethylbenzene	1.5	1.9	<0.33	7.3	3.9	9.41	1.9	31	0.78	22	7	3.3	8
Toluene	32	43	3.7	96	46	99.3	13	47	<3.3	5	54	110	70.8
Xylenes (total)	16	14	4	50	27	53	17	180	7.5	100	44	22	38.6
nC6-nC10 (F1)	1100	1100	400	1700	1800	-	1000	2500	520	1100	1000	1600	-
nC10-nC16 (total) (F2)	580	1300	<330	2000	2200	-	1100	1100	360	370	540	1200	-
Naphthalene	<0.48	<0.46	<0.33	<0.33	1.3	0.923	0.77	0.64	<0.33	<0.34	2.7	<0.33	1.14

Notes:
All units in $\mu g/m^3$, unless otherwise noted.
mbgs - metres below ground surface.
A denotes deeper well, B denotes shallow well.

Table 14: Results of Soil Vapour Quality Control Analysis
Canada Cresote Site - North Bow
Human Health Risk Assessment

Sample Name		MW10-1	MW10-1		DUP5A**	DUP5B**				MW10-20	MW10-20		DUP6A**	DUP6B**			
Location	Reporting	MW10-1 well	MW10-1 well	Percent	MW10-6 Well	MW10-6 Well	Mean	Relative	Difference	MW10-20 well	MW10-20 well	Percent	MW10-20 well	MW10-20 well	Mean	Relative	Difference
Date	Detection	09-Mar-11	09-Mar-11	Ratio* 1st/2nd	15-Mar-11	15-Mar-11		Percent	Factor	11-Mar-11	11-Mar-11	Ratio* 1st/2nd	15-Mar-11	15-Mar-11		Percent	Factor
QA/QC	Limit	first tube in series	second tube in series	Tube	FD - Fast Flow Rate	FD - Slow Flow Rate		Difference	(DF)	first tube in series	second tube in series	Tube	FD - Fast Flow Rate	FD - Slow Flow Rate		Difference	(DF)
Hydrocarbons																	
nC6-nC8 (total)	150	470	200	**43**	790	1000	895	23.5%	NA	370	200	**54**	440	800	620	NA	2.40
nC6-nC8 (aromatic)	3.1	24	<3.4	NA	14	17	NC	NC	NA	57	<3.4	NA	47	52	NC	NC	NA
nC6-nC8 (non-aromatic)	150	470	200	**43**	790	1000	895	23.5%	NA	320	200	**63**	400	760	580	NA	2.40
nC8-nC10 (total)	150	700	340	**49**	7900	6600	7250	17.9%	NA	640	<170	NA	1400	2900	NC	NC	NA
nC8-nC10 (aromatic)	15	<17	<17	NA	330	260	NC	NC	NA	50	<17	NA	84	68	NC	NC	NA
nC8-nC10 (non-aromatic)	150	700	340	**49**	7600	6300	6950	18.7%	NA	600	<170	NA	1300	2800	NC	NC	NA
nC6-nC10 (total)	310	1200	540	**45**	8600	7600	8100	12.3%	NA	1000	370	**37**	1900	3700	2800	64.3%	NA
nC10-nC12 (total)	150	570	200	**35**	13000	9100	11050	35.3%	NA	270	<170	NA	940	2300	NC	NC	NA
nC10-nC12 (aromatic)	15	<17	<17	NA	280	170	NC	NC	NA	<17	<17	NA	<17	<44	NC	NC	NA
nC10-nC12 (non-aromatic)	150	570	210	**37**	13000	8900	10950	37.4%	NA	260	<170	NA	940	2300	NC	NC	NA
nC12-nC16 (total)	150	270	200	**74**	6300	4600	5450	31.2%	NA	270	200	**74**	370	890	630	NA	3.47
nC12-nC16 (aromatic)	15	<17	<17	NA	<17	<47	NC	NC	NA	<17	<17	NA	<17	<44	NC	NC	NA
nC12-nC16 (non-aromatic)	150	260	190	**74**	6300	4600	5450	31.2%	NA	270	190	**70**	370	890	630	NA	3.47
nC10-nC16 (total)	310	840	400	**48**	19000	14000	16500	30.3%	NA	540	<340	NA	1300	3200	NC	NC	NA
VHv (6-13)	310	970	540	**56**	11000	9300	10150	16.7%	NA	670	370	**55**	1400	3200	2300	78.3%	NA
VPHv	310	940	540	**57**	11000	9200	10100	17.8%	NA	570	370	**65**	1300	3100	2200	81.8%	NA
Volatile Organic Compounds																	
1,1,1,2-Tetrachloroethane	0.15	<0.17	<0.17	NA	<0.17	<0.47	NC	NC	NA	<0.17	<0.17	NA	<0.17	<0.44	NC	NC	NA
1,1,1-Trichloroethane	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
1,1,2,2-Tetrachloroethane	0.15	<0.17	<0.17	NA	<0.17	<0.47	NC	NC	NA	<0.17	<0.17	NA	<0.17	<0.44	NC	NC	NA
1,1,2-Trichloroethane	0.15	<0.17	<0.17	NA	<0.17	<0.47	NC	NC	NA	<0.17	<0.17	NA	<0.17	<0.44	NC	NC	NA
1,1-Dichloroethane	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
1,1-Dichloroethene	0.092	<0.1	<0.1	NA	<0.099	<0.28	NC	NC	NA	<0.1	<0.1	NA	<0.1	<0.27	NC	NC	NA
1,2,3-Trichloropropane	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
1,2,3-Trimethylbenzene	3.1	<3.4	<3.4	NA	86	56	71.00	42.3%	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1,2,4,5-Tetramethylbenzene	3.1	<3.4	<3.4	NA	30	17	23.50	55.3%	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1,2,4-Trichlorobenzene	0.31	0.8	<0.34	NA	<0.33	<0.94	NC	NC	NA	0.77	<3.4	NA	<0.34	<0.89	NC	NC	NA
1,2,4-Triethylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1,2,4-Trimethylbenzene	0.61	<0.67	<0.67	NA	69	51	60.00	30.0%	NA	1.5	<0.67	NA	4.4	5.1	4.75	14.7%	NA
1,2-Dibromo-3-chloropropane	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
1,2-Dibromoethane	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
1,2-Dichlorobenzene	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
1,2-Dichloroethane	0.092	<0.1	<0.1	NA	0.099	<0.28	NC	NC	NA	<0.1	<0.1	NA	<0.1	<0.27	NC	NC	NA
1,2-Dichloropropane	0.15	<0.17	<0.17	NA	<0.17	<0.47	NC	NC	NA	<0.17	<0.17	NA	<0.17	<0.44	NC	NC	NA
1,2-Diethylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1,2-Dimethyl-3-Ethylbenzene	3.1	<3.4	<3.4	NA	5.9	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1,2-Dimethyl-4-Ethylbenzene	3.1	<3.4	<3.4	NA	36	22	29.00	48.3%	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1,3,5-Triethylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1,3,5-Trimethylbenzene	0.61	<0.67	<0.67	NA	66	50	58.00	27.6%	NA	<0.67	<0.67	NA	1.2	<1.8	NC	NC	NA
1,3-Dichlorobenzene	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
1,3-Dichloropropane	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
1,3-Dichloropropene (cis+trans)	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
1,3-Dimethyl-2-Ethylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1,3-Dimethyl-5-Ethylbenzene	3.1	<3.4	<3.4	NA	9.6	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1,4-Dichlorobenzene	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
1,4-Dimethyl-2-Ethylbenzene	3.1	<3.4	<3.4	NA	9.6	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1-methyl-2-ethylbenzene	3.1	<3.4	<3.4	NA	36	30	33.00	18.2%	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1-Methyl-2-Isopropylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1-Methyl-2-n-Propylbenzene	3.1	<3.4	<3.4	NA	6.6	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1-methyl-3-ethylbenzene	3.1	<3.4	<3.4	NA	43	30	36.50	35.6%	NA	<3.4	<3.4	NA	4.4	<8.9	NC	NC	NA
1-Methyl-3-Isopropylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1-Methyl-3-n-Propylbenzene	3.1	<3.4	<3.4	NA	12	10	11.00	NA	0.65	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1-methyl-4-ethylbenzene	3.1	<3.4	<3.4	NA	29	26	27.50	10.9%	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1-Methyl-4-Isopropylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
1-Methyl-4-n-Propylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
2-Chlorotoluene	0.61	<0.67	<0.67	NA	<0.66	<1.9	NC	NC	NA	<0.67	<0.67	NA	<0.67	<1.8	NC	NC	NA
2-Methylbutylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
Acetone	3.1	<3.4	<3.4	NA	11	19	15.00	NA	2.58	<3.4	<3.4	NA	9.1	21	15.05	NA	NA
Acrylonitrile	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
Allyl chloride	0.15	<0.17	<0.17	NA	<0.17	<0.47	NC	NC	NA	<0.17	<0.17	NA	<0.17	<0.44	NC	NC	NA
Benzene	0.15	3.7	<0.17	NA	0.56	<0.47	NC	NC	NA	0.2	<0.17	NA	0.47	<0.44	NC	NC	NA
Bromobenzene	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
Bromodichloromethane	0.15	<0.17	<0.17	NA	<0.17	<0.47	NC	NC	NA	<0.17	<0.17	NA	<0.17	<0.44	NC	NC	NA
Bromoform	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA

Table 14: Results of Soil Vapour Quality Control Analysis
Canada Cresote Site - North Bow
Human Health Risk Assessment

Sample Name		MW10-1	MW10-1		DUP5A**	DUP5B**				MW10-20	MW10-20		DUP6A**	DUP6B**			
Location	Reporting	MW10-1 well	MW10-1 well	Percent	MW10-6 Well	MW10-6 Well	Mean	Relative	Difference	MW10-20 well	MW10-20 well	Percent	MW10-20 well	MW10-20 well	Mean	Relative	Difference
Date	Detection	09-Mar-11	09-Mar-11	Ratio*	15-Mar-11	15-Mar-11		Percent	Factor	11-Mar-11	11-Mar-11	Ratio*	15-Mar-11	15-Mar-11		Percent	Factor
QA/QC	Limit	first tube in series	second tube in series	1st/2nd Tube	FD - Fast Flow Rate	FD - Slow Flow Rate		Difference	(DF)	first tube in series	second tube in series	1st/2nd Tube	FD - Fast Flow Rate	FD - Slow Flow Rate		Difference	(DF)
Carbon disulfide	0.61	13	<0.67	NA	30	24	27.00	22.2%	NA	<0.67	<0.67	NA	2.4	<1.8	NC	NC	NA
Carbon tetrachloride	0.092	<0.1	<0.1	NA	0.099	<0.28	NC	NC	NA	<0.1	<0.1	NA	0.91	0.89	0.90	2.2%	NA
Chlorobenzene	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
Chloroethane	1.5	<1.7	<1.7	NA	<1.7	<4.7	NC	NC	NA	<1.7	<1.7	NA	<1.7	<4.4	NC	NC	NA
Chloroform	0.15	8.4	<0.17	NA	9.6	6.7	8.15	35.6%	NA	0.8	<0.17	NA	6.1	5.3	5.70	14.0%	NA
cis-1,2-Dichloroethene	0.31	<0.34	<0.34	NA	2.2	2.1	2.15	4.7%	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
Cumene	0.31	<0.34	<0.34	NA	20	14	17.00	35.3%	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
Dibromochloromethane	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
Dibromomethane	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
Dichlorodifluoromethane	0.61	5.7	<0.67	NA	18	14	16.00	25.0%	NA	6.7	<0.67	NA	16	18	17.0	11.8%	NA
Ethyl acetate	1.5	<1.7	<1.7	NA	<1.7	<4.7	NC	NC	NA	<1.7	<1.7	NA	<1.7	<4.4	NC	NC	NA
Ethyl ether	0.61	<0.67	<0.67	NA	<0.66	<1.9	NC	NC	NA	<0.67	<0.67	NA	<0.67	<1.8	NC	NC	NA
Ethyl methacrylate	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
Ethylbenzene	0.31	0.47	<0.34	NA	9.9	6.3	8.10	44.4%	NA	7	<0.34	NA	11	7.9	9.45	32.8%	NA
Hexachlorobutadiene	0.15	0.44	<0.17	NA	<0.17	<0.47	NC	NC	NA	0.5	<0.17	NA	<0.17	1.2	NC	NC	NA
Hexachloroethane	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
Isobutylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
Methacrylonitrile	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
Methyl acrylate	1.5	<1.7	<1.7	NA	<1.7	<4.7	NC	NC	NA	<1.7	<1.7	NA	<1.7	<4.4	NC	NC	NA
Methyl cyclohexane	0.61	5.7	<0.67	NA	32	27	29.50	16.9%	NA	<0.67	<0.67	NA	2.1	<1.8	NC	NC	NA
Methyl ethyl ketone	0.61	<0.67	<0.67	NA	1.8	<1.9	NC	NC	NA	<0.67	<0.67	NA	1	<1.8	NC	NC	NA
Methyl isobutyl ketone	0.61	<0.67	<0.67	NA	<0.66	<1.9	NC	NC	NA	<0.67	<0.67	NA	<0.67	<1.8	NC	NC	NA
Methyl methacrylate	0.61	<0.67	<0.67	NA	<0.66	<1.9	NC	NC	NA	<0.67	<0.67	NA	<0.67	<1.8	NC	NC	NA
Methyl tert-butyl ether	0.61	<0.67	<0.67	NA	<0.66	<1.9	NC	NC	NA	<0.67	<0.67	NA	<0.67	<1.8	NC	NC	NA
Methylene chloride	3.1	<3.4	8.4	NA	11	32	21.50	97.7%	NA	<3.4	<3.4	NA	<3.4	16	NC	NC	NA
Naphthalene	0.31	<0.34	<0.34	NA	83	52	67.50	45.9%	NA	2.7	<0.34	NA	0.74	<0.89	NC	NC	NA
n-Butylbenzene	3.1	<3.4	<3.4	NA	<3.3	12	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
nC10-nC12 Non-reg. Aromatics	15	<17	<17	NA	190	120	155.00	45.2%	NA	<17	<17	NA	<17	<44	NC	NC	NA
nC10-nC12 Other Aromatics	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
nC12-nC16 Non-reg. Aromatics	15	<17	<17	NA	<17	<47	NC	NC	NA	<17	<17	NA	<17	<44	NC	NC	NA
nC12-nC16 Other Aromatics	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
nC8-nC10 Non-reg. Aromatics	15	<17	<17	NA	110	86	98.00	24.5%	NA	<17	<17	NA	<17	<44	NC	NC	NA
n-Decane	0.92	<1	<1	NA	<0.99	<2.8	NC	NC	NA	<1	<1	NA	1.5	<2.7	NC	NC	NA
n-Hexane	3.1	6.7	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	4	<8.9	NC	NC	NA
n-Hexylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
Nitrobenzene	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
n-Pentylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
n-Propylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	3.4	<3.4	NA	3.7	<8.9	NC	NC	NA
sec-Butylbenzene	3.1	<3.4	<3.4	NA	4.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
Styrene	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
t-1-Butyl-3,5-Dimethylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
t-1-Butyl-4-Ethylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
tert-1-Butyl-2-Methylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
tert-Butylbenzene	3.1	<3.4	<3.4	NA	<3.3	<9.4	NC	NC	NA	<3.4	<3.4	NA	<3.4	<8.9	NC	NC	NA
Tetrachloroethene	1.5	15	<1.7	NA	110	89	99.50	21.1%	NA	<1.7	<1.7	NA	2.6	<4.4	NC	NC	NA
Tetrahydrofuran	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	0.61	<0.89	NC	NC	NA
Toluene	3.1	20	<3.4	NA	13	17	15.00	NA	1.29	54	<3.4	NA	44	52	48.0	16.7%	NA
trans-1,2-Dichloroethene	0.31	<0.34	<0.34	NA	<0.33	<0.94	NC	NC	NA	<0.34	<0.34	NA	<0.34	<0.89	NC	NC	NA
Trichloroethene	0.092	0.27	<0.1	NA	2.4	2	2.20	18.2%	NA	<0.1	<0.1	NA	<0.1	<0.27	NC	NC	NA
Trichlorofluoromethane	0.31	<0.34	<0.34	NA	3	2.3	2.65	26.4%	NA	1.2	<0.34	NA	4	3.2	3.60	22.2%	NA
Vinyl chloride	0.61	<0.67	<0.67	NA	<0.66	<1.9	NC	NC	NA	<0.67	<0.67	NA	<0.67	<1.8	NC	NC	NA
Xylenes (total)	1.5	6	<1.7	NA	63	52	57.50	19.1%	NA	44	<1.7	NA	67	54	60.5	21.5%	NA

Notes:

All concentrations in µg/m^3, unless otherwise noted.
FD = Field Duplicate

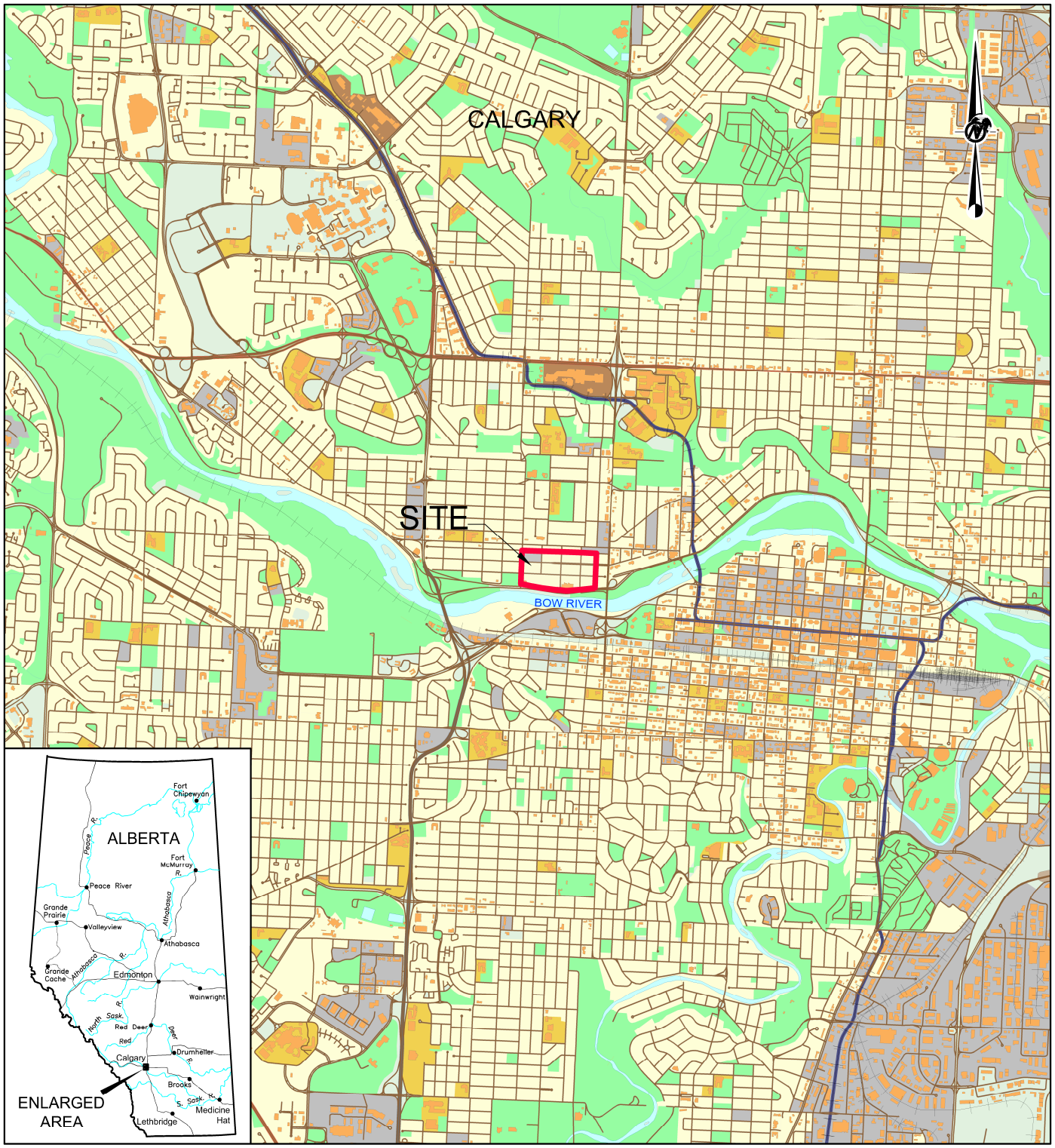
NA = Not Applicable

Table 15: Comparison of Predicted Measured Soil Vapour Concentrations
(Xylenes and Naphthalene)
Canada Creosote Site - North Bow
Human Health Risk Assessment

Sample Name		MW10-1	MW10-10	MW10-11	MW10-15	MW10-16	MW10-18	MW10-2	MW10-20	MW10-22	MW10-3B	MW10-6	DUP 2 (MW10-06)	MW10-7B	DUP 1 (MW10-7B)	MW10-9B
Location																
Date		3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011
QA/QC													FD		FD	
Xylenes, Total	**Unit**															
Shallow groundwater	mg/L	< 0.0008	0.0017	< 0.0008	< 0.0008	< 0.0008	< 0.0008	< 0.0008	0.0016	< 0.0008	0.0028	0.0081	0.0085	0.0052	0.0036	< 0.0008
Predicted soil vapour	$\mu g/m^3$	NA	507	NA	NA	NA	NA	NA	477	NA	835	2416	2535	1551	1074	NA
Maximum measured soil vapour	$\mu g/m^3$	30	30	16	53	180	100	5.2	44	39	46	110	110	130	130	250
Ratio of measured to predicted		NA	0.06	NA	NA	NA	NA	NA	0.09	NA	0.06	0.05	0.04	0.08	0.12	NA
Naphthalene																
Shallow groundwater	mg/L	0.02	0.092	0.00031	0.00023	0.0013	0.0021	< 0.00010	0.00016	0.0011	0.00027	0.77	0.68	0.13	0.2	0.0012
Predicted soil vapour	$\mu g/m^3$	347	1595	5.4	4.0	23	36	NA	2.8	19	4.7	13349	11789	2254	3467	21
Maximum measured soil vapour	$\mu g/m^3$	0.34	0.47	0.48	1.30	0.77	0.34	<0.31	2.70	1.14	0.34	58	58.00	45	45	0.64
Ratio of measured to predicted		0.0010	0.0003	0.0893	0.326	0.0342	0.0093	NA	0.973	0.0598	0.0726	0.0043	0.0049	0.0200	0.0130	0.0308

Notes:
mg/L = milligrams per litre
$\mu g/m^3$ = micrograms per cubic metre
NA = Not Applicable

FIGURES



LEGEND

- GOLDER PROJECT
- PARK
- RAIL NETWORK
- LRT ROUTE
- ROADWAY
- RIVER AND STREAM
- BUILDING FOOTPRINT
- COMMERCIAL
- GOVERNMENT AND INSTITUTIONAL
- OPEN WATER
- PARKS AND RECREATIONAL
- RESIDENTIAL
- RESOURCE AND INDUSTRIAL

REFERENCE

DIGITAL DATA OBTAINED FROM DMTI SPATIAL INC. 2009, USED UNDER LICENSE.
DATUM: NAD83 PROJECTION UTM ZONE 12

1 0 1
SCALE KILOMETRES

PROJECT

ALBERTA ENVIRONMENT
NORTH BOW SITE
HUMAN HEALTH RISK ASSESSMENT

TITLE

SITE LOCATION PLAN

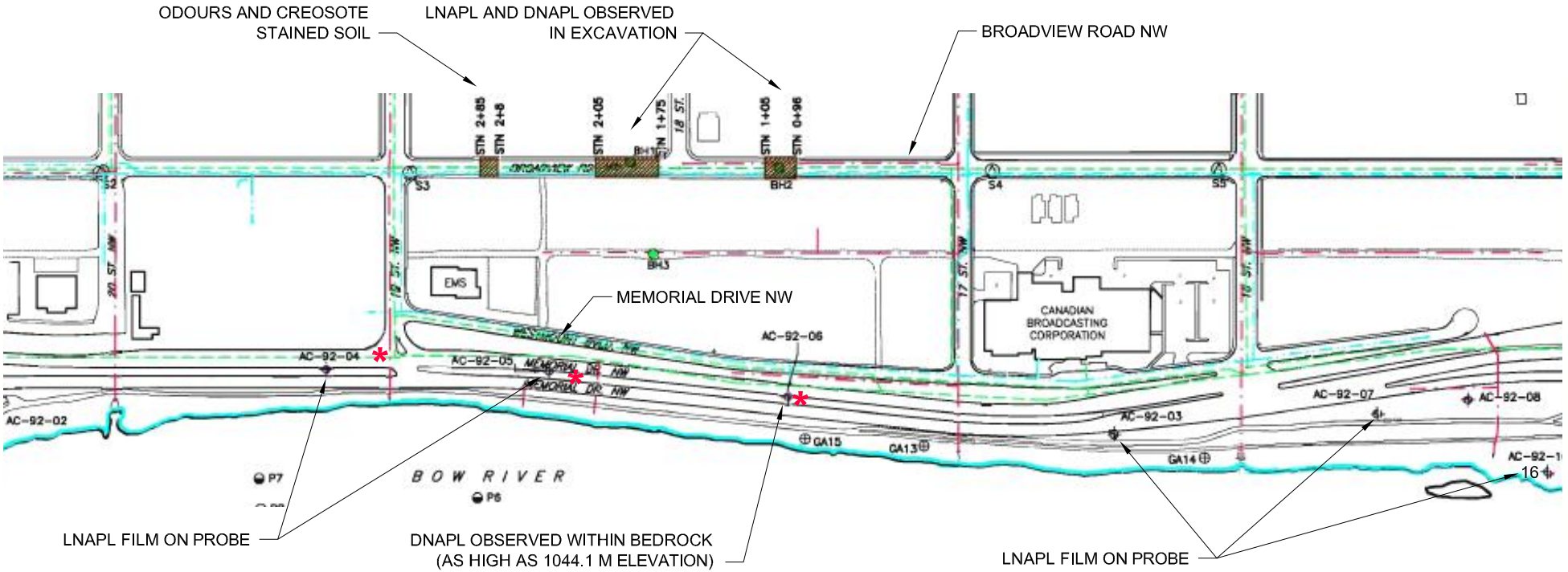
Golder Associates
Calgary, Alberta

PROJECT	10.1346.0048.4000		FILE No.	10134600464000A001
DESIGN	DLS	05 Nov. 2010	SCALE AS SHOWN	REV. 0
CADD	JJB	23 Nov. 2010		
CHECK	IH	07 Jun. 2011		
REVIEW	IH	07 Jun. 2011		

FIGURE: 1

L:\2010\1346\10-1346-0046\40CO\Report A\Fig 1 10134600464000A001 Site Location Plan.dwg Sep 02, 2011 - 3:56pm

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-02_A.dwg Monday, August 29, 2011 11:58:01 AM By: NSmirnova



0 40 80 120 160 200

SCALE IN METRES
(APPROXIMATE)

LEGEND

* CREOSOTE STAINING VISIBLE IN FRACTURE ZONE AT DEPTHS OF 1-5 M BELOW SOIL/BEDROCK INTERFACE, IN BEDROCK AT AC-92-4, 5 AND 6

PROJECT

ALBERTA ENVIRONMENT
NORTH BOW SITE
HUMAN HEALTH RISK ASSESSMENT

TITLE

HISTORICAL OBSERVATIONS OF NAPL (GOLDER 1991 AND GOLDER 1992)

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.	3000
DESIGN	IH	02JUN11	SCALE AS SHOWN	REV. –
CADD	NS	02JUN11		
CHECK	IH	07JUN11		
REVIEW	IH	07JUN11		

FIGURE 2

LEGEND

- STUDY AREA
- GROUNDWATER AND/OR SOIL VAPOUR WELL AND PROBE LOCATION (APPROXIMATE)
- HISTORICAL WELL WITH MEASURABLE DNAPL
- HISTORICAL WELL WITH DNAPL AND/OR LNAPL SHEEN
- HISTORICAL NAPL ZONES

NOTE

1. WHEN MULTIPLE PROBES WERE PRESENT AT ONE LOCATION, THE MAXIMUM CONCENTRATION WAS PLOTTED.
2. ALL LOCATIONS ARE APPROXIMATE.

0 20 40 60 80 100
SCALE IN METRES
(APPROXIMATE)

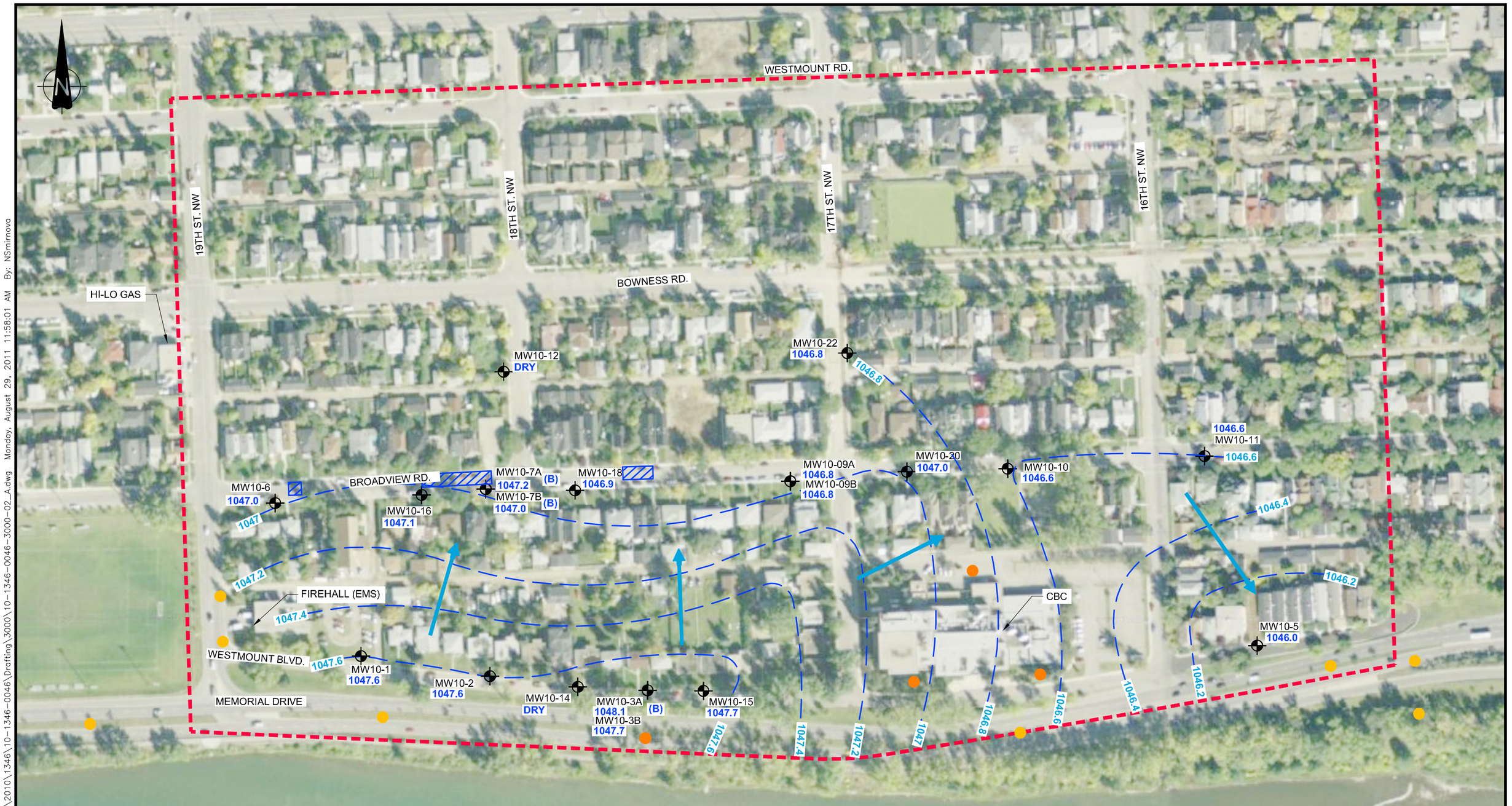
PROJECT
ALBERTA ENVIRONMENT
NORTH BOW SITE
HUMAN HEALTH RISK ASSESSMENT

TITLE
MONITORING WELL AND PROBE LOCATIONS

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	02JUN11	SCALE	AS SHOWN	REV. –
CADD	NS	02JUN11	**FIGURE 3**		
CHECK	IH	07JUN11			
REVIEW	IH	07JUN11			

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-02_A.dwg Monday, August 29, 2011 11:58:01 AM By: NSmirnova



LEGEND

- STUDY AREA
- GROUNDWATER AND/OR SOIL VAPOUR WELL AND PROBE LOCATION (APPROXIMATE)
- HISTORICAL WELL WITH MEASURABLE DNAPL
- HISTORICAL WELL WITH DNAPL AND/OR LNAPL SHEEN
- HISTORICAL NAPL ZONES
- 1047.6 POTENTIOMETRIC ELEVATIONS (m)
- INFERRED SHALLOW GROUNDWATER FLOW DIRECTION
- INFERRED POTENTIOMETRIC CONTOUR (m)
- (B) INDICATES BEDROCK

NOTE

1. POTENTIOMETRIC ELEVATIONS IN BEDROCK NOT USED.
2. ALL LOCATIONS ARE APPROXIMATE.

0 20 40 60 80 100
SCALE IN METRES
(APPROXIMATE)

PROJECT
ALBERTA ENVIRONMENT
NORTH BOW SITE
HUMAN HEALTH RISK ASSESSMENT

TITLE
POTENTIOMETRIC ELEVATIONS AND GROUNDWATER FLOW DIRECTION FEBRUARY 28, 2011

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.	3000
DESIGN	IH	02JUN11	SCALE AS SHOWN	REV. –
CADD	NS	02JUN11		
CHECK	IH	07JUN11		
REVIEW	IH	07JUN11		

FIGURE 5

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-02_A.dwg Monday, August 29, 2011 11:58:01 AM By: NSmirnova

WESTMOUNT RD.

19TH ST. NW

18TH ST. NW

17TH ST. NW

16TH ST. NW

BOWNESS RD.

HI-LO GAS

MW10-12
DRY

MW10-22
<0.1/<0.1

MW10-11
<0.1/0.2

<1/4.7

MW10-7A

BROADVIEW RD.

MW10-18
<0.1/<0.1

<0.1/<0.1

MW10-09A

MW10-20
<0.1/<0.1

MW10-10
<0.1/0.1

MW10-6
<0.1/3.0

MW10-16
<0.1/<0.1

MW10-7B
<0.1/6

MW10-09B
<0.1/<0.1

FIREHALL (EMS)

CBC

MW10-5
DRY

WESTMOUNT BLVD.

MW10-1
<0.1/<0.1

MW10-2
<0.1/<0.1

MEMORIAL DRIVE

MW10-14
DRY

<0.1/<0.1

MW10-3A

MW10-15
<0.1/<0.1

MW10-3B
<0.1/<0.1

LEGEND

- STUDY AREA
- GROUNDWATER AND/OR SOIL VAPOUR WELL AND PROBE LOCATION (APPROXIMATE)
- HISTORICAL WELL WITH MEASURABLE DNAPL
- HISTORICAL WELL WITH DNAPL AND/OR LNAPL SHEEN
- HISTORICAL NAPL ZONES
- <0.1/<0.1 GROUNDWATER F1 AND F2 CONCENTRATIONS (mg/L)
  - F2
  - F1

NOTE

1. WHERE FIELD DUPLICATE AVAILABLE, THE MAXIMUM OF THE DUPLICATES WAS PLOTTED.
2. ALL LOCATIONS ARE APPROXIMATE.

0 20 40 60 80 100
SCALE IN METRES
(APPROXIMATE)

PROJECT
ALBERTA ENVIRONMENT
NORTH BOW SITE
HUMAN HEALTH RISK ASSESSMENT

TITLE
GROUNDWATER F1 AND F2 CONCENTRATIONS MARCH 2011

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.	3000
DESIGN	IH	02JUN11	SCALE AS SHOWN	REV. –
CADD	NS	02JUN11		
CHECK	IH	07JUN11		
REVIEW	IH	07JUN11		

FIGURE 8

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-02_A.dwg Monday, August 29, 2011 11:58:01 AM By: NSmirnova

WESTMOUNT RD.

19TH ST. NW

18TH ST. NW

17TH ST. NW

16TH ST. NW

BOWNESS RD.

HI-LO GAS

MW10-12
DRY

MW10-22
0.0011

MW10-11
0.00031

MW10-20
0.00016

MW10-10
0.092

0.00015
MW10-09A
MW10-09B
0.0012

2.6
MW10-7A
MW10-7B
0.130

MW10-18
0.0021

MW10-6
0.770

BROADVIEW RD.

MW10-16
0.0013

FIREHALL (EMS)

CBC

MW10-5
DRY

WESTMOUNT BLVD.

MW10-1
0.020

MW10-2
<0.0001

MEMORIAL DRIVE

MW10-14
DRY

0.00032
MW10-3A

MW10-15
0.00023

MW10-3B
0.00027

LEGEND

- STUDY AREA
- GROUNDWATER AND/OR SOIL VAPOUR WELL AND PROBE LOCATION (APPROXIMATE)
- HISTORICAL WELL WITH MEASURABLE DNAPL
- HISTORICAL WELL WITH DNAPL AND/OR LNAPL SHEEN
- HISTORICAL NAPL ZONES
- <0.0001 GROUNDWATER NAPHTHALENE CONCENTRATIONS (mg/L)

NOTE

1. ALL LOCATIONS ARE APPROXIMATE.

0 20 40 60 80 100
SCALE IN METRES
(APPROXIMATE)

PROJECT
ALBERTA ENVIRONMENT
NORTH BOW SITE
HUMAN HEALTH RISK ASSESSMENT

TITLE
GROUNDWATER NAPHTHALENE CONCENTRATIONS MARCH 2011

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	02JUN11	SCALE AS SHOWN	REV.	–
CADD	NS	02JUN11			
CHECK	IH	07JUN11			
REVIEW	IH	07JUN11			

FIGURE 9

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-02_A.dwg Monday, August 29, 2011 11:58:01 AM By: NSmirnova

LEGEND

- STUDY AREA
- GROUNDWATER AND/OR SOIL VAPOUR WELL AND PROBE LOCATION (APPROXIMATE)
- HISTORICAL WELL WITH MEASURABLE DNAPL
- HISTORICAL WELL WITH DNAPL AND/OR LNAPL SHEEN
- HISTORICAL NAPL ZONES

0.00028 GROUNDWATER TOTAL XYLENES CONCENTRATIONS (mg/L)

NOTE

1. WHERE FIELD DUPLICATE AVAILABLE, THE MAXIMUM OF THE DUPLICATES WAS PLOTTED.
2. ALL LOCATIONS ARE APPROXIMATE.

0 20 40 60 80 100
SCALE IN METRES
(APPROXIMATE)

PROJECT
ALBERTA ENVIRONMENT
NORTH BOW SITE
HUMAN HEALTH RISK ASSESSMENT

TITLE
GROUNDWATER TOTAL XYLENES CONCENTRATIONS MARCH 2011

Golder Associates
Greater Vancouver Office, BC

PROJECT No.	10-1346-0046		PHASE No.	3000	
DESIGN	IH	02JUN11	SCALE	AS SHOWN	REV. –
CADD	NS	02JUN11			
CHECK	IH	07JUN11			
REVIEW	IH	07JUN11			

FIGURE 10

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-02_A.dwg Monday, August 29, 2011 11:58:01 AM By: NSmirnova

LEGEND

- STUDY AREA
- GROUNDWATER AND/OR SOIL VAPOUR WELL AND PROBE LOCATION (APPROXIMATE)
- HISTORICAL WELL WITH MEASURABLE DNAPL
- HISTORICAL WELL WITH DNAPL AND/OR LNAPL SHEEN
- HISTORICAL NAPL ZONES

1800 F1 SOIL VAPOUR CONCENTRATION (µg/m³)

2200 F2 SOIL VAPOUR CONCENTRATION (µg/m³)

NOTE

1. WHEN MULTIPLE PROBES WERE PRESENT AT ONE LOCATION, THE MAXIMUM CONCENTRATION WAS PLOTTED.
2. ALL LOCATIONS ARE APPROXIMATE.

0 20 40 60 80 100
SCALE IN METRES
(APPROXIMATE)

PROJECT
ALBERTA ENVIRONMENT
NORTH BOW SITE
HUMAN HEALTH RISK ASSESSMENT

TITLE
SOIL VAPOUR
F1 AND F2 CONCENTRATIONS
MARCH 2011

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	02JUN11	SCALE	AS SHOWN	REV. –
CADD	NS	02JUN11			
CHECK	IH	07JUN11			
REVIEW	IH	07JUN11			

FIGURE 11

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-02_A.dwg Monday, August 29, 2011 11:58:01 AM By: NSmirnova

WESTMOUNT RD.

19TH ST. NW

18TH ST. NW

17TH ST. NW

16TH ST. NW

BOWNESS RD.

HI-LO GAS

MW10-12
<0.33

MW10-22
<1.14
[19]

MW10-11
<0.48
[5.3]

MW10-20
2.7
[2.7]

MW10-10
<0.47
[1600]

MW10-18
<0.34
[36]

MW10-09B
0.64
[21]

MW10-6
58
[13000]

BROADVIEW RD.

MW10-16
0.77
[22]

MW10-7B
45
[2200]

FIREHALL (EMS)

CBC

MW10-5
2

WESTMOUNT BLVD.

MEMORIAL DRIVE

MW10-1
<0.34
[340]

MW10-2
<0.31
[1.7]

MW10-14
<0.33

MW10-3A

MW10-3B
<0.34
[4.6]

MW10-15
1.3
[4.0]

LEGEND

- STUDY AREA
- GROUNDWATER AND/OR SOIL VAPOUR WELL AND PROBE LOCATION (APPROXIMATE)
- HISTORICAL WELL WITH MEASURABLE DNAPL
- HISTORICAL WELL WITH DNAPL AND/OR LNAPL SHEEN
- HISTORICAL NAPL ZONES

<0.31 SOIL VAPOUR NAPHTHALENE CONCENTRATIONS (µg /m³)

[4.6] SOIL VAPOUR CONCENTRATION PREDICTED FROM SHALLOW GROUNDWATER CONCENTRATION USING HENRY'S LAW CONSTANT (IF NO CONCENTRATION PROVIDED WELL WAS DRY).

NOTE

1. ALL LOCATIONS ARE APPROXIMATE.

0 20 40 60 80 100
SCALE IN METRES
(APPROXIMATE)

PROJECT
ALBERTA ENVIRONMENT
NORTH BOW SITE
HUMAN HEALTH RISK ASSESSMENT

TITLE
SOIL VAPOUR NAPHTHALENE CONCENTRATIONS MARCH 2011

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	02JUN11	SCALE	AS SHOWN	REV. –
CADD	NS	02JUN11			
CHECK	IH	07JUN11			
REVIEW	IH	07JUN11			

FIGURE 12

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-02_A.dwg Monday, August 29, 2011 11:58:01 AM By: NSmirnova

LEGEND

- STUDY AREA
- GROUNDWATER AND/OR SOIL VAPOUR WELL AND PROBE LOCATION (APPROXIMATE)
- HISTORICAL WELL WITH MEASURABLE DNAPL
- HISTORICAL WELL WITH DNAPL AND/OR LNAPL SHEEN
- HISTORICAL NAPL ZONES
- 50 SOIL VAPOUR TOTAL XYLENE CONCENTRATIONS (µg /m³)

NOTE

1. ALL LOCATIONS ARE APPROXIMATE.

0 20 40 60 80 100
SCALE IN METRES
(APPROXIMATE)

PROJECT
ALBERTA ENVIRONMENT
NORTH BOW SITE
HUMAN HEALTH RISK ASSESSMENT

TITLE
SOIL VAPOUR TOTAL XYLENES CONCENTRATIONS MARCH 2011

Golder Associates
Greater Vancouver Office, BC

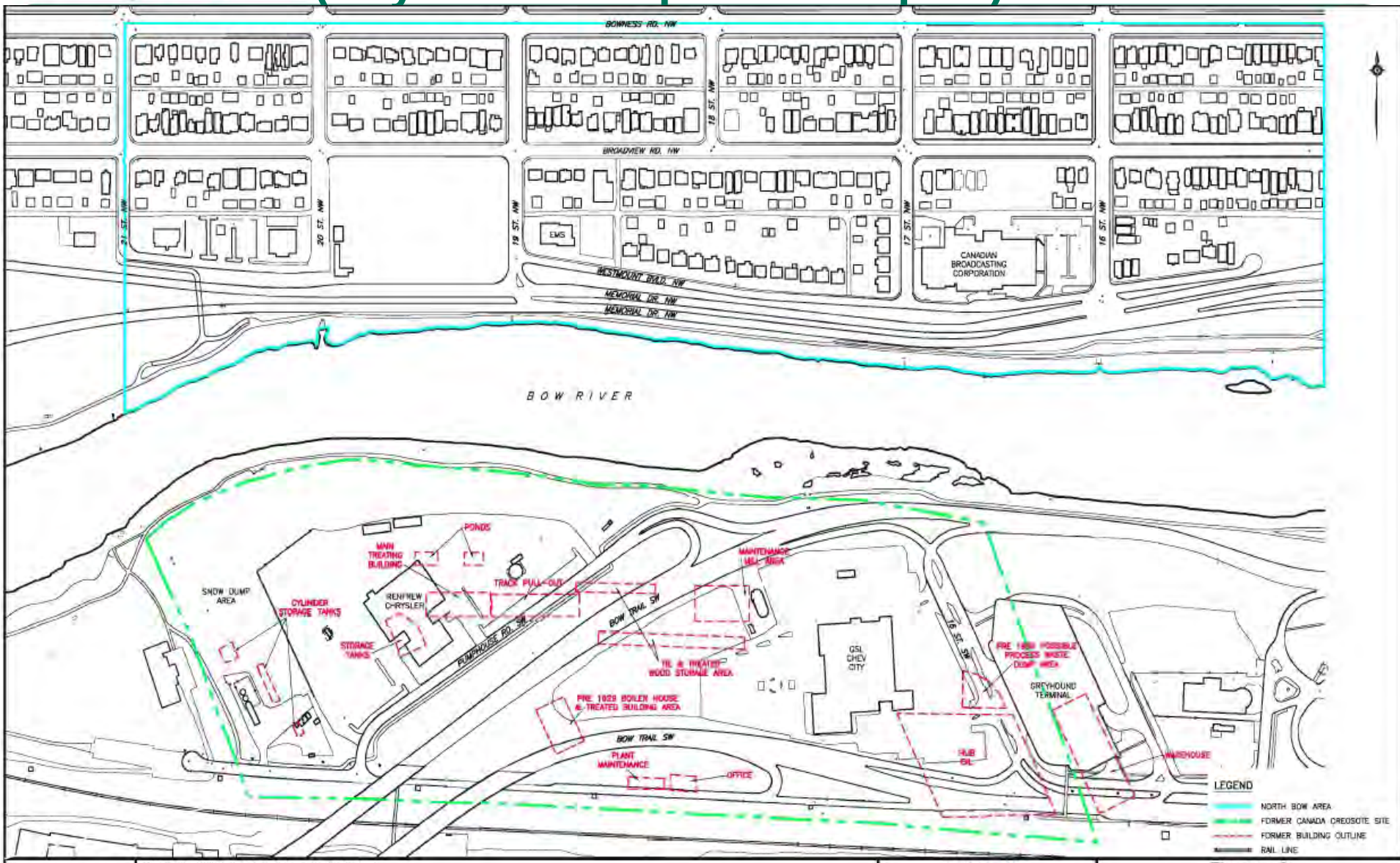
PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	02JUN11	SCALE	AS SHOWN	REV. –
CADD	NS	02JUN11	**FIGURE 13**		
CHECK	IH	07JUN11			
REVIEW	IH	07JUN11			

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-02_A.dwg Monday, August 29, 2011 11:58:01 AM By: NSmirnova

APPENDIX A

Historical Plans

Canada Creosote Site (Keystone Compilation Report)



KEYSTONE ENVIRONMENTAL

NOTE: THIS DRAWING IS FOR GENERAL INFORMATION ONLY. LOT BOUNDARIES AND FEATURES ARE APPROXIMATE.

25m 0 100m

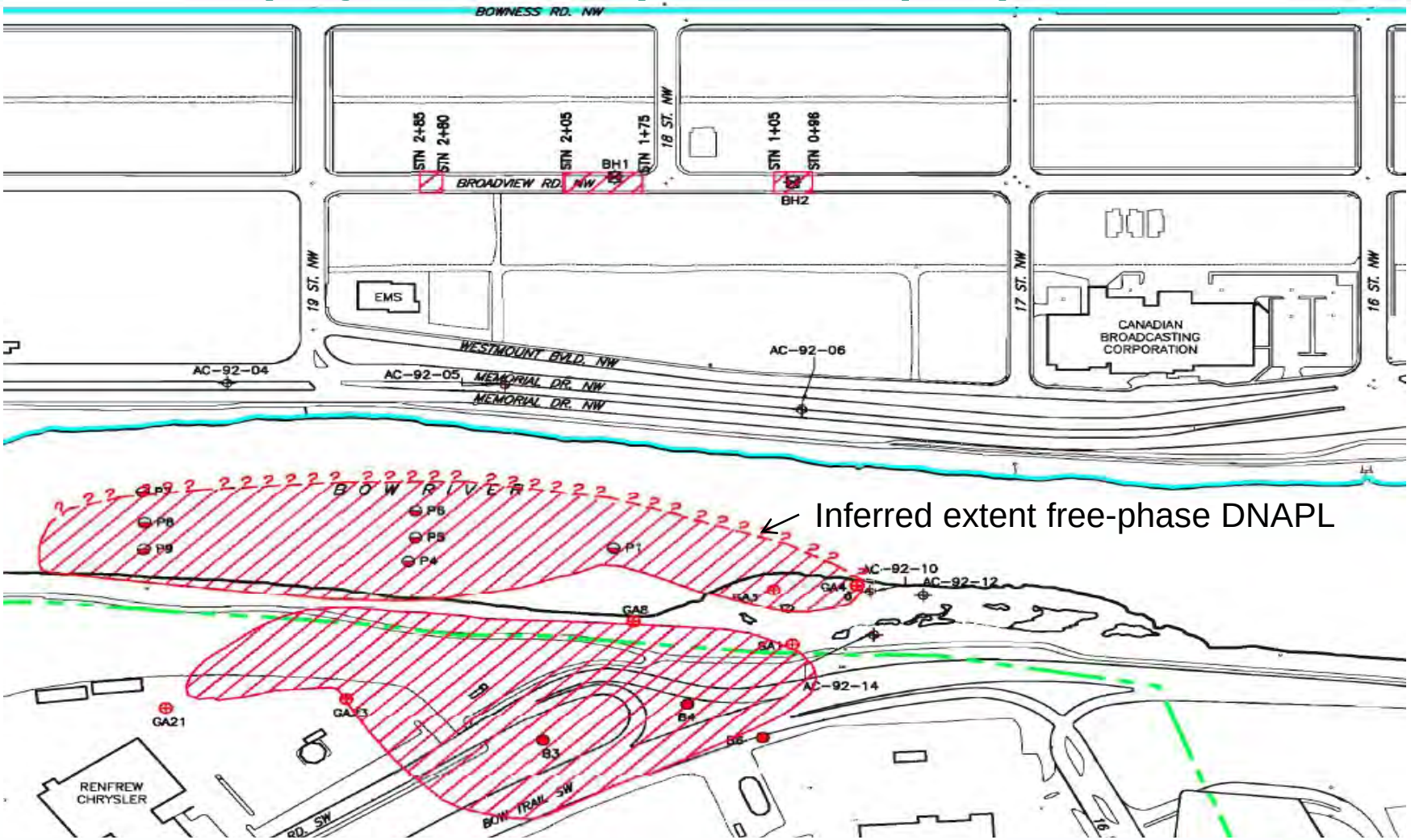
SCALE: 1:3000 (approx.)

North Bow Area
Calgary, Alberta
City of Calgary

REVISION No. | DATE | PROJECT No.

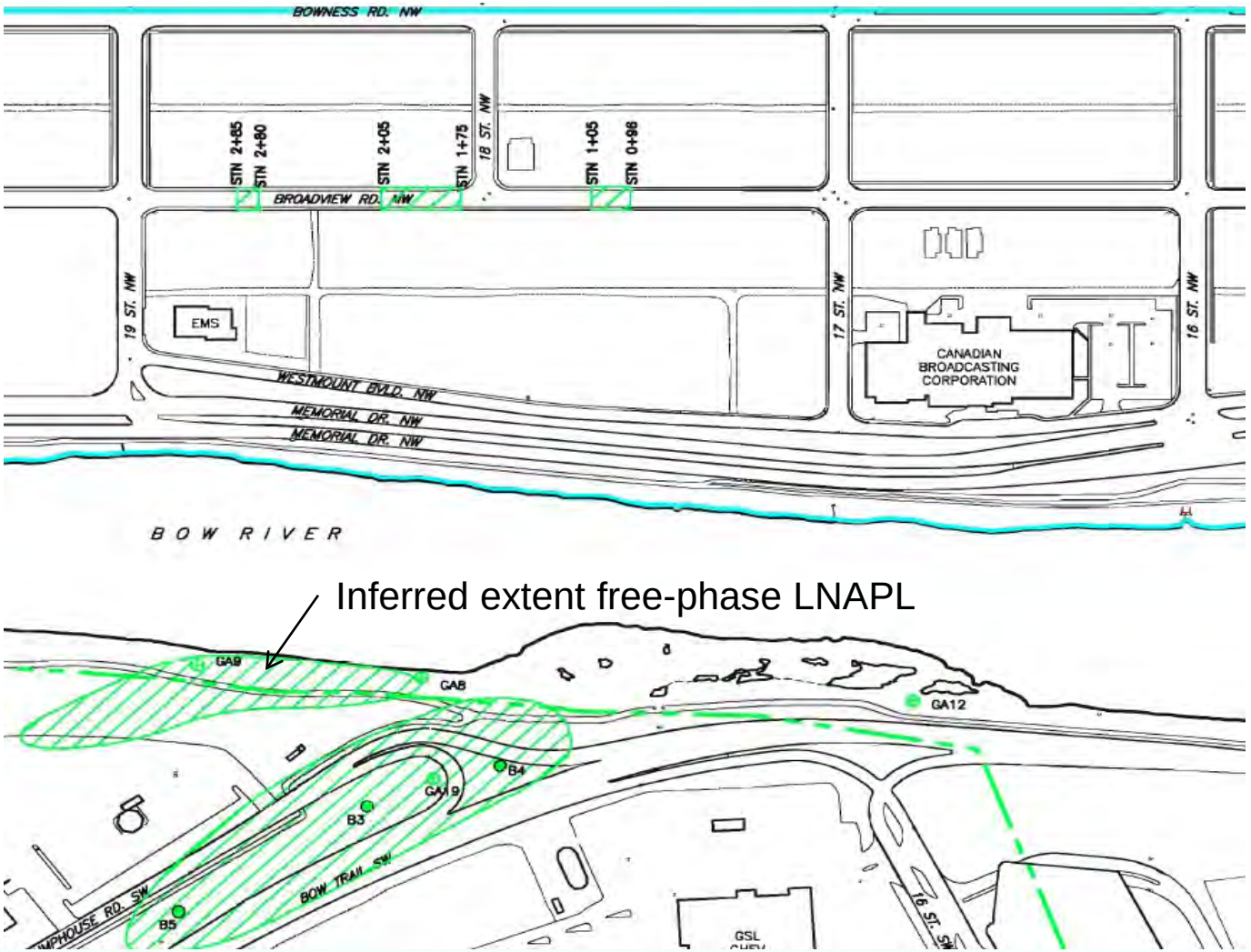
Figure 2
Site Plan & Former Canada Creosote Facilities

Canada Creosote Site (Keystone Compilation Report)

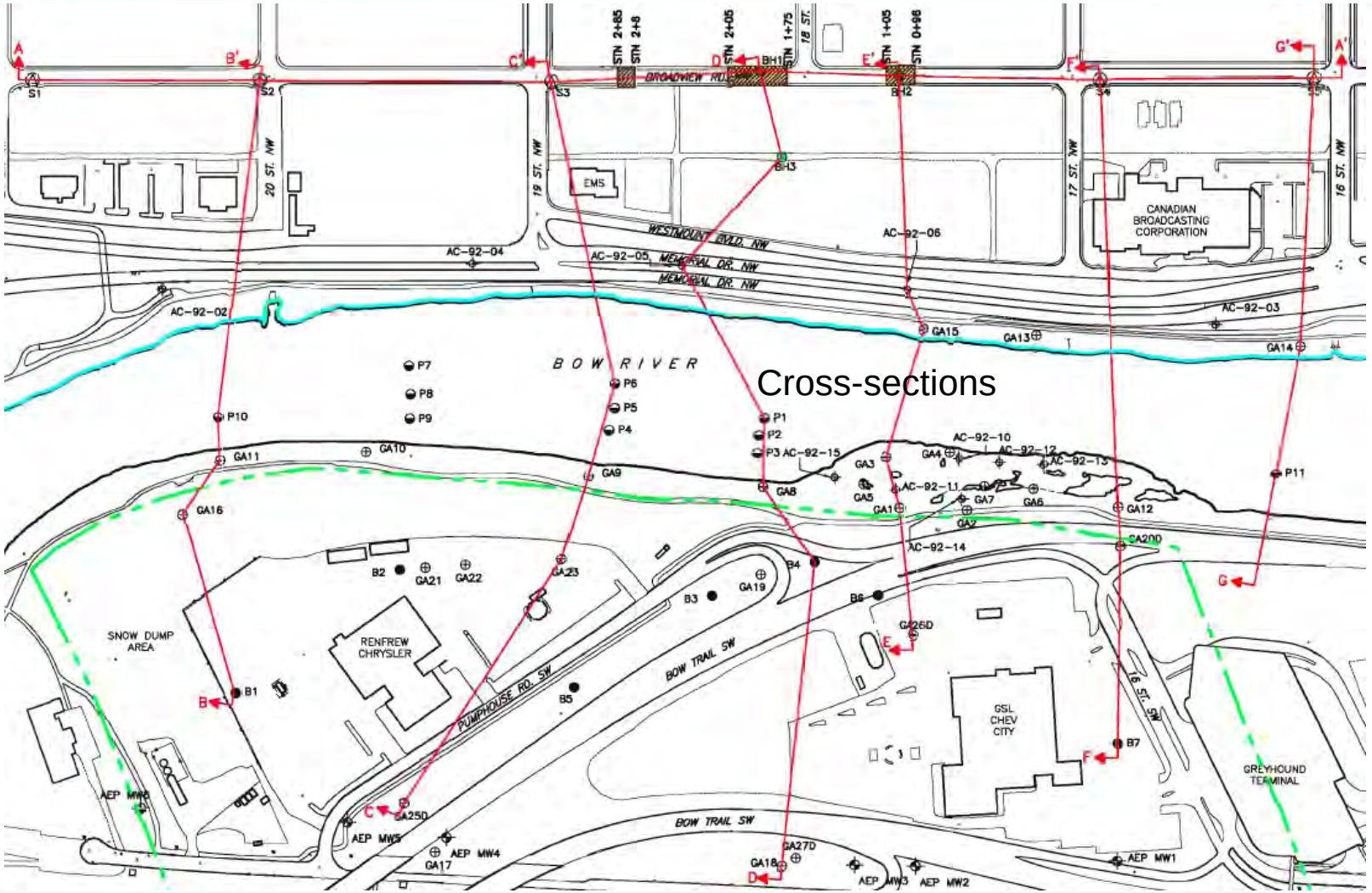


Golder Associates

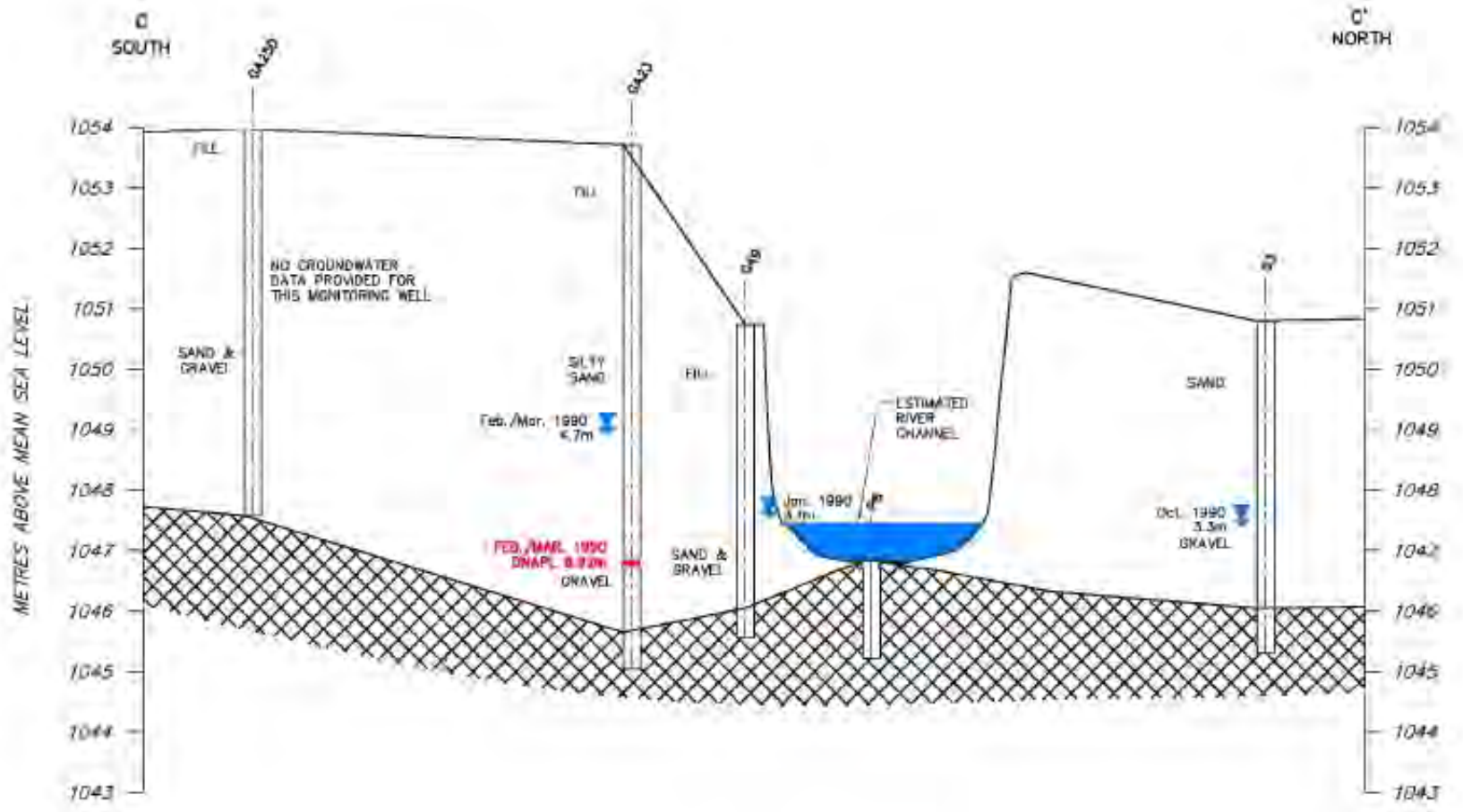
Canada Creosote Site (Keystone Compilation Report)



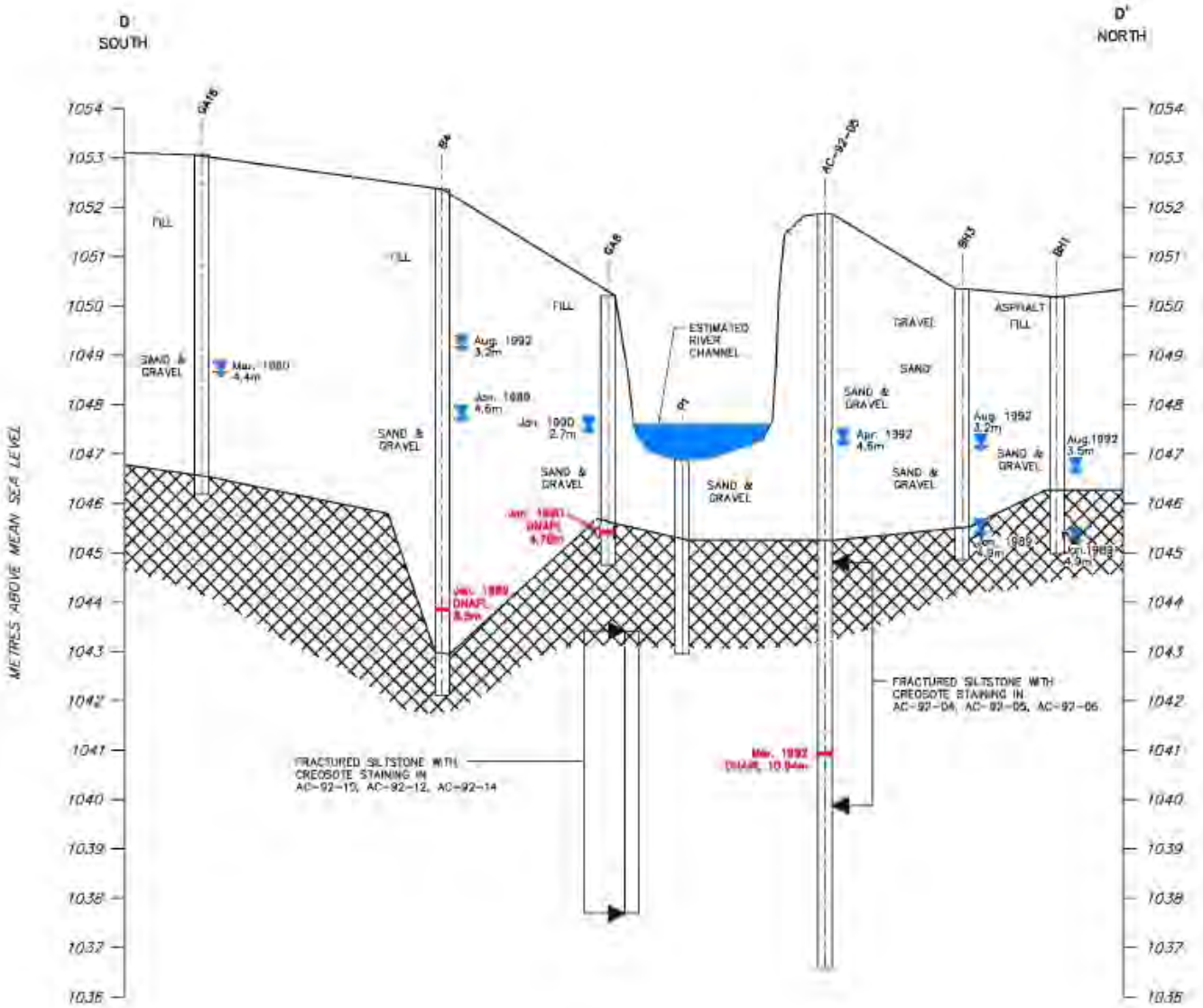
Canada Creosote Site (Keystone Compilation Report)



Canada Creosote Site (Keystone Compilation Report)

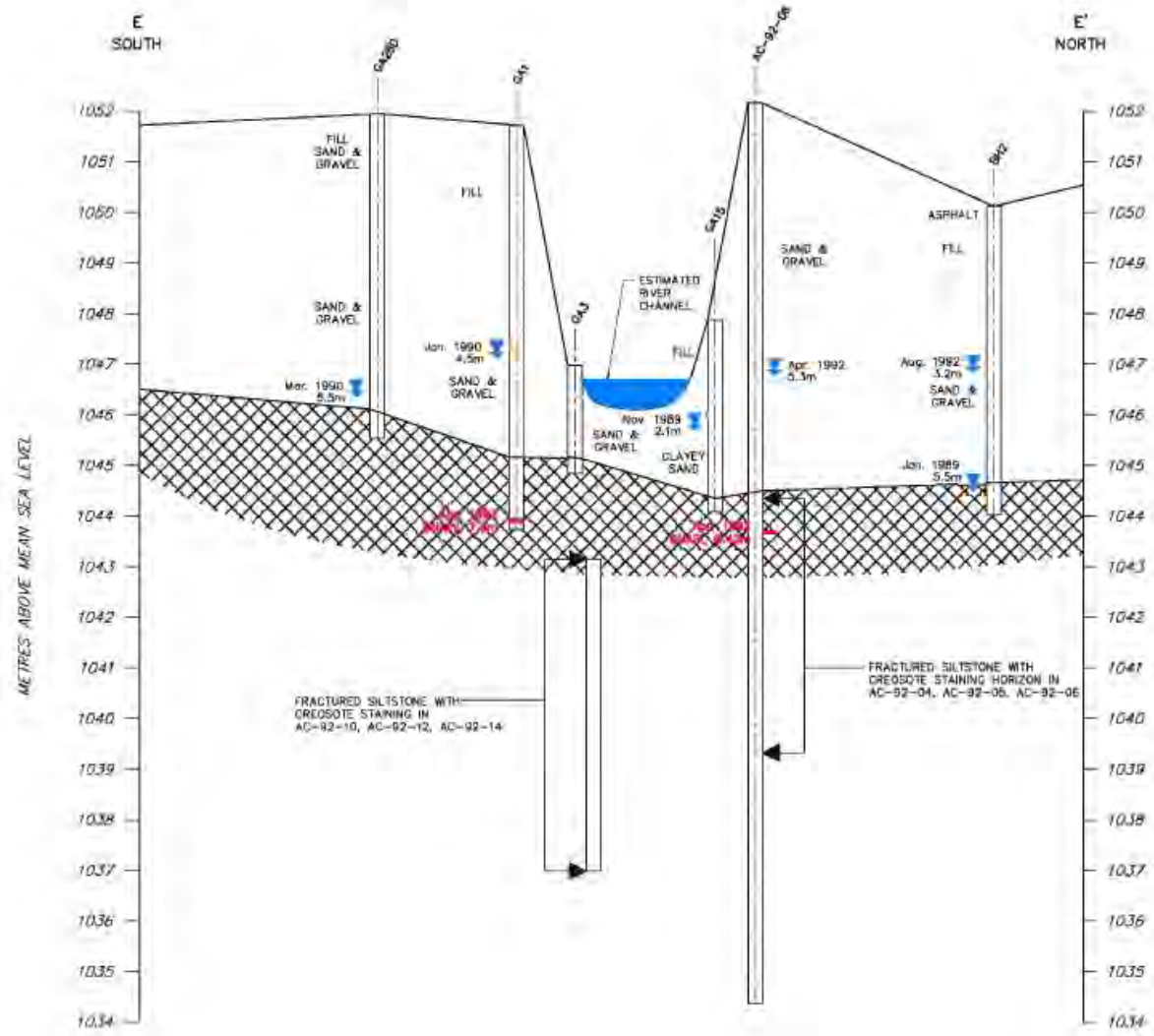


Canada Creosote Site (Keystone Compilation Report)



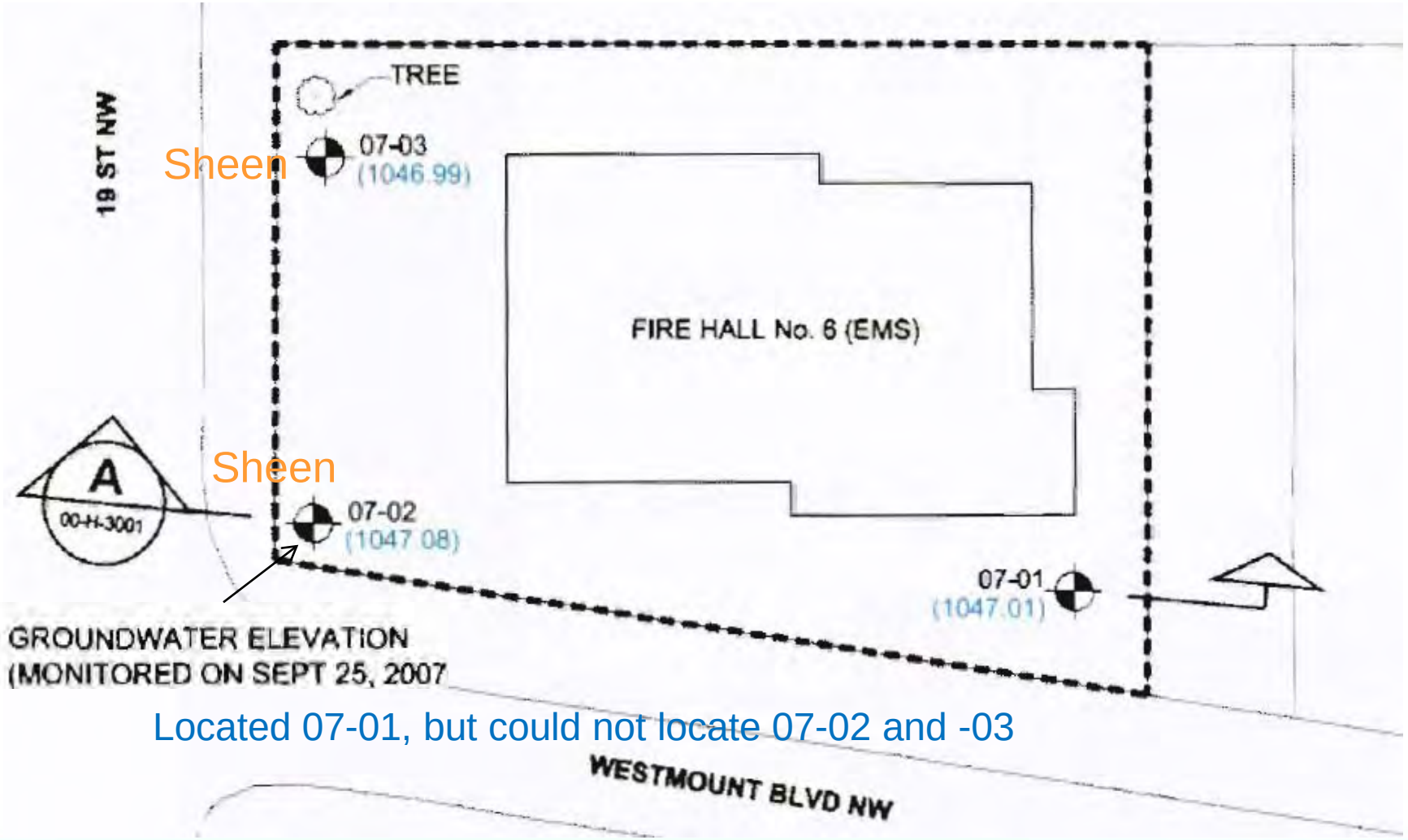
Golder Associates

Canada Creosote Site (Keystone Compilation Report)

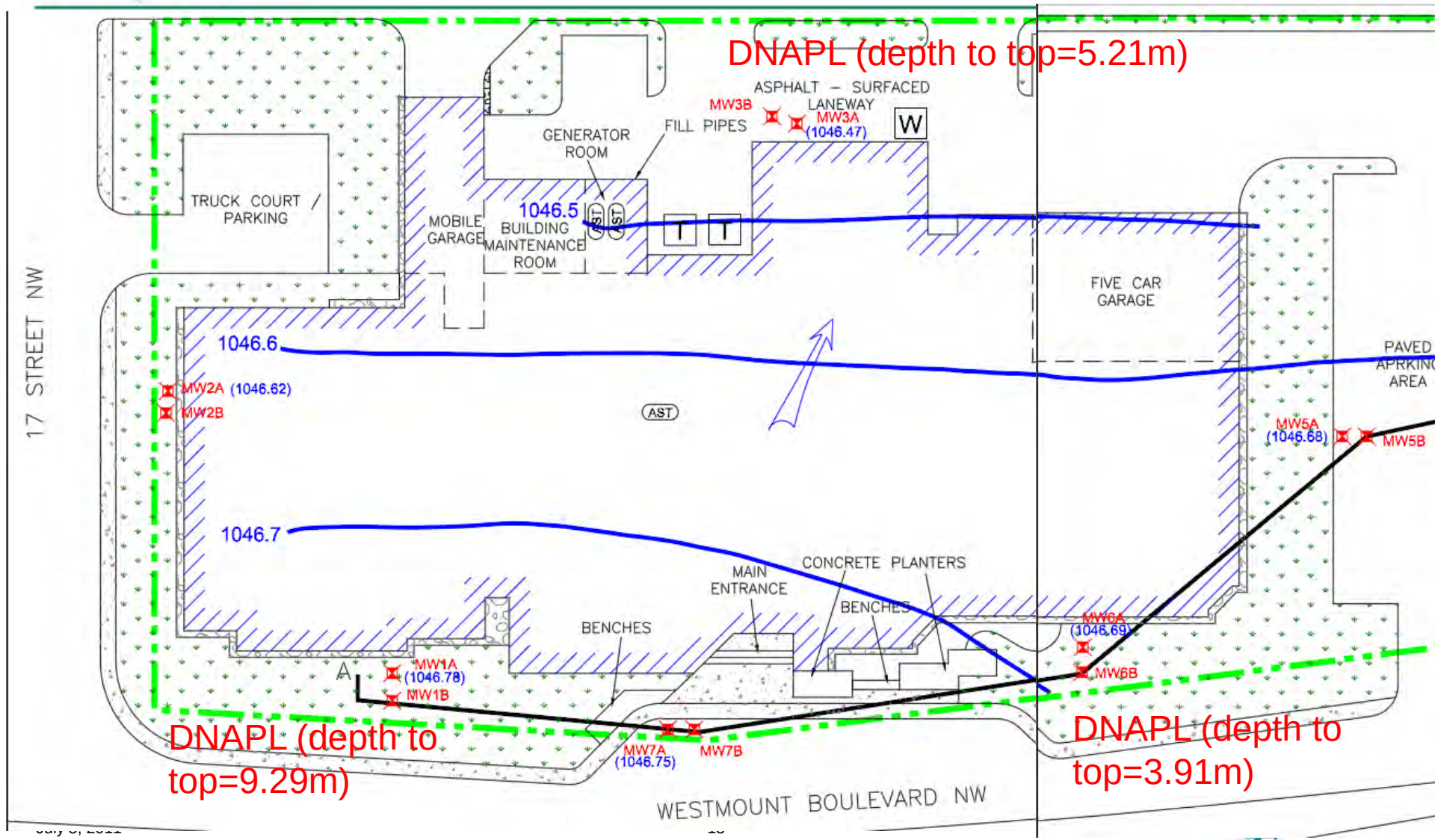


Golder Associates

UMA Fire Hall No. 6 Investigation (EMS)

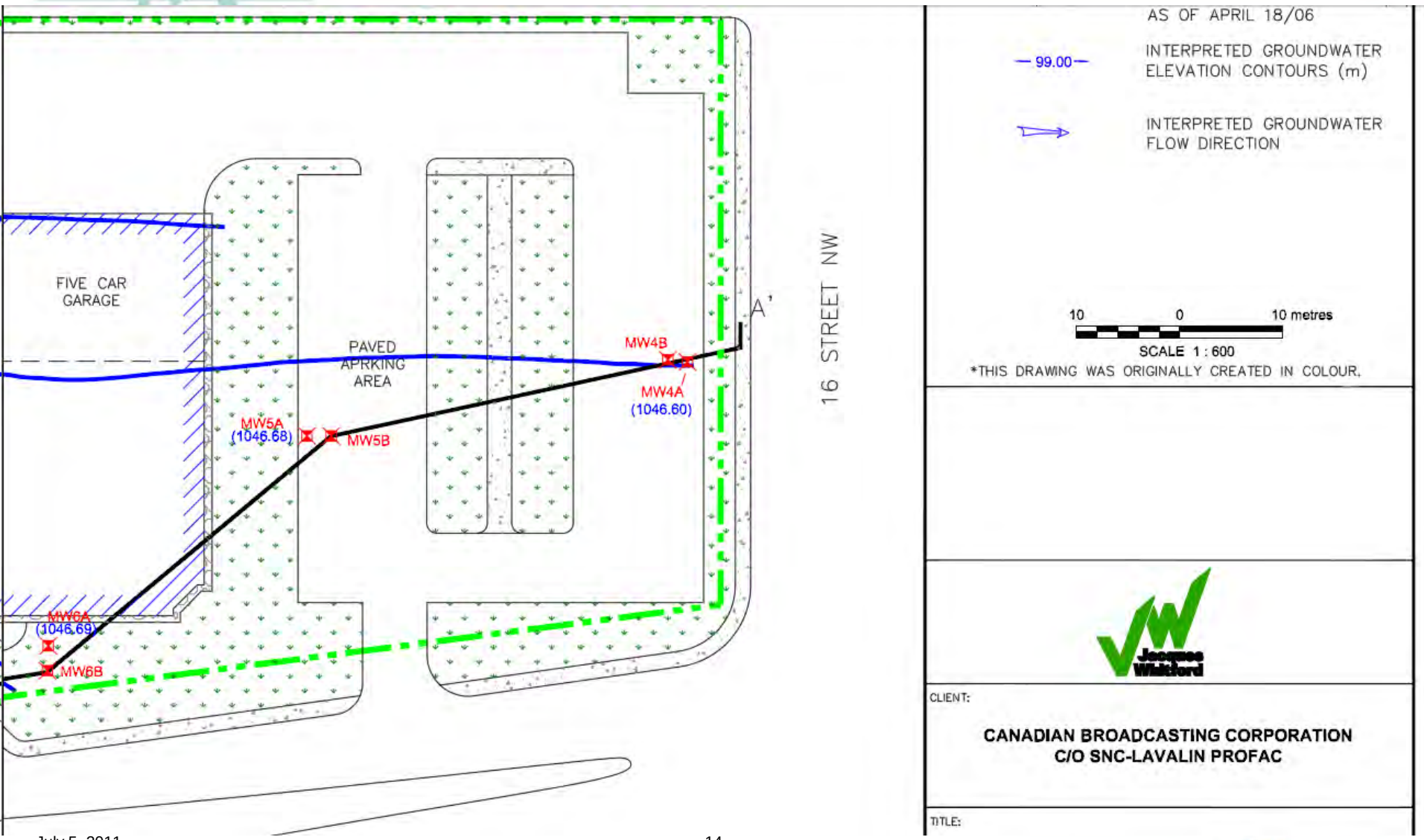


Jacques-Whitford CBC Site Investigation



Golder Associates

Jacques-Whitford CBC Site Investigation

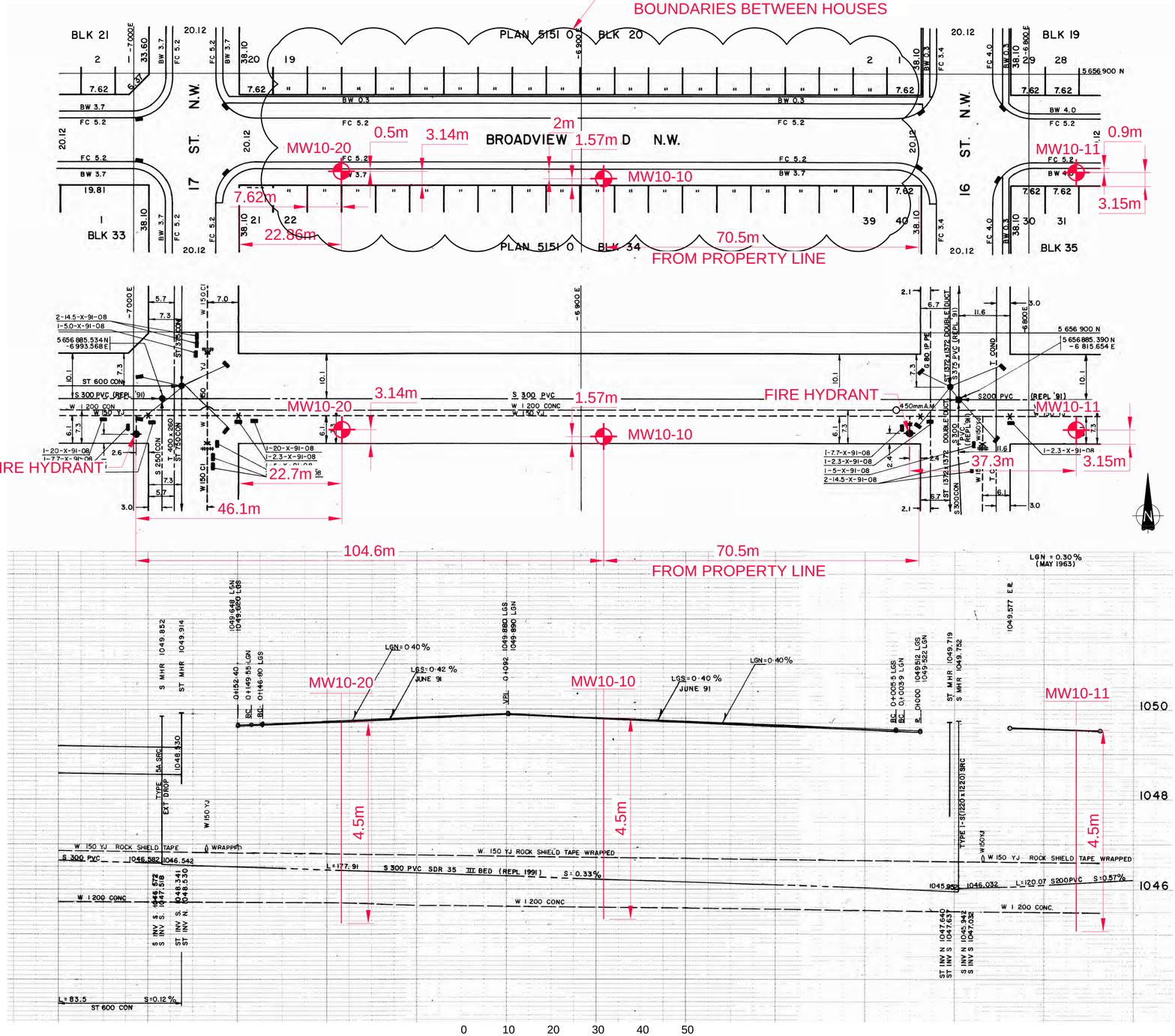


Golder Associates

APPENDIX B

Borehole Plans Sent to City

LOT LINES HERE DO NOT SEEM TO CORRESPOND TO ACTUAL LOT BOUNDARIES BETWEEN HOUSES



0 10 20 30 40 50

APPROXIMATE HORIZONTAL SCALE IN METRES

0 1 2 3 4 5

APPROXIMATE VERTICAL SCALE IN METRES

PROJECT

ALBERTA ENVIRONMENT

TITLE

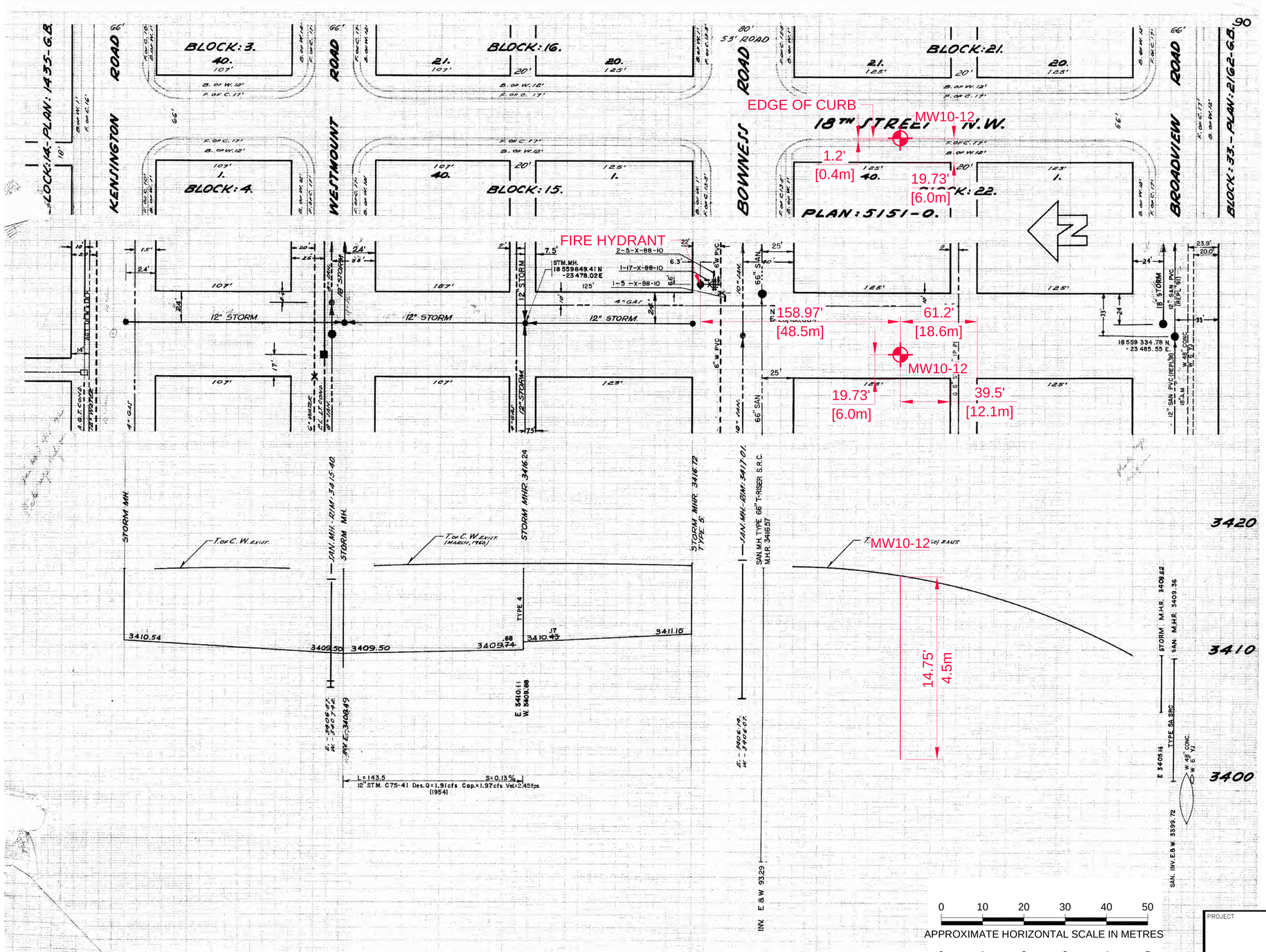
PROPOSED BOREHOLE LOCATIONS

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	18NOV10	SCALE	AS SHOWN	REV. –
CADD	NS	18NOV10			
CHECK	IH	17DEC10			
REVIEW	IH	17DEC10			

FIGURE 3

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-01_A.dwg Thursday, January 13, 2011 9:20:13 AM By: NSmirnova



PROJECT

ALBERTA ENVIRONMENT

TITLE

PROPOSED BOREHOLE LOCATIONS

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	18NOV10	SCALE	AS SHOWN	REV. –
CADD	NS	18NOV10			
CHECK	IH	17DEC10			
REVIEW	IH	17DEC10			

FIGURE 4

LOT LINES HERE DO NOT SEEM TO CORRESPOND TO ACTUAL LOT BOUNDARIES BETWEEN HOUSES

BLK. 23

19th STREET N.W.

BROADVIEW ROAD N.W.

18 ST N.W.

BLK. 21

PLAN 4118 JK
BLK. 6

BLK. 33 PLAN 5151 O

BLK. 33 PLAN 2162 GB

A.S.C.M. 24224

MW10-6

MW10-16

MW10-17

MW10-7

MW10-7A/B

0.5m

14m

16.3m

36m

16.5m

1.2m

3.6m

14.91m

FIRE HYDRANT

5656885.177N
-7331.380E

5656885.242N
-7158.395E

44m

14m

2.83m

78.3m

94.2m

138.2m

L.G.N.-0.906%
(80-10)

LGN=0.419%
JUNE 91

1050

1048

1046

4.5m

7.0m

L=172.31 S=0.16%

L=164.83 S=0.30%

L=83.5 S=0.12%

ST 600

APPROXIMATE HORIZONTAL SCALE IN METRES

0 10 20 30 40 50

APPROXIMATE VERTICAL SCALE IN METRES

0 1 2 3 4 5

PROJECT

ALBERTA ENVIRONMENT

TITLE

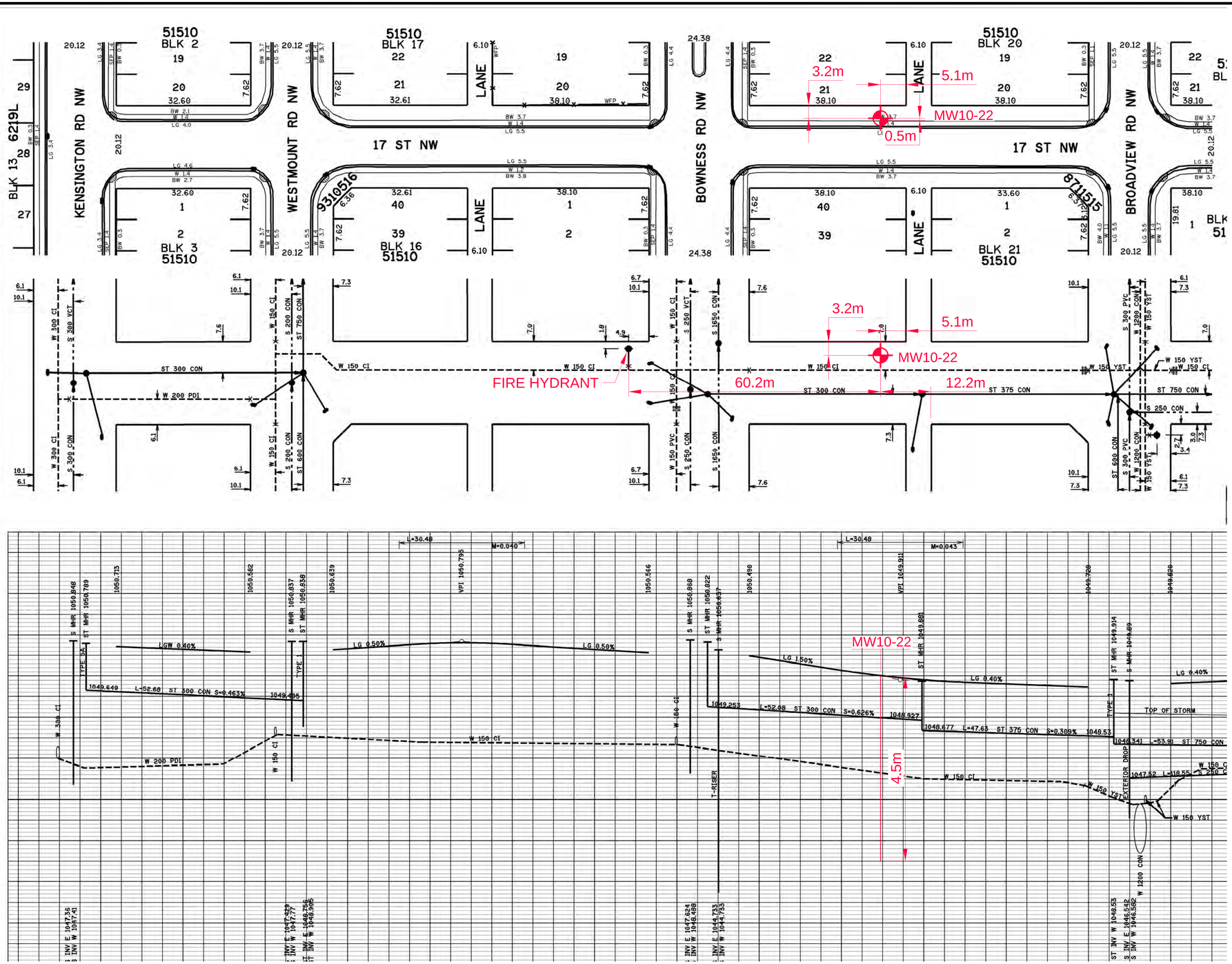
PROPOSED BOREHOLE LOCATIONS

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	18NOV10	SCALE AS SHOWN	REV.	–
CADD	NS	18NOV10			
CHECK	IH	17DEC10			
REVIEW	IH	17DEC10			

FIGURE 5

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-01_A.dwg Thursday, January 13, 2011 9:20:13 AM By: NSmirnova



0 10 20 30 40 50

APPROXIMATE HORIZONTAL SCALE IN METRES

0 1 2 3 4 5

APPROXIMATE VERTICAL SCALE IN METRES

PROJECT

ALBERTA ENVIRONMENT

TITLE

PROPOSED BOREHOLE LOCATIONS

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	18NOV10	SCALE	AS SHOWN	REV. –
CADD	NS	18NOV10			
CHECK	IH	17DEC10			
REVIEW	IH	17DEC10			

FIGURE 6

118

45.4m

4.7m

MW10-5

0.5m

FIRE HYDRANT

BLOCK 35 PLAN 5151 O

16 ST. N.W.

WESTMOUNT BLVD.

MEMORIAL DRIVE N.W.

14 STREET N.W.

RIVER BOW

CURVE DATA								
No.	5	6	7	8	9	10	11	12
Δ	6°10'46.02"	4°23'09.10"	9°10'02.37"	14°08'42.92"	74°46'09.81"	10°04'27.85"	8°31'44.02"	79°28'43.23"
R	350.000	1500.000	475.000	100.000	20.000	480.250	110.000	26.500
L	37.748	114.822	76.000	24.688	26.099	84.443	16.374	36.760
T	18.892	57.439	38.081	12.407	15.283	42.331	8.202	22.051
E	0.510	1.099	1.524	0.767	5.171	1.855	0.305	6.123

NOTE: ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.

T.C.N.=0.40%

T.C.S.=0.40%

MW10-5

4.5m

PART OF WATERWORKS WORK ORDER No.56-1950

EXTENTION OF 150mm C.I. WATERMAN 6.10m N. on WESTMOUNT BOULEVARD

APPROXIMATE HORIZONTAL SCALE IN METRES

0 10 20 30 40 50

APPROXIMATE VERTICAL SCALE IN METRES

0 1 2 3 4 5

PROJECT

ALBERTA ENVIRONMENT

TITLE

PROPOSED BOREHOLE LOCATIONS

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	18NOV10	SCALE	AS SHOWN	REV. –
CADD	NS	18NOV10			
CHECK	IH	17DEC10			
REVIEW	IH	17DEC10			

FIGURE 7

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-01_A.dwg Thursday, January 13, 2011 9:20:13 AM By: NSmirnova

405.8'
[123.7m]

320.7'
[97.8m]

174.4'
[53.2m]

PROPERTY LINE

PROPERTY LINE

39.9'
[12.2m]

43.5'
[13.3m]

6'
[1.8m]

8' 27
328'
[82.4m]

3131.9'
[95.7m]

FIRE HYDRANT

MW10-3A/B

MW10-15

MW10-4

1.5'
[0.5m]

1.5'
[0.5m]

1.5'
[0.5m]

MEMORIAL DRIVE (WESTMOUNT BLVD.)

N84°07'W

N61°25'W

119

2162 GB

468.12'

E.C. 16.3

10" SAN (ABANDON)

10" SAN (ABANDON)

30" SAN.

15" STORM

16" SAN.

10" SAN (REF.)

MUDLINE

SAN. M.H. - 3412.49
E-3392.27
N-3398.56

1920.31

P.I. @ 341099

P.I. @ 341120

P.I. @ 341125

P.I. @ 341040

100' V.C.

100' V.C.

50' V.C.

60' V.C.

0.40%

0.50%

0.50%

1.13%

0.40%

STORM M.H. TYPE 5A
3411.10

SAN. M.H. - 3410.56
M.H. TYPE 7A
M.H. - 3410.62

SAN. M.H. TYPE 7A
3411.35

STORM M.H. 3410.64

T.O.C. GRADE
(22/4/59)

MW10-3A/B

MW10-15

MW10-4

14.75'
4.5m

14.75'
4.5m

14.75'
4.5m

23'
7.0m

3410

3400

3390

3405.80

3402.70

3402.00

3401.69

3401.64

3404.00

3398.64

6" C.I. WATER INVERT

2.71'-10" CEMENT-ASBESTOS-CLASS-2400-S=0.26%
SAND BEDDING

EXIST. 30" SAN.

10" CEMENT ASBESTOS CLASS 2400 S=0.40% SAND BEDDING

S-3403.16
N-3403.29

-:NOTE:-
EXISTING 10" SAN. EAST OF 17TH ST. IS TO BE ABANDONED. THE SINGLE SERVICE (SAN.) TIED IN TO THIS 10" LINE, (FROM C.B.C. BLDG.) WILL BE EXTENDED SOUTHERLY TO TIE DIRECTLY INTO THE 30" SAN.

0 10 20 30 40 50

APPROXIMATE HORIZONTAL SCALE IN METRES

0 1 2 3 4 5

APPROXIMATE VERTICAL SCALE IN METRES

PROJECT

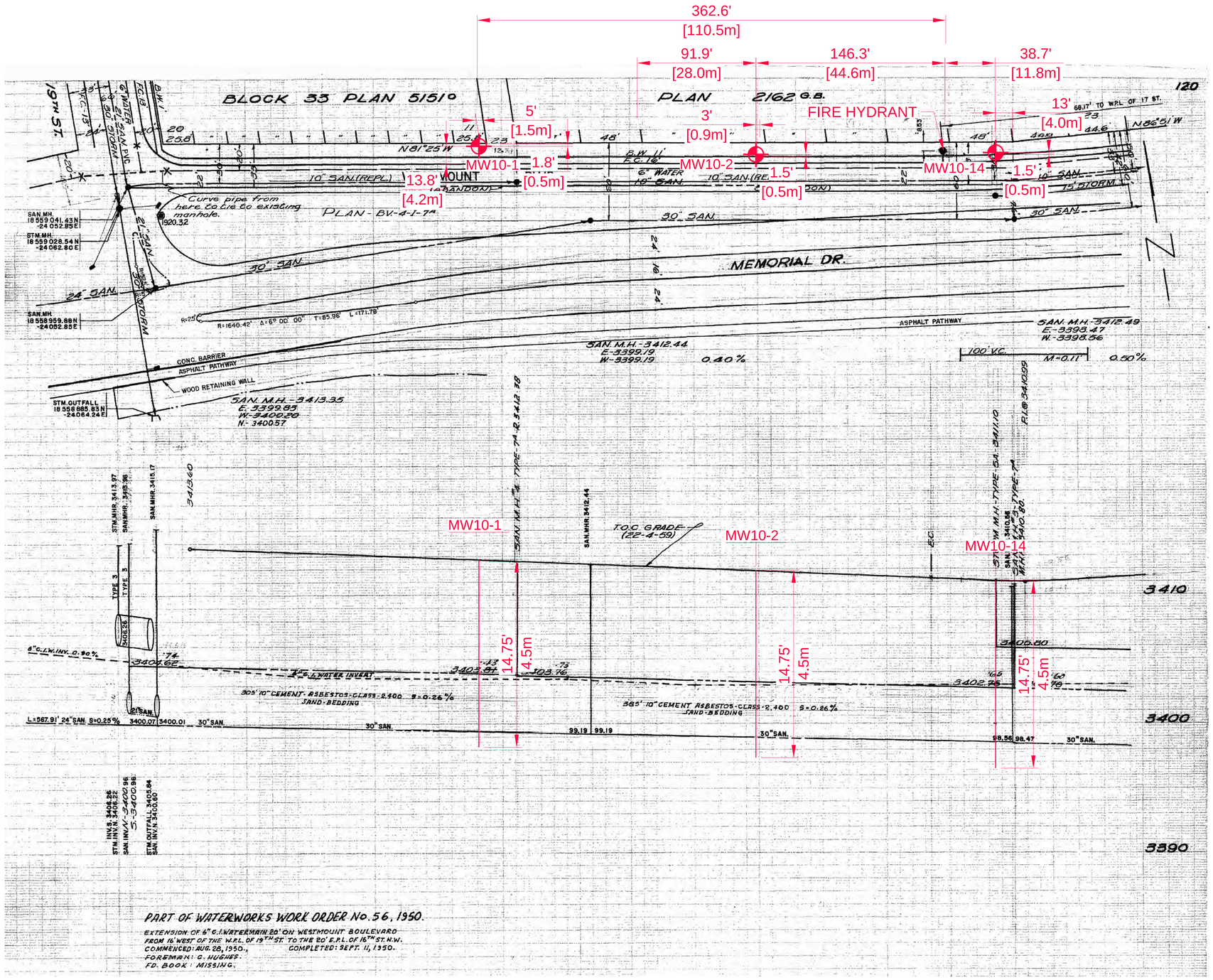
ALBERTA ENVIRONMENT

TITLE

PROPOSED BOREHOLE LOCATIONS

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	18NOV10	SCALE AS SHOWN	REV.	–
CADD	NS	18NOV10	FIGURE 8		
CHECK	IH	17DEC10			
REVIEW	IH	17DEC10			



0 10 20 30 40 50

APPROXIMATE HORIZONTAL SCALE IN METRES

0 1 2 3 4 5

APPROXIMATE VERTICAL SCALE IN METRES

PROJECT

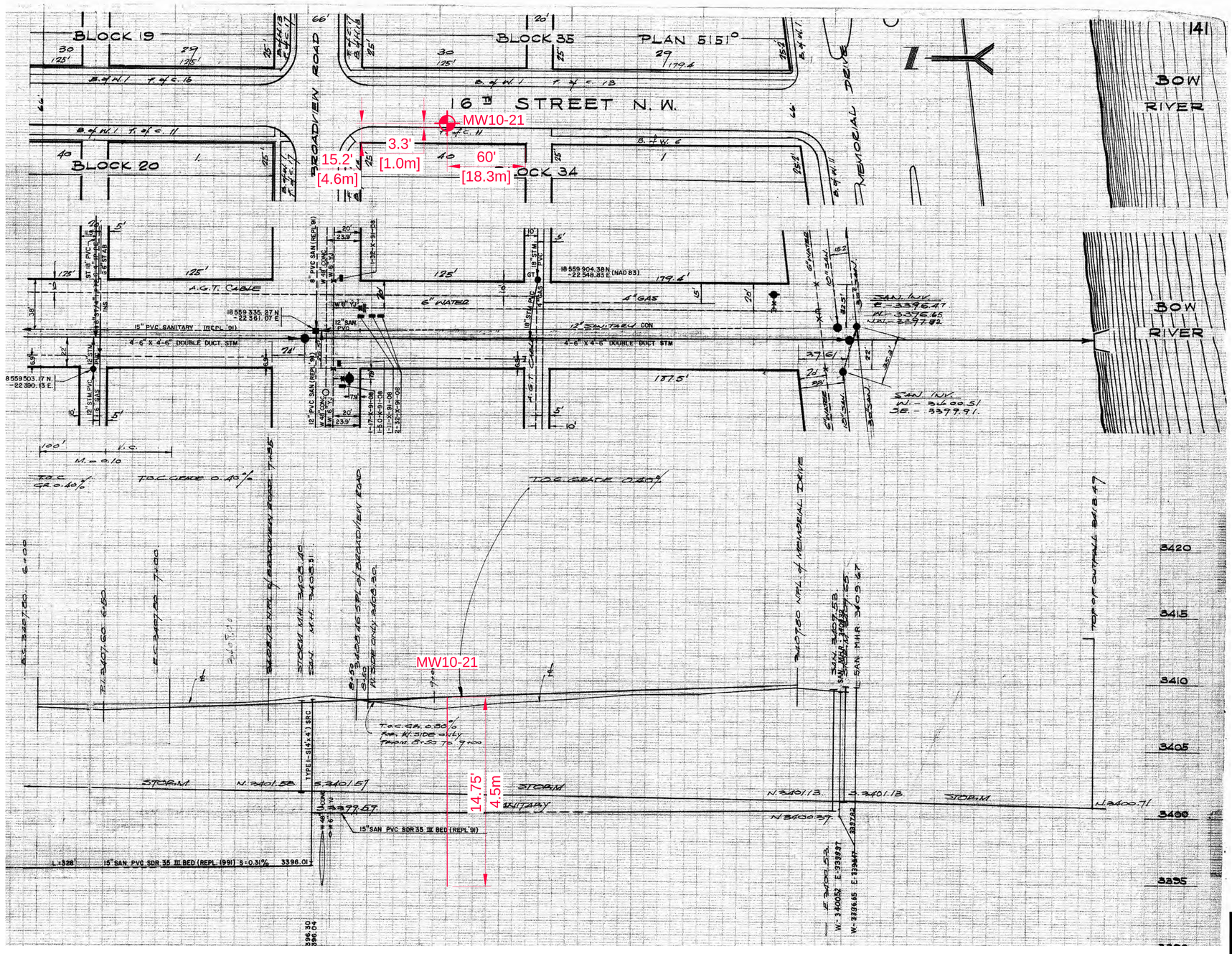
ALBERTA ENVIRONMENT

TITLE

PROPOSED BOREHOLE LOCATIONS

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	18NOV10	SCALE	AS SHOWN	REV. –
CADD	NS	18NOV10	**FIGURE 9**		
CHECK	IH	17DEC10			
REVIEW	IH	17DEC10			



0 10 20 30 40 50

APPROXIMATE HORIZONTAL SCALE IN METRES

0 1 2 3 4 5

APPROXIMATE VERTICAL SCALE IN METRES

PROJECT

ALBERTA ENVIRONMENT

TITLE

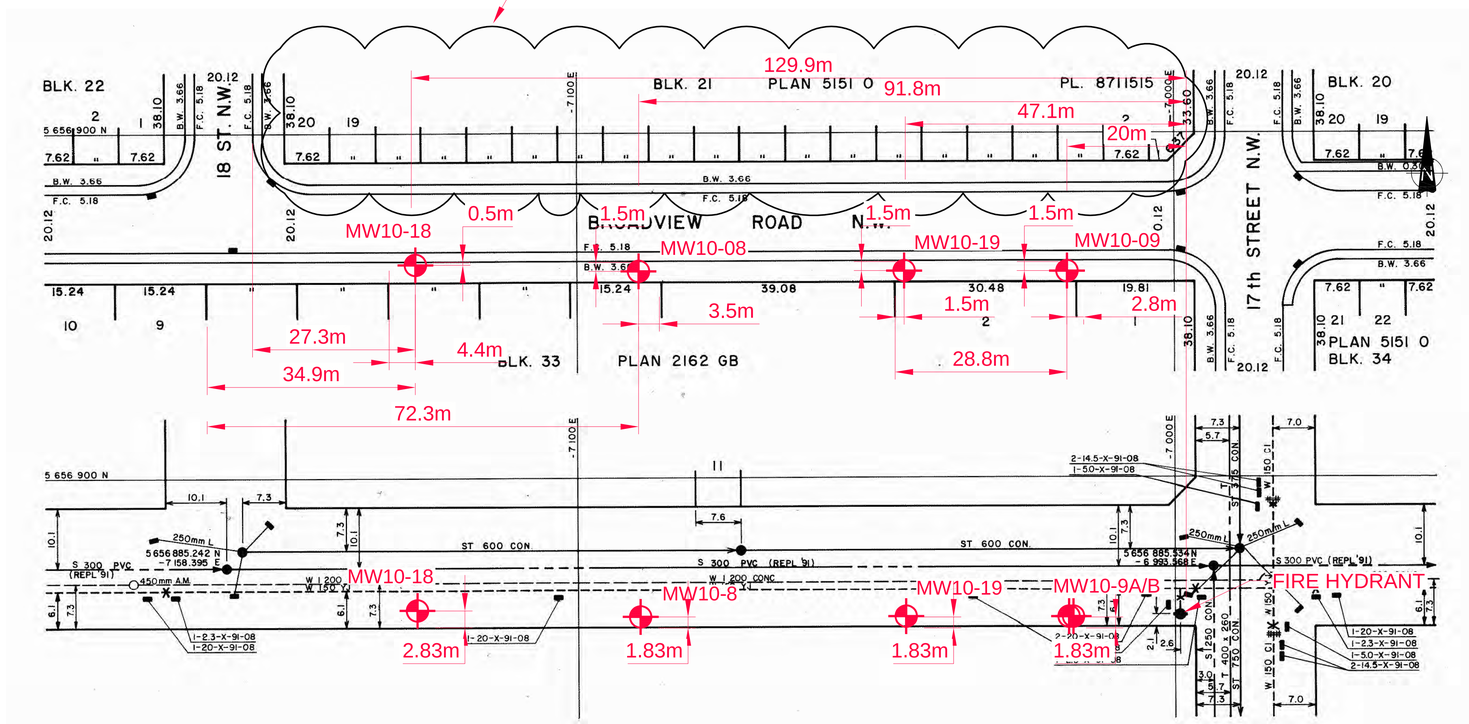
PROPOSED BOREHOLE LOCATIONS

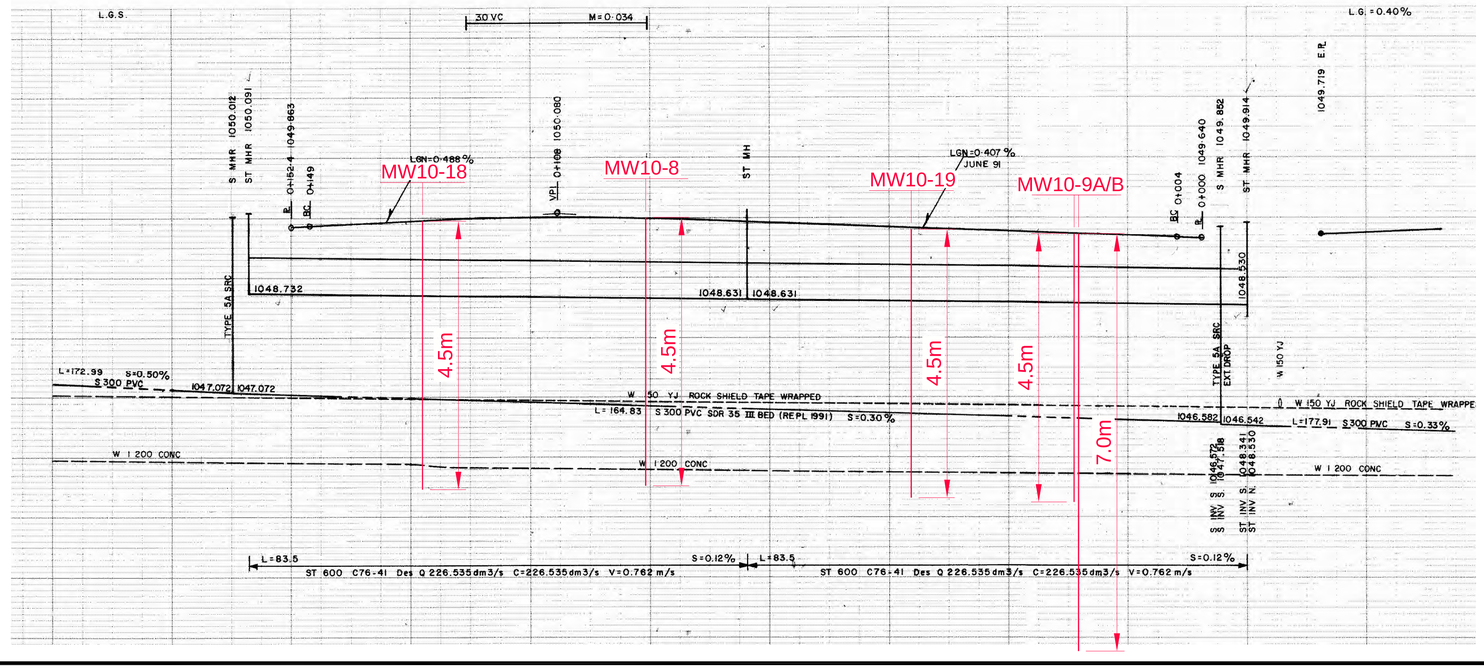
Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	18NOV10	SCALE	AS SHOWN	REV. –
CADD	NS	18NOV10			
CHECK	IH	17DEC10			
REVIEW	IH	17DEC10			

FIGURE 10

LOT LINES HERE DO NOT SEEM TO CORRESPOND TO ACTUAL LOT BOUNDARIES BETWEEN HOUSES





0 10 20 30 40 50

APPROXIMATE HORIZONTAL SCALE IN METRES

0 1 2 3 4 5

APPROXIMATE VERTICAL SCALE IN METRES

PROJECT

ALBERTA ENVIRONMENT

TITLE

PROPOSED BOREHOLE LOCATIONS

Golder Associates
Greater Vancouver Office, BC

PROJECT No. 10-1346-0046			PHASE No.		3000
DESIGN	IH	18NOV10	SCALE AS SHOWN	REV.	-
CADD	NS	18NOV10			
CHECK	IH	17DEC10			
REVIEW	IH	17DEC10			

FIGURE 11

Drawing File: N:\Bur-Graphics\Projects\2010\1346\10-1346-0046\Drafting\3000\10-1346-0046-3000-01-A.dwg Thursday, January 13, 2011 9:20:13 AM By: NSmirnova

APPENDIX C

AENV Groundwater Information System Report

Government of Alberta

Reconnaissance Report

View in Imperial

You have selected more than one water well.
Please click the water well ID to generate Water Well Drilling Report.

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (m)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (m)	TEST RATE (L/min)
354219	NE	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-08-25	11.58	New Well	Dewatering		2		HAZCO ENVIRONMENTAL #DW1A	6.10	24.61
356170	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-23	10.67	New Well	Dewatering		4		HAZCO #DW 3	4.21	37.85
356171	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-23	10.67	New Well	Dewatering		4		HAZCO	4.21	37.85
394736	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-05-27	10.36	New Well	Dewatering		2		HAZCO #CW 2	4.39	18.93
399928	NW	16	024	01	5	WENGER (D) DRILLING	1946-09-13	9.14	Well Inventory	Stock		3		JONES, G.L.	3.81	56.78
399932	SW	21	024	01	5	RICHMOND WW DRLG	1977-08-10	27.43	New Well	Domestic		2		NIELSON, BEN	12.50	113.56
416033	SE	20	024	01	5	DIVERSIFIED DRILLING & EXPLORATION CO.	1981-11-02	21.34	New Well	Domestic		5		CALGARY, CITY OF	3.66	45.42
493298	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-16	16.15	New Well	Dewatering		3		HAZCO #DW 2	4.94	37.85
493299	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-20	10.06	New Well	Dewatering		4		HAZCO #DW 4	3.44	18.93
493300	NE	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-08-26	11.89	New Well	Dewatering		3		HAZCO ENV #DW 2A	5.49	32.93
493303	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-13	15.24	New Well	Dewatering		4		HAZCO #DW 1	5.36	26.50
493357	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-05-30	11.89	New Well	Dewatering		2		HAZCO #CW 5	5.09	56.78
493358	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-11	10.67	New Well	Dewatering		2		HAZCO #CW 7	4.11	37.85
493359	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-02	10.36	New Well	Dewatering		2		HAZCO #CW 3	4.79	18.93
493360	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-05	10.36	New Well	Dewatering		2		HAZCO #CW 6	4.72	5.68

Government of Alberta

Reconnaissance Report

View in Metric

You have selected more than one water well.
Please click the water well ID to generate Water Well Drilling Report.

Well ID	LSD	SEC	TWP	RGE	M	DRILLING COMPANY	DATE COMPLETED	DEPTH (ft)	TYPE OF WORK	USE	CHM	LT	PT	WELL OWNER	STATIC LEVEL (ft)	TEST RATE (igpm)
354219	NE	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-08-25	38.00	New Well	Dewatering		2		HAZCO ENVIRONMENTAL #DW1A	20.00	6.50
356170	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-23	35.00	New Well	Dewatering		4		HAZCO #DW 3	13.80	10.00
356171	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-23	35.00	New Well	Dewatering		4		HAZCO	13.80	10.00
394736	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-05-27	34.00	New Well	Dewatering		2		HAZCO #CW 2	14.40	5.00
493298	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-16	53.00	New Well	Dewatering		3		HAZCO #DW 2	16.20	10.00
493299	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-20	33.00	New Well	Dewatering		4		HAZCO #DW 4	11.30	5.00
493300	NE	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-08-26	39.00	New Well	Dewatering		3		HAZCO ENV #DW 2A	18.00	8.70
493303	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-13	50.00	New Well	Dewatering		4		HAZCO #DW 1	17.60	7.00
493357	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-05-30	39.00	New Well	Dewatering		2		HAZCO #CW 5	16.70	15.00
493358	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-11	35.00	New Well	Dewatering		2		HAZCO #CW 7	13.50	10.00
493359	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-02	34.00	New Well	Dewatering		2		HAZCO #CW 3	15.70	5.00
493360	NH	17	024	01	5	CORA LYNN DRILLING CO. LTD.	1995-06-05	34.00	New Well	Dewatering		2		HAZCO #CW 6	15.50	1.50

APPENDIX D

Borehole Logs and Well Completion Details

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-1

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 14, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) 500 1000 1500 2000 / Combustible gas content (% Volume) 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples Boart Longyear	ORGANIC SOIL, loose, moist, black		0.00							
		SILTY SAND, some gravel, trace organics, dry, olive brown		0.20	S1	CORE					10/20 Sand
1		SAND and GRAVEL, some cobbles, loose, dry, light grey		1.20	S2	CORE					Hydrated Bentonite Chips
		SAND and GRAVEL, some cobbles, loose, dry, olive brown		1.50	S3	CORE					
2											10/20 Sand
3		--- Wet from 3.0 to 3.8 m			S4	CORE					Feb.28/2011 ▽ Slotted Section
		SAND and GRAVEL, trace silt, trace clay, loose, wet, medium brown		3.80	S5	CORE					
4											Bentonite Chips
		End of MONITORING WELL.		4.50							
5											

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JB

CHECKED: IH

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-10

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 16, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) ⊕ 500 1000 1500 2000 / Combustible gas content (% Volume) □ 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, slightly moist, black		0.00							10/20 Sand
		SANDY SILT, very fine to fine-grained sand, trace fine-grained gravel, trace roots, trace rootlets, loose, slightly moist, medium brown		0.31							
1					S1	CORE		⊕			Hydrated Bentonite Chips
2											
		Fine-grained SAND and fine and coarse-grained GRAVEL, loose, dry, medium brown, creosote-like odour		2.44							10/20 Sand
					S2	CORE		⊕			
3		--- Wet from 3.0 to 4.6 m									Feb.28/2011 ▽
											Slotted Section
4					S3	CORE		⊕			
		End of MONITORING WELL.		4.57							
5											

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-11

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 16, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) 500 1000 1500 2000 / Combustible gas content (% Volume) 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, slightly moist, black		0.00							10/20 Sand
		SILTY SAND, trace gravel, trace rootlets, loose, dry, medium brown		0.31	S1	CORE					Hydrated Bentonite Chips
1		Fine-grained SAND, some fine and coarse-grained gravel, trace rootlets, loose, dry, medium brown		0.91	S2	CORE					10/20 Sand
		SANDY SILT, fine-grained sand, trace fine-grained gravel, trace rootlets, loose, slightly moist, medium brown		1.52	S3	CORE					Hydrated Bentonite Chips
2											10/20 Sand
		Medium-grained SAND and fine and coarse-grained GRAVEL, loose, slightly moist, medium brown, slight creosote-like odour		2.44							Feb.28/2011 ▽
3		--- Wet from 3.0 to 4.6 m			S4	CORE					Slotted Section
4					S5	CORE					Bentonite Chips
		End of MONITORING WELL.		4.57							
5											

DEPTH SCALE
1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

DATA ENTRY: JJB

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-12

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 16, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) 500 1000 1500 2000 / Combustible gas content (% Volume) 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ASPHALT		0.00							
		Fine-grained GRAVELLY SAND, fine and coarse-grained gravel, trace cobbles, trace clay, loose, moist, medium brown, slight chemical odour		0.10	S1	CORE		⊕			10/20 Sand
1		Fine grained SAND and fine and coarse-grained GRAVEL, trace cobbles, loose, dry, light brownish grey, slight chemical odour --- Increased grain size to medium-grained sand and cobble content to some with depth		0.91	S2	CORE		⊕			Hydrated Bentonite Chips
2					S3	CORE		⊕			
3		--- Slightly moist from 3.0 to 4.0 m, medium brown from 3.0 to 4.6 m									10/20 Sand
4		--- Wet from 4.0 to 4.6 m			S4	CORE		⊕			Slotted Section
					S5	CORE		⊕			
		End of MONITORING WELL.		4.57							
5											

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-14

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 17, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) ⊕ 500 1000 1500 2000 / Combustible gas content (% Volume) □ 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, loose, slightly moist, black		0.00							10/20 Sand
		SANDY SILT, fine-grained sand, trace coarse-grained gravel, trace rootlets, loose, slightly moist, medium brown		0.31	S1	CORE		⊕			
1		Fine-grained GRAVELLY SAND, coarse-grained gravel, some cobbles, loose, slightly moist, medium brown		0.91							Hydrated Bentonite Chips
		SANDY SILT, fine-grained sand, some coarse-grained gravel, loose, slightly moist, medium brown		1.22	S2	CORE		⊕			
2		Fine-grained SAND and fine and coarse-grained GRAVEL, some cobbles, loose, slightly moist, medium brown, slight creosote-like odour		1.83							10/20 Sand
3					S3	CORE		⊕			Slotted Section
		Fine-grained SILTY SAND, trace coarse-grained gravel, loose, wet, medium brown, slight creosote-like odour		3.35	S4	CORE			⊕6800		
4		Fine-grained SAND and fine and coarse-grained GRAVEL, some cobbles, loose, wet, medium brown, slight creosote-like odour		3.66	S5	CORE		⊕			Bentonite Chips
		End of MONITORING WELL.		4.57							
5											

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-15

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 17, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) 500 1000 1500 2000 / Combustible gas content (% Volume) 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, slightly moist, black		0.00							10/20 Sand
		Fine-grained SILTY SAND, some coarse-grained gravel, trace rootlets, loose, slightly moist, medium brown		0.31	S1	CORE		⊕			Hydrated Bentonite Chips
1		Fine to medium-grained GRAVELLY SAND, fine to coarse-grained gravel, trace cobbles, loose, slightly moist, medium brown		1.52	S2	CORE		⊕			
		Fine-grained SAND and fine and coarse-grained GRAVEL, trace cobbles, light brownish grey		1.83							10/20 Sand
2											Feb.28/2011 ▽
		--- Slight creosote-like odour from 2.7 to 3.7 m			S3	CORE		⊕			
3		--- Wet, some cobbles from 3.0 to 3.7 m									Slotted Section
					S4	CORE		⊕			
		No recovery		3.66							
4											Bentonite Chips
		End of MONITORING WELL.		4.57							
5											

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-16

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 18, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) 500 1000 1500 2000 / Combustible gas content (% Volume) 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, loose, slightly moist, black		0.00							10/20 Sand
		SANDY SILT, fine-grained sand, trace fine-grained gravel, dense, slightly moist, medium brown		0.31							Hydrated Bentonite Chips
1		--- Loose from 0.9 to 1.5 m			S1	CORE		⊕			10/20 Sand
		Fine-grained SAND and fine and coarse-grained GRAVEL, some cobbles, loose, dry, light brownish grey, slight creosote-like odour		1.52							Hydrated Bentonite Chips
2		Fine and medium-grained SAND, some fine and coarse-grained gravel, loose, slightly moist, medium brown, creosote-like odour		1.83	S2	CORE		⊕			10/20 Sand
		Fine-grained SAND and fine and coarse-grained GRAVEL, some cobbles, loose, slightly moist, light brownish grey, slight creosote-like odour		2.44	S3	CORE		⊕			Feb.28/2011 ▽
3		--- Wet from 3.0 to 3.4 m			S4	CORE			⊕6600		Slotted Section
		No recovery		3.35							
4		End of MONITORING WELL.		4.57							Bentonite Chips
5											

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-18

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 18, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) 500 1000 1500 2000 / Combustible gas content (% Volume) 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, loose, dry, black		0.00							10/20 Sand
		SANDY SILT, fine-grained sand, trace fine-grained gravel, loose (some 10 cm thick dense layers), dry, medium brown		0.31	S1	CORE					Hydrated Bentonite Chips
1											
		Fine to medium-grained SAND and fine to coarse-grained GRAVEL, loose, medium brown, slight creosote-ike odour		1.22							10/20 Sand
		--- Slightly moist from 1.5 to 3.0 m									Hydrated Bentonite Chips
2					S2	CORE					10/20 Sand
					S3	CORE					
3		--- Wet from 3.0 to 4.6 m									Feb.28/2011 ▽ Slotted Section
4					S4	CORE					Bentonite Chips
		End of MONITORING WELL.		4.57							
5											

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

DATA ENTRY: JJB

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-2

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 14, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) / Combustible gas content (% Volume)	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Finished with Valve
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, loose, dry, black		0.00							Top
		SILTY SAND, some organics, trace gravel, loose, dry, medium brown		0.30	S1	CORE					10/20 Sand
1		SAND and GRAVEL, some cobbles, loose, dry, light grey		0.80	S2	CORE					Hydrated Bentonite Chips
2		SILTY SAND, some gravel, loose, moist, medium brown		1.60	S3	CORE					10/20 Sand
		SAND and GRAVEL, some cobbles, loose, dry, light grey		2.50	S4	CORE					Feb.28/2011 ▽
3		--- Moist from 3.3 to 4.0 m, olive brown from 3.3 to 4.5 m			S5	CORE					Slotted Section
4		--- Wet, slight chemical odour from 4.0 to 4.5 m			S6	CORE					
		End of MONITORING WELL.		4.60							
5											

Combustible gas content (ppm): 500, 1000, 1500, 2000 ⊕
Combustible gas content (% Volume): 0.2, 0.4, 0.6, 0.8 □
HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}
WATER CONTENT PERCENT: Wp — W — Wl; 10, 20, 30, 40

DEPTH SCALE
1 : 25

Golder Associates

LOGGED: JMB
CHECKED: IH

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-20

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 17, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) 500 1000 1500 2000 / Combustible gas content (% Volume) 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, loose, slightly moist, black		0.00							10/20 Sand
		Very fine and fine-grained SILTY SAND, loose, dry, medium brown --- Trace gravel, trace roots from 0.3 to 0.9 m		0.31	S1	CORE		⊕			
1		--- Trace cobbles, light brown from 0.9 to 1.5 m									Hydrated Bentonite Chips
		--- Some gravel, slightly moist, medium brown from 1.5 to 2.7 m									
2					S2	CORE		⊕			10/20 Sand
		Fine and medium-grained SAND and fine and coarse-grained GRAVEL, loose, slightly moist, medium brown --- Some cobbles from 2.7 to 4.0 m		2.74							Feb.28/2011 ▽
3		--- Wet, slight creosote-like odour from 3.0 to 4.6 m			S3	CORE		⊕9050			Slotted Section
4		--- Dark brown from 4.0 to 4.6 m			S4	CORE		⊕			Bentonite Chips
		End of MONITORING WELL.		4.57							
5											

DEPTH SCALE
1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-22

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 17, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) ⊕ 500 1000 1500 2000 / Combustible gas content (% Volume) □ 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, loose, slightly moist, black		0.00							10/20 Sand
		Very fine and fine-grained SILTY SAND, loose, slightly moist, medium brown --- Trace rootlets, trace gravel from 0.3 to 0.9 m		0.31	S1	CORE		⊕			
1		--- Some cobbles, light brown from 0.9 to 1.2 m --- Some gravel from 1.2 to 2.7 m									Hydrated Bentonite Chips
2					S2	CORE		⊕			10/20 Sand
		Fine to medium-grained SAND and fine to coarse-grained GRAVEL, some cobbles, loose, moist, medium brown		2.74	S3	CORE		⊕			Feb.28/2011 ▽
3		Very fine and fine-grained SILTY SAND, dense, wet, medium brown		3.05	S4	CORE		⊕			Slotted Section
		Fine to medium-grained SAND and fine to coarse-grained GRAVEL, some cobbles, loose, wet, medium brown		3.35	S5	CORE		⊕			
		Fine and medium-grained SAND, compact, wet, dark grey		3.66	S6	CORE		⊕			
4		Fine to medium-grained SAND and fine to coarse-grained GRAVEL, some cobbles, loose, wet, medium brown		3.96	S7	CORE		⊕			Bentonite Chips
		End of MONITORING WELL.		4.57							
5											

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

DATA ENTRY: JJB

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-3A

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: February 14, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) 500 1000 1500 2000 / Combustible gas content (% Volume) 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, loose, moist, black		0.00							10/20 Sand
		SANDY SILT, trace gravel, trace organics, loose, dry, medium brown		0.30	S1	CORE		⊕			
1		SAND and GRAVEL, some cobbles, loose, dry, light brown to grey		0.90	S2	CORE		⊕			
		SANDY SILT, soft, moist, medium olive brown		1.50	S3	CORE		⊕			
2		SAND and GRAVEL and COBBLES, loose, compact, dry, light brown		2.10	S4	CORE		⊕			Feb.28/2011 ▽ Hydrated Bentonite Chips
3		--- Moist from 3.6 to 4.2 m									
4		--- Wet from 4.2 to 6.5 m			S5	CORE		⊕			
					S6	CORE					
5		*CONTINUED NEXT PAGE*									

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JB

CHECKED: IH

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-3A

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: February 14, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) ⊕ 500 1000 1500 2000 / Combustible gas content (% Volume) □ 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
5	6" Mini Sonic Core Samples Boart Longyear	SAND and GRAVEL and COBBLES, loose, compact, dry, light brown *(continued)*			S6	CORE		⊕			Hydrated Bentonite Chips
6											10/20 Sand
		SILTSTONE (BEDROCK), dry grey		6.50							Slotted Section
7					S7	CORE		⊕			Bentonite Chips
		End of MONITORING WELL.		7.50							
8											
9											
10											

DEPTH SCALE
1 : 25

Golder Associates

LOGGED: JB

CHECKED: IH

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-3B

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 17, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface											Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, loose, moist, black		0.00									10/20 Sand
		SANDY SILT, fine-grained sand, trace coarse-grained gravel, trace rootlets, loose, dry, medium brown											Hydrated Bentonite Chips
1		Fine-grained SAND and fine and coarse-grained GRAVEL, some cobbles, loose, dry, light brownish grey		0.91									10/20 Sand
		SANDY SILT, fine-grained sand, trace coarse-grained gravel, loose, slightly moist, medium brown		1.52									Hydrated Bentonite Chips
		Fine-grained SAND and fine and coarse-grained GRAVEL and COBBLES, loose, dry, medium brown		1.68									10/20 Sand
2													Hydrated Bentonite Chips
													Feb.28/2011 10/20 Sand
		--- Slightly moist from 2.7 to 3.0 m											
3		--- Wet from 3.0 to 4.6 m											
													Slotted Section
4													
													Bentonite Chips
		End of MONITORING WELL.		4.57									
5													

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-5

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 16, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) 500 1000 1500 2000 / Combustible gas content (% Volume) 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, loose, slightly moist, black		0.00							10/20 Sand
		Fine-grained SAND and fine and coarse-grained GRAVEL, trace cobbles increasing in proportion with depth, loose, slightly moist, medium brown		0.31	S1	CORE					Hydrated Bentonite Chips
1											10/20 Sand
		No recovery		1.52							Hydrated Bentonite Chips
2											10/20 Sand
3		Fine and medium-grained SAND, loose, wet, medium brown, slight creosote odour		3.05	S2	CORE					Slotted Section
		Fine-grained SAND and fine and coarse-grained GRAVEL, trace cobbles increasing in proportion with depth, loose, wet, medium brown, slight creosote odour		3.35							Feb.28/2011 ▽
4					S3	CORE					Bentonite Chips
		End of MONITORING WELL.		4.57							
5											

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-6

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 15, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) 500 1000 1500 2000 / Combustible gas content (% Volume) 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, loose, dark brown		0.00							10/20 Sand
		SANDY SILT, trace fine-grained gravel, trace rootlets, loose, slightly moist		0.30	S1	CORE					
1		SAND and GRAVEL, some cobbles, loose, dry, light brown		0.90							Hydrated Bentonite Chips
2		SANDY SILT, fine-grained sand, trace rootlets, loose, slightly moist, medium brown		2.00	S2	CORE					10/20 Sand
3		--- Moist from 3.0 to 3.5 m			S3	CORE					Hydrated Bentonite Chips 10/20 Sand Feb.28/2011
		Medium to coarse-grained SAND and fine to coarse-grained GRAVEL, trace cobbles, moist		3.50							Slotted Section
4		--- Creosote-like odour and sheen from 4.0 to 4.5 m			S4	CORE					
		End of MONITORING WELL.		4.57							
5											

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JB and NB

CHECKED: IH

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-7A

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: February 15, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) 500 1000 1500 2000 / Combustible gas content (% Volume) 0.2 0.4 0.6 0.8	HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3} / WATER CONTENT PERCENT Wp W Wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Slip Cap Flush Mount Road Box
0	6" Mini Sonic Core Samples Boart Longyear	ORGANIC SOIL, rootlets, loose, moist, black		0.00							10/20 Sand
		SANDY SILT, very fine-grained sand, trace fine to coarse-grained gravel, trace rootlets, loose, moist, medium brown		0.31	S1	CORE		⊕			
1		Fine to medium-grained SAND and fine to coarse-grained GRAVEL, trace cobbles, loose, moist, medium brown		1.22							
2					S2	CORE		⊕			
		SANDY fine and coarse-grained GRAVEL, fine-grained sand, trace cobbles, loose, dry, light brownish grey		2.59							Hydrated Bentonite Chips Feb.28/2011 ▽
3		--- Moist from 3.0 to 3.658 m			S3	CORE		⊕			
		SILTSTONE (BEDROCK), dry, grey, creosote-like odour		3.66							
4		--- Weathered from 3.7 to 4.0 m			S4	CORE		⊕			
					S5	CORE					
5		*CONTINUED NEXT PAGE*									

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JB and NB

CHECKED: IH

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-7A

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: February 15, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) / Combustible gas content (% Volume)	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
								⊕ 500 1000 1500 2000 / □ 0.2 0.4 0.6 0.8	10^{-6} 10^{-5} 10^{-4} 10^{-3} / Wp W Wl 10 20 30 40		
5	6" Mini Sonic Core Samples, Boart Longyear	SILTSTONE (BEDROCK), dry, grey, creosote-like odour *(continued)*			S5 CORE			⊕			Hydrated Bentonite Chips
6		--- Slightly moist from 6.1 to 7.6 m									10/20 Sand
7					S6 CORE			⊕			Slotted Section
		End of MONITORING WELL.		7.62							Bentonite Chips
8											
9											
10											

DEPTH SCALE
1 : 25

Golder Associates

LOGGED: JB and NB

CHECKED: IH

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-7B

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 15, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3})	WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface											Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, loose, moist, black		0.00									10/20 Sand
		SANDY SILT, very fine-grained sand, trace fine and coarse-grained gravel, trace rootlets, slightly moist, medium brown		0.31									Hydrated Bentonite Chips
1													10/20 Sand
		Medium-grained SAND and fine and coarse-grained GRAVEL, slightly moist, medium brown		1.83									Hydrated Bentonite Chips
2													10/20 Sand
		SANDY fine and coarse-grained GRAVEL, fine-grained sand, trace cobbles, dry, light brownish grey, creosote odour		2.44									Feb.28/2011 Hydrated Bentonite Chips
3													10/20 Sand
		SILTY CLAY, firm, grey, creosote-like odour, sheen		3.35									
4		SILTSTONE (BEDROCK), slightly moist, dark grey, creosote-like odour		3.96									Slotted Section
		End of MONITORING WELL.		4.88									
5													

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JB and NB

CHECKED: IH

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-9A

SHEET 1 OF 2

LOCATION: See Location Plan

BORING DATE: February 18, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) / Combustible gas content (% Volume)	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface						500 1000 1500 2000 / 0.2 0.4 0.6 0.8	10^{-6} 10^{-5} 10^{-4} 10^{-3} / Wp W Wl 10 20 30 40		Flush Mount Road Box
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, rootlets, trace roots, loose, slightly moist, black		0.00							Slip Cap
		Fine and very fine-grained SILTY SAND, trace coarse-grained gravel, loose, dry, medium brown		0.31							10/20 Sand
1					S1	CORE		⊕			
2											Hydrated Bentonite Chips
		Fine to medium-grained SAND and fine to coarse-grained GRAVEL, loose, slightly moist, medium brown		2.74	S2	CORE		⊕			
3											Feb.28/2011 ▽
		Medium-grained SAND, trace fine-grained gravel, loose, wet, medium brown		3.05	S3	CORE		⊕			
4		Fine-grained SAND and fine to coarse-grained GRAVEL, loose, wet, medium brown		3.96	S4	CORE		⊕			10/20 Sand
5		*CONTINUED NEXT PAGE*									

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-9A

SHEET 2 OF 2

LOCATION: See Location Plan

BORING DATE: February 18, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) ⊕ / Combustible gas content (% Volume) □	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
5	6" Mini Sonic Core Samples, Boart Longyear	Fine-grained SAND and fine to coarse-grained GRAVEL, loose, wet, medium brown *(continued)*									
		CLAYEY SILT, some fine-grained sand, trace to some fine to coarse-grained gravel, trace cobbles, dense, wet, medium grey		5.49	S5	CORE		⊕			10/20 Sand
6											
					S6	CORE		⊕			Slotted Section
7											
		End of MONITORING WELL.		7.62							
8											
9											
10											

Combustible gas content (ppm): 500, 1000, 1500, 2000

Combustible gas content (% Volume): 0.2, 0.4, 0.6, 0.8

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl; 10, 20, 30, 40

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: NB

CHECKED: IH

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

DATA ENTRY: JJB

PROJECT No.: 10-1346-0046

RECORD OF MONITORING WELL: MW10-9B

SHEET 1 OF 1

LOCATION: See Location Plan

BORING DATE: February 15, 2011

DATUM: Local

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	Combustible gas content (ppm) / Combustible gas content (% Volume)	HYDRAULIC CONDUCTIVITY, k, cm/s / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface									Flush Mount
0	6" Mini Sonic Core Samples, Boart Longyear	ORGANIC SOIL, wood chips, rootlets, trace roots, loose, slightly moist, black		0.00							
		Very fine and fine-grained SILTY SAND, trace coarse-grained gravel, loose, slightly moist, medium brown		0.61							Hydrated Bentonite Chips
1					S1	CORE		⊕			10/20 Sand
2											Hydrated Bentonite Chips
											10/20 Sand
											Hydrated Bentonite Chips
3		Fine-grained SAND and fine and coarse-grained GRAVEL, loose, wet, medium brown		3.05							Feb.28/2011 ▽ 10/20 Sand
4		SILT, some fine-grained gravel, dense, slightly moist, dark grey		3.96							Slotted Section
		End of MONITORING WELL.		4.88							
5											

Combustible gas content (ppm): 500, 1000, 1500, 2000 ⊕

Combustible gas content (% Volume): 0.2, 0.4, 0.6, 0.8 □

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}

WATER CONTENT PERCENT: Wp — W — Wl; 10, 20, 30, 40

DEPTH SCALE

1 : 25

Golder Associates

LOGGED: JB and NB

CHECKED: IH

BOREHOLE - EXPANDED ADD. LAB TESTING 10-1346-0046.GPJ CALGARY.GDT 08/30/11

APPENDIX E

Additional Soil Vapour Data

Sample Location ID		MW10-1				MW10-2	MW10-3B			MW10-5		MW10-6			MW10-7B		MW10-9B		MW10-10	MW10-11		MW10-12	MW10-14	MW10-15			MW10-16		MW10-18		MW10-20	MW10-22		
LAB ID		R103247-01	R103247-02		AUC0212-03	R103247-03	R103247-04	R103247-05	R103247-06	R103247-07	R103247-08	R103247-09		AUC0212-04	R103247-10	R103247-11	R103247-12	R103247-13	R103247-14	R103247-15	R103247-16	R103247-17	R103247-18	R103247-19		AUC0212-02	R103247-20	R103247-21	R103247-22	R103247-23	R103247-24	R103247-25		AUC0212-01
SAMPLE METHOD		Well	Deep probe		Well	Well	Shallow probe	Deep probe	Well	Well	Deep probe	Deep probe		Well	Deep probe	Shallow probe	Well	Shallow probe	Well	Deep probe	Well	Well	Well	Well		Well	Deep probe	Well	Well	Deep probe	Well	Well		Well
SAMPLE DEPTH (mbgs)		2.7-3.3	2.4-2.55		2.7-3.3	2.5-3.1	0.81-1.37	1.68-2.13	2.74-3.00	2.13-3.9	1.07-1.52	1.65-2.44		1.65-2.44	1.96-2.74	1.22-1.68		1.37-1.83	2.74-3.3	1.22-1.52	2.13-3.1	3.05-4.57	2.13-4.27	2.13-2.85		2.13-2.85	1.22-1.52	2.13-3.3	2.13-3.2	1.07-1.52	2.13-3.0	2.13-3.3		2.13-3.3
DATE SAMPLED		09-Mar-11	09-Mar-11		09-Mar-11	09-Mar-11	09-Mar-11	09-Mar-11	09-Mar-11	11-Mar-11	11-Mar-11	10-Mar-11		10-Mar-11	10-Mar-11	10-Mar-11	11-Mar-11	11-Mar-11	08-Mar-11	08-Mar-11	08-Mar-11	11-Mar-11	09-Mar-11	09-Mar-11		09-Mar-11	10-Mar-11	10-Mar-11	10-Mar-11	10-Mar-11	11-Mar-11	09-Mar-11		09-Mar-11
LABORATORY	CARO	CARO	CARO	Test America	Test America	CARO	CARO	CARO	CARO	CARO	CARO	CARO	Test America	Test America	CARO	CARO	CARO	CARO	CARO	CARO	CARO	CARO	CARO	CARO	Test America	Test America	CARO	CARO	CARO	CARO	CARO	CARO	Test America	Test America
MATRIX	RDL	Air	Air	MDL	Air	Air	Air	Air	Air	Air	Air	Air	MDL	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	MDL	Air	Air	Air	Air	Air	Air	Air	MDL	Air
Hydrocarbons																																		
nC6-nC8 (total)	150	470	710	-	-	220	390	570	750	1700	1400	550	-	-	710	470	2300	430	370	390	550	200	600	520	-	-	290	440	230	230	370	680	-	-
nC6-nC8 (aromatic)	3.1	24	96	-	-	4.3	24	84	69	360	280	81	-	-	140	81	610	66	16	32	44	3.7	100	49	-	-	14	47	<3.3	5.7	57	110	-	-
nC6-nC8 (aliphatic)	150	470	610	-	-	210	360	510	650	1300	1100	480	-	-	580	370	1700	360	350	360	500	200	500	490	-	-	280	410	230	230	320	550	-	-
nC8-nC10 (total)	150	700	670	-	-	490	1100	980	1400	790	460	2200	-	-	840	540	1300	330	370	680	600	200	1100	1200	-	-	740	2100	290	870	640	880	-	-
nC8-nC10 (aromatic)	15	<17	22	-	-	<15	91	67	78	66	85	320	-	-	140	150	290	22	34	<24	<23	<17	90	33	-	-	19	210	<16	130	50	29	-	-
nC8-nC10 (aliphatic)	150	700	670	-	-	490	1000	910	1300	730	390	1800	-	-	710	410	1000	310	350	680	550	200	1000	1200	-	-	740	1900	280	770	600	850	-	-
nC6-nC10 (F1)	310	1200	1400	-	-	710	1500	1600	2200	2500	1900	2700	-	-	1600	1000	3700	760	740	1100	1100	400	1700	1800	-	-	1000	2500	520	1100	1000	1600	-	-
nC10-nC12 (total)	150	570	710	-	-	370	2500	3000	2200	1200	1100	4500	-	-	650	240	470	300	<230	290	370	<170	1300	1600	-	-	580	680	200	200	270	780	-	-
nC10-nC12 (aromatic)	15	<17	<16	-	-	<15	<16	<17	<16	<17	<16	180	-	-	45	<17	<17	<16	<23	<24	<23	<17	<17	<16	-	-	<16	<17	<16	<17	<17	<16	-	-
nC10-nC12 (aliphatic)	150	570	710	-	-	370	2500	3000	2200	1200	1100	4200	-	-	580	220	470	280	<230	270	340	<170	1300	1600	-	-	580	680	190	200	260	780	-	-
nC12-nC16 (total)	150	270	740	-	-	220	1700	2200	880	2400	2800	3500	-	-	650	300	270	300	230	290	920	200	660	560	-	-	550	410	160	170	270	360	-	-
nC12-nC16 (aromatic)	15	<17	<16	-	-	<15	<16	<17	<16	<17	<16	<16	-	-	<16	<17	<17	<16	<23	<24	<23	<17	<17	<16	-	-	<16	<17	<16	<17	<17	<16	-	-
nC12-nC16 (aliphatic)	150	260	740	-	-	230	1700	2200	880	2400	2800	3500	-	-	650	310	280	290	250	300	920	190	660	560	-	-	550	410	170	180	270	360	-	-
nC10-nC16 (total) (F2)	310	840	1400	-	-	580	4200	5100	3000	3600	3900	8100	-	-	1300	540	740	590	<470	580	1300	<330	2000	2200	-	-	1100	1100	360	370	540	1200	-	-
VHv (6-13)	310	970	1300	-	-	650	2800	2900	2500	2900	2700	4500	-	-	1400	780	2300	660	600	770	1100	360	1700	1900	-	-	870	1400	420	600	670	1300	-	-
VPHv	310	940	1200	-	-	610	2700	2700	2400	2500	2400	4200	-	-	1100	580	1400	560	560	720	1100	330	1600	1800	-	-	840	1200	420	470	570	1100	-	-
Volatile Organic Compounds																																		
1,1,1,2-Tetrachloroethane	0.15	<0.17	<0.16	-	-	<0.15	<0.16	<0.17	<0.16	<0.17	<0.16	<0.16	-	-	<0.16	<0.17	<0.17	<0.16	<0.23	<0.24	<0.23	<0.17	<0.17	<0.16	-	-	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	-	-
1,1,1-Trichloroethane	0.31	<0.34	<0.32	0.46	ND	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	0.459	ND	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	0.419	ND	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	0.456	ND
1,1,2,2-Tetrachloroethane	0.15	<0.17	<0.16	0.585	ND	<0.15	<0.16	<0.17	<0.16	<0.17	<0.16	<0.16	0.583	ND	<0.16	<0.17	<0.17	<0.16	<0.23	<0.24	<0.23	<0.17	<0.17	<0.16	0.532	ND	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	0.58	ND
1,1,2-Trichloroethane	0.15	<0.17	<0.16	0.46	ND	<0.15	<0.16	<0.17	<0.16	<0.17	<0.16	<0.16	0.459	ND	<0.16	<0.17	<0.17	<0.16	<0.23	<0.24	<0.23	<0.17	<0.17	<0.16	0.419	ND	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	0.456	ND
1,1,2-Trichlorotrifluoroethane	-	-	-	0.653	ND	-	-	-	-	-	-	-	0.651	ND	-	-	-	-	-	-	-	-	-	-	0.594	0.684	-	-	-	-	-	-	0.647	ND
1,1-Dichloroethane	0.31	<0.34	<0.32	0.345	ND	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	0.344	ND	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	0.314	ND	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	0.342	ND
1,1-Dichloroethene	0.092	<0.1	<0.096	0.402	ND	<0.092	<0.097	<0.1	<0.098	<0.099	<0.099	<0.097	0.401	ND	<0.097	<0.1	<0.1	<0.099	<0.14	<0.15	<0.14	<0.1	<0.1	<0.098	0.366	ND	<0.097	<0.1	<0.098	<0.1	<0.1	<0.098	0.399	ND
1,2,3-Trichloropropane	0.31	<0.34	<0.32	-	-	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	-	-	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	-	-
1,2,3-Trimethylbenzene	3.1	<3.4	<3.2	0.818	1.29	<3.1	4.9	<3.4	<3.3	<3.3	<3.3	68	0.816	35.8	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	0.744	3.2	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	0.811	1.38
1,2,4,5-Tetramethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	9.7	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1,2,4-Trichlorobenzene	0.31	0.8	<0.32	0.611	ND	0.61	<0.32	<0.34	<0.33	0.86	<0.33	<0.32	0.609	ND	<0.32	<0.34	0.64	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	0.556	ND	<0.32	<0.34	<0.33	<0.34	0.77	<0.33	0.605	ND
1,2,4-Triethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1,2,4-Trimethylbenzene	0.61	<0.67	1.2	0.419	4.11	0.77	11	7.4	5.2	6.9	6.9	61	0.418	39	3.6	1.8	2.6	<0.66	<0.93	2.6	<0.92	<0.66	6	2.3	0.381	9.74	<0.64	1.5	<0.65	<0.67	1.5	2.7	0.415	5.71
1,2-Dibromo-3-chloropropane	0.31	<0.34	<0.32	-	-	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	-	-	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	-	-
1,2-Dibromoethane	0.31	<0.34	<0.32	-	-	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	-	-	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	-	-
1,2-Dibromoethane (EDB)	-	-	-	0.655	ND	-	-	-	-	-	-	-	0.653	ND	-	-	-	-	-	-	-	-	-	-	0.596	ND	-	-	-	-	-	-	0.649	ND
1,2-Dichloro-1,1,2,2-tetrafluoroethane	-	-	-	0.59	ND	-	-	-	-	-	-	-	0.588	ND	-	-	-	-	-	-	-	-	-	-	0.537	ND	-	-	-	-	-	-	0.585	ND
1,2-Dichlorobenzene	0.31	<0.34	<0.32	0.507	ND	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	0.506	ND	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	0.462	ND	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	0.503	ND
1,2-Dichloroethane	0.092	<0.1	<0.096	0.345	ND	<0.092	<0.097	<0.1	<0.098	<0.099	<0.099	<0.097	0.344	ND	<0.097	<0.1	<0.1	<0.099	<0.14	<0.15	<0.14	<0.1	<0.1	<0.098	0.314	ND	<0.097	<0.1	<0.098	<0.1	<0.1	<0.098	0.342	ND
1,2-Dichloropropane	0.15	<0.17	<0.16	0.394	ND	<0.15	<0.16	<0.17	<0.16	<0.17	<0.16	<0.16	0.393	ND	<0.16	<0.17	<0.17	<0.16	<0.23	<0.24	<0.23	<0.17	<0.17	<0.16	0.358	ND	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	0.39	ND
1,2-Diethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1,2-Dimethyl-3-Ethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1,2-Dimethyl-4-Ethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	20	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1,3,5-Triethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1,3,5-Trimethylbenzene	0.61	<0.67	1.1	0.419	1.5	<0.61	4.9	3.4	2.4	2.4	1.7	61	0.418	89.2	1.2	<0.68	0.85	<0.66	<0.93	<0.97	<0.92	<0.66	3.1	1.1	0.381	3.54	<0.64	<0.68	<0.65	<0.67	<0.67	1.1	0.415	2.09
1,3-Butadiene	-	-	-	0.165	30.7	-	-	-	-	-	-	-	0.165	4.35	-	-	-	-	-	-	-	-	-	-	0.15	5.79	-	-	-	-	-	-	0.164	1.56
1,3-Dichlorobenzene	0.31	<0.34	<0.32	0.507	ND	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	0.506	ND	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	0.462	ND	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	0.503	ND
1,3-Dichloropropane	0.31	<0.34	<0.32	-	-	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	-	-	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	-	-
1,3-Dichloropropene (cis+trans)	0.31	<0.34	<0.32	-	-	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	-	-	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	-	-
1,3-Diethylbenzene	-	-	-	0.905	ND	-	-	-	-	-	-	-	0.902	14	-	-	-	-	-	-	-	-	-	-	0.823	1.07	-	-	-	-	-	-	0.896	ND
1,3-Dimethyl-2-Ethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1,3-Dimethyl-5-Ethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	5.8	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1,4-Dichlorobenzene	0.31	<0.34	<0.32	0.512	ND	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	0.511	ND	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	0.466	ND	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	0.508	ND
1,4-Diethylbenzene	-	-	-	0.896	ND	-	-	-	-	-	-	-	0.893	ND	-	-	-	-	-	-	-	-	-	-	0.815	ND	-	-	-	-	-	-	0.888	ND
1,4-Dimethyl-2-Ethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	6.1	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1,4-Dioxane	-	-	-	0.442	ND	-	-	-	-	-	-	-	0.441	ND	-	-	-	-	-	-	-	-	-	-	0.402	ND	-	-	-	-	-	-	0.438	ND
1-Butene/Isobutene	-	-	-	31.3	598	-	-	-	-	-	-	-	0.677	178	-	-	-	-	-	-	-	-	-	-	0.965	142	-	-	-	-	-	-	0.21	58.1
1-Decene	-	-	-	0.902	ND	-	-	-	-	-	-	-	0.899	ND	-	-	-	-	-	-	-	-	-	-	0.82	ND	-	-	-	-	-	-	0.893	ND
1-Heptene	-	-	-	0.631	48.5	-	-	-	-	-	-	-	0.629	28.5	-	-	-	-	-	-	-	-	-	-	0.574	19.8	-	-	-	-	-	-	0.625	9.43
1-Hexene	-	-	-	0.532	132	-	-	-	-	-	-	-	0.53	ND	-	-	-	-	-	-	-	-	-	-	0.484	30.5	-	-	-	-	-	-	0.527	5.22
1-methyl-2-ethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	5.5	4	3.9	3.6	3.3	20	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	4	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1-Methyl-2-Isopropylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1-Methyl-2-n-Propylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	3.5	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1-methyl-3-ethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	11	7.4	5.6	5.9	5.6	39	-	-	3.9	<3.4	4.1	<3.3	<4.7	<4.8	<4.6	<3.3	7.6	3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	3.3	-	-
1-Methyl-3-Isopropylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1-Methyl-3-n-Propylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	8.4	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1-methyl-4-ethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	6.2	4.4	3.6	4	3.9	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	5	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1-Methyl-4-Isopropylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1-Methyl-4-n-Propylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
1-Methylcyclohexene	-	-	-	0.345	ND	-	-	-	-	-	-	-	0.344	1.28	-	-	-	-	-	-	-	-	-	-	0.314	ND	-	-	-	-	-	-	0.342	ND
1-Methylcyclopentene	-	-	-	0.292	3.82	-	-	-	-	-	-	-	0.291	0.706	-	-	-	-	-	-	-	-	-	-	0.265	0.669	-	-	-	-	-	-	0.289	0.426
1-Nonene	-	-	-	0.811	3.23	-	-	-	-	-	-	-	0.809	23.2	-	-	-	-	-	-	-	-	-	-	0.738	7.16	-	-	-	-	-	-	0.804	3.06
1-Octene	-	-	-	0.203	5.2	-	-	-	-	-	-	-	0.202	6.31	-	-	-	-	-	-	-	-	-	-	0.184	3.38	-	-	-	-	-	-	0.201	2.06
1-Pentene	-	-	-	1.23	395	-	-	-	-	-	-	-	0.22	50.2	-	-	-	-	-	-	-	-	-	-	0.201	57	-	-	-	-	-	-	0.219	16.4
1-Undecene	-	-	-	0.515	5.84	-	-	-	-	-	-	-	0.514	ND	-	-	-	-	-	-	-	-	-	-	0.469	ND	-	-	-	-	-	-	0.511	ND
2 & 3-Chlorotoluene	-	-	-	0.886	ND	-	-	-	-	-	-	-	0.884	ND	-	-	-	-	-	-	-	-	-	-	0.807	ND	-	-	-	-	-	-	0.879	ND
2,2,3-Trimethylpentane	-	-	-	0.394	6.86	-	-	-	-	-	-	-	0.393	4.58	-	-	-	-	-	-	-	-	-	-	0.359	1.43	-	-	-	-	-	-	0.391	0.701
2,2,4-Trimethylpentane	-	-	-	0.398	6.18	-	-	-	-	-	-	-	0.397	2.73	-	-	-	-	-	-	-	-	-	-	0.362	1.79	-	-	-	-	-	-	0.394	2.22
2,2,5-Trimethylhexane	-	-	-	0.46	19.6	-	-	-	-	-	-	-	0.459	9.62	-	-	-	-	-	-	-	-	-	-	0.419	3.24	-	-	-	-	-	-	0.456	0.624
2,2-Dimethylbutane	-	-	-	0.281	8.66	-	-	-	-	-	-	-	0.281	2.58	-	-	-	-	-	-	-	-	-	-	0.256	1.05	-	-	-	-	-	-	0.279	0.493
2,3,4-Trimethylpentane	-	-	-	0.275	22.2	-	-	-	-	-	-	-	0.274	11.1	-	-	-	-	-	-	-	-	-	-	0.25	3.69	-	-	-	-	-	-	0.272	1.79
2,3-Dimethylbutane	-	-	-	0.208	19.9	-	-	-	-	-	-	-	0.208	5.73	-	-	-	-	-	-	-	-	-	-	0.189	2.55	-	-	-	-	-	-	0.206	1.46
2,3-Dimethylpentane	-	-	-	0.353	24.5	-	-	-	-	-	-	-	0.352	11.9	-	-	-	-	-	-	-	-	-	-	0.321	5.2	-	-	-	-	-	-	0.349	3.54
2,4,4-Trimethyl-1-pentene	-	-	-	0.387	0.516	-	-	-	-	-	-	-	0.386	ND	-	-	-	-	-	-	-	-	-	-	0.352	ND	-	-	-	-	-	-	0.384	ND
2,4,4-Trimethyl-2-pentene	-	-	-	0.402	ND	-	-	-	-	-	-	-	0.401	ND	-	-	-	-	-	-	-	-	-	-	0.366	ND	-	-	-	-	-	-	0.399	ND
2,4-Dimethylpentane	-	-	-	0.349	9.26	-	-	-	-	-	-	-	0.348	4.24	-	-	-	-	-	-	-	-	-	-	0.318	1.74	-	-	-	-	-	-	0.346	0.884
2,5-Dimethylhexane	-	-	-	0.394	6.31	-	-	-	-	-	-	-	0.393	3.39	-	-	-	-	-	-	-	-	-	-	0.359	1.61	-	-	-	-	-	-	0.391	0.632
2-Chlorotoluene	0.61	<0.67	<0.64	-	-	<0.61	<0.65	<0.67	<0.65	<0.66	<0.66	<0.64	-	-	<0.65	<0.68	<0.68	<0.66	<0.93	<0.97	<0.92	<0.66	<0.66	<0.65	-	-	<0.64	<0.68	<0.65	<0.67	<0.67	<0.65	-	-
2-Ethyl-1-butene	-	-	-	0.291	27.9	-	-	-	-	-	-	-	0.29	2.33	-	-	-	-	-	-	-	-	-	-	0.264	4.87	-	-	-	-	-	-	0.288	1.23
2-Ethyltoluene	-	-	-	0.419	0.88	-	-	-	-	-	-	-	0.418	34.5	-	-	-	-	-	-	-	-	-	-	0.381	2.42	-	-	-	-	-	-	0.415	1.15
2-Hexanone	-	-	-	0.238	ND	-	-	-	-	-	-	-	0.237	ND	-	-	-	-	-	-	-	-	-	-	0.216	ND	-	-	-	-	-	-	0.236	ND
2-Methyl-1-pentene	-	-	-	0.253	94.8	-	-	-	-	-	-	-	0.252	9.53	-	-	-	-	-	-	-	-	-	-	0.23	15.7	-	-	-	-	-	-	0.25	3.46
2-Methyl-2-butene	-	-	-	0.193	38.5	-	-	-	-	-	-	-	0.192	3.75	-	-	-	-	-	-	-	-	-	-	0.175	6.82	-	-	-	-	-	-	0.191	2.31
2-Methyl-2-pentene	-	-	-	0.285	7.37	-	-	-	-	-	-	-	0.284	0.457	-	-	-	-	-	-	-	-	-	-	0.259	1.41	-	-	-	-	-	-	0.282	0.703
2-Methylbutylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
2-Methylheptane	-	-	-	0.398	26.4	-	-	-	-	-	-	-	0.397	1.77	-	-	-	-	-	-	-	-	-	-	0.362	11.2	-	-	-	-	-	-	0.394	0.832
3-Ethyltoluene	-	-	-	0.419	2.36	-	-	-	-	-	-	-	0.418	26.7	-	-	-	-	-	-	-	-	-	-	0.381	9.75	-	-	-	-	-	-	0.415	4.42
3-Methyl-1-butene	-	-	-	0.207	113	-	-	-	-	-	-	-	0.207	13.7	-	-	-	-	-	-	-	-	-	-	0.189	12	-	-	-	-	-	-	0.206	3.78
3-Methylheptane	-	-	-	0.77	32.9	-	-	-	-	-	-	-	0.768	2.16	-	-	-	-	-	-	-	-	-	-	0.7	8.94	-	-	-	-	-	-	0.763	0.776
3-Methylhexane	-	-	-	0.294	73	-	-	-	-	-	-	-	0.294	21.8	-	-	-	-	-	-	-	-	-	-	0.268	16.8	-	-	-	-	-	-	0.292	6.64
3-Methylpentane	-	-	-	0.258	101	-	-	-	-	-	-	-	0.257	20.3	-	-	-	-	-	-	-	-	-	-	0.235	15.2	-	-	-	-	-	-	0.256	4.76
4-Chlorotoluene	-	-	-	0.805	ND	-	-	-	-	-	-	-	0.803	ND	-	-	-	-	-	-	-	-	-	-	0.733	ND	-	-	-	-	-	-	0.798	ND
4-Ethyltoluene	-	-	-	0.415	1.05	-	-	-	-	-	-	-	0.414	16.5	-	-	-	-	-	-	-	-	-	-	0.377	2.22	-	-	-	-	-	-	0.411	1.84
4-Isopropyltoluene	-	-	-	0.897	1.9	-	-	-	-	-	-	-	0.894	63.6	-	-	-	-	-	-	-	-	-	-	0.816	3.56	-	-	-	-	-	-	0.889	4.54
4-Methyl-1-pentene	-	-	-	0.213	44.3	-	-	-	-	-	-	-	0.212	5.33	-	-	-	-	-	-	-	-	-	-	0.194	5.61	-	-	-	-	-	-	0.211	1.17
4-Nonene	-	-	-	0.172	4.17	-	-	-	-	-	-	-	0.172	15.8	-	-	-	-	-	-	-	-	-	-	0.157	3.23	-	-	-	-	-	-	0.171	2.27
Acetaldehyde	-	-	-	0.532	19.4	-	-	-	-	-	-	-	0.531	16.4	-	-	-	-	-	-	-	-	-	-	0.484	14.2	-	-	-	-	-	-	0.527	11.3
Acetone	3.1	<3.4	<3.2	0.173	8.37	<3.1	17	20	12	7.9	<3.3	<3.2	0.173	19.3	18	21	37	3.9	6.5	8.2	<4.6	14	<3.3	4.6	0.158	8.84	5.5	5.8	<3.3	14	<3.4	18	0.172	4.21
Acetonitrile	-	-	-	0.163	ND	-	-	-	-	-	-	-	0.162	0.207	-	-	-	-	-	-	-	-	-	-	0.148	ND	-	-	-	-	-	-	0.161	ND
Acetylene	-	-	-	0.182	1.53	-	-	-	-	-	-	-	0.181	0.925	-	-	-	-	-	-	-	-	-	-	0.165	0.589	-	-	-	-	-	-	0.18	0.522
Acrylonitrile	0.31	<0.34	<0.32	0.667	ND	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	0.665	ND	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	0.607	ND	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	0.661	ND
Allyl chloride	0.15	<0.17	<0.16	0.262	ND	<0.15	<0.16	<0.17	<0.16	<0.17	<0.16	<0.16	0.261	ND	<0.16	<0.17	<0.17	<0.16	<0.23	<0.24	<0.23	<0.17	<0.17	<0.16	0.238	ND	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	0.26	ND
alpha-Pinene	-	-	-	0.479	1.8	-	-	-	-	-	-	-	6.2	577	-	-	-	-	-	-	-	-	-	-	2.18	222	-	-	-	-	-	-	0.475	0.754
Benzaldehyde	-	-	-	0.398	ND	-	-	-	-	-	-	-	0.397	ND	-	-	-	-	-	-	-	-	-	-	0.362	ND	-	-	-	-	-	-	0.394	0.541
Benzene	0.15	3.7	5.8	0.205	14.6	0.68	2.9	3.7	2.3	0.59	0.53	2.4	0.205	1.21	0.91	0.44	0.31	0.99	0.23	<0.24	0.78	<0.17	2.5	2.6	0.187	10.9	1	1.1	0.23	0.54	0.2	1.7	0.204	2.49
Benzyl chloride	-	-	-	1.58	ND	-	-	-	-	-	-	-	1.57	ND	-	-	-	-	-	-	-	-	-	-	1.43	ND	-	-	-	-	-	-	1.56	ND
beta-Pinene	-	-	-	0.475	0.985	-	-	-	-	-	-	-	0.473	40.4	-	-	-	-	-	-	-	-	-	-	0.432	58	-	-	-	-	-	-	0.47	1.13
Bromobenzene	0.31	<0.34	<0.32	-	-	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	-	-	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	-	-
Bromochloromethane	-	-	-	0.464	ND	-	-	-	-	-	-	-	0.463	ND	-	-	-	-	-	-	-	-	-	-	0.422	ND	-	-	-	-	-	-	0.46	ND
Bromodichloromethane	0.15	<0.17	<0.16	0.588	ND	<0.15	<0.16	<0.17	<0.16	<0.17	<0.16	<0.16	0.586	ND	<0.16	<0.17	<0.17	<0.16	<0.23	<0.24	<0.23	<0.17	<0.17	<0.16	0.535	ND	<0.16	<0.17	<0.16	<0.17	<0.17	<0.16	0.582	ND
Bromoform	0.31	<0.34	<0.32	0.907	ND	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	0.904	ND	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	0.825	ND	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	0.899	ND

Sample Location ID		MW10-1				MW10-2	MW10-3B			MW10-5		MW10-6			MW10-7B		MW10-9B		MW10-10	MW10-11		MW10-12	MW10-14	MW10-15			MW10-16		MW10-18		MW10-20	MW10-22		
LAB ID		R103247-01	R103247-02		AUC0212-03	R103247-03	R103247-04	R103247-05	R103247-06	R103247-07	R103247-08	R103247-09		AUC0212-04	R103247-10	R103247-11	R103247-12	R103247-13	R103247-14	R103247-15	R103247-16	R103247-17	R103247-18	R103247-19		AUC0212-02	R103247-20	R103247-21	R103247-22	R103247-23	R103247-24	R103247-25		AUC0212-01
SAMPLE METHOD		Well	Deep probe		Well	Well	Shallow probe	Deep probe	Well	Well	Deep probe	Deep probe		Well	Deep probe	Shallow probe	Well	Shallow probe	Well	Deep probe	Well	Well	Well	Well		Well	Deep probe	Well	Well	Deep probe	Well	Well		Well
SAMPLE DEPTH (mbgs)		2.7-3.3	2.4-2.55		2.7-3.3	2.5-3.1	0.81-1.37	1.68-2.13	2.74-3.00	2.13-3.9	1.07-1.52	1.65-2.44		1.65-2.44	1.96-2.74	1.22-1.68		1.37-1.83	2.74-3.3	1.22-1.52	2.13-3.1	3.05-4.57	2.13-4.27	2.13-2.85		2.13-2.85	1.22-1.52	2.13-3.3	2.13-3.2	1.07-1.52	2.13-3.0	2.13-3.3		2.13-3.3
DATE SAMPLED		09-Mar-11	09-Mar-11		09-Mar-11	09-Mar-11	09-Mar-11	09-Mar-11	09-Mar-11	11-Mar-11	11-Mar-11	10-Mar-11		10-Mar-11	10-Mar-11	10-Mar-11	11-Mar-11	11-Mar-11	08-Mar-11	08-Mar-11	08-Mar-11	11-Mar-11	09-Mar-11	09-Mar-11		09-Mar-11	10-Mar-11	10-Mar-11	10-Mar-11	10-Mar-11	11-Mar-11	09-Mar-11		09-Mar-11
LABORATORY	CARO	CARO	CARO	Test America	Test America	CARO	CARO	CARO	CARO	CARO	CARO	CARO	Test America	Test America	CARO	CARO	CARO	CARO	CARO	CARO	CARO	CARO	CARO	CARO	Test America	Test America	CARO	CARO	CARO	CARO	CARO	CARO	Test America	Test America
MATRIX	RDL	Air	Air	MDL	Air	Air	Air	Air	Air	Air	Air	Air	MDL	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	Air	MDL	Air	Air	Air	Air	Air	Air	Air	MDL	Air
Bromomethane	-	-	-	0.331	ND	-	-	-	-	-	-	-	0.33	ND	-	-	-	-	-	-	-	-	-	-	0.301	ND	-	-	-	-	-	-	0.328	ND
Butane	-	-	-	40.6	514	-	-	-	-	-	-	-	0.878	137	-	-	-	-	-	-	-	-	-	-	0.161	115	-	-	-	-	-	-	0.176	44.4
Butyl acrylate	-	-	-	1.52	ND	-	-	-	-	-	-	-	1.52	ND	-	-	-	-	-	-	-	-	-	-	1.38	ND	-	-	-	-	-	-	1.51	ND
Butyraldehyde	-	-	-	0.863	1.63	-	-	-	-	-	-	-	0.861	4.07	-	-	-	-	-	-	-	-	-	-	0.785	1.22	-	-	-	-	-	-	0.856	1.69
Carbon disulfide	0.61	13	11	0.903	53.3	3.7	8.1	11	8.5	4	1.4	12	0.9	40.8	1.6	<0.68	<0.68	3.9	<0.93	<0.97	2.9	<0.66	12	8.2	0.821	28.1	8.4	6.1	<0.65	2	<0.67	6.2	0.895	11.2
Carbon tetrachloride	0.092	<0.1	<0.096	0.536	ND	<0.092	<0.097	<0.1	<0.098	<0.099	0.13	<0.097	0.535	ND	0.23	0.14	0.2	0.13	<0.14	<0.15	0.23	<0.1	0.1	<0.098	0.488	ND	<0.097	<0.1	0.52	0.1	<0.1	<0.098	0.531	ND
Chlorobenzene	0.31	<0.34	<0.32	0.396	ND	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	0.395	ND	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	0.36	ND	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	0.393	ND
Chlorodibromomethane	-	-	-	0.747	ND	-	-	-	-	-	-	-	0.745	ND	-	-	-	-	-	-	-	-	-	-	0.68	ND	-	-	-	-	-	-	0.741	ND
Chlorodifluoromethane	-	-	-	0.561	ND	-	-	-	-	-	-	-	0.56	0.62	-	-	-	-	-	-	-	-	-	-	0.511	ND	-	-	-	-	-	-	0.556	0.628
Chloroethane	1.5	<1.7	<1.6	0.16	ND	<1.5	<1.6	<1.7	<1.6	<1.7	<1.6	<1.6	0.159	ND	<1.6	<1.7	<1.7	<1.6	<2.3	<2.4	<2.3	<1.7	<1.7	<1.6	0.145	ND	<1.6	<1.7	<1.6	<1.7	<1.7	<1.6	0.158	ND
Chloroform	0.15	8.4	4.5	0.416	25.6	2	2.9	4	16	1.1	0.43	3.9	0.415	24.7	0.16	<0.17	0.27	0.72	0.33	0.29	5.5	0.23	4.6	6.5	0.378	24.3	3.1	2.4	0.2	<0.17	0.8	3	0.412	2.02
Chloromethane	-	-	-	0.143	1.19	-	-	-	-	-	-	-	0.143	1.7	-	-	-	-	-	-	-	-	-	-	0.13	0.931	-	-	-	-	-	-	0.142	0.822
Chloroprene	-	-	-	0.219	ND	-	-	-	-	-	-	-	0.219	ND	-	-	-	-	-	-	-	-	-	-	0.2	ND	-	-	-	-	-	-	0.217	ND
cis/trans-4-Methyl-2-pentene	-	-	-	0.592	12.2	-	-	-	-	-	-	-	0.591	3.23	-	-	-	-	-	-	-	-	-	-	0.539	1.73	-	-	-	-	-	-	0.587	1.02
cis-1,2-Dichloroethene	0.31	<0.34	<0.32	0.338	ND	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	0.337	4.25	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	0.307	ND	<0.32	0.41	<0.33	<0.34	<0.34	<0.33	0.335	ND
cis-1,3-Dichloropropene	-	-	-	0.387	ND	-	-	-	-	-	-	-	0.386	ND	-	-	-	-	-	-	-	-	-	-	0.352	ND	-	-	-	-	-	-	0.383	ND
cis-2-Butene	-	-	-	1.43	216	-	-	-	-	-	-	-	0.186	25.6	-	-	-	-	-	-	-	-	-	-	0.17	26.7	-	-	-	-	-	-	0.185	9.15
cis-2-Hexene	-	-	-	0.562	40.8	-	-	-	-	-	-	-	0.561	0.645	-	-	-	-	-	-	-	-	-	-	0.511	8.35	-	-	-	-	-	-	0.557	1.54
cis-2-Octene	-	-	-	0.387	4.08	-	-	-	-	-	-	-	0.386	3.99	-	-	-	-	-	-	-	-	-	-	0.352	1.76	-	-	-	-	-	-	0.384	0.621
cis-2-Pentene	-	-	-	0.226	112	-	-	-	-	-	-	-	0.226	6.69	-	-	-	-	-	-	-	-	-	-	0.206	19.7	-	-	-	-	-	-	0.224	5.25
cis-3-Heptene	-	-	-	0.143	19.4	-	-	-	-	-	-	-	0.143	1.23	-	-	-	-	-	-	-	-	-	-	0.13	3.67	-	-	-	-	-	-	0.142	0.206
cis-3-Hexene	-	-	-	0.299	19.5	-	-	-	-	-	-	-	0.298	0.903	-	-	-	-	-	-	-	-	-	-	0.272	3.86	-	-	-	-	-	-	0.296	0.605
cis-3-Methyl-2-pentene	-	-	-	0.291	7.84	-	-	-	-	-	-	-	0.29	0.365	-	-	-	-	-	-	-	-	-	-	0.264	1.26	-	-	-	-	-	-	0.288	0.325
Cumene	0.31	<0.34	<0.32	0.81	ND	<0.31	0.74	0.54	0.56	0.46	0.36	11	0.808	27.4	0.49	0.37	0.95	<0.33	<0.47	<0.48	<0.46	<0.33	0.66	0.33	0.737	0.917	<0.32	0.78	<0.33	<0.34	<0.34	<0.33	0.803	ND
Cyclohexane	-	-	-	0.215	38.3	-	-	-	-	-	-	-	0.214	27.8	-	-	-	-	-	-	-	-	-	-	0.195	9.38	-	-	-	-	-	-	0.213	6.56
Cyclohexene	-	-	-	0.131	1.86	-	-	-	-	-	-	-	0.131	0.635	-	-	-	-	-	-	-	-	-	-	0.119	0.53	-	-	-	-	-	-	0.13	0.237
Cyclopentane	-	-	-	0.195	4.35	-	-	-	-	-	-	-	0.195	2.32	-	-	-	-	-	-	-	-	-	-	0.178	1.24	-	-	-	-	-	-	0.194	0.742
Cyclopentene	-	-	-	0.186	10.9	-	-	-	-	-	-	-	0.185	1.35	-	-	-	-	-	-	-	-	-	-	0.169	2.1	-	-	-	-	-	-	0.184	0.556
Dibromochloromethane	0.31	<0.34	<0.32	-	-	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	-	-	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	-	-
Dibromomethane	0.31	<0.34	<0.32	-	-	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	-	-	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	-	-
Dichlorodifluoromethane	0.61	5.7	6.4	0.417	2.59	4	3.9	5.4	2	4.3	8.5	9.3	0.416	2.83	13	9.8	7.8	3.6	5.1	2.7	5.1	2	5.6	5.9	0.38	2.34	8.7	7.8	2.4	5.7	6.7	6.8	0.414	2.02
Dichlorofluoromethane	-	-	-	0.359	ND	-	-	-	-	-	-	-	0.358	ND	-	-	-	-	-	-	-	-	-	-	0.326	ND	-	-	-	-	-	-	0.355	ND
Diethyl ether	-	-	-	0.466	ND	-	-	-	-	-	-	-	0.465	ND	-	-	-	-	-	-	-	-	-	-	0.424	ND	-	-	-	-	-	-	0.462	ND
Ethane	-	-	-	57.8	2250	-	-	-	-	-	-	-	3.24	314	-	-	-	-	-	-	-	-	-	-	1.14	233	-	-	-	-	-	-	1.24	125
Ethanol	-	-	-	1.58	230	-	-	-	-	-	-	-	1.58	398	-	-	-	-	-	-	-	-	-	-	0.207	39.4	-	-	-	-	-	-	0.225	40.8
Ethene	-	-	-	47.2	812	-	-	-	-	-	-	-	1.02	265	-	-	-	-	-	-	-	-	-	-	0.932	122	-	-	-	-	-	-	0.203	30.1
Ethyl acetate	1.5	<1.7	<1.6	-	-	<1.5	<1.6	<1.7	<1.6	<1.7	<1.6	<1.6	-	-	<1.6	<1.7	<1.7	<1.6	<2.3	<2.4	<2.3	<1.7	<1.7	<1.6	-	-	<1.6	<1.7	<1.6	<1.7	<1.7	<1.6	-	-
Ethyl ether	0.61	<0.67	<0.64	-	-	<0.61	<0.65	<0.67	<0.65	<0.66	<0.66	<0.64	-	-	<0.65	<0.68	<0.68	<0.66	<0.93	<0.97	<0.92	<0.66	<0.66	<0.65	-	-	<0.64	<0.68	<0.65	<0.67	<0.67	<0.65	-	-
Ethyl methacrylate	0.31	<0.34	<0.32	-	-	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	-	-	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	-	-
Ethylbenzene	0.31	0.47	2.8	0.37	5.82	<0.31	5.5	4	7.8	5.3	9.5	25	0.369	17.7	22	25	44	3.2	4.7	1.5	1.9	<0.33	7.3	3.9	0.337	9.41	1.9	31	0.78	22	7	3.3	0.367	8
Halocarbon 134A	-	-	-	0.355	3.95	-	-	-	-	-	-	-	0.354	0.8	-	-	-	-	-	-	-	-	-	-	0.323	ND	-	-	-	-	-	-	0.352	ND
Heptanal	-	-	-	1.35	6.3	-	-	-	-	-	-	-	1.35	ND	-	-	-	-	-	-	-	-	-	-	1.23	3.34	-	-	-	-	-	-	1.34	5.69
Heptane	-	-	-	0.241	48.1	-	-	-	-	-	-	-	0.24	1.48	-	-	-	-	-	-	-	-	-	-	0.219	23.9	-	-	-	-	-	-	0.239	2.7
Hexachlorobutadiene	0.15	0.44	<0.16	0.916	ND	0.34	<0.16	<0.17	<0.16	<0.17	<0.16	<0.16	0.913	ND	<0.16	<0.17	<0.17	<0.16	<0.23	<0.24	<0.23	<0.17	<0.17	<0.16	0.833	ND	<0.16	<0.17	<0.16	<0.17	0.5	<0.16	0.908	ND
Hexachloroethane	0.31	<0.34	<0.32	-	-	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	-	-	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	-	-
Hexanal	-	-	-	0.541	5	-	-	-	-	-	-	-	0.54	ND	-	-	-	-	-	-	-	-	-	-	0.492	2.59	-	-	-	-	-	-	0.536	5.39
Indan	-	-	-	0.424	0.724	-	-	-	-	-	-	-	0.423	83.8	-	-	-	-	-	-	-	-	-	-	0.386	1.56	-	-	-	-	-	-	0.42	0.798
Indene	-	-	-	0.189	ND	-	-	-	-	-	-	-	0.188	12.3	-	-	-	-	-	-	-	-	-	-	0.172	ND	-	-	-	-	-	-	0.187	ND
Isobutane	-	-	-	1.63	378	-	-	-	-	-	-	-	0.205	40.2	-	-	-	-	-	-	-	-	-	-	0.187	27.4	-	-	-	-	-	-	0.204	12.5
Isobutylbenzene	3.1	<3.4	<3.2	0.481	ND	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	0.48	2.88	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	0.438	0.702	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	0.477	ND
Isoheptane	-	-	-	0.349	53.2	-	-	-	-	-	-	-	0.348	8.77	-	-	-	-	-	-	-	-	-	-	0.318	13.9	-	-	-	-	-	-	0.346	4.31
Isohexane	-	-	-	0.234	112	-	-	-	-	-	-	-	0.234	27.8	-	-	-	-	-	-	-	-	-	-	0.213	20.8	-	-	-	-	-	-	0.232	8.71
Isopentane	-	-	-	2.5	383	-	-	-	-	-	-	-	0.469	54.4	-	-	-	-	-	-	-	-	-	-	0.428	41.8	-	-	-	-	-	-	0.466	18.4
Isoprene	-	-	-	0.201	13.1	-	-	-	-	-	-	-	0.2	1.44	-	-	-	-	-	-	-	-	-	-	0.183	3.48	-	-	-	-	-	-	0.199	1.37
Isopropyl alcohol	-	-	-	0.228	4	-	-	-	-	-	-	-	0.227	2.07	-	-	-	-	-	-	-	-	-	-	0.207	1.52	-	-	-	-	-	-	0.226	0.604
Limonene	-	-	-	0.884	3.31	-	-	-	-	-	-	-	0.882	56.8	-	-	-	-	-	-	-	-	-	-	0.804	26.4	-	-	-	-	-	-	0.876	10.2
Methacrylonitrile	0.31	<0.34	<0.32	-	-	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	-	-	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	-	-
Methanol	-	-	-	92.3	2030	-	-	-	-	-	-	-	2	131	-	-	-	-	-	-	-	-	-	-	30.4	759	-	-	-	-	-	-	136	4430
Methyl acrylate	1.5	<1.7	<1.6	-	-	<1.5	<1.6	<1.7	<1.6	<1.7	<1.6	<1.6	-	-	<1.6	<1.7	<1.7	<1.6	<2.3	<2.4	<2.3	<1.7	<1.7	<1.6	-	-	<1.6	<1.7	<1.6	<1.7	<1.7	<1.6	-	-
Methyl ethyl ketone	0.61	<0.67	<0.64	0.496	3.14	<0.61	2.6	5.4	3.1	1.3	<0.66	<0.64	0.494	8.54	2.1	3.4	20	<0.66	<0.93	1.2	<0.92	<0.66	<0.66	0.88	0.451	1.74	<0.64	2.4	1.1	<0.67	<0.67	<0.65	0.491	0.814
Methyl isobutyl ketone	0.61	<0.67	<0.64	0.682	ND	<0.61	0.97	1	0.65	<0.66	<0.66	<0.64	0.68	ND	<0.65	<0.68	1.1	<0.66	<0.93	<0.97	<0.92	<0.66	<0.66	<0.65	0.62	1.52	<0.64	<0.68	<0.65	<0.67	<0.67	<0.65	0.676	ND
Methyl methacrylate	0.61	<0.67	<0.64	-	-	<0.61	<0.65	<0.67	<0.65	2.1	<0.66	<0.64	-	-	<0.65	<0.68	4.1	<0.66	<0.93	<0.97	<0.92	<0.66	<0.66	<0.65	-	-	<0.64	<0.68	<0.65	<0.67	<0.67	<0.65	-	-
Methyl tert-butyl ether	0.61	<0.67	<0.64	0.566	ND	<0.61	<0.65	<0.67	<0.65	<0.66	<0.66	<0.64	0.565	ND	<0.65	<0.68	<0.68	<0.66	<0.93	<0.97	<0.92	<0.66	<0.66	<0.65	0.515	ND	<0.64	<0.68	<0.65	<0.67	<0.67	<0.65	0.561	ND
Methylcyclohexane	0.61	5.7	4.8	0.342	86.6	<0.61	5.8	6.1	11	1.6	0.72	6.4	0.341	89.6	4.9	1.3	0.85	1.6	<0.93	<0.97	0.96	<0.66	3.1	4.3	0.311	26.6	2	2.5	1.3	1.1	<0.67	2.2	0.339	16.5
Methylcyclopentane	-	-	-	0.217	24.9	-	-	-	-	-	-	-	0.216	14.5	-	-	-	-	-	-	-	-	-	-	0.197	6.12	-	-	-	-	-	-	0.215	4.85
Methylene chloride	3.1	<3.4	<3.2	0.299	0.796	5.2	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	0.298	0.973	22	17	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	5.3	<3.3	0.272	0.698	3.9	<3.4	<3.3	13	<3.4	4.2	0.296	ND
m-Xylene & p-Xylene	-	-	-	0.74	18.1	-	-	-	-	-	-	-	0.738	42.4	-	-	-	-	-	-	-	-	-	-	0.673	32.4	-	-	-	-	-	-	0.733	27.8
Naphthalene	0.31	<0.34	<0.32	0.709	ND	<0.31	<0.32	<0.34	<0.33	2	<0.33	58	0.707	30.7	45	12	0.64	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	1.3	0.645	0.923	0.77	0.64	<0.33	<0.34	2.7	<0.33	0.703	1.14
n-Butanol	-	-	-	0.448	27.3	-	-	-	-	-	-	-	0.447	21.6	-	-	-	-	-	-	-	-	-	-	0.408	3.6	-	-	-	-	-	-	0.444	0.838
n-Butylbenzene	3.1	<3.4	<3.2	0.233	ND	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	0.232	ND	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	0.212	ND	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	0.23	1.75
nC10-nC12 Non-reg. Aromatics	15	<17	<16	-	-	<15	<16	<17	<16	<17	<16	130	-	-	<16	<17	<17	<16	<23	<24	<23	<17	<17	<16	-	-	<16	<17	<16	<17	<17	<16	-	-
nC10-nC12 Other Aromatics	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
nC12-nC16 Non-reg. Aromatics	15	<17	<16	-	-	<15	<16	<17	<16	<17	<16	<16	-	-	<16	<17	<17	<16	<23	<24	<23	<17	<17	<16	-	-	<16	<17	<16	<17	<17	<16	-	-
nC12-nC16 Other Aromatics	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
nC8-nC10 Non-reg. Aromatics	15	<17	<16	-	-	<15	28	21	18	18	17	71	-	-	<16	<17	<17	<16	<23	<24	<23	<17	21	<16	-	-	<16	<17	<16	<17	<17	<16	-	-
n-Decane	0.92	<1	1.7	0.496	4.1	<0.92	21	19	12	2.8	1.4	<0.97	0.494	3.51	1.4	<1	4.1	<0.99	<1.4	<1.5	<1.4	<1	5.6	7.2	0.451	24.9	1.7	1.6	<0.98	2.4	<1	<0.98	0.491	4.07
Neopentane	-	-	-	0.264	3.52	-	-	-	-	-	-	-	0.263	0.747	-	-	-	-	-	-	-	-	-	-	0.24	0.31	-	-	-	-	-	-	0.261	ND
n-Hexane	3.1	6.7	6.7	0.272	121	<3.1	4.2	4	7.8	<3.3	<3.3	<3.2	0.271	2.15	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	3.7	<3.3	4.3	0.247	32.9	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	0.269	9.63
n-Hexylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
Nitrobenzene	0.31	<0.34	<0.32	-	-	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	-	-	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	-	-
n-Nonane	-	-	-	0.447	1.93	-	-	-	-	-	-	-	0.446	2.05	-	-	-	-	-	-	-	-	-	-	0.407	13.9	-	-	-	-	-	-	0.443	1.84
n-Octane	-	-	-	0.402	21.5	-	-	-	-	-	-	-	0.401	2.11	-	-	-	-	-	-	-	-	-	-	0.366	19.9	-	-	-	-	-	-	0.398	2.37
n-Pentane	-	-	-	1.96	436	-	-	-	-	-	-	-	0.251	29.2	-	-	-	-	-	-	-	-	-	-	0.229	73.2	-	-	-	-	-	-	0.249	28.5
n-Pentylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
n-Propylbenzene	3.1	<3.4	3.5	0.423	0.742	<3.1	5.2	4.7	4.3	4.3	4.3	13	0.422	6.39	3.6	3.7	4.4	3.6	<4.7	<4.8	<4.6	<3.3	5	<3.3	0.385	1.68	<3.2	4.1	<3.3	<3.4	3.4	3.6	0.419	1.84
n-Undecane	-	-	-	0.29	1.08	-	-	-	-	-	-	-	0.289	6.75	-	-	-	-	-	-	-	-	-	-	0.263	13	-	-	-	-	-	-	0.287	2.19
o-Xylene	-	-	-	0.37	12.1	-	-	-	-	-	-	-	0.369	53.8	-	-	-	-	-	-	-	-	-	-	0.337	20.6	-	-	-	-	-	-	0.367	10.8
Propane	-	-	-	48.2	1350	-	-	-	-	-	-	-	1.04	292	-	-	-	-	-	-	-	-	-	-	0.674	177	-	-	-	-	-	-	0.147	72.6
Propanol	-	-	-	0.718	55.4	-	-	-	-	-	-	-	0.716	31.2	-	-	-	-	-	-	-	-	-	-	0.653	ND	-	-	-	-	-	-	0.712	ND
Propylene	-	-	-	25.3	919	-	-	-	-	-	-	-	0.547	283	-	-	-	-	-	-	-	-	-	-	0.675	176	-	-	-	-	-	-	0.147	56.1
sec-Butylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	5.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
Styrene	0.31	<0.34	<0.32	0.363	ND	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	0.362	ND	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	0.33	0.409	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	0.36	ND
t-1-Butyl-3,5-Dimethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
t-1-Butyl-4-Ethylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
tert-1-Butyl-2-Methylbenzene	3.1	<3.4	<3.2	-	-	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	-	-	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	-	-	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	-	-
tert-Butylbenzene	3.1	<3.4	<3.2	0.481	ND	<3.1	<3.2	<3.4	<3.3	<3.3	<3.3	<3.2	0.48	ND	<3.2	<3.4	<3.4	<3.3	<4.7	<4.8	<4.6	<3.3	<3.3	<3.3	0.438	ND	<3.2	<3.4	<3.3	<3.4	<3.4	<3.3	0.477	ND
Tetrachloroethene	1.5	15	71	0.578	19	3.4	4.5	3	3.6	79	8.9	32	0.576	228	1.8	<1.7	3.4	4.3	<2.3	<2.4	<2.3	<1.7	5.6	2.3	0.526	4.33	<1.6	4.7	<1.6	<1.7	<1.7	3.9	0.573	11.3
Tetrahydrofuran	0.31	<0.34	<0.32	-	-	0.43	0.52	1	0.59	0.56	<0.33	<0.32	-	-	0.42	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	-	-	<0.32	<0.34	<0.33	0.34	<0.34	0.85	-	-
Toluene	3.1	20	90	0.321	182	3.7	21	81	69	360	280	81	0.32	35.4	140	78	610	66	16	32	43	3.7	96	46	0.292	99.3	13	47	<3.3	5	54	110	0.318	70.8
trans-1,2-Dichloroethene	0.31	<0.34	<0.32	0.653	ND	<0.31	<0.32	<0.34	<0.33	<0.33	<0.33	<0.32	0.651	4.55	<0.32	<0.34	<0.34	<0.33	<0.47	<0.48	<0.46	<0.33	<0.33	<0.33	0.594	ND	<0.32	<0.34	<0.33	<0.34	<0.34	<0.33	0.647	ND
trans-1,3-Dichloropropene	-	-	-	0.387	ND	-	-	-	-	-	-	-	0.386	ND	-	-	-	-	-	-	-	-	-	-	0.352	ND	-	-	-	-	-	-	0.383	ND
trans-2-Butene	-	-	-	0.178	51.9	-	-	-	-	-	-	-	0.177	8.77	-	-	-	-	-	-	-	-	-	-	0.162	7.95	-	-	-	-	-	-	0.176	3.49
trans-2-Heptene	-	-	-	0.17	2.12	-	-	-	-	-	-	-	0.169	ND	-	-	-	-	-	-	-	-	-	-	0.155	0.812	-	-	-	-	-	-	0.168	ND
trans-2-Hexene	-	-	-	0.22	11.6	-	-	-	-	-	-	-	0.22	ND	-	-	-	-	-	-	-	-	-	-	0.201	2.81	-	-	-	-	-	-	0.218	0.737
trans-2-Pentene	-	-	-	0.296	31.8	-	-	-	-	-	-	-	0.295	2.23	-	-	-	-	-	-	-	-	-	-	0.269	6.19	-	-	-	-	-	-	0.293	2.11
trans-3-Heptene	-	-	-	0.335	4.55	-	-	-	-	-	-	-	0.335	ND	-	-	-	-	-	-	-	-	-	-	0.305	ND	-	-	-	-	-	-	0.332	ND
Trichloroethene	0.092	0.27	<0.096	0.458	0.898	<0.092	<0.097	<0.1	<0.098	<0.099	<0.099	<0.097	0.457	4.42	<0.097	0.14	<0.1	<0.099	0.42	<0.15	1.5	<0.1	<0.1	0.26	0.417	0.758	<0.097	0.27	<0.098	<0.1	<0.1	0.33	0.454	ND
Trichlorofluoromethane	0.31	<0.34	0.77	0.474	1.02	0.71	<0.32	<0.34	<0.33	1.5	2.4	1.8	0.473	1.21	3.1	2.3	2.8	0.79	1.3	<0.48	1.3	<0.33	1.8	1.4	0.431	0.913	2.1	1.8	<0.33	<0.34	1.2	<0.33	0.47	0.959
Vinyl acetate	-	-	-	1.27	ND	-	-	-	-	-	-	-	1.27	ND	-	-	-	-	-	-	-	-	-	-	1.16	ND	-	-	-	-	-	-	1.26	ND
Vinyl bromide	-	-	-	0.68	ND	-	-	-	-	-	-	-	0.679	ND	-	-	-	-	-	-	-	-	-	-	0.619	ND	-	-	-	-	-	-	0.674	ND
Vinyl chloride	0.61	<0.67	<0.64	0.205	ND	<0.61	<0.65	<0.67	<0.65	<0.66	<0.66	<0.64	0.204	0.214	<0.65	<0.68	<0.68	<0.66	<0.93	<0.97	<0.92	<0.66	<0.66	<0.65	0.186	ND	<0.64	<0.68	<0.65	<0.67	<0.67	<0.65	0.203	ND
Xylenes (total)	1.5	6	16	0.549	30.3	5.2	39	31	46	33	49	110	0.548	96.1	110	130	250	18	30	16	14	4	50	27	0.5	53	17	180	7.5	100	44	22	0.544	38.6

Notes:

All units in $\mu g/m^3$, unless otherwise noted.

Table E-2
Summary of Field Vapour Measurements
Canada Creosote Site - North Bow
Human Health Risk Assessment

Sample ID		MW10-1	MW10-2	MW10-3A	MW10-3B	MW10-5	MW10-6	MW10-7A	MW10-7B	MW10-9A	MW10-9B	MW10-10	MW10-11	MW10-12	MW10-14	MW10-15	MW10-16	MW10-18	MW10-20	MW10-22
Date Monitored	**Units**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**	**28-Feb-11**
Organic Vapour Concentration	**ppm**	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
Combustible Gas Concentration	**ppm**	**410**	**65**	**940**	**125**	**0**	**125**	**580**	**35**	**550**	**310**	**0**	**0**	**145**	**115**	**150**	**115**	**250**	**190**	**0**

Notes:
A denotes deeper well, B denotes shallow well.
Organic vapour measured with photoionization detector with 10.6 eV lamp.
Combustible gas concentration measured using RKI 2 Eagle.

APPENDIX F

Laboratory Reports

Analytical Report

Work Order: AUC0212

Project Description

Westmount - Calgary

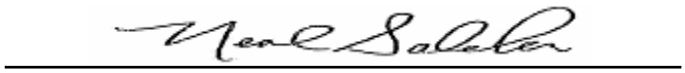
For:

Ian Hers

Golder Associates Ltd.

500-4260 Still Creek Drive

Burnaby, British Columbia, CANADA V5C6C6



Neal Salcher

Project Manager

Neal.Salcher@testamericainc.com

Tuesday, May 10, 2011

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

14050 Summit Drive, Suite A100 Austin, TX 78728 * 512-244-0855 * Fax 512-244-0160

Golder Associates Ltd. 500-4260 Still Creek Drive Burnaby, British Columbia, CANADA V5C6C6 Ian Hers	Work Order: Project: Project Number:	AUC0212 AENV Canada Creosote 10-1346-0046	Received: Reported:	03/17/11 08:57 05/10/11 08:56

May 10, 2011

LABORATORY REPORT

Client:
Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Attn: Ian Hers

Work Order:	AUC0212
Project Name:	AENV Canada Creosote
Project Number:	10-1346-0046
Date Received:	03/17/11

TestAmerica Laboratories, Inc. certifies that the analytical results contained herein apply only to the specific sample(s) analyzed.

The Chain(s) of Custody, 2 pages, are included and are an integral part of this report. This entire report was reviewed and approved for release.

If you have any questions relating to this analytical report, please contact your Laboratory Project Manager at 512-244-0855.

Analyses included in this report were performed by the laboratory shown at the top of this report unless otherwise indicated.

TestAmerica
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Golder Associates Ltd.	Work Order:	AUC0212	Received: 03/17/11 08:57
500-4260 Still Creek Drive			Reported: 05/10/11 08:56
Burnaby, British Columbia, CANADA V5C6C6	Project:	AENV Canada Creosote	
Ian Hers	Project Number:	10-1346-0046	

10-1346-0046

This report contains results for the samples received under chain-of-custody by TestAmerica Laboratories, Inc. 3/17/2011 8:57:00 AM .

These samples are associated with your **AENV Canada Creosote** project.

All samples were received in good condition and within temperature requirements.

All applicable quality control procedures met method specified acceptance criteria except where flagged on the result pages or noted in the case narrative.

If you should have any questions, please feel free to contact me at neal.salcher@testamericainc.com or (512) 310-5215.

Note that if this report contains tests performed for the following methods, the associated method deviations are applicable.
EPA 410.4, COD: Laboratory uses different analytical wavelength as specified by instrument manufacturer.
EPA 340.2, Fluoride: Preliminary Bellack distillation not performed.
EPA 624: The laboratory uses a different desorb time and purge volume than stated in the method.
Iowa OA1: Benzene, toluene, ethylbenzene and xylenes (BTEX) are not analyzed along with the Gasoline Range Organics if client does not require BTEX.
EPA TO-12: Samples not analyzed in duplicate.
EPA TO-14A and TO-15: Zero humidified nitrogen is used in place of air for method blanks.
10-1346-0046

Approved By:

Neal Salcher
Project Manager

NELAP Certification # T104704217-10-6

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Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

SAMPLE IDENTIFICATION	LAB NUMBER	COLLECTION	MATRIX	CONTAINER TYPE
MW10-22	AUC0212-01	03/14/11 14:00	Air	Passivated Canister
MW10-15	AUC0212-02	03/14/11 15:50	Air	Passivated Canister
MW10-1	AUC0212-03	03/14/11 17:25	Air	Passivated Canister
MW10-6	AUC0212-04	03/14/11 19:00	Air	Passivated Canister

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Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-01 (MW10-22 - Air) **Sampled: 03/14/11 14:00**

EPA TO15 - Volatile Organic Compounds by GC/MS

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Ethene	**30.1**	RA	ug/m³ Air	0.203	1.31	5.69	04/04/11 15:12	GCMSQ2	KDK	11D0020
Acetylene	**0.522**	RA,J	ug/m³ Air	0.180	1.21	5.69	04/04/11 15:12	GCMSQ2	KDK	11D0020
Ethane	**125**	RA	ug/m³ Air	1.24	7.00	28.4	04/04/11 20:51	GCMSQ2	KDK	11D0020
Halocarbon 134A	ND	U	ug/m³ Air	0.352	4.75	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Propylene	**56.1**		ug/m³ Air	0.147	1.96	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Chlorodifluoromethane	**0.628**	J	ug/m³ Air	0.556	4.02	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Propane	**72.6**		ug/m³ Air	0.147	2.05	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Dichlorodifluoromethane	**2.02**	J	ug/m³ Air	0.414	5.63	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Chloromethane	**0.822**	J	ug/m³ Air	0.142	2.35	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Isobutane	**12.5**		ug/m³ Air	0.204	2.70	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	U	ug/m³ Air	0.585	7.95	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Acetaldehyde	**11.3**		ug/m³ Air	0.527	2.05	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Vinyl chloride	ND	U	ug/m³ Air	0.203	2.91	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1-Butene/Isobutene	**58.1**		ug/m³ Air	0.210	2.61	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,3-Butadiene	**1.56**	J	ug/m³ Air	0.164	2.52	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Butane	**44.4**		ug/m³ Air	0.176	2.70	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Methanol	**4430**	RA, H2,B	ug/m³ Air	136	511	1950	04/19/11 02:45	GCMSQ2	KDK	11D0170
trans-2-Butene	**3.49**		ug/m³ Air	0.176	2.61	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Neopentane	ND	U	ug/m³ Air	0.261	3.36	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Dichlorofluoromethane	ND	U	ug/m³ Air	0.355	4.79	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Bromomethane	ND	U	ug/m³ Air	0.328	4.42	5.69	03/30/11 18:09	VMSC	KRW	11C0385
cis-2-Butene	**9.15**		ug/m³ Air	0.185	2.61	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Chloroethane	ND	U	ug/m³ Air	0.158	3.00	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Vinyl bromide	ND	U	ug/m³ Air	0.674	4.98	5.69	03/30/11 18:09	VMSC	KRW	11C0385
3-Methyl-1-butene	**3.78**		ug/m³ Air	0.206	3.26	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Ethanol	**40.8**		ug/m³ Air	0.225	2.14	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Acetonitrile	ND	U	ug/m³ Air	0.161	1.91	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Isopentane	**18.4**		ug/m³ Air	0.466	3.36	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Trichlorofluoromethane	**0.959**	J	ug/m³ Air	0.470	6.39	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1-Pentene	**16.4**		ug/m³ Air	0.219	3.26	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Acetone	**4.21**	B	ug/m³ Air	0.172	2.70	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Isopropyl alcohol	**0.604**	J	ug/m³ Air	0.226	2.80	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Acrylonitrile	ND	U	ug/m³ Air	0.661	2.47	5.69	03/30/11 18:09	VMSC	KRW	11C0385
n-Pentane	**28.5**		ug/m³ Air	0.249	3.36	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Diethyl ether	ND	U	ug/m³ Air	0.462	3.45	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Isoprene	**1.37**	J	ug/m³ Air	0.199	3.17	5.69	03/30/11 18:09	VMSC	KRW	11C0385
trans-2-Pentene	**2.11**	J	ug/m³ Air	0.293	3.26	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,1-Dichloroethene	ND	U	ug/m³ Air	0.399	4.51	5.69	03/30/11 18:09	VMSC	KRW	11C0385
cis-2-Pentene	**5.25**		ug/m³ Air	0.224	3.26	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Methylene chloride	ND	U	ug/m³ Air	0.296	3.95	5.69	03/30/11 18:09	VMSC	KRW	11C0385

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Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-01 (MW10-22 - Air) - cont. **Sampled: 03/14/11 14:00**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
2-Methyl-2-butene	**2.31**	J	ug/m³ Air	0.191	3.26	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Carbon disulfide	**11.2**		ug/m³ Air	0.895	3.54	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Allyl chloride	ND	U	ug/m³ Air	0.260	3.56	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,1,2-Trichlorotrifluoroethane	ND	U	ug/m³ Air	0.647	8.72	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2,2-Dimethylbutane	**0.493**	J	ug/m³ Air	0.279	4.01	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Cyclopentene	**0.556**	J	ug/m³ Air	0.184	3.17	5.69	03/30/11 18:09	VMSC	KRW	11C0385
trans-1,2-Dichloroethene	ND	U	ug/m³ Air	0.648	4.51	5.69	03/30/11 18:09	VMSC	KRW	11C0385
4-Methyl-1-pentene	**1.17**	J	ug/m³ Air	0.211	3.92	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Propanol	ND	U	ug/m³ Air	0.712	2.80	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,1-Dichloroethane	ND	U	ug/m³ Air	0.342	4.61	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Cyclopentane	**0.742**	J	ug/m³ Air	0.194	3.26	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2,3-Dimethylbutane	**1.46**	J	ug/m³ Air	0.206	4.01	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Methyl tert-Butyl Ether	ND	U	ug/m³ Air	0.561	4.10	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Isohexane	**8.71**		ug/m³ Air	0.232	4.01	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Vinyl acetate	ND	U	ug/m³ Air	1.26	4.01	5.69	03/30/11 18:09	VMSC	KRW	11C0385
cis/trans-4-Methyl-2-pentene	**1.02**	J	ug/m³ Air	0.587	7.84	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Butyraldehyde	**1.69**	J	ug/m³ Air	0.856	3.36	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2-Butanone (MEK)	**0.814**	J	ug/m³ Air	0.491	3.36	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Chloroprene	ND	U	ug/m³ Air	0.217	4.12	5.69	03/30/11 18:09	VMSC	KRW	11C0385
3-Methylpentane	**4.76**		ug/m³ Air	0.256	4.01	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2-Methyl-1-pentene	**3.46**	J	ug/m³ Air	0.250	3.92	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1-Hexene	**5.22**		ug/m³ Air	0.527	3.92	5.69	03/30/11 18:09	VMSC	KRW	11C0385
cis-1,2-Dichloroethene	ND	U	ug/m³ Air	0.335	4.51	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Bromochloromethane	ND	U	ug/m³ Air	0.460	6.02	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2-Ethyl-1-butene	**1.23**	J	ug/m³ Air	0.288	3.92	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Hexane	**9.63**		ug/m³ Air	0.269	4.01	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Chloroform	**2.02**	J	ug/m³ Air	0.412	5.56	5.69	03/30/11 18:09	VMSC	KRW	11C0385
cis-3-Hexene	**0.605**	J	ug/m³ Air	0.296	3.92	5.69	03/30/11 18:09	VMSC	KRW	11C0385
trans-2-Hexene	**0.737**	J	ug/m³ Air	0.218	3.92	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2-Methyl-2-pentene	**0.703**	J	ug/m³ Air	0.282	3.92	5.69	03/30/11 18:09	VMSC	KRW	11C0385
cis-3-Methyl-2-pentene	**0.325**	J	ug/m³ Air	0.288	3.92	5.69	03/30/11 18:09	VMSC	KRW	11C0385
cis-2-Hexene	**1.54**	J	ug/m³ Air	0.557	3.92	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Methylcyclopentane	**4.85**		ug/m³ Air	0.215	3.92	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,2-Dichloroethane	ND	U	ug/m³ Air	0.342	4.61	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2,4-Dimethylpentane	**0.884**	J	ug/m³ Air	0.346	4.66	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,1,1-Trichloroethane	ND	U	ug/m³ Air	0.456	6.21	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1-Methylcyclopentene	**0.426**	J	ug/m³ Air	0.289	3.82	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Benzene	**2.49**	J	ug/m³ Air	0.204	3.63	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Carbon tetrachloride	ND	U	ug/m³ Air	0.531	7.16	5.69	03/30/11 18:09	VMSC	KRW	11C0385
n-Butanol	**0.838**	J	ug/m³ Air	0.444	3.45	5.69	03/30/11 18:09	VMSC	KRW	11C0385

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Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-01 (MW10-22 - Air) - cont. **Sampled: 03/14/11 14:00**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Cyclohexane	**6.56**		ug/m³ Air	0.213	3.92	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Isoheptane	**4.31**	J	ug/m³ Air	0.346	4.66	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2,3-Dimethylpentane	**3.54**	J	ug/m³ Air	0.349	4.66	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Cyclohexene	**0.237**	J	ug/m³ Air	0.130	3.82	5.69	03/30/11 18:09	VMSC	KRW	11C0385
3-Methylhexane	**6.64**		ug/m³ Air	0.292	4.66	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,2-Dichloropropane	ND	U	ug/m³ Air	0.390	5.26	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Bromodichloromethane	ND	U	ug/m³ Air	0.582	7.62	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Trichloroethene	ND	U	ug/m³ Air	0.454	6.11	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,4-Dioxane	ND	U	ug/m³ Air	0.438	4.10	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1-Heptene	**9.43**		ug/m³ Air	0.625	4.57	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2,2,4-Trimethylpentane	**2.22**	J	ug/m³ Air	0.394	5.32	5.69	03/30/11 18:09	VMSC	KRW	11C0385
trans-3-Heptene	ND	U	ug/m³ Air	0.332	4.57	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Heptane	**2.70**	J	ug/m³ Air	0.239	4.66	5.69	03/30/11 18:09	VMSC	KRW	11C0385
cis-3-Heptene	**0.206**	J	ug/m³ Air	0.142	4.57	5.69	03/30/11 18:09	VMSC	KRW	11C0385
trans-2-Heptene	ND	U	ug/m³ Air	0.168	4.57	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2,4,4-Trimethyl-1-pentene	ND	U	ug/m³ Air	0.384	5.22	5.69	03/30/11 18:09	VMSC	KRW	11C0385
cis-1,3-Dichloropropene	ND	U	ug/m³ Air	0.383	5.16	5.69	03/30/11 18:09	VMSC	KRW	11C0385
4-Methyl-2-pentanone (MIBK)	ND	U	ug/m³ Air	0.676	4.66	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Methylcyclohexane	**16.5**		ug/m³ Air	0.339	4.57	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2,4,4-Trimethyl-2-pentene	ND	U	ug/m³ Air	0.399	5.22	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2,5-Dimethylhexane	**0.632**	J	ug/m³ Air	0.391	5.31	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2,2,3-Trimethylpentane	**0.701**	J	ug/m³ Air	0.391	5.31	5.69	03/30/11 18:09	VMSC	KRW	11C0385
trans-1,3-Dichloropropene	ND	U	ug/m³ Air	0.383	5.16	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,1,2-Trichloroethane	ND	U	ug/m³ Air	0.456	6.21	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2,3,4-Trimethylpentane	**1.79**	J	ug/m³ Air	0.272	5.31	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Toluene	**70.8**		ug/m³ Air	0.318	4.29	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2-Hexanone	ND	U	ug/m³ Air	0.236	4.66	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2-Methylheptane	**0.832**	J	ug/m³ Air	0.394	5.31	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1-Methylcyclohexene	ND	U	ug/m³ Air	0.342	4.48	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Chlorodibromomethane	ND	U	ug/m³ Air	0.741	9.69	5.69	03/30/11 18:09	VMSC	KRW	11C0385
3-Methylheptane	**0.776**	J	ug/m³ Air	0.763	5.31	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Hexanal	**5.39**		ug/m³ Air	0.536	4.66	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,2-Dibromoethane (EDB)	ND	U	ug/m³ Air	0.649	8.74	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2,2,5-Trimethylhexane	**0.624**	J	ug/m³ Air	0.456	5.97	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1-Octene	**2.06**	J	ug/m³ Air	0.201	5.22	5.69	03/30/11 18:09	VMSC	KRW	11C0385
n-Octane	**2.37**	J	ug/m³ Air	0.398	5.32	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Tetrachloroethene	**11.3**		ug/m³ Air	0.573	7.72	5.69	03/30/11 18:09	VMSC	KRW	11C0385
cis-2-Octene	**0.621**	J	ug/m³ Air	0.384	5.22	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Chlorobenzene	ND	U	ug/m³ Air	0.393	5.24	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Ethylbenzene	**8.00**		ug/m³ Air	0.367	4.94	5.69	03/30/11 18:09	VMSC	KRW	11C0385

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-01 (MW10-22 - Air) - cont. **Sampled: 03/14/11 14:00**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
m-Xylene & p-Xylene	**27.8**		ug/m³ Air	0.733	9.88	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Bromoform	ND	U	ug/m³ Air	0.899	11.8	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Butyl acrylate	ND	U	ug/m³ Air	1.51	5.97	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Heptanal	**5.69**		ug/m³ Air	1.34	5.31	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Styrene	ND	U	ug/m³ Air	0.360	4.85	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,1,2,2-Tetrachloroethane	ND	U	ug/m³ Air	0.580	7.81	5.69	03/30/11 18:09	VMSC	KRW	11C0385
o-Xylene	**10.8**		ug/m³ Air	0.367	4.94	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Xylenes, total	**38.6**		ug/m³ Air	0.544	14.8	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1-Nonene	**3.06**	J	ug/m³ Air	0.804	5.87	5.69	03/30/11 18:09	VMSC	KRW	11C0385
4-Nonene	**2.27**	J	ug/m³ Air	0.171	5.87	5.69	03/30/11 18:09	VMSC	KRW	11C0385
n-Nonane	**1.84**	J	ug/m³ Air	0.443	5.97	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Isopropylbenzene	ND	U	ug/m³ Air	0.803	5.59	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Benzaldehyde	**0.541**	J	ug/m³ Air	0.394	4.94	5.69	03/30/11 18:09	VMSC	KRW	11C0385
alpha-Pinene	**0.754**	J	ug/m³ Air	0.475	6.34	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2 & 3-Chlorotoluene	ND	U	ug/m³ Air	0.879	11.8	5.69	03/30/11 18:09	VMSC	KRW	11C0385
4-Chlorotoluene	ND	U	ug/m³ Air	0.798	5.89	5.69	03/30/11 18:09	VMSC	KRW	11C0385
n-Propylbenzene	**1.84**	J	ug/m³ Air	0.419	5.59	5.69	03/30/11 18:09	VMSC	KRW	11C0385
3-Ethyltoluene	**4.42**	J	ug/m³ Air	0.415	5.59	5.69	03/30/11 18:09	VMSC	KRW	11C0385
4-Ethyltoluene	**1.84**	J	ug/m³ Air	0.411	5.59	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,3,5-Trimethylbenzene	**2.09**	J	ug/m³ Air	0.415	5.59	5.69	03/30/11 18:09	VMSC	KRW	11C0385
2-Ethyltoluene	**1.15**	J	ug/m³ Air	0.415	5.59	5.69	03/30/11 18:09	VMSC	KRW	11C0385
beta-Pinene	**1.13**	J	ug/m³ Air	0.470	6.34	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,2,4-Trimethylbenzene	**5.71**		ug/m³ Air	0.415	5.59	5.69	03/30/11 18:09	VMSC	KRW	11C0385
tert-Butylbenzene	ND	U	ug/m³ Air	0.477	6.25	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1-Decene	ND	U	ug/m³ Air	0.893	6.53	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Benzyl chloride	ND	U	ug/m³ Air	1.56	5.89	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,3-Dichlorobenzene	ND	U	ug/m³ Air	0.503	6.84	5.69	03/30/11 18:09	VMSC	KRW	11C0385
n-Decane	**4.07**	J	ug/m³ Air	0.491	6.62	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,4-Dichlorobenzene	ND	U	ug/m³ Air	0.508	6.84	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Isobutylbenzene	ND	U	ug/m³ Air	0.477	6.25	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,2,3-Trimethylbenzene	**1.38**	J	ug/m³ Air	0.811	5.59	5.69	03/30/11 18:09	VMSC	KRW	11C0385
4-Isopropyltoluene	**4.54**	J	ug/m³ Air	0.889	6.25	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,2-Dichlorobenzene	ND	U	ug/m³ Air	0.503	6.84	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Limonene	**10.2**		ug/m³ Air	0.876	6.34	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Indan	**0.798**	J	ug/m³ Air	0.420	5.50	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Indene	ND	U	ug/m³ Air	0.187	5.41	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,3-Diethylbenzene	ND	U	ug/m³ Air	0.896	6.25	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,4-Diethylbenzene	ND	U	ug/m³ Air	0.888	6.25	5.69	03/30/11 18:09	VMSC	KRW	11C0385
n-Butylbenzene	**1.75**	J	ug/m³ Air	0.230	6.25	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1-Undecene	ND	U	ug/m³ Air	0.511	7.18	5.69	03/30/11 18:09	VMSC	KRW	11C0385

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-01 (MW10-22 - Air) - cont. **Sampled: 03/14/11 14:00**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
n-Undecane	**2.19**	J	ug/m³ Air	0.287	7.27	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,2,4-Trichlorobenzene	ND	U	ug/m³ Air	0.605	8.44	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Naphthalene	**1.14**	J	ug/m³ Air	0.703	5.96	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Hexachlorobutadiene	ND	U	ug/m³ Air	0.908	12.1	5.69	03/30/11 18:09	VMSC	KRW	11C0385
1,2-Dichloroethene, Total	ND	U	ug/m³ Air	0.647	9.02	5.69	03/30/11 18:09	VMSC	KRW	11C0385
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*75 %*						03/30/11 18:09	VMSC	KRW	11C0385
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*78 %*	*RA*					04/04/11 15:12	GCMSQ2	KDK	11D0020
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*84 %*	*RA*					04/04/11 20:51	GCMSQ2	KDK	11D0020
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*109 %*	*RA, H2*					04/19/11 02:45	GCMSQ2	KDK	11D0170
Surr: Fluorobenzene (62-122%)	*69 %*						03/30/11 18:09	VMSC	KRW	11C0385
Surr: Fluorobenzene (62-122%)	*71 %*	*RA*					04/04/11 15:12	GCMSQ2	KDK	11D0020
Surr: Fluorobenzene (62-122%)	*75 %*	*RA*					04/04/11 20:51	GCMSQ2	KDK	11D0020
Surr: Fluorobenzene (62-122%)	*74 %*	*RA, H2*					04/19/11 02:45	GCMSQ2	KDK	11D0170
Surr: Toluene-d8 (67-127%)	*98 %*						03/30/11 18:09	VMSC	KRW	11C0385
Surr: Toluene-d8 (67-127%)	*99 %*	*RA*					04/04/11 15:12	GCMSQ2	KDK	11D0020
Surr: Toluene-d8 (67-127%)	*99 %*	*RA*					04/04/11 20:51	GCMSQ2	KDK	11D0020
Surr: Toluene-d8 (67-127%)	*108 %*	*RA, H2*					04/19/11 02:45	GCMSQ2	KDK	11D0170
Surr: 1,4-Dichlorobutane (76-136%)	*105 %*						03/30/11 18:09	VMSC	KRW	11C0385
Surr: 1,4-Dichlorobutane (76-136%)	*106 %*	*RA*					04/04/11 15:12	GCMSQ2	KDK	11D0020
Surr: 1,4-Dichlorobutane (76-136%)	*106 %*	*RA*					04/04/11 20:51	GCMSQ2	KDK	11D0020
Surr: 1,4-Dichlorobutane (76-136%)	*97 %*	*RA, H2*					04/19/11 02:45	GCMSQ2	KDK	11D0170
Surr: 4-Bromofluorobenzene (73-133%)	*108 %*						03/30/11 18:09	VMSC	KRW	11C0385
Surr: 4-Bromofluorobenzene (73-133%)	*110 %*	*RA*					04/04/11 15:12	GCMSQ2	KDK	11D0020
Surr: 4-Bromofluorobenzene (73-133%)	*109 %*	*RA*					04/04/11 20:51	GCMSQ2	KDK	11D0020
Surr: 4-Bromofluorobenzene (73-133%)	*104 %*	*RA, H2*					04/19/11 02:45	GCMSQ2	KDK	11D0170

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-02 (MW10-15 - Air) **Sampled: 03/14/11 15:50**

EPA TO15 - Volatile Organic Compounds by GC/MS

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Ethene	**122**	RA	ug/m³ Air	0.932	5.99	26.1	04/04/11 21:47	GCMSQ2	KDK	11D0020
Acetylene	**0.589**	RA,J	ug/m³ Air	0.165	1.11	5.22	04/04/11 16:09	GCMSQ2	KDK	11D0020
Ethane	**233**	RA	ug/m³ Air	1.14	6.42	26.1	04/04/11 21:47	GCMSQ2	KDK	11D0020
Halocarbon 134A	ND	U	ug/m³ Air	0.323	4.36	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Propylene	**176**	RA	ug/m³ Air	0.675	8.99	26.1	03/30/11 21:06	VMSC	KRW	11C0385
Chlorodifluoromethane	ND	U	ug/m³ Air	0.511	3.69	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Propane	**177**	RA	ug/m³ Air	0.674	9.42	26.1	03/30/11 21:06	VMSC	KRW	11C0385
Dichlorodifluoromethane	**2.34**	J	ug/m³ Air	0.380	5.17	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Chloromethane	**0.931**	J	ug/m³ Air	0.130	2.16	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Isobutane	**27.4**		ug/m³ Air	0.187	2.48	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	U	ug/m³ Air	0.537	7.30	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Acetaldehyde	**14.2**		ug/m³ Air	0.484	1.88	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Vinyl chloride	ND	U	ug/m³ Air	0.186	2.67	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1-Butene/Isobutene	**142**	RA	ug/m³ Air	0.965	12.0	26.1	03/30/11 21:06	VMSC	KRW	11C0385
1,3-Butadiene	**5.79**		ug/m³ Air	0.150	2.31	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Butane	**115**		ug/m³ Air	0.161	2.48	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Methanol	**759**	RA, H2,B	ug/m³ Air	30.4	114	437	04/19/11 03:42	GCMSQ2	KDK	11D0170
trans-2-Butene	**7.95**		ug/m³ Air	0.162	2.40	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Neopentane	**0.310**	J	ug/m³ Air	0.240	3.08	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Dichlorofluoromethane	ND	U	ug/m³ Air	0.326	4.40	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Bromomethane	ND	U	ug/m³ Air	0.301	4.06	5.22	03/30/11 20:08	VMSC	KRW	11C0385
cis-2-Butene	**26.7**		ug/m³ Air	0.170	2.40	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Chloroethane	ND	U	ug/m³ Air	0.145	2.76	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Vinyl bromide	ND	U	ug/m³ Air	0.619	4.57	5.22	03/30/11 20:08	VMSC	KRW	11C0385
3-Methyl-1-butene	**12.0**		ug/m³ Air	0.189	2.99	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Ethanol	**39.4**		ug/m³ Air	0.207	1.97	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Acetonitrile	ND	U	ug/m³ Air	0.148	1.75	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Isopentane	**41.8**		ug/m³ Air	0.428	3.08	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Trichlorofluoromethane	**0.913**	J	ug/m³ Air	0.431	5.87	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1-Pentene	**57.0**		ug/m³ Air	0.201	2.99	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Acetone	**8.84**	B	ug/m³ Air	0.158	2.48	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Isopropyl alcohol	**1.52**	J	ug/m³ Air	0.207	2.57	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Acrylonitrile	ND	U	ug/m³ Air	0.607	2.27	5.22	03/30/11 20:08	VMSC	KRW	11C0385
n-Pentane	**73.2**		ug/m³ Air	0.229	3.08	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Diethyl ether	ND	U	ug/m³ Air	0.424	3.17	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Isoprene	**3.48**		ug/m³ Air	0.183	2.91	5.22	03/30/11 20:08	VMSC	KRW	11C0385
trans-2-Pentene	**6.19**		ug/m³ Air	0.269	2.99	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,1-Dichloroethene	ND	U	ug/m³ Air	0.366	4.14	5.22	03/30/11 20:08	VMSC	KRW	11C0385
cis-2-Pentene	**19.7**		ug/m³ Air	0.206	2.99	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Methylene chloride	**0.698**	J	ug/m³ Air	0.272	3.63	5.22	03/30/11 20:08	VMSC	KRW	11C0385

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Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-02 (MW10-15 - Air) - cont. **Sampled: 03/14/11 15:50**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
2-Methyl-2-butene	**6.82**		ug/m³ Air	0.175	2.99	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Carbon disulfide	**28.1**		ug/m³ Air	0.821	3.25	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Allyl chloride	ND	U	ug/m³ Air	0.238	3.27	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,1,2-Trichlorotrifluoroethane	**0.684**	J	ug/m³ Air	0.594	8.00	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2,2-Dimethylbutane	**1.05**	J	ug/m³ Air	0.256	3.68	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Cyclopentene	**2.10**	J	ug/m³ Air	0.169	2.91	5.22	03/30/11 20:08	VMSC	KRW	11C0385
trans-1,2-Dichloroethene	ND	U	ug/m³ Air	0.595	4.14	5.22	03/30/11 20:08	VMSC	KRW	11C0385
4-Methyl-1-pentene	**5.61**		ug/m³ Air	0.194	3.60	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Propanol	ND	U	ug/m³ Air	0.653	2.57	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,1-Dichloroethane	ND	U	ug/m³ Air	0.314	4.23	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Cyclopentane	**1.24**	J	ug/m³ Air	0.178	2.99	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2,3-Dimethylbutane	**2.55**	J	ug/m³ Air	0.189	3.68	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Methyl tert-Butyl Ether	ND	U	ug/m³ Air	0.515	3.77	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Isohexane	**20.8**		ug/m³ Air	0.213	3.68	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Vinyl acetate	ND	U	ug/m³ Air	1.16	3.68	5.22	03/30/11 20:08	VMSC	KRW	11C0385
cis/trans-4-Methyl-2-pentene	**1.73**	J	ug/m³ Air	0.539	7.19	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Butyraldehyde	**1.22**	J	ug/m³ Air	0.785	3.08	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2-Butanone (MEK)	**1.74**	J	ug/m³ Air	0.451	3.08	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Chloroprene	ND	U	ug/m³ Air	0.200	3.78	5.22	03/30/11 20:08	VMSC	KRW	11C0385
3-Methylpentane	**15.2**		ug/m³ Air	0.235	3.68	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2-Methyl-1-pentene	**15.7**		ug/m³ Air	0.230	3.60	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1-Hexene	**30.5**		ug/m³ Air	0.484	3.60	5.22	03/30/11 20:08	VMSC	KRW	11C0385
cis-1,2-Dichloroethene	ND	U	ug/m³ Air	0.307	4.14	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Bromochloromethane	ND	U	ug/m³ Air	0.422	5.53	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2-Ethyl-1-butene	**4.87**		ug/m³ Air	0.264	3.60	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Hexane	**32.9**		ug/m³ Air	0.247	3.68	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Chloroform	**24.3**		ug/m³ Air	0.378	5.10	5.22	03/30/11 20:08	VMSC	KRW	11C0385
cis-3-Hexene	**3.86**		ug/m³ Air	0.272	3.60	5.22	03/30/11 20:08	VMSC	KRW	11C0385
trans-2-Hexene	**2.81**	J	ug/m³ Air	0.201	3.60	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2-Methyl-2-pentene	**1.41**	J	ug/m³ Air	0.259	3.60	5.22	03/30/11 20:08	VMSC	KRW	11C0385
cis-3-Methyl-2-pentene	**1.26**	J	ug/m³ Air	0.264	3.60	5.22	03/30/11 20:08	VMSC	KRW	11C0385
cis-2-Hexene	**8.35**		ug/m³ Air	0.511	3.60	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Methylcyclopentane	**6.12**		ug/m³ Air	0.197	3.60	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,2-Dichloroethane	ND	U	ug/m³ Air	0.314	4.23	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2,4-Dimethylpentane	**1.74**	J	ug/m³ Air	0.318	4.28	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,1,1-Trichloroethane	ND	U	ug/m³ Air	0.419	5.70	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1-Methylcyclopentene	**0.669**	J	ug/m³ Air	0.265	3.51	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Benzene	**10.9**		ug/m³ Air	0.187	3.34	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Carbon tetrachloride	ND	U	ug/m³ Air	0.488	6.57	5.22	03/30/11 20:08	VMSC	KRW	11C0385
n-Butanol	**3.60**		ug/m³ Air	0.408	3.17	5.22	03/30/11 20:08	VMSC	KRW	11C0385

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-02 (MW10-15 - Air) - cont. **Sampled: 03/14/11 15:50**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Cyclohexane	**9.38**		ug/m³ Air	0.195	3.60	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Isoheptane	**13.9**		ug/m³ Air	0.318	4.28	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2,3-Dimethylpentane	**5.20**		ug/m³ Air	0.321	4.28	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Cyclohexene	**0.530**	J	ug/m³ Air	0.119	3.51	5.22	03/30/11 20:08	VMSC	KRW	11C0385
3-Methylhexane	**16.8**		ug/m³ Air	0.268	4.28	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,2-Dichloropropane	ND	U	ug/m³ Air	0.358	4.83	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Bromodichloromethane	ND	U	ug/m³ Air	0.535	7.00	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Trichloroethene	**0.758**	J	ug/m³ Air	0.417	5.61	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,4-Dioxane	ND	U	ug/m³ Air	0.402	3.76	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1-Heptene	**19.8**		ug/m³ Air	0.574	4.20	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2,2,4-Trimethylpentane	**1.79**	J	ug/m³ Air	0.362	4.88	5.22	03/30/11 20:08	VMSC	KRW	11C0385
trans-3-Heptene	ND	U	ug/m³ Air	0.305	4.20	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Heptane	**23.9**		ug/m³ Air	0.219	4.28	5.22	03/30/11 20:08	VMSC	KRW	11C0385
cis-3-Heptene	**3.67**	J	ug/m³ Air	0.130	4.20	5.22	03/30/11 20:08	VMSC	KRW	11C0385
trans-2-Heptene	**0.812**	J	ug/m³ Air	0.155	4.20	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2,4,4-Trimethyl-1-pentene	ND	U	ug/m³ Air	0.352	4.79	5.22	03/30/11 20:08	VMSC	KRW	11C0385
cis-1,3-Dichloropropene	ND	U	ug/m³ Air	0.352	4.74	5.22	03/30/11 20:08	VMSC	KRW	11C0385
4-Methyl-2-pentanone (MIBK)	**1.52**	J	ug/m³ Air	0.620	4.28	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Methylcyclohexane	**26.6**		ug/m³ Air	0.311	4.19	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2,4,4-Trimethyl-2-pentene	ND	U	ug/m³ Air	0.366	4.79	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2,5-Dimethylhexane	**1.61**	J	ug/m³ Air	0.359	4.88	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2,2,3-Trimethylpentane	**1.43**	J	ug/m³ Air	0.359	4.88	5.22	03/30/11 20:08	VMSC	KRW	11C0385
trans-1,3-Dichloropropene	ND	U	ug/m³ Air	0.352	4.74	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,1,2-Trichloroethane	ND	U	ug/m³ Air	0.419	5.70	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2,3,4-Trimethylpentane	**3.69**	J	ug/m³ Air	0.250	4.88	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Toluene	**99.3**		ug/m³ Air	0.292	3.94	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2-Hexanone	ND	U	ug/m³ Air	0.216	4.28	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2-Methylheptane	**11.2**		ug/m³ Air	0.362	4.88	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1-Methylcyclohexene	ND	U	ug/m³ Air	0.314	4.11	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Chlorodibromomethane	ND	U	ug/m³ Air	0.680	8.90	5.22	03/30/11 20:08	VMSC	KRW	11C0385
3-Methylheptane	**8.94**		ug/m³ Air	0.700	4.88	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Hexanal	**2.59**	J	ug/m³ Air	0.492	4.28	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,2-Dibromoethane (EDB)	ND	U	ug/m³ Air	0.596	8.03	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2,2,5-Trimethylhexane	**3.24**	J	ug/m³ Air	0.419	5.48	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1-Octene	**3.38**	J	ug/m³ Air	0.184	4.79	5.22	03/30/11 20:08	VMSC	KRW	11C0385
n-Octane	**19.9**		ug/m³ Air	0.366	4.88	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Tetrachloroethene	**4.33**	J	ug/m³ Air	0.526	7.08	5.22	03/30/11 20:08	VMSC	KRW	11C0385
cis-2-Octene	**1.76**	J	ug/m³ Air	0.352	4.79	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Chlorobenzene	ND	U	ug/m³ Air	0.360	4.81	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Ethylbenzene	**9.41**		ug/m³ Air	0.337	4.54	5.22	03/30/11 20:08	VMSC	KRW	11C0385

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Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-02 (MW10-15 - Air) - cont. **Sampled: 03/14/11 15:50**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
m-Xylene & p-Xylene	**32.4**		ug/m³ Air	0.673	9.07	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Bromoform	ND	U	ug/m³ Air	0.825	10.8	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Butyl acrylate	ND	U	ug/m³ Air	1.38	5.48	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Heptanal	**3.34**	J	ug/m³ Air	1.23	4.88	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Styrene	**0.409**	J	ug/m³ Air	0.330	4.45	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,1,2,2-Tetrachloroethane	ND	U	ug/m³ Air	0.532	7.17	5.22	03/30/11 20:08	VMSC	KRW	11C0385
o-Xylene	**20.6**		ug/m³ Air	0.337	4.54	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Xylenes, total	**53.0**		ug/m³ Air	0.500	13.6	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1-Nonene	**7.16**		ug/m³ Air	0.738	5.39	5.22	03/30/11 20:08	VMSC	KRW	11C0385
4-Nonene	**3.23**	J	ug/m³ Air	0.157	5.39	5.22	03/30/11 20:08	VMSC	KRW	11C0385
n-Nonane	**13.9**		ug/m³ Air	0.407	5.48	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Isopropylbenzene	**0.917**	J	ug/m³ Air	0.737	5.13	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Benzaldehyde	ND	U	ug/m³ Air	0.362	4.53	5.22	03/30/11 20:08	VMSC	KRW	11C0385
alpha-Pinene	**222**	RA	ug/m³ Air	2.18	29.1	26.1	03/30/11 21:06	VMSC	KRW	11C0385
2 & 3-Chlorotoluene	ND	U	ug/m³ Air	0.807	10.8	5.22	03/30/11 20:08	VMSC	KRW	11C0385
4-Chlorotoluene	ND	U	ug/m³ Air	0.733	5.41	5.22	03/30/11 20:08	VMSC	KRW	11C0385
n-Propylbenzene	**1.68**	J	ug/m³ Air	0.385	5.13	5.22	03/30/11 20:08	VMSC	KRW	11C0385
3-Ethyltoluene	**9.75**		ug/m³ Air	0.381	5.14	5.22	03/30/11 20:08	VMSC	KRW	11C0385
4-Ethyltoluene	**2.22**	J	ug/m³ Air	0.377	5.13	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,3,5-Trimethylbenzene	**3.54**	J	ug/m³ Air	0.381	5.13	5.22	03/30/11 20:08	VMSC	KRW	11C0385
2-Ethyltoluene	**2.42**	J	ug/m³ Air	0.381	5.14	5.22	03/30/11 20:08	VMSC	KRW	11C0385
beta-Pinene	**58.0**		ug/m³ Air	0.432	5.82	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,2,4-Trimethylbenzene	**9.74**		ug/m³ Air	0.381	5.13	5.22	03/30/11 20:08	VMSC	KRW	11C0385
tert-Butylbenzene	ND	U	ug/m³ Air	0.438	5.73	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1-Decene	ND	U	ug/m³ Air	0.820	5.99	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Benzyl chloride	ND	U	ug/m³ Air	1.43	5.41	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,3-Dichlorobenzene	ND	U	ug/m³ Air	0.462	6.28	5.22	03/30/11 20:08	VMSC	KRW	11C0385
n-Decane	**24.9**		ug/m³ Air	0.451	6.08	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,4-Dichlorobenzene	ND	U	ug/m³ Air	0.466	6.28	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Isobutylbenzene	**0.702**	J	ug/m³ Air	0.438	5.73	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,2,3-Trimethylbenzene	**3.20**	J	ug/m³ Air	0.744	5.13	5.22	03/30/11 20:08	VMSC	KRW	11C0385
4-Isopropyltoluene	**3.56**	J	ug/m³ Air	0.816	5.73	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,2-Dichlorobenzene	ND	U	ug/m³ Air	0.462	6.28	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Limonene	**26.4**		ug/m³ Air	0.804	5.82	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Indan	**1.56**	J	ug/m³ Air	0.386	5.05	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Indene	ND	U	ug/m³ Air	0.172	4.96	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,3-Diethylbenzene	**1.07**	J	ug/m³ Air	0.823	5.73	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,4-Diethylbenzene	ND	U	ug/m³ Air	0.815	5.73	5.22	03/30/11 20:08	VMSC	KRW	11C0385
n-Butylbenzene	ND	U	ug/m³ Air	0.212	5.73	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1-Undecene	ND	U	ug/m³ Air	0.469	6.59	5.22	03/30/11 20:08	VMSC	KRW	11C0385

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Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: AUC0212-02 (MW10-15 - Air) - cont.							**Sampled: 03/14/11 15:50**			
EPA TO15 - Volatile Organic Compounds by GC/MS - cont.										
n-Undecane	**13.0**		ug/m³ Air	0.263	6.68	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,2,4-Trichlorobenzene	ND	U	ug/m³ Air	0.556	7.75	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Naphthalene	**0.923**	J	ug/m³ Air	0.645	5.48	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Hexachlorobutadiene	ND	U	ug/m³ Air	0.833	11.1	5.22	03/30/11 20:08	VMSC	KRW	11C0385
1,2-Dichloroethene, Total	ND	U	ug/m³ Air	0.594	8.28	5.22	03/30/11 20:08	VMSC	KRW	11C0385
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*88 %*						03/30/11 20:08	VMSC	KRW	11C0385
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*92 %*	*RA*					03/30/11 21:06	VMSC	KRW	11C0385
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*88 %*	*RA*					04/04/11 16:09	GCMSQ2	KDK	11D0020
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*89 %*	*RA*					04/04/11 21:47	GCMSQ2	KDK	11D0020
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*78 %*	*RA, H2*					04/19/11 03:42	GCMSQ2	KDK	11D0170
Surr: Fluorobenzene (62-122%)	*81 %*						03/30/11 20:08	VMSC	KRW	11C0385
Surr: Fluorobenzene (62-122%)	*81 %*	*RA*					03/30/11 21:06	VMSC	KRW	11C0385
Surr: Fluorobenzene (62-122%)	*86 %*	*RA*					04/04/11 16:09	GCMSQ2	KDK	11D0020
Surr: Fluorobenzene (62-122%)	*80 %*	*RA*					04/04/11 21:47	GCMSQ2	KDK	11D0020
Surr: Fluorobenzene (62-122%)	*55 %*	*RA, H2,ZX*					04/19/11 03:42	GCMSQ2	KDK	11D0170
Surr: Toluene-d8 (67-127%)	*97 %*						03/30/11 20:08	VMSC	KRW	11C0385
Surr: Toluene-d8 (67-127%)	*100 %*	*RA*					03/30/11 21:06	VMSC	KRW	11C0385
Surr: Toluene-d8 (67-127%)	*97 %*	*RA*					04/04/11 16:09	GCMSQ2	KDK	11D0020
Surr: Toluene-d8 (67-127%)	*101 %*	*RA*					04/04/11 21:47	GCMSQ2	KDK	11D0020
Surr: Toluene-d8 (67-127%)	*102 %*	*RA, H2*					04/19/11 03:42	GCMSQ2	KDK	11D0170
Surr: 1,4-Dichlorobutane (76-136%)	*104 %*						03/30/11 20:08	VMSC	KRW	11C0385
Surr: 1,4-Dichlorobutane (76-136%)	*106 %*	*RA*					03/30/11 21:06	VMSC	KRW	11C0385
Surr: 1,4-Dichlorobutane (76-136%)	*106 %*	*RA*					04/04/11 16:09	GCMSQ2	KDK	11D0020
Surr: 1,4-Dichlorobutane (76-136%)	*105 %*	*RA*					04/04/11 21:47	GCMSQ2	KDK	11D0020
Surr: 1,4-Dichlorobutane (76-136%)	*93 %*	*RA, H2*					04/19/11 03:42	GCMSQ2	KDK	11D0170
Surr: 4-Bromofluorobenzene (73-133%)	*110 %*						03/30/11 20:08	VMSC	KRW	11C0385
Surr: 4-Bromofluorobenzene (73-133%)	*105 %*	*RA*					03/30/11 21:06	VMSC	KRW	11C0385
Surr: 4-Bromofluorobenzene (73-133%)	*111 %*	*RA*					04/04/11 16:09	GCMSQ2	KDK	11D0020
Surr: 4-Bromofluorobenzene (73-133%)	*109 %*	*RA*					04/04/11 21:47	GCMSQ2	KDK	11D0020
Surr: 4-Bromofluorobenzene (73-133%)	*98 %*	*RA, H2*					04/19/11 03:42	GCMSQ2	KDK	11D0170

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Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-03 (MW10-1 - Air) **Sampled: 03/14/11 17:25**

EPA TO15 - Volatile Organic Compounds by GC/MS

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Ethene	**812**	RA, H2	ug/m³ Air	47.2	304	1320	04/19/11 04:38	GCMSQ2	KDK	11D0170
Acetylene	**1.53**	RA	ug/m³ Air	0.182	1.22	5.74	04/04/11 17:05	GCMSQ2	KDK	11D0020
Ethane	**2250**	RA, H2	ug/m³ Air	57.8	326	1320	04/19/11 04:38	GCMSQ2	KDK	11D0170
Halocarbon 134A	**3.95**	J	ug/m³ Air	0.355	4.79	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Propylene	**919**	RA, H2	ug/m³ Air	25.3	456	1320	04/19/11 04:38	GCMSQ2	KDK	11D0170
Chlorodifluoromethane	ND	U	ug/m³ Air	0.561	4.06	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Propane	**1350**	RA, H2	ug/m³ Air	48.2	478	1320	04/19/11 04:38	GCMSQ2	KDK	11D0170
Dichlorodifluoromethane	**2.59**	J	ug/m³ Air	0.417	5.68	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Chloromethane	**1.19**	J	ug/m³ Air	0.143	2.37	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Isobutane	**378**	RA	ug/m³ Air	1.63	13.6	28.7	04/04/11 23:40	GCMSQ2	KDK	11D0020
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	U	ug/m³ Air	0.590	8.03	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Acetaldehyde	**19.4**		ug/m³ Air	0.532	2.07	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Vinyl chloride	ND	U	ug/m³ Air	0.205	2.93	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1-Butene/Isobutene	**598**	RA, H2,J	ug/m³ Air	31.3	607	1320	04/19/11 04:38	GCMSQ2	KDK	11D0170
1,3-Butadiene	**30.7**		ug/m³ Air	0.165	2.54	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Butane	**514**	RA, H2,J	ug/m³ Air	40.6	629	1320	04/19/11 04:38	GCMSQ2	KDK	11D0170
Methanol	**2030**	RA, H2,B	ug/m³ Air	92.3	347	1320	04/19/11 04:38	GCMSQ2	KDK	11D0170
trans-2-Butene	**51.9**		ug/m³ Air	0.178	2.63	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Neopentane	**3.52**		ug/m³ Air	0.264	3.39	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Dichlorofluoromethane	ND	U	ug/m³ Air	0.359	4.83	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Bromomethane	ND	U	ug/m³ Air	0.331	4.46	5.74	03/30/11 22:07	VMSC	KRW	11C0385
cis-2-Butene	**216**	RA	ug/m³ Air	1.43	13.2	28.7	04/04/11 23:40	GCMSQ2	KDK	11D0020
Chloroethane	ND	U	ug/m³ Air	0.160	3.03	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Vinyl bromide	ND	U	ug/m³ Air	0.680	5.02	5.74	03/30/11 22:07	VMSC	KRW	11C0385
3-Methyl-1-butene	**113**		ug/m³ Air	0.207	3.29	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Ethanol	**230**	RA	ug/m³ Air	1.58	10.8	28.7	04/04/11 23:40	GCMSQ2	KDK	11D0020
Acetonitrile	ND	U	ug/m³ Air	0.163	1.93	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Isopentane	**383**	RA	ug/m³ Air	2.50	16.9	28.7	04/04/11 23:40	GCMSQ2	KDK	11D0020
Trichlorofluoromethane	**1.02**	J	ug/m³ Air	0.474	6.45	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1-Pentene	**395**	RA	ug/m³ Air	1.23	16.5	28.7	04/04/11 23:40	GCMSQ2	KDK	11D0020
Acetone	**8.37**	B	ug/m³ Air	0.173	2.73	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Isopropyl alcohol	**4.00**		ug/m³ Air	0.228	2.82	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Acrylonitrile	ND	U	ug/m³ Air	0.667	2.49	5.74	03/30/11 22:07	VMSC	KRW	11C0385
n-Pentane	**436**	RA	ug/m³ Air	1.96	16.9	28.7	04/04/11 23:40	GCMSQ2	KDK	11D0020
Diethyl ether	ND	U	ug/m³ Air	0.466	3.48	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Isoprene	**13.1**		ug/m³ Air	0.201	3.20	5.74	03/30/11 22:07	VMSC	KRW	11C0385
trans-2-Pentene	**31.8**		ug/m³ Air	0.296	3.29	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,1-Dichloroethene	ND	U	ug/m³ Air	0.402	4.55	5.74	03/30/11 22:07	VMSC	KRW	11C0385
cis-2-Pentene	**112**		ug/m³ Air	0.226	3.29	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Methylene chloride	**0.796**	J	ug/m³ Air	0.299	3.99	5.74	03/30/11 22:07	VMSC	KRW	11C0385

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-03 (MW10-1 - Air) - cont. **Sampled: 03/14/11 17:25**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
2-Methyl-2-butene	**38.5**		ug/m³ Air	0.193	3.29	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Carbon disulfide	**53.3**		ug/m³ Air	0.903	3.58	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Allyl chloride	ND	U	ug/m³ Air	0.262	3.59	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,1,2-Trichlorotrifluoroethane	ND	U	ug/m³ Air	0.653	8.80	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2,2-Dimethylbutane	**8.66**		ug/m³ Air	0.281	4.05	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Cyclopentene	**10.9**		ug/m³ Air	0.186	3.20	5.74	03/30/11 22:07	VMSC	KRW	11C0385
trans-1,2-Dichloroethene	ND	U	ug/m³ Air	0.653	4.55	5.74	03/30/11 22:07	VMSC	KRW	11C0385
4-Methyl-1-pentene	**44.3**		ug/m³ Air	0.213	3.95	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Propanol	**55.4**		ug/m³ Air	0.718	2.82	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,1-Dichloroethane	ND	U	ug/m³ Air	0.345	4.65	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Cyclopentane	**4.35**		ug/m³ Air	0.195	3.29	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2,3-Dimethylbutane	**19.9**		ug/m³ Air	0.208	4.05	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Methyl tert-Butyl Ether	ND	U	ug/m³ Air	0.566	4.14	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Isohexane	**112**		ug/m³ Air	0.234	4.05	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Vinyl acetate	ND	U	ug/m³ Air	1.27	4.04	5.74	03/30/11 22:07	VMSC	KRW	11C0385
cis/trans-4-Methyl-2-pentene	**12.2**		ug/m³ Air	0.592	7.91	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Butyraldehyde	**1.63**	J	ug/m³ Air	0.863	3.39	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2-Butanone (MEK)	**3.14**	J	ug/m³ Air	0.496	3.39	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Chloroprene	ND	U	ug/m³ Air	0.219	4.16	5.74	03/30/11 22:07	VMSC	KRW	11C0385
3-Methylpentane	**101**		ug/m³ Air	0.258	4.05	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2-Methyl-1-pentene	**94.8**		ug/m³ Air	0.253	3.95	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1-Hexene	**132**		ug/m³ Air	0.532	3.95	5.74	03/30/11 22:07	VMSC	KRW	11C0385
cis-1,2-Dichloroethene	ND	U	ug/m³ Air	0.338	4.55	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Bromochloromethane	ND	U	ug/m³ Air	0.464	6.07	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2-Ethyl-1-butene	**27.9**		ug/m³ Air	0.291	3.95	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Hexane	**121**		ug/m³ Air	0.272	4.05	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Chloroform	**25.6**		ug/m³ Air	0.416	5.61	5.74	03/30/11 22:07	VMSC	KRW	11C0385
cis-3-Hexene	**19.5**		ug/m³ Air	0.299	3.95	5.74	03/30/11 22:07	VMSC	KRW	11C0385
trans-2-Hexene	**11.6**		ug/m³ Air	0.220	3.95	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2-Methyl-2-pentene	**7.37**		ug/m³ Air	0.285	3.95	5.74	03/30/11 22:07	VMSC	KRW	11C0385
cis-3-Methyl-2-pentene	**7.84**		ug/m³ Air	0.291	3.95	5.74	03/30/11 22:07	VMSC	KRW	11C0385
cis-2-Hexene	**40.8**		ug/m³ Air	0.562	3.95	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Methylcyclopentane	**24.9**		ug/m³ Air	0.217	3.95	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,2-Dichloroethane	ND	U	ug/m³ Air	0.345	4.65	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2,4-Dimethylpentane	**9.26**		ug/m³ Air	0.349	4.70	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,1,1-Trichloroethane	ND	U	ug/m³ Air	0.460	6.26	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1-Methylcyclopentene	**3.82**	J	ug/m³ Air	0.292	3.86	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Benzene	**14.6**		ug/m³ Air	0.205	3.67	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Carbon tetrachloride	ND	U	ug/m³ Air	0.536	7.22	5.74	03/30/11 22:07	VMSC	KRW	11C0385
n-Butanol	**27.3**		ug/m³ Air	0.448	3.48	5.74	03/30/11 22:07	VMSC	KRW	11C0385

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-03 (MW10-1 - Air) - cont. **Sampled: 03/14/11 17:25**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Cyclohexane	**38.3**		ug/m³ Air	0.215	3.95	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Isoheptane	**53.2**		ug/m³ Air	0.349	4.70	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2,3-Dimethylpentane	**24.5**		ug/m³ Air	0.353	4.70	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Cyclohexene	**1.86**	J	ug/m³ Air	0.131	3.86	5.74	03/30/11 22:07	VMSC	KRW	11C0385
3-Methylhexane	**73.0**		ug/m³ Air	0.294	4.70	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,2-Dichloropropane	ND	U	ug/m³ Air	0.394	5.31	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Bromodichloromethane	ND	U	ug/m³ Air	0.588	7.69	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Trichloroethene	**0.898**	J	ug/m³ Air	0.458	6.17	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,4-Dioxane	ND	U	ug/m³ Air	0.442	4.14	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1-Heptene	**48.5**		ug/m³ Air	0.631	4.61	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2,2,4-Trimethylpentane	**6.18**		ug/m³ Air	0.398	5.36	5.74	03/30/11 22:07	VMSC	KRW	11C0385
trans-3-Heptene	**4.55**	J	ug/m³ Air	0.335	4.61	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Heptane	**48.1**		ug/m³ Air	0.241	4.70	5.74	03/30/11 22:07	VMSC	KRW	11C0385
cis-3-Heptene	**19.4**		ug/m³ Air	0.143	4.61	5.74	03/30/11 22:07	VMSC	KRW	11C0385
trans-2-Heptene	**2.12**	J	ug/m³ Air	0.170	4.61	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2,4,4-Trimethyl-1-pentene	**0.516**	J	ug/m³ Air	0.387	5.27	5.74	03/30/11 22:07	VMSC	KRW	11C0385
cis-1,3-Dichloropropene	ND	U	ug/m³ Air	0.387	5.21	5.74	03/30/11 22:07	VMSC	KRW	11C0385
4-Methyl-2-pentanone (MIBK)	ND	U	ug/m³ Air	0.682	4.70	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Methylcyclohexane	**86.6**		ug/m³ Air	0.342	4.61	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2,4,4-Trimethyl-2-pentene	ND	U	ug/m³ Air	0.402	5.27	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2,5-Dimethylhexane	**6.31**		ug/m³ Air	0.394	5.36	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2,2,3-Trimethylpentane	**6.86**		ug/m³ Air	0.394	5.36	5.74	03/30/11 22:07	VMSC	KRW	11C0385
trans-1,3-Dichloropropene	ND	U	ug/m³ Air	0.387	5.21	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,1,2-Trichloroethane	ND	U	ug/m³ Air	0.460	6.26	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2,3,4-Trimethylpentane	**22.2**		ug/m³ Air	0.275	5.36	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Toluene	**182**		ug/m³ Air	0.321	4.33	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2-Hexanone	ND	U	ug/m³ Air	0.238	4.70	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2-Methylheptane	**26.4**		ug/m³ Air	0.398	5.36	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1-Methylcyclohexene	ND	U	ug/m³ Air	0.345	4.52	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Chlorodibromomethane	ND	U	ug/m³ Air	0.747	9.78	5.74	03/30/11 22:07	VMSC	KRW	11C0385
3-Methylheptane	**32.9**		ug/m³ Air	0.770	5.36	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Hexanal	**5.00**		ug/m³ Air	0.541	4.70	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,2-Dibromoethane (EDB)	ND	U	ug/m³ Air	0.655	8.82	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2,2,5-Trimethylhexane	**19.6**		ug/m³ Air	0.460	6.02	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1-Octene	**5.20**	J	ug/m³ Air	0.203	5.27	5.74	03/30/11 22:07	VMSC	KRW	11C0385
n-Octane	**21.5**		ug/m³ Air	0.402	5.36	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Tetrachloroethene	**19.0**		ug/m³ Air	0.578	7.79	5.74	03/30/11 22:07	VMSC	KRW	11C0385
cis-2-Octene	**4.08**	J	ug/m³ Air	0.387	5.27	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Chlorobenzene	ND	U	ug/m³ Air	0.396	5.29	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Ethylbenzene	**5.82**		ug/m³ Air	0.370	4.98	5.74	03/30/11 22:07	VMSC	KRW	11C0385

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Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-03 (MW10-1 - Air) - cont. **Sampled: 03/14/11 17:25**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
m-Xylene & p-Xylene	**18.1**		ug/m³ Air	0.740	9.97	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Bromoform	ND	U	ug/m³ Air	0.907	11.9	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Butyl acrylate	ND	U	ug/m³ Air	1.52	6.02	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Heptanal	**6.30**		ug/m³ Air	1.35	5.36	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Styrene	ND	U	ug/m³ Air	0.363	4.89	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,1,2,2-Tetrachloroethane	ND	U	ug/m³ Air	0.585	7.88	5.74	03/30/11 22:07	VMSC	KRW	11C0385
o-Xylene	**12.1**		ug/m³ Air	0.370	4.98	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Xylenes, total	**30.3**		ug/m³ Air	0.549	15.0	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1-Nonene	**3.23**	J	ug/m³ Air	0.811	5.93	5.74	03/30/11 22:07	VMSC	KRW	11C0385
4-Nonene	**4.17**	J	ug/m³ Air	0.172	5.93	5.74	03/30/11 22:07	VMSC	KRW	11C0385
n-Nonane	**1.93**	J	ug/m³ Air	0.447	6.02	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Isopropylbenzene	ND	U	ug/m³ Air	0.810	5.64	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Benzaldehyde	ND	U	ug/m³ Air	0.398	4.98	5.74	03/30/11 22:07	VMSC	KRW	11C0385
alpha-Pinene	**1.80**	J	ug/m³ Air	0.479	6.40	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2 & 3-Chlorotoluene	ND	U	ug/m³ Air	0.886	11.9	5.74	03/30/11 22:07	VMSC	KRW	11C0385
4-Chlorotoluene	ND	U	ug/m³ Air	0.805	5.94	5.74	03/30/11 22:07	VMSC	KRW	11C0385
n-Propylbenzene	**0.742**	J	ug/m³ Air	0.423	5.64	5.74	03/30/11 22:07	VMSC	KRW	11C0385
3-Ethyltoluene	**2.36**	J	ug/m³ Air	0.419	5.64	5.74	03/30/11 22:07	VMSC	KRW	11C0385
4-Ethyltoluene	**1.05**	J	ug/m³ Air	0.415	5.64	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,3,5-Trimethylbenzene	**1.50**	J	ug/m³ Air	0.419	5.64	5.74	03/30/11 22:07	VMSC	KRW	11C0385
2-Ethyltoluene	**0.880**	J	ug/m³ Air	0.419	5.64	5.74	03/30/11 22:07	VMSC	KRW	11C0385
beta-Pinene	**0.985**	J	ug/m³ Air	0.475	6.40	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,2,4-Trimethylbenzene	**4.11**	J	ug/m³ Air	0.419	5.64	5.74	03/30/11 22:07	VMSC	KRW	11C0385
tert-Butylbenzene	ND	U	ug/m³ Air	0.481	6.30	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1-Decene	ND	U	ug/m³ Air	0.902	6.59	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Benzyl chloride	ND	U	ug/m³ Air	1.58	5.94	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,3-Dichlorobenzene	ND	U	ug/m³ Air	0.507	6.90	5.74	03/30/11 22:07	VMSC	KRW	11C0385
n-Decane	**4.10**	J	ug/m³ Air	0.496	6.68	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,4-Dichlorobenzene	ND	U	ug/m³ Air	0.512	6.90	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Isobutylbenzene	ND	U	ug/m³ Air	0.481	6.30	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,2,3-Trimethylbenzene	**1.29**	J	ug/m³ Air	0.818	5.64	5.74	03/30/11 22:07	VMSC	KRW	11C0385
4-Isopropyltoluene	**1.90**	J	ug/m³ Air	0.897	6.30	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,2-Dichlorobenzene	ND	U	ug/m³ Air	0.507	6.90	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Limonene	**3.31**	J	ug/m³ Air	0.884	6.40	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Indan	**0.724**	J	ug/m³ Air	0.424	5.55	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Indene	ND	U	ug/m³ Air	0.189	5.46	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,3-Diethylbenzene	ND	U	ug/m³ Air	0.905	6.30	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,4-Diethylbenzene	ND	U	ug/m³ Air	0.896	6.30	5.74	03/30/11 22:07	VMSC	KRW	11C0385
n-Butylbenzene	ND	U	ug/m³ Air	0.233	6.30	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1-Undecene	**5.84**	J	ug/m³ Air	0.515	7.25	5.74	03/30/11 22:07	VMSC	KRW	11C0385

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Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: AUC0212-03 (MW10-1 - Air) - cont.							**Sampled: 03/14/11 17:25**			
EPA TO15 - Volatile Organic Compounds by GC/MS - cont.										
n-Undecane	**1.08**	J	ug/m³ Air	0.290	7.34	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,2,4-Trichlorobenzene	ND	U	ug/m³ Air	0.611	8.52	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Naphthalene	ND	U	ug/m³ Air	0.709	6.02	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Hexachlorobutadiene	ND	U	ug/m³ Air	0.916	12.2	5.74	03/30/11 22:07	VMSC	KRW	11C0385
1,2-Dichloroethene, Total	ND	U	ug/m³ Air	0.653	9.10	5.74	03/30/11 22:07	VMSC	KRW	11C0385
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*87 %*						03/30/11 22:07	VMSC	KRW	11C0385
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*96 %*	*RA*					04/04/11 17:05	GCMSQ2	KDK	11D0020
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*105 %*	*RA*					04/04/11 23:40	GCMSQ2	KDK	11D0020
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*80 %*	*RA, H2*					04/19/11 04:38	GCMSQ2	KDK	11D0170
Surr: Fluorobenzene (62-122%)	*86 %*						03/30/11 22:07	VMSC	KRW	11C0385
Surr: Fluorobenzene (62-122%)	*113 %*	*RA*					04/04/11 17:05	GCMSQ2	KDK	11D0020
Surr: Fluorobenzene (62-122%)	*103 %*	*RA*					04/04/11 23:40	GCMSQ2	KDK	11D0020
Surr: Fluorobenzene (62-122%)	*57 %*	*RA, H2,ZX*					04/19/11 04:38	GCMSQ2	KDK	11D0170
Surr: Toluene-d8 (67-127%)	*99 %*						03/30/11 22:07	VMSC	KRW	11C0385
Surr: Toluene-d8 (67-127%)	*96 %*	*RA*					04/04/11 17:05	GCMSQ2	KDK	11D0020
Surr: Toluene-d8 (67-127%)	*102 %*	*RA*					04/04/11 23:40	GCMSQ2	KDK	11D0020
Surr: Toluene-d8 (67-127%)	*104 %*	*RA, H2*					04/19/11 04:38	GCMSQ2	KDK	11D0170
Surr: 1,4-Dichlorobutane (76-136%)	*104 %*						03/30/11 22:07	VMSC	KRW	11C0385
Surr: 1,4-Dichlorobutane (76-136%)	*101 %*	*RA*					04/04/11 17:05	GCMSQ2	KDK	11D0020
Surr: 1,4-Dichlorobutane (76-136%)	*105 %*	*RA*					04/04/11 23:40	GCMSQ2	KDK	11D0020
Surr: 1,4-Dichlorobutane (76-136%)	*97 %*	*RA, H2*					04/19/11 04:38	GCMSQ2	KDK	11D0170
Surr: 4-Bromofluorobenzene (73-133%)	*109 %*						03/30/11 22:07	VMSC	KRW	11C0385
Surr: 4-Bromofluorobenzene (73-133%)	*105 %*	*RA*					04/04/11 17:05	GCMSQ2	KDK	11D0020
Surr: 4-Bromofluorobenzene (73-133%)	*108 %*	*RA*					04/04/11 23:40	GCMSQ2	KDK	11D0020
Surr: 4-Bromofluorobenzene (73-133%)	*104 %*	*RA, H2*					04/19/11 04:38	GCMSQ2	KDK	11D0170

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-04 (MW10-6 - Air) **Sampled: 03/14/11 19:00**

EPA TO15 - Volatile Organic Compounds by GC/MS

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Ethene	**265**	RA	ug/m³ Air	1.02	6.57	28.6	04/05/11 01:32	GCMSQ2	KDK	11D0020
Acetylene	**0.925**	RA,J	ug/m³ Air	0.181	1.22	5.73	04/04/11 18:02	GCMSQ2	KDK	11D0020
Ethane	**314**	RA, H2	ug/m³ Air	3.24	18.3	74.2	04/19/11 05:35	GCMSQ2	KDK	11D0170
Halocarbon 134A	**0.800**	J	ug/m³ Air	0.354	4.78	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Propylene	**283**	RA	ug/m³ Air	0.547	9.85	28.6	04/05/11 01:32	GCMSQ2	KDK	11D0020
Chlorodifluoromethane	**0.620**	J	ug/m³ Air	0.560	4.05	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Propane	**292**	RA	ug/m³ Air	1.04	10.3	28.6	04/05/11 01:32	GCMSQ2	KDK	11D0020
Dichlorodifluoromethane	**2.83**	J	ug/m³ Air	0.416	5.66	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Chloromethane	**1.70**	J	ug/m³ Air	0.143	2.36	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Isobutane	**40.2**		ug/m³ Air	0.205	2.72	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	U	ug/m³ Air	0.588	8.00	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Acetaldehyde	**16.4**	B	ug/m³ Air	0.531	2.06	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Vinyl chloride	**0.214**	J	ug/m³ Air	0.204	2.93	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1-Butene/Isobutene	**178**	RA	ug/m³ Air	0.677	13.1	28.6	04/05/11 01:32	GCMSQ2	KDK	11D0020
1,3-Butadiene	**4.35**		ug/m³ Air	0.165	2.53	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Butane	**137**	RA	ug/m³ Air	0.878	13.6	28.6	04/05/11 01:32	GCMSQ2	KDK	11D0020
Methanol	**131**	RA,B	ug/m³ Air	2.00	7.50	28.6	04/05/11 01:32	GCMSQ2	KDK	11D0020
trans-2-Butene	**8.77**		ug/m³ Air	0.177	2.63	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Neopentane	**0.747**	J	ug/m³ Air	0.263	3.38	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Dichlorofluoromethane	ND	U	ug/m³ Air	0.358	4.82	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Bromomethane	ND	U	ug/m³ Air	0.330	4.45	5.73	03/31/11 17:59	VMSC	KRW	11C0400
cis-2-Butene	**25.6**		ug/m³ Air	0.186	2.63	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Chloroethane	ND	U	ug/m³ Air	0.159	3.02	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Vinyl bromide	ND	U	ug/m³ Air	0.679	5.01	5.73	03/31/11 17:59	VMSC	KRW	11C0400
3-Methyl-1-butene	**13.7**		ug/m³ Air	0.207	3.28	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Ethanol	**398**	RA	ug/m³ Air	1.58	10.8	28.6	04/05/11 01:32	GCMSQ2	KDK	11D0020
Acetonitrile	**0.207**	J	ug/m³ Air	0.162	1.92	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Isopentane	**54.4**		ug/m³ Air	0.469	3.38	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Trichlorofluoromethane	**1.21**	J	ug/m³ Air	0.473	6.43	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1-Pentene	**50.2**		ug/m³ Air	0.220	3.28	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Acetone	**19.3**	B	ug/m³ Air	0.173	2.72	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Isopropyl alcohol	**2.07**	J	ug/m³ Air	0.227	2.81	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Acrylonitrile	ND	U	ug/m³ Air	0.665	2.48	5.73	03/31/11 17:59	VMSC	KRW	11C0400
n-Pentane	**29.2**		ug/m³ Air	0.251	3.38	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Diethyl ether	ND	U	ug/m³ Air	0.465	3.47	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Isoprene	**1.44**	J	ug/m³ Air	0.200	3.19	5.73	03/31/11 17:59	VMSC	KRW	11C0400
trans-2-Pentene	**2.23**	J	ug/m³ Air	0.295	3.28	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,1-Dichloroethene	ND	U	ug/m³ Air	0.401	4.54	5.73	03/31/11 17:59	VMSC	KRW	11C0400
cis-2-Pentene	**6.69**		ug/m³ Air	0.226	3.28	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Methylene chloride	**0.973**	J	ug/m³ Air	0.298	3.98	5.73	03/31/11 17:59	VMSC	KRW	11C0400

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-04 (MW10-6 - Air) - cont. **Sampled: 03/14/11 19:00**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
2-Methyl-2-butene	**3.75**		ug/m³ Air	0.192	3.28	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Carbon disulfide	**40.8**		ug/m³ Air	0.900	3.57	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Allyl chloride	ND	U	ug/m³ Air	0.261	3.58	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,1,2-Trichlorotrifluoroethane	ND	U	ug/m³ Air	0.651	8.78	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2,2-Dimethylbutane	**2.58**	J	ug/m³ Air	0.281	4.04	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Cyclopentene	**1.35**	J	ug/m³ Air	0.185	3.19	5.73	03/31/11 17:59	VMSC	KRW	11C0400
trans-1,2-Dichloroethene	ND	U	ug/m³ Air	0.652	4.54	5.73	03/31/11 17:59	VMSC	KRW	11C0400
4-Methyl-1-pentene	**5.33**		ug/m³ Air	0.212	3.94	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Propanol	**31.2**		ug/m³ Air	0.716	2.81	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,1-Dichloroethane	ND	U	ug/m³ Air	0.344	4.63	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Cyclopentane	**2.32**	J	ug/m³ Air	0.195	3.28	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2,3-Dimethylbutane	**5.73**		ug/m³ Air	0.208	4.04	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Methyl tert-Butyl Ether	ND	U	ug/m³ Air	0.565	4.13	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Isohexane	**27.8**		ug/m³ Air	0.234	4.04	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Vinyl acetate	ND	U	ug/m³ Air	1.27	4.03	5.73	03/31/11 17:59	VMSC	KRW	11C0400
cis/trans-4-Methyl-2-pentene	**3.23**	J	ug/m³ Air	0.591	7.89	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Butyraldehyde	**4.07**		ug/m³ Air	0.861	3.38	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2-Butanone (MEK)	**8.54**		ug/m³ Air	0.494	3.38	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Chloroprene	ND	U	ug/m³ Air	0.219	4.14	5.73	03/31/11 17:59	VMSC	KRW	11C0400
3-Methylpentane	**20.3**		ug/m³ Air	0.257	4.04	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2-Methyl-1-pentene	**9.53**		ug/m³ Air	0.252	3.94	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1-Hexene	ND	U	ug/m³ Air	0.530	3.94	5.73	03/31/11 17:59	VMSC	KRW	11C0400
cis-1,2-Dichloroethene	**4.25**	J	ug/m³ Air	0.337	4.54	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Bromochloromethane	ND	U	ug/m³ Air	0.463	6.06	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2-Ethyl-1-butene	**2.33**	J	ug/m³ Air	0.290	3.94	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Hexane	**2.15**	J	ug/m³ Air	0.271	4.04	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Chloroform	**24.7**		ug/m³ Air	0.415	5.59	5.73	03/31/11 17:59	VMSC	KRW	11C0400
cis-3-Hexene	**0.903**	J	ug/m³ Air	0.298	3.94	5.73	03/31/11 17:59	VMSC	KRW	11C0400
trans-2-Hexene	ND	U	ug/m³ Air	0.220	3.94	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2-Methyl-2-pentene	**0.457**	J	ug/m³ Air	0.284	3.94	5.73	03/31/11 17:59	VMSC	KRW	11C0400
cis-3-Methyl-2-pentene	**0.365**	J	ug/m³ Air	0.290	3.94	5.73	03/31/11 17:59	VMSC	KRW	11C0400
cis-2-Hexene	**0.645**	J	ug/m³ Air	0.561	3.94	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Methylcyclopentane	**14.5**		ug/m³ Air	0.216	3.94	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,2-Dichloroethane	ND	U	ug/m³ Air	0.344	4.63	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2,4-Dimethylpentane	**4.24**	J	ug/m³ Air	0.348	4.69	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,1,1-Trichloroethane	ND	U	ug/m³ Air	0.459	6.25	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1-Methylcyclopentene	**0.706**	J	ug/m³ Air	0.291	3.85	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Benzene	**1.21**	J	ug/m³ Air	0.205	3.66	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Carbon tetrachloride	ND	U	ug/m³ Air	0.535	7.20	5.73	03/31/11 17:59	VMSC	KRW	11C0400
n-Butanol	**21.6**		ug/m³ Air	0.447	3.47	5.73	03/31/11 17:59	VMSC	KRW	11C0400

Golder Associates Ltd.
500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-04 (MW10-6 - Air) - cont. **Sampled: 03/14/11 19:00**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Cyclohexane	**27.8**		ug/m³ Air	0.214	3.94	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Isoheptane	**8.77**		ug/m³ Air	0.348	4.69	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2,3-Dimethylpentane	**11.9**		ug/m³ Air	0.352	4.69	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Cyclohexene	**0.635**	J	ug/m³ Air	0.131	3.85	5.73	03/31/11 17:59	VMSC	KRW	11C0400
3-Methylhexane	**21.8**		ug/m³ Air	0.294	4.69	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,2-Dichloropropane	ND	U	ug/m³ Air	0.393	5.29	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Bromodichloromethane	ND	U	ug/m³ Air	0.586	7.67	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Trichloroethene	**4.42**	J	ug/m³ Air	0.457	6.15	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,4-Dioxane	ND	U	ug/m³ Air	0.441	4.13	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1-Heptene	**28.5**		ug/m³ Air	0.629	4.60	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2,2,4-Trimethylpentane	**2.73**	J	ug/m³ Air	0.397	5.35	5.73	03/31/11 17:59	VMSC	KRW	11C0400
trans-3-Heptene	ND	U	ug/m³ Air	0.335	4.60	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Heptane	**1.48**	J	ug/m³ Air	0.240	4.69	5.73	03/31/11 17:59	VMSC	KRW	11C0400
cis-3-Heptene	**1.23**	J	ug/m³ Air	0.143	4.60	5.73	03/31/11 17:59	VMSC	KRW	11C0400
trans-2-Heptene	ND	U	ug/m³ Air	0.169	4.60	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2,4,4-Trimethyl-1-pentene	ND	U	ug/m³ Air	0.386	5.25	5.73	03/31/11 17:59	VMSC	KRW	11C0400
cis-1,3-Dichloropropene	ND	U	ug/m³ Air	0.386	5.20	5.73	03/31/11 17:59	VMSC	KRW	11C0400
4-Methyl-2-pentanone (MIBK)	ND	U	ug/m³ Air	0.680	4.69	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Methylcyclohexane	**89.6**		ug/m³ Air	0.341	4.60	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2,4,4-Trimethyl-2-pentene	ND	U	ug/m³ Air	0.401	5.25	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2,5-Dimethylhexane	**3.39**	J	ug/m³ Air	0.393	5.35	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2,2,3-Trimethylpentane	**4.58**	J	ug/m³ Air	0.393	5.35	5.73	03/31/11 17:59	VMSC	KRW	11C0400
trans-1,3-Dichloropropene	ND	U	ug/m³ Air	0.386	5.20	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,1,2-Trichloroethane	ND	U	ug/m³ Air	0.459	6.25	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2,3,4-Trimethylpentane	**11.1**		ug/m³ Air	0.274	5.35	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Toluene	**35.4**		ug/m³ Air	0.320	4.32	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2-Hexanone	ND	U	ug/m³ Air	0.237	4.69	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2-Methylheptane	**1.77**	J	ug/m³ Air	0.397	5.35	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1-Methylcyclohexene	**1.28**	J	ug/m³ Air	0.344	4.51	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Chlorodibromomethane	ND	U	ug/m³ Air	0.745	9.75	5.73	03/31/11 17:59	VMSC	KRW	11C0400
3-Methylheptane	**2.16**	J	ug/m³ Air	0.768	5.35	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Hexanal	ND	U	ug/m³ Air	0.540	4.69	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,2-Dibromoethane (EDB)	ND	U	ug/m³ Air	0.653	8.80	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2,2,5-Trimethylhexane	**9.62**		ug/m³ Air	0.459	6.01	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1-Octene	**6.31**		ug/m³ Air	0.202	5.25	5.73	03/31/11 17:59	VMSC	KRW	11C0400
n-Octane	**2.11**	J	ug/m³ Air	0.401	5.35	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Tetrachloroethene	**228**		ug/m³ Air	0.576	7.77	5.73	03/31/11 17:59	VMSC	KRW	11C0400
cis-2-Octene	**3.99**	J	ug/m³ Air	0.386	5.25	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Chlorobenzene	ND	U	ug/m³ Air	0.395	5.27	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Ethylbenzene	**17.7**		ug/m³ Air	0.369	4.97	5.73	03/31/11 17:59	VMSC	KRW	11C0400

Golder Associates Ltd.
500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-04 (MW10-6 - Air) - cont. **Sampled: 03/14/11 19:00**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
m-Xylene & p-Xylene	**42.4**		ug/m³ Air	0.738	9.94	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Bromoform	ND	U	ug/m³ Air	0.904	11.8	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Butyl acrylate	ND	U	ug/m³ Air	1.52	6.00	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Heptanal	ND	U	ug/m³ Air	1.35	5.35	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Styrene	ND	U	ug/m³ Air	0.362	4.88	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,1,2,2-Tetrachloroethane	ND	U	ug/m³ Air	0.583	7.86	5.73	03/31/11 17:59	VMSC	KRW	11C0400
o-Xylene	**53.8**		ug/m³ Air	0.369	4.97	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Xylenes, total	**96.1**		ug/m³ Air	0.548	14.9	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1-Nonene	**23.2**		ug/m³ Air	0.809	5.91	5.73	03/31/11 17:59	VMSC	KRW	11C0400
4-Nonene	**15.8**		ug/m³ Air	0.172	5.91	5.73	03/31/11 17:59	VMSC	KRW	11C0400
n-Nonane	**2.05**	J	ug/m³ Air	0.446	6.01	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Isopropylbenzene	**27.4**		ug/m³ Air	0.808	5.63	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Benzaldehyde	ND	U	ug/m³ Air	0.397	4.97	5.73	03/31/11 17:59	VMSC	KRW	11C0400
alpha-Pinene	**577**	RA, H2	ug/m³ Air	6.20	82.7	74.2	04/24/11 10:41	GCMSQ2	DAH	11D0255
2 & 3-Chlorotoluene	ND	U	ug/m³ Air	0.884	11.9	5.73	03/31/11 17:59	VMSC	KRW	11C0400
4-Chlorotoluene	ND	U	ug/m³ Air	0.803	5.93	5.73	03/31/11 17:59	VMSC	KRW	11C0400
n-Propylbenzene	**6.39**		ug/m³ Air	0.422	5.63	5.73	03/31/11 17:59	VMSC	KRW	11C0400
3-Ethyltoluene	**26.7**		ug/m³ Air	0.418	5.63	5.73	03/31/11 17:59	VMSC	KRW	11C0400
4-Ethyltoluene	**16.5**		ug/m³ Air	0.414	5.63	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,3,5-Trimethylbenzene	**89.2**		ug/m³ Air	0.418	5.63	5.73	03/31/11 17:59	VMSC	KRW	11C0400
2-Ethyltoluene	**34.5**		ug/m³ Air	0.418	5.63	5.73	03/31/11 17:59	VMSC	KRW	11C0400
beta-Pinene	**40.4**		ug/m³ Air	0.473	6.38	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,2,4-Trimethylbenzene	**39.0**		ug/m³ Air	0.418	5.63	5.73	03/31/11 17:59	VMSC	KRW	11C0400
tert-Butylbenzene	ND	U	ug/m³ Air	0.480	6.29	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1-Decene	ND	U	ug/m³ Air	0.899	6.57	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Benzyl chloride	ND	U	ug/m³ Air	1.57	5.93	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,3-Dichlorobenzene	ND	U	ug/m³ Air	0.506	6.88	5.73	03/31/11 17:59	VMSC	KRW	11C0400
n-Decane	**3.51**	J	ug/m³ Air	0.494	6.66	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,4-Dichlorobenzene	ND	U	ug/m³ Air	0.511	6.88	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Isobutylbenzene	**2.88**	J	ug/m³ Air	0.480	6.29	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,2,3-Trimethylbenzene	**35.8**		ug/m³ Air	0.816	5.63	5.73	03/31/11 17:59	VMSC	KRW	11C0400
4-Isopropyltoluene	**63.6**		ug/m³ Air	0.894	6.29	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,2-Dichlorobenzene	ND	U	ug/m³ Air	0.506	6.88	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Limonene	**56.8**		ug/m³ Air	0.882	6.38	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Indan	**83.8**		ug/m³ Air	0.423	5.54	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Indene	**12.3**		ug/m³ Air	0.188	5.44	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,3-Diethylbenzene	**14.0**		ug/m³ Air	0.902	6.29	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,4-Diethylbenzene	ND	U	ug/m³ Air	0.893	6.29	5.73	03/31/11 17:59	VMSC	KRW	11C0400
n-Butylbenzene	ND	U	ug/m³ Air	0.232	6.29	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1-Undecene	ND	U	ug/m³ Air	0.514	7.23	5.73	03/31/11 17:59	VMSC	KRW	11C0400

Golder Associates Ltd.
500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

ANALYTICAL REPORT

Sample ID: AUC0212-04 (MW10-6 - Air) - cont. **Sampled: 03/14/11 19:00**

EPA TO15 - Volatile Organic Compounds by GC/MS - cont.

Analyte	Result	Data Qualifiers	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
n-Undecane	**6.75**	J	ug/m³ Air	0.289	7.32	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,2,4-Trichlorobenzene	ND	U	ug/m³ Air	0.609	8.50	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Naphthalene	**30.7**	B	ug/m³ Air	0.707	6.00	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Hexachlorobutadiene	ND	U	ug/m³ Air	0.913	12.2	5.73	03/31/11 17:59	VMSC	KRW	11C0400
1,2-Dichloroethene, Total	**4.55**	J	ug/m³ Air	0.651	9.08	5.73	03/31/11 17:59	VMSC	KRW	11C0400
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*92 %*						03/31/11 17:59	VMSC	KRW	11C0400
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*95 %*	*RA*					04/04/11 18:02	GCMSQ2	KDK	11D0020
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*88 %*	*RA*					04/05/11 01:32	GCMSQ2	KDK	11D0020
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*80 %*	*RA, H2*					04/19/11 05:35	GCMSQ2	KDK	11D0170
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*93 %*	*RA, H2*					04/24/11 10:41	GCMSQ2	DAH	11D0255
Surr: Fluorobenzene (62-122%)	*87 %*						03/31/11 17:59	VMSC	KRW	11C0400
Surr: Fluorobenzene (62-122%)	*96 %*	*RA*					04/04/11 18:02	GCMSQ2	KDK	11D0020
Surr: Fluorobenzene (62-122%)	*82 %*	*RA*					04/05/11 01:32	GCMSQ2	KDK	11D0020
Surr: Fluorobenzene (62-122%)	*59 %*	*RA, H2,ZX*					04/19/11 05:35	GCMSQ2	KDK	11D0170
Surr: Fluorobenzene (62-122%)	*79 %*	*RA, H2*					04/24/11 10:41	GCMSQ2	DAH	11D0255
Surr: Toluene-d8 (67-127%)	*94 %*						03/31/11 17:59	VMSC	KRW	11C0400
Surr: Toluene-d8 (67-127%)	*96 %*	*RA*					04/04/11 18:02	GCMSQ2	KDK	11D0020
Surr: Toluene-d8 (67-127%)	*99 %*	*RA*					04/05/11 01:32	GCMSQ2	KDK	11D0020
Surr: Toluene-d8 (67-127%)	*98 %*	*RA, H2*					04/19/11 05:35	GCMSQ2	KDK	11D0170
Surr: Toluene-d8 (67-127%)	*104 %*	*RA, H2*					04/24/11 10:41	GCMSQ2	DAH	11D0255
Surr: 1,4-Dichlorobutane (76-136%)	*106 %*						03/31/11 17:59	VMSC	KRW	11C0400
Surr: 1,4-Dichlorobutane (76-136%)	*103 %*	*RA*					04/04/11 18:02	GCMSQ2	KDK	11D0020
Surr: 1,4-Dichlorobutane (76-136%)	*105 %*	*RA*					04/05/11 01:32	GCMSQ2	KDK	11D0020
Surr: 1,4-Dichlorobutane (76-136%)	*105 %*	*RA, H2*					04/19/11 05:35	GCMSQ2	KDK	11D0170
Surr: 1,4-Dichlorobutane (76-136%)	*107 %*	*RA, H2*					04/24/11 10:41	GCMSQ2	DAH	11D0255
Surr: 4-Bromofluorobenzene (73-133%)	*127 %*						03/31/11 17:59	VMSC	KRW	11C0400
Surr: 4-Bromofluorobenzene (73-133%)	*121 %*	*RA*					04/04/11 18:02	GCMSQ2	KDK	11D0020
Surr: 4-Bromofluorobenzene (73-133%)	*111 %*	*RA*					04/05/11 01:32	GCMSQ2	KDK	11D0020
Surr: 4-Bromofluorobenzene (73-133%)	*112 %*	*RA, H2*					04/19/11 05:35	GCMSQ2	KDK	11D0170
Surr: 4-Bromofluorobenzene (73-133%)	*110 %*	*RA, H2*					04/24/11 10:41	GCMSQ2	DAH	11D0255

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11C0385-BLK1 (Blank - Air)										
EPA TO15 - Volatile Organic Compounds by GC/MS										
Halocarbon 134A	ND	U	ug/m³ Air	0.124	1.67	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Propylene	ND	U	ug/m³ Air	0.0517	0.688	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Chlorodifluoromethane	ND	U	ug/m³ Air	0.196	1.41	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Propane	ND	U	ug/m³ Air	0.0517	0.721	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Dichlorodifluoromethane	ND	U	ug/m³ Air	0.145	1.98	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Chloromethane	ND	U	ug/m³ Air	0.0498	0.826	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Isobutane	ND	U	ug/m³ Air	0.0716	0.951	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	U	ug/m³ Air	0.206	2.80	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Acetaldehyde	ND	U	ug/m³ Air	0.185	0.721	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Vinyl chloride	ND	U	ug/m³ Air	0.0713	1.02	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1-Butene/Isobutene	ND	U	ug/m³ Air	0.0739	0.918	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,3-Butadiene	ND	U	ug/m³ Air	0.0576	0.885	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Butane	ND	U	ug/m³ Air	0.0618	0.951	2.00	03/30/11 15:11	VMSC	KRW	11C0385
trans-2-Butene	ND	U	ug/m³ Air	0.0620	0.918	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Neopentane	ND	U	ug/m³ Air	0.0919	1.18	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Dichlorofluoromethane	ND	U	ug/m³ Air	0.125	1.68	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Bromomethane	ND	U	ug/m³ Air	0.115	1.55	2.00	03/30/11 15:11	VMSC	KRW	11C0385
cis-2-Butene	ND	U	ug/m³ Air	0.0650	0.918	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Chloroethane	ND	U	ug/m³ Air	0.0556	1.06	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Vinyl bromide	ND	U	ug/m³ Air	0.237	1.75	2.00	03/30/11 15:11	VMSC	KRW	11C0385
3-Methyl-1-butene	ND	U	ug/m³ Air	0.0723	1.15	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Ethanol	ND	U	ug/m³ Air	0.0791	0.754	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Acetonitrile	ND	U	ug/m³ Air	0.0567	0.672	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Isopentane	ND	U	ug/m³ Air	0.164	1.18	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Trichlorofluoromethane	ND	U	ug/m³ Air	0.165	2.25	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1-Pentene	ND	U	ug/m³ Air	0.0768	1.15	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Acetone	**0.229**	**J**	ug/m³ Air	0.0604	0.950	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Isopropyl alcohol	ND	U	ug/m³ Air	0.0794	0.983	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Acrylonitrile	ND	U	ug/m³ Air	0.232	0.868	2.00	03/30/11 15:11	VMSC	KRW	11C0385
n-Pentane	ND	U	ug/m³ Air	0.0876	1.18	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Diethyl ether	ND	U	ug/m³ Air	0.162	1.21	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Isoprene	ND	U	ug/m³ Air	0.0699	1.11	2.00	03/30/11 15:11	VMSC	KRW	11C0385
trans-2-Pentene	ND	U	ug/m³ Air	0.103	1.15	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,1-Dichloroethene	ND	U	ug/m³ Air	0.140	1.59	2.00	03/30/11 15:11	VMSC	KRW	11C0385
cis-2-Pentene	ND	U	ug/m³ Air	0.0788	1.15	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Methylene chloride	ND	U	ug/m³ Air	0.104	1.39	2.00	03/30/11 15:11	VMSC	KRW	11C0385

Golder Associates Ltd.
500-4260 Still Creek Drive
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Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11C0385-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
2-Methyl-2-butene	ND	U	ug/m³ Air	0.0672	1.15	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Carbon disulfide	ND	U	ug/m³ Air	0.315	1.25	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Allyl chloride	ND	U	ug/m³ Air	0.0913	1.25	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,1,2-Trichlorotrifluoroethane	ND	U	ug/m³ Air	0.227	3.07	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2,2-Dimethylbutane	ND	U	ug/m³ Air	0.0981	1.41	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Cyclopentene	ND	U	ug/m³ Air	0.0648	1.11	2.00	03/30/11 15:11	VMSC	KRW	11C0385
trans-1,2-Dichloroethene	ND	U	ug/m³ Air	0.228	1.59	2.00	03/30/11 15:11	VMSC	KRW	11C0385
4-Methyl-1-pentene	ND	U	ug/m³ Air	0.0742	1.38	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Propanol	ND	U	ug/m³ Air	0.250	0.983	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,1-Dichloroethane	ND	U	ug/m³ Air	0.120	1.62	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Cyclopentane	ND	U	ug/m³ Air	0.0681	1.15	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2,3-Dimethylbutane	ND	U	ug/m³ Air	0.0725	1.41	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Methyl tert-Butyl Ether	ND	U	ug/m³ Air	0.197	1.44	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Isohexane	ND	U	ug/m³ Air	0.0817	1.41	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Vinyl acetate	ND	U	ug/m³ Air	0.443	1.41	2.00	03/30/11 15:11	VMSC	KRW	11C0385
cis/trans-4-Methyl-2-pentene	ND	U	ug/m³ Air	0.206	2.76	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Butyraldehyde	ND	U	ug/m³ Air	0.301	1.18	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2-Butanone (MEK)	ND	U	ug/m³ Air	0.173	1.18	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Chloroprene	ND	U	ug/m³ Air	0.0764	1.45	2.00	03/30/11 15:11	VMSC	KRW	11C0385
3-Methylpentane	ND	U	ug/m³ Air	0.0898	1.41	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2-Methyl-1-pentene	ND	U	ug/m³ Air	0.0880	1.38	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1-Hexene	ND	U	ug/m³ Air	0.185	1.38	2.00	03/30/11 15:11	VMSC	KRW	11C0385
cis-1,2-Dichloroethene	ND	U	ug/m³ Air	0.118	1.59	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Bromochloromethane	ND	U	ug/m³ Air	0.162	2.12	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2-Ethyl-1-butene	ND	U	ug/m³ Air	0.101	1.38	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Hexane	ND	U	ug/m³ Air	0.0946	1.41	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Chloroform	ND	U	ug/m³ Air	0.145	1.95	2.00	03/30/11 15:11	VMSC	KRW	11C0385
cis-3-Hexene	ND	U	ug/m³ Air	0.104	1.38	2.00	03/30/11 15:11	VMSC	KRW	11C0385
trans-2-Hexene	ND	U	ug/m³ Air	0.0768	1.38	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2-Methyl-2-pentene	ND	U	ug/m³ Air	0.0992	1.38	2.00	03/30/11 15:11	VMSC	KRW	11C0385
cis-3-Methyl-2-pentene	ND	U	ug/m³ Air	0.101	1.38	2.00	03/30/11 15:11	VMSC	KRW	11C0385
cis-2-Hexene	ND	U	ug/m³ Air	0.196	1.38	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Methylcyclopentane	ND	U	ug/m³ Air	0.0756	1.38	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,2-Dichloroethane	ND	U	ug/m³ Air	0.120	1.62	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2,4-Dimethylpentane	ND	U	ug/m³ Air	0.122	1.64	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,1,1-Trichloroethane	ND	U	ug/m³ Air	0.160	2.18	2.00	03/30/11 15:11	VMSC	KRW	11C0385

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11C0385-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
1-Methylcyclopentene	ND	U	ug/m³ Air	0.102	1.34	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Benzene	ND	U	ug/m³ Air	0.0716	1.28	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Carbon tetrachloride	ND	U	ug/m³ Air	0.187	2.52	2.00	03/30/11 15:11	VMSC	KRW	11C0385
n-Butanol	ND	U	ug/m³ Air	0.156	1.21	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Cyclohexane	ND	U	ug/m³ Air	0.0748	1.38	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Isoheptane	ND	U	ug/m³ Air	0.122	1.64	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2,3-Dimethylpentane	ND	U	ug/m³ Air	0.123	1.64	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Cyclohexene	ND	U	ug/m³ Air	0.0456	1.34	2.00	03/30/11 15:11	VMSC	KRW	11C0385
3-Methylhexane	ND	U	ug/m³ Air	0.103	1.64	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,2-Dichloropropane	ND	U	ug/m³ Air	0.137	1.85	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Bromodichloromethane	ND	U	ug/m³ Air	0.205	2.68	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Trichloroethene	ND	U	ug/m³ Air	0.159	2.15	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,4-Dioxane	ND	U	ug/m³ Air	0.154	1.44	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1-Heptene	ND	U	ug/m³ Air	0.220	1.61	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2,2,4-Trimethylpentane	ND	U	ug/m³ Air	0.139	1.87	2.00	03/30/11 15:11	VMSC	KRW	11C0385
trans-3-Heptene	ND	U	ug/m³ Air	0.117	1.61	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Heptane	ND	U	ug/m³ Air	0.0839	1.64	2.00	03/30/11 15:11	VMSC	KRW	11C0385
cis-3-Heptene	ND	U	ug/m³ Air	0.0498	1.61	2.00	03/30/11 15:11	VMSC	KRW	11C0385
trans-2-Heptene	ND	U	ug/m³ Air	0.0592	1.61	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2,4,4-Trimethyl-1-pentene	ND	U	ug/m³ Air	0.135	1.84	2.00	03/30/11 15:11	VMSC	KRW	11C0385
cis-1,3-Dichloropropene	ND	U	ug/m³ Air	0.135	1.82	2.00	03/30/11 15:11	VMSC	KRW	11C0385
4-Methyl-2-pentanone (MIBK)	ND	U	ug/m³ Air	0.238	1.64	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Methylcyclohexane	ND	U	ug/m³ Air	0.119	1.61	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2,4,4-Trimethyl-2-pentene	ND	U	ug/m³ Air	0.140	1.84	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2,5-Dimethylhexane	ND	U	ug/m³ Air	0.137	1.87	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2,2,3-Trimethylpentane	ND	U	ug/m³ Air	0.137	1.87	2.00	03/30/11 15:11	VMSC	KRW	11C0385
trans-1,3-Dichloropropene	ND	U	ug/m³ Air	0.135	1.82	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,1,2-Trichloroethane	ND	U	ug/m³ Air	0.160	2.18	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2,3,4-Trimethylpentane	ND	U	ug/m³ Air	0.0958	1.87	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Toluene	ND	U	ug/m³ Air	0.112	1.51	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2-Hexanone	ND	U	ug/m³ Air	0.0828	1.64	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2-Methylheptane	ND	U	ug/m³ Air	0.139	1.87	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1-Methylcyclohexene	ND	U	ug/m³ Air	0.120	1.57	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Chlorodibromomethane	ND	U	ug/m³ Air	0.260	3.41	2.00	03/30/11 15:11	VMSC	KRW	11C0385
3-Methylheptane	ND	U	ug/m³ Air	0.268	1.87	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Hexanal	ND	U	ug/m³ Air	0.189	1.64	2.00	03/30/11 15:11	VMSC	KRW	11C0385

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11C0385-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
1,2-Dibromoethane (EDB)	ND	U	ug/m³ Air	0.228	3.07	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2,2,5-Trimethylhexane	ND	U	ug/m³ Air	0.160	2.10	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1-Octene	ND	U	ug/m³ Air	0.0706	1.84	2.00	03/30/11 15:11	VMSC	KRW	11C0385
n-Octane	ND	U	ug/m³ Air	0.140	1.87	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Tetrachloroethene	ND	U	ug/m³ Air	0.201	2.71	2.00	03/30/11 15:11	VMSC	KRW	11C0385
cis-2-Octene	ND	U	ug/m³ Air	0.135	1.84	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Chlorobenzene	ND	U	ug/m³ Air	0.138	1.84	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Ethylbenzene	ND	U	ug/m³ Air	0.129	1.74	2.00	03/30/11 15:11	VMSC	KRW	11C0385
m-Xylene & p-Xylene	ND	U	ug/m³ Air	0.258	3.47	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Bromoform	ND	U	ug/m³ Air	0.316	4.13	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Butyl acrylate	ND	U	ug/m³ Air	0.530	2.10	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Heptanal	ND	U	ug/m³ Air	0.472	1.87	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Styrene	ND	U	ug/m³ Air	0.126	1.70	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,1,2,2-Tetrachloroethane	ND	U	ug/m³ Air	0.204	2.75	2.00	03/30/11 15:11	VMSC	KRW	11C0385
o-Xylene	ND	U	ug/m³ Air	0.129	1.74	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Xylenes, total	ND	U	ug/m³ Air	0.191	5.21	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1-Nonene	ND	U	ug/m³ Air	0.283	2.06	2.00	03/30/11 15:11	VMSC	KRW	11C0385
4-Nonene	ND	U	ug/m³ Air	0.0601	2.06	2.00	03/30/11 15:11	VMSC	KRW	11C0385
n-Nonane	ND	U	ug/m³ Air	0.156	2.10	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Isopropylbenzene	ND	U	ug/m³ Air	0.282	1.97	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Benzaldehyde	ND	U	ug/m³ Air	0.139	1.74	2.00	03/30/11 15:11	VMSC	KRW	11C0385
alpha-Pinene	ND	U	ug/m³ Air	0.167	2.23	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2 & 3-Chlorotoluene	ND	U	ug/m³ Air	0.309	4.14	2.00	03/30/11 15:11	VMSC	KRW	11C0385
4-Chlorotoluene	ND	U	ug/m³ Air	0.281	2.07	2.00	03/30/11 15:11	VMSC	KRW	11C0385
n-Propylbenzene	ND	U	ug/m³ Air	0.147	1.97	2.00	03/30/11 15:11	VMSC	KRW	11C0385
3-Ethyltoluene	ND	U	ug/m³ Air	0.146	1.97	2.00	03/30/11 15:11	VMSC	KRW	11C0385
4-Ethyltoluene	ND	U	ug/m³ Air	0.145	1.97	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,3,5-Trimethylbenzene	ND	U	ug/m³ Air	0.146	1.97	2.00	03/30/11 15:11	VMSC	KRW	11C0385
2-Ethyltoluene	ND	U	ug/m³ Air	0.146	1.97	2.00	03/30/11 15:11	VMSC	KRW	11C0385
beta-Pinene	ND	U	ug/m³ Air	0.165	2.23	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,2,4-Trimethylbenzene	ND	U	ug/m³ Air	0.146	1.97	2.00	03/30/11 15:11	VMSC	KRW	11C0385
tert-Butylbenzene	ND	U	ug/m³ Air	0.168	2.20	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1-Decene	ND	U	ug/m³ Air	0.314	2.30	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Benzyl chloride	ND	U	ug/m³ Air	0.549	2.07	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,3-Dichlorobenzene	ND	U	ug/m³ Air	0.177	2.40	2.00	03/30/11 15:11	VMSC	KRW	11C0385
n-Decane	ND	U	ug/m³ Air	0.173	2.33	2.00	03/30/11 15:11	VMSC	KRW	11C0385

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11C0385-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
1,4-Dichlorobenzene	ND	U	ug/m³ Air	0.178	2.40	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Isobutylbenzene	ND	U	ug/m³ Air	0.168	2.20	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,2,3-Trimethylbenzene	ND	U	ug/m³ Air	0.285	1.97	2.00	03/30/11 15:11	VMSC	KRW	11C0385
4-Isopropyltoluene	ND	U	ug/m³ Air	0.312	2.20	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,2-Dichlorobenzene	ND	U	ug/m³ Air	0.177	2.40	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Limonene	ND	U	ug/m³ Air	0.308	2.23	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Indan	ND	U	ug/m³ Air	0.148	1.93	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Indene	ND	U	ug/m³ Air	0.0658	1.90	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,3-Diethylbenzene	ND	U	ug/m³ Air	0.315	2.20	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,4-Diethylbenzene	ND	U	ug/m³ Air	0.312	2.20	2.00	03/30/11 15:11	VMSC	KRW	11C0385
n-Butylbenzene	ND	U	ug/m³ Air	0.0810	2.20	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1-Undecene	ND	U	ug/m³ Air	0.180	2.52	2.00	03/30/11 15:11	VMSC	KRW	11C0385
n-Undecane	ND	U	ug/m³ Air	0.101	2.56	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,2,4-Trichlorobenzene	**0.236**	**J**	ug/m³ Air	0.213	2.97	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Naphthalene	ND	U	ug/m³ Air	0.247	2.10	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Hexachlorobutadiene	ND	U	ug/m³ Air	0.319	4.27	2.00	03/30/11 15:11	VMSC	KRW	11C0385
1,2-Dichloroethene, Total	ND	U	ug/m³ Air	0.228	3.17	2.00	03/30/11 15:11	VMSC	KRW	11C0385
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*91%*						03/30/11 15:11	VMSC	KRW	11C0385
Surr: Fluorobenzene (62-122%)	*78%*						03/30/11 15:11	VMSC	KRW	11C0385
Surr: Toluene-d8 (67-127%)	*100%*						03/30/11 15:11	VMSC	KRW	11C0385
Surr: 1,4-Dichlorobutane (76-136%)	*109%*						03/30/11 15:11	VMSC	KRW	11C0385
Surr: 4-Bromofluorobenzene (73-133%)	*107%*						03/30/11 15:11	VMSC	KRW	11C0385
Sample ID: 11C0400-BLK1 (Blank - Air)										
EPA TO15 - Volatile Organic Compounds by GC/MS										
Halocarbon 134A	ND	U	ug/m³ Air	0.124	1.67	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Propylene	ND	U	ug/m³ Air	0.0517	0.688	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Chlorodifluoromethane	ND	U	ug/m³ Air	0.196	1.41	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Propane	ND	U	ug/m³ Air	0.0517	0.721	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Dichlorodifluoromethane	ND	U	ug/m³ Air	0.145	1.98	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Chloromethane	ND	U	ug/m³ Air	0.0498	0.826	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Isobutane	ND	U	ug/m³ Air	0.0716	0.951	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	U	ug/m³ Air	0.206	2.80	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Acetaldehyde	**0.263**	**J**	ug/m³ Air	0.185	0.721	2.00	03/31/11 13:55	VMSC	KRW	11C0400

Golder Associates Ltd.
500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11C0400-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
Vinyl chloride	ND	U	ug/m³ Air	0.0713	1.02	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1-Butene/Isobutene	ND	U	ug/m³ Air	0.0739	0.918	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,3-Butadiene	ND	U	ug/m³ Air	0.0576	0.885	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Butane	ND	U	ug/m³ Air	0.0618	0.951	2.00	03/31/11 13:55	VMSC	KRW	11C0400
trans-2-Butene	ND	U	ug/m³ Air	0.0620	0.918	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Neopentane	ND	U	ug/m³ Air	0.0919	1.18	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Dichlorofluoromethane	ND	U	ug/m³ Air	0.125	1.68	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Bromomethane	ND	U	ug/m³ Air	0.115	1.55	2.00	03/31/11 13:55	VMSC	KRW	11C0400
cis-2-Butene	ND	U	ug/m³ Air	0.0650	0.918	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Chloroethane	ND	U	ug/m³ Air	0.0556	1.06	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Vinyl bromide	ND	U	ug/m³ Air	0.237	1.75	2.00	03/31/11 13:55	VMSC	KRW	11C0400
3-Methyl-1-butene	ND	U	ug/m³ Air	0.0723	1.15	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Ethanol	ND	U	ug/m³ Air	0.0791	0.754	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Acetonitrile	ND	U	ug/m³ Air	0.0567	0.672	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Isopentane	ND	U	ug/m³ Air	0.164	1.18	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Trichlorofluoromethane	ND	U	ug/m³ Air	0.165	2.25	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1-Pentene	ND	U	ug/m³ Air	0.0768	1.15	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Acetone	**0.210**	**J**	ug/m³ Air	0.0604	0.950	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Isopropyl alcohol	ND	U	ug/m³ Air	0.0794	0.983	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Acrylonitrile	ND	U	ug/m³ Air	0.232	0.868	2.00	03/31/11 13:55	VMSC	KRW	11C0400
n-Pentane	ND	U	ug/m³ Air	0.0876	1.18	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Diethyl ether	ND	U	ug/m³ Air	0.162	1.21	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Isoprene	ND	U	ug/m³ Air	0.0699	1.11	2.00	03/31/11 13:55	VMSC	KRW	11C0400
trans-2-Pentene	ND	U	ug/m³ Air	0.103	1.15	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,1-Dichloroethene	ND	U	ug/m³ Air	0.140	1.59	2.00	03/31/11 13:55	VMSC	KRW	11C0400
cis-2-Pentene	ND	U	ug/m³ Air	0.0788	1.15	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Methylene chloride	ND	U	ug/m³ Air	0.104	1.39	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2-Methyl-2-butene	ND	U	ug/m³ Air	0.0672	1.15	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Carbon disulfide	ND	U	ug/m³ Air	0.315	1.25	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Allyl chloride	ND	U	ug/m³ Air	0.0913	1.25	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,1,2-Trichlorotrifluoroethane	ND	U	ug/m³ Air	0.227	3.07	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2,2-Dimethylbutane	ND	U	ug/m³ Air	0.0981	1.41	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Cyclopentene	ND	U	ug/m³ Air	0.0648	1.11	2.00	03/31/11 13:55	VMSC	KRW	11C0400
trans-1,2-Dichloroethene	ND	U	ug/m³ Air	0.228	1.59	2.00	03/31/11 13:55	VMSC	KRW	11C0400
4-Methyl-1-pentene	ND	U	ug/m³ Air	0.0742	1.38	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Propanol	ND	U	ug/m³ Air	0.250	0.983	2.00	03/31/11 13:55	VMSC	KRW	11C0400

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11C0400-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
1,1-Dichloroethane	ND	U	ug/m³ Air	0.120	1.62	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Cyclopentane	ND	U	ug/m³ Air	0.0681	1.15	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2,3-Dimethylbutane	ND	U	ug/m³ Air	0.0725	1.41	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Methyl tert-Butyl Ether	ND	U	ug/m³ Air	0.197	1.44	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Isohexane	ND	U	ug/m³ Air	0.0817	1.41	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Vinyl acetate	ND	U	ug/m³ Air	0.443	1.41	2.00	03/31/11 13:55	VMSC	KRW	11C0400
cis/trans-4-Methyl-2-pentene	ND	U	ug/m³ Air	0.206	2.76	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Butyraldehyde	ND	U	ug/m³ Air	0.301	1.18	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2-Butanone (MEK)	ND	U	ug/m³ Air	0.173	1.18	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Chloroprene	ND	U	ug/m³ Air	0.0764	1.45	2.00	03/31/11 13:55	VMSC	KRW	11C0400
3-Methylpentane	ND	U	ug/m³ Air	0.0898	1.41	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2-Methyl-1-pentene	ND	U	ug/m³ Air	0.0880	1.38	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1-Hexene	ND	U	ug/m³ Air	0.185	1.38	2.00	03/31/11 13:55	VMSC	KRW	11C0400
cis-1,2-Dichloroethene	ND	U	ug/m³ Air	0.118	1.59	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Bromochloromethane	ND	U	ug/m³ Air	0.162	2.12	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2-Ethyl-1-butene	ND	U	ug/m³ Air	0.101	1.38	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Hexane	ND	U	ug/m³ Air	0.0946	1.41	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Chloroform	ND	U	ug/m³ Air	0.145	1.95	2.00	03/31/11 13:55	VMSC	KRW	11C0400
cis-3-Hexene	ND	U	ug/m³ Air	0.104	1.38	2.00	03/31/11 13:55	VMSC	KRW	11C0400
trans-2-Hexene	ND	U	ug/m³ Air	0.0768	1.38	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2-Methyl-2-pentene	ND	U	ug/m³ Air	0.0992	1.38	2.00	03/31/11 13:55	VMSC	KRW	11C0400
cis-3-Methyl-2-pentene	ND	U	ug/m³ Air	0.101	1.38	2.00	03/31/11 13:55	VMSC	KRW	11C0400
cis-2-Hexene	ND	U	ug/m³ Air	0.196	1.38	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Methylcyclopentane	ND	U	ug/m³ Air	0.0756	1.38	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,2-Dichloroethane	ND	U	ug/m³ Air	0.120	1.62	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2,4-Dimethylpentane	ND	U	ug/m³ Air	0.122	1.64	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,1,1-Trichloroethane	ND	U	ug/m³ Air	0.160	2.18	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1-Methylcyclopentene	ND	U	ug/m³ Air	0.102	1.34	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Benzene	ND	U	ug/m³ Air	0.0716	1.28	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Carbon tetrachloride	ND	U	ug/m³ Air	0.187	2.52	2.00	03/31/11 13:55	VMSC	KRW	11C0400
n-Butanol	ND	U	ug/m³ Air	0.156	1.21	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Cyclohexane	ND	U	ug/m³ Air	0.0748	1.38	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Isoheptane	ND	U	ug/m³ Air	0.122	1.64	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2,3-Dimethylpentane	ND	U	ug/m³ Air	0.123	1.64	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Cyclohexene	ND	U	ug/m³ Air	0.0456	1.34	2.00	03/31/11 13:55	VMSC	KRW	11C0400
3-Methylhexane	ND	U	ug/m³ Air	0.103	1.64	2.00	03/31/11 13:55	VMSC	KRW	11C0400

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11C0400-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
1,2-Dichloropropane	ND	U	ug/m³ Air	0.137	1.85	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Bromodichloromethane	ND	U	ug/m³ Air	0.205	2.68	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Trichloroethene	ND	U	ug/m³ Air	0.159	2.15	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,4-Dioxane	ND	U	ug/m³ Air	0.154	1.44	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1-Heptene	ND	U	ug/m³ Air	0.220	1.61	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2,2,4-Trimethylpentane	ND	U	ug/m³ Air	0.139	1.87	2.00	03/31/11 13:55	VMSC	KRW	11C0400
trans-3-Heptene	ND	U	ug/m³ Air	0.117	1.61	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Heptane	ND	U	ug/m³ Air	0.0839	1.64	2.00	03/31/11 13:55	VMSC	KRW	11C0400
cis-3-Heptene	ND	U	ug/m³ Air	0.0498	1.61	2.00	03/31/11 13:55	VMSC	KRW	11C0400
trans-2-Heptene	ND	U	ug/m³ Air	0.0592	1.61	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2,4,4-Trimethyl-1-pentene	ND	U	ug/m³ Air	0.135	1.84	2.00	03/31/11 13:55	VMSC	KRW	11C0400
cis-1,3-Dichloropropene	ND	U	ug/m³ Air	0.135	1.82	2.00	03/31/11 13:55	VMSC	KRW	11C0400
4-Methyl-2-pentanone (MIBK)	ND	U	ug/m³ Air	0.238	1.64	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Methylcyclohexane	ND	U	ug/m³ Air	0.119	1.61	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2,4,4-Trimethyl-2-pentene	ND	U	ug/m³ Air	0.140	1.84	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2,5-Dimethylhexane	ND	U	ug/m³ Air	0.137	1.87	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2,2,3-Trimethylpentane	ND	U	ug/m³ Air	0.137	1.87	2.00	03/31/11 13:55	VMSC	KRW	11C0400
trans-1,3-Dichloropropene	ND	U	ug/m³ Air	0.135	1.82	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,1,2-Trichloroethane	ND	U	ug/m³ Air	0.160	2.18	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2,3,4-Trimethylpentane	ND	U	ug/m³ Air	0.0958	1.87	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Toluene	ND	U	ug/m³ Air	0.112	1.51	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2-Hexanone	ND	U	ug/m³ Air	0.0828	1.64	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2-Methylheptane	ND	U	ug/m³ Air	0.139	1.87	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1-Methylcyclohexene	ND	U	ug/m³ Air	0.120	1.57	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Chlorodibromomethane	ND	U	ug/m³ Air	0.260	3.41	2.00	03/31/11 13:55	VMSC	KRW	11C0400
3-Methylheptane	ND	U	ug/m³ Air	0.268	1.87	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Hexanal	ND	U	ug/m³ Air	0.189	1.64	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,2-Dibromoethane (EDB)	ND	U	ug/m³ Air	0.228	3.07	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2,2,5-Trimethylhexane	ND	U	ug/m³ Air	0.160	2.10	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1-Octene	ND	U	ug/m³ Air	0.0706	1.84	2.00	03/31/11 13:55	VMSC	KRW	11C0400
n-Octane	ND	U	ug/m³ Air	0.140	1.87	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Tetrachloroethene	ND	U	ug/m³ Air	0.201	2.71	2.00	03/31/11 13:55	VMSC	KRW	11C0400
cis-2-Octene	ND	U	ug/m³ Air	0.135	1.84	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Chlorobenzene	ND	U	ug/m³ Air	0.138	1.84	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Ethylbenzene	ND	U	ug/m³ Air	0.129	1.74	2.00	03/31/11 13:55	VMSC	KRW	11C0400
m-Xylene & p-Xylene	ND	U	ug/m³ Air	0.258	3.47	2.00	03/31/11 13:55	VMSC	KRW	11C0400

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11C0400-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
Bromoform	ND	U	ug/m³ Air	0.316	4.13	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Butyl acrylate	ND	U	ug/m³ Air	0.530	2.10	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Heptanal	ND	U	ug/m³ Air	0.472	1.87	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Styrene	ND	U	ug/m³ Air	0.126	1.70	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,1,2,2-Tetrachloroethane	ND	U	ug/m³ Air	0.204	2.75	2.00	03/31/11 13:55	VMSC	KRW	11C0400
o-Xylene	ND	U	ug/m³ Air	0.129	1.74	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Xylenes, total	ND	U	ug/m³ Air	0.191	5.21	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1-Nonene	ND	U	ug/m³ Air	0.283	2.06	2.00	03/31/11 13:55	VMSC	KRW	11C0400
4-Nonene	ND	U	ug/m³ Air	0.0601	2.06	2.00	03/31/11 13:55	VMSC	KRW	11C0400
n-Nonane	ND	U	ug/m³ Air	0.156	2.10	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Isopropylbenzene	ND	U	ug/m³ Air	0.282	1.97	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Benzaldehyde	ND	U	ug/m³ Air	0.139	1.74	2.00	03/31/11 13:55	VMSC	KRW	11C0400
alpha-Pinene	ND	U	ug/m³ Air	0.167	2.23	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2 & 3-Chlorotoluene	ND	U	ug/m³ Air	0.309	4.14	2.00	03/31/11 13:55	VMSC	KRW	11C0400
4-Chlorotoluene	ND	U	ug/m³ Air	0.281	2.07	2.00	03/31/11 13:55	VMSC	KRW	11C0400
n-Propylbenzene	ND	U	ug/m³ Air	0.147	1.97	2.00	03/31/11 13:55	VMSC	KRW	11C0400
3-Ethyltoluene	ND	U	ug/m³ Air	0.146	1.97	2.00	03/31/11 13:55	VMSC	KRW	11C0400
4-Ethyltoluene	ND	U	ug/m³ Air	0.145	1.97	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,3,5-Trimethylbenzene	ND	U	ug/m³ Air	0.146	1.97	2.00	03/31/11 13:55	VMSC	KRW	11C0400
2-Ethyltoluene	ND	U	ug/m³ Air	0.146	1.97	2.00	03/31/11 13:55	VMSC	KRW	11C0400
beta-Pinene	ND	U	ug/m³ Air	0.165	2.23	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,2,4-Trimethylbenzene	ND	U	ug/m³ Air	0.146	1.97	2.00	03/31/11 13:55	VMSC	KRW	11C0400
tert-Butylbenzene	ND	U	ug/m³ Air	0.168	2.20	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1-Decene	ND	U	ug/m³ Air	0.314	2.30	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Benzyl chloride	ND	U	ug/m³ Air	0.549	2.07	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,3-Dichlorobenzene	**0.242**	**J**	ug/m³ Air	0.177	2.40	2.00	03/31/11 13:55	VMSC	KRW	11C0400
n-Decane	ND	U	ug/m³ Air	0.173	2.33	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,4-Dichlorobenzene	**0.293**	**J**	ug/m³ Air	0.178	2.40	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Isobutylbenzene	ND	U	ug/m³ Air	0.168	2.20	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,2,3-Trimethylbenzene	ND	U	ug/m³ Air	0.285	1.97	2.00	03/31/11 13:55	VMSC	KRW	11C0400
4-Isopropyltoluene	ND	U	ug/m³ Air	0.312	2.20	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,2-Dichlorobenzene	**0.261**	**J**	ug/m³ Air	0.177	2.40	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Limonene	ND	U	ug/m³ Air	0.308	2.23	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Indan	ND	U	ug/m³ Air	0.148	1.93	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Indene	ND	U	ug/m³ Air	0.0658	1.90	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,3-Diethylbenzene	ND	U	ug/m³ Air	0.315	2.20	2.00	03/31/11 13:55	VMSC	KRW	11C0400

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11C0400-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
1,4-Diethylbenzene	ND	**U**	ug/m³ Air	0.312	2.20	2.00	03/31/11 13:55	VMSC	KRW	11C0400
n-Butylbenzene	**0.135**	**J**	ug/m³ Air	0.0810	2.20	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1-Undecene	ND	**U**	ug/m³ Air	0.180	2.52	2.00	03/31/11 13:55	VMSC	KRW	11C0400
n-Undecane	ND	**U**	ug/m³ Air	0.101	2.56	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,2,4-Trichlorobenzene	**0.733**	**J**	ug/m³ Air	0.213	2.97	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Naphthalene	**0.655**	**J**	ug/m³ Air	0.247	2.10	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Hexachlorobutadiene	**0.331**	**J**	ug/m³ Air	0.319	4.27	2.00	03/31/11 13:55	VMSC	KRW	11C0400
1,2-Dichloroethene, Total	ND	**U**	ug/m³ Air	0.228	3.17	2.00	03/31/11 13:55	VMSC	KRW	11C0400
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*96%*						03/31/11 13:55	VMSC	KRW	11C0400
Surr: Fluorobenzene (62-122%)	*86%*						03/31/11 13:55	VMSC	KRW	11C0400
Surr: Toluene-d8 (67-127%)	*101%*						03/31/11 13:55	VMSC	KRW	11C0400
Surr: 1,4-Dichlorobutane (76-136%)	*109%*						03/31/11 13:55	VMSC	KRW	11C0400
Surr: 4-Bromofluorobenzene (73-133%)	*107%*						03/31/11 13:55	VMSC	KRW	11C0400
Sample ID: 11D0020-BLK1 (Blank - Air)										
EPA TO15 - Volatile Organic Compounds by GC/MS										
Ethene	ND	**U**	ug/m³ Air	0.0714	0.459	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
Acetylene	ND	**U**	ug/m³ Air	0.0633	0.426	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
Ethane	ND	**U**	ug/m³ Air	0.0873	0.492	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
Propylene	ND	**U**	ug/m³ Air	0.0382	0.688	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
Propane	ND	**U**	ug/m³ Air	0.0729	0.721	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
Isobutane	ND	**U**	ug/m³ Air	0.114	0.951	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
1-Butene/Isobutene	ND	**U**	ug/m³ Air	0.0473	0.918	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
Butane	ND	**U**	ug/m³ Air	0.0613	0.951	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
Methanol	**0.200**	**J**	ug/m³ Air	0.139	0.524	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
cis-2-Butene	ND	**U**	ug/m³ Air	0.0996	0.918	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
Ethanol	ND	**U**	ug/m³ Air	0.110	0.754	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
Isopentane	ND	**U**	ug/m³ Air	0.174	1.18	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
1-Pentene	ND	**U**	ug/m³ Air	0.0860	1.15	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
n-Pentane	ND	**U**	ug/m³ Air	0.136	1.18	2.00	04/04/11 14:15	GCMSQ2	KDK	11D0020
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*89%*						04/04/11 14:15	GCMSQ2	KDK	11D0020
Surr: Fluorobenzene (62-122%)	*75%*						04/04/11 14:15	GCMSQ2	KDK	11D0020
Surr: Toluene-d8 (67-127%)	*99%*						04/04/11 14:15	GCMSQ2	KDK	11D0020

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11D0020-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
Surr: 1,4-Dichlorobutane (76-136%)	*107%*						04/04/11 14:15	GCMSQ2	KDK	11D0020
Surr: 4-Bromofluorobenzene (73-133%)	*111%*						04/04/11 14:15	GCMSQ2	KDK	11D0020
Sample ID: 11D0170-BLK1 (Blank - Air)										
EPA TO15 - Volatile Organic Compounds by GC/MS										
Ethene	ND	**U**	ug/m³ Air	0.0714	0.459	2.00	04/18/11 13:31	GCMSQ2	KDK	11D0170
Acetylene	ND	**U**	ug/m³ Air	0.0633	0.426	2.00	04/18/11 13:31	GCMSQ2	KDK	11D0170
Ethane	ND	**U**	ug/m³ Air	0.0873	0.492	2.00	04/18/11 13:31	GCMSQ2	KDK	11D0170
Propylene	ND	**U**	ug/m³ Air	0.0382	0.688	2.00	04/18/11 13:31	GCMSQ2	KDK	11D0170
Propane	ND	**U**	ug/m³ Air	0.0729	0.721	2.00	04/18/11 13:31	GCMSQ2	KDK	11D0170
1-Butene/Isobutene	ND	**U**	ug/m³ Air	0.0473	0.918	2.00	04/18/11 13:31	GCMSQ2	KDK	11D0170
Butane	ND	**U**	ug/m³ Air	0.0613	0.951	2.00	04/18/11 13:31	GCMSQ2	KDK	11D0170
Methanol	**0.567**		ug/m³ Air	0.139	0.524	2.00	04/18/11 13:31	GCMSQ2	KDK	11D0170
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*88%*						04/18/11 13:31	GCMSQ2	KDK	11D0170
Surr: Fluorobenzene (62-122%)	*64%*						04/18/11 13:31	GCMSQ2	KDK	11D0170
Surr: Toluene-d8 (67-127%)	*100%*						04/18/11 13:31	GCMSQ2	KDK	11D0170
Surr: 1,4-Dichlorobutane (76-136%)	*102%*						04/18/11 13:31	GCMSQ2	KDK	11D0170
Surr: 4-Bromofluorobenzene (73-133%)	*109%*						04/18/11 13:31	GCMSQ2	KDK	11D0170
Sample ID: 11D0255-BLK1 (Blank - Air)										
EPA TO15 - Volatile Organic Compounds by GC/MS										
Ethene	ND	**U**	ug/m³ Air	0.0714	0.459	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Acetylene	ND	**U**	ug/m³ Air	0.0633	0.426	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Ethane	ND	**U**	ug/m³ Air	0.0873	0.492	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Halocarbon 134A	ND	**U**	ug/m³ Air	0.117	1.67	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Propylene	ND	**U**	ug/m³ Air	0.0382	0.688	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Chlorodifluoromethane	ND	**U**	ug/m³ Air	0.0990	1.41	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Propane	ND	**U**	ug/m³ Air	0.0729	0.721	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Dichlorodifluoromethane	ND	**U**	ug/m³ Air	0.145	1.98	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Chloromethane	ND	**U**	ug/m³ Air	0.0933	0.826	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Isobutane	ND	**U**	ug/m³ Air	0.114	0.951	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	**U**	ug/m³ Air	0.261	2.80	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11D0255-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
Acetaldehyde	ND	U	ug/m³ Air	0.246	0.721	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Vinyl chloride	ND	U	ug/m³ Air	0.120	1.02	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1-Butene/Isobutene	ND	U	ug/m³ Air	0.0473	0.918	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,3-Butadiene	ND	U	ug/m³ Air	0.0469	0.885	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Butane	ND	U	ug/m³ Air	0.0613	0.951	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Methanol	**0.266**	**J**	ug/m³ Air	0.139	0.524	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
trans-2-Butene	ND	U	ug/m³ Air	0.105	0.918	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Neopentane	ND	U	ug/m³ Air	0.0868	1.18	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Dichlorofluoromethane	ND	U	ug/m³ Air	0.118	1.68	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Bromomethane	ND	U	ug/m³ Air	0.171	1.55	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
cis-2-Butene	ND	U	ug/m³ Air	0.0996	0.918	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Chloroethane	ND	U	ug/m³ Air	0.139	1.06	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Vinyl bromide	ND	U	ug/m³ Air	0.120	1.75	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
3-Methyl-1-butene	ND	U	ug/m³ Air	0.134	1.15	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Ethanol	ND	U	ug/m³ Air	0.110	0.754	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Acetonitrile	ND	U	ug/m³ Air	0.0809	0.672	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Isopentane	ND	U	ug/m³ Air	0.174	1.18	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Trichlorofluoromethane	ND	U	ug/m³ Air	0.165	2.25	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1-Pentene	ND	U	ug/m³ Air	0.0860	1.15	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Acetone	**0.278**	**J**	ug/m³ Air	0.0637	0.950	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Isopropyl alcohol	ND	U	ug/m³ Air	0.254	0.983	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Acrylonitrile	ND	U	ug/m³ Air	0.0655	0.868	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
n-Pentane	ND	U	ug/m³ Air	0.136	1.18	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Diethyl ether	ND	U	ug/m³ Air	0.149	1.21	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Isoprene	ND	U	ug/m³ Air	0.126	1.11	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
trans-2-Pentene	ND	U	ug/m³ Air	0.133	1.15	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,1-Dichloroethene	ND	U	ug/m³ Air	0.154	1.59	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
cis-2-Pentene	ND	U	ug/m³ Air	0.115	1.15	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Methylene chloride	ND	U	ug/m³ Air	0.0945	1.39	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2-Methyl-2-butene	ND	U	ug/m³ Air	0.0665	1.15	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Carbon disulfide	ND	U	ug/m³ Air	0.133	1.25	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Allyl chloride	ND	U	ug/m³ Air	0.190	1.25	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,1,2-Trichlorotrifluoroethane	ND	U	ug/m³ Air	0.277	3.07	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2,2-Dimethylbutane	ND	U	ug/m³ Air	0.0867	1.41	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Cyclopentene	ND	U	ug/m³ Air	0.265	1.11	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
trans-1,2-Dichloroethene	ND	U	ug/m³ Air	0.234	1.59	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11D0255-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
4-Methyl-1-pentene	ND	U	ug/m³ Air	0.176	1.38	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Propanol	ND	U	ug/m³ Air	0.252	0.983	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,1-Dichloroethane	ND	U	ug/m³ Air	0.209	1.62	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Cyclopentane	ND	U	ug/m³ Air	0.150	1.15	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2,3-Dimethylbutane	ND	U	ug/m³ Air	0.171	1.41	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Methyl tert-Butyl Ether	ND	U	ug/m³ Air	0.185	1.44	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Isohexane	ND	U	ug/m³ Air	0.148	1.41	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Vinyl acetate	ND	U	ug/m³ Air	0.174	1.41	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
cis/trans-4-Methyl-2-pentene	ND	U	ug/m³ Air	0.194	2.76	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Butyraldehyde	ND	U	ug/m³ Air	0.115	1.18	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2-Butanone (MEK)	**0.152**	**J**	ug/m³ Air	0.119	1.18	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Chloroprene	ND	U	ug/m³ Air	0.164	1.45	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
3-Methylpentane	ND	U	ug/m³ Air	0.154	1.41	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2-Methyl-1-pentene	ND	U	ug/m³ Air	0.104	1.38	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1-Hexene	ND	U	ug/m³ Air	0.340	1.38	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
cis-1,2-Dichloroethene	ND	U	ug/m³ Air	0.117	1.59	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Bromochloromethane	ND	U	ug/m³ Air	0.130	2.12	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2-Ethyl-1-butene	ND	U	ug/m³ Air	0.0950	1.38	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Hexane	ND	U	ug/m³ Air	0.178	1.41	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Chloroform	ND	U	ug/m³ Air	0.255	1.95	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
cis-3-Hexene	ND	U	ug/m³ Air	0.108	1.38	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
trans-2-Hexene	ND	U	ug/m³ Air	0.149	1.38	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2-Methyl-2-pentene	ND	U	ug/m³ Air	0.0937	1.38	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
cis-3-Methyl-2-pentene	ND	U	ug/m³ Air	0.0950	1.38	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
cis-2-Hexene	ND	U	ug/m³ Air	0.195	1.38	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Methylcyclopentane	ND	U	ug/m³ Air	0.147	1.38	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,2-Dichloroethane	ND	U	ug/m³ Air	0.171	1.62	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2,4-Dimethylpentane	ND	U	ug/m³ Air	0.121	1.64	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,1,1-Trichloroethane	ND	U	ug/m³ Air	0.271	2.18	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1-Methylcyclopentene	ND	U	ug/m³ Air	0.0961	1.34	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Benzene	ND	U	ug/m³ Air	0.0946	1.28	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Carbon tetrachloride	ND	U	ug/m³ Air	0.186	2.52	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
n-Butanol	ND	U	ug/m³ Air	0.205	1.21	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Cyclohexane	ND	U	ug/m³ Air	0.103	1.38	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Isoheptane	ND	U	ug/m³ Air	0.0967	1.64	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2,3-Dimethylpentane	ND	U	ug/m³ Air	0.173	1.64	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255

Golder Associates Ltd.
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11D0255-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
Cyclohexene	ND	U	ug/m³ Air	0.0927	1.34	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
3-Methylhexane	ND	U	ug/m³ Air	0.123	1.64	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,2-Dichloropropane	ND	U	ug/m³ Air	0.111	1.85	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Bromodichloromethane	ND	U	ug/m³ Air	0.205	2.68	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Trichloroethene	ND	U	ug/m³ Air	0.133	2.15	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,4-Dioxane	ND	U	ug/m³ Air	0.259	1.44	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1-Heptene	ND	U	ug/m³ Air	0.0843	1.61	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2,2,4-Trimethylpentane	ND	U	ug/m³ Air	0.138	1.87	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
trans-3-Heptene	ND	U	ug/m³ Air	0.110	1.61	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Heptane	ND	U	ug/m³ Air	0.120	1.64	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
cis-3-Heptene	ND	U	ug/m³ Air	0.110	1.61	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
trans-2-Heptene	ND	U	ug/m³ Air	0.121	1.61	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2,4,4-Trimethyl-1-pentene	ND	U	ug/m³ Air	0.127	1.84	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
cis-1,3-Dichloropropene	ND	U	ug/m³ Air	0.0935	1.82	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
4-Methyl-2-pentanone (MIBK)	**0.247**	**J**	ug/m³ Air	0.102	1.64	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Methylcyclohexane	ND	U	ug/m³ Air	0.119	1.61	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2,4,4-Trimethyl-2-pentene	ND	U	ug/m³ Air	0.132	1.84	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2,5-Dimethylhexane	ND	U	ug/m³ Air	0.129	1.87	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2,2,3-Trimethylpentane	ND	U	ug/m³ Air	0.129	1.87	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
trans-1,3-Dichloropropene	ND	U	ug/m³ Air	0.113	1.82	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,1,2-Trichloroethane	ND	U	ug/m³ Air	0.160	2.18	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2,3,4-Trimethylpentane	ND	U	ug/m³ Air	0.137	1.87	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Toluene	ND	U	ug/m³ Air	0.112	1.51	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2-Hexanone	ND	U	ug/m³ Air	0.0852	1.64	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2-Methylheptane	ND	U	ug/m³ Air	0.138	1.87	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1-Methylcyclohexene	ND	U	ug/m³ Air	0.113	1.57	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Chlorodibromomethane	ND	U	ug/m³ Air	0.261	3.41	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
3-Methylheptane	ND	U	ug/m³ Air	0.138	1.87	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Hexanal	ND	U	ug/m³ Air	0.437	1.64	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,2-Dibromoethane (EDB)	ND	U	ug/m³ Air	0.346	3.07	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2,2,5-Trimethylhexane	ND	U	ug/m³ Air	0.151	2.10	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1-Octene	ND	U	ug/m³ Air	0.101	1.84	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
n-Octane	ND	U	ug/m³ Air	0.178	1.87	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Tetrachloroethene	ND	U	ug/m³ Air	0.147	2.71	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
cis-2-Octene	ND	U	ug/m³ Air	0.100	1.84	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Chlorobenzene	ND	U	ug/m³ Air	0.138	1.84	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255

Golder Associates Ltd.
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11D0255-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
Ethylbenzene	ND	U	ug/m³ Air	0.194	1.74	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
m-Xylene & p-Xylene	ND	U	ug/m³ Air	0.367	3.47	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Bromoform	ND	U	ug/m³ Air	0.535	4.13	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Butyl acrylate	ND	U	ug/m³ Air	0.189	2.10	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Heptanal	ND	U	ug/m³ Air	0.213	1.87	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Styrene	ND	U	ug/m³ Air	0.250	1.70	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,1,2,2-Tetrachloroethane	ND	U	ug/m³ Air	0.302	2.75	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
o-Xylene	ND	U	ug/m³ Air	0.174	1.74	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Xylenes, total	ND	U	ug/m³ Air	0.367	5.21	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1-Nonene	ND	U	ug/m³ Air	0.142	2.06	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
4-Nonene	ND	U	ug/m³ Air	0.136	2.06	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
n-Nonane	ND	U	ug/m³ Air	0.223	2.10	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Isopropylbenzene	ND	U	ug/m³ Air	0.254	1.97	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Benzaldehyde	ND	U	ug/m³ Air	0.184	1.74	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
alpha-Pinene	ND	U	ug/m³ Air	0.167	2.23	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2 & 3-Chlorotoluene	ND	U	ug/m³ Air	0.291	4.14	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
4-Chlorotoluene	ND	U	ug/m³ Air	0.142	2.07	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
n-Propylbenzene	ND	U	ug/m³ Air	0.297	1.97	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
3-Ethyltoluene	ND	U	ug/m³ Air	0.113	1.97	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
4-Ethyltoluene	ND	U	ug/m³ Air	0.114	1.97	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,3,5-Trimethylbenzene	ND	U	ug/m³ Air	0.331	1.97	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
2-Ethyltoluene	ND	U	ug/m³ Air	0.335	1.97	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
beta-Pinene	ND	U	ug/m³ Air	0.252	2.23	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,2,4-Trimethylbenzene	ND	U	ug/m³ Air	0.121	1.97	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
tert-Butylbenzene	ND	U	ug/m³ Air	0.158	2.20	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1-Decene	ND	U	ug/m³ Air	0.119	2.30	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Benzyl chloride	ND	U	ug/m³ Air	0.489	2.07	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,3-Dichlorobenzene	ND	U	ug/m³ Air	0.189	2.40	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
n-Decane	ND	U	ug/m³ Air	0.223	2.33	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,4-Dichlorobenzene	ND	U	ug/m³ Air	0.304	2.40	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Isobutylbenzene	ND	U	ug/m³ Air	0.158	2.20	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,2,3-Trimethylbenzene	ND	U	ug/m³ Air	0.342	1.97	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
4-Isopropyltoluene	ND	U	ug/m³ Air	0.169	2.20	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,2-Dichlorobenzene	ND	U	ug/m³ Air	0.267	2.40	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Limonene	ND	U	ug/m³ Air	0.120	2.23	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Indan	ND	U	ug/m³ Air	0.115	1.93	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255

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500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Blank - Cont.

Analyte	Result	Data Qualifier	Units	MDL	RL	Dilution	Date Analyzed	Instrument	Analyst	QC Batch
Sample ID: 11D0255-BLK1 (Blank - Air) - cont.										
EPA TO15 - Volatile Organic Compounds by GC/MS										
Indene	ND	**U**	ug/m³ Air	0.173	1.90	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,3-Diethylbenzene	ND	**U**	ug/m³ Air	0.440	2.20	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,4-Diethylbenzene	ND	**U**	ug/m³ Air	0.165	2.20	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
n-Butylbenzene	ND	**U**	ug/m³ Air	0.159	2.20	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1-Undecene	ND	**U**	ug/m³ Air	0.183	2.52	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
n-Undecane	ND	**U**	ug/m³ Air	0.237	2.56	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,2,4-Trichlorobenzene	ND	**U**	ug/m³ Air	1.33	2.97	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Naphthalene	ND	**U**	ug/m³ Air	0.825	2.10	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Hexachlorobutadiene	ND	**U**	ug/m³ Air	1.52	4.27	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
1,2-Dichloroethene, Total	ND	**U**	ug/m³ Air	0.916	3.17	2.00	04/23/11 14:44	GCMSQ2	DAH	11D0255
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*90%*						04/23/11 14:44	GCMSQ2	DAH	11D0255
Surr: Fluorobenzene (62-122%)	*85%*						04/23/11 14:44	GCMSQ2	DAH	11D0255
Surr: Toluene-d8 (67-127%)	*99%*						04/23/11 14:44	GCMSQ2	DAH	11D0255
Surr: 1,4-Dichlorobutane (76-136%)	*106%*						04/23/11 14:44	GCMSQ2	DAH	11D0255
Surr: 4-Bromofluorobenzene (73-133%)	*108%*						04/23/11 14:44	GCMSQ2	DAH	11D0255

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Calibration Check

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0385-CCV1 (Calibration Check - Air)											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Propylene	16.9		ug/m³ Air	0.688	2.00	18.0	94%	70 - 130	VMSC	03/30/11 11:04	11C0385
Propane	17.8		ug/m³ Air	0.721	2.00	18.7	95%	70 - 130	VMSC	03/30/11 11:04	11C0385
Dichlorodifluoromethane	51.6		ug/m³ Air	1.98	2.00	51.7	100%	70 - 130	VMSC	03/30/11 11:04	11C0385
Chloromethane	20.5		ug/m³ Air	0.826	2.00	21.8	94%	70 - 130	VMSC	03/30/11 11:04	11C0385
Isobutane	23.0		ug/m³ Air	0.951	2.00	24.6	93%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,2-Dichloro-1,1,2,2-tetrafluoroethane	65.1		ug/m³ Air	2.80	2.00	72.4	90%	70 - 130	VMSC	03/30/11 11:04	11C0385
Acetaldehyde	14.6		ug/m³ Air	0.721	2.00	19.4	75%	50 - 150	VMSC	03/30/11 11:04	11C0385
Vinyl chloride	22.4		ug/m³ Air	1.02	2.00	26.7	84%	70 - 130	VMSC	03/30/11 11:04	11C0385
1-Butene/Isobutene	22.2		ug/m³ Air	0.918	2.00	23.5	94%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,3-Butadiene	23.7		ug/m³ Air	0.885	2.00	24.6	96%	70 - 130	VMSC	03/30/11 11:04	11C0385
Butane	22.5		ug/m³ Air	0.951	2.00	24.4	92%	70 - 130	VMSC	03/30/11 11:04	11C0385
trans-2-Butene	22.7		ug/m³ Air	0.918	2.00	23.5	97%	70 - 130	VMSC	03/30/11 11:04	11C0385
Bromomethane	35.1		ug/m³ Air	1.55	2.00	40.6	86%	70 - 130	VMSC	03/30/11 11:04	11C0385
cis-2-Butene	24.7		ug/m³ Air	0.918	2.00	25.2	98%	70 - 130	VMSC	03/30/11 11:04	11C0385
Chloroethane	25.1		ug/m³ Air	1.06	2.00	27.6	91%	70 - 130	VMSC	03/30/11 11:04	11C0385
Vinyl bromide	35.9		ug/m³ Air	1.75	2.00	47.6	75%	50 - 150	VMSC	03/30/11 11:04	11C0385
3-Methyl-1-butene	31.6		ug/m³ Air	1.15	2.00	31.8	99%	70 - 130	VMSC	03/30/11 11:04	11C0385
Ethanol	9.57	C4	ug/m³ Air	0.754	2.00	20.3	47%	50 - 150	VMSC	03/30/11 11:04	11C0385
Acetonitrile	14.5		ug/m³ Air	0.672	2.00	18.3	79%	50 - 150	VMSC	03/30/11 11:04	11C0385
Isopentane	30.8		ug/m³ Air	1.18	2.00	30.9	100%	70 - 130	VMSC	03/30/11 11:04	11C0385
Trichlorofluoromethane	64.5		ug/m³ Air	2.25	2.00	61.2	105%	70 - 130	VMSC	03/30/11 11:04	11C0385
1-Pentene	31.1		ug/m³ Air	1.15	2.00	31.2	100%	70 - 130	VMSC	03/30/11 11:04	11C0385
Acetone	26.3	B	ug/m³ Air	0.950	2.00	27.6	95%	70 - 130	VMSC	03/30/11 11:04	11C0385
Acrylonitrile	20.4		ug/m³ Air	0.868	2.00	24.1	85%	70 - 130	VMSC	03/30/11 11:04	11C0385
n-Pentane	31.6		ug/m³ Air	1.18	2.00	32.1	98%	70 - 130	VMSC	03/30/11 11:04	11C0385
Isoprene	26.2		ug/m³ Air	1.11	2.00	30.0	87%	70 - 130	VMSC	03/30/11 11:04	11C0385
trans-2-Pentene	31.6		ug/m³ Air	1.15	2.00	31.8	99%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,1-Dichloroethene	43.0		ug/m³ Air	1.59	2.00	43.6	99%	70 - 130	VMSC	03/30/11 11:04	11C0385
cis-2-Pentene	31.0		ug/m³ Air	1.15	2.00	31.2	99%	70 - 130	VMSC	03/30/11 11:04	11C0385
Methylene chloride	38.3		ug/m³ Air	1.39	2.00	37.5	102%	70 - 130	VMSC	03/30/11 11:04	11C0385
2-Methyl-2-butene	32.8		ug/m³ Air	1.15	2.00	32.4	101%	70 - 130	VMSC	03/30/11 11:04	11C0385
Carbon disulfide	28.0		ug/m³ Air	1.25	2.00	33.9	83%	50 - 150	VMSC	03/30/11 11:04	11C0385
Allyl chloride	34.9		ug/m³ Air	1.25	2.00	35.1	100%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,1,2-Trichlorotrifluoroethane	73.2		ug/m³ Air	3.07	2.00	83.5	88%	70 - 130	VMSC	03/30/11 11:04	11C0385
2,2-Dimethylbutane	36.2		ug/m³ Air	1.41	2.00	38.0	95%	70 - 130	VMSC	03/30/11 11:04	11C0385
Cyclopentene	25.3		ug/m³ Air	1.11	2.00	29.1	87%	70 - 130	VMSC	03/30/11 11:04	11C0385

Golder Associates Ltd.
500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Calibration Check - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0385-CCV1 (Calibration Check - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
trans-1,2-Dichloroethene	41.8		ug/m³ Air	1.59	2.00	43.6	96%	70 - 130	VMSC	03/30/11 11:04	11C0385
4-Methyl-1-pentene	38.3		ug/m³ Air	1.38	2.00	37.1	103%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,1-Dichloroethane	45.5		ug/m³ Air	1.62	2.00	45.3	100%	70 - 130	VMSC	03/30/11 11:04	11C0385
Cyclopentane	30.8		ug/m³ Air	1.15	2.00	30.9	100%	70 - 130	VMSC	03/30/11 11:04	11C0385
2,3-Dimethylbutane	40.7		ug/m³ Air	1.41	2.00	37.7	108%	70 - 130	VMSC	03/30/11 11:04	11C0385
Methyl tert-Butyl Ether	35.2		ug/m³ Air	1.44	2.00	38.9	91%	70 - 130	VMSC	03/30/11 11:04	11C0385
Isohexane	39.7		ug/m³ Air	1.41	2.00	38.8	103%	70 - 130	VMSC	03/30/11 11:04	11C0385
Vinyl acetate	36.7		ug/m³ Air	1.41	2.00	41.0	90%	50 - 150	VMSC	03/30/11 11:04	11C0385
2-Butanone (MEK)	29.0		ug/m³ Air	1.18	2.00	34.0	85%	50 - 150	VMSC	03/30/11 11:04	11C0385
Chloroprene	44.2		ug/m³ Air	1.45	2.00	38.7	114%	70 - 130	VMSC	03/30/11 11:04	11C0385
3-Methylpentane	36.7		ug/m³ Air	1.41	2.00	38.4	95%	70 - 130	VMSC	03/30/11 11:04	11C0385
2-Methyl-1-pentene	37.1		ug/m³ Air	1.38	2.00	37.1	100%	70 - 130	VMSC	03/30/11 11:04	11C0385
1-Hexene	42.3		ug/m³ Air	1.38	2.00	36.8	115%	70 - 130	VMSC	03/30/11 11:04	11C0385
cis-1,2-Dichloroethene	43.9		ug/m³ Air	1.59	2.00	44.0	100%	70 - 130	VMSC	03/30/11 11:04	11C0385
Bromochloromethane	51.3		ug/m³ Air	2.12	2.00	57.0	90%	70 - 130	VMSC	03/30/11 11:04	11C0385
Hexane	38.4		ug/m³ Air	1.41	2.00	39.5	97%	70 - 130	VMSC	03/30/11 11:04	11C0385
Chloroform	55.3		ug/m³ Air	1.95	2.00	53.7	103%	70 - 130	VMSC	03/30/11 11:04	11C0385
trans-2-Hexene	40.5		ug/m³ Air	1.38	2.00	38.2	106%	70 - 130	VMSC	03/30/11 11:04	11C0385
cis-2-Hexene	37.3		ug/m³ Air	1.38	2.00	35.3	106%	70 - 130	VMSC	03/30/11 11:04	11C0385
Methylcyclopentane	35.5		ug/m³ Air	1.38	2.00	36.8	97%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,2-Dichloroethane	54.1		ug/m³ Air	1.62	2.00	45.3	119%	70 - 130	VMSC	03/30/11 11:04	11C0385
2,4-Dimethylpentane	46.6		ug/m³ Air	1.64	2.00	44.6	104%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,1,1-Trichloroethane	67.1		ug/m³ Air	2.18	2.00	61.1	110%	70 - 130	VMSC	03/30/11 11:04	11C0385
Benzene	37.4		ug/m³ Air	1.28	2.00	36.1	104%	70 - 130	VMSC	03/30/11 11:04	11C0385
Carbon tetrachloride	**92.9**	**C8**	**ug/m³ Air**	**2.52**	**2.00**	**69.8**	**133%**	**70 - 130**	**VMSC**	**03/30/11 11:04**	**11C0385**
n-Butanol	16.1		ug/m³ Air	1.21	2.00	31.1	52%	50 - 150	VMSC	03/30/11 11:04	11C0385
Cyclohexane	41.6		ug/m³ Air	1.38	2.00	38.6	108%	70 - 130	VMSC	03/30/11 11:04	11C0385
Isoheptane	53.7		ug/m³ Air	1.64	2.00	44.6	120%	70 - 130	VMSC	03/30/11 11:04	11C0385
2,3-Dimethylpentane	50.1		ug/m³ Air	1.64	2.00	44.2	114%	70 - 130	VMSC	03/30/11 11:04	11C0385
3-Methylhexane	51.8		ug/m³ Air	1.64	2.00	44.2	117%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,2-Dichloropropane	57.2		ug/m³ Air	1.85	2.00	51.8	111%	70 - 130	VMSC	03/30/11 11:04	11C0385
Bromodichloromethane	86.7		ug/m³ Air	2.68	2.00	71.6	121%	70 - 130	VMSC	03/30/11 11:04	11C0385
Trichloroethene	60.0		ug/m³ Air	2.15	2.00	57.4	105%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,4-Dioxane	17.7	C4	ug/m³ Air	1.44	2.00	39.6	45%	50 - 150	VMSC	03/30/11 11:04	11C0385
2,2,4-Trimethylpentane	56.4		ug/m³ Air	1.87	2.00	50.4	112%	70 - 130	VMSC	03/30/11 11:04	11C0385
Heptane	45.5		ug/m³ Air	1.64	2.00	44.6	102%	70 - 130	VMSC	03/30/11 11:04	11C0385

Golder Associates Ltd.
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Calibration Check - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0385-CCV1 (Calibration Check - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
cis-1,3-Dichloropropene	52.7		ug/m³ Air	1.82	2.00	49.9	106%	70 - 130	VMSC	03/30/11 11:04	11C0385
4-Methyl-2-pentanone (MIBK)	51.7		ug/m³ Air	1.64	2.00	47.2	110%	50 - 150	VMSC	03/30/11 11:04	11C0385
Methylcyclohexane	44.6		ug/m³ Air	1.61	2.00	43.7	102%	70 - 130	VMSC	03/30/11 11:04	11C0385
trans-1,3-Dichloropropene	56.8		ug/m³ Air	1.82	2.00	52.8	108%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,1,2-Trichloroethane	65.3		ug/m³ Air	2.18	2.00	61.7	106%	70 - 130	VMSC	03/30/11 11:04	11C0385
2,3,4-Trimethylpentane	60.1		ug/m³ Air	1.87	2.00	50.9	118%	70 - 130	VMSC	03/30/11 11:04	11C0385
Toluene	46.9		ug/m³ Air	1.51	2.00	43.4	108%	70 - 130	VMSC	03/30/11 11:04	11C0385
2-Methylheptane	62.2		ug/m³ Air	1.87	2.00	50.9	122%	70 - 130	VMSC	03/30/11 11:04	11C0385
Chlorodibromomethane	115		ug/m³ Air	3.41	2.00	93.6	123%	70 - 130	VMSC	03/30/11 11:04	11C0385
3-Methylheptane	52.6		ug/m³ Air	1.87	2.00	50.4	104%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,2-Dibromoethane (EDB)	91.7		ug/m³ Air	3.07	2.00	87.7	104%	70 - 130	VMSC	03/30/11 11:04	11C0385
n-Octane	61.2		ug/m³ Air	1.87	2.00	50.9	120%	70 - 130	VMSC	03/30/11 11:04	11C0385
Tetrachloroethene	79.5		ug/m³ Air	2.71	2.00	76.0	105%	70 - 130	VMSC	03/30/11 11:04	11C0385
Chlorobenzene	54.0		ug/m³ Air	1.84	2.00	52.6	103%	70 - 130	VMSC	03/30/11 11:04	11C0385
Ethylbenzene	54.0		ug/m³ Air	1.74	2.00	49.6	109%	70 - 130	VMSC	03/30/11 11:04	11C0385
m-Xylene & p-Xylene	111		ug/m³ Air	3.47	2.00	97.3	114%	70 - 130	VMSC	03/30/11 11:04	11C0385
Bromoform	138		ug/m³ Air	4.13	2.00	116	119%	70 - 130	VMSC	03/30/11 11:04	11C0385
Styrene	50.1		ug/m³ Air	1.70	2.00	49.1	102%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,1,2,2-Tetrachloroethane	81.9		ug/m³ Air	2.75	2.00	77.6	106%	70 - 130	VMSC	03/30/11 11:04	11C0385
o-Xylene	56.5		ug/m³ Air	1.74	2.00	49.1	115%	70 - 130	VMSC	03/30/11 11:04	11C0385
Xylenes, total	168		ug/m³ Air	5.21	2.00	146	114%	70 - 130	VMSC	03/30/11 11:04	11C0385
n-Nonane	68.6		ug/m³ Air	2.10	2.00	56.6	121%	70 - 130	VMSC	03/30/11 11:04	11C0385
Isopropylbenzene	56.2		ug/m³ Air	1.97	2.00	51.4	109%	70 - 130	VMSC	03/30/11 11:04	11C0385
alpha-Pinene	72.1		ug/m³ Air	2.23	2.00	63.0	114%	70 - 130	VMSC	03/30/11 11:04	11C0385
n-Propylbenzene	56.2		ug/m³ Air	1.97	2.00	52.0	108%	70 - 130	VMSC	03/30/11 11:04	11C0385
3-Ethyltoluene	55.7		ug/m³ Air	1.97	2.00	52.0	107%	70 - 130	VMSC	03/30/11 11:04	11C0385
4-Ethyltoluene	56.6		ug/m³ Air	1.97	2.00	52.5	108%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,3,5-Trimethylbenzene	61.6		ug/m³ Air	1.97	2.00	56.6	109%	70 - 130	VMSC	03/30/11 11:04	11C0385
2-Ethyltoluene	55.5		ug/m³ Air	1.97	2.00	51.4	108%	70 - 130	VMSC	03/30/11 11:04	11C0385
beta-Pinene	49.5		ug/m³ Air	2.23	2.00	44.2	112%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,2,4-Trimethylbenzene	62.0		ug/m³ Air	1.97	2.00	56.6	110%	70 - 130	VMSC	03/30/11 11:04	11C0385
Benzyl chloride	70.3		ug/m³ Air	2.07	2.00	59.6	118%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,3-Dichlorobenzene	69.2		ug/m³ Air	2.40	2.00	69.3	100%	70 - 130	VMSC	03/30/11 11:04	11C0385
n-Decane	72.3		ug/m³ Air	2.33	2.00	63.4	114%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,4-Dichlorobenzene	68.1		ug/m³ Air	2.40	2.00	68.7	99%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,2,3-Trimethylbenzene	56.8		ug/m³ Air	1.97	2.00	50.9	112%	70 - 130	VMSC	03/30/11 11:04	11C0385

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500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Calibration Check - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0385-CCV1 (Calibration Check - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
1,2-Dichlorobenzene	72.0		ug/m³ Air	2.40	2.00	68.7	105%	70 - 130	VMSC	03/30/11 11:04	11C0385
Limonene	57.2		ug/m³ Air	2.23	2.00	61.8	92%	50 - 150	VMSC	03/30/11 11:04	11C0385
Indan	48.8		ug/m³ Air	1.93	2.00	53.7	91%	50 - 150	VMSC	03/30/11 11:04	11C0385
Indene	48.0		ug/m³ Air	1.90	2.00	51.8	93%	50 - 150	VMSC	03/30/11 11:04	11C0385
1,3-Diethylbenzene	62.9		ug/m³ Air	2.20	2.00	56.3	112%	70 - 130	VMSC	03/30/11 11:04	11C0385
1,4-Diethylbenzene	63.5		ug/m³ Air	2.20	2.00	57.4	111%	70 - 130	VMSC	03/30/11 11:04	11C0385
n-Undecane	56.9		ug/m³ Air	2.56	2.00	68.9	83%	50 - 150	VMSC	03/30/11 11:04	11C0385
1,2,4-Trichlorobenzene	35.3	C4, B	ug/m³ Air	2.97	2.00	85.5	41%	50 - 150	VMSC	03/30/11 11:04	11C0385
Naphthalene	27.0	C4	ug/m³ Air	2.10	2.00	60.4	45%	50 - 150	VMSC	03/30/11 11:04	11C0385
Hexachlorobutadiene	54.9	C4	ug/m³ Air	4.27	2.00	122	45%	50 - 150	VMSC	03/30/11 11:04	11C0385
1,2-Dichloroethene, Total	85.7		ug/m³ Air	3.17	2.00	87.6	98%	70 - 130	VMSC	03/30/11 11:04	11C0385
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*92%*								VMSC	03/30/11 11:04	11C0385
Surr: Fluorobenzene (62-122%)	*90%*								VMSC	03/30/11 11:04	11C0385
Surr: Toluene-d8 (67-127%)	*106%*								VMSC	03/30/11 11:04	11C0385
Surr: 1,4-Dichlorobutane (76-136%)	*103%*								VMSC	03/30/11 11:04	11C0385
Surr: 4-Bromofluorobenzene (73-133%)	*102%*								VMSC	03/30/11 11:04	11C0385
Sample ID: 11C0400-CCV1 (Calibration Check - Air)											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Propylene	18.7		ug/m³ Air	0.688	2.00	18.0	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
Propane	19.7		ug/m³ Air	0.721	2.00	18.7	106%	70 - 130	VMSC	03/31/11 10:52	11C0400
Dichlorodifluoromethane	55.7		ug/m³ Air	1.98	2.00	51.7	108%	70 - 130	VMSC	03/31/11 10:52	11C0400
Chloromethane	22.8		ug/m³ Air	0.826	2.00	21.8	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
Isobutane	25.8		ug/m³ Air	0.951	2.00	24.6	105%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,2-Dichloro-1,1,2,2-tetrafluoroethane	71.9		ug/m³ Air	2.80	2.00	72.4	99%	70 - 130	VMSC	03/31/11 10:52	11C0400
Acetaldehyde	18.0	B	ug/m³ Air	0.721	2.00	19.4	93%	50 - 150	VMSC	03/31/11 10:52	11C0400
Vinyl chloride	25.2		ug/m³ Air	1.02	2.00	26.7	94%	70 - 130	VMSC	03/31/11 10:52	11C0400
1-Butene/Isobutene	24.4		ug/m³ Air	0.918	2.00	23.5	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,3-Butadiene	25.5		ug/m³ Air	0.885	2.00	24.6	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
Butane	24.6		ug/m³ Air	0.951	2.00	24.4	101%	70 - 130	VMSC	03/31/11 10:52	11C0400
trans-2-Butene	24.7		ug/m³ Air	0.918	2.00	23.5	105%	70 - 130	VMSC	03/31/11 10:52	11C0400
Bromomethane	39.0		ug/m³ Air	1.55	2.00	40.6	96%	70 - 130	VMSC	03/31/11 10:52	11C0400
cis-2-Butene	26.8		ug/m³ Air	0.918	2.00	25.2	106%	70 - 130	VMSC	03/31/11 10:52	11C0400
Chloroethane	28.0		ug/m³ Air	1.06	2.00	27.6	101%	70 - 130	VMSC	03/31/11 10:52	11C0400

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Calibration Check - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0400-CCV1 (Calibration Check - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Vinyl bromide	39.9		ug/m³ Air	1.75	2.00	47.6	84%	50 - 150	VMSC	03/31/11 10:52	11C0400
3-Methyl-1-butene	34.7		ug/m³ Air	1.15	2.00	31.8	109%	70 - 130	VMSC	03/31/11 10:52	11C0400
Ethanol	10.7		ug/m³ Air	0.754	2.00	20.3	53%	50 - 150	VMSC	03/31/11 10:52	11C0400
Acetonitrile	15.4		ug/m³ Air	0.672	2.00	18.3	84%	50 - 150	VMSC	03/31/11 10:52	11C0400
Isopentane	33.2		ug/m³ Air	1.18	2.00	30.9	107%	70 - 130	VMSC	03/31/11 10:52	11C0400
Trichlorofluoromethane	67.8		ug/m³ Air	2.25	2.00	61.2	111%	70 - 130	VMSC	03/31/11 10:52	11C0400
1-Pentene	32.6		ug/m³ Air	1.15	2.00	31.2	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
Acetone	27.5	B	ug/m³ Air	0.950	2.00	27.6	99%	70 - 130	VMSC	03/31/11 10:52	11C0400
Acrylonitrile	21.1		ug/m³ Air	0.868	2.00	24.1	88%	70 - 130	VMSC	03/31/11 10:52	11C0400
n-Pentane	33.4		ug/m³ Air	1.18	2.00	32.1	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
Isoprene	28.0		ug/m³ Air	1.11	2.00	30.0	93%	70 - 130	VMSC	03/31/11 10:52	11C0400
trans-2-Pentene	32.7		ug/m³ Air	1.15	2.00	31.8	103%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,1-Dichloroethene	43.7		ug/m³ Air	1.59	2.00	43.6	100%	70 - 130	VMSC	03/31/11 10:52	11C0400
cis-2-Pentene	32.3		ug/m³ Air	1.15	2.00	31.2	103%	70 - 130	VMSC	03/31/11 10:52	11C0400
Methylene chloride	38.9		ug/m³ Air	1.39	2.00	37.5	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
2-Methyl-2-butene	34.1		ug/m³ Air	1.15	2.00	32.4	105%	70 - 130	VMSC	03/31/11 10:52	11C0400
Carbon disulfide	29.2		ug/m³ Air	1.25	2.00	33.9	86%	50 - 150	VMSC	03/31/11 10:52	11C0400
Allyl chloride	35.3		ug/m³ Air	1.25	2.00	35.1	101%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,1,2-Trichlorotrifluoroethane	80.6		ug/m³ Air	3.07	2.00	83.5	97%	70 - 130	VMSC	03/31/11 10:52	11C0400
2,2-Dimethylbutane	39.7		ug/m³ Air	1.41	2.00	38.0	105%	70 - 130	VMSC	03/31/11 10:52	11C0400
Cyclopentene	26.8		ug/m³ Air	1.11	2.00	29.1	92%	70 - 130	VMSC	03/31/11 10:52	11C0400
trans-1,2-Dichloroethene	42.5		ug/m³ Air	1.59	2.00	43.6	98%	70 - 130	VMSC	03/31/11 10:52	11C0400
4-Methyl-1-pentene	40.4		ug/m³ Air	1.38	2.00	37.1	109%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,1-Dichloroethane	46.0		ug/m³ Air	1.62	2.00	45.3	102%	70 - 130	VMSC	03/31/11 10:52	11C0400
Cyclopentane	32.3		ug/m³ Air	1.15	2.00	30.9	105%	70 - 130	VMSC	03/31/11 10:52	11C0400
2,3-Dimethylbutane	43.7		ug/m³ Air	1.41	2.00	37.7	116%	70 - 130	VMSC	03/31/11 10:52	11C0400
Methyl tert-Butyl Ether	39.3		ug/m³ Air	1.44	2.00	38.9	101%	70 - 130	VMSC	03/31/11 10:52	11C0400
Isohexane	41.6		ug/m³ Air	1.41	2.00	38.8	107%	70 - 130	VMSC	03/31/11 10:52	11C0400
Vinyl acetate	36.8		ug/m³ Air	1.41	2.00	41.0	90%	50 - 150	VMSC	03/31/11 10:52	11C0400
2-Butanone (MEK)	30.2		ug/m³ Air	1.18	2.00	34.0	89%	50 - 150	VMSC	03/31/11 10:52	11C0400
Chloroprene	42.8		ug/m³ Air	1.45	2.00	38.7	111%	70 - 130	VMSC	03/31/11 10:52	11C0400
3-Methylpentane	39.3		ug/m³ Air	1.41	2.00	38.4	102%	70 - 130	VMSC	03/31/11 10:52	11C0400
2-Methyl-1-pentene	39.4		ug/m³ Air	1.38	2.00	37.1	106%	70 - 130	VMSC	03/31/11 10:52	11C0400
1-Hexene	38.8		ug/m³ Air	1.38	2.00	36.8	106%	70 - 130	VMSC	03/31/11 10:52	11C0400
cis-1,2-Dichloroethene	43.6		ug/m³ Air	1.59	2.00	44.0	99%	70 - 130	VMSC	03/31/11 10:52	11C0400
Bromochloromethane	51.9		ug/m³ Air	2.12	2.00	57.0	91%	70 - 130	VMSC	03/31/11 10:52	11C0400

Golder Associates Ltd.
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Calibration Check - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0400-CCV1 (Calibration Check - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Hexane	39.1		ug/m³ Air	1.41	2.00	39.5	99%	70 - 130	VMSC	03/31/11 10:52	11C0400
Chloroform	54.1		ug/m³ Air	1.95	2.00	53.7	101%	70 - 130	VMSC	03/31/11 10:52	11C0400
trans-2-Hexene	40.4		ug/m³ Air	1.38	2.00	38.2	106%	70 - 130	VMSC	03/31/11 10:52	11C0400
cis-2-Hexene	37.1		ug/m³ Air	1.38	2.00	35.3	105%	70 - 130	VMSC	03/31/11 10:52	11C0400
Methylcyclopentane	37.3		ug/m³ Air	1.38	2.00	36.8	102%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,2-Dichloroethane	50.7		ug/m³ Air	1.62	2.00	45.3	112%	70 - 130	VMSC	03/31/11 10:52	11C0400
2,4-Dimethylpentane	48.8		ug/m³ Air	1.64	2.00	44.6	109%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,1,1-Trichloroethane	68.4		ug/m³ Air	2.18	2.00	61.1	112%	70 - 130	VMSC	03/31/11 10:52	11C0400
Benzene	36.5		ug/m³ Air	1.28	2.00	36.1	101%	70 - 130	VMSC	03/31/11 10:52	11C0400
Carbon tetrachloride	90.9		ug/m³ Air	2.52	2.00	69.8	130%	70 - 130	VMSC	03/31/11 10:52	11C0400
n-Butanol	20.4		ug/m³ Air	1.21	2.00	31.1	66%	50 - 150	VMSC	03/31/11 10:52	11C0400
Cyclohexane	43.2		ug/m³ Air	1.38	2.00	38.6	112%	70 - 130	VMSC	03/31/11 10:52	11C0400
Isoheptane	51.7		ug/m³ Air	1.64	2.00	44.6	116%	70 - 130	VMSC	03/31/11 10:52	11C0400
2,3-Dimethylpentane	50.9		ug/m³ Air	1.64	2.00	44.2	115%	70 - 130	VMSC	03/31/11 10:52	11C0400
3-Methylhexane	50.9		ug/m³ Air	1.64	2.00	44.2	115%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,2-Dichloropropane	55.1		ug/m³ Air	1.85	2.00	51.8	107%	70 - 130	VMSC	03/31/11 10:52	11C0400
Bromodichloromethane	81.3		ug/m³ Air	2.68	2.00	71.6	114%	70 - 130	VMSC	03/31/11 10:52	11C0400
Trichloroethene	58.2		ug/m³ Air	2.15	2.00	57.4	101%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,4-Dioxane	19.2	C4	ug/m³ Air	1.44	2.00	39.6	49%	50 - 150	VMSC	03/31/11 10:52	11C0400
2,2,4-Trimethylpentane	57.2		ug/m³ Air	1.87	2.00	50.4	114%	70 - 130	VMSC	03/31/11 10:52	11C0400
Heptane	44.3		ug/m³ Air	1.64	2.00	44.6	99%	70 - 130	VMSC	03/31/11 10:52	11C0400
cis-1,3-Dichloropropene	50.9		ug/m³ Air	1.82	2.00	49.9	102%	70 - 130	VMSC	03/31/11 10:52	11C0400
4-Methyl-2-pentanone (MIBK)	50.8		ug/m³ Air	1.64	2.00	47.2	108%	50 - 150	VMSC	03/31/11 10:52	11C0400
Methylcyclohexane	44.9		ug/m³ Air	1.61	2.00	43.7	103%	70 - 130	VMSC	03/31/11 10:52	11C0400
trans-1,3-Dichloropropene	54.9		ug/m³ Air	1.82	2.00	52.8	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,1,2-Trichloroethane	63.3		ug/m³ Air	2.18	2.00	61.7	103%	70 - 130	VMSC	03/31/11 10:52	11C0400
2,3,4-Trimethylpentane	58.2		ug/m³ Air	1.87	2.00	50.9	114%	70 - 130	VMSC	03/31/11 10:52	11C0400
Toluene	45.1		ug/m³ Air	1.51	2.00	43.4	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
2-Methylheptane	58.5		ug/m³ Air	1.87	2.00	50.9	115%	70 - 130	VMSC	03/31/11 10:52	11C0400
Chlorodibromomethane	108		ug/m³ Air	3.41	2.00	93.6	115%	70 - 130	VMSC	03/31/11 10:52	11C0400
3-Methylheptane	50.9		ug/m³ Air	1.87	2.00	50.4	101%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,2-Dibromoethane (EDB)	87.7		ug/m³ Air	3.07	2.00	87.7	100%	70 - 130	VMSC	03/31/11 10:52	11C0400
n-Octane	57.6		ug/m³ Air	1.87	2.00	50.9	113%	70 - 130	VMSC	03/31/11 10:52	11C0400
Tetrachloroethene	76.2		ug/m³ Air	2.71	2.00	76.0	100%	70 - 130	VMSC	03/31/11 10:52	11C0400
Chlorobenzene	52.1		ug/m³ Air	1.84	2.00	52.6	99%	70 - 130	VMSC	03/31/11 10:52	11C0400
Ethylbenzene	52.0		ug/m³ Air	1.74	2.00	49.6	105%	70 - 130	VMSC	03/31/11 10:52	11C0400

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Calibration Check - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0400-CCV1 (Calibration Check - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
m-Xylene & p-Xylene	106		ug/m³ Air	3.47	2.00	97.3	109%	70 - 130	VMSC	03/31/11 10:52	11C0400
Bromoform	132		ug/m³ Air	4.13	2.00	116	114%	70 - 130	VMSC	03/31/11 10:52	11C0400
Styrene	48.7		ug/m³ Air	1.70	2.00	49.1	99%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,1,2,2-Tetrachloroethane	79.5		ug/m³ Air	2.75	2.00	77.6	102%	70 - 130	VMSC	03/31/11 10:52	11C0400
o-Xylene	53.8		ug/m³ Air	1.74	2.00	49.1	110%	70 - 130	VMSC	03/31/11 10:52	11C0400
Xylenes, total	159		ug/m³ Air	5.21	2.00	146	109%	70 - 130	VMSC	03/31/11 10:52	11C0400
n-Nonane	65.0		ug/m³ Air	2.10	2.00	56.6	115%	70 - 130	VMSC	03/31/11 10:52	11C0400
Isopropylbenzene	54.5		ug/m³ Air	1.97	2.00	51.4	106%	70 - 130	VMSC	03/31/11 10:52	11C0400
alpha-Pinene	68.6		ug/m³ Air	2.23	2.00	63.0	109%	70 - 130	VMSC	03/31/11 10:52	11C0400
n-Propylbenzene	54.2		ug/m³ Air	1.97	2.00	52.0	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
3-Ethyltoluene	54.1		ug/m³ Air	1.97	2.00	52.0	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
4-Ethyltoluene	54.6		ug/m³ Air	1.97	2.00	52.5	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,3,5-Trimethylbenzene	59.1		ug/m³ Air	1.97	2.00	56.6	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
2-Ethyltoluene	53.4		ug/m³ Air	1.97	2.00	51.4	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
beta-Pinene	47.8		ug/m³ Air	2.23	2.00	44.2	108%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,2,4-Trimethylbenzene	59.3		ug/m³ Air	1.97	2.00	56.6	105%	70 - 130	VMSC	03/31/11 10:52	11C0400
Benzyl chloride	66.6		ug/m³ Air	2.07	2.00	59.6	112%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,3-Dichlorobenzene	65.9	B	ug/m³ Air	2.40	2.00	69.3	95%	70 - 130	VMSC	03/31/11 10:52	11C0400
n-Decane	68.2		ug/m³ Air	2.33	2.00	63.4	108%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,4-Dichlorobenzene	64.8	B	ug/m³ Air	2.40	2.00	68.7	94%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,2,3-Trimethylbenzene	53.0		ug/m³ Air	1.97	2.00	50.9	104%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,2-Dichlorobenzene	66.7	B	ug/m³ Air	2.40	2.00	68.7	97%	70 - 130	VMSC	03/31/11 10:52	11C0400
Limonene	54.6		ug/m³ Air	2.23	2.00	61.8	88%	50 - 150	VMSC	03/31/11 10:52	11C0400
Indan	46.4		ug/m³ Air	1.93	2.00	53.7	87%	50 - 150	VMSC	03/31/11 10:52	11C0400
Indene	45.0		ug/m³ Air	1.90	2.00	51.8	87%	50 - 150	VMSC	03/31/11 10:52	11C0400
1,3-Diethylbenzene	60.3		ug/m³ Air	2.20	2.00	56.3	107%	70 - 130	VMSC	03/31/11 10:52	11C0400
1,4-Diethylbenzene	61.7		ug/m³ Air	2.20	2.00	57.4	108%	70 - 130	VMSC	03/31/11 10:52	11C0400
n-Undecane	67.9		ug/m³ Air	2.56	2.00	68.9	99%	50 - 150	VMSC	03/31/11 10:52	11C0400
1,2,4-Trichlorobenzene	64.9	B	ug/m³ Air	2.97	2.00	85.5	76%	50 - 150	VMSC	03/31/11 10:52	11C0400
Naphthalene	49.4	B	ug/m³ Air	2.10	2.00	60.4	82%	50 - 150	VMSC	03/31/11 10:52	11C0400
Hexachlorobutadiene	99.2	B	ug/m³ Air	4.27	2.00	122	81%	50 - 150	VMSC	03/31/11 10:52	11C0400
1,2-Dichloroethene, Total	86.1		ug/m³ Air	3.17	2.00	87.6	98%	70 - 130	VMSC	03/31/11 10:52	11C0400
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*95%*								VMSC	03/31/11 10:52	11C0400
Surr: Fluorobenzene (62-122%)	*94%*								VMSC	03/31/11 10:52	11C0400
Surr: Toluene-d8 (67-127%)	*105%*								VMSC	03/31/11 10:52	11C0400

Golder Associates Ltd.
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Calibration Check - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0400-CCV1 (Calibration Check - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Surr: 1,4-Dichlorobutane (76-136%)	*103%*								VMSC	03/31/11 10:52	11C0400
Surr: 4-Bromofluorobenzene (73-133%)	*100%*								VMSC	03/31/11 10:52	11C0400
Sample ID: 11D0020-CCV1 (Calibration Check - Air)											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Ethene	15.0		ug/m³ Air	0.459	2.00	12.3	122%	70 - 130	GCMSQ2	04/04/11 10:28	11D0020
Acetylene	10.5		ug/m³ Air	0.426	2.00	11.4	92%	70 - 130	GCMSQ2	04/04/11 10:28	11D0020
Ethane	12.8		ug/m³ Air	0.492	2.00	13.2	97%	50 - 150	GCMSQ2	04/04/11 10:28	11D0020
Propylene	18.5		ug/m³ Air	0.688	2.00	18.1	102%	70 - 130	GCMSQ2	04/04/11 10:28	11D0020
Propane	18.3		ug/m³ Air	0.721	2.00	18.7	98%	70 - 130	GCMSQ2	04/04/11 10:28	11D0020
Isobutane	25.0		ug/m³ Air	0.951	2.00	24.7	101%	70 - 130	GCMSQ2	04/04/11 10:28	11D0020
1-Butene/Isobutene	24.3		ug/m³ Air	0.918	2.00	23.6	103%	70 - 130	GCMSQ2	04/04/11 10:28	11D0020
Butane	24.2		ug/m³ Air	0.951	2.00	24.4	99%	70 - 130	GCMSQ2	04/04/11 10:28	11D0020
Methanol	13.4	B	ug/m³ Air	0.524	2.00	14.4	93%	50 - 150	GCMSQ2	04/04/11 10:28	11D0020
cis-2-Butene	26.4		ug/m³ Air	0.918	2.00	25.3	104%	70 - 130	GCMSQ2	04/04/11 10:28	11D0020
Ethanol	18.4		ug/m³ Air	0.754	2.00	20.4	90%	50 - 150	GCMSQ2	04/04/11 10:28	11D0020
Isopentane	28.7		ug/m³ Air	1.18	2.00	31.0	93%	70 - 130	GCMSQ2	04/04/11 10:28	11D0020
1-Pentene	31.2		ug/m³ Air	1.15	2.00	31.3	100%	70 - 130	GCMSQ2	04/04/11 10:28	11D0020
n-Pentane	31.9		ug/m³ Air	1.18	2.00	32.2	99%	70 - 130	GCMSQ2	04/04/11 10:28	11D0020
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*98%*								GCMSQ2	04/04/11 10:28	11D0020
Surr: Fluorobenzene (62-122%)	*96%*								GCMSQ2	04/04/11 10:28	11D0020
Surr: Toluene-d8 (67-127%)	*105%*								GCMSQ2	04/04/11 10:28	11D0020
Surr: 1,4-Dichlorobutane (76-136%)	*104%*								GCMSQ2	04/04/11 10:28	11D0020
Surr: 4-Bromofluorobenzene (73-133%)	*102%*								GCMSQ2	04/04/11 10:28	11D0020
Sample ID: 11D0170-CCV1 (Calibration Check - Air)											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Ethene	12.5		ug/m³ Air	0.459	2.00	12.2	102%	70 - 130	GCMSQ2	04/18/11 10:36	11D0170
Acetylene	9.81		ug/m³ Air	0.426	2.00	11.4	86%	70 - 130	GCMSQ2	04/18/11 10:36	11D0170
Ethane	11.5		ug/m³ Air	0.492	2.00	13.1	87%	50 - 150	GCMSQ2	04/18/11 10:36	11D0170
Propylene	15.6		ug/m³ Air	0.688	2.00	18.0	87%	70 - 130	GCMSQ2	04/18/11 10:36	11D0170
Propane	15.8		ug/m³ Air	0.721	2.00	18.7	84%	70 - 130	GCMSQ2	04/18/11 10:36	11D0170

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Calibration Check - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11D0170-CCV1 (Calibration Check - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
1-Butene/Isobutene	21.1		ug/m³ Air	0.918	2.00	23.5	90%	70 - 130	GCMSQ2	04/18/11 10:36	11D0170
Butane	20.5		ug/m³ Air	0.951	2.00	24.3	84%	70 - 130	GCMSQ2	04/18/11 10:36	11D0170
Methanol	11.6	B	ug/m³ Air	0.524	2.00	14.4	81%	50 - 150	GCMSQ2	04/18/11 10:36	11D0170
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*93%*								GCMSQ2	04/18/11 10:36	11D0170
Surr: Fluorobenzene (62-122%)	*83%*								GCMSQ2	04/18/11 10:36	11D0170
Surr: Toluene-d8 (67-127%)	*104%*								GCMSQ2	04/18/11 10:36	11D0170
Surr: 1,4-Dichlorobutane (76-136%)	*109%*								GCMSQ2	04/18/11 10:36	11D0170
Surr: 4-Bromofluorobenzene (73-133%)	*108%*								GCMSQ2	04/18/11 10:36	11D0170
Sample ID: 11D0255-CCV1 (Calibration Check - Air)											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Ethene	11.8		ug/m³ Air	0.459	2.00	12.2	97%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Acetylene	10.4		ug/m³ Air	0.426	2.00	11.3	93%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Ethane	12.7		ug/m³ Air	0.492	2.00	13.0	97%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
Propylene	16.9		ug/m³ Air	0.688	2.00	17.9	94%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Propane	17.0		ug/m³ Air	0.721	2.00	18.5	91%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Dichlorodifluoromethane	47.1		ug/m³ Air	1.98	2.00	51.4	92%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Chloromethane	20.1		ug/m³ Air	0.826	2.00	21.7	93%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Isobutane	22.7		ug/m³ Air	0.951	2.00	24.4	93%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,2-Dichloro-1,1,2,2-tetrafluoroethane	64.8		ug/m³ Air	2.80	2.00	71.9	90%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Acetaldehyde	19.2		ug/m³ Air	0.721	2.00	19.3	100%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
Vinyl chloride	24.2		ug/m³ Air	1.02	2.00	26.6	91%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1-Butene/Isobutene	22.7		ug/m³ Air	0.918	2.00	23.4	97%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,3-Butadiene	24.3		ug/m³ Air	0.885	2.00	24.4	100%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Butane	22.5		ug/m³ Air	0.951	2.00	24.2	93%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Methanol	12.9	B	ug/m³ Air	0.524	2.00	14.3	90%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
trans-2-Butene	23.8		ug/m³ Air	0.918	2.00	23.4	102%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Bromomethane	36.9		ug/m³ Air	1.55	2.00	40.3	91%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
cis-2-Butene	25.5		ug/m³ Air	0.918	2.00	25.0	102%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Chloroethane	28.1		ug/m³ Air	1.06	2.00	27.4	102%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Vinyl bromide	43.7		ug/m³ Air	1.75	2.00	47.2	92%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
3-Methyl-1-butene	32.1		ug/m³ Air	1.15	2.00	31.6	102%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Ethanol	16.2		ug/m³ Air	0.754	2.00	20.2	80%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
Acetonitrile	20.9		ug/m³ Air	0.672	2.00	18.1	115%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Calibration Check - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11D0255-CCV1 (Calibration Check - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Isopentane	29.9		ug/m³ Air	1.18	2.00	30.7	97%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Trichlorofluoromethane	59.5		ug/m³ Air	2.25	2.00	60.7	98%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1-Pentene	35.4		ug/m³ Air	1.15	2.00	31.0	114%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Acetone	29.1	B	ug/m³ Air	0.950	2.00	27.4	106%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Acrylonitrile	25.3		ug/m³ Air	0.868	2.00	23.9	106%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
n-Pentane	32.0		ug/m³ Air	1.18	2.00	31.9	100%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Isoprene	30.2		ug/m³ Air	1.11	2.00	29.8	101%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
trans-2-Pentene	32.8		ug/m³ Air	1.15	2.00	31.6	104%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,1-Dichloroethene	43.4		ug/m³ Air	1.59	2.00	43.3	100%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
cis-2-Pentene	32.3		ug/m³ Air	1.15	2.00	31.0	104%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Methylene chloride	39.4		ug/m³ Air	1.39	2.00	37.2	106%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
2-Methyl-2-butene	34.1		ug/m³ Air	1.15	2.00	32.2	106%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Carbon disulfide	31.9		ug/m³ Air	1.25	2.00	33.6	95%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
Allyl chloride	36.8		ug/m³ Air	1.25	2.00	34.8	106%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,1,2-Trichlorotrifluoroethane	74.2		ug/m³ Air	3.07	2.00	82.8	90%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
2,2-Dimethylbutane	36.9		ug/m³ Air	1.41	2.00	37.7	98%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Cyclopentene	28.9		ug/m³ Air	1.11	2.00	28.9	100%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
trans-1,2-Dichloroethene	44.4		ug/m³ Air	1.59	2.00	43.3	103%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
4-Methyl-1-pentene	40.5		ug/m³ Air	1.38	2.00	36.9	110%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,1-Dichloroethane	47.9		ug/m³ Air	1.62	2.00	45.0	106%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Cyclopentane	31.0		ug/m³ Air	1.15	2.00	30.7	101%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
2,3-Dimethylbutane	38.6		ug/m³ Air	1.41	2.00	37.3	103%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Methyl tert-Butyl Ether	40.1		ug/m³ Air	1.44	2.00	38.6	104%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Isohexane	43.3		ug/m³ Air	1.41	2.00	38.5	113%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Vinyl acetate	44.6		ug/m³ Air	1.41	2.00	40.6	110%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
2-Butanone (MEK)	34.1	B	ug/m³ Air	1.18	2.00	33.7	101%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
Chloroprene	41.3		ug/m³ Air	1.45	2.00	38.3	108%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
3-Methylpentane	39.3		ug/m³ Air	1.41	2.00	38.1	103%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
2-Methyl-1-pentene	40.5		ug/m³ Air	1.38	2.00	36.9	110%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1-Hexene	39.6		ug/m³ Air	1.38	2.00	36.5	109%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
cis-1,2-Dichloroethene	45.4		ug/m³ Air	1.59	2.00	43.7	104%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Bromochloromethane	54.2		ug/m³ Air	2.12	2.00	56.6	96%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Hexane	40.1		ug/m³ Air	1.41	2.00	39.2	102%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Chloroform	54.5		ug/m³ Air	1.95	2.00	53.3	102%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
trans-2-Hexene	39.8		ug/m³ Air	1.38	2.00	37.9	105%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
cis-2-Hexene	36.8		ug/m³ Air	1.38	2.00	35.1	105%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255

Golder Associates Ltd.
500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Calibration Check - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11D0255-CCV1 (Calibration Check - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Methylcyclopentane	38.1		ug/m³ Air	1.38	2.00	36.5	105%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,2-Dichloroethane	48.8		ug/m³ Air	1.62	2.00	45.0	108%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
2,4-Dimethylpentane	49.9		ug/m³ Air	1.64	2.00	44.3	113%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,1,1-Trichloroethane	64.1		ug/m³ Air	2.18	2.00	60.7	106%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Benzene	41.3		ug/m³ Air	1.28	2.00	35.8	115%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Carbon tetrachloride	79.9		ug/m³ Air	2.52	2.00	69.3	115%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
n-Butanol	12.2	C4	ug/m³ Air	1.21	2.00	30.9	40%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
Cyclohexane	40.9		ug/m³ Air	1.38	2.00	38.3	107%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Isoheptane	55.3		ug/m³ Air	1.64	2.00	44.3	125%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
2,3-Dimethylpentane	55.0		ug/m³ Air	1.64	2.00	43.9	125%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
3-Methylhexane	54.5		ug/m³ Air	1.64	2.00	43.9	124%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,2-Dichloropropane	60.9		ug/m³ Air	1.85	2.00	51.4	119%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Bromodichloromethane	81.4		ug/m³ Air	2.68	2.00	71.0	115%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Trichloroethene	61.2		ug/m³ Air	2.15	2.00	56.9	108%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,4-Dioxane	40.0		ug/m³ Air	1.44	2.00	39.3	102%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
2,2,4-Trimethylpentane	64.4		ug/m³ Air	1.87	2.00	50.0	129%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Heptane	50.2		ug/m³ Air	1.64	2.00	44.3	113%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
cis-1,3-Dichloropropene	56.2		ug/m³ Air	1.82	2.00	49.5	114%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
4-Methyl-2-pentanone (MIBK)	56.0	B	ug/m³ Air	1.64	2.00	46.8	120%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
Methylcyclohexane	51.2		ug/m³ Air	1.61	2.00	43.4	118%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
trans-1,3-Dichloropropene	59.7		ug/m³ Air	1.82	2.00	52.4	114%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,1,2-Trichloroethane	67.0		ug/m³ Air	2.18	2.00	61.2	109%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
2,3,4-Trimethylpentane	63.0		ug/m³ Air	1.87	2.00	50.4	125%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Toluene	47.7		ug/m³ Air	1.51	2.00	43.1	111%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
2-Methylheptane	60.7		ug/m³ Air	1.87	2.00	50.4	120%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Chlorodibromomethane	97.8		ug/m³ Air	3.41	2.00	92.9	105%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
3-Methylheptane	55.7		ug/m³ Air	1.87	2.00	50.0	111%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,2-Dibromoethane (EDB)	94.2		ug/m³ Air	3.07	2.00	87.1	108%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
n-Octane	58.6		ug/m³ Air	1.87	2.00	50.5	116%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Tetrachloroethene	77.9		ug/m³ Air	2.71	2.00	75.4	103%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Chlorobenzene	54.5		ug/m³ Air	1.84	2.00	52.2	104%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Ethylbenzene	53.5		ug/m³ Air	1.74	2.00	49.2	109%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
m-Xylene & p-Xylene	105		ug/m³ Air	3.47	2.00	96.6	109%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Bromoform	103		ug/m³ Air	4.13	2.00	115	89%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Styrene	51.1		ug/m³ Air	1.70	2.00	48.7	105%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,1,2,2-Tetrachloroethane	82.2		ug/m³ Air	2.75	2.00	77.0	107%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Calibration Check - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11D0255-CCV1 (Calibration Check - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
o-Xylene	53.5		ug/m³ Air	1.74	2.00	48.7	110%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Xylenes, total	158		ug/m³ Air	5.21	2.00	145	109%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
n-Nonane	63.5		ug/m³ Air	2.10	2.00	56.1	113%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Isopropylbenzene	54.2		ug/m³ Air	1.97	2.00	51.1	106%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
alpha-Pinene	70.2		ug/m³ Air	2.23	2.00	62.5	112%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
n-Propylbenzene	53.9		ug/m³ Air	1.97	2.00	51.6	104%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
3-Ethyltoluene	52.7		ug/m³ Air	1.97	2.00	51.6	102%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
4-Ethyltoluene	53.7		ug/m³ Air	1.97	2.00	52.1	103%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,3,5-Trimethylbenzene	57.1		ug/m³ Air	1.97	2.00	56.2	102%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
2-Ethyltoluene	52.0		ug/m³ Air	1.97	2.00	51.1	102%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
beta-Pinene	49.2		ug/m³ Air	2.23	2.00	43.8	112%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,2,4-Trimethylbenzene	56.3		ug/m³ Air	1.97	2.00	56.2	100%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Benzyl chloride	59.7		ug/m³ Air	2.07	2.00	59.2	101%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,3-Dichlorobenzene	65.9		ug/m³ Air	2.40	2.00	68.7	96%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
n-Decane	66.2		ug/m³ Air	2.33	2.00	62.9	105%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,4-Dichlorobenzene	65.0		ug/m³ Air	2.40	2.00	68.1	95%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,2,3-Trimethylbenzene	50.2		ug/m³ Air	1.97	2.00	50.5	99%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,2-Dichlorobenzene	64.0		ug/m³ Air	2.40	2.00	68.1	94%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Limonene	64.2		ug/m³ Air	2.23	2.00	61.3	105%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
Indan	50.5		ug/m³ Air	1.93	2.00	53.2	95%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
Indene	48.8		ug/m³ Air	1.90	2.00	51.3	95%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
1,3-Diethylbenzene	57.2		ug/m³ Air	2.20	2.00	55.9	102%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
1,4-Diethylbenzene	57.5		ug/m³ Air	2.20	2.00	57.0	101%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
n-Undecane	79.7		ug/m³ Air	2.56	2.00	68.4	117%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
1,2,4-Trichlorobenzene	79.2		ug/m³ Air	2.97	2.00	84.8	93%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
Naphthalene	53.6		ug/m³ Air	2.10	2.00	59.9	89%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
Hexachlorobutadiene	124		ug/m³ Air	4.27	2.00	121	102%	50 - 150	GCMSQ2	04/23/11 11:51	11D0255
1,2-Dichloroethene, Total	89.8		ug/m³ Air	3.17	2.00	86.9	103%	70 - 130	GCMSQ2	04/23/11 11:51	11D0255
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*96%*								GCMSQ2	04/23/11 11:51	11D0255
Surr: Fluorobenzene (62-122%)	*93%*								GCMSQ2	04/23/11 11:51	11D0255
Surr: Toluene-d8 (67-127%)	*104%*								GCMSQ2	04/23/11 11:51	11D0255
Surr: 1,4-Dichlorobutane (76-136%)	*101%*								GCMSQ2	04/23/11 11:51	11D0255
Surr: 4-Bromofluorobenzene (73-133%)	*98%*								GCMSQ2	04/23/11 11:51	11D0255

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11C0385-DUP1 (Duplicate - Air)									
EPA TO15 - Volatile Organic Compounds by GC/MS									
Halocarbon 134A	**3.95**	**J**	**3.88**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
Propylene	**1510**	**E**	**1420**	ug/m³ Air	6	25	11C0385	AUC0212-03	03/30/11 23:08
Chlorodifluoromethane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Propane	**1750**	**E**	**1650**	ug/m³ Air	6	25	11C0385	AUC0212-03	03/30/11 23:08
Dichlorodifluoromethane	**2.59**	**J**	**2.64**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
Chloromethane	**1.19**	**J**	**1.20**	ug/m³ Air	0.5	25	11C0385	AUC0212-03	03/30/11 23:08
Isobutane	**327**	**E**	**324**	ug/m³ Air	0.8	25	11C0385	AUC0212-03	03/30/11 23:08
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Acetaldehyde	**19.4**		**20.2**	ug/m³ Air	4	25	11C0385	AUC0212-03	03/30/11 23:08
Vinyl chloride	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
1-Butene/Isobutene	**1170**	**E**	**1110**	ug/m³ Air	5	25	11C0385	AUC0212-03	03/30/11 23:08
1,3-Butadiene	**30.7**		**29.0**	ug/m³ Air	6	25	11C0385	AUC0212-03	03/30/11 23:08
Butane	**899**	**E**	**860**	ug/m³ Air	4	25	11C0385	AUC0212-03	03/30/11 23:08
trans-2-Butene	**51.9**		**52.1**	ug/m³ Air	0.4	25	11C0385	AUC0212-03	03/30/11 23:08
Neopentane	**3.52**		**3.48**	ug/m³ Air	0.9	25	11C0385	AUC0212-03	03/30/11 23:08
Dichlorofluoromethane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Bromomethane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
cis-2-Butene	**192**	**E**	**190**	ug/m³ Air	1	25	11C0385	AUC0212-03	03/30/11 23:08
Chloroethane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Vinyl bromide	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
3-Methyl-1-butene	**113**		**114**	ug/m³ Air	0.9	25	11C0385	AUC0212-03	03/30/11 23:08
Ethanol	**214**	**E**	**192**	ug/m³ Air	11	25	11C0385	AUC0212-03	03/30/11 23:08
Acetonitrile	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Isopentane	**368**	**E**	**365**	ug/m³ Air	0.9	25	11C0385	AUC0212-03	03/30/11 23:08
Trichlorofluoromethane	**1.02**	**J**	**1.02**	ug/m³ Air	0.3	25	11C0385	AUC0212-03	03/30/11 23:08
1-Pentene	**360**	**E**	**356**	ug/m³ Air	1	25	11C0385	AUC0212-03	03/30/11 23:08
Acetone	**8.37**	**B**	**8.44**	ug/m³ Air	0.8	25	11C0385	AUC0212-03	03/30/11 23:08
Isopropyl alcohol	**4.00**		**3.78**	ug/m³ Air	6	50	11C0385	AUC0212-03	03/30/11 23:08
Acrylonitrile	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
n-Pentane	**353**	**E**	**350**	ug/m³ Air	0.6	25	11C0385	AUC0212-03	03/30/11 23:08
Diethyl ether	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Isoprene	**13.1**		**13.5**	ug/m³ Air	3	25	11C0385	AUC0212-03	03/30/11 23:08
trans-2-Pentene	**31.8**		**32.9**	ug/m³ Air	3	25	11C0385	AUC0212-03	03/30/11 23:08
1,1-Dichloroethene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08

Golder Associates Ltd.
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate - Cont.

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11C0385-DUP1 (Duplicate - Air) - cont.									
EPA TO15 - Volatile Organic Compounds by GC/MS									
cis-2-Pentene	**112**		**115**	ug/m³ Air	3	25	11C0385	AUC0212-03	03/30/11 23:08
Methylene chloride	**0.796**	**J**	**0.734**	ug/m³ Air	8	25	11C0385	AUC0212-03	03/30/11 23:08
2-Methyl-2-butene	**38.5**		**39.5**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
Carbon disulfide	**53.3**		**54.8**	ug/m³ Air	3	25	11C0385	AUC0212-03	03/30/11 23:08
Allyl chloride	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
1,1,2-Trichlorotrifluoroethane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
2,2-Dimethylbutane	**8.66**		**8.69**	ug/m³ Air	0.3	25	11C0385	AUC0212-03	03/30/11 23:08
Cyclopentene	**10.9**		**11.4**	ug/m³ Air	5	25	11C0385	AUC0212-03	03/30/11 23:08
trans-1,2-Dichloroethene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
4-Methyl-1-pentene	**44.3**		**44.9**	ug/m³ Air	1	25	11C0385	AUC0212-03	03/30/11 23:08
Propanol	**55.4**		**51.7**	ug/m³ Air	7	25	11C0385	AUC0212-03	03/30/11 23:08
1,1-Dichloroethane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Cyclopentane	**4.35**		**4.56**	ug/m³ Air	5	25	11C0385	AUC0212-03	03/30/11 23:08
2,3-Dimethylbutane	**19.9**		**20.0**	ug/m³ Air	0.7	25	11C0385	AUC0212-03	03/30/11 23:08
Methyl tert-Butyl Ether	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Isohexane	**112**		**113**	ug/m³ Air	1	25	11C0385	AUC0212-03	03/30/11 23:08
Vinyl acetate	ND	**U**	ND	ug/m³ Air		50	11C0385	AUC0212-03	03/30/11 23:08
cis/trans-4-Methyl-2-pentene	**12.2**		**12.5**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
Butyraldehyde	**1.63**	**J**	**1.81**	ug/m³ Air	11	25	11C0385	AUC0212-03	03/30/11 23:08
2-Butanone (MEK)	**3.14**	**J**	**3.08**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
Chloroprene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
3-Methylpentane	**101**		**103**	ug/m³ Air	1	25	11C0385	AUC0212-03	03/30/11 23:08
2-Methyl-1-pentene	**94.8**		**93.0**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
1-Hexene	**132**		**143**	ug/m³ Air	8	25	11C0385	AUC0212-03	03/30/11 23:08
cis-1,2-Dichloroethene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Bromochloromethane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
2-Ethyl-1-butene	**27.9**		**29.0**	ug/m³ Air	4	25	11C0385	AUC0212-03	03/30/11 23:08
Hexane	**121**		**124**	ug/m³ Air	3	25	11C0385	AUC0212-03	03/30/11 23:08
Chloroform	**25.6**		**26.1**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
cis-3-Hexene	**19.5**		**20.3**	ug/m³ Air	4	25	11C0385	AUC0212-03	03/30/11 23:08
trans-2-Hexene	**11.6**		**12.4**	ug/m³ Air	7	25	11C0385	AUC0212-03	03/30/11 23:08
2-Methyl-2-pentene	**7.37**		**7.49**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
cis-3-Methyl-2-pentene	**7.84**		**8.09**	ug/m³ Air	3	25	11C0385	AUC0212-03	03/30/11 23:08
cis-2-Hexene	**40.8**		**42.9**	ug/m³ Air	5	25	11C0385	AUC0212-03	03/30/11 23:08

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate - Cont.

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11C0385-DUP1 (Duplicate - Air) - cont.									
EPA TO15 - Volatile Organic Compounds by GC/MS									
Methylcyclopentane	**24.9**		**25.2**	ug/m³ Air	1	25	11C0385	AUC0212-03	03/30/11 23:08
1,2-Dichloroethane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
2,4-Dimethylpentane	**9.26**		**9.29**	ug/m³ Air	0.4	25	11C0385	AUC0212-03	03/30/11 23:08
1,1,1-Trichloroethane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
1-Methylcyclopentene	**3.82**	**J**	**3.79**	ug/m³ Air	0.7	25	11C0385	AUC0212-03	03/30/11 23:08
Benzene	**14.6**		**13.9**	ug/m³ Air	5	25	11C0385	AUC0212-03	03/30/11 23:08
Carbon tetrachloride	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
n-Butanol	**27.3**		**27.1**	ug/m³ Air	0.7	50	11C0385	AUC0212-03	03/30/11 23:08
Cyclohexane	**38.3**		**36.3**	ug/m³ Air	5	25	11C0385	AUC0212-03	03/30/11 23:08
Isoheptane	**53.2**		**49.1**	ug/m³ Air	8	25	11C0385	AUC0212-03	03/30/11 23:08
2,3-Dimethylpentane	**24.5**		**22.5**	ug/m³ Air	8	25	11C0385	AUC0212-03	03/30/11 23:08
Cyclohexene	**1.86**	**J**	**1.86**	ug/m³ Air	0.4	25	11C0385	AUC0212-03	03/30/11 23:08
3-Methylhexane	**73.0**		**67.9**	ug/m³ Air	7	25	11C0385	AUC0212-03	03/30/11 23:08
1,2-Dichloropropane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Bromodichloromethane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Trichloroethene	**0.898**	**J**	**0.827**	ug/m³ Air	8	25	11C0385	AUC0212-03	03/30/11 23:08
1,4-Dioxane	ND	**U**	ND	ug/m³ Air		50	11C0385	AUC0212-03	03/30/11 23:08
1-Heptene	**48.5**		**48.1**	ug/m³ Air	0.7	25	11C0385	AUC0212-03	03/30/11 23:08
2,2,4-Trimethylpentane	**6.18**		**5.89**	ug/m³ Air	5	25	11C0385	AUC0212-03	03/30/11 23:08
trans-3-Heptene	**4.55**	**J**	**4.46**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
Heptane	**48.1**		**46.7**	ug/m³ Air	3	25	11C0385	AUC0212-03	03/30/11 23:08
cis-3-Heptene	**19.4**		**17.9**	ug/m³ Air	8	25	11C0385	AUC0212-03	03/30/11 23:08
trans-2-Heptene	**2.12**	**J**	**2.15**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
2,4,4-Trimethyl-1-pentene	**0.516**	**J**	**0.474**	ug/m³ Air	9	25	11C0385	AUC0212-03	03/30/11 23:08
cis-1,3-Dichloropropene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
4-Methyl-2-pentanone (MIBK)	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Methylcyclohexane	**86.6**		**80.3**	ug/m³ Air	7	25	11C0385	AUC0212-03	03/30/11 23:08
2,4,4-Trimethyl-2-pentene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
2,5-Dimethylhexane	**6.31**		**6.07**	ug/m³ Air	4	25	11C0385	AUC0212-03	03/30/11 23:08
2,2,3-Trimethylpentane	**6.86**		**6.24**	ug/m³ Air	9	25	11C0385	AUC0212-03	03/30/11 23:08
trans-1,3-Dichloropropene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
1,1,2-Trichloroethane	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
2,3,4-Trimethylpentane	**22.2**		**20.2**	ug/m³ Air	9	25	11C0385	AUC0212-03	03/30/11 23:08
Toluene	**182**		**171**	ug/m³ Air	6	25	11C0385	AUC0212-03	03/30/11 23:08

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate - Cont.

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11C0385-DUP1 (Duplicate - Air) - cont.									
EPA TO15 - Volatile Organic Compounds by GC/MS									
2-Hexanone	ND	U	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
2-Methylheptane	**26.4**		**24.7**	ug/m³ Air	7	25	11C0385	AUC0212-03	03/30/11 23:08
1-Methylcyclohexene	ND	U	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Chlorodibromomethane	ND	U	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
3-Methylheptane	**32.9**	R2	**24.8**	ug/m³ Air	28	25	11C0385	AUC0212-03	03/30/11 23:08
Hexanal	**5.00**	J	**4.14**	ug/m³ Air	19	25	11C0385	AUC0212-03	03/30/11 23:08
1,2-Dibromoethane (EDB)	ND	U	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
2,2,5-Trimethylhexane	**19.6**		**18.2**	ug/m³ Air	8	25	11C0385	AUC0212-03	03/30/11 23:08
1-Octene	**5.20**		**5.32**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
n-Octane	**21.5**		**20.0**	ug/m³ Air	7	25	11C0385	AUC0212-03	03/30/11 23:08
Tetrachloroethene	**19.0**		**17.7**	ug/m³ Air	7	25	11C0385	AUC0212-03	03/30/11 23:08
cis-2-Octene	**4.08**	J	**3.74**	ug/m³ Air	9	25	11C0385	AUC0212-03	03/30/11 23:08
Chlorobenzene	ND	U	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Ethylbenzene	**5.82**		**5.16**	ug/m³ Air	12	25	11C0385	AUC0212-03	03/30/11 23:08
m-Xylene & p-Xylene	**18.1**		**16.6**	ug/m³ Air	9	25	11C0385	AUC0212-03	03/30/11 23:08
Bromoform	ND	U	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Butyl acrylate	ND	U	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Heptanal	**6.30**		**5.45**	ug/m³ Air	14	25	11C0385	AUC0212-03	03/30/11 23:08
Styrene	ND	U	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
1,1,2,2-Tetrachloroethane	ND	U	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
o-Xylene	**12.1**		**11.2**	ug/m³ Air	8	25	11C0385	AUC0212-03	03/30/11 23:08
Xylenes, total	**30.3**		**27.8**	ug/m³ Air	9	25	11C0385	AUC0212-03	03/30/11 23:08
1-Nonene	**3.23**	J	**3.30**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
4-Nonene	**4.17**	J	**3.69**	ug/m³ Air	12	25	11C0385	AUC0212-03	03/30/11 23:08
n-Nonane	**1.93**	J	**1.71**	ug/m³ Air	12	25	11C0385	AUC0212-03	03/30/11 23:08
Isopropylbenzene	ND	U	ND	ug/m³ Air		50	11C0385	AUC0212-03	03/30/11 23:08
Benzaldehyde	ND	U	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
alpha-Pinene	**1.80**	J	**1.54**	ug/m³ Air	16	25	11C0385	AUC0212-03	03/30/11 23:08
2 & 3-Chlorotoluene	ND	U	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
4-Chlorotoluene	ND	U	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
n-Propylbenzene	**0.742**	J	**0.705**	ug/m³ Air	5	25	11C0385	AUC0212-03	03/30/11 23:08
3-Ethyltoluene	**2.36**	J	**2.15**	ug/m³ Air	9	25	11C0385	AUC0212-03	03/30/11 23:08
4-Ethyltoluene	**1.05**	J	**0.976**	ug/m³ Air	8	25	11C0385	AUC0212-03	03/30/11 23:08
1,3,5-Trimethylbenzene	**1.50**	J	**1.40**	ug/m³ Air	7	25	11C0385	AUC0212-03	03/30/11 23:08

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate - Cont.

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11C0385-DUP1 (Duplicate - Air) - cont.									
EPA TO15 - Volatile Organic Compounds by GC/MS									
2-Ethyltoluene	**0.880**	**J**	**0.855**	ug/m³ Air	3	25	11C0385	AUC0212-03	03/30/11 23:08
beta-Pinene	**0.985**	**J**	**0.985**	ug/m³ Air	0	25	11C0385	AUC0212-03	03/30/11 23:08
1,2,4-Trimethylbenzene	**4.11**	**J**	**3.85**	ug/m³ Air	6	25	11C0385	AUC0212-03	03/30/11 23:08
tert-Butylbenzene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
1-Decene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Benzyl chloride	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
1,3-Dichlorobenzene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
n-Decane	**4.10**	**J**	**4.19**	ug/m³ Air	2	25	11C0385	AUC0212-03	03/30/11 23:08
1,4-Dichlorobenzene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Isobutylbenzene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
1,2,3-Trimethylbenzene	**1.29**	**J**	**1.21**	ug/m³ Air	6	25	11C0385	AUC0212-03	03/30/11 23:08
4-Isopropyltoluene	**1.90**	**J**	**1.76**	ug/m³ Air	8	25	11C0385	AUC0212-03	03/30/11 23:08
1,2-Dichlorobenzene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Limonene	**3.31**	**J**	**3.32**	ug/m³ Air	0.2	25	11C0385	AUC0212-03	03/30/11 23:08
Indan	**0.724**	**J**	**0.658**	ug/m³ Air	10	25	11C0385	AUC0212-03	03/30/11 23:08
Indene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
1,3-Diethylbenzene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
1,4-Diethylbenzene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
n-Butylbenzene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
1-Undecene	5.84	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
n-Undecane	**1.08**	**J**	**0.980**	ug/m³ Air	10	25	11C0385	AUC0212-03	03/30/11 23:08
1,2,4-Trichlorobenzene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Naphthalene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Hexachlorobutadiene	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
1,2-Dichloroethene, Total	ND	**U**	ND	ug/m³ Air		25	11C0385	AUC0212-03	03/30/11 23:08
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*91%*						11C0385		03/30/11 23:08
Surr: Fluorobenzene (62-122%)	*91%*						11C0385		03/30/11 23:08
Surr: Toluene-d8 (67-127%)	*98%*						11C0385		03/30/11 23:08
Surr: 1,4-Dichlorobutane (76-136%)	*102%*						11C0385		03/30/11 23:08
Surr: 4-Bromofluorobenzene (73-133%)	*107%*						11C0385		03/30/11 23:08

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate - Cont.

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11C0400-DUP1 (Duplicate - Air)									
EPA TO15 - Volatile Organic Compounds by GC/MS									
Halocarbon 134A	**0.800**	**J**	**0.798**	ug/m³ Air	0.3	25	11C0400	AUC0212-04	03/31/11 19:02
Propylene	**298**	**E**	**279**	ug/m³ Air	7	25	11C0400	AUC0212-04	03/31/11 19:02
Chlorodifluoromethane	**0.620**	**J**	**0.589**	ug/m³ Air	5	25	11C0400	AUC0212-04	03/31/11 19:02
Propane	**316**	**E**	**297**	ug/m³ Air	6	25	11C0400	AUC0212-04	03/31/11 19:02
Dichlorodifluoromethane	**2.83**	**J**	**2.49**	ug/m³ Air	13	25	11C0400	AUC0212-04	03/31/11 19:02
Chloromethane	**1.70**	**J**	**1.63**	ug/m³ Air	4	25	11C0400	AUC0212-04	03/31/11 19:02
Isobutane	**40.2**		**38.6**	ug/m³ Air	4	25	11C0400	AUC0212-04	03/31/11 19:02
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Acetaldehyde	**16.4**	**B**	**16.5**	ug/m³ Air	0.3	25	11C0400	AUC0212-04	03/31/11 19:02
Vinyl chloride	0.214	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
1-Butene/Isobutene	**208**	**E**	**201**	ug/m³ Air	3	25	11C0400	AUC0212-04	03/31/11 19:02
1,3-Butadiene	**4.35**		**4.35**	ug/m³ Air	0.09	25	11C0400	AUC0212-04	03/31/11 19:02
Butane	**152**	**E**	**146**	ug/m³ Air	4	25	11C0400	AUC0212-04	03/31/11 19:02
trans-2-Butene	**8.77**		**9.20**	ug/m³ Air	5	25	11C0400	AUC0212-04	03/31/11 19:02
Neopentane	**0.747**	**J**	**0.750**	ug/m³ Air	0.5	25	11C0400	AUC0212-04	03/31/11 19:02
Dichlorofluoromethane	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Bromomethane	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
cis-2-Butene	**25.6**		**26.5**	ug/m³ Air	3	25	11C0400	AUC0212-04	03/31/11 19:02
Chloroethane	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Vinyl bromide	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
3-Methyl-1-butene	**13.7**		**13.3**	ug/m³ Air	2	25	11C0400	AUC0212-04	03/31/11 19:02
Ethanol	**417**	**E**	**442**	ug/m³ Air	6	25	11C0400	AUC0212-04	03/31/11 19:02
Acetonitrile	**0.207**	**J**	**0.224**	ug/m³ Air	8	25	11C0400	AUC0212-04	03/31/11 19:02
Isopentane	**54.4**		**51.1**	ug/m³ Air	6	25	11C0400	AUC0212-04	03/31/11 19:02
Trichlorofluoromethane	**1.21**	**J**	**1.14**	ug/m³ Air	6	25	11C0400	AUC0212-04	03/31/11 19:02
1-Pentene	**50.2**		**47.6**	ug/m³ Air	5	25	11C0400	AUC0212-04	03/31/11 19:02
Acetone	**19.3**	**B**	**18.6**	ug/m³ Air	4	25	11C0400	AUC0212-04	03/31/11 19:02
Isopropyl alcohol	**2.07**	**J**	**2.27**	ug/m³ Air	9	50	11C0400	AUC0212-04	03/31/11 19:02
Acrylonitrile	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
n-Pentane	**29.2**		**28.0**	ug/m³ Air	4	25	11C0400	AUC0212-04	03/31/11 19:02
Diethyl ether	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Isoprene	**1.44**	**J**	**1.49**	ug/m³ Air	3	25	11C0400	AUC0212-04	03/31/11 19:02
trans-2-Pentene	**2.23**	**J**	**2.28**	ug/m³ Air	2	25	11C0400	AUC0212-04	03/31/11 19:02
1,1-Dichloroethene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02

Golder Associates Ltd.
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate - Cont.

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11C0400-DUP1 (Duplicate - Air) - cont.									
EPA TO15 - Volatile Organic Compounds by GC/MS									
cis-2-Pentene	**6.69**		**6.80**	ug/m³ Air	2	25	11C0400	AUC0212-04	03/31/11 19:02
Methylene chloride	**0.973**	**J**	**1.03**	ug/m³ Air	6	25	11C0400	AUC0212-04	03/31/11 19:02
2-Methyl-2-butene	**3.75**		**3.83**	ug/m³ Air	2	25	11C0400	AUC0212-04	03/31/11 19:02
Carbon disulfide	**40.8**		**41.0**	ug/m³ Air	0.5	25	11C0400	AUC0212-04	03/31/11 19:02
Allyl chloride	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
1,1,2-Trichlorotrifluoroethane	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
2,2-Dimethylbutane	**2.58**	**J**	**2.72**	ug/m³ Air	6	25	11C0400	AUC0212-04	03/31/11 19:02
Cyclopentene	**1.35**	**J**	**1.48**	ug/m³ Air	9	25	11C0400	AUC0212-04	03/31/11 19:02
trans-1,2-Dichloroethene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
4-Methyl-1-pentene	**5.33**		**5.11**	ug/m³ Air	4	25	11C0400	AUC0212-04	03/31/11 19:02
Propanol	**31.2**		**31.8**	ug/m³ Air	2	25	11C0400	AUC0212-04	03/31/11 19:02
1,1-Dichloroethane	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Cyclopentane	**2.32**	**J**	**2.32**	ug/m³ Air	0.07	25	11C0400	AUC0212-04	03/31/11 19:02
2,3-Dimethylbutane	**5.73**		**5.76**	ug/m³ Air	0.7	25	11C0400	AUC0212-04	03/31/11 19:02
Methyl tert-Butyl Ether	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Isohexane	**27.8**		**26.2**	ug/m³ Air	6	25	11C0400	AUC0212-04	03/31/11 19:02
Vinyl acetate	ND	**U**	ND	ug/m³ Air		50	11C0400	AUC0212-04	03/31/11 19:02
cis/trans-4-Methyl-2-pentene	**3.23**	**R4, J**	**1.31**	ug/m³ Air	85	25	11C0400	AUC0212-04	03/31/11 19:02
Butyraldehyde	**4.07**		**4.04**	ug/m³ Air	0.8	25	11C0400	AUC0212-04	03/31/11 19:02
2-Butanone (MEK)	**8.54**		**7.67**	ug/m³ Air	11	25	11C0400	AUC0212-04	03/31/11 19:02
Chloroprene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
3-Methylpentane	**20.3**		**20.2**	ug/m³ Air	0.3	25	11C0400	AUC0212-04	03/31/11 19:02
2-Methyl-1-pentene	**9.53**		**9.32**	ug/m³ Air	2	25	11C0400	AUC0212-04	03/31/11 19:02
1-Hexene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
cis-1,2-Dichloroethene	**4.25**	**J**	**4.10**	ug/m³ Air	4	25	11C0400	AUC0212-04	03/31/11 19:02
Bromochloromethane	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
2-Ethyl-1-butene	**2.33**	**J**	**2.35**	ug/m³ Air	0.7	25	11C0400	AUC0212-04	03/31/11 19:02
Hexane	**2.15**	**J**	**2.09**	ug/m³ Air	3	25	11C0400	AUC0212-04	03/31/11 19:02
Chloroform	**24.7**		**21.3**	ug/m³ Air	15	25	11C0400	AUC0212-04	03/31/11 19:02
cis-3-Hexene	**0.903**	**J**	**0.870**	ug/m³ Air	4	25	11C0400	AUC0212-04	03/31/11 19:02
trans-2-Hexene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
2-Methyl-2-pentene	**0.457**	**J**	**0.471**	ug/m³ Air	3	25	11C0400	AUC0212-04	03/31/11 19:02
cis-3-Methyl-2-pentene	**0.365**	**J**	**0.406**	ug/m³ Air	11	25	11C0400	AUC0212-04	03/31/11 19:02
cis-2-Hexene	**0.645**	**J**	**0.617**	ug/m³ Air	4	25	11C0400	AUC0212-04	03/31/11 19:02

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate - Cont.

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11C0400-DUP1 (Duplicate - Air) - cont.									
EPA TO15 - Volatile Organic Compounds by GC/MS									
Methylcyclopentane	**14.5**		**14.4**	ug/m³ Air	1	25	11C0400	AUC0212-04	03/31/11 19:02
1,2-Dichloroethane	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
2,4-Dimethylpentane	**4.24**	**J**	**4.38**	ug/m³ Air	3	25	11C0400	AUC0212-04	03/31/11 19:02
1,1,1-Trichloroethane	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
1-Methylcyclopentene	**0.706**	**R4, J**	**0.402**	ug/m³ Air	55	25	11C0400	AUC0212-04	03/31/11 19:02
Benzene	**1.21**	**J**	**1.22**	ug/m³ Air	2	25	11C0400	AUC0212-04	03/31/11 19:02
Carbon tetrachloride	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
n-Butanol	**21.6**		**23.4**	ug/m³ Air	8	50	11C0400	AUC0212-04	03/31/11 19:02
Cyclohexane	**27.8**		**30.4**	ug/m³ Air	9	25	11C0400	AUC0212-04	03/31/11 19:02
Isoheptane	**8.77**		**9.40**	ug/m³ Air	7	25	11C0400	AUC0212-04	03/31/11 19:02
2,3-Dimethylpentane	**11.9**		**13.1**	ug/m³ Air	9	25	11C0400	AUC0212-04	03/31/11 19:02
Cyclohexene	**0.635**	**J**	**0.552**	ug/m³ Air	14	25	11C0400	AUC0212-04	03/31/11 19:02
3-Methylhexane	**21.8**		**23.2**	ug/m³ Air	6	25	11C0400	AUC0212-04	03/31/11 19:02
1,2-Dichloropropane	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Bromodichloromethane	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Trichloroethene	**4.42**	**J**	**4.49**	ug/m³ Air	2	25	11C0400	AUC0212-04	03/31/11 19:02
1,4-Dioxane	ND	**U**	ND	ug/m³ Air		50	11C0400	AUC0212-04	03/31/11 19:02
1-Heptene	**28.5**		**30.2**	ug/m³ Air	6	25	11C0400	AUC0212-04	03/31/11 19:02
2,2,4-Trimethylpentane	**2.73**	**J**	**3.12**	ug/m³ Air	14	25	11C0400	AUC0212-04	03/31/11 19:02
trans-3-Heptene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Heptane	**1.48**	**J**	**1.67**	ug/m³ Air	12	25	11C0400	AUC0212-04	03/31/11 19:02
cis-3-Heptene	**1.23**	**J**	**1.33**	ug/m³ Air	7	25	11C0400	AUC0212-04	03/31/11 19:02
trans-2-Heptene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
2,4,4-Trimethyl-1-pentene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
cis-1,3-Dichloropropene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
4-Methyl-2-pentanone (MIBK)	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Methylcyclohexane	**89.6**		**95.6**	ug/m³ Air	6	25	11C0400	AUC0212-04	03/31/11 19:02
2,4,4-Trimethyl-2-pentene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
2,5-Dimethylhexane	**3.39**	**J**	**4.03**	ug/m³ Air	17	25	11C0400	AUC0212-04	03/31/11 19:02
2,2,3-Trimethylpentane	**4.58**	**J**	**5.26**	ug/m³ Air	14	25	11C0400	AUC0212-04	03/31/11 19:02
trans-1,3-Dichloropropene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
1,1,2-Trichloroethane	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
2,3,4-Trimethylpentane	**11.1**		**12.3**	ug/m³ Air	10	25	11C0400	AUC0212-04	03/31/11 19:02
Toluene	**35.4**		**31.7**	ug/m³ Air	11	25	11C0400	AUC0212-04	03/31/11 19:02

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate - Cont.

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11C0400-DUP1 (Duplicate - Air) - cont.									
EPA TO15 - Volatile Organic Compounds by GC/MS									
2-Hexanone	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
2-Methylheptane	**1.77**	**J**	**1.79**	ug/m³ Air	2	25	11C0400	AUC0212-04	03/31/11 19:02
1-Methylcyclohexene	**1.28**	**J**	**1.28**	ug/m³ Air	0.4	25	11C0400	AUC0212-04	03/31/11 19:02
Chlorodibromomethane	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
3-Methylheptane	**2.16**	**J**	**2.29**	ug/m³ Air	6	25	11C0400	AUC0212-04	03/31/11 19:02
Hexanal	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
1,2-Dibromoethane (EDB)	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
2,2,5-Trimethylhexane	**9.62**		**11.0**	ug/m³ Air	14	25	11C0400	AUC0212-04	03/31/11 19:02
1-Octene	**6.31**		**6.34**	ug/m³ Air	0.5	25	11C0400	AUC0212-04	03/31/11 19:02
n-Octane	**2.11**	**J**	**1.94**	ug/m³ Air	8	25	11C0400	AUC0212-04	03/31/11 19:02
Tetrachloroethene	**228**		**204**	ug/m³ Air	12	25	11C0400	AUC0212-04	03/31/11 19:02
cis-2-Octene	**3.99**	**J**	**4.49**	ug/m³ Air	12	25	11C0400	AUC0212-04	03/31/11 19:02
Chlorobenzene	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Ethylbenzene	**17.7**		**15.2**	ug/m³ Air	15	25	11C0400	AUC0212-04	03/31/11 19:02
m-Xylene & p-Xylene	**42.4**		**36.1**	ug/m³ Air	16	25	11C0400	AUC0212-04	03/31/11 19:02
Bromoform	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Butyl acrylate	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Heptanal	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Styrene	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
1,1,2,2-Tetrachloroethane	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
o-Xylene	**53.8**		**45.6**	ug/m³ Air	16	25	11C0400	AUC0212-04	03/31/11 19:02
Xylenes, total	**96.1**		**81.7**	ug/m³ Air	16	25	11C0400	AUC0212-04	03/31/11 19:02
1-Nonene	**23.2**		**24.3**	ug/m³ Air	5	25	11C0400	AUC0212-04	03/31/11 19:02
4-Nonene	**15.8**		**15.3**	ug/m³ Air	3	25	11C0400	AUC0212-04	03/31/11 19:02
n-Nonane	**2.05**	**J**	**1.76**	ug/m³ Air	15	25	11C0400	AUC0212-04	03/31/11 19:02
Isopropylbenzene	**27.4**		**23.6**	ug/m³ Air	15	50	11C0400	AUC0212-04	03/31/11 19:02
Benzaldehyde	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
alpha-Pinene	**1200**	**E**	**1030**	ug/m³ Air	16	25	11C0400	AUC0212-04	03/31/11 19:02
2 & 3-Chlorotoluene	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
4-Chlorotoluene	ND	U	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
n-Propylbenzene	**6.39**		**6.05**	ug/m³ Air	6	25	11C0400	AUC0212-04	03/31/11 19:02
3-Ethyltoluene	**26.7**		**22.4**	ug/m³ Air	18	25	11C0400	AUC0212-04	03/31/11 19:02
4-Ethyltoluene	**16.5**		**13.6**	ug/m³ Air	19	25	11C0400	AUC0212-04	03/31/11 19:02
1,3,5-Trimethylbenzene	**89.2**		**74.5**	ug/m³ Air	18	25	11C0400	AUC0212-04	03/31/11 19:02

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate - Cont.

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11C0400-DUP1 (Duplicate - Air) - cont.									
EPA TO15 - Volatile Organic Compounds by GC/MS									
2-Ethyltoluene	**34.5**		**28.8**	ug/m³ Air	18	25	11C0400	AUC0212-04	03/31/11 19:02
beta-Pinene	**40.4**		**36.9**	ug/m³ Air	9	25	11C0400	AUC0212-04	03/31/11 19:02
1,2,4-Trimethylbenzene	**39.0**		**31.7**	ug/m³ Air	21	25	11C0400	AUC0212-04	03/31/11 19:02
tert-Butylbenzene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
1-Decene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Benzyl chloride	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
1,3-Dichlorobenzene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
n-Decane	**3.51**	**J**	**3.14**	ug/m³ Air	11	25	11C0400	AUC0212-04	03/31/11 19:02
1,4-Dichlorobenzene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Isobutylbenzene	**2.88**	**J**	**2.29**	ug/m³ Air	23	25	11C0400	AUC0212-04	03/31/11 19:02
1,2,3-Trimethylbenzene	**35.8**		**28.0**	ug/m³ Air	24	25	11C0400	AUC0212-04	03/31/11 19:02
4-Isopropyltoluene	**63.6**	**R2**	**47.2**	ug/m³ Air	30	25	11C0400	AUC0212-04	03/31/11 19:02
1,2-Dichlorobenzene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Limonene	**56.8**		**45.0**	ug/m³ Air	23	25	11C0400	AUC0212-04	03/31/11 19:02
Indan	**83.8**	**R2**	**64.5**	ug/m³ Air	26	25	11C0400	AUC0212-04	03/31/11 19:02
Indene	**12.3**	**R2**	**8.50**	ug/m³ Air	36	25	11C0400	AUC0212-04	03/31/11 19:02
1,3-Diethylbenzene	**14.0**	**R2**	**9.76**	ug/m³ Air	36	25	11C0400	AUC0212-04	03/31/11 19:02
1,4-Diethylbenzene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
n-Butylbenzene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
1-Undecene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
n-Undecane	**6.75**	**J**	**5.67**	ug/m³ Air	17	25	11C0400	AUC0212-04	03/31/11 19:02
1,2,4-Trichlorobenzene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
Naphthalene	**30.7**	**R2, B**	**43.1**	ug/m³ Air	34	25	11C0400	AUC0212-04	03/31/11 19:02
Hexachlorobutadiene	ND	**U**	ND	ug/m³ Air		25	11C0400	AUC0212-04	03/31/11 19:02
1,2-Dichloroethene, Total	**4.55**	**J**	**4.40**	ug/m³ Air	3	25	11C0400	AUC0212-04	03/31/11 19:02
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*96%*						11C0400		03/31/11 19:02
Surr: Fluorobenzene (62-122%)	*87%*						11C0400		03/31/11 19:02
Surr: Toluene-d8 (67-127%)	*100%*						11C0400		03/31/11 19:02
Surr: 1,4-Dichlorobutane (76-136%)	*99%*						11C0400		03/31/11 19:02
Surr: 4-Bromofluorobenzene (73-133%)	*118%*						11C0400		03/31/11 19:02

Golder Associates Ltd.
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate - Cont.

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11D0020-DUP1 (Duplicate - Air)									
EPA TO15 - Volatile Organic Compounds by GC/MS									
Ethene	**122**		**130**	ug/m³ Air	6	25	11D0020	AUC0212-02RE3	04/04/11 22:44
Acetylene	**1.30**	**J**	**1.22**	ug/m³ Air	7	25	11D0020	AUC0212-02RE3	04/04/11 22:44
Ethane	**233**		**236**	ug/m³ Air	1	25	11D0020	AUC0212-02RE3	04/04/11 22:44
Methanol	**1770**	**E, B**	**1750**	ug/m³ Air	1	50	11D0020	AUC0212-02RE3	04/04/11 22:44
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*91%*						11D0020		04/04/11 22:44
Surr: Fluorobenzene (62-122%)	*79%*						11D0020		04/04/11 22:44
Surr: Toluene-d8 (67-127%)	*100%*						11D0020		04/04/11 22:44
Surr: 1,4-Dichlorobutane (76-136%)	*107%*						11D0020		04/04/11 22:44
Surr: 4-Bromofluorobenzene (73-133%)	*110%*						11D0020		04/04/11 22:44
Sample ID: 11D0020-DUP2 (Duplicate - Air)									
EPA TO15 - Volatile Organic Compounds by GC/MS									
Ethene	**1920**	**E, R2**	**1480**	ug/m³ Air	26	25	11D0020	AUC0212-03RE2	04/05/11 0:36
Ethane	**3880**	**E**	**3190**	ug/m³ Air	20	25	11D0020	AUC0212-03RE2	04/05/11 0:36
Propylene	**2470**	**E**	**2010**	ug/m³ Air	20	25	11D0020	AUC0212-03RE2	04/05/11 0:36
Propane	**2620**	**E**	**2150**	ug/m³ Air	20	25	11D0020	AUC0212-03RE2	04/05/11 0:36
Isobutane	**378**		**308**	ug/m³ Air	21	25	11D0020	AUC0212-03RE2	04/05/11 0:36
1-Butene/Isobutene	**1580**	**E**	**1270**	ug/m³ Air	22	25	11D0020	AUC0212-03RE2	04/05/11 0:36
Butane	**1240**	**E**	**1010**	ug/m³ Air	20	25	11D0020	AUC0212-03RE2	04/05/11 0:36
Methanol	**4980**	**E, B**	**4000**	ug/m³ Air	22	50	11D0020	AUC0212-03RE2	04/05/11 0:36
cis-2-Butene	**216**		**174**	ug/m³ Air	22	25	11D0020	AUC0212-03RE2	04/05/11 0:36
Ethanol	**230**		**202**	ug/m³ Air	13	25	11D0020	AUC0212-03RE2	04/05/11 0:36
Isopentane	**383**		**322**	ug/m³ Air	17	25	11D0020	AUC0212-03RE2	04/05/11 0:36
1-Pentene	**395**		**321**	ug/m³ Air	21	25	11D0020	AUC0212-03RE2	04/05/11 0:36
n-Pentane	**436**		**342**	ug/m³ Air	24	25	11D0020	AUC0212-03RE2	04/05/11 0:36
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*91%*						11D0020		04/05/11 0:36
Surr: Fluorobenzene (62-122%)	*87%*						11D0020		04/05/11 0:36
Surr: Toluene-d8 (67-127%)	*101%*						11D0020		04/05/11 0:36
Surr: 1,4-Dichlorobutane (76-136%)	*104%*						11D0020		04/05/11 0:36
Surr: 4-Bromofluorobenzene (73-133%)	*107%*						11D0020		04/05/11 0:36

Golder Associates Ltd.
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate - Cont.

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11D0170-DUP1 (Duplicate - Air)									
EPA TO15 - Volatile Organic Compounds by GC/MS									
Ethene	**171**		**196**	ug/m³ Air	14	25	11D0170	AUD0063-01RE2	04/18/11 22:58
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*80%*						11D0170		04/18/11 22:58
Surr: Fluorobenzene (62-122%)	*56%*	ZX					11D0170		04/18/11 22:58
Surr: Toluene-d8 (67-127%)	*96%*						11D0170		04/18/11 22:58
Surr: 1,4-Dichlorobutane (76-136%)	*114%*						11D0170		04/18/11 22:58
Surr: 4-Bromofluorobenzene (73-133%)	*117%*						11D0170		04/18/11 22:58
Sample ID: 11D0170-DUP2 (Duplicate - Air)									
EPA TO15 - Volatile Organic Compounds by GC/MS									
Propylene	**111**		**109**	ug/m³ Air	2	25	11D0170	AUD0121-01RE1	04/19/11 0:51
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*79%*						11D0170		04/19/11 0:51
Surr: Fluorobenzene (62-122%)	*57%*	ZX					11D0170		04/19/11 0:51
Surr: Toluene-d8 (67-127%)	*97%*						11D0170		04/19/11 0:51
Surr: 1,4-Dichlorobutane (76-136%)	*111%*						11D0170		04/19/11 0:51
Surr: 4-Bromofluorobenzene (73-133%)	*115%*						11D0170		04/19/11 0:51
Sample ID: 11D0255-DUP1 (Duplicate - Air)									
EPA TO15 - Volatile Organic Compounds by GC/MS									
1,1,2-Trichlorotrifluoroethane	**3900**		**3620**	ug/m³ Air	8	25	11D0255	AUD0139-11RE2	04/23/11 20:42
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*95%*						11D0255		04/23/11 20:42
Surr: Fluorobenzene (62-122%)	*84%*						11D0255		04/23/11 20:42
Surr: Toluene-d8 (67-127%)	*101%*						11D0255		04/23/11 20:42
Surr: 1,4-Dichlorobutane (76-136%)	*108%*						11D0255		04/23/11 20:42
Surr: 4-Bromofluorobenzene (73-133%)	*110%*						11D0255		04/23/11 20:42
Sample ID: 11D0255-DUP2 (Duplicate - Air)									
EPA TO15 - Volatile Organic Compounds by GC/MS									
1,1,2-Trichlorotrifluoroethane	**3280**		**3070**	ug/m³ Air	7	25	11D0255	AUD0139-10RE2	04/24/11 1:15
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*92%*						11D0255		04/24/11 1:15

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

Duplicate - Cont.

Analyte	Orig.	Data Qualifier	Duplicate	Units	RPD	Limit	QC Batch	Sample Duplicated	Date Analyzed
Sample ID: 11D0255-DUP2 (Duplicate - Air) - cont.									
EPA TO15 - Volatile Organic Compounds by GC/MS									
Surr: Fluorobenzene (62-122%)	*84%*						11D0255		04/24/11 1:15
Surr: Toluene-d8 (67-127%)	*98%*						11D0255		04/24/11 1:15
Surr: 1,4-Dichlorobutane (76-136%)	*104%*						11D0255		04/24/11 1:15
Surr: 4-Bromofluorobenzene (73-133%)	*109%*						11D0255		04/24/11 1:15

Golder Associates Ltd.
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
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PROJECT QUALITY CONTROL DATA

LCS

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0385-BS1 (LCS - Air)											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Propylene	16.8		ug/m³ Air	0.688	2.00	17.8	94%	50 - 150	VMSC	03/30/11 12:05	11C0385
Chlorodifluoromethane	36.5		ug/m³ Air	1.41	2.00	38.4	95%	50 - 150	VMSC	03/30/11 12:05	11C0385
Propane	17.3		ug/m³ Air	0.721	2.00	18.4	94%	50 - 150	VMSC	03/30/11 12:05	11C0385
Dichlorodifluoromethane	54.3		ug/m³ Air	1.98	2.00	52.1	104%	50 - 150	VMSC	03/30/11 12:05	11C0385
Chloromethane	21.9		ug/m³ Air	0.826	2.00	22.0	99%	50 - 150	VMSC	03/30/11 12:05	11C0385
Isobutane	23.3		ug/m³ Air	0.951	2.00	24.3	96%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,2-Dichloro-1,1,2,2-tetrafluoroethane	61.7		ug/m³ Air	2.80	2.00	73.7	84%	50 - 150	VMSC	03/30/11 12:05	11C0385
Vinyl chloride	23.7		ug/m³ Air	1.02	2.00	27.2	87%	50 - 150	VMSC	03/30/11 12:05	11C0385
1-Butene/Isobutene	21.4		ug/m³ Air	0.918	2.00	23.2	92%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,3-Butadiene	23.4		ug/m³ Air	0.885	2.00	24.0	97%	50 - 150	VMSC	03/30/11 12:05	11C0385
Butane	22.6		ug/m³ Air	0.951	2.00	24.3	93%	50 - 150	VMSC	03/30/11 12:05	11C0385
trans-2-Butene	21.7		ug/m³ Air	0.918	2.00	23.2	93%	50 - 150	VMSC	03/30/11 12:05	11C0385
Bromomethane	36.3		ug/m³ Air	1.55	2.00	40.9	89%	50 - 150	VMSC	03/30/11 12:05	11C0385
cis-2-Butene	23.6		ug/m³ Air	0.918	2.00	24.9	95%	50 - 150	VMSC	03/30/11 12:05	11C0385
Chloroethane	25.9		ug/m³ Air	1.06	2.00	27.5	94%	50 - 150	VMSC	03/30/11 12:05	11C0385
Vinyl bromide	36.1		ug/m³ Air	1.75	2.00	46.6	78%	50 - 150	VMSC	03/30/11 12:05	11C0385
3-Methyl-1-butene	31.3		ug/m³ Air	1.15	2.00	30.8	102%	50 - 150	VMSC	03/30/11 12:05	11C0385
Acetonitrile	15.1		ug/m³ Air	0.672	2.00	17.7	85%	50 - 150	VMSC	03/30/11 12:05	11C0385
Isopentane	30.1		ug/m³ Air	1.18	2.00	32.1	94%	50 - 150	VMSC	03/30/11 12:05	11C0385
Trichlorofluoromethane	64.5		ug/m³ Air	2.25	2.00	60.4	107%	50 - 150	VMSC	03/30/11 12:05	11C0385
1-Pentene	30.8		ug/m³ Air	1.15	2.00	32.0	96%	50 - 150	VMSC	03/30/11 12:05	11C0385
Acetone	27.0	B	ug/m³ Air	0.950	2.00	25.8	105%	50 - 150	VMSC	03/30/11 12:05	11C0385
Isopropyl alcohol	21.0		ug/m³ Air	0.983	2.00	29.8	71%	50 - 150	VMSC	03/30/11 12:05	11C0385
Acrylonitrile	21.3		ug/m³ Air	0.868	2.00	23.6	90%	50 - 150	VMSC	03/30/11 12:05	11C0385
n-Pentane	30.5		ug/m³ Air	1.18	2.00	32.1	95%	50 - 150	VMSC	03/30/11 12:05	11C0385
Diethyl ether	25.7		ug/m³ Air	1.21	2.00	32.9	78%	50 - 150	VMSC	03/30/11 12:05	11C0385
Isoprene	26.7		ug/m³ Air	1.11	2.00	30.3	88%	50 - 150	VMSC	03/30/11 12:05	11C0385
trans-2-Pentene	30.3		ug/m³ Air	1.15	2.00	31.4	97%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,1-Dichloroethene	43.0		ug/m³ Air	1.59	2.00	43.5	99%	50 - 150	VMSC	03/30/11 12:05	11C0385
cis-2-Pentene	30.4		ug/m³ Air	1.15	2.00	31.1	98%	50 - 150	VMSC	03/30/11 12:05	11C0385
Methylene chloride	39.2		ug/m³ Air	1.39	2.00	37.3	105%	50 - 150	VMSC	03/30/11 12:05	11C0385
2-Methyl-2-butene	30.9		ug/m³ Air	1.15	2.00	32.6	95%	50 - 150	VMSC	03/30/11 12:05	11C0385
Carbon disulfide	25.4		ug/m³ Air	1.25	2.00	34.1	75%	50 - 150	VMSC	03/30/11 12:05	11C0385
Allyl chloride	32.5		ug/m³ Air	1.25	2.00	33.6	97%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,1,2-Trichlorotrifluoroethane	78.1		ug/m³ Air	3.07	2.00	84.8	92%	50 - 150	VMSC	03/30/11 12:05	11C0385
trans-1,2-Dichloroethene	39.7		ug/m³ Air	1.59	2.00	42.2	94%	50 - 150	VMSC	03/30/11 12:05	11C0385

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0385-BS1 (LCS - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
4-Methyl-1-pentene	37.5		ug/m³ Air	1.38	2.00	36.7	102%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,1-Dichloroethane	44.6		ug/m³ Air	1.62	2.00	44.4	101%	50 - 150	VMSC	03/30/11 12:05	11C0385
Methyl tert-Butyl Ether	38.7		ug/m³ Air	1.44	2.00	39.9	97%	50 - 150	VMSC	03/30/11 12:05	11C0385
Vinyl acetate	35.7		ug/m³ Air	1.41	2.00	40.1	89%	50 - 150	VMSC	03/30/11 12:05	11C0385
2-Butanone (MEK)	30.0		ug/m³ Air	1.18	2.00	33.6	89%	50 - 150	VMSC	03/30/11 12:05	11C0385
Chloroprene	41.7		ug/m³ Air	1.45	2.00	39.3	106%	50 - 150	VMSC	03/30/11 12:05	11C0385
cis-1,2-Dichloroethene	43.9		ug/m³ Air	1.59	2.00	44.3	99%	50 - 150	VMSC	03/30/11 12:05	11C0385
Hexane	35.5		ug/m³ Air	1.41	2.00	40.9	87%	50 - 150	VMSC	03/30/11 12:05	11C0385
Chloroform	54.8		ug/m³ Air	1.95	2.00	52.5	104%	50 - 150	VMSC	03/30/11 12:05	11C0385
trans-2-Hexene	39.1		ug/m³ Air	1.38	2.00	38.1	103%	50 - 150	VMSC	03/30/11 12:05	11C0385
cis-2-Hexene	36.3		ug/m³ Air	1.38	2.00	36.7	99%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,2-Dichloroethane	50.6		ug/m³ Air	1.62	2.00	44.4	114%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,1,1-Trichloroethane	65.3		ug/m³ Air	2.18	2.00	59.3	110%	50 - 150	VMSC	03/30/11 12:05	11C0385
Benzene	39.0		ug/m³ Air	1.28	2.00	35.0	111%	50 - 150	VMSC	03/30/11 12:05	11C0385
Carbon tetrachloride	97.7		ug/m³ Air	2.52	2.00	71.6	136%	50 - 150	VMSC	03/30/11 12:05	11C0385
n-Butanol	26.8		ug/m³ Air	1.21	2.00	34.5	78%	50 - 150	VMSC	03/30/11 12:05	11C0385
Cyclohexane	41.2		ug/m³ Air	1.38	2.00	38.5	107%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,2-Dichloropropane	60.3		ug/m³ Air	1.85	2.00	51.2	118%	50 - 150	VMSC	03/30/11 12:05	11C0385
Bromodichloromethane	98.0		ug/m³ Air	2.68	2.00	74.9	131%	50 - 150	VMSC	03/30/11 12:05	11C0385
Trichloroethene	63.1		ug/m³ Air	2.15	2.00	60.0	105%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,4-Dioxane	16.4	L4	ug/m³ Air	1.44	2.00	40.3	41%	50 - 150	VMSC	03/30/11 12:05	11C0385
2,2,4-Trimethylpentane	55.7		ug/m³ Air	1.87	2.00	49.8	112%	50 - 150	VMSC	03/30/11 12:05	11C0385
Heptane	45.8		ug/m³ Air	1.64	2.00	45.8	100%	50 - 150	VMSC	03/30/11 12:05	11C0385
cis-1,3-Dichloropropene	58.3		ug/m³ Air	1.82	2.00	51.7	113%	50 - 150	VMSC	03/30/11 12:05	11C0385
4-Methyl-2-pentanone (MIBK)	53.6		ug/m³ Air	1.64	2.00	47.1	114%	50 - 150	VMSC	03/30/11 12:05	11C0385
trans-1,3-Dichloropropene	54.6		ug/m³ Air	1.82	2.00	47.3	115%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,1,2-Trichloroethane	69.0		ug/m³ Air	2.18	2.00	60.4	114%	50 - 150	VMSC	03/30/11 12:05	11C0385
Toluene	48.3		ug/m³ Air	1.51	2.00	42.1	115%	50 - 150	VMSC	03/30/11 12:05	11C0385
2-Hexanone	53.0		ug/m³ Air	1.64	2.00	46.6	114%	50 - 150	VMSC	03/30/11 12:05	11C0385
Chlorodibromomethane	125		ug/m³ Air	3.41	2.00	96.1	130%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,2-Dibromoethane (EDB)	94.3		ug/m³ Air	3.07	2.00	85.1	111%	50 - 150	VMSC	03/30/11 12:05	11C0385
n-Octane	60.6		ug/m³ Air	1.87	2.00	50.2	121%	50 - 150	VMSC	03/30/11 12:05	11C0385
Tetrachloroethene	82.8		ug/m³ Air	2.71	2.00	70.7	117%	50 - 150	VMSC	03/30/11 12:05	11C0385
Chlorobenzene	56.5		ug/m³ Air	1.84	2.00	51.9	109%	50 - 150	VMSC	03/30/11 12:05	11C0385
Ethylbenzene	56.3		ug/m³ Air	1.74	2.00	48.5	116%	50 - 150	VMSC	03/30/11 12:05	11C0385
m-Xylene & p-Xylene	116		ug/m³ Air	3.47	2.00	95.2	122%	50 - 150	VMSC	03/30/11 12:05	11C0385

Golder Associates Ltd.
500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0385-BS1 (LCS - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Bromoform	153		ug/m³ Air	4.13	2.00	113	135%	50 - 150	VMSC	03/30/11 12:05	11C0385
Styrene	52.5		ug/m³ Air	1.70	2.00	48.1	109%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,1,2,2-Tetrachloroethane	86.8		ug/m³ Air	2.75	2.00	78.1	111%	50 - 150	VMSC	03/30/11 12:05	11C0385
o-Xylene	59.6		ug/m³ Air	1.74	2.00	49.4	121%	50 - 150	VMSC	03/30/11 12:05	11C0385
Xylenes, total	175		ug/m³ Air	5.21	2.00	145	121%	50 - 150	VMSC	03/30/11 12:05	11C0385
n-Nonane	69.6		ug/m³ Air	2.10	2.00	56.4	123%	50 - 150	VMSC	03/30/11 12:05	11C0385
Isopropylbenzene	60.4		ug/m³ Air	1.97	2.00	52.4	115%	50 - 150	VMSC	03/30/11 12:05	11C0385
2 & 3-Chlorotoluene	55.6		ug/m³ Air	4.14	2.00	55.7	100%	50 - 150	VMSC	03/30/11 12:05	11C0385
n-Propylbenzene	59.8		ug/m³ Air	1.97	2.00	51.8	115%	50 - 150	VMSC	03/30/11 12:05	11C0385
4-Ethyltoluene	65.7		ug/m³ Air	1.97	2.00	56.5	116%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,3,5-Trimethylbenzene	63.6		ug/m³ Air	1.97	2.00	54.4	117%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,2,4-Trimethylbenzene	65.6		ug/m³ Air	1.97	2.00	53.9	122%	50 - 150	VMSC	03/30/11 12:05	11C0385
tert-Butylbenzene	71.8		ug/m³ Air	2.20	2.00	60.2	119%	50 - 150	VMSC	03/30/11 12:05	11C0385
Benzyl chloride	80.2		ug/m³ Air	2.07	2.00	58.4	137%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,3-Dichlorobenzene	69.9		ug/m³ Air	2.40	2.00	67.8	103%	50 - 150	VMSC	03/30/11 12:05	11C0385
n-Decane	72.5		ug/m³ Air	2.33	2.00	63.8	114%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,4-Dichlorobenzene	69.0		ug/m³ Air	2.40	2.00	65.9	105%	50 - 150	VMSC	03/30/11 12:05	11C0385
4-Isopropyltoluene	65.9		ug/m³ Air	2.20	2.00	59.6	111%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,2-Dichlorobenzene	73.1		ug/m³ Air	2.40	2.00	67.8	108%	50 - 150	VMSC	03/30/11 12:05	11C0385
n-Butylbenzene	71.0		ug/m³ Air	2.20	2.00	60.2	118%	50 - 150	VMSC	03/30/11 12:05	11C0385
n-Undecane	77.0		ug/m³ Air	2.56	2.00	70.1	110%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,2,4-Trichlorobenzene	51.9	B	ug/m³ Air	2.97	2.00	85.3	61%	50 - 150	VMSC	03/30/11 12:05	11C0385
Naphthalene	39.9		ug/m³ Air	2.10	2.00	56.9	70%	50 - 150	VMSC	03/30/11 12:05	11C0385
Hexachlorobutadiene	89.0		ug/m³ Air	4.27	2.00	119	75%	50 - 150	VMSC	03/30/11 12:05	11C0385
1,2-Dichloroethene, Total	83.6		ug/m³ Air	3.17	2.00	86.5	97%	50 - 150	VMSC	03/30/11 12:05	11C0385
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*91%*								VMSC	03/30/11 12:05	11C0385
Surr: Fluorobenzene (62-122%)	*83%*								VMSC	03/30/11 12:05	11C0385
Surr: Toluene-d8 (67-127%)	*102%*								VMSC	03/30/11 12:05	11C0385
Surr: 1,4-Dichlorobutane (76-136%)	*103%*								VMSC	03/30/11 12:05	11C0385
Surr: 4-Bromofluorobenzene (73-133%)	*101%*								VMSC	03/30/11 12:05	11C0385
Sample ID: 11C0400-BS1 (LCS - Air)											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Propylene	18.4		ug/m³ Air	0.688	2.00	17.8	103%	50 - 150	VMSC	03/31/11 11:53	11C0400

Golder Associates Ltd.
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Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0400-BS1 (LCS - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Chlorodifluoromethane	38.8		ug/m³ Air	1.41	2.00	38.4	101%	50 - 150	VMSC	03/31/11 11:53	11C0400
Propane	18.8		ug/m³ Air	0.721	2.00	18.4	102%	50 - 150	VMSC	03/31/11 11:53	11C0400
Dichlorodifluoromethane	57.4		ug/m³ Air	1.98	2.00	52.1	110%	50 - 150	VMSC	03/31/11 11:53	11C0400
Chloromethane	23.7		ug/m³ Air	0.826	2.00	22.0	108%	50 - 150	VMSC	03/31/11 11:53	11C0400
Isobutane	25.0		ug/m³ Air	0.951	2.00	24.3	103%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,2-Dichloro-1,1,2,2-tetrafluoroethane	65.8		ug/m³ Air	2.80	2.00	73.7	89%	50 - 150	VMSC	03/31/11 11:53	11C0400
Vinyl chloride	25.8		ug/m³ Air	1.02	2.00	27.2	95%	50 - 150	VMSC	03/31/11 11:53	11C0400
1-Butene/Isobutene	22.9		ug/m³ Air	0.918	2.00	23.2	98%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,3-Butadiene	24.7		ug/m³ Air	0.885	2.00	24.0	103%	50 - 150	VMSC	03/31/11 11:53	11C0400
Butane	23.8		ug/m³ Air	0.951	2.00	24.3	98%	50 - 150	VMSC	03/31/11 11:53	11C0400
trans-2-Butene	23.0		ug/m³ Air	0.918	2.00	23.2	99%	50 - 150	VMSC	03/31/11 11:53	11C0400
Bromomethane	39.2		ug/m³ Air	1.55	2.00	40.9	96%	50 - 150	VMSC	03/31/11 11:53	11C0400
cis-2-Butene	25.0		ug/m³ Air	0.918	2.00	24.9	100%	50 - 150	VMSC	03/31/11 11:53	11C0400
Chloroethane	27.8		ug/m³ Air	1.06	2.00	27.5	101%	50 - 150	VMSC	03/31/11 11:53	11C0400
Vinyl bromide	39.0		ug/m³ Air	1.75	2.00	46.6	84%	50 - 150	VMSC	03/31/11 11:53	11C0400
3-Methyl-1-butene	33.6		ug/m³ Air	1.15	2.00	30.8	109%	50 - 150	VMSC	03/31/11 11:53	11C0400
Acetonitrile	15.8		ug/m³ Air	0.672	2.00	17.7	89%	50 - 150	VMSC	03/31/11 11:53	11C0400
Isopentane	32.0		ug/m³ Air	1.18	2.00	32.1	100%	50 - 150	VMSC	03/31/11 11:53	11C0400
Trichlorofluoromethane	67.8		ug/m³ Air	2.25	2.00	60.4	112%	50 - 150	VMSC	03/31/11 11:53	11C0400
1-Pentene	32.2		ug/m³ Air	1.15	2.00	32.0	101%	50 - 150	VMSC	03/31/11 11:53	11C0400
Acetone	27.8	B	ug/m³ Air	0.950	2.00	25.8	108%	50 - 150	VMSC	03/31/11 11:53	11C0400
Isopropyl alcohol	24.8		ug/m³ Air	0.983	2.00	29.8	83%	50 - 150	VMSC	03/31/11 11:53	11C0400
Acrylonitrile	21.8		ug/m³ Air	0.868	2.00	23.6	92%	50 - 150	VMSC	03/31/11 11:53	11C0400
n-Pentane	32.2		ug/m³ Air	1.18	2.00	32.1	100%	50 - 150	VMSC	03/31/11 11:53	11C0400
Diethyl ether	27.0		ug/m³ Air	1.21	2.00	32.9	82%	50 - 150	VMSC	03/31/11 11:53	11C0400
Isoprene	28.1		ug/m³ Air	1.11	2.00	30.3	93%	50 - 150	VMSC	03/31/11 11:53	11C0400
trans-2-Pentene	31.1		ug/m³ Air	1.15	2.00	31.4	99%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,1-Dichloroethene	44.1		ug/m³ Air	1.59	2.00	43.5	102%	50 - 150	VMSC	03/31/11 11:53	11C0400
cis-2-Pentene	31.3		ug/m³ Air	1.15	2.00	31.1	100%	50 - 150	VMSC	03/31/11 11:53	11C0400
Methylene chloride	39.5		ug/m³ Air	1.39	2.00	37.3	106%	50 - 150	VMSC	03/31/11 11:53	11C0400
2-Methyl-2-butene	32.0		ug/m³ Air	1.15	2.00	32.6	98%	50 - 150	VMSC	03/31/11 11:53	11C0400
Carbon disulfide	26.2		ug/m³ Air	1.25	2.00	34.1	77%	50 - 150	VMSC	03/31/11 11:53	11C0400
Allyl chloride	32.8		ug/m³ Air	1.25	2.00	33.6	98%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,1,2-Trichlorotrifluoroethane	83.9		ug/m³ Air	3.07	2.00	84.8	99%	50 - 150	VMSC	03/31/11 11:53	11C0400
trans-1,2-Dichloroethene	40.5		ug/m³ Air	1.59	2.00	42.2	96%	50 - 150	VMSC	03/31/11 11:53	11C0400
4-Methyl-1-pentene	39.1		ug/m³ Air	1.38	2.00	36.7	107%	50 - 150	VMSC	03/31/11 11:53	11C0400

Golder Associates Ltd.
500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0400-BS1 (LCS - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
1,1-Dichloroethane	45.5		ug/m³ Air	1.62	2.00	44.4	103%	50 - 150	VMSC	03/31/11 11:53	11C0400
Methyl tert-Butyl Ether	40.7		ug/m³ Air	1.44	2.00	39.9	102%	50 - 150	VMSC	03/31/11 11:53	11C0400
Vinyl acetate	35.6		ug/m³ Air	1.41	2.00	40.1	89%	50 - 150	VMSC	03/31/11 11:53	11C0400
2-Butanone (MEK)	30.7		ug/m³ Air	1.18	2.00	33.6	91%	50 - 150	VMSC	03/31/11 11:53	11C0400
Chloroprene	41.2		ug/m³ Air	1.45	2.00	39.3	105%	50 - 150	VMSC	03/31/11 11:53	11C0400
cis-1,2-Dichloroethene	43.9		ug/m³ Air	1.59	2.00	44.3	99%	50 - 150	VMSC	03/31/11 11:53	11C0400
Hexane	36.4		ug/m³ Air	1.41	2.00	40.9	89%	50 - 150	VMSC	03/31/11 11:53	11C0400
Chloroform	54.8		ug/m³ Air	1.95	2.00	52.5	104%	50 - 150	VMSC	03/31/11 11:53	11C0400
trans-2-Hexene	39.2		ug/m³ Air	1.38	2.00	38.1	103%	50 - 150	VMSC	03/31/11 11:53	11C0400
cis-2-Hexene	36.4		ug/m³ Air	1.38	2.00	36.7	99%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,2-Dichloroethane	49.3		ug/m³ Air	1.62	2.00	44.4	111%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,1,1-Trichloroethane	67.3		ug/m³ Air	2.18	2.00	59.3	114%	50 - 150	VMSC	03/31/11 11:53	11C0400
Benzene	37.0		ug/m³ Air	1.28	2.00	35.0	106%	50 - 150	VMSC	03/31/11 11:53	11C0400
Carbon tetrachloride	92.1		ug/m³ Air	2.52	2.00	71.6	129%	50 - 150	VMSC	03/31/11 11:53	11C0400
n-Butanol	23.8		ug/m³ Air	1.21	2.00	34.5	69%	50 - 150	VMSC	03/31/11 11:53	11C0400
Cyclohexane	40.7		ug/m³ Air	1.38	2.00	38.5	106%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,2-Dichloropropane	56.8		ug/m³ Air	1.85	2.00	51.2	111%	50 - 150	VMSC	03/31/11 11:53	11C0400
Bromodichloromethane	90.5		ug/m³ Air	2.68	2.00	74.9	121%	50 - 150	VMSC	03/31/11 11:53	11C0400
Trichloroethene	59.0		ug/m³ Air	2.15	2.00	60.0	98%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,4-Dioxane	22.7		ug/m³ Air	1.44	2.00	40.3	56%	50 - 150	VMSC	03/31/11 11:53	11C0400
2,2,4-Trimethylpentane	54.3		ug/m³ Air	1.87	2.00	49.8	109%	50 - 150	VMSC	03/31/11 11:53	11C0400
Heptane	43.5		ug/m³ Air	1.64	2.00	45.8	95%	50 - 150	VMSC	03/31/11 11:53	11C0400
cis-1,3-Dichloropropene	55.6		ug/m³ Air	1.82	2.00	51.7	108%	50 - 150	VMSC	03/31/11 11:53	11C0400
4-Methyl-2-pentanone (MIBK)	50.2		ug/m³ Air	1.64	2.00	47.1	107%	50 - 150	VMSC	03/31/11 11:53	11C0400
trans-1,3-Dichloropropene	52.0		ug/m³ Air	1.82	2.00	47.3	110%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,1,2-Trichloroethane	65.5		ug/m³ Air	2.18	2.00	60.4	108%	50 - 150	VMSC	03/31/11 11:53	11C0400
Toluene	45.3		ug/m³ Air	1.51	2.00	42.1	108%	50 - 150	VMSC	03/31/11 11:53	11C0400
2-Hexanone	50.6		ug/m³ Air	1.64	2.00	46.6	108%	50 - 150	VMSC	03/31/11 11:53	11C0400
Chlorodibromomethane	118		ug/m³ Air	3.41	2.00	96.1	123%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,2-Dibromoethane (EDB)	89.8		ug/m³ Air	3.07	2.00	85.1	106%	50 - 150	VMSC	03/31/11 11:53	11C0400
n-Octane	56.3		ug/m³ Air	1.87	2.00	50.2	112%	50 - 150	VMSC	03/31/11 11:53	11C0400
Tetrachloroethene	77.8		ug/m³ Air	2.71	2.00	70.7	110%	50 - 150	VMSC	03/31/11 11:53	11C0400
Chlorobenzene	53.8		ug/m³ Air	1.84	2.00	51.9	104%	50 - 150	VMSC	03/31/11 11:53	11C0400
Ethylbenzene	53.6		ug/m³ Air	1.74	2.00	48.5	110%	50 - 150	VMSC	03/31/11 11:53	11C0400
m-Xylene & p-Xylene	109		ug/m³ Air	3.47	2.00	95.2	114%	50 - 150	VMSC	03/31/11 11:53	11C0400
Bromoform	147		ug/m³ Air	4.13	2.00	113	130%	50 - 150	VMSC	03/31/11 11:53	11C0400

Golder Associates Ltd.
500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11C0400-BS1 (LCS - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Styrene	50.3		ug/m³ Air	1.70	2.00	48.1	105%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,1,2,2-Tetrachloroethane	82.7		ug/m³ Air	2.75	2.00	78.1	106%	50 - 150	VMSC	03/31/11 11:53	11C0400
o-Xylene	55.7		ug/m³ Air	1.74	2.00	49.4	113%	50 - 150	VMSC	03/31/11 11:53	11C0400
Xylenes, total	165		ug/m³ Air	5.21	2.00	145	114%	50 - 150	VMSC	03/31/11 11:53	11C0400
n-Nonane	65.3		ug/m³ Air	2.10	2.00	56.4	116%	50 - 150	VMSC	03/31/11 11:53	11C0400
Isopropylbenzene	57.0		ug/m³ Air	1.97	2.00	52.4	109%	50 - 150	VMSC	03/31/11 11:53	11C0400
2 & 3-Chlorotoluene	53.0		ug/m³ Air	4.14	2.00	55.7	95%	50 - 150	VMSC	03/31/11 11:53	11C0400
n-Propylbenzene	56.8		ug/m³ Air	1.97	2.00	51.8	110%	50 - 150	VMSC	03/31/11 11:53	11C0400
4-Ethyltoluene	62.8		ug/m³ Air	1.97	2.00	56.5	111%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,3,5-Trimethylbenzene	60.2		ug/m³ Air	1.97	2.00	54.4	111%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,2,4-Trimethylbenzene	61.7		ug/m³ Air	1.97	2.00	53.9	114%	50 - 150	VMSC	03/31/11 11:53	11C0400
tert-Butylbenzene	67.2		ug/m³ Air	2.20	2.00	60.2	112%	50 - 150	VMSC	03/31/11 11:53	11C0400
Benzyl chloride	75.8		ug/m³ Air	2.07	2.00	58.4	130%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,3-Dichlorobenzene	67.4	B	ug/m³ Air	2.40	2.00	67.8	99%	50 - 150	VMSC	03/31/11 11:53	11C0400
n-Decane	68.4		ug/m³ Air	2.33	2.00	63.8	107%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,4-Dichlorobenzene	66.5	B	ug/m³ Air	2.40	2.00	65.9	101%	50 - 150	VMSC	03/31/11 11:53	11C0400
4-Isopropyltoluene	60.9		ug/m³ Air	2.20	2.00	59.6	102%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,2-Dichlorobenzene	69.3	B	ug/m³ Air	2.40	2.00	67.8	102%	50 - 150	VMSC	03/31/11 11:53	11C0400
n-Butylbenzene	63.3	B	ug/m³ Air	2.20	2.00	60.2	105%	50 - 150	VMSC	03/31/11 11:53	11C0400
n-Undecane	72.9		ug/m³ Air	2.56	2.00	70.1	104%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,2,4-Trichlorobenzene	64.7	B	ug/m³ Air	2.97	2.00	85.3	76%	50 - 150	VMSC	03/31/11 11:53	11C0400
Naphthalene	48.4	B	ug/m³ Air	2.10	2.00	56.9	85%	50 - 150	VMSC	03/31/11 11:53	11C0400
Hexachlorobutadiene	99.2	B	ug/m³ Air	4.27	2.00	119	83%	50 - 150	VMSC	03/31/11 11:53	11C0400
1,2-Dichloroethene, Total	84.3		ug/m³ Air	3.17	2.00	86.5	97%	50 - 150	VMSC	03/31/11 11:53	11C0400
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*94%*								VMSC	03/31/11 11:53	11C0400
Surr: Fluorobenzene (62-122%)	*90%*								VMSC	03/31/11 11:53	11C0400
Surr: Toluene-d8 (67-127%)	*101%*								VMSC	03/31/11 11:53	11C0400
Surr: 1,4-Dichlorobutane (76-136%)	*103%*								VMSC	03/31/11 11:53	11C0400
Surr: 4-Bromofluorobenzene (73-133%)	*102%*								VMSC	03/31/11 11:53	11C0400
Sample ID: 11D0020-BS1 (LCS - Air)											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Ethene	15.2		ug/m³ Air	0.459	2.00	12.2	125%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020
Acetylene	10.4		ug/m³ Air	0.426	2.00	11.3	92%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020

Golder Associates Ltd.
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11D0020-BS1 (LCS - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Ethane	13.2		ug/m³ Air	0.492	2.00	13.0	101%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020
Propylene	19.3		ug/m³ Air	0.688	2.00	17.7	109%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020
Propane	18.7		ug/m³ Air	0.721	2.00	18.4	102%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020
Isobutane	26.1		ug/m³ Air	0.951	2.00	24.2	108%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020
1-Butene/Isobutene	25.4		ug/m³ Air	0.918	2.00	23.1	110%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020
Butane	25.1		ug/m³ Air	0.951	2.00	24.2	104%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020
Methanol	12.5	B	ug/m³ Air	0.524	2.00	14.2	88%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020
cis-2-Butene	27.8		ug/m³ Air	0.918	2.00	24.8	112%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020
Isopentane	30.6		ug/m³ Air	1.18	2.00	31.9	96%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020
1-Pentene	34.6		ug/m³ Air	1.15	2.00	31.9	108%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020
n-Pentane	35.6		ug/m³ Air	1.18	2.00	31.9	112%	50 - 150	GCMSQ2	04/04/11 11:25	11D0020
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*99%*								GCMSQ2	04/04/11 11:25	11D0020
Surr: Fluorobenzene (62-122%)	*94%*								GCMSQ2	04/04/11 11:25	11D0020
Surr: Toluene-d8 (67-127%)	*103%*								GCMSQ2	04/04/11 11:25	11D0020
Surr: 1,4-Dichlorobutane (76-136%)	*106%*								GCMSQ2	04/04/11 11:25	11D0020
Surr: 4-Bromofluorobenzene (73-133%)	*104%*								GCMSQ2	04/04/11 11:25	11D0020
Sample ID: 11D0170-BS1 (LCS - Air)											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Ethene	13.1		ug/m³ Air	0.459	2.00	12.3	106%	50 - 150	GCMSQ2	04/18/11 11:33	11D0170
Acetylene	11.0		ug/m³ Air	0.426	2.00	11.4	96%	50 - 150	GCMSQ2	04/18/11 11:33	11D0170
Ethane	11.4		ug/m³ Air	0.492	2.00	13.2	87%	50 - 150	GCMSQ2	04/18/11 11:33	11D0170
Propylene	16.0		ug/m³ Air	0.688	2.00	17.9	89%	50 - 150	GCMSQ2	04/18/11 11:33	11D0170
Propane	15.8		ug/m³ Air	0.721	2.00	18.6	85%	50 - 150	GCMSQ2	04/18/11 11:33	11D0170
1-Butene/Isobutene	21.7		ug/m³ Air	0.918	2.00	23.4	93%	50 - 150	GCMSQ2	04/18/11 11:33	11D0170
Butane	20.9		ug/m³ Air	0.951	2.00	24.5	85%	50 - 150	GCMSQ2	04/18/11 11:33	11D0170
Methanol	10.9	B	ug/m³ Air	0.524	2.00	14.3	76%	50 - 150	GCMSQ2	04/18/11 11:33	11D0170
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*92%*								GCMSQ2	04/18/11 11:33	11D0170
Surr: Fluorobenzene (62-122%)	*77%*								GCMSQ2	04/18/11 11:33	11D0170
Surr: Toluene-d8 (67-127%)	*103%*								GCMSQ2	04/18/11 11:33	11D0170
Surr: 1,4-Dichlorobutane (76-136%)	*111%*								GCMSQ2	04/18/11 11:33	11D0170
Surr: 4-Bromofluorobenzene (73-133%)	*109%*								GCMSQ2	04/18/11 11:33	11D0170

Golder Associates Ltd.
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11D0255-BS1 (LCS - Air)											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Ethene	10.8		ug/m³ Air	0.459	2.00	12.3	88%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Acetylene	12.2		ug/m³ Air	0.426	2.00	11.4	107%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Ethane	12.4		ug/m³ Air	0.492	2.00	13.2	94%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Propylene	16.6		ug/m³ Air	0.688	2.00	17.9	93%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Chlorodifluoromethane	37.6		ug/m³ Air	1.41	2.00	38.7	97%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Propane	16.4		ug/m³ Air	0.721	2.00	18.6	88%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Dichlorodifluoromethane	49.1		ug/m³ Air	1.98	2.00	52.5	94%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Chloromethane	21.1		ug/m³ Air	0.826	2.00	22.2	95%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Isobutane	22.4		ug/m³ Air	0.951	2.00	24.5	91%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,2-Dichloro-1,1,2,2-tetrafluoroethane	60.2		ug/m³ Air	2.80	2.00	74.2	81%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Vinyl chloride	25.5		ug/m³ Air	1.02	2.00	27.4	93%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1-Butene/Isobutene	22.3		ug/m³ Air	0.918	2.00	23.4	95%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,3-Butadiene	24.8		ug/m³ Air	0.885	2.00	24.2	102%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Butane	22.1		ug/m³ Air	0.951	2.00	24.5	90%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Methanol	8.38	B	ug/m³ Air	0.524	2.00	14.3	58%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
trans-2-Butene	23.5		ug/m³ Air	0.918	2.00	23.4	100%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Bromomethane	38.8		ug/m³ Air	1.55	2.00	41.2	94%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
cis-2-Butene	25.3		ug/m³ Air	0.918	2.00	25.1	101%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Chloroethane	29.8		ug/m³ Air	1.06	2.00	27.7	108%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Vinyl bromide	45.9		ug/m³ Air	1.75	2.00	46.9	98%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
3-Methyl-1-butene	32.4		ug/m³ Air	1.15	2.00	31.1	104%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Acetonitrile	21.8		ug/m³ Air	0.672	2.00	17.8	122%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Isopentane	29.9		ug/m³ Air	1.18	2.00	32.3	93%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Trichlorofluoromethane	61.9		ug/m³ Air	2.25	2.00	60.9	102%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1-Pentene	38.3		ug/m³ Air	1.15	2.00	32.3	119%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Acetone	32.4	B	ug/m³ Air	0.950	2.00	26.0	125%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Isopropyl alcohol	15.6		ug/m³ Air	0.983	2.00	30.0	52%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Acrylonitrile	28.9		ug/m³ Air	0.868	2.00	23.7	122%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
n-Pentane	33.5		ug/m³ Air	1.18	2.00	32.3	104%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Diethyl ether	38.3		ug/m³ Air	1.21	2.00	33.2	115%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Isoprene	33.2		ug/m³ Air	1.11	2.00	30.5	109%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
trans-2-Pentene	34.6		ug/m³ Air	1.15	2.00	31.7	109%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,1-Dichloroethene	47.5		ug/m³ Air	1.59	2.00	43.8	108%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
cis-2-Pentene	34.8		ug/m³ Air	1.15	2.00	31.4	111%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Methylene chloride	43.7		ug/m³ Air	1.39	2.00	37.6	116%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
2-Methyl-2-butene	34.7		ug/m³ Air	1.15	2.00	32.9	106%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11D0255-BS1 (LCS - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Carbon disulfide	30.2		ug/m³ Air	1.25	2.00	34.4	88%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Allyl chloride	38.6		ug/m³ Air	1.25	2.00	33.9	114%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,1,2-Trichlorotrifluoroethane	79.9		ug/m³ Air	3.07	2.00	85.5	93%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
trans-1,2-Dichloroethene	46.8		ug/m³ Air	1.59	2.00	42.5	110%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
4-Methyl-1-pentene	42.0		ug/m³ Air	1.38	2.00	37.0	114%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,1-Dichloroethane	53.5		ug/m³ Air	1.62	2.00	44.7	120%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Methyl tert-Butyl Ether	43.7		ug/m³ Air	1.44	2.00	40.2	109%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Vinyl acetate	46.5		ug/m³ Air	1.41	2.00	40.4	115%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
2-Butanone (MEK)	38.7	B	ug/m³ Air	1.18	2.00	33.8	115%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Chloroprene	45.1		ug/m³ Air	1.45	2.00	39.6	114%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
cis-1,2-Dichloroethene	51.7		ug/m³ Air	1.59	2.00	44.6	116%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Hexane	41.8		ug/m³ Air	1.41	2.00	41.2	101%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Chloroform	62.1		ug/m³ Air	1.95	2.00	52.9	117%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
trans-2-Hexene	43.4		ug/m³ Air	1.38	2.00	38.4	113%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
cis-2-Hexene	40.3		ug/m³ Air	1.38	2.00	37.0	109%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,2-Dichloroethane	54.5		ug/m³ Air	1.62	2.00	44.7	122%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,1,1-Trichloroethane	68.7		ug/m³ Air	2.18	2.00	59.7	115%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Benzene	45.8		ug/m³ Air	1.28	2.00	35.3	130%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Carbon tetrachloride	88.6		ug/m³ Air	2.52	2.00	72.2	123%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
n-Butanol	9.94	L4	ug/m³ Air	1.21	2.00	34.8	29%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Cyclohexane	38.8		ug/m³ Air	1.38	2.00	38.8	100%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,2-Dichloropropane	68.8		ug/m³ Air	1.85	2.00	51.5	133%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Bromodichloromethane	100		ug/m³ Air	2.68	2.00	75.5	133%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Trichloroethene	68.1		ug/m³ Air	2.15	2.00	60.5	113%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,4-Dioxane	27.8		ug/m³ Air	1.44	2.00	40.6	68%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
2,2,4-Trimethylpentane	63.6		ug/m³ Air	1.87	2.00	50.1	127%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Heptane	53.6		ug/m³ Air	1.64	2.00	46.2	116%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
cis-1,3-Dichloropropene	66.7		ug/m³ Air	1.82	2.00	52.1	128%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
4-Methyl-2-pentanone (MIBK)	62.1	B	ug/m³ Air	1.64	2.00	47.4	131%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
trans-1,3-Dichloropropene	61.4		ug/m³ Air	1.82	2.00	47.7	129%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,1,2-Trichloroethane	75.4		ug/m³ Air	2.18	2.00	60.8	124%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Toluene	53.0		ug/m³ Air	1.51	2.00	42.4	125%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
2-Hexanone	59.9		ug/m³ Air	1.64	2.00	47.0	128%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Chlorodibromomethane	122		ug/m³ Air	3.41	2.00	96.8	126%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,2-Dibromoethane (EDB)	104		ug/m³ Air	3.07	2.00	85.7	121%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
n-Octane	62.1		ug/m³ Air	1.87	2.00	50.6	123%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255

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500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	Instrument	Date Analyzed	QC Batch
Sample ID: 11D0255-BS1 (LCS - Air) - cont.											
EPA TO15 - Volatile Organic Compounds by GC/MS											
Tetrachloroethene	86.7		ug/m³ Air	2.71	2.00	71.3	122%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Chlorobenzene	60.7		ug/m³ Air	1.84	2.00	52.3	116%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Ethylbenzene	60.0		ug/m³ Air	1.74	2.00	48.9	123%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
m-Xylene & p-Xylene	118		ug/m³ Air	3.47	2.00	95.9	123%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Bromoform	144		ug/m³ Air	4.13	2.00	114	126%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Styrene	56.7		ug/m³ Air	1.70	2.00	48.4	117%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,1,2,2-Tetrachloroethane	91.1		ug/m³ Air	2.75	2.00	78.7	116%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
o-Xylene	60.3		ug/m³ Air	1.74	2.00	49.8	121%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Xylenes, total	179		ug/m³ Air	5.21	2.00	146	123%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
n-Nonane	69.1		ug/m³ Air	2.10	2.00	56.8	122%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Isopropylbenzene	61.6		ug/m³ Air	1.97	2.00	52.8	117%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
2 & 3-Chlorotoluene	64.1		ug/m³ Air	4.14	2.00	56.1	114%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
n-Propylbenzene	60.5		ug/m³ Air	1.97	2.00	52.2	116%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
4-Ethyltoluene	65.7		ug/m³ Air	1.97	2.00	56.9	115%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,3,5-Trimethylbenzene	62.5		ug/m³ Air	1.97	2.00	54.8	114%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,2,4-Trimethylbenzene	61.9		ug/m³ Air	1.97	2.00	54.3	114%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
tert-Butylbenzene	79.6		ug/m³ Air	2.20	2.00	60.6	131%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Benzyl chloride	71.5		ug/m³ Air	2.07	2.00	58.8	122%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,3-Dichlorobenzene	70.5		ug/m³ Air	2.40	2.00	68.3	103%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
n-Decane	70.6		ug/m³ Air	2.33	2.00	64.2	110%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,4-Dichlorobenzene	69.6		ug/m³ Air	2.40	2.00	66.4	105%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
4-Isopropyltoluene	68.5		ug/m³ Air	2.20	2.00	60.1	114%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,2-Dichlorobenzene	68.3		ug/m³ Air	2.40	2.00	68.3	100%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
n-Butylbenzene	70.3		ug/m³ Air	2.20	2.00	60.6	116%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
n-Undecane	91.3		ug/m³ Air	2.56	2.00	70.6	129%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,2,4-Trichlorobenzene	86.3		ug/m³ Air	2.97	2.00	85.9	100%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Naphthalene	59.2		ug/m³ Air	2.10	2.00	57.4	103%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Hexachlorobutadiene	134		ug/m³ Air	4.27	2.00	120	112%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
1,2-Dichloroethene, Total	98.5		ug/m³ Air	3.17	2.00	87.1	113%	50 - 150	GCMSQ2	04/23/11 12:48	11D0255
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*96%*								GCMSQ2	04/23/11 12:48	11D0255
Surr: Fluorobenzene (62-122%)	*93%*								GCMSQ2	04/23/11 12:48	11D0255
Surr: Toluene-d8 (67-127%)	*104%*								GCMSQ2	04/23/11 12:48	11D0255
Surr: 1,4-Dichlorobutane (76-136%)	*100%*								GCMSQ2	04/23/11 12:48	11D0255
Surr: 4-Bromofluorobenzene (73-133%)	*98%*								GCMSQ2	04/23/11 12:48	11D0255

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
14050 Summit Drive, Suite A100 Austin, TX 78728 * 512-244-0855 * Fax 512-244-0160

Golder Associates Ltd.	Work Order:	AUC0212	Received: 03/17/11 08:57
500-4260 Still Creek Drive			Reported: 05/10/11 08:56
Burnaby, British Columbia, CANADA V5C6C6	Project:	AENV Canada Creosote	
Ian Hers	Project Number:	10-1346-0046	

PROJECT QUALITY CONTROL DATA

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS Dup

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	RPD	RPD Limit	Date Analyzed	QC Batch
Sample ID: 11C0385-BSD1 (LCS Dup - Air)												
EPA TO15 - Volatile Organic Compounds by GC/MS												
Propylene	19.1		ug/m³ Air	0.688	2.00	17.8	107%	50 - 150	13	25	03/30/11 13:07	11C0385
Chlorodifluoromethane	41.0		ug/m³ Air	1.41	2.00	38.4	107%	50 - 150	12	25	03/30/11 13:07	11C0385
Propane	19.5		ug/m³ Air	0.721	2.00	18.4	106%	50 - 150	12	25	03/30/11 13:07	11C0385
Dichlorodifluoromethane	61.0		ug/m³ Air	1.98	2.00	52.1	117%	50 - 150	12	25	03/30/11 13:07	11C0385
Chloromethane	24.8		ug/m³ Air	0.826	2.00	22.0	113%	50 - 150	12	25	03/30/11 13:07	11C0385
Isobutane	26.2		ug/m³ Air	0.951	2.00	24.3	108%	50 - 150	12	25	03/30/11 13:07	11C0385
1,2-Dichloro-1,1,2,2-tetrafluoroethane	69.3		ug/m³ Air	2.80	2.00	73.7	94%	50 - 150	12	25	03/30/11 13:07	11C0385
Vinyl chloride	27.1		ug/m³ Air	1.02	2.00	27.2	99%	50 - 150	13	25	03/30/11 13:07	11C0385
1-Butene/Isobutene	24.8		ug/m³ Air	0.918	2.00	23.2	107%	50 - 150	14	25	03/30/11 13:07	11C0385
1,3-Butadiene	27.2		ug/m³ Air	0.885	2.00	24.0	113%	50 - 150	15	25	03/30/11 13:07	11C0385
Butane	25.3		ug/m³ Air	0.951	2.00	24.3	104%	50 - 150	11	25	03/30/11 13:07	11C0385
trans-2-Butene	25.2		ug/m³ Air	0.918	2.00	23.2	108%	50 - 150	15	25	03/30/11 13:07	11C0385
Bromomethane	42.2		ug/m³ Air	1.55	2.00	40.9	103%	50 - 150	15	25	03/30/11 13:07	11C0385
cis-2-Butene	27.3		ug/m³ Air	0.918	2.00	24.9	110%	50 - 150	15	25	03/30/11 13:07	11C0385
Chloroethane	30.3		ug/m³ Air	1.06	2.00	27.5	110%	50 - 150	16	25	03/30/11 13:07	11C0385
Vinyl bromide	42.0		ug/m³ Air	1.75	2.00	46.6	90%	50 - 150	15	25	03/30/11 13:07	11C0385
3-Methyl-1-butene	35.8		ug/m³ Air	1.15	2.00	30.8	116%	50 - 150	13	25	03/30/11 13:07	11C0385
Acetonitrile	16.8		ug/m³ Air	0.672	2.00	17.7	95%	50 - 150	11	25	03/30/11 13:07	11C0385
Isopentane	34.3		ug/m³ Air	1.18	2.00	32.1	107%	50 - 150	13	25	03/30/11 13:07	11C0385
Trichlorofluoromethane	74.2		ug/m³ Air	2.25	2.00	60.4	123%	50 - 150	14	25	03/30/11 13:07	11C0385
1-Pentene	35.2		ug/m³ Air	1.15	2.00	32.0	110%	50 - 150	13	25	03/30/11 13:07	11C0385
Acetone	29.4	B	ug/m³ Air	0.950	2.00	25.8	114%	50 - 150	8	25	03/30/11 13:07	11C0385
Isopropyl alcohol	25.8		ug/m³ Air	0.983	2.00	29.8	87%	50 - 150	20	50	03/30/11 13:07	11C0385
Acrylonitrile	23.6		ug/m³ Air	0.868	2.00	23.6	100%	50 - 150	10	25	03/30/11 13:07	11C0385
n-Pentane	35.5		ug/m³ Air	1.18	2.00	32.1	111%	50 - 150	15	25	03/30/11 13:07	11C0385
Diethyl ether	28.5		ug/m³ Air	1.21	2.00	32.9	87%	50 - 150	10	25	03/30/11 13:07	11C0385
Isoprene	30.5		ug/m³ Air	1.11	2.00	30.3	101%	50 - 150	13	25	03/30/11 13:07	11C0385
trans-2-Pentene	34.3		ug/m³ Air	1.15	2.00	31.4	109%	50 - 150	12	25	03/30/11 13:07	11C0385
1,1-Dichloroethene	49.6		ug/m³ Air	1.59	2.00	43.5	114%	50 - 150	14	25	03/30/11 13:07	11C0385
cis-2-Pentene	34.3		ug/m³ Air	1.15	2.00	31.1	110%	50 - 150	12	25	03/30/11 13:07	11C0385
Methylene chloride	44.4		ug/m³ Air	1.39	2.00	37.3	119%	50 - 150	12	25	03/30/11 13:07	11C0385
2-Methyl-2-butene	34.9		ug/m³ Air	1.15	2.00	32.6	107%	50 - 150	12	25	03/30/11 13:07	11C0385
Carbon disulfide	29.0		ug/m³ Air	1.25	2.00	34.1	85%	50 - 150	13	25	03/30/11 13:07	11C0385
Allyl chloride	36.4		ug/m³ Air	1.25	2.00	33.6	108%	50 - 150	11	25	03/30/11 13:07	11C0385
1,1,2-Trichlorotrifluoroethane	89.5		ug/m³ Air	3.07	2.00	84.8	106%	50 - 150	14	25	03/30/11 13:07	11C0385
trans-1,2-Dichloroethene	44.7		ug/m³ Air	1.59	2.00	42.2	106%	50 - 150	12	25	03/30/11 13:07	11C0385

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS Dup - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	RPD	RPD Limit	Date Analyzed	QC Batch
Sample ID: 11C0385-BSD1 (LCS Dup - Air) - cont.												
EPA TO15 - Volatile Organic Compounds by GC/MS												
4-Methyl-1-pentene	42.9		ug/m³ Air	1.38	2.00	36.7	117%	50 - 150	13	25	03/30/11 13:07	11C0385
1,1-Dichloroethane	49.9		ug/m³ Air	1.62	2.00	44.4	112%	50 - 150	11	25	03/30/11 13:07	11C0385
Methyl tert-Butyl Ether	43.2		ug/m³ Air	1.44	2.00	39.9	108%	50 - 150	11	25	03/30/11 13:07	11C0385
Vinyl acetate	38.9		ug/m³ Air	1.41	2.00	40.1	97%	50 - 150	9	50	03/30/11 13:07	11C0385
2-Butanone (MEK)	33.2		ug/m³ Air	1.18	2.00	33.6	99%	50 - 150	10	25	03/30/11 13:07	11C0385
Chloroprene	46.4		ug/m³ Air	1.45	2.00	39.3	118%	50 - 150	11	25	03/30/11 13:07	11C0385
cis-1,2-Dichloroethene	48.9		ug/m³ Air	1.59	2.00	44.3	110%	50 - 150	11	25	03/30/11 13:07	11C0385
Hexane	40.0		ug/m³ Air	1.41	2.00	40.9	98%	50 - 150	12	25	03/30/11 13:07	11C0385
Chloroform	61.1		ug/m³ Air	1.95	2.00	52.5	116%	50 - 150	11	25	03/30/11 13:07	11C0385
trans-2-Hexene	43.2		ug/m³ Air	1.38	2.00	38.1	113%	50 - 150	10	25	03/30/11 13:07	11C0385
cis-2-Hexene	40.4		ug/m³ Air	1.38	2.00	36.7	110%	50 - 150	11	25	03/30/11 13:07	11C0385
1,2-Dichloroethane	56.0		ug/m³ Air	1.62	2.00	44.4	126%	50 - 150	10	25	03/30/11 13:07	11C0385
1,1,1-Trichloroethane	74.6		ug/m³ Air	2.18	2.00	59.3	126%	50 - 150	13	25	03/30/11 13:07	11C0385
Benzene	40.4		ug/m³ Air	1.28	2.00	35.0	115%	50 - 150	4	25	03/30/11 13:07	11C0385
Carbon tetrachloride	103		ug/m³ Air	2.52	2.00	71.6	145%	50 - 150	6	25	03/30/11 13:07	11C0385
n-Butanol	25.8		ug/m³ Air	1.21	2.00	34.5	75%	50 - 150	4	50	03/30/11 13:07	11C0385
Cyclohexane	44.3		ug/m³ Air	1.38	2.00	38.5	115%	50 - 150	7	25	03/30/11 13:07	11C0385
1,2-Dichloropropane	62.1		ug/m³ Air	1.85	2.00	51.2	121%	50 - 150	3	25	03/30/11 13:07	11C0385
Bromodichloromethane	100		ug/m³ Air	2.68	2.00	74.9	134%	50 - 150	2	25	03/30/11 13:07	11C0385
Trichloroethene	64.6		ug/m³ Air	2.15	2.00	60.0	108%	50 - 150	2	25	03/30/11 13:07	11C0385
1,4-Dioxane	23.7		ug/m³ Air	1.44	2.00	40.3	59%	50 - 150	37	50	03/30/11 13:07	11C0385
2,2,4-Trimethylpentane	59.3		ug/m³ Air	1.87	2.00	49.8	119%	50 - 150	6	25	03/30/11 13:07	11C0385
Heptane	47.3		ug/m³ Air	1.64	2.00	45.8	103%	50 - 150	3	25	03/30/11 13:07	11C0385
cis-1,3-Dichloropropene	60.2		ug/m³ Air	1.82	2.00	51.7	117%	50 - 150	3	25	03/30/11 13:07	11C0385
4-Methyl-2-pentanone (MIBK)	53.5		ug/m³ Air	1.64	2.00	47.1	114%	50 - 150	0.02	25	03/30/11 13:07	11C0385
trans-1,3-Dichloropropene	56.1		ug/m³ Air	1.82	2.00	47.3	119%	50 - 150	3	25	03/30/11 13:07	11C0385
1,1,2-Trichloroethane	70.9		ug/m³ Air	2.18	2.00	60.4	117%	50 - 150	3	25	03/30/11 13:07	11C0385
Toluene	49.5		ug/m³ Air	1.51	2.00	42.1	117%	50 - 150	2	25	03/30/11 13:07	11C0385
2-Hexanone	52.9		ug/m³ Air	1.64	2.00	46.6	113%	50 - 150	0.2	25	03/30/11 13:07	11C0385
Chlorodibromomethane	129		ug/m³ Air	3.41	2.00	96.1	135%	50 - 150	3	25	03/30/11 13:07	11C0385
1,2-Dibromoethane (EDB)	97.4		ug/m³ Air	3.07	2.00	85.1	114%	50 - 150	3	25	03/30/11 13:07	11C0385
n-Octane	62.3		ug/m³ Air	1.87	2.00	50.2	124%	50 - 150	3	25	03/30/11 13:07	11C0385
Tetrachloroethene	85.0		ug/m³ Air	2.71	2.00	70.7	120%	50 - 150	3	25	03/30/11 13:07	11C0385
Chlorobenzene	58.5		ug/m³ Air	1.84	2.00	51.9	113%	50 - 150	4	25	03/30/11 13:07	11C0385
Ethylbenzene	58.4		ug/m³ Air	1.74	2.00	48.5	120%	50 - 150	4	25	03/30/11 13:07	11C0385
m-Xylene & p-Xylene	120		ug/m³ Air	3.47	2.00	95.2	126%	50 - 150	3	25	03/30/11 13:07	11C0385

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS Dup - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	RPD	Limit	Date Analyzed	QC Batch
Sample ID: 11C0385-BSD1 (LCS Dup - Air) - cont.												
EPA TO15 - Volatile Organic Compounds by GC/MS												
Bromoform	161		ug/m³ Air	4.13	2.00	113	142%	50 - 150	5	25	03/30/11 13:07	11C0385
Styrene	54.6		ug/m³ Air	1.70	2.00	48.1	114%	50 - 150	4	25	03/30/11 13:07	11C0385
1,1,2,2-Tetrachloroethane	90.1		ug/m³ Air	2.75	2.00	78.1	115%	50 - 150	4	25	03/30/11 13:07	11C0385
o-Xylene	61.7		ug/m³ Air	1.74	2.00	49.4	125%	50 - 150	4	25	03/30/11 13:07	11C0385
Xylenes, total	182		ug/m³ Air	5.21	2.00	145	126%	50 - 150	3	25	03/30/11 13:07	11C0385
n-Nonane	72.5		ug/m³ Air	2.10	2.00	56.4	129%	50 - 150	4	25	03/30/11 13:07	11C0385
Isopropylbenzene	62.9		ug/m³ Air	1.97	2.00	52.4	120%	50 - 150	4	50	03/30/11 13:07	11C0385
2 & 3-Chlorotoluene	58.1		ug/m³ Air	4.14	2.00	55.7	104%	50 - 150	4	25	03/30/11 13:07	11C0385
n-Propylbenzene	62.4		ug/m³ Air	1.97	2.00	51.8	120%	50 - 150	4	25	03/30/11 13:07	11C0385
4-Ethyltoluene	68.7		ug/m³ Air	1.97	2.00	56.5	122%	50 - 150	4	25	03/30/11 13:07	11C0385
1,3,5-Trimethylbenzene	66.2		ug/m³ Air	1.97	2.00	54.4	122%	50 - 150	4	25	03/30/11 13:07	11C0385
1,2,4-Trimethylbenzene	67.4		ug/m³ Air	1.97	2.00	53.9	125%	50 - 150	3	25	03/30/11 13:07	11C0385
tert-Butylbenzene	74.0		ug/m³ Air	2.20	2.00	60.2	123%	50 - 150	3	25	03/30/11 13:07	11C0385
Benzyl chloride	82.1		ug/m³ Air	2.07	2.00	58.4	141%	50 - 150	2	25	03/30/11 13:07	11C0385
1,3-Dichlorobenzene	73.1		ug/m³ Air	2.40	2.00	67.8	108%	50 - 150	4	25	03/30/11 13:07	11C0385
n-Decane	74.5		ug/m³ Air	2.33	2.00	63.8	117%	50 - 150	3	25	03/30/11 13:07	11C0385
1,4-Dichlorobenzene	72.6		ug/m³ Air	2.40	2.00	65.9	110%	50 - 150	5	25	03/30/11 13:07	11C0385
4-Isopropyltoluene	66.0		ug/m³ Air	2.20	2.00	59.6	111%	50 - 150	0.2	25	03/30/11 13:07	11C0385
1,2-Dichlorobenzene	74.6		ug/m³ Air	2.40	2.00	67.8	110%	50 - 150	2	25	03/30/11 13:07	11C0385
n-Butylbenzene	69.5		ug/m³ Air	2.20	2.00	60.2	115%	50 - 150	2	25	03/30/11 13:07	11C0385
n-Undecane	78.6		ug/m³ Air	2.56	2.00	70.1	112%	50 - 150	2	25	03/30/11 13:07	11C0385
1,2,4-Trichlorobenzene	61.1	B	ug/m³ Air	2.97	2.00	85.3	72%	50 - 150	16	25	03/30/11 13:07	11C0385
Naphthalene	46.3		ug/m³ Air	2.10	2.00	56.9	81%	50 - 150	15	25	03/30/11 13:07	11C0385
Hexachlorobutadiene	98.6		ug/m³ Air	4.27	2.00	119	83%	50 - 150	10	25	03/30/11 13:07	11C0385
1,2-Dichloroethene, Total	93.6		ug/m³ Air	3.17	2.00	86.5	108%	50 - 150	11	25	03/30/11 13:07	11C0385
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*91%*										03/30/11 13:07	11C0385
Surr: Fluorobenzene (62-122%)	*87%*										03/30/11 13:07	11C0385
Surr: Toluene-d8 (67-127%)	*100%*										03/30/11 13:07	11C0385
Surr: 1,4-Dichlorobutane (76-136%)	*107%*										03/30/11 13:07	11C0385
Surr: 4-Bromofluorobenzene (73-133%)	*104%*										03/30/11 13:07	11C0385
Sample ID: 11C0400-BSD1 (LCS Dup - Air)												
EPA TO15 - Volatile Organic Compounds by GC/MS												
Propylene	18.6		ug/m³ Air	0.688	2.00	17.8	105%	50 - 150	1	25	03/31/11 12:54	11C0400

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS Dup - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	RPD	Limit	Date Analyzed	QC Batch
Sample ID: 11C0400-BSD1 (LCS Dup - Air) - cont.												
EPA TO15 - Volatile Organic Compounds by GC/MS												
Chlorodifluoromethane	39.1		ug/m³ Air	1.41	2.00	38.4	102%	50 - 150	0.9	25	03/31/11 12:54	11C0400
Propane	19.1		ug/m³ Air	0.721	2.00	18.4	103%	50 - 150	1	25	03/31/11 12:54	11C0400
Dichlorodifluoromethane	58.1		ug/m³ Air	1.98	2.00	52.1	112%	50 - 150	1	25	03/31/11 12:54	11C0400
Chloromethane	23.9		ug/m³ Air	0.826	2.00	22.0	109%	50 - 150	0.9	25	03/31/11 12:54	11C0400
Isobutane	25.4		ug/m³ Air	0.951	2.00	24.3	105%	50 - 150	1	25	03/31/11 12:54	11C0400
1,2-Dichloro-1,1,2,2-tetrafluoroethane	66.7		ug/m³ Air	2.80	2.00	73.7	90%	50 - 150	1	25	03/31/11 12:54	11C0400
Vinyl chloride	25.9		ug/m³ Air	1.02	2.00	27.2	95%	50 - 150	0.2	25	03/31/11 12:54	11C0400
1-Butene/Isobutene	22.8		ug/m³ Air	0.918	2.00	23.2	98%	50 - 150	0.3	25	03/31/11 12:54	11C0400
1,3-Butadiene	24.5		ug/m³ Air	0.885	2.00	24.0	102%	50 - 150	0.8	25	03/31/11 12:54	11C0400
Butane	23.7		ug/m³ Air	0.951	2.00	24.3	98%	50 - 150	0.4	25	03/31/11 12:54	11C0400
trans-2-Butene	22.8		ug/m³ Air	0.918	2.00	23.2	98%	50 - 150	0.9	25	03/31/11 12:54	11C0400
Bromomethane	39.0		ug/m³ Air	1.55	2.00	40.9	95%	50 - 150	0.6	25	03/31/11 12:54	11C0400
cis-2-Butene	24.7		ug/m³ Air	0.918	2.00	24.9	99%	50 - 150	1	25	03/31/11 12:54	11C0400
Chloroethane	27.8		ug/m³ Air	1.06	2.00	27.5	101%	50 - 150	0.2	25	03/31/11 12:54	11C0400
Vinyl bromide	38.1		ug/m³ Air	1.75	2.00	46.6	82%	50 - 150	2	25	03/31/11 12:54	11C0400
3-Methyl-1-butene	33.3		ug/m³ Air	1.15	2.00	30.8	108%	50 - 150	0.8	25	03/31/11 12:54	11C0400
Acetonitrile	15.1		ug/m³ Air	0.672	2.00	17.7	85%	50 - 150	4	25	03/31/11 12:54	11C0400
Isopentane	31.7		ug/m³ Air	1.18	2.00	32.1	99%	50 - 150	1	25	03/31/11 12:54	11C0400
Trichlorofluoromethane	67.4		ug/m³ Air	2.25	2.00	60.4	112%	50 - 150	0.5	25	03/31/11 12:54	11C0400
1-Pentene	31.4		ug/m³ Air	1.15	2.00	32.0	98%	50 - 150	2	25	03/31/11 12:54	11C0400
Acetone	26.9	B	ug/m³ Air	0.950	2.00	25.8	104%	50 - 150	3	25	03/31/11 12:54	11C0400
Isopropyl alcohol	22.6		ug/m³ Air	0.983	2.00	29.8	76%	50 - 150	9	50	03/31/11 12:54	11C0400
Acrylonitrile	21.3		ug/m³ Air	0.868	2.00	23.6	90%	50 - 150	2	25	03/31/11 12:54	11C0400
n-Pentane	31.6		ug/m³ Air	1.18	2.00	32.1	99%	50 - 150	2	25	03/31/11 12:54	11C0400
Diethyl ether	26.3		ug/m³ Air	1.21	2.00	32.9	80%	50 - 150	3	25	03/31/11 12:54	11C0400
Isoprene	27.4		ug/m³ Air	1.11	2.00	30.3	91%	50 - 150	2	25	03/31/11 12:54	11C0400
trans-2-Pentene	30.2		ug/m³ Air	1.15	2.00	31.4	96%	50 - 150	3	25	03/31/11 12:54	11C0400
1,1-Dichloroethene	43.4		ug/m³ Air	1.59	2.00	43.5	100%	50 - 150	2	25	03/31/11 12:54	11C0400
cis-2-Pentene	30.5		ug/m³ Air	1.15	2.00	31.1	98%	50 - 150	2	25	03/31/11 12:54	11C0400
Methylene chloride	38.5		ug/m³ Air	1.39	2.00	37.3	103%	50 - 150	3	25	03/31/11 12:54	11C0400
2-Methyl-2-butene	31.1		ug/m³ Air	1.15	2.00	32.6	95%	50 - 150	3	25	03/31/11 12:54	11C0400
Carbon disulfide	25.7		ug/m³ Air	1.25	2.00	34.1	75%	50 - 150	2	25	03/31/11 12:54	11C0400
Allyl chloride	31.9		ug/m³ Air	1.25	2.00	33.6	95%	50 - 150	3	25	03/31/11 12:54	11C0400
1,1,2-Trichlorotrifluoroethane	84.0		ug/m³ Air	3.07	2.00	84.8	99%	50 - 150	0.2	25	03/31/11 12:54	11C0400
trans-1,2-Dichloroethene	39.6		ug/m³ Air	1.59	2.00	42.2	94%	50 - 150	2	25	03/31/11 12:54	11C0400
4-Methyl-1-pentene	38.5		ug/m³ Air	1.38	2.00	36.7	105%	50 - 150	2	25	03/31/11 12:54	11C0400

Golder Associates Ltd.
500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS Dup - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	RPD	RPD Limit	Date Analyzed	QC Batch
Sample ID: 11C0400-BSD1 (LCS Dup - Air) - cont.												
EPA TO15 - Volatile Organic Compounds by GC/MS												
1,1-Dichloroethane	44.4		ug/m³ Air	1.62	2.00	44.4	100%	50 - 150	3	25	03/31/11 12:54	11C0400
Methyl tert-Butyl Ether	40.4		ug/m³ Air	1.44	2.00	39.9	101%	50 - 150	0.7	25	03/31/11 12:54	11C0400
Vinyl acetate	35.1		ug/m³ Air	1.41	2.00	40.1	88%	50 - 150	1	50	03/31/11 12:54	11C0400
2-Butanone (MEK)	30.3		ug/m³ Air	1.18	2.00	33.6	90%	50 - 150	1	25	03/31/11 12:54	11C0400
Chloroprene	40.4		ug/m³ Air	1.45	2.00	39.3	103%	50 - 150	2	25	03/31/11 12:54	11C0400
cis-1,2-Dichloroethene	43.2		ug/m³ Air	1.59	2.00	44.3	98%	50 - 150	2	25	03/31/11 12:54	11C0400
Hexane	35.7		ug/m³ Air	1.41	2.00	40.9	88%	50 - 150	2	25	03/31/11 12:54	11C0400
Chloroform	53.6		ug/m³ Air	1.95	2.00	52.5	102%	50 - 150	2	25	03/31/11 12:54	11C0400
trans-2-Hexene	38.5		ug/m³ Air	1.38	2.00	38.1	101%	50 - 150	2	25	03/31/11 12:54	11C0400
cis-2-Hexene	35.7		ug/m³ Air	1.38	2.00	36.7	97%	50 - 150	2	25	03/31/11 12:54	11C0400
1,2-Dichloroethane	48.6		ug/m³ Air	1.62	2.00	44.4	110%	50 - 150	1	25	03/31/11 12:54	11C0400
1,1,1-Trichloroethane	65.4		ug/m³ Air	2.18	2.00	59.3	110%	50 - 150	3	25	03/31/11 12:54	11C0400
Benzene	37.2		ug/m³ Air	1.28	2.00	35.0	106%	50 - 150	0.8	25	03/31/11 12:54	11C0400
Carbon tetrachloride	92.0		ug/m³ Air	2.52	2.00	71.6	129%	50 - 150	0.05	25	03/31/11 12:54	11C0400
n-Butanol	24.1		ug/m³ Air	1.21	2.00	34.5	70%	50 - 150	1	50	03/31/11 12:54	11C0400
Cyclohexane	41.1		ug/m³ Air	1.38	2.00	38.5	107%	50 - 150	1	25	03/31/11 12:54	11C0400
1,2-Dichloropropane	57.3		ug/m³ Air	1.85	2.00	51.2	112%	50 - 150	0.8	25	03/31/11 12:54	11C0400
Bromodichloromethane	91.7		ug/m³ Air	2.68	2.00	74.9	123%	50 - 150	1	25	03/31/11 12:54	11C0400
Trichloroethene	59.9		ug/m³ Air	2.15	2.00	60.0	100%	50 - 150	2	25	03/31/11 12:54	11C0400
1,4-Dioxane	20.2		ug/m³ Air	1.44	2.00	40.3	50%	50 - 150	12	50	03/31/11 12:54	11C0400
2,2,4-Trimethylpentane	54.3		ug/m³ Air	1.87	2.00	49.8	109%	50 - 150	0.02	25	03/31/11 12:54	11C0400
Heptane	44.0		ug/m³ Air	1.64	2.00	45.8	96%	50 - 150	1	25	03/31/11 12:54	11C0400
cis-1,3-Dichloropropene	56.6		ug/m³ Air	1.82	2.00	51.7	109%	50 - 150	2	25	03/31/11 12:54	11C0400
4-Methyl-2-pentanone (MIBK)	50.3		ug/m³ Air	1.64	2.00	47.1	107%	50 - 150	0.3	25	03/31/11 12:54	11C0400
trans-1,3-Dichloropropene	53.4		ug/m³ Air	1.82	2.00	47.3	113%	50 - 150	3	25	03/31/11 12:54	11C0400
1,1,2-Trichloroethane	66.4		ug/m³ Air	2.18	2.00	60.4	110%	50 - 150	1	25	03/31/11 12:54	11C0400
Toluene	45.9		ug/m³ Air	1.51	2.00	42.1	109%	50 - 150	1	25	03/31/11 12:54	11C0400
2-Hexanone	51.3		ug/m³ Air	1.64	2.00	46.6	110%	50 - 150	1	25	03/31/11 12:54	11C0400
Chlorodibromomethane	119		ug/m³ Air	3.41	2.00	96.1	124%	50 - 150	1	25	03/31/11 12:54	11C0400
1,2-Dibromoethane (EDB)	91.8		ug/m³ Air	3.07	2.00	85.1	108%	50 - 150	2	25	03/31/11 12:54	11C0400
n-Octane	57.2		ug/m³ Air	1.87	2.00	50.2	114%	50 - 150	2	25	03/31/11 12:54	11C0400
Tetrachloroethene	78.9		ug/m³ Air	2.71	2.00	70.7	112%	50 - 150	1	25	03/31/11 12:54	11C0400
Chlorobenzene	55.1		ug/m³ Air	1.84	2.00	51.9	106%	50 - 150	2	25	03/31/11 12:54	11C0400
Ethylbenzene	54.0		ug/m³ Air	1.74	2.00	48.5	111%	50 - 150	0.8	25	03/31/11 12:54	11C0400
m-Xylene & p-Xylene	111		ug/m³ Air	3.47	2.00	95.2	116%	50 - 150	1	25	03/31/11 12:54	11C0400
Bromoform	150		ug/m³ Air	4.13	2.00	113	132%	50 - 150	2	25	03/31/11 12:54	11C0400

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500-4260 Still Creek Drive
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS Dup - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	RPD	RPD Limit	Date Analyzed	QC Batch
Sample ID: 11C0400-BSD1 (LCS Dup - Air) - cont.												
EPA TO15 - Volatile Organic Compounds by GC/MS												
Styrene	51.5		ug/m³ Air	1.70	2.00	48.1	107%	50 - 150	2	25	03/31/11 12:54	11C0400
1,1,2,2-Tetrachloroethane	84.2		ug/m³ Air	2.75	2.00	78.1	108%	50 - 150	2	25	03/31/11 12:54	11C0400
o-Xylene	56.4		ug/m³ Air	1.74	2.00	49.4	114%	50 - 150	1	25	03/31/11 12:54	11C0400
Xylenes, total	167		ug/m³ Air	5.21	2.00	145	115%	50 - 150	1	25	03/31/11 12:54	11C0400
n-Nonane	66.9		ug/m³ Air	2.10	2.00	56.4	119%	50 - 150	2	25	03/31/11 12:54	11C0400
Isopropylbenzene	57.7		ug/m³ Air	1.97	2.00	52.4	110%	50 - 150	1	50	03/31/11 12:54	11C0400
2 & 3-Chlorotoluene	54.0		ug/m³ Air	4.14	2.00	55.7	97%	50 - 150	2	25	03/31/11 12:54	11C0400
n-Propylbenzene	58.1		ug/m³ Air	1.97	2.00	51.8	112%	50 - 150	2	25	03/31/11 12:54	11C0400
4-Ethyltoluene	63.9		ug/m³ Air	1.97	2.00	56.5	113%	50 - 150	2	25	03/31/11 12:54	11C0400
1,3,5-Trimethylbenzene	61.8		ug/m³ Air	1.97	2.00	54.4	114%	50 - 150	3	25	03/31/11 12:54	11C0400
1,2,4-Trimethylbenzene	63.9		ug/m³ Air	1.97	2.00	53.9	119%	50 - 150	4	25	03/31/11 12:54	11C0400
tert-Butylbenzene	69.1		ug/m³ Air	2.20	2.00	60.2	115%	50 - 150	3	25	03/31/11 12:54	11C0400
Benzyl chloride	80.3		ug/m³ Air	2.07	2.00	58.4	137%	50 - 150	6	25	03/31/11 12:54	11C0400
1,3-Dichlorobenzene	70.2	B	ug/m³ Air	2.40	2.00	67.8	103%	50 - 150	4	25	03/31/11 12:54	11C0400
n-Decane	71.4		ug/m³ Air	2.33	2.00	63.8	112%	50 - 150	4	25	03/31/11 12:54	11C0400
1,4-Dichlorobenzene	69.4	B	ug/m³ Air	2.40	2.00	65.9	105%	50 - 150	4	25	03/31/11 12:54	11C0400
4-Isopropyltoluene	64.1		ug/m³ Air	2.20	2.00	59.6	108%	50 - 150	5	25	03/31/11 12:54	11C0400
1,2-Dichlorobenzene	72.9	B	ug/m³ Air	2.40	2.00	67.8	108%	50 - 150	5	25	03/31/11 12:54	11C0400
n-Butylbenzene	67.6	B	ug/m³ Air	2.20	2.00	60.2	112%	50 - 150	7	25	03/31/11 12:54	11C0400
n-Undecane	75.2		ug/m³ Air	2.56	2.00	70.1	107%	50 - 150	3	25	03/31/11 12:54	11C0400
1,2,4-Trichlorobenzene	67.0	B	ug/m³ Air	2.97	2.00	85.3	79%	50 - 150	3	25	03/31/11 12:54	11C0400
Naphthalene	49.8	B	ug/m³ Air	2.10	2.00	56.9	87%	50 - 150	3	25	03/31/11 12:54	11C0400
Hexachlorobutadiene	102	B	ug/m³ Air	4.27	2.00	119	86%	50 - 150	3	25	03/31/11 12:54	11C0400
1,2-Dichloroethene, Total	82.7		ug/m³ Air	3.17	2.00	86.5	96%	50 - 150	2	25	03/31/11 12:54	11C0400
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*93%*										03/31/11 12:54	11C0400
Surr: Fluorobenzene (62-122%)	*88%*										03/31/11 12:54	11C0400
Surr: Toluene-d8 (67-127%)	*101%*										03/31/11 12:54	11C0400
Surr: 1,4-Dichlorobutane (76-136%)	*105%*										03/31/11 12:54	11C0400
Surr: 4-Bromofluorobenzene (73-133%)	*103%*										03/31/11 12:54	11C0400
Sample ID: 11D0020-BSD1 (LCS Dup - Air)												
EPA TO15 - Volatile Organic Compounds by GC/MS												
Ethene	15.2		ug/m³ Air	0.459	2.00	12.2	125%	50 - 150	0.09	25	04/04/11 12:21	11D0020
Acetylene	11.4		ug/m³ Air	0.426	2.00	11.3	101%	50 - 150	9	25	04/04/11 12:21	11D0020

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500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS Dup - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	RPD	RPD Limit	Date Analyzed	QC Batch
Sample ID: 11D0020-BSD1 (LCS Dup - Air) - cont.												
EPA TO15 - Volatile Organic Compounds by GC/MS												
Ethane	14.3		ug/m³ Air	0.492	2.00	13.0	109%	50 - 150	8	25	04/04/11 12:21	11D0020
Propylene	21.1		ug/m³ Air	0.688	2.00	17.7	119%	50 - 150	9	25	04/04/11 12:21	11D0020
Propane	20.3		ug/m³ Air	0.721	2.00	18.4	111%	50 - 150	8	25	04/04/11 12:21	11D0020
Isobutane	28.5		ug/m³ Air	0.951	2.00	24.2	118%	50 - 150	9	25	04/04/11 12:21	11D0020
1-Butene/Isobutene	27.3		ug/m³ Air	0.918	2.00	23.1	118%	50 - 150	7	25	04/04/11 12:21	11D0020
Butane	27.2		ug/m³ Air	0.951	2.00	24.2	112%	50 - 150	8	25	04/04/11 12:21	11D0020
Methanol	13.7	B	ug/m³ Air	0.524	2.00	14.2	96%	50 - 150	9	50	04/04/11 12:21	11D0020
cis-2-Butene	29.4		ug/m³ Air	0.918	2.00	24.8	119%	50 - 150	6	25	04/04/11 12:21	11D0020
Isopentane	33.2		ug/m³ Air	1.18	2.00	31.9	104%	50 - 150	8	25	04/04/11 12:21	11D0020
1-Pentene	37.6		ug/m³ Air	1.15	2.00	31.9	118%	50 - 150	8	25	04/04/11 12:21	11D0020
n-Pentane	39.1		ug/m³ Air	1.18	2.00	31.9	122%	50 - 150	9	25	04/04/11 12:21	11D0020
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*92%*										04/04/11 12:21	11D0020
Surr: Fluorobenzene (62-122%)	*93%*										04/04/11 12:21	11D0020
Surr: Toluene-d8 (67-127%)	*102%*										04/04/11 12:21	11D0020
Surr: 1,4-Dichlorobutane (76-136%)	*111%*										04/04/11 12:21	11D0020
Surr: 4-Bromofluorobenzene (73-133%)	*107%*										04/04/11 12:21	11D0020
Sample ID: 11D0170-BSD1 (LCS Dup - Air)												
EPA TO15 - Volatile Organic Compounds by GC/MS												
Ethene	12.7		ug/m³ Air	0.459	2.00	12.3	103%	50 - 150	3	25	04/18/11 12:30	11D0170
Acetylene	13.1		ug/m³ Air	0.426	2.00	11.4	115%	50 - 150	18	25	04/18/11 12:30	11D0170
Ethane	13.9		ug/m³ Air	0.492	2.00	13.2	106%	50 - 150	20	25	04/18/11 12:30	11D0170
Propylene	19.4		ug/m³ Air	0.688	2.00	17.9	108%	50 - 150	19	25	04/18/11 12:30	11D0170
Propane	19.0		ug/m³ Air	0.721	2.00	18.6	102%	50 - 150	19	25	04/18/11 12:30	11D0170
1-Butene/Isobutene	26.1		ug/m³ Air	0.918	2.00	23.4	112%	50 - 150	19	25	04/18/11 12:30	11D0170
Butane	25.4		ug/m³ Air	0.951	2.00	24.5	104%	50 - 150	20	25	04/18/11 12:30	11D0170
Methanol	13.1	B	ug/m³ Air	0.524	2.00	14.3	91%	50 - 150	18	50	04/18/11 12:30	11D0170
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*114%*										04/18/11 12:30	11D0170
Surr: Fluorobenzene (62-122%)	*101%*										04/18/11 12:30	11D0170
Surr: Toluene-d8 (67-127%)	*102%*										04/18/11 12:30	11D0170
Surr: 1,4-Dichlorobutane (76-136%)	*108%*										04/18/11 12:30	11D0170
Surr: 4-Bromofluorobenzene (73-133%)	*109%*										04/18/11 12:30	11D0170

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Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS Dup - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	RPD	RPD Limit	Date Analyzed	QC Batch
Sample ID: 11D0255-BSD1 (LCS Dup - Air)												
EPA TO15 - Volatile Organic Compounds by GC/MS												
Ethene	10.9		ug/m³ Air	0.459	2.00	12.3	89%	50 - 150	1	25	04/23/11 13:46	11D0255
Acetylene	12.1		ug/m³ Air	0.426	2.00	11.4	106%	50 - 150	1	25	04/23/11 13:46	11D0255
Ethane	12.3		ug/m³ Air	0.492	2.00	13.2	93%	50 - 150	1	25	04/23/11 13:46	11D0255
Propylene	16.4		ug/m³ Air	0.688	2.00	17.9	91%	50 - 150	1	25	04/23/11 13:46	11D0255
Chlorodifluoromethane	37.1		ug/m³ Air	1.41	2.00	38.7	96%	50 - 150	1	25	04/23/11 13:46	11D0255
Propane	16.2		ug/m³ Air	0.721	2.00	18.6	87%	50 - 150	1	25	04/23/11 13:46	11D0255
Dichlorodifluoromethane	48.7		ug/m³ Air	1.98	2.00	52.5	93%	50 - 150	0.9	25	04/23/11 13:46	11D0255
Chloromethane	20.9		ug/m³ Air	0.826	2.00	22.2	94%	50 - 150	1	25	04/23/11 13:46	11D0255
Isobutane	22.1		ug/m³ Air	0.951	2.00	24.5	90%	50 - 150	1	25	04/23/11 13:46	11D0255
1,2-Dichloro-1,1,2,2-tetrafluoroethane	59.7		ug/m³ Air	2.80	2.00	74.2	80%	50 - 150	0.8	25	04/23/11 13:46	11D0255
Vinyl chloride	25.2		ug/m³ Air	1.02	2.00	27.4	92%	50 - 150	0.8	25	04/23/11 13:46	11D0255
1-Butene/Isobutene	22.2		ug/m³ Air	0.918	2.00	23.4	95%	50 - 150	0.7	25	04/23/11 13:46	11D0255
1,3-Butadiene	24.7		ug/m³ Air	0.885	2.00	24.2	102%	50 - 150	0.6	25	04/23/11 13:46	11D0255
Butane	21.9		ug/m³ Air	0.951	2.00	24.5	90%	50 - 150	1	25	04/23/11 13:46	11D0255
Methanol	8.10	B	ug/m³ Air	0.524	2.00	14.3	56%	50 - 150	3	50	04/23/11 13:46	11D0255
trans-2-Butene	23.4		ug/m³ Air	0.918	2.00	23.4	100%	50 - 150	0.2	25	04/23/11 13:46	11D0255
Bromomethane	38.6		ug/m³ Air	1.55	2.00	41.2	93%	50 - 150	0.7	25	04/23/11 13:46	11D0255
cis-2-Butene	25.2		ug/m³ Air	0.918	2.00	25.1	101%	50 - 150	0.3	25	04/23/11 13:46	11D0255
Chloroethane	29.6		ug/m³ Air	1.06	2.00	27.7	107%	50 - 150	0.7	25	04/23/11 13:46	11D0255
Vinyl bromide	45.8		ug/m³ Air	1.75	2.00	46.9	98%	50 - 150	0.2	25	04/23/11 13:46	11D0255
3-Methyl-1-butene	32.3		ug/m³ Air	1.15	2.00	31.1	104%	50 - 150	0.4	25	04/23/11 13:46	11D0255
Acetonitrile	20.8		ug/m³ Air	0.672	2.00	17.8	117%	50 - 150	5	25	04/23/11 13:46	11D0255
Isopentane	29.7		ug/m³ Air	1.18	2.00	32.3	92%	50 - 150	0.4	25	04/23/11 13:46	11D0255
Trichlorofluoromethane	61.8		ug/m³ Air	2.25	2.00	60.9	102%	50 - 150	0.2	25	04/23/11 13:46	11D0255
1-Pentene	38.3		ug/m³ Air	1.15	2.00	32.3	119%	50 - 150	0.06	25	04/23/11 13:46	11D0255
Acetone	31.0	B	ug/m³ Air	0.950	2.00	26.0	119%	50 - 150	5	25	04/23/11 13:46	11D0255
Isopropyl alcohol	15.7		ug/m³ Air	0.983	2.00	30.0	52%	50 - 150	0.2	50	04/23/11 13:46	11D0255
Acrylonitrile	27.3		ug/m³ Air	0.868	2.00	23.7	115%	50 - 150	6	25	04/23/11 13:46	11D0255
n-Pentane	33.7		ug/m³ Air	1.18	2.00	32.3	104%	50 - 150	0.7	25	04/23/11 13:46	11D0255
Diethyl ether	36.4		ug/m³ Air	1.21	2.00	33.2	110%	50 - 150	5	25	04/23/11 13:46	11D0255
Isoprene	32.8		ug/m³ Air	1.11	2.00	30.5	108%	50 - 150	1	25	04/23/11 13:46	11D0255
trans-2-Pentene	34.0		ug/m³ Air	1.15	2.00	31.7	108%	50 - 150	2	25	04/23/11 13:46	11D0255
1,1-Dichloroethene	47.8		ug/m³ Air	1.59	2.00	43.8	109%	50 - 150	0.7	25	04/23/11 13:46	11D0255
cis-2-Pentene	34.2		ug/m³ Air	1.15	2.00	31.4	109%	50 - 150	2	25	04/23/11 13:46	11D0255
Methylene chloride	42.8		ug/m³ Air	1.39	2.00	37.6	114%	50 - 150	2	25	04/23/11 13:46	11D0255
2-Methyl-2-butene	33.9		ug/m³ Air	1.15	2.00	32.9	103%	50 - 150	2	25	04/23/11 13:46	11D0255

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS Dup - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	RPD	RPD Limit	Date Analyzed	QC Batch
Sample ID: 11D0255-BSD1 (LCS Dup - Air) - cont.												
EPA TO15 - Volatile Organic Compounds by GC/MS												
Carbon disulfide	29.9		ug/m³ Air	1.25	2.00	34.4	87%	50 - 150	0.8	25	04/23/11 13:46	11D0255
Allyl chloride	37.6		ug/m³ Air	1.25	2.00	33.9	111%	50 - 150	3	25	04/23/11 13:46	11D0255
1,1,2-Trichlorotrifluoroethane	79.1		ug/m³ Air	3.07	2.00	85.5	93%	50 - 150	1	25	04/23/11 13:46	11D0255
trans-1,2-Dichloroethene	46.2		ug/m³ Air	1.59	2.00	42.5	109%	50 - 150	1	25	04/23/11 13:46	11D0255
4-Methyl-1-pentene	41.2		ug/m³ Air	1.38	2.00	37.0	111%	50 - 150	2	25	04/23/11 13:46	11D0255
1,1-Dichloroethane	51.9		ug/m³ Air	1.62	2.00	44.7	116%	50 - 150	3	25	04/23/11 13:46	11D0255
Methyl tert-Butyl Ether	42.9		ug/m³ Air	1.44	2.00	40.2	107%	50 - 150	2	25	04/23/11 13:46	11D0255
Vinyl acetate	44.6		ug/m³ Air	1.41	2.00	40.4	110%	50 - 150	4	50	04/23/11 13:46	11D0255
2-Butanone (MEK)	37.9	B	ug/m³ Air	1.18	2.00	33.8	112%	50 - 150	2	25	04/23/11 13:46	11D0255
Chloroprene	43.8		ug/m³ Air	1.45	2.00	39.6	111%	50 - 150	3	25	04/23/11 13:46	11D0255
cis-1,2-Dichloroethene	50.3		ug/m³ Air	1.59	2.00	44.6	113%	50 - 150	3	25	04/23/11 13:46	11D0255
Hexane	40.7		ug/m³ Air	1.41	2.00	41.2	99%	50 - 150	3	25	04/23/11 13:46	11D0255
Chloroform	60.0		ug/m³ Air	1.95	2.00	52.9	114%	50 - 150	3	25	04/23/11 13:46	11D0255
trans-2-Hexene	42.0		ug/m³ Air	1.38	2.00	38.4	109%	50 - 150	3	25	04/23/11 13:46	11D0255
cis-2-Hexene	39.0		ug/m³ Air	1.38	2.00	37.0	106%	50 - 150	3	25	04/23/11 13:46	11D0255
1,2-Dichloroethane	52.7		ug/m³ Air	1.62	2.00	44.7	118%	50 - 150	3	25	04/23/11 13:46	11D0255
1,1,1-Trichloroethane	67.0		ug/m³ Air	2.18	2.00	59.7	112%	50 - 150	2	25	04/23/11 13:46	11D0255
Benzene	43.3		ug/m³ Air	1.28	2.00	35.3	123%	50 - 150	5	25	04/23/11 13:46	11D0255
Carbon tetrachloride	84.8		ug/m³ Air	2.52	2.00	72.2	118%	50 - 150	4	25	04/23/11 13:46	11D0255
n-Butanol	9.26	L4	ug/m³ Air	1.21	2.00	34.8	27%	50 - 150	7	50	04/23/11 13:46	11D0255
Cyclohexane	37.3		ug/m³ Air	1.38	2.00	38.8	96%	50 - 150	4	25	04/23/11 13:46	11D0255
1,2-Dichloropropane	64.9		ug/m³ Air	1.85	2.00	51.5	126%	50 - 150	6	25	04/23/11 13:46	11D0255
Bromodichloromethane	96.0		ug/m³ Air	2.68	2.00	75.5	127%	50 - 150	4	25	04/23/11 13:46	11D0255
Trichloroethene	65.4		ug/m³ Air	2.15	2.00	60.5	108%	50 - 150	4	25	04/23/11 13:46	11D0255
1,4-Dioxane	27.0		ug/m³ Air	1.44	2.00	40.6	66%	50 - 150	3	50	04/23/11 13:46	11D0255
2,2,4-Trimethylpentane	60.1		ug/m³ Air	1.87	2.00	50.1	120%	50 - 150	6	25	04/23/11 13:46	11D0255
Heptane	51.0		ug/m³ Air	1.64	2.00	46.2	110%	50 - 150	5	25	04/23/11 13:46	11D0255
cis-1,3-Dichloropropene	64.1		ug/m³ Air	1.82	2.00	52.1	123%	50 - 150	4	25	04/23/11 13:46	11D0255
4-Methyl-2-pentanone (MIBK)	60.3	B	ug/m³ Air	1.64	2.00	47.4	127%	50 - 150	3	25	04/23/11 13:46	11D0255
trans-1,3-Dichloropropene	59.5		ug/m³ Air	1.82	2.00	47.7	125%	50 - 150	3	25	04/23/11 13:46	11D0255
1,1,2-Trichloroethane	72.9		ug/m³ Air	2.18	2.00	60.8	120%	50 - 150	3	25	04/23/11 13:46	11D0255
Toluene	50.6		ug/m³ Air	1.51	2.00	42.4	119%	50 - 150	5	25	04/23/11 13:46	11D0255
2-Hexanone	60.2		ug/m³ Air	1.64	2.00	47.0	128%	50 - 150	0.5	25	04/23/11 13:46	11D0255
Chlorodibromomethane	119		ug/m³ Air	3.41	2.00	96.8	123%	50 - 150	2	25	04/23/11 13:46	11D0255
1,2-Dibromoethane (EDB)	101		ug/m³ Air	3.07	2.00	85.7	118%	50 - 150	2	25	04/23/11 13:46	11D0255
n-Octane	59.7		ug/m³ Air	1.87	2.00	50.6	118%	50 - 150	4	25	04/23/11 13:46	11D0255

Golder Associates Ltd.
500-4260 Still Creek Drive
Burnaby, British Columbia, CANADA V5C6C6
Ian Hers

Work Order: AUC0212
Project: AENV Canada Creosote
Project Number: 10-1346-0046

Received: 03/17/11 08:57
Reported: 05/10/11 08:56

PROJECT QUALITY CONTROL DATA

LCS Dup - Cont.

Analyte	Result	Data Qualifiers	Units	RL	Dilution	Spike Conc	% Rec	Target Range	RPD	RPD Limit	Date Analyzed	QC Batch
Sample ID: 11D0255-BSD1 (LCS Dup - Air) - cont.												
EPA TO15 - Volatile Organic Compounds by GC/MS												
Tetrachloroethene	84.0		ug/m³ Air	2.71	2.00	71.3	118%	50 - 150	3	25	04/23/11 13:46	11D0255
Chlorobenzene	60.0		ug/m³ Air	1.84	2.00	52.3	115%	50 - 150	1	25	04/23/11 13:46	11D0255
Ethylbenzene	59.1		ug/m³ Air	1.74	2.00	48.9	121%	50 - 150	1	25	04/23/11 13:46	11D0255
m-Xylene & p-Xylene	117		ug/m³ Air	3.47	2.00	95.9	122%	50 - 150	0.8	25	04/23/11 13:46	11D0255
Bromoform	146		ug/m³ Air	4.13	2.00	114	128%	50 - 150	2	25	04/23/11 13:46	11D0255
Styrene	57.4		ug/m³ Air	1.70	2.00	48.4	119%	50 - 150	1	25	04/23/11 13:46	11D0255
1,1,2,2-Tetrachloroethane	92.9		ug/m³ Air	2.75	2.00	78.7	118%	50 - 150	2	25	04/23/11 13:46	11D0255
o-Xylene	59.9		ug/m³ Air	1.74	2.00	49.8	120%	50 - 150	0.7	25	04/23/11 13:46	11D0255
Xylenes, total	177		ug/m³ Air	5.21	2.00	146	122%	50 - 150	0.8	25	04/23/11 13:46	11D0255
n-Nonane	68.4		ug/m³ Air	2.10	2.00	56.8	120%	50 - 150	1	25	04/23/11 13:46	11D0255
Isopropylbenzene	62.4		ug/m³ Air	1.97	2.00	52.8	118%	50 - 150	1	50	04/23/11 13:46	11D0255
2 & 3-Chlorotoluene	66.1		ug/m³ Air	4.14	2.00	56.1	118%	50 - 150	3	25	04/23/11 13:46	11D0255
n-Propylbenzene	62.7		ug/m³ Air	1.97	2.00	52.2	120%	50 - 150	4	25	04/23/11 13:46	11D0255
4-Ethyltoluene	68.6		ug/m³ Air	1.97	2.00	56.9	120%	50 - 150	4	25	04/23/11 13:46	11D0255
1,3,5-Trimethylbenzene	65.2		ug/m³ Air	1.97	2.00	54.8	119%	50 - 150	4	25	04/23/11 13:46	11D0255
1,2,4-Trimethylbenzene	65.3		ug/m³ Air	1.97	2.00	54.3	120%	50 - 150	5	25	04/23/11 13:46	11D0255
tert-Butylbenzene	81.5		ug/m³ Air	2.20	2.00	60.6	134%	50 - 150	2	25	04/23/11 13:46	11D0255
Benzyl chloride	75.7		ug/m³ Air	2.07	2.00	58.8	129%	50 - 150	6	25	04/23/11 13:46	11D0255
1,3-Dichlorobenzene	74.1		ug/m³ Air	2.40	2.00	68.3	108%	50 - 150	5	25	04/23/11 13:46	11D0255
n-Decane	72.5		ug/m³ Air	2.33	2.00	64.2	113%	50 - 150	3	25	04/23/11 13:46	11D0255
1,4-Dichlorobenzene	73.4		ug/m³ Air	2.40	2.00	66.4	111%	50 - 150	5	25	04/23/11 13:46	11D0255
4-Isopropyltoluene	72.5		ug/m³ Air	2.20	2.00	60.1	121%	50 - 150	6	25	04/23/11 13:46	11D0255
1,2-Dichlorobenzene	72.6		ug/m³ Air	2.40	2.00	68.3	106%	50 - 150	6	25	04/23/11 13:46	11D0255
n-Butylbenzene	74.0		ug/m³ Air	2.20	2.00	60.6	122%	50 - 150	5	25	04/23/11 13:46	11D0255
n-Undecane	92.6		ug/m³ Air	2.56	2.00	70.6	131%	50 - 150	1	25	04/23/11 13:46	11D0255
1,2,4-Trichlorobenzene	90.9		ug/m³ Air	2.97	2.00	85.9	106%	50 - 150	5	25	04/23/11 13:46	11D0255
Naphthalene	62.3		ug/m³ Air	2.10	2.00	57.4	109%	50 - 150	5	25	04/23/11 13:46	11D0255
Hexachlorobutadiene	137		ug/m³ Air	4.27	2.00	120	114%	50 - 150	2	25	04/23/11 13:46	11D0255
1,2-Dichloroethene, Total	96.4		ug/m³ Air	3.17	2.00	87.1	111%	50 - 150	2	25	04/23/11 13:46	11D0255
Surr: 2-Bromo-1,1,1-trifluoroethane (70-130%)	*94%*										04/23/11 13:46	11D0255
Surr: Fluorobenzene (62-122%)	*92%*										04/23/11 13:46	11D0255
Surr: Toluene-d8 (67-127%)	*102%*										04/23/11 13:46	11D0255
Surr: 1,4-Dichlorobutane (76-136%)	*102%*										04/23/11 13:46	11D0255
Surr: 4-Bromofluorobenzene (73-133%)	*101%*										04/23/11 13:46	11D0255

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
14050 Summit Drive, Suite A100 Austin, TX 78728 * 512-244-0855 * Fax 512-244-0160

Golder Associates Ltd.	Work Order:	AUC0212	Received: 03/17/11 08:57
500-4260 Still Creek Drive			Reported: 05/10/11 08:56
Burnaby, British Columbia, CANADA V5C6C6	Project:	AENV Canada Creosote	
Ian Hers	Project Number:	10-1346-0046	

PROJECT QUALITY CONTROL DATA

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
14050 Summit Drive, Suite A100 Austin, TX 78728 * 512-244-0855 * Fax 512-244-0160

Golder Associates Ltd.	Work Order:	AUC0212	Received: 03/17/11 08:57
500-4260 Still Creek Drive			Reported: 05/10/11 08:56
Burnaby, British Columbia, CANADA V5C6C6	Project:	AENV Canada Creosote	
Ian Hers	Project Number:	10-1346-0046	

DATA QUALIFIERS AND DEFINITIONS

B	Analyte was detected in the associated Method Blank.
C4	Calibration Verification recovery was below the method control limit for this analyte.
C8	Calibration Verification recovery was above the method control limit for this analyte. A high bias may be indicated.
E	Concentration exceeds the calibration range and therefore result is semi-quantitative.
H2	Initial analysis within holding time. Reanalysis for the required dilution was past holding time.
J	Estimated value. Analyte detected at a level less than the Reporting Limit (RL) and greater than or equal to the Method Detection Limit (MDL). The user of this data should be aware that this data is of limited reliability.
L4	Laboratory Control Sample and/or Laboratory Control Sample Duplicate recovery was below the acceptance limits. A low bias to sample results is indicated.
R2	The RPD exceeded the acceptance limit.
R4	Due to the low levels of analyte in the sample, the duplicate RPD calculation does not provide useful information.
RA	Results are from a second analysis of the sample.
U	Result less than sample specific method detection limit
ZX	Due to sample matrix effects, the surrogate recovery was outside the acceptance limits.
ND	Not detected.

AENV Canada Creosote

TestAmerica – Austin Laboratory Chain of Custody Addendum Work Order Number AUC0212

RECEIVED BY: RL, CLIENT: Golder Assoc. Ltd

DATE/TIME RECEIVED: 3/17/11 0830 PROJECT: ~~Shell Research Project~~ JNS 3/17/11

UNPACKED DATE/TIME: 3/17/11 1040 LOGIN BY: BM LOGIN REVIEWED BY:

Number of Shipping Containers Received with COC: 1

VOC SAMPLES: [x] YES (IF YES, GO TO SECTIONS 1.0, 2.0, 6.0, & 7.0)

1.0 CONTAINERS EXAMINED UPON RECEIPT: RL.

Container Sealed: [x] YES [ ] NO Custody Seal Present: [ ] YES [x] NO Custody Seal Signed/Dated: [ ] YES [x] NO

If seal not intact list air bill number of that container(s):

2.0 VOC CANISTERS EXAMINED UPON RECEIPT: RL.

Canister Valves Closed: [x] YES [ ] NO Canister Valves Capped: [x] YES [ ] NO

Sample IDs match COC: [x] YES [ ] NO Other Equipment Received: [x] YES [ ] NO

Valve Cap Tightened Properly: [x] YES [ ] NO Can Size: [x] 6L [ ] 1L Other:

Packing Material Used: (circle) None / Absorbent / (Paper) / Bubble Wrap 4-Flow Cont.

Samples received in Tedlar bags [ ] N/A [ ] YES [x] NO

3.0 CONDITION OF BOTTLES/CONTAINERS VERIFIED BY:

Sample IDs match COC: [ ] YES [ ] NO Bottles received intact: [ ] YES [ ] NO

See additional discrepancies/comments section: [ ] YES [ ] NO Samples received from USDA restricted area: [ ] YES [ ] NO

Chain-of-Custody form properly maintained: [ ] YES [ ] NO VOA trip blanks included: [ ] N/A [ ] YES [ ] NO

4.0 SAMPLE TEMPERATURE UPON RECEIPT BY: IR THERMOMETER #: [ ] P5 [ ] P7

Container(s) temperature: TB = Temp. Blank and/or SC = Sample Container CF = Correction Factor *[acceptable tolerance ≤6°C]*

TB ☐ SC ☐	TB ☐ SC ☐	TB ☐ SC ☐	TB ☐ SC ☐	TB ☐ SC ☐	TB ☐ SC ☐	TB ☐ SC ☐	TB ☐ SC ☐
Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial
CF	CF	CF	CF	CF	CF	CF	CF
Final	Final	Final	Final	Final	Final	Final	Final

If temperature is outside acceptable tolerance, Project Manager was notified (PM). Date: Time:

Samples received do not require cooling OK to analyze samples: [ ] YES [ ] NO

5.0 PRESERVATION CHECKS

PRESERVATION OF SAMPLES REQUIRED: [ ] N/A [ ] YES [ ] VOA Samples VERIFIED BY:

NOTE: pH CHECK OF SAMPLES PERFORMED AT TIME OF ANALYSIS BY BENCH ANALYST

pH CHECK OF VOLATILE SAMPLES PERFORMED AFTER ANALYSIS BY THE BENCH ANALYST.

Cyanide samples checked for sulfides: [ ] YES [ ] NO

Sulfide samples appear to be preserved with zinc acetate: [ ] YES [ ] NO

Chlorine checked per specification (EPA 335.x & N.C.) [ ] YES [ ] NO Free chlorine present: [ ] YES [ ] NO

If preservation is outside acceptable limit, PM notified (PM) Date/Time:

Volatile samples filled completely: [ ] YES [ ] NO (if no, list ID and approximate amt. of headspace in comments section 7.0)

6.0 SHIPPING DOCUMENTATION:

Air/freight bill is available and attached to COC: [x] YES [ ] NO Air bill #:

Hand-delivered Carrier: Date: Time:

7.0 OTHER COMMENTS:

8.0 CORRECTIVE ACTION:

Client's Name: Informed verbally on: By:

Client's Name: Informed verbally on: By:

Sample(s) processed "as is" comments:

Samples(s) on hold until: If released, notify:

Project Management Login Review: Neal Gallen Date: 3/21/11

SIGNED ORIGINAL MUST BE RETAINED IN THE PROJECT FILE

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Canister Samples Chain of Custody Record

ALC0212

TestAmerica Austin
14050 Summit Dr.
Suite A-100
Austin, TX 78728
phone: 512-244-0855 fax: 512-244-0160

Client Contact Information	**Project Manager:** Julie Burghardt		1 of 1 COCs
Company: Golder Associates	**Phone:** 1-403-532-5795	**Samples Collected By:** NB	
Address: 102, 2535 - 3rd Ave SE	**Email:** Jburghardt@golder.com ihers@golder.com		
City/State/Zip Calgary, Alberta, Canada	**Site Contact:**		
Phone: 1-403-532-5795 T2A-7W5	**LAB Contact:** Carl Skelley		
FAX:	**Analysis Turnaround Time**		
Project Name: AENV. Canada Creosote	Standard (Specify) X		
Site: Westmount - Calgary	Rush (Specity)		
PO # 10-1346-0046			

Sample Identification	Sample Date(s)	Time Start	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, Hg (Stop)	Flow Controller ID	Canister ID	TO-15	TO-14A	TO-3	EPA 3C	EPA 25C	ASTM D-1946	Other (Please specify in notes section)	Sample Type	Indoor Air	Ambient Air	Soil Gas	Landfill Gas	Other (Please specify in notes section)
MW10-22	March 14	12:58	14:00	24	4		3623	X												
MW10-15	"	14:45	15:50	27	6		HL0878	X												
MW10-1	"	16:25	17:25	27	6		HL0915	X												
MW10-6	"	18:04	19:00	26	6		5468	X												

Special Instructions/QC Requirements & Comments:
- confirm sampling analysis with email correspondence from Ian Hers

Samples Shipped by: NB	Date/Time: March 15, 2011	Samples Received by: Nicole Tarpley	3/17/11 0830
Samples Relinquished by:	Date/Time:	Received by:	
Relinquished by:	Date/Time:	Received by:	

TAL-4143 (0608)

Lab Use Only **Shipper Name:** **Opened by:** **Condition:**

Success Through Science®

Your Project #: 10-1346-0046/CANADA CRESOTE
Your C.O.C. #: A030375, A030377

Attention: Julie Burghardt
GOLDER ASSOCIATES LTD.
CALGARY - NATIONAL CONTRACT
102, 2535 - 3rd Avenue SE
CALGARY, AB
CANADA T2A 7W5

Report Date: 2011/03/08

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B116507
Received: 2011/03/02, 13:05

Sample Matrix: Water
Samples Received: 19

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS	2	N/A	2011/03/05	CAL SOP-00190	CCME CWS, EPA 8260C
BTEX/F1 in Water by HS GC/MS	17	N/A	2011/03/06	CAL SOP-00190	CCME CWS, EPA 8260C
CCME Hydrocarbons in Water (F2; C10-C16)	12	2011/03/03	2011/03/03	CAL SOP-00086 AB WI-00017	EPA3510C/CCME PHCCWS
CCME Hydrocarbons in Water (F2; C10-C16)	7	2011/03/03	2011/03/04	CAL SOP-00086 AB WI-00017	EPA3510C/CCME PHCCWS
Benzo[a]pyrene Equivalency	19	N/A	2011/03/08	AB SOP-00003	EPA 8270D
Polycyclic Aromatic Hydrocarbons (1)	18	2011/03/03	2011/03/04	AB SOP-00003 AB WI-00017	EPA 3510C/8270D
Polycyclic Aromatic Hydrocarbons (1)	1	2011/03/03	2011/03/07	AB SOP-00003 AB WI-00017	EPA 3510C/8270D
Total Trihalomethanes Calculation	7	N/A	2011/03/07	CAL SOP-00104	EPA 8260 C
VOCs in Water by P&T GC/MS (Std List)	7	N/A	2011/03/04	CAL SOP-00104	EPA 8260 C

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) B[a]P TPE is calculated using 1/2 of the RDL for non detect results as per Alberta Environment instructions. This protocol may not apply in other jurisdictions.

Encryption Key

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

LESLEY LEM, Project Manager
Email: LLem@maxxam.ca
Phone# (403) 735-2207 Ext:2207

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

Total cover pages: 1

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		AB4245	AB4248	AB4249	AB4249	AB4250	AB4251	AB4252	AB4253	AB4254		
Sampling Date		2011/03/01	2011/03/01	2011/03/01	2011/03/01	2011/03/01	2011/03/01	2011/03/01	2011/03/01	2011/03/01		
	Units	**RINSEATE**	**MW10-1**	**MW10-18**	**MW10-18 Lab-Dup**	**MW10-9A**	**MW10-9B**	**MW10-3A**	**MW10-3B**	**MW10-2**	**RDL**	**QC Batch**
Hydrocarbons												
F2 (C10-C16 Hydrocarbons)	mg/L	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	0.1	4676116
Surrogate Recovery (%)												
O-TERPHENYL (sur.)	%	116	114	115		116	101	114	112	109		4676116
Volatiles												
Benzene	mg/L	<0.0004	0.0007	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.0004	4676908
Toluene	mg/L	<0.0004	0.0011	<0.0004	<0.0004	0.0009	0.0015	0.0011	0.0006	<0.0004	0.0004	4676908
Ethylbenzene	mg/L	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.0005	0.0005	<0.0004	0.0004	4676908
o-Xylene	mg/L	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.0009	0.0010	<0.0004	0.0004	4676908
m & p-Xylene	mg/L	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	0.0022	0.0019	<0.0008	0.0008	4676908
Xylenes (Total)	mg/L	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	0.0031	0.0028	<0.0008	0.0008	4676908
F1 (C6-C10) - BTEX	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	4676908
(C6-C10)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	4676908
Surrogate Recovery (%)												
4-BROMOFLUOROBENZENE (sur.)	%	92	92	92	93	92	93	91	89	90		4676908
D4-1,2-DICHLOROETHANE (sur.)	%	98	98	93	98	97	98	98	99	98		4676908
D8-TOLUENE (sur.)	%	97	95	95	95	96	96	96	95	95		4676908

RDL = Reportable Detection Limit

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		AB4255	AB4256	AB4257	AB4258	AB4259	AB4260		
Sampling Date		2011/03/01	2011/03/01	2011/03/01	2011/03/01	2011/03/01	2011/03/01		
	Units	**MW10-15**	**MW10-11**	**MW10-10**	**MW10-20**	**MW10-7B**	**DUP 1**	**RDL**	**QC Batch**
Hydrocarbons									
F2 (C10-C16 Hydrocarbons)	mg/L	<0.1	0.2	0.1	<0.1	0.6	1.2	0.1	4676116
Surrogate Recovery (%)									
O-TERPHENYL (sur.)	%	115	115	119	116	100	104		4676116
Volatiles									
Benzene	mg/L	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.0004	4676908
Toluene	mg/L	<0.0004	<0.0004	<0.0004	0.0017	<0.0004	<0.0004	0.0004	4676908
Ethylbenzene	mg/L	<0.0004	<0.0004	<0.0004	<0.0004	0.0013	0.0009	0.0004	4676908
o-Xylene	mg/L	<0.0004	<0.0004	0.0017	0.0006	0.0018	0.0011	0.0004	4676908
m & p-Xylene	mg/L	<0.0008	<0.0008	<0.0008	0.0011	0.0034	0.0024	0.0008	4676908
Xylenes (Total)	mg/L	<0.0008	<0.0008	0.0017	0.0016	0.0052	0.0036	0.0008	4676908
F1 (C6-C10) - BTEX	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	4676908
(C6-C10)	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	4676908
Surrogate Recovery (%)									
4-BROMOFLUOROBENZENE (sur.)	%	93	88	94	90	91	94		4676908
D4-1,2-DICHLOROETHANE (sur.)	%	97	97	95	93	97	101		4676908
D8-TOLUENE (sur.)	%	96	94	96	98	94	95		4676908

RDL = Reportable Detection Limit

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		AB4261	AB4262	AB4263	AB4264	AB4265	AB4265		
Sampling Date		2011/03/01	2011/03/01	2011/03/01	2011/03/01	2011/03/01	2011/03/01		
	Units	**MW10-7A**	**MW10-22**	**MW10-16**	**MW10-6**	**DUP 2**	**DUP 2 Lab-Dup**	**RDL**	**QC Batch**
Hydrocarbons									
F2 (C10-C16 Hydrocarbons)	mg/L	4.7	<0.1	<0.1	3.0	3.0	4.1	0.1	4676116
Surrogate Recovery (%)									
O-TERPHENYL (sur.)	%	118	104	115	109	115	125		4676116
Volatiles									
Benzene	mg/L	0.039	<0.0004	<0.0004	<0.0004	<0.0004		0.0004	4676908
Toluene	mg/L	0.0083	<0.0004	<0.0004	0.0005	0.0005		0.0004	4676908
Ethylbenzene	mg/L	0.081	<0.0004	<0.0004	0.0019	0.0020		0.0004	4676908
o-Xylene	mg/L	0.077	<0.0004	<0.0004	0.0036	0.0038		0.0004	4676908
m & p-Xylene	mg/L	0.065	<0.0008	<0.0008	0.0045	0.0048		0.0008	4676908
Xylenes (Total)	mg/L	0.14	<0.0008	<0.0008	0.0081	0.0085		0.0008	4676908
F1 (C6-C10) - BTEX	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1		0.1	4676908
(C6-C10)	mg/L	0.3	<0.1	<0.1	<0.1	<0.1		0.1	4676908
Surrogate Recovery (%)									
4-BROMOFLUOROBENZENE (sur.)	%	95	92	94	92	94			4676908
D4-1,2-DICHLOROETHANE (sur.)	%	97	95	97	96	97			4676908
D8-TOLUENE (sur.)	%	95	95	98	98	95			4676908

RDL = Reportable Detection Limit

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		AB4245	AB4248	AB4249		AB4250		AB4251		AB4252		
Sampling Date		2011/03/01	2011/03/01	2011/03/01		2011/03/01		2011/03/01		2011/03/01		
	Units	**RINSEATE**	**MW10-1**	**MW10-18**	**QC Batch**	**MW10-9A**	**RDL**	**MW10-9B**	**RDL**	**MW10-3A**	**RDL**	**QC Batch**
Polycyclic Aromatics												
Benzo[a]pyrene equivalency	mg/L	<0.00001	<0.00001	0.00004	4674524	0.00004	0.00001	0.00066	0.00001	0.00001	0.00001	4675630
Acenaphthene	mg/L	<0.00010	0.00022	0.00071	4676112	<0.00010	0.00010	0.00030	0.00010	<0.00010	0.00010	4676112
Acenaphthylene	mg/L	<0.00010	<0.00010	<0.00010	4676112	<0.00010	0.00010	<0.00010	0.00010	<0.00010	0.00010	4676112
Acridine	mg/L	<0.00020	<0.00020	<0.00020	4676112	<0.00020	0.00020	<0.00020	0.00020	<0.00020	0.00020	4676112
Anthracene	mg/L	<0.000010	0.000022	0.000023	4676112	0.000036	0.000010	0.00038	0.000010	0.000021	0.000010	4676112
Benzo(a)anthracene	mg/L	<0.0000085	<0.0000085	0.000030	4676112	0.000041	0.0000085	0.00071	0.0000085	0.0000095	0.0000085	4676112
Benzo(b&j)fluoranthene	mg/L	<0.0000085	<0.0000085	0.000035	4676112	0.000045	0.0000085	0.00061	0.0000085	0.000014	0.0000085	4676112
Benzo(k)fluoranthene	mg/L	<0.0000085	<0.0000085	0.000015	4676112	0.000014	0.0000085	0.00020	0.0000085	<0.0000085	0.0000085	4676112
Benzo(g,h,i)perylene	mg/L	<0.0000085	<0.0000085	0.000019	4676112	0.000018	0.0000085	0.00015	0.0000085	0.000020	0.0000085	4676112
Benzo(c)phenanthrene	mg/L	<0.000050	<0.000050	<0.000050	4676112	<0.000050	0.000050	<0.00010(1)	0.00010	<0.000050	0.000050	4676112
Benzo(a)pyrene	mg/L	<0.0000075	<0.0000075	0.000027	4676112	0.000024	0.0000075	0.00043	0.0000075	<0.0000075	0.0000075	4676112
Benzo[e]pyrene	mg/L	<0.000050	<0.000050	<0.000050	4676112	<0.000050	0.000050	0.00031	0.000050	<0.000050	0.000050	4676112
Chrysene	mg/L	<0.0000085	0.000020	0.000050	4676112	0.000070	0.0000085	0.00074	0.0000085	0.000051	0.0000085	4676112
Dibenz(a,h)anthracene	mg/L	<0.0000075	<0.0000075	<0.0000075	4676112	0.0000083	0.0000075	0.000056	0.0000075	<0.0000075	0.0000075	4676112
Fluoranthene	mg/L	<0.000040	<0.000040	0.000091	4676112	0.00012	0.000040	0.0022	0.000040	0.00018	0.000040	4676112
Fluorene	mg/L	<0.000050	0.000092	0.00040	4676112	0.000072	0.000050	0.00028	0.000050	0.000055	0.000050	4676112
Indeno(1,2,3-cd)pyrene	mg/L	<0.0000085	<0.0000085	0.000016	4676112	0.000016	0.0000085	0.00015	0.0000085	0.000010	0.0000085	4676112
2-Methylnaphthalene	mg/L	<0.00010	0.00087	0.00020	4676112	0.00015	0.00010	0.00051	0.00010	0.00025	0.00010	4676112
Naphthalene	mg/L	<0.00010	0.020	0.0021	4676112	0.00015	0.00010	0.0012	0.00010	0.00032	0.00010	4676112
Phenanthrene	mg/L	<0.000050	0.00031	0.00028	4676112	0.00023	0.000050	0.0019	0.000050	0.00030	0.000050	4676112
Perylene	mg/L	<0.000050	<0.000050	<0.000050	4676112	<0.000050	0.000050	0.000092	0.000050	<0.000050	0.000050	4676112
Pyrene	mg/L	<0.000020	0.000035	0.000089	4676112	0.00015	0.000020	0.0020	0.000020	0.00027	0.000020	4676112
Quinoline	mg/L	<0.00020	<0.00020	<0.00020	4676112	<0.00020	0.00020	<0.00020	0.00020	<0.00020	0.00020	4676112
Surrogate Recovery (%)												
D10-ANTHRACENE (sur.)	%	100	117	107	4676112	94		89		92		4676112
D12-BENZO(A)PYRENE (sur.)	%	95	128	109	4676112	80		91		94		4676112
D8-ACENAPHTHYLENE (sur.)	%	80	124	94	4676112	79		85		74		4676112
TERPHENYL-D14 (sur.)	%	102	125	112	4676112	93		94		97		4676112

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

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		AB4253	AB4254	AB4255	AB4256		AB4257		AB4258		
Sampling Date		2011/03/01	2011/03/01	2011/03/01	2011/03/01		2011/03/01		2011/03/01		
	Units	**MW10-3B**	**MW10-2**	**MW10-15**	**MW10-11**	**RDL**	**MW10-10**	**RDL**	**MW10-20**	**RDL**	**QC Batch**
Polycyclic Aromatics											
Benzo[a]pyrene equivalency	mg/L	0.00001	<0.00001	<0.00001	0.00006	0.00001	0.00005	0.00001	0.00004	0.00001	4675630
Acenaphthene	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	0.0014	0.00010	<0.00010	0.00010	4676112
Acenaphthylene	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	0.00010	<0.00010	0.00010	4676112
Acridine	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	<0.00020	0.00020	<0.00020	0.00020	4676112
Anthracene	mg/L	0.000020	<0.000010	0.000015	0.000033	0.000010	0.00027	0.000010	0.000030	0.000010	4676112
Benzo(a)anthracene	mg/L	0.000014	<0.0000085	<0.0000085	0.000042	0.0000085	0.000058	0.0000085	0.000026	0.0000085	4676112
Benzo(b&j)fluoranthene	mg/L	0.000016	<0.0000085	<0.0000085	0.000048	0.0000085	0.000049	0.0000085	0.000029	0.0000085	4676112
Benzo(k)fluoranthene	mg/L	<0.0000085	<0.0000085	<0.0000085	0.000018	0.0000085	0.000020	0.0000085	0.000014	0.0000085	4676112
Benzo(g,h,i)perylene	mg/L	0.0000095	<0.0000085	<0.0000085	0.000031	0.0000085	0.000024	0.0000085	0.000023	0.0000085	4676112
Benzo(c)phenanthrene	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	0.000050	<0.000050	0.000050	4676112
Benzo(a)pyrene	mg/L	<0.0000075	<0.0000075	<0.0000075	0.000038	0.0000075	0.000024	0.0000075	0.000023	0.0000075	4676112
Benzo[e]pyrene	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	0.000050	<0.000050	0.000050	4676112
Chrysene	mg/L	0.000045	<0.0000085	<0.0000085	0.000067	0.0000085	0.00011	0.0000085	0.000051	0.0000085	4676112
Dibenz(a,h)anthracene	mg/L	<0.0000075	<0.0000075	<0.0000075	0.0000085	0.0000075	0.0000078	0.0000075	<0.0000075	0.0000075	4676112
Fluoranthene	mg/L	0.00012	<0.000040	<0.000040	0.00012	0.000040	0.00066	0.000040	0.00011	0.000040	4676112
Fluorene	mg/L	0.000076	<0.000050	<0.000050	0.00011	0.000050	0.00081	0.000050	<0.000050	0.000050	4676112
Indeno(1,2,3-cd)pyrene	mg/L	<0.0000085	<0.0000085	<0.0000085	0.000023	0.0000085	0.000018	0.0000085	0.000016	0.0000085	4676112
2-Methylnaphthalene	mg/L	0.00028	0.00011	0.00022	0.00032	0.00010	0.0026	0.00010	0.00019	0.00010	4676112
Naphthalene	mg/L	0.00027	<0.00010	0.00023	0.00031	0.00010	0.092(1)	0.0010	0.00016	0.00010	4676112
Phenanthrene	mg/L	0.00033	0.000098	0.00017	0.00039	0.000050	0.0025	0.000050	0.00025	0.000050	4676112
Perylene	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	<0.000050	0.000050	<0.000050	0.000050	4676112
Pyrene	mg/L	0.00014	0.000037	<0.000020	0.00012	0.000020	0.00056	0.000020	0.00012	0.000020	4676112
Quinoline	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00020	<0.00020	0.00020	<0.00020	0.00020	4676112
Surrogate Recovery (%)											
D10-ANTHRACENE (sur.)	%	114	129	97	102		99		108		4676112
D12-BENZO(A)PYRENE (sur.)	%	100	128	96	104		100		105		4676112
D8-ACENAPHTHYLENE (sur.)	%	101	121	82	94		94		91		4676112
TERPHENYL-D14 (sur.)	%	110	140(2)	98	106		103		108		4676112

RDL = Reportable Detection Limit
(1) - Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		AB4259	AB4260		AB4261		AB4262		
Sampling Date		2011/03/01	2011/03/01		2011/03/01		2011/03/01		
	Units	**MW10-7B**	**DUP 1**	**RDL**	**MW10-7A**	**RDL**	**MW10-22**	**RDL**	**QC Batch**
Polycyclic Aromatics									
Benzo[a]pyrene equivalency	mg/L	0.026	0.026	0.00001	0.00022	0.00001	<0.00001	0.00001	4675630
Acenaphthene	mg/L	0.056	0.069	0.00010	0.027	0.00010	<0.00010	0.00010	4676112
Acenaphthylene	mg/L	0.0024	0.0029	0.00010	0.0016	0.00010	<0.00010	0.00010	4676112
Acridine	mg/L	<0.00020	<0.00020	0.00020	<0.00020	0.00020	<0.00020	0.00020	4676112
Anthracene	mg/L	0.040	0.046	0.000010	0.0025	0.000010	<0.000010	0.000010	4676112
Benzo(a)anthracene	mg/L	0.031	0.033	0.0000085	0.00055	0.0000085	<0.0000085	0.0000085	4676112
Benzo(b&j)fluoranthene	mg/L	0.024	0.021	0.0000085	0.00018	0.0000085	<0.0000085	0.0000085	4676112
Benzo(k)fluoranthene	mg/L	0.0073	0.0071	0.0000085	0.000066	0.0000085	<0.0000085	0.0000085	4676112
Benzo(g,h,i)perylene	mg/L	0.0063	0.0064	0.0000085	0.000044	0.0000085	<0.0000085	0.0000085	4676112
Benzo(c)phenanthrene	mg/L	<0.0050(1)	<0.0050(1)	0.0050	<0.00015(1)	0.00015	<0.000050	0.000050	4676112
Benzo(a)pyrene	mg/L	0.017	0.016	0.0000075	0.00012	0.0000075	<0.0000075	0.0000075	4676112
Benzo[e]pyrene	mg/L	0.012	0.012	0.000050	0.00010	0.000050	<0.000050	0.000050	4676112
Chrysene	mg/L	0.033	0.033	0.0000085	0.00062	0.0000085	<0.0000085	0.0000085	4676112
Dibenz(a,h)anthracene	mg/L	0.0025	0.0024	0.0000075	0.000011	0.0000075	<0.0000075	0.0000075	4676112
Fluoranthene	mg/L	0.13(2)	0.15(2)	0.00080	0.0056	0.000040	<0.000040	0.000040	4676112
Fluorene	mg/L	0.057	0.067	0.000050	0.010	0.000050	<0.000050	0.000050	4676112
Indeno(1,2,3-cd)pyrene	mg/L	0.0064	0.0063	0.0000085	0.000035	0.0000085	<0.0000085	0.0000085	4676112
2-Methylnaphthalene	mg/L	0.059	0.075	0.00010	0.066	0.00010	0.00011	0.00010	4676112
Naphthalene	mg/L	0.13(2)	0.20(2)	0.0020	2.6(2)	0.010	0.0011	0.00010	4676112
Phenanthrene	mg/L	0.21(2)	0.27(2)	0.0010	0.015	0.000050	0.000067	0.000050	4676112
Perylene	mg/L	0.0039	0.0040	0.000050	0.000093	0.000050	<0.000050	0.000050	4676112
Pyrene	mg/L	0.12(2)	0.14(2)	0.00040	0.0049	0.000020	0.000033	0.000020	4676112
Quinoline	mg/L	<0.00020	<0.00020	0.00020	<0.00020	0.00020	<0.00020	0.00020	4676112
Surrogate Recovery (%)									
D10-ANTHRACENE (sur.)	%	86	114		85		107		4676112
D12-BENZO(A)PYRENE (sur.)	%	84	118		79		101		4676112
D8-ACENAPHTHYLENE (sur.)	%	74	100		86		98		4676112
TERPHENYL-D14 (sur.)	%	84	118		86		106		4676112

RDL = Reportable Detection Limit
(1) - Detection limits raised due to matrix interference
(2) - Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

SEMIVOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		AB4263		AB4264		AB4265		AB4265		
Sampling Date		2011/03/01		2011/03/01		2011/03/01		2011/03/01		
	Units	**MW10-16**	**RDL**	**MW10-6**	**RDL**	**DUP 2**	**RDL**	**DUP 2 Lab-Dup**	**RDL**	**QC Batch**
Polycyclic Aromatics										
Benzo[a]pyrene equivalency	mg/L	0.00006	0.00001	0.012	0.00001	0.011	0.00001			4675630
Acenaphthene	mg/L	0.00013	0.00010	0.20(1)	0.0050	0.18(1)	0.0050	0.22	0.0050	4676112
Acenaphthylene	mg/L	<0.00010	0.00010	0.0029	0.00010	<0.0050	0.0050	<0.0050	0.0050	4676112
Acridine	mg/L	<0.00020	0.00020	<0.00020	0.00020	<0.010	0.010	<0.010	0.010	4676112
Anthracene	mg/L	0.000058	0.000010	0.063	0.000010	0.063	0.00050	0.090	0.00050	4676112
Benzo(a)anthracene	mg/L	0.000054	0.0000085	0.024	0.0000085	0.024	0.00043	0.032	0.00043	4676112
Benzo(b&j)fluoranthene	mg/L	0.000060	0.0000085	0.010	0.0000085	0.0075	0.00043	0.012(2)	0.00043	4676112
Benzo(k)fluoranthene	mg/L	0.000025	0.0000085	0.0032	0.0000085	0.0040	0.00043	0.0046	0.00043	4676112
Benzo(g,h,i)perylene	mg/L	0.000031	0.0000085	0.0020	0.0000085	0.0037	0.00043	0.0053	0.00043	4676112
Benzo(c)phenanthrene	mg/L	<0.000050	0.000050	<0.0043(3)	0.0043	<0.0040(3)	0.0040	<0.0055	0.0055	4676112
Benzo(a)pyrene	mg/L	0.000039	0.0000075	0.0065	0.0000075	0.0060	0.00038	0.0085	0.00038	4676112
Benzo[e]pyrene	mg/L	<0.000050	0.000050	0.0048	0.000050	0.0036	0.0025	0.0063	0.0025	4676112
Chrysene	mg/L	0.000094	0.0000085	0.024	0.0000085	0.020	0.00043	0.029	0.00043	4676112
Dibenz(a,h)anthracene	mg/L	<0.0000075	0.0000075	0.00081	0.0000075	0.0013	0.00038	0.0019	0.00038	4676112
Fluoranthene	mg/L	0.00016	0.000040	0.19(1)	0.0020	0.15(1)	0.0020	0.22	0.0020	4676112
Fluorene	mg/L	0.00018	0.000050	0.15(1)	0.0025	0.14(1)	0.0025	0.18	0.0025	4676112
Indeno(1,2,3-cd)pyrene	mg/L	0.000025	0.0000085	0.0020	0.0000085	0.0035	0.00043	0.0050	0.00043	4676112
2-Methylnaphthalene	mg/L	0.0011	0.00010	0.23(1)	0.0050	0.21(1)	0.0050	0.27	0.0050	4676112
Naphthalene	mg/L	0.0013	0.00010	0.77(1)	0.0050	0.68(1)	0.0050	0.89	0.0050	4676112
Phenanthrene	mg/L	0.00063	0.000050	0.44(1)	0.0025	0.36(1)	0.0025	0.52	0.0025	4676112
Perylene	mg/L	<0.000050	0.000050	0.0017	0.000050	<0.0025	0.0025	0.0036	0.0025	4676112
Pyrene	mg/L	0.00017	0.000020	0.15(1)	0.0010	0.12(1)	0.0010	0.17	0.0010	4676112
Quinoline	mg/L	<0.00020	0.00020	<0.00020	0.00020	<0.010	0.010	<0.010	0.010	4676112
Surrogate Recovery (%)										
D10-ANTHRACENE (sur.)	%	116		95		400(2)		350(2)		4676112
D12-BENZO(A)PYRENE (sur.)	%	112		92		100		100		4676112
D8-ACENAPHTHYLENE (sur.)	%	95		82		100		100		4676112
TERPHENYL-D14 (sur.)	%	121		96		100		100		4676112

RDL = Reportable Detection Limit
(1) - Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.
(3) - Detection limits raised due to matrix interference

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		AB4245	AB4245	AB4248	AB4251		AB4252	AB4259	AB4261	AB4264		
Sampling Date		2011/03/01	2011/03/01	2011/03/01	2011/03/01		2011/03/01	2011/03/01	2011/03/01	2011/03/01		
	Units	**RINSEATE**	**RINSEATE Lab-Dup**	**MW10-1**	**MW10-9B**	**QC Batch**	**MW10-3A**	**MW10-7B**	**MW10-7A**	**MW10-6**	**RDL**	**QC Batch**
Volatiles												
Total Trihalomethanes	mg/L	<0.002		<0.002	0.004	4673776	0.003	<0.002	0.005	<0.002	0.002	4675631
Bromodichloromethane	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
Bromoform	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
Bromomethane	mg/L	<0.002	<0.002	<0.002	<0.002	4677123	<0.002	<0.002	<0.002	<0.002	0.002	4677123
Carbon tetrachloride	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
Chlorobenzene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
Chlorodibromomethane	mg/L	<0.001	<0.001	<0.001	<0.001	4677123	<0.001	<0.001	<0.001	<0.001	0.001	4677123
Chloroethane	mg/L	<0.001	<0.001	<0.001	<0.001	4677123	<0.001	<0.001	<0.001	<0.001	0.001	4677123
Chloroform	mg/L	<0.0005	<0.0005	0.0019	0.0041	4677123	0.0027	<0.0005	0.0051	0.0006	0.0005	4677123
Chloromethane	mg/L	<0.002	<0.002	<0.002	<0.002	4677123	<0.002	<0.002	<0.002	<0.002	0.002	4677123
1,2-dibromoethane	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
1,2-dichlorobenzene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
1,3-dichlorobenzene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
1,4-dichlorobenzene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
1,1-dichloroethane	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
1,2-dichloroethane	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
1,1-dichloroethene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
cis-1,2-dichloroethene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
trans-1,2-dichloroethene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
Dichloromethane	mg/L	<0.002	<0.002	<0.002	<0.002	4677123	<0.002	<0.002	<0.002	<0.002	0.002	4677123
1,2-dichloropropane	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
cis-1,3-dichloropropene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
trans-1,3-dichloropropene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
Methyl methacrylate	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
Methyl-tert-butylether (MTBE)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
Styrene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
1,1,1,2-tetrachloroethane	mg/L	<0.002	<0.002	<0.002	<0.002	4677123	<0.002	<0.002	<0.002	<0.002	0.002	4677123
1,1,2,2-tetrachloroethane	mg/L	<0.002	<0.002	<0.002	<0.002	4677123	<0.002	<0.002	<0.002	<0.002	0.002	4677123
Tetrachloroethene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	0.0006	<0.0005	<0.0005	0.0015	0.0005	4677123
1,2,3-trichlorobenzene	mg/L	<0.001	<0.001	<0.001	<0.001	4677123	<0.001	<0.001	<0.001	<0.001	0.001	4677123
1,2,4-trichlorobenzene	mg/L	<0.001	<0.001	<0.001	<0.001	4677123	<0.001	<0.001	<0.001	<0.001	0.001	4677123
1,3,5-trichlorobenzene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
1,1,1-trichloroethane	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
1,1,2-trichloroethane	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
Trichloroethene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123

RDL = Reportable Detection Limit

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		AB4245	AB4245	AB4248	AB4251		AB4252	AB4259	AB4261	AB4264		
Sampling Date		2011/03/01	2011/03/01	2011/03/01	2011/03/01		2011/03/01	2011/03/01	2011/03/01	2011/03/01		
	Units	**RINSEATE**	**RINSEATE Lab-Dup**	**MW10-1**	**MW10-9B**	**QC Batch**	**MW10-3A**	**MW10-7B**	**MW10-7A**	**MW10-6**	**RDL**	**QC Batch**
Trichlorofluoromethane	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
1,2,4-trimethylbenzene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	0.0032	0.025	0.013	0.0005	4677123
1,3,5-trimethylbenzene	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
Vinyl chloride	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	4677123	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	4677123
Surrogate Recovery (%)												
4-BROMOFLUOROBENZENE (sur.)	%	80	79	77	80	4677123	78	79	83	80		4677123
D4-1,2-DICHLOROETHANE (sur.)	%	99	98	108	98	4677123	95	99	96	94		4677123
D8-TOLUENE (sur.)	%	98	98	95	97	4677123	96	97	96	97		4677123

RDL = Reportable Detection Limit

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

Package 1	1.0°C
Package 2	3.0°C

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

SEMIVOLATILE ORGANICS BY GC-MS (WATER) Comments

Sample AB4265-01 Polycyclic Aromatic Hydrocarbons: Detection limits raised due to dilution to bring analyte within the calibrated range.

VOLATILE ORGANICS BY GC-MS (WATER) Comments

Sample AB4245-01 VOCs in Water by P&T GC/MS (Std List): Sample was run by GC/MS/Headspace as per CAL SOP-00227.

Sample AB4248-01 VOCs in Water by P&T GC/MS (Std List): Sample was run by GC/MS/Headspace as per CAL SOP-00227.

Sample AB4251-01 VOCs in Water by P&T GC/MS (Std List): Sample was run by GC/MS/Headspace as per CAL SOP-00227.

Sample AB4252-01 VOCs in Water by P&T GC/MS (Std List): Sample was run by GC/MS/Headspace as per CAL SOP-00227.

Sample AB4259-01 VOCs in Water by P&T GC/MS (Std List): Sample was run by GC/MS/Headspace as per CAL SOP-00227.

Sample AB4261-01 VOCs in Water by P&T GC/MS (Std List): Sample was run by GC/MS/Headspace as per CAL SOP-00227.

Sample AB4264-01 VOCs in Water by P&T GC/MS (Std List): Sample was run by GC/MS/Headspace as per CAL SOP-00227.

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
4676112	D10-ANTHRACENE (sur.)	2011/03/04	94	30 - 130	126	30 - 130	117	%		
4676112	D12-BENZO(A)PYRENE (sur.)	2011/03/04	96	30 - 130	122	30 - 130	105	%		
4676112	D8-ACENAPHTHYLENE (sur.)	2011/03/04	64	30 - 130	103	30 - 130	90	%		
4676112	TERPHENYL-D14 (sur.)	2011/03/04	99	30 - 130	129	30 - 130	118	%		
4676112	Acenaphthene	2011/03/07	NC	30 - 130	108	30 - 130	<0.00010	mg/L	22.7	40
4676112	Acenaphthylene	2011/03/07	NC	30 - 130	98	30 - 130	<0.00010	mg/L	NC	40
4676112	Acridine	2011/03/07	68	30 - 130	73	30 - 130	<0.00020	mg/L	NC	40
4676112	Anthracene	2011/03/07	NC	30 - 130	94	30 - 130	<0.000010	mg/L	34.9	40
4676112	Benzo(a)anthracene	2011/03/07	NC	30 - 130	101	30 - 130	<0.0000085	mg/L	30.4	40
4676112	Benzo(b&j)fluoranthene	2011/03/07	NC	30 - 130	101	30 - 130	<0.0000085	mg/L	43.0(1)	40
4676112	Benzo(k)fluoranthene	2011/03/07	NC	30 - 130	98	30 - 130	<0.0000085	mg/L	14.0	40
4676112	Benzo(g,h,i)perylene	2011/03/07	NC	30 - 130	98	30 - 130	<0.0000085	mg/L	34.8	40
4676112	Benzo(c)phenanthrene	2011/03/07	NC	30 - 130	107	30 - 130	<0.000050	mg/L	NC	40
4676112	Benzo(a)pyrene	2011/03/07	NC	30 - 130	102	30 - 130	<0.0000075	mg/L	34.5	40
4676112	Benzo[e]pyrene	2011/03/07	NC	30 - 130	102	30 - 130	<0.000050	mg/L	NC	40
4676112	Chrysene	2011/03/07	NC	30 - 130	125	30 - 130	<0.0000085	mg/L	36.1	40
4676112	Dibenz(a,h)anthracene	2011/03/07	NC	30 - 130	76	30 - 130	<0.0000075	mg/L	NC	40
4676112	Fluoranthene	2011/03/07	NC	30 - 130	110	30 - 130	<0.000040	mg/L	35.0	40
4676112	Fluorene	2011/03/07	NC	30 - 130	104	30 - 130	<0.000050	mg/L	25.1	40
4676112	Indeno(1,2,3-cd)pyrene	2011/03/07	NC	30 - 130	92	30 - 130	<0.0000085	mg/L	37.1	40
4676112	2-Methylnaphthalene	2011/03/07	NC	30 - 130	101	30 - 130	<0.00010	mg/L	26.7	40
4676112	Naphthalene	2011/03/07	NC	30 - 130	104	30 - 130	<0.00010	mg/L	26.3	40
4676112	Phenanthrene	2011/03/07	NC	30 - 130	118	30 - 130	<0.000050	mg/L	37.7	40
4676112	Perylene	2011/03/07	NC	30 - 130	109	30 - 130	<0.000050	mg/L	NC	40
4676112	Pyrene	2011/03/07	NC	30 - 130	121	30 - 130	<0.000020	mg/L	36.1	40
4676112	Quinoline	2011/03/07	118	30 - 130	105	30 - 130	<0.00020	mg/L	NC	40
4676116	O-TERPHENYL (sur.)	2011/03/03	115	70 - 130	116	70 - 130	114	%		
4676116	F2 (C10-C16 Hydrocarbons)	2011/03/03	113	70 - 130	110	70 - 130	<0.1	mg/L	31.7	40
4676908	4-BROMOFLUOROBENZENE (sur.)	2011/03/06	98	70 - 130	96	70 - 130	91	%		
4676908	D4-1,2-DICHLOROETHANE (sur.)	2011/03/06	103	70 - 130	100	70 - 130	95	%		
4676908	D8-TOLUENE (sur.)	2011/03/06	97	70 - 130	99	70 - 130	98	%		
4676908	Benzene	2011/03/06	102	70 - 130	97	70 - 130	<0.0004	mg/L	NC	40
4676908	Toluene	2011/03/06	91	70 - 130	87	70 - 130	<0.0004	mg/L	NC	40
4676908	Ethylbenzene	2011/03/06	103	70 - 130	98	70 - 130	<0.0004	mg/L	NC	40
4676908	o-Xylene	2011/03/06	103	70 - 130	94	70 - 130	<0.0004	mg/L	NC	40
4676908	m & p-Xylene	2011/03/06	103	70 - 130	97	70 - 130	<0.0008	mg/L	NC	40
4676908	(C6-C10)	2011/03/06			75	70 - 130	<0.1	mg/L	NC	40
4676908	Xylenes (Total)	2011/03/06					<0.0008	mg/L	NC	40
4676908	F1 (C6-C10) - BTEX	2011/03/06					<0.1	mg/L	NC	40
4677123	4-BROMOFLUOROBENZENE (sur.)	2011/03/04	106	70 - 130	101	70 - 130	81	%		

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
4677123	D4-1,2-DICHLOROETHANE (sur.)	2011/03/04	106	70 - 130	94	70 - 130	95	%		
4677123	D8-TOLUENE (sur.)	2011/03/04	93	70 - 130	97	70 - 130	98	%		
4677123	Bromodichloromethane	2011/03/04	89	70 - 130	89	70 - 130	<0.0005	mg/L	NC	40
4677123	Bromoform	2011/03/04	105	70 - 130	84	70 - 130	<0.0005	mg/L	NC	40
4677123	Chlorobenzene	2011/03/04	93	70 - 130	111	70 - 130	<0.0005	mg/L	NC	40
4677123	Chlorodibromomethane	2011/03/04	95	70 - 130	89	70 - 130	<0.001	mg/L	NC	40
4677123	Chloroform	2011/03/04	84	70 - 130	93	70 - 130	<0.0005	mg/L	NC	40
4677123	1,2-dibromoethane	2011/03/04	101	70 - 130	91	70 - 130	<0.0005	mg/L	NC	40
4677123	1,2-dichlorobenzene	2011/03/04	92	70 - 130	86	70 - 130	<0.0005	mg/L	NC	40
4677123	1,3-dichlorobenzene	2011/03/04	89	70 - 130	90	70 - 130	<0.0005	mg/L	NC	40
4677123	1,4-dichlorobenzene	2011/03/04	95	70 - 130	89	70 - 130	<0.0005	mg/L	NC	40
4677123	1,1-dichloroethane	2011/03/04	76	70 - 130	94	70 - 130	<0.0005	mg/L	NC	40
4677123	1,2-dichloroethane	2011/03/04	107	70 - 130	93	70 - 130	<0.0005	mg/L	NC	40
4677123	cis-1,2-dichloroethene	2011/03/04	78	70 - 130	88	70 - 130	<0.0005	mg/L	NC	40
4677123	Dichloromethane	2011/03/04	90	70 - 130	89	70 - 130	<0.002	mg/L	NC	40
4677123	1,2-dichloropropane	2011/03/04	87	70 - 130	90	70 - 130	<0.0005	mg/L	NC	40
4677123	cis-1,3-dichloropropene	2011/03/04	81	70 - 130	87	70 - 130	<0.0005	mg/L	NC	40
4677123	trans-1,3-dichloropropene	2011/03/04	100	70 - 130	94	70 - 130	<0.0005	mg/L	NC	40
4677123	Methyl methacrylate	2011/03/04	99	70 - 130	82	70 - 130	<0.0005	mg/L	NC	40
4677123	1,1,1,2-tetrachloroethane	2011/03/04	123	70 - 130	104	70 - 130	<0.002	mg/L	NC	40
4677123	1,1,2,2-tetrachloroethane	2011/03/04	127	70 - 130	90	70 - 130	<0.002	mg/L	NC	40
4677123	1,1,2-trichloroethane	2011/03/04	108	70 - 130	93	70 - 130	<0.0005	mg/L	NC	40
4677123	Bromomethane	2011/03/04			89	70 - 130	<0.002	mg/L	NC	40
4677123	Carbon tetrachloride	2011/03/04			92	70 - 130	<0.0005	mg/L	NC	40
4677123	Chloroethane	2011/03/04			86	70 - 130	<0.001	mg/L	NC	40
4677123	Chloromethane	2011/03/04			97	70 - 130	<0.002	mg/L	NC	40
4677123	1,1-dichloroethene	2011/03/04			87	70 - 130	<0.0005	mg/L	NC	40
4677123	trans-1,2-dichloroethene	2011/03/04			101	70 - 130	<0.0005	mg/L	NC	40
4677123	Methyl-tert-butylether (MTBE)	2011/03/04			72	70 - 130	<0.0005	mg/L	NC	40
4677123	Styrene	2011/03/04			78	70 - 130	<0.0005	mg/L	NC	40
4677123	Tetrachloroethene	2011/03/04			91	70 - 130	<0.0005	mg/L	NC	40
4677123	1,2,3-trichlorobenzene	2011/03/04			63(1)	70 - 130	<0.001	mg/L	NC	40
4677123	1,2,4-trichlorobenzene	2011/03/04			67(1)	70 - 130	<0.001	mg/L	NC	40
4677123	1,3,5-trichlorobenzene	2011/03/04			74	70 - 130	<0.0005	mg/L	NC	40
4677123	1,1,1-trichloroethane	2011/03/04			94	70 - 130	<0.0005	mg/L	NC	40
4677123	Trichloroethene	2011/03/04			93	70 - 130	<0.0005	mg/L	NC	40
4677123	Trichlorofluoromethane	2011/03/04			90	70 - 130	<0.0005	mg/L	NC	40
4677123	1,2,4-trimethylbenzene	2011/03/04			79	70 - 130	<0.0005	mg/L	NC	40

Maxxam Job #: B116507
Report Date: 2011/03/08

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046/CANADA CRESOTE

Sampler Initials: JZ

QUALITY ASSURANCE REPORT

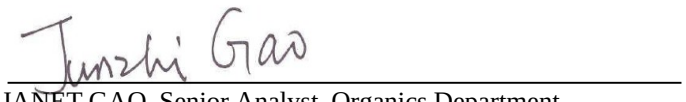
			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
4677123	1,3,5-trimethylbenzene	2011/03/04			80	70 - 130	<0.0005	mg/L	NC	40
4677123	Vinyl chloride	2011/03/04			102	70 - 130	<0.0005	mg/L	NC	40

N/A = Not Applicable
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Validation Signature Page

Maxxam Job #: B116507

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



JANET GAO, Senior Analyst, Organics Department

JENNIFER LO, Senior Analyst, Organics Department

==========

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

Maxxam
Calgary: 4000 19st St. NE, T2E 6P8. Ph: (403) 291-3077, Fax: (403) 735-2240, Toll free: (800) 386-7247
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www.maxxamanalytics.com

Chain of Custody

A030375

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☑
Company:	Golder Associates.	
Contact:	Julie Burghardt	
Address:	2-2535 3 Ave SE	
	Prov: AB PC: T2A 7W5	Prov: PC:
Contact #s:	Ph: Cell:	Ph: Cell:

Report Distribution (E-Mail): JBurghardt@golder.com; JZemek@golder.com.

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

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

PO #: ~~10-1~~

Project # / Name: 10-1349-0049 / Canada Creosote

Site Location: Lower Bay

Quote #:

Sampled By: J. Zemek.

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

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: ☐ VOCs BTEX F1	☐ BTEX F1-F4 BTEX F1-F2	☐ Routine Water ☐ Turb ☐ F	☐ TOC ☐ DOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury ☐ Total ☐ Dissolved	Other Analysis: PAH	VOCs	HOLD - Do not Analyze	# of Containers Submitted
1	Rinsate		GW	Mar. 1							X	X						X	X		7
2	MW10-1		"	"							X	X						X	X		7
3	MW10-18		"	"							X	X						X			7
4	MW10-9A		"	"							X	X						X			7
5	MW10-9B		"	"							X	X						X	X		7
6	MW10-3A		"	"							X	X						X	X		7
7	MW10-3B		"	"							X	X						X			7
8	MW10-2		"	"							X	X						X			7
9	MW10-15		"	"							X	X						X			7
10	MW10-11		"	"							X	X						X			7
11	MW10-10		"	"							X	X						X			7
12	MW10-20		"	"							X	X						X			7

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

Relinquished By (Signature/Print): Jeremy Zemek	Date (YY/MM/DD): 11-Mar-02	Time (24:00): 1300	
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):	
Special Instructions:		# of Jars Used & Not Submitted	

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: B116507		
	RECEIVED MAR 02 2011 13:05		Custody Seal	Temperature	Ice
Lab Comments:			No	1,0,2 2,2,5	✓

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

Chain of Custody

A030377

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☐	Report Distribution (E-Mail):
Company:			
Contact:	See page 1	See page 1	
Address:			
	Prov: PC:	Prov: PC:	
Contact #s:	Ph: Cell:	Ph: Cell:	

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

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

PO #:
Project # / Name:
Site Location: See page 1
Quote #:
Sampled By:

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

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: ☐VOCs BTEX F1	☐BTEX F1-F4 BTEX F1-F2	☐ Routine Water ☐ Turb ☐ F	☐ TOC ☐ DOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury ☐ Total ☐ Dissolved	Other Analysis: PAH	VOCs	HOLD - Do not Analyze	# of Containers Submitted
1	MW10-7B		GW	Mar 1							X	X						X	X		9
2	Dup 1		"	"							X	X						X			7
3	MW10-7A		"	"							X	X						X	X		7
4	MW10-22		"	"							X	X						X			7
5	MW10-16		"	"							X	X						X			7
6	MW10-6		"	"							X	X						X	X		7
7	Dup 2		"	"								X						X			7
8																					
9																					
10																					
11																					
12																					

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

Relinquished By (Signature/Print): J. Zemek	Date (YY/MM/DD): 11-Mar-02	Time (24:00): 1300
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions:

# of Jars Used & Not Submitted:

LAB USE ONLY

Received By: Date: Time: Maxxam Job #: B116507

RECEIVED MAR 0 2 2011 13:05

Custody Seal	Temperature	Ice
No	1,1,0,2 2,2,5	✓

Lab Comments:

CERTIFICATE OF ANALYSIS

CLIENT	**Golder Associates Ltd (Calgary)**		
	102-2535 3rd Avenue SE		
	Calgary AB/CAN	TEL	1-403-532-5798
	T2A7W5	FAX	1-403-299-5606
ATTENTION	**Julie Burghardt**		
RECEIVED / TEMP	Mar-17-11 11:52 / 5.0 °C	**WORK ORDER**	R103247
REPORTED	Apr-28-11	**PROJECT**	10-1346-0046
COC #(s)	online	**PROJECT INFO**	AENV Canada Creosote

General Comments:

CARO Analytical Services employs methods which are based on those found in "Standard Methods for the Examination of Water and Wastewater", 21st Edition, 2005, published by the American Public Health Association (APHA); US EPA protocols found in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846", 3rd Edition; protocols published by the British Columbia Ministry of Environment (BCMOE); and/or CCME Canada-wide Standard Reference methods.

Methods not described in these publications are conducted according to procedures accepted by appropriate regulatory agencies, and/or are done in accordance with recognized professional standards using accepted testing methodologies and quality control efforts except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirity. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

- All solids results are reported on a dry weight basis unless otherwise noted

- Units: mg/kg = milligrams per kilogram, equivalent to parts per million (ppm)
  mg/L = milligrams per litre, equivalent to parts per million (ppm)
  ug/L = micrograms per litre, equivalent to parts per billion (ppb)
  ug/g = micrograms per gram, equivalent to parts per million (ppm)
  ug/m3 = micrograms per cubic meter of air

- "RDL" Reported detection limit
- "<" Less than reported detection limit
- "AO" Aesthetic objective
- "MAC" Maximum acceptable concentration (health-related guideline)
- "LAB" RMD = Richmond location, KEL = Kelowna location, EDM = Edmonton location, SUB = Subcontracted

Please contact CARO if more information is needed.

CARO Analytical Services

Final Review Per: **Stephen Varisco, B.Sc., PChem For Patrick Novak, B.Sc., PChem**
Business Manager

SAMPLE DATA

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Aggregate Organic Parameters

MW10-1 well (R103247-01) Matrix: Air Sampled: Mar-09-11 16:45 To Mar-09-11 17:00

Sampling Flow (mL/min): 199 Sampling Time (min): 15

nC6-nC8 (total)	**470**	170	ug/m3 Air	Mar-17-11	Custom	RMD
nC6-nC8 (aromatic)	**24**	3.4	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC6-nC8 (non-aromatic)	**470**	170	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC8-nC10 (total)	**700**	170	ug/m3 Air	Mar-17-11	Custom	RMD
nC8-nC10 (aromatic)	< 17	17	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC8-nC10 (non-aromatic)	**700**	170	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC6-nC10 (total)	**1200**	340	ug/m3 Air	Mar-17-11	Custom	RMD
nC10-nC12 (total)	**570**	170	ug/m3 Air	Mar-17-11	Custom	RMD
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC10-nC12 (non-aromatic)	**570**	170	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC12-nC16 (total)	**270**	170	ug/m3 Air	Mar-17-11	Custom	RMD
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC12-nC16 (non-aromatic)	**260**	170	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC10-nC16 (total)	**840**	340	ug/m3 Air	Mar-17-11	Custom	RMD
VHv (6-13)	**970**	340	ug/m3 Air	Mar-17-11	BCMOE	RMD
VPHv	**940**	340	ug/m3 Air	Mar-17-11	[CALC]	RMD

MW10-1 probe (R103247-02) Matrix: Air Sampled: Mar-09-11 17:45 To Mar-09-11 18:00

Sampling Flow (mL/min): 208 Sampling Time (min): 15

nC6-nC8 (total)	**710**	160	ug/m3 Air	Mar-17-11	Custom	RMD
nC6-nC8 (aromatic)	**96**	3.2	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC6-nC8 (non-aromatic)	**610**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC8-nC10 (total)	**670**	160	ug/m3 Air	Mar-17-11	Custom	RMD
nC8-nC10 (aromatic)	**22**	16	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC8-nC10 (non-aromatic)	**670**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC6-nC10 (total)	**1400**	320	ug/m3 Air	Mar-17-11	Custom	RMD
nC10-nC12 (total)	**710**	160	ug/m3 Air	Mar-17-11	Custom	RMD
nC10-nC12 (aromatic)	< 16	16	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC10-nC12 (non-aromatic)	**710**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC12-nC16 (total)	**740**	160	ug/m3 Air	Mar-17-11	Custom	RMD
nC12-nC16 (aromatic)	< 16	16	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC12-nC16 (non-aromatic)	**740**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC10-nC16 (total)	**1400**	320	ug/m3 Air	Mar-17-11	Custom	RMD
VHv (6-13)	**1300**	320	ug/m3 Air	Mar-17-11	BCMOE	RMD
VPHv	**1200**	320	ug/m3 Air	Mar-17-11	[CALC]	RMD

MW10-2 well (R103247-03) Matrix: Air Sampled: Mar-09-11 15:15 To Mar-09-11 15:30

Sampling Flow (mL/min): 217 Sampling Time (min): 15

nC6-nC8 (total)	**220**	150	ug/m3 Air	Mar-17-11	Custom	RMD
nC6-nC8 (aromatic)	**4.3**	3.1	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC6-nC8 (non-aromatic)	**210**	150	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC8-nC10 (total)	**490**	150	ug/m3 Air	Mar-17-11	Custom	RMD
nC8-nC10 (aromatic)	< 15	15	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC8-nC10 (non-aromatic)	**490**	150	ug/m3 Air	Mar-17-11	[CALC]	RMD
nC6-nC10 (total)	**710**	310	ug/m3 Air	Mar-17-11	Custom	RMD

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Aggregate Organic Parameters, Continued

MW10-2 well (R103247-03) Matrix: Air Sampled: Mar-09-11 15:15 To Mar-09-11 15:30, Continued

Sampling Flow (mL/min): 217 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC10-nC12 (total)	**370**	150	ug/m3 Air	Mar-17-11	Custom	RMD	
nC10-nC12 (aromatic)	< 15	15	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**370**	150	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC12-nC16 (total)	**220**	150	ug/m3 Air	Mar-17-11	Custom	RMD	
nC12-nC16 (aromatic)	< 15	15	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**230**	150	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC10-nC16 (total)	**580**	310	ug/m3 Air	Mar-17-11	Custom	RMD	
VHv (6-13)	**650**	310	ug/m3 Air	Mar-17-11	BCMOE	RMD	
VPHv	**610**	310	ug/m3 Air	Mar-17-11	[CALC]	RMD	

MW10-3B Shallow probe (R103247-04) Matrix: Air Sampled: Mar-09-11 10:15 To Mar-09-11 10:30

Sampling Flow (mL/min): 206 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**390**	160	ug/m3 Air	Mar-17-11	Custom	RMD	
nC6-nC8 (aromatic)	**24**	3.2	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**360**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC8-nC10 (total)	**1100**	160	ug/m3 Air	Mar-17-11	Custom	RMD	
nC8-nC10 (aromatic)	**91**	16	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**1000**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC6-nC10 (total)	**1500**	320	ug/m3 Air	Mar-17-11	Custom	RMD	
nC10-nC12 (total)	**2500**	160	ug/m3 Air	Mar-17-11	Custom	RMD	
nC10-nC12 (aromatic)	< 16	16	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**2500**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC12-nC16 (total)	**1700**	160	ug/m3 Air	Mar-17-11	Custom	RMD	
nC12-nC16 (aromatic)	< 16	16	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**1700**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC10-nC16 (total)	**4200**	320	ug/m3 Air	Mar-17-11	Custom	RMD	
VHv (6-13)	**2800**	320	ug/m3 Air	Mar-17-11	BCMOE	RMD	
VPHv	**2700**	320	ug/m3 Air	Mar-17-11	[CALC]	RMD	

MW10-3B deep probe (R103247-05) Matrix: Air Sampled: Mar-09-11 11:15 To Mar-09-11 11:30

Sampling Flow (mL/min): 198 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**570**	170	ug/m3 Air	Mar-17-11	Custom	RMD	
nC6-nC8 (aromatic)	**84**	3.4	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**510**	170	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC8-nC10 (total)	**980**	170	ug/m3 Air	Mar-17-11	Custom	RMD	
nC8-nC10 (aromatic)	**67**	17	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**910**	170	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC6-nC10 (total)	**1600**	340	ug/m3 Air	Mar-17-11	Custom	RMD	
nC10-nC12 (total)	**3000**	170	ug/m3 Air	Mar-17-11	Custom	RMD	
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**3000**	170	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC12-nC16 (total)	**2200**	170	ug/m3 Air	Mar-17-11	Custom	RMD	
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**2200**	170	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC10-nC16 (total)	**5100**	340	ug/m3 Air	Mar-17-11	Custom	RMD	

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MW10-3B deep probe (R103247-05) Matrix: Air Sampled: Mar-09-11 11:15 To Mar-09-11 11:30, Continued

Sampling Flow (mL/min): 198 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
VHv (6-13)	**2900**	340	ug/m3 Air	Mar-17-11	BCMOE	RMD	
VPHv	**2700**	340	ug/m3 Air	Mar-17-11	[CALC]	RMD	

MW10-3B well (R103247-06) Matrix: Air Sampled: Mar-09-11 12:15 To Mar-09-11 12:30

Sampling Flow (mL/min): 204 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**750**	160	ug/m3 Air	Mar-17-11	Custom	RMD	
nC6-nC8 (aromatic)	**69**	3.3	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**650**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC8-nC10 (total)	**1400**	160	ug/m3 Air	Mar-17-11	Custom	RMD	
nC8-nC10 (aromatic)	**78**	16	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**1300**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC6-nC10 (total)	**2200**	330	ug/m3 Air	Mar-17-11	Custom	RMD	
nC10-nC12 (total)	**2200**	160	ug/m3 Air	Mar-17-11	Custom	RMD	
nC10-nC12 (aromatic)	< 16	16	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**2200**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC12-nC16 (total)	**880**	160	ug/m3 Air	Mar-17-11	Custom	RMD	
nC12-nC16 (aromatic)	< 16	16	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**880**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC10-nC16 (total)	**3000**	330	ug/m3 Air	Mar-17-11	Custom	RMD	
VHv (6-13)	**2500**	330	ug/m3 Air	Mar-17-11	BCMOE	RMD	
VPHv	**2400**	330	ug/m3 Air	Mar-17-11	[CALC]	RMD	

MW10-5 well (R103247-07) Matrix: Air Sampled: Mar-11-11 09:45 To Mar-11-11 10:00

Sampling Flow (mL/min): 202 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**1700**	170	ug/m3 Air	Mar-17-11	Custom	RMD	
nC6-nC8 (aromatic)	**360**	33	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**1300**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (total)	**790**	170	ug/m3 Air	Mar-17-11	Custom	RMD	
nC8-nC10 (aromatic)	**66**	17	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**730**	170	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC6-nC10 (total)	**2500**	330	ug/m3 Air	Mar-17-11	Custom	RMD	
nC10-nC12 (total)	**1200**	170	ug/m3 Air	Mar-17-11	Custom	RMD	
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**1200**	170	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC12-nC16 (total)	**2400**	170	ug/m3 Air	Mar-17-11	Custom	RMD	
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**2400**	170	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC10-nC16 (total)	**3600**	330	ug/m3 Air	Mar-17-11	Custom	RMD	
VHv (6-13)	**2900**	330	ug/m3 Air	Mar-17-11	BCMOE	RMD	
VPHv	**2500**	360	ug/m3 Air	Mar-18-11	[CALC]	RMD	

MW10-5 probe (R103247-08) Matrix: Air Sampled: Mar-11-11 10:30 To Mar-11-11 10:45

Sampling Flow (mL/min): 203 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**1400**	160	ug/m3 Air	Mar-17-11	Custom	RMD	

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MW10-5 probe (R103247-08) Matrix: Air Sampled: Mar-11-11 10:30 To Mar-11-11 10:45, Continued

Sampling Flow (mL/min): 203 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (aromatic)	**280**	33	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**1100**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (total)	**460**	160	ug/m3 Air	Mar-17-11	Custom	RMD	
nC8-nC10 (aromatic)	**85**	16	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**390**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC6-nC10 (total)	**1900**	330	ug/m3 Air	Mar-17-11	Custom	RMD	
nC10-nC12 (total)	**1100**	160	ug/m3 Air	Mar-17-11	Custom	RMD	
nC10-nC12 (aromatic)	< 16	16	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**1100**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC12-nC16 (total)	**2800**	160	ug/m3 Air	Mar-17-11	Custom	RMD	
nC12-nC16 (aromatic)	< 16	16	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**2800**	160	ug/m3 Air	Mar-17-11	[CALC]	RMD	
nC10-nC16 (total)	**3900**	330	ug/m3 Air	Mar-17-11	Custom	RMD	
VHv (6-13)	**2700**	330	ug/m3 Air	Mar-17-11	BCMOE	RMD	
VPHv	**2400**	360	ug/m3 Air	Mar-18-11	[CALC]	RMD	

MW10-6 probe (R103247-09) Matrix: Air Sampled: Mar-10-11 08:45 To Mar-10-11 09:00

Sampling Flow (mL/min): 207 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**550**	160	ug/m3 Air	Mar-18-11	Custom	RMD	
nC6-nC8 (aromatic)	**81**	3.2	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**480**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (total)	**2200**	160	ug/m3 Air	Mar-18-11	Custom	RMD	
nC8-nC10 (aromatic)	**320**	16	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**1800**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC10 (total)	**2700**	320	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (total)	**4500**	160	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (aromatic)	**180**	16	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**4200**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (total)	**3500**	160	ug/m3 Air	Mar-18-11	Custom	RMD	
nC12-nC16 (aromatic)	< 16	16	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**3500**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC16 (total)	**8100**	320	ug/m3 Air	Mar-18-11	Custom	RMD	
VHv (6-13)	**4500**	320	ug/m3 Air	Mar-18-11	BCMOE	RMD	
VPHv	**4200**	320	ug/m3 Air	Mar-18-11	[CALC]	RMD	

MW10-7B deep probe (R103247-10) Matrix: Air Sampled: Mar-10-11 14:15 To Mar-10-11 14:30

Sampling Flow (mL/min): 206 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**710**	160	ug/m3 Air	Mar-18-11	Custom	RMD	
nC6-nC8 (aromatic)	**140**	32	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**580**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (total)	**840**	160	ug/m3 Air	Mar-18-11	Custom	RMD	
nC8-nC10 (aromatic)	**140**	16	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**710**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC10 (total)	**1600**	320	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (total)	**650**	160	ug/m3 Air	Mar-18-11	Custom	RMD	

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MW10-7B deep probe (R103247-10) Matrix: Air Sampled: Mar-10-11 14:15 To Mar-10-11 14:30, Continued

Sampling Flow (mL/min): 206 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC10-nC12 (aromatic)	**45**	16	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**580**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (total)	**650**	160	ug/m3 Air	Mar-18-11	Custom	RMD	
nC12-nC16 (aromatic)	< 16	16	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**650**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC16 (total)	**1300**	320	ug/m3 Air	Mar-18-11	Custom	RMD	
VHv (6-13)	**1400**	320	ug/m3 Air	Mar-18-11	BCMOE	RMD	
VPHv	**1100**	360	ug/m3 Air	Mar-18-11	[CALC]	RMD	

MW10-7B shallow probe (R103247-11) Matrix: Air Sampled: Mar-10-11 15:15 To Mar-10-11 15:30

Sampling Flow (mL/min): 197 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**470**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC6-nC8 (aromatic)	**81**	3.4	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**370**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (total)	**540**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC8-nC10 (aromatic)	**150**	17	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**410**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC10 (total)	**1000**	340	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (total)	**240**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**220**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (total)	**300**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**310**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC16 (total)	**540**	340	ug/m3 Air	Mar-18-11	Custom	RMD	
VHv (6-13)	**780**	340	ug/m3 Air	Mar-18-11	BCMOE	RMD	
VPHv	**580**	340	ug/m3 Air	Mar-18-11	[CALC]	RMD	

MW10-9B well (R103247-12) Matrix: Air Sampled: Mar-10-11 12:00 To Mar-11-11 12:15

Sampling Flow (mL/min): 197 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**2300**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC6-nC8 (aromatic)	**610**	34	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**1700**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (total)	**1300**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC8-nC10 (aromatic)	**290**	17	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**1000**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC10 (total)	**3700**	340	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (total)	**470**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**470**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (total)	**270**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**280**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC16 (total)	**740**	340	ug/m3 Air	Mar-18-11	Custom	RMD	

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Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Aggregate Organic Parameters, Continued

MW10-9B well (R103247-12) Matrix: Air Sampled: Mar-10-11 12:00 To Mar-11-11 12:15, Continued

Sampling Flow (mL/min): 197 Sampling Time (min): 15

VHv (6-13)	**2300**	340	ug/m3 Air	Mar-18-11	BCMOE	RMD
VPHv	**1400**	370	ug/m3 Air	Mar-18-11	[CALC]	RMD

MW10-9B shallow probe (R103247-13) Matrix: Air Sampled: Mar-10-11 13:15 To Mar-11-11 13:30

Sampling Flow (mL/min): 203 Sampling Time (min): 15

nC6-nC8 (total)	**430**	160	ug/m3 Air	Mar-18-11	Custom	RMD
nC6-nC8 (aromatic)	**66**	3.3	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC6-nC8 (non-aromatic)	**360**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC8-nC10 (total)	**330**	160	ug/m3 Air	Mar-18-11	Custom	RMD
nC8-nC10 (aromatic)	**22**	16	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC8-nC10 (non-aromatic)	**310**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC6-nC10 (total)	**760**	330	ug/m3 Air	Mar-18-11	Custom	RMD
nC10-nC12 (total)	**300**	160	ug/m3 Air	Mar-18-11	Custom	RMD
nC10-nC12 (aromatic)	< 16	16	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC10-nC12 (non-aromatic)	**280**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC12-nC16 (total)	**300**	160	ug/m3 Air	Mar-18-11	Custom	RMD
nC12-nC16 (aromatic)	< 16	16	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC12-nC16 (non-aromatic)	**290**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC10-nC16 (total)	**590**	330	ug/m3 Air	Mar-18-11	Custom	RMD
VHv (6-13)	**660**	330	ug/m3 Air	Mar-18-11	BCMOE	RMD
VPHv	**560**	330	ug/m3 Air	Mar-18-11	[CALC]	RMD

MW10-10 well (R103247-14) Matrix: Air Sampled: Mar-08-11 17:50 To Mar-08-11 18:00

Sampling Flow (mL/min): 215 Sampling Time (min): 10

nC6-nC8 (total)	**370**	230	ug/m3 Air	Mar-18-11	Custom	RMD
nC6-nC8 (aromatic)	**16**	4.7	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC6-nC8 (non-aromatic)	**350**	230	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC8-nC10 (total)	**370**	230	ug/m3 Air	Mar-18-11	Custom	RMD
nC8-nC10 (aromatic)	**34**	23	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC8-nC10 (non-aromatic)	**350**	230	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC6-nC10 (total)	**740**	470	ug/m3 Air	Mar-18-11	Custom	RMD
nC10-nC12 (total)	< 230	230	ug/m3 Air	Mar-18-11	Custom	RMD
nC10-nC12 (aromatic)	< 23	23	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC10-nC12 (non-aromatic)	< 230	230	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC12-nC16 (total)	**230**	230	ug/m3 Air	Mar-18-11	Custom	RMD
nC12-nC16 (aromatic)	< 23	23	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC12-nC16 (non-aromatic)	**250**	230	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC10-nC16 (total)	< 470	470	ug/m3 Air	Mar-18-11	Custom	RMD
VHv (6-13)	**600**	470	ug/m3 Air	Mar-18-11	BCMOE	RMD
VPHv	**560**	470	ug/m3 Air	Mar-18-11	[CALC]	RMD

MW10-11 probe (R103247-15) Matrix: Air Sampled: Mar-08-11 14:20 To Mar-08-11 14:30

Sampling Flow (mL/min): 207 Sampling Time (min): 10

nC6-nC8 (total)	**390**	240	ug/m3 Air	Mar-18-11	Custom	RMD
nC6-nC8 (aromatic)	**32**	4.8	ug/m3 Air	Mar-18-11	[CALC]	RMD

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Aggregate Organic Parameters, Continued

MW10-11 probe (R103247-15) Matrix: Air Sampled: Mar-08-11 14:20 To Mar-08-11 14:30, Continued

Sampling Flow (mL/min): 207 Sampling Time (min): 10

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (non-aromatic)	**360**	240	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (total)	**680**	240	ug/m3 Air	Mar-18-11	Custom	RMD	
nC8-nC10 (aromatic)	< 24	24	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**680**	240	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC10 (total)	**1100**	480	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (total)	**290**	240	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (aromatic)	< 24	24	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**270**	240	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (total)	**290**	240	ug/m3 Air	Mar-18-11	Custom	RMD	
nC12-nC16 (aromatic)	< 24	24	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**300**	240	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC16 (total)	**580**	480	ug/m3 Air	Mar-18-11	Custom	RMD	
VHv (6-13)	**770**	480	ug/m3 Air	Mar-18-11	BCMOE	RMD	
VPHv	**720**	480	ug/m3 Air	Mar-18-11	[CALC]	RMD	

MW10-11 well (R103247-16) Matrix: Air Sampled: Mar-08-11 15:50 To Mar-08-11 16:00

Sampling Flow (mL/min): 218 Sampling Time (min): 10

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**550**	230	ug/m3 Air	Mar-18-11	Custom	RMD	
nC6-nC8 (aromatic)	**44**	4.6	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**500**	230	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (total)	**600**	230	ug/m3 Air	Mar-18-11	Custom	RMD	
nC8-nC10 (aromatic)	< 23	23	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**550**	230	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC10 (total)	**1100**	460	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (total)	**370**	230	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (aromatic)	< 23	23	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**340**	230	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (total)	**920**	230	ug/m3 Air	Mar-18-11	Custom	RMD	
nC12-nC16 (aromatic)	< 23	23	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**920**	230	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC16 (total)	**1300**	460	ug/m3 Air	Mar-18-11	Custom	RMD	
VHv (6-13)	**1100**	460	ug/m3 Air	Mar-18-11	BCMOE	RMD	
VPHv	**1100**	460	ug/m3 Air	Mar-18-11	[CALC]	RMD	

MW10-12 well (R103247-17) Matrix: Air Sampled: Mar-11-11 17:15 To Mar-11-11 17:30

Sampling Flow (mL/min): 201 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**200**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC6-nC8 (aromatic)	**3.7**	3.3	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**200**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (total)	**200**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC8-nC10 (aromatic)	< 17	17	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**200**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC10 (total)	**400**	330	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (total)	< 170	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-18-11	[CALC]	RMD	

CARO ANALYTICAL SERVICES

CLIENT Golder Associates Ltd (Calgary) **WORK ORDER #** R103247
PROJECT 10-1346-0046 **REPORTED** Apr-28-11

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Aggregate Organic Parameters, Continued

MW10-12 well (R103247-17) Matrix: Air Sampled: Mar-11-11 17:15 To Mar-11-11 17:30, Continued
Sampling Flow (mL/min): 201 Sampling Time (min): 15

nC10-nC12 (non-aromatic)	< 170	170	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC12-nC16 (total)	**200**	170	ug/m3 Air	Mar-18-11	Custom	RMD
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC12-nC16 (non-aromatic)	**190**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC10-nC16 (total)	< 330	330	ug/m3 Air	Mar-18-11	Custom	RMD
VHv (6-13)	**360**	330	ug/m3 Air	Mar-18-11	BCMOE	RMD
VPHv	**330**	330	ug/m3 Air	Mar-18-11	[CALC]	RMD

MW10-14 well (R103247-18) Matrix: Air Sampled: Mar-09-11 14:00 To Mar-09-11 14:15
Sampling Flow (mL/min): 201 Sampling Time (min): 15

nC6-nC8 (total)	**600**	170	ug/m3 Air	Mar-18-11	Custom	RMD
nC6-nC8 (aromatic)	**100**	3.3	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC6-nC8 (non-aromatic)	**500**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC8-nC10 (total)	**1100**	170	ug/m3 Air	Mar-18-11	Custom	RMD
nC8-nC10 (aromatic)	**90**	17	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC8-nC10 (non-aromatic)	**1000**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC6-nC10 (total)	**1700**	330	ug/m3 Air	Mar-18-11	Custom	RMD
nC10-nC12 (total)	**1300**	170	ug/m3 Air	Mar-18-11	Custom	RMD
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC10-nC12 (non-aromatic)	**1300**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC12-nC16 (total)	**660**	170	ug/m3 Air	Mar-18-11	Custom	RMD
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC12-nC16 (non-aromatic)	**660**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC10-nC16 (total)	**2000**	330	ug/m3 Air	Mar-18-11	Custom	RMD
VHv (6-13)	**1700**	330	ug/m3 Air	Mar-18-11	BCMOE	RMD
VPHv	**1600**	330	ug/m3 Air	Mar-18-11	[CALC]	RMD

MW10-15 well (R103247-19) Matrix: Air Sampled: Mar-09-11 08:45 To Mar-09-11 09:00
Sampling Flow (mL/min): 204 Sampling Time (min): 15

nC6-nC8 (total)	**520**	160	ug/m3 Air	Mar-18-11	Custom	RMD
nC6-nC8 (aromatic)	**49**	3.3	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC6-nC8 (non-aromatic)	**490**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC8-nC10 (total)	**1200**	160	ug/m3 Air	Mar-18-11	Custom	RMD
nC8-nC10 (aromatic)	**33**	16	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC8-nC10 (non-aromatic)	**1200**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC6-nC10 (total)	**1800**	330	ug/m3 Air	Mar-18-11	Custom	RMD
nC10-nC12 (total)	**1600**	160	ug/m3 Air	Mar-18-11	Custom	RMD
nC10-nC12 (aromatic)	< 16	16	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC10-nC12 (non-aromatic)	**1600**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC12-nC16 (total)	**560**	160	ug/m3 Air	Mar-18-11	Custom	RMD
nC12-nC16 (aromatic)	< 16	16	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC12-nC16 (non-aromatic)	**560**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD
nC10-nC16 (total)	**2200**	330	ug/m3 Air	Mar-18-11	Custom	RMD
VHv (6-13)	**1900**	330	ug/m3 Air	Mar-18-11	BCMOE	RMD
VPHv	**1800**	330	ug/m3 Air	Mar-18-11	[CALC]	RMD

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Aggregate Organic Parameters, Continued

MW10-16 probe (R103247-20) Matrix: Air Sampled: Mar-10-11 11:45 To Mar-10-11 12:00

Sampling Flow (mL/min): 207 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**290**	160	ug/m3 Air	Mar-18-11	Custom	RMD	
nC6-nC8 (aromatic)	**14**	3.2	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**280**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (total)	**740**	160	ug/m3 Air	Mar-18-11	Custom	RMD	
nC8-nC10 (aromatic)	**19**	16	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**740**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC10 (total)	**1000**	320	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (total)	**580**	160	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (aromatic)	< 16	16	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**580**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (total)	**550**	160	ug/m3 Air	Mar-18-11	Custom	RMD	
nC12-nC16 (aromatic)	< 16	16	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**550**	160	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC16 (total)	**1100**	320	ug/m3 Air	Mar-18-11	Custom	RMD	
VHv (6-13)	**870**	320	ug/m3 Air	Mar-18-11	BCMOE	RMD	
VPHv	**840**	320	ug/m3 Air	Mar-18-11	[CALC]	RMD	

MW10-16 well (R103247-21) Matrix: Air Sampled: Mar-10-11 12:45 To Mar-10-11 13:00

Sampling Flow (mL/min): 197 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**440**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC6-nC8 (aromatic)	**47**	3.4	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**410**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (total)	**2100**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC8-nC10 (aromatic)	**210**	17	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**1900**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC10 (total)	**2500**	340	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (total)	**680**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**680**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (total)	**410**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**410**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC16 (total)	**1100**	340	ug/m3 Air	Mar-19-11	Custom	RMD	
VHv (6-13)	**1400**	340	ug/m3 Air	Mar-19-11	BCMOE	RMD	
VPHv	**1200**	340	ug/m3 Air	Mar-19-11	[CALC]	RMD	

MW10-18 well (R103247-22) Matrix: Air Sampled: Mar-10-11 17:15 To Mar-10-11 17:30

Sampling Flow (mL/min): 204 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**230**	160	ug/m3 Air	Mar-19-11	Custom	RMD	
nC6-nC8 (aromatic)	< 3.3	3.3	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**230**	160	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (total)	**290**	160	ug/m3 Air	Mar-19-11	Custom	RMD	
nC8-nC10 (aromatic)	< 16	16	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**280**	160	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC10 (total)	**520**	330	ug/m3 Air	Mar-19-11	Custom	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
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Aggregate Organic Parameters, Continued

MW10-18 well (R103247-22) Matrix: Air Sampled: Mar-10-11 17:15 To Mar-10-11 17:30, Continued

Sampling Flow (mL/min): 204 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC10-nC12 (total)	**200**	160	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (aromatic)	< 16	16	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**190**	160	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (total)	**160**	160	ug/m3 Air	Mar-19-11	Custom	RMD	
nC12-nC16 (aromatic)	< 16	16	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**170**	160	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC16 (total)	**360**	330	ug/m3 Air	Mar-19-11	Custom	RMD	
VHv (6-13)	**420**	330	ug/m3 Air	Mar-19-11	BCMOE	RMD	
VPHv	**420**	330	ug/m3 Air	Mar-19-11	[CALC]	RMD	

MW10-18 probe (R103247-23) Matrix: Air Sampled: Mar-10-11 17:45 To Mar-10-11 18:00

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**230**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC6-nC8 (aromatic)	**5.7**	3.4	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**230**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (total)	**870**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC8-nC10 (aromatic)	**130**	17	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**770**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC10 (total)	**1100**	340	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (total)	**200**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**200**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (total)	**170**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**180**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC16 (total)	**370**	340	ug/m3 Air	Mar-19-11	Custom	RMD	
VHv (6-13)	**600**	340	ug/m3 Air	Mar-19-11	BCMOE	RMD	
VPHv	**470**	340	ug/m3 Air	Mar-19-11	[CALC]	RMD	

MW10-20 well (R103247-24) Matrix: Air Sampled: Mar-11-11 16:00 To Mar-11-11 16:15

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**370**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC6-nC8 (aromatic)	**57**	3.4	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**320**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (total)	**640**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC8-nC10 (aromatic)	**50**	17	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**600**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC6-nC10 (total)	**1000**	340	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (total)	**270**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**260**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (total)	**270**	170	ug/m3 Air	Mar-18-11	Custom	RMD	
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**270**	170	ug/m3 Air	Mar-18-11	[CALC]	RMD	
nC10-nC16 (total)	**540**	340	ug/m3 Air	Mar-18-11	Custom	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
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Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Aggregate Organic Parameters, Continued							
MW10-20 well (R103247-24) Matrix: Air Sampled: Mar-11-11 16:00 To Mar-11-11 16:15, Continued							
Sampling Flow (mL/min): 199	Sampling Time (min): 15						
VHv (6-13)	**670**	340	ug/m3 Air	Mar-18-11	BCMOE	RMD	
VPHv	**570**	340	ug/m3 Air	Mar-18-11	[CALC]	RMD	
MW10-22 well (R103247-25) Matrix: Air Sampled: Mar-09-11 18:45 To Mar-09-11 19:00							
Sampling Flow (mL/min): 205	Sampling Time (min): 15						
nC6-nC8 (total)	**680**	160	ug/m3 Air	Mar-19-11	Custom	RMD	
nC6-nC8 (aromatic)	**110**	33	ug/m3 Air	Mar-21-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**550**	160	ug/m3 Air	Mar-21-11	[CALC]	RMD	
nC8-nC10 (total)	**880**	160	ug/m3 Air	Mar-19-11	Custom	RMD	
nC8-nC10 (aromatic)	**29**	16	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**850**	160	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC10 (total)	**1600**	330	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (total)	**780**	160	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (aromatic)	< 16	16	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**780**	160	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (total)	**360**	160	ug/m3 Air	Mar-19-11	Custom	RMD	
nC12-nC16 (aromatic)	< 16	16	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**360**	160	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC16 (total)	**1200**	330	ug/m3 Air	Mar-19-11	Custom	RMD	
VHv (6-13)	**1300**	330	ug/m3 Air	Mar-19-11	BCMOE	RMD	
VPHv	**1100**	360	ug/m3 Air	Mar-21-11	[CALC]	RMD	
DUP1 (R103247-26) Matrix: Air Sampled: Mar-09-11 18:45 To Mar-09-11 19:00							
Sampling Flow (mL/min): 199	Sampling Time (min): 15						
nC6-nC8 (total)	**200**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC6-nC8 (aromatic)	< 3.4	3.4	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**200**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (total)	**340**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC8-nC10 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**340**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC10 (total)	**540**	340	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (total)	**200**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**210**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (total)	**200**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**190**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC16 (total)	**400**	340	ug/m3 Air	Mar-19-11	Custom	RMD	
VHv (6-13)	**540**	340	ug/m3 Air	Mar-19-11	BCMOE	RMD	
VPHv	**540**	340	ug/m3 Air	Mar-19-11	[CALC]	RMD	
DUP4 (R103247-27) Matrix: Air Sampled: Mar-11-11							
Sampling Flow (mL/min): 199	Sampling Time (min): 15						
nC6-nC8 (total)	**200**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC6-nC8 (aromatic)	< 3.4	3.4	ug/m3 Air	Mar-19-11	[CALC]	RMD	

CARO ANALYTICAL SERVICES

CLIENT Golder Associates Ltd (Calgary) **WORK ORDER #** R103247
PROJECT 10-1346-0046 **REPORTED** Apr-28-11

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Aggregate Organic Parameters, Continued

DUP4 (R103247-27) Matrix: Air Sampled: Mar-11-11, Continued
Sampling Flow (mL/min): 199 Sampling Time (min): 15

nC6-nC8 (non-aromatic)	**200**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC8-nC10 (total)	< 170	170	ug/m3 Air	Mar-19-11	Custom	RMD
nC8-nC10 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC8-nC10 (non-aromatic)	< 170	170	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC6-nC10 (total)	**370**	340	ug/m3 Air	Mar-19-11	Custom	RMD
nC10-nC12 (total)	< 170	170	ug/m3 Air	Mar-19-11	Custom	RMD
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC10-nC12 (non-aromatic)	< 170	170	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC12-nC16 (total)	**200**	170	ug/m3 Air	Mar-19-11	Custom	RMD
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC12-nC16 (non-aromatic)	**190**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC10-nC16 (total)	< 340	340	ug/m3 Air	Mar-19-11	Custom	RMD
VHv (6-13)	**370**	340	ug/m3 Air	Mar-19-11	BCMOE	RMD
VPHv	**370**	340	ug/m3 Air	Mar-19-11	[CALC]	RMD

DUP5A (R103247-28) Matrix: Air Sampled: Mar-15-11 13:15 To Mar-15-11 13:30
Sampling Flow (mL/min): 202 Sampling Time (min): 15

nC6-nC8 (total)	**790**	170	ug/m3 Air	Mar-19-11	Custom	RMD
nC6-nC8 (aromatic)	**14**	3.3	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC6-nC8 (non-aromatic)	**790**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC8-nC10 (total)	**7900**	170	ug/m3 Air	Mar-19-11	Custom	RMD
nC8-nC10 (aromatic)	**330**	17	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC8-nC10 (non-aromatic)	**7600**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC6-nC10 (total)	**8600**	330	ug/m3 Air	Mar-19-11	Custom	RMD
nC10-nC12 (total)	**13000**	170	ug/m3 Air	Mar-19-11	Custom	RMD
nC10-nC12 (aromatic)	**280**	17	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC10-nC12 (non-aromatic)	**13000**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC12-nC16 (total)	**6300**	170	ug/m3 Air	Mar-19-11	Custom	RMD
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC12-nC16 (non-aromatic)	**6300**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC10-nC16 (total)	**19000**	330	ug/m3 Air	Mar-19-11	Custom	RMD
VHv (6-13)	**11000**	330	ug/m3 Air	Mar-19-11	BCMOE	RMD
VPHv	**11000**	330	ug/m3 Air	Mar-19-11	[CALC]	RMD

DUP5B (R103247-29) Matrix: Air Sampled: Mar-15-11 13:15 To Mar-15-11 13:30
Sampling Flow (mL/min): 71 Sampling Time (min): 15

nC6-nC8 (total)	**1000**	470	ug/m3 Air	Mar-19-11	Custom	RMD
nC6-nC8 (aromatic)	**17**	9.4	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC6-nC8 (non-aromatic)	**1000**	470	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC8-nC10 (total)	**6600**	470	ug/m3 Air	Mar-19-11	Custom	RMD
nC8-nC10 (aromatic)	**260**	47	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC8-nC10 (non-aromatic)	**6300**	470	ug/m3 Air	Mar-19-11	[CALC]	RMD
nC6-nC10 (total)	**7600**	940	ug/m3 Air	Mar-19-11	Custom	RMD
nC10-nC12 (total)	**9100**	470	ug/m3 Air	Mar-19-11	Custom	RMD
nC10-nC12 (aromatic)	**170**	47	ug/m3 Air	Mar-19-11	[CALC]	RMD

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Aggregate Organic Parameters, Continued

DUP5B (R103247-29) Matrix: Air Sampled: Mar-15-11 13:15 To Mar-15-11 13:30, Continued
Sampling Flow (mL/min): 71 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC10-nC12 (non-aromatic)	**8900**	470	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (total)	**4600**	470	ug/m3 Air	Mar-19-11	Custom	RMD	
nC12-nC16 (aromatic)	< 47	47	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**4600**	470	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC16 (total)	**14000**	940	ug/m3 Air	Mar-19-11	Custom	RMD	
VHv (6-13)	**9300**	940	ug/m3 Air	Mar-19-11	BCMOE	RMD	
VPHv	**9200**	940	ug/m3 Air	Mar-19-11	[CALC]	RMD	

DUP6A (R103247-30) Matrix: Air Sampled: Mar-15-11 14:15 To Mar-15-11 14:30
Sampling Flow (mL/min): 198 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**440**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC6-nC8 (aromatic)	**47**	3.4	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**400**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (total)	**1400**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC8-nC10 (aromatic)	**84**	17	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**1300**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC10 (total)	**1900**	340	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (total)	**940**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**940**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (total)	**370**	170	ug/m3 Air	Mar-19-11	Custom	RMD	
nC12-nC16 (aromatic)	< 17	17	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**370**	170	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC16 (total)	**1300**	340	ug/m3 Air	Mar-19-11	Custom	RMD	
VHv (6-13)	**1400**	340	ug/m3 Air	Mar-19-11	BCMOE	RMD	
VPHv	**1300**	340	ug/m3 Air	Mar-19-11	[CALC]	RMD	

DUP6B (R103247-31) Matrix: Air Sampled: Mar-15-11 14:15 To Mar-15-11 14:30
Sampling Flow (mL/min): 75 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC6-nC8 (total)	**800**	440	ug/m3 Air	Mar-19-11	Custom	RMD	
nC6-nC8 (aromatic)	**52**	8.9	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC8 (non-aromatic)	**760**	440	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (total)	**2900**	440	ug/m3 Air	Mar-19-11	Custom	RMD	
nC8-nC10 (aromatic)	**68**	44	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC8-nC10 (non-aromatic)	**2800**	440	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC6-nC10 (total)	**3700**	890	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (total)	**2300**	440	ug/m3 Air	Mar-19-11	Custom	RMD	
nC10-nC12 (aromatic)	< 44	44	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC12 (non-aromatic)	**2300**	440	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (total)	**890**	440	ug/m3 Air	Mar-19-11	Custom	RMD	
nC12-nC16 (aromatic)	< 44	44	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC12-nC16 (non-aromatic)	**890**	440	ug/m3 Air	Mar-19-11	[CALC]	RMD	
nC10-nC16 (total)	**3200**	890	ug/m3 Air	Mar-19-11	Custom	RMD	
VHv (6-13)	**3200**	890	ug/m3 Air	Mar-19-11	BCMOE	RMD	
VPHv	**3100**	890	ug/m3 Air	Mar-19-11	[CALC]	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Aggregate Organic Parameters, Continued

Trip Blank (R103247-32) Matrix: Air Sampled: Mar-15-11

nC6-nC8 (total)	**0.5**	0.5	ug	Mar-19-11	Custom	RMD
nC6-nC8 (aromatic)	< 0.010	0.010	ug	Mar-19-11	[CALC]	RMD
nC6-nC8 (non-aromatic)	**0.54**	0.50	ug	Mar-19-11	[CALC]	RMD
nC8-nC10 (total)	< 0.5	0.5	ug	Mar-19-11	Custom	RMD
nC8-nC10 (aromatic)	< 0.050	0.050	ug	Mar-19-11	[CALC]	RMD
nC8-nC10 (non-aromatic)	< 0.50	0.50	ug	Mar-19-11	[CALC]	RMD
nC6-nC10 (total)	< 1.0	1.0	ug	Mar-19-11	Custom	RMD
nC10-nC12 (total)	< 0.5	0.5	ug	Mar-19-11	Custom	RMD
nC10-nC12 (aromatic)	< 0.050	0.050	ug	Mar-19-11	[CALC]	RMD
nC10-nC12 (non-aromatic)	< 0.50	0.50	ug	Mar-19-11	[CALC]	RMD
nC12-nC16 (total)	< 0.5	0.5	ug	Mar-19-11	Custom	RMD
nC12-nC16 (aromatic)	< 0.050	0.050	ug	Mar-19-11	[CALC]	RMD
nC12-nC16 (non-aromatic)	< 0.50	0.50	ug	Mar-19-11	[CALC]	RMD
nC10-nC16 (total)	< 1.0	1.0	ug	Mar-19-11	Custom	RMD
VHv (6-13)	< 1.0	1.0	ug	Mar-19-11	BCMOE	RMD
VPHv	< 1.0	1.0	ug	Mar-19-11	[CALC]	RMD

Volatile Organic Compounds by TD-GCMS

MW10-1 well (R103247-01) Matrix: Air Sampled: Mar-09-11 16:45 To Mar-09-11 17:00

Sampling Flow (mL/min): 199 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,1,1-Trichloroethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,1-Dichloroethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,1-Dichloroethene	< 0.10	0.10	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2,3-Trichloropropane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2,4-Trichlorobenzene	**0.80**	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2,4-Trimethylbenzene	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2-Dibromo-3-chloropropane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2-Dibromoethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2-Dichloroethane	< 0.10	0.10	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,3,5-Trimethylbenzene	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,3-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,3-Dichloropropane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,3-Dichloropropene (cis+trans)	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
Hexachlorobutadiene	**0.44**	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,4-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
2-Chlorotoluene	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
Acetone	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
Acrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
Benzene	**3.7**	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-1 well (R103247-01) Matrix: Air Sampled: Mar-09-11 16:45 To Mar-09-11 17:00, Continued

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Bromobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromoform	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon disulfide	**13**	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.10	0.10	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroform	**8.4**	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Cumene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromomethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**5.7**	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl ether	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethylbenzene	**0.47**	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachloroethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl cyclohexane	**5.7**	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methylene chloride	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Naphthalene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Decane	< 1.0	1.0	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexane	**6.7**	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Nitrobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Styrene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrachloroethene	**15**	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Toluene	**20**	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichloroethene	**0.27**	0.10	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichlorofluoromethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Vinyl chloride	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Xylenes (total)	**6.0**	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-1 well (R103247-01) Matrix: Air Sampled: Mar-09-11 16:45 To Mar-09-11 17:00, Continued

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC8-nC10 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*86 %*	*66-122*		*Mar-17-11*			

MW10-1 probe (R103247-02) Matrix: Air Sampled: Mar-09-11 17:45 To Mar-09-11 18:00

Sampling Flow (mL/min): 208 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.096	0.096	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**1.2**	0.64	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-1 probe (R103247-02) Matrix: Air Sampled: Mar-09-11 17:45 To Mar-09-11 18:00, Continued

Sampling Flow (mL/min): 208 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,2-Dibromoethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.096	0.096	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**1.1**	0.64	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.64	0.64	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Acetone	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Acrylonitrile	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Allyl chloride	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Benzene	**5.8**	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromoform	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon disulfide	**11**	0.64	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.096	0.096	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroethane	< 1.6	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroform	**4.5**	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Cumene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromomethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**6.4**	0.64	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl acetate	< 1.6	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl ether	< 0.64	0.64	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethylbenzene	**2.8**	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachloroethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl acrylate	< 1.6	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl cyclohexane	**4.8**	0.64	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.64	0.64	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.64	0.64	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.64	0.64	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.64	0.64	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methylene chloride	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Naphthalene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Decane	**1.7**	0.96	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexane	**6.7**	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-1 probe (R103247-02) Matrix: Air Sampled: Mar-09-11 17:45 To Mar-09-11 18:00, Continued

Sampling Flow (mL/min): 208 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Nitrobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Styrene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrachloroethene	**71**	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Toluene	**90**	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichloroethene	< 0.096	0.096	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichlorofluoromethane	**0.77**	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Vinyl chloride	< 0.64	0.64	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Xylenes (total)	**16**	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Propylbenzene	**3.5**	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-1 probe (R103247-02) Matrix: Air Sampled: Mar-09-11 17:45 To Mar-09-11 18:00, Continued

Sampling Flow (mL/min): 208 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC12-nC16 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*93 %*	*66-122*		*Mar-17-11*			

MW10-2 well (R103247-03) Matrix: Air Sampled: Mar-09-11 15:15 To Mar-09-11 15:30

Sampling Flow (mL/min): 217 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1,1,2-Tetrachloroethane	< 0.15	0.15	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.15	0.15	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.15	0.15	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.092	0.092	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	**0.61**	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**0.77**	0.61	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.092	0.092	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.15	0.15	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.61	0.61	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachlorobutadiene	**0.34**	0.15	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.61	0.61	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Acetone	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Acrylonitrile	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Allyl chloride	< 0.15	0.15	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Benzene	**0.68**	0.15	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromobenzene	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.15	0.15	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromoform	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon disulfide	**3.7**	0.61	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.092	0.092	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chlorobenzene	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroethane	< 1.5	1.5	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroform	**2.0**	0.15	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Cumene	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromomethane	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**4.0**	0.61	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl acetate	< 1.5	1.5	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-2 well (R103247-03) Matrix: Air Sampled: Mar-09-11 15:15 To Mar-09-11 15:30, Continued

Sampling Flow (mL/min): 217 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Ethyl ether	< 0.61	0.61	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethylbenzene	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachloroethane	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl acrylate	< 1.5	1.5	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl cyclohexane	< 0.61	0.61	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.61	0.61	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.61	0.61	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.61	0.61	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.61	0.61	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methylene chloride	**5.2**	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Naphthalene	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Decane	< 0.92	0.92	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexane	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Nitrobenzene	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Styrene	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrachloroethene	**3.4**	1.5	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrahydrofuran	**0.43**	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Toluene	**3.7**	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.31	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichloroethene	< 0.092	0.092	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichlorofluoromethane	**0.71**	0.31	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Vinyl chloride	< 0.61	0.61	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Xylenes (total)	**5.2**	1.5	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Propylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 15	15	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Volatile Organic Compounds by TD-GCMS, Continued

MW10-2 well (R103247-03) Matrix: Air Sampled: Mar-09-11 15:15 To Mar-09-11 15:30, Continued

Sampling Flow (mL/min): 217 Sampling Time (min): 15

1,2-Dimethyl-4-Ethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,3-Dimethyl-2-Ethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2-Dimethyl-3-Ethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2,4,5-Tetramethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
2-Methylbutylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
tert-1-Butyl-2-Methylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
n-Pentylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
t-1-Butyl-3,5-Dimethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
t-1-Butyl-4-Ethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
nC10-nC12 Other Aromatics	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
nC10-nC12 Non-reg. Aromatics	< 15	15	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,3,5-Triethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2,4-Triethylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
n-Hexylbenzene	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
nC12-nC16 Other Aromatics	< 3.1	3.1	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
nC12-nC16 Non-reg. Aromatics	< 15	15	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
Surrogate: Toluene-d8	*90 %*	*66-122*		*Mar-17-11*		

MW10-3B Shallow probe (R103247-04) Matrix: Air Sampled: Mar-09-11 10:15 To Mar-09-11 10:30

Sampling Flow (mL/min): 206 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,1,1-Trichloroethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,1,2,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,1,2-Trichloroethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,1-Dichloroethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,1-Dichloroethene	< 0.097	0.097	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2,3-Trichloropropane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2,4-Trichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2,4-Trimethylbenzene	**11**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2-Dibromo-3-chloropropane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2-Dibromoethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2-Dichloroethane	< 0.097	0.097	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2-Dichloropropane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,3,5-Trimethylbenzene	**4.9**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,3-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,3-Dichloropropane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,3-Dichloropropene (cis+trans)	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
Hexachlorobutadiene	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,4-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
2-Chlorotoluene	< 0.65	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
Acetone	**17**	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
Acrylonitrile	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
Allyl chloride	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-3B Shallow probe (R103247-04) Matrix: Air Sampled: Mar-09-11 10:15 To Mar-09-11 10:30, Continued

Sampling Flow (mL/min): 206 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Benzene	**2.9**	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromoform	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon disulfide	**8.1**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.097	0.097	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroethane	< 1.6	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroform	**2.9**	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Cumene	**0.74**	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromomethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**3.9**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl acetate	< 1.6	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl ether	< 0.65	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethylbenzene	**5.5**	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachloroethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl acrylate	< 1.6	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl cyclohexane	**5.8**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl ethyl ketone	**2.6**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl isobutyl ketone	**0.97**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.65	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.65	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methylene chloride	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Naphthalene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Decane	**21**	0.97	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexane	**4.2**	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Nitrobenzene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Styrene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrachloroethene	**4.5**	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrahydrofuran	**0.52**	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Toluene	**21**	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichloroethene	< 0.097	0.097	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichlorofluoromethane	< 0.32	0.32	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Vinyl chloride	< 0.65	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Xylenes (total)	**39**	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Propylbenzene	**5.2**	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**11**	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	**6.2**	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-3B Shallow probe (R103247-04) Matrix: Air Sampled: Mar-09-11 10:15 To Mar-09-11 10:30, Continued

Sampling Flow (mL/min): 206 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1-methyl-2-ethylbenzene	**5.5**	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	**28**	16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	**4.9**	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.2	3.2	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*89 %*	*66-122*		*Mar-17-11*			

MW10-3B deep probe (R103247-05) Matrix: Air Sampled: Mar-09-11 11:15 To Mar-09-11 11:30

Sampling Flow (mL/min): 198 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.10	0.10	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-3B deep probe (R103247-05) Matrix: Air Sampled: Mar-09-11 11:15 To Mar-09-11 11:30, Continued

Sampling Flow (mL/min): 198 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,2,4-Trichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**7.4**	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.10	0.10	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**3.4**	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Acetone	**20**	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Acrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Benzene	**3.7**	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromoform	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon disulfide	**11**	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.10	0.10	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroform	**4.0**	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Cumene	**0.54**	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromomethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**5.4**	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl ether	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethylbenzene	**4.0**	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachloroethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl cyclohexane	**6.1**	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl ethyl ketone	**5.4**	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl isobutyl ketone	**1.0**	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-3B deep probe (R103247-05) Matrix: Air Sampled: Mar-09-11 11:15 To Mar-09-11 11:30, Continued

Sampling Flow (mL/min): 198 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Methylene chloride	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Naphthalene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Decane	**19**	1.0	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexane	**4.0**	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Nitrobenzene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Styrene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrachloroethene	**3.0**	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrahydrofuran	**1.0**	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Toluene	**81**	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichloroethene	< 0.10	0.10	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichlorofluoromethane	< 0.34	0.34	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Vinyl chloride	< 0.67	0.67	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Xylenes (total)	**31**	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Propylbenzene	**4.7**	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**7.4**	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	**4.4**	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	**4.0**	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	**21**	17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-3B deep probe (R103247-05) Matrix: Air Sampled: Mar-09-11 11:15 To Mar-09-11 11:30, Continued

Sampling Flow (mL/min): 198 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*87 %*	*66-122*		*Mar-17-11*			

MW10-3B well (R103247-06) Matrix: Air Sampled: Mar-09-11 12:15 To Mar-09-11 12:30

Sampling Flow (mL/min): 204 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.098	0.098	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**5.2**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.098	0.098	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**2.4**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.65	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Acetone	**12**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Acrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Allyl chloride	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Benzene	**2.3**	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromoform	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon disulfide	**8.5**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.098	0.098	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroethane	< 1.6	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroform	**16**	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-3B well (R103247-06) Matrix: Air Sampled: Mar-09-11 12:15 To Mar-09-11 12:30, Continued

Sampling Flow (mL/min): 204 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
cis-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Cumene	**0.56**	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromomethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**2.0**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl acetate	< 1.6	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl ether	< 0.65	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethylbenzene	**7.8**	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachloroethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl acrylate	< 1.6	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl cyclohexane	**11**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl ethyl ketone	**3.1**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl isobutyl ketone	**0.65**	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.65	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.65	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methylene chloride	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Naphthalene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Decane	**12**	0.98	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexane	**7.8**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Nitrobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Styrene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrachloroethene	**3.6**	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrahydrofuran	**0.59**	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Toluene	**69**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichloroethene	< 0.098	0.098	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichlorofluoromethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Vinyl chloride	< 0.65	0.65	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Xylenes (total)	**46**	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Propylbenzene	**4.3**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**5.6**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	**3.6**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	**3.9**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	**18**	16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-3B well (R103247-06) Matrix: Air Sampled: Mar-09-11 12:15 To Mar-09-11 12:30, Continued

Sampling Flow (mL/min): 204 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1-Methyl-4-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*96 %*	*66-122*		*Mar-17-11*			

MW10-5 well (R103247-07) Matrix: Air Sampled: Mar-11-11 09:45 To Mar-11-11 10:00

Sampling Flow (mL/min): 202 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.099	0.099	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	**0.86**	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**6.9**	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.099	0.099	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**2.4**	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-5 well (R103247-07) Matrix: Air Sampled: Mar-11-11 09:45 To Mar-11-11 10:00, Continued

Sampling Flow (mL/min): 202 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Hexachlorobutadiene	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.66	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Acetone	**7.9**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Acrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Benzene	**0.59**	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromoform	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon disulfide	**4.0**	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.099	0.099	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroform	**1.1**	0.17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Cumene	**0.46**	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromomethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**4.3**	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl ether	< 0.66	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethylbenzene	**5.3**	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachloroethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl cyclohexane	**1.6**	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl ethyl ketone	**1.3**	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.66	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl methacrylate	**2.1**	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.66	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methylene chloride	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Naphthalene	**2.0**	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Decane	**2.8**	0.99	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexane	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Nitrobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Styrene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrachloroethene	**79**	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	RA2
Tetrahydrofuran	**0.56**	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Toluene	**360**	33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	RA2
trans-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichloroethene	< 0.099	0.099	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichlorofluoromethane	**1.5**	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-5 well (R103247-07) Matrix: Air Sampled: Mar-11-11 09:45 To Mar-11-11 10:00, Continued

Sampling Flow (mL/min): 202 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Vinyl chloride	< 0.66	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Xylenes (total)	**33**	1.7	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Propylbenzene	**4.3**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**5.9**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	**4.0**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	**3.6**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	**18**	17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*103 %*	*66-122*		*Mar-17-11*			

MW10-5 probe (R103247-08) Matrix: Air Sampled: Mar-11-11 10:30 To Mar-11-11 10:45

Sampling Flow (mL/min): 203 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-5 probe (R103247-08) Matrix: Air Sampled: Mar-11-11 10:30 To Mar-11-11 10:45, Continued

Sampling Flow (mL/min): 203 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1,2-Trichloroethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.099	0.099	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**6.9**	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.099	0.099	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**1.7**	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.66	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Acetone	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Acrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Allyl chloride	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Benzene	**0.53**	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.16	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Bromoform	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon disulfide	**1.4**	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Carbon tetrachloride	**0.13**	0.099	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroethane	< 1.6	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Chloroform	**0.43**	0.16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Cumene	**0.36**	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dibromomethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**8.5**	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl acetate	< 1.6	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl ether	< 0.66	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Ethylbenzene	**9.5**	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Hexachloroethane	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl acrylate	< 1.6	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl cyclohexane	**0.72**	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.66	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-5 probe (R103247-08) Matrix: Air Sampled: Mar-11-11 10:30 To Mar-11-11 10:45, Continued

Sampling Flow (mL/min): 203 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Methyl isobutyl ketone	< 0.66	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.66	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.66	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Methylene chloride	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Naphthalene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Decane	**1.4**	0.99	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Hexane	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Nitrobenzene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Styrene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrachloroethene	**8.9**	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Toluene	**280**	33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	RA2
trans-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichloroethene	< 0.099	0.099	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Trichlorofluoromethane	**2.4**	0.33	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Vinyl chloride	< 0.66	0.66	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Xylenes (total)	**49**	1.6	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Propylbenzene	**4.3**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**5.6**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	**3.9**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	**3.3**	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	**17**	16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Volatile Organic Compounds by TD-GCMS, Continued

MW10-5 probe (R103247-08) Matrix: Air Sampled: Mar-11-11 10:30 To Mar-11-11 10:45, Continued

Sampling Flow (mL/min): 203 Sampling Time (min): 15

t-1-Butyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
nC10-nC12 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
nC10-nC12 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,3,5-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
1,2,4-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
n-Hexylbenzene	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
nC12-nC16 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
nC12-nC16 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-17-11	EPA TO-17	RMD
Surrogate: Toluene-d8	*93 %*	*66-122*		*Mar-17-11*		

MW10-6 probe (R103247-09) Matrix: Air Sampled: Mar-10-11 08:45 To Mar-10-11 09:00

Sampling Flow (mL/min): 207 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1,1-Trichloroethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1,2,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1,2-Trichloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1-Dichloroethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1-Dichloroethene	< 0.097	0.097	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,3-Trichloropropane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,4-Trichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,4-Trimethylbenzene	**61**	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dibromo-3-chloropropane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dibromoethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dichloroethane	< 0.097	0.097	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dichloropropane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3,5-Trimethylbenzene	**61**	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3-Dichloropropane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3-Dichloropropene (cis+trans)	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Hexachlorobutadiene	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,4-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
2-Chlorotoluene	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Acetone	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Acrylonitrile	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Allyl chloride	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Benzene	**2.4**	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Bromobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Bromodichloromethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Bromoform	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Carbon disulfide	**12**	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Carbon tetrachloride	< 0.097	0.097	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Chlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Chloroethane	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-6 probe (R103247-09) Matrix: Air Sampled: Mar-10-11 08:45 To Mar-10-11 09:00, Continued

Sampling Flow (mL/min): 207 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Chloroform	**3.9**	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	**11**	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromomethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**9.3**	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl acetate	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	**25**	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl acrylate	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	**6.4**	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Naphthalene	**58**	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Decane	< 0.97	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Styrene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	**32**	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**81**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichloroethene	< 0.097	0.097	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	**1.8**	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**110**	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Propylbenzene	**13**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**39**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	**20**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	**71**	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
sec-Butylbenzene	**5.2**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	**68**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-6 probe (R103247-09) Matrix: Air Sampled: Mar-10-11 08:45 To Mar-10-11 09:00, Continued

Sampling Flow (mL/min): 207 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1-Methyl-3-n-Propylbenzene	**8.4**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	**5.8**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	**3.5**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	**6.1**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	**20**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	**9.7**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	**130**	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*83 %*	*66-122*		*Mar-18-11*			

MW10-7B deep probe (R103247-10) Matrix: Air Sampled: Mar-10-11 14:15 To Mar-10-11 14:30

Sampling Flow (mL/min): 206 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref	Lab	Notes
1,1,1,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.097	0.097	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**3.6**	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.097	0.097	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**1.2**	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-7B deep probe (R103247-10) Matrix: Air Sampled: Mar-10-11 14:15 To Mar-10-11 14:30, Continued

Sampling Flow (mL/min): 206 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,3-Dichloropropene (cis+trans)	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.65	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acetone	**18**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acrylonitrile	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Allyl chloride	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Benzene	**0.91**	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromoform	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon disulfide	**1.6**	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon tetrachloride	**0.23**	0.097	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroethane	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroform	**0.16**	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	**0.49**	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromomethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**13**	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl acetate	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.65	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	**22**	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl acrylate	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	**4.9**	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	**2.1**	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.65	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.65	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.65	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	**22**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Naphthalene	**45**	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Decane	**1.4**	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Styrene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	**1.8**	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	**0.42**	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**140**	32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	RA2
trans-1,2-Dichloroethene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-7B deep probe (R103247-10) Matrix: Air Sampled: Mar-10-11 14:15 To Mar-10-11 14:30, Continued

Sampling Flow (mL/min): 206 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Trichloroethene	< 0.097	0.097	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	**3.1**	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.65	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**110**	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Propylbenzene	**3.6**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**3.9**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*87 %*	*66-122*		*Mar-18-11*			

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-7B shallow probe (R103247-11) Matrix: Air Sampled: Mar-10-11 15:15 To Mar-10-11 15:30

Sampling Flow (mL/min): 197 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.10	0.10	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**1.8**	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.10	0.10	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acetone	**21**	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Benzene	**0.44**	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromoform	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon disulfide	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon tetrachloride	**0.14**	0.10	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroform	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	**0.37**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromomethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**9.8**	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	**25**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-7B shallow probe (R103247-11) Matrix: Air Sampled: Mar-10-11 15:15 To Mar-10-11 15:30, Continued

Sampling Flow (mL/min): 197 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	**1.3**	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	**3.4**	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	**17**	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Naphthalene	**12**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Decane	< 1.0	1.0	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Styrene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**78**	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichloroethene	**0.14**	0.10	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	**2.3**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**130**	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Propylbenzene	**3.7**	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Volatile Organic Compounds by TD-GCMS, Continued

MW10-7B shallow probe (R103247-11) Matrix: Air Sampled: Mar-10-11 15:15 To Mar-10-11 15:30, Continued

Sampling Flow (mL/min): 197 Sampling Time (min): 15

2-Methylbutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*84 %*	*66-122*		*Mar-18-11*			

MW10-9B well (R103247-12) Matrix: Air Sampled: Mar-10-11 12:00 To Mar-11-11 12:15

Sampling Flow (mL/min): 197 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.10	0.10	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	**0.64**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**2.6**	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.10	0.10	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**0.85**	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acetone	**37**	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Benzene	**0.31**	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-9B well (R103247-12) Matrix: Air Sampled: Mar-10-11 12:00 To Mar-11-11 12:15, Continued

Sampling Flow (mL/min): 197 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Bromoform	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon disulfide	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon tetrachloride	**0.20**	0.10	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroform	**0.27**	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	**0.95**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromomethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**7.8**	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	**44**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	**0.85**	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	**20**	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	**1.1**	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	**4.1**	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Naphthalene	**0.64**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Decane	**4.1**	1.0	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Styrene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	**3.4**	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**610**	34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	RA2
trans-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichloroethene	< 0.10	0.10	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	**2.8**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.68	0.68	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**250**	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Propylbenzene	**4.4**	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**4.1**	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Volatile Organic Compounds by TD-GCMS, Continued

MW10-9B well (R103247-12) Matrix: Air Sampled: Mar-10-11 12:00 To Mar-11-11 12:15, Continued

Sampling Flow (mL/min): 197 Sampling Time (min): 15

sec-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-Methyl-3-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,3-Trimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-Methyl-4-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-Methyl-2-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-Methyl-3-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-Methyl-4-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
n-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3-Dimethyl-5-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Diethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-Methyl-2-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,4-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dimethyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dimethyl-3-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,4,5-Tetramethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
2-Methylbutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
tert-1-Butyl-2-Methylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
n-Pentylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
t-1-Butyl-3,5-Dimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
t-1-Butyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC10-nC12 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3,5-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,4-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
n-Hexylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC12-nC16 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Surrogate: Toluene-d8	*100 %*	*66-122*		*Mar-18-11*		

MW10-9B shallow probe (R103247-13) Matrix: Air Sampled: Mar-10-11 13:15 To Mar-11-11 13:30

Sampling Flow (mL/min): 203 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1,1-Trichloroethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1,2,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1,2-Trichloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1-Dichloroethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1-Dichloroethene	< 0.099	0.099	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,3-Trichloropropane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,4-Trichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,4-Trimethylbenzene	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dibromo-3-chloropropane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dibromoethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-9B shallow probe (R103247-13) Matrix: Air Sampled: Mar-10-11 13:15 To Mar-11-11 13:30, Continued

Sampling Flow (mL/min): 203 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,2-Dichloroethane	< 0.099	0.099	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acetone	**3.9**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Allyl chloride	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Benzene	**0.99**	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromoform	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon disulfide	**3.9**	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon tetrachloride	**0.13**	0.099	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroethane	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroform	**0.72**	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromomethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**3.6**	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl acetate	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	**3.2**	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl acrylate	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	**1.6**	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Naphthalene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Decane	< 0.99	0.99	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-9B shallow probe (R103247-13) Matrix: Air Sampled: Mar-10-11 13:15 To Mar-11-11 13:30, Continued

Sampling Flow (mL/min): 203 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Styrene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	**4.3**	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**66**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichloroethene	< 0.099	0.099	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	**0.79**	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**18**	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Propylbenzene	**3.6**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-9B shallow probe (R103247-13) Matrix: Air Sampled: Mar-10-11 13:15 To Mar-11-11 13:30, Continued

Sampling Flow (mL/min): 203 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC12-nC16 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*86 %*	*66-122*		*Mar-18-11*			

MW10-10 well (R103247-14) Matrix: Air Sampled: Mar-08-11 17:50 To Mar-08-11 18:00

Sampling Flow (mL/min): 215 Sampling Time (min): 10

1,1,1,2-Tetrachloroethane	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.14	0.14	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	< 0.93	0.93	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.14	0.14	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.93	0.93	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.93	0.93	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acetone	**6.5**	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acrylonitrile	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Allyl chloride	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Benzene	**0.23**	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromobenzene	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromoform	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon disulfide	< 0.93	0.93	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.14	0.14	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chlorobenzene	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroethane	< 2.3	2.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroform	**0.33**	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromomethane	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**5.1**	0.93	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-10 well (R103247-14) Matrix: Air Sampled: Mar-08-11 17:50 To Mar-08-11 18:00, Continued

Sampling Flow (mL/min): 215 Sampling Time (min): 10

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Ethyl acetate	< 2.3	2.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.93	0.93	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	**4.7**	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl acrylate	< 2.3	2.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	< 0.93	0.93	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.93	0.93	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.93	0.93	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.93	0.93	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.93	0.93	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Naphthalene	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Decane	< 1.4	1.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Styrene	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	< 2.3	2.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**16**	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.47	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichloroethene	**0.42**	0.14	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	**1.3**	0.47	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.93	0.93	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**30**	2.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Propylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-Butylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 23	23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Isobutylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
sec-Butylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Butylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Volatile Organic Compounds by TD-GCMS, Continued

MW10-10 well (R103247-14) Matrix: Air Sampled: Mar-08-11 17:50 To Mar-08-11 18:00, Continued

Sampling Flow (mL/min): 215 Sampling Time (min): 10

1,4-Dimethyl-2-Ethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dimethyl-4-Ethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3-Dimethyl-2-Ethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dimethyl-3-Ethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,4,5-Tetramethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
2-Methylbutylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
tert-1-Butyl-2-Methylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
n-Pentylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
t-1-Butyl-3,5-Dimethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
t-1-Butyl-4-Ethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC10-nC12 Other Aromatics	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC10-nC12 Non-reg. Aromatics	< 23	23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3,5-Triethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,4-Triethylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
n-Hexylbenzene	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC12-nC16 Other Aromatics	< 4.7	4.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC12-nC16 Non-reg. Aromatics	< 23	23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Surrogate: Toluene-d8	*88 %*	*66-122*		*Mar-18-11*		

MW10-11 probe (R103247-15) Matrix: Air Sampled: Mar-08-11 14:20 To Mar-08-11 14:30

Sampling Flow (mL/min): 207 Sampling Time (min): 10

1,1,1,2-Tetrachloroethane	< 0.24	0.24	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1,1-Trichloroethane	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1,2,2-Tetrachloroethane	< 0.24	0.24	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1,2-Trichloroethane	< 0.24	0.24	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1-Dichloroethane	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1-Dichloroethene	< 0.15	0.15	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,3-Trichloropropane	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,4-Trichlorobenzene	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,4-Trimethylbenzene	**2.6**	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dibromo-3-chloropropane	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dibromoethane	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dichlorobenzene	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dichloroethane	< 0.15	0.15	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dichloropropane	< 0.24	0.24	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3,5-Trimethylbenzene	< 0.97	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3-Dichlorobenzene	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3-Dichloropropane	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3-Dichloropropene (cis+trans)	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Hexachlorobutadiene	< 0.24	0.24	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,4-Dichlorobenzene	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
2-Chlorotoluene	< 0.97	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Acetone	**8.2**	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Acrylonitrile	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-11 probe (R103247-15) Matrix: Air Sampled: Mar-08-11 14:20 To Mar-08-11 14:30, Continued

Sampling Flow (mL/min): 207 Sampling Time (min): 10

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Allyl chloride	< 0.24	0.24	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Benzene	< 0.24	0.24	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromobenzene	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.24	0.24	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromoform	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon disulfide	< 0.97	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.15	0.15	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chlorobenzene	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroethane	< 2.4	2.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroform	**0.29**	0.24	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromomethane	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**2.7**	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl acetate	< 2.4	2.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.97	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	**1.5**	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl acrylate	< 2.4	2.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	< 0.97	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	**1.2**	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.97	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.97	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.97	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Naphthalene	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Decane	< 1.5	1.5	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Styrene	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	< 2.4	2.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**32**	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichloroethene	< 0.15	0.15	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	< 0.48	0.48	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.97	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**16**	2.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Propylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-11 probe (R103247-15) Matrix: Air Sampled: Mar-08-11 14:20 To Mar-08-11 14:30, Continued

Sampling Flow (mL/min): 207 Sampling Time (min): 10

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1-methyl-2-ethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-Butylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 24	24	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Isobutylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
sec-Butylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Butylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Pentylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 24	24	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexylbenzene	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 4.8	4.8	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 24	24	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*83 %*	*66-122*		*Mar-18-11*			

MW10-11 well (R103247-16) Matrix: Air Sampled: Mar-08-11 15:50 To Mar-08-11 16:00

Sampling Flow (mL/min): 218 Sampling Time (min): 10

1,1,1,2-Tetrachloroethane	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.14	0.14	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-11 well (R103247-16) Matrix: Air Sampled: Mar-08-11 15:50 To Mar-08-11 16:00, Continued

Sampling Flow (mL/min): 218 Sampling Time (min): 10

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,2,4-Trimethylbenzene	< 0.92	0.92	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.14	0.14	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.92	0.92	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.92	0.92	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acetone	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acrylonitrile	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Allyl chloride	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Benzene	**0.78**	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromobenzene	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.23	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromoform	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon disulfide	**2.9**	0.92	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon tetrachloride	**0.23**	0.14	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chlorobenzene	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroethane	< 2.3	2.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroform	**5.5**	0.23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromomethane	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**5.1**	0.92	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl acetate	< 2.3	2.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.92	0.92	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	**1.9**	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl acrylate	< 2.3	2.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	**0.96**	0.92	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.92	0.92	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.92	0.92	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.92	0.92	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.92	0.92	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Naphthalene	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-11 well (R103247-16) Matrix: Air Sampled: Mar-08-11 15:50 To Mar-08-11 16:00, Continued

Sampling Flow (mL/min): 218 Sampling Time (min): 10

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
n-Decane	< 1.4	1.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Styrene	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	< 2.3	2.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**43**	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.46	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichloroethene	**1.5**	0.14	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	**1.3**	0.46	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.92	0.92	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**14**	2.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Propylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-Butylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 23	23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Isobutylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
sec-Butylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Butylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Pentylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 23	23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-11 well (R103247-16) Matrix: Air Sampled: Mar-08-11 15:50 To Mar-08-11 16:00, Continued

Sampling Flow (mL/min): 218 Sampling Time (min): 10

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
n-Hexylbenzene	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 4.6	4.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 23	23	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*88 %*	*66-122*		*Mar-18-11*			

MW10-12 well (R103247-17) Matrix: Air Sampled: Mar-11-11 17:15 To Mar-11-11 17:30

Sampling Flow (mL/min): 201 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.100	0.100	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.100	0.100	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acetone	**14**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Benzene	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromoform	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon disulfide	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.100	0.100	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroform	**0.23**	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromomethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-12 well (R103247-17) Matrix: Air Sampled: Mar-11-11 17:15 To Mar-11-11 17:30, Continued

Sampling Flow (mL/min): 201 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Dichlorodifluoromethane	**2.0**	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Naphthalene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Decane	< 1.00	1.00	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	**3.7**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Styrene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**3.7**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichloroethene	< 0.100	0.100	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**4.0**	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-12 well (R103247-17) Matrix: Air Sampled: Mar-11-11 17:15 To Mar-11-11 17:30, Continued

Sampling Flow (mL/min): 201 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1-Methyl-2-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*87 %*	*66-122*		*Mar-18-11*			

MW10-14 well (R103247-18) Matrix: Air Sampled: Mar-09-11 14:00 To Mar-09-11 14:15

Sampling Flow (mL/min): 201 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.100	0.100	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**6.0**	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.100	0.100	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**3.1**	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acetone	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-14 well (R103247-18) Matrix: Air Sampled: Mar-09-11 14:00 To Mar-09-11 14:15, Continued

Sampling Flow (mL/min): 201 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Acrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Benzene	**2.5**	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromoform	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon disulfide	**12**	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon tetrachloride	**0.100**	0.100	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroform	**4.6**	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	**0.66**	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromomethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**5.6**	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	**7.3**	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	**3.1**	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	**5.3**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Naphthalene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Decane	**5.6**	1.00	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Styrene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	**5.6**	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**96**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichloroethene	< 0.100	0.100	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	**1.8**	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.66	0.66	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**50**	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Propylbenzene	**5.0**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**7.6**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Volatile Organic Compounds by TD-GCMS, Continued

MW10-14 well (R103247-18) Matrix: Air Sampled: Mar-09-11 14:00 To Mar-09-11 14:15, Continued

Sampling Flow (mL/min): 201 Sampling Time (min): 15

1-methyl-4-ethylbenzene	**5.0**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-methyl-2-ethylbenzene	**4.0**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
tert-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC8-nC10 Non-reg. Aromatics	**21**	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Isobutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
sec-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-Methyl-3-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,3-Trimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-Methyl-4-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-Methyl-2-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-Methyl-3-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-Methyl-4-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
n-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3-Dimethyl-5-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Diethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1-Methyl-2-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,4-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dimethyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2-Dimethyl-3-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,4,5-Tetramethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
2-Methylbutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
tert-1-Butyl-2-Methylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
n-Pentylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
t-1-Butyl-3,5-Dimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
t-1-Butyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC10-nC12 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,3,5-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,4-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
n-Hexylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC12-nC16 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
Surrogate: Toluene-d8	*88 %*	*66-122*		*Mar-18-11*		

MW10-15 well (R103247-19) Matrix: Air Sampled: Mar-09-11 08:45 To Mar-09-11 09:00

Sampling Flow (mL/min): 204 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1,1-Trichloroethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1,2,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1,2-Trichloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1-Dichloroethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,1-Dichloroethene	< 0.098	0.098	ug/m3 Air	Mar-18-11	EPA TO-17	RMD
1,2,3-Trichloropropane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-15 well (R103247-19) Matrix: Air Sampled: Mar-09-11 08:45 To Mar-09-11 09:00, Continued

Sampling Flow (mL/min): 204 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,2,4-Trichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**2.3**	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.098	0.098	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**1.1**	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.65	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acetone	**4.6**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Allyl chloride	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Benzene	**2.6**	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromoform	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon disulfide	**8.2**	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.098	0.098	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroethane	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroform	**6.5**	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	**0.33**	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromomethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**5.9**	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl acetate	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.65	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	**3.9**	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl acrylate	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	**4.3**	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	**0.88**	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.65	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.65	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.65	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-15 well (R103247-19) Matrix: Air Sampled: Mar-09-11 08:45 To Mar-09-11 09:00, Continued

Sampling Flow (mL/min): 204 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Naphthalene	**1.3**	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Decane	**7.2**	0.98	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	**4.3**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Styrene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	**2.3**	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**46**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichloroethene	**0.26**	0.098	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	**1.4**	0.33	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.65	0.65	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**27**	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**3.3**	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-15 well (R103247-19) Matrix: Air Sampled: Mar-09-11 08:45 To Mar-09-11 09:00, Continued

Sampling Flow (mL/min): 204 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,2,4-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*86 %*	*66-122*		*Mar-18-11*			

MW10-16 probe (R103247-20) Matrix: Air Sampled: Mar-10-11 11:45 To Mar-10-11 12:00

Sampling Flow (mL/min): 207 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref	Lab	Notes
1,1,1,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.097	0.097	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.097	0.097	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acetone	**5.5**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acrylonitrile	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Allyl chloride	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Benzene	**1.0**	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.16	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromoform	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon disulfide	**8.4**	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.097	0.097	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chlorobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroethane	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroform	**3.1**	0.16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-16 probe (R103247-20) Matrix: Air Sampled: Mar-10-11 11:45 To Mar-10-11 12:00, Continued

Sampling Flow (mL/min): 207 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Dibromomethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**8.7**	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl acetate	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	**1.9**	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl acrylate	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	**2.0**	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	**3.9**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Naphthalene	**0.77**	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Decane	**1.7**	0.97	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Styrene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	< 1.6	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**13**	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.32	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichloroethene	< 0.097	0.097	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	**2.1**	0.32	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.64	0.64	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**17**	1.6	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-16 probe (R103247-20) Matrix: Air Sampled: Mar-10-11 11:45 To Mar-10-11 12:00, Continued

Sampling Flow (mL/min): 207 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,2-Diethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.2	3.2	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*82 %*	*66-122*		*Mar-18-11*			

MW10-16 well (R103247-21) Matrix: Air Sampled: Mar-10-11 12:45 To Mar-10-11 13:00

Sampling Flow (mL/min): 197 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**1.5**	0.68	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.68	0.68	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.68	0.68	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-16 well (R103247-21) Matrix: Air Sampled: Mar-10-11 12:45 To Mar-10-11 13:00, Continued

Sampling Flow (mL/min): 197 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Acetone	**5.8**	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Benzene	**1.1**	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromoform	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon disulfide	**6.1**	0.68	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroform	**2.4**	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	**0.41**	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Cumene	**0.78**	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromomethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**7.8**	0.68	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl ether	< 0.68	0.68	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethylbenzene	**31**	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl cyclohexane	**2.5**	0.68	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl ethyl ketone	**2.4**	0.68	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.68	0.68	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.68	0.68	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.68	0.68	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methylene chloride	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Naphthalene	**0.64**	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Decane	**1.6**	1.0	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexane	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Nitrobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Styrene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrachloroethene	**4.7**	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Toluene	**47**	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichloroethene	**0.27**	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichlorofluoromethane	**1.8**	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Vinyl chloride	< 0.68	0.68	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Xylenes (total)	**180**	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Propylbenzene	**4.1**	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-16 well (R103247-21) Matrix: Air Sampled: Mar-10-11 12:45 To Mar-10-11 13:00, Continued

Sampling Flow (mL/min): 197 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1-methyl-3-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*82 %*	*66-122*		*Mar-19-11*			

MW10-18 well (R103247-22) Matrix: Air Sampled: Mar-10-11 17:15 To Mar-10-11 17:30

Sampling Flow (mL/min): 204 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.098	0.098	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-18 well (R103247-22) Matrix: Air Sampled: Mar-10-11 17:15 To Mar-10-11 17:30, Continued

Sampling Flow (mL/min): 204 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,2,3-Trichloropropane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.098	0.098	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acetone	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Allyl chloride	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Benzene	**0.23**	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromoform	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon disulfide	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon tetrachloride	**0.52**	0.098	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroethane	< 1.6	1.6	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroform	**0.20**	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Cumene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromomethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**2.4**	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl acetate	< 1.6	1.6	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl ether	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethylbenzene	**0.78**	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachloroethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl acrylate	< 1.6	1.6	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl cyclohexane	**1.3**	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl ethyl ketone	**1.1**	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-18 well (R103247-22) Matrix: Air Sampled: Mar-10-11 17:15 To Mar-10-11 17:30, Continued

Sampling Flow (mL/min): 204 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Methylene chloride	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Naphthalene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Decane	< 0.98	0.98	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexane	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Nitrobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Styrene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrachloroethene	< 1.6	1.6	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Toluene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichloroethene	< 0.098	0.098	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichlorofluoromethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Vinyl chloride	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Xylenes (total)	**7.5**	1.6	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-18 well (R103247-22) Matrix: Air Sampled: Mar-10-11 17:15 To Mar-10-11 17:30, Continued

Sampling Flow (mL/min): 204 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,3,5-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*85 %*	*66-122*		*Mar-19-11*			

MW10-18 probe (R103247-23) Matrix: Air Sampled: Mar-10-11 17:45 To Mar-10-11 18:00

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acetone	**14**	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Benzene	**0.54**	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromoform	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon disulfide	**2.0**	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon tetrachloride	**0.10**	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroform	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Cumene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-18 probe (R103247-23) Matrix: Air Sampled: Mar-10-11 17:45 To Mar-10-11 18:00, Continued

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Dibromochloromethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromomethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**5.7**	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl ether	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethylbenzene	**22**	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl cyclohexane	**1.1**	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methylene chloride	**13**	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Naphthalene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Decane	**2.4**	1.0	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexane	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Nitrobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Styrene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrachloroethene	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrahydrofuran	**0.34**	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Toluene	**5.0**	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichloroethene	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichlorofluoromethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Vinyl chloride	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Xylenes (total)	**100**	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-18 probe (R103247-23) Matrix: Air Sampled: Mar-10-11 17:45 To Mar-10-11 18:00, Continued

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,3-Dimethyl-5-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*83 %*	*66-122*		*Mar-19-11*			

MW10-20 well (R103247-24) Matrix: Air Sampled: Mar-11-11 16:00 To Mar-11-11 16:15

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.10	0.10	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	**0.77**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**1.5**	0.67	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.10	0.10	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.67	0.67	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachlorobutadiene	**0.50**	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-20 well (R103247-24) Matrix: Air Sampled: Mar-11-11 16:00 To Mar-11-11 16:15, Continued

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
2-Chlorotoluene	< 0.67	0.67	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acetone	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Acrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Benzene	**0.20**	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Bromoform	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon disulfide	< 0.67	0.67	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.10	0.10	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Chloroform	**0.80**	0.17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Cumene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dibromomethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**6.7**	0.67	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl ether	< 0.67	0.67	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Ethylbenzene	**7.0**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Hexachloroethane	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl cyclohexane	< 0.67	0.67	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.67	0.67	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.67	0.67	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.67	0.67	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.67	0.67	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Methylene chloride	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Naphthalene	**2.7**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Decane	< 1.0	1.0	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexane	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Nitrobenzene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Styrene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrachloroethene	< 1.7	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Toluene	**54**	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichloroethene	< 0.10	0.10	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Trichlorofluoromethane	**1.2**	0.34	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Vinyl chloride	< 0.67	0.67	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Xylenes (total)	**44**	1.7	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-20 well (R103247-24) Matrix: Air Sampled: Mar-11-11 16:00 To Mar-11-11 16:15, Continued

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
n-Propylbenzene	**3.4**	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-18-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*81 %*	*66-122*		*Mar-18-11*			

MW10-22 well (R103247-25) Matrix: Air Sampled: Mar-09-11 18:45 To Mar-09-11 19:00

Sampling Flow (mL/min): 205 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-22 well (R103247-25) Matrix: Air Sampled: Mar-09-11 18:45 To Mar-09-11 19:00, Continued

Sampling Flow (mL/min): 205 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1-Dichloroethene	< 0.098	0.098	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**2.7**	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.098	0.098	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**1.1**	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acetone	**18**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Allyl chloride	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Benzene	**1.7**	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.16	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromoform	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon disulfide	**6.2**	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.098	0.098	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroethane	< 1.6	1.6	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroform	**3.0**	0.16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Cumene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromomethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**6.8**	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl acetate	< 1.6	1.6	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl ether	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethylbenzene	**3.3**	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachloroethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl acrylate	< 1.6	1.6	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl cyclohexane	**2.2**	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

MW10-22 well (R103247-25) Matrix: Air Sampled: Mar-09-11 18:45 To Mar-09-11 19:00, Continued

Sampling Flow (mL/min): 205 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Methyl tert-butyl ether	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methylene chloride	**4.2**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Naphthalene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Decane	< 0.98	0.98	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexane	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Nitrobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Styrene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrachloroethene	**3.9**	1.6	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrahydrofuran	**0.85**	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Toluene	**110**	33	ug/m3 Air	Mar-21-11	EPA TO-17	RMD	RA2
trans-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichloroethene	**0.33**	0.098	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichlorofluoromethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Vinyl chloride	< 0.65	0.65	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Xylenes (total)	**22**	1.6	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Propylbenzene	**3.6**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**3.3**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Volatile Organic Compounds by TD-GCMS, Continued

MW10-22 well (R103247-25) Matrix: Air Sampled: Mar-09-11 18:45 To Mar-09-11 19:00, Continued

Sampling Flow (mL/min): 205 Sampling Time (min): 15

nC10-nC12 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,3,5-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2,4-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
n-Hexylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
nC12-nC16 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
nC12-nC16 Non-reg. Aromatics	< 16	16	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Surrogate: Toluene-d8	*86 %*	*66-122*		*Mar-19-11*		

DUP1 (R103247-26) Matrix: Air Sampled: Mar-09-11 18:45 To Mar-09-11 19:00

Sampling Flow (mL/min): 199 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,1,1-Trichloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,1-Dichloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,1-Dichloroethene	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2,3-Trichloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2,4-Trichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2,4-Trimethylbenzene	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2-Dibromo-3-chloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2-Dibromoethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2-Dichloroethane	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,3,5-Trimethylbenzene	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,3-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,3-Dichloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,3-Dichloropropene (cis+trans)	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Hexachlorobutadiene	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,4-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
2-Chlorotoluene	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Acetone	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Acrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Benzene	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Bromobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Bromoform	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Carbon disulfide	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Carbon tetrachloride	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Chlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Chloroform	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
cis-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP1 (R103247-26) Matrix: Air Sampled: Mar-09-11 18:45 To Mar-09-11 19:00, Continued

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Cumene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromomethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dichlorodifluoromethane	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl ether	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethylbenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl cyclohexane	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methylene chloride	**8.4**	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Naphthalene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Decane	< 1.0	1.0	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexane	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Nitrobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Styrene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrachloroethene	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Toluene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichloroethene	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichlorofluoromethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Vinyl chloride	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Xylenes (total)	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP1 (R103247-26) Matrix: Air Sampled: Mar-09-11 18:45 To Mar-09-11 19:00, Continued

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
n-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*85 %*	*66-122*		*Mar-19-11*			

DUP4 (R103247-27) Matrix: Air Sampled: Mar-11-11

Sampling Flow (mL/min): 199 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	RA1
1,2,4-Trimethylbenzene	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP4 (R103247-27) Matrix: Air Sampled: Mar-11-11, Continued
Sampling Flow (mL/min): 199 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,4-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acetone	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Benzene	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromoform	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon disulfide	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroform	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Cumene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromomethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dichlorodifluoromethane	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl ether	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethylbenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl cyclohexane	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methylene chloride	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Naphthalene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Decane	< 1.0	1.0	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexane	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Nitrobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Styrene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrachloroethene	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Toluene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichloroethene	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichlorofluoromethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Vinyl chloride	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes

Volatile Organic Compounds by TD-GCMS, Continued

DUP4 (R103247-27) Matrix: Air Sampled: Mar-11-11, Continued

Sampling Flow (mL/min): 199 Sampling Time (min): 15

Xylenes (total)	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1-methyl-3-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1-methyl-4-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1-methyl-2-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
tert-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
nC8-nC10 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Isobutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
sec-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1-Methyl-3-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2,3-Trimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1-Methyl-4-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1-Methyl-2-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1-Methyl-3-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1-Methyl-4-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
n-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,3-Dimethyl-5-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2-Diethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1-Methyl-2-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,4-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2-Dimethyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,3-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2-Dimethyl-3-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2,4,5-Tetramethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
2-Methylbutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
tert-1-Butyl-2-Methylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
n-Pentylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
t-1-Butyl-3,5-Dimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
t-1-Butyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
nC10-nC12 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,3,5-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,2,4-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
n-Hexylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
nC12-nC16 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
Surrogate: Toluene-d8	*86 %*	*66-122*		*Mar-19-11*		

DUP5A (R103247-28) Matrix: Air Sampled: Mar-15-11 13:15 To Mar-15-11 13:30

Sampling Flow (mL/min): 202 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,1,1-Trichloroethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP5A (R103247-28) Matrix: Air Sampled: Mar-15-11 13:15 To Mar-15-11 13:30, Continued

Sampling Flow (mL/min): 202 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1-Dichloroethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.099	0.099	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**69**	0.66	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloroethane	**0.099**	0.099	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**66**	0.66	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.66	0.66	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acetone	**11**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Benzene	**0.56**	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromoform	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon disulfide	**30**	0.66	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon tetrachloride	**0.099**	0.099	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chlorobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroform	**9.6**	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	**2.2**	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Cumene	**20**	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromomethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**18**	0.66	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl ether	< 0.66	0.66	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethylbenzene	**9.9**	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachloroethane	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl cyclohexane	**32**	0.66	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl ethyl ketone	**1.8**	0.66	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.66	0.66	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP5A (R103247-28) Matrix: Air Sampled: Mar-15-11 13:15 To Mar-15-11 13:30, Continued

Sampling Flow (mL/min): 202 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Methyl methacrylate	< 0.66	0.66	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.66	0.66	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methylene chloride	**11**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Naphthalene	**83**	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Decane	< 0.99	0.99	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexane	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Nitrobenzene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Styrene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrachloroethene	**110**	17	ug/m3 Air	Mar-21-11	EPA TO-17	RMD	RA2
Tetrahydrofuran	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Toluene	**13**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.33	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichloroethene	**2.4**	0.099	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichlorofluoromethane	**3.0**	0.33	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Vinyl chloride	< 0.66	0.66	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Xylenes (total)	**63**	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**43**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	**29**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	**36**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	**110**	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
sec-Butylbenzene	**4.3**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	**86**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	**12**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	**9.6**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	**6.6**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	**9.6**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	**36**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	**5.9**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	**30**	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP5A (R103247-28) Matrix: Air Sampled: Mar-15-11 13:15 To Mar-15-11 13:30, Continued
Sampling Flow (mL/min): 202 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
nC10-nC12 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	**190**	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.3	3.3	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*74 %*	*66-122*		*Mar-19-11*			

DUP5B (R103247-29) Matrix: Air Sampled: Mar-15-11 13:15 To Mar-15-11 13:30
Sampling Flow (mL/min): 71 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.47	0.47	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.47	0.47	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.47	0.47	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.28	0.28	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**51**	1.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.28	0.28	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.47	0.47	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**50**	1.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.47	0.47	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Chlorotoluene	< 1.9	1.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acetone	**19**	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acrylonitrile	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Allyl chloride	< 0.47	0.47	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Benzene	< 0.47	0.47	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromobenzene	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.47	0.47	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromoform	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon disulfide	**24**	1.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.28	0.28	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chlorobenzene	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroethane	< 4.7	4.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroform	**6.7**	0.47	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP5B (R103247-29) Matrix: Air Sampled: Mar-15-11 13:15 To Mar-15-11 13:30, Continued

Sampling Flow (mL/min): 71 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
cis-1,2-Dichloroethene	**2.1**	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Cumene	**14**	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromomethane	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**14**	1.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl acetate	< 4.7	4.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl ether	< 1.9	1.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethylbenzene	**6.3**	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachloroethane	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl acrylate	< 4.7	4.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl cyclohexane	**27**	1.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 1.9	1.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 1.9	1.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl methacrylate	< 1.9	1.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 1.9	1.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methylene chloride	**32**	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Naphthalene	**52**	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Decane	< 2.8	2.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexane	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Nitrobenzene	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Styrene	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrachloroethene	**89**	4.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Toluene	**17**	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.94	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichloroethene	**2.0**	0.28	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichlorofluoromethane	**2.3**	0.94	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Vinyl chloride	< 1.9	1.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Xylenes (total)	**52**	4.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Propylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**30**	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	**26**	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	**30**	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-Butylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	**86**	47	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Isobutylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
sec-Butylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	**56**	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	**10**	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP5B (R103247-29) Matrix: Air Sampled: Mar-15-11 13:15 To Mar-15-11 13:30, Continued

Sampling Flow (mL/min): 71 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1-Methyl-4-n-Propylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Butylbenzene	**12**	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	**22**	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	**17**	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Pentylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	**120**	47	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexylbenzene	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 9.4	9.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 47	47	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*86 %*	*66-122*		*Mar-19-11*			

DUP6A (R103247-30) Matrix: Air Sampled: Mar-15-11 14:15 To Mar-15-11 14:30

Sampling Flow (mL/min): 198 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**4.4**	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	**1.2**	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP6A (R103247-30) Matrix: Air Sampled: Mar-15-11 14:15 To Mar-15-11 14:30, Continued

Sampling Flow (mL/min): 198 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Hexachlorobutadiene	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acetone	**9.1**	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Allyl chloride	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Benzene	**0.47**	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromoform	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon disulfide	**2.4**	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon tetrachloride	**0.91**	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chlorobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroethane	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroform	**6.1**	0.17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Cumene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromomethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**16**	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl acetate	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl ether	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethylbenzene	**11**	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachloroethane	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl acrylate	< 1.7	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl cyclohexane	**2.1**	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl ethyl ketone	**1.0**	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methylene chloride	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Naphthalene	**0.74**	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Decane	**1.5**	1.0	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexane	**4.0**	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Nitrobenzene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Styrene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrachloroethene	**2.6**	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrahydrofuran	**0.61**	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Toluene	**44**	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichloroethene	< 0.10	0.10	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichlorofluoromethane	**4.0**	0.34	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP6A (R103247-30) Matrix: Air Sampled: Mar-15-11 14:15 To Mar-15-11 14:30, Continued

Sampling Flow (mL/min): 198 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Vinyl chloride	< 0.67	0.67	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Xylenes (total)	**67**	1.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Propylbenzene	**3.7**	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	**4.4**	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Isobutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
sec-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Butylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Pentylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexylbenzene	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 3.4	3.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 17	17	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*81 %*	*66-122*		*Mar-19-11*			

DUP6B (R103247-31) Matrix: Air Sampled: Mar-15-11 14:15 To Mar-15-11 14:30

Sampling Flow (mL/min): 75 Sampling Time (min): 15

1,1,1,2-Tetrachloroethane	< 0.44	0.44	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.44	0.44	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP6B (R103247-31) Matrix: Air Sampled: Mar-15-11 14:15 To Mar-15-11 14:30, Continued

Sampling Flow (mL/min): 75 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
1,1,2-Trichloroethane	< 0.44	0.44	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.27	0.27	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	**5.1**	1.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.27	0.27	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.44	0.44	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 1.8	1.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachlorobutadiene	**1.2**	0.44	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Chlorotoluene	< 1.8	1.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acetone	**21**	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Acrylonitrile	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Allyl chloride	< 0.44	0.44	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Benzene	< 0.44	0.44	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromobenzene	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.44	0.44	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Bromoform	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon disulfide	< 1.8	1.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Carbon tetrachloride	**0.89**	0.27	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chlorobenzene	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroethane	< 4.4	4.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Chloroform	**5.3**	0.44	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
cis-1,2-Dichloroethene	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Cumene	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dibromomethane	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Dichlorodifluoromethane	**18**	1.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl acetate	< 4.4	4.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl ether	< 1.8	1.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Ethylbenzene	**7.9**	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Hexachloroethane	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl acrylate	< 4.4	4.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl cyclohexane	< 1.8	1.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 1.8	1.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP6B (R103247-31) Matrix: Air Sampled: Mar-15-11 14:15 To Mar-15-11 14:30, Continued

Sampling Flow (mL/min): 75 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
Methyl isobutyl ketone	< 1.8	1.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl methacrylate	< 1.8	1.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 1.8	1.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Methylene chloride	**16**	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Naphthalene	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Decane	< 2.7	2.7	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexane	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Nitrobenzene	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Styrene	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrachloroethene	< 4.4	4.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Toluene	**52**	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.89	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichloroethene	< 0.27	0.27	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Trichlorofluoromethane	**3.2**	0.89	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Vinyl chloride	< 1.8	1.8	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Xylenes (total)	**54**	4.4	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Propylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-Butylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 44	44	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Isobutylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
sec-Butylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Butylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Pentylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

DUP6B (R103247-31) Matrix: Air Sampled: Mar-15-11 14:15 To Mar-15-11 14:30, Continued

Sampling Flow (mL/min): 75 Sampling Time (min): 15

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
t-1-Butyl-4-Ethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 44	44	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
n-Hexylbenzene	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 8.9	8.9	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 44	44	ug/m3 Air	Mar-19-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*79 %*	*66-122*		*Mar-19-11*			

Trip Blank (R103247-32) Matrix: Air Sampled: Mar-15-11

1,1,1,2-Tetrachloroethane	< 0.0005	0.0005	ug	Mar-19-11	EPA TO-17	RMD	
1,1,1-Trichloroethane	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
1,1,2,2-Tetrachloroethane	< 0.0005	0.0005	ug	Mar-19-11	EPA TO-17	RMD	
1,1,2-Trichloroethane	< 0.0005	0.0005	ug	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethane	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
1,1-Dichloroethene	< 0.0003	0.0003	ug	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trichloropropane	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trichlorobenzene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
1,2,4-Trimethylbenzene	< 0.0020	0.0020	ug	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromo-3-chloropropane	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
1,2-Dibromoethane	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
1,2-Dichlorobenzene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloroethane	< 0.0003	0.0003	ug	Mar-19-11	EPA TO-17	RMD	
1,2-Dichloropropane	< 0.0005	0.0005	ug	Mar-19-11	EPA TO-17	RMD	
1,3,5-Trimethylbenzene	< 0.0020	0.0020	ug	Mar-19-11	EPA TO-17	RMD	
1,3-Dichlorobenzene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropane	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
1,3-Dichloropropene (cis+trans)	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Hexachlorobutadiene	< 0.0005	0.0005	ug	Mar-19-11	EPA TO-17	RMD	
1,4-Dichlorobenzene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
2-Chlorotoluene	< 0.0020	0.0020	ug	Mar-19-11	EPA TO-17	RMD	
Acetone	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
Acrylonitrile	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Allyl chloride	< 0.0005	0.0005	ug	Mar-19-11	EPA TO-17	RMD	
Benzene	< 0.0005	0.0005	ug	Mar-19-11	EPA TO-17	RMD	
Bromobenzene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Bromodichloromethane	< 0.0005	0.0005	ug	Mar-19-11	EPA TO-17	RMD	
Bromoform	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Carbon disulfide	< 0.0020	0.0020	ug	Mar-19-11	EPA TO-17	RMD	
Carbon tetrachloride	< 0.0003	0.0003	ug	Mar-19-11	EPA TO-17	RMD	
Chlorobenzene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Chloroethane	< 0.0050	0.0050	ug	Mar-19-11	EPA TO-17	RMD	
Chloroform	< 0.0005	0.0005	ug	Mar-19-11	EPA TO-17	RMD	

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Continued

Trip Blank (R103247-32) Matrix: Air Sampled: Mar-15-11, Continued

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
cis-1,2-Dichloroethene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Cumene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Dibromochloromethane	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Dibromomethane	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Dichlorodifluoromethane	< 0.0020	0.0020	ug	Mar-19-11	EPA TO-17	RMD	
Ethyl acetate	< 0.0050	0.0050	ug	Mar-19-11	EPA TO-17	RMD	
Ethyl ether	< 0.0020	0.0020	ug	Mar-19-11	EPA TO-17	RMD	
Ethyl methacrylate	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Ethylbenzene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Hexachloroethane	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Methacrylonitrile	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Methyl acrylate	< 0.0050	0.0050	ug	Mar-19-11	EPA TO-17	RMD	
Methyl cyclohexane	< 0.0020	0.0020	ug	Mar-19-11	EPA TO-17	RMD	
Methyl ethyl ketone	< 0.0020	0.0020	ug	Mar-19-11	EPA TO-17	RMD	
Methyl isobutyl ketone	< 0.0020	0.0020	ug	Mar-19-11	EPA TO-17	RMD	
Methyl methacrylate	< 0.0020	0.0020	ug	Mar-19-11	EPA TO-17	RMD	
Methyl tert-butyl ether	< 0.0020	0.0020	ug	Mar-19-11	EPA TO-17	RMD	
Methylene chloride	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
Naphthalene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
n-Decane	< 0.0030	0.0030	ug	Mar-19-11	EPA TO-17	RMD	
n-Hexane	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
Nitrobenzene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Styrene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Tetrachloroethene	< 0.0050	0.0050	ug	Mar-19-11	EPA TO-17	RMD	
Tetrahydrofuran	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Toluene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
trans-1,2-Dichloroethene	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Trichloroethene	< 0.0003	0.0003	ug	Mar-19-11	EPA TO-17	RMD	
Trichlorofluoromethane	< 0.0010	0.0010	ug	Mar-19-11	EPA TO-17	RMD	
Vinyl chloride	< 0.0020	0.0020	ug	Mar-19-11	EPA TO-17	RMD	
Xylenes (total)	< 0.0050	0.0050	ug	Mar-19-11	EPA TO-17	RMD	
n-Propylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1-methyl-3-ethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1-methyl-4-ethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1-methyl-2-ethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
tert-Butylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
nC8-nC10 Non-reg. Aromatics	< 0.050	0.050	ug	Mar-19-11	EPA TO-17	RMD	
Isobutylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
sec-Butylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-Isopropylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1,2,3-Trimethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-Isopropylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-Isopropylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1-Methyl-3-n-Propylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1-Methyl-4-n-Propylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	

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Volatile Organic Compounds by TD-GCMS, Continued

Trip Blank (R103247-32) Matrix: Air Sampled: Mar-15-11, Continued

Analyte	Result	RDL	Units	Analyzed	Method Ref (*mod. from)	Lab	Notes
n-Butylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-5-Ethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1,2-Diethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1-Methyl-2-n-Propylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1,4-Dimethyl-2-Ethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-4-Ethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1,3-Dimethyl-2-Ethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1,2-Dimethyl-3-Ethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1,2,4,5-Tetramethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
2-Methylbutylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
tert-1-Butyl-2-Methylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
n-Pentylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-3,5-Dimethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
t-1-Butyl-4-Ethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Other Aromatics	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
nC10-nC12 Non-reg. Aromatics	< 0.050	0.050	ug	Mar-19-11	EPA TO-17	RMD	
1,3,5-Triethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
1,2,4-Triethylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
n-Hexylbenzene	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Other Aromatics	< 0.010	0.010	ug	Mar-19-11	EPA TO-17	RMD	
nC12-nC16 Non-reg. Aromatics	< 0.050	0.050	ug	Mar-19-11	EPA TO-17	RMD	
Surrogate: Toluene-d8	*80 %*	*66-122*		*Mar-19-11*			

Sample Qualifiers:

RA1 Reported Detection Limit (RDL) for this analyte has been raised due to failed ion ratio and/or matrix interference.

RA2 Reported Detection Limit (RDL) for this analyte has been raised because initial result was over the calibration range. The sample was diluted and re-analyzed.

QUALITY CONTROL DATA

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The following section reports quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with quality control samples that ensure your data is of the highest quality. Common QC types include:

• Method Blank (Blk): Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment

• Duplicate (Dup): Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method's precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.

• Blank Spike (BS): A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method's accuracy (i.e. closeness of the result to a target value).

• Standard Reference Material (SRM): A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested for.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
Aggregate Organic Parameters, Batch R100746										
Blank (R100746-BLK1)				Analyzed: Mar-17-11						
nC6-nC8 (total)	< 0.5	0.5	ug							
nC8-nC10 (total)	< 0.5	0.5	ug							
nC6-nC10 (total)	< 1.0	1.0	ug							
nC10-nC12 (total)	< 0.5	0.5	ug							
nC12-nC16 (total)	< 0.5	0.5	ug							
nC10-nC16 (total)	< 1.0	1.0	ug							
VHv (6-13)	< 1.0	1.0	ug							
LCS (R100746-BS2)				Analyzed: Mar-18-11						
VHv (6-13)	10.1	1.0	ug	10.0		101	86-122			
Aggregate Organic Parameters, Batch R100750										
Blank (R100750-BLK1)				Analyzed: Mar-17-11						
nC6-nC8 (total)	< 0.5	0.5	ug							
nC8-nC10 (total)	< 0.5	0.5	ug							
nC6-nC10 (total)	< 1.0	1.0	ug							
nC10-nC12 (total)	< 0.5	0.5	ug							
nC12-nC16 (total)	< 0.5	0.5	ug							
nC10-nC16 (total)	< 1.0	1.0	ug							
VHv (6-13)	< 1.0	1.0	ug							
LCS (R100750-BS2)				Analyzed: Mar-19-11						
VHv (6-13)	10.4	1.0	ug	10.0		104	86-122			
Duplicate (R100750-DUP1)		**Source: R103247-15**		Analyzed: Mar-18-11						
nC6-nC8 (total)	430	240	ug/m3 Air		390				30	
nC8-nC10 (total)	770	240	ug/m3 Air		680				30	
nC10-nC12 (total)	340	240	ug/m3 Air		290				30	
nC12-nC16 (total)	430	240	ug/m3 Air		290				30	
VHv (6-13)	870	480	ug/m3 Air		770				30	
Aggregate Organic Parameters, Batch R100755										
Blank (R100755-BLK1)				Analyzed: Mar-15-11						
nC6-nC8 (total)	< 0.5	0.5	ug							
nC8-nC10 (total)	< 0.5	0.5	ug							
nC6-nC10 (total)	< 1.0	1.0	ug							
nC10-nC12 (total)	< 0.5	0.5	ug							
nC12-nC16 (total)	< 0.5	0.5	ug							

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
Aggregate Organic Parameters, Batch R100755, Continued										
Blank (R100755-BLK1), Continued				Analyzed: Mar-15-11						
nC10-nC16 (total)	< 1.0	1.0	ug							
VHv (6-13)	< 1.0	1.0	ug							
LCS (R100755-BS2)				Analyzed: Mar-21-11						
VHv (6-13)	10.6	1.0	ug	10.0		106	86-122			
Duplicate (R100755-DUP1)		**Source: R103247-24**		Analyzed: Mar-19-11						
nC6-nC8 (total)	400	170	ug/m3 Air		370				30	
nC8-nC10 (total)	600	170	ug/m3 Air		640				30	
nC10-nC12 (total)	300	170	ug/m3 Air		270				30	
nC12-nC16 (total)	370	170	ug/m3 Air		270				30	
VHv (6-13)	700	340	ug/m3 Air		670				30	
Aggregate Organic Parameters, Batch R100763										
Blank (R100763-BLK1)				Analyzed: Mar-24-11						
nC6-nC8 (total)	< 0.5	0.5	ug							
nC8-nC10 (total)	< 0.5	0.5	ug							
nC6-nC10 (total)	< 1.0	1.0	ug							
nC10-nC12 (total)	< 0.5	0.5	ug							
nC12-nC16 (total)	< 0.5	0.5	ug							
nC10-nC16 (total)	< 1.0	1.0	ug							
VHv (6-13)	< 1.0	1.0	ug							
LCS (R100763-BS2)				Analyzed: Mar-23-11						
VHv (6-13)	10.7	1.0	ug	10.0		107	86-122			
Volatile Organic Compounds by TD-GCMS, Batch R100746										
Blank (R100746-BLK1)				Analyzed: Mar-17-11						
1,1,1,2-Tetrachloroethane	< 0.0005	0.0005	ug							
1,1,1-Trichloroethane	< 0.0010	0.0010	ug							
1,1,2,2-Tetrachloroethane	< 0.0005	0.0005	ug							
1,1,2-Trichloroethane	< 0.0005	0.0005	ug							
1,1-Dichloroethane	< 0.0010	0.0010	ug							
1,1-Dichloroethene	< 0.0003	0.0003	ug							
1,2,3-Trichloropropane	< 0.0010	0.0010	ug							
1,2,4-Trichlorobenzene	< 0.0010	0.0010	ug							
1,2,4-Trimethylbenzene	< 0.0020	0.0020	ug							
1,2-Dibromo-3-chloropropane	< 0.0010	0.0010	ug							
1,2-Dibromoethane	< 0.0010	0.0010	ug							
1,2-Dichlorobenzene	< 0.0010	0.0010	ug							
1,2-Dichloroethane	< 0.0003	0.0003	ug							
1,2-Dichloropropane	< 0.0005	0.0005	ug							
1,3,5-Trimethylbenzene	< 0.0020	0.0020	ug							
1,3-Dichlorobenzene	< 0.0010	0.0010	ug							
1,3-Dichloropropane	< 0.0010	0.0010	ug							
1,3-Dichloropropene (cis+trans)	< 0.0010	0.0010	ug							
Hexachlorobutadiene	< 0.0005	0.0005	ug							
1,4-Dichlorobenzene	< 0.0010	0.0010	ug							
2-Chlorotoluene	< 0.0020	0.0020	ug							
Acetone	< 0.010	0.010	ug							
Acrylonitrile	< 0.0010	0.0010	ug							
Allyl chloride	< 0.0005	0.0005	ug							
Benzene	< 0.0005	0.0005	ug							
Bromobenzene	< 0.0010	0.0010	ug							
Bromodichloromethane	< 0.0005	0.0005	ug							
Bromoform	< 0.0010	0.0010	ug							
Carbon disulfide	< 0.0020	0.0020	ug							
Carbon tetrachloride	< 0.0003	0.0003	ug							
Chlorobenzene	< 0.0010	0.0010	ug							
Chloroethane	< 0.0050	0.0050	ug							

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Volatile Organic Compounds by TD-GCMS, Batch R100746, Continued

Blank (R100746-BLK1), Continued — Analyzed: Mar-17-11

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
Chloroform	< 0.0005	0.0005	ug							
cis-1,2-Dichloroethene	< 0.0010	0.0010	ug							
Cumene	< 0.0010	0.0010	ug							
Dibromochloromethane	< 0.0010	0.0010	ug							
Dibromomethane	< 0.0010	0.0010	ug							
Dichlorodifluoromethane	< 0.0020	0.0020	ug							
Ethyl acetate	< 0.0050	0.0050	ug							
Ethyl ether	< 0.0020	0.0020	ug							
Ethyl methacrylate	< 0.0010	0.0010	ug							
Ethylbenzene	< 0.0010	0.0010	ug							
Hexachloroethane	< 0.0010	0.0010	ug							
Methacrylonitrile	< 0.0010	0.0010	ug							
Methyl acrylate	< 0.0050	0.0050	ug							
Methyl cyclohexane	< 0.0020	0.0020	ug							
Methyl ethyl ketone	< 0.0020	0.0020	ug							
Methyl isobutyl ketone	< 0.0020	0.0020	ug							
Methyl methacrylate	< 0.0020	0.0020	ug							
Methyl tert-butyl ether	< 0.0020	0.0020	ug							
Methylene chloride	< 0.010	0.010	ug							
Naphthalene	< 0.0010	0.0010	ug							
n-Decane	< 0.0030	0.0030	ug							
n-Hexane	< 0.010	0.010	ug							
Nitrobenzene	< 0.0010	0.0010	ug							
Styrene	< 0.0010	0.0010	ug							
Tetrachloroethene	< 0.0050	0.0050	ug							
Tetrahydrofuran	< 0.0010	0.0010	ug							
Toluene	< 0.010	0.010	ug							
trans-1,2-Dichloroethene	< 0.0010	0.0010	ug							
Trichloroethene	< 0.0003	0.0003	ug							
Trichlorofluoromethane	< 0.0010	0.0010	ug							
Vinyl chloride	< 0.0020	0.0020	ug							
Xylenes (total)	< 0.0050	0.0050	ug							
n-Propylbenzene	< 0.010	0.010	ug							
1-methyl-3-ethylbenzene	< 0.010	0.010	ug							
1-methyl-4-ethylbenzene	< 0.010	0.010	ug							
1-methyl-2-ethylbenzene	< 0.010	0.010	ug							
tert-Butylbenzene	< 0.010	0.010	ug							
nC8-nC10 Non-reg. Aromatics	< 0.050	0.050	ug							
Isobutylbenzene	< 0.010	0.010	ug							
sec-Butylbenzene	< 0.010	0.010	ug							
1-Methyl-3-Isopropylbenzene	< 0.010	0.010	ug							
1,2,3-Trimethylbenzene	< 0.010	0.010	ug							
1-Methyl-4-Isopropylbenzene	< 0.010	0.010	ug							
1-Methyl-2-Isopropylbenzene	< 0.010	0.010	ug							
1-Methyl-3-n-Propylbenzene	< 0.010	0.010	ug							
1-Methyl-4-n-Propylbenzene	< 0.010	0.010	ug							
n-Butylbenzene	< 0.010	0.010	ug							
1,3-Dimethyl-5-Ethylbenzene	< 0.010	0.010	ug							
1,2-Diethylbenzene	< 0.010	0.010	ug							
1-Methyl-2-n-Propylbenzene	< 0.010	0.010	ug							
1,4-Dimethyl-2-Ethylbenzene	< 0.010	0.010	ug							
1,2-Dimethyl-4-Ethylbenzene	< 0.010	0.010	ug							
1,3-Dimethyl-2-Ethylbenzene	< 0.010	0.010	ug							
1,2-Dimethyl-3-Ethylbenzene	< 0.010	0.010	ug							
1,2,4,5-Tetramethylbenzene	< 0.010	0.010	ug							
2-Methylbutylbenzene	< 0.010	0.010	ug							
tert-1-Butyl-2-Methylbenzene	< 0.010	0.010	ug							
n-Pentylbenzene	< 0.010	0.010	ug							
t-1-Butyl-3,5-Dimethylbenzene	< 0.010	0.010	ug							
t-1-Butyl-4-Ethylbenzene	< 0.010	0.010	ug							
nC10-nC12 Other Aromatics	< 0.010	0.010	ug							
nC10-nC12 Non-reg. Aromatics	< 0.050	0.050	ug							
1,3,5-Triethylbenzene	< 0.010	0.010	ug							
1,2,4-Triethylbenzene	< 0.010	0.010	ug							

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Volatile Organic Compounds by TD-GCMS, Batch R100746, Continued

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
Blank (R100746-BLK1), Continued				Analyzed: Mar-17-11						
n-Hexylbenzene	< 0.010	0.010	ug							
nC12-nC16 Other Aromatics	< 0.010	0.010	ug							
nC12-nC16 Non-reg. Aromatics	< 0.050	0.050	ug							
LCS (R100746-BS1)				Analyzed: Mar-17-11						
1,1,1,2-Tetrachloroethane	0.0617	0.0005	ug	0.0500		123	70-130			
1,1,1-Trichloroethane	0.0428	0.0010	ug	0.0500		86	70-130			
1,1,2,2-Tetrachloroethane	0.0452	0.0005	ug	0.0500		90	70-130			
1,1,2-Trichloroethane	0.0417	0.0005	ug	0.0500		83	70-130			
1,1-Dichloroethane	0.0430	0.0010	ug	0.0500		86	70-130			
1,1-Dichloroethene	0.0408	0.0003	ug	0.0500		82	70-130			
1,2,3-Trichloropropane	0.0530	0.0010	ug	0.0500		106	70-130			
1,2,4-Trichlorobenzene	0.0455	0.0010	ug	0.0500		91	70-130			
1,2,4-Trimethylbenzene	0.0439	0.0020	ug	0.0500		88	70-130			
1,2-Dibromo-3-chloropropane	0.0446	0.0010	ug	0.0500		89	70-130			
1,2-Dibromoethane	0.0420	0.0010	ug	0.0500		84	70-130			
1,2-Dichlorobenzene	0.0438	0.0010	ug	0.0500		88	70-130			
1,2-Dichloroethane	0.0492	0.0003	ug	0.0500		98	70-130			
1,2-Dichloropropane	0.0444	0.0005	ug	0.0500		89	70-130			
1,3,5-Trimethylbenzene	0.0433	0.0020	ug	0.0500		87	70-130			
1,3-Dichlorobenzene	0.0444	0.0010	ug	0.0500		89	70-130			
1,3-Dichloropropane	0.0443	0.0010	ug	0.0500		89	70-130			
1,3-Dichloropropene (cis+trans)	0.0953	0.0010	ug	0.100		95	70-130			
Hexachlorobutadiene	0.0515	0.0005	ug	0.0500		103	70-130			
1,4-Dichlorobenzene	0.0441	0.0010	ug	0.0500		88	70-130			
2-Chlorotoluene	0.0453	0.0020	ug	0.0500		91	70-130			
Acetone	0.0492	0.010	ug	0.0500		98	70-130			
Acrylonitrile	0.0436	0.0010	ug	0.0500		87	70-130			
Allyl chloride	0.0479	0.0005	ug	0.0500		96	70-130			
Benzene	0.0410	0.0005	ug	0.0500		82	70-130			
Bromobenzene	0.0450	0.0010	ug	0.0500		90	70-130			
Bromodichloromethane	0.0472	0.0005	ug	0.0500		94	70-130			
Bromoform	0.0578	0.0010	ug	0.0500		116	70-130			
Carbon disulfide	0.0363	0.0020	ug	0.0500		73	70-130			
Carbon tetrachloride	0.0493	0.0003	ug	0.0500		99	70-130			
Chlorobenzene	0.0436	0.0010	ug	0.0500		87	70-130			
Chloroethane	0.0395	0.0050	ug	0.0500		79	70-130			
Chloroform	0.0447	0.0005	ug	0.0500		89	70-130			
cis-1,2-Dichloroethene	0.0402	0.0010	ug	0.0500		80	70-130			
Cumene	0.0458	0.0010	ug	0.0500		92	70-130			
Dibromochloromethane	0.0448	0.0010	ug	0.0500		90	70-130			
Dibromomethane	0.0452	0.0010	ug	0.0500		90	70-130			
Dichlorodifluoromethane	0.0381	0.0020	ug	0.0500		76	70-130			
Ethyl acetate	0.0595	0.0050	ug	0.0500		119	70-130			
Ethyl ether	0.0409	0.0020	ug	0.0500		82	70-130			
Ethyl methacrylate	0.0453	0.0010	ug	0.0500		91	70-130			
Ethylbenzene	0.0447	0.0010	ug	0.0500		89	70-130			
Methacrylonitrile	0.0491	0.0010	ug	0.0500		98	70-130			
Methyl acrylate	0.0468	0.0050	ug	0.0500		94	70-130			
Methyl cyclohexane	0.0500	0.0020	ug	0.0500		100	70-130			
Methyl ethyl ketone	0.0375	0.0020	ug	0.0500		75	70-130			
Methyl isobutyl ketone	0.0454	0.0020	ug	0.0500		91	70-130			
Methyl methacrylate	0.0500	0.0020	ug	0.0500		100	70-130			
Methyl tert-butyl ether	0.0526	0.0020	ug	0.0500		105	70-130			
Methylene chloride	0.0351	0.010	ug	0.0500		70	70-130			
Naphthalene	0.0523	0.0010	ug	0.0500		105	70-130			
n-Decane	0.0479	0.0030	ug	0.0500		96	70-130			
n-Hexane	0.0576	0.010	ug	0.0500		115	70-130			
Nitrobenzene	0.0460	0.0010	ug	0.0500		92	70-130			
Styrene	0.0438	0.0010	ug	0.0500		88	70-130			
Tetrachloroethene	0.0446	0.0050	ug	0.0500		89	70-130			
Tetrahydrofuran	0.0440	0.0010	ug	0.0500		88	70-130			
Toluene	0.0488	0.010	ug	0.0500		98	70-130			
trans-1,2-Dichloroethene	0.0387	0.0010	ug	0.0500		77	70-130			

CARO ANALYTICAL SERVICES

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Batch R100746, Continued

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
LCS (R100746-BS1), Continued				Analyzed: Mar-17-11						
Trichloroethene	0.0417	0.0003	ug	0.0500		83	70-130			
Trichlorofluoromethane	0.0502	0.0010	ug	0.0500		100	70-130			
Vinyl chloride	0.0617	0.0020	ug	0.0500		123	70-130			
Xylenes (total)	0.142	0.0050	ug	0.150		95	70-130			
LCS Dup (R100746-BSD1)				Analyzed: Mar-17-11						
1,1,1,2-Tetrachloroethane	0.0568	0.0005	ug	0.0500		114	70-130	8	12	
1,1,1-Trichloroethane	0.0467	0.0010	ug	0.0500		93	70-130	9	17	
1,1,2,2-Tetrachloroethane	0.0420	0.0005	ug	0.0500		84	70-130	7	15	
1,1,2-Trichloroethane	0.0434	0.0005	ug	0.0500		87	70-130	4	12	
1,1-Dichloroethane	0.0477	0.0010	ug	0.0500		95	70-130	10	26	
1,1-Dichloroethene	0.0528	0.0003	ug	0.0500		106	70-130	25	29	
1,2,3-Trichloropropane	0.0493	0.0010	ug	0.0500		99	70-130	7	13	
1,2,4-Trichlorobenzene	0.0463	0.0010	ug	0.0500		93	70-130	2	16	
1,2,4-Trimethylbenzene	0.0446	0.0020	ug	0.0500		89	70-130	2	15	
1,2-Dibromo-3-chloropropane	0.0403	0.0010	ug	0.0500		81	70-130	10	26	
1,2-Dibromoethane	0.0436	0.0010	ug	0.0500		87	70-130	4	17	
1,2-Dichlorobenzene	0.0427	0.0010	ug	0.0500		85	70-130	3	16	
1,2-Dichloroethane	0.0493	0.0003	ug	0.0500		99	70-130	< 1	17	
1,2-Dichloropropane	0.0464	0.0005	ug	0.0500		93	70-130	4	13	
1,3,5-Trimethylbenzene	0.0438	0.0020	ug	0.0500		88	70-130	1	13	
1,3-Dichlorobenzene	0.0433	0.0010	ug	0.0500		87	70-130	2	14	
1,3-Dichloropropane	0.0462	0.0010	ug	0.0500		92	70-130	4	9	
1,3-Dichloropropene (cis+trans)	0.0953	0.0010	ug	0.100		95	70-130	< 1	25	
Hexachlorobutadiene	0.0485	0.0005	ug	0.0500		97	70-130	6	20	
1,4-Dichlorobenzene	0.0433	0.0010	ug	0.0500		87	70-130	2	16	
2-Chlorotoluene	0.0419	0.0020	ug	0.0500		84	70-130	8	22	
Acetone	0.0575	0.010	ug	0.0500		115	70-130	16	27	
Acrylonitrile	0.0412	0.0010	ug	0.0500		82	70-130	6	25	
Allyl chloride	0.0510	0.0005	ug	0.0500		102	70-130	6	25	
Benzene	0.0459	0.0005	ug	0.0500		92	70-130	11	14	
Bromobenzene	0.0437	0.0010	ug	0.0500		87	70-130	3	17	
Bromodichloromethane	0.0471	0.0005	ug	0.0500		94	70-130	< 1	22	
Bromoform	0.0534	0.0010	ug	0.0500		107	70-130	8	16	
Carbon disulfide	0.0474	0.0020	ug	0.0500		95	70-130	26	27	
Carbon tetrachloride	0.0533	0.0003	ug	0.0500		107	70-130	8	29	
Chlorobenzene	0.0420	0.0010	ug	0.0500		84	70-130	4	14	
Chloroethane	0.0523	0.0050	ug	0.0500		105	70-130	28	29	
Chloroform	0.0444	0.0005	ug	0.0500		89	70-130	< 1	21	
cis-1,2-Dichloroethene	0.0404	0.0010	ug	0.0500		81	70-130	< 1	16	
Cumene	0.0450	0.0010	ug	0.0500		90	70-130	2	16	
Dibromochloromethane	0.0458	0.0010	ug	0.0500		92	70-130	2	23	
Dibromomethane	0.0429	0.0010	ug	0.0500		86	70-130	5	16	
Dichlorodifluoromethane	0.0493	0.0020	ug	0.0500		99	70-130	26	30	
Ethyl acetate	0.0607	0.0050	ug	0.0500		121	70-130	2	24	
Ethyl ether	0.0442	0.0020	ug	0.0500		88	70-130	8	17	
Ethyl methacrylate	0.0421	0.0010	ug	0.0500		84	70-130	7	24	
Ethylbenzene	0.0435	0.0010	ug	0.0500		87	70-130	3	19	
Methacrylonitrile	0.0484	0.0010	ug	0.0500		97	70-130	1	23	
Methyl acrylate	0.0472	0.0050	ug	0.0500		94	70-130	< 1	21	
Methyl cyclohexane	0.0464	0.0020	ug	0.0500		93	70-130	7	15	
Methyl ethyl ketone	0.0380	0.0020	ug	0.0500		76	70-130	1	27	
Methyl isobutyl ketone	0.0409	0.0020	ug	0.0500		82	70-130	10	11	
Methyl methacrylate	0.0477	0.0020	ug	0.0500		95	70-130	5	12	
Methyl tert-butyl ether	0.0540	0.0020	ug	0.0500		108	70-130	2	28	
Methylene chloride	0.0444	0.010	ug	0.0500		89	70-130	23	27	
Naphthalene	0.0543	0.0010	ug	0.0500		109	70-130	4	22	
n-Decane	0.0489	0.0030	ug	0.0500		98	70-130	2	15	
n-Hexane	0.0575	0.010	ug	0.0500		115	70-130	< 1	21	
Nitrobenzene	0.0426	0.0010	ug	0.0500		85	70-130	8	22	
Styrene	0.0421	0.0010	ug	0.0500		84	70-130	4	16	
Tetrachloroethene	0.0441	0.0050	ug	0.0500		88	70-130	1	22	
Tetrahydrofuran	0.0424	0.0010	ug	0.0500		85	70-130	4	19	
Toluene	0.0486	0.010	ug	0.0500		97	70-130	< 1	15	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
Volatile Organic Compounds by TD-GCMS, Batch R100746, Continued										
LCS Dup (R100746-BSD1), Continued				Analyzed: Mar-17-11						
trans-1,2-Dichloroethene	0.0397	0.0010	ug	0.0500		79	70-130	3	16	
Trichloroethene	0.0433	0.0003	ug	0.0500		87	70-130	4	16	
Trichlorofluoromethane	0.0602	0.0010	ug	0.0500		120	70-130	18	49	
Vinyl chloride	0.0558	0.0020	ug	0.0500		112	70-130	10	31	
Xylenes (total)	0.139	0.0050	ug	0.150		93	70-130	2	16	
Volatile Organic Compounds by TD-GCMS, Batch R100750										
Blank (R100750-BLK1)				Analyzed: Mar-17-11						
1,1,1,2-Tetrachloroethane	< 0.0005	0.0005	ug							
1,1,1-Trichloroethane	< 0.0010	0.0010	ug							
1,1,2,2-Tetrachloroethane	< 0.0005	0.0005	ug							
1,1,2-Trichloroethane	< 0.0005	0.0005	ug							
1,1-Dichloroethane	< 0.0010	0.0010	ug							
1,1-Dichloroethene	< 0.0003	0.0003	ug							
1,2,3-Trichloropropane	< 0.0010	0.0010	ug							
1,2,4-Trichlorobenzene	< 0.0010	0.0010	ug							
1,2,4-Trimethylbenzene	< 0.0020	0.0020	ug							
1,2-Dibromo-3-chloropropane	< 0.0010	0.0010	ug							
1,2-Dibromoethane	< 0.0010	0.0010	ug							
1,2-Dichlorobenzene	< 0.0010	0.0010	ug							
1,2-Dichloroethane	< 0.0003	0.0003	ug							
1,2-Dichloropropane	< 0.0005	0.0005	ug							
1,3,5-Trimethylbenzene	< 0.0020	0.0020	ug							
1,3-Dichlorobenzene	< 0.0010	0.0010	ug							
1,3-Dichloropropane	< 0.0010	0.0010	ug							
1,3-Dichloropropene (cis+trans)	< 0.0010	0.0010	ug							
Hexachlorobutadiene	< 0.0005	0.0005	ug							
1,4-Dichlorobenzene	< 0.0010	0.0010	ug							
2-Chlorotoluene	< 0.0020	0.0020	ug							
Acetone	< 0.010	0.010	ug							
Acrylonitrile	< 0.0010	0.0010	ug							
Allyl chloride	< 0.0005	0.0005	ug							
Benzene	< 0.0005	0.0005	ug							
Bromobenzene	< 0.0010	0.0010	ug							
Bromodichloromethane	< 0.0005	0.0005	ug							
Bromoform	< 0.0010	0.0010	ug							
Carbon disulfide	< 0.0020	0.0020	ug							
Carbon tetrachloride	< 0.0003	0.0003	ug							
Chlorobenzene	< 0.0010	0.0010	ug							
Chloroethane	< 0.0050	0.0050	ug							
Chloroform	< 0.0005	0.0005	ug							
cis-1,2-Dichloroethene	< 0.0010	0.0010	ug							
Cumene	< 0.0010	0.0010	ug							
Dibromochloromethane	< 0.0010	0.0010	ug							
Dibromomethane	< 0.0010	0.0010	ug							
Dichlorodifluoromethane	< 0.0020	0.0020	ug							
Ethyl acetate	< 0.0050	0.0050	ug							
Ethyl ether	< 0.0020	0.0020	ug							
Ethyl methacrylate	< 0.0010	0.0010	ug							
Ethylbenzene	< 0.0010	0.0010	ug							
Hexachloroethane	< 0.0010	0.0010	ug							
Methacrylonitrile	< 0.0010	0.0010	ug							
Methyl acrylate	< 0.0050	0.0050	ug							
Methyl cyclohexane	< 0.0020	0.0020	ug							
Methyl ethyl ketone	< 0.0020	0.0020	ug							
Methyl isobutyl ketone	< 0.0020	0.0020	ug							
Methyl methacrylate	< 0.0020	0.0020	ug							
Methyl tert-butyl ether	< 0.0020	0.0020	ug							
Methylene chloride	< 0.010	0.010	ug							
Naphthalene	< 0.0010	0.0010	ug							
n-Decane	< 0.0030	0.0030	ug							
n-Hexane	< 0.010	0.010	ug							

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes

Volatile Organic Compounds by TD-GCMS, Batch R100750, Continued

Blank (R100750-BLK1), Continued				Analyzed: Mar-17-11						
Nitrobenzene	< 0.0010	0.0010	ug							
Styrene	< 0.0010	0.0010	ug							
Tetrachloroethene	< 0.0050	0.0050	ug							
Tetrahydrofuran	< 0.0010	0.0010	ug							
Toluene	< 0.010	0.010	ug							
trans-1,2-Dichloroethene	< 0.0010	0.0010	ug							
Trichloroethene	< 0.0003	0.0003	ug							
Trichlorofluoromethane	< 0.0010	0.0010	ug							
Vinyl chloride	< 0.0020	0.0020	ug							
Xylenes (total)	< 0.0050	0.0050	ug							
n-Propylbenzene	< 0.010	0.010	ug							
1-methyl-3-ethylbenzene	< 0.010	0.010	ug							
1-methyl-4-ethylbenzene	< 0.010	0.010	ug							
1-methyl-2-ethylbenzene	< 0.010	0.010	ug							
tert-Butylbenzene	< 0.010	0.010	ug							
nC8-nC10 Non-reg. Aromatics	< 0.050	0.050	ug							
Isobutylbenzene	< 0.010	0.010	ug							
sec-Butylbenzene	< 0.010	0.010	ug							
1-Methyl-3-Isopropylbenzene	< 0.010	0.010	ug							
1,2,3-Trimethylbenzene	< 0.010	0.010	ug							
1-Methyl-4-Isopropylbenzene	< 0.010	0.010	ug							
1-Methyl-2-Isopropylbenzene	< 0.010	0.010	ug							
1-Methyl-3-n-Propylbenzene	< 0.010	0.010	ug							
1-Methyl-4-n-Propylbenzene	< 0.010	0.010	ug							
n-Butylbenzene	< 0.010	0.010	ug							
1,3-Dimethyl-5-Ethylbenzene	< 0.010	0.010	ug							
1,2-Diethylbenzene	< 0.010	0.010	ug							
1-Methyl-2-n-Propylbenzene	< 0.010	0.010	ug							
1,4-Dimethyl-2-Ethylbenzene	< 0.010	0.010	ug							
1,2-Dimethyl-4-Ethylbenzene	< 0.010	0.010	ug							
1,3-Dimethyl-2-Ethylbenzene	< 0.010	0.010	ug							
1,2-Dimethyl-3-Ethylbenzene	< 0.010	0.010	ug							
1,2,4,5-Tetramethylbenzene	< 0.010	0.010	ug							
2-Methylbutylbenzene	< 0.010	0.010	ug							
tert-1-Butyl-2-Methylbenzene	< 0.010	0.010	ug							
n-Pentylbenzene	< 0.010	0.010	ug							
t-1-Butyl-3,5-Dimethylbenzene	< 0.010	0.010	ug							
t-1-Butyl-4-Ethylbenzene	< 0.010	0.010	ug							
nC10-nC12 Other Aromatics	< 0.010	0.010	ug							
nC10-nC12 Non-reg. Aromatics	< 0.050	0.050	ug							
1,3,5-Triethylbenzene	< 0.010	0.010	ug							
1,2,4-Triethylbenzene	< 0.010	0.010	ug							
n-Hexylbenzene	< 0.010	0.010	ug							
nC12-nC16 Other Aromatics	< 0.010	0.010	ug							
nC12-nC16 Non-reg. Aromatics	< 0.050	0.050	ug							
LCS (R100750-BS1)				Analyzed: Mar-18-11						
1,1,1,2-Tetrachloroethane	0.0531	0.0005	ug	0.0500		106	70-130			
1,1,1-Trichloroethane	0.0439	0.0010	ug	0.0500		88	70-130			
1,1,2,2-Tetrachloroethane	0.0404	0.0005	ug	0.0500		81	70-130			
1,1,2-Trichloroethane	0.0370	0.0005	ug	0.0500		74	70-130			
1,1-Dichloroethane	0.0393	0.0010	ug	0.0500		79	70-130			
1,1-Dichloroethene	0.0397	0.0003	ug	0.0500		79	70-130			
1,2,3-Trichloropropane	0.0495	0.0010	ug	0.0500		99	70-130			
1,2,4-Trichlorobenzene	0.0386	0.0010	ug	0.0500		77	70-130			
1,2,4-Trimethylbenzene	0.0407	0.0020	ug	0.0500		81	70-130			
1,2-Dibromo-3-chloropropane	0.0394	0.0010	ug	0.0500		79	70-130			
1,2-Dibromoethane	0.0368	0.0010	ug	0.0500		74	70-130			
1,2-Dichlorobenzene	0.0388	0.0010	ug	0.0500		78	70-130			
1,2-Dichloroethane	0.0497	0.0003	ug	0.0500		99	70-130			
1,2-Dichloropropane	0.0393	0.0005	ug	0.0500		79	70-130			
1,3,5-Trimethylbenzene	0.0403	0.0020	ug	0.0500		81	70-130			
1,3-Dichlorobenzene	0.0395	0.0010	ug	0.0500		79	70-130			
1,3-Dichloropropane	0.0399	0.0010	ug	0.0500		80	70-130			

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes

Volatile Organic Compounds by TD-GCMS, Batch R100750, Continued

LCS (R100750-BS1), Continued				Analyzed: Mar-18-11						
1,3-Dichloropropene (cis+trans)	0.0861	0.0010	ug	0.100		86	70-130			
Hexachlorobutadiene	0.0432	0.0005	ug	0.0500		86	70-130			
1,4-Dichlorobenzene	0.0391	0.0010	ug	0.0500		78	70-130			
2-Chlorotoluene	0.0426	0.0020	ug	0.0500		85	70-130			
Acetone	0.0393	0.010	ug	0.0500		79	70-130			
Acrylonitrile	0.0386	0.0010	ug	0.0500		77	70-130			
Allyl chloride	0.0424	0.0005	ug	0.0500		85	70-130			
Benzene	0.0366	0.0005	ug	0.0500		73	70-130			
Bromobenzene	0.0393	0.0010	ug	0.0500		79	70-130			
Bromodichloromethane	0.0435	0.0005	ug	0.0500		87	70-130			
Bromoform	0.0474	0.0010	ug	0.0500		95	70-130			
Carbon disulfide	0.0378	0.0020	ug	0.0500		76	70-130			
Carbon tetrachloride	0.0466	0.0003	ug	0.0500		93	70-130			
Chlorobenzene	0.0398	0.0010	ug	0.0500		80	70-130			
Chloroethane	0.0363	0.0050	ug	0.0500		73	70-130			
Chloroform	0.0424	0.0005	ug	0.0500		85	70-130			
cis-1,2-Dichloroethene	0.0360	0.0010	ug	0.0500		72	70-130			
Cumene	0.0428	0.0010	ug	0.0500		86	70-130			
Dibromochloromethane	0.0392	0.0010	ug	0.0500		78	70-130			
Dibromomethane	0.0380	0.0010	ug	0.0500		76	70-130			
Dichlorodifluoromethane	0.0405	0.0020	ug	0.0500		81	70-130			
Ethyl acetate	0.0515	0.0050	ug	0.0500		103	70-130			
Ethyl ether	0.0391	0.0020	ug	0.0500		78	70-130			
Ethyl methacrylate	0.0397	0.0010	ug	0.0500		79	70-130			
Ethylbenzene	0.0418	0.0010	ug	0.0500		84	70-130			
Methacrylonitrile	0.0426	0.0010	ug	0.0500		85	70-130			
Methyl acrylate	0.0423	0.0050	ug	0.0500		85	70-130			
Methyl cyclohexane	0.0450	0.0020	ug	0.0500		90	70-130			
Methyl ethyl ketone	0.0370	0.0020	ug	0.0500		74	70-130			
Methyl isobutyl ketone	0.0385	0.0020	ug	0.0500		77	70-130			
Methyl methacrylate	0.0445	0.0020	ug	0.0500		89	70-130			
Methyl tert-butyl ether	0.0502	0.0020	ug	0.0500		100	70-130			
Methylene chloride	0.0389	0.010	ug	0.0500		78	70-130			
Naphthalene	0.0558	0.0010	ug	0.0500		112	70-130			
n-Decane	0.0424	0.0030	ug	0.0500		85	70-130			
n-Hexane	0.0529	0.010	ug	0.0500		106	70-130			
Nitrobenzene	0.0417	0.0010	ug	0.0500		83	70-130			
Styrene	0.0395	0.0010	ug	0.0500		79	70-130			
Tetrachloroethene	0.0372	0.0050	ug	0.0500		74	70-130			
Tetrahydrofuran	0.0387	0.0010	ug	0.0500		77	70-130			
Toluene	0.0452	0.010	ug	0.0500		90	70-130			
trans-1,2-Dichloroethene	0.0352	0.0010	ug	0.0500		70	70-130			
Trichloroethene	0.0357	0.0003	ug	0.0500		71	70-130			
Trichlorofluoromethane	0.0414	0.0010	ug	0.0500		83	70-130			
Vinyl chloride	0.0616	0.0020	ug	0.0500		123	70-130			
Xylenes (total)	0.136	0.0050	ug	0.150		90	70-130			
LCS Dup (R100750-BSD1)				Analyzed: Mar-19-11						
1,1,1,2-Tetrachloroethane	0.0484	0.0005	ug	0.0500		97	70-130	9	12	
1,1,1-Trichloroethane	0.0432	0.0010	ug	0.0500		86	70-130	1	17	
1,1,2,2-Tetrachloroethane	0.0383	0.0005	ug	0.0500		77	70-130	6	15	
1,1,2-Trichloroethane	0.0392	0.0005	ug	0.0500		78	70-130	6	12	
1,1-Dichloroethane	0.0464	0.0010	ug	0.0500		93	70-130	17	26	
1,1-Dichloroethene	0.0523	0.0003	ug	0.0500		105	70-130	27	29	
1,2,3-Trichloropropane	0.0474	0.0010	ug	0.0500		95	70-130	4	13	
1,2,4-Trichlorobenzene	0.0380	0.0010	ug	0.0500		76	70-130	1	16	
1,2,4-Trimethylbenzene	0.0422	0.0020	ug	0.0500		84	70-130	4	15	
1,2-Dibromo-3-chloropropane	0.0366	0.0010	ug	0.0500		73	70-130	7	26	
1,2-Dibromoethane	0.0385	0.0010	ug	0.0500		77	70-130	5	17	
1,2-Dichlorobenzene	0.0372	0.0010	ug	0.0500		74	70-130	4	16	
1,2-Dichloroethane	0.0493	0.0003	ug	0.0500		99	70-130	< 1	17	
1,2-Dichloropropane	0.0421	0.0005	ug	0.0500		84	70-130	7	13	
1,3,5-Trimethylbenzene	0.0413	0.0020	ug	0.0500		83	70-130	3	13	
1,3-Dichlorobenzene	0.0378	0.0010	ug	0.0500		76	70-130	4	14	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Batch R100750, Continued

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
LCS Dup (R100750-BSD1), Continued				Analyzed: Mar-19-11						
1,3-Dichloropropane	0.0426	0.0010	ug	0.0500		85	70-130	7	9	
1,3-Dichloropropene (cis+trans)	0.0879	0.0010	ug	0.100		88	70-130	2	25	
Hexachlorobutadiene	0.0390	0.0005	ug	0.0500		78	70-130	10	20	
1,4-Dichlorobenzene	0.0374	0.0010	ug	0.0500		75	70-130	4	16	
2-Chlorotoluene	0.0411	0.0020	ug	0.0500		82	70-130	3	22	
Acetone	0.0506	0.010	ug	0.0500		101	70-130	25	27	
Acrylonitrile	0.0394	0.0010	ug	0.0500		79	70-130	2	25	
Allyl chloride	0.0501	0.0005	ug	0.0500		100	70-130	16	25	
Benzene	0.0416	0.0005	ug	0.0500		83	70-130	13	14	
Bromobenzene	0.0372	0.0010	ug	0.0500		74	70-130	6	17	
Bromodichloromethane	0.0426	0.0005	ug	0.0500		85	70-130	2	22	
Bromoform	0.0439	0.0010	ug	0.0500		88	70-130	8	16	
Carbon disulfide	0.0401	0.0020	ug	0.0500		80	70-130	6	27	
Carbon tetrachloride	0.0444	0.0003	ug	0.0500		89	70-130	5	29	
Chlorobenzene	0.0389	0.0010	ug	0.0500		78	70-130	2	14	
Chloroethane	0.0441	0.0050	ug	0.0500		88	70-130	19	29	
Chloroform	0.0422	0.0005	ug	0.0500		84	70-130	< 1	21	
cis-1,2-Dichloroethene	0.0364	0.0010	ug	0.0500		73	70-130	< 1	16	
Cumene	0.0424	0.0010	ug	0.0500		85	70-130	< 1	16	
Dibromochloromethane	0.0394	0.0010	ug	0.0500		79	70-130	< 1	23	
Dibromomethane	0.0358	0.0010	ug	0.0500		72	70-130	6	16	
Dichlorodifluoromethane	0.0515	0.0020	ug	0.0500		103	70-130	24	30	
Ethyl acetate	0.0501	0.0050	ug	0.0500		100	70-130	3	24	
Ethyl ether	0.0416	0.0020	ug	0.0500		83	70-130	6	17	
Ethyl methacrylate	0.0391	0.0010	ug	0.0500		78	70-130	2	24	
Ethylbenzene	0.0414	0.0010	ug	0.0500		83	70-130	1	19	
Methacrylonitrile	0.0426	0.0010	ug	0.0500		85	70-130	< 1	23	
Methyl acrylate	0.0433	0.0050	ug	0.0500		87	70-130	2	21	
Methyl cyclohexane	0.0438	0.0020	ug	0.0500		88	70-130	3	15	
Methyl ethyl ketone	0.0353	0.0020	ug	0.0500		71	70-130	5	27	
Methyl isobutyl ketone	0.0379	0.0020	ug	0.0500		76	70-130	2	11	
Methyl methacrylate	0.0445	0.0020	ug	0.0500		89	70-130	< 1	12	
Methyl tert-butyl ether	0.0501	0.0020	ug	0.0500		100	70-130	< 1	28	
Methylene chloride	0.0454	0.010	ug	0.0500		91	70-130	15	27	
Naphthalene	0.0588	0.0010	ug	0.0500		118	70-130	5	22	
n-Decane	0.0444	0.0030	ug	0.0500		89	70-130	4	15	
n-Hexane	0.0565	0.010	ug	0.0500		113	70-130	7	21	
Nitrobenzene	0.0409	0.0010	ug	0.0500		82	70-130	2	22	
Styrene	0.0386	0.0010	ug	0.0500		77	70-130	3	16	
Tetrachloroethene	0.0389	0.0050	ug	0.0500		78	70-130	5	22	
Tetrahydrofuran	0.0391	0.0010	ug	0.0500		78	70-130	1	19	
Toluene	0.0473	0.010	ug	0.0500		95	70-130	4	15	
trans-1,2-Dichloroethene	0.0361	0.0010	ug	0.0500		72	70-130	3	16	
Trichloroethene	0.0352	0.0003	ug	0.0500		70	70-130	1	16	
Trichlorofluoromethane	0.0616	0.0010	ug	0.0500		123	70-130	39	49	
Vinyl chloride	0.0609	0.0020	ug	0.0500		122	70-130	1	31	
Xylenes (total)	0.134	0.0050	ug	0.150		89	70-130	1	16	
Duplicate (R100750-DUP1)		**Source: R103247-15**		Analyzed: Mar-18-11						
1,1,1,2-Tetrachloroethane	< 0.24	0.24	ug/m3 Air		< 0.24				30	
1,1,1-Trichloroethane	< 0.48	0.48	ug/m3 Air		< 0.48				30	
1,1,2,2-Tetrachloroethane	< 0.24	0.24	ug/m3 Air		< 0.24				30	
1,1,2-Trichloroethane	< 0.24	0.24	ug/m3 Air		< 0.24				30	
1,1-Dichloroethane	< 0.48	0.48	ug/m3 Air		< 0.48				30	
1,1-Dichloroethene	< 0.14	0.14	ug/m3 Air		< 0.14				30	
1,2,3-Trichloropropane	< 0.48	0.48	ug/m3 Air		< 0.48				30	
1,2,4-Trichlorobenzene	< 0.48	0.48	ug/m3 Air		< 0.48				30	
1,2,4-Trimethylbenzene	3.0	0.97	ug/m3 Air		2.6				30	
1,2-Dibromo-3-chloropropane	< 0.48	0.48	ug/m3 Air		< 0.48				30	
1,2-Dibromoethane	< 0.48	0.48	ug/m3 Air		< 0.48				30	
1,2-Dichlorobenzene	< 0.48	0.48	ug/m3 Air		< 0.48				30	
1,2-Dichloroethane	< 0.14	0.14	ug/m3 Air		< 0.14				30	
1,2-Dichloropropane	< 0.24	0.24	ug/m3 Air		< 0.24				30	
1,3,5-Trimethylbenzene	0.97	0.97	ug/m3 Air		< 0.97				30	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
Volatile Organic Compounds by TD-GCMS, Batch R100750, Continued										
Duplicate (R100750-DUP1), Continued				**Source: R103247-15**	Analyzed: Mar-18-11					
1,3-Dichlorobenzene	< 0.48	0.48	ug/m3 Air		< 0.48				30	
1,3-Dichloropropane	< 0.48	0.48	ug/m3 Air		< 0.48				30	
1,3-Dichloropropene (cis+trans)	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Hexachlorobutadiene	< 0.24	0.24	ug/m3 Air		< 0.24				30	
1,4-Dichlorobenzene	< 0.48	0.48	ug/m3 Air		< 0.48				30	
2-Chlorotoluene	< 0.97	0.97	ug/m3 Air		< 0.97				30	
Acetone	9.6	4.8	ug/m3 Air		8.0				40	
Acrylonitrile	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Allyl chloride	< 0.24	0.24	ug/m3 Air		< 0.24				30	
Benzene	0.43	0.24	ug/m3 Air		< 0.24				30	
Bromobenzene	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Bromodichloromethane	< 0.24	0.24	ug/m3 Air		< 0.24				30	
Bromoform	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Carbon disulfide	< 0.97	0.97	ug/m3 Air		< 0.97				30	
Carbon tetrachloride	< 0.14	0.14	ug/m3 Air		< 0.14				30	
Chlorobenzene	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Chloroethane	< 2.4	2.4	ug/m3 Air		< 2.4				30	
Chloroform	0.34	0.24	ug/m3 Air		0.29				30	
cis-1,2-Dichloroethene	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Cumene	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Dibromochloromethane	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Dibromomethane	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Dichlorodifluoromethane	3.4	0.97	ug/m3 Air		2.7				30	
Ethyl acetate	< 2.4	2.4	ug/m3 Air		< 2.4				30	
Ethyl ether	< 0.97	0.97	ug/m3 Air		< 0.97				30	
Ethyl methacrylate	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Ethylbenzene	1.7	0.48	ug/m3 Air		1.4				30	
Hexachloroethane	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Methacrylonitrile	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Methyl acrylate	< 2.4	2.4	ug/m3 Air		< 2.4				30	
Methyl cyclohexane	< 0.97	0.97	ug/m3 Air		< 0.97				30	
Methyl ethyl ketone	1.5	0.97	ug/m3 Air		1.2				30	
Methyl isobutyl ketone	< 0.97	0.97	ug/m3 Air		< 0.97				30	
Methyl methacrylate	< 0.97	0.97	ug/m3 Air		< 0.97				30	
Methyl tert-butyl ether	< 0.97	0.97	ug/m3 Air		< 0.97				30	
Methylene chloride	< 4.8	4.8	ug/m3 Air		< 4.8				30	
Naphthalene	< 0.48	0.48	ug/m3 Air		< 0.48				30	
n-Decane	< 1.4	1.4	ug/m3 Air		< 1.4				30	
n-Hexane	< 4.8	4.8	ug/m3 Air		< 4.8				30	
Nitrobenzene	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Styrene	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Tetrachloroethene	< 2.4	2.4	ug/m3 Air		< 2.4				30	
Tetrahydrofuran	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Toluene	34	4.8	ug/m3 Air		32			5	30	
trans-1,2-Dichloroethene	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Trichloroethene	< 0.14	0.14	ug/m3 Air		< 0.14				30	
Trichlorofluoromethane	< 0.48	0.48	ug/m3 Air		< 0.48				30	
Vinyl chloride	< 0.97	0.97	ug/m3 Air		< 0.97				30	
Xylenes (total)	17	2.4	ug/m3 Air		16			9	30	
Volatile Organic Compounds by TD-GCMS, Batch R100755										
Blank (R100755-BLK1)					Analyzed: Mar-15-11					
1,1,1,2-Tetrachloroethane	< 0.0005	0.0005	ug							
1,1,1-Trichloroethane	< 0.0010	0.0010	ug							
1,1,2,2-Tetrachloroethane	< 0.0005	0.0005	ug							
1,1,2-Trichloroethane	< 0.0005	0.0005	ug							
1,1-Dichloroethane	< 0.0010	0.0010	ug							
1,1-Dichloroethene	< 0.0003	0.0003	ug							
1,2,3-Trichloropropane	< 0.0010	0.0010	ug							
1,2,4-Trichlorobenzene	< 0.0010	0.0010	ug							
1,2,4-Trimethylbenzene	< 0.0020	0.0020	ug							
1,2-Dibromo-3-chloropropane	< 0.0010	0.0010	ug							

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
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Volatile Organic Compounds by TD-GCMS, Batch R100755, Continued

Blank (R100755-BLK1), Continued — Analyzed: Mar-15-11

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
1,2-Dibromoethane	< 0.0010	0.0010	ug							
1,2-Dichlorobenzene	< 0.0010	0.0010	ug							
1,2-Dichloroethane	< 0.0003	0.0003	ug							
1,2-Dichloropropane	< 0.0005	0.0005	ug							
1,3,5-Trimethylbenzene	< 0.0020	0.0020	ug							
1,3-Dichlorobenzene	< 0.0010	0.0010	ug							
1,3-Dichloropropane	< 0.0010	0.0010	ug							
1,3-Dichloropropene (cis+trans)	< 0.0010	0.0010	ug							
Hexachlorobutadiene	< 0.0005	0.0005	ug							
1,4-Dichlorobenzene	< 0.0010	0.0010	ug							
2-Chlorotoluene	< 0.0020	0.0020	ug							
Acetone	< 0.010	0.010	ug							
Acrylonitrile	< 0.0010	0.0010	ug							
Allyl chloride	< 0.0005	0.0005	ug							
Benzene	< 0.0005	0.0005	ug							
Bromobenzene	< 0.0010	0.0010	ug							
Bromodichloromethane	< 0.0005	0.0005	ug							
Bromoform	< 0.0010	0.0010	ug							
Carbon disulfide	< 0.0020	0.0020	ug							
Carbon tetrachloride	< 0.0003	0.0003	ug							
Chlorobenzene	< 0.0010	0.0010	ug							
Chloroethane	< 0.0050	0.0050	ug							
Chloroform	< 0.0005	0.0005	ug							
cis-1,2-Dichloroethene	< 0.0010	0.0010	ug							
Cumene	< 0.0010	0.0010	ug							
Dibromochloromethane	< 0.0010	0.0010	ug							
Dibromomethane	< 0.0010	0.0010	ug							
Dichlorodifluoromethane	< 0.0020	0.0020	ug							
Ethyl acetate	< 0.0050	0.0050	ug							
Ethyl ether	< 0.0020	0.0020	ug							
Ethyl methacrylate	< 0.0010	0.0010	ug							
Ethylbenzene	< 0.0010	0.0010	ug							
Hexachloroethane	< 0.0010	0.0010	ug							
Methacrylonitrile	< 0.0010	0.0010	ug							
Methyl acrylate	< 0.0050	0.0050	ug							
Methyl cyclohexane	< 0.0020	0.0020	ug							
Methyl ethyl ketone	< 0.0020	0.0020	ug							
Methyl isobutyl ketone	< 0.0020	0.0020	ug							
Methyl methacrylate	< 0.0020	0.0020	ug							
Methyl tert-butyl ether	< 0.0020	0.0020	ug							
Methylene chloride	< 0.010	0.010	ug							
Naphthalene	< 0.0010	0.0010	ug							
n-Decane	< 0.0030	0.0030	ug							
n-Hexane	< 0.010	0.010	ug							
Nitrobenzene	< 0.0010	0.0010	ug							
Styrene	< 0.0010	0.0010	ug							
Tetrachloroethene	< 0.0050	0.0050	ug							
Tetrahydrofuran	< 0.0010	0.0010	ug							
Toluene	< 0.010	0.010	ug							
trans-1,2-Dichloroethene	< 0.0010	0.0010	ug							
Trichloroethene	< 0.0003	0.0003	ug							
Trichlorofluoromethane	< 0.0010	0.0010	ug							
Vinyl chloride	< 0.0020	0.0020	ug							
Xylenes (total)	< 0.0050	0.0050	ug							
n-Propylbenzene	< 0.010	0.010	ug							
1-methyl-3-ethylbenzene	< 0.010	0.010	ug							
1-methyl-4-ethylbenzene	< 0.010	0.010	ug							
1-methyl-2-ethylbenzene	< 0.010	0.010	ug							
tert-Butylbenzene	< 0.010	0.010	ug							
nC8-nC10 Non-reg. Aromatics	< 0.050	0.050	ug							
Isobutylbenzene	< 0.010	0.010	ug							
sec-Butylbenzene	< 0.010	0.010	ug							
1-Methyl-3-Isopropylbenzene	< 0.010	0.010	ug							
1,2,3-Trimethylbenzene	< 0.010	0.010	ug							

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
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Volatile Organic Compounds by TD-GCMS, Batch R100755, Continued

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
Blank (R100755-BLK1), Continued				Analyzed: Mar-15-11						
1-Methyl-4-Isopropylbenzene	< 0.010	0.010	ug							
1-Methyl-2-Isopropylbenzene	< 0.010	0.010	ug							
1-Methyl-3-n-Propylbenzene	< 0.010	0.010	ug							
1-Methyl-4-n-Propylbenzene	< 0.010	0.010	ug							
n-Butylbenzene	< 0.010	0.010	ug							
1,3-Dimethyl-5-Ethylbenzene	< 0.010	0.010	ug							
1,2-Diethylbenzene	< 0.010	0.010	ug							
1-Methyl-2-n-Propylbenzene	< 0.010	0.010	ug							
1,4-Dimethyl-2-Ethylbenzene	< 0.010	0.010	ug							
1,2-Dimethyl-4-Ethylbenzene	< 0.010	0.010	ug							
1,3-Dimethyl-2-Ethylbenzene	< 0.010	0.010	ug							
1,2-Dimethyl-3-Ethylbenzene	< 0.010	0.010	ug							
1,2,4,5-Tetramethylbenzene	< 0.010	0.010	ug							
2-Methylbutylbenzene	< 0.010	0.010	ug							
tert-1-Butyl-2-Methylbenzene	< 0.010	0.010	ug							
n-Pentylbenzene	< 0.010	0.010	ug							
t-1-Butyl-3,5-Dimethylbenzene	< 0.010	0.010	ug							
t-1-Butyl-4-Ethylbenzene	< 0.010	0.010	ug							
nC10-nC12 Other Aromatics	< 0.010	0.010	ug							
nC10-nC12 Non-reg. Aromatics	< 0.050	0.050	ug							
1,3,5-Triethylbenzene	< 0.010	0.010	ug							
1,2,4-Triethylbenzene	< 0.010	0.010	ug							
n-Hexylbenzene	< 0.010	0.010	ug							
nC12-nC16 Other Aromatics	< 0.010	0.010	ug							
nC12-nC16 Non-reg. Aromatics	< 0.050	0.050	ug							
LCS (R100755-BS1)				Analyzed: Mar-21-11						
1,1,1,2-Tetrachloroethane	0.0502	0.0005	ug	0.0500		100	70-130			
1,1,1-Trichloroethane	0.0472	0.0010	ug	0.0500		94	70-130			
1,1,2,2-Tetrachloroethane	0.0419	0.0005	ug	0.0500		84	70-130			
1,1,2-Trichloroethane	0.0415	0.0005	ug	0.0500		83	70-130			
1,1-Dichloroethane	0.0453	0.0010	ug	0.0500		91	70-130			
1,1-Dichloroethene	0.0486	0.0003	ug	0.0500		97	70-130			
1,2,3-Trichloropropane	0.0529	0.0010	ug	0.0500		106	70-130			
1,2,4-Trichlorobenzene	0.0403	0.0010	ug	0.0500		81	70-130			
1,2,4-Trimethylbenzene	0.0454	0.0020	ug	0.0500		91	70-130			
1,2-Dibromo-3-chloropropane	0.0398	0.0010	ug	0.0500		80	70-130			
1,2-Dibromoethane	0.0410	0.0010	ug	0.0500		82	70-130			
1,2-Dichlorobenzene	0.0412	0.0010	ug	0.0500		82	70-130			
1,2-Dichloroethane	0.0567	0.0003	ug	0.0500		113	70-130			
1,2-Dichloropropane	0.0456	0.0005	ug	0.0500		91	70-130			
1,3,5-Trimethylbenzene	0.0448	0.0020	ug	0.0500		90	70-130			
1,3-Dichlorobenzene	0.0416	0.0010	ug	0.0500		83	70-130			
1,3-Dichloropropane	0.0458	0.0010	ug	0.0500		92	70-130			
1,3-Dichloropropene (cis+trans)	0.0883	0.0010	ug	0.100		88	70-130			
Hexachlorobutadiene	0.0447	0.0005	ug	0.0500		89	70-130			
1,4-Dichlorobenzene	0.0416	0.0010	ug	0.0500		83	70-130			
2-Chlorotoluene	0.0517	0.0020	ug	0.0500		103	70-130			
Acetone	0.0450	0.010	ug	0.0500		90	70-130			
Acrylonitrile	0.0439	0.0010	ug	0.0500		88	70-130			
Allyl chloride	0.0492	0.0005	ug	0.0500		98	70-130			
Benzene	0.0416	0.0005	ug	0.0500		83	70-130			
Bromobenzene	0.0415	0.0010	ug	0.0500		83	70-130			
Bromodichloromethane	0.0476	0.0005	ug	0.0500		95	70-130			
Bromoform	0.0458	0.0010	ug	0.0500		92	70-130			
Carbon disulfide	0.0370	0.0020	ug	0.0500		74	70-130			
Carbon tetrachloride	0.0362	0.0003	ug	0.0500		72	70-130			
Chlorobenzene	0.0426	0.0010	ug	0.0500		85	70-130			
Chloroethane	0.0494	0.0050	ug	0.0500		99	70-130			
Chloroform	0.0474	0.0005	ug	0.0500		95	70-130			
cis-1,2-Dichloroethene	0.0395	0.0010	ug	0.0500		79	70-130			
Cumene	0.0469	0.0010	ug	0.0500		94	70-130			
Dibromochloromethane	0.0419	0.0010	ug	0.0500		84	70-130			
Dibromomethane	0.0403	0.0010	ug	0.0500		81	70-130			

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Batch R100755, Continued

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
LCS (R100755-BS1), Continued				Analyzed: Mar-21-11						
Dichlorodifluoromethane	0.0478	0.0020	ug	0.0500		96	70-130			
Ethyl acetate	0.0598	0.0050	ug	0.0500		120	70-130			
Ethyl ether	0.0438	0.0020	ug	0.0500		88	70-130			
Ethyl methacrylate	0.0402	0.0010	ug	0.0500		80	70-130			
Ethylbenzene	0.0458	0.0010	ug	0.0500		92	70-130			
Methacrylonitrile	0.0503	0.0010	ug	0.0500		101	70-130			
Methyl acrylate	0.0496	0.0050	ug	0.0500		99	70-130			
Methyl cyclohexane	0.0481	0.0020	ug	0.0500		96	70-130			
Methyl ethyl ketone	0.0375	0.0020	ug	0.0500		75	70-130			
Methyl isobutyl ketone	0.0419	0.0020	ug	0.0500		84	70-130			
Methyl methacrylate	0.0477	0.0020	ug	0.0500		95	70-130			
Methyl tert-butyl ether	0.0511	0.0020	ug	0.0500		102	70-130			
Methylene chloride	0.0398	0.010	ug	0.0500		80	70-130			
Naphthalene	0.0589	0.0010	ug	0.0500		118	70-130			
n-Decane	0.0481	0.0030	ug	0.0500		96	70-130			
n-Hexane	0.0587	0.010	ug	0.0500		117	70-130			
Nitrobenzene	0.0456	0.0010	ug	0.0500		91	70-130			
Styrene	0.0419	0.0010	ug	0.0500		84	70-130			
Tetrachloroethene	0.0458	0.0050	ug	0.0500		92	70-130			
Tetrahydrofuran	0.0432	0.0010	ug	0.0500		86	70-130			
Toluene	0.0460	0.010	ug	0.0500		92	70-130			
trans-1,2-Dichloroethene	0.0387	0.0010	ug	0.0500		77	70-130			
Trichloroethene	0.0409	0.0003	ug	0.0500		82	70-130			
Trichlorofluoromethane	0.0419	0.0010	ug	0.0500		84	70-130			
Vinyl chloride	0.0524	0.0020	ug	0.0500		105	70-130			
Xylenes (total)	0.146	0.0050	ug	0.150		97	70-130			
LCS Dup (R100755-BSD1)				Analyzed: Mar-21-11						
1,1,1,2-Tetrachloroethane	0.0458	0.0005	ug	0.0500		92	70-130	9	12	
1,1,1-Trichloroethane	0.0464	0.0010	ug	0.0500		93	70-130	2	17	
1,1,2,2-Tetrachloroethane	0.0409	0.0005	ug	0.0500		82	70-130	3	15	
1,1,2-Trichloroethane	0.0437	0.0005	ug	0.0500		87	70-130	5	12	
1,1-Dichloroethane	0.0544	0.0010	ug	0.0500		109	70-130	18	26	
1,1-Dichloroethene	0.0596	0.0003	ug	0.0500		119	70-130	20	29	
1,2,3-Trichloropropane	0.0519	0.0010	ug	0.0500		104	70-130	2	13	
1,2,4-Trichlorobenzene	0.0404	0.0010	ug	0.0500		81	70-130	< 1	16	
1,2,4-Trimethylbenzene	0.0472	0.0020	ug	0.0500		94	70-130	4	15	
1,2-Dibromo-3-chloropropane	0.0373	0.0010	ug	0.0500		75	70-130	7	26	
1,2-Dibromoethane	0.0426	0.0010	ug	0.0500		85	70-130	4	17	
1,2-Dichlorobenzene	0.0396	0.0010	ug	0.0500		79	70-130	4	16	
1,2-Dichloroethane	0.0564	0.0003	ug	0.0500		113	70-130	< 1	17	
1,2-Dichloropropane	0.0475	0.0005	ug	0.0500		95	70-130	4	13	
1,3,5-Trimethylbenzene	0.0456	0.0020	ug	0.0500		91	70-130	2	13	
1,3-Dichlorobenzene	0.0403	0.0010	ug	0.0500		81	70-130	3	14	
1,3-Dichloropropane	0.0482	0.0010	ug	0.0500		96	70-130	5	9	
1,3-Dichloropropene (cis+trans)	0.0873	0.0010	ug	0.100		87	70-130	1	25	
Hexachlorobutadiene	0.0413	0.0005	ug	0.0500		83	70-130	8	20	
1,4-Dichlorobenzene	0.0399	0.0010	ug	0.0500		80	70-130	4	16	
2-Chlorotoluene	0.0497	0.0020	ug	0.0500		99	70-130	4	22	
Acetone	0.0548	0.010	ug	0.0500		110	70-130	20	27	
Acrylonitrile	0.0441	0.0010	ug	0.0500		88	70-130	< 1	25	
Allyl chloride	0.0605	0.0005	ug	0.0500		121	70-130	21	25	
Benzene	0.0465	0.0005	ug	0.0500		93	70-130	11	14	
Bromobenzene	0.0394	0.0010	ug	0.0500		79	70-130	5	17	
Bromodichloromethane	0.0456	0.0005	ug	0.0500		91	70-130	4	22	
Bromoform	0.0422	0.0010	ug	0.0500		84	70-130	8	16	
Carbon disulfide	0.0456	0.0020	ug	0.0500		91	70-130	21	27	
Carbon tetrachloride	0.0225	0.0003	ug	0.0500		45	70-130	47	29	SPK
Chlorobenzene	0.0420	0.0010	ug	0.0500		84	70-130	1	14	
Chloroethane	0.0546	0.0050	ug	0.0500		109	70-130	10	29	
Chloroform	0.0475	0.0005	ug	0.0500		95	70-130	< 1	21	
cis-1,2-Dichloroethene	0.0398	0.0010	ug	0.0500		80	70-130	< 1	16	
Cumene	0.0469	0.0010	ug	0.0500		94	70-130	< 1	16	
Dibromochloromethane	0.0416	0.0010	ug	0.0500		83	70-130	< 1	23	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Batch R100755, Continued

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
LCS Dup (R100755-BSD1), Continued				Analyzed: Mar-21-11						
Dibromomethane	0.0389	0.0010	ug	0.0500		78	70-130	3	16	
Dichlorodifluoromethane	0.0588	0.0020	ug	0.0500		118	70-130	21	30	
Ethyl acetate	0.0577	0.0050	ug	0.0500		115	70-130	4	24	
Ethyl ether	0.0474	0.0020	ug	0.0500		95	70-130	8	17	
Ethyl methacrylate	0.0407	0.0010	ug	0.0500		81	70-130	1	24	
Ethylbenzene	0.0465	0.0010	ug	0.0500		93	70-130	1	19	
Methacrylonitrile	0.0505	0.0010	ug	0.0500		101	70-130	< 1	23	
Methyl acrylate	0.0497	0.0050	ug	0.0500		99	70-130	< 1	21	
Methyl cyclohexane	0.0479	0.0020	ug	0.0500		96	70-130	< 1	15	
Methyl ethyl ketone	0.0354	0.0020	ug	0.0500		71	70-130	6	27	
Methyl isobutyl ketone	0.0428	0.0020	ug	0.0500		86	70-130	2	11	
Methyl methacrylate	0.0480	0.0020	ug	0.0500		96	70-130	< 1	12	
Methyl tert-butyl ether	0.0460	0.0020	ug	0.0500		92	70-130	11	28	
Methylene chloride	0.0468	0.010	ug	0.0500		94	70-130	16	27	
Naphthalene	0.0600	0.0010	ug	0.0500		120	70-130	2	22	
n-Decane	0.0510	0.0030	ug	0.0500		102	70-130	6	15	
n-Hexane	0.0610	0.010	ug	0.0500		122	70-130	4	21	
Nitrobenzene	0.0428	0.0010	ug	0.0500		86	70-130	6	22	
Styrene	0.0418	0.0010	ug	0.0500		84	70-130	< 1	16	
Tetrachloroethene	0.0553	0.0050	ug	0.0500		111	70-130	19	22	
Tetrahydrofuran	0.0434	0.0010	ug	0.0500		87	70-130	< 1	19	
Toluene	0.0474	0.010	ug	0.0500		95	70-130	3	15	
trans-1,2-Dichloroethene	0.0397	0.0010	ug	0.0500		79	70-130	3	16	
Trichloroethene	0.0457	0.0003	ug	0.0500		91	70-130	11	16	
Trichlorofluoromethane	0.0626	0.0010	ug	0.0500		125	70-130	40	49	
Vinyl chloride	0.0647	0.0020	ug	0.0500		129	70-130	21	31	
Xylenes (total)	0.147	0.0050	ug	0.150		98	70-130	< 1	16	
Duplicate (R100755-DUP1)		**Source: R103247-24**		Analyzed: Mar-19-11						
1,1,1,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air		< 0.17				30	
1,1,1-Trichloroethane	< 0.34	0.34	ug/m3 Air		< 0.34				30	
1,1,2,2-Tetrachloroethane	< 0.17	0.17	ug/m3 Air		< 0.17				30	
1,1,2-Trichloroethane	< 0.17	0.17	ug/m3 Air		< 0.17				30	
1,1-Dichloroethane	< 0.34	0.34	ug/m3 Air		< 0.34				30	
1,1-Dichloroethene	< 0.10	0.10	ug/m3 Air		< 0.10				30	
1,2,3-Trichloropropane	< 0.34	0.34	ug/m3 Air		< 0.34				30	
1,2,4-Trichlorobenzene	0.84	0.34	ug/m3 Air		0.77				30	
1,2,4-Trimethylbenzene	1.4	0.67	ug/m3 Air		1.5				30	
1,2-Dibromo-3-chloropropane	0.87	0.34	ug/m3 Air		< 0.34				30	
1,2-Dibromoethane	< 0.34	0.34	ug/m3 Air		< 0.34				30	
1,2-Dichlorobenzene	< 0.34	0.34	ug/m3 Air		< 0.34				30	
1,2-Dichloroethane	0.10	0.10	ug/m3 Air		< 0.10				30	
1,2-Dichloropropane	< 0.17	0.17	ug/m3 Air		< 0.17				30	
1,3,5-Trimethylbenzene	< 0.67	0.67	ug/m3 Air		< 0.67				30	
1,3-Dichlorobenzene	< 0.34	0.34	ug/m3 Air		< 0.34				30	
1,3-Dichloropropane	< 0.34	0.34	ug/m3 Air		< 0.34				30	
1,3-Dichloropropene (cis+trans)	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Hexachlorobutadiene	0.54	0.17	ug/m3 Air		0.50				30	
1,4-Dichlorobenzene	< 0.34	0.34	ug/m3 Air		< 0.34				30	
2-Chlorotoluene	< 0.67	0.67	ug/m3 Air		< 0.67				30	
Acetone	< 3.4	3.4	ug/m3 Air		< 3.4				40	
Acrylonitrile	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Allyl chloride	< 0.17	0.17	ug/m3 Air		< 0.17				30	
Benzene	0.17	0.17	ug/m3 Air		0.20				30	
Bromobenzene	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Bromodichloromethane	< 0.17	0.17	ug/m3 Air		< 0.17				30	
Bromoform	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Carbon disulfide	< 0.67	0.67	ug/m3 Air		< 0.67				30	
Carbon tetrachloride	< 0.10	0.10	ug/m3 Air		< 0.10				30	
Chlorobenzene	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Chloroethane	< 1.7	1.7	ug/m3 Air		< 1.7				30	
Chloroform	0.80	0.17	ug/m3 Air		0.80				30	
cis-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Cumene	< 0.34	0.34	ug/m3 Air		< 0.34				30	

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes

Volatile Organic Compounds by TD-GCMS, Batch R100755, Continued

Duplicate (R100755-DUP1), Continued **Source: R103247-24** Analyzed: Mar-19-11

Dibromochloromethane	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Dibromomethane	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Dichlorodifluoromethane	6.9	0.67	ug/m3 Air		6.8			2	30	
Ethyl acetate	< 1.7	1.7	ug/m3 Air		< 1.7				30	
Ethyl ether	< 0.67	0.67	ug/m3 Air		< 0.67				30	
Ethyl methacrylate	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Ethylbenzene	7.0	0.34	ug/m3 Air		6.9			2	30	
Hexachloroethane	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Methacrylonitrile	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Methyl acrylate	< 1.7	1.7	ug/m3 Air		< 1.7				30	
Methyl cyclohexane	< 0.67	0.67	ug/m3 Air		< 0.67				30	
Methyl ethyl ketone	< 0.67	0.67	ug/m3 Air		< 0.67				30	
Methyl isobutyl ketone	< 0.67	0.67	ug/m3 Air		< 0.67				30	
Methyl methacrylate	< 0.67	0.67	ug/m3 Air		< 0.67				30	
Methyl tert-butyl ether	< 0.67	0.67	ug/m3 Air		< 0.67				30	
Methylene chloride	< 3.4	3.4	ug/m3 Air		< 3.4				30	
Naphthalene	2.9	0.34	ug/m3 Air		2.6			12	30	
n-Decane	< 1.0	1.0	ug/m3 Air		< 1.0				30	
n-Hexane	< 3.4	3.4	ug/m3 Air		< 3.4				30	
Nitrobenzene	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Styrene	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Tetrachloroethene	< 1.7	1.7	ug/m3 Air		< 1.7				30	
Tetrahydrofuran	0.40	0.34	ug/m3 Air		0.34				30	
Toluene	56	3.4	ug/m3 Air		55			2	30	
trans-1,2-Dichloroethene	< 0.34	0.34	ug/m3 Air		< 0.34				30	
Trichloroethene	0.13	0.10	ug/m3 Air		0.10				30	
Trichlorofluoromethane	1.1	0.34	ug/m3 Air		1.2				30	
Vinyl chloride	< 0.67	0.67	ug/m3 Air		< 0.67				30	
Xylenes (total)	43	1.7	ug/m3 Air		42			1	30	

Volatile Organic Compounds by TD-GCMS, Batch R100763

Blank (R100763-BLK1) Analyzed: Mar-24-11

1,1,1,2-Tetrachloroethane	< 0.0005	0.0005	ug
1,1,1-Trichloroethane	< 0.0010	0.0010	ug
1,1,2,2-Tetrachloroethane	< 0.0005	0.0005	ug
1,1,2-Trichloroethane	< 0.0005	0.0005	ug
1,1-Dichloroethane	< 0.0010	0.0010	ug
1,1-Dichloroethene	< 0.0003	0.0003	ug
1,2,3-Trichloropropane	< 0.0010	0.0010	ug
1,2,4-Trichlorobenzene	< 0.0010	0.0010	ug
1,2,4-Trimethylbenzene	< 0.0020	0.0020	ug
1,2-Dibromo-3-chloropropane	< 0.0010	0.0010	ug
1,2-Dibromoethane	< 0.0010	0.0010	ug
1,2-Dichlorobenzene	< 0.0010	0.0010	ug
1,2-Dichloroethane	< 0.0003	0.0003	ug
1,2-Dichloropropane	< 0.0005	0.0005	ug
1,3,5-Trimethylbenzene	< 0.0020	0.0020	ug
1,3-Dichlorobenzene	< 0.0010	0.0010	ug
1,3-Dichloropropane	< 0.0010	0.0010	ug
1,3-Dichloropropene (cis+trans)	< 0.0010	0.0010	ug
Hexachlorobutadiene	< 0.0005	0.0005	ug
1,4-Dichlorobenzene	< 0.0010	0.0010	ug
2-Chlorotoluene	< 0.0020	0.0020	ug
Acetone	< 0.010	0.010	ug
Acrylonitrile	< 0.0010	0.0010	ug
Allyl chloride	< 0.0005	0.0005	ug
Benzene	< 0.0005	0.0005	ug
Bromobenzene	< 0.0010	0.0010	ug
Bromodichloromethane	< 0.0005	0.0005	ug
Bromoform	< 0.0010	0.0010	ug
Carbon disulfide	< 0.0020	0.0020	ug
Carbon tetrachloride	< 0.0003	0.0003	ug

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Batch R100763, Continued

Blank (R100763-BLK1), Continued — Analyzed: Mar-24-11

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
Chlorobenzene	< 0.0010	0.0010	ug							
Chloroethane	< 0.0050	0.0050	ug							
Chloroform	< 0.0005	0.0005	ug							
cis-1,2-Dichloroethene	< 0.0010	0.0010	ug							
Cumene	< 0.0010	0.0010	ug							
Dibromochloromethane	< 0.0010	0.0010	ug							
Dibromomethane	< 0.0010	0.0010	ug							
Dichlorodifluoromethane	< 0.0020	0.0020	ug							
Ethyl acetate	< 0.0050	0.0050	ug							
Ethyl ether	< 0.0020	0.0020	ug							
Ethyl methacrylate	< 0.0010	0.0010	ug							
Ethylbenzene	< 0.0010	0.0010	ug							
Hexachloroethane	< 0.0010	0.0010	ug							
Methacrylonitrile	< 0.0010	0.0010	ug							
Methyl acrylate	< 0.0050	0.0050	ug							
Methyl cyclohexane	< 0.0020	0.0020	ug							
Methyl ethyl ketone	< 0.0020	0.0020	ug							
Methyl isobutyl ketone	< 0.0020	0.0020	ug							
Methyl methacrylate	< 0.0020	0.0020	ug							
Methyl tert-butyl ether	< 0.0020	0.0020	ug							
Methylene chloride	< 0.010	0.010	ug							
Naphthalene	< 0.0010	0.0010	ug							
n-Decane	< 0.0030	0.0030	ug							
n-Hexane	< 0.010	0.010	ug							
Nitrobenzene	< 0.0010	0.0010	ug							
Styrene	< 0.0010	0.0010	ug							
Tetrachloroethene	< 0.0050	0.0050	ug							
Tetrahydrofuran	< 0.0010	0.0010	ug							
Toluene	< 0.010	0.010	ug							
trans-1,2-Dichloroethene	< 0.0010	0.0010	ug							
Trichloroethene	< 0.0003	0.0003	ug							
Trichlorofluoromethane	< 0.0010	0.0010	ug							
Vinyl chloride	< 0.0020	0.0020	ug							
Xylenes (total)	< 0.0050	0.0050	ug							
n-Propylbenzene	< 0.010	0.010	ug							
1-methyl-3-ethylbenzene	< 0.010	0.010	ug							
1-methyl-4-ethylbenzene	< 0.010	0.010	ug							
1-methyl-2-ethylbenzene	< 0.010	0.010	ug							
tert-Butylbenzene	< 0.010	0.010	ug							
nC8-nC10 Non-reg. Aromatics	< 0.050	0.050	ug							
Isobutylbenzene	< 0.010	0.010	ug							
sec-Butylbenzene	< 0.010	0.010	ug							
1-Methyl-3-Isopropylbenzene	< 0.010	0.010	ug							
1,2,3-Trimethylbenzene	< 0.010	0.010	ug							
1-Methyl-4-Isopropylbenzene	< 0.010	0.010	ug							
1-Methyl-2-Isopropylbenzene	< 0.010	0.010	ug							
1-Methyl-3-n-Propylbenzene	< 0.010	0.010	ug							
1-Methyl-4-n-Propylbenzene	< 0.010	0.010	ug							
n-Butylbenzene	< 0.010	0.010	ug							
1,3-Dimethyl-5-Ethylbenzene	< 0.010	0.010	ug							
1,2-Diethylbenzene	< 0.010	0.010	ug							
1-Methyl-2-n-Propylbenzene	< 0.010	0.010	ug							
1,4-Dimethyl-2-Ethylbenzene	< 0.010	0.010	ug							
1,2-Dimethyl-4-Ethylbenzene	< 0.010	0.010	ug							
1,3-Dimethyl-2-Ethylbenzene	< 0.010	0.010	ug							
1,2-Dimethyl-3-Ethylbenzene	< 0.010	0.010	ug							
1,2,4,5-Tetramethylbenzene	< 0.010	0.010	ug							
2-Methylbutylbenzene	< 0.010	0.010	ug							
tert-1-Butyl-2-Methylbenzene	< 0.010	0.010	ug							
n-Pentylbenzene	< 0.010	0.010	ug							
t-1-Butyl-3,5-Dimethylbenzene	< 0.010	0.010	ug							
t-1-Butyl-4-Ethylbenzene	< 0.010	0.010	ug							
nC10-nC12 Other Aromatics	< 0.010	0.010	ug							
nC10-nC12 Non-reg. Aromatics	< 0.050	0.050	ug							

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Batch R100763, Continued

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
Blank (R100763-BLK1), Continued				Analyzed: Mar-24-11						
1,3,5-Triethylbenzene	< 0.010	0.010	ug							
1,2,4-Triethylbenzene	< 0.010	0.010	ug							
n-Hexylbenzene	< 0.010	0.010	ug							
nC12-nC16 Other Aromatics	< 0.010	0.010	ug							
nC12-nC16 Non-reg. Aromatics	< 0.050	0.050	ug							
LCS (R100763-BS1)				Analyzed: Mar-24-11						
1,1,1,2-Tetrachloroethane	0.0479	0.0005	ug	0.0500		96	70-130			
1,1,1-Trichloroethane	0.0432	0.0010	ug	0.0500		86	70-130			
1,1,2,2-Tetrachloroethane	0.0371	0.0005	ug	0.0500		74	70-130			
1,1,2-Trichloroethane	0.0366	0.0005	ug	0.0500		73	70-130			
1,1-Dichloroethane	0.0413	0.0010	ug	0.0500		83	70-130			
1,1-Dichloroethene	0.0455	0.0003	ug	0.0500		91	70-130			
1,2,3-Trichloropropane	0.0482	0.0010	ug	0.0500		96	70-130			
1,2,4-Trichlorobenzene	0.0372	0.0010	ug	0.0500		74	70-130			
1,2,4-Trimethylbenzene	0.0400	0.0020	ug	0.0500		80	70-130			
1,2-Dibromo-3-chloropropane	0.0328	0.0010	ug	0.0500		66	70-130			SPK
1,2-Dibromoethane	0.0363	0.0010	ug	0.0500		73	70-130			
1,2-Dichlorobenzene	0.0368	0.0010	ug	0.0500		74	70-130			
1,2-Dichloroethane	0.0514	0.0003	ug	0.0500		103	70-130			
1,2-Dichloropropane	0.0398	0.0005	ug	0.0500		80	70-130			
1,3,5-Trimethylbenzene	0.0392	0.0020	ug	0.0500		78	70-130			
1,3-Dichlorobenzene	0.0373	0.0010	ug	0.0500		75	70-130			
1,3-Dichloropropane	0.0405	0.0010	ug	0.0500		81	70-130			
1,3-Dichloropropene (cis+trans)	0.0868	0.0010	ug	0.100		87	70-130			
Hexachlorobutadiene	0.0413	0.0005	ug	0.0500		83	70-130			
1,4-Dichlorobenzene	0.0369	0.0010	ug	0.0500		74	70-130			
2-Chlorotoluene	0.0428	0.0020	ug	0.0500		86	70-130			
Acetone	0.0450	0.010	ug	0.0500		90	70-130			
Acrylonitrile	0.0378	0.0010	ug	0.0500		76	70-130			
Allyl chloride	0.0496	0.0005	ug	0.0500		99	70-130			
Benzene	0.0354	0.0005	ug	0.0500		71	70-130			
Bromobenzene	0.0365	0.0010	ug	0.0500		73	70-130			
Bromodichloromethane	0.0430	0.0005	ug	0.0500		86	70-130			
Bromoform	0.0436	0.0010	ug	0.0500		87	70-130			
Carbon disulfide	0.0351	0.0020	ug	0.0500		70	70-130			
Carbon tetrachloride	0.0417	0.0003	ug	0.0500		83	70-130			
Chlorobenzene	0.0375	0.0010	ug	0.0500		75	70-130			
Chloroethane	0.0415	0.0050	ug	0.0500		83	70-130			
Chloroform	0.0420	0.0005	ug	0.0500		84	70-130			
cis-1,2-Dichloroethene	0.0363	0.0010	ug	0.0500		73	70-130			
Cumene	0.0407	0.0010	ug	0.0500		81	70-130			
Dibromochloromethane	0.0390	0.0010	ug	0.0500		78	70-130			
Dibromomethane	0.0359	0.0010	ug	0.0500		72	70-130			
Dichlorodifluoromethane	0.0469	0.0020	ug	0.0500		94	70-130			
Ethyl acetate	0.0527	0.0050	ug	0.0500		105	70-130			
Ethyl ether	0.0377	0.0020	ug	0.0500		75	70-130			
Ethyl methacrylate	0.0384	0.0010	ug	0.0500		77	70-130			
Ethylbenzene	0.0397	0.0010	ug	0.0500		79	70-130			
Methacrylonitrile	0.0442	0.0010	ug	0.0500		88	70-130			
Methyl acrylate	0.0422	0.0050	ug	0.0500		84	70-130			
Methyl cyclohexane	0.0422	0.0020	ug	0.0500		84	70-130			
Methyl ethyl ketone	0.0378	0.0020	ug	0.0500		76	70-130			
Methyl isobutyl ketone	0.0391	0.0020	ug	0.0500		78	70-130			
Methyl methacrylate	0.0425	0.0020	ug	0.0500		85	70-130			
Methyl tert-butyl ether	0.0516	0.0020	ug	0.0500		103	70-130			
Methylene chloride	0.0356	0.010	ug	0.0500		71	70-130			
Naphthalene	0.0465	0.0010	ug	0.0500		93	70-130			
n-Decane	0.0419	0.0030	ug	0.0500		84	70-130			
n-Hexane	0.0506	0.010	ug	0.0500		101	70-130			
Nitrobenzene	0.0440	0.0010	ug	0.0500		88	70-130			
Styrene	0.0367	0.0010	ug	0.0500		73	70-130			
Tetrachloroethene	0.0438	0.0050	ug	0.0500		88	70-130			
Tetrahydrofuran	0.0376	0.0010	ug	0.0500		75	70-130			

CLIENT	Golder Associates Ltd (Calgary)	**WORK ORDER #**	R103247
PROJECT	10-1346-0046	**REPORTED**	Apr-28-11

Volatile Organic Compounds by TD-GCMS, Batch R100763, Continued

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
LCS (R100763-BS1), Continued				Analyzed: Mar-24-11						
Toluene	0.0402	0.010	ug	0.0500		80	70-130			
trans-1,2-Dichloroethene	0.0354	0.0010	ug	0.0500		71	70-130			
Trichloroethene	0.0385	0.0003	ug	0.0500		77	70-130			
Trichlorofluoromethane	0.0500	0.0010	ug	0.0500		100	70-130			
Vinyl chloride	0.0537	0.0020	ug	0.0500		107	70-130			
Xylenes (total)	0.129	0.0050	ug	0.150		86	70-130			
LCS Dup (R100763-BSD1)				Analyzed: Mar-24-11						
1,1,1,2-Tetrachloroethane	0.0429	0.0005	ug	0.0500		86	70-130	11	12	
1,1,1-Trichloroethane	0.0436	0.0010	ug	0.0500		87	70-130	< 1	17	
1,1,2,2-Tetrachloroethane	0.0352	0.0005	ug	0.0500		70	70-130	5	15	
1,1,2-Trichloroethane	0.0379	0.0005	ug	0.0500		76	70-130	3	12	
1,1-Dichloroethane	0.0463	0.0010	ug	0.0500		93	70-130	11	26	
1,1-Dichloroethene	0.0576	0.0003	ug	0.0500		115	70-130	23	29	
1,2,3-Trichloropropane	0.0465	0.0010	ug	0.0500		93	70-130	4	13	
1,2,4-Trichlorobenzene	0.0379	0.0010	ug	0.0500		76	70-130	2	16	
1,2,4-Trimethylbenzene	0.0405	0.0020	ug	0.0500		81	70-130	1	15	
1,2-Dibromo-3-chloropropane	0.0242	0.0010	ug	0.0500		48	70-130	30	26	SPK
1,2-Dibromoethane	0.0371	0.0010	ug	0.0500		74	70-130	2	17	
1,2-Dichlorobenzene	0.0369	0.0010	ug	0.0500		74	70-130	< 1	16	
1,2-Dichloroethane	0.0514	0.0003	ug	0.0500		103	70-130	< 1	17	
1,2-Dichloropropane	0.0406	0.0005	ug	0.0500		81	70-130	2	13	
1,3,5-Trimethylbenzene	0.0395	0.0020	ug	0.0500		79	70-130	< 1	13	
1,3-Dichlorobenzene	0.0374	0.0010	ug	0.0500		75	70-130	< 1	14	
1,3-Dichloropropane	0.0416	0.0010	ug	0.0500		83	70-130	3	9	
1,3-Dichloropropene (cis+trans)	0.0833	0.0010	ug	0.100		83	70-130	4	25	
Hexachlorobutadiene	0.0382	0.0005	ug	0.0500		76	70-130	8	20	
1,4-Dichlorobenzene	0.0372	0.0010	ug	0.0500		74	70-130	1	16	
2-Chlorotoluene	0.0465	0.0020	ug	0.0500		93	70-130	8	22	
Acetone	0.0515	0.010	ug	0.0500		103	70-130	14	27	
Acrylonitrile	0.0380	0.0010	ug	0.0500		76	70-130	< 1	25	
Allyl chloride	0.0614	0.0005	ug	0.0500		123	70-130	21	25	
Benzene	0.0380	0.0005	ug	0.0500		76	70-130	7	14	
Bromobenzene	0.0364	0.0010	ug	0.0500		73	70-130	< 1	17	
Bromodichloromethane	0.0419	0.0005	ug	0.0500		84	70-130	2	22	
Bromoform	0.0399	0.0010	ug	0.0500		80	70-130	9	16	
Carbon disulfide	0.0397	0.0020	ug	0.0500		79	70-130	12	27	
Carbon tetrachloride	0.0342	0.0003	ug	0.0500		68	70-130	20	29	SPK
Chlorobenzene	0.0374	0.0010	ug	0.0500		75	70-130	< 1	14	
Chloroethane	0.0511	0.0050	ug	0.0500		102	70-130	21	29	
Chloroform	0.0425	0.0005	ug	0.0500		85	70-130	1	21	
cis-1,2-Dichloroethene	0.0353	0.0010	ug	0.0500		71	70-130	3	16	
Cumene	0.0400	0.0010	ug	0.0500		80	70-130	2	16	
Dibromochloromethane	0.0383	0.0010	ug	0.0500		77	70-130	2	23	
Dibromomethane	0.0350	0.0010	ug	0.0500		70	70-130	3	16	
Dichlorodifluoromethane	0.0615	0.0020	ug	0.0500		123	70-130	27	30	
Ethyl acetate	0.0503	0.0050	ug	0.0500		101	70-130	5	24	
Ethyl ether	0.0411	0.0020	ug	0.0500		82	70-130	9	17	
Ethyl methacrylate	0.0384	0.0010	ug	0.0500		77	70-130	< 1	24	
Ethylbenzene	0.0395	0.0010	ug	0.0500		79	70-130	< 1	19	
Methacrylonitrile	0.0441	0.0010	ug	0.0500		88	70-130	< 1	23	
Methyl acrylate	0.0417	0.0050	ug	0.0500		83	70-130	1	21	
Methyl cyclohexane	0.0416	0.0020	ug	0.0500		83	70-130	1	15	
Methyl ethyl ketone	0.0390	0.0020	ug	0.0500		78	70-130	3	27	
Methyl isobutyl ketone	0.0389	0.0020	ug	0.0500		78	70-130	< 1	11	
Methyl methacrylate	0.0419	0.0020	ug	0.0500		84	70-130	1	12	
Methyl tert-butyl ether	0.0504	0.0020	ug	0.0500		101	70-130	2	28	
Methylene chloride	0.0435	0.010	ug	0.0500		87	70-130	20	27	
Naphthalene	0.0479	0.0010	ug	0.0500		96	70-130	3	22	
n-Decane	0.0433	0.0030	ug	0.0500		87	70-130	3	15	
n-Hexane	0.0536	0.010	ug	0.0500		107	70-130	6	21	
Nitrobenzene	0.0422	0.0010	ug	0.0500		84	70-130	4	22	
Styrene	0.0366	0.0010	ug	0.0500		73	70-130	< 1	16	
Tetrachloroethene	0.0543	0.0050	ug	0.0500		109	70-130	21	22	

QUALITY CONTROL DATA

CLIENT Golder Associates Ltd (Calgary)
PROJECT 10-1346-0046

WORK ORDER # R103247
REPORTED Apr-28-11

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	% REC	% REC Limits	% RPD	% RPD Limit	Notes
Volatile Organic Compounds by TD-GCMS, Batch R100763, Continued										
LCS Dup (R100763-BSD1), Continued				Analyzed: Mar-24-11						
Tetrahydrofuran	0.0375	0.0010	ug	0.0500		75	70-130	< 1	19	
Toluene	0.0408	0.010	ug	0.0500		82	70-130	1	15	
trans-1,2-Dichloroethene	0.0361	0.0010	ug	0.0500		72	70-130	2	16	
Trichloroethene	0.0435	0.0003	ug	0.0500		87	70-130	12	16	
Trichlorofluoromethane	0.0625	0.0010	ug	0.0500		125	70-130	22	49	
Vinyl chloride	0.0568	0.0020	ug	0.0500		114	70-130	6	31	
Xylenes (total)	0.130	0.0050	ug	0.150		86	70-130	< 1	16	

QC Qualifiers:

SPK Recovery of one or more analytes on Blank Spike (BS) analysis are outside of control limits. Data accepted based on acceptable performance of other batch QC.

Maxxam

Success Through Science®

Your Project #: 10-1346-0046 CANADA CREOSOTE
Your C.O.C. #: A030225

Attention: Julie Burghardt
GOLDER ASSOCIATES LTD.
CALGARY - NATIONAL CONTRACT
102, 2535 - 3rd Avenue SE
CALGARY, AB
CANADA T2A 7W5

Report Date: 2011/03/04

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B113399
Received: 2011/02/18, 17:28

Sample Matrix: Leachate
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX in Leachates by HS GC/MS	1	2011/02/23	2011/02/24	CAL SOP-00190	EPA 1311, EPA 8260C
ICPMS Metals on TCLP Leachate	1	2011/02/25	2011/02/26	AB SOP-00043	EPA 200.8

Sample Matrix: Soil
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Flash Point	1	N/A	2011/02/24	CAL SOP-00175	ASTM D93-07, 3828-05
Fraction of Organic Carbon	8	N/A	2011/03/03	Calc	
Moisture	8	N/A	2011/02/24	CAL SOP-00023	McKeague MSSMA 2.411
Free Liquid (Paint filter)	1	N/A	2011/02/24	AB SOP-00047	EPA SW846/9095B
pH (1:1 extract, solid waste)	1	2011/02/25	2011/02/25	AB SOP-00006	SSMA 16.2
Particle Size by Sieve (75 micron)	4	N/A	2011/02/28	AB SOP-00022	SSMA 55.4
Total Organic Carbon LECO Method	8	2011/03/02	2011/03/03	CAL SOP-00243	LECO# 203-821-170

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

Encryption Key

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

LESLEY LEM, Project Manager
Email: LLem@maxxam.ca
Phone# (403) 735-2207 Ext:2207

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

Total cover pages: 1

Maxxam Job #: B113399
Report Date: 2011/03/04

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046 CANADA CREOSOTE

Sampler Initials: NB

BASIC CLASS II LANDFILL PACKAGE (LEACHATE)

Maxxam ID		Z97929		
Sampling Date		2011/02/18		
	Units	**COMPOSITE**	**RDL**	**QC Batch**
Elements				
Leachable Antimony (Sb)	mg/L	<1	1	4662542
Leachable Arsenic (As)	mg/L	<0.5	0.5	4662542
Leachable Barium (Ba)	mg/L	2	1	4662542
Leachable Beryllium (Be)	mg/L	<0.5	0.5	4662542
Leachable Boron (B)	mg/L	<1	1	4662542
Leachable Cadmium (Cd)	mg/L	<0.1	0.1	4662542
Leachable Chromium (Cr)	mg/L	<0.5	0.5	4662542
Leachable Cobalt (Co)	mg/L	<1	1	4662542
Leachable Copper (Cu)	mg/L	<1	1	4662542
Leachable Iron (Fe)	mg/L	27(1)	5	4662542
Leachable Lead (Pb)	mg/L	<0.5	0.5	4662542
Leachable Mercury (Hg)	mg/L	<0.02	0.02	4662542
Leachable Nickel (Ni)	mg/L	<0.5	0.5	4662542
Leachable Selenium (Se)	mg/L	<0.1	0.1	4662542
Leachable Silver (Ag)	mg/L	<0.5	0.5	4662542
Leachable Thallium (Tl)	mg/L	<0.5	0.5	4662542
Leachable Uranium (U)	mg/L	<0.2	0.2	4662542
Leachable Vanadium (V)	mg/L	<1	1	4662542
Leachable Zinc (Zn)	mg/L	<1	1	4662542
Leachable Zirconium (Zr)	mg/L	<1	1	4662542
Volatiles				
Leachable (ZH) Benzene	mg/L	<0.01	0.01	4654486
Leachable (ZH) Toluene	mg/L	<0.01	0.01	4654486
Leachable (ZH) Ethylbenzene	mg/L	<0.01	0.01	4654486
Leachable (ZH) o-Xylene	mg/L	<0.01	0.01	4654486
Leachable (ZH) m & p-Xylene	mg/L	<0.02	0.02	4654486
Leachable (ZH) Xylenes (Total)	mg/L	<0.02	0.02	4654486
Surrogate Recovery (%)				
Leachable (ZH) 4-BROMOFLUOROBENZENE (sur.)	%	97		4654486
Leachable (ZH) D4-1,2-DICHLOROETHANE (sur.)	%	97		4654486
Leachable (ZH) D8-TOLUENE (sur.)	%	95		4654486

RDL = Reportable Detection Limit
(1) - Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B113399
Report Date: 2011/03/04

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046 CANADA CREOSOTE

Sampler Initials: NB

BASIC CLASS II LANDFILL PACKAGE (SOIL)

Maxxam ID		Z97929		
Sampling Date		2011/02/18		
	Units	**COMPOSITE**	**RDL**	**QC Batch**
Soluble Parameters				
Soluble (1:1) pH	N/A	8.75	N/A	4661404
Physical Properties				
Closed Cup Flash point	deg. C	>61	N/A	4658552
Free Liquid	N/A	PASS	N/A	4658556

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		Z97921	Z97922	Z97923	Z97924	Z97925	Z97926	Z97927	Z97928		
Sampling Date		2011/02/15	2011/02/15	2011/02/17	2011/02/16	2011/02/17	2011/02/18	2011/02/14	2011/02/14		
	Units	**MW10-6 S4**	**MW10-7A S4**	**MW10-22 S4**	**MW10-11 S2**	**MW10-15 S1**	**MW10-9-A S5**	**MW10-1 S3**	**MW10-2 S6**	**RDL**	**QC Batch**
Misc. Inorganics											
Fraction of Organic Carbon	g/g	0.0008	0.0064	0.0069	0.017	0.0066	0.0033	0.0020	0.0014	0.0002	4649796
Physical Properties											
Moisture	%	12	11	18	8.1	9.3	13	2.4	9.7	0.3	4660785
Sieve - Pan	%	11	52	59			69			0.2	4663445
Sieve - #200 (>0.075mm)	%	89	48	41			31			0.2	4663445
Grain Size	%	COARSE	FINE	FINE			FINE			0.2	4663445

MISCELLANEOUS (SOIL)

Maxxam ID		Z97921	Z97922	Z97923	Z97924	Z97925	Z97926	Z97927	Z97928		
Sampling Date		2011/02/15	2011/02/15	2011/02/17	2011/02/16	2011/02/17	2011/02/18	2011/02/14	2011/02/14		
	Units	**MW10-6 S4**	**MW10-7A S4**	**MW10-22 S4**	**MW10-11 S2**	**MW10-15 S1**	**MW10-9-A S5**	**MW10-1 S3**	**MW10-2 S6**	**RDL**	**QC Batch**
Misc. Inorganics											
Total Organic Carbon (C)	%	0.08	0.64	0.69	1.7	0.66	0.33	0.20	0.14	0.02	4674990

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B113399
Report Date: 2011/03/04

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046 CANADA CREOSOTE

Sampler Initials: NB

Package 1	1.3°C

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

General Comments

Maxxam Job #: B113399
Report Date: 2011/03/04

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046 CANADA CREOSOTE

Sampler Initials: NB

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
4654486	Leachable (ZH) 4-BROMOFLUOROBENZENE (sur.)	2011/02/24			102	60 - 140	96	%		
4654486	Leachable (ZH) D4-1,2-DICHLOROETHANE (sur.)	2011/02/24			102	60 - 140	99	%		
4654486	Leachable (ZH) D8-TOLUENE (sur.)	2011/02/24			98	60 - 140	99	%		
4654486	Leachable (ZH) Benzene	2011/02/24			112	70 - 130	<0.01	mg/L	NC	50
4654486	Leachable (ZH) Toluene	2011/02/24			99	70 - 130	<0.01	mg/L	NC	50
4654486	Leachable (ZH) Ethylbenzene	2011/02/24			111	70 - 130	<0.01	mg/L	NC	50
4654486	Leachable (ZH) o-Xylene	2011/02/24			109	70 - 130	<0.01	mg/L	NC	50
4654486	Leachable (ZH) m & p-Xylene	2011/02/24			112	70 - 130	<0.02	mg/L	NC	50
4654486	Leachable (ZH) Xylenes (Total)	2011/02/24					<0.02	mg/L	NC	50
4658552	Closed Cup Flash point	2011/02/24							NC	35
4660785	Moisture	2011/02/24							0	20
4661404	Soluble (1:1) pH	2011/02/25			100	97 - 102			1.1	5
4662542	Leachable Antimony (Sb)	2011/02/26	88	75 - 125	81	80 - 120	<1	mg/L	NC	35
4662542	Leachable Arsenic (As)	2011/02/26	93	75 - 125	94	85 - 107	<0.5	mg/L	NC	35
4662542	Leachable Barium (Ba)	2011/02/26	NC	75 - 125	93	80 - 120	<1	mg/L	NC	35
4662542	Leachable Beryllium (Be)	2011/02/26	87	75 - 125	104	80 - 120	<0.5	mg/L	NC	35
4662542	Leachable Boron (B)	2011/02/26	93	75 - 125	104	80 - 120	<1	mg/L	NC	35
4662542	Leachable Cadmium (Cd)	2011/02/26	94	75 - 125	95	80 - 120	<0.1	mg/L	NC	35
4662542	Leachable Chromium (Cr)	2011/02/26	92	75 - 125	92	80 - 120	<0.5	mg/L	NC	35
4662542	Leachable Cobalt (Co)	2011/02/26	92	75 - 125	94	80 - 120	<1	mg/L	NC	35
4662542	Leachable Copper (Cu)	2011/02/26	89	75 - 125	94	81 - 120	<1	mg/L	NC	35
4662542	Leachable Iron (Fe)	2011/02/26	NC	75 - 125	97	80 - 120	<1	mg/L	NC	35
4662542	Leachable Lead (Pb)	2011/02/26	88	75 - 125	93	85 - 113	<0.5	mg/L	NC	35
4662542	Leachable Mercury (Hg)	2011/02/26	90	75 - 125	91	80 - 120	<0.02	mg/L	NC	35
4662542	Leachable Nickel (Ni)	2011/02/26	91	75 - 125	96	82 - 120	<0.5	mg/L	NC	35
4662542	Leachable Selenium (Se)	2011/02/26	100	75 - 125	93	80 - 120	<0.1	mg/L	NC	35
4662542	Leachable Silver (Ag)	2011/02/26	91	75 - 125	92	80 - 120	<0.5	mg/L	NC	35
4662542	Leachable Thallium (Tl)	2011/02/26	92	75 - 125	95	80 - 120	<0.5	mg/L	NC	35
4662542	Leachable Uranium (U)	2011/02/26	105	75 - 125	104	80 - 120	<0.2	mg/L	NC	35
4662542	Leachable Vanadium (V)	2011/02/26	99	75 - 125	96	80 - 120	<1	mg/L	NC	35
4662542	Leachable Zinc (Zn)	2011/02/26	90	75 - 125	96	80 - 120	<1	mg/L	NC	35
4662542	Leachable Zirconium (Zr)	2011/02/26	77	75 - 125	85	80 - 120	<1	mg/L	NC	35
4663445	Sieve - Pan	2011/02/28							0.7	35
4663445	Sieve - #200 (>0.075mm)	2011/02/28							15.2	35
4674990	Total Organic Carbon (C)	2011/03/03			99	75 - 125	0.02, RDL=0.02	%	2.8	50

GOLDER ASSOCIATES LTD.
Client Project #: 10-1346-0046 CANADA CREOSOTE

Maxxam Job #: B113399
Report Date: 2011/03/04

Sampler Initials: NB

QUALITY ASSURANCE REPORT

			QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits
4661404	Soluble (1:1) pH	2011/02/25	106	91 - 109
4663445	Sieve - Pan	2011/02/28	103	92 - 108
4663445	Sieve - #200 (>0.075mm)	2011/02/28	92	79 - 121
4674990	Total Organic Carbon (C)	2011/03/03	106	75 - 125

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B113399

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

JENNIFER LO, Senior Analyst, Organics Department

LUBA SHYMUSHOVSKA, Senior Analyst, Organic Department

LILI ZHOU, Senior analyst, Inorganic department.

==========

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

Maxxam
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Chain of Custody

A030225

Page: 1 of 1

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☒
Company:	Golder Associates	
Contact:	Julie Burghardt	
Address:	102, 2535 3rd Ave SE	
	Prov: AB PC: T2A 7W5	Prov: PC:
Contact #s:	Ph: 403-532-5795 Cell:	Ph: Cell:

Report Distribution (E-Mail): jburghardt@golder.com, nbaumann@golder.com

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

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

PO #:
Project # / Name: 10-1346-0046 Canada Creosote
Site Location:
Quote #:
Sampled By: NB/JB

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

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	moisture	FOC	WATER: ☐BTEX F1 ☐VOCs	☐BTEX F1-F2 ☐BTEX F1-F4	☐ Routine Water ☐ Turb ☐ F	☐ TOC ☐ DOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury ☐ Total ☐ Dissolved	Other Analysis	HOLD - Do not Analyze	# of Containers Submitted
1	MW10-6 S4		Soil	11/02/15		X					X	X								hold jars		
2	MW10-7A S4		"	11/02/15		X					X	X										
3	MW10-22 S4		"	11/02/17		X					X	X								~~hold jars~~		
4	MW10-11 S2		"	11/02/16							X	X										
5	MW10-15 S1		"	11/02/17							X	X										
6	MW10-9-A S5		"	11/02/18		X					X	X										
7	MW10-1 S3		"	11/02/14							X	X										
8	MW10-2 S6		"	11/02/14							X	X								hold jars		
9	Composite		"	11/02/18					X	X												
10																						
11																						
12																						

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

Relinquished By (Signature/Print): NB Baumann Niki Baumann	Date (YY/MM/DD): 11/02/18	Time (24:00): 17:25	
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):	
Special Instructions: hold jars MW10-6 S4 and MW10-2 S6		# of Jars Used & Not Submitted	

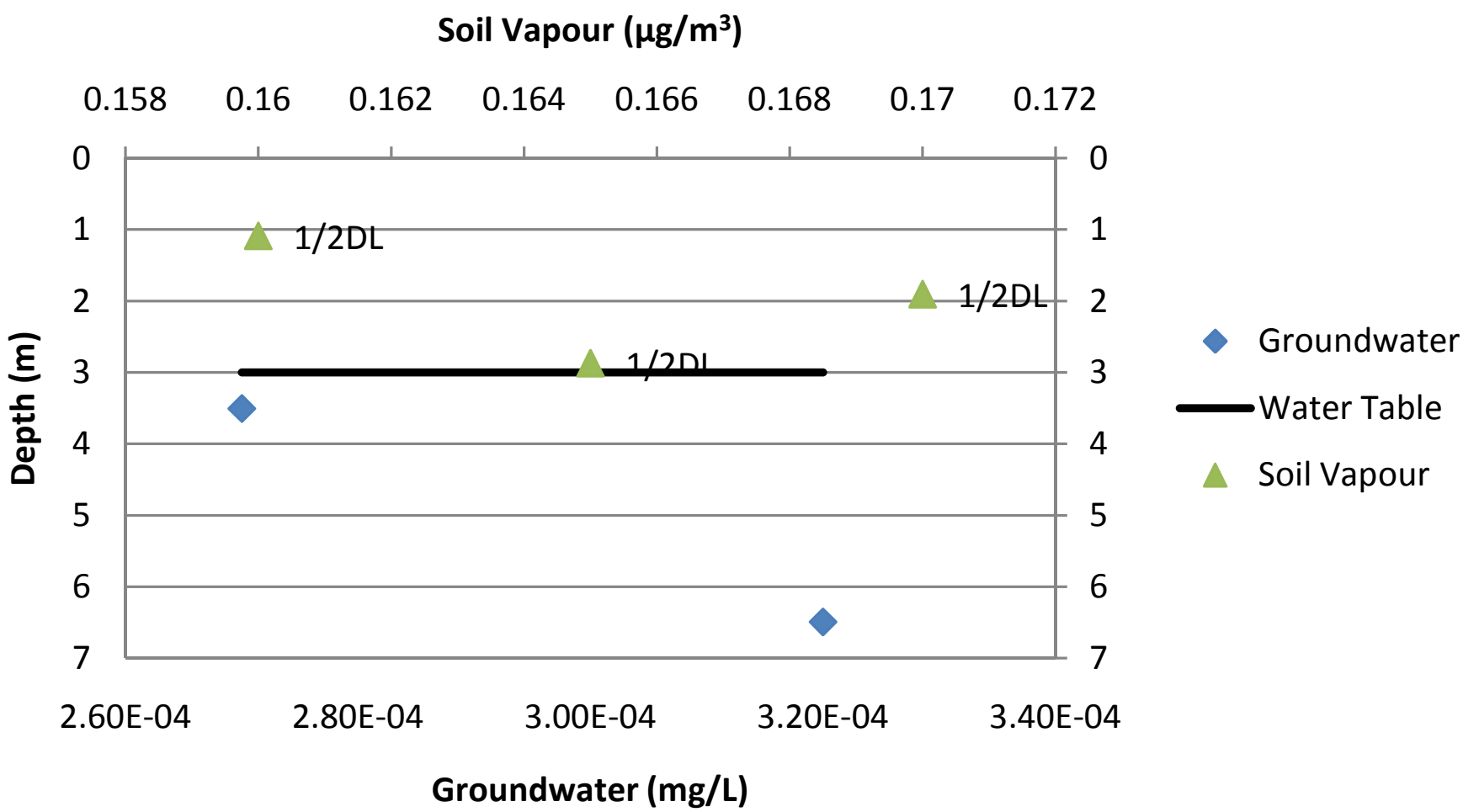
LAB USE ONLY

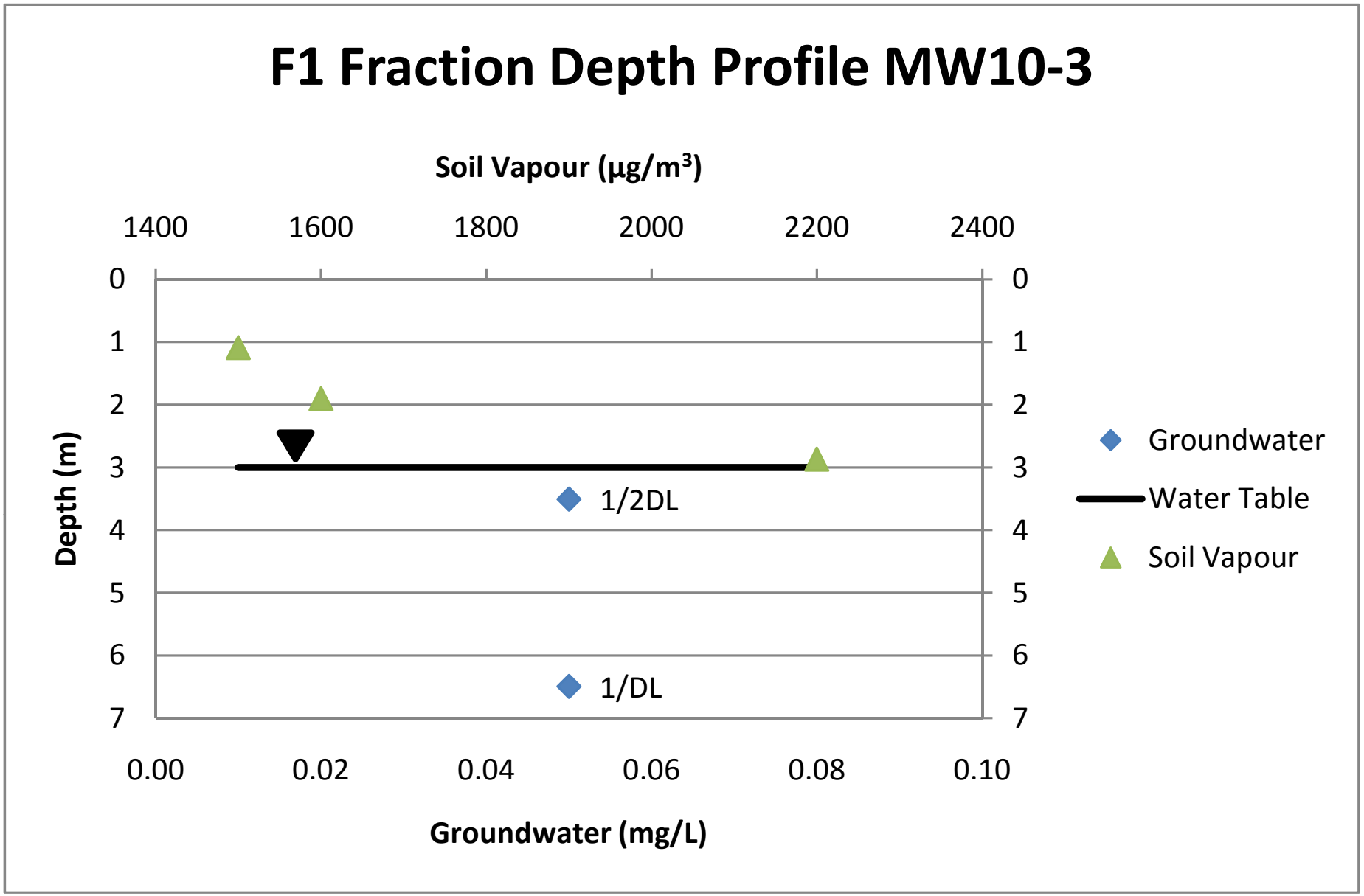
Received By:	Date:	Time:	Maxxam Job #: B113399		
RECEIVED FEB 18 2011			Custody Seal	Temperature	Ice
Lab Comments: 17:28			\	0, 2, 2	\

APPENDIX G

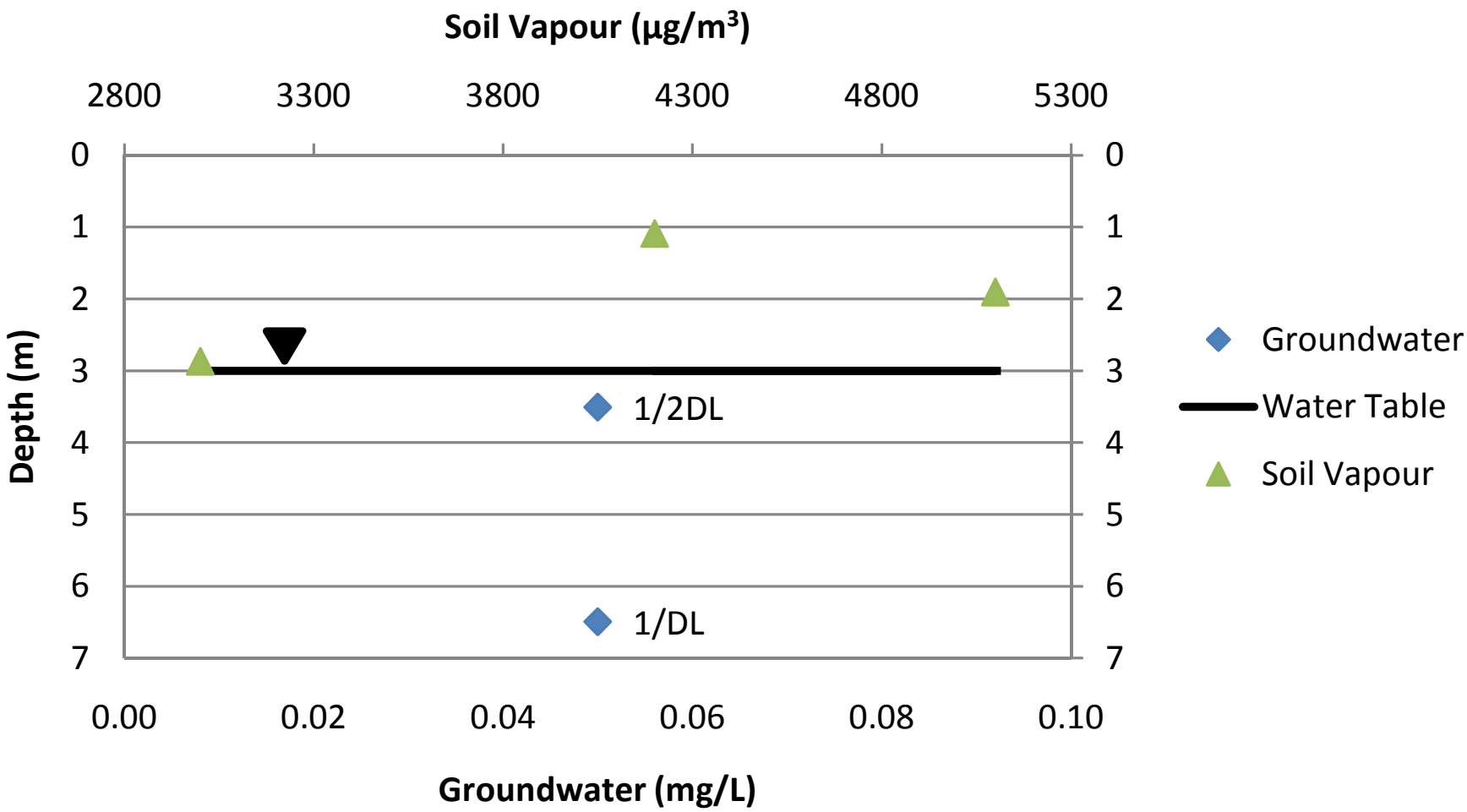
Depth Profile Data

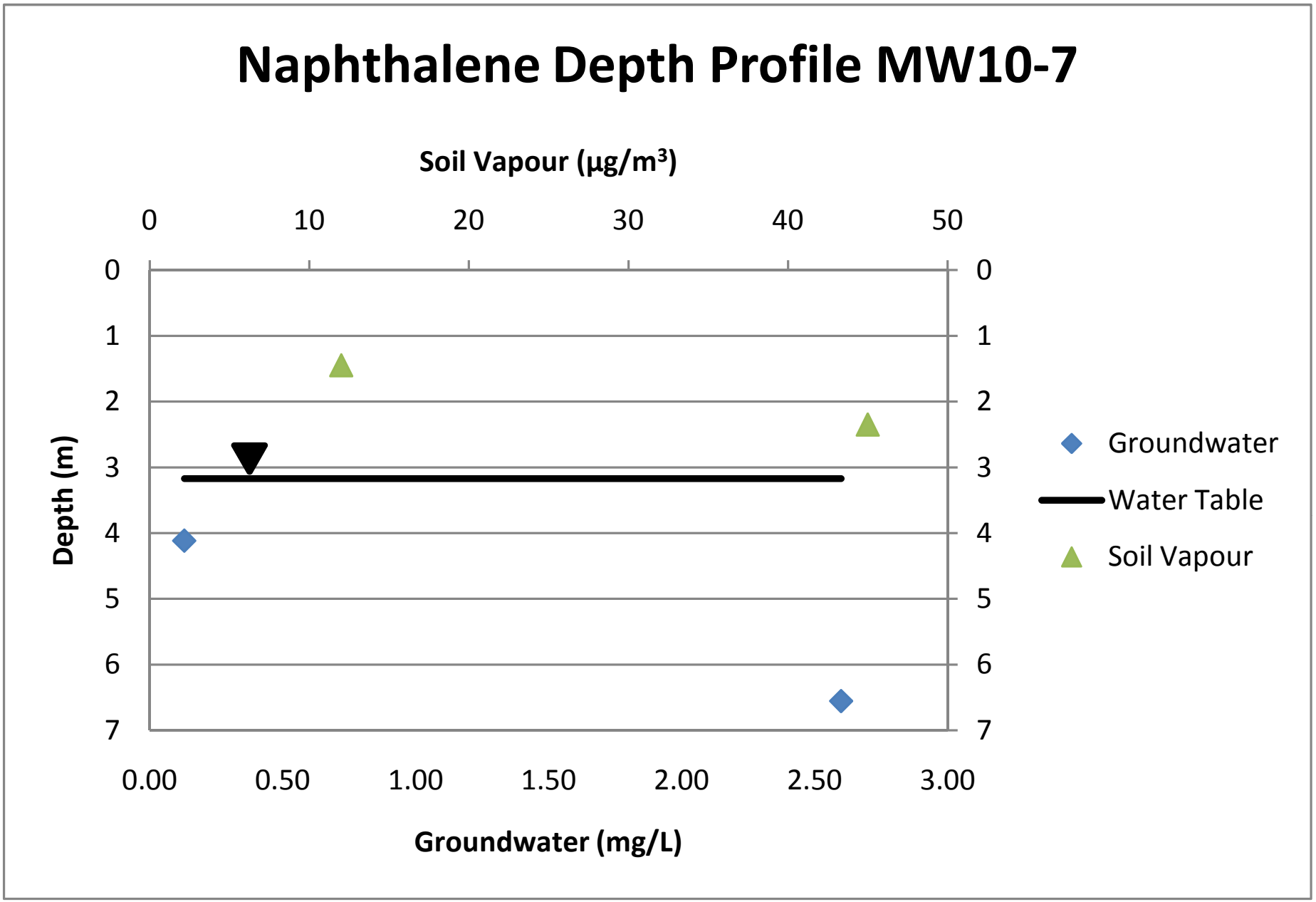
Naphthalene Depth Profile MW10-3

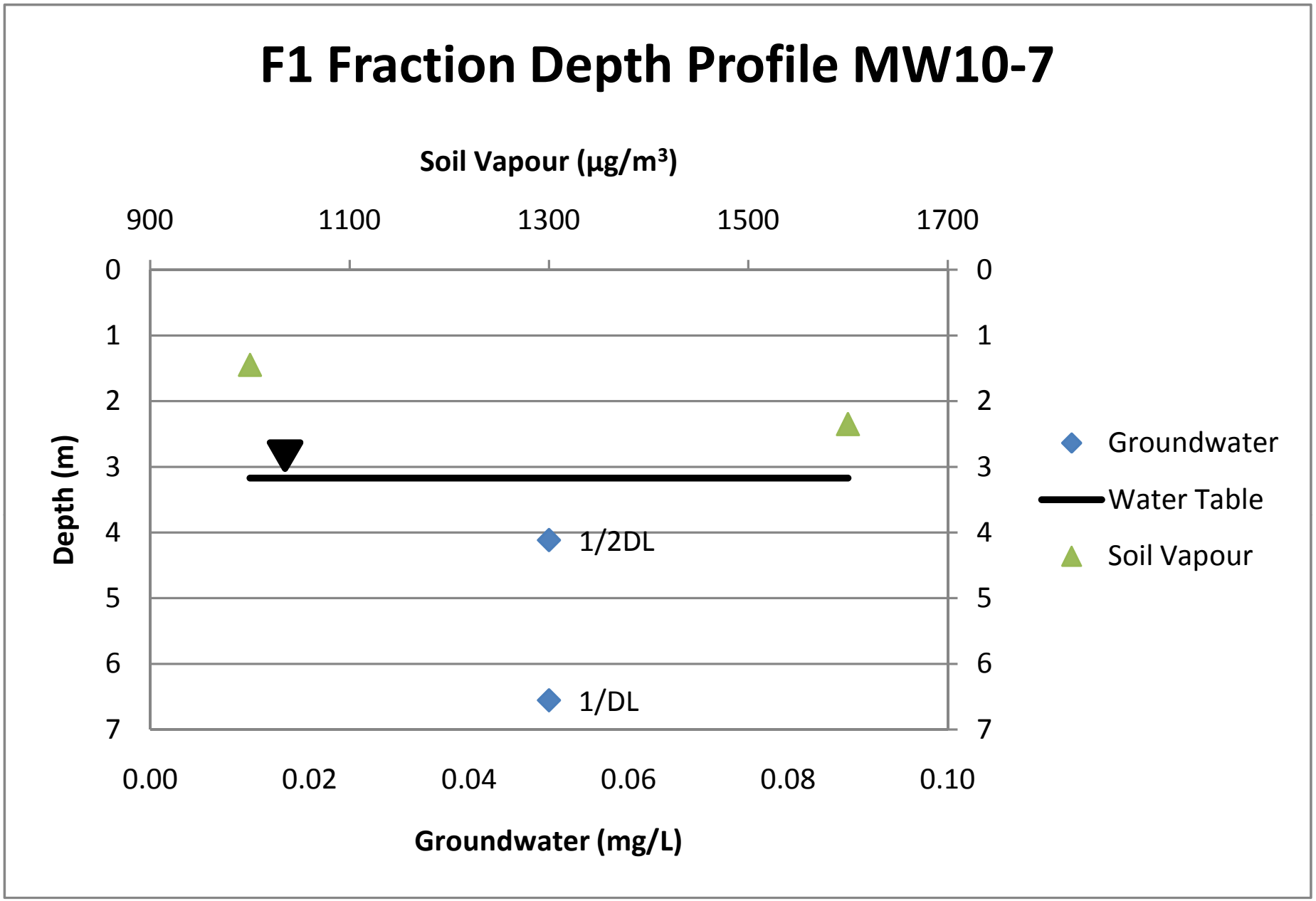


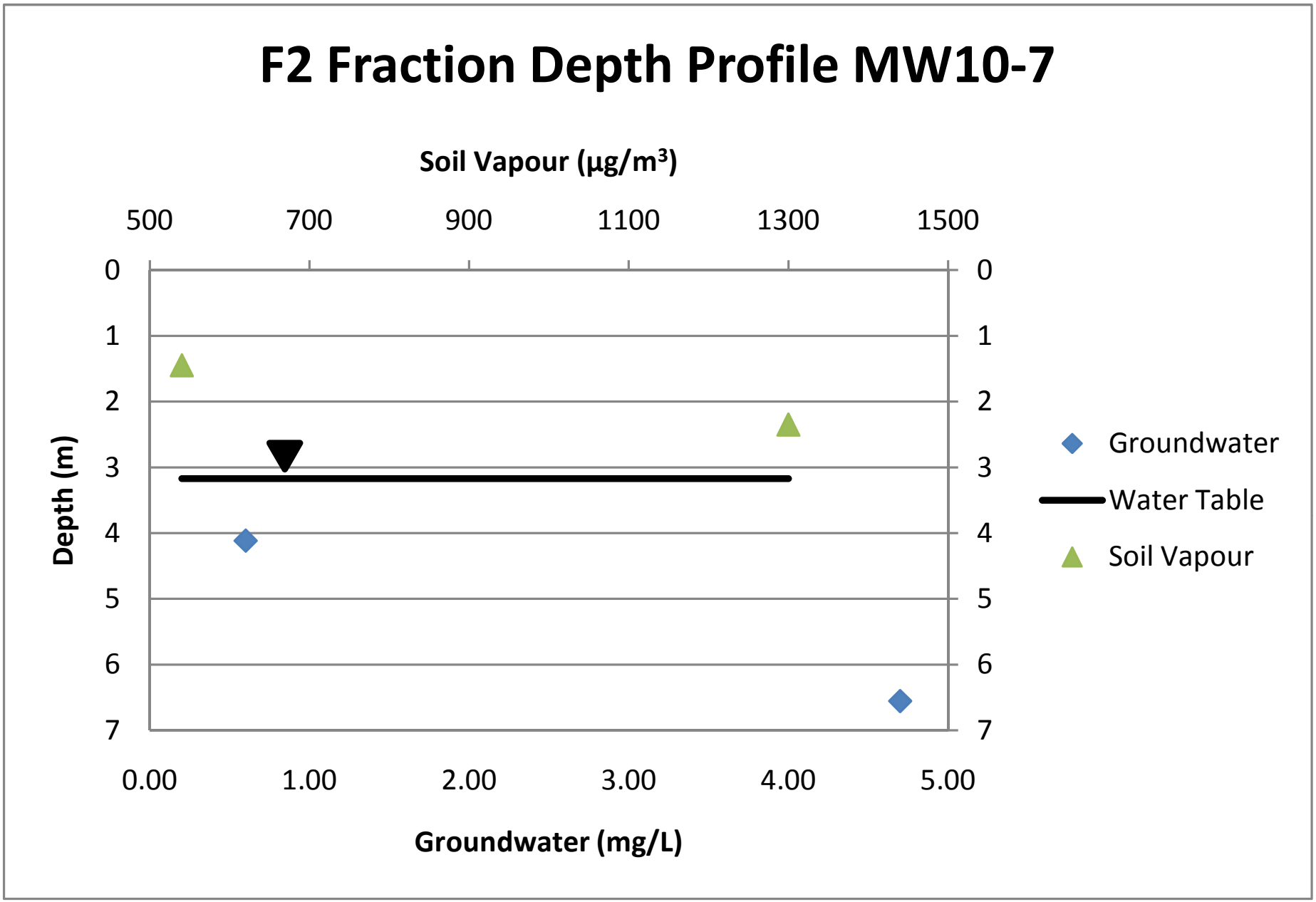

F1 Fraction Depth Profile MW10-3
Soil Vapour (µg/m³)
1400
1600
1800
2000
2200
2400
0
1
2
3
4
5
6
7
Depth (m)
1/2DL
1/DL
Groundwater
Water Table
Soil Vapour
0.00
0.02
0.04
0.06
0.08
0.10
Groundwater (mg/L)

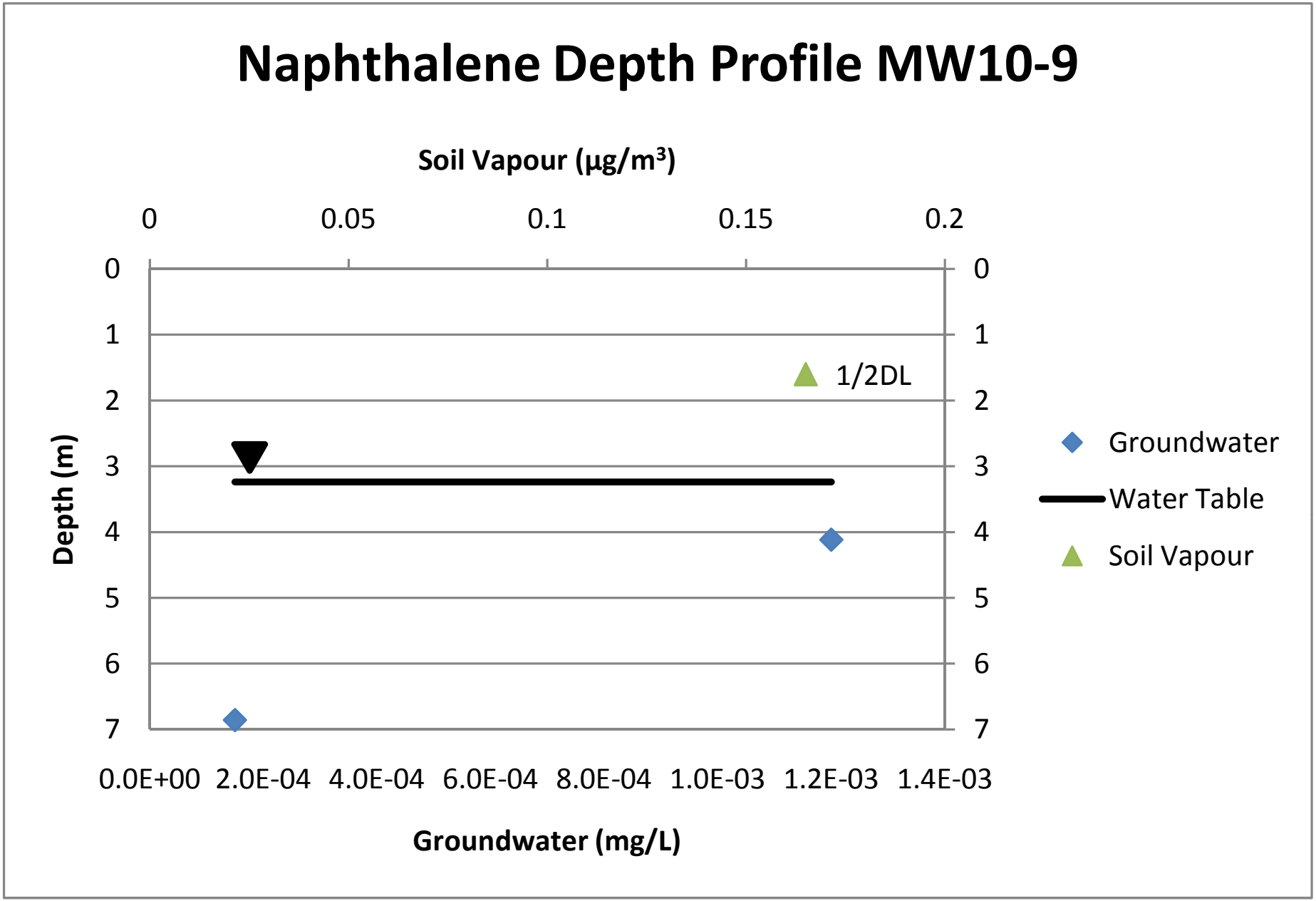
F2 Fraction Depth Profile MW10-3

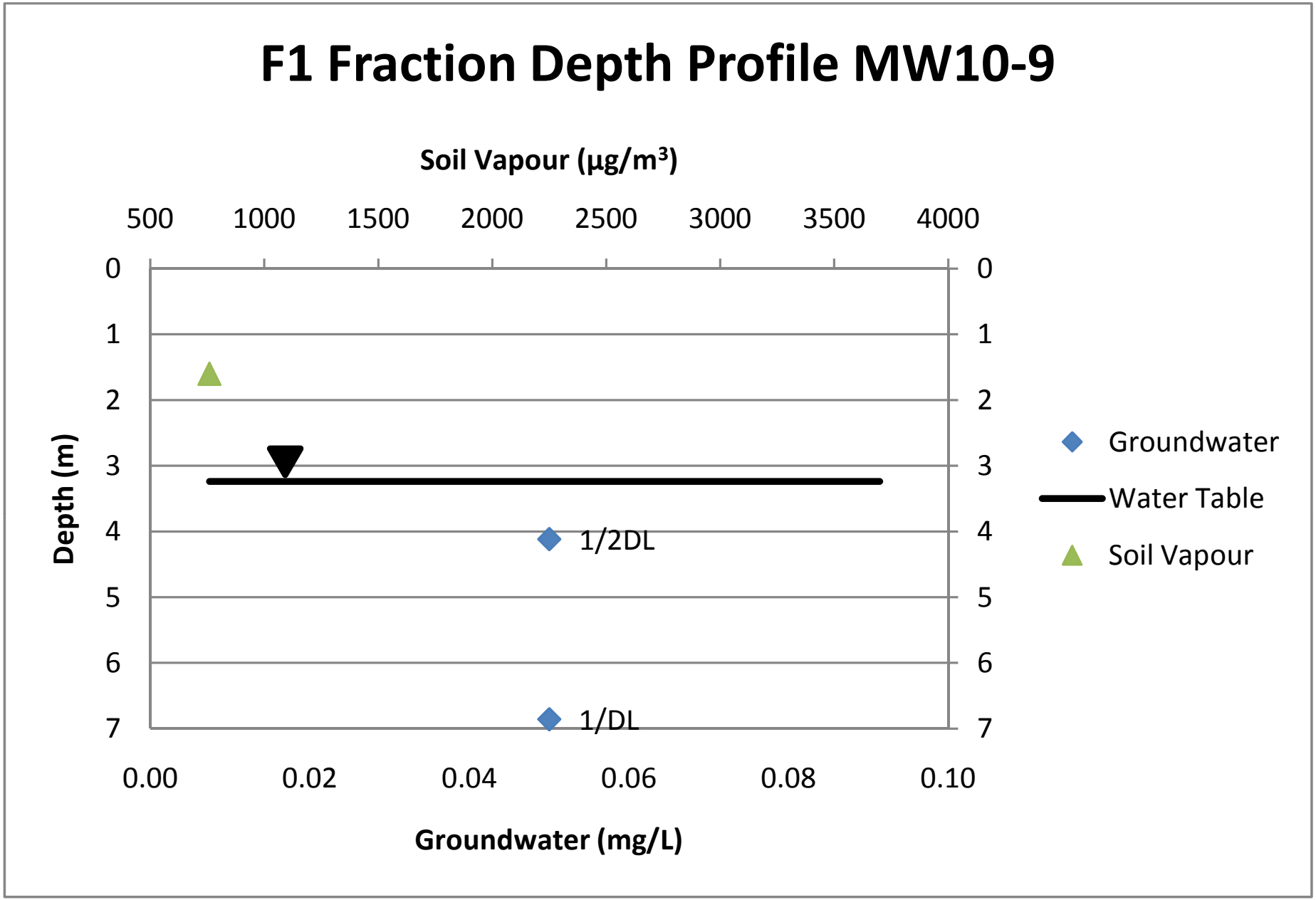


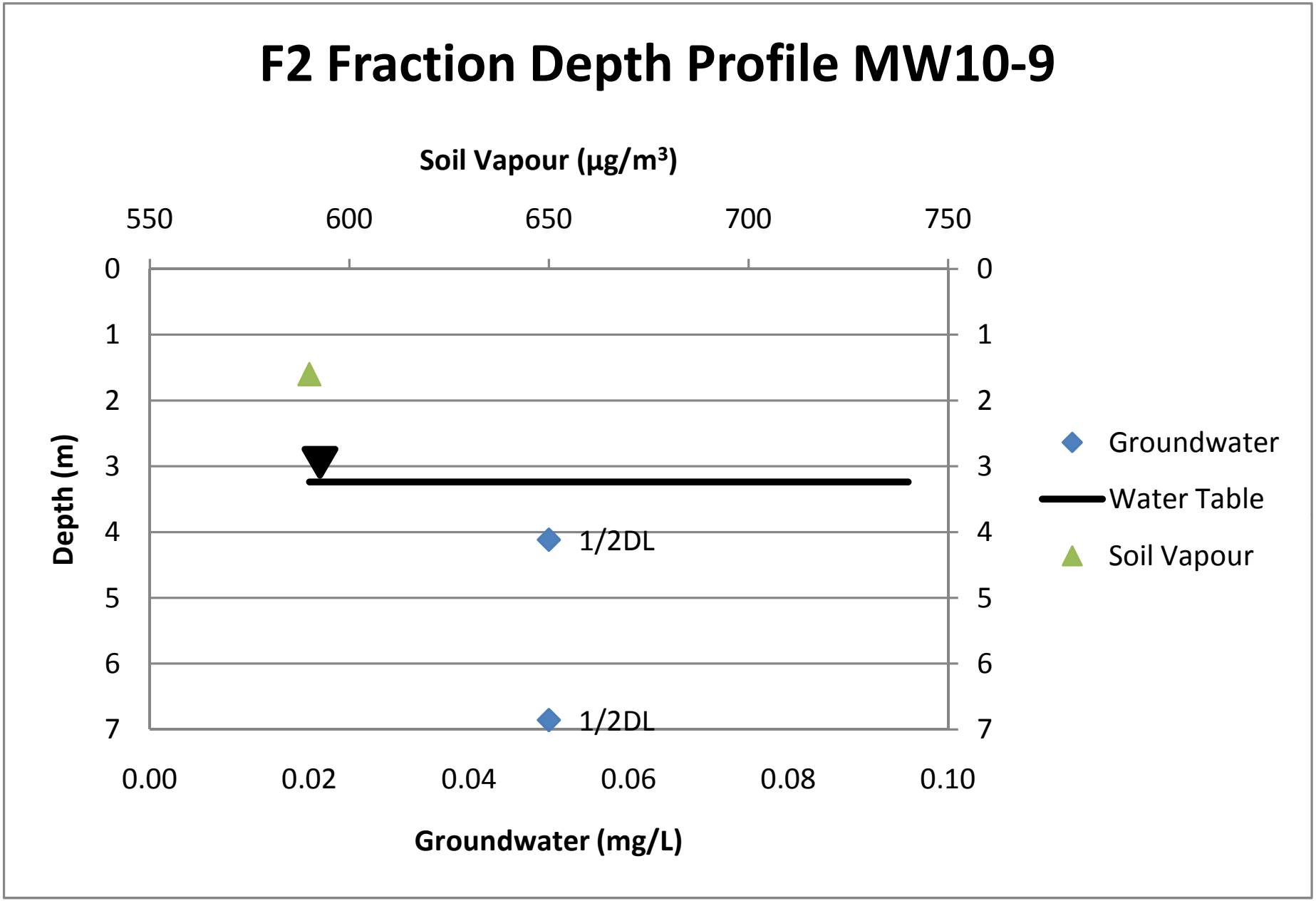

Naphthalene Depth Profile MW10-7
Soil Vapour (µg/m³)
0
10
20
30
40
50
Depth (m)
0
1
2
3
4
5
6
7
0.00
0.50
1.00
1.50
2.00
2.50
3.00
Groundwater (mg/L)
Groundwater
Water Table
Soil Vapour


F1 Fraction Depth Profile MW10-7
Soil Vapour (µg/m³)
900
1100
1300
1500
1700
0
1
2
3
4
5
6
7
Depth (m)
1/2DL
1/DL
Groundwater
Water Table
Soil Vapour
0.00
0.02
0.04
0.06
0.08
0.10
Groundwater (mg/L)


F2 Fraction Depth Profile MW10-7
Soil Vapour (µg/m³)
500
700
900
1100
1300
1500
0
1
2
3
4
5
6
7
Depth (m)
0.00
1.00
2.00
3.00
4.00
5.00
Groundwater (mg/L)
Groundwater
Water Table
Soil Vapour


Naphthalene Depth Profile MW10-9
Soil Vapour (µg/m³)
0
0.05
0.1
0.15
0.2
Depth (m)
0
1
2
3
4
5
6
7
1/2DL
Groundwater
Water Table
Soil Vapour
0.0E+00
2.0E-04
4.0E-04
6.0E-04
8.0E-04
1.0E-03
1.2E-03
1.4E-03
Groundwater (mg/L)


F1 Fraction Depth Profile MW10-9
Soil Vapour (µg/m³)
500
1000
1500
2000
2500
3000
3500
4000
0
1
2
3
4
5
6
7
Depth (m)
1/2DL
1/DL
Groundwater
Water Table
Soil Vapour
0.00
0.02
0.04
0.06
0.08
0.10
Groundwater (mg/L)


F2 Fraction Depth Profile MW10-9
Soil Vapour (µg/m³)
550
600
650
700
750
0
1
2
3
4
5
6
7
Depth (m)
1/2DL
1/2DL
Groundwater
Water Table
Soil Vapour
0.00
0.02
0.04
0.06
0.08
0.10
Groundwater (mg/L)

APPENDIX H

Screened Soil Vapour and Groundwater Data

Table H-1
Soil Vapour Guideline Development
Canada Creosote Site (north of Bow River), Calgary, Alberta

Parameter	Residential Soil Vapour Guideline (for distance < 1 m) ($\mu g/m^3$)	Derivation of Soil Vapour Guideline[1]					Carcinogenic									
		Non-carcinogen (with RfC)	Carcinogen (with RsC)	Jurisdiction	RfC	Ca	TRV (Unit Risk for Carcinogens)	Jurisdiction	ILCR	RsC	SAF	BAF	ET	AF	Maximum Measured Soil Vapour Concentration	Exceed Soil Vapour Guideline
Units	**α = 0.01**	($\mu g/m^3$)	($\mu g/m^3$)	-	mg/m^3	mg/m^3	$(mg/m^3)^{-1}$	-	-	mg/m^3	-	-	-	-	$\mu g/m^3$	-
Petroleum Hydrocarbon Ranges																
nC6-nC8 (total)															2300	NA
nC6-nC8 (aromatic)															610	NA
nC6-nC8 (aliphatic)	3.66E+05	3.66E+05		A	18.4	9.11E-02					0.2	1	1	0.01	1700	No
nC8-nC10 (total)															2200	NA
nC8-nC10 (aromatic)	3.25E+03	3.25E+03		A	0.2	3.75E-02					0.2	1	1	0.01	320	No
nC8-nC10 Non-reg. Aromatics															71	NA
nC8-nC10 (aliphatic)	1.92E+04	1.92E+04		A	1	3.88E-02					0.2	1	1	0.01	1900	No
nC6-nC10 (total)															3700	NA
nC10-nC12 (total)															4500	NA
nC10-nC12 (aromatic)	4.00E+03	4.00E+03		A	0.2						0.2	1	1	0.01	180	No
nC10-nC12 Non-reg. Aromatics															130	NA
nC10-nC12 (aliphatic)	2.00E+04	2.00E+04		A	1						0.2	1	1	0.01	4200	No
nC12-nC16 (total)															3500	NA
nC12-nC16 (aliphatic)	2.00E+04	2.00E+04		A	1						0.2	1	1	0.01	3500	No
nC10-nC16 (total)															8100	NA
VHv (6-13)															4500	NA
VPHv															4200	NA
																NA
Volatile Organic Compounds																
Acetaldehyde	4.55E+01	1.80E+02	4.55E+01	IRIS	0.009		**2.20E-03**	IRIS	1E-06	4.55E-04	0.2	1	1	0.01	19.4	No
Acetone	6.20E+05	6.20E+05		RSL	31						0.2	1	1	0.01	37	No
Acetonitrile	1.20E+03	1.20E+03		IRIS	0.06						0.2	1	1	0.01	0.207	No
Acetylene															1.53	NA
Benzaldehyde															0.541	NA
Benzene	3.03E+01	6.00E+02	3.03E+01	IRIS	0.03		**0.0033**	A	1E-06	3.03E-04	0.2	1	1	0.01	14.6	No
Butadiene (1,3-)	3.33E+00	4.00E+01	3.33E+00	IRIS	0.002		**3.00E-02**	IRIS	1E-06	3.33E-05	0.2	1	1	0.01	30.7	Yes
Butane															514	NA
Butanol (n-)															27.3	NA
Butene (cis-2-)															216	NA
Butene (trans-2-)															51.9	NA
Butene/Isobutene (1-)															598	NA
Butylbenzene (n-)															1.75	NA
Butylbenzene (sec-)															5.2	NA
Butyraldehyde															4.07	NA
Carbon disulfide	1.40E+04	1.40E+04		IRIS	0.7						0.2	1	1	0.01	53.3	No
Carbon tetrachloride	6.67E+00	6.26E+01	6.67E+00	A	0.00313		**0.015**	A	1E-06	6.67E-05	0.2	1	1	0.01	0.52	No
Chlorodifluoromethane	1.00E+06	1.00E+06		IRIS	50						0.2	1	1	0.01	0.628	No

Table H-1
Soil Vapour Guideline Development
Canada Creosote Site (north of Bow River), Calgary, Alberta

Parameter	Residential Soil Vapour Guideline (for distance < 1 m) ($\mu g/m^3$)	Derivation of Soil Vapour Guideline[1]					Carcinogenic									
		Non-carcinogen (with RfC)	Carcinogen (with RsC)	Jurisdiction	RfC	Ca	TRV (Unit Risk for Carcinogens)	Jurisdiction	ILCR	RsC	SAF	BAF	ET	AF	Maximum Measured Soil Vapour Concentration	Exceed Soil Vapour Guideline
Units	**α = 0.01**	($\mu g/m^3$)	($\mu g/m^3$)	-	mg/m^3	mg/m^3	$(mg/m^3)^{-1}$	-	-	mg/m^3	-	-	-	-	$\mu g/m^3$	-
Chloroform	4.35E+00	7.69E+02	4.35E+00	A	0.04475	6.30E-03	**0.023**	A	1E-06	4.35E-05	0.2	1	1	0.01	25.6	Yes
Chloromethane	1.80E+03	1.80E+03		RSL	0.09						0.2	1	1	0.01	1.7	No
Cumene	2.00E+04	2.00E+04		HC	0.4						0.5	1	1	0.01	27.4	No
Cyclohexane	1.20E+05	1.20E+05		IRIS	6						0.2	1	1	0.01	38.3	No
Cyclohexene															1.86	NA
Cyclopentane															4.35	NA
Cyclopentene															10.9	NA
Decane (n-)															24.9	NA
Dichlorodifluoromethane				RSL	0.1										13	NA
Dichloroethene (1,2-), trans	1.20E+03	1.20E+03		RSL	0.06						0.2	1	1	0.01	4.55	No
Dichloroethene (cis-1,2-)															4.25	NA
Diethylbenzene (1,3-)															14	NA
Dimethyl-2-Ethylbenzene (1,4-)															6.1	NA
Dimethyl-4-Ethylbenzene (1,2-)															20	NA
Dimethyl-5-Ethylbenzene (1,3-)															5.8	NA
Dimethylbutane (2,2-)															8.66	NA
Dimethylbutane (2,3-)															19.9	NA
Dimethylhexane (2,5-)															6.31	NA
Dimethylpentane (2,3-)															24.5	NA
Dimethylpentane (2,4-)															9.26	NA
Ethane															2250	NA
Ethanol															398	NA
Ethene															812	NA
Ethyl-1-butene (2-)															27.9	NA
Ethylbenzene	1.99E+04	1.99E+04		A	1	7.50E-03					0.2	1	1	0.01	44	No
Ethyltoluene (2-)															34.5	NA
Ethyltoluene (3-)															26.7	NA
Ethyltoluene (4-)															16.5	NA
Halocarbon 134A															3.95	NA
Heptanal															6.3	NA
Heptane															48.1	NA
Heptene (1-)															48.5	NA
Heptene (cis-3-)															19.4	NA
Heptene (trans-2-)															2.12	NA
Heptene (trans-3-)															4.55	NA

Table H-1
Soil Vapour Guideline Development
Canada Creosote Site (north of Bow River), Calgary, Alberta

Parameter	Residential Soil Vapour Guideline (for distance < 1 m) ($\mu g/m^3$)	Derivation of Soil Vapour Guideline[1]					Carcinogenic									
		Non-carcinogen (with RfC)	Carcinogen (with RsC)	Jurisdiction	RfC	Ca	TRV (Unit Risk for Carcinogens)	Jurisdiction	ILCR	RsC	SAF	BAF	ET	AF	Maximum Measured Soil Vapour Concentration	Exceed Soil Vapour Guideline
Units	**α = 0.01**	($\mu g/m^3$)	($\mu g/m^3$)	-	mg/m^3	mg/m^3	$(mg/m^3)^{-1}$	-	-	mg/m^3	-	-	-	-	$\mu g/m^3$	-
Hexachlorobutadiene	4.55E+00		4.55E+00			6.00E-05	**0.022**	A	1E-06	4.55E-05	0.2	1	1	0.01	0.5	No
Hexanal															5.39	NA
Hexane (n-)	1.40E+04	1.40E+04		IRIS	0.7						0.2	1	1	0.01	121	No
Hexene (1-)															132	NA
Hexene (cis-2-)															40.8	NA
Hexene (cis-3-)															19.5	NA
Hexene (trans-2-)															11.6	NA
Indan															83.8	NA
Indene															12.3	NA
Isobutane															378	NA
Isobutylbenzene															2.88	NA
Isoheptane															53.2	NA
Isohexane															112	NA
Isopentane															383	NA
Isoprene															13.1	NA
Isopropyl alcohol	1.40E+05	1.40E+05		RSL	7						0.2	1	1	0.01	4	No
Isopropyltoluene (4-)															63.6	NA
Limonene															56.8	NA
Methanol	4.32E+04	4.32E+04		A	2.2	4.00E-02					0.2	1	1	0.01	4430	No
Methyl ethyl ketone	1.00E+05	1.00E+05		IRIS	5						0.2	1	1	0.01	20	No
Methyl isobutyl ketone	6.00E+04	6.00E+04		IRIS	3						0.2	1	1	0.01	1.52	No
Methyl methacrylate	1.04E+03	1.04E+03		A	0.052	2.44E-07					0.2	1	1	0.01	4.1	No
Methyl-1-butene (3-)															113	NA
Methyl-1-pentene (2-)															94.8	NA
Methyl-1-pentene (4-)															44.3	NA
Methyl-2-butene (2-)															38.5	NA
methyl-2-ethylbenzene (1-)															20	NA
Methyl-2-n-Propylbenzene (1-)															3.5	NA
Methyl-2-pentene (2-)															7.37	NA
Methyl-2-pentene (cis/trans-4-)															12.2	NA
Methyl-2-pentene (cis-3-)															7.84	NA
methyl-3-ethylbenzene (1-)															39	NA
Methyl-3-n-Propylbenzene (1-)															8.4	NA
methyl-4-ethylbenzene (1-)															6.2	NA

Table H-1
Soil Vapour Guideline Development
Canada Creosote Site (north of Bow River), Calgary, Alberta

Parameter	Residential Soil Vapour Guideline (for distance < 1 m) ($\mu g/m^3$)	Derivation of Soil Vapour Guideline[1]					Carcinogenic									
		Non-carcinogen (with RfC)	Carcinogen (with RsC)	Jurisdiction	RfC	Ca	TRV (Unit Risk for Carcinogens)	Jurisdiction	ILCR	RsC	SAF	BAF	ET	AF	Maximum Measured Soil Vapour Concentration	Exceed Soil Vapour Guideline
Units	**α = 0.01**	($\mu g/m^3$)	($\mu g/m^3$)	-	mg/m^3	mg/m^3	$(mg/m^3)^{-1}$	-	-	mg/m^3	-	-	-	-	$\mu g/m^3$	-
Methylcyclohexane															89.6	NA
Methylcyclohexene (1-)															1.28	NA
Methylcyclopentane															24.9	NA
Methylcyclopentene (1-)															3.82	NA
Methylene chloride	4.35E+03	5.99E+04	4.35E+03	A	3	6.30E-03	**0.000023**	A	1E-06	4.35E-02	0.2	1	1	0.01	22	No
Methylheptane (2-)															26.4	NA
Methylheptane (3-)															32.9	NA
Methylhexane (3-)															73	NA
Methylpentane (3-)															101	NA
Naphthalene	4.10E+01	4.10E+01		A	0.003	9.50E-04					0.2	1	1	0.01	58	Yes
Neopentane															3.52	NA
Nonane (n-)	4.00E+03	4.00E+03		RSL	0.2						0.2	1	1	0.01	13.9	No
Nonene (1-)															23.2	NA
Nonene (4-)															15.8	NA
Octane (n-)															21.5	NA
Octene (1-)															6.31	NA
Octene (cis-2-)															4.08	NA
Pentane (n-)	2.00E+04	2.00E+04		RSL	1						0.2	1	1	0.01	436	No
Pentene (1-)															395	NA
Pentene (cis-2-)															112	NA
Pentene (trans-2-)															31.8	NA
Pinene (alpha-)															577	NA
Pinene (beta-)															58	NA
Propane															1350	NA
Propanol															55.4	NA
Propylbenzene (n-)	2.00E+04	2.00E+04		RSL	1						0.2	1	1	0.01	13	No
Propylene	6.00E+04	6.00E+04		RSL	3						0.2	1	1	0.01	919	No
Styrene	1.83E+03	1.83E+03		A	0.092	2.80E-04					0.2	1	1	0.01	0.409	No
Tetrachloroethene	7.20E+03	7.20E+03		A	0.36						0.2	1	1	0.01	228	No
Tetrahydrofuran															1	NA
Tetramethylbenzene (1,2,4,5-)															9.7	NA
Toluene	7.51E+04	7.51E+04		A	3.8	4.42E-02					0.2	1	1	0.01	610	No
Trichlorobenzene (1,2,4-)	1.04E+02	1.04E+02		A	0.007	1.80E-03					0.2	1	1	0.01	0.86	No
Trichloroethene	1.64E+02	7.72E+02	1.64E+02	A	0.04	1.40E-03	**0.00061**	A	1E-06	1.64E-03	0.2	1	1	0.01	4.42	No
Trichlorofluoromethane	1.40E+04	1.40E+04		RSL	0.7						0.2	1	1	0.01	3.1	No
Trichlorotrifluoroethane (1,1,2-)	6.00E+05	6.00E+05		RSL	30						0.2	1	1	0.01	0.684	No

Table H-1
Soil Vapour Guideline Development
Canada Creosote Site (north of Bow River), Calgary, Alberta

Parameter	Residential Soil Vapour Guideline (for distance < 1 m) ($\mu g/m^3$)	Derivation of Soil Vapour Guideline[1]					Carcinogenic									
		Non-carcinogen (with RfC)	Carcinogen (with RsC)	Jurisdiction	RfC	Ca	TRV (Unit Risk for Carcinogens)	Jurisdiction	ILCR	RsC	SAF	BAF	ET	AF	Maximum Measured Soil Vapour Concentration	Exceed Soil Vapour Guideline
Units	**α = 0.01**	($\mu g/m^3$)	($\mu g/m^3$)	-	mg/m^3	mg/m^3	$(mg/m^3)^{-1}$	-	-	mg/m^3	-	-	-	-	$\mu g/m^3$	-
Trimethyl-1-pentene (2,4,4-)															0.516	NA
Trimethylbenzene (1,2,3-)				RSL	0.005										68	NA
Trimethylbenzene (1,2,4-)	1.40E+02	1.40E+02		RSL	0.007						0.2	1	1	0.01	61	No
Trimethylbenzene (1,3,5-)															89.2	NA
Trimethylhexane (2,2,5-)															19.6	NA
Trimethylpentane (2,2,3-)															6.86	NA
Trimethylpentane (2,2,4-)															6.18	NA
Trimethylpentane (2,3,4-)															22.2	NA
Undecane (n-)															13	NA
Undecene (1-)															5.84	NA
Vinyl chloride	1.14E+01	2.00E+03	1.14E+01	A	0.1		**0.0088**	A	1E-06	1.14E-04	0.2	1	1	0.01	0.214	No
Xylene (m- & p-)	2.00E+03	2.00E+03		RSL	0.1						0.2	1	1	0.01	42.4	No
Xylene (o-)	2.00E+03	2.00E+03		RSL	0.1						0.2	1	1	0.01	53.8	No
Xylenes (total)	3.56E+03	3.56E+03		A	0.18	1.82E-03					0.2	1	1	0.01	250	No

Notes:

Table to be read in conjunction with accompanying report. See Section 3.2.4 for information and equations used in Soil Vapour Guideline Development.

Where both non-carcinogenic and carcinogenic guidelines were calculated, the most conservative guideline was applied.

TRV - Toxicological Reference Value

A - Alberta Environment Tier 1 Soil and Groundwater Remediation Guidelines, Appendix C: Protocols for Calculating Tier 1 Soil and Groundwater Remediation Guidelines, Table C-7: Human TRVs (December 2010).

HC - Health Canada Contaminated Sites Program, Federal Contaminated Sites Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-specific factors (May 2009).

IRIS - US Environmental Protection Agency (US EPA) Integrated Risk Information Systems (IRIS), A-Z List of Substances (accessed May 2011).

RSL - US Environmental Protection Agency (US EPA) Regional Screening Levels (RSL), Residential Air Supporting Tables (updated May 2011).

RfC = reference air concentration (mg/m^3)

RsC = risk specific concentration (mg/m^3)

Ca = background indoor/outdoor air concentration (mg/m^3)

SAF = soil vapour allocation factor (unitless)

BAF = biodegradation adjustment factor (10, if eligible; assumed to be not eligible for all compounds)

ET = Exposure term (unitless)

AF = attenuation factor between soil vapour and indoor air (unitless)

ILCR - Incremental Lifetime Cancer Risk (unitless)

µg/m3 - micrograms per cubic metre.

mg/m^3 - miligrams per cubic metre.

Values of 0 and 0.2 were assumed for Ca and SAF, respectively, for TRVs from US EPA IRIS or RSL.

Table H-2
Summary of Groundwater BTEX and PAH Results
Canada Creosote Site - North Bow
Human Health Risk Assessment

Sample Name	Alberta Tier 1 Res/Prkind most stringent of fine and coarse[1]	Alberta Tier 1 Res/Prkind for coarse grained soil Inhalation Pathway	Alberta Tier 1 Res/Prkind potable water use	MW10-1	MW10-10	MW10-11	MW10-15	MW10-16	MW10-18	MW10-2	MW10-20	MW10-22	MW10-3A	MW10-3B	MW10-6	DUP 2 (MW10-06)	MW10-7A	MW10-7B	DUP 1 (MW10-7B)	MW10-9A	MW10-9B
Location				MW10-1	MW10-10	MW10-11	MW10-15	MW10-16	MW10-18	MW10-2	MW10-20	MW10-22	MW10-3	MW10-3	MW10-6	MW10-6	MW10-7	MW10-7	MW10-7	MW10-9	MW10-9
Date				3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011 FD	3/1/2011	3/1/2011	3/1/2011 FD	3/1/2011	3/1/2011
QA/QC																					
BTEX																					
Benzene	**0.005**	0.14	**0.005**	0.0007	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	**0.039**	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Toluene	0.024	74	0.024	0.0011	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	0.0017	< 0.0004	0.0011	0.0006	0.0005	0.0005	0.0083	< 0.0004	< 0.0004	0.0009	0.0015
Ethylbenzene	**0.0024**	16	**0.0024**	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	0.0005	0.0005	0.0019	0.002	**0.081**	0.0013	0.0009	< 0.0004	< 0.0004
Xylenes, Total	0.3	3.9	0.3	< 0.0008	0.0017	< 0.0008	< 0.0008	< 0.0008	< 0.0008	< 0.0008	0.0016	< 0.0008	0.0031	0.0028	0.0081	0.0085	0.14	0.0052	0.0036	< 0.0008	< 0.0008
F1 (C6-C10) - BTEX	0.81	0.81	2.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
F2 (C10-C16)	**1.1**	**1.5**	**1.1**	< 0.1	0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	**3**	**3**	**4.7**	0.6	**1.2**	< 0.1	< 0.1
PAH																					
2-Methylnaphthalene	NG	0.6[2]	0.47[2]	0.00087	0.0026	0.00032	0.00022	0.0011	0.0002	0.00011	0.00019	0.00011	0.00025	0.00028	0.23	0.21	0.066	0.059	0.075	0.00015	0.00051
Acenaphthene	**0.0058**	NGR	1.4	0.00022	0.0014	< 0.00010	< 0.00010	0.00013	0.00071	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	**0.2**	**0.18**	**0.027**	**0.056**	**0.069**	< 0.00010	0.0003
Acenaphthylene	0.046	NG	NG	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010	0.0029	< 0.0050	0.0016	0.0024	0.0029	< 0.00010	< 0.00010
Acridine	NG	NG	NG	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.010	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Anthracene	**0.000012**	NGR	NGR	**0.000022**	**0.00027**	**0.000033**	**0.000015**	**0.000058**	**0.000023**	< 0.000010	**0.00003**	< 0.000010	**0.000021**	**0.00002**	**0.063**	**0.063**	**0.0025**	**0.04**	**0.046**	**0.000036**	**0.00038**
B(a)P Equivalency	**0.00001**	NG	**0.00001**	< 0.00001	**0.00005**	**0.00006**	< 0.00001	**0.00006**	**0.00004**	< 0.00001	**0.00004**	< 0.00001	**0.00001**	**0.00001**	**0.012**	**0.011**	**0.00022**	**0.026**	**0.026**	**0.00004**	**0.00066**
Benzo(a)anthracene	**0.000018**	NG	NG	< 0.0000085	**0.000058**	**0.000042**	< 0.0000085	**0.000054**	**0.00003**	< 0.0000085	**0.000026**	< 0.0000085	0.0000095	0.000014	**0.024**	**0.024**	**0.00055**	**0.031**	**0.033**	**0.000041**	**0.00071**
Benzo(a)pyrene	**0.000015**	NG	NG	< 0.0000075	**0.000024**	**0.000038**	< 0.0000075	**0.000039**	**0.000027**	< 0.0000075	**0.000023**	< 0.0000075	< 0.0000075	< 0.0000075	**0.0065**	**0.006**	**0.00012**	**0.017**	**0.016**	**0.000024**	**0.00043**
Benzo[b,j]fluoranthene	**0.00048**	NG	NG	< 0.0000085	0.000049	0.000048	< 0.0000085	0.00006	0.000035	< 0.0000085	0.000029	< 0.0000085	0.000014	0.000016	**0.01**	**0.0075**	0.00018	**0.024**	**0.021**	0.000045	**0.00061**
Benzo[c]phenanthrene	NG	NG	NG	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.0043	< 0.0040	< 0.00015	< 0.0050	< 0.0050	< 0.000050	< 0.00010
Benzo[e]pyrene	NG	NG	NG	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	0.0048	0.0036	0.0001	0.012	0.012	< 0.000050	0.00031
Benzo[g,h,i]perylene	**0.00017**	NG	NG	< 0.0000085	0.000024	0.000031	< 0.0000085	0.000031	0.000019	< 0.0000085	0.000023	< 0.0000085	0.00002	0.0000095	**0.002**	**0.0037**	0.000044	**0.0063**	**0.0064**	0.000018	0.00015
Benzo[k]fluoranthene	**0.00048**	NG	NG	< 0.0000085	0.00002	0.000018	< 0.0000085	0.000025	0.000015	< 0.0000085	0.000014	< 0.0000085	< 0.0000085	< 0.0000085	**0.0032**	**0.004**	0.000066	**0.0073**	**0.0071**	0.000014	0.0002
Chrysene	**0.0014**	NG	NG	0.00002	0.00011	0.000067	< 0.0000085	0.000094	0.00005	< 0.0000085	0.000051	< 0.0000085	0.000051	0.000045	**0.024**	**0.02**	0.00062	**0.033**	**0.033**	0.00007	0.00074
Dibenz(a,h)anthracene	**0.00026**	NG	NG	< 0.0000075	0.0000078	0.0000085	< 0.0000075	< 0.0000075	< 0.0000075	< 0.0000075	< 0.0000075	< 0.0000075	< 0.0000075	< 0.0000075	**0.00081**	**0.0013**	0.000011	**0.0025**	**0.0024**	0.0000083	0.000056
Fluoranthene	**0.00004**	NGR	NGR	< 0.000040	**0.00066**	**0.00012**	< 0.000040	**0.00016**	**0.000091**	< 0.000040	**0.00011**	< 0.000040	**0.00018**	**0.00012**	**0.19**	**0.15**	**0.0056**	**0.13**	**0.15**	**0.00012**	**0.0022**
Fluorene	**0.003**	NGR	0.94	0.000092	0.00081	0.00011	< 0.000050	0.00018	0.0004	< 0.000050	< 0.000050	< 0.000050	0.000055	0.000076	**0.15**	**0.14**	**0.01**	**0.057**	**0.067**	0.000072	0.00028
Indeno[1,2,3-cd]pyrene	**0.00021**	NG	NG	< 0.0000085	0.000018	0.000023	< 0.0000085	0.000025	0.000016	< 0.0000085	0.000016	< 0.0000085	0.00001	< 0.0000085	**0.002**	**0.0035**	0.000035	**0.0064**	**0.0063**	0.000016	0.00015
Naphthalene	**0.0011**	**0.6**	**0.47**	**0.02**	**0.092**	0.00031	0.00023	**0.0013**	**0.0021**	< 0.00010	0.00016	**0.0011**	0.00032	0.00027	**0.77**	**0.68**	**2.6**	**0.13**	**0.2**	0.00015	**0.0012**
Perylene	NG	NG	NG	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	0.0017	< 0.0025	0.000093	0.0039	0.004	< 0.000050	0.000092
Phenanthrene	**0.0004**	NG	NG	0.00031	**0.0025**	0.00039	0.00017	**0.00063**	0.00028	0.000098	0.00025	0.000067	0.0003	0.00033	**0.44**	**0.36**	**0.015**	**0.21**	**0.27**	0.00023	**0.0019**
Pyrene	**0.000025**	NGR	0.71	**0.000035**	**0.00056**	**0.00012**	< 0.000020	**0.00017**	**0.000089**	**0.000037**	**0.00012**	**0.000033**	**0.00027**	**0.00014**	**0.15**	**0.12**	**0.0049**	**0.12**	**0.14**	**0.00015**	**0.002**
Quinoline	NG	NG	NG	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.010	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020

Notes:
All concentrations in mg/L unless otherwise noted.
1 - Alberta Tier 1 Guidelines, Residential Land Use, Most Stringent Guideline of Either Fine or Coarse Grained Soil (AENV, 2010)
2 - The guideline value is for naphthalene.
NG - No Guideline
NGR - No Guildeline Required (calculated value > solubility, or > 1,000,000 mg/L).
Bold values indicate exceedance of the lowest guideline.

Table H-3
Summary of Groundwater VOCs Results
Canada Creosote Site - North Bow
Human Health Risk Assessment

Sample Name Location Date QA/QC	Tier 1 Res/PrkInd most stringent of fine and coarse	Alberta Tier 1 Res/PrkInd for coarse grained soil Inhalation Pathway	Alberta Tier 1 Res/PrkInd potable water use	MW10-1 MW10-1 3/1/2011	MW10-3A MW10-3 3/1/2011	MW10-6 MW10-6 3/1/2011	MW10-7A MW10-7 3/1/2011	MW10-7B MW10-7 3/1/2011	MW10-9B MW10-9 3/1/2011
1,1,1,2-Tetrachloroethane	NG	NG	NG	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
1,1,1-Trichloroethane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,1,2,2-Tetrachloroethane	NG	NG	NG	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
1,1,2-Trichloroethane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,1-Dichloroethane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,1-Dichloroethene	0.014	0.039	0.014	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2,3-Trichlorobenzene	0.008	0.032	0.014	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1,2,4-Trichlorobenzene	0.015	0.028	0.015	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
1,2,4-Trimethylbenzene	NG	NG	NG	< 0.0005	< 0.0005	0.013	0.025	0.0032	< 0.0005
1,2-Dibromoethane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2-Dichlorobenzene	0.0007	5.4	0.003	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2-Dichloroethane	0.005	0.01	0.005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2-Dichloropropane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,3,5-Trichlorobenzene	0.014	0.015	0.014	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,3,5-Trimethylbenzene	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,3-Dichlorobenzene	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,4-Dichlorobenzene	0.001	0.22	0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bromodichloromethane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bromoform	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bromomethane	NG	NG	NG	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Carbon Tetrachloride	0.00056	0.00056	0.005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Chlorobenzene	0.0013	0.014	0.03	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Chloroethane	NG	NG	NG	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chloroform	**0.0018**	0.003	0.093	**0.0019**	**0.0027**	0.0006	**0.0051**	< 0.0005	**0.0041**
Chloromethane	NG	NG	NG	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
cis-1,2-Dichloroethene	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
cis-1,3-Dichloropropene	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dibromochloromethane	0.19	1.1	0.19	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dichloromethane	0.05	3.4	0.05	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Methyl Methacrylate	0.47	0.84	0.47	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Methyl tert-Butyl Ether	0.015	0.34	0.015	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Styrene	0.072	4.3	2.8	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Tetrachloroethene	0.03	0.11	0.03	< 0.0005	0.0006	0.0015	< 0.0005	< 0.0005	< 0.0005
trans-1,2-Dichloroethene	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
trans-1,3-Dichloropropene	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Trichloroethene	0.005	0.02	0.005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Trichlorofluoromethane	NG	NG	NG	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Vinyl Chloride	0.0011	0.0011	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Notes:
All concentrations in mg/L unless otherwise noted.
NG - No Guideline

Table H-4
Results of Groundwater Quality Control Analysis
Canada Creosote Site - North Bow
Human Health Risk Assessment

Sample Name	MW10-6	DUP 2 (MW10-06)					MW10-7B	DUP 1 (MW10-7B)				
Location	MW10-6	MW10-6	Reporting Detection Limit	Mean	Relative Percent Difference	Difference Factor (DF)	MW10-7	MW10-7	Reporting Detection Limit	Mean	Relative Percent Difference	Difference Factor (DF)
Date	3/1/2011	3/1/2011					3/1/2011	3/1/2011				
QA/QC		FD						FD				
BTEX												
Benzene	< 0.0004	< 0.0004	0.0004	NC	NC	NC	< 0.0004	< 0.0004	0.0004	NC	NC	NC
Toluene	0.0005	0.0005	0.0004	0.0005	NA	0.00	< 0.0004	< 0.0004	0.0004	NC	NC	NC
Ethylbenzene	0.0019	0.002	0.0004	0.0020	NA	0.25	0.0013	0.0009	0.0004	0.0011	NA	1.00
Xylenes, Total	0.0081	0.0085	0.0008	0.0083	4.82%	NA	0.0052	0.0036	0.0008	0.0044	36.4%	NA
F1 (C6-C10) - BTEX	< 0.1	< 0.1	0.10	NC	NC	NC	< 0.1	< 0.1	0.1	NC	NC	NC
F2 (C10-C16)	**3**	**3**	0.10	3.0000	0.00%	NA	0.6	**1.2**	0.1	0.9000	66.7%	NA
PAH												
2-Methylnaphthalene	0.23	0.21	0.0050	0.2200	9.09%	NA	0.059	0.075	0.00010	0.0670	23.9%	NA
Acenaphthene	**0.2**	**0.18**	0.0050	0.1900	10.5%	NA	**0.056**	**0.069**	0.00010	0.0625	20.8%	NA
Acenaphthylene	0.0029	< 0.0050	0.00010	NC	NC	NC	0.0024	0.0029	0.00010	0.0027	18.9%	NA
Acridine	< 0.00020	< 0.010	0.00020	NC	NC	NC	< 0.00020	< 0.00020	0.00020	NC	NC	NC
Anthracene	**0.063**	**0.063**	0.000010	0.0630	0.00%	NA	**0.04**	**0.046**	0.000010	0.0430	14.0%	NA
B(a)P Equivalency	**0.012**	**0.011**	0.00001	0.0115	8.70%	NA	**0.026**	**0.026**	0.00001	0.0260	0.00%	NA
Benzo(a)anthracene	**0.024**	**0.024**	0.0000085	0.0240	0.00%	NA	**0.031**	**0.033**	0.0000085	0.0320	6.25%	NA
Benzo(a)pyrene	**0.0065**	**0.006**	0.0000075	0.0063	8.00%	NA	**0.017**	**0.016**	0.0000075	0.0165	6.06%	NA
Benzo[b,j]fluoranthene	**0.01**	**0.0075**	0.0000085	0.0088	28.6%	NA	**0.024**	**0.021**	0.0000085	0.0225	13.3%	NA
Benzo[c]phenanthrene	< 0.0043	< 0.0040	0.0043	NC	NC	NC	< 0.0050	< 0.0050	0.0050	NC	NC	NC
Benzo[e]pyrene	0.0048	0.0036	0.000050	0.0042	28.6%	NA	0.012	0.012	0.000050	0.0120	0.00%	NA
Benzo[g,h,i]perylene	**0.002**	**0.0037**	0.0000085	0.0029	59.6%	NA	**0.0063**	**0.0064**	0.0000085	0.0064	1.57%	NA
Benzo[k]fluoranthene	**0.0032**	**0.004**	0.0000085	0.0036	22.2%	NA	**0.0073**	**0.0071**	0.0000085	0.0072	2.78%	NA
Chrysene	**0.024**	**0.02**	0.0000085	0.0220	18.2%	NA	**0.033**	**0.033**	0.0000085	0.0330	0.00%	NA
Dibenz(a,h)anthracene	**0.00081**	**0.0013**	0.0000075	0.0011	46.4%	NA	**0.0025**	**0.0024**	0.0000075	0.0025	4.08%	NA
Fluoranthene	**0.19**	**0.15**	0.0020	0.1700	23.5%	NA	**0.13**	**0.15**	0.00080	0.1400	14.3%	NA
Fluorene	**0.15**	**0.14**	0.0025	0.1450	6.90%	NA	**0.057**	**0.067**	0.000050	0.0620	16.1%	NA
Indeno[1,2,3-cd]pyrene	**0.002**	**0.0035**	0.0000085	0.0028	54.5%	NA	**0.0064**	**0.0063**	0.0000085	0.0064	1.57%	NA
Naphthalene	**0.77**	**0.68**	0.0050	0.7250	12.4%	NA	**0.13**	**0.2**	0.0020	0.1650	42.4%	NA
Perylene	0.0017	< 0.0025	0.000050	NC	NC	NC	0.0039	0.004	0.000050	0.0040	2.53%	NA
Phenanthrene	**0.44**	**0.36**	0.0025	0.4000	20.0%	NA	**0.21**	**0.27**	0.0010	0.2400	25.0%	NA
Pyrene	**0.15**	**0.12**	0.0010	0.1350	22.2%	NA	**0.12**	**0.14**	0.00040	0.1300	15.4%	NA
Quinoline	< 0.00020	< 0.010	0.00020	NC	NC	NC	< 0.00020	< 0.00020	0.00020	NC	NC	NC

Notes:
All concentrations in mg/L unless otherwise noted.
Bold values indicate exceedance of the lowest guideline.
FD = field duplicate
QA/QC = quality assurance/quality control
NC = Not Calculated
NA = Not Applicable

Table H-5
Comparison of Predicted & Measured Soil Vapour
(Xylenes and Naphthalene)
Canada Creosote Site - North Bow
Human Health Risk Assessment

Sample Name		MW10-1	MW10-10	MW10-11	MW10-15	MW10-16	MW10-18	MW10-2	MW10-20	MW10-22	MW10-3B	MW10-6	DUP 2 (MW10-06)	MW10-7B	DUP 1 (MW10-7B)	MW10-9B
Location		MW10-1	MW10-10	MW10-11	MW10-15	MW10-16	MW10-18	MW10-2	MW10-20	MW10-22	MW10-3	MW10-6	MW10-6	MW10-7	MW10-7	MW10-9
Date		3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011	3/1/2011
QA/QC													FD		FD	
Xylenes, Total	**Unit**															
Shallow groundwater	mg/L	< 0.0008	0.0017	< 0.0008	< 0.0008	< 0.0008	< 0.0008	< 0.0008	0.0016	< 0.0008	0.0028	0.0081	0.0085	0.0052	0.0036	< 0.0008
Predicted soil vapour	µg/m^3	NA	507	NA	NA	NA	NA	NA	477	NA	835	2416	2535	1551	1074	NA
Maximum measured soil vapour	µg/m^3	NA	30	NA	NA	NA	NA	NA	44	NA	46	110	110	130	130	NA
Ratio of measured to predicted		NA	0.06	NA	NA	NA	NA	NA	0.09	NA	0.06	0.05	0.04	0.08	0.12	NA
Naphthalene																
Shallow groundwater	mg/L	0.02	0.092	0.00031	0.00023	0.0013	0.0021	< 0.00010	0.00016	0.0011	0.00027	0.77	0.68	0.13	0.2	0.0012
Predicted soil vapour	µg/m^3	347	1595	5.4	4.0	23	36	NA	2.8	19	4.7	13349	11789	2254	3467	21
Maximum measured soil vapour	µg/m^3	0.34	0.47	0.48	1.30	0.77	0.34	NA	2.70	1.14	0.34	58	58.00	45	45	0.64
Ratio of measured to predicted		0.0010	0.0003	0.0893	0.326	0.0342	0.0093	NA	0.973	0.0598	0.0726	0.0043	0.0049	0.0200	0.0130	0.0308

Notes:
mg/L = milligrams per litre
µg/m^3 = micrograms per cubic metre
NA = Not Applicable

APPENDIX I

Permeation of Chemicals in Pipes

APPENDIX I
Literature Review of Pipe Permeation and Degradation Studies

This appendix presents a focused literature review of studies where permeation or degradation of utilities has been evaluated and is intended to support the human health risk assessment (HHRA) for the North Bow area. The reason for preparing this appendix is that the results of current and historical site investigations in the North Bow River area indicate that there are localized zones of creosote-related dense non-aqueous phase liquid (DNAPL) and light non-aqueous phase liquid (LNAPL), and a larger area with creosote-related dissolved phase impacts in groundwater. There are also generally low concentrations of creosote-related compounds in soil vapour in the North Bow area. As common to all residential areas, there are subsurface utilities present, which include water mains, storm sewers, sanitary sewers and gas lines.

Subsurface contamination may represent several potential issues for subsurface utilities including possible permeation of subsurface chemicals through utility materials (*e.g.*, pipes, gaskets, connections) and degradation of utility materials by chemicals (which could also lead to eventual entry of chemicals into the utility piping system). There is also the related issue of preferential migration of chemicals along coarse-grained backfill surrounding utilities, although this appendix does not address that issue.

The purpose of this appendix is to conduct a focused literature review of studies where permeation or degradation of utilities has been evaluated. Through this review, general information that could be used to assess this issue in the North Bow area is obtained. A discussion of the implications of this issue is provided in the main body of the report. Relevant information from eight studies is summarized below.

1) Anglian Water Services Limited (2009). *Information for developers about contaminated land and ground condition assessment*. Guidance and advice given by Anglian Water. AW123/01/09. www.anglianwater.co.uk. Cambridgeshire, UK.

The guidance concludes that polyethylene (PE) water pipes may be compromised for water quality due to permeation of hydrocarbon contaminants in soil. This document provides recommendations for when alternative pipe materials may be required, as documented in Table I-1.

Table I-1: Recommended Mains Materials (from Anglian Water Services Limited (2009)

Typical Ground Conditions	Main Materials
Natural soil with no contaminants	PE
Inorganic contaminants only	PE
Organic contaminants only	Ductile iron or barrier pipe
Organic and inorganic contaminants (light chemical, *e.g.*, refuse site, farmyard, *etc.*)	Ductile iron or barrier pipe
Organic and inorganic contaminants (made ground containing clinker, bricks, flints or other materials likely to cause mechanical damage)	Ductile iron or barrier pipe
Organic and inorganic contaminants (heavy chemicals, *e.g.*, disused gas plants, industrial sites, mines, chemical plants etc)	Ductile iron or barrier pipe

This document further recommends that the manufacturers' instructions be followed on the suitability of their pipe system for certain ground conditions, and that all metallic fittings be protected against corrosion.

A barrier pipe is defined as a composite material of PE pipe with an integral metal barrier to prevent permeation of hydrocarbons and related chemicals.

For a protected pipeline using ductile iron or barrier pipe, the recommended service pipe material is copper with PE coating or multilayer plastic pipe, and wall mounted box or boundary box for contaminated land for the mains material.

They recommend that soil samples be taken at pipe depths and analyzed for a given set of organic and inorganic contaminants as a minimum requirement and provide trigger concentrations for each contaminant (attachment 1).

2) Environment Agency (2000). Risks of Contaminated Land to Buildings, Building Materials and Services – A literature review. Research & Development Technical Report P331, Bristol, UK.

This report contains a section on organic materials, and in particular the use of plastic pipes in contaminated land. Five types of plastic pipes are considered whose performance is reviewed under various temperatures and contaminants. A table with a summary of results is provided in Table I-2.

This study also reports on a review of statistics on permeation incidents regarding potable water in the US, which indicates that 89% were caused by petroleum products and that most of the incidents involved gross contamination by free products and not aqueous solutions.

Table I-2: Corrosion Resistance of Plastic Pipe Material at various Temperatures (after Raman)

	PVC			PP			PE			PVDF			PTFE		
Temp/°C	**27**	**65**	**85**	**27**	**65**	**85**	**27**	**65**	**85**	**27**	**65**	**85**	**27**	**65**	**85**
Medium															
H_2SO_4 (99%)	+	+	-	+	+	-	+	+	-	+	+	0	+	+	+
HF (40%)	+	+	-	+	-	-	+	-	-	+	+	-	+	+	+
KOH (45%)	+	+	-	+	+	-	+	-	+	-	-	-	+	+	+
NaOH (45%)	+	+	-	+	+	+	+	+	-	+	+	-	+	+	+
Benzene	+	+	-	+	+	+	+	+	-	+	+		+	+	+
Toluene	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+
Choloroform	+	+	-	+			+			+			+	+	+
Aniline	+	+	0	-			-			-			-		
Tea	+	+	-	+			-			-			-		

Notes:
+ = polymer is resistant
0 = use under these condition is doubtful
- = polymer is not resistant
blank = no result
PVC = polyvinyl chloride
PP = polypropylene
PE = polyethylene
PVDF = polyvinylidene fluoride
PTFE = polytetrafluorethylene

3) Water Regulations Advisory Scheme - WRAS (2002). *The Selection of Materials for Water Supply Pipes to be Laid in Contaminated Land*. No 9-04-03, Issue 1, October 2002.

This report provides a table of concentrations of various contaminants in mg/kg of dry soil that could be used as a maximum level (threshold) beyond which material selection for the pipe becomes an issue. However, they recommend that if any of the chemicals are present above background values, it is best to take a conservative approach and select the pipe material accordingly (see Table I-3 below). A section of this table on organic contaminants is provided below as Table I-4.

Table I-3: Materials Suitable for Use with Different Contaminants

Type of Contaminant	Suitable Pipe Material
None	No special requirements
Flammable	Metallic – in the absence of corrosive contaminants. Wrapped Iron – if corrosive and flammable contaminants are present.
Toxic	Metallic or Plastic – but see Note 1
Organic	Metallic (iron, copper) or PE/AI/PE
Corrosive	Plastic pipe, plastic coated copper or wrapped iron
Organic and Corrosive	Wrapped Iron or PE/AI/PE

Note 1: Following recommendations of the Foundation for Water Research guidance notes (FWR 1994), the laying of water pipes across any land where arsenic or cyanide are identified or suspected is unacceptable without site recommendation.

Notes:
PE/AI/PE = Polyethene/aluminum/polythene

Table I-4: Threshold Concentrations of Contaminants in Soils Affecting Material Selection

Organic Contaminants	(mg/kg dried soil)
Coal Tar	50
Cyclohexane extractable	50
Phenol Poly Aromatic HYdrocarbons	5 50
Toluene extractable	50
Petroleum Hydrocarbons	50

4) UK Water Industry (2009). UK Water Industry Specification 2009: Polyethylene pressure pipe systems with an aluminium barrier layer for potable water supply in contaminated land – size 25mm to 630mm. WIS 4-32-19, April 2009: Issue 2.

This standard covers the physical and mechanical performance specifications for PE pipes with an aluminum barrier layer, as well as the requirements for fittings and joints. Two types of pipe construction are considered: type A, where only the inner polymer layers are designed to bear the long-term hydrostatic pressure; and type B, where both the inner polymer layers and aluminum barrier layer are designed to bear the stresses.

For the purposes of the standard and testing, the most aggressive contaminant is considered to be hydrocarbon fuels, for which a standard fuel simulant, ASTM D471 Fuel C, is used. This document also contains a section on testing of the pipe system (pipe, joint and fitting combinations), which includes resistance of permeation of contaminants. The leachate samples taken from the Test Piece must meet the odour and flavour testing as specified and the hydrocarbon concentration must not be greater than 100 ug/L. The Test Piece is part of a pipe assembly that contains a fitting or joint, which is filled with potable water and immersed in synthetic petroleum fuel until the outer PE is saturated (60 days). A combination of liquid and saturated vapour is also acceptable. Appendix B of this document describes the permeation testing method in detail.

5) Mao (2008). *Permeation of hydrocarbons through polyvinyl chloride (PVC) and polyethylene (PE) pipes and pipe gaskets*. Ph.D. Thesis by Feng Mao, Civil Engineering (Environmental Engineering), Iowa State University. 2008.

This is an experimental study using a light microscope to investigate the propagation of organic fronts through PE and PVC pipes. The study shows that new PVC pipe materials are effective barriers to typical commercial gasoline (*i.e.*, in a NIST reference fuel, a BTEX concentration of 40% (v/v) was required to cause permeation). Permeation from aqueous and vapor phases were investigated using pipe-bottle tests, gravimetric sorption tests and microscopic visualization. Saturated organic vapours penetrated 1-inch diameter PVC pipes in 30 days. However, since sum of the volumetric fractions of BTEX compounds in free product gasoline is generally lower than 30%, the authors conclude that PVC pipe should be an effective barrier against gasoline permeation. The given explanation is that the premium gasoline used in the experiments did not have sufficient swelling compounds such as BTEX to soften the PVC material.

This study also investigated the permeation of petroleum products through pipes equipped with Rieber gasket systems, and were found to be much more vulnerable to permeation than straight PVC pipes.

Experiments were also conducted on the permeation of BTEX through 1-inch PE pipes under simulated field conditions of gasoline leaks and spills, gasoline-contaminated groundwater, and gasoline-contaminated soil. The authors found that the 1-inch PE pipe was rapidly permeated when exposed to either free product gasoline, in groundwater, or soil vapour.

a) Holsen, T. M., J. K. Park, et al. (1991). "The Effect of Soils on the Permeation of Plastic Pipes by Organic-Chemicals." Journal American Water Works Association 83(11): 85-91.

Permeation of various organic chemicals through 0.75-inch polybutylene pipes were investigated using two experimental methods: 1. Pipes buried in contaminated water-saturated and unsaturated soils; and 2. Pipe-bottle experiments containing no soil. Comparison of results showed that

i) the concentration in the soil pore controls the rate of permeation through buried pipes

ii) soils of high organic carbon content were permeated more slowly, although high organic carbon soil cannot be relied upon for protecting against permeation

The authors found that predicting the equilibrium concentration of organic chemical in the soil pore was useful in determining the likelihood of permeation through buried pipes.

b) Holsen, T. M., J. K. Park, et al. (1991). "Contamination of Potable Water by Permeation of Plastic Pipe." Journal American Water Works Association **83**(8): 53-56.

In this study, samples of soil, pipe material and pipe water were collected at seven sites with incidents of piper permeation (July 1986 – December 1987). The analysis of these samples along with a comprehensive literature review of other cases of permeation indicated the following:

- Majority of cases were associated with gross soil contamination in the area surrounding the pipe.
- Soil contamination occurred after pipe installation.
- Half of the incidents were in low risk areas.

c) Mao, F., J. A. Gaunt, et al. (2010). "Permeation of BTEX compounds through HDPE pipes under simulated field conditions." Journal American Water Works Association **102**(3): 107-+.

This study investigated the permeation of BTEX compounds into potable water in HDPE pipes from gasoline-contaminated groundwater and unsaturated soil. The authors developed empirical equations along with permeation rates and diffusion coefficients to predict permeation under field conditions. They concluded that PE pipes should not be used for drinking water conveyance in gasoline-contaminated sites and that at no level of contamination is the PE pipe resistant to permeation. They further advise that corrective action is necessary in the event of a gasoline spill near a PE service line.

In this study, it is noted that because PE is nonpolar, lipophilic organic compounds can permeate through PE pipes, while they are resistant to strongly polar compounds. They also note that factors such as the synergistic effects of organic mixtures as well as the environmental conditions (*e.g.*, soil type) can influence permeation through pipes. The BTEX concentrations used for the gasoline contaminated soil ranged from 32-1216 mg/kg dry soil, while the concentration of BTEX for gasoline-saturated water was 150 mg/L.

Attachment 1: Trigger Concentrations from Anglian Water Services Limited (2009

Contaminants	Trigger concentration (mg/kg dry soil)
Arsenic	10 ‡
Cadmium	3 ‡
Chromium (hexavalent)	25 ‡
Chromium (total)	250 §
Copper	100 §
Lead	150 §
Mercury	1 ‡
Nickel	70 ‡
Selenium	3 ‡
Zinc	300 ‡
Boron	3 ‡
Cyanide (free)	10 §
Cyanide (complex)	50 §
Thiocyanate	50 ‡
Sulphate	2000 ‡
Sulphide	250 ‡
Chloride	1500 (300 if wet)
Sulphur	5000 ‡
Acidity	pH<5 ‡

§ Data taken from WRc Report PRD 1452 – M/1 – Crathorne et al May 1987.

‡ Data taken from ICRCL Guidance note 59/83 2nd Edition July 1987.

Family	Contaminants	Trigger concentration in soil (mg/kg)
Chlorinated/ halogenated/aliphatic hydrocarbons	Dichloromethane	1 ‡
	1,2-dichloroethane	0.2 ‡
	1,1,1-trichloroethane	8 ‡
	1,2-dichloropropane	0.1 ‡
	Tetrachloromethane	0.15 ‡
	Trichloroethene	1.5 ‡
	Tetrachloroethene	0.5 ‡
	Vinyl chloride	0.1 ‡
	Methyl bromide	10 ‡
	Total	**7 ***
Aromatic hydrocarbons	Benzene	0.5 ‡
	Ethylebenzene	0.5 ‡
	Trimethyl benzene	0.1 ‡
	Propylbenzene	2 ‡
	Toluene	0.25 ‡
	Xylenes	0.5 ‡
	Nitrobenzene	NA
Phenols	Phenol	1 §
	Cresol	1 *
	Total aromatics	**7 §**
Chlorinated phenols	Chlorophenols	0.5 §
	Dichlorophenols	0.5 §
	Trichlorophenols	0.5 §
	2,4,6-trichlorophenol	0.5 §
	Pentachlorophenol	0.5 §
	Total	**1 §**
Chlorinated aromatic hydrocarbons	Chlorobenzene	0.4 ‡
	Dichlorobenzene	0.01 ‡
	Trichlorobenzene	0.5 ‡
	Pentachlorobenzene	1 *
	Total	**2 ***

‡ *Taken from WRc DoE report 2982(P) – Wilson & Norris July 1992.*
§ *Taken from WRc report PRD1452 – M/1 – Crathorne et al May 1987.*
* *Taken from KIWA report no. 87 – Veenendaal et al October 1985.*

Family	Contaminants	Trigger concentration in soil (mg/kg)
Polycyclic aromatic hydrocarbons (PAH)	Naphthalene	5 §
	Anthracene	10 §
	Phenanthrene	10 §
	Fluoranthene	10 §
	Pyrene	10 §
	Benzopyrene	1 §
	Total	**20 §**
Miscellaneous	Total petroleum hydrocarbons (TPH)	50mg/kg** is the standard however the upper limit is 1000mg/kg*** but in all cases all the compounds in appendix 3 require analysing for in contaminated areas. If the soil analysis results exceeds the 50mg/kg trigger value but the other organic contaminants listed above do not exceed or contribute greatly (no greater than 75 per cent of the trigger concentration) to TPH value then the recommendation for unprotected materials can be made until an upper threshold of 1000*** above which protected materials must be used.
	Tetrahydrafurane (THF)	4 §
	Styrene	5 §
	Pyridene	2 §

‡ *Taken from WRc DoE report 2982(P) – Wilson & Norris July 1992.*
§ *Taken from WRc report PRD1452 – M/1 – Crathorne et al May 1987.*
* *Taken from KIWA report no. 87 – Veenendaal et al October 1985.*

Environment Agency (2000). *Risks of Contaminated Land to Buildings*

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APPENDIX J

Exposure Dose and Risk Calculations

HEALTH CANADA DQRA SPREADSHEET
USER INPUT SHEET

User Name:	Golder Associates Ltd.	Site:	Canada Creosote Site
Proponent:	Alberta Environment	File #:	10-1346-0046
Date:	June 5, 2011	Comment:	Residents

PROBLEM FORMULATION

Potential Land Uses (Yes/No)

		Default
Agricultural	No	Yes
Residential/urban parkland	No	Yes
Commercial	No	Yes
Industrial	No	Yes
Occupational - Outdoors	No	Yes
Recreational	No	Yes
Other		No
specify:	Residential 24 hour indoor	

Exposure Scenario Residential 24 hour indoor — NA

Receptor Groups (Yes/No)

		Default
General public or residents		Yes
Employees		Yes
Canadian native communities		No
Other		No
specify:		

Operative Pathways (Yes/No)

		Default
Inadvertent ingestion of soil	No	Yes
Inhalation of soil particles	No	Yes
Inhalation of indoor contaminant vapours	Yes	Yes
Inhalation of outdoor contaminant vapours	No	Yes
Ingestion of drinking water	No	Yes
Dermal contact with soil	No	Yes
Dermal contact with water	No	Yes
Ingestion of contaminated food		No

Vapour Transport Modelling

Vapour source for exposure calculations	Most Conservative	Most Conservative
Model applied for soil to indoor air		Health Canada
Model applied for groundwater to indoor air		Health Canada
Model applied for soil vapour to indoor air		Health Canada

Indoor air concentrations entered over-ride modelling

Active Critical Receptors (Yes/No)

		Default
Infant	No	Yes
Toddler	Yes	Yes
Child	No	Yes
Teen	No	Yes
Adult	Yes	Yes
Other		No
specify:		

Contaminant Concentrations

Chemical Name	required	F2	Naphthalene	Benzene			
Soil (mg/kg)	required						
Mole Fraction in Soil (unitless)	optional						
Groundwater - source (mg/L)	optional						
Mole Fraction in Groundwater (unitless)	optional						
Drinking water (mg/L)	optional						
Bathing/swimming water (mg/L)	optional						
Indoor air - vapours (mg/m^3)	optional	0.081	0.00058	0.000146			
Outdoor air - vapours (mg/m^3)	optional						
Outdoor air - particulate (mg/m^3)	optional						
Soil vapours (> 1 m below foundation) (mg/m3)	optional						
Subslab/shallow soil vapour (<1 m) (mg/m3)	optional						
Root vegetables (mg/kg wet weight)	optional						
Other vegetables (mg/kg wet weight)	optional						
Fish (mg/kg wet weight)	optional						
Wild game (mg/kg wet weight)	optional						

See also PHC Sheet

Risk Assessment Endpoints

		Default
Acceptable hazard index:		0.2
Acceptable cancer risk:		1.00E-05

Precluding Conditions for Fate and Transport Models

Are non-aqueous phase liquids (NAPL) present?	No
Is groundwater contamination present in fractured bedrock?	No
Is groundwater contamination migrating through a confined aquifer?	No
Is there active pumping or drawdown of groundwater at the site?	No
Is contamination present within 1 m of building foundation?	No
Do any buildings within 5 m of contamination have earthen foundations?	No
Are any buildings constructed on very high permeability media?	No
Are there preferential vapour flow pathways connecting contamination to a building?	No

Fate and Transport Model Input

	Value	Default	Models Affected
Soil Type		coarse-grained	PS, V-H, V-C, V-O, GW
Significant vehicle traffic on unpaved roads?		No	P-O
Site Characteristics			
Source Length (m)		10	GW, V-O
Source Width (m)		10	GW, V-O
Depth to Groundwater (m)		3	GW, V-O
Depth from Surface to Contamination (m)		0	GW, V-O
Thickness of Contamination (m)		3	GW
Distance - Contaminated Soil to Building (m)		1	V-H, V-C
Distance - Contaminated GW to Building (m)		1	V-H, V-C
Depth Below Building to Vapour Sample (m)		1	V-H, V-C
Distance to potable water user (m)		0	GW
Distance to Bathing/Swimming Water (m)		0	GW
Particulate Concentration in Air (ug/m^3)		0.76	P-O
Hydrological Parameters			
Recharge (m/y)		0.28	GW
Soil/Groundwater Characteristics	coarse-grained		
Vadose Zone			
Dry Bulk Density (g/cm3)		1.700	PS, V-C
Water Content (g/g dry wt)		0.070	PS, V-C
Capillary Zone			
Thickness of Capillary Zone (cm)		5	V-C
Water Content (g/g dry wt)		0.070	V-C
Aquifer/Contaminated Zone			
Saturated Hydraulic Conductivity (m/y)		320	GW
Hydraulic Gradient (m/m)		0.028	GW
Organic Carbon Fraction (g/g)		0.005	PS, GW
Soil Temperature (^oC)		21	PS, PGW
Depth of unconfined aquifer (m)		5	GW
Vapour Transport Properties			
Soil Vapour Permeability (cm^2) - CCME model		6.00E-08	V-C
Building Type		Residential - Slab on Grade	V-H, V-C
Building Characteristics	Residential - Slab on Grade		
Building length (m)		12.25	V-C
Building width (m)		12.25	V-C
Building mixing height (m)		3.6	V-H, V-C
Thickness of building foundation (cm)		11.25	V-C
Depth to base of foundation (m)		0.1125	V-C
Air exchanges per hour		0.5	V-C
Pressure differential (Pa)		40	V-C
Crack Area (cm^2)		994.5	V-C
Additional Vapour Intrusion Parameters (Health Canada model)			
Apply biodegradation adjustment?		No	V-H
Apply groundwater mass flux check?		No	V-H
Apply source depletion check?		No	V-H
Additional Groundwater Model Parameters			
Apply biodegradation during transport?		No	GW

Optional Sections

User-defined Chemicals

Note: user-defined chemicals should be named in this section before being selected in the 'Contaminant Concentrations' table above

		Chemical 1	Chemical 2	Chemical 3
Name				
CAS Number				
Chemical class (organic/inorganic)				
Tolerable daily intake (mg/kg/d) - infant	*Enter all applicable and appropriate toxicity benchmarks; values must be referenced and justified in the PQRA report.*			
Tolerable daily intake (mg/kg/d) - toddler				
Tolerable daily intake (mg/kg/d) - child				
Tolerable daily intake (mg/kg/d) - teen				
Tolerable daily intake (mg/kg/d) - adult				
Tolerable concentration (mg/m^3)				
Oral slope factor $(mg/kg/d)^{-1}$				
Inhalation slope factor $(mg/kg/d)^{-1}$				
Inhalation unit risk $(mg/m^3)^{-1}$				
Relative dermal absorption factor				
Organic carbon partitioning coefficient (mL/g) - Koc				
Log Kow (unitless)				
Henry's Law constant at 25°C (unitless) - H'				
Henry's Law constant at 25°C (atm-m3/mol) - H				
Water Solubility at 25°C (mg/L)				
Molecular Weight (g/mol)				
Diffusivity in air (cm2/s)				
Diffusivity in water (cm2/s)				
Vapour Pressure at 25°C (atm)				
Normal Boiling Point (K) - optional				
Critical Temperature (K) - optional				
Enthalpy of Vaporization @ Boiling Point (cal/mol) - optional				
Biodegradation Adjustment Factor (unitless)				
Half-Life - unsaturated zone (days)				
Half-Life - saturated zone (days)				

Note: values in grayed cells will not be used; Health Canada default values are applied.

User-defined Receptor

Name		Defaults
Age group		Toddler
Body weight (kg)		16.5
Soil ingestion rate (g/d)		0.08
Inhalation rate (m^3/d)		9.3
Water ingestion rate (L/d)		0.6
Skin surface area (cm^2)		
- hands		430
- arms		890
- legs		1690
- total		6130
Soil loading to exposed skin (g/cm^2/event)		
- hands		0.0001
- surfaces other than hands		0.00001
Food ingestion (g/d)		
- root vegetables		105
- other vegetables		67
- fish		56
- wild game		0
Evaluate Cancer Risks (Yes/No)?		No

User-defined Land-Use / Exposure Scenario

Scenario name	Residential 24 hour indoc	Defaults
Hours per day (indoors)	24	22.5
Hours per day (outdoors)	0	1.5
Days per week		7
Weeks per year		52
Dermal exposure events/day		1
Water contact events per day		1
Duration of water contact event (h)		1
Days/year contaminated food ingestion		365
Exposure duration (years)		60
Years for carcinogen amortization		60

SUMMARY OF DQRA RESULTS Version: May 1, 2009

User Name:	Golder Associates Ltd.	**Site:**	Canada Creosote Site
Proponent:	Alberta Environment	**File #:**	10-1346-0046
Date:	June 5, 2011	**Comment:**	Residents

		Maximum Hazard/Risk Estimates					
		F2	**Naphthalene**	**Benzene**			
Hazard Quotient - Oral/Dermal		NA	NA	NA	NA	NA	NA
Hazard Quotient - Inhalation		9.00E-02	1.93E-01	NA	NA	NA	NA
Hazard Index - Total		9.00E-02	1.93E-01	NA	NA	NA	NA
Target Hazard Index:	0.2						
Cancer Risk - Oral		NA	NA	NA	NA	NA	NA
Cancer Risk - Dermal		NA	NA	NA	NA	NA	NA
Cancer Risk - Oral + Dermal		NA	NA	NA	NA	NA	NA
Cancer Risk - Inhalation		NA	NA	4.82E-07	NA	NA	NA
Cancer Risk - Total		NA	NA	4.82E-07	NA	NA	NA
Target Cancer Risk:	1.00E-05						

	Critical Receptors					
	F2	**Naphthalene**	**Benzene**			
Oral/Dermal - non-cancer effects	NA	NA	NA	NA	NA	NA
Inhalation - non-cancer effects	All Age Groups	All Age Groups	NA	NA	NA	NA
Total - non-cancer effects	All Age Groups	All Age Groups	NA	NA	NA	NA
Oral - cancer effects	NA	NA	NA	NA	NA	NA
Dermal - cancer effects	NA	NA	NA	NA	NA	NA
Oral + Dermal - cancer effects	NA	NA	NA	NA	NA	NA
Inhalation - cancer effects	NA	NA	Adult	NA	NA	NA
Total - cancer effects	NA	NA	Adult	NA	NA	NA
Source of indoor air vapours	User-specified	User-specified	User-specified	NA	NA	NA
Model used for vapour transport	NA	NA	NA	NA	NA	NA

Key Calculated Model Parameters						
Vapour Intrusion Model Parameters	Note: parameters show as "NA" if relevant exposure pathways are inoperative or if user-input concentration is used instead of modelled value					
Qsoil/Qbuilding	NA	NA	NA	NA	NA	NA
Soil alpha	NA	NA	NA	NA	NA	NA
Groundwater alpha	NA	NA	NA	NA	NA	NA
Soil vapour alpha	NA	NA	NA	NA	NA	NA
Groundwater model dilution factors						
DF1 (soil to leachate)	NA	NA	NA	NA	NA	NA
DF2 (leachate at source to water table):	NA	NA	NA	NA	NA	NA
DF3 (leachate at water table to groundwater):	NA	NA	NA	NA	NA	NA
DF4 (source to receptor) - drinking water:	NA	NA	NA	NA	NA	NA
DF4 (source to receptor) - bathing/swimming water:	NA	NA	NA	NA	NA	NA

Notes/Comments

Vapour Intrusion Model

Chemical Interactions

All chemicals of concern present at the site should be evaluated for potential additive effects based on target organs and mechanisms of effect.

Concentration Checks

Precluding Conditions

Other Notes

HEALTH CANADA DQRA SPREADSHEET
USER INPUT SHEET

User Name:	Golder Associates Ltd.	Site:	Canada Creosote Site
Proponent:	Alberta Environment	File #:	10-1346-0046
Date:	June 5, 2011	Comment:	Residents

PROBLEM FORMULATION

Potential Land Uses (Yes/No)		Default
Agricultural	No	Yes
Residential/urban parkland	No	Yes
Commercial	No	Yes
Industrial	No	Yes
Occupational - Outdoors	No	Yes
Recreational	No	Yes
Other	Yes	No
specify:	Residential 24 hours	

Operative Pathways (Yes/No)		Default
Inadvertent ingestion of soil	No	Yes
Inhalation of soil particles	No	Yes
Inhalation of indoor contaminant vapours	Yes	Yes
Inhalation of outdoor contaminant vapours	No	Yes
Ingestion of drinking water	No	Yes
Dermal contact with soil	No	Yes
Dermal contact with water	No	Yes
Ingestion of contaminated food		No

Exposure Scenario	Residential 24 hours	Residential 24 hours

Vapour Transport Modelling		
Vapour source for exposure calculations	Most Conservative	Most Conservative
Model applied for soil to indoor air		Health Canada
Model applied for groundwater to indoor air		Health Canada
Model applied for soil vapour to indoor air		Health Canada
Indoor air concentrations entered over-ride modelling		

Receptor Groups (Yes/No)		Default
General public or residents		Yes
Employees		Yes
Canadian native communities		No
Other		No
specify:		

Active Critical Receptors (Yes/No)		Default
Infant	No	Yes
Toddler	Yes	Yes
Child	No	Yes
Teen	No	Yes
Adult	Yes	Yes
Other		No
specify:		

Contaminant Concentrations

Chemical Name	required	Acetaldehyde	Butadiene, 1,3-	Chloroform			
Soil (mg/kg)	required						
Mole Fraction in Soil (unitless)	optional						
Groundwater - source (mg/L)	optional						
Mole Fraction in Groundwater (unitless)	optional						
Drinking water (mg/L)	optional						
Bathing/swimming water (mg/L)	optional						
Indoor air - vapours (mg/m^3)	optional	0.000194	0.000307	0.000256			
Outdoor air - vapours (mg/m^3)	optional						
Outdoor air - particulate (mg/m^3)	optional						
Soil vapours (> 1 m below foundation) (mg/m3)	optional						
Subslab/shallow soil vapour (<1 m) (mg/m3)	optional						
Root vegetables (mg/kg wet weight)	optional						
Other vegetables (mg/kg wet weight)	optional						
Fish (mg/kg wet weight)	optional						
Wild game (mg/kg wet weight)	optional						

Risk Assessment Endpoints		Default
Acceptable hazard index:		0.2
Acceptable cancer risk:		1.00E-05

Precluding Conditions for Fate and Transport Models

Are non-aqueous phase liquids (NAPL) present?	No
Is groundwater contamination present in fractured bedrock?	No
Is groundwater contamination migrating through a confined aquifer?	No
Is there active pumping or drawdown of groundwater at the site?	No
Is contamination present within 1 m of building foundation?	No
Do any buildings within 5 m of contamination have earthen foundations?	No
Are any buildings constructed on very high permeability media?	No
Are there preferential vapour flow pathways connecting contamination to a building?	No

Fate and Transport Model Input

	Value	Default	Models Affected
Soil Type		coarse-grained	PS, V-H, V-C, V-O, GW
Significant vehicle traffic on unpaved roads?		No	P-O
Site Characteristics			
Source Length (m)		10	GW, V-O
Source Width (m)		10	GW, V-O
Depth to Groundwater (m)		3	GW, V-O
Depth from Surface to Contamination (m)		0	GW, V-O
Thickness of Contamination (m)		3	GW
Distance - Contaminated Soil to Building (m)		1	V-H, V-C
Distance - Contaminated GW to Building (m)		1	V-H, V-C
Depth Below Building to Vapour Sample (m)		1	V-H, V-C
Distance to potable water user (m)		0	GW
Distance to Bathing/Swimming Water (m)		0	GW
Particulate Concentration in Air (ug/m^3)		0.76	P-O
Hydrological Parameters			
Recharge (m/y)		0.28	GW
Soil/Groundwater Characteristics	coarse-grained		
Vadose Zone			
Dry Bulk Density (g/cm3)		1.700	PS, V-C
Water Content (g/g dry wt)		0.070	PS, V-C
Capillary Zone			
Thickness of Capillary Zone (cm)		5	V-C
Water Content (g/g dry wt)		0.070	V-C
Aquifer/Contaminated Zone			
Saturated Hydraulic Conductivity (m/y)		320	GW
Hydraulic Gradient (m/m)		0.028	GW
Organic Carbon Fraction (g/g)		0.005	PS, GW
Soil Temperature (^oC)		21	PS, PGW
Depth of unconfined aquifer (m)		5	GW
Vapour Transport Properties			
Soil Vapour Permeability (cm^2) - CCME model		6.00E-08	V-C
Building Type		Residential - Slab on Grade	V-H, V-C
Building Characteristics	Residential - Slab on Grade		
Building length (m)		12.25	V-C
Building width (m)		12.25	V-C
Building mixing height (m)		3.6	V-H, V-C
Thickness of building foundation (cm)		11.25	V-C
Depth to base of foundation (m)		0.1125	V-C
Air exchanges per hour		0.5	V-C
Pressure differential (Pa)		40	V-C
Crack Area (cm^2)		994.5	V-C
Additional Vapour Intrusion Parameters (Health Canada model)			
Apply biodegradation adjustment?		No	V-H
Apply groundwater mass flux check?		No	V-H
Apply source depletion check?		No	V-H
Additional Groundwater Model Parameters			
Apply biodegradation during transport?		No	GW

Optional Sections

User-defined Chemicals

Note: user-defined chemicals should be named in this section before being selected in the 'Contaminant Concentrations' table above

		Chemical 1		Chemical 2		Chemical 3	
Name		Acetaldehyde	*Health Canada values*	Butadiene, 1,3-	*Health Canada values*	Chloroform	*Health Canada values*
CAS Number			75-07-0		106-99-0		*67-66-3*
Chemical class (organic/inorganic)			organic		organic		organic
Tolerable daily intake (mg/kg/d) - infant	*Enter all applicable and appropriate toxicity benchmarks; values must be referenced and justified in the PQRA report.*						
Tolerable daily intake (mg/kg/d) - toddler							
Tolerable daily intake (mg/kg/d) - child							
Tolerable daily intake (mg/kg/d) - teen							
Tolerable daily intake (mg/kg/d) - adult							
Tolerable concentration (mg/m^3)		0.009		0.002		0.04475	
Oral slope factor $(mg/kg/d)^{-1}$							
Inhalation slope factor $(mg/kg/d)^{-1}$							
Inhalation unit risk $(mg/m^3)^{-1}$		2.20E-03		3.00E-02		0.023	
Relative dermal absorption factor							0.03
Organic carbon partitioning coefficient (mL/g) - Koc			1.06		128.8249552		42.65795188
Log Kow (unitless)			0.45		1.99		1.97
Henry's Law constant at 25°C (unitless) - H'			0.002989155		3.008518352		0.153854773
Henry's Law constant at 25°C (atm-m3/mol) - H			7.3131E-05		0.073604737		0.003764125
Water Solubility at 25°C (mg/L)			1000000		735		8200
Molecular Weight (g/mol)			44.052		54.091		119.378
Diffusivity in air (cm2/s)			0.124		0.249		0.104
Diffusivity in water (cm2/s)			0.0000141		0.0000108		0.00001
Vapour Pressure at 25°C (atm)			1.197137923		2.773254379		0.258573896
Normal Boiling Point (K) - optional			293.25		268.74		334.32
Critical Temperature (K) - optional			466		425		536.4
Enthalpy of Vaporization @ Boiling Point (cal/mol) - optional			6156.64		5370.33		7495.219885
Biodegradation Adjustment Factor (unitless)			1		10		1
Half-Life - unsaturated zone (days)							
Half-Life - saturated zone (days)							

Note: values in grayed cells will not be used; Health Canada default values are applied.

User-defined Receptor

Name		Defaults
Age group		Toddler
Body weight (kg)		16.5
Soil ingestion rate (g/d)		0.08
Inhalation rate (m^3/d)		9.3
Water ingestion rate (L/d)		0.6
Skin surface area (cm^2)		
- hands		430
- arms		890
- legs		1690
- total		6130
Soil loading to exposed skin (g/cm^2/event)		
- hands		0.0001
- surfaces other than hands		0.00001
Food ingestion (g/d)		
- root vegetables		105
- other vegetables		67
- fish		56
- wild game		0
Evaluate Cancer Risks (Yes/No)?		No

User-defined Land-Use / Exposure Scenario

Scenario name	Residential 24 hours	Defaults
Hours per day (indoors)	24	22.5
Hours per day (outdoors)	0	1.5
Days per week		7
Weeks per year		52
Dermal exposure events/day		1
Water contact events per day		1
Duration of water contact event (h)		1
Days/year contaminated food ingestion		365
Exposure duration (years)		60
Years for carcinogen amortization		60

SUMMARY OF DQRA RESULTS Version: May 1, 2009

User Name:	Golder Associates Ltd.	**Site:**	Canada Creosote Site
Proponent:	Alberta Environment	**File #:**	10-1346-0046
Date:	June 5, 2011	**Comment:**	Residents

		Maximum Hazard/Risk Estimates					
		Acetaldehyde	**Butadiene, 1,3-**	**Chloroform**			
Hazard Quotient - Oral/Dermal		NA	NA	NA	NA	NA	NA
Hazard Quotient - Inhalation		2.16E-02	1.54E-01	5.72E-03	NA	NA	NA
Hazard Index - Total		2.16E-02	1.54E-01	5.72E-03	NA	NA	NA
Target Hazard Index:	0.2						
Cancer Risk - Oral		NA	NA	NA	NA	NA	NA
Cancer Risk - Dermal		NA	NA	NA	NA	NA	NA
Cancer Risk - Oral + Dermal		NA	NA	NA	NA	NA	NA
Cancer Risk - Inhalation		4.27E-07	9.21E-06	5.89E-06	NA	NA	NA
Cancer Risk - Total		4.27E-07	9.21E-06	5.89E-06	NA	NA	NA
Target Cancer Risk:	1.00E-05						

	Critical Receptors					
	Acetaldehyde	**Butadiene, 1,3-**	**Chloroform**			
Oral/Dermal - non-cancer effects	NA	NA	NA	NA	NA	NA
Inhalation - non-cancer effects	All Age Groups	All Age Groups	All Age Groups	NA	NA	NA
Total - non-cancer effects	All Age Groups	All Age Groups	All Age Groups	NA	NA	NA
Oral - cancer effects	NA	NA	NA	NA	NA	NA
Dermal - cancer effects	NA	NA	NA	NA	NA	NA
Oral + Dermal - cancer effects	NA	NA	NA	NA	NA	NA
Inhalation - cancer effects	Adult	Adult	Adult	NA	NA	NA
Total - cancer effects	Adult	Adult	Adult	NA	NA	NA
Source of indoor air vapours	User-specified	User-specified	User-specified	NA	NA	NA
Model used for vapour transport	NA	NA	NA	NA	NA	NA

Key Calculated Model Parameters						
Vapour Intrusion Model Parameters	Note: parameters show as "NA" if relevant exposure pathways are inoperative or if user-input concentration is used instead of modelled value					
Qsoil/Qbuilding	NA	NA	NA	NA	NA	NA
Soil alpha	NA	NA	NA	NA	NA	NA
Groundwater alpha	NA	NA	NA	NA	NA	NA
Soil vapour alpha	NA	NA	NA	NA	NA	NA
Groundwater model dilution factors						
DF1 (soil to leachate)	NA	NA	NA	NA	NA	NA
DF2 (leachate at source to water table):	NA	NA	NA	NA	NA	NA
DF3 (leachate at water table to groundwater):	NA	NA	NA	NA	NA	NA
DF4 (source to receptor) - drinking water:	NA	NA	NA	NA	NA	NA
DF4 (source to receptor) - bathing/swimming water:	NA	NA	NA	NA	NA	NA

Notes/Comments

Vapour Intrusion Model

Chemical Interactions

All chemicals of concern present at the site should be evaluated for potential additive effects based on target organs and mechanisms of effect.

Concentration Checks

Precluding Conditions

Other Notes

HEALTH CANADA DQRA SPREADSHEET
USER INPUT SHEET

User Name:	Golder Associates Ltd.	Site:	Canada Creosote Site
Proponent:	Alberta Environment	File #:	10-1346-0046
Date:	June 5, 2011	Comment:	Residents

PROBLEM FORMULATION

Potential Land Uses (Yes/No)		Default
Agricultural	No	Yes
Residential/urban parkland	No	Yes
Commercial	No	Yes
Industrial	No	Yes
Occupational - Outdoors	No	Yes
Recreational	No	Yes
Other	Yes	No
specify:	Residential 24 hours	

Exposure Scenario		
	Residential 24 hours	Residential 24 hours

Receptor Groups (Yes/No)		Default
General public or residents		Yes
Employees	No	Yes
Canadian native communities		No
Other		No
specify:		

Operative Pathways (Yes/No)		Default
Inadvertent ingestion of soil	No	Yes
Inhalation of soil particles	No	Yes
Inhalation of indoor contaminant vapours	Yes	Yes
Inhalation of outdoor contaminant vapours	No	Yes
Ingestion of drinking water	No	Yes
Dermal contact with soil	No	Yes
Dermal contact with water	No	Yes
Ingestion of contaminated food		No

Vapour Transport Modelling		
Vapour source for exposure calculations	Most Conservative	Most Conservative
Model applied for soil to indoor air		Health Canada
Model applied for groundwater to indoor air		Health Canada
Model applied for soil vapour to indoor air		Health Canada
		Indoor air concentrations entered over-ride modelling

Active Critical Receptors (Yes/No)		Default
Infant	No	Yes
Toddler	Yes	Yes
Child	No	Yes
Teen	No	Yes
Adult	Yes	Yes
Other		No
specify:		

Contaminant Concentrations

Chemical Name	required	Hexachloro-1,3-butadiene	Methanol	Trimethylbenzene, 1,2,4-			
Soil (mg/kg)	required						
Mole Fraction in Soil (unitless)	optional						
Groundwater - source (mg/L)	optional						
Mole Fraction in Groundwater (unitless)	optional						
Drinking water (mg/L)	optional						
Bathing/swimming water (mg/L)	optional						
Indoor air - vapours (mg/m^3)	optional	0.000005	0.0443	0.00061			
Outdoor air - vapours (mg/m^3)	optional						
Outdoor air - particulate (mg/m^3)	optional						
Soil vapours (> 1 m below foundation) (mg/m3)	optional						
Subslab/shallow soil vapour (<1 m) (mg/m3)	optional						
Root vegetables (mg/kg wet weight)	optional						
Other vegetables (mg/kg wet weight)	optional						
Fish (mg/kg wet weight)	optional						
Wild game (mg/kg wet weight)	optional						

Risk Assessment Endpoints		Default
Acceptable hazard index:		0.2
Acceptable cancer risk:		1.00E-05

Precluding Conditions for Fate and Transport Models

Are non-aqueous phase liquids (NAPL) present?	No
Is groundwater contamination present in fractured bedrock?	No
Is groundwater contamination migrating through a confined aquifer?	No
Is there active pumping or drawdown of groundwater at the site?	No
Is contamination present within 1 m of building foundation?	No
Do any buildings within 5 m of contamination have earthen foundations?	No
Are any buildings constructed on very high permeability media?	No
Are there preferential vapour flow pathways connecting contamination to a building?	No

Fate and Transport Model Input

	Value	Default	Models Affected
Soil Type		coarse-grained	PS, V-H, V-C, V-O, GW
Significant vehicle traffic on unpaved roads?		No	P-O
Site Characteristics			
Source Length (m)		10	GW, V-O
Source Width (m)		10	GW, V-O
Depth to Groundwater (m)		3	GW, V-O
Depth from Surface to Contamination (m)		0	GW, V-O
Thickness of Contamination (m)		3	GW
Distance - Contaminated Soil to Building (m)		1	V-H, V-C
Distance - Contaminated GW to Building (m)		1	V-H, V-C
Depth Below Building to Vapour Sample (m)		1	V-H, V-C
Distance to potable water user (m)		0	GW
Distance to Bathing/Swimming Water (m)		0	GW
Particulate Concentration in Air (ug/m^3)		0.76	P-O
Hydrological Parameters			
Recharge (m/y)		0.28	GW
Soil/Groundwater Characteristics	coarse-grained		
Vadose Zone			
Dry Bulk Density (g/cm3)		1.700	PS, V-C
Water Content (g/g dry wt)		0.070	PS, V-C
Capillary Zone			
Thickness of Capillary Zone (cm)		5	V-C
Water Content (g/g dry wt)		0.070	V-C
Aquifer/Contaminated Zone			
Saturated Hydraulic Conductivity (m/y)		320	GW
Hydraulic Gradient (m/m)		0.028	GW
Organic Carbon Fraction (g/g)		0.005	PS, GW
Soil Temperature (^oC)		21	PS, PGW
Depth of unconfined aquifer (m)		5	GW
Vapour Transport Properties			
Soil Vapour Permeability (cm^2) - CCME model		6.00E-08	V-C
Building Type		Residential - Slab on Grade	V-H, V-C
Building Characteristics	Residential - Slab on Grade		
Building length (m)		12.25	V-C
Building width (m)		12.25	V-C
Building mixing height (m)		3.6	V-H, V-C
Thickness of building foundation (cm)		11.25	V-C
Depth to base of foundation (m)		0.1125	V-C
Air exchanges per hour		0.5	V-C
Pressure differential (Pa)		40	V-C
Crack Area (cm^2)		994.5	V-C
Additional Vapour Intrusion Parameters (Health Canada model)			
Apply biodegradation adjustment?		No	V-H
Apply groundwater mass flux check?		No	V-H
Apply source depletion check?		No	V-H
Additional Groundwater Model Parameters			
Apply biodegradation during transport?		No	GW

Optional Sections

User-defined Chemicals

Note: user-defined chemicals should be named in this section before being selected in the 'Contaminant Concentrations' table above

		Chemical 1		Chemical 2	Chemical 3	
Name		Hexachloro-1,3-butadiene	*Health Canada values*	Methanol	Trimethylbenzene, 1,2,4-	*Health Canada values*
CAS Number			87-68-3	67-56-1		*95-63-6*
Chemical class (organic/inorganic)			organic	organic		organic
Tolerable daily intake (mg/kg/d) - infant	*Enter all applicable and appropriate toxicity benchmarks; values must be referenced and justified in the PQRA report.*					
Tolerable daily intake (mg/kg/d) - toddler						
Tolerable daily intake (mg/kg/d) - child						
Tolerable daily intake (mg/kg/d) - teen						
Tolerable daily intake (mg/kg/d) - adult						
Tolerable concentration (mg/m^3)				2.2	0.007	0.007
Oral slope factor $(mg/kg/d)^{-1}$						
Inhalation slope factor $(mg/kg/d)^{-1}$						
Inhalation unit risk $(mg/m^3)^{-1}$			0.022			
Relative dermal absorption factor						
Organic carbon partitioning coefficient (mL/g) - Koc			53700	1		1905.460718
Log Kow (unitless)			4.7	-7.70E-01		3.6
Henry's Law constant at 25°C (unitless) - H'			0.657533509	1.86E-04		0.229531636
Henry's Law constant at 25°C (atm-m3/mol) - H			0.016086849	4.55E-06		0.005615593
Water Solubility at 25°C (mg/L)			3.2	1.00E+06		57
Molecular Weight (g/mol)			260.761	32		120.191
Diffusivity in air (cm2/s)			0.0561	1.58E-01		0.0606
Diffusivity in water (cm2/s)			0.00000616	1.65E-05		0.00000792
Vapour Pressure at 25°C (atm)			0.000197385	0.17		0.002664693
Normal Boiling Point (K) - optional			488.15			442.53
Critical Temperature (K) - optional			738			649.17
Enthalpy of Vaporization @ Boiling Point (cal/mol) - optional			10206			9368.8
Biodegradation Adjustment Factor (unitless)			1	1		10
Half-Life - unsaturated zone (days)						
Half-Life - saturated zone (days)						

Note: values in grayed cells will not be used; Health Canada default values are applied.

User-defined Receptor

Name		Defaults
Age group		Toddler
Body weight (kg)		16.5
Soil ingestion rate (g/d)		0.08
Inhalation rate (m^3/d)		9.3
Water ingestion rate (L/d)		0.6
Skin surface area (cm^2)		
- hands		430
- arms		890
- legs		1690
- total		6130
Soil loading to exposed skin (g/cm^2/event)		
- hands		0.0001
- surfaces other than hands		0.00001
Food ingestion (g/d)		
- root vegetables		105
- other vegetables		67
- fish		56
- wild game		0
Evaluate Cancer Risks (Yes/No)?		No

User-defined Land-Use / Exposure Scenario

Scenario name	Residential 24 hours	Defaults
Hours per day (indoors)	24	22.5
Hours per day (outdoors)	0	1.5
Days per week		7
Weeks per year		52
Dermal exposure events/day		1
Water contact events per day		1
Duration of water contact event (h)		1
Days/year contaminated food ingestion		365
Exposure duration (years)		60
Years for carcinogen amortization		60

SUMMARY OF DQRA RESULTS Version: May 1, 2009

User Name:	Golder Associates Ltd.	**Site:**	Canada Creosote Site
Proponent:	Alberta Environment	**File #:**	10-1346-0046
Date:	June 5, 2011	**Comment:**	Residents

		Maximum Hazard/Risk Estimates					
		Hexachloro-1,3-butadiene	**Methanol**	**Trimethylbenzene, 1,2,4-**			
Hazard Quotient - Oral/Dermal		NA	NA	NA	NA	NA	NA
Hazard Quotient - Inhalation		NA	2.01E-02	8.71E-02	NA	NA	NA
Hazard Index - Total		NA	2.01E-02	8.71E-02	NA	NA	NA
Target Hazard Index:	0.2						
Cancer Risk - Oral		NA	NA	NA	NA	NA	NA
Cancer Risk - Dermal		NA	NA	NA	NA	NA	NA
Cancer Risk - Oral + Dermal		NA	NA	NA	NA	NA	NA
Cancer Risk - Inhalation		1.10E-07	NA	NA	NA	NA	NA
Cancer Risk - Total		1.10E-07	NA	NA	NA	NA	NA
Target Cancer Risk:	1.00E-05						

	Critical Receptors					
	Hexachloro-1,3-butadiene	**Methanol**	**Trimethylbenzene, 1,2,4-**			
Oral/Dermal - non-cancer effects	NA	NA	NA	NA	NA	NA
Inhalation - non-cancer effects	NA	All Age Groups	All Age Groups	NA	NA	NA
Total - non-cancer effects	NA	All Age Groups	All Age Groups	NA	NA	NA
Oral - cancer effects	NA	NA	NA	NA	NA	NA
Dermal - cancer effects	NA	NA	NA	NA	NA	NA
Oral + Dermal - cancer effects	NA	NA	NA	NA	NA	NA
Inhalation - cancer effects	Adult	NA	NA	NA	NA	NA
Total - cancer effects	Adult	NA	NA	NA	NA	NA
Source of indoor air vapours	User-specified	User-specified	User-specified	NA	NA	NA
Model used for vapour transport	NA	NA	NA	NA	NA	NA

Key Calculated Model Parameters						
Vapour Intrusion Model Parameters	Note: parameters show as "NA" if relevant exposure pathways are inoperative or if user-input concentration is used instead of modelled value					
Qsoil/Qbuilding	NA	NA	NA	NA	NA	NA
Soil alpha	NA	NA	NA	NA	NA	NA
Groundwater alpha	NA	NA	NA	NA	NA	NA
Soil vapour alpha	NA	NA	NA	NA	NA	NA
Groundwater model dilution factors						
DF1 (soil to leachate)	NA	NA	NA	NA	NA	NA
DF2 (leachate at source to water table):	NA	NA	NA	NA	NA	NA
DF3 (leachate at water table to groundwater):	NA	NA	NA	NA	NA	NA
DF4 (source to receptor) - drinking water:	NA	NA	NA	NA	NA	NA
DF4 (source to receptor) - bathing/swimming water:	NA	NA	NA	NA	NA	NA

Notes/Comments

Vapour Intrusion Model

Chemical Interactions

All chemicals of concern present at the site should be evaluated for potential additive effects based on target organs and mechanisms of effect.

Concentration Checks

Precluding Conditions

Other Notes

HEALTH CANADA DQRA SPREADSHEET
USER INPUT SHEET

User Name:	Golder Associates Ltd.	Site:	Canada Creosote Site
Proponent:	City of Calgary	File #:	10-1436-0046
Date:	June 5, 2011	Comment:	Construction Worker (Trench)

PROBLEM FORMULATION

Potential Land Uses (Yes/No)		Default
Agricultural	No	Yes
Residential/urban parkland	No	Yes
Commercial	No	Yes
Industrial	No	Yes
Occupational - Outdoors	No	Yes
Recreational	No	Yes
Other	Yes	No
specify:	Alberta worker 10 hours	

Operative Pathways (Yes/No)		Default
Inadvertent ingestion of soil	No	Yes
Inhalation of soil particles	No	Yes
Inhalation of indoor contaminant vapours	No	Yes
Inhalation of outdoor contaminant vapours	Yes	Yes
Ingestion of drinking water	No	Yes
Dermal contact with soil	No	Yes
Dermal contact with water	Yes	Yes
Ingestion of contaminated food		No

Exposure Scenario	Alberta worker 10 hours	Alberta worker 10 hours

Vapour Transport Modelling		
Vapour source for exposure calculations	Most Conservative	Most Conservative
Model applied for soil to indoor air		NA
Model applied for groundwater to indoor air		NA
Model applied for soil vapour to indoor air		NA

Receptor Groups (Yes/No)		Default
General public or residents		Yes
Employees		Yes
Canadian native communities		No
Other		No
specify:		

Active Critical Receptors (Yes/No)		Default
Infant	No	Yes
Toddler	No	Yes
Child	No	Yes
Teen	No	Yes
Adult	Yes	Yes
Other		No
specify:		

Contaminant Concentrations

Chemical Name	required	Ethylbenzene	Naphthalene	Benzene	Chloroform	Trimethylbenzene, 1,2,4-	
Soil (mg/kg)	required						
Mole Fraction in Soil (unitless)	optional						
Groundwater - source (mg/L)	optional	0.081	2.6	0.039	0.0051	0.025	
Mole Fraction in Groundwater (unitless)	optional						
Drinking water (mg/L)	optional						
Bathing/swimming water (mg/L)	optional						
Indoor air - vapours (mg/m^3)	optional						
Outdoor air - vapours (mg/m^3)	optional	1.616247314	42.87253554	0.904213779	0.095247747	0.468034274	
Outdoor air - particulate (mg/m^3)	optional						
Soil vapours (> 1 m below foundation) (mg/m3)	optional						
Subslab/shallow soil vapour (<1 m) (mg/m3)	optional						
Root vegetables (mg/kg wet weight)	optional						
Other vegetables (mg/kg wet weight)	optional						
Fish (mg/kg wet weight)	optional						
Wild game (mg/kg wet weight)	optional						

Risk Assessment Endpoints		Default
Acceptable hazard index:		0.2
Acceptable cancer risk:		1.00E-05

Precluding Conditions for Fate and Transport Models

Are non-aqueous phase liquids (NAPL) present?	No
Is groundwater contamination present in fractured bedrock?	No
Is groundwater contamination migrating through a confined aquifer?	No
Is there active pumping or drawdown of groundwater at the site?	No
Is contamination present within 1 m of building foundation?	No
Do any buildings within 5 m of contamination have earthen foundations?	No
Are any buildings constructed on very high permeability media?	No
Are there preferential vapour flow pathways connecting contamination to a building?	No

Fate and Transport Model Input

	Value	Default	Models Affected
Soil Type		coarse-grained	PS, V-H, V-C, V-O, GW
Significant vehicle traffic on unpaved roads?		No	P-O
Site Characteristics			
Source Length (m)		10	GW, V-O
Source Width (m)		10	GW, V-O
Depth to Groundwater (m)		3	GW, V-O
Depth from Surface to Contamination (m)		0	GW, V-O
Thickness of Contamination (m)		3	GW
Distance - Contaminated Soil to Building (m)		1	V-H, V-C
Distance - Contaminated GW to Building (m)		1	V-H, V-C
Depth Below Building to Vapour Sample (m)		1	V-H, V-C
Distance to potable water user (m)		0	GW
Distance to Bathing/Swimming Water (m)		0	GW
Particulate Concentration in Air (ug/m^3)		0.76	P-O
Hydrological Parameters			
Recharge (m/y)		0.28	GW
Soil/Groundwater Characteristics	coarse-grained		
Vadose Zone			
Dry Bulk Density (g/cm3)		1.700	PS, V-C
Water Content (g/g dry wt)		0.070	PS, V-C
Capillary Zone			
Thickness of Capillary Zone (cm)		5	V-C
Water Content (g/g dry wt)		0.070	V-C
Aquifer/Contaminated Zone			
Saturated Hydraulic Conductivity (m/y)		320	GW
Hydraulic Gradient (m/m)		0.028	GW
Organic Carbon Fraction (g/g)		0.005	PS, GW
Soil Temperature (^oC)		21	PS, PGW
Depth of unconfined aquifer (m)		5	GW
Vapour Transport Properties			
Soil Vapour Permeability (cm^2) - CCME model		6.00E-08	V-C
Building Type		Residential - Slab on Grade	V-H, V-C
Building Characteristics	Residential - Slab on Grade		
Building length (m)		12.25	V-C
Building width (m)		12.25	V-C
Building mixing height (m)		3.6	V-H, V-C
Thickness of building foundation (cm)		11.25	V-C
Depth to base of foundation (m)		0.1125	V-C
Air exchanges per hour		0.5	V-C
Pressure differential (Pa)		40	V-C
Crack Area (cm^2)		994.5	V-C
Additional Vapour Intrusion Parameters (Health Canada model)			
Apply biodegradation adjustment?		No	V-H
Apply groundwater mass flux check?		No	V-H
Apply source depletion check?		No	V-H
Additional Groundwater Model Parameters			
Apply biodegradation during transport?		No	GW

Optional Sections

User-defined Chemicals

Note: user-defined chemicals should be named in this section before being selected in the 'Contaminant Concentrations' table above

		Chemical 1		Chemical 2		Chemical 3
Name		Chloroform	*Health Canada values*	Trimethylbenzene, 1,2,4-	*Health Canada values*	
CAS Number			67-66-3		95-63-6	
Chemical class (organic/inorganic)			organic		organic	
Tolerable daily intake (mg/kg/d) - infant	*Enter all applicable and appropriate toxicity benchmarks; values must be referenced and justified in the PQRA report.*					
Tolerable daily intake (mg/kg/d) - toddler						
Tolerable daily intake (mg/kg/d) - child						
Tolerable daily intake (mg/kg/d) - teen						
Tolerable daily intake (mg/kg/d) - adult		0.01				
Tolerable concentration (mg/m^3)		0.04475		0.007		
Oral slope factor $(mg/kg/d)^{-1}$						
Inhalation slope factor $(mg/kg/d)^{-1}$						
Inhalation unit risk $(mg/m^3)^{-1}$		0.023				
Relative dermal absorption factor			0.03			
Organic carbon partitioning coefficient (mL/g) - Koc			42.65795188		1905.460718	
Log Kow (unitless)			1.97		3.6	
Henry's Law constant at 25°C (unitless) - H'			0.153854773		0.229531636	
Henry's Law constant at 25°C (atm-m3/mol) - H			0.003764125		0.005615593	
Water Solubility at 25°C (mg/L)			8200		57	
Molecular Weight (g/mol)			119.378		120.191	
Diffusivity in air (cm2/s)			0.104		0.0606	
Diffusivity in water (cm2/s)			0.00001		0.00000792	
Vapour Pressure at 25°C (atm)			0.258573896		0.002664693	
Normal Boiling Point (K) - optional			334.32		442.53	
Critical Temperature (K) - optional			536.4		649.17	
Enthalpy of Vaporization @ Boiling Point (cal/mol) - optional			7495.219885		9368.8	
Biodegradation Adjustment Factor (unitless)			1		10	
Half-Life - unsaturated zone (days)						
Half-Life - saturated zone (days)						

Note: values in grayed cells will not be used; Health Canada default values are applied.

User-defined Receptor

Name		Defaults
Age group		Toddler
Body weight (kg)		16.5
Soil ingestion rate (g/d)		0.08
Inhalation rate (m^3/d)		9.3
Water ingestion rate (L/d)		0.6
Skin surface area (cm^2)		
- hands		430
- arms		890
- legs		1690
- total		6130
Soil loading to exposed skin (g/cm^2/event)		
- hands		0.0001
- surfaces other than hands		0.00001
Food ingestion (g/d)		
- root vegetables		105
- other vegetables		67
- fish		56
- wild game		0
Evaluate Cancer Risks (Yes/No)?		No

User-defined Land-Use / Exposure Scenario

Scenario name	Alberta worker 10 hours	Defaults
Hours per day (indoors)	0	22.5
Hours per day (outdoors)	10	1.5
Days per week	5	7
Weeks per year	48	52
Dermal exposure events/day		1
Water contact events per day		1
Duration of water contact event (h)		1
Days/year contaminated food ingestion		365
Exposure duration (years)		60
Years for carcinogen amortization		60

SUMMARY OF DQRA RESULTS Version: May 1, 2009

User Name:	Golder Associates Ltd.	**Site:**	Canada Creosote Site
Proponent:	City of Calgary	**File #:**	10-1436-0046
Date:	June 5, 2011	**Comment:**	Construction Worker (Trench)

		Maximum Hazard/Risk Estimates					
		Ethylbenzene	**Naphthalene**	**Benzene**	**Chloroform**	**Trimethylbenzene, 1,2,4-**	
Hazard Quotient - Oral/Dermal		1.21E-02	2.23E+00	NA	1.10E-03	NA	NA
Hazard Quotient - Inhalation		4.44E-01	3.93E+03	NA	5.85E-01	1.84E+01	NA
Hazard Index - Total		4.56E-01	3.93E+03	NA	5.86E-01	1.84E+01	NA
Target Hazard Index:	0.2	**Target Hazard Index Exceeded**	**Target Hazard Index Exceeded**		**Target Hazard Index Exceeded**	**Target Hazard Index Exceeded**	
Cancer Risk - Oral		NA	NA	NA	NA	NA	NA
Cancer Risk - Dermal		NA	NA	3.38E-05	NA	NA	NA
Cancer Risk - Oral + Dermal		NA	NA	3.38E-05	NA	NA	NA
Cancer Risk - Inhalation		NA	NA	8.20E-04	6.02E-04	NA	NA
Cancer Risk - Total		NA	NA	8.54E-04	6.02E-04	NA	NA
Target Cancer Risk:	1.00E-05			**Target Cancer Risk Exceeded**	**Target Cancer Risk Exceeded**		

	Critical Receptors					
	Ethylbenzene	**Naphthalene**	**Benzene**	**Chloroform**	**Trimethylbenzene, 1,2,4-**	
Oral/Dermal - non-cancer effects	Adult	Adult	NA	Adult	NA	NA
Inhalation - non-cancer effects	All Age Groups	All Age Groups	NA	All Age Groups	All Age Groups	NA
Total - non-cancer effects	Adult	Adult	NA	Adult	All Age Groups	NA
Oral - cancer effects	NA	NA	NA	NA	NA	NA
Dermal - cancer effects	NA	NA	Adult	NA	NA	NA
Oral + Dermal - cancer effects	NA	NA	Adult	NA	NA	NA
Inhalation - cancer effects	NA	NA	Adult	Adult	NA	NA
Total - cancer effects	NA	NA	Adult	Adult	NA	NA
Source of indoor air vapours	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	NA
Model used for vapour transport	NA	NA	NA	NA	NA	NA

Key Calculated Model Parameters						
Vapour Intrusion Model Parameters	Note: parameters show as "NA" if relevant exposure pathways are inoperative or if user-input concentration is used instead of modelled value					
Qsoil/Qbuilding	NA	NA	NA	NA	NA	NA
Soil alpha	NA	NA	NA	NA	NA	NA
Groundwater alpha	NA	NA	NA	NA	NA	NA
Soil vapour alpha	NA	NA	NA	NA	NA	NA
Groundwater model dilution factors						
DF1 (soil to leachate)	NA	NA	NA	NA	NA	NA
DF2 (leachate at source to water table):	NA	NA	NA	NA	NA	NA
DF3 (leachate at water table to groundwater):	NA	NA	NA	NA	NA	NA
DF4 (source to receptor) - drinking water:	NA	NA	NA	NA	NA	NA
DF4 (source to receptor) - bathing/swimming water:	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	NA

Notes/Comments

Vapour Intrusion Model

Chemical Interactions

All chemicals of concern present at the site should be evaluated for potential additive effects based on target organs and mechanisms of effect.

Concentration Checks

Precluding Conditions

Other Notes

1.0 INHALATION OF CONTAMINANT VAPOURS DOSE RATE:

$$D_v = \frac{C_A \times AF_{inh} \times D_1 \times D_2 \times D_3 \times D_4}{LE}$$	Equation 1

Where:
D_V = dose from inhalation of COPC in indoor air (mg/m^3)
C_A = COPC concentration predicted in indoor air (mg/m^3)
AF_{inh} = bioavailability via inhalation (unitless)
D_1= hours per day exposed (hrs/day)
D_2= days per week exposed / 7 days
D_3= weeks per year exposed / 52 weeks
D_4= total years exposed to site (for carcinogens only)
LE = life expectancy (yr) (for carcinogens only)

Inhalation of naphthalene in indoor air for the toddler resident:

DR_V = 0.00058 mg/m^3 x 1 x 24 hrs/24 hrs x 7 days/7 days x 52 wks/52 wks

DR_V = **5.8 E-04 mg/m^3**

Inhalation of benzene (as a carcinogen) in indoor air for the adult resident:

$$D_V = \frac{\text{1.46 E-04 mg/m}^3 \text{ x 1 x 24 hrs/24 hrs x 7 days/7 days x 52 wks/52 wks x 60 years}}{\text{60 years}}$$

D_V = **1.46 E-04 mg/m^3**

2.0 DERMAL CONTACT WITH GROUNDWATER FOR ORGANIC SUBSTANCES

$$DR_{DC} = \frac{SA \times DA_{event} \times D_1 \times D_2 \times D_3}{BW \times LE}$$	Equation 2

Where:

DR_{DC} = dose rate from dermal contact with COPC in groundwater (mg/kg bw/day)

SA = skin surface area available for dermal contact (cm^2)

DA_{event} = absorbed dose per event (mg/cm^2-event/day)

D_1= days per week exposed / 7 days

D_2= weeks per year exposed /52 weeks

D_3= total years exposed to site (for carcinogens only)

BW = body weight (kg)

LE = life expectancy (yr) (for carcinogens only)

Sample calculation:

Dermal contact with naphthalene in groundwater for the construction worker (trench scenario):

$$DR_{DC} = \frac{17640\ cm^2 \times 2.71E\text{-}04\ mg/cm^2\text{-event/day} \times 5\ days/7\ days \times 48\ weeks/52\ weeks}{70.7\ kg}$$

DR_{DC} = 4.46 E-02 mg/kg bw/day

The approach to calculating the absorbed dermal dose is recommended by USEPA (2004). Dermal absorption is based on a two-compartment model which is composed of two layers, the stratum corneum and the viable epidermis. The stratum corneum acts as the primary barrier to the COPCs. The model describes the absorption of COPCs from water through the skin as a function of the stratum corneum and the event duration (USEPA 2004). The equations below are used to calculate the absorbed dermal dose for organic COPCs.

2.1 Dermal Absorbed Dose (DA_{event}) for Organic Substances in Groundwater

If $t_{event} \leq t^*$

$$DA_{event} = 2FA \times K_p \times C_w((6\tau_{event} \times t_{event})/\pi)^{1/2}$$	Equation 3

If $t_{event} > t^*$

$$DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2\tau_{event}\frac{1+3B+3B^2}{1+B^2}\right]$$	Equation 4

Where:

DA_{event} = Absorbed dose per event (mg/cm^2-event)

FA = Fraction absorbed water (unitless)

Kp = Dermal permeability coefficient of the compound in water (cm/hr)

Cw = Chemical concentration in water (mg/cm^3)

τ_{event} = Lag time per event (hr/event)

t_{event} = Event duration (hr/event)

t* = Time to reach steady-state (hr) = 2.4τevent

B = Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

Sample calculation:

$t_{event} \leq t^*$, therefore Equation 3 applies for naphthalene

DA_{event} = 2 x 1.0 x 5.09E-02 cm/hr x 2.6 mg/L x 0.001 L/cm^3 x [6*0.549 hr/event x 1 hr/event/ π]$^{1/2}$

DA_{event} = 2.71E-04 mg/cm^2-event

2.1.1 Parameters Required to Calculate Dermal Absorbed Dose (DA $_{event}$) for Organic Substances in Groundwater

Dermal Permeability Coefficient for Organics (B)

$LogK_p = -2.80 + 0.66LogK_{ow} - 0.0056MW$	Equation 5

Where:

MW = molecular weight (g/mol)

Kp = Dermal permeability coefficient of the compound in water (cm/hr)

Kow = Octanol water partitioning coefficient (unitless)

Sample calculation:

Log Kp for naphthalene = -2.80 + 0.66(3.37) – 0.0056(128.171 g/mol)

= -1.29

Kp = 5.09xE-02 cm/hr

Ratio of the Permeability Coefficient of a Compound through the Stratum Corneum Relative to its Permeability Coefficient across the Viable Epidermis (B)

$B = -\frac{K_p\sqrt{MW}}{2.6}$	Equation 6

Where:

B = Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless)

MW = molecular weight (g/mol)

Kp = Dermal permeability coefficient of the compound in water (cm/hr)

Sample calculation:

B for naphthalene (dimensionless) = $\frac{(5.09E-02)\sqrt{128.171}}{2.6}$ = 0.22

Effective Diffusive Coefficient for Chemical Transfer through the Stratum Corneum (Dsc)

$D_{sc} = l_{sc} \times 10^{(-2.80-0.0056\times MW)}$	Equation 7

Where:

D_{sc} = Effective diffusive coefficient for chemical transfer through the stratum corneum (cm^2/hr)

l_{sc}= Apparent thickness of corneum (1E-3 cm)

MW = Molecular weight (g/mol)

Sample calculation:

D_{SC} for naphthalene (cm^2/hr) = $1E-03 \times 10^{(-2.80-0.0056\times 128.171)}$ = 3.04E-07 cm^2/hr

Lag Time per Exposure Event (τ_{event})

$\tau_{event} = \frac{l_{sc}^2}{6D_{sc}^2}$	Equation 8

Where:

τ_{event} = Lag time per event (hr/event)

l_{sc}= Apparent thickness of corneum (1E-3 cm)

D_{sc} = Effective diffusive coefficient for chemical transfer through the stratum corneum (cm^2/hr)

Sample calculation:

τ_{event} for naphthalene (hr/event) = $\frac{(0.001cm)^2}{6\times 3.04E-07 cm^2/hr}$ = 0.549 hr/event

Time to Reach Steady State (t*)

If B ≤ 0.6

$t^* = 2.4 \times \tau_{event}$	Equation 9

If B > 0.6

$t^* = 6 \times \tau_{event}\left(b - (b^2 - c^2)^{1/2}\right)$	Equation 10

Where:

t* = Time to reach steady-state (hr) = $2.4\tau_{event}$

τ_{event} = Event duration (hr/event)

B = Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

b,c= correlation coefficients

Sample calculation:

B ≤ 0.6, therefore Equation 9 applies

t* = Time to reach steady-state (hr) = $2.4\tau_{event}$

t* = 2.4(0.549 hr/event)

t* = 1.32 hr/event

Correlation Coefficients

$b = \frac{2(1+B)^2}{\pi} - c$	Equation 11

Where:

B = Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

b,c= correlation coefficients

$b = \frac{1 + 3B + 3B^2}{3(1+B)}$	Equation 12

Where:

B = Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).

c = correlation coefficients

3.0 HAZARD/RISK ESTIMATION:

Hazard Quotient (HQ) = Estimated Exposure (Dose) (mg/kg bw/day) / Tolerable Daily Intake (TDI) (mg/kg bw/day)

Hazard/Risk Estimate for dermal pathway for chloroform for the construction worker (trench scenario):

HQ = dermal water contact dose / TDI

HQ = 1.10 E-05 mg/kg bw/day / 1.0 E-02 mg/kg bw/day

HQ = 1.1 E-03

Hazard/Risk Estimate for the inhalation pathway for naphthalene for the toddler resident:

$$HQ = \frac{Inhalation\ Dose\ (mg/m^3)}{Tolerable\ Concentration\ (mg/m^3)}$$

$$HQ = \frac{5.8E{-}04\ (mg/m^3)}{0.003\ (mg/m^3)}$$

HQ = 1.93 E-01

Integrated Lifetime Cancer Risk (ILCR) Estimate for oral/dermal pathways for benzene for the construction worker (trench scenario):

ILCR = dermal soil contact dose x oral slope factor

ILCR = (1.50 E-04 mg/kg bw/day) x 0.226 $(mg/kg\ bw/day)^{-1}$

ILCR = 3.4 E-05

Integrated Lifetime Cancer Risk (ILCR) Estimate for inhalation pathways for benzene for the construction worker (trench scenario):

ILCR = outdoor vapour inhalation dose x unit risk

ILCR = (2.48E-01 mg/m^3) x 0.0033 $(mg/m^3)^{-1}$

ILCR = 8.2 E-04

4.0 REFERENCES

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APPENDIX K

Toxicity Reference Values

Table K-1
Toxicity Reference Values
Canada Creosote Site, North Bow River, Calgary, Alberta

COPC	Carcinogen Classification [a]			Assessed as a Carcinogen?	Toxicity Reference Values								
					Oral				Inhalation				
	Health Canada	IARC	US EPA		TDI/RfD_o mg/kg/day	SF $(mg/kg/day)^{-1}$	Target Organ/Effect	Source	RfD^c mg/kg/day	RfC mg/m^3	IUR $(mg/m^3)^{-1}$	Target Organ/Effect	Source
Volatile Organic Compounds													
Acetaldehyde	NC	2B	B2	Yes	-	-	–	–	-	9.00E-03	2.20E-03	Degeneration of olfactory epithelium and likely human carcinogen	US EPA IRIS, 2011
Benzene	I	1	A	Yes	4.00E-03	2.26E-01	Decreased lymphocyte count (RfD); leukemia, lymphoma and carcinoma (SF)	US EPA IRIS, 2011 (RfD); Health Canada, 2009 (SF)	-	3.00E-02	3.30E-03	Decreased lymphocyte count	US EPA IRIS, 2011 (RfC); Health Canada, 2009 (IUR)
Butadiene (1,3-)	NC	1	B2	Yes	-	-	-	-	-	2.00E-03	3.00E-02	Ovarian atrophy	US EPA IRIS, 2011
Chloroform	NC	2B	B2	Yes	1.00E-02		Moderate to marked fatty cyst formation in the liver and elevated serum glutamate-private transaminase (SGPT)	US EPA IRIS, 2011	0.01	-	2.30E-02	Moderate to marked fatty cyst formation in the liver and elevated serum glutamate-private transaminase (SGPT)	US EPA IRIS, 2011
Hexachlorobutadiene	NC	3	C	Yes	-	7.80E-02	Renal tubular adenomas and adenocarcinomas	US EPA IRIS, 2011	-	-	0.022	Renal tubular adenomas and adenocarcinomas	US EPA IRIS, 2011
Methanol	NC	NC	NC	No	5.0E-01	-	Neurological effects and decresed brain weight	AENV, 2010	-	2.2E+00	-	Neurological effects and decresed brain weight	AENV, 2010
Naphthalene	NC	2B	NC	No	2.0E-02	-	Decreased mean terminal body weight in males	US EPA IRIS, 2011	-	3.0E-03	-	Cancer in respiratory and olfactory epithelium	US EPA , 20011
Trimethylbenzene (1,2,4-)	NC	NC	NC	No	–	–	–	–	-	7.00E-03	-	Potential neurological effects in humans carcinogenic properties are undetermined at present	US EPA RSL, 2011
Petroleum Hydrocarbons													
CCME F1													
Aliphatics C_6-C_8	NC	NC	NC	No	5	–	Neurotoxicity	CCME, 2008	–	18.4	–	Neurotoxicity	CCME, 2008
Aliphatics C_8-C_{10}	NC	NC	NC	No	0.1	–	Hepatic and hematological changes	CCME, 2008	–	1.0	–	Hepatic and hematological changes	CCME, 2008
Aromatics C_8-C_{10}	NC	NC	NC	No	0.04	–	Decreased body weight	CCME, 2008	–	0.2	–	Decreased body weight	CCME, 2008
CCME F2													
Aliphatics $C_{>10}$-C_{12}	NC	NC	NC	No	0.1	-	Hepatic and hematological changes	CCME, 2008	-	1	-	Hepatic and hematological changes	CCME, 2008
Aliphatics $C_{>12}$-C_{16}	NC	NC	NC	No	0.1	-	Hepatic and hematological changes	CCME, 2008	-	1	-	Hepatic and hematological changes	CCME, 2008
Aromatics $C_{>10}$-C_{12}	NC	NC	NC	No	0.04	-	Decreased body weight	CCME, 2008	-	0.2	-	Decreased body weight	CCME, 2008
Aromatics $C_{>12}$-C_{16}	NC	NC	NC	No	0.04	-	Decreased body weight	CCME, 2008	-	0.2	-	Decreased body weight	CCME, 2008

"-" no information available or not applicable
NC - not classified
COPC - Contaminant of Potential Concern
US EPA - United States Environmental Protection Agency, IRIS - Integrated Risk
TDI - tolerable daily intake; RfD - reference dose; RfC - reference concentration; SF -
IARC - International Agency for Research on Cancer
IUR - inhalation unit risk
RfDs are in mg/kg-d; SF are in $(mg/kg\text{-}d)^{-1}$; RfCs are in mg/m^3, IURs are in $(mg/m^3)^{-1}$
a - Health Canada classifications are from Health Canada 2006, 2009a; US EPA classifications are from US EPA IRIS (2011).
b - no dermal RfD or SF values are available therefore applied oral values
c - Oral RfD (mg/kg·d) adopted as inhalation RfC not available.
d - An oral TRV was not available for acenaphthylene from Health Canada, US EPA

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AENV Alberta preferred Screening value 2010 (adopted from Health Canada 2010 or US EPA IRIS 2011 standards)

ACETALDEHYDE

Pharmacokinetics

Oral Exposure

Little information is available regarding oral exposure to acetaldehyde due to its high vapor pressure. Animal studies indicate acetaldehyde is readily metabolized in the liver to acetate, which then enters normal metabolic pathways and is excreted by the lungs as CO2 and water (ATSDR, 1992).

Inhalation Exposure

No studies were identified evaluating the pharmacokinetics of acetaldehyde via inhalation.

Dermal Exposure

No studies were identified evaluating the dermal toxicity of acetaldehyde.

Toxicity

Non-Carcinogenic Effects

Oral Exposure

Toxicity of acetaldehyde following oral exposure has not been established.

Inhalation Exposure

The major toxic effects of acetaldehyde exposure via inhalation include degeneration of

olfactory, laryngeal, and tracheal epithelium. In animal studies high concentrations (4,004 and 9,100 mg/m3) resulted in severe dyspnea, reduced growth, and mortality. Other effects observed in animal studies include reduced body weight, decreased liver weights, and increased lung weights (US EPA, 2011).

Inhalation studies were not available for humans; however animal study NOAELs range from 150 ppm (273 mg/m3) in Wistar rats to 390 ppm (709.8 mg/m3) in hamsters (focusing on respiratory effects) (ATSDR 1992). Inhalation LOAELs range from 243 (442.3 mg/m3) ppm to 750 (1365 mg/m3) ppm in Wistar rats (causing irritation and changes in olfactory epithelium).

Dermal Exposure

Toxicity of acetaldehyde following dermal exposure has not been established.

Reference Dose for Chronic Oral Exposure (RfD)

Health Canada and US EPA have not assessed acetaldehyde for oral toxicity Health Canada, 2009; US EPA, 2011).

Reference Concentration for Chronic Inhalation Exposure (RfC)

Health Canada has not assessed acetaldehyde for toxicity due to inhalation (Health Canada, 2009).

The US EPA (2011) established a chronic reference concentration (RfC) for acetaldehyde of 9E-3 (mg/m3) based on two studies by Appeleman et al (1986 and1982). A NOAEL of 150 ppm (273 mg/m3) was identified from a 4 week study conducted by Appleman et al. (1986) using male Wistar rats. Rats were exposed to acetaldehyde at concentrations of 0, 150 ppm (273 mg/m3), and 500 ppm (910 mg/m3) for 6 hours a day, 5 days

a week. Rats exposed to 500 ppm (910 mg/m3) demonstrated histophathological changes in their nasal cavity, while no changes were observed in rats exposed to 150 ppm (273 mg/m3).

A similar study conducted by Appleman et al. (1982) exposed Wistar rats to 0, 400 (728 mg/m3), 1000 (1820 mg/m3), 2200 (4004 mg/m3), or 5000 (9100 mg/m3) ppm acetaldehyde for 6 hr/d, 5 d/wk, for 4 weeks and resulted in a LOAEL of 400 ppm (728 mg/m3). The human equivalent NOAEL (HEC) of 8.7 mg/m3 was calculated based on respiratory effect in the extrathoracic region. The NOAEL (HEC) was used to derive the RfC, a NOAEL(HEC) could not be calculated from Appelman (1986) as body weight of the rats was not provided; however the two studies provide reasonably similar results (US EPA 2011). An uncertainty factor of 1000 was applied to account for the following: 1) use of a subchronic study (10); 2) interspecies extrapolation (10); and 3) sensitive human populations.

Carcinogenic Effects

Health Canada has not assessed acetaldehyde as a carcinogen (Health Canada, 2009).

The US EPA (2011) classified acetaldehyde as a B2 carcinogen (probable human carcinogen). US EPA (2011) identified a single epidemiological study involving exposure to acetaldehyde. The study by Bittersohl (1974) compared the cancer rate of workers producing acetaldehyde to the general population; however the study covered a short duration, had a small sample set, and did not account for other limitations (age, smoking, or exposure to other chemicals). Chronic (52-week) animal studies have found hamsters and rats exposed to acetaldehyde developed nasal tumors or squamous cell carcinomas (US EPA, 2011).

Carcinogenic Risk from Oral Exposure

Health Canada (2009) and US EPA (2011) have not developed an oral slope factor for acetaldehyde.

Carcinogenic Risk from Inhalation Exposure

An Inhalation Unit Risk for acetaldehyde is not available at this time (Health Canada, 2009).

The US EPA has developed an inhalation unit risk of 2.2E-3 mg/m3 (US EPA 2011) based on the development of nasal squamous cell carcinoma or adenocarcinoma in male Wistar rats exposed to 750 ppm (1365 mg/m3) acetaldehyde for 52 weeks.

Summary

Oral Chronic RfD	not available at this time	Health Canada, 2009; US EPA, 2011.
Inhalation RfC	not available at this time	Health Canada, 2009
9E-03 (mg/m3) (degeneration	US EPA, 2011 of olfactory epithelium)	
Oral Slope Factor	not available at this time	Health Canada, 2009; US EPA, 2011
Inhalation Unit Risk US EPA, 2011	not available at this time	Health Canada, 2009; 2.2E-3 (mg/m3)

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BENZENE

Pharmacokinetics

Oral Exposure

No data are available on the distribution of orally administered benzene in humans. In rats, unconjugated benzene metabolites (i.e., hydroquinone) appeared in the liver, kidney, and blood while conjugated metabolites (e.g., phenyl sulphate) appeared primarily in the blood, bone marrow, oral cavity, kidney and liver. The metabolism of benzene is similar in humans and experimental animals, with the major toxic metabolites produced being benzoquinone and muconaldehyde (Health Canada, 1993). The production of toxic metabolites appears to be a saturable process, thereby leading to the greater production of toxic metabolites at low rather than high benzene doses (Health Canada, 1993). Studies quantifying the excretion of benzene and its metabolites by rabbits given oral doses of benzene, revealed that the animals eliminated approximately 40% of the dose as unchanged benzene in exhaled air and about 35% in the urine. Similar patterns of excretion have been observed for humans, cats and dogs, rats, and mice (ATSDR, 1997). In humans and rats, the excretion of benzene in expired air appears to biphasic.

Inhalation Exposure

Inhaled benzene is absorbed rapidly in humans and animals. In several inhalation studies uptake was 47-70% and retention was approximately 30% (ATSDR, 1997). Animal data also confirm that benzene is absorbed rapidly through the lungs. Absorbed benzene is distributed throughout the body with most accumulation in adipose tissue. In rats and pregnant mice exposed to benzene concentrations the parent compound and its metabolites were found in lipid-rich tissues, such as brain and fat, and in well-perfused tissues such as the lungs, liver, kidney, and spleen as well as in the fetuses and placenta (ATSDR, 1997). Metabolites of benzene (phenol, catechol, and hydroquinone) were detected in the blood and in the bone marrow, where levels of the metabolites exceeded those in the blood (ATSDR, 1997). The levels of phenol in the blood and bone marrow declined more rapidly than did those of catechol or hydroquinone, suggesting that catechol and hydroquinone may accumulate in the body. It appears that benzene metabolism is similar for different routes of administration and for different species, including humans (ATSDR, 1997). Benzene metabolites are excreted primarily in the urine, while unmetabolized benzene is exhaled (ATSDR, 1997).

Dermal Exposure

Recent studies have indicated that absorption of benzene through the skin may be a significant route of exposure, particularly for workers. It has been estimated that employees in tire-building operations could absorb 17 to 40% of total benzene dose through skin and inhalation (ATSDR, 1997). Dermal application of benzene to the skin of male rats indicated that the kidney, liver and treated skin are target tissues (ATSDR, 1997).

Toxicity

Non-Carcinogenic Exposure

Oral Exposure

Limited data show that non-lethal oral doses of benzene can impact the nervous, hematological, and immunological systems. Ingested benzene produces symptoms of neurotoxicity at acute doses of 2 mL for humans and 325 mg/kg for rats (ATSDR, 1997). Rats and mice exposed to benzene via gavage developed dose-related lymphocytopenia at 25 mg/kg/day and hyperplasia of the bone marrow (US EPA, 1992).

Inhalation Exposure

The targets for non-lethal concentrations of inhaled benzene include the nervous, hematological, and immunological systems. Neurological symptoms in humans may appear at exposure concentrations of 2237 mg/m3 (ATSDR, 1997). In animals, 1 week of exposure to 959 mg/m3 induced behavioural effects, and one to four weeks of exposure to benzene concentrations ranging from 67 to 160 mg/m3 suppressed the bone marrow, cellular immune response, and the humoral immune response. Inhalation of benzene vapour concentrations of 63,900 mg/m3 for 5-10 minutes can be fatal to humans; death results from central nervous system depression (US EPA, 1992).

Subchronic and chronic exposures to benzene vapours induce a progressive depletion of the bone marrow and dysfunction of the hematopoietic system. A group of patients exposed to benzene concentrations of 497 to 2077 mg/m3 for 4 months to 15 years exhibited severe blood dyscrasias and eight of the 32 patients died with thrombocytopenic hemorrhage and infection (ATSDR, 1997). These human data are supported by animal data showing bone marrow suppression in mice and rats exposed to benzene concentrations ranging from 32 mg/m3 for 24 weeks to 959 mg/m3 for 13 weeks (ATSDR, 1997). Benzene may also have long-term effects on the central nervous system. Workers exposed to benzene for 0.5 to 8 years exhibited electroencephalograph (EEG) changes, atypical sleep activity consistent with neurotoxicity, and peripheral nerve damage. In humans, benzene crosses the placenta and is present in the umbilical cord blood in amounts equal to those in maternal blood; however, studies of the effects of benzene on human reproduction and development have been confounded by the presence of other chemicals in the environment (ATSDR, 1997). Benzene does produce developmental effects (fetal toxicity, but not malformations) in the offspring of treated animals, mostly at doses toxic to the mother (ATDSR, 1997).

Dermal Exposure

Dermal exposure to benzene may cause skin dryness, irritation and dermatitis (ATSDR, 1997).

Tolerable Daily Intake (TDI) and Reference Dose (RfD) for Chronic Oral Exposure

A tolerable oral daily intake value for benzene is not available from Health Canada (Health Canada, 1996).

The US EPA (2011) has developed a reference dose for chronic oral exposure to benzene of 4.0E-03 mg/kg/day from a human occupational inhalation study measuring decreased lymphocyte count as the critical effect. A benchmark modeling dose (BMD) approach was used assess experimental animal and human occupational inhalation studies to derive a benchmark dose level (BMDL) of 1.2 mg/kg/day (from the rat gavage study, most sensitive endpoint) (US EPA, 2011). The BMDL was derived by route-to-route extrapolation with the assumptions that inhalation absorption was 50% and oral absorption was 100% in the dose range near the benchmark concentration (BMC). The overall uncertainty factor of 300 is comprised of a factor of 3 for effect-level extrapolation, a factor of 10 for sensitive subpopulations, and a factor of 3 for subchronic-to-chronic extrapolation, and an additional factor of 3 for database deficiencies. Overall confidence in the RfD is medium.

Tolerable Concentration (TC) and Reference Concentration (RfC) for Chronic Inhalation Exposure

A tolerable inhalation concentration value for benzene is not available from Health Canada (Health Canada, 2009).

The US EPA has developed a reference concentration for chronic inhalation exposure to benzene of 3.0E-02 mg/m3, which is derived from a human occupational inhalation study measuring decreased lymphocyte count as a critical effect. A 95% lower confidence limit of the benchmark concentration (BMCL) of 8.2 mg/m3 was derived from the study and an uncertainty factor of 300 applied to derive the RfC (US EPA, 2011). The overall uncertainty factor is comprised of factors for effect-level extrapolation (3), for sensitive subpopulations (10), for subchronic-to-chronic extrapolation (3), and for database deficiencies (3).

Carcinogenic Effects

Health Canada (1993) has classified benzene as a Group I substance (i.e., carcinogenic to humans) based on its documented carcinogenicity in humans and experimental animals.

Benzene is classified as being Class A – known carcinogen by the US EPA based on several studies of increased incidence of nonlymphocytic leukemia from occupational exposure, increased incidence of neoplasia in rats and mice exposed by inhalation and gavage (US EPA, 2011). Benzene is carcinogenic in humans and animals by inhalation and in animals by the oral route of exposure. Occupational exposure to benzene has been associated mainly with increased incidences of acute myeloblastic or erythroblastic leukemias and chronic myeloid and lymphoid leukemias among workers (ATDSR, 1997). A historical prospective mortality study of chemical workers described a dose-response relationship between exposure to benzene and lymphatic and hematopoietic cancers, adding strength to the association between exposure in the workplace and cancer development (US EPA, 1992).

Carcinogenic Risk from Oral Exposure

Health Canada (2009) provides an oral slope factor of 2.26E-01 (mg/kd/day)-1, derived from the drinking water quality guideline of 0.005 mg/L.

A tumorigenic dose value for benzene is not available from Health Canada (1996).

The US EPA has developed an oral slope factor ranging from of 1.5E-02 to 5.5E-02 (mg/kg/day)-1, based on human leukemia epidemiological data from occupational inhalation exposure to benzene (US EPA, 2011).

Carcinogenic Risk from Inhalation Exposure

Health Canada developed a tumorigenic concentration value (TC05) of 15 mg/m3 based on the occurrence of acute myelogenous leukemia in an occupational study. This study was selected for the development of a TC05 because of the large number of deaths in the study, and sufficient exposure information for the development of a quantitative risk assessment (i.e., benzene was the only solvent used in the workplace, and concomitant exposure to other possibly disease-causing chemicals did not occur). The TC05 was converted stepwise to a slope factor by first dividing by a factor of 5000. An appropriate risk level (i.e., 1E-5) was then selected, and divided by the converted TC05 and multiplied by a standard human body weight (70.7 kg) over inhalation rate (15.8 m3/day) ratio. The resulting inhalation slope factor is 1.46E-02 (mg/kg/day)-1. The associated inhalation unit risk is 3.3E-03 (mg/m3)-1.

The US EPA has developed inhalation unit risk values ranging from 2.2E-03 to 7.8E-03 (mg/m3)-1 based on an epidemiological study of leukemia incidence workers occupationally exposed to benzene (US EPA, 2011).

Summary

Oral Chronic RfDo	4.0E-03 mg/kg/day	decreased lymphocytes	US EPA, 2011
Inhalation RfC	3.0E-02 mg/m3	decreased lymphocytes	US EPA, 2011
Oral Slope Factor	2.26E-01 (mg/kg/day)-1	Health Canada, 2009	
Oral Slope Factor	5.5E-2 (mg/kg/day)-1 leukemia	US EPA, 2011	
Inhalation Unit Risk	3.30E-03 (mg/m3)-1	Health Canada, 2009	
Inhalation Unit Risk	7.8E-6 (µg/m3)-1	leukemia	US EPA, 2011

For the purposes of this study, the Health Canada slope factors and incremental unit risks were used to assess risks due to oral ingestion and inhalation.

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1,3-BUTADIENE

Pharmacokinetics

Oral Exposure

The extent of absorption from oral exposure to 1,3-butadiene is not known (ATSDR, 2009).

Inhalation Exposure

1,3-butadiene is readily absorbed in the lung across alveolar tissues into the blood and distributed throughout the body. No data are available on its binding to blood constituents such as albumins, but it forms stable adducts with hemoglobin through monoepoxide metabolite (ATSDR, 2009). Studies in vitro indicate that 1,3-butadiene accumulates in fatty tissue, although it has not been confirmed by in vivo data. Genotoxicity of 1,3-butadiene depends on its oxidative metabolism to 3,4-epoxy-1-butene (EB), 1,2:3,4-diepoxybutane (DEB), or 3,4-epoxy-1,2-diol (EBdiol). Animal studies suggest that primates have lower susceptibility to toxic effects of low levels of 1,3-butadiene. For example, mice have relatively greater 1,3,-butadiene oxidation capacity compared to rats and primates (ATSDR, 2009). Similarly, other studies have shown greater ability of 1,3-butadiene to deplete nonprotein sufhydryl (NPSH) in mouse than in rat metabolism (ATSDR, 2009). Further animal studies have indicated that at 22.5 mg/m3 exposure to 1,3-butadiene, the blood concentrations of 1,3-butadiene metabolites in monkeys were about 5-50 times lower than in mice and about 4-14 times lower than in rats (ATSDR, 2009).

Dermal Exposure

Information on the extent of absorption of 1,3-butadiene by dermal pathway is not available (ATSDR, 2009). 1,3-butadiene is typically present as gas. Dermal contact with liquid 1,3-butadiene would be an unusual scenario, however, it could occur as the result of rapid expansion of pressurized 1,3-butadiene from liquid to gas states – the resulting contact may cause frostbite. One study has indicated mild skin irritation from exposure to high gas concentrations (cited in ATSDR, 2009).

Toxicity

Non-carcinogenic effects

Oral Exposure

Data on the toxicity of 1,3-butadiene following oral exposure is not available (ATSDR, 2009).

Inhalation Exposure

The targets for non-lethal concentrations of inhaled 1,3-butadiene include the respiratory, cardiovascular, and nervous systems in humans (ATSDR, 2009). In addition, in one study, ocular effects were reported by two men after a 6-7 hour exposure to 2,000 and 4,000 ppm 1,3-butadiene (cited in ATSDR, 2009). Respiratory effects on exposed workers were transient with no symptoms upon removal from the gas. The effect of inhaled exposure to 1,3-butadiene is unclear, since increased mortality due to heart disease were reported in three studies, while heart disease was not evident in three other studies involving 1,3-butadiene monomer workers. The effect of inhalation exposure on the nervous system is narcotic at low concentrations, however, at high concentrations (>10,000 ppm indicative of spills or leaks), respiratory paralysis and death result from narcosis.

In animal studies, chronic exposure to 1,3-butadiene caused increased respiratory effects in mice at 6.25 ppm 6 hours/day, 5 days/week for two years; while two studies showed that chronic exposure to 8,000 ppm caused respiratory effects in rats (ATSDR, 2009). Cardiovascular effects on mice were observed after exposure to 200 ppm for 6 hours/day, 5 days/week for 40 weeks (ATSDR, 2009). The NOAEL for chronic exposure leading to death is 1,000 ppm derived from studies on rats (ATSDR, 2009).

Dermal Exposure

There is one study that shows dermal exposure to high gas concentrations may cause mild skin irritation (cited in ATSDR, 2009). One other study on liquid contact with 1,3-butadiene suggests frostbite may occur due to rapid expansion of pressurized liquid to gas state with no data on potential toxic effects, however, exposure to liquid 1,3-butadiene is unlikely (ATSDR, 2009).

Reference Dose for Chronic Oral Exposure (RfD)

Health Canada (2009) and US EPA (2011) have not developed a tolerable daily intake or chronic reference dose for 1,3-butadiene as it is primarily present as gas.

Reference Concentration for Chronic Inhalation Exposure (RfC)

Health Canada (2004) has not developed a tolerable concentration for 1,3-butadiene.

The RfC for 1,3-butadiene is 2 x10-3 mg/m3 based on a chronic study with mice and ovarian atrophy as the critical effect (US EPA, 2011). The RfC is based on a LOAEL of 14 mg/m3, which was the lowest exposure level studied. An uncertainty factor of 1000 based on a factor of 10 to account for intra-species variation, a factor of 10 for extrapolation to a level below the 10% effect level (LOAEL-to-NOAEL factor), a factor of 101/2 for extrapolation to humans, and a factor of 101/2 for database deficiencies (US EPA IRIS database, 2011) was applied to LOAEL derive the RfC. Confidence in the study and database are high, while confidence for RfC is medium for two reasons: 1) although many exposure levels were used, a NOAEL was not determined; and 2) studies on rats did not show reproductive and developmental effects and no human data on these effects are available (US EPA, 2011).

Carcinogenic Effects

Health Canada (2009) has not assessed the carcinogenicity of 1,3-butadiene.

1,3-Butadiene is classified as being Class A – known carcinogen by the US EPA based on studies of increased incidence of lymphohematopoietic cancers from occupational exposure, and increased incidence of tumors at multiple sites in mice and rats exposed by inhalation (US EPA 2011). There is evidence from epidemiological studies that there is increased incidence of lymphohematopoietic cancers for inhalation exposure to both monomer and polymer workers, and for leukemias with a dose-response relationship in polymer workers (US EPA 2011). The International Agency for Research on Cancer (IARC) has also classified 1,3-butadiene as a Group 1 carcinogen (IARC 2010). Cancer Effect Levels (CEL) are reported for chronic exposures to 1,3-butadiene as 6.25 ppm and 1,000 ppm in studies of mice and rats, respectively (ASTDR, 2009).

Carcinogenic Risk from Oral Exposure

An oral slope factor for 1,3-butadiene is not available at this time (Health Canada, 2009, US EPA, 2011). As mentioned above, oral exposure is unlikely as 1,3-butadiene is a gas at room temperature and pressure and poorly soluble in water.

Carcinogenic Risk from Inhalation Exposure

An inhalation unit risk for 1,3-butadiene is not available at this time from Health Canada (2009).

The inhalation unit risk for 1,3-butadiene is 3x10-5 (µg/m3)-1 based on an epidemiological study of leukemia risk involving male workers occupationally exposed to 1,3-butadiene.

Summary

Inhalation RfC	2.0 x10-3 mg/m3 (ovarian atrophy)	US EPA, 2011
Oral Chronic RfD	not available at this time	US EPA, 2011
Oral Slope Factor	not available at this time	US EPA, 2011
Inhalation Unit Risk	3x10-5 (µg/m3)-1	US EPA, 2011

References

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CCME PETROLEUM HYDROCARBON FRACTIONS

Pharmacokinetics

Oral Exposure

Petroleum hydrocarbon (PHC) fractions are defined by the CCME as follows: Fraction 1 (C>6-8 aliphatic, C>8-10 aliphatic, and C>8-10 aromatic); Fraction 2 (C>10 16 aliphatic and C>10-16 aromatic); Fraction 3 (C>16-34 aliphatic and C>16-34 aromatic); and Fraction 4 (C>34 50 aliphatic and C>34-50 aromatic). CCME PHC fractions exclude known carcinogens such as benzene and benzo(a)pyrene, which are addressed as separate target compounds (CCME, 2008a). In addition, toluene, ethylbenzene and xylenes are also excluded from PHC fractions as these compounds have historically been assessed as separate target compounds (CCME, 2008a).

Fuel oils are made up of six types of fuel with complex mixtures of aliphatic and aromatic hydrocarbons. The aliphatic alkanes (paraffins) and cycloalkanes (naphthenes) are hydrogen saturated and make up approximately 80 to 90% of fuel oils, and aromatics and olefins (e.g., styrene and indene) compose 10 to 20% and l%, respectively (benzene and benzo(a)pyrene were not explicitly excluded from the reviews of human and animal toxicity studies) (ATSDR, 1995a). Little is known about the absorption, distribution and excretion of fuel oils in humans and animals, although a study of 422 cases of kerosene ingestion found pulmonary complications in 11 individuals, which indicating that absorption and some distribution are likely. No studies were found on the distribution of fuel oils in humans following oral exposure, but a study with tracheotomized baboons found radiolabeled kerosene components administered via nasogastric tube were distributed in the brain, lungs, liver, spleen, heart, and kidney after 6 hours, although the concentrations were not very high, indicating low gastrointestinal absorption rates (ATSDR, 1995a). No quantitative information is available on the excretion of fuel oils following oral exposure (ATSDR, 1995a).

Inhalation Exposure

No studies are available regarding the absorption of fuel oils in humans or animals following inhalation exposure, however gastrointestinal, cardiovascular, hematological, renal and/or dermal and ocular effects have been observed in pilots who were exposed to JP-5 fuel vapor while flying (ATSDR, 1995a). No studies were found on the distribution or excretion of fuel oils in humans and animals following inhalation exposure (ATSDR, 1995a).

Dermal Exposure

Studies on absorption of fuel oils following dermal exposure are limited for humans, although animal studies have found toxic effects upon acute, intermediate and chronic dermal exposure to marine diesel fuel and JP-5 fuel (ATSDR, 1995a). Human evidence is provided by a case where a man washed his hair with diesel and a second where a man washed his hands with diesel, although the effects of inhalation exposure were not separated out from dermal exposure. Dermal exposure to diesel vapor may also result in absorption, and studies have found acute renal failure or necrosis following exposure to vapors No studies were found on the distribution or excretion of fuel oils in humans and animals following dermal exposure (ATSDR, 1995a).

The CCME 2008b document also summarizes PHC absorption using ATSDR toxicological profiles, and notes that although absorption of aromatic and aliphatic PHCs was reviewed by ATSDR, studies on total applied dose absorption or skin penetration rates for many hydrocarbons were not published when the CCME document was produced (CCME, 2008b). Absorption of a PAH mixture in organic solvent is between 50 to 80% of the applied dose, but this is reduced to 20% when applied in a soil matrix.

Toxicity

Non-Carcinogenic Effects

Oral Exposure

Toxicity following oral exposure to fuel oils is normally associated with children who accidentally ingest kerosene fuel. Major effects of fuel toxicity following oral exposure include: death, respiratory effects, tachycardia, gastrointestinal effects (vomiting, abdominal pain, distension, gastroenteritis, and diarrhea), increased leucocytes, various dermal effects and neurological effects (ATSDR, 1995a). It is important to note that the studies cited did not explicitly exclude benzene, benzo(a)pyrene, toluene, ethylbenzene or xylenes, so the effects of these hydrocarbon constituents may be included.

Fuel oil oral uptake studies with experimental animals found measurable NOAELs ranging from 8,000 mg/kg/day in female rats (neurological endpoints) to 37,824 g/kg/day in male rats (renal system endpoints). The measurable oral intake LOAEL values range from 12,000 mg/kg/day in female rats (causing 33% mortality) to 47,280 mg/kg/day in male rats (causing renal effects and 33% mortality) (ATSDR, 1995a).

Data are limited on toxic effects resulting from human oral exposure to total PAHs (including benzo(a)pyrene). Effects in animals include hematological, hepatic, renal, reproductive, developmental, and genotoxicity (ATSDR, 1995b). n-Hexane, commercial hexane and practical grade heptane may cause peripheral nerve damage in humans. (MDEP, 2002).

Inhalation Exposure

Due to the low volatility of fuel oils, human exposure to vapour concentrations over 100 mg/m3 is unlikely, however increased ambient temperature and other environmental variables will increase vapour concentrations (ATSDR, 1995a). Toxicity following inhalation exposure to fuel oil constituents includes: death (in rats exposed to high concentrations of diesel), respiratory effects (in a case where a man washed his hair with diesel) and heaviness in the chest, mild hypertension (following human exposure to JP-5 and diesel vapor), gastrointestinal symptoms, hematological effects (nose bleeds, low platelet counts following exposure to a diesel fuel injector leak), acute renal failure, ocular effects (eye irritation, burning sensation following exposure to JP-5 fuel), and various neurological effects (coordination and concentration difficulties, headache, apparent intoxication and anorexia following human exposure to JP-5 fuel, with chronic workplace exposure to jet fuel causing neurasthenia) (MDEP, 2002).

Fuel oil inhalation uptake studies on experimental animals found NOAELs ranging from 65 mg/m3 over 5 days in male mice (focusing on cardiovascular effects) to 1,500 mg/m3 over 4 hours/day to 13 weeks in rats (focusing on reproductive and general systemic effects) (ATSDR, 1995a). Fuel oil LOAELs from inhalation uptake studies range from 20 g/m3 for 13 weeks, 6 hours per day in male dogs (causing increased body weight) to 4,000 mg/m3 over 1 day in rats (causing 30% mortality) (ATSDR, 1995a).

Statistically significant decreases in ventilatory function and other respiratory symptoms (e.g., breathing problems, chest pains, throat irritation, and cough) occurred following prolonged exposure to total PAHs (including benzo(a)pyrene) and particulate matter have been found to correlate with employment duration in a rubber factory (ATSDR, 1995b). Another study showed that coke oven workers, exposed to high concentrations of atmospheric PAHs had reduced levels of serum immunoglobins. Genotoxic effects have also been revealed in women exposed to burning wood and/or coal.

Dermal Exposure

Toxicity of fuel oils following dermal exposure is seen in the following body systems: respiratory, cardiovascular, gastrointestinal, hematological, hepatic, renal, dermal and ocular, systemic, immunological and neurological, with similar symptoms to other pathways (ATSDR, 1995a).

Fuel oil dermal uptake studies on experimental animals found NOAELs ranging from 42.2 mg/application in mice (focusing on hepatic effects) to 8000 mg/kg/day in mice (focusing on general systemic effects) (ATSDR, 1995a). Fuel oil LOAELs from dermal uptake studies range from 21.1 mg/application in mice (causing hepatic and renal effects and increased body weight) to 30,000 mg/kg/day in mice (causing 100% mortality in females and 0% in males). Note the different rates of application reported.

Dermal application of mixtures of total PAHs (including benzo(a)pyrene) can cause skin disorders in humans and animals. However, specific effects in humans due to dermal exposure to individual PAHs have not been reported except for benzo[a]pyrene which is not included in CCME PHC fractions (ATSDR, 1995b). Adverse dermal effects have also been observed in animals following both acute- and intermediate-duration dermal exposure to various PAHs. Skin damage caused by sunlight exposure can be potentiated by anthracene, resulting in skin inflammation (ATSDR, 1995b).

Tolerable Daily Intake (TDI) and Reference Dose (RfD) for Chronic Oral Exposure and Tolerable Concentration (TC) and Reference Concentration (RfC) for Chronic Inhalation Exposure

A summary of oral and inhalation TRVs for CCME PHC compounds are provided below (CCME, 2008b; TPHCWG, 1997):

TPH Compound	Fraction	% Total Fraction	Oral RfD (mg/kg/day)	Inhalation RfC (mg/m^3)	Critical Effect
CCME F1	$C_{>6-8}$ aliphatic	55%	5.0	18.4	neurotoxicity
	$C_{>8-10}$ aliphatic	36%	0.1	1.0	hepatic / hematological changes
	$C_{>8-10}$ aromatic	9%	0.04	0.2	decreased body weight, nephrotoxicity
CCME F2	$C_{>10-16}$ aliphatic	80%	0.1	1.0	hepatic / hematological changes
	$C_{>10-16}$ aromatic	20%	0.04	0.2	decreased body weight
CCME F3	$C_{>16-34}$ aliphatic	80%	2.0	N/A[1]	hepatic granuloma
	$C_{>16-34}$ aromatic	20%	0.03	N/A[1]	nephrotoxicity
CCME F4	$C_{>34-50}$ aliphatic	80%	20.0	N/A[1]	hepatic granuloma
	$C_{>34-50}$ aromatic	20%	0.03	N/A[1]	nephrotoxicity

Carcinogenic Effects

Because the CCME has defined PHC fractions for the derivation of soil quality levels for non-carcinogenic PHCs only, carcinogenic PHCs (benzene, some PAHs) are not included. These carcinogenic components, as well as toluene, ethylbenzene and xylenes are directly quantified and subtracted from total PHC contamination prior to application of PHC Tier 1 levels (CCME, 2008b).

ATSDR (1995a) reviewed numerous animal carcinogenicity studies on dermal exposure to fuel oils, with many studies finding skin tumours in mice following exposure to JP 5 or marine diesel fuel, catalytically cracked clarified oil and commercial #2 heating oils, furnace oil and others, although it was not made clear if known carcinogens such as benzene or benzo(a)pyrene were excluded (ATSDR, 1995a). No studies were found regarding carcinogenicity in humans or animals following oral exposure to fuel oil (ATSDR, 1995a), and limited studies on inhalation exposure in humans have found possible risks of various cancers associated with diesel fuel, various “petroleum products” including diesel, although some concerns regarding study designs have arisen. Rat studies have found no evidence of cancer following inhalation exposure to JP-5 or marine diesel fuel, although the study in question was not designed to test for carcinogenicity. Total carcinogenic risk of fuel oils has not been assessed.

Reference Dose for Chronic Dermal Exposure (RfD)

The US DOE has developed a chronic dermal reference doses for petroleum hydrocarbon fractions as follows: light aliphatic: 4.8E-02 mg/kg/day; light aromatic: 1.6E-01 mg/kg/day; medium aliphatic: 8E-02 mg/kg/day; medium aromatic: 1.6E-01 mg/kg/day; heavy aliphatic: 1.6 mg/kg/day; heavy aromatic: 2.4E-2 mg/kg/day (US DOE RAIS, 2005).

Carcinogenic Risk from Oral Exposure

Oral slope factors for CCME PHC fractions are not applicable, as fractions are defined as containing only non-carcinogenic hydrocarbons (CCME, 2008b).

Carcinogenic Risk from Inhalation Exposure

Inhalation slope factors for CCME PHC fractions are not applicable, as fractions are defined as containing only non-carcinogenic hydrocarbons (CCME, 2008b).

Summary

See tables above.

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CHLOROFORM

Pharmacokinetics

Oral, Inhalation and Dermal Exposure

The adsorption, distribution, metabolism and excretion pathways of chloroform are well known based on studies with experimental animals. In general, chloroform is easily absorbed into the blood stream following inhalation exposure, with peak levels occurring 5 to 6 minutes following oral uptake (dermal uptake is also possible) (ATSDR, 1997). Chloroform is then distributed to adipose tissues, brain, liver, kidneys, blood, adrenal and embryonic neural tissue. In humans, approximately 50% of chloroform is eventually metabolized to CO2 with an intermediate metabolite, phosgene, formed in the liver (the main site of metabolism). Chloroform is excreted in small amounts in the urine or feces as parent compound or as CO2 following pulmonary desorption.

Toxicity

Non-Carcinogenic Effects

Oral and Inhalation Exposure

Chloroform can affect the central nervous system, liver, and kidneys after inhalation or oral exposure from the air or water (ATSDR, 1997). Acute inhalation exposure causes fatigue, dizziness and headache, while chronic exposure can cause liver and kidney damage.

Chloroform oral uptake studies with experimental animals found NOAELs ranging from 0.96 mg/kg/day in a chronic human study (renal and hepatic endpoints) to 765 mg/kg/day (administered once) in female mice (immune system endpoints). The oral intake LOAEL values range from 15 mg/kg/day in beagles (causing increased liver enzyme activity) to 2,180 mg/kg/day in female rats (an LD50) and up to 2,410 mg/kg/day in a male human (causing a arrhythmia, jaundice and toxic hepatitis, oliguria and deep coma).

Inhalation uptake studies on experimental animals found NOAELs ranging from 1.99 ppm (9.7 mg/m3) over 13 weeks (7 days per week and 6 days per hour) in male mice (focusing on renal effects) to 2,500 ppm (12,200 mg/m3) over 0.5 to 2 hours in mice (focusing on the neurological system) (ATSDR, 1997). Chloroform LOAELs from inhalation uptake studies range from 10 ppm (48.8 mg/m3) for 7 days, 6 hours per day in female mice (causing an increased number of S-phase nuclei and respiratory effects) to 9,770 ppm (47,677 mg/m3) over 4 hours in female rats (an LC50 value) and up to 22,500 ppm (109,800 mg/m3) over 0.5 to 2 hours in humans (causing vomiting, respiratory changes, cardiac arrhythmia and bradycardia, and narcosis) (ATSDR, 1997).

Dermal Exposure

Dermal application of 0.01 mL chloroform for 24 hours to rabbits caused slight skin irritation. Application of 1,000 mg/kg resulted in skin necrosis and weight loss in rabbits (ATSDR 1997).

Tolerable Daily Intake (TDI) and Reference Dose (RfD) for Chronic Oral Exposure

A tolerable oral daily intake value for chloroform is not available from Health Canada (Health Canada, 2009).

The oral RfD for chloroform is 0.01 mg/kg/day based on a LOAEL of 15 mg/kg/day (converted to 12.9 mg/kg/day based on continuous exposure) from a chronic exposure study on dogs (US EPA, 2011) assessing cyst formation in the liver. The LOAEL is based on moderate to marked fatty cyst formation in the liver and elevated

liver enzymes. The total uncertainty factor is 1,000 based on a UF of 10 to account for interspecies extrapolation, a factor of 10 for the protection of sensitive subpopulations and a third factor of 10 to account for the extrapolation of a LOAEL to a NOAEL. In this case a benchmark dose (BMD) approach was also used (resulting in the same RfD value), and is considered a preferable derivation for the RfD.

Tolerable Concentration (TC) and Reference Concentration (RfC) for Chronic Inhalation Exposure

A tolerable inhalation concentration value for chloroform is not available from Health Canada (Health Canada, 2009).

An RfC for chloroform is unavailable at this time from the US EPA IRIS website (US EPA, 2011).

Carcinogenic Effects

Health Canada has not assessed the carcinogenicity of chloroform to humans, and a classification of carcinogenicity is not available (Health Canada, 1996).

The US EPA classifies chloroform as a Class B2 carcinogen – probable carcinogen. This classification is based on sufficient animal test evidence (US EPA, 2011). Inconclusive evidence has been found linking cancer in humans with the consumption of chlorinated drinking water; confounding factors include the presence of numerous chlorination by-products (ATSDR, 1997).

Carcinogenic Risk from Oral Exposure

A tumorigenic dose value for chloroform is not available from Health Canada (2009).

An oral slope factor for chloroform carcinogenicity is not applicable, because available information shows the carcinogenic effects is secondary to another toxicity threshold (in this case cytotoxicity and regenerative hyperplasia). In this case, an RfD of 0.01 mg/kg/day is considered to be protective against the risk of cancer (US EPA, 2011).

Carcinogenic Risk from Inhalation Exposure

A tumorigenic concentration value for chloroform is not available from Health Canada (2009).

The inhalation unit risk value for chloroform is 2.3E-2 (mg/m3)-1 based on a gavage-administered dose on a female mouse causing liver cancer (US EPA, 2011).

Summary

Oral chronic RfD	1.0E-02 mg/kg/day	liver damage	US EPA, 2011
Inhalation RfC	not available	Health Canada, US EPA	
Oral Slope Factor	not available	Health Canada, US EPA	
Inhalation Slope Factor	not available	Health Canada, US EPA	
Inhalation Unit Risk	2.3E-02 (mg/m3)-1	liver cancer	US EPA, 2011

References

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URL: http://www.epa.gov/iris/

HEXACHLORO-1,3-BUTADIENE

Pharmacokinetics

Oral Exposure

Hexachloro-1,3-butadiene is presumed to be absorbed across the lipid portions of the intestinal tract and readily absorbed at low doses (ATSDR, 1994). Animal studies show that absorption can depend on the type of solvent in which the hexachloro-1,3-butadiene is present in . Following absorption, it is carried to the liver and excreted in the bile where other metabolites are formed, and all of which are distributed to the kidney, liver, adipose deposits, and possible the brain (ATSDR, 1994). The main route of hexachloro-1,3-butadiene elimination is through excretion via urine and feces with limited degradation to carbon dioxide and exhalation.

Inhalation Exposure

Data on the toxicity of hexachloro-1,3-butadiene following inhalation exposure is not available (ATSDR, 1994).

Dermal Exposure

Data on the toxicity of hexachloro-1,3-butadiene following dermal exposure in humans is not available, but in one animal study 388-1,550 mg/kg of pure hexachloro-1,3-butadiene was absorbed in 8 hours when applied to the skin of rabbits (ATSDR, 1994).

Toxicity

Non-carcinogenic Effects

Oral Exposure

Chronic exposure in rats indicates a LOAEL of 20 mg/kg/day results in increased mortality (ATSDR, 1994). Other studies on rats show chronic exposure can lead to renal effects with NOAEL of 0.2 mg/kg/day and a Cancer Effect Level (CEL) of 20 mg/kg/day based on increased incidence of kidney tumors (ATSDR, 1994).

Reference Dose for Chronic Oral Exposure (RfD)

Health Canada and US EPA have not assessed hexachloro-1,3-butadiene for toxicity (Health Canada, 2009; US EPA, 2010a). US EPA RSL (2010b) report an RfD of 1.0E-03 mg/kg/day based on a Provisional Peer Reviewed Toxicity Value (PPRTV).

Inhalation Exposure

Limited data focused on hepatic effects on humans from inhalation exposure to hexachloro-1,3-butadiene are available, while animal studies are available on respiratory and renal effects. In one study, hepatic effects were noted in workers exposed to 0.05-0.2 mg/m^3 hexachloro-1,3-butadiene, but the significance of this finding is limited due to the co-exposure of worker to other solvents (ATSDR, 1994). Respiratory and renal effects were reported in rats at 260 mg/m^3 for 15 days (6 hours/day) (ATSDR, 1994).

Reference Concentration for Chronic Inhalation Exposure (RfC)

Health Canada and US EPA have not assessed hexachloro-1,3-butadiene for toxicity (Health Canada, 2009; US EPA, 2010).

Carcinogenic Effects

Health Canada has not assessed hexachloro-1,3-butadiene for carcinogenicity (Health Canada, 2009). US EPA (2010a) considers hexachloro-1,3-butadiene to be a possible human carcinogen (Group C).

Carcinogenic Risk from Oral Exposure

A slope factor was not available from Health Canada (2009).

US EPA (2010a) provides an oral slope factor of 7.8E-02(mg/kg/day)$^{-1}$ for hexachloro-1,3-butadiene based on the development of renal tubular adenomas and adenocarcinomas in rats (US EPA 2010a).

Carcinogenic Risk from Inhalation Exposure

An inhalation unit risk of 2.20E-02 (mg/m^3)$^{-1}$ was reported by the US EPA IRIS (2010a) for hexachloro-1,3-butadiene based on the oral slope factor presented above.

Summary

Oral Chronic RfD	1.0E-03 mg/kg/day	US EPA RSL, 2010b
Inhalation RfC	not available	Health Canada, 2009; US EPA, 2010a
Oral Slope Factor	7.8E-02 (mg/kg/day)$^{-1}$	US EPA IRIS, 2010a
Inhalation Slope Factor	not available	Health Canada, 2009; US EPA, 2010a
Inhalation Unit Risk	2.2E-02 (mg/m^3)$^{-1}$	US EPA IRIS, 2010a

References

Health Canada. 2009. Federal Contaminated Site Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs). Environmental Health Assessment Services. Safe Environments Program. Health Canada, Ottawa, ON.

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United States Environmental Protection Agency (US EPA) Regional Screening Levels. 2011b. Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites. URL: http://www.epa.gov/region09/superfund/prg/index.html

METHANOL

Pharmacokinetics

Methanol absorption is rapid, irrespective of mode of exposure (i.e., ingestion, inhalation or dermal contact) and tends to be uniformly distributed in tissues in relation to water content (AENV 2010). AENV (2010) indicates that each of the modes of exposure is assumed to be toxicologically equivalent due to the uniform distribution within the tissues.

Methanol is predominantly (97%) metabolized by the liver to form carbon dioxide and excreted through the lungs while a smaller portion is only oxidized to formaldehyde and excreted in the urine (AENV 2010).

Reference Dose for Chronic Oral Exposure (RfD)

Health Canada has not assessed methanol for toxicity (Health Canada, 2008).

US EPA has developed a chronic oral RfD of 0.5 mg/kg-day based on a subchronic test using Sprague-Dawley rats (US EPA, 2011a). Rats were exposed daily to 0, 100, 500, or 2500 mg/kg/day methanol over a 90-day period via gavage. Rats exposed to 2500 mg methanol/kg/day had significantly lower brain weights compared to control; additionally serum glutamate-private transaminase (SGPT) and sensory action potential (SAP) were elevated but not significantly (US EPA, 1986). The No-observed Adverse Effects Level (NOAEL) was considered to be 500 mg/kg/day and an uncertainty factor of 1000 was applied to the NOAEL to derive the RfD. The uncertainty factor included a factor of 10 for each of the following: (1) interspecies extrapolation, (2) sensitive human populations and (3) extrapolation from a subchronic to chronic exposure.

Reference Concentration for Chronic Inhalation Exposure (RfC)

Health Canada and US EPA has not assessed methanol for toxicity due to inhalation (Health Canada, 2009, US EPA 2011a). AENV (2010) provides an RfC of 2.2 mg/m3 based on conversion from the chronic oral RfD based on an evaluation from WHO (1997) which indicates that methanol is absorbed quickly via both inhalation and oral exposure and that toxicity associated with methanol exposure is more closely related to concentrations in the blood rather than the route of exposure. The conversion was conducted using an adult body weight (70.7 kg) and inhalation rate (2.2 mg/m3).

The US EPA RSLs (2011b) provide an RfC of 4.0 mg/m3 which was adopted from California EPA.

Carcinogenic Effects

Health Canada has not assessed methanol for carcinogenicity (Health Canada, 2009). US EPA (2011a,b) does not have a carcinogen assessment of methanol available at this time.

Carcinogenic Risk from Oral Exposure

A slope factor was not available from Health Canada (2009) or US EPA (2011a,b).

Carcinogenic Risk from Inhalation Exposure

An inhalation unit risk was not available from Health Canada (2009) or US EPA (2011a,b).

Summary

Oral Chronic RfD	0.5 mg/kg-day	US EPA IRIS, 2011a
Inhalation RfC	not available	Health Canada, 2009
2.2 mg/m3	Alberta Environment, 2010	
4.0 mg/m3	US EPA RSL, 2011b	
Oral Slope Factor	not available	Health Canada, 2009; US EPA, 2011a,b
Inhalation Unit Risk	not available	Health Canada, 2009; US EPA, 2011a,b

References

Alberta Environment. 2010. Soil and Groundwater Remediation Guidelines for Methanol. December 2010. URL: http://environment.gov.ab.ca/info/library/8311.pdf

Health Canada. 2009. Federal Contaminated Site Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs). Environmental Health Assessment Services. Safe Environments Program. Health Canada, Ottawa, ON.

United States Environmental Protection Agency (US EPA). 2011a. Integrated Risk Information System (IRIS) Summary for Methanol. Last revised July 1993. URL: http://www.epa.gov/iris/subst/0305.htm#studoral

United States Environmental Protection Agency (US EPA) Regional Screening Levels. 2011b. Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites. Updated June 2011 URL: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/pdf/master_sl_table_run_JUN2011.pdf

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NAPHTHALENE

Pharmacokinetics

Oral Exposure

Limited data are available on the pharmacokinetics of naphthalene in human systems, and no data are available for 2-methylnaphthalene (ATSDR, 2003). Naphthalene is known to be absorbed by the gastrointestinal tract, respiratory tract and skin based on evidence of adverse effects on animals upon exposure (US EPA, 2002). Absorption of naphthalene consumed orally is thought to occur via passive diffusion through the lipophilic matrix of the intestinal membrane; rates of absorption are unavailable. Small doses of 2-methylnaphthalene appear to be rapidly absorbed from the gastrointestinal tract of guinea pigs; at least 80% of a 10 mg/kg dose was absorbed within 24-hours (ATSDR, 2003). Naphthalene has been measured in human body fat and milk, however distribution mechanisms of naphthalene in humans are not known. Naphthalene is able to cross the placenta in high enough concentrations to cause hemolytic anemia in newborn infants whose mothers consume naphthalene during their pregnancy. Targets of 2-methylnaphthalene upon oral exposure include the gall bladder, kidneys, liver, lungs and blood (ATSDR, 2003). Naphthalene metabolism is catalyzed by cytochrome P-450 oyxgenases which produces a reactive intermediary, 1,2-napthalene oxide. Animal studies indicate that naphthalene excretion occurs primarily through the urine, with feces representing a relatively minor excretion pathway. Possible elimination of unmetabolized naphthalene by exhalation following inhalation exposure has not yet been assessed (ATSDR, 2003).

Inhalation Exposure

As mentioned, limited data are available on the pharmacokinetics of naphthalene, although it is known to cause adverse health effects in humans based on prolonged exposure to vapours, which infers absorption via the lungs is possible. Rates of absorption have not been determined, but it is thought that naphthalene may move across the alveolar membrane by passive diffusion.

Dermal Exposure

Absorption of naphthalene through the skin is inferred based on several cases of hemolytic anaemia in very young children resulting from the use of diapers stored in mothball containing closets. The addition of sand or clay soil to radiolabeled naphthalene applied to shaved rat skin decreased the rate of absorption somewhat (absorption half-life was 2.1 hours for naphthalene; 2.8 hours for naphthalene with clay and 4.6 hours for naphthalene with sand) (ATSDR, 2003). The rate of absorption did not affect the total amount of naphthalene absorbed over a 48-hour period. The decreased naphthalene absorption associated with the presence of clay is likely due to the higher organic content in clay (4.4%) compared to sand (1.6%) (ATSDR, 2003).

Toxicity

Non-Carcinogenic Effects

Oral Exposure

There are three main types of health effects associated with naphthalene exposure: hemolysis (causing decreased oxygen carrying capacity in the blood); the development of cataracts; and lesions of the respiratory tract (ATSDR, 2003). Humans experience red blood cell hemolysis after naphthalene exposure through oral, inhalation and dermal routes, and appear to be more susceptible to hemolysis than animals (ATSDR, 2003). Naphthalene exposure via the three main routes also results in cataracts in humans based on case and

industrial exposure studies. Unfortunately, these industrial studies have not been verified by epidemiological studies, and impurities present in the industrial grade naphthalene may also contribute to cataract formation. Animal studies have also demonstrated a cause and effect relationship between naphthalene and cataracts. Both non-neoplastic and neoplastic respiratory lesions have been associated with naphthalene exposure in mice and rats. An acute human exposure to naphthalene via consumption of mothballs or chips has resulted in several deaths, while sub-lethal acute naphthalene poisoning has resulted in hemolytic anemia and cataracts.

Inhalation Exposure

Gastrointestinal and neurological symptoms have been reported by a family exposed to high naphthalene indoor air concentrations resulting from excessive use of mothballs (US EPA, 2002). Removal of the mothballs from the home resulted in the cessation of symptoms. A rat study found decreased sensitivity to pain following inhalation exposure to 352 or 525 mg/m3 2-methylnaphthalene (ATSDR, 2003).

Dermal Exposure

Pulmonary alveolar proteinosis was noted in nearly all female mice administered a mixture of 1- and 2-methylnaphthalene for 30- and 61-week durations (ATSDR, 2003).

Reference Dose for Chronic Oral Exposure (RfD)

Health Canada (2009) has developed a tolerable daily intake of 2.0E-02 mg/kg/day for naphthalene based on a NOAEL of 100 mg/kg/day from a sub-chronic study of rats assessing decreased mean terminal body weight in male rats. This NOAEL was adjusted for continuous exposure and an uncertainty factor of 3000 was applied. The uncertainty factor accounted for intra-species variation (10), interspecies variation (10), sub-chronic to chronic data (10), and database deficiencies (3).

US EPA has developed an RfD for naphthalene of 2.0E-02 mg/kg/day based on a rat study with naphthalene administered in corn oil via gavage (US EPA, 2011). Parameters examined in the study included: food consumption and body weight, clinical signs of toxicity, hematological parameters, necropsy and histopathological examination of 27 organs in the control and highest dose group at study termination. Decreased body weight was determined to be the most sensitive effect; a decrease in mean body weight of greater than 10% relative to the control group occurred in male rats exposed to 200 mg/kg naphthalene and this value was used for the LOAEL. The NOAEL was 100 mg/kg, which is 71.4 mg/kg/day when adjusted for exposure duration. An uncertainty factor of 3000 was applied to the NOAEL and consisted of: a factor of 10 to account for interspecies extrapolation; a factor of 10 to account for sensitive subpopulations; a factor of 10 to account for the use of a subchronic study to develop a chronic RfD; and a factor of 3 for database deficiencies including the lack of chronic oral and two-generation reproductive studies. The US EPA indicates that confidence in the RfD is low because, although the study was well designed, the database is lacking in chronic oral data and the lack of dose-response data for hemolytic anaemia, which is one of the primary potential health hazards associated with human exposure to naphthalene (US EPA, 2011). As confidence in the database is low, confidence in the RfD is also low (see PAH toxicity profile for an explanation).

Reference Concentration for Chronic Inhalation Exposure (RfC)

Health Canada (2009) has developed a tolerable concentration of 3.0E-03 mg/m3 for naphthalene.

The US EPA has developed an RfC of 0.003 mg/m3 for naphthalene based on a chronic mouse inhalation study (US EPA, 2011). Parameters examined in this study included, hematology (limited number of animals only), biomicroscopy and ophthalmoscopic examinations (limited number of animals at six month intervals) and gross necropsies and histopathological examinations on all animals remaining at study termination. The US EPA (2011) concluded that the observed naphthalene-related effects were caused by reactive oxygenated metabolites formed following absorption of naphthalene rather than direct contact with naphthalene, based on the low water solubility and reactivity of naphthalene. Following US EPA guidance (US EPA, 2011) for category 3 gases, an RfC was derived by adjusting experimental exposure concentrations for a continuous exposure duration and then converted this dosed to a human equivalent concentration (HEC) by multiplying the experimental concentration adjusted for continuous exposure by the ratio of the mouse-to-human blood/gas partition coefficients. As blood/gas partition coefficients are not available for naphthalene, a default of one was utilized. A NOAEL could not be derived from the study detailed above and a LOAEL (HEC) of 9.3 mg/m3 was selected based on nasal effects in mice. An uncertainty factor of 3000 was applied to the LOAEL consisting of: a factor of 10 to account for interspecies extrapolation; a factor of 10 to account for sensitive subpopulations; a factor of 10 to extrapolate from a LOAEL to a NOAEL; and a factor of 3 for database deficiencies including the lack of chronic oral and two-generation reproductive studies. The US EPA indicates confidence in the RfC is low to medium; although adequate numbers of mice were used and increased severity in nasal effects was noted with increased exposure, the principle study demonstrated high mortality in the male control group due to fighting and did not measure hematological parameters after 14 days (US EPA, 2011). The database is lacking in chronic or subchronic inhalation studies in other animals and because there are no reproductive or developmental studies for inhalation exposure. Overall confidence in the RfC is low to medium.

Carcinogenic Effects

Health Canada (1996) has not assessed the carcinogenicity of naphthalene.

The US EPA has classified naphthalene as Class C – possible human carcinogen due to inadequate human data via oral or inhalation exposure routes and limited evidence of carcinogenicity in animals. The available human data are inadequate to identify a causal relationship between naphthalene and cancer in humans. The incidence of benign respiratory tumors and one case of carcinoma in female mice provide limited, suggestive evidence that naphthalene may cause cancer. The mechanism by which the respiratory tumors are produced is not known, however, may involve the production of oxygenated reactive metabolites by the cytochrome P-450 system (US EPA, 2006). Naphthalene has generally produces negative results in genotoxic tests. Quantitative estimates of slope factors or unit risk values are not available at this time.

Carcinogenic Risk from Oral Exposure

An oral slope factor for naphthalene is not available (Health Canada, 2009 and US EPA, 2011).

Carcinogenic Risk from Inhalation Exposure

An inhalation slope factor for naphthalene is not available (Health Canada, 2009 and US EPA, 2011).

Summary

Tolerable Daily Intake	2.0E-02 mg/kg/day	Health Canada, 2009	
Oral chronic RfD	2.0E-02 mg/kg/day	weight loss	US EPA, 2011
Inhalation RfC	3.0E-03 mg/m3	nasal effects	US EPA, 2011
Oral Slope Factor	not available	Health Canada, 2009; US EPA, 2011	
Inhalation Slope Factor	not available	Health Canada, 2009; US EPA, 2011	

References

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Health Canada. 1996. Health-Based Tolerable Daily Intakes/Concentrations and Tumorigenic Doses/Concentrations for Priority Substances. Environmental Health Directorate, Health Protection Branch. Minister of Supply and Services Canada. 96-EHD-194.

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United States Environmental Protection Agency (US EPA). 2002. Health Effects Support Document for Naphthalene. External Review Draft. Prepared by Sciences International, Inc. for Health and Ecological Criteria Division, Office of Water. EPA 822-R-02-031.

US EPA. 2011. Integrated Risk Information System (IRIS) Summary for Naphthalene.

URL: http://www.epa.gov/iris/

TRIMETHYLBENZENES (1,2,4- AND 1,3,5-TRIMETHYLBENZENE)

Pharmacokinetics

Oral, Inhalation and Dermal Exposure

Pharmacokinetic information is not available for either trimethylbenzene (TMB) isomer.

Toxicity

Non-Carcinogenic Effects

Oral, Inhalation and Dermal Exposure

General toxicity information is not available for either TMB isomer.

Tolerable Daily Intake (TDI) and Reference Dose (RfD) for Chronic Oral Exposure

Health Canada has not developed a TDI for either 1,2,4-TMB or 1,3,5-TMB (Health Canada, 1996).

The provisional RfD for 1,2,4-TMB from the EPA-NCEA is 5.0E-2 mg/kg/day, and the provisional RfD for 1,3,5-TMB is the same (US EPA Region 9, 2004). Reference doses are not currently available from the US EPA IRIS website (US EPA, 2004).

Tolerable Concentration (TC) and Reference Concentration (RfC) for Chronic Inhalation

Non-carcinogenic inhalation reference values (TCs or RfCs) for 1,2,4-TMB or 1,3,5-TMB are not available from either Health Canada or US EPA (Health Canada, 1996; US EPA, 2004). The provisional reference dose for inhalation exposure, RfDi, is 1.70E-3 for both isomers (US EPA Region 9, 2004).

Carcinogenic Effects

Carcinogenicity information for 1,2,4- and 1,3,5-TMB is not available from either Health Canada or the US EPA.

Carcinogenic Risk from Oral Exposure

Tumorigenic dose and oral slope factor values are not available for either TMB isomer.

Carcinogenic Risk from Inhalation Exposure

Tumorigenic concentration and inhalation slope factor values are not available for either TMB isomer.

Summary

1,2,4-TMB

Tolerable Daily Intake	not available	Health Canada, 1996
Oral Chronic RfDo	5.0E-2 mg/kg/day*	US EPA Region 9, 2004
Tolerable Concentration	not available	Health Canada, 1996
Inhalation RfDi	1.7E-3 mg/kg/day*	US EPA Region 9, 2004
Tumorigenic Dose	not available	Health Canada, 1996
Oral Slope Factor	not available	US EPA, 2004

Tumorigenic Conc.	not available	Health Canada, 1996
Inhalation Slope Factor	not available	US EPA, 2004

1,3,5-TMB

Tolerable Daily Intake	not available	Health Canada, 1996
Oral Chronic RfDo	5.0E-2 mg/kg/day*	US EPA Region 9, 2004
Tolerable Concentration	not available	Health Canada, 1996
Inhalation RfDi	1.7E-3 mg/kg/day*	US EPA Region 9, 2004
Tumorigenic Dose	not available	Health Canada, 1996
Oral Slope Factor	not available	US EPA, 2004
Tumorigenic Conc.	not available	Health Canada, 1996
Inhalation Slope Factor	not available	US EPA, 2004

*Note: these are provisional values

References

Health Canada. 1996. Health-Based Tolerable Daily Intakes/Concentrations and Tumorigenic Doses/Concentrations for Priority Substances. Environmental Health Directorate, Health Protection Branch. Minister of Supply and Services Canada. 96-EHD-194.

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