Phase II Environmental Site Assessment

Gilbert Plains Cardlock Facility
SW-09-025-22 W1M, near Gilbert Plains, Manitoba

Trace Project No. 400-299
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Prepared for:

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Executive Summary

Federated Co-operatives Limited, on behalf of Gilbert Plains Consumers Cooperative Limited, retained Trace Associates Inc. to perform a Phase II environmental site assessment (ESA) for the Gilbert Plains Co-op cardlock facility, located within SW-09-025-22 W1M, near Gilbert Plains, Manitoba, to investigate the potential presence and/or absence of petroleum hydrocarbon (PHC) impacts in soil and groundwater at the Site.

The Phase II ESA consisted of drilling six boreholes, advancing one borehole using a hydro-excavator, completing each borehole as a groundwater monitoring well, collecting soil and groundwater samples, submitting samples for laboratory analyses, and interpreting the data.

Guidelines were established based on the requirements of the Contaminated Sites Remediation Act (CSRA) and the Contaminated Sites Remediation Regulation of the Province of Manitoba, and the Manitoba Sustainable Development (MSD) document: ESAs in Manitoba.

A summary of the Phase II ESA findings is presented below.

Soil

- The Site's surface was predominantly covered with sand and gravel fill. Topsoil was mixed with the sand and gravel fill at two of the borehole locations.
- Field-screening results for volatile organic vapour concentrations ranged from 0.5 to 223 parts per million (ppm). The volatile organic vapour concentration of 223 ppm was observed in the soil sample collected from a depth of 2.0 metres below ground surface (mbgs) to 2.5 mbgs at monitoring well 19MW03.
- Both coarse and fine-grained soil were observed at the Site; however coarse-grained soil was considered to be the soil type that could potentially govern contaminant migration at the Site.
- PHC impacts above guidelines were detected at two assessment locations: monitoring well 19MW03, located between the above-ground storage tank (AST) compound and the cardlock pump islands; and surface soil sample SS-1, located south of the AST compound. The impacts at monitoring well 19MW03 were observed at depths generally consist with the subsurface sand and gravel zone.
- PHC concentrations in the soil samples collected from the remaining assessment locations were below the applicable regulatory guidelines.

Vertical delineation of PHC impacts in soil was not achieved at SS-1 and monitoring well 19MW03 but was achieved at all other assessment locations at the Site. Horizontal delineation of PHC impacts in subsurface soil was achieved in all directions at the Site.

Groundwater

- Concentrations of benzene, toluene, and PHC fractions F1 and F2 in the groundwater sample collected from monitoring well 19MW03 exceeded the applicable regulatory guidelines.
- Concentrations of PHCs at the remaining assessment locations were below the applicable regulatory guidelines and were generally below laboratory detection limits.
- Concentrations of general water quality parameter nitrite as nitrogen were above the applicable regulatory guideline in one groundwater sample collected at the Site.
- Dissolved zinc concentrations were greater than the applicable regulatory guideline in one groundwater sample collected at the Site.

- Concentrations of various total metals parameters including aluminum, cadmium, iron, and zinc that exceeded applicable guidelines were identified in groundwater samples collected from the Site.
- Hydraulic conductivity measured at monitoring well 19MW01, screened from 3.1 to 6.1 mbgs, was 5.2 x 10^{-7} metres per second (m/s). Hydraulic conductivity measured at monitoring well 17MW06, screened from 8.1 to 9.1 mbgs, was 2.0 x 10^{-8} m/s.
- Based on the groundwater data collected in July 2019, the interpreted lateral groundwater flow direction within the subsurface sand and gravel zone at the Site was towards the east-northeast, at an approximate gradient of 0.01 metres per metre.
- The estimated linear velocity of the shallow groundwater at the Site, with consideration to advection only, was estimated at 1.6 metres per year.

Horizontal delineation of PHC impacts in groundwater was achieved in all directions at the Site.

Concentrations of various parameters that were above the reporting standards were observed in soil and groundwater samples at the Site. As such, these parameters must be reported to MSD under the provisions of the CSRA.

The results of the National Classification System for Contaminated Sites scoresheet indicate the Site is considered a medium priority for action.

Table of Contents

FIGURES

TABLES

APPENDICES

1.0 Introduction

Federated Co-operatives Limited (FCL), on behalf of Gilbert Plains Consumers Cooperative Limited (Gilbert Plains Co-op) retained Trace Associates Inc. (Trace) to perform this Phase II environmental site assessment (ESA) for the Gilbert Plains Co-op cardlock facility. located within SW-09-025-22 W1M, near Gilbert Plains, Manitoba, hereinafter referred to as "the Site."

1.1 Authorization and General Conditions

Trace received authorization from Mr. Sean Cruz, Environmental Advisor with FCL, to proceed with the project. Trace personnel conducted this Phase II ESA in general accordance with CSA Group CAN/CSA-Z769-00 (R2018): Phase II ESA (CSA, 2000), Trace's Standard Operating Procedure (SOP) No. 2000 Phase II ESA, and Trace's Environmental Report – General Conditions, attached as Appendix A.

This report was prepared for the exclusive use of FCL and their approved agents, for the specific application described in Section 1.0 of this report. The conclusions presented herein are based on the scope of work as described in Section 1.3. This report was prepared in accordance with generally accepted environmental consulting practices. No other warranty is made, either expressed or implied.

1.2 Objective

The objective of the Phase II ESA was to investigate the potential presence and/or absence of petroleum hydrocarbon (PHC) impacts in soil and groundwater at the Site.

1.3 Scope of Work

The following work was conducted to meet the objective of the Phase II ESA:

- Completed a safety file, obtained the necessary access agreements from the Site Operator and FCL, and informed all applicable stakeholders of activities.
- Conducted a desktop water well survey of the Site and surrounding area prior to visiting the Site.
- Confirmed the surrounding land use in the area.
- Reviewed available historical information for the Site and surrounding area that was on file with the Town of Gilbert Plains.
- Reviewed historical spill and hazardous materials storage database information.
- Conducted a historical aerial photograph review of the Site and adjacent properties.
- Reviewed readily available soil, geology, hydrogeology, and physiography information to develop and confirm the sampling plan.
- Finalized the borehole placement strategy upon review and approval by FCL.
- Coordinated the Manitoba Click Before You Dig notification and ensured that proximity agreements and/or access agreements were obtained.
- Coordinated above-ground and underground utility locates including a four-way sweep, and performed a review of ground disturbance documentation for the proposed work area and a surrounding 30 metre (m) buffer zone.
- Confirmed areas with surficial staining and modified the drilling plan to meet assessment goals, where required.

- Conducted the Phase II ESA, which consisted of the following:
  - Drilled five boreholes to depths of approximately 6.0 metres below ground surface (mbgs) and one borehole to a depth of approximately 9.0 mbgs using a track-mounted direct push drill rig. The general borehole placement strategy included:
    - Three boreholes in the area of the above-ground storage tanks (ASTs) including monitoring wells 19MW01, 19MW02, and 19MW03.
    - Two boreholes in the area of the cardlock pump island including monitoring wells 19MW04 and 19MW05.
    - One suspected upgradient or side-gradient monitoring well (identified as monitoring well 19MW06) to assess the applicability of the potable groundwater pathway.
  - Recovered soil samples at depth intervals of 0 to 0.5 metres (m), 0.5 to 1.0 m, 1.0 to 1.5 m, and at 0.5 m intervals in the boreholes thereafter.
  - At least two soil samples from each borehole were selected for laboratory analysis: one sample that represented the highest soil vapour concentrations and/or demonstrated characteristics representative of potential impacts (i.e. coarse-grained material), and one soil sample collected from below the suspected impacted zone. The samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene, xylenes (BTEX), and PHC fractions F1(C_6-C_{10}), F2(C_{10}-C_{16}), F3(C_{16}-C_{34}), and F4(C_{34}-C_{50}).
  - Submitted three samples from the Site for particle grain size analysis.
  - One blind field duplicate soil sample was submitted for analysis as part of the quality assurance / quality control (QA/QC) process.
  - The six boreholes were completed as monitoring wells as per Trace SOP P2004 – Installing Groundwater Monitoring Wells.
  - A seventh monitoring well (19MW07) was installed within a borehole that was advanced using a hydro-excavator. This well was located east of the cardlock pump island. This method was selected because of the proximity to buried cables, above-ground cables, and the property boundary in this portion of the Site.
  - One soil sample was collected from the vicinity of monitoring well 19MW07 using a hand auger and submitted for laboratory analysis of BTEX and PHC fractions F1 to F4.
  - One surface soil sample was collected from an area of apparent soil staining submitted for laboratory analysis.
  - One sample of granular fill material, that was imported to the Site, was collected and submitted for laboratory analysis.
- A groundwater monitoring event that utilized the seven newly installed groundwater monitoring wells was performed following Trace SOP P6001 – Groundwater Monitoring and Sampling, and consisted of the following activities:
  - Measured monitoring well standpipe volatile organic vapour concentrations.
  - Assessed for the presence of light non-aqueous phase liquids (LNAPLs).
  - Determined groundwater elevations in the groundwater monitoring wells.
  - Measured dissolved oxygen (DO), oxidation/reduction potential (ORP), electrical conductivity (EC), pH, temperature, and total dissolved solids (TDS) in all groundwater monitoring wells.
  - Collected groundwater samples from each of the seven groundwater monitoring wells for laboratory analysis of BTEX and PHC fractions F1 and F2.
  - Groundwater samples collected from three monitoring wells were also analyzed for routine chemistry parameters, total and dissolved metals, and total organic carbon (TOC), as per the FCL Nutrient package.

- One blind field duplicate groundwater sample was submitted for analysis of BTEX and PHC fractions F1 and F2 as part of the QA/QC process.
- Conducted hydraulic conductivity tests at two groundwater monitoring wells.

- Prepared a report summarizing the results of the field and laboratory analyses, as well as any relevant conclusions and recommendations, including a completed copy of the Canadian Council of Ministers of the Environment (CCME) National Classification System for Contaminated Sites (NCSCS) scoresheet for the Site (CCME, 2008a).

Modifications to the scope of work were required as follows:

- Monitoring well 19MW07 was installed using a hydro-excavator due to the proximity of buried and above-ground utilities at the property boundary.
- One soil sample for laboratory analysis was collected from the vicinity of monitoring well 19MW07 using a hand auger.
- One surface soil sample was collected for laboratory analysis.
- One sample of clean fill material that was imported to the Site was collected for laboratory analysis.

1.4 Qualifications of the Assessors

Mr. Adam Gabriel, B.A.Sc., E.I.T., conducted the groundwater monitoring and sampling program, including hydraulic conductivity testing. Mr. Gabriel is an Environmental Engineer-in-Training with Trace, and has approximately six years of environmental assessment, monitoring, and remediation experience in the industrial, commercial, and oil and gas sectors. He has been involved in various environmental programs including ESAs, soil and groundwater monitoring and sampling programs, remedial excavations, and in-situ remediation projects.

Mr. Ardis Oleksyn, B.A.I.E.M., C.E.T., conducted the borehole drilling and monitoring well installation program, and was responsible for data analysis and report preparation. Mr. Oleksyn is a Senior Project Manager with Trace and has over 19 years of environmental assessment, monitoring, and remediation experience across all market sectors in the consulting engineering field, and has managed, developed, and implemented a wide variety of environmental projects, with a focus on ESAs and site characterization, monitoring and sampling, and contaminated site management and remediation

Mr. Jon Gudmundsson, B.A.I.E.M., C.E.T., was responsible for project management and coordination. Mr. Gudmundsson is a Senior Environmental Scientist and a Partner with Trace, and has over 19 years of environmental assessment, monitoring, and remediation experience in the oil and gas sector. Mr. Gudmundsson has been involved in various ESAs, groundwater and air monitoring programs, remedial excavations, and reclamation activities.

Mr. Michael Lakustiak, B.A.Sc., P.Eng., provided a senior technical review. Mr. Lakustiak is a Senior Environmental Engineer and a Partner with Trace, and has over 22 years of experience in environmental consulting in Western Canada. Michael has been involved in various environmental programs including Phase I, II, and III ESAs, groundwater and air monitoring, remedial excavations, and in-situ remediation including enhanced attenuation through biostimulation with electron acceptors.

1.5 Desktop Review

A desktop review was conducted prior to completing the Phase II ESA drilling program. Supporting documentation is included in Appendix B.

The following information was identified during the review:

- Client file information: One letter report summarizing a surface soil sampling program that was conducted in 2018 in association with decommissioning of a series of ASTs was provided (Wood, 2018).
- Water well search: Five water wells listed as being for domestic or livestock usage were identified as potentially located within 500 m of the Site. Additional details are presented in Section 1.6.2.
- Contaminated sites search: The Government of Canada Federal Contaminated Sites Inventory (www.tbs-sct.gc.ca/fcsi-rscf/home-accueil-eng.aspx) and the Government of Manitoba Contaminated and Impacted Sites Lists (https://www.gov.mb.ca/sd/waste_management/contaminated_sites/index.html) did not identify any contaminated or impacted sites associated with the Site.
- Petroleum Storage Permits Search: The Government of Manitoba's Valid Petroleum Storage Permits list, as of October 7, 2019 (https://www.gov.mb.ca/sd/pubs/envir_bio/valid_permit_list.pdf), identified the Gilbert Plains Consumers Co-operative as permit holder 43414 for ASTs.

1.5.1 Interviews

Trace personnel interviewed representatives from the Town of Gilbert Plains and FCL. The interviews were conducted to obtain information regarding current and past activities and events that may have affected the environmental conditions at the Site, as well as sensitive receptor information.

The findings of the third-party interviews, which have been incorporated into this report, are in general agreement with the records reviewed and site observations.

1.6 Site Description

The following sections provide background information for the Site.

1.6.1 Site Information

The Site is located within SW-09-025-22 W1M, at the western extent of the unincorporated urban community of Gilbert Plains, Manitoba. The Site is situated on the south side of Highway 5, approximately 850 m west of the junction of Highway 5 and Highway 274. The Site is comprised of an irregularly shaped lot roughly 1.25 hectares in area. The Site is zoned as commercial; however, the adjacent property to the east is zoned as residential. The Site is also bordered by Highway 5 to the north, and commercial properties to the south and west.

The surface at the Site is predominantly gravel. On-site infrastructure includes: three chemical storage buildings: a fenced compound enclosing two 75,000 litres (L) fuel ASTs, a control building, and storage space; a storage yard; three cardlock pump islands; and a satellite pump. Previously, a nest of eight 90,000 L ASTs had been present within the fenced compound. These ASTs were decommissioned in 2018.

A site location map is presented as Figure 1 and a site plan showing the infrastructure, the newly installed monitoring well locations, and surface soil sample location is presented as Figure 2. An overhead powerline is present along the Site's east boundary, and various buried cables are present beneath the Site.

1.6.2 Physiography, Geography, and Hydrogeology

The Site topography is relatively flat, with localized surface drainage directed towards the north into a ditch along Highway 5, as well as to a low area along the Site's east boundary. The nearest surface water feature to the Site appears to be a pond located approximately 220 m southeast of the Site. The Valley River is located approximately 350 m north of the Site.

Soil survey information indicates that soil materials in the region were deposited during the last glaciation and during the time of glacial Lake Agassiz. Lacustrine sediments ranging from sandy to loamy and clayey textures are dominant in the region, with stony, loam textured glacial till being most common at higher elevations in the Valley River Plain (AAFC, 2000).

Well records were obtained through the Province of Manitoba Groundwater Management Section's GW Drill Database (2018). There were five water wells listed as being for domestic or livestock use, each identified by well process identification (PID) numbers, potentially located within 500 m of the Site: 52064 (M. Sydor), 154994 (Murray S. Gara), 154976 (Tyrone Sanko), 154978 (John Zaplithny), and 193814 (Gilbert Plains Municipality). Water well records are presented in Appendix B.

Well 52064 was drilled in 1984 to approximately 26.0 feet (ft) below ground surface. The lithology was listed as brown till to a depth of 18 ft, followed by gravelly till from 18 to 19 ft, and grey till from 19 to 26 ft. The well was constructed of steel casing that was perforated from 16 to 26 ft below ground. No pump test information was available.

No drilling or well completion information is available for wells 154994, 154976, 154978, or 193814.

1.6.3 Previous Environmental Reporting

One report detailing the results of a soil sampling program conducted in association with the decommissioning of the eight 90,000-L ASTs was provided to Trace. This report was prepared by Wood Environment & Infrastructure Solutions (Wood). The report indicated that a hand auger was used to collect 10 soil samples from areas of visible surface soil staining following the decommissioning of the ASTs. These samples were screened in the field for volatile organic vapour concentrations, and elevated vapour concentrations were confirmed. Two of these samples were submitted for laboratory analysis of BTEX and PHC fractions F1 through F4. The BTEX, and PHC fractions F1 and F2 concentrations in one of these samples, collected from the AST footprint, were above the applicable CCME guidelines. Based on these observations, follow-up investigations were recommended (Wood, 2018).

2.0 Methods

2.1 Health and Safety

Trace personnel and contractors had valid safety certificates for Workplace Hazardous Materials Information System, Transportation of Dangerous Goods, and Standard First Aid. Level II Ground Disturbance training was required for the personnel directly involved in ground disturbance activities.

A safety meeting and hazard assessment were conducted each day prior to starting work activities. Fire-retardant reflective coveralls, hardhats, steel-toed boots, work gloves, and safety glasses were worn by on-site personnel. Written directions and a map to the nearest hospital were maintained on site during fieldwork activities.

2.2 Utility Locating

The utility locating activities and methods that occurred prior to completing ground disturbance activities at the Site are summarized below:

- Coordinated the Manitoba Click Before You Dig notification process.
- Reviewed historical utility information, including the current land title information.
- Coordinated an independent utility locator, Altus Group Manitoba Land Surveyors Ltd. (Altus), to identify above-ground and underground facilities including, but not limited to, pipelines, telecommunication lines, powerlines, and potential buried debris.
- Altus marked the underground utilities with spray paint, conducted a four-way sweep of the work area and 30 m buffer zone, and prepared a site facility sketch.

2.3 Soil Sampling

Soil sampling activities were conducted at the Site on June 13 and 14, and July 16, 2019. A site plan showing the monitoring well and surface soil sample locations is provided as Figure 2. The soil sampling activities were conducted using the following methods:

- Intercore Environmental Services Ltd. was coordinated to drill six boreholes to depths of 6.0 mbgs and 9.0 mbgs using a track-mounted direct-push drilling rig. Soil samples were collected as the boreholes were advanced.
- A hand auger was used to collect subsurface soil samples in the location of monitoring well 19MW07.
- Soils were described using a modified version of the Unified Soil Classification System (ASTM, 2017). Borehole logs are provided in Appendix C and include soil stratigraphy and comments related to unusual stains and/or debris.
- Discrete soil samples were collected from a sample tube advanced within the direct-push probe at stratigraphy changes or at 0.5 m intervals.
- Soil was placed in laboratory-supplied zipper locking plastic bags and screened in the field for volatile organic vapours using a PID calibrated to an isobutylene standard. The measured volatile organic vapour concentrations of each sample were recorded and are presented on the borehole logs in Appendix C.
- Three bagged soil samples were submitted for laboratory particle size analysis.
- One surface soil sample was collected from a depth of approximately 0.15 m at an area of visible surface soil staining south of the ASTs and submitted for laboratory analysis.
- One sample of granular backfill material imported to the Site was collected and submitted for laboratory analysis.
- Soil samples for laboratory analysis of volatile parameters including BTEX and PHC fraction F1 were collected using sample collection devices provided by the laboratory, and then transferred from the sampling device to the specified 40 millilitre (mL) collection vial containing 10 mL of methanol preservative.
- Soil samples collected for analysis of PHC fractions F2 to F4 were placed into laboratory-supplied 120 mL glass jars with Teflon-lined lids.
- The samples were kept in coolers with ice packs.

- Laboratory chain of custody forms, which included selected laboratory analyses, were completed in the field. Soil samples were identified for laboratory analyses based on the field-screening results and other observations.
- The soil samples were transported under chain of custody to Bureau Veritas Laboratories (BV Labs) (formerly Maxxam Analytics Inc.), in Winnipeg, Manitoba, for laboratory analysis. The analytical methods are referenced with the laboratory certificates of analysis presented in Appendix D.
- Soil cuttings were placed into a 1.0 cubic metre (m^3) soil tote bag and stored on the Site for future disposal.

2.4 Soil Laboratory Analyses

BV Labs analyzed selected soil samples for the following parameters:

- Three soil samples were analyzed for particle size by hydrometer.
- One soil sample from each borehole that represented the highest soil vapour concentrations and/or demonstrated characteristics representative of potential impacts (i.e. coarse-grained material) was submitted for analysis of BTEX, and PHC fractions F1 through F4.
- One additional soil sample from each of the six drilled boreholes was submitted for analysis of BTEX, and PHC fractions F1 through F4 to establish vertical delineation of any potential impacts.
- One surface soil sample and one sample of imported fill material were submitted for analysis of BTEX, and PHC fractions F1 through F4.
- One soil sample was submitted for duplicate analysis as part of the QA/QC process.

The regulatory guideline comparison is presented in Table 1A. The soil analytical results are presented in Table 1B and illustrated on Figure 3.

2.5 Monitoring Well Construction

Groundwater monitoring wells were installed within the seven boreholes advanced at the Site (six drilled, one advanced using a hydro-excavator) on June 13 and 14, 2019. The construction details for the groundwater monitoring wells are provided on the borehole logs in Appendix C and summarized in Table 2. The following is a summary of the methods and materials used to construct the monitoring wells:

- Installed 0.254 millimetre (mm) (10 slot) machine slotted 51 mm diameter schedule 40 polyvinyl chloride (PVC) well screen within the borehole annulus.
- The well screens were positioned to intersect PHC impacts, the observed/suspected groundwater table, and/or confining layers in potential aquitards. Trace personnel positioned solid schedule 40 PVC pipe from the ground surface to approximately the top of the well screen. Silica sand was placed within the borehole annulus adjacent to the well screen and to approximately 30 centimetres (cm) above the well screen. Well screened intervals are included in Table 2.
- Bentonite chips were placed above the silica sand to seal the borehole annulus and to minimize the potential for surface water infiltration into the monitoring wells.
- In the case of the well installed within the hydro-excavated borehole (19BH07), sand material that sloughed into the borehole from the subsurface formation surrounded the bottom 30 cm of the well screen. Silica sand was placed adjacent to the remainder of the well screen and to approximately 30 cm above the screen. A 30 cm thick layer of bentonite was placed above the silica sand and hydrated. The remainder of the borehole was then backfilled with imported clean sand and gravel at the surface.
- The groundwater monitoring wells were completed with flush-mounted steel protective casings.

- The groundwater monitoring wells were developed by removing a minimum of three well volumes of water, or until dry, during purging to establish an effective hydraulic connection with the adjacent soil formation.

2.6 Groundwater Monitoring and Sampling

Trace personnel conducted the groundwater monitoring and sampling activities on July 11 and 16, 2019, using the following methods:

- Monitoring well standpipe volatile organic vapour concentrations were monitored using a PID calibrated to an isobutylene standard.
- Each monitoring well was monitored for presence and thickness of LNAPLs, depth to water, and general groundwater chemistry parameters including DO, EC, ORP, temperature, pH, and TDS.
- Monitoring equipment was cleaned with Liquinox® between each monitoring point to avoid potential cross contamination between monitoring well locations.
- The wells were purged of a minimum three well volumes, or until dry, with a certified clean dedicated bailer on July 11, 2019.
- Groundwater samples were collected on July 16, 2019, using the same dedicated bailer and twine.
- Groundwater samples were placed into clean glass sample bottles provided by the laboratory. Where required, laboratory-supplied preservative was placed in the appropriate samples. Minimal headspace was maintained for samples collected for potential organic analysis.
- Sample bottles were placed in a cooler with ice packs and delivered under chain of custody to BV Labs. The analytical methods are referenced with the laboratory certificates of analysis presented in Appendix D.

2.7 Hydrogeological Characteristics

Trace personnel conducted single well response tests on two of the groundwater monitoring wells to determine the hydraulic conductivity of the subsurface formation. The hydraulic conductivity values were determined using the Hvorslev method (Hvorslev, 1951). The results of the hydraulic conductivity calculations are presented in Appendix E and in Table 2.

2.8 Groundwater Laboratory Analyses

BV Labs analyzed the groundwater samples for the following parameters:

- PHC parameters, including BTEX, and PHC fractions F1 and F2 (seven samples and one duplicate)
- Routine potability (three samples)
- Dissolved metals (three samples)
- Total metals (three samples)

The groundwater analytical results are presented in Tables 3 to 6.

2.9 Site Surveying

Trace personnel collected site features and borehole / monitoring well locations using global positioning system (GPS) coordinates referenced to the North American Datum of 1983 (NAD83), Universal Transverse Mercator (UTM) Projection Zone 14 system. Groundwater monitoring wells were surveyed to an arbitrary on-site benchmark with an assigned elevation of 100 metres above datum (mAD). Monitoring well PVC top-of-pipe and ground elevations were measured with reference to the benchmark.

2.10 Sampling Quality Assurance / Quality Control

Trace personnel implemented the following methods/tasks as a part of the QA/QC program for sampling:

- Clean and calibrated sampling equipment was used.
- Disposable nitrile gloves were worn while handling samples.
- Laboratory-supplied sample containers were used.
- One field duplicate soil sample and one field duplicate groundwater sample were collected and submitted for laboratory analysis.
- Chain of custody forms were completed in the field and the samples were delivered directly to the laboratory.

3.0 Governing Regulatory Guidelines

The Manitoba Sustainable Development (MSD) guideline document ESAs in Manitoba (MSD, 2016a) outlines comparative guidelines to be used when assessing sites in Manitoba. The primary guidelines to be followed are the CCME Canadian Environmental Quality Guidelines (CCME, 1999), the CCME Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil (CCME, 2008b), and the Health Canada Guidelines for Drinking Water Quality (Health Canada, 2012). The MSD Information Bulletin: Assessment Criteria for Groundwater (MSD, 2016b) indicates that "where the CCME and the Health Canada documents do not provide guidance for the risk to a receptor via a particular pathway present at the site, or for a particular COC, the Federal Contaminated Sites Action Plan (FCSAP) Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites (GOC, 2013) may be referenced". Where CCME, Health Canada, or FCSAP guidelines do not exist for a specific parameter, the secondary guidelines to be followed are the Ontario Ministry of the Environment Soil, Ground Water and Sediment Standards (OMOE, 2011).

CCME guidelines are developed using a tiered approach as follows:

- Tier 1 Endpoints: Most Conservative Values Based on Land Use and Basic Site Characteristics
- Tier 2 Endpoints: Pathway-Specific Values Based on Site Conditions and Exposure Pathway Elimination
- Tier 3 Endpoints: Site-Specific Risk Assessment / Guideline Development

Tier 2 Endpoints are considered applicable for soil and groundwater guidelines at a site after an evaluation of site information and a review of exposure pathways.

The Saskatchewan Environmental Code Endpoint Selection Standard (GOS, 2016) was developed to set the manner in which the appropriate endpoints may be selected for environmentally impacted sites in Saskatchewan. Elimination of exposure pathways in the standard typically deal with PHCs and BTEX; however, the standard may be used as guidance when eliminating exposure pathways for other substances of potential concern (SOPC) (GOS, 2016). Discussion with MSD confirmed that the rational presented in the Endpoint Selection Standard (GOS, 2016) is consistent with what is required to evaluate exposure pathways in Manitoba. As such, this document was used to determine the applicable Tier 2 endpoints for the Site based on existing site conditions. Factors in selecting Tier 2 Endpoints are discussed in further detail in the following subsequent sections.

3.1 Land Use Assessment

The CCME recognizes four different land use classes for application of soil and groundwater guidelines. These include agricultural, residential/parkland, commercial, and industrial land use. When a site is situated within 30 m of an adjacent property where a more stringent land use remediation criterion applies, the more stringent criteria must be applied. This may result in more than one remediation criteria applied to a site. The Site is considered a commercial property with residential land adjacent to the Site's east boundary; therefore, the most stringent criteria between commercial and residential/parkland applies to the Site. The guideline buffers are illustrated on Figures 2 through 5.

3.2 Determination of Soil Type

The CCME specify criteria for surface soils and subsurface soils. Surface soils are defined as soil samples collected from depths less than or equal to 1.5 mbgs, and subsurface soils are defined as soil samples collected from depths greater than 1.5 mbgs. Surface and subsurface soil criteria are applicable based on the depths of the soil samples collected and submitted for analysis.

Guideline selection is categorized for two soil types, coarse grained and fine grained, which is applicable to the soil type that governs contaminant migration. The CCME defines coarse-grained soil as soils which contain greater than (>) 50% by mass particles greater than 75 micrometres (µm) mean diameter (D_{50} > 75 µm), while fine-grained soil types are defined as soils which contain > 50% mass particles less than (<) 75 µm mean diameter (D_{50} < 75 µm).

Grain size determination at the Site was established based on the submission of soil samples to the laboratory for particle size analysis, along with field observations made at the time of the assessment. Laboratory analytical results from monitoring well locations 19MW05 at 4.0 to 4.5 mbgs and 19MW06 at 7.5 to 8.0 mbgs confirmed that 74% and 92%, respectively, of the samples consisted of particle sizes less than 75 µm in diameter, signifying fine-grained soil. Analysis of the soil sample from 19MW06 at 1.5 to 2.0 mbgs indicated that 95% of the sample particle sizes were > 75 µm in diameter, signifying coarse-grained soil at this depth. These results are consistent with the field observations of soils consisting generally of silt and clay, with a sand zone present in most boreholes at depths of approximately 1.2 to 2.4 mbgs.

Both coarse and fine-grained soil were observed at the Site; however, coarse-grained soil was considered to be the soil type that could potentially govern contaminant migration at the Site. As such, coarse-grained soils are applied for the Tier 2 Endpoints. A summary of the particle size results is presented in Table 1B.

3.3 Exposure Pathway Assessment

3.3.1 Soil Ingestion and Dermal Contact

The Endpoint Selection Standard (GOS, 2016) indicates the Soil Ingestion pathway may be eliminated if:

(a) The SOPCs are PHCs or BTEX compounds and no other SOPCs are present at the site and;
(b) The SOPCs are more than 1.5 mbgs; and
(c) One or more of the following are met:
    i. Physical controls are present at the site;
    ii. Engineering controls are present at the site;

iii. Appropriate administrative controls are established to reduce the risk of soil ingestion.

The Endpoint Selection Standard (GOS, 2016) indicates the Dermal Contact pathway may be eliminated if:

(a) The SOPCs are PHCs or BTEX compounds and no other SOPCs are present at the site and;
(b) The SOPCs are more than 1.5 mbgs; and
(c) One or more of the following are met:
    i. Physical controls are present at the site;
    ii. Engineering controls are present at the site;
    iii. Appropriate administrative controls are established to reduce the risk of dermal contact.

The Soil Ingestion and Dermal Contact pathways are considered applicable as surface soil staining was observed at the Site.

3.3.2 Indoor Vapour Inhalation

The Endpoint Selection Standard (GOS, 2016) indicates the Vapour Inhalation pathway may be eliminated if:

(a) The SOPCs are PHCs or BTEX compounds and no other SOPCs are present at the site; and
(b) There are no occupied buildings within 30 m of the site; and
(c) One or more of the following are met:
    i. Physical controls are present at the site;
    ii. Engineering controls are present at the site;
    iii. Appropriate administrative controls are established to reduce the risk of vapour inhalation.

The indoor Vapour Inhalation pathway is considered applicable to the Site as a church is present within 30 m of the Site's east boundary, and limited physical or engineered controls are in place to reduce the risk of migration of vapours.

3.3.3 Potable Groundwater

As a guide in Saskatchewan, water-bearing units with a hydraulic conductivity of less than 10^{-6} metres per second (m/s) are unlikely to be considered an aquifer for domestic water supplies; however, there are situations where low hydraulic conductivity units may be the only groundwater resource available, so the local water well records must also be checked during the assessment.

The Endpoint Selection Standard (GOS, 2016) indicates the Potable Groundwater pathway may be excluded if:

(a) The SOPCs are PHCs or BTEX compounds and no other SOPCs are present at the site; and
(b) One or more of the following are met:
    i. Sufficient physical controls exist to prevent the SOPC from reaching the aquifer. Physical controls are defined within the document as:
        1. Isolation of the aquifer by geologic unit that will ensure that natural attenuation will reduce the concentration of the SOPCs below the Tier 2 values of the Saskatchewan Environmental Quality Guidelines (SKEQG).
        2. Hydrodynamic containment of the SOPCs in a geologic unit such they will not contaminate an aquifer.

ii. The groundwater present at the site does not provide sufficient yield or quality to be used as a potable supply, and there are no persons withdrawing water for consumption within 500 m of the site. A potable water aquifer as defined within the document as a hydro stratigraphic unit that:
    1. Has a bulk hydraulic conductivity of 1×10^{-6} m/s or greater.
    2. Has sufficient thickness to support a sustained yield of 0.76 litre per minute (1.2667×10^{-5} cubic metres per second) or greater for a minimum of 20 years.
    3. Does not contain chemical constituents that make the water unsafe for human consumption or contain constituents that render the water undesirable aesthetically if those constituents cannot be removed.

iii. The SOPCs will be attenuated such that the concentrations will be below the applicable environmental criteria before the SOPCs reach the aquifer.

After completing hydraulic conductivity testing on one well installed to a depth of 6.1 mbgs (19MW01) and one well installed to a depth of 9.0 mbgs (19MW06), the conductivities were determined to be 5.2×10^{-7} m/s and 2.0×10^{-8} m/s, respectively. This indicates that both the shallow and deeper aquifer have hydraulic conductivities of less than 1×10^{-6} m/s which does not meet the definition of a potable water aquifer, as noted above. Potential underlying potable aquifers are isolated by greater than 6 m of clay that will support natural attenuation to reduce the concentration of the SOPCs based on the hydraulic conductivity results. As such, the Potable Groundwater pathway is not considered to be applicable at the Site.

3.3.4 Ecological Soil Contact

The Endpoint Selection Standard (GOS, 2016) indicates the Ecological Soil Contact pathway may be excluded if:

(a) The SOPCs are PHCs or BTEX compounds and no other SOPCs are present at the site; and
    i. The SOPCs are more than 3.0 mbgs; or
    ii. The SOPCs are between 1.5 and 3.0 mbgs and all of the following are met:
        A. Sufficient engineering controls are present at the site to prevent receptor exposure and there is no productive use for the soil at the impacted site;
        B. Appropriate administrative controls are established to address exposure to the contaminated soils.

The Ecological Soil Contact pathway is considered applicable to the surface soils at the Site as SOPCs are present in soil and groundwater less than 1.5 mbgs. Ecological Soil Contact can be eliminated for subsoils located greater than 3.0 mbgs.

3.3.5 Soil Ingestion by Livestock/Wildlife

The Endpoint Selection Standard (GOS, 2016) indicates the Soil Ingestion by Livestock/Wildlife pathway may be excluded if:

(a) The SOPCs are PHCs or BTEX compounds and no other SOPCs are present at the site; and
(b) The SOPCs are more than 1.5 mbgs; and
(c) Appropriate administrative controls are established to reduce the risk of soil ingestion; and
(d) One or more of the following are met:

i. Physical controls are present at the site;
ii. Engineering controls are present at the site.

The Soil Ingestion by Livestock/Wildlife pathway is considered applicable to the Site as surface soil staining was observed at the Site.

3.3.6 Groundwater for Freshwater Aquatic Life, Irrigation, Livestock, and Wildlife Watering

Per the Endpoint Selection Standard (GOS, 2016), the Freshwater Aquatic Life (FAL), Irrigation, Livestock, and Wildlife Watering exposure pathway may be excluded if:

(a) The SOPCs are PHCs or BTEX compounds and no other SOPCs are present at the site; and
   i. There are no permanent waterbodies that sustain aquatic life within 500 m of the site; or
   ii. One or more of the following are met:
      A. There are sufficient physical controls to prevent SOPCs reaching the permanent waterbody;
      B. Natural attenuation of the SOPCs will reduce the concentrations to below applicable environmental standards before the SOPCs reach the waterbody;
      C. It can be established there is no hydrologic connection between contaminated media and the waterbody;
      D. Engineering controls with sufficient administrative controls are present to prevent receptor exposure.

The nearest surface waterbody is a pond located approximately 220 m southeast of the Site. Given the distance to the nearest waterbody (less than 500 m), the FAL, Irrigation, Livestock, and Wildlife Watering Exposure Pathway is considered applicable to the Site.

3.4 Reporting Standards

The Contaminated Sites Remediation Act (CSRA) requires that the owner or occupier of a site must notify the Director when he or she becomes aware of information indicating that the site has been contaminated at a level that exceeds an applicable standard (GOM, 1997a). The applicable standards are listed in the Contaminated Sites Remediation Regulation (CSRR) (GOM, 1997b), and include the following:

- Primary Standards: the CCME Canadian Environmental Quality Guidelines (CCME, 1999), the CCME Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil (CCME, 2008b), and the Health Canada Guidelines for Drinking Water Quality (Health Canada, 2012).
- Secondary Standard: the Ontario Ministry of the Environment Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act (MOECC, 2011).
- Tertiary Standard: the Government of Alberta Tier 1 Soil and Groundwater Remediation Guidelines (AEP, 2010).

The stated purpose of the reporting standards is to determine if the ESA report must be forwarded to MSD to satisfy the reporting requirements of the CSRA. This differs from the purpose of assessment criteria, which is to determine the significance of contamination discovered by an ESA and what future action is recommended for the site (MSD, 2015).

3.5 Applicable Regulatory Guidelines

In order to satisfy the requirements of the CSRA, as well as the recommendations within the MSD Environmental Site Assessments in Manitoba (MSD, 2016a) document, the laboratory results were compared to the most stringent of the applicable regulatory criteria following MSD guidelines. The following is a summary of the exposure pathways evaluation for the Site as summarized in the regulatory guideline comparison tables:

- The exposure pathways identified in the Canadian Environmental Quality Guidelines (CCME, 1999) are deemed operative, with the exception of marine receptors based on the absence of natural salt waterbodies, agricultural receptors based on the absence of surrounding agricultural land, and the potable groundwater pathway.
- The exposure pathways identified in the CCME Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil (CCME, 2008b) are deemed operative with the exception of the potable groundwater pathway.
- The exposure pathways identified in the Guidelines for Canadian Drinking Water Quality (Health Canada, 2012) are not deemed operative, as they only apply to potable water.
- The exposure pathways identified in the Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites (FCSAP, 2013) are deemed operative, with the exception of marine receptors, based on the absence of natural salt waterbodies.
- The exposure pathways identified in the Ontario Ministry of the Environment Soil, Groundwater and Sediment Standards (OMOE, 2011) are deemed operative, with the exception of Table 1: Full Depth Background Site Condition Standards, Table 6: Generic Site Condition Standards for Shallow Soils in a Potable Ground Water Condition, Table 7: Generic Site Condition Standards for Shallow Soils in a Non-Potable Ground Water Condition, Table 8: Generic Site Condition Standards for Use within 30 m of a Water Body in a Potable Groundwater Condition, and Table 9: Generic Site Condition Standards for Use within 30 m of a Water Body in a Non-Potable Groundwater Condition.

Note that, in cases where the criteria referenced in the CSRA, CSRR, or Manitoba guidance has been updated, the most recent version has been used for the purposes of this assessment. Specifically, the Health Canada Guidelines for Canadian Drinking Water Quality (Health Canada, 2019) and the Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites (FCSAP, 2016) were referenced.

The applicable regulatory guidelines are presented in Tables 1A and 1B for soil and Tables 3 to 6 for groundwater.

4.0 Results

4.1 Soil Assessment

Drilling and soil sampling activities were conducted on June 13 and 14, and July 16, 2019. The laboratory analytical results and comparative regulatory standards for soil are summarized in Tables 1A and 1B. Soil sample locations are illustrated on Figure 2.

4.1.1 Soil Conditions

The soil material encountered during the drilling program generally consisted of the following:

- Sand and gravel fill from surface up to a maximum of 1.4 mbgs.

- Topsoil was mixed with sand and gravel fill in the upper 1.2 to 1.4 m at boreholes 19MW05 and 19MW06.
- Clay with varying amounts of silt was present beneath the sand and gravel fill at depths of 0.3 to 0.6 mbgs at boreholes 19MW01 through 19MW04.
- A zone of medium-grained sand to fine gravel was observed in all boreholes from depths of approximately 1.2 to 2.4 mbgs.
- Clay and clay till were observed from beneath the sand and gravel zone to the maximum depths of investigation, ranging from 2.5 to 9.0 mbgs.

4.1.2 Soil Quality

Three boreholes (19MW01, 19MW02, and 19MW03) were advanced in the area of the ASTs. Three boreholes (19MW04, 19MW05, and 19MW07) were advanced in the area of the cardlock pump island. Borehole 19MW06 was advanced south of the ASTs to assess the applicability of the potable groundwater pathway. One surface soil sample was collected from an area of visible surface soil staining south of the AST compound. One sample of granular fill material imported to the Site was also collected.

The following is a summary of the soil sampling results for the assessment locations:

- Laboratory analysis of particle size indicated that the soils were both coarse and fine-grained.
- Field-screening results for soil vapour concentrations ranged from 0.5 to 223 parts per million (ppm).
- PHC impacts in the form of elevated volatile organic vapour concentrations and/or visual staining were identified at:
  - Borehole 19MW03, between the ASTs and the cardlock pump islands, from depths of 1.4 to 3.5 mbgs.
  - Surface soil sample SS1.
- Concentrations of PHC parameters exceeded the applicable regulatory guideline at borehole 19MW03 at a depth of 2.0 to 2.5 mbgs, with concentrations of 0.60 milligrams per kilogram (mg/kg) for benzene and 0.52 mg/kg for toluene.
- The benzene concentration of 0.057 mg/kg, identified in soil sample 19MW03 at a depth of 3.5 to 4.0 mbgs, exceeded the applicable regulatory guideline; however, all other PHC parameters were at concentrations below detection limits in this sample.
- Concentrations of all other BTEX and PHC fraction parameters in the soil samples collected at borehole 19MW03 were below the applicable regulatory guidelines.
- No detectable concentrations of BTEX or PHC fractions F1 to F4 parameters were identified in the soil samples analyzed from all remaining borehole locations, including boreholes 19MW01, 19MW02, 19MW04, 19MW05, 19MW06, and 19MW07.
- The PHC fraction F2 (430 mg/kg), F3 (21,000 mg/kg), and F4 (4,900 mg/kg) concentrations in surface soil sample SS-1 were above the applicable regulatory guidelines.
- No detectable concentrations of the BTEX or PHC fractions parameters were identified in the sample of fill material imported to the Site.

Vertical delineation was not achieved in the immediate vicinity of borehole 19MW03 as the benzene concentration in the deepest sample from this location, upon which laboratory analyses were performed, was above the applicable criteria. Vertical delineation was achieved at all other borehole locations as no detectable concentrations of BTEX or PHC fractions parameters were identified in the soil samples collected from these boreholes.

Horizontal delineation of subsurface impacts was achieved at the Site as concentrations of parameters that exceeded the applicable regulatory guideline at borehole 19MW03 were below the laboratory's minimum detection limits at all other borehole locations.

Surface soil concentrations that were above the applicable guidelines were confirmed at surface soil sample location SS-1 but were not delineated vertically or horizontally.

The benzene and toluene concentrations in sample 19MW03 (2.0 to 2.5 m), the benzene concentration in sample 19MW03 (3.5 to 4.0 m), and the PHC fraction F2, F3, and F4 concentrations in surface soil sample SS-1 were above the reporting standards referenced by the CSRA.

Borehole logs including the field-screening volatile organic vapour concentration results are presented in Appendix C. Laboratory analytical soil results are summarized in Table 1B, and PHC guideline exceedances are illustrated on Figure 3. The laboratory certificates of analysis are presented in Appendix D.

4.2 Site Survey

Monitoring well locations were surveyed using GPS coordinates referenced to the NAD83, UTM Projection Zone 14 system. Groundwater monitoring wells were surveyed to a temporary benchmark on the south bolt of a fire hydrant located at the northeast corner of the Site, which was set as the benchmark and assigned an elevation of 100 mAD. Monitoring well PVC top of pipe and ground elevations were measured with reference to the benchmark. Coordinates are presented on the borehole logs in Appendix C.

4.3 Groundwater Assessment

Newly installed groundwater monitoring wells 19MW01 to 19MW07 were monitored and purged on July 11, 2019 and monitored and sampled on July 16, 2019. The groundwater monitoring and sampling results are presented in Tables 2 through 6 and illustrated on Figures 4 and 5.

4.3.1 Groundwater Monitoring

The groundwater monitoring data collected at the Site is summarized as follows:

- The measured depth to groundwater in the wells screened to include the subsurface sand and gravel zone ranged from 1.51 mbgs in monitoring well 19MW05 to 1.75 mbgs at monitoring well 19MW07.
- Depth to water at groundwater monitoring well 19MW06, screened from approximately 8.1 to 9.1 mbgs, was 2.29 mbgs.
- Groundwater elevations measured in the wells screened to include the subsurface sand and gravel zone on July 16, 2019, ranged from 97.34 mAD in monitoring well 19MW07 to 98.20 mAD in monitoring well 19MW02. The groundwater elevation in monitoring well 17MW06 was 96.33 mAD.
- Based on data collected during the groundwater monitoring event on July 16, 2019, lateral groundwater flow direction in the wells screened to include the subsurface sand and gravel zone appeared to be directed towards the east-northeast.
- Hydraulic conductivity measured at monitoring well 19MW01, screened from 3.1 to 6.1 mbgs, was 5.2×10^{-7} m/s. Hydraulic conductivity measured at monitoring well 17MW06, screened from 8.1 to 9.1 mbgs, was 2.0×10^{-8} m/s.

- Field-screening results for standpipe combustible vapour concentrations ranged from 0.8 ppm at monitoring well 19MW06 to 194.2 ppm at monitoring well 19MW03 on July 11, 2019, and from 0.8 ppm at monitoring well 19MW06 to 10.0 ppm at monitoring well 19MW03 on July 16, 2019.

The interpreted lateral groundwater flow direction was to the east-northeast at an approximate gradient of 0.01 metres per metre (m/m) and is illustrated on Figure 5.

Based upon hydraulic conductivity (K) of 5.2 x 10^{-7} m/s in monitoring well 19MW01 screened in a zone consistent with unconsolidated clay deposits (Freeze and Cherry, 1979), a conservative effective porosity (Ne) of 10% representing the variations of clay deposits at the Site (Johnson, 1967), and an average hydraulic gradient (I) of 0.01 m/m, the estimated linear velocity (VL) (with consideration to advection only) of shallow groundwater at the Site has been calculated using Darcy's Law as follows:

VL = KI/Ne

= [(5.2 x 10^{-7} m/s) x (0.01 m/m)] / 0.10

= 5.2 x 10^{-8} m/s x 3.156 x 10^{7} seconds per year

= 1.6 metres per year (m/yr)

This is considered an estimate based on the limited hydrogeological data available. The estimated linear velocities in the shallow sand are anticipated to be at a higher rate. Groundwater elevations and monitoring well completion details are summarized in Table 2. Groundwater elevations and contours are illustrated on Figure 4 and hydraulic conductivity results are provided in Appendix E.

4.3.2 Groundwater Quality

The following is a summary of the groundwater results for the groundwater sampling event that was conducted on July 16, 2019:

- Concentrations of benzene, toluene, and PHC fractions F1 and F2 in the groundwater sample collected from monitoring well 19MW03, along with these concentrations in a blind field duplicate sample collected from this well, exceeded the applicable regulatory guidelines.
- Concentrations of BTEX, and PHC fractions F1 and F2 in the groundwater samples collected from the remaining monitoring wells were below the applicable regulatory guidelines and generally below the laboratory's minimum detection limits.
- The nitrate as nitrogen concentrations in the samples collected from monitoring well 19MW04 was above the applicable guideline concentrations.
- Dissolved zinc concentrations exceeded the applicable guideline in the samples collected from monitoring wells 19MW03 and 19MW04.
- Total aluminum, iron, and zinc concentrations exceeded the applicable guidelines in samples collected from monitoring wells 19MW03 and 19MW04.
- Total cadmium concentrations exceeded the applicable guidelines in samples collected from monitoring wells 19MW03 and 19MW04.

Concentrations of parameters that were above the reporting standards referenced by the CSRA were identified in groundwater samples collected at the Site, as follows:

- 19MW02: chloride, nitrate (as NO_3), nitrite (as NO_3), TDS, dissolved cadmium, dissolved manganese, and dissolved zinc.

- 19MW03: benzene, toluene, chloride, sulphate, TDS, dissolved cadmium, dissolved manganese, and dissolved zinc.
- 19MW04: chloride, nitrate (as NO_3), nitrite (as NO_3), sulphate, TDS, dissolved cadmium, dissolved manganese, and dissolved zinc.

The groundwater laboratory analytical results are presented in Tables 3 to 6 and illustrated on Figure 5.

4.3.3 Natural Attenuation Conditions

Assessment of redox-sensitive indicator parameters of sulphate, nitrate, dissolved iron, and dissolved manganese were completed to assess the capacity to attenuate concentrations of PHC parameters at the Site.

Stuyfzand (1993) proposed a semi-empirical redox indexing based on measured concentrations of redox sensitive elements in groundwater. A system of three redox levels was used to demonstrate the relative redox conditions based on the analytical results of redox sensitive elements including nitrate, sulphate, dissolved iron, and dissolved manganese.

The three simplified redox levels in groundwater are:

- Oxic Zone: Nitrate concentrations are typically stable and dissolved iron and manganese are not present in appreciable concentrations.
- Suboxic Zone: In this redox situation, nitrate is nearly completely reduced (less than 1.0 milligrams per litre [mg/L]); dissolved manganese is present in concentrations greater than 0.1 mg/L, without accompanying dissolved iron increase.

Anoxic Zone: Nitrate is reduced; dissolved iron and dissolved manganese occur in concentrations typically greater than 0.1 mg/L and sulphate reduction is occurring based on concentrations that are less than typical background. Groundwater samples were assessed with respect to redox indicator parameters to determine the natural capacity to attenuate concentrations of dissolved PHC in groundwater. The significance of the groundwater redox condition is that under aerobic (oxic) conditions, the dissolved PHC parameters are expected to attenuate much faster than under anoxic conditions (ASTM, 2015). Redox indicator parameters were analyzed in the following wells:

- 19MW02: located north of, and side-gradient to, the PHC-impacted area.
- 19MW03: located within the PHC-impacted area.
- 19MW04: located south of, and side-gradient to, the PHC-impacted area.

The redox condition at monitoring well 19MW02 was considered to be oxic as the nitrate concentration of 6.6 mg/L appears consistent with expected background concentrations, low concentrations of dissolved iron (0.33 mg/L), and dissolved manganese (0.3 mg/L) were present, and the concentration of sulphate was 83 mg/L.

The redox condition at monitoring well 19MW03 was considered to be either suboxic or anoxic as the nitrate concentration is reduced to 0.083 mg/L, and elevated concentrations of dissolved iron (7.5 mg/L) and manganese (2.7 mg/L) were observed, but the concentration of sulphate remained elevated at 160 mg/L.

The redox condition at monitoring well 19MW04 did not match any of the redox conditions identified above, as the nitrate concentration remained elevated (29 mg/L), while elevated concentrations of dissolved iron (20 mg/L), dissolved manganese (1.5 mg/L), and sulphate (150 mg/L) were all observed in this sample.

Laboratory analysis of TOC concentrations was also performed on the groundwater samples collected from these three groundwater monitoring wells. The TOC concentrations measured in these samples were 2 mg/L (19MW02), 6.6 mg/L (19MW03), and <2.5 mg/L (19MW04). The United States Environmental Protection Agency (USEPA, n.d.) indicates that TOC concentrations >20 mg/L are desirable for the occurrence of anaerobic biodegradation processes.

The redox sensitive parameters and TOC concentrations identified in these selected groundwater samples indicate that conditions conducive to natural attenuation of PHC parameters appear to be occurring aerobically in the subsurface of the Site.

4.4 Laboratory Quality Assurance / Quality Control

One blind field duplicate soil sample and one blind field duplicate groundwater sample were submitted for laboratory analysis of PHC parameters. The duplicate samples were both labeled as DUP A. The duplicate analytical results are presented in Tables 1B and 3. The relative percent difference (RPD) was calculated from the original and duplicate results, using the following formula:

$$RPD = [X_1 – X_2]/X_{AVE} \times 100$$

Where:

X_1 = concentration of the original sample
X_2 = concentration of the duplicate sample
X_{AVE} = average concentration = $[(X_1 + X_2)/2]$

The RPD results met an acceptable range for each duplicate soil and groundwater parameter (60% for soil and 40% for water). Based on the RPD analysis, soil and groundwater analytical results are considered reproducible. Where parameters for original and duplicate samples were less than method detection limit, the results are considered satisfactory.

4.5 Material Management

The drill cuttings were placed into a plastic tote bag and left on the Site near the southeast corner of the AST compound for eventual disposal. The purged groundwater from the monitoring wells was classified as non-hazardous and was returned to the ground surface.

4.6 National Classification System for Contaminated Sites

The CCME NCSCS scoresheet was completed for the Site and is summarized in Appendix F. The NCSCS is a tool used to aid in the evaluation and prioritization of contaminated sites. The tool classifies contaminated sites into categories of high, medium, or low risk, according to their current or potential adverse impact on human health and/or the environment (CCME, 2008a). Application of the NCSCS indicates that the Site falls under the Class 2 – Medium Priority for Action category, with a total score of 56.2 at a certainty percentage of 69%. The letter grade has been defined as C based on the detailed Phase II ESA completed at the Site.

5.0 Conclusions

The Phase II ESA consisted of drilling six boreholes, advancing one borehole using a hydro-excavator, completing each borehole as a groundwater monitoring well, collecting soil and groundwater samples, submitting samples for laboratory analyses, and data interpretation.

Guidelines were established based on the requirements of the CSRA, the CSRR, and recommendations contained within the MSD document ESA (MSD, 2016a), both of which outline comparative guidelines to be used for sites in Manitoba.

A summary of the soil and groundwater conditions is presented below.

5.1 Soil

- The Site's surface was predominantly covered with sand and gravel fill. Topsoil was mixed with the sand and gravel fill at two of the borehole locations.
- The dominant soil type beneath the fill was clay mixed with various amounts of silt. A zone of medium-grained sand to fine gravel was observed in all boreholes from depths of approximately 1.2 to 2.4 mbgs. Beneath this zone was clay and clay till to the maximum depths of investigation.
- Field-screening results for volatile organic vapour concentrations ranged from 0.5 to 223 ppm. The volatile organic vapour concentration of 223 ppm was observed in the soil sample collected from a depth of 2.0 to 2.5 mbgs at monitoring well 19MW03.
- Laboratory analysis of particle size for a soil sample collected within the subsurface sand and gravel zone confirmed the soil was coarse grained, while particle size analyses performed on two soil samples collected from the clay and clay till material found beneath the sand and gravel zone confirmed that this material was fine grained. Both coarse and fine-grained soil were observed at the Site; however, coarse-grained soil was considered to be the soil type that could potentially govern contaminant migration at the Site.
- PHC impacts above guidelines were detected at two assessment locations: monitoring well 19MW03, located between the AST compound and the cardlock pump islands; and surface soil sample SS-1, located south of the AST compound. The impacts at monitoring well 19MW03 were observed at depths generally consist with the subsurface sand and gravel zone.
- PHC concentrations in the soil samples collected from monitoring well 19MW03 at depths of 2.0 to 2.5 mbgs and 3.5 to 4.0 mbgs were above the applicable regulatory guidelines.
- PHC concentrations in the soil samples collected from the remaining assessment locations were below the applicable regulatory guidelines.

Vertical delineation of PHC impacts in soil was not achieved at SS-1 and monitoring well 19MW03 but was achieved at all other assessment locations at the Site. Horizontal delineation of PHC impacts in subsurface soil was achieved in all directions at the Site.

5.2 Groundwater

- Concentrations of benzene, toluene, and PHC fractions F1 and F2 in the groundwater sample collected from monitoring well 19MW03 exceeded the applicable regulatory guidelines.
- Concentrations of PHCs at the remaining assessment locations were below the applicable regulatory guidelines and were generally below laboratory detection limits.

- Concentrations of general water quality parameter nitrite as nitrogen were above the applicable regulatory guideline in one groundwater sample collected at the Site.
- Dissolved zinc concentrations were greater than the applicable regulatory guideline in one groundwater sample collected at the Site.
- Concentrations of various total metals parameters including aluminum, cadmium, iron, and zinc that exceeded applicable guidelines were identified in groundwater samples collected from the Site.
- Hydraulic conductivity measured at monitoring well 19MW01, screened from 3.1 to 6.1 mbgs, was 5.2 x 10^{-7} m/s. Hydraulic conductivity measured at monitoring well 17MW06, screened from 8.1 to 9.1 mbgs, was 2.0 x 10^{-8} m/s.
- Based on the groundwater data collected in July 2019, the interpreted lateral groundwater flow direction within the subsurface sand and gravel zone at the Site was towards the east-northeast, at an approximate gradient of 0.01 m/m.
- The estimated linear velocity of the shallow groundwater at the Site, with consideration to advection only, was estimated at 1.6 m/yr.

Horizontal delineation of PHC impacts in groundwater was achieved in all directions at the Site.

Concentrations of various parameters that were above the reporting standards were observed in soil and groundwater samples at the Site. As such, these parameters must be reported to MSD under the provisions of the CSRA.

The results of the NCSCS scoresheet indicate the Site is considered a medium priority for action.

6.0 Limitations of Report

This report is based solely on the conditions which existed on site at the time of Trace's investigation. The client, and any other parties using this report with the express written consent of the client and Trace, acknowledges that conditions affecting the environmental assessment of the Site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

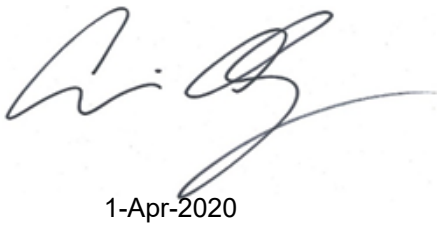
The client, and any other party using this report with the express written consent of the client and Trace, also acknowledges that the conclusions and recommendations set out in this report are based on limited observations and testing on the Site and that conditions may vary across the Site which, in turn, could affect the conclusions and recommendations made.

The client acknowledges that Trace is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment, or development of the Site, the decisions on which are the sole responsibility of the client.

7.0 Closure and Quality Management

We trust that this meets your present requirements. Should you have any questions or comments, please contact Mr. Jon Gudmundsson (D 306.450.9164 or E jgudmundsson@traceassociates.ca) at our Regina office.

Respectfully submitted,
Trace Associates Inc.



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FIGURES

400-299.Fig01.Rev01.Site Location Map Date and Time Saved: Oct 04, 2019 1:04:31 PM Drawn By: cvandenberg Reviewed By: JG Revision: 1

Site Plan Showing Monitoring Well Locations

Federated Co-operatives Limited
Phase II Environmental Site Assessment

Gilbert Plains Cardlock Facility
Gilbert Plains, Manitoba
Trace Project No. 400-299

Legend

- Distance to Potential Receptor
- Rail Line
- Local Street
- Highway
- Waterbody

0 50 100 200 300 m

1:5,000 (At original plot size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Features: ISC, CanVec, Water Security Agency
3. Base Image: 2013 DigitalGlobe
4. Inset Image: Canada Base Map - Transportation
5. Last Field Update: N/A

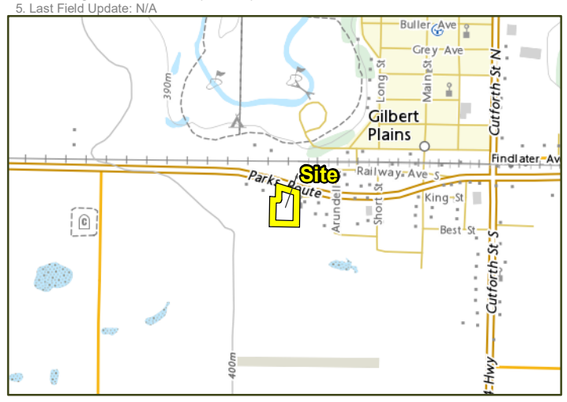


Figure No. 1

400-299 Fig02 Rev01 Site Plan Date and Time Saved: Oct 04, 2019 1:25:14 PM Drawn By: cvandenberg Reviewed By: JG Revision: 1

395200 395250 395300 395350

5667200 5667150 5667100 5667050

19MW01 19MW02 19MW03 19MW04 19MW05 19MW06 19MW07 SS1 Former ASTs

N

Site Plan Showing Monitoring Well Locations

Federated Co-operatives Limited
Phase II Environmental Site Assessment

Gilbert Plains Cardlock Facility
Gilbert Plains, Manitoba
Trace Project No. 400-299

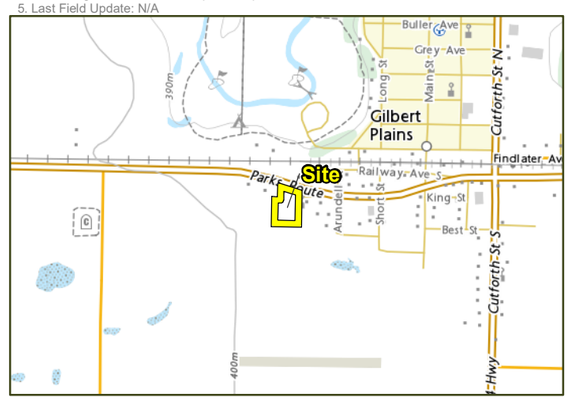
Legend

- Monitoring Well
- Surface Soil Sample
- Powerline (Approximate Location)
- Communications Line (Approximate Location)
- Local Street
- Highway
- Site
- Residential Boundary
- Residential Boundary 30m Buffer *(Residential Guideline Area)*
- Former Site Feature
- MLI Cadastral Parcel

0 10 20 40 60 m

1:750 (At original plot size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Features: ISC, CanVec, Water Security Agency
3. Base Image: GeoManitoba Provincial Imagery
4. Inset Image: Canada Base Map - Transportation
5. Last Field Update: N/A



Trace ASSOCIATES

Figure No. 2

395200 395250 395300 395350

5667200 5667150 5667100 5667050

Parameter	Residential Guideline Surface Soil (mg/kg)	Residential Guideline Subsoil (mg/kg)	Commercial Guideline Surface Soil (mg/kg)	Commercial Guideline Subsoil Soil (mg/kg)
Benzene (B)	0.095	0.30	0.11	0.32
Toluene (T)	0.10	0.10	0.10	0.10
Ethylbenzene (E)	50	50	50	50
Xylenes (X)	14	37	16	37
F1-BTEX (F1)	30	30	320	320
F2	150	150	260	260
F3	300	300	1,700	1,700
F4/F4-HTG (F4)	2,800	2,800	3,300	3,300

	19MW02 (1.5-2.0) (mg/kg)	19MW02 (3.0-3.5) (mg/kg)
Vapour (ppm)	1.3	1.3
B	<0.0050	<0.0050
T	<0.050	<0.050
E	<0.010	<0.010
X	<0.045	<0.045
F1	<10	<10
F2	<10	<10
F3	<50	<50
F4	<50	<50

	19MW05 (2.0-2.5) (mg/kg)	19MW05 (3.5-4.0) (mg/kg)
Vapour (ppm)	1.0	2.1
B	<0.0050	<0.0050
T	<0.050	<0.050
E	<0.010	<0.010
X	<0.045	<0.045
F1	<10	<10
F2	<10	<10
F3	<50	<50
F4	<50	<50

	19MW01 (1.0-1.5) (mg/kg)	19MW01 (4.0-4.5) (mg/kg)
Vapour (ppm)	2.6	1.4
B	<0.0050	<0.0050
T	<0.050	<0.050
E	<0.010	<0.010
X	<0.045	<0.045
F1	<10	<10
F2	<10	<10
F3	<50	<50
F4	<50	<50

	19MW07 (2.0-2.5) (mg/kg)
Vapour (ppm)	2.4
B	<0.0050
T	<0.050
E	<0.010
X	<0.045
F1	<10
F2	<10
F3	<50
F4	<50

	SS-1 (0-0.15) (mg/kg)
B	<0.0050
T	<0.050
E	<0.010
X	<0.045
F1	<10
F2	430
F3	21,000
F4	4,900

	19MW06 (2.0-2.5) (mg/kg)	19MW06 (8.5-9.0) (mg/kg)
Vapour (ppm)	2.5	1.1
B	<0.0050	<0.0050
T	<0.050	<0.050
E	<0.010	<0.010
X	<0.045	<0.045
F1	<10	<10
F2	<10	<10
F3	<50	<50
F4	<50	<50

	19MW04 (1.5-2.0) (mg/kg)	Dup A (mg/kg)	19MW04 (1.5-2.0) (mg/kg)
Vapour (ppm)	0.7	0.7	0.6
B	<0.0050	<0.0050	<0.0050
T	<0.050	<0.050	<0.050
E	<0.010	<0.010	<0.010
X	<0.045	<0.045	<0.045
F1	<10	<10	<10
F2	<10	<10	<10
F3	<50	<50	<50
F4	<50	<50	<50

	19MW03 (2.0-2.5) (mg/kg)	19MW03 (3.5-4.0) (mg/kg)
Vapour (ppm)	222.7	3.1
B	**0.60**	**0.057**
T	**0.52**	<0.050
E	3.4	<0.010
X	0.38	<0.045
F1	26	<10
F2	29	<10
F3	<50	<50
F4	<50	<50

19MW02 Former ASTs 19MW05 19MW01 19MW03 19MW07 SS1 19MW04 19MW06

Site Plan Showing Soil Petroleum Hydrocarbon Analytical Results

Federated Co-operatives Limited
Phase II Environmental Site Assessment

Gilbert Plains Cardlock Facility
Gilbert Plains, Manitoba
Trace Project No. 400-299

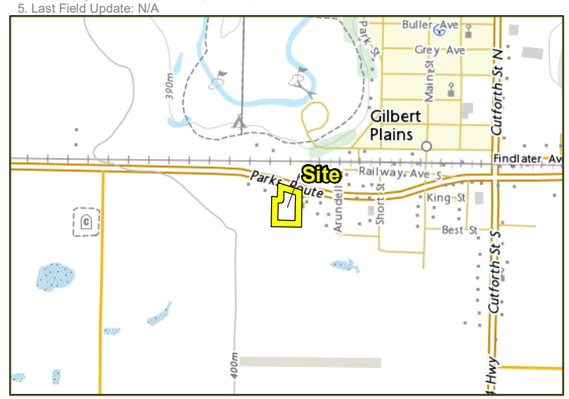
Legend

- Monitoring Well
- Surface Soil Sample
- Soil Analytical Results Within Applicable Guideline
- Soil Analytical Results Exceed Applicable Guideline
- Powerline (Approximate Location)
- Communications Line (Approximate Location)
- Local Street
- Highway
- Site
- Residential Boundary
- Residential Boundary 30m Buffer *(Residential Guideline Area)*
- Former Site Feature
- MLI Cadastral Parcel

0 10 20 40 60 m

1:750 (At original plot size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Features: ISC, CanVec, Water Security Agency
3. Base Image: ESRI Worl dImagery, 2013
4. Inset Image: Canada Base Map - Transportation
5. Last Field Update: N/A



Trace ASSOCIATES

Figure No. 3

395200 395250 395300 395350

5667200 5667150 5667100 5667050

19MW02 (98.19)

Former ASTs

19MW05 (98.05)

19MW01 (98.47)

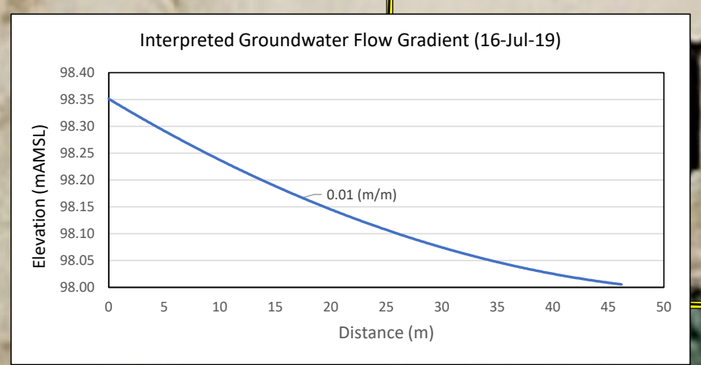
98.3 98.2 98.1 98

19MW03 (98.07)

19MW07 (97.96)

19MW04 (98.06)

19MW06* (97.34)



Site Plan Showing Interpreted Groundwater Flow Direction

Federated Co-operatives Limited
Phase II Environmental Site Assessment

Gilbert Plains Cardlock Facility
Gilbert Plains, Manitoba
Trace Project No. 400-299

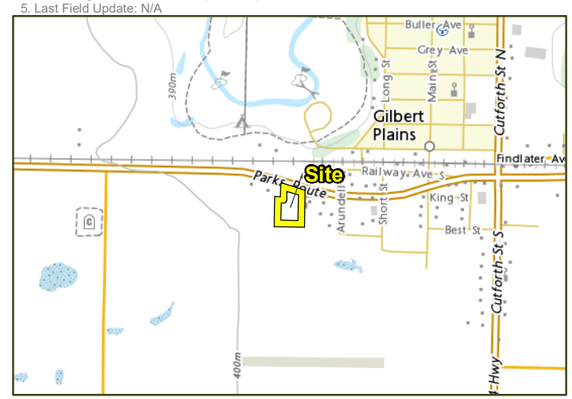
Legend

- Monitoring Well
- (99.00) Groundwater Elevation (16-July-2019)
- Excluded from Groundwater Contouring
- Interpreted Groundwater Flow Direction
- Powerline (Approximate Location)
- Communications Line (Approximate Location)
- Local Street
- Highway
- Site
- Residential Boundary
- Residential Boundary 30m Buffer *(Residential Guideline Area)*
- Former Site Feature
- MLI Cadastral Parcel

0 10 20 40 60 m

1:750 (At original plot size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Features: ISC, CanVec, Water Security Agency
3. Base Image: GeoManitoba Provincial Imagery
4. Inset Image: Canada Base Map - Transportation
5. Last Field Update: N/A



Trace ASSOCIATES

Figure No. 4

395200 395250 395300 395350

5667200 5667150 5667100 5667050

Parameter	Guideline (mg/L)
Benzene (B)	0.14
Toluene (T)	0.018
Ethylbenzene (E)	0.80
Xylenes (X)	3.9
F1-BTEX (F1)	0.81
F2	1.5

	19MW02 (mg/L)
	16-Jul-19
B	<0.00040
T	<0.00040
E	<0.00040
X	<0.00089
F1	<0.10
F2	<0.10

	19MW05 (mg/L)
	16-Jul-19
B	<0.00040
T	<0.00040
E	<0.00040
X	<0.00089
F1	<0.10
F2	<0.10

	19MW01 (mg/L)
	16-Jul-19
B	<0.00040
T	<0.00040
E	<0.00040
X	<0.00089
F1	<0.10
F2	<0.10

	19MW07 (mg/L)
	16-Jul-19
B	0.00056
T	<0.00040
E	<0.00040
X	<0.00089
F1	<0.10
F2	<0.10

	19MW06 (mg/L)
	16-Jul-19
B	<0.00040
T	<0.00040
E	<0.00040
X	<0.00089
F1	<0.10
F2	<0.10

	19MW04 (mg/L)
	16-Jul-19
B	<0.00040
T	<0.00040
E	<0.00040
X	<0.00089
F1	<0.10
F2	<0.10

	19MW03 (mg/L)	DUP A (mg/L)
	16-Jul-19	16-Jul-19
B	**0.41**	**0.50**
T	0.011	0.017
E	0.046	0.074
X	0.072	0.093
F1	**2.2**	**2.0**
F2	**2.2**	**2.2**

19MW02 19MW05 Former ASTs 19MW01 19MW03 19MW07 SS1 19MW04 19MW06

Site Plan Showing Groundwater Petroleum Hydrocarbon Analytical Results

Federated Co-operatives Limited
Phase II Environmental Site Assessment

Gilbert Plains Cardlock Facility
Gilbert Plains, Manitoba
Trace Project No. 400-299

Legend

- Monitoring Well
- Surface Soil Sample
- Groundwater Analytical Results Within Applicable Guideline
- Groundwater Analytical Results Exceed Applicable Guideline
- Powerline (Approximate Location)
- Communications Line (Approximate Location)
- Local Street
- Highway
- Site
- Residential Boundary
- Residential Boundary 30m Buffer *(Residential Guideline Area)*
- Former Site Feature
- MLI Cadastral Parcel

0 10 20 40 60 m

1:750 (At original plot size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 14N
2. Base Features: ISC, CanVec, Water Security Agency
3. Base Image: ESRI World Imagery, 2013
4. Inset Image: Canada Base Map - Transportation
5. Last Field Update: N/A

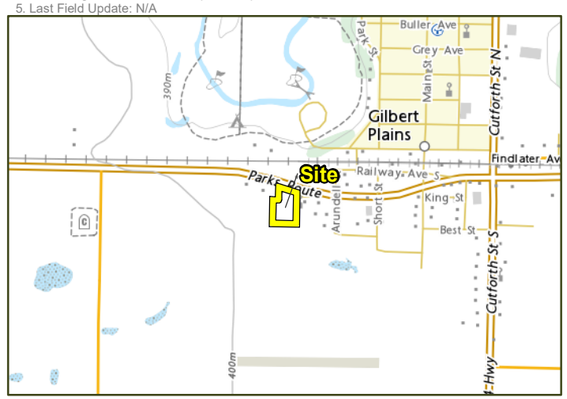


Figure No. 5

TABLES

TABLE 1A - REGULATORY GUIDELINE COMPARISON (Petroleum Hydrocarbons in Soil)

Phase II Environmental Site Assessment - Federated Co-operatives Limited
Gilbert Plains Cardlock Facility, SW-09-025-22 W1M, near Gilbert Plains, Manitoba
Trace Project No. 400-299

GUIDELINE DESCRIPTIONS						PETROLEUM HYDROCARBONS							
Regulatory Guideline(s)	Standard Level(s)	Land Use Designation	Soil Type	Soil Layer	Pathway	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	F1-BTEX (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4/F4-HTG[a] (mg/kg)
CCME 1999	Primary	Residential/Parkland	Coarse	Surface Soil	Soil Ingestion$_{HH}$	110	22,000	10,000	150,000	-	-	-	-
		Residential/Parkland	Coarse	Surface Soil	Direct Soil Contact$_{HH}$	250	220,000	58,000	-	-	-	-	-
		Residential/Parkland	Coarse	Surface Soil	Vapour Inhalation$_{HH}$ Basement	0.15	200	88	22	-	-	-	-
		Residential/Parkland	Coarse	Surface Soil	Vapour Inhalation$_{HH}$ Slab	0.095	120	55	14	-	-	-	-
		~~Residential/Parkland~~	~~Coarse~~	~~Surface Soil~~	~~Potable Ground Water$_{HH}$~~	~~0.030~~	~~0.37~~	~~0.082~~	~~11~~	-	-	-	-
		Residential/Parkland	Coarse	Surface Soil	Soil Contact$_{E}$	31	75	55	95	-	-	-	-
		Residential/Parkland	Coarse	Surface Soil	Soil Food Injestion$_{E}$	-	-	-	-	-	-	-	-
		Residential/Parkland	Coarse	Surface Soil	Ground Water Livestock$_{E}$	-	-	-	-	-	-	-	-
		Residential/Parkland	Coarse	Surface Soil	Ground Water Aquatic Life$_{E}$	1.0	0.10	50	37	-	-	-	-
		Commercial	Coarse	Surface Soil	Soil Ingestion$_{HH}$	110	82,000	36,000	560,000	-	-	-	-
		Commercial	Coarse	Surface Soil	Direct Soil Contact$_{HH}$	250	790,000	210,000	-	-	-	-	-
		Commercial	Coarse	Surface Soil	Vapour Inhalation$_{HH}$ Basement	-	-	-	-	-	-	-	-
		Commercial	Coarse	Surface Soil	Vapour Inhalation$_{HH}$ Slab	0.30	1,400	630	160	-	-	-	-
		~~Commercial~~	~~Coarse~~	~~Surface Soil~~	~~Potable Ground Water$_{HH}$~~	~~0.030~~	~~0.37~~	~~0.082~~	~~11~~	-	-	-	-
		Commercial	Coarse	Surface Soil	Soil Contact$_{E}$	180	250	300	350	-	-	-	-
		Commercial	Coarse	Surface Soil	Soil Food Injestion$_{E}$	-	-	-	-	-	-	-	-
		Commercial	Coarse	Surface Soil	Ground Water Livestock$_{E}$	-	-	-	-	-	-	-	-
		Commercial	Coarse	Surface Soil	Ground Water Aquatic Life$_{E}$	1.0	0.10	50	37	-	-	-	-
		Residential/Parkland	Coarse	Subsoil	Soil Ingestion$_{HH}$	-	-	-	-	-	-	-	-
		Residential/Parkland	Coarse	Subsoil	Direct Soil Contact$_{HH}$	-	-	-	-	-	-	-	-
		Residential/Parkland	Coarse	Subsoil	Vapour Inhalation$_{HH}$ Basement	0.15	200	88	22	-	-	-	-
		Residential/Parkland	Coarse	Subsoil	Vapour Inhalation$_{HH}$ Slab	0.11	140	63	16	-	-	-	-
		~~Residential/Parkland~~	~~Coarse~~	~~Subsoil~~	~~Potable Ground Water$_{HH}$~~	~~0.030~~	~~0.37~~	~~0.082~~	~~11~~	-	-	-	-
		Residential/Parkland	Coarse	Subsoil	Soil Contact$_{E}$	62	150	110	190	-	-	-	-
		Residential/Parkland	Coarse	Subsoil	Soil Food Injestion$_{E}$	-	-	-	-	-	-	-	-
		Residential/Parkland	Coarse	Subsoil	Ground Water Livestock$_{E}$	-	-	-	-	-	-	-	-
		Residential/Parkland	Coarse	Subsoil	Ground Water Aquatic Life$_{E}$	1.0	0.10	50	37	-	-	-	-
		Commercial	Coarse	Subsoil	Soil Ingestion$_{HH}$	-	-	-	-	-	-	-	-
		Commercial	Coarse	Subsoil	Direct Soil Contact$_{HH}$	-	-	-	-	-	-	-	-
		Commercial	Coarse	Subsoil	Vapour Inhalation$_{HH}$ Basement	-	-	-	-	-	-	-	-
		Commercial	Coarse	Subsoil	Vapour Inhalation$_{HH}$ Slab	0.32	1,500	670	170	-	-	-	-
		~~Commercial~~	~~Coarse~~	~~Subsoil~~	~~Potable Ground Water$_{HH}$~~	~~0.030~~	~~0.37~~	~~0.082~~	~~11~~	-	-	-	-
		Commercial	Coarse	Subsoil	Soil Contact$_{E}$	360	500	600	700	-	-	-	-
		Commercial	Coarse	Subsoil	Soil Food Injestion$_{E}$	-	-	-	-	-	-	-	-
		Commercial	Coarse	Subsoil	Ground Water Livestock$_{E}$	-	-	-	-	-	-	-	-
		Commercial	Coarse	Subsoil	Ground Water Aquatic Life$_{E}$	1.0	0.10	50	37	-	-	-	-
CCME 2008	Primary	Residential/Parkland	Coarse	Surface/Subsoil	Direct Soil Contact$_{HH}$	-	-	-	-	12,000	6,800	15,000	21,000
		Residential/Parkland	Coarse	Surface/Subsoil	Vapour Inhalation$_{HH}$ Basement	-	-	-	-	40	190	-	-
		Residential/Parkland	Coarse	Surface/Subsoil	Vapour Inhalation$_{HH}$ Slab	-	-	-	-	30	150	-	-
		Residential/Parkland	Coarse	Surface/Subsoil	Ecological Soil Contact	-	-	-	-	210	150	300	2,800
		~~Residential/Parkland~~	~~Coarse~~	~~Surface/Subsoil~~	~~Potable Ground Water$_{HH}$~~	-	-	-	-	~~240~~	~~320~~	-	-
		Residential/Parkland	Coarse	Surface/Subsoil	Ground Water Aquatic Life	-	-	-	-	970	380	-	-
		Residential/Parkland	Coarse	Surface/Subsoil	Ground Water Livestock	-	-	-	-	-	-	-	-
		Residential/Parkland	Coarse	Surface/Subsoil	Management Level	-	-	-	-	700	1,000	2,500	10,000
		Commercial	Coarse	Surface/Subsoil	Direct Soil Contact$_{HH}$	-	-	-	-	19,000	10,000	23,000	-
		Commercial	Coarse	Surface/Subsoil	Vapour Inhalation$_{HH}$ Indoor	-	-	-	-	320	1,700	-	-
		Commercial	Coarse	Surface/Subsoil	Ecological Soil Contact	-	-	-	-	320	260	1,700	3,300
		~~Commercial~~	~~Coarse~~	~~Surface/Subsoil~~	~~Potable Ground Water$_{HH}$~~	-	-	-	-	~~240~~	~~320~~	-	-
		Commercial	Coarse	Surface/Subsoil	Ground Water Aquatic Life	-	-	-	-	970	380	-	-
		Commercial	Coarse	Surface/Subsoil	Management Level	-	-	-	-	700	1,000	3,500	10,000
					Applicable Regulatory Guidelines (Residential Surface soil):	**0.095**	**0.10**	**50**	**14**	**30**	**150**	**300**	**2,800**
					Applicable Regulatory Guidelines (Residential Subsoil):	**0.30**	**0.10**	**50**	**37**	**30**	**150**	**300**	**2,800**
					Applicable Regulatory Guidelines (Commercial Surface soil):	**0.11**	**0.10**	**50**	**16**	**320**	**260**	**1,700**	**3,300**
					Applicable Regulatory Guidelines (Commercial Subsoil):	**0.32**	**0.10**	**50**	**37**	**320**	**260**	**1,700**	**3,300**

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File Name: 400-299 R01 T01A SoilPHC.xlsx

References: - CCME (Canadian Council of Ministers of the Environment). (1999). *Canadian Environmental Quality Guidelines (and updates) (Pub. No. 1299, ISBN 1-896997-34-1*). Winnipeg, MB.
- CCME (Canadian Council of Ministers of the Environment). (2008, January). *Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil - Technical Supplement.* Canadian Council of Ministers of the Environment, Winnipeg, MB.

Legend:
BTEX = Benzene, toluene, ethylbenzene, and xylenes
mg/kg = Milligrams per kilogram
- = No guideline
$_{HH}$ = Human Health
$_{E}$ = Ecological

Notes: ___ - Underline and shaded indicates the applicable regulatory guideline.
[a] - F4-HTG recorded when chromatograph does not reach baseline.

TABLE 1B - SOIL ANALYTICAL RESULTS (Petroleum Hydrocarbons and Particle Size Analysis)

Phase II Environmental Site Assessment - Federated Co-operatives Limited
Gilbert Plains Cardlock Facility, SW-09-025-22 W1M, near Gilbert Plains, Manitoba
Trace Project No. 400-299

SAMPLE LOCATION AND DESCRIPTIONS				FIELD READINGS	PETROLEUM HYDROCARBONS								SOIL PROPERTIES			
Borehole Name	Depth (m)	Date (d-m-y)	Soil Layer[c]	Vapour Reading[a] (ppm)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	F1-BTEX (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4/F4-HTG[b] (mg/kg)	Sand (%)	Silt (%)	Clay (%)	Texture
	Applicable Regulatory Guidelines (Residential Surface soil):				**0.095**	**0.10**	**50**	**14**	**30**	**150**	**300**	**2,800**	-	-	-	-
	Applicable Regulatory Guidelines (Residential Subsoil):				**0.30**	**0.10**	**50**	**37**	**30**	**150**	**300**	**2,800**	-	-	-	-
	Applicable Regulatory Guidelines (Commercial Surface soil):				**0.11**	**0.10**	**50**	**16**	**320**	**260**	**1,700**	**3,300**	-	-	-	-
	Applicable Regulatory Guidelines (Commercial Subsoil):				**0.32**	**0.10**	**50**	**37**	**320**	**260**	**1,700**	**3,300**	-	-	-	-
2019 PHASE II ESA ANALYTICAL DATA																
19MW01	1.0-1.5	13-Jun-2019	Surface Soil	2.6	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
	4.0-4.5	13-Jun-2019	Subsoil	1.4	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
19MW02	1.5-2.0	13-Jun-2019	Subsoil	1.3	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
	3.0-3.5	13-Jun-2019	Subsoil	1.3	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
19MW03	2.0-2.5	13-Jun-2019	Subsoil	222.7	**0.60**	**0.52**	3.4	0.38	26	29	<50	<50	-	-	-	-
	3.5-4.0	13-Jun-2019	Subsoil	3.1	**0.057**	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
19MW04	1.5-2.0	14-Jun-2019	Subsoil	0.7	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
DUP A	1.5-2.0	14-Jun-2019	Subsoil	0.7	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
			Method Detection Limit (MDL)		0.0050	0.050	0.010	0.045	10	10	50	50	-	-	-	-
			Difference		--	--	--	--	--	--	--	--	-	-	-	-
			Relative Percent Difference (RPD)		OK	OK	OK	OK	OK	OK	OK	OK	-	-	-	-
19MW04	2.0-2.5	14-Jun-2019	Subsoil	0.6	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
19MW05	2.0-2.5	14-Jun-2019	Subsoil	1.0	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
	3.5-4.0	14-Jun-2019	Subsoil	2.1	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
	4.0-4.5	14-Jun-2019	Subsoil	1.3	-	-	-	-	-	-	-	-	26	37	38	Clay Loam
19MW06	1.5-2.0	14-Jun-2019	Subsoil	1.1	-	-	-	-	-	-	-	-	95	2.7	2.6	Sand
	2.0-2.5	14-Jun-2019	Subsoil	2.5	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
	7.5-8.0	14-Jun-2019	Subsoil	1.1	-	-	-	-	-	-	-	-	7.8	37	55	Clay
	8.5-9.0	14-Jun-2019	Subsoil	1.1	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
19MW07	2.0-2.5	16-Jul-2019	Subsoil	2.4	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
FILL 1	-	14-Jun-2019	-	-	<0.0050	<0.050	<0.010	<0.045	<10	<10	<50	<50	-	-	-	-
SS-1	0 - 0.15	14-Jun-2019	Surface Soil	-	<0.0050	<0.050	<0.010	<0.045	<10	**430**	**21,000**	**4,900**	-	-	-	-

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	0	1.1	AG	20-Mar-2020	ML	20-Mar-2020	31-Mar-2020

File Name: 400-299 R01 T01B SoilPHC.xlsx

References: - CCME (Canadian Council of Ministers of the Environment). (1999). *Canadian Environmental Quality Guidelines (and updates) (Pub. No. 1299, ISBN 1-896997-34-1*). Winnipeg, MB.
- CCME (Canadian Council of Ministers of the Environment). (2008, January). *Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil - Technical Supplement.* Canadian Council of Ministers of the Environment, Winnipeg, MB.

Legend:
m = Metres
d-m-y = Day-month-year
ppm = Parts per million equivalent
mg/kg = Milligrams per kilogram
- = No guideline / not tested
DUP= Duplicate sample
< = Less than
BTEX = Benzene, toluene, ethylbenzene, and xylenes

Notes: **Bold and shaded indicates a value does not meet the applicable regulatory standard.**

RPD - Relative percent difference, designated as $(X_1 - X_2)/[(X_1 + X_2)/2] \times 100\%$, where X_1 designates original sample and X_2 duplicate sample.

-- - Difference cannot be calculated where one or both samples yielded nondetectable results.

OK - Indicates acceptable reproducibility at nondetectable levels.

[a] - Headspace vapour concentrations in bagged soil samples measured with a MiniRAE photoionization detector calibrated to an 100 ppm isobutylene standard.

[b] - F4-HTG recorded when chromatograph does not reach baseline.

[c] - Subsoils are defined as soils deeper then 3.0 metres below surface level.

TABLE 2 - MONITORING WELL COMPLETION DETAILS AND MEASURED DATA

Phase II Environmental Site Assessment - Federated Co-operatives Limited
Gilbert Plains Cardlock Facility, SW-09-025-22 W1M, near Gilbert Plains, Manitoba
Trace Project No. 400-299

Monitoring Well Name	Drilling Date (d-m-y)	Elevation[1]		Well Details						
		Ground Surface (mAD)	Top of Casing (mAD)	Standpipe Stickup (mags)	Total Depth (mbTPC)	Total Depth (mbgs)	Top of Screen (mbgs)	Base of Screen (mbgs)	Lithology at Screen	Hydraulic Conductivity[2] (m/s)
19MW01	13-Jun-2019	99.94	99.74	-0.20	5.94	6.13	3.09	6.13	Clay	5.2E-07
19MW02	13-Jun-2019	99.98	99.80	-0.18	4.66	4.84	1.80	4.84	Sand / clay	NM
19MW03	13-Jun-2019	99.98	99.75	-0.23	2.46	2.69	1.78	2.69	Sand / clay	NM
19MW04	14-Jun-2019	99.76	99.62	-0.14	2.37	2.51	1.60	2.51	Sand	NM
19MW05	14-Jun-2019	99.73	99.56	-0.17	3.01	3.18	1.35	3.18	Sand / clay	NM
19MW06	14-Jun-2019	99.83	99.64	-0.19	8.95	9.14	8.23	9.14	Clay / clay till	2.0E-08
19MW07	14-Jun-2019	99.24	99.09	-0.15	2.11	2.26	1.35	2.26	Sand / clay	NM

Monitoring Well Name	Location NAD83 / UTM 14N		Measured Data (16-Jul-2019)					
	Easting (mE)	Northing (mN)	Standpipe Vapour Concentration[3] (ppm)	Depth to Groundwater (mbTPC)	Depth to Groundwater (mbgs)	Depth to Product (mbTPC)	Groundwater Elevation[1] (mAD)	Apparent Product Thickness (m)
19MW01	395255.35	5667151.68	1.1	1.49	1.69	ND	98.25	ND
19MW02	395277.64	5667178.94	1.2	1.60	1.78	ND	98.20	ND
19MW03	395295.44	5667152.42	10.0	1.66	1.89	ND	98.09	ND
19MW04	395299.47	5667136.84	1.3	1.53	1.68	ND	98.08	ND
19MW05	395302.02	5667167.63	1.1	1.51	1.68	ND	98.05	ND
19MW06	395276.98	5667128.60	0.8	3.30	3.50	ND	96.33	ND
19MW07	395323.38	5667151.85	1.5	1.75	1.90	ND	97.34	ND

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File Name: 400-299 R01 T02 Well Details.xls

References: - Hvorslev, M.J., 1951. Time Lag and Soil Permeability in Groundwater Observations. U.S. Army Corps of Engineers. Waterways Experiment Stations. Bulletin 36. Vicksburg, Miss. 50 pp.
- Schlumberger (Schlumberger Water Services). (2007). *Aquifer Test (Version 4.2) (Computer software)* . Waterloo, ON: Schlumberger Water Services.

Legend:

d-m-y =	Day-month-year	mbTPC =	Metres below top of pipe casing	mAD=	Metres above datum	mE =	Metres East
ND =	Non-detect	mbgs =	Metres below ground surface	ppm =	Parts per million equivalent	mN =	Metres North
mags =	Metres above ground surface	m/s =	Metres per second	NM =	Not measured	m =	Metres

Notes: [1] - Elevation - measured relative to 100 metre benchmark (Top of fire hydrant on NW corner of Site).
[2] - Field data collected using a Bail Down ('Rising Head') Test. Hydraulic conductivity calculated using 'Aquifer Test' (Schlumberger, 2007). Results interpreted using Hvorslev Method (Hvorslev, 1951) .
[3] - Standpipe hydrocarbon vapour concentration measured with a MiniRAE photoionization detector calibrated to an 100 ppm isobutylene standard.

TABLE 3 - GROUNDWATER ANALYTICAL RESULTS (Petroleum Hydrocarbons)

Phase II Environmental Site Assessment - Federated Co-operatives Limited
Gilbert Plains Cardlock Facility, SW-09-025-22 W1M, near Gilbert Plains, Manitoba
Trace Project No. 400-299

GUIDELINE DESCRIPTIONS					PETROLEUM HYDROCARBONS					
Standard Level(s)	**Regulatory Guideline(s)**	**Designated Land Use**	**Particle Size**	**Pathway Type**	**Benzene (mg/L)**	**Toluene (mg/L)**	**Ethylbenzene (mg/L)**	**Xylenes (mg/L)**	**F1-BTEX (mg/L)**	**F2 (mg/L)**
Primary	**CCME 1999**	-	Fine/Coarse	Freshwater[d]	3.29	0.018	0.80	-	-	-
				~~Marine~~	~~0.11~~	~~0.215~~	~~0.025~~	-	-	-
				~~Irrigation~~	-	-	-	-	-	-
				~~Livestock~~	-	~~0.024~~	~~0.0024~~	-	-	-
	Health Canada 2019	-	Fine/Coarse	~~MAC~~	~~0.005~~	~~0.06~~	~~0.14~~	~~0.09~~	-	-
				~~AO~~[a]	-	~~0.024~~	~~0.0016~~	~~0.02~~	-	-
	FCSAP 2016	Residential / Parkland	Coarse	Inhalation	0.14	74	16	3.9	0.81	1.5
				Soil Organisms Direct Contact	61	59	20	31	7.1	1.8
				Freshwater Life[d]	6.1	0.7	365	160	87	12
				~~Marine Life~~	~~0.2~~	~~8.9~~	~~11~~	-	-	-
		Commercial	Coarse	Inhalation	1.8	-	-	48	9.1	17
				Soil Organisms Direct Contact	350	200	110	120	11	3.1
				Freshwater Life[d]	6.1	0.7	365	160	87	12
				~~Marine Life~~	~~0.2~~	~~8.9~~	~~11~~	-	-	-
Secondary	**OMOE 2011**	-	Coarse	~~Non-Potable - MOE Water RL~~[b]	~~0.0005~~	~~0.0005~~	~~0.0005~~	~~0.0005~~	~~0.025~~	~~0.1~~
				~~Non-Potable - Ont. GW Bkgrd~~[b]	~~0.0005~~	~~0.0008~~	~~0.0005~~	~~0.072~~	~~0.42~~	~~0.15~~
				Non-Potable - GW2 Residential	0.044	82	16	7.8	1.4	2.3
				Non-Potable - GW2 Industrial	0.83	1,700	93	160	28	47
				Non-Potable - GW2 Residential Odour	1,700	47	78	530	-	-
				Non-Potable - GW2 Industrial Odour	10,000	280	460	3,200	-	-
				Non-Potable - GW3	5.8	18	2.3	4.2	0.75	0.97
				Non-Potable - 1/2 Solubility	900	260	85	53	1.9	0.15
SELECTED CRITERIA SUMMARY ACCORDING TO LAND USE AND WATER USE										
				Applicable Regulatory Guideline	**0.14**	**0.018**	**0.80**	**3.9**	**0.81**	**1.5**

ANALYTICAL RESULTS

SAMPLE LOCATIONS AND DESCRIPTIONS		FIELD PARAMETERS							PETROLEUM HYDROCARBONS					
Monitoring Well Name	**Date (d-m-y)**	**Vapour Reading (ppm)[c]**	**EC (µS/cm)**	**pH**	**Temperature (°C)**	**Total Dissolved Solids (mg/L)**	**ORP (mV)**	**Dissolved Oxygen (mg/L)**	**Benzene (mg/L)**	**Toluene (mg/L)**	**Ethylbenzene (mg/L)**	**Xylenes (mg/L)**	**F1-BTEX (mg/L)**	**F2 (mg/L)**
19MW01	16-Jul-2019	1.1	2,552	6.28	18.4	1,275	228.8	4.55	<0.00040	<0.00040	<0.00040	<0.00089	<0.10	<0.10
19MW02	16-Jul-2019	1.2	1,350	6.25	16.7	674	235.0	2.49	<0.00040	<0.00040	<0.00040	<0.00089	<0.10	<0.10
19MW03	16-Jul-2019	10.0	1,844	6.27	13.7	922	234.2	2.00	**0.41**	0.011	0.046	0.072	**2.2**	**2.2**
DUP A	16-Jul-2019	10.0	1,844	6.27	13.7	922	234.2	2.00	**0.50**	0.017	0.074	0.093	**2.0**	**2.2**
Method Detection Limit (MDL)		-	-	-	-	-	-	-	0.00040	0.00040	0.00040	0.00089	0.10	0.10
Difference		-	-	-	-	-	-	-	0.09	0.01	0.03	0.02	0.20	0.00
Relative Percent Difference (RPD)		-	-	-	-	-	-	-	19.8	42.9	46.7	25.5	9.5	0.0
19MW04	16-Jul-2019	1.3	1,488	6.19	11.7	742	226.0	3.82	<0.00040	<0.00040	<0.00040	<0.00089	<0.10	<0.10
19MW05	16-Jul-2019	1.1	2,147	6.20	10.5	1,083	237.6	3.70	<0.00040	<0.00040	<0.00040	<0.00089	<0.10	<0.10
19MW06	16-Jul-2019	0.8	1,604	6.32	9.2	806	223.0	4.49	<0.00040	<0.00040	<0.00040	<0.00089	<0.10	<0.10
19MW07	16-Jul-2019	1.5	1,468	6.24	17.2	729	239.4	1.53	0.00056	<0.00040	<0.00040	<0.00089	<0.10	<0.10

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References:
- CCME (Canadian Council of Ministers of the Environment). (1999). *Canadian Environmental Quality Guidelines (and updates) (Pub. No. 1299).* Winnipeg, MB.
- FCSAP (Federal Contaminated Sites Action Plan). (2016, November). *Federal Contaminated Sites Action Plan (FCSAP). Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites.* (ISBN No. 979-1-100-22281-3). Retrieved from: http://esdat.net/Environmental%20Standards/Canada/Fed/Fed%20Interim%20GW%20En14-91-2013-eng.pdf
- Health Canada. (2019). *Guidelines for Canadian Drinking Water Quality - Summary Table* . Ottawa, ON: Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada. Ottawa, ON.
- OMOE (Ontario Ministry of the Environment) (2011, April 15). *Soil, Ground Water and Sediment Standards for Use Under Part XV.I or the Environmental Protection Act. (PIBS # 7382e01).* Ministry of the Environment. Ontario.

Legend:

EC =	Electrical conductivity	MAC =	Maximum acceptable concentration	GW1 =	Ingestion of potable groundwater
mg/L =	Milligrams per litre	AO =	Aesthetic objective	GW2 =	Inhalation of indoor air containing soil vapour from groundwater
- =	No guideline / not tested	d-m-y =	Day-month-year	GW3 =	Exposure to aquatic biota via groundwater discharge to surface water
ppm =	Parts per million	mS/m =	milli Siemens per metre	ORP =	Oxidation reduction potential
BTEX =	Benzene, toluene, ethylbenzene, and xylenes	< =	Less than	mV =	Millivolt
MOE =	Ministry of Environment	°C =	Degress Celsius	µS/cm =	micro Siemens per centimetre

Notes:
___ - Underline and shaded indicates the most stringent applicable regulatory guideline.
Bold and shaded indicates applicable guideline exceedance.
~~Strikethrough~~ - Indicates a pathway and its applicable guidelines that have been excluded.
DUP - Duplicate sample.
RPD - Relative percent difference, designated as $(X_1 - X_2)/[(X_1 + X_2)/2] \times 100\%$, where X_1 designates original sample and X_2 duplicate sample.
[a] - Aesthetic guidelines address drinking water parameters that may influence general population acceptance (taste, odour, colour, etc.).
[b] - MOE and the Ontario background groundwater guidelines are generally achievable in site situations typical of background conditions and the protection of sensitive ecosystems. These guidelines are not remediation target guidelines and may not be applicable.
[c] - Headspace vapour concentrations in bagged soil samples measured with a MiniRAE photoionization detector calibrated to an 100 ppm isobutylene standard.
[d] - Guideline has been multiplied by a distance adjustment factor of 8.9, which is applicable for the distance to the nearest surface waterbodies of 250 to 299 metres (FCSAP, 2016).

TABLE 4 - GROUNDWATER ANALYTICAL RESULTS (Routine Potability)

Phase II Environmental Site Assessment - Federated Co-operatives Limited
Gilbert Plains Cardlock Facility, SW-09-025-22 W1M, near Gilbert Plains, Manitoba
Trace Project No. 400-299

GUIDELINE DESCRIPTIONS				ROUTINE PARAMETERS																				
Standard Level(s)	Regulatory Guideline(s)	Designated Land Use	Pathway Type	pH	EC (µS/cm)	SAR	Calcium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Magnesium (mg/L)	Nitrate as Nitrogen (mg/L)	Nitrate + Nitrite as nitrogen (mg/L)	Nitrite as nitrogen (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Sulphate (mg/L) [b]	Total Alkalinity (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Hardness ($CaCO_3$ equivalent) (mg/L)	Hydroxide (mg/L)	Total Dissolved Solids (mg/L)	Total Organic Carbon (mg/L)
Primary	CCME 1999	-	Freshwater Life[c]	6.5-9.0	-	-	-	1,068	1.07	-	116	-	0.53	-	-	-	-	-	-	-	-	-	-
			~~Marine~~	~~7.0-8.7~~	-	-	-	-	-	-	200	-	-	-	-	-	-	-	-	-	-	-	-
			~~Irrigation~~	-	-	-	-	~~100-900~~[a]	~~1~~	-	-	-	-	-	-	-	-	-	-	-	-	~~500-3,500~~[a]	-
			~~Livestock~~	-	-	-	~~1,000~~	-	~~1-2~~	-	-	~~100~~	~~10~~	-	-	~~1,000~~	-	-	-	-	-	~~3,000~~	-
	Health Canada 2019	-	~~Potable MAC~~	-	-	-	-	-	~~1.5~~	-	~~10~~	-	~~1~~	-	-	-	-	-	-	-	-	-	-
			Other	6.5-8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			~~Potable Aob~~	-	-	-	-	~~250~~	-	-	-	-	-	-	~~200~~	~~500~~	-	-	-	-	-	~~500~~	-
	FCSAP 2016	Residential / Parkland	Inhalation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Residential / Parkland	Soil Organisms Direct Contact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Residential / Parkland	Freshwater Life[c]	6.5-9.0	-	-	-	1,068	1.07	-	116	-	0.53	-	-	890	-	-	-	-	-	-	-
		Residential / Parkland	~~Marine Life~~	~~7.0-8.7~~	-	-	-	-	~~1.5~~	-	~~16~~	-	-	-	-	-	-	-	-	-	-	-	-
		Commercial	Inhalation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Commercial	Soil Organisms Direct Contact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Commercial	Freshwater Life[c]	6.5-9.0	-	-	-	1,068	1.07	-	116	-	0.53	-	-	890	-	-	-	-	-	-	-
		Commercial	~~Marine Life~~	~~7.0-8.7~~	-	-	-	-	~~1.5~~	-	~~16~~	-	-	-	-	-	-	-	-	-	-	-	-
Secondary	OMOE 2011	-	~~Non-Potable - MOE Water RL~~[a]	-	-	-	-	~~1~~	-	-	-	-	-	-	~~5~~	-	-	-	-	-	-	-	-
		-	~~Non-Potable - Ont. GW Bkgrd~~[c]	-	-	-	-	~~790~~	-	-	-	-	-	-	~~490~~	-	-	-	-	-	-	-	-
		-	Non-Potable - GW2 Residential	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	Non-Potable - GW2 Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	Non-Potable - GW2 Residential Odour	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	Non-Potable - GW2 Industrial Odour	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	Non-Potable - GW3	-	-	-	-	2,300	-	-	-	-	-	-	2,300	-	-	-	-	-	-	-	-
		-	Non-Potable - 1/2 Solubility	-	-	-	-	21,000	-	-	-	-	-	-	220,000	-	-	-	-	-	-	-	-
SELECTED CRITERIA SUMMARY ACCORDING TO LAND USE AND WATER USE																							
			Applicable Regulatory Guideline	**6.5-8.5**	**-**	**-**	**-**	**1,068**	**1.07**	**-**	**116**	**-**	**0.53**	**-**	**2,300**	**890**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

ANALYTICAL RESULTS																								
SAMPLE LOCATIONS AND DESCRIPTIONS		FIELD MEASUREMENTS			DISSOLVED ROUTINE PARAMETERS																			
Monitoring Well Name	Date (d-m-y)	Field pH	Field Temperature (°C)	Field EC (µS/cm)	pH	EC (µS/cm)	SAR	Calcium (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Magnesium (mg/L)	Nitrate as Nitrogen (mg/L)	Nitrate + Nitrite as nitrogen (mg/L)	Nitrite as N (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Sulphate (mg/L)	Total Alkalinity (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Hardness ($CaCO_3$ equivalent) (mg/L)	Hydroxide (mg/L)	Total Dissolved Solids (mg/L)	Total Organic Carbon (mg/L)
19MW02	16-Jul-2019	6.25	16.7	1,350	7.96	1,400	-	140	150	-	64	29	6.6	0.021	2.7	20	83	400	490	<1.0	610	<1.0	730	2.4
19MW03	16-Jul-2019	6.27	13.7	1,844	7.45	1,900	-	210	240 (1)	-	81	0.37	0.094	0.011	1.8	27	160 (1)	490	590	<1.0	860	<1.0	1,000	6.6 (2)
19MW04	16-Jul-2019	6.19	11.7	1,488	7.64	1,700	-	150	190	-	77	**130**	29	0.20	3.0	45	150	360	430	<1.0	700	<1.0	960	<2.5 (2)

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	0	1.1	AG	20-Mar-2020	ML	20-Mar-2020	1-Apr-2020

File Name: 400-299 R01 T04 GWRoutine.xlsx

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- OMOE (Ontario Ministry of the Environment) (2011, April 15). *Soil, Ground Water and Sediment Standards for Use Under Part XV.I or the Environmental Protection Act.* (PIBS # 7382e01). Ministry of the Environment. Ontario.

Legend:

mg/L =	Milligrams per litre	AO =	Aesthetic objective	< =	Less than
EC =	Electrical conductivity	MAC =	Maximum acceptable concentration	GW1 =	Ingestion of potable groundwater
µS/cm =	micro Siemens per centimetre	SAR =	Sodium adsorption ratio	GW2 =	Inhalation of indoor air containing soil vapour from groundwater
d-m-y =	Date-month-year	- =	No guideline / not tested	GW3 =	Exposure to aquatic biota via groundwater discharge to surface water

°C = Degrees Celsius

Notes: ___ - Underline and shaded indicates the most stringent applicable regulatory standard.
Bold and shaded indicates applicable guideline exceedance.
~~Strikethrough~~ - Strikethrough indicates a pathway and its applicable guidelines that have been excluded.
[a] - Guidelines are species specific. Refer to CCME guidelines (CCME, 1999).
[b] - Aesthetic guidelines address drinking water parameters that may influence general population acceptance (taste, odour, colour, etc.).
c - Guideline has been multiplied by a distance adjustment factor of 8.9, which is applicable for the distance to the nearest surface waterbodies of 250 to 299 metres (FCSAP, 2016).
(1) - Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) - Detection limits raised due to sample matrix.

TABLE 5 - GROUNDWATER ANALYTICAL RESULTS (Dissolved Metals)

Phase II Environmental Site Assessment - Federated Co-operatives Limited
Gilbert Plains Cardlock Facility, SW-09-025-22 W1M, near Gilbert Plains, Manitoba
Trace Project No. 400-299

GUIDELINE DESCRIPTIONS			METALS																						
Standard Level(s)	Regulatory Guideline(s)	Designated Land Use	Particle Size	Pathway Type	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (Trivalent) (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Thallium (mg/L)	Tin (mg/L)	Uranium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
Primary	CCME 1999	Aquatic Life	N/A	Freshwater Life[g]	0.89	-	0.045	-	-	13.4	0.00080	0.079[b]/0.0089[c]	-	Notes below[a]	2.7	Notes below[a]	-	0.00023	0.65	Notes below[a]	0.0089	0.0022	0.0071	-	0.13	-	0.27
		~~Aquatic Life~~	~~N/A~~	~~Marine~~	-	-	~~0.0125~~	-	-	-	~~0.00012~~	~~0.056[b]/0.0015[e]~~	-	-	-	-	-	~~0.000016~~	-	-	-	~~0.0075~~	-	-	-	-
		~~Agricultural Uses~~	~~N/A~~	~~Irrigation~~	~~5~~	-	~~0.1~~	-	~~0.1~~	~~0.50-6[d]~~	~~0.0051~~	~~0.0049[b]/0.008[e]~~	~~0.05~~	~~0.2-1[d]~~	~~5~~	~~0.2~~	~~0.2~~	-	~~0.01~~	~~0.2~~	~~0.020-0.050[e]~~	-	-	-	~~0.01~~	~~0.1~~	~~1.5[f]~~
		~~Agricultural Uses~~	~~N/A~~	~~Livestock~~	~~5~~	-	~~0.025~~	-	~~0.1~~	~~5~~	~~0.08~~	~~0.05[b]/0.05[c]~~	~~1~~	~~0.5-5[d]~~	-	~~0.1~~	-	~~0.003~~	~~0.5~~	~~1~~	~~0.05~~	-	-	-	~~0.2~~	~~0.1~~	~~50~~
	Health Canada 2019	~~Community~~	~~N/A~~	~~Potable MAC^^~~	-	~~0.006~~	~~0.01~~	~~1~~	-	~~5~~	~~0.005~~	~~0.05~~	-	-	-	~~0.01~~	-	~~0.001~~	-	-	~~0.05~~	-	-	-	~~0.02~~	-	-
		~~Community~~	~~N/A~~	~~Potable AO (or OG)~~	~~[0.1/0.2]~~	-	-	-	-	-	-	-	-	~~1~~	~~0.3~~	-	~~0.05~~	-	-	-	-	-	-	-	-	~~<5.0~~
	FCSAP 2016	Residential / Parkland	N/A	Inhalation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Residential / Parkland	N/A	Soil Organisms Direct Contact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Residential / Parkland	N/A	Freshwater Life[g]	-	18	0.045	26	0.047	-	0.00015	0.0792	-	Notes below[a]	2.7	Notes below[a]	-	0.00023	0.65	Notes below[a]	0.0089	0.00089	0.0071	-	0.13	-	0.27
		~~Residential / Parkland~~	~~N/A~~	~~Marine Life~~	-	-	~~0.0125~~	~~0.5~~	~~0.1~~	~~5~~	~~0.00012~~	~~0.056~~	-	~~0.002~~	-	~~0.002~~	-	~~0.000016~~	-	~~0.083~~	~~0.054~~	~~0.0015~~	-	-	-	-	~~0.01~~
		Commercial	N/A	Inhalation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Commercial	N/A	Soil Organisms Direct Contact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Commercial	N/A	Freshwater Life[g]	-	18	0.045	26	0.047	-	0.00015	0.0792	-	Notes below[a]	2.7	Notes below[a]	-	0.00023	0.65	Notes below[a]	0.0089	0.00089	0.0071	-	0.13	-	0.27
		~~Commercial~~	~~N/A~~	~~Marine Life~~	-	-	~~0.0125~~	~~0.5~~	~~0.1~~	~~5~~	~~0.00012~~	~~0.056~~	-	~~0.002~~	-	~~0.002~~	-	~~0.000016~~	-	~~0.083~~	~~0.054~~	~~0.0015~~	-	-	-	-	~~0.01~~
Secondary	OMOE 2011	-	~~Coarse~~	~~Non-Potable - MOE Water RL[b]~~	-	~~0.0005~~	~~0.001~~	~~0.002~~	~~0.0005~~	~~0.01~~	~~0.0005~~	~~0.01[d]~~	~~0.001~~	~~0.005~~	-	~~0.001~~	-	~~0.0001~~	~~0.0005~~	~~0.001~~	~~0.005~~	~~0.0003~~	~~0.0005~~	-	~~0.002~~	~~0.0005~~	~~0.005~~
		-	~~Coarse~~	~~Non-Potable - Ont. GW Bkgrd[b]~~	-	~~0.0015~~	~~0.013~~	~~0.61~~	~~0.0005~~	~~1.7~~	~~0.0005~~	~~0.025[d]~~	~~0.0038~~	~~0.005~~	-	~~0.0019~~	-	~~0.0001~~	~~0.023~~	~~0.014~~	~~0.005~~	~~0.0003~~	~~0.0005~~	-	~~0.0089~~	~~0.0039~~	~~0.16~~
		-	Coarse	Non-Potable - GW2 Residential	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00029	-	-	-	-	-	-	-	-	-
		-	Coarse	Non-Potable - GW2 Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0061	-	-	-	-	-	-	-	-	-
		-	Coarse	Non-Potable - GW2 Residential Odour	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	Coarse	Non-Potable - GW2 Industrial Odour	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	Coarse	Non-Potable - GW3	-	20	1.9	29	0.067	45	0.0027	0.14[d]	0.066	0.087	-	0.025	-	1.3E+10	9.2	0.49	0.063	0.0015	0.51	-	0.42	0.25	1.1
		-	Coarse	Non-Potable - 1/2 Solubility	-	12,000	17,000	27,000	75,000	22,000	62,000	6,000[d]	44,000	210,000	-	4,800	-	0.03	38,000	210,000	41,000	35,000	13,000	-	-	43,000	170,000
SELECTED CRITERIA SUMMARY ACCORDING TO LAND USE AND WATER USE																										
			Applicable Regulatory Guideline		**0.89**	**18**	**0.045**	**26**	**0.047**	**13.4**	**0.00015**	**0.079**	-	-	**2.7**	-	-	**0.00023**	**0.65**	**0.49**	**0.0089**	**0.00089**	**0.0071**	-	**0.13**	**0.1**	**0.27**

ANALYTICAL RESULTS																										
SAMPLE LOCATIONS AND DESCRIPTIONS		DISSOLVED METALS																								
Monitoring Well Name	Date (d-m-y)	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (Trivalent) (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Thallium (mg/L)	Tin (mg/L)	Uranium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
19MW02	16-Jul-2019	<0.0030	<0.00060	<0.00020	0.17	<0.0010	0.081	0.000028	<0.0010	0.00073	0.0014	0.094	<0.00020	0.27	-	0.0040	0.0038	<0.00020	<0.00010	<0.00020	<0.0010	0.0077	<0.0010	0.044
19MW03	16-Jul-2019	<0.0030	<0.00060	<0.00020	0.092	<0.0010	0.17	0.00015	<0.0010	0.0044	0.00031	0.16	<0.00020	2.3	-	0.0035	0.012	<0.00020	<0.00010	<0.00020	<0.0010	0.0072	<0.0010	**0.30**
19MW04	16-Jul-2019	<0.0030	<0.00060	0.00028	0.071	<0.0010	0.21	0.000099	<0.0010	0.0010	0.0012	0.13	<0.00020	0.41	-	0.0082	0.0093	<0.00020	<0.00010	<0.00020	<0.0010	0.0047	<0.0010	**0.41**

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- OMOE (Ontario Ministry of the Environment) (2011, April 15). *Soil, Ground Water and Sediment Standards for Use Under Part XV.I or the Environmental Protection Act* . (PIBS # 7382e01). Ministry of the Environment. Ontario.

Legend:

d-m-y =	Day-month-year	MAC =	Maximum acceptable concentration	GW1 =	Ingestion of potable groundwater
mg/L =	Milligrams per litre	AO =	Aesthetic objective	GW2 =	Inhalation of indoor air containing soil vapour from groundwater
N/A =	Not applicable	OG =	Operational guidance values	GW3 =	Exposure to aquatic biota via groundwater discharge to surface water

MOE =	Ministry of Environment
< =	Less than
- =	No guideline / not tested

Notes:
___ - Underline and shaded indicates the most stringent applicable regulatory guideline.
Bold and shaded indicates applicable guideline exceedance.
~~Strikethrough~~ - Indicates a pathway and its applicable guidelines that have been excluded.
^^ - As per Summary of Guidelines for Canadian Drinking Water Quality [04/04], Federal - Provincial - Territorial Committee on Drinking Water
[a] - Calculated based on water hardness. Refer to AEP Tier 1 guidelines, Appendix B (AEP, 2019) in conjunction with Environmental Quality Guidelines for Alberta Surface Waters (Table 1.3 [GOA, 2018]).
[b] - Trivalent chromium criteria.
[c] - Hexavalent chromium criteria.
[d] - Guidelines are species specific.
[e] - Selenium guidelines: 20 micrograms per litre (µg/L) for continuous use; 50 µg/L for intermittent use.
[f] - Zinc guideline = 1,000 µg/L when soil pH is <6.5; 5,000 µg/L when soil pH is >6.5.
[g] - Guideline has been multiplied by a distance adjustment factor of 8.9, which is applicable for the distance to the nearest surface waterbodies of 250 to 299 m (FCSAP, 2016).

TABLE 6 - GROUNDWATER ANALYTICAL RESULTS (Total Metals)

Phase II Environmental Site Assessment - Federated Co-operatives Limited
Gilbert Plains Cardlock Facility, SW-09-025-22 W1M, near Gilbert Plains, Manitoba
Trace Project No. 400-299

GUIDELINE DESCRIPTIONS					METALS																				
Standard Level(s)	Regulatory Guideline(s)	Designated Land Use	Particle Size	Pathway Type	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (Trivalent) (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Thallium (mg/L)	Tin (mg/L)	Uranium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
Primary	CCME 1999	Aquatic Life	N/A	Freshwater Life[g]	0.89	-	0.045	-	-	13.4	0.00080	0.079[b]/0.0089[c]	-	Notes below[a]	2.7	Notes below[a]	-	0.00023	0.65	Notes below[a]	0.0089	0.0022	0.0071	-	0.13	-	0.27
		~~Aquatic Life~~	~~N/A~~	~~Marine~~	-	-	~~0.0125~~	-	-	-	~~0.00012~~	~~0.056[b]/0.0015[c]~~	-	-	-	-	-	~~0.000016~~	-	-	-	~~0.0075~~	-	-	-	-	-
		~~Agricultural Uses~~	~~N/A~~	~~Irrigation~~	~~5~~	-	~~0.1~~	-	~~0.1~~	~~0.50-6[d]~~	~~0.0051~~	~~0.0049[b]/0.008[c]~~	~~0.05~~	~~0.2-1[d]~~	~~5~~	~~0.2~~	~~0.2~~	-	~~0.01~~	~~0.2~~	~~0.020-0.050[e]~~	-	-	-	~~0.01~~	~~0.1~~	~~1-5[f]~~
		~~Agricultural Uses~~	~~N/A~~	~~Livestock~~	~~5~~	-	~~0.025~~	-	~~0.1~~	~~5~~	~~0.08~~	~~0.05[b]/0.05[c]~~	~~1~~	~~0.5-5[d]~~	-	~~0.1~~	-	~~0.003~~	~~0.5~~	~~1~~	~~0.05~~	-	-	-	~~0.2~~	~~0.1~~	~~50~~
	Health Canada 2019	~~Community~~	~~N/A~~	~~Potable MAC^^~~	-	~~0.006~~	~~0.01~~	~~1~~	-	~~5~~	~~0.005~~	~~0.05~~	-	-	-	~~0.01~~	-	~~0.001~~	-	-	~~0.05~~	-	-	-	~~0.02~~	-	-
		~~Community~~	~~N/A~~	~~Potable AO (or OG)~~	~~[0.1/0.2]~~	-	-	-	-	-	-	-	-	~~1~~	~~0.3~~	-	~~0.05~~	-	-	-	-	-	-	-	-	-	~~<5.0~~
	FCSAP 2016	Residential / Parkland	N/A	Inhalation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Residential / Parkland	N/A	Soil Organisms Direct Contact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Residential / Parkland	N/A	Freshwater Life[g]	-	18	0.045	26	0.047	-	0.00015	0.0792	-	Notes below[a]	2.7	Notes below[a]	-	0.00023	0.65	Notes below[a]	0.0089	0.00089	0.0071	-	0.13	-	0.27
		~~Residential / Parkland~~	~~N/A~~	~~Marine Life~~	-	-	~~0.0125~~	~~0.5~~	~~0.1~~	~~5~~	~~0.00012~~	~~0.056~~	-	~~0.002~~	-	~~0.002~~	-	~~0.000016~~	-	~~0.083~~	~~0.054~~	~~0.0015~~	-	-	-	-	~~0.01~~
		Commercial	N/A	Inhalation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Commercial	N/A	Soil Organisms Direct Contact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Commercial	N/A	Freshwater Life[g]	-	18	0.045	26	0.047	-	0.00015	0.0792	-	Notes below[a]	2.7	Notes below[a]	-	0.00023	0.65	Notes below[a]	0.0089	0.00089	0.0071	-	0.13	-	0.27
		~~Commercial~~	~~N/A~~	~~Marine Life~~	-	-	~~0.0125~~	~~0.5~~	~~0.1~~	~~5~~	~~0.00012~~	~~0.056~~	-	~~0.002~~	-	~~0.002~~	-	~~0.000016~~	-	~~0.083~~	~~0.054~~	~~0.0015~~	-	-	-	-	~~0.01~~
Secondary	OMOE 2011	-	~~Coarse~~	~~Non-Potable - MOE Water RL[b]~~	-	~~0.0005~~	~~0.001~~	~~0.002~~	~~0.0005~~	~~0.01~~	~~0.0005~~	~~0.01[d]~~	~~0.001~~	~~0.005~~	-	~~0.001~~	-	~~0.0001~~	~~0.0005~~	~~0.001~~	~~0.005~~	~~0.0003~~	~~0.0005~~	-	~~0.002~~	~~0.0005~~	~~0.005~~
		-	~~Coarse~~	~~Non-Potable - Ont. GW Bkgrd[b]~~	-	~~0.0015~~	~~0.013~~	~~0.61~~	~~0.0005~~	~~1.7~~	~~0.0005~~	~~0.025[d]~~	~~0.0038~~	~~0.005~~	-	~~0.0019~~	-	~~0.0001~~	~~0.023~~	~~0.014~~	~~0.005~~	~~0.0003~~	~~0.0005~~	-	~~0.0089~~	~~0.0039~~	~~0.16~~
		-	Coarse	Non-Potable - GW2 Residential	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00029	-	-	-	-	-	-	-	-	-
		-	Coarse	Non-Potable - GW2 Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0061	-	-	-	-	-	-	-	-	-
		-	Coarse	Non-Potable - GW2 Residential Odour	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	Coarse	Non-Potable - GW2 Industrial Odour	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	Coarse	Non-Potable - GW3	-	20	1.9	29	0.067	45	0.0027	0.14[d]	0.066	0.087	-	0.025	-	1.3E+10	9.2	0.49	0.063	0.0015	0.51	-	0.42	0.25	1.1
		-	Coarse	Non-Potable - 1/2 Solubility	-	12,000	17,000	27,000	75,000	22,000	62,000	6,000[d]	44,000	210,000	-	4,800	-	0.03	38,000	210,000	41,000	35,000	13,000	-	-	43,000	170,000
SELECTED CRITERIA SUMMARY ACCORDING TO LAND USE AND WATER USE																											
				Applicable Regulatory Guideline	**0.89**	**18**	**0.045**	**26**	**0.047**	**13.4**	**0.00015**	**0.079**	**-**	**-**	**2.7**	**-**	**-**	**0.00023**	**0.65**	**0.49**	**0.0089**	**0.00089**	**0.0071**	**-**	**0.13**	**0.1**	**0.27**

ANALYTICAL RESULTS																											
SAMPLE LOCATIONS AND DESCRIPTIONS		DISSOLVED METALS																									
Monitoring Well Name	Date (d-m-y)	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Boron (mg/L)	Cadmium (mg/L)	Chromium (Trivalent) (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Molybdenum (mg/L)	Nickel (mg/L)	Selenium (mg/L)	Silver (mg/L)	Thallium (mg/L)	Tin (mg/L)	Uranium (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
19MW02	16-Jul-2019	0.11	<0.00060	0.00042	0.18	<0.0010	0.086	0.000078	<0.0010	0.00088	0.0014	0.33	0.0011	0.3	-	0.0036	0.0042	0.00035	<0.00010	<0.00020	<0.0010	0.0076	<0.0010	0.048
19MW03	16-Jul-2019	**2.3**	<0.00060	0.0043	0.19	<0.0010	0.20	**0.00077**	0.0062	0.0068	0.012	**7.5**	0.0036	2.7	-	0.0040	0.019	0.00040	<0.00010	0.00022	<0.0010	0.0089	0.012	**0.41**
19MW04	16-Jul-2019	**8**	0.00095	0.0090	0.27	<0.0010	0.23	**0.00072**	0.020	0.012	0.023	**20**	0.0087	1.5	-	0.0098	0.036	0.00049	0.00015	0.00041	0.0024	0.0084	0.038	**0.50**

Document Control:	Revision	Version	Entered by	Entered on	Checked by	Last checked	Last printed
	0	1.1	AG	20-Mar-2020	ML	20-Mar-2020	31-Mar-2020

File Name: 400-299 R01 T06 GWTotalMetals.xlsx

References:
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- Health Canada. (2019). *Guidelines for Canadian Drinking Water Quality - Summary Table.* Ottawa, ON: Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada. Ottawa, ON.
- OMOE (Ontario Ministry of the Environment) (2011, April 15). *Soil, Ground Water and Sediment Standards for Use Under Part XV.I or the Environmental Protection Act* . (PIBS # 7382e01). Ministry of the Environment. Ontario.

Legend:

d-m-y =	Day-month-year	MAC =	Maximum acceptable concentration	GW1 =	Ingestion of potable groundwater
mg/L =	Milligrams per litre	AO =	Aesthetic objective	GW2 =	Inhalation of indoor air containing soil vapour from groundwater
N/A =	Not applicable	OG =	Operational guidance values	GW3 =	Exposure to aquatic biota via groundwater discharge to surface water

MOE =	Ministry of Environment		
< =	Less than		
- =	No guideline / not tested		

Notes:
___ - Underline and shaded indicates the most stringent applicable regulatory guideline.
Bold - Bold and shaded indicates applicable guideline exceedance.
~~Strikethrough~~ - Indicates a pathway and its applicable guidelines that have been excluded.
^^ - As per Summary of Guidelines for Canadian Drinking Water Quality [04/04], Federal - Provincial - Territorial Committee on Drinking Water
[a] - Calculated based on water hardness. Refer to AEP Tier 1 guidelines, Appendix B (AEP, 2019) in conjunction with Environmental Quality Guidelines for Alberta Surface Waters (Table 1.3 [GOA, 2018]).
[b] - Trivalent chromium criteria.
[c] - Hexavalent chromium criteria.
[d] - Guidelines are species specific.
[e] - Selenium guidelines: 20 micrograms per litre (µg/L) for continuous use; 50 µg/L for intermittent use.
[f] - Zinc guideline = 1,000 µg/L when soil pH is <6.5; 5,000 µg/L when soil pH is >6.5.
[g] - Guideline has been multiplied by a distance adjustment factor of 8.9, which is applicable for the distance to the nearest surface waterbodies of 250 to 299 m (FCSAP, 2016).

APPENDIX A

Trace Associates Inc. Environmental Report – General Conditions

Environmental Report – General Conditions

1.0 Use of Report

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of Trace Associates Inc.'s (Trace's) client. Trace does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Trace's client (hereunder referred to as the "Client") or an approved agent of the Client. Any unauthorized use of or reliance on the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of Trace. The Client agrees that it shall use the report for its own internal purposes and it shall not provide the report to another party other than an approved agent.

2.0 Limitation of Report

This report is based solely on the conditions that existed on site at the time of Trace's investigation. The Client, and any other parties using this report with the express written consent of the Client and Trace, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The Client, and any other party using this report with the express written consent of the Client and Trace, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The Client acknowledges that Trace is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the site, the decisions on which are the sole responsibility of the Client.

3.0 Information Provided to Trace by Others

During the performance of the work and the preparation of this report, Trace may have relied on information provided by persons other than the Client. While Trace endeavours to verify the accuracy of such information when instructed to do so by the Client, Trace accepts no responsibility for the accuracy or the reliability of such information that may affect the report.

4.0 Limitation of Liability

The Client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising from the presence of those materials. In consideration of these risks, and in consideration of Trace providing the services requested, the Client agrees that Trace's liability shall be limited as follows:

(1) With respect to any claims brought against Trace by the Client for damages of any kind whatsoever, including without limitation, incidental, consequential, exemplary or punitive, for any reason whatsoever arising out of the provision or failure to provide services hereunder the amount of such claim and the extent of Trace's liability shall be limited to the amount of fees paid by the Client to Trace under this Agreement.

(2) With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the Client agrees to indemnify, defend, and hold harmless Trace from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by Trace.

5.0 Job Site Safety

Trace is only responsible for the activities of its employees on the job site and is not responsible for the safety or supervision of any other persons whatsoever. The presence of Trace personnel on the job site shall not be construed in any way to relieve the Client or any other persons on site from their responsibility for job site safety.

T 1.877.418.7223 (1.877.41TRACE)
www.traceassociates.ca

6.0 Disclosure of Information by Client

The Client agrees to fully cooperate with Trace with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client acknowledges that in order for Trace to properly provide the service, Trace requires and shall rely upon the full disclosure and accuracy of any and all such information.

7.0 Standard of Care

Services performed by Trace for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering and scientific judgment have been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

8.0 Emergency Procedures

The Client undertakes to inform Trace of all hazardous conditions, or possible hazardous conditions that are known to it. The Client recognizes that the activities of Trace may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency procedures to protect Trace employees, other persons, and the environment. These procedures may involve additional costs outside of any budgets previously agreed upon. The Client agrees to pay Trace for any expenses incurred as a result of such discoveries and to compensate Trace through payment of additional fees and expenses for time spent by Trace to deal with the consequences of such discoveries.

9.0 Notification of Authorities

The Client acknowledges that in certain instances the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the Client agrees that notification to such bodies or persons, as required, may be done by Trace in its reasonably exercised discretion.

10.0 Ownership of Instruments of Service

The Client acknowledges that all reports, plans, and data generated by Trace during the performance of the work and other documents prepared by Trace are considered its professional work product and shall remain the copyright property of Trace.

11.0 Alternate Report Format

Where Trace submits both electronic file and hard copy versions of reports, drawings and other documents and deliverables (collectively termed "Trace's instruments of professional service"), the Client agrees that only the signed and stamped versions shall be considered final and legally binding. Trace shall keep the original electronic documents for record and working purposes, and, in the event of a dispute or discrepancies, Trace’s electronic copy shall govern.

The Client agrees that both electronic file and hard copy versions of Trace's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Trace. The Client warrants that Trace's instruments of professional service will be used only and exactly as submitted by Trace and for the purpose for which such instruments of professional service were intended.

The Client recognizes and agrees that electronic files submitted by Trace have been prepared and submitted using specific software and hardware systems. Trace makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

12.0 Governing Law

The validity, construction and performance of this Agreement shall be governed by the laws in effect in the Province of Alberta.

APPENDIX B

Desktop Review

Well_PID: 1184
Owner: UNKNOWN
Driller: MANITOBA GOVERNMENT
Well Name:
Well Use: PRODUCTION
Water Use: Domestic
UTMX: 394090.8380
UTMY: 5666925.30
Accuracy XY: UNKNOWN
UTMZ:
Accuracy Z:
Date Completed: 1913 Nov 29

WELL LOG

From (ft.)	To (ft.)	Log
0	75.0	SAND AND CLAY
75.0	164.9	BLUE CLAY AND SHALE
164.9	179.9	ROCK, SALTY WATER

No construction data for this well.

Top of Casing: 0 ft. below ground

No pump test data for this well.

Location: 9-25-22W

Well_PID: 52064
Owner: M SYDOR
Driller: Wescan Drilling Ltd.
Well Name:
Well Use: PRODUCTION
Water Use: Domestic,Livestock
UTMX: 395356.81
UTMY: 5667302.32
Accuracy XY: UNKNOWN
UTMZ:
Accuracy Z:
Date Completed: 1984 Jul 21

WELL LOG

From (ft.)	To (ft.)	Log
0	18.0	TILL; BROWN, BOULDERS
18.0	19.0	TILL; GRAVELLY
19.0	26.0	TILL; GREY

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	26.0	casing	30.00				GALVANIZED
16.0	26.0	perforations	30.00				GALVANIZED
0	0	gravel pack					

Top of Casing: 0 ft. below ground

PUMPING TEST

Date:
Pumping Rate: 0 Imp. gallons/minute
Water level before pumping: 11.0 ft. below ground
Pumping level at end of test: ?? ft. below ground
Test duration: hours, minutes
Water temperature: ?? degrees F

Location: NE9-25-22W

Well_PID: 154994
Owner: MURRAY S. GARA
Driller: UNKNOWN
Well Name:
Well Use: PRODUCTION
Water Use: Domestic
UTMX: 395347
UTMY: 5667293
Accuracy XY: 1 EXACT [<5M] [GPS]
UTMZ: 400
Accuracy Z: 4 FAIR - Shuttle at Centroid
Date Completed: 1900 Jan 01

No well log data for this well.

No construction data for this well.

Top of Casing:

No pump test data for this well.

REMARKS

DRILL DATE UNKNOWN. NO LOG. 223 HEATH AVE WEST. GILBERT PLAINS

Location: NE9-25-22W

Well_PID: 154993
Owner: LIONEL DEBAETS
Driller: UNKNOWN
Well Name:
Well Use: PRODUCTION
Water Use: Domestic
UTMX: 395742
UTMY: 5668063
Accuracy XY: 1 EXACT [<5M] [GPS]
UTMZ: 400
Accuracy Z: 4 FAIR - Shuttle at Centroid
Date Completed: 1900 Jan 01

No well log data for this well.

No construction data for this well.

Top of Casing:

No pump test data for this well.

REMARKS

DRILL DATE UNKNOWN. NO LOG. 21 MACORMIA AVE. WEST. GILBERT PLAINS

Location: NE9-25-22W

Well_PID: 154976
Owner: TYRONE SANKO
Driller: UNKNOWN
Well Name:
Well Use: PRODUCTION
Water Use: Domestic

UTMX: 395435
UTMY: 5667156
Accuracy XY: 1 EXACT [<5M] [GPS]
UTMZ: 400
Accuracy Z: 4 FAIR - Shuttle at Centroid
Date Completed: 1900 Jan 01

No well log data for this well.

No construction data for this well.

Top of Casing:

No pump test data for this well.

REMARKS

DRILL DATE UNKNOWN. NO LOG. 205 KING ST. GILBERT PLAINS

Location: NE9-25-22W

Well_PID: 160744
Owner: JOHN JUBENVILL
Driller: UNKNOWN
Well Name: 2010-02
Well Use: PRODUCTION
Water Use: Domestic
UTMX: 395894
UTMY: 5667735
Accuracy XY:
UTMZ:
Accuracy Z: UNKNOWN
Date Completed: 1900 Jan 01

No well log data for this well.

No construction data for this well.

Top of Casing:

No pump test data for this well.

REMARKS

DRILL DATE UNKNOWN. NO LOG. 306 MAIN ST. GILBERT PLAINS, MB

Accuracy Z: UNKNOWN
Date Completed: 1963 Jun 09

WELL LOG

From (ft.)	To (ft.)	Log
0	2.0	SAND AND GRAVEL
2.0	5.0	GREY CLAYEY SILT
5.0	9.0	SAME WITH PEBBLES
9.0	14.0	GREY TILL
14.0	19.0	GREY TILL, STIFFER
19.0	24.0	GREY TILL
24.0	27.0	GREY SILTY FINE TO MEDIUM SAND
27.0	36.0	GREY SILTY FINE TO COARSE SAND AND GRAVEL AND BOULDERS
36.0	39.0	DARK GREY SHALE

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	0	casing	2.50				

Top of Casing: 0 ft. below ground

PUMPING TEST

Date: 1963 Jun 09
Pumping Rate: 45.000 Imp. gallons/minute
Water level before pumping: 6.0 ft. below ground
Pumping level at end of test: ?? ft. below ground
Test duration: ??? hours, ?? minutes
Water temperature: ?? degrees F

REMARKS

AT DAM SITE #1 ON RIVER APPROX 15 FT FROM NORTH BANK OF RIVER, AT 26.5 FT FIRST FLOWING WATER AT 2 IGPM, AT 30 FT 8 IGPM, AT 33.5 FT 15 IGPM, AT 35 FT 20 IGPM, CHEMICAL ANALYSIS, GROUND LEVEL ELEV EST 1265 FT

Location: SE9-25-22W

Well_PID: 154978
Owner: JOHN ZAPLITHNY

Driller: UNKNOWN
Well Name:
Well Use: PRODUCTION
Water Use: Domestic
UTMX: 395456
UTMY: 5667304
Accuracy XY: 1 EXACT [<5M] [GPS]
UTMZ: 398
Accuracy Z: 4 FAIR - Shuttle at Centroid
Date Completed: 1900 Jan 01

No well log data for this well.

No construction data for this well.

Top of Casing:

No pump test data for this well.

REMARKS

DRILL DATE UNKNOWN. NO LOG

Location: SE9-25-22W

Well_PID: 154977
Owner: TOWN OF GILBERT PLAINS
Driller: UNKNOWN
Well Name:
Well Use: PRODUCTION
Water Use: Domestic
UTMX: 395886
UTMY: 5667196
Accuracy XY: 1 EXACT [<5M] [GPS]
UTMZ: 398
Accuracy Z: 4 FAIR - Shuttle at Centroid
Date Completed: 1900 Jan 01

No well log data for this well.

No construction data for this well.

Top of Casing:

No pump test data for this well.

From (ft.)	To (ft.)	Log
0	18.0	TILL; BROWN, BOULDERS
18.0	19.0	TILL; GRAVELLY
19.0	26.0	TILL; GREY

WELL CONSTRUCTION

From (ft.)	To (ft.)	Casing Type	Inside Dia.(in)	Outside Dia.(in)	Slot Size(in)	Type	Material
0	26.0	casing	30.00				GALVANIZED
16.0	26.0	perforations	30.00				GALVANIZED
0	0	gravel pack					

Top of Casing: 0 ft. below ground

PUMPING TEST

Date:
Pumping Rate: 0 Imp. gallons/minute
Water level before pumping: 11.0 ft. below ground
Pumping level at end of test: ?? ft. below ground
Test duration: hours, minutes
Water temperature: ?? degrees F

Location: NE9-25-22W

Well_PID: 154994
Owner: MURRAY S. GARA
Driller: UNKNOWN
Well Name:
Well Use: PRODUCTION
Water Use: Domestic
UTMX: 395347
UTMY: 5667293
Accuracy XY: 1 EXACT [<5M] [GPS]
UTMZ: 400
Accuracy Z: 4 FAIR - Shuttle at Centroid
Date Completed: 1900 Jan 01

No well log data for this well.

No construction data for this well.

Top of Casing:

No pump test data for this well.

REMARKS

DRILL DATE UNKNOWN. NO LOG. 223 HEATH AVE WEST. GILBERT PLAINS

Location: NE9-25-22W

Well_PID: 154993
Owner: LIONEL DEBAETS
Driller: UNKNOWN
Well Name:
Well Use: PRODUCTION
Water Use: Domestic
UTMX: 395742
UTMY: 5668063
Accuracy XY: 1 EXACT [<5M] [GPS]
UTMZ: 400
Accuracy Z: 4 FAIR - Shuttle at Centroid
Date Completed: 1900 Jan 01

No well log data for this well.

No construction data for this well.

Top of Casing:

No pump test data for this well.

REMARKS

DRILL DATE UNKNOWN. NO LOG. 21 MACORMIA AVE. WEST. GILBERT PLAINS

Location: NE9-25-22W

Well_PID: 154976
Owner: TYRONE SANKO
Driller: UNKNOWN
Well Name:
Well Use: PRODUCTION
Water Use: Domestic

REMARKS

DRILL DATE UNKNOWN. NO LOG

Location: SE9-25-22W

Well_PID: 193814
Owner: GILBERT PLAINS MUNICIPALITY
Driller: UNKNOWN
Well Name: 2015-107
Well Use: PRODUCTION
Water Use: DOMESTIC
UTMX: 395420
UTMY: 5667235
Accuracy XY: 1 EXACT [<5M] [GPS]
UTMZ: 398
Accuracy Z: 4 FAIR - Shuttle at Centroid
Date Completed: 1900 Jan 01

No well log data for this well.

No construction data for this well.

Top of Casing: 1.000 ft. above ground

No pump test data for this well.

REMARKS

PHANTOM WELL . UNKNOWN DRILLING DATE . BOX 220 , GILBERT PLAINS MB , R0L 0X0 .LOT 4 BLOCK 10 PLAN 365 WEST 1/2 . RM OF GILBERT PLAINS .

Location: SE-9-25-22W

Well_PID: 12718
Owner: GSC
Driller: G.S.C.
Well Name: A.H. #16-69
Well Use: TEST WELL
Water Use:
UTMX: 395744.02

Permit #	Business Name	Expiry Date	Type of Facility	Name
27663	FRONTIER SCHOOL DIVISION - BROCHET	03-31-20	Above Ground Storage Tank(s)	Brochet
41810	G C FARMS LTD	09-30-20	Above Ground Storage Tank(s)	Lorne
31698	GARDAN GAS BAR	09-30-20	Under Ground Storage Tank(s)	Winnipeg
25141	GARDEWINE NORTH - 60 EAGLE DR	09-30-20	Above Ground Storage Tank(s)	Winnipeg
25139	GARDEWINE NORTH - THOMPSON	09-30-20	Above Ground Storage Tank(s)	Thompson
21915	GARSON GROCERY	06-30-20	Above Ground Storage Tank(s)	Brokenhead
44566	GATEWAY GAS BAR & C-STORE	10-31-21	Above Ground Storage Tank(s)	Bifrost
32538	GAUDET FARMS	09-30-20	Above Ground Storage Tank(s)	Lorne
20692	GEE TEE HOLDINGS	09-30-20	Above Ground Storage Tank(s)	Springfield
41744	GEE TEE HOLDINGS	09-30-20	Above Ground Storage Tank(s)	Oakbank
35264	GERALD HILDERBRAND	09-30-20	Above Ground Storage Tank(s)	Boissevain
31551	GERDAU MANITOBA METALLICS RAW MATERIALS	03-31-20	Above Ground Storage Tank(s)	Selkirk
43333	GFL ENVIRONMENTAL INC	06-30-20	Above Ground Storage Tank(s)	Flin Flon
23647	GFL ENVIRONMENTAL INC	12-31-22	Above Ground Storage Tank(s)	Winnipeg
33697	GFL ENVIRONMENTAL INC - STE ANNE FACILITY	06-30-20	Above Ground Storage Tank(s)	Ste. Anne
22696	GILBERT PLAINS CONSUMERS CO-OP - GAS BAR	09-30-20	Above Ground Storage Tank(s)	Gilbert Plains
43414	GILBERT PLAINS CONSUMERS CO-OPERATIVE	06-30-20	Above Ground Storage Tank(s)	Gilbert Plains
33433	GILL FARMS LTD	06-30-20	Above Ground Storage Tank(s)	Blanshard
35909	GILLAM CO-OP LTD	09-30-20	Above Ground Storage Tank(s)	Gillam
35591	GILMI AIRPORT - RM OF GIMLI	06-30-20	Above Ground Storage Tank(s)	Gimli
21707	GIMLI CO-OP GAS	06-30-20	Under Ground Storage Tank(s)	Gimli
23791	GIMLI HARBOUR AUTHORITY	09-30-20	Above Ground Storage Tank(s)	Gimli
20644	GIMLI HUSKY	03-31-20	Under Ground Storage Tank(s)	Gimli
35369	GRACE GENERAL HOSPITAL	06-30-20	Above Ground Storage Tank(s)	Winnipeg
23388	GRAND BEACH CENTRAL STATION	06-30-20	Above Ground Storage Tank(s)	St. Clements
27924	GRAND COLONY FARMS LTD	09-30-20	Above Ground Storage Tank(s)	Portage la Prairie
34499	GRAND RAPIDS ESSO	09-30-20	Above Ground Storage Tank(s)	Grand Rapids
28853	GRANITE RECREATIONAL PARK LTD	06-30-20	Above Ground Storage Tank(s)	Lac Du Bonnet
21692	GRANT DOMO - 582 PEMBINA HWY	09-30-20	Under Ground Storage Tank(s)	Winnipeg
20783	GRAYMONT WESTERN CANADA INC	09-30-20	Above Ground Storage Tank(s)	Grahamdale
34118	GRAYMONT WESTERN CANADA INC	09-30-20	Above Ground Storage Tank(s)	Grahamdale
25058	GREAT WEST LIFE ASSURANCE	09-30-20	Under Ground Storage Tank(s)	Winnipeg
35272	GREAT-WEST LIFE DATA CENTRE	09-30-20	Under Ground Storage Tank(s)	Winnipeg
34222	GREENVALLEY EQUIPMENT (2009) INC	09-30-20	Above Ground Storage Tank(s)	Stanley
32890	GREENWALD COLONY FARMS	09-30-20	Above Ground Storage Tank(s)	St. Clements
32539	GRENIER MINI-STOP	06-30-20	Above Ground Storage Tank(s)	Notre Dame de Lourdes
34169	GRENVILLE FARMS	03-31-20	Above Ground Storage Tank(s)	Portage la Prairie
24272	GREYHOUND - THOMPSON	06-30-20	Above Ground Storage Tank(s)	Thompson
34653	GRINDSTONE GENERAL STORE	06-30-20	Above Ground Storage Tank(s)	Grindstone Provincial Park
44561	H BAUDRY CONSTRUCTION (1980)	08-31-20	Jobsite Storage Tank(s)	Ritchot
41154	H BAUDRY CONSTRUCTION (1980)	08-31-20	Jobsite Storage Tank(s)	Ritchot
41150	H BAUDRY CONSTRUCTION (1980)	08-31-20	Jobsite Storage Tank(s)	Ritchot

APPENDIX C

Borehole Logs

BOREHOLE No. 19MW01

Client: Federated Co-operatives Limited	**Facility Name:** Gilbert Plains Cardlock	**Project Name:** Gilbert Plains Bulk Fuel and Cardlock Facility
Site Location: Gilbert Plains, MB	**Project No:** 400-299	**Date:** 13-Jun-2019
NAD83 (E,N): 395255.4 mE, 5667151.7 mN	**Total Depth of Hole:** 6.1 m	**Land Use:** Commercial
Projection/Datum: NAD83 / UTM 14N	**Drilling Contractor:** Intercore Environmental Services	**Slope Gradient/Position:** Flat
Hole Diameter: 6 inch (15 cm)	**Logged By:** A. Oleksyn	**Field Screening Type (PHC/Sal):** MiniRAE PID
Drilling Method: Direct Push	**Checked By:** M. Lakustiak	**Ground Cover/Vegetation:** Gravel Fill

SUBSURFACE PROFILE

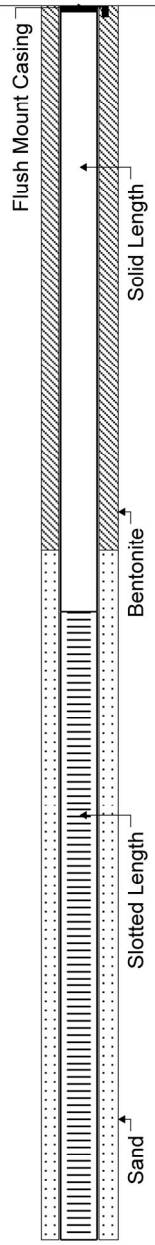
Depth (m)	Legend	Soil Description
0.0		Sand and Gravel Fill - fine sand to coarse gravel, dense, well graded, dry, brown, trace cobbles
0.5		Clay - hard high plasticity, dry, gray to brown, black discoloured pocket @ 1.1 m
1.0		Sand Trace Silt - dense, well graded, damp, brown, medium grained, trace coarse gravel
1.5		- moist
2.0		Clay - trace silt inclusion, stiff high plasticity, damp, brown, trace oxidation, trace black staining at 3.3 m, trace coarse gravel below 3.4 m, moist and firm below 3.4 m, dark brown below 3.55 m
2.5		
3.0		
3.5		
4.0		
4.5		
5.0		
5.5		
6.0		
6.5		End of hole at 6.1 m

SAMPLE INFORMATION

Sample Type (Vial/Jar)	Sample Depth (m)	Vapour (ppm)
-	0-0.5	2.4
-	0.5-1.0	2.4
J/V	1.0-1.5	2.6
-	1.5-2.0	1.7
-	2.0-2.5	1.8
-	2.5-3.0	1.5
-	3.0-3.5	1.9
-	3.5-4.0	1.7
J/V	4.0-4.5	1.4
-	4.5-5.0	0.9
-	5.0-5.5	1.0
-	5.5-6.0	1.5

Vapour (ppm) 50 150 250

Backfill / Construction



BOREHOLE No. 19MW02

Client: Federated Co-operatives Limited	**Facility Name:** Gilbert Plains Cardlock	**Project Name:** Gilbert Plains Bulk Fuel and Cardlock Facility
Site Location: Gilbert Plains, MB	**Project No:** 400-299	**Date:** 13-Jun-2019
NAD83 (E,N): 395277.6 mE, 5667178.9 mN	**Total Depth of Hole:** 6.1 m	**Land Use:** Commercial
Projection/Datum: NAD83 / UTM 14N	**Drilling Contractor:** Intercore Environmental Services	**Slope Gradient/Position:** Flat
Hole Diameter: 6 inch (15 cm)	**Logged By:** A. Oleksyn	**Field Screening Type (PHC/Sal):** MiniRAE PID
Drilling Method: Direct Push	**Checked By:** M. Lakustiak	**Ground Cover/Vegetation:** Gravel Fill

SUBSURFACE PROFILE / SAMPLE INFORMATION

Depth (m)	Legend	Soil Description	Sample Type (Vial/Jar)	Sample Depth (m)	Vapour (ppm)	Backfill / Construction
0		Sand Fill - fine to medium grained, trace coarse gravel, very dense, well graded, dry, brown	-	0-0.5	1.9	Flush Mount Casing
0.5		Clay - trace silt, hard, high plasticity, dry, brown, trace oxidation, black staining at 0.8 m	-	0.5-1.0	1.6	Bentonite
1.0			-	1.0-1.5	1.7	
1.5		Sand - medium grained, compact, well graded, damp, brown, oxidation, gravel and wet below 2.0 m	J/V	1.5-2.0	1.3	Solid Length
2.0			-	2.0-2.5	1.4	
2.5		Clay - firm, high plasticity, damp, brown, trace silt inclusions, trace oxidation, trace coarse gravel below 3.5 m	-	2.5-3.0	1.2	
3.0			J/V	3.0-3.5	1.3	Sand
3.5			-	3.5-4.0	1.1	
4.0		- soft, moist, dark brown	-	4.0-4.5	1.3	
4.5			-	4.5-5.0	0.8	Slotted Length
5.0			-	5.0-5.5	0.9	
5.5			-	5.5-6.0	0.8	
6.0						Bentonite
6.5		End of hole at 6.1 m				

BOREHOLE No. 19MW03

Client: Federated Co-operatives Limited	**Facility Name:** Gilbert Plains Cardlock	**Project Name:** Gilbert Plains Bulk Fuel and Cardlock Facility
Site Location: Gilbert Plains, MB	**Project No:** 400-299	**Date:** 13-Jun-2019
NAD83 (E,N): 395295.4 mE, 5667152.4 mN	**Total Depth of Hole:** 6.1 m	**Land Use:** Commercial
Projection/Datum: NAD83 / UTM 14N	**Drilling Contractor:** Intercore Environmental Services	**Slope Gradient/Position:** Flat
Hole Diameter: 6 inch (15 cm)	**Logged By:** A. Oleksyn	**Field Screening Type (PHC/Sal):** MiniRAE PID
Drilling Method: Direct Push	**Checked By:** M. Lakustiak	**Ground Cover/Vegetation:** Gravel Fill

SUBSURFACE PROFILE / SAMPLE INFORMATION

Depth (m)	Soil Description	Sample Type (Vial/Jar)	Sample Depth (m)	Vapour (ppm)	Backfill / Construction
0.0	Sand and Gravel Fill - fine sand to coarse gravel, dense, well graded, dry, brown	-	0-0.5	4.0	Flush Mount Casing
0.5	Clay with Silt - hard, high plasticity, damp, brown, trace oxidation, trace silt inclusions.	-	0.5-1.0	1.7	Bentonite
1.0		-	1.0-1.4	13.0	Solid Length
1.5	- with coarse sand, black Sand - medium grained, some coarse sand to fine gravel, compact, well graded, moist, brown - wet	J/V	1.4-2.2	22.0	Sand
2.0	- staining and PHC odour				
2.5	Clay - stiff, high plasticity, damp, gray, PHC odour	J/V	2.2-2.5	222.7	Slotted Length
	- brown, reduced odour	-	2.5-3.0	69.5	
3.0	- oxidation	J/V	3.0-3.5	28.5	
3.5		J/V	3.5-3.75	3.1	Bentonite
4.0	Clay Till - soft, high plasticity, wet, dark brown, trace coarse gravel	-	3.75-4.5	1.3	
4.5		-	4.5-5.25	2.2	
5.0				2.5	
5.5		-	5.25-6.0		
6.0					
6.5	End of hole at 6.1 m				

BOREHOLE No. 19MW04

Client: Federated Co-operatives Limited	**Facility Name:** Gilbert Plains Cardlock	**Project Name:** Gilbert Plains Bulk Fuel and Cardlock Facility
Site Location: Gilbert Plains, MB	**Project No:** 400-299	**Date:** 13-Jun-2019
NAD83 (E,N): 395299.5 mE, 5667136.8 mN	**Total Depth of Hole:** 6.1 m	**Land Use:** Commercial
Projection/Datum: NAD83 / UTM 14N	**Drilling Contractor:** Intercore Environmental Services	**Slope Gradient/Position:** Flat
Hole Diameter: 6 inch (15 cm)	**Logged By:** A. Oleksyn	**Field Screening Type (PHC/Sal):** MiniRAE PID
Drilling Method: Direct Push	**Checked By:** M. Lakustiak	**Ground Cover/Vegetation:** Gravel Fill

SUBSURFACE PROFILE / SAMPLE INFORMATION

Depth (m)	Soil Description	Sample Type (Vial/Jar)	Sample Depth (m)	Vapour (ppm)	Backfill / Construction
0	Sand and Gravel Fill - fine sand to coarse gravel, very dense, well graded, dry, brown	-	0-0.5	2.5	Flush Mount Casing
0.5	Clay - some silt, very stiff, high plasticity, damp, brown, trace oxidation	-	0.5-1.0	2.0	Bentonite
1.0	- black	-	1.0-1.5	1.5	Solid Length
1.5	Sand - medium grained, trace coarse sand and fine gravel, dense, well graded,moist, brown, trace oxidation	J	1.5-2.0	0.7	Sand
2.0	- saturated, no odour	J	2.0-2.5	0.6	
2.5	Clay - stiff, high plasticity, damp, brown, oxidation, silt inclusions	-	2.5-3.0	1.0	Slotted Length
3.0		-	3.0-3.5	0.9	
3.5	Clay Till - trace coarse gravel, trace silt, stiff, high plasticity, damp, grey	-	3.5-4.0	1.0	
4.0	- firm, moist	-	4.0-4.5	1.1	Bentonite
4.5		-	4.5-5.0	0.7	
5.0		-	5.0-5.5	0.5	
5.5		-	5.5-6.0	0.5	
6.0	End of hole at 6.1 m				
6.5					

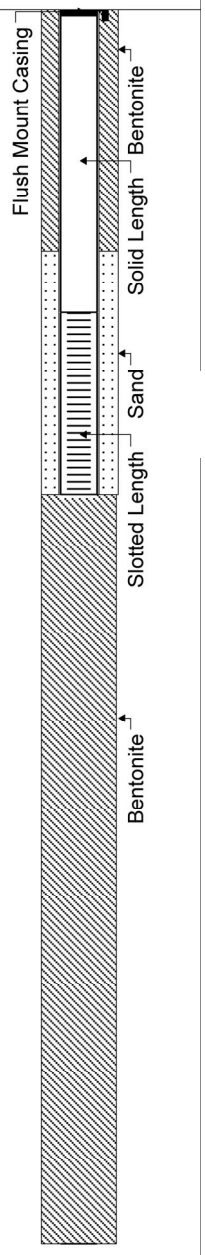
Vapour (ppm) scale: 50 150 250

BOREHOLE No. 19MW05

Client: Federated Co-operatives Limited	**Facility Name:** Gilbert Plains Cardlock	**Project Name:** Gilbert Plains Bulk Fuel and Cardlock Facility
Site Location: Gilbert Plains, MB	**Project No:** 400-299	**Date:** 13-Jun-2019
NAD83 (E,N): 395302.0 mE, 5667167.6 mN	**Total Depth of Hole:** 6.1 m	**Land Use:** Commercial
Projection/Datum: NAD83 / UTM 14N	**Drilling Contractor:** Intercore Environmental Services	**Slope Gradient/Position:** Flat
Hole Diameter: 6 inch (15 cm)	**Logged By:** A. Oleksyn	**Field Screening Type (PHC/Sal):** MiniRAE PID
Drilling Method: Direct Push	**Checked By:** M. Lakustiak	**Ground Cover/Vegetation:** Gravel Fill

SUBSURFACE PROFILE / SAMPLE INFORMATION

Depth (m)	Soil Description	Sample Type (Vial/Jar)	Sample Depth (m)	Vapour (ppm)
0.0	Topsoil - some sand and gravel fill, soft, low plasticity, damp, black, increasing silt and clay content below 0.7 m	-	0-0.5	2.3
0.5		-	0.5-1.0	4.1
1.0	Sand - some silt, medium grained, compact, well graded, moist, brown, oxidized	-	1.0-1.5	1.5
1.5	- trace fine gravel and coarse sand, wet	J/V	1.5-2.0	1.0
2.0	Clay - silt inclusions, stiff, high plasticity, damp, brown	J/V	2.0-2.5	1.0
2.5		-	2.5-3.0	1.1
3.0	- grey	-	3.0-3.5	0.6
3.5		J/V	3.5-4.0	2.1
4.0	Clay Till - trace coarse gravel, firm, high plasticity, moist, dark brown	B	4.0-4.5	1.3
4.5		-	4.5-5.0	1.3
5.0		-	5.0-5.5	1.1
5.5		-	5.5-6.0	0.5
6.0	End of hole at 6.1 m			
6.5				



BOREHOLE No. 19MW06

Client: Federated Co-operatives Limited	**Facility Name:** Gilbert Plains Cardlock	**Project Name:** Gilbert Plains Bulk Fuel and Cardlock Facility
Site Location: Gilbert Plains, MB	**Project No:** 400-299	**Date:** 13-Jun-2019
NAD83 (E,N): 395277.0 mE, 5667128.6 mN	**Total Depth of Hole:** 9.1 m	**Land Use:** Commercial
Projection/Datum: NAD83 / UTM 14N	**Drilling Contractor:** Intercore Environmental Services	**Slope Gradient/Position:** Flat
Hole Diameter: 6 inch (15 cm)	**Logged By:** A. Oleksyn	**Field Screening Type (PHC/Sal):** MiniRAE PID
Drilling Method: Direct Push	**Checked By:** M. Lakustiak	**Ground Cover/Vegetation:** Gravel Fill

SUBSURFACE PROFILE			SAMPLE INFORMATION			
Depth (m)	Legend	Soil Description	Sample Type (Vial/Jar)	Sample Depth (m)	Vapour (ppm) 50 150 250	Backfill / Construction
0.0		Sand and Gravel Fill - fine sand to coarse gravel, very dense, well graded, dry, brown	-	0-0.5	1.3	Flush Mount Casing
0.5		Topsoil - very stiff, low plasticity, damp, black	-	0.5-1.0	1.7	
1.0			-	1.0-1.5	1.6	
1.5		Sand - medium grained, compact, well graded, moist, brown, oxidized	GS	1.5-2.0	1.1	Solid Length
2.0		- wet	J	2.0-2.5	2.5	
2.5		Clay - silt inclusions, firm, high plasticity, moist, brown, oxidation, trace organic staining at 2.4 m	-	2.5-3.0	1.9	
3.0			-	3.0-3.5	1.6	
3.5		Clay Till - trace coarse gravel, stiff, high plasticity, moist, brown, oxidation	-	3.5-4.0	0.6	
4.0			-	4.0-4.5	2.4	Bentonite
4.5			-	4.5-5.0	0.6	
5.0		Clay Till - trace coarse gravel, firm, high plasticity, moist, grey	-	5.0-5.5	1.6	
5.5		Clay - trace silt, inclusions, firm, high plasticity, moist, grey	-	5.5-6.0	1.0	
6.0			-	6.0-6.5	1.6	
6.5			-	6.5-7.0	0.9	
7.0			-	7.0-7.5	1.6	
7.5			GS	7.5-8.0	1.1	Sand
8.0			-	8.0-8.5	1.3	
8.5		Clay Till - trace coarse and fine gravel, firm, medium plasticity, wet, grey	J	8.5-9.0	1.1	Slotted Length
9.0		End of hole at 9.1 m				
9.5						

BOREHOLE No. 19MW07

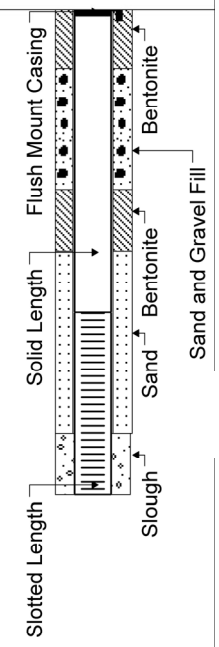
Client: Federated Co-operatives Limited	**Facility Name:** Gilbert Plains Cardlock	**Project Name:** Gilbert Plains Bulk Fuel and Cardlock Facility
Site Location: Gilbert Plains, MB	**Project No:** 400-299	**Date:** 16-Jul-2019
NAD83 (E,N): 395323.4 mE, 5667151.9 mN	**Total Depth of Hole:** 2.5 m	**Land Use:** Commercial
Projection/Datum: NAD83 / UTM 14N	**Drilling Contractor:** Intercore Environmental Services	**Slope Gradient/Position:** Flat
Hole Diameter: 3 inch (7.6 cm)	**Logged By:** A. Gabriel	**Field Screening Type (PHC/Sal):** MiniRAE PID
Drilling Method: Hydrovac / Hand Auger	**Checked By:** M. Lakustiak	**Ground Cover/Vegetation:** Gravel Fill

SUBSURFACE PROFILE

SAMPLE INFORMATION

Depth (m)	Legend	Soil Description	Sample Type (Vial/Jar)	Sample Depth (m)	Vapour (ppm) 50 150 250
0.0		Topsoil - some silt, some clay, trace sand, low plasticity, firm, moist, dark brown, organic	-	0-2.0	
0.5		Clay - some silt, medium plasticity, moist, firm-stiff, brown, trace oxidation			
1.0					
1.5		Sand - trace silt, medium grained, well graded, moist, compact, brown			
2.0		- wet	J/V	2.0-2.5	
2.5		Clay - some silt, medium plasticity, moist, firm-stiff, brown, trace oxidation			
3.0		End of hole at 2.5 m			
3.5					
4.0					
4.5					
5.0					
5.5					
6.0					
6.5					

Backfill / Construction



APPENDIX D

Laboratory Analytical Reports

Your P.O. #: 400-299
Your Project #: 400-299
Site Location: GILBERT PLAINS, MB

Attention: JON GUDMUNDSSON

TRACE ASSOCIATES INC.
Suite100, 320 Gardiner Park Ct
Regina, SK
Canada S4V 1R9

Report Date: 2019/07/04
Report #: R2747542
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: B947160
Received: 2019/06/17, 11:45

Sample Matrix: Soil
Samples Received: 18

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS/FID (MeOH extract) (1, 2)	13	N/A	2019/06/20	AB SOP-00039	CCME CWS/EPA 8260d m
BTEX/F1 by HS GC/MS/FID (MeOH extract) (1, 2)	2	N/A	2019/07/03	AB SOP-00039	CCME CWS/EPA 8260d m
F1-BTEX (1)	13	N/A	2019/06/21		Auto Calc
F1-BTEX (1)	2	N/A	2019/07/04		Auto Calc
CCME Hydrocarbons (F2-F4 in soil) (3)	12	2019/06/17	2019/06/18	WIN SOP-00056	CCME PHC-CWS m
CCME Hydrocarbons (F2-F4 in soil) (3)	1	2019/06/17	2019/06/20	WIN SOP-00056	CCME PHC-CWS m
CCME Hydrocarbons (F2-F4 in soil) (1, 3)	2	2019/07/02	2019/07/03	AB SOP-00036	CCME PHC-CWS m
Moisture	13	N/A	2019/06/18	WIN SOP-00060	CCME PHC-CWS m
Moisture (1)	2	N/A	2019/07/03	AB SOP-00002	CCME PHC-CWS m
Texture by Hydrometer (1)	3	N/A	2019/06/21	AB SOP-00030	Carter 2nd ed 55.3 m
Texture Class (1)	3	N/A	2019/06/21		Auto Calc

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by BV Labs Calgary Environmental
(2) No lab extraction date is given for F1BTEX & VOC samples that are field preserved with methanol. Extraction date is date sampled unless otherwise stated.

Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Your P.O. #: 400-299
Your Project #: 400-299
Site Location: GILBERT PLAINS, MB

Attention: JON GUDMUNDSSON

TRACE ASSOCIATES INC.
Suite100, 320 Gardiner Park Ct
Regina, SK
Canada S4V 1R9

Report Date: 2019/07/04
Report #: R2747542
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BV LABS JOB #: B947160
Received: 2019/06/17, 11:45

(3) All CCME results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Bureau Veritas Laboratories conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following Alberta Environment's Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil, Validation of Performance-Based Alternative Methods September 2003. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Linsay Sunderman, Key Account Specialist
Email: Lsunderman@bvlabs.com
Phone# (403)735-2237 Ext:2237

==========

BV Labs 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.

Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

BV Labs Job #: B947160
Report Date: 2019/07/04

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: JS

AT1 BTEX AND F1-F4 IN SOIL (VIALS)

BV Labs ID		VX1835	VX1835	VX1836	VX1837	VX1837		
Sampling Date		2019/06/13 15:00	2019/06/13 15:00	2019/06/13 15:10	2019/06/13 16:00	2019/06/13 16:00		
	UNITS	19MW01 1.0-1.5	19MW01 1.0-1.5 Lab-Dup	19MW01 4.0-4.5	19MW02 1.5-2.0	19MW02 1.5-2.0 Lab-Dup	RDL	QC Batch
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	<10	<10	N/A	10	9471030
F3 (C16-C34 Hydrocarbons)	mg/kg	<50	<50	<50	<50	N/A	50	9471030
F4 (C34-C50 Hydrocarbons)	mg/kg	<50	<50	<50	<50	N/A	50	9471030
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	N/A	9471030
Physical Properties								
Moisture	%	12	N/A	21	11	11	0.30	9471051
Volatiles								
Xylenes (Total)	mg/kg	<0.045	N/A	<0.045	<0.045	N/A	0.045	9470450
F1 (C6-C10) - BTEX	mg/kg	<10	N/A	<10	<10	N/A	10	9470450
Field Preserved Volatiles								
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	N/A	0.0050	9472838
Toluene	mg/kg	<0.050	<0.050	<0.050	<0.050	N/A	0.050	9472838
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	N/A	0.010	9472838
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	N/A	0.040	9472838
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	N/A	0.020	9472838
F1 (C6-C10)	mg/kg	<10	<10	<10	<10	N/A	10	9472838
Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	93	89	93	89	N/A	N/A	9472838
4-Bromofluorobenzene (sur.)	%	104	104	102	105	N/A	N/A	9472838
D10-o-Xylene (sur.)	%	122	115	117	108	N/A	N/A	9472838
D4-1,2-Dichloroethane (sur.)	%	108	126	108	118	N/A	N/A	9472838
O-TERPHENYL (sur.)	%	104	104	101	110	N/A	N/A	9471030

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

Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

BV Labs Job #: B947160
Report Date: 2019/07/04

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: JS

AT1 BTEX AND F1-F4 IN SOIL (VIALS)

BV Labs ID		VX1838	VX1840	VX1842	VX1843	VX1844		
Sampling Date		2019/06/13 16:10	2019/06/13 17:20	2019/06/13 17:30	2019/06/14 13:15	2019/06/14 13:20		
	UNITS	19MW02 3.0-3.5	19MW03 2.0-2.5	19MW03 3.5-4.0	19MW04 1.5-2.0	19MW04 2.0-2.5	RDL	QC Batch
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	29	<10	<10	<10	10	9471030
F3 (C16-C34 Hydrocarbons)	mg/kg	<50	<50	<50	<50	<50	50	9471030
F4 (C34-C50 Hydrocarbons)	mg/kg	<50	<50	<50	<50	<50	50	9471030
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	Yes	N/A	9471030
Physical Properties								
Moisture	%	23	21	15	11	23	0.30	9471051
Volatiles								
Xylenes (Total)	mg/kg	<0.045	0.38	<0.045	<0.045	<0.045	0.045	9470450
F1 (C6-C10) - BTEX	mg/kg	<10	26	<10	<10	<10	10	9470450
Field Preserved Volatiles								
Benzene	mg/kg	<0.0050	0.60	0.057	<0.0050	<0.0050	0.0050	9472838
Toluene	mg/kg	<0.050	0.52	<0.050	<0.050	<0.050	0.050	9472838
Ethylbenzene	mg/kg	<0.010	3.4	<0.010	<0.010	<0.010	0.010	9472838
m & p-Xylene	mg/kg	<0.040	0.27	<0.040	<0.040	<0.040	0.040	9472838
o-Xylene	mg/kg	<0.020	0.12	<0.020	<0.020	<0.020	0.020	9472838
F1 (C6-C10)	mg/kg	<10	31	<10	<10	<10	10	9472838
Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	90	91	92	94	101	N/A	9472838
4-Bromofluorobenzene (sur.)	%	103	103	103	102	100	N/A	9472838
D10-o-Xylene (sur.)	%	115	122	120	99	106	N/A	9472838
D4-1,2-Dichloroethane (sur.)	%	112	114	106	118	99	N/A	9472838
O-TERPHENYL (sur.)	%	106	101	98	108	94	N/A	9471030

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Laboratories Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

BV Labs Job #: B947160
Report Date: 2019/07/04

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: JS

AT1 BTEX AND F1-F4 IN SOIL (VIALS)

BV Labs ID		VX1846	VX1847	VX1848	VX1849	VX1850		
Sampling Date		2019/06/14 14:40	2019/06/14 14:45	2019/06/14 15:30	2019/06/14 15:40	2019/06/14 20:00		
	UNITS	19MW05 2.0-2.5	19MW05 3.5-4.0	19MW06 2.0-2.5	19MW06 8.5-9.0	DUP A	RDL	QC Batch
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	<10	<10	<10	10	9471030
F3 (C16-C34 Hydrocarbons)	mg/kg	<50	<50	<50	<50	<50	50	9471030
F4 (C34-C50 Hydrocarbons)	mg/kg	<50	<50	<50	<50	<50	50	9471030
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	Yes	N/A	9471030
Physical Properties								
Moisture	%	24	25	22	17	11	0.30	9471051
Volatiles								
Xylenes (Total)	mg/kg	<0.045	<0.045	<0.045	<0.045	<0.045	0.045	9470450
F1 (C6-C10) - BTEX	mg/kg	<10	<10	<10	<10	<10	10	9470450
Field Preserved Volatiles								
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9472838
Toluene	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	0.050	9472838
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9472838
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	9472838
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9472838
F1 (C6-C10)	mg/kg	<10	<10	<10	<10	<10	10	9472838
Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	94	103	103	100	98	N/A	9472838
4-Bromofluorobenzene (sur.)	%	102	100	103	99	101	N/A	9472838
D10-o-Xylene (sur.)	%	102	112	110	106	104	N/A	9472838
D4-1,2-Dichloroethane (sur.)	%	111	102	104	102	99	N/A	9472838
O-TERPHENYL (sur.)	%	99	98	104	101	100	N/A	9471030

RDL = Reportable Detection Limit
N/A = Not Applicable

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BV Labs Job #: B947160
Report Date: 2019/07/04

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: JS

AT1 BTEX AND F1-F4 IN SOIL (VIALS)

BV Labs ID		VX1851	VX1852		
Sampling Date		2019/06/14 12:00	2019/06/14 16:15		
	UNITS	FILL 1	SS-1	RDL	QC Batch
Ext. Pet. Hydrocarbon					
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	430	10	9489714
F3 (C16-C34 Hydrocarbons)	mg/kg	<50	21000	50	9489714
F4 (C34-C50 Hydrocarbons)	mg/kg	<50	4900	50	9489714
Reached Baseline at C50	mg/kg	Yes	Yes	N/A	9489714
Physical Properties					
Moisture	%	3.3	3.1	0.30	9489763
Volatiles					
Xylenes (Total)	mg/kg	<0.045	<0.045	0.045	9488792
F1 (C6-C10) - BTEX	mg/kg	<10	<10	10	9488792
Field Preserved Volatiles					
Benzene	mg/kg	<0.0050	<0.0050	0.0050	9489744
Toluene	mg/kg	<0.050	<0.050	0.050	9489744
Ethylbenzene	mg/kg	<0.010	<0.010	0.010	9489744
m & p-Xylene	mg/kg	<0.040	<0.040	0.040	9489744
o-Xylene	mg/kg	<0.020	<0.020	0.020	9489744
F1 (C6-C10)	mg/kg	<10	<10	10	9489744
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	96	97	N/A	9489744
4-Bromofluorobenzene (sur.)	%	109	114	N/A	9489744
D10-o-Xylene (sur.)	%	94	95	N/A	9489744
D4-1,2-Dichloroethane (sur.)	%	100	103	N/A	9489744
O-TERPHENYL (sur.)	%	113	88	N/A	9489714

RDL = Reportable Detection Limit
N/A = Not Applicable

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BV Labs Job #: B947160
Report Date: 2019/07/04

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: JS

PHYSICAL TESTING (SOIL)

BV Labs ID		VX1853	VX1854	VX1855		
Sampling Date		2019/06/14 13:25	2019/06/14 15:45	2019/06/14 15:50		
	UNITS	19MW05 4.0-4.5	19MW06 1.5-2.0	19MW06 7.5-8.0	RDL	QC Batch
Physical Properties						
% sand by hydrometer	%	26	95	7.8	2.0	9476163
% silt by hydrometer	%	37	2.7	37	2.0	9476163
Clay Content	%	38	2.6	55	2.0	9476163
Texture	N/A	CLAY LOAM	SAND	CLAY	N/A	9471028

RDL = Reportable Detection Limit
N/A = Not Applicable

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BV Labs Job #: B947160
Report Date: 2019/07/04

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: JS

GENERAL COMMENTS

As per client request, additional analysis has been completed. 2 x BTEX and F1 to F4, the client request was received 2019/06/28.

Sample VX1851 [FILL 1] : Sample was analyzed past method specified hold time for CCME Hydrocarbons (F2-F4 in soil).

Sample VX1852 [SS-1] : Sample was analyzed past method specified hold time for CCME Hydrocarbons (F2-F4 in soil).

Results relate only to the items tested.

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BV Labs Job #: B947160
Report Date: 2019/07/04

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: JS

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9471030	SPR	Matrix Spike [VX1836-01]	O-TERPHENYL (sur.)	2019/06/18		98	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2019/06/18		112	%	60 - 140
			F3 (C16-C34 Hydrocarbons)	2019/06/18		111	%	60 - 140
			F4 (C34-C50 Hydrocarbons)	2019/06/18		94	%	60 - 140
9471030	SPR	Spiked Blank	O-TERPHENYL (sur.)	2019/06/18		95	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2019/06/18		108	%	60 - 140
			F3 (C16-C34 Hydrocarbons)	2019/06/18		98	%	60 - 140
			F4 (C34-C50 Hydrocarbons)	2019/06/18		90	%	60 - 140
9471030	SPR	Method Blank	O-TERPHENYL (sur.)	2019/06/18		98	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2019/06/18	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2019/06/18	<50		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2019/06/18	<50		mg/kg	
9471030	SPR	RPD [VX1835-01]	F2 (C10-C16 Hydrocarbons)	2019/06/18	NC		%	40
			F3 (C16-C34 Hydrocarbons)	2019/06/18	NC		%	40
			F4 (C34-C50 Hydrocarbons)	2019/06/18	NC		%	40
9471051	KMP	Method Blank	Moisture	2019/06/18	<0.30		%	
9471051	KMP	RPD [VX1837-01]	Moisture	2019/06/18	1.9		%	20
9472838	DO1	Matrix Spike [VX1835-02]	1,4-Difluorobenzene (sur.)	2019/06/20		93	%	50 - 140
			4-Bromofluorobenzene (sur.)	2019/06/20		104	%	50 - 140
			D10-o-Xylene (sur.)	2019/06/20		133	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2019/06/20		100	%	50 - 140
			Benzene	2019/06/20		118	%	50 - 140
			Toluene	2019/06/20		102	%	50 - 140
			Ethylbenzene	2019/06/20		113	%	50 - 140
			m & p-Xylene	2019/06/20		113	%	50 - 140
			o-Xylene	2019/06/20		115	%	50 - 140
			F1 (C6-C10)	2019/06/20		93	%	60 - 140
9472838	DO1	Spiked Blank	1,4-Difluorobenzene (sur.)	2019/06/20		100	%	50 - 140
			4-Bromofluorobenzene (sur.)	2019/06/20		107	%	50 - 140
			D10-o-Xylene (sur.)	2019/06/20		106	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2019/06/20		117	%	50 - 140
			Benzene	2019/06/20		97	%	60 - 130
			Toluene	2019/06/20		86	%	60 - 130
			Ethylbenzene	2019/06/20		94	%	60 - 130
			m & p-Xylene	2019/06/20		91	%	60 - 130
			o-Xylene	2019/06/20		94	%	60 - 130
			F1 (C6-C10)	2019/06/20		93	%	60 - 140
9472838	DO1	Method Blank	1,4-Difluorobenzene (sur.)	2019/06/20		91	%	50 - 140
			4-Bromofluorobenzene (sur.)	2019/06/20		104	%	50 - 140
			D10-o-Xylene (sur.)	2019/06/20		107	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2019/06/20		117	%	50 - 140
			Benzene	2019/06/20	<0.0050		mg/kg	
			Toluene	2019/06/20	<0.050		mg/kg	
			Ethylbenzene	2019/06/20	<0.010		mg/kg	
			m & p-Xylene	2019/06/20	<0.040		mg/kg	
			o-Xylene	2019/06/20	<0.020		mg/kg	
			F1 (C6-C10)	2019/06/20	<10		mg/kg	
9472838	DO1	RPD [VX1835-02]	Benzene	2019/06/20	NC		%	50
			Toluene	2019/06/20	NC		%	50
			Ethylbenzene	2019/06/20	NC		%	50
			m & p-Xylene	2019/06/20	NC		%	50
			o-Xylene	2019/06/20	NC		%	50

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			F1 (C6-C10)	2019/06/20	NC		%	30
9476163	XWA	QC Standard	% sand by hydrometer	2019/06/21		106	%	87 - 113
			% silt by hydrometer	2019/06/21		97	%	90 - 110
			Clay Content	2019/06/21		97	%	79 - 121
9476163	XWA	RPD	% sand by hydrometer	2019/06/21	4.2		%	30
			% silt by hydrometer	2019/06/21	0.066		%	30
			Clay Content	2019/06/21	15		%	30
9489714	LSH	Matrix Spike	O-TERPHENYL (sur.)	2019/07/03		93	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2019/07/03		NC	%	60 - 140
			F3 (C16-C34 Hydrocarbons)	2019/07/03		NC	%	60 - 140
			F4 (C34-C50 Hydrocarbons)	2019/07/03		NC	%	60 - 140
9489714	LSH	Spiked Blank	O-TERPHENYL (sur.)	2019/07/03		98	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2019/07/03		116	%	60 - 140
			F3 (C16-C34 Hydrocarbons)	2019/07/03		107	%	60 - 140
			F4 (C34-C50 Hydrocarbons)	2019/07/03		108	%	60 - 140
9489714	LSH	Method Blank	O-TERPHENYL (sur.)	2019/07/03		107	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2019/07/03	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2019/07/03	<50		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2019/07/03	<50		mg/kg	
9489714	LSH	RPD	F2 (C10-C16 Hydrocarbons)	2019/07/03	9.0		%	40
			F3 (C16-C34 Hydrocarbons)	2019/07/03	5.0		%	40
			F4 (C34-C50 Hydrocarbons)	2019/07/03	28		%	40
9489744	RSU	Matrix Spike	1,4-Difluorobenzene (sur.)	2019/07/03		98	%	50 - 140
			4-Bromofluorobenzene (sur.)	2019/07/03		111	%	50 - 140
			D10-o-Xylene (sur.)	2019/07/03		113	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2019/07/03		99	%	50 - 140
			Benzene	2019/07/03		92	%	50 - 140
			Toluene	2019/07/03		94	%	50 - 140
			Ethylbenzene	2019/07/03		104	%	50 - 140
			m & p-Xylene	2019/07/03		101	%	50 - 140
			o-Xylene	2019/07/03		99	%	50 - 140
			F1 (C6-C10)	2019/07/03		89	%	60 - 140
9489744	RSU	Spiked Blank	1,4-Difluorobenzene (sur.)	2019/07/03		96	%	50 - 140
			4-Bromofluorobenzene (sur.)	2019/07/03		110	%	50 - 140
			D10-o-Xylene (sur.)	2019/07/03		99	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2019/07/03		97	%	50 - 140
			Benzene	2019/07/03		84	%	60 - 130
			Toluene	2019/07/03		87	%	60 - 130
			Ethylbenzene	2019/07/03		96	%	60 - 130
			m & p-Xylene	2019/07/03		95	%	60 - 130
			o-Xylene	2019/07/03		94	%	60 - 130
			F1 (C6-C10)	2019/07/03		86	%	60 - 140
9489744	RSU	Method Blank	1,4-Difluorobenzene (sur.)	2019/07/03		96	%	50 - 140
			4-Bromofluorobenzene (sur.)	2019/07/03		111	%	50 - 140
			D10-o-Xylene (sur.)	2019/07/03		95	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2019/07/03		102	%	50 - 140
			Benzene	2019/07/03	<0.0050		mg/kg	
			Toluene	2019/07/03	<0.050		mg/kg	
			Ethylbenzene	2019/07/03	<0.010		mg/kg	
			m & p-Xylene	2019/07/03	<0.040		mg/kg	
			o-Xylene	2019/07/03	<0.020		mg/kg	
			F1 (C6-C10)	2019/07/03	<10		mg/kg	

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BV Labs Job #: B947160
Report Date: 2019/07/04

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: JS

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9489744	RSU	RPD	Benzene	2019/07/03	NC		%	50
			Toluene	2019/07/03	NC		%	50
			Ethylbenzene	2019/07/03	NC		%	50
			m & p-Xylene	2019/07/03	NC		%	50
			o-Xylene	2019/07/03	NC		%	50
			F1 (C6-C10)	2019/07/03	NC		%	30
9489763	EHW	Method Blank	Moisture	2019/07/03	<0.30		%	
9489763	EHW	RPD	Moisture	2019/07/03	0		%	20

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

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

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

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

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

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

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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BV Labs Job #: B947160
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TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
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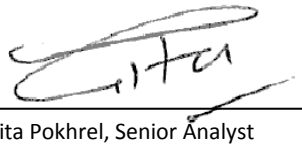
VALIDATION SIGNATURE PAGE

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

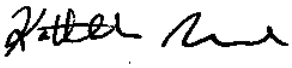
Dennis Ngondu, B.Sc., P.Chem., QP, Supervisor, Organics

Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics



Gita Pokhrel, Senior Analyst

Janet Gao, B.Sc., QP, Supervisor, Organics



Kathleah Manuel, B.Sc, Analyst

Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics

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

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Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
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CHAIN OF CUSTODY RECORD

Invoice Information		Report Information (if differs from invoice)		Project Information		Turnaround Time (TAT) Required
Company :	Trace Associates	Company:	Same as Invoice	Quotation #:	Trace Associates Rates	[X] 5 - 7 Days Regular (Most analyses)
Contact Name:	Jon Gudmundsson	Contact Name:	"	P.O. #/ AFE#:	400 - 299	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	Suite No. 100, 320 Gardiner Park Court	Address:	"			Rush TAT (Surcharges will be applied)
	Regina, SK S4V1R9		"	Project #:	400 - 299	[ ] Same Day [ ] 2 Days
Phone:	306-450-9164	Phone:	"	Site Location:	Gilbert Plains, MB	[ ] 1 Day [ ] 3-4 Days
Email:	jgudmundsson@traceassociates.ca	Email:	"	Site #:		Date Required:
Copies:	aoleksyn@traceassociates.ca	Copies:	"	Sampled By:	JS/GD/AO	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp	8.3	7.0	6.0
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp	9.7	9.8	7.9
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present						
Seal Intact			Temp	20.6	20.6	20.6
Cooling Media		✓				

Depot Reception: soil bags

Analysis Requested

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 [ ] VOC	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals [ ] Tot [ ] Diss	Mercury [ ] Total [ ] Dissolved	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	PAHs	HOLD - DO NOT ANALYZE
1	19MW01 1.0 - 1.5	m	2019/06/13	—	SOIL				X									
2	19MW01 4.0 - 4.5	m		—					X									
3	19MW02 1.5 - 2.0	m		—					X									
4	19MW02 3.0 - 3.5	m		—					X									
5	19MW03 1.5 - 2.0	m		—														X
6	19MW03 2.0 - 2.5	m		—					X									
7	19MW03 3.0 - 3.5	m		—														X
8	19MW03 3.5 - 4.0	m	↓	—					X									
9	19MW04 1.5 - 2.0	m	2019/06/14	1315					X									
10	19MW04 2.0 - 2.5	m	"	1320	↓				X									

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

Regulatory Criteria

- [X] AT1/CCME
- [ ] Drinking Water
- [X] ~~Saskatchewan~~
- [ ] D50 (Drilling Waste)
- [X] Other: Ontario MOECC Table 2

Special Instructions

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
A. Oleksyn / Andrea Oleksyn	2019/06/17	1145	T. Hanwell Tegan Hanwell	2019/06/17	11:45	B947160

AB FCD-00331/6

Maxxam
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Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

Invoice Information	Report Information (if differs from invoice)	Project Information	Turnaround Time (TAT) Required
Company : Trace Associates	Company: Same as Invoice	Quotation #: Trace Associates Rates	[X] 5 - 7 Days Regular (Most analyses)
Contact Name: Jon Gudmundsson	Contact Name: "	P.O. #/ AFE#: 400 - 299	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address: Suite No. 100, 320 Gardiner Park Court	Address: "		Rush TAT (Surcharges will be applied)
Regina, SK S4V1R9	"	Project #: 400 - 299	[ ] Same Day [ ] 2 Days
Phone: 306-450-9164	Phone: "	Site Location: Gilbert Plains, MB	[ ] 1 Day [ ] 3-4 Days
Email: jgudmundsson@traceassociates.ca	Email: "	Site #:	Date Required:
Copies: Adrian@traceassociates.ca jgudmundsson@traceassociates.ca	Copies: "	Sampled By: JS/GD/AO	Rush Confirmation #:

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present						
Seal Intact		/	Temp	8.3	7.0	6.0
Cooling Media	/					
	YES	NO	Cooler ID			
Seal Present						
Seal Intact	/	/	Temp	9.7	9.8	7.9
Cooling Media	/					
	YES	NO	Cooler ID			
Seal Present						
Seal Intact		/	Temp	20.6	20.6	20.6
Cooling Media		/				

Depot Reception: Soil bags

Analysis Requested

Regulatory Criteria
- [X] AT/CCME
- [ ] Drinking Water
- [ ] ~~Saskatchewan~~
- [ ] D50 (Drilling Waste)
- [X] Other: Ontario MOECC Table 2

Special Instructions

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 [ ] VOC	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals [ ] Tot [ ] Diss	Mercury [ ] Total [ ] Dissolved	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	PAHs	HOLD - DO NOT ANALYZE
1	19MW05 1.5-2.0	m	2019/06/14	1430	Soil													X
2	19MW05 2.0-2.5	m		1440				X										
3	19MW05 3.5-4.0	m		1445				X										
4	19MW06 2.0-2.5	m		1530				X										
5	19MW06 8.5-9.0	m		1540				X										
6	DUP A			2000				X										
7	FILL 1			1200														X
8	SS-1			1615														X
9	19MW05 4.0-4.5	m		-										X				
10	19MW06 1.5-2.0	m		-										X				

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

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
A-Oj / Adrian Ockelyn	2019/06/17	1145	T. Hannell Tegan Hannell	2019/06/17	11:45	B947160

AB FCD-00331/6

Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD

Invoice Information		Report Information (if differs from invoice)		Project Information		Turnaround Time (TAT) Required	
Company:	Trace Associates	Company:	Same as Invoice	Quotation #:	Trace Associates Rates	X	5 - 7 Days Regular (Most analyses)
Contact Name:	Jon Gudmundsson	Contact Name:	"	P.O. #/ AFE#:	400 - 299	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS	
Address:	Suite No. 100, 320 Gardiner Park Court	Address:	"			Rush TAT (Surcharges will be applied)	
	Regina, SK S4V1R9		"	Project #:	400 - 299		Same Day / 2 Days / 1 Day / 3-4 Days
Phone:	306-450-9164	Phone:	"	Site Location:	Gilbert Plains, MB	Date Required:	
Email:	jgudmundsson@traceassociates.ca	Email:	"	Site #:		Rush Confirmation #:	
Copies:	Aleksyn ~~agabriel~~@traceassociates.ca	Copies:	"	Sampled By:	JS/GD/AO		

Laboratory Use Only

	YES	NO	Cooler ID			
Seal Present		/				
Seal Intact		/	Temp	8.3	7.0	6.0
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present		/				
Seal Intact		/	Temp	9.7	9.8	7.9
Cooling Media	✓					
	YES	NO	Cooler ID			
Seal Present		/				
Seal Intact		/	Temp	20.6	20.6	20.6
Cooling Media		✓				

Depot Reception: Soil bags

Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals ☐ Diss ☐ Tot	Mercury ☐ Dissolved ☐ Total	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	PAHs	HOLD - DO NOT ANALYZE
1 (GMW06 7.5-8.0)	→ m	2019/06/14	—	SOIL										X			
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

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

Regulatory Criteria: X CCME; ☐ Drinking Water; X Saskatchewan; ☐ D50 (Drilling Waste); X Other: Ontario MOECC Table 2

Special Instructions

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Maxxam Job #
Aleksyn	2019/06/17	1145	Y. Hamell Tegan Hamel	2019/06/17	11:45	B947160

AB FCD-00331/6

Thanks Lindsay.

Can you please also analyze the following samples that are on hold for BTEX and F1-F4:

- FILL 1
- SS-1

Please confirm that this will be possible, and feel free to contact me if you have any questions or comments, or if you require any additional information.

Regards,

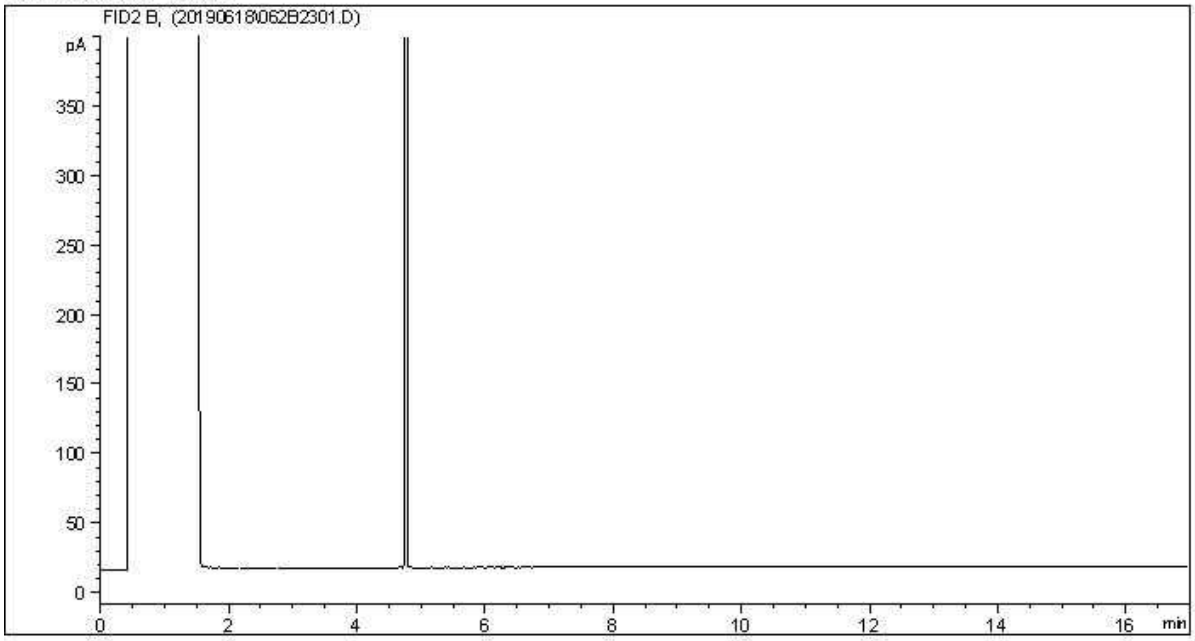
Ardis Oleksyn, B.A.I.E.M., A.Sc.T. I Senior Project Manager I Trace Associates Inc.

BV Labs Job #: B947160
Report Date: 2019/07/04
BV Labs Sample: VX1835

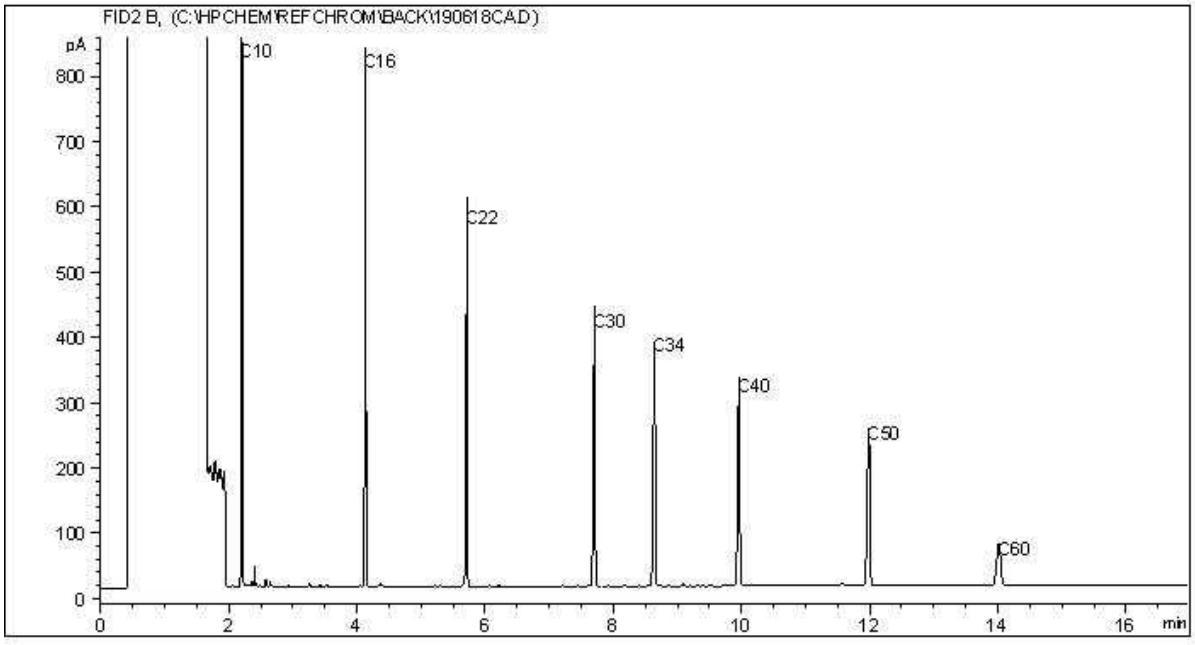
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: 19MW01 1.0-1.5

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

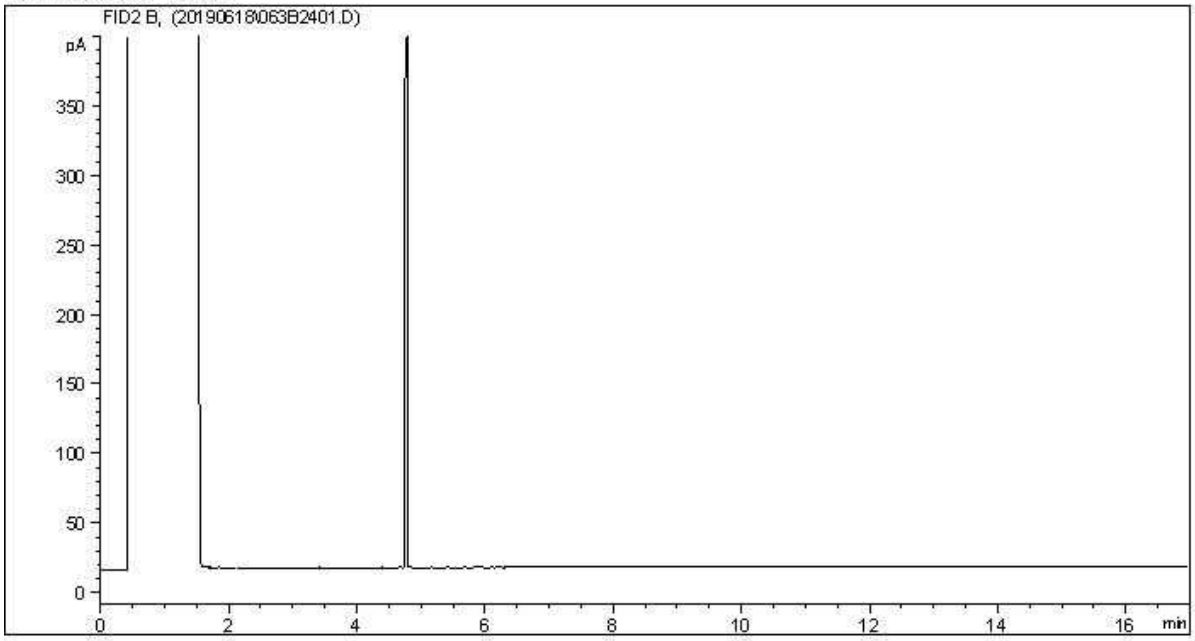
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B947160
Report Date: 2019/07/04
BV Labs Sample: VX1835 Lab-Dup

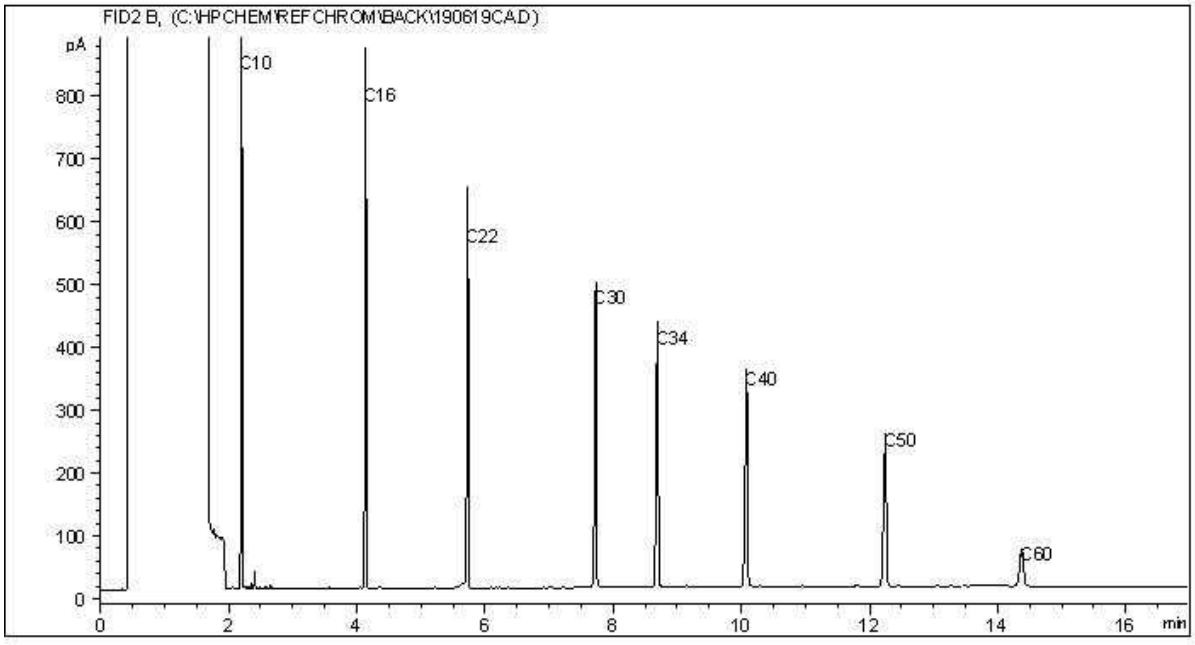
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: 19MW01 1.0-1.5

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

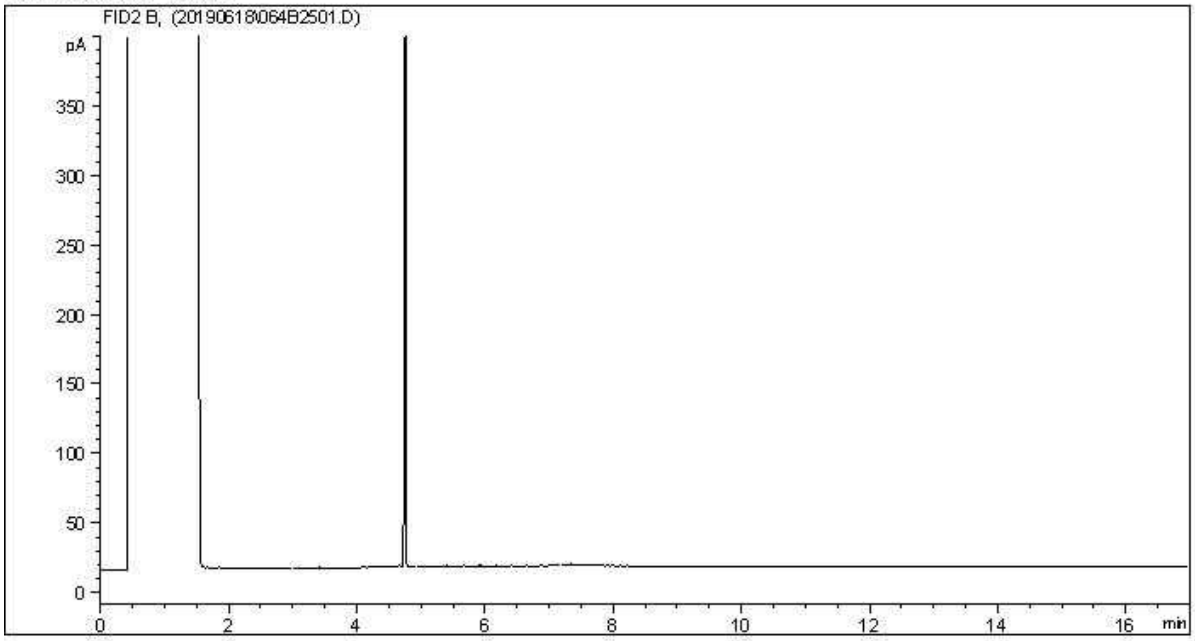
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B947160
Report Date: 2019/07/04
BV Labs Sample: VX1836

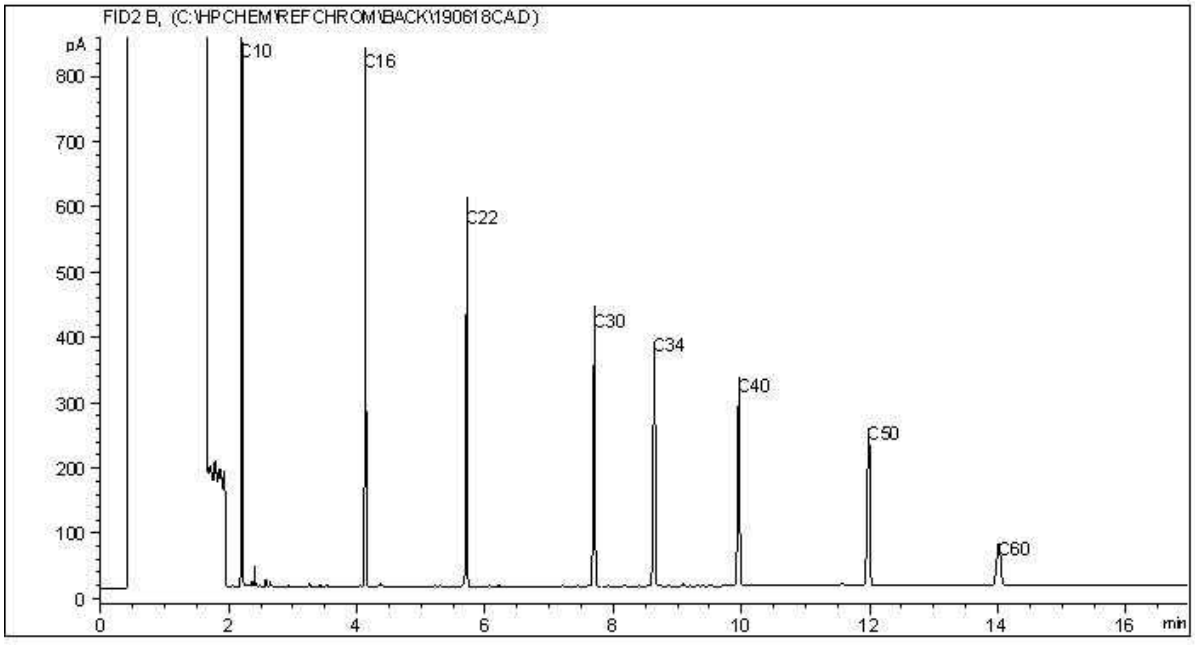
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: 19MW01 4.0-4.5

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

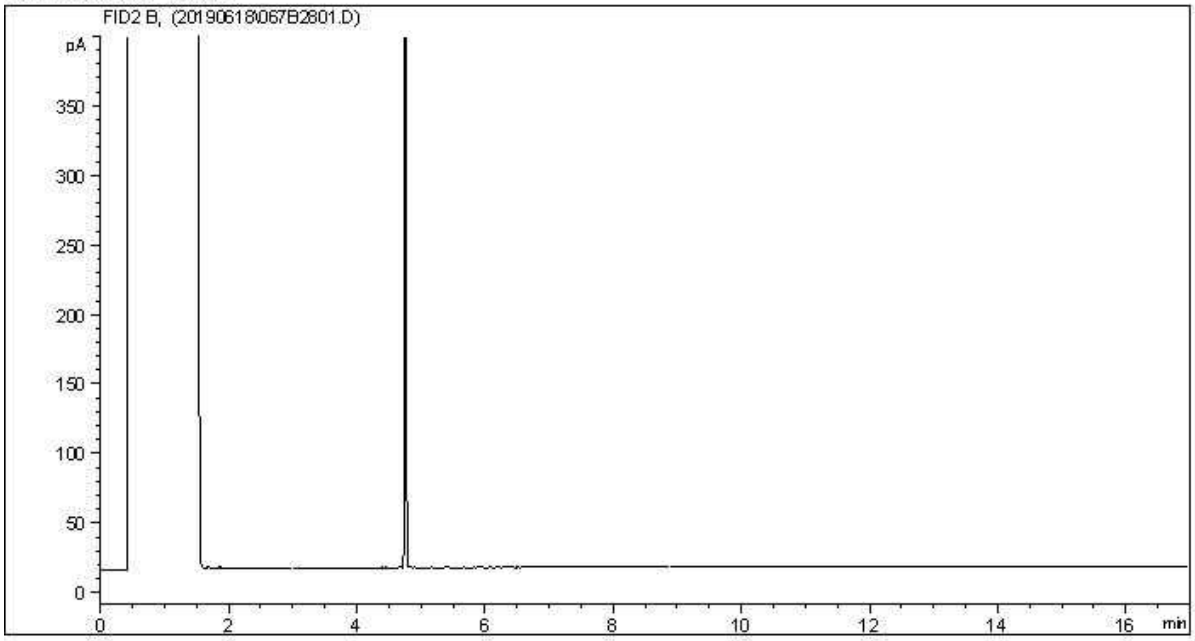
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B947160
Report Date: 2019/07/04
BV Labs Sample: VX1837

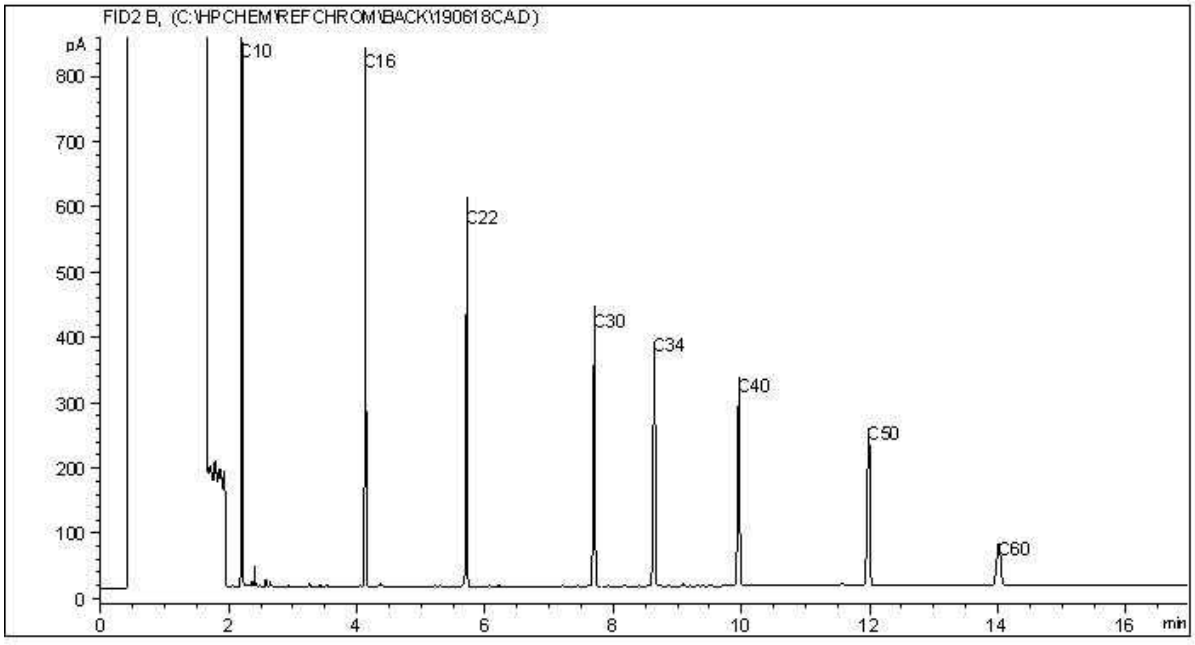
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: 19MW02 1.5-2.0

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

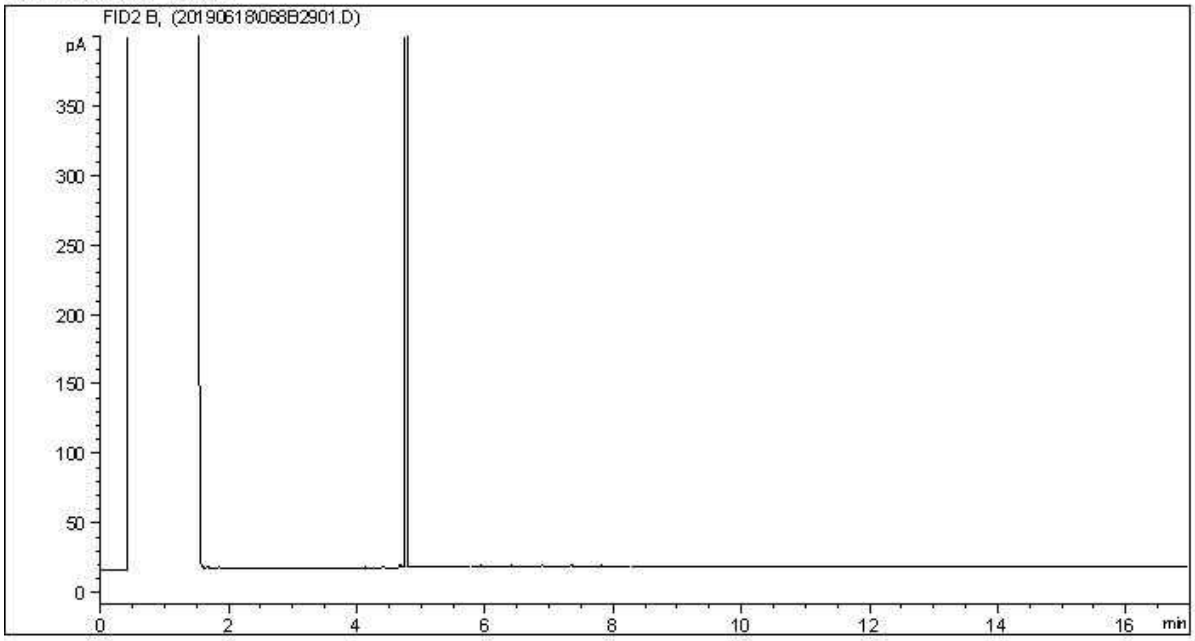
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B947160
Report Date: 2019/07/04
BV Labs Sample: VX1838

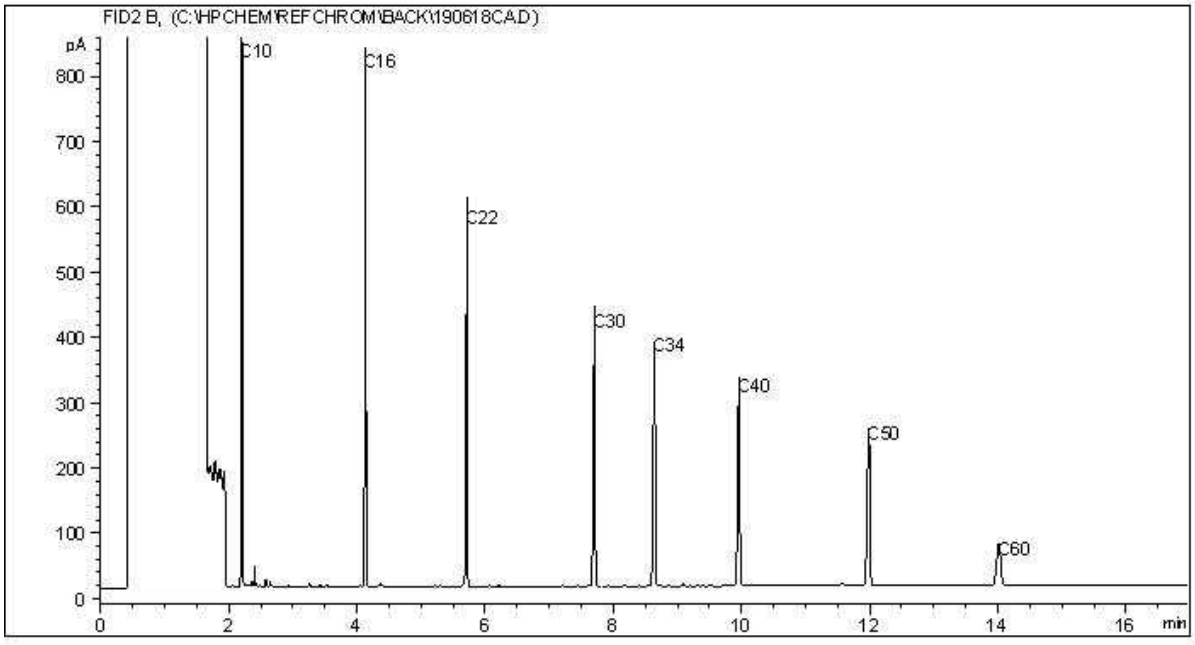
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: 19MW02 3.0-3.5

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



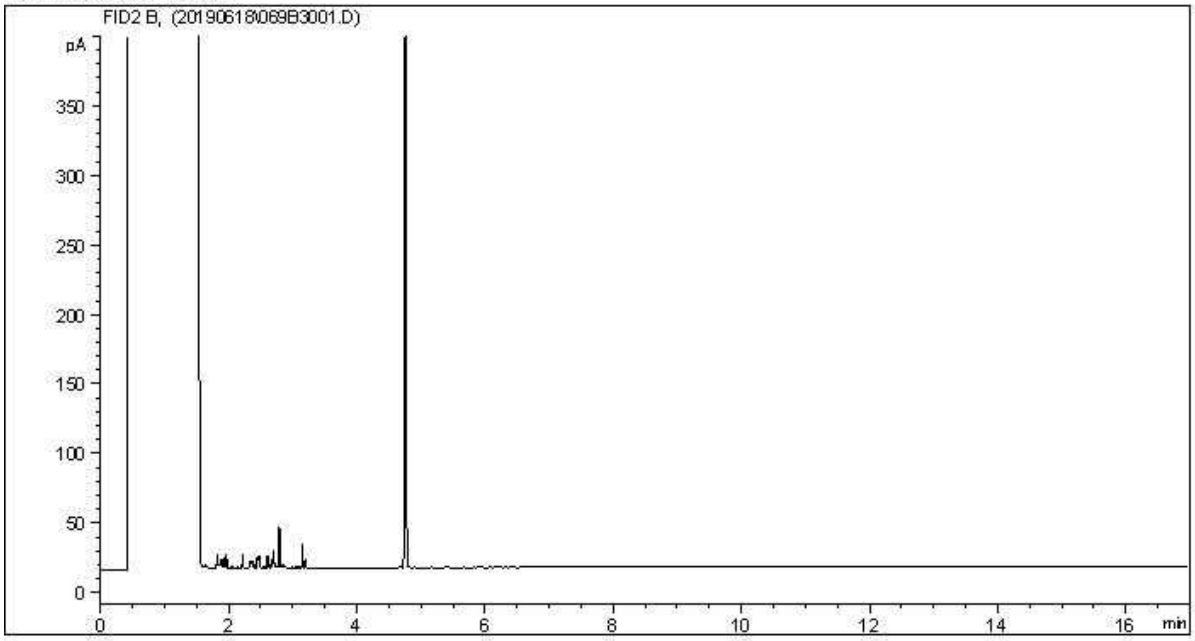
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

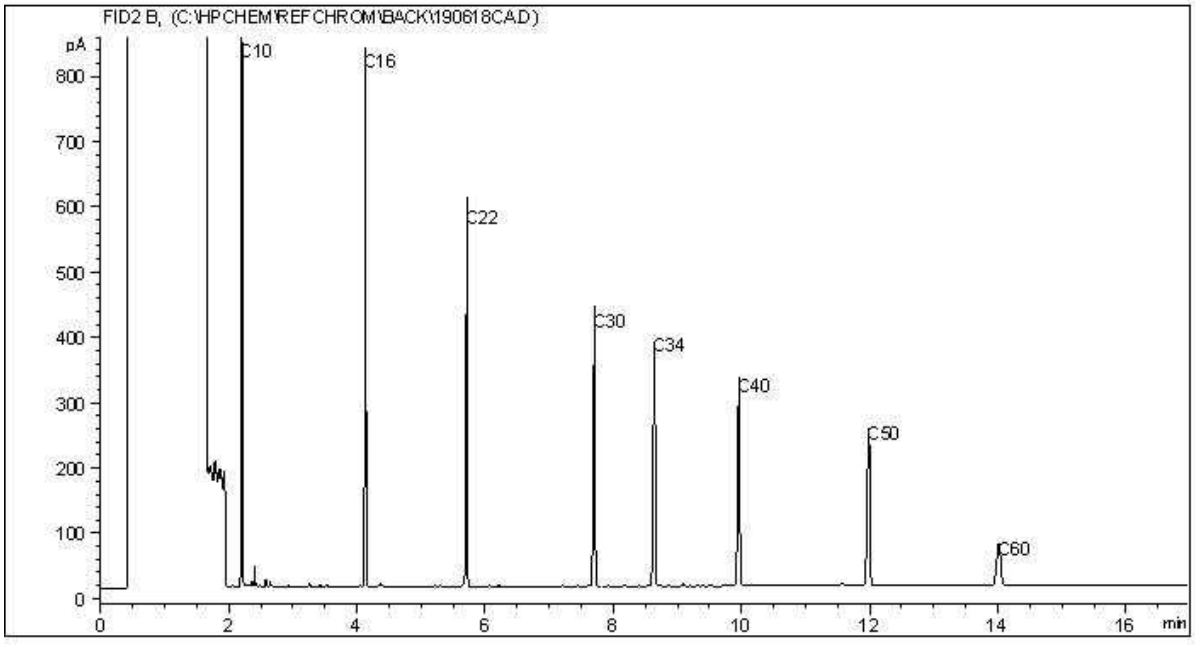
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

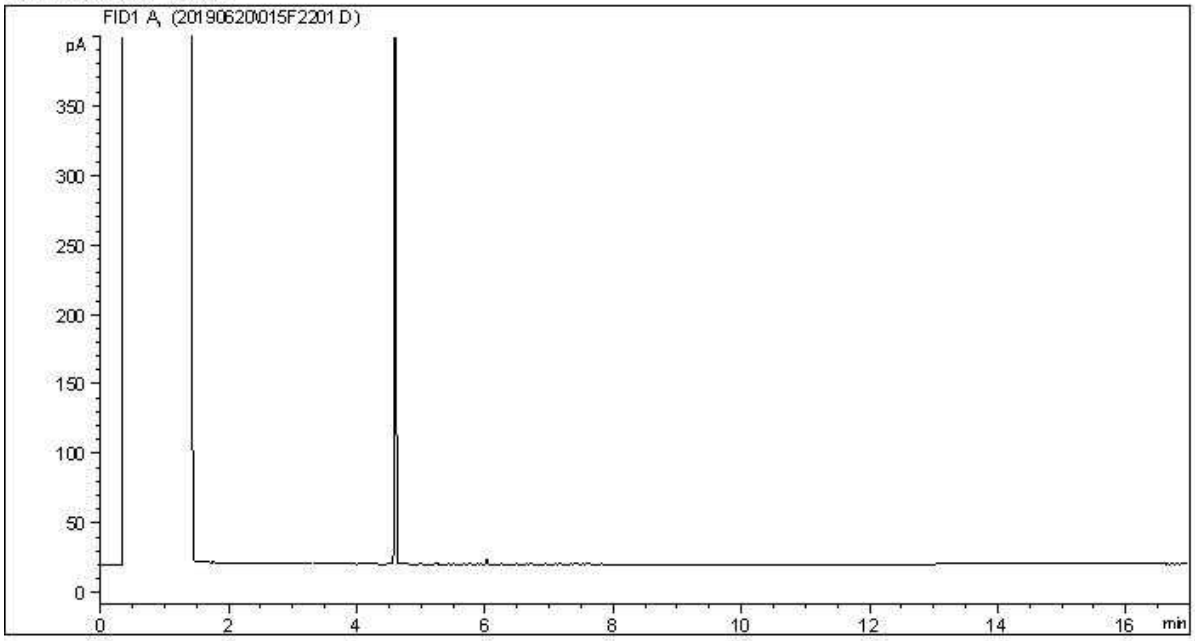
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B947160
Report Date: 2019/07/04
BV Labs Sample: VX1842

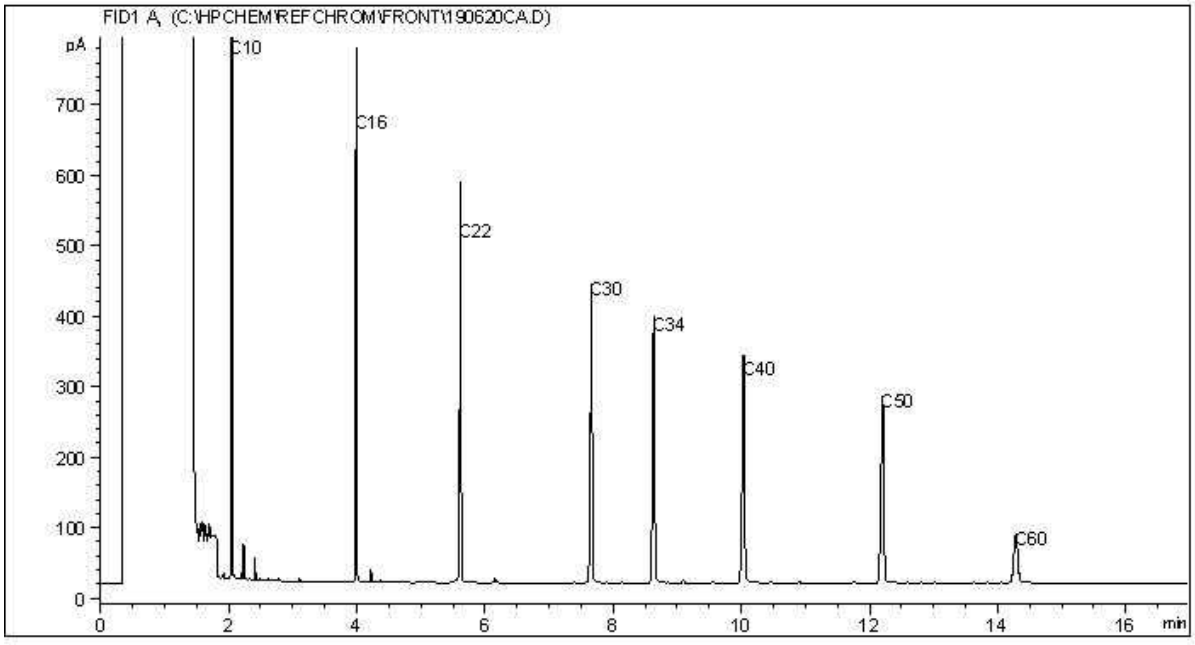
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: 19MW03 3.5-4.0

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



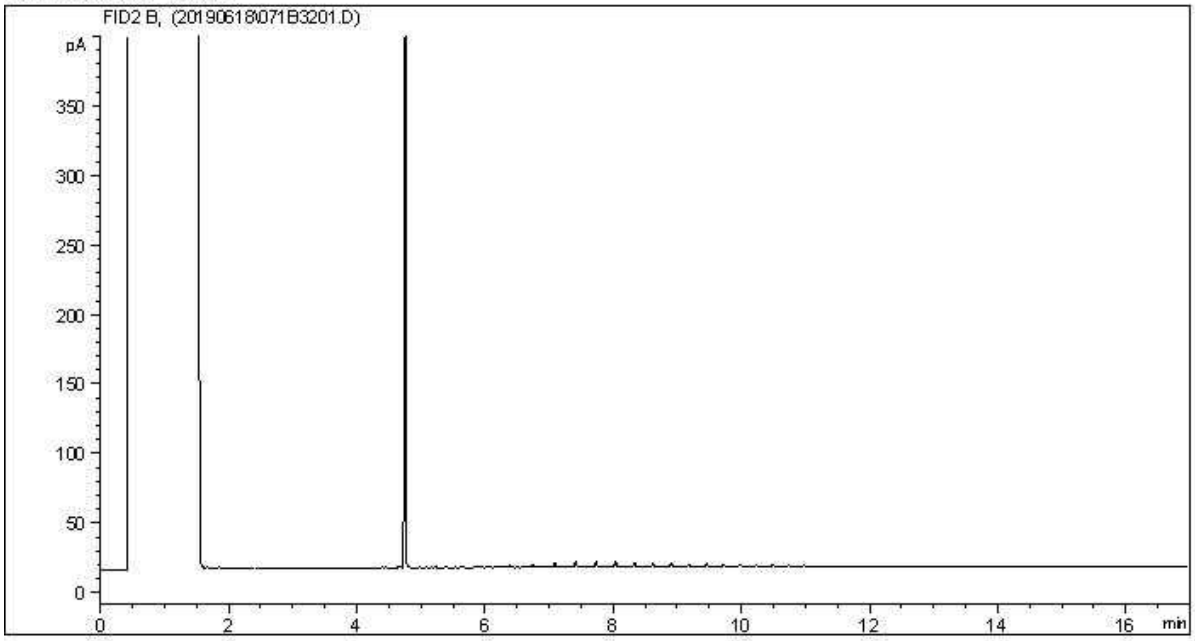
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

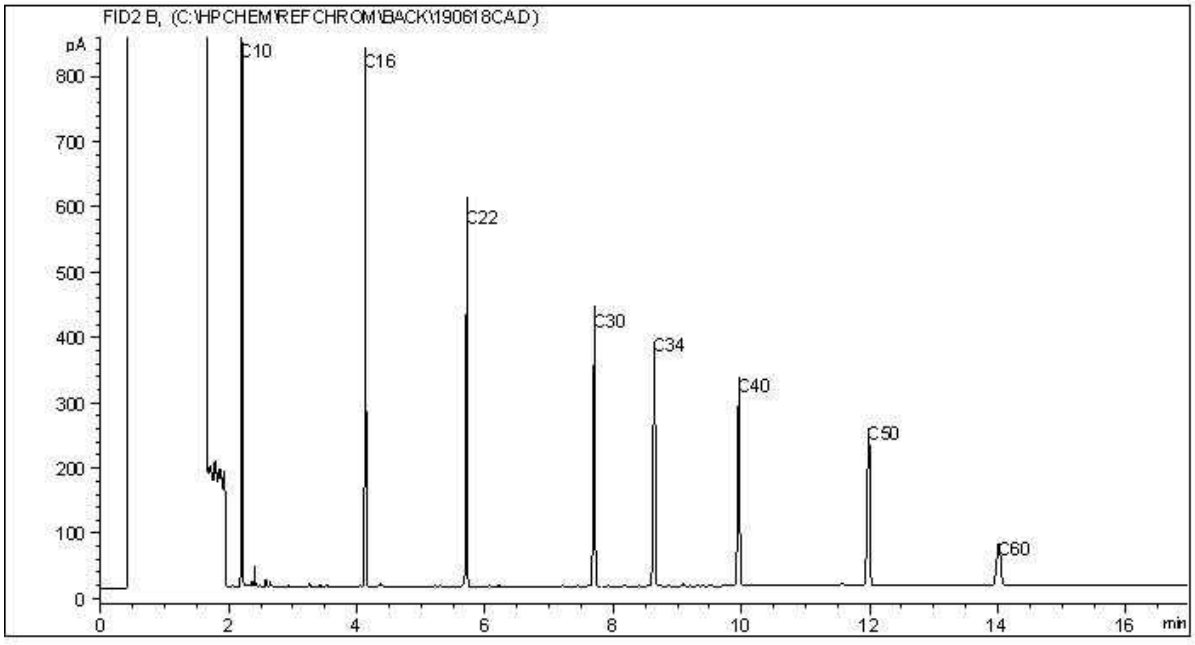
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



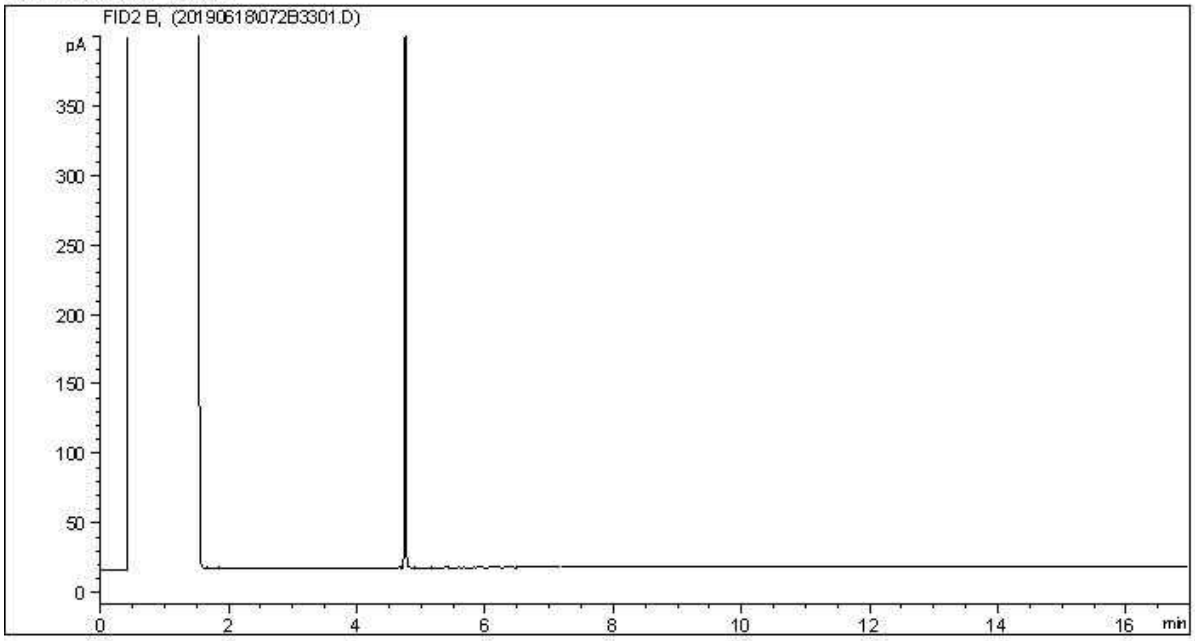
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

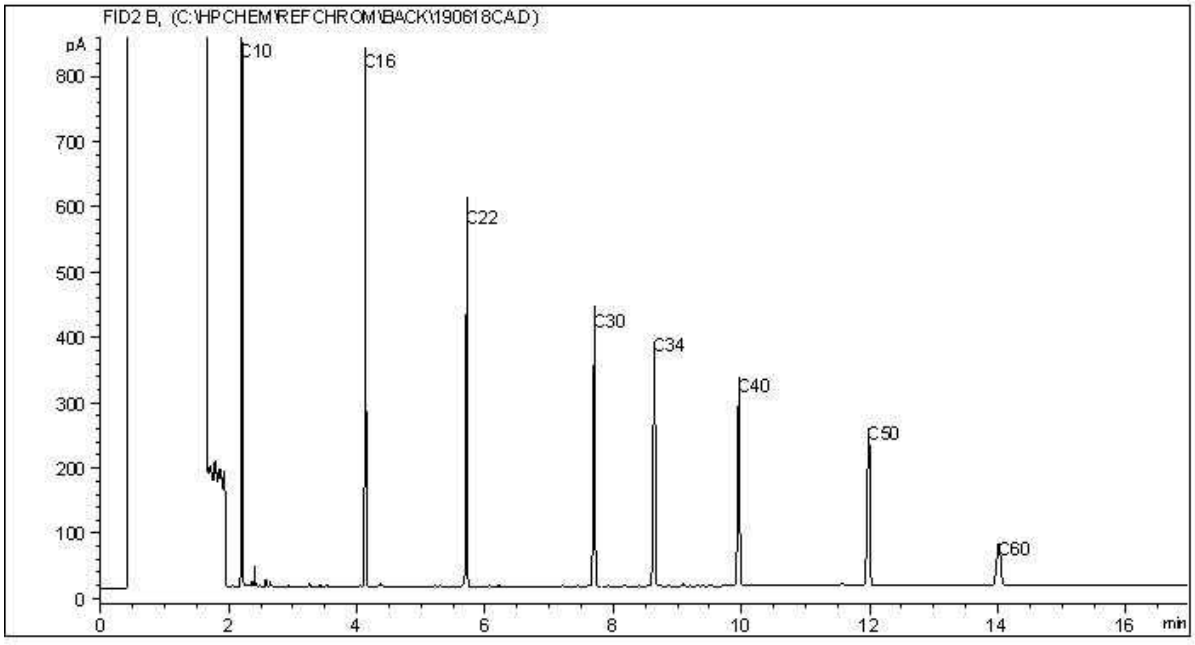
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

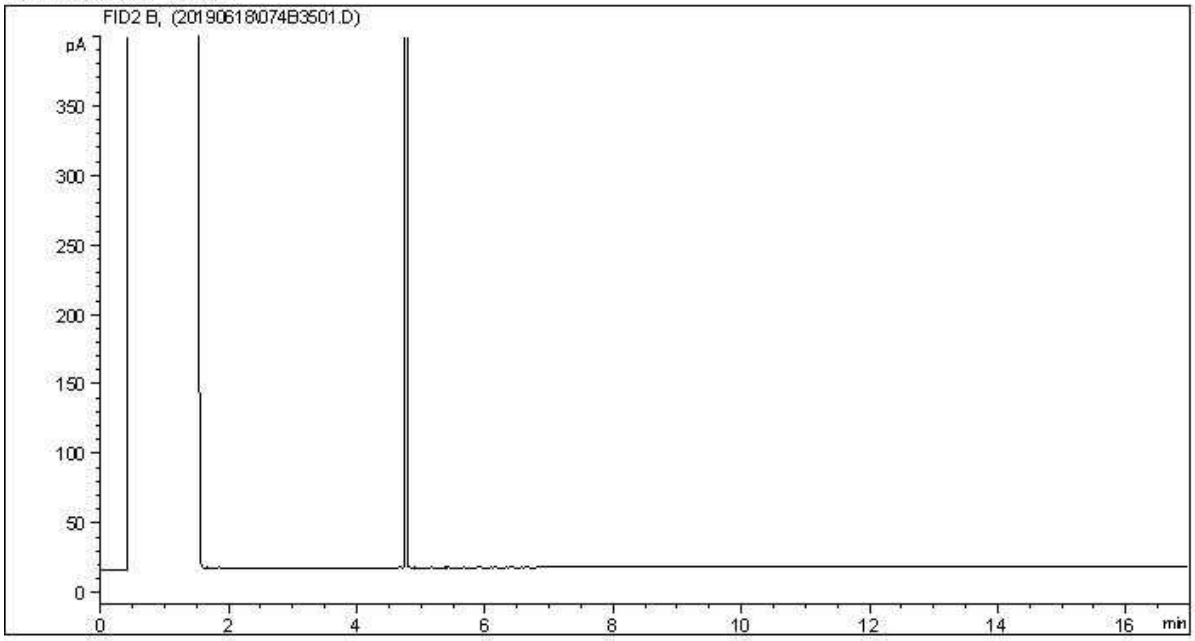
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B947160
Report Date: 2019/07/04
BV Labs Sample: VX1846

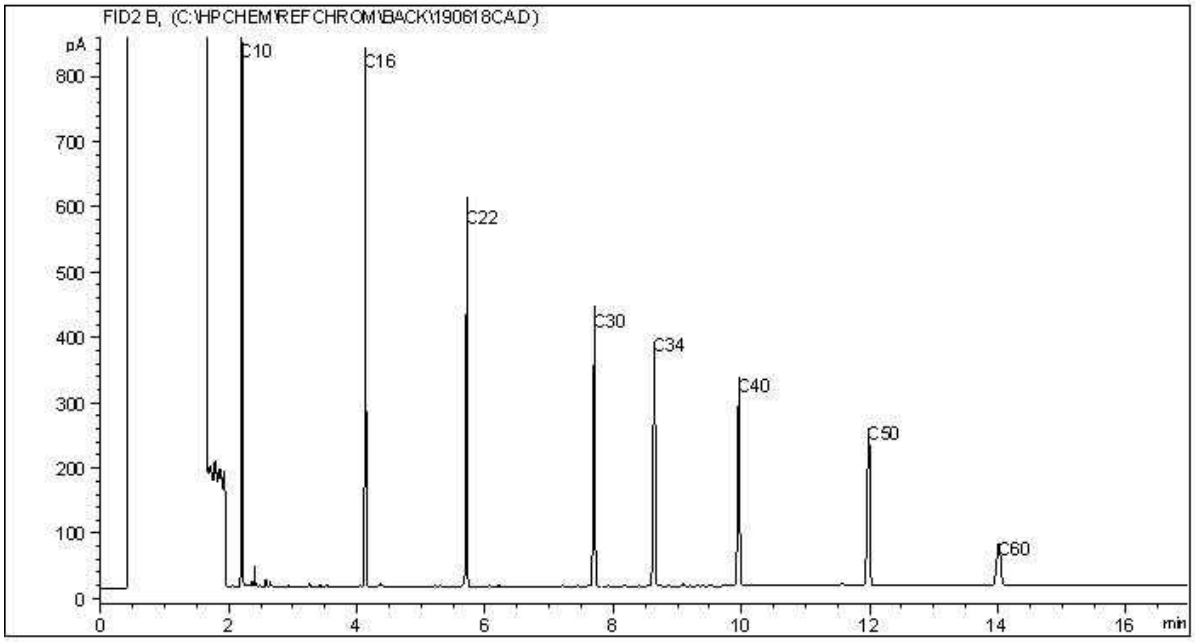
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: 19MW05 2.0-2.5

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

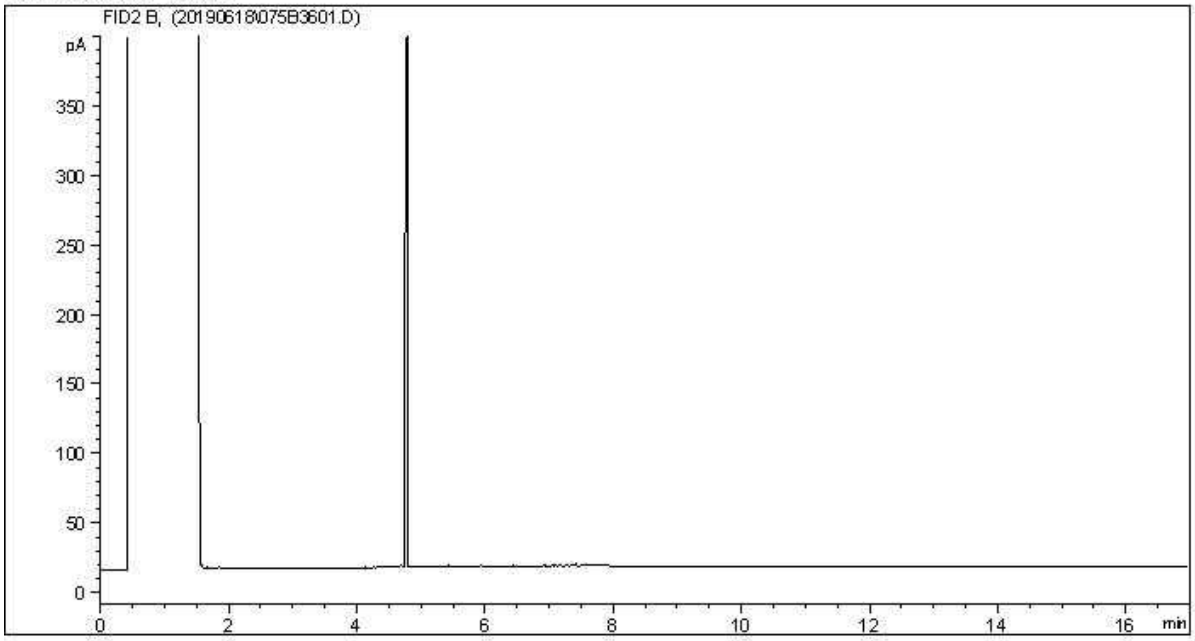
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B947160
Report Date: 2019/07/04
BV Labs Sample: VX1847

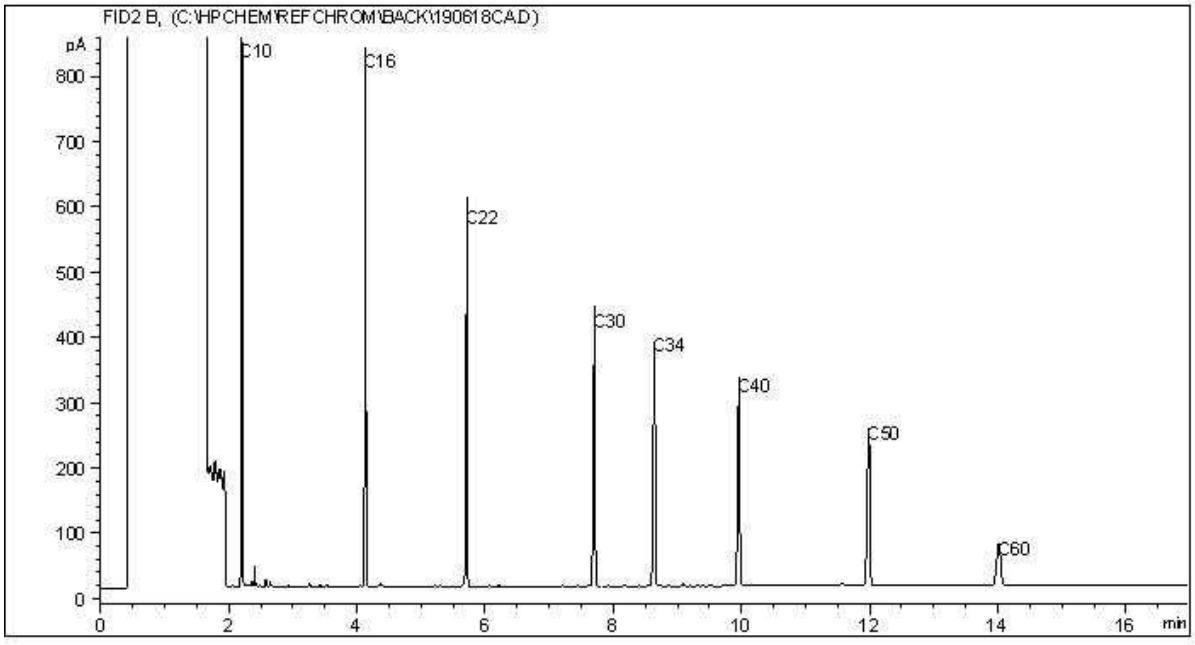
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: 19MW05 3.5-4.0

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

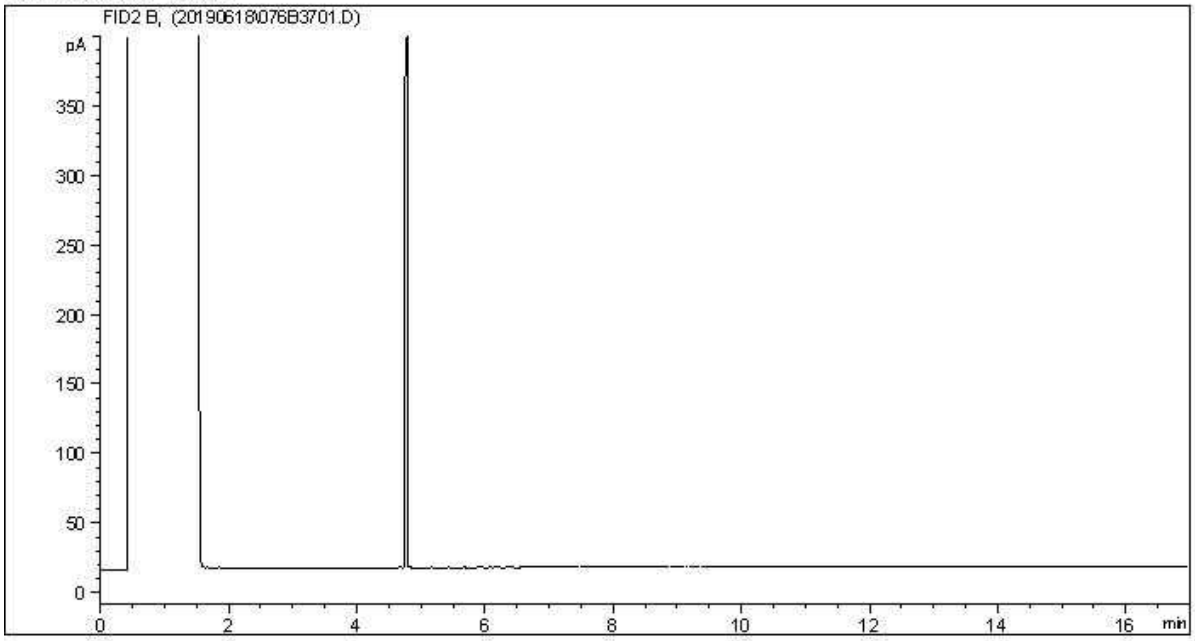
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B947160
Report Date: 2019/07/04
BV Labs Sample: VX1848

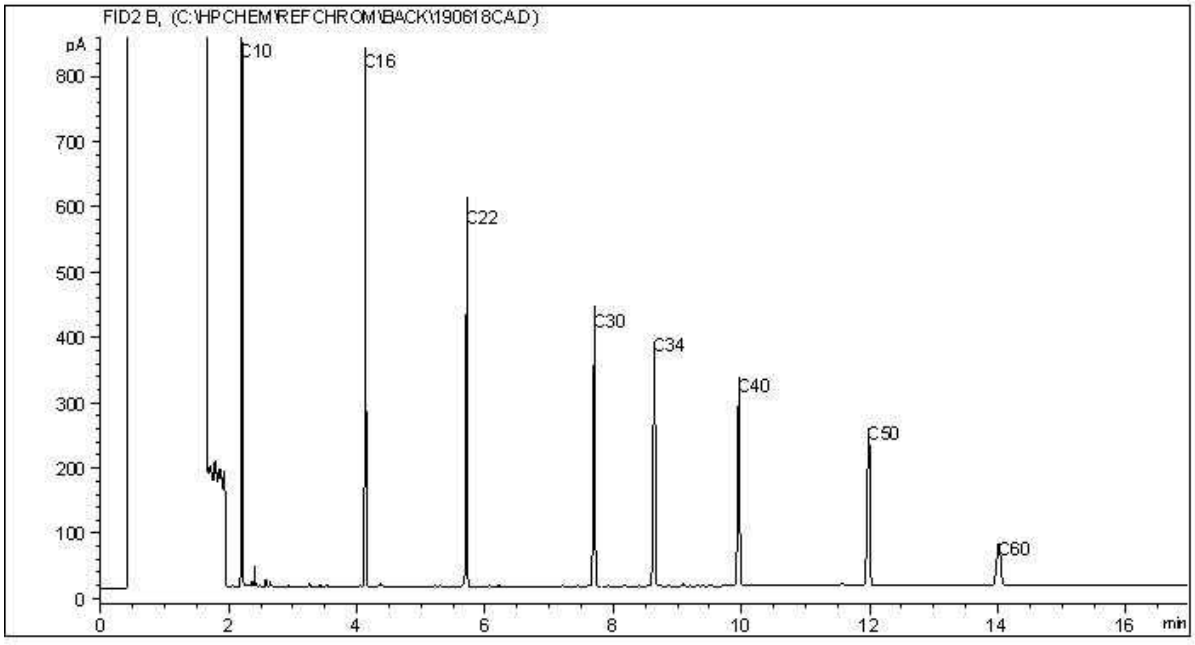
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: 19MW06 2.0-2.5

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



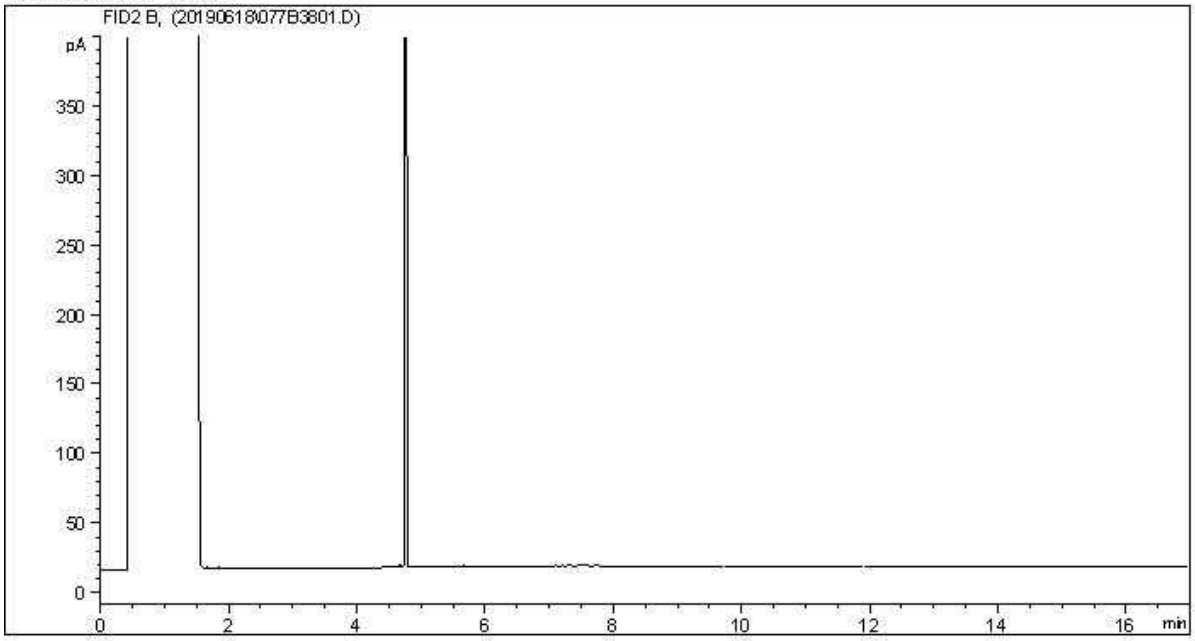
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

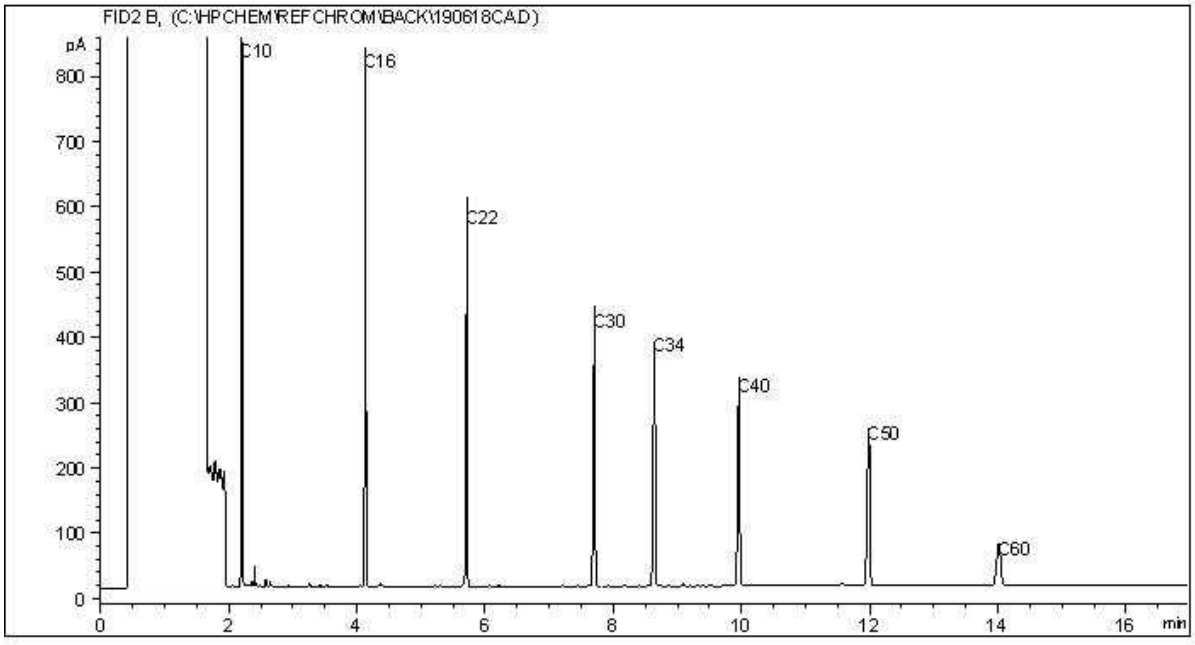
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

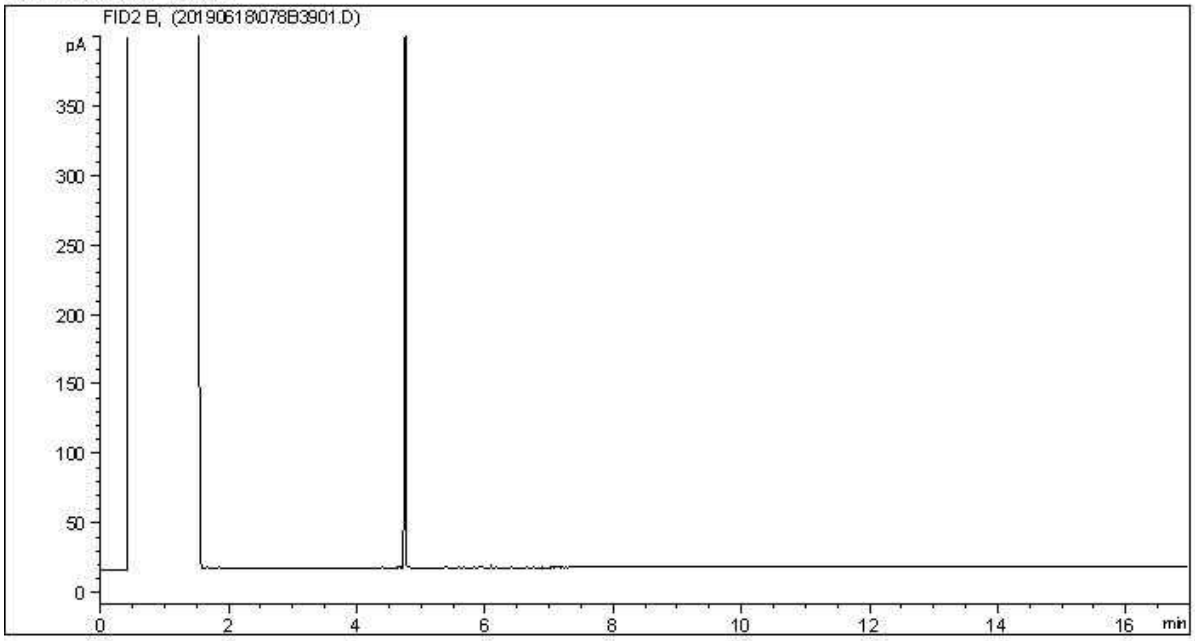
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B947160
Report Date: 2019/07/04
BV Labs Sample: VX1850

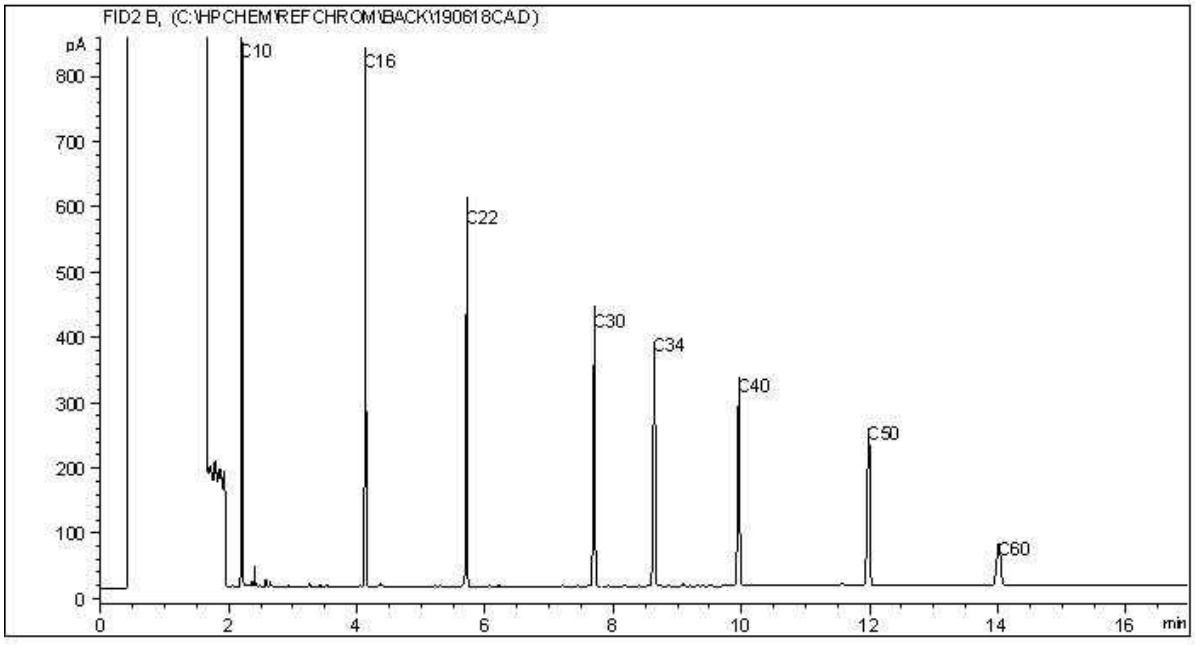
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: DUP A

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: WGC1



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

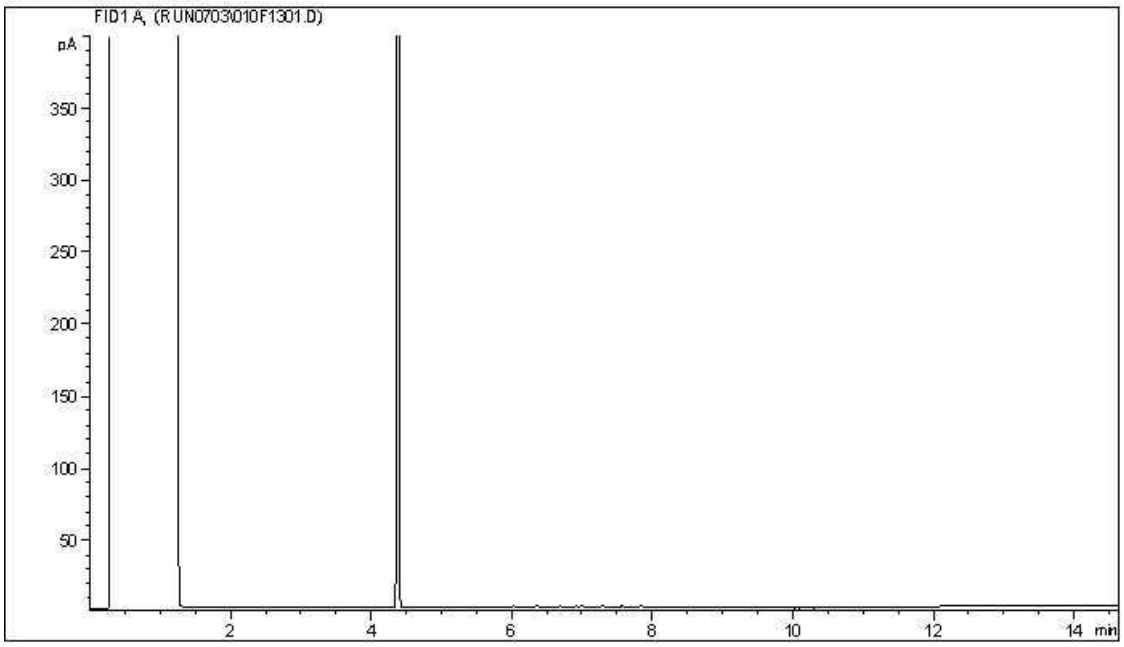
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B947160
Report Date: 2019/07/04
BV Labs Sample: VX1851

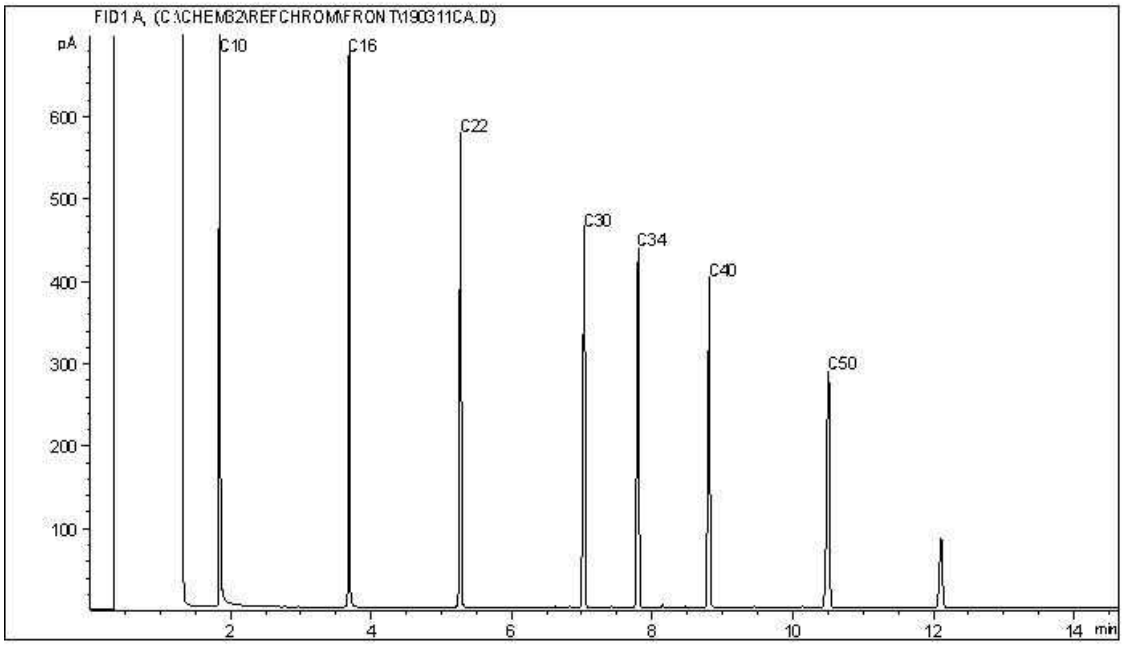
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: FILL 1

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: GC10



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

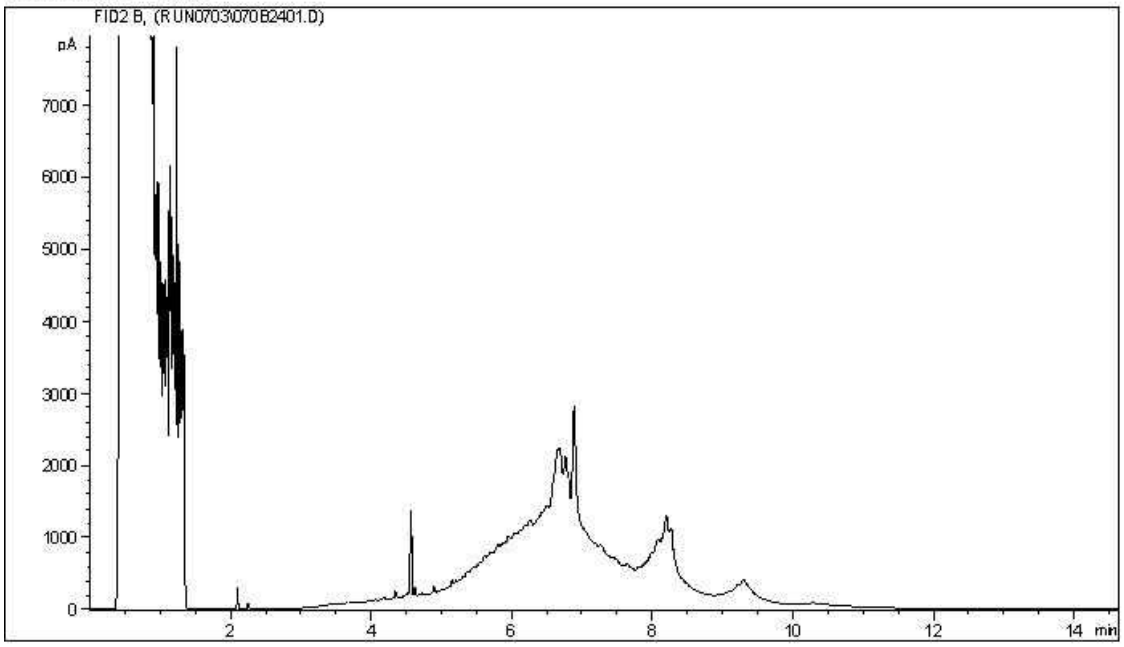
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B947160
Report Date: 2019/07/04
BV Labs Sample: VX1852

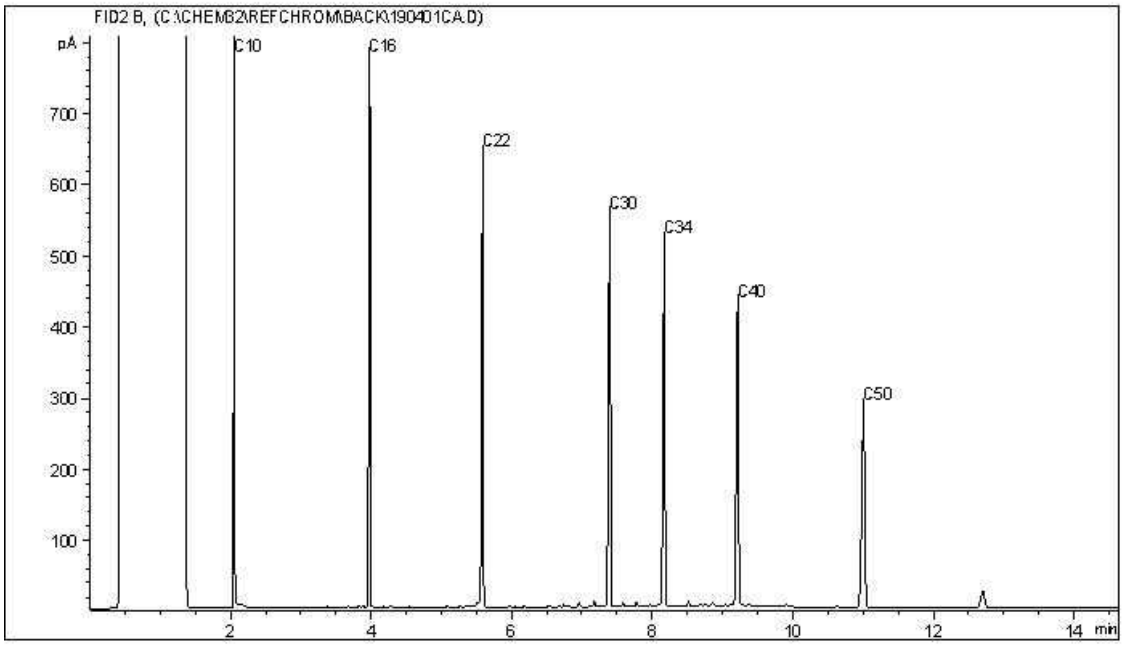
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: SS-1

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: GC10



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Your P.O. #: 400-299
Your Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your C.O.C. #: 1 of 1

Attention: JON GUDMUNDSSON

TRACE ASSOCIATES INC.
SUITE 300
37 RICHARD WAY SW
CALGARY, AB
CANADA T3E7M8

Report Date: 2019/07/25
Report #: R2757921
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B958521
Received: 2019/07/17, 08:15

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS/FID (MeOH extract) (1)	1	N/A	2019/07/22	AB SOP-00039	CCME CWS/EPA 8260d m
F1-BTEX	1	N/A	2019/07/23		Auto Calc
CCME Hydrocarbons (F2-F4 in soil) (2)	1	2019/07/19	2019/07/20	AB SOP-00036	CCME PHC-CWS m
Moisture	1	N/A	2019/07/20	AB SOP-00002	CCME PHC-CWS m

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	3	N/A	2019/07/21	AB SOP-00005	SM 23 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	8	N/A	2019/07/20	AB SOP-00039	CCME CWS/EPA 8260d m
F1-BTEX	8	N/A	2019/07/22		Auto Calc
Cadmium - low level CCME - Dissolved	3	N/A	2019/07/22		Auto Calc
Cadmium - low level CCME (Total)	3	N/A	2019/07/23		Auto Calc
Chloride by Automated Colourimetry	3	N/A	2019/07/24	AB SOP-00020	SM 23-4500-Cl-E m
Conductivity @25C	3	N/A	2019/07/21	AB SOP-00005	SM 23 2510 B m
CCME Hydrocarbons in Water (F2; C10-C16) (3)	1	2019/07/20	2019/07/20	AB SOP-00037 AB SOP-00040	CCME PHC-CWS m
CCME Hydrocarbons in Water (F2; C10-C16) (3)	7	2019/07/20	2019/07/21	AB SOP-00037 AB SOP-00040	CCME PHC-CWS m
Hardness	3	N/A	2019/07/22		Auto Calc
Elements by ICP-Dissolved-Lab Filtered (4)	3	N/A	2019/07/20	AB SOP-00042	EPA 6010d R5 m
Elements by ICP - Total	3	2019/07/20	2019/07/22	AB SOP-00014 / AB SOP-00042	EPA 6010d R4 m
Elements by ICPMS-Dissolved-Lab Filtered (5)	3	N/A	2019/07/21	AB SOP-00043	EPA 6020b R2 m
Elements by ICPMS - Total	3	2019/07/20	2019/07/22	AB SOP-00014 / AB SOP-00043	EPA 6020b R2 m
Ion Balance	3	N/A	2019/07/21		Auto Calc
Sum of cations, anions	3	N/A	2019/07/22		Auto Calc
Nitrate and Nitrite	3	N/A	2019/07/22		Auto Calc
Nitrate + Nitrite-N (calculated)	3	N/A	2019/07/22		Auto Calc
Nitrogen (Nitrite - Nitrate) by IC	3	N/A	2019/07/21	AB SOP-00023	SM 23 4110 B m

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Your P.O. #: 400-299
Your Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your C.O.C. #: 1 of 1

Attention: JON GUDMUNDSSON

TRACE ASSOCIATES INC.
SUITE 300
37 RICHARD WAY SW
CALGARY, AB
CANADA T3E7M8

Report Date: 2019/07/25
Report #: R2757921
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B958521
Received: 2019/07/17, 08:15

Sample Matrix: Water
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
pH @25°C (6)	3	N/A	2019/07/21	AB SOP-00005	SM 23 4500-H+B m
Sulphate by Automated Colourimetry	3	N/A	2019/07/24	AB SOP-00018	SM 23 4500-SO4 E m
Total Dissolved Solids (Calculated)	3	N/A	2019/07/24		Auto Calc
Carbon (Total Organic) (7)	3	N/A	2019/07/25	AB SOP-00087	MMCW 119 1996 m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) No lab extraction date is given for F1BTEX & VOC samples that are field preserved with methanol. Extraction date is date sampled unless otherwise stated.
(2) All CCME results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Bureau Veritas Laboratories conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil, Validation of Performance-Based Alternative Methods September 2003. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.
(3) Silica gel clean up employed.
(4) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(5) Samples were filtered and preserved at the lab. Values may not reflect concentrations at the time of sampling. Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Your P.O. #: 400-299
Your Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your C.O.C. #: 1 of 1

Attention: JON GUDMUNDSSON

TRACE ASSOCIATES INC.
SUITE 300
37 RICHARD WAY SW
CALGARY, AB
CANADA T3E7M8

Report Date: 2019/07/25
Report #: R2757921
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: B958521
Received: 2019/07/17, 08:15

(6) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas Laboratories endeavours to analyze samples as soon as possible after receipt.
(7) TOC present in the sample should be considered as non-purgeable TOC.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Linsay Sunderman, Key Account Specialist
Email: Lsunderman@bvlabs.com
Phone# (403)735-2237 Ext:2237
==========
This report has been generated and distributed using a secure automated process.
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

BV Labs Job #: B958521
Report Date: 2019/07/25

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: AG

AT1 BTEX AND F1-F2 IN WATER (WATER)

BV Labs ID		WD0838	WD0839	WD0840	WD0841	WD0842	WD0843		
Sampling Date		2019/07/16	2019/07/16	2019/07/16	2019/07/16	2019/07/16	2019/07/16		
COC Number		1 of 1	1 of 1	1 of 1	1 of 1	1 of 1	1 of 1		
	UNITS	**19MW01**	**19MW02**	**19MW03**	**19MW04**	**19MW05**	**19MW06**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon									
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	2.2	<0.10	<0.10	<0.10	0.10	9515141
Volatiles									
Benzene	mg/L	<0.00040	<0.00040	0.41	<0.00040	<0.00040	<0.00040	0.00040	9514569
Toluene	mg/L	<0.00040	<0.00040	0.011	<0.00040	<0.00040	<0.00040	0.00040	9514569
Ethylbenzene	mg/L	<0.00040	<0.00040	0.046	<0.00040	<0.00040	<0.00040	0.00040	9514569
m & p-Xylene	mg/L	<0.00080	<0.00080	0.069	<0.00080	<0.00080	<0.00080	0.00080	9514569
o-Xylene	mg/L	<0.00040	<0.00040	0.0024	<0.00040	<0.00040	<0.00040	0.00040	9514569
Xylenes (Total)	mg/L	<0.00089	<0.00089	0.072	<0.00089	<0.00089	<0.00089	0.00089	9513835
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	2.2	<0.10	<0.10	<0.10	0.10	9513835
F1 (C6-C10)	mg/L	<0.10	<0.10	2.8	<0.10	<0.10	<0.10	0.10	9514569
Surrogate Recovery (%)									
1,4-Difluorobenzene (sur.)	%	100	96	101	101	98	101	N/A	9514569
4-Bromofluorobenzene (sur.)	%	96	96	100	94	97	98	N/A	9514569
D4-1,2-Dichloroethane (sur.)	%	113	119	126	101	117	106	N/A	9514569
O-TERPHENYL (sur.)	%	108	85	82	81	82	89	N/A	9515141

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

BV Labs Job #: B958521
Report Date: 2019/07/25

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: AG

AT1 BTEX AND F1-F2 IN WATER (WATER)

BV Labs ID		WD0844	WD0846	WD0846		
Sampling Date		2019/07/16	2019/07/16	2019/07/16		
COC Number		1 of 1	1 of 1	1 of 1		
	UNITS	19MW07	DUP A	DUP A Lab-Dup	RDL	QC Batch
Ext. Pet. Hydrocarbon						
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	2.2	2.2	0.10	9515141
Volatiles						
Benzene	mg/L	0.00056	0.50	N/A	0.00040	9514569
Toluene	mg/L	<0.00040	0.017	N/A	0.00040	9514569
Ethylbenzene	mg/L	<0.00040	0.074	N/A	0.00040	9514569
m & p-Xylene	mg/L	<0.00080	0.089	N/A	0.00080	9514569
o-Xylene	mg/L	<0.00040	0.0037	N/A	0.00040	9514569
Xylenes (Total)	mg/L	<0.00089	0.093	N/A	0.00089	9513835
F1 (C6-C10) - BTEX	mg/L	<0.10	2.0	N/A	0.10	9513835
F1 (C6-C10)	mg/L	<0.10	2.7	N/A	0.10	9514569
Surrogate Recovery (%)						
1,4-Difluorobenzene (sur.)	%	103	104	N/A	N/A	9514569
4-Bromofluorobenzene (sur.)	%	96	101	N/A	N/A	9514569
D4-1,2-Dichloroethane (sur.)	%	102	125	N/A	N/A	9514569
O-TERPHENYL (sur.)	%	87	89	84	N/A	9515141

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

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

BV Labs Job #: B958521
Report Date: 2019/07/25

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: AG

AT1 BTEX AND F1-F4 IN SOIL (VIALS)

BV Labs ID		WD0845		
Sampling Date		2019/07/16		
COC Number		1 of 1		
	UNITS	19MW07 (2.0-2.5)	RDL	QC Batch
Ext. Pet. Hydrocarbon				
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	10	9514661
F3 (C16-C34 Hydrocarbons)	mg/kg	<50	50	9514661
F4 (C34-C50 Hydrocarbons)	mg/kg	<50	50	9514661
Reached Baseline at C50	mg/kg	Yes	N/A	9514661
Physical Properties				
Moisture	%	14	0.30	9514790
Volatiles				
Xylenes (Total)	mg/kg	<0.045	0.045	9513866
F1 (C6-C10) - BTEX	mg/kg	<10	10	9513866
Field Preserved Volatiles				
Benzene	mg/kg	<0.0050	0.0050	9516502
Toluene	mg/kg	<0.050	0.050	9516502
Ethylbenzene	mg/kg	<0.010	0.010	9516502
m & p-Xylene	mg/kg	<0.040	0.040	9516502
o-Xylene	mg/kg	<0.020	0.020	9516502
F1 (C6-C10)	mg/kg	<10	10	9516502
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	103	N/A	9516502
4-Bromofluorobenzene (sur.)	%	99	N/A	9516502
D10-o-Xylene (sur.)	%	96	N/A	9516502
D4-1,2-Dichloroethane (sur.)	%	104	N/A	9516502
O-TERPHENYL (sur.)	%	117	N/A	9514661

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

BV Labs Job #: B958521
Report Date: 2019/07/25

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: AG

ROUTINE + DISS. REG. METALS – LAB FILT (WATER)

BV Labs ID		WD0839		WD0840		WD0841		
Sampling Date		2019/07/16		2019/07/16		2019/07/16		
COC Number		1 of 1		1 of 1		1 of 1		
	UNITS	19MW02	RDL	19MW03	RDL	19MW04	RDL	QC Batch
Calculated Parameters								
Anion Sum	meq/L	14	N/A	20	N/A	18	N/A	9513936
Cation Sum	meq/L	13	N/A	18	N/A	16	N/A	9513936
Hardness (CaCO3)	mg/L	610	0.50	860	0.50	700	0.50	9513934
Ion Balance (% Difference)	%	4.4	N/A	3.4	N/A	5.2	N/A	9513935
Dissolved Nitrate (NO3)	mg/L	29	0.044	0.37	0.044	130	0.22	9513937
Nitrate plus Nitrite (N)	mg/L	6.6	0.014	0.094	0.014	29	0.051	9513938
Dissolved Nitrite (NO2)	mg/L	0.069	0.033	0.035	0.033	0.67	0.033	9513937
Calculated Total Dissolved Solids	mg/L	730	10	1000	10	960	10	9513940
Misc. Inorganics								
Conductivity	uS/cm	1400	2.0	1900	2.0	1700	2.0	9516437
pH	pH	7.96	N/A	7.45	N/A	7.64	N/A	9516436
Low Level Elements								
Dissolved Cadmium (Cd)	ug/L	0.028	0.020	0.15	0.020	0.099	0.020	9513930
Anions								
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	<1.0	1.0	<1.0	1.0	9516435
Alkalinity (Total as CaCO3)	mg/L	400	1.0	490	1.0	360	1.0	9516435
Bicarbonate (HCO3)	mg/L	490	1.0	590	1.0	430	1.0	9516435
Carbonate (CO3)	mg/L	<1.0	1.0	<1.0	1.0	<1.0	1.0	9516435
Hydroxide (OH)	mg/L	<1.0	1.0	<1.0	1.0	<1.0	1.0	9516435
Dissolved Sulphate (SO4)	mg/L	83	1.0	160 (1)	2.0	150	1.0	9521016
Dissolved Chloride (Cl)	mg/L	150	1.0	240 (1)	2.0	190	1.0	9521013
Nutrients								
Dissolved Nitrite (N)	mg/L	0.021	0.010	0.011	0.010	0.20	0.010	9515730
Dissolved Nitrate (N)	mg/L	6.6	0.010	0.083	0.010	29 (1)	0.050	9515730
Lab Filtered Elements								
Dissolved Aluminum (Al)	mg/L	<0.0030	0.0030	<0.0030	0.0030	<0.0030	0.0030	9516466
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	<0.00060	0.00060	<0.00060	0.00060	9516466
Dissolved Arsenic (As)	mg/L	<0.00020	0.00020	<0.00020	0.00020	0.00028	0.00020	9516466
Dissolved Barium (Ba)	mg/L	0.17	0.010	0.092	0.010	0.071	0.010	9516135
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	0.0010	9516466

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

BV Labs Job #: B958521
Report Date: 2019/07/25

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: AG

ROUTINE + DISS. REG. METALS – LAB FILT (WATER)

BV Labs ID		WD0839		WD0840		WD0841		
Sampling Date		2019/07/16		2019/07/16		2019/07/16		
COC Number		1 of 1		1 of 1		1 of 1		
	UNITS	19MW02	RDL	19MW03	RDL	19MW04	RDL	QC Batch
Dissolved Boron (B)	mg/L	0.081	0.020	0.17	0.020	0.21	0.020	9516135
Dissolved Calcium (Ca)	mg/L	140	0.30	210	0.30	150	0.30	9516135
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	0.0010	9516466
Dissolved Cobalt (Co)	mg/L	0.00073	0.00030	0.0044	0.00030	0.0010	0.00030	9516466
Dissolved Copper (Cu)	mg/L	0.0014	0.00020	0.00031	0.00020	0.0012	0.00020	9516466
Dissolved Iron (Fe)	mg/L	0.094	0.060	0.16	0.060	0.13	0.060	9516135
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	<0.00020	0.00020	<0.00020	0.00020	9516466
Dissolved Lithium (Li)	mg/L	0.042	0.020	0.22	0.020	0.32	0.020	9516135
Dissolved Magnesium (Mg)	mg/L	64	0.20	81	0.20	77	0.20	9516135
Dissolved Manganese (Mn)	mg/L	0.27	0.0040	2.3	0.0040	0.41	0.0040	9516135
Dissolved Molybdenum (Mo)	mg/L	0.0040	0.00020	0.0035	0.00020	0.0082	0.00020	9516466
Dissolved Nickel (Ni)	mg/L	0.0038	0.00050	0.012	0.00050	0.0093	0.00050	9516466
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	<0.10	0.10	<0.10	0.10	9516135
Dissolved Potassium (K)	mg/L	2.7	0.30	1.8	0.30	3.0	0.30	9516135
Dissolved Selenium (Se)	mg/L	<0.00020	0.00020	<0.00020	0.00020	<0.00020	0.00020	9516466
Dissolved Silicon (Si)	mg/L	7.9	0.10	5.6	0.10	5.1	0.10	9516135
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	<0.00010	0.00010	<0.00010	0.00010	9516466
Dissolved Sodium (Na)	mg/L	20	0.50	27	0.50	45	0.50	9516135
Dissolved Strontium (Sr)	mg/L	0.29	0.020	0.26	0.020	0.32	0.020	9516135
Dissolved Sulphur (S)	mg/L	23	0.20	47	0.20	41	0.20	9516135
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	<0.00020	0.00020	<0.00020	0.00020	9516466
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	0.0010	9516466
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	0.0010	9516466
Dissolved Uranium (U)	mg/L	0.0077	0.00010	0.0072	0.00010	0.0047	0.00010	9516466
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	<0.0010	0.0010	<0.0010	0.0010	9516466
Dissolved Zinc (Zn)	mg/L	0.044	0.0030	0.30	0.0030	0.41	0.0030	9516466

RDL = Reportable Detection Limit

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BV Labs Job #: B958521
Report Date: 2019/07/25

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: AG

REGULATED METALS (CCME/AT1) - TOTAL

BV Labs ID		WD0839	WD0840	WD0841		
Sampling Date		2019/07/16	2019/07/16	2019/07/16		
COC Number		1 of 1	1 of 1	1 of 1		
	UNITS	19MW02	19MW03	19MW04	RDL	QC Batch
Low Level Elements						
Total Cadmium (Cd)	ug/L	0.078	0.77	0.72	0.020	9513931
Elements						
Total Aluminum (Al)	mg/L	0.11	2.3	8.0	0.0030	9515808
Total Antimony (Sb)	mg/L	<0.00060	<0.00060	0.00095	0.00060	9515808
Total Arsenic (As)	mg/L	0.00042	0.0043	0.0090	0.00020	9515808
Total Barium (Ba)	mg/L	0.18	0.19	0.27	0.010	9515781
Total Beryllium (Be)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	9515808
Total Boron (B)	mg/L	0.086	0.20	0.23	0.020	9515781
Total Calcium (Ca)	mg/L	150	300	430	0.30	9515781
Total Chromium (Cr)	mg/L	<0.0010	0.0062	0.020	0.0010	9515808
Total Cobalt (Co)	mg/L	0.00088	0.0068	0.012	0.00030	9515808
Total Copper (Cu)	mg/L	0.0014	0.012	0.023	0.00020	9515808
Total Iron (Fe)	mg/L	0.33	7.5	20	0.060	9515781
Total Lead (Pb)	mg/L	0.0011	0.0036	0.0087	0.00020	9515808
Total Lithium (Li)	mg/L	0.046	0.25	0.34	0.020	9515781
Total Magnesium (Mg)	mg/L	73	110	170	0.20	9515781
Total Manganese (Mn)	mg/L	0.30	2.7	1.5	0.0040	9515781
Total Molybdenum (Mo)	mg/L	0.0036	0.0040	0.0098	0.00020	9515808
Total Nickel (Ni)	mg/L	0.0042	0.019	0.036	0.00050	9515808
Total Phosphorus (P)	mg/L	<0.10	0.23	0.81	0.10	9515781
Total Potassium (K)	mg/L	2.9	2.5	4.7	0.30	9515781
Total Selenium (Se)	mg/L	0.00035	0.00040	0.00049	0.00020	9515808
Total Silicon (Si)	mg/L	9.5	11	21	0.10	9515781
Total Silver (Ag)	mg/L	<0.00010	<0.00010	0.00015	0.00010	9515808
Total Sodium (Na)	mg/L	21	29	45	0.50	9515781
Total Strontium (Sr)	mg/L	0.30	0.31	0.46	0.020	9515781
Total Sulphur (S)	mg/L	28	60	48	0.20	9515781
Total Thallium (Tl)	mg/L	<0.00020	0.00022	0.00041	0.00020	9515808
Total Tin (Sn)	mg/L	<0.0010	<0.0010	0.0024	0.0010	9515808
Total Titanium (Ti)	mg/L	0.0049	0.11	0.35	0.0010	9515808
Total Uranium (U)	mg/L	0.0076	0.0089	0.0084	0.00010	9515808
Total Vanadium (V)	mg/L	<0.0010	0.012	0.038	0.0010	9515808
RDL = Reportable Detection Limit						

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BV Labs Job #: B958521
Report Date: 2019/07/25

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: AG

REGULATED METALS (CCME/AT1) - TOTAL

BV Labs ID		WD0839	WD0840	WD0841		
Sampling Date		2019/07/16	2019/07/16	2019/07/16		
COC Number		1 of 1	1 of 1	1 of 1		
	UNITS	**19MW02**	**19MW03**	**19MW04**	**RDL**	**QC Batch**
Total Zinc (Zn)	mg/L	0.048	0.41	0.50	0.0030	9515808
RDL = Reportable Detection Limit						

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BV Labs Job #: B958521
Report Date: 2019/07/25

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: AG

RESULTS OF CHEMICAL ANALYSES OF WATER

BV Labs ID		WD0839		WD0840	WD0841		
Sampling Date		2019/07/16		2019/07/16	2019/07/16		
COC Number		1 of 1		1 of 1	1 of 1		
	UNITS	19MW02	RDL	19MW03	19MW04	RDL	QC Batch
Misc. Inorganics							
Total Organic Carbon (C)	mg/L	2.4	0.50	6.6 (1)	<2.5 (1)	2.5	9519963

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

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BV Labs Job #: B958521
Report Date: 2019/07/25

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: AG

GENERAL COMMENTS

Sample WD0839 [19MW02] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD0840 [19MW03] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Sample WD0841 [19MW04] : Nitrogen (Nitrite - Nitrate) by IC completed within 48h after laboratory receipt to a maximum of five days from sampling. Data are satisfactory for compliance purposes.

Results relate only to the items tested.

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BV Labs Job #: B958521
Report Date: 2019/07/25

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: AG

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9514569	DO1	Matrix Spike	1,4-Difluorobenzene (sur.)	2019/07/19		103	%	50 - 140
			4-Bromofluorobenzene (sur.)	2019/07/19		98	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2019/07/19		107	%	50 - 140
			Benzene	2019/07/19		94	%	50 - 140
			Toluene	2019/07/19		89	%	50 - 140
			Ethylbenzene	2019/07/19		89	%	50 - 140
			m & p-Xylene	2019/07/19		85	%	50 - 140
			o-Xylene	2019/07/19		90	%	50 - 140
			F1 (C6-C10)	2019/07/19		82	%	60 - 140
9514569	DO1	Spiked Blank	1,4-Difluorobenzene (sur.)	2019/07/19		103	%	50 - 140
			4-Bromofluorobenzene (sur.)	2019/07/19		94	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2019/07/19		102	%	50 - 140
			Benzene	2019/07/19		93	%	60 - 130
			Toluene	2019/07/19		89	%	60 - 130
			Ethylbenzene	2019/07/19		90	%	60 - 130
			m & p-Xylene	2019/07/19		86	%	60 - 130
			o-Xylene	2019/07/19		89	%	60 - 130
			F1 (C6-C10)	2019/07/19		94	%	60 - 140
9514569	DO1	Method Blank	1,4-Difluorobenzene (sur.)	2019/07/19		93	%	50 - 140
			4-Bromofluorobenzene (sur.)	2019/07/19		102	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2019/07/19		130	%	50 - 140
			Benzene	2019/07/19	<0.00040		mg/L	
			Toluene	2019/07/19	<0.00040		mg/L	
			Ethylbenzene	2019/07/19	<0.00040		mg/L	
			m & p-Xylene	2019/07/19	<0.00080		mg/L	
			o-Xylene	2019/07/19	<0.00040		mg/L	
			F1 (C6-C10)	2019/07/19	<0.10		mg/L	
9514569	DO1	RPD	Benzene	2019/07/20	NC		%	30
			Toluene	2019/07/20	NC		%	30
			Ethylbenzene	2019/07/20	NC		%	30
			m & p-Xylene	2019/07/20	NC		%	30
			o-Xylene	2019/07/20	NC		%	30
			F1 (C6-C10)	2019/07/20	NC		%	30
9514661	LSH	Matrix Spike	O-TERPHENYL (sur.)	2019/07/19		107	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2019/07/19		113	%	60 - 140
			F3 (C16-C34 Hydrocarbons)	2019/07/19		114	%	60 - 140
			F4 (C34-C50 Hydrocarbons)	2019/07/19		111	%	60 - 140
9514661	LSH	Spiked Blank	O-TERPHENYL (sur.)	2019/07/19		101	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2019/07/19		109	%	60 - 140
			F3 (C16-C34 Hydrocarbons)	2019/07/19		109	%	60 - 140
			F4 (C34-C50 Hydrocarbons)	2019/07/19		105	%	60 - 140
9514661	LSH	Method Blank	O-TERPHENYL (sur.)	2019/07/19		117	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2019/07/19	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2019/07/19	<50		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2019/07/19	<50		mg/kg	
9514661	LSH	RPD	F2 (C10-C16 Hydrocarbons)	2019/07/19	NC		%	40
			F3 (C16-C34 Hydrocarbons)	2019/07/19	NC		%	40
			F4 (C34-C50 Hydrocarbons)	2019/07/19	NC		%	40
9514790	SAY	Method Blank	Moisture	2019/07/20	<0.30		%	
9514790	SAY	RPD	Moisture	2019/07/20	6.9		%	20
9515141	MHF	Matrix Spike	O-TERPHENYL (sur.)	2019/07/20		89	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2019/07/20		110	%	60 - 140

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9515141	MHF	Spiked Blank	O-TERPHENYL (sur.)	2019/07/20		91	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2019/07/20		105	%	60 - 140
9515141	MHF	Method Blank	O-TERPHENYL (sur.)	2019/07/20		98	%	60 - 140
			F2 (C10-C16 Hydrocarbons)	2019/07/20	<0.10		mg/L	
9515141	MHF	RPD [WD0846-01]	F2 (C10-C16 Hydrocarbons)	2019/07/20	2.5		%	30
9515730	KD9	Matrix Spike	Dissolved Nitrite (N)	2019/07/20		100	%	80 - 120
			Dissolved Nitrate (N)	2019/07/20		NC	%	80 - 120
9515730	KD9	Spiked Blank	Dissolved Nitrite (N)	2019/07/20		100	%	80 - 120
			Dissolved Nitrate (N)	2019/07/20		100	%	80 - 120
9515730	KD9	Method Blank	Dissolved Nitrite (N)	2019/07/20	<0.010		mg/L	
			Dissolved Nitrate (N)	2019/07/20	<0.010		mg/L	
9515730	KD9	RPD	Dissolved Nitrite (N)	2019/07/20	2.9		%	20
			Dissolved Nitrate (N)	2019/07/20	0.46		%	20
9515781	ALX	Matrix Spike	Total Barium (Ba)	2019/07/22		102	%	80 - 120
			Total Boron (B)	2019/07/22		102	%	80 - 120
			Total Calcium (Ca)	2019/07/22		96	%	80 - 120
			Total Iron (Fe)	2019/07/22		106	%	80 - 120
			Total Lithium (Li)	2019/07/22		105	%	80 - 120
			Total Magnesium (Mg)	2019/07/22		101	%	80 - 120
			Total Manganese (Mn)	2019/07/22		101	%	80 - 120
			Total Phosphorus (P)	2019/07/22		98	%	80 - 120
			Total Potassium (K)	2019/07/22		100	%	80 - 120
			Total Silicon (Si)	2019/07/22		102	%	80 - 120
			Total Sodium (Na)	2019/07/22		102	%	80 - 120
			Total Strontium (Sr)	2019/07/22		102	%	80 - 120
			Total Sulphur (S)	2019/07/22		101	%	80 - 120
9515781	ALX	Spiked Blank	Total Barium (Ba)	2019/07/22		103	%	80 - 120
			Total Boron (B)	2019/07/22		102	%	80 - 120
			Total Calcium (Ca)	2019/07/22		97	%	80 - 120
			Total Iron (Fe)	2019/07/22		108	%	80 - 120
			Total Lithium (Li)	2019/07/22		105	%	80 - 120
			Total Magnesium (Mg)	2019/07/22		102	%	80 - 120
			Total Manganese (Mn)	2019/07/22		102	%	80 - 120
			Total Phosphorus (P)	2019/07/22		99	%	80 - 120
			Total Potassium (K)	2019/07/22		100	%	80 - 120
			Total Silicon (Si)	2019/07/22		103	%	80 - 120
			Total Sodium (Na)	2019/07/22		102	%	80 - 120
			Total Strontium (Sr)	2019/07/22		104	%	80 - 120
			Total Sulphur (S)	2019/07/22		101	%	80 - 120
9515781	ALX	Method Blank	Total Barium (Ba)	2019/07/22	<0.010		mg/L	
			Total Boron (B)	2019/07/22	<0.020		mg/L	
			Total Calcium (Ca)	2019/07/22	<0.30		mg/L	
			Total Iron (Fe)	2019/07/22	<0.060		mg/L	
			Total Lithium (Li)	2019/07/22	<0.020		mg/L	
			Total Magnesium (Mg)	2019/07/22	<0.20		mg/L	
			Total Manganese (Mn)	2019/07/22	<0.0040		mg/L	
			Total Phosphorus (P)	2019/07/22	<0.10		mg/L	
			Total Potassium (K)	2019/07/22	<0.30		mg/L	
			Total Silicon (Si)	2019/07/22	<0.10		mg/L	
			Total Sodium (Na)	2019/07/22	<0.50		mg/L	
			Total Strontium (Sr)	2019/07/22	<0.020		mg/L	
			Total Sulphur (S)	2019/07/22	<0.20		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9515781	ALX	RPD	Total Barium (Ba)	2019/07/22	NC		%	20
			Total Boron (B)	2019/07/22	6.4		%	20
			Total Calcium (Ca)	2019/07/22	5.7 (1)		%	20
			Total Iron (Fe)	2019/07/22	3.4		%	20
			Total Lithium (Li)	2019/07/22	1.0		%	20
			Total Magnesium (Mg)	2019/07/22	1.3		%	20
			Total Manganese (Mn)	2019/07/22	2.9		%	20
			Total Phosphorus (P)	2019/07/22	NC		%	20
			Total Potassium (K)	2019/07/22	1.7		%	20
			Total Silicon (Si)	2019/07/22	1.0		%	20
			Total Sodium (Na)	2019/07/22	0.73		%	20
			Total Strontium (Sr)	2019/07/22	1.3		%	20
			Total Sulphur (S)	2019/07/22	0.35 (1)		%	20
9515808	ANE	Matrix Spike	Total Aluminum (Al)	2019/07/22		NC	%	80 - 120
			Total Antimony (Sb)	2019/07/22		106	%	80 - 120
			Total Arsenic (As)	2019/07/22		103	%	80 - 120
			Total Beryllium (Be)	2019/07/22		103	%	80 - 120
			Total Chromium (Cr)	2019/07/22		105	%	80 - 120
			Total Cobalt (Co)	2019/07/22		104	%	80 - 120
			Total Copper (Cu)	2019/07/22		105	%	80 - 120
			Total Lead (Pb)	2019/07/22		105	%	80 - 120
			Total Molybdenum (Mo)	2019/07/22		108	%	80 - 120
			Total Nickel (Ni)	2019/07/22		102	%	80 - 120
			Total Selenium (Se)	2019/07/22		103	%	80 - 120
			Total Silver (Ag)	2019/07/22		107	%	80 - 120
			Total Thallium (Tl)	2019/07/22		107	%	80 - 120
			Total Tin (Sn)	2019/07/22		106	%	80 - 120
			Total Titanium (Ti)	2019/07/22		102	%	80 - 120
			Total Uranium (U)	2019/07/22		107	%	80 - 120
			Total Vanadium (V)	2019/07/22		106	%	80 - 120
			Total Zinc (Zn)	2019/07/22		100	%	80 - 120
9515808	ANE	Spiked Blank	Total Aluminum (Al)	2019/07/22		99	%	80 - 120
			Total Antimony (Sb)	2019/07/22		102	%	80 - 120
			Total Arsenic (As)	2019/07/22		99	%	80 - 120
			Total Beryllium (Be)	2019/07/22		95	%	80 - 120
			Total Chromium (Cr)	2019/07/22		101	%	80 - 120
			Total Cobalt (Co)	2019/07/22		100	%	80 - 120
			Total Copper (Cu)	2019/07/22		102	%	80 - 120
			Total Lead (Pb)	2019/07/22		102	%	80 - 120
			Total Molybdenum (Mo)	2019/07/22		101	%	80 - 120
			Total Nickel (Ni)	2019/07/22		99	%	80 - 120
			Total Selenium (Se)	2019/07/22		98	%	80 - 120
			Total Silver (Ag)	2019/07/22		101	%	80 - 120
			Total Thallium (Tl)	2019/07/22		103	%	80 - 120
			Total Tin (Sn)	2019/07/22		99	%	80 - 120
			Total Titanium (Ti)	2019/07/22		101	%	80 - 120
			Total Uranium (U)	2019/07/22		98	%	80 - 120
			Total Vanadium (V)	2019/07/22		100	%	80 - 120
			Total Zinc (Zn)	2019/07/22		97	%	80 - 120
9515808	ANE	Method Blank	Total Aluminum (Al)	2019/07/22	<0.0030		mg/L	
			Total Antimony (Sb)	2019/07/22	<0.00060		mg/L	
			Total Arsenic (As)	2019/07/22	<0.00020		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Beryllium (Be)	2019/07/22	<0.0010		mg/L	
			Total Chromium (Cr)	2019/07/22	<0.0010		mg/L	
			Total Cobalt (Co)	2019/07/22	<0.00030		mg/L	
			Total Copper (Cu)	2019/07/22	<0.00020		mg/L	
			Total Lead (Pb)	2019/07/22	<0.00020		mg/L	
			Total Molybdenum (Mo)	2019/07/22	<0.00020		mg/L	
			Total Nickel (Ni)	2019/07/22	<0.00050		mg/L	
			Total Selenium (Se)	2019/07/22	<0.00020		mg/L	
			Total Silver (Ag)	2019/07/22	<0.00010		mg/L	
			Total Thallium (Tl)	2019/07/22	<0.00020		mg/L	
			Total Tin (Sn)	2019/07/22	<0.0010		mg/L	
			Total Titanium (Ti)	2019/07/22	<0.0010		mg/L	
			Total Uranium (U)	2019/07/22	<0.00010		mg/L	
			Total Vanadium (V)	2019/07/22	<0.0010		mg/L	
			Total Zinc (Zn)	2019/07/22	<0.0030		mg/L	
9515808	ANE	RPD	Total Aluminum (Al)	2019/07/22	4.1		%	20
			Total Antimony (Sb)	2019/07/22	0.66		%	20
			Total Arsenic (As)	2019/07/22	7.4		%	20
			Total Beryllium (Be)	2019/07/22	NC		%	20
			Total Chromium (Cr)	2019/07/22	5.9		%	20
			Total Cobalt (Co)	2019/07/22	7.8		%	20
			Total Copper (Cu)	2019/07/22	8.3		%	20
			Total Lead (Pb)	2019/07/22	3.1		%	20
			Total Molybdenum (Mo)	2019/07/22	1.8		%	20
			Total Nickel (Ni)	2019/07/22	5.0		%	20
			Total Selenium (Se)	2019/07/22	20		%	20
			Total Silver (Ag)	2019/07/22	NC		%	20
			Total Thallium (Tl)	2019/07/22	NC		%	20
			Total Tin (Sn)	2019/07/22	NC		%	20
			Total Titanium (Ti)	2019/07/22	5.7		%	20
			Total Uranium (U)	2019/07/22	4.5		%	20
			Total Vanadium (V)	2019/07/22	NC		%	20
			Total Zinc (Zn)	2019/07/22	3.9		%	20
9516135	ALX	Matrix Spike	Dissolved Barium (Ba)	2019/07/20		93	%	80 - 120
			Dissolved Boron (B)	2019/07/20		93	%	80 - 120
			Dissolved Calcium (Ca)	2019/07/20		89	%	80 - 120
			Dissolved Iron (Fe)	2019/07/20		95	%	80 - 120
			Dissolved Lithium (Li)	2019/07/20		94	%	80 - 120
			Dissolved Magnesium (Mg)	2019/07/20		93	%	80 - 120
			Dissolved Manganese (Mn)	2019/07/20		93	%	80 - 120
			Dissolved Phosphorus (P)	2019/07/20		91	%	80 - 120
			Dissolved Potassium (K)	2019/07/20		94	%	80 - 120
			Dissolved Silicon (Si)	2019/07/20		93	%	80 - 120
			Dissolved Sodium (Na)	2019/07/20		95	%	80 - 120
			Dissolved Strontium (Sr)	2019/07/20		91	%	80 - 120
			Dissolved Sulphur (S)	2019/07/20		96	%	80 - 120
9516135	ALX	Spiked Blank	Dissolved Barium (Ba)	2019/07/20		95	%	80 - 120
			Dissolved Boron (B)	2019/07/20		95	%	80 - 120
			Dissolved Calcium (Ca)	2019/07/20		90	%	80 - 120
			Dissolved Iron (Fe)	2019/07/20		99	%	80 - 120
			Dissolved Lithium (Li)	2019/07/20		96	%	80 - 120
			Dissolved Magnesium (Mg)	2019/07/20		95	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Manganese (Mn)	2019/07/20		96	%	80 - 120
			Dissolved Phosphorus (P)	2019/07/20		92	%	80 - 120
			Dissolved Potassium (K)	2019/07/20		93	%	80 - 120
			Dissolved Silicon (Si)	2019/07/20		95	%	80 - 120
			Dissolved Sodium (Na)	2019/07/20		98	%	80 - 120
			Dissolved Strontium (Sr)	2019/07/20		96	%	80 - 120
			Dissolved Sulphur (S)	2019/07/20		94	%	80 - 120
9516135	ALX	Method Blank	Dissolved Barium (Ba)	2019/07/20	<0.010		mg/L	
			Dissolved Boron (B)	2019/07/20	<0.020		mg/L	
			Dissolved Calcium (Ca)	2019/07/20	<0.30		mg/L	
			Dissolved Iron (Fe)	2019/07/20	<0.060		mg/L	
			Dissolved Lithium (Li)	2019/07/20	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2019/07/20	<0.20		mg/L	
			Dissolved Manganese (Mn)	2019/07/20	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2019/07/20	<0.10		mg/L	
			Dissolved Potassium (K)	2019/07/20	<0.30		mg/L	
			Dissolved Silicon (Si)	2019/07/20	<0.10		mg/L	
			Dissolved Sodium (Na)	2019/07/20	<0.50		mg/L	
			Dissolved Strontium (Sr)	2019/07/20	<0.020		mg/L	
			Dissolved Sulphur (S)	2019/07/20	<0.20		mg/L	
9516135	ALX	RPD	Dissolved Barium (Ba)	2019/07/20	NC		%	20
			Dissolved Boron (B)	2019/07/20	NC		%	20
			Dissolved Calcium (Ca)	2019/07/20	NC		%	20
			Dissolved Iron (Fe)	2019/07/20	NC		%	20
			Dissolved Lithium (Li)	2019/07/20	NC		%	20
			Dissolved Magnesium (Mg)	2019/07/20	NC		%	20
			Dissolved Manganese (Mn)	2019/07/20	NC		%	20
			Dissolved Phosphorus (P)	2019/07/20	NC		%	20
			Dissolved Potassium (K)	2019/07/20	NC		%	20
			Dissolved Silicon (Si)	2019/07/20	NC		%	20
			Dissolved Sodium (Na)	2019/07/20	NC		%	20
			Dissolved Strontium (Sr)	2019/07/20	NC		%	20
			Dissolved Sulphur (S)	2019/07/20	NC		%	20
9516435	KD9	Spiked Blank	Alkalinity (Total as CaCO3)	2019/07/21		93	%	80 - 120
9516435	KD9	Method Blank	Alkalinity (PP as CaCO3)	2019/07/21	<1.0		mg/L	
			Alkalinity (Total as CaCO3)	2019/07/21	<1.0		mg/L	
			Bicarbonate (HCO3)	2019/07/21	<1.0		mg/L	
			Carbonate (CO3)	2019/07/21	<1.0		mg/L	
			Hydroxide (OH)	2019/07/21	<1.0		mg/L	
9516435	KD9	RPD	Alkalinity (PP as CaCO3)	2019/07/21	NC		%	20
			Alkalinity (Total as CaCO3)	2019/07/21	0.99		%	20
			Bicarbonate (HCO3)	2019/07/21	0.99		%	20
			Carbonate (CO3)	2019/07/21	NC		%	20
			Hydroxide (OH)	2019/07/21	NC		%	20
9516436	KD9	Spiked Blank	pH	2019/07/21		100	%	97 - 103
9516436	KD9	RPD	pH	2019/07/21	0.56		%	N/A
9516437	KD9	Spiked Blank	Conductivity	2019/07/21		100	%	90 - 110
9516437	KD9	Method Blank	Conductivity	2019/07/21	<2.0		uS/cm	
9516437	KD9	RPD	Conductivity	2019/07/21	0		%	10
9516466	LQ1	Matrix Spike	Dissolved Aluminum (Al)	2019/07/21		107	%	80 - 120
			Dissolved Antimony (Sb)	2019/07/21		111	%	80 - 120
			Dissolved Arsenic (As)	2019/07/21		102	%	80 - 120

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Beryllium (Be)	2019/07/21		105	%	80 - 120
			Dissolved Chromium (Cr)	2019/07/21		102	%	80 - 120
			Dissolved Cobalt (Co)	2019/07/21		101	%	80 - 120
			Dissolved Copper (Cu)	2019/07/21		100	%	80 - 120
			Dissolved Lead (Pb)	2019/07/21		101	%	80 - 120
			Dissolved Molybdenum (Mo)	2019/07/21		109	%	80 - 120
			Dissolved Nickel (Ni)	2019/07/21		100	%	80 - 120
			Dissolved Selenium (Se)	2019/07/21		106	%	80 - 120
			Dissolved Silver (Ag)	2019/07/21		104	%	80 - 120
			Dissolved Thallium (Tl)	2019/07/21		102	%	80 - 120
			Dissolved Tin (Sn)	2019/07/21		105	%	80 - 120
			Dissolved Titanium (Ti)	2019/07/21		103	%	80 - 120
			Dissolved Uranium (U)	2019/07/21		107	%	80 - 120
			Dissolved Vanadium (V)	2019/07/21		105	%	80 - 120
			Dissolved Zinc (Zn)	2019/07/21		105	%	80 - 120
9516466	LQ1	Spiked Blank	Dissolved Aluminum (Al)	2019/07/21		107	%	80 - 120
			Dissolved Antimony (Sb)	2019/07/21		107	%	80 - 120
			Dissolved Arsenic (As)	2019/07/21		97	%	80 - 120
			Dissolved Beryllium (Be)	2019/07/21		99	%	80 - 120
			Dissolved Chromium (Cr)	2019/07/21		98	%	80 - 120
			Dissolved Cobalt (Co)	2019/07/21		99	%	80 - 120
			Dissolved Copper (Cu)	2019/07/21		100	%	80 - 120
			Dissolved Lead (Pb)	2019/07/21		99	%	80 - 120
			Dissolved Molybdenum (Mo)	2019/07/21		101	%	80 - 120
			Dissolved Nickel (Ni)	2019/07/21		99	%	80 - 120
			Dissolved Selenium (Se)	2019/07/21		101	%	80 - 120
			Dissolved Silver (Ag)	2019/07/21		99	%	80 - 120
			Dissolved Thallium (Tl)	2019/07/21		99	%	80 - 120
			Dissolved Tin (Sn)	2019/07/21		98	%	80 - 120
			Dissolved Titanium (Ti)	2019/07/21		95	%	80 - 120
			Dissolved Uranium (U)	2019/07/21		102	%	80 - 120
			Dissolved Vanadium (V)	2019/07/21		100	%	80 - 120
			Dissolved Zinc (Zn)	2019/07/21		100	%	80 - 120
9516466	LQ1	Method Blank	Dissolved Aluminum (Al)	2019/07/21	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2019/07/21	<0.00060		mg/L	
			Dissolved Arsenic (As)	2019/07/21	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2019/07/21	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2019/07/21	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2019/07/21	<0.00030		mg/L	
			Dissolved Copper (Cu)	2019/07/21	<0.00020		mg/L	
			Dissolved Lead (Pb)	2019/07/21	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2019/07/21	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2019/07/21	<0.00050		mg/L	
			Dissolved Selenium (Se)	2019/07/21	<0.00020		mg/L	
			Dissolved Silver (Ag)	2019/07/21	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2019/07/21	<0.00020		mg/L	
			Dissolved Tin (Sn)	2019/07/21	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2019/07/21	<0.0010		mg/L	
			Dissolved Uranium (U)	2019/07/21	<0.00010		mg/L	
			Dissolved Vanadium (V)	2019/07/21	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2019/07/21	<0.0030		mg/L	
9516466	LQ1	RPD	Dissolved Aluminum (Al)	2019/07/21	NC		%	20

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Antimony (Sb)	2019/07/21	NC		%	20
			Dissolved Arsenic (As)	2019/07/21	5.9		%	20
			Dissolved Beryllium (Be)	2019/07/21	NC		%	20
			Dissolved Chromium (Cr)	2019/07/21	NC		%	20
			Dissolved Cobalt (Co)	2019/07/21	11		%	20
			Dissolved Copper (Cu)	2019/07/21	8.2		%	20
			Dissolved Lead (Pb)	2019/07/21	NC		%	20
			Dissolved Molybdenum (Mo)	2019/07/21	0.98		%	20
			Dissolved Nickel (Ni)	2019/07/21	1.7		%	20
			Dissolved Selenium (Se)	2019/07/21	NC		%	20
			Dissolved Silver (Ag)	2019/07/21	NC		%	20
			Dissolved Thallium (Tl)	2019/07/21	NC		%	20
			Dissolved Tin (Sn)	2019/07/21	14		%	20
			Dissolved Titanium (Ti)	2019/07/21	NC		%	20
			Dissolved Uranium (U)	2019/07/21	0.20		%	20
			Dissolved Vanadium (V)	2019/07/21	NC		%	20
			Dissolved Zinc (Zn)	2019/07/21	2.7		%	20
9516502	DO1	Matrix Spike	1,4-Difluorobenzene (sur.)	2019/07/22		104	%	50 - 140
			4-Bromofluorobenzene (sur.)	2019/07/22		98	%	50 - 140
			D10-o-Xylene (sur.)	2019/07/22		106	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2019/07/22		103	%	50 - 140
			Benzene	2019/07/22		98	%	50 - 140
			Toluene	2019/07/22		97	%	50 - 140
			Ethylbenzene	2019/07/22		104	%	50 - 140
			m & p-Xylene	2019/07/22		97	%	50 - 140
			o-Xylene	2019/07/22		97	%	50 - 140
			F1 (C6-C10)	2019/07/22		85	%	60 - 140
9516502	DO1	Spiked Blank	1,4-Difluorobenzene (sur.)	2019/07/22		104	%	50 - 140
			4-Bromofluorobenzene (sur.)	2019/07/22		96	%	50 - 140
			D10-o-Xylene (sur.)	2019/07/22		81	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2019/07/22		99	%	50 - 140
			Benzene	2019/07/22		86	%	60 - 130
			Toluene	2019/07/22		87	%	60 - 130
			Ethylbenzene	2019/07/22		89	%	60 - 130
			m & p-Xylene	2019/07/22		84	%	60 - 130
			o-Xylene	2019/07/22		86	%	60 - 130
			F1 (C6-C10)	2019/07/22		89	%	60 - 140
9516502	DO1	Method Blank	1,4-Difluorobenzene (sur.)	2019/07/22		99	%	50 - 140
			4-Bromofluorobenzene (sur.)	2019/07/22		96	%	50 - 140
			D10-o-Xylene (sur.)	2019/07/22		90	%	50 - 140
			D4-1,2-Dichloroethane (sur.)	2019/07/22		106	%	50 - 140
			Benzene	2019/07/22	<0.0050		mg/kg	
			Toluene	2019/07/22	<0.050		mg/kg	
			Ethylbenzene	2019/07/22	<0.010		mg/kg	
			m & p-Xylene	2019/07/22	<0.040		mg/kg	
			o-Xylene	2019/07/22	<0.020		mg/kg	
			F1 (C6-C10)	2019/07/22	<10		mg/kg	
9516502	DO1	RPD	Benzene	2019/07/22	NC		%	50
			Toluene	2019/07/22	NC		%	50
			Ethylbenzene	2019/07/22	NC		%	50
			m & p-Xylene	2019/07/22	NC		%	50
			o-Xylene	2019/07/22	NC		%	50

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

BV Labs Job #: B958521
Report Date: 2019/07/25

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: AG

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			F1 (C6-C10)	2019/07/22	NC		%	30
9519963	KGH	Matrix Spike	Total Organic Carbon (C)	2019/07/25		104	%	80 - 120
9519963	KGH	Spiked Blank	Total Organic Carbon (C)	2019/07/25		101	%	80 - 120
9519963	KGH	Method Blank	Total Organic Carbon (C)	2019/07/25	<0.50		mg/L	
9519963	KGH	RPD	Total Organic Carbon (C)	2019/07/25	6.6		%	20
9521013	ZI	Matrix Spike	Dissolved Chloride (Cl)	2019/07/24		NC	%	80 - 120
9521013	ZI	Spiked Blank	Dissolved Chloride (Cl)	2019/07/24		98	%	80 - 120
9521013	ZI	Method Blank	Dissolved Chloride (Cl)	2019/07/24	<1.0		mg/L	
9521013	ZI	RPD	Dissolved Chloride (Cl)	2019/07/24	1.6		%	20
9521016	ZI	Matrix Spike	Dissolved Sulphate (SO4)	2019/07/24		NC	%	80 - 120
9521016	ZI	Spiked Blank	Dissolved Sulphate (SO4)	2019/07/24		97	%	80 - 120
9521016	ZI	Method Blank	Dissolved Sulphate (SO4)	2019/07/24	<1.0		mg/L	
9521016	ZI	RPD	Dissolved Sulphate (SO4)	2019/07/24	0.41		%	20

N/A = Not Applicable

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

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

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

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

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 spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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

Bureau Veritas Laboratories Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

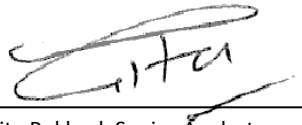
BV Labs Job #: B958521
Report Date: 2019/07/25

TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Location: GILBERT PLAINS, MB
Your P.O. #: 400-299
Sampler Initials: AG

VALIDATION SIGNATURE PAGE

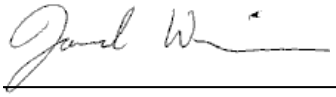
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Dennis Ngondu, B.Sc., P.Chem., QP, Supervisor, Organics

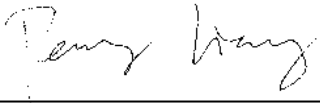


Gita Pokhrel, Senior Analyst

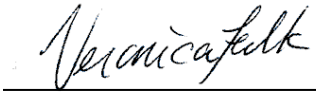
Janet Gao, B.Sc., QP, Supervisor, Organics



Jared Wiseman, B.Sc., P.Chem., QP, Senior Analyst, Organics



Harry (Peng) Liang, Senior Analyst



Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam
A Bureau Veritas Group Company

Calgary: 4000 19th St. NE, T2E 6P8. Toll Free (800) 386-7247
Edmonton: 9331-48 St. T6B 2R4. Toll Free (800) 386-7247
maxxam.ca

CHAIN OF CUSTODY RECORD 730

Invoice Information		Report Information (if differs from invoice)		Project Information		Turnaround Time (TAT) Required	
Company :	Trace Associates	Company:	Same as Invoice	Quotation #:	Trace Associates Rates	X	5 - 7 Days Regular (Most analyses)
Contact Name:	Jon Gudmundsson	Contact Name:	"	P.O. #/ AFE#:	400-299	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS	
Address:	Suite No. 100, 320 Gardiner Park Court	Address:	"			Rush TAT (Surcharges will be applied)	
	Regina, SK S4V1R9		"	Project #:	400-299	Same Day / 2 Days / 1 Day / 3-4 Days	
Phone:	306-450-9164	Phone:	"	Site Location:	Gilbert Plains, MB		
Email:	jgudmundsson@traceassociates.ca	Email:	"	Site #:	N/A	Date Required:	
Copies:	agabriel@traceassociates.ca	Copies:	"	Sampled By:	AG	Rush Confirmation #:	

Laboratory Use Only

	YES	NO	Cooler ID	Temp		
Seal Present	✓					
Seal Intact	✓					
Cooling Media	✓					

	YES	NO	Cooler ID	Temp		
Seal Present						
Seal Intact						
Cooling Media						

	YES	NO	Cooler ID	Temp		
Seal Present						
Seal Intact						
Cooling Media						

Received In Saskatoon
Depot Reception
By: Leeann McKinnon
CS-Y I-Y JUL 17 2019 08:15
Temp: 2 12 6

	Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of containers	BTEX F1 ☐ VOC ☐	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals Tot ☒ Diss ☒	Mercury Total ☐ Dissolved ☐	Salinity 4	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	PAHs	TOC	HOLD - DO NOT ANALYZE
1	19MW01	—	2019/07/16	AM	GW	4		X											
2	19MW02			AM		6		X		X	X							X	
3	19 MW03			AM		7		X		X	X							X	
4	19 MW04			AM		7		X		X	X							X	
5	19MW05			AM		4		X											
6	19 MW06			AM		4		X											
7	19MW07			AM		4		X											
8	19MW07 (2.0-2.5)	2.0-2.5		PM	Soil	5			X										
9	DUP A	—		AM	GW	4		X											
10																			

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

Regulatory Criteria

- X AT1/CCME
- ☐ Drinking Water
- X Saskatchewan
- ☐ D50 (Drilling Waste)
- ☐ Other:

Special Instructions

→ Dissolved + total metals not field filtered or preserved

Relinquished by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)	Received by: (Signature/ Print)	DATE (YYYY/MM/DD)	Time (HH:MM)
Adam Gabriel / Adam Gabriel	2019/07/16	1900	Jordan Bell	2019/07/18	08:30

17-Jul-19 08:15
Linsay Sunderman
B958521
JEM INS-0187

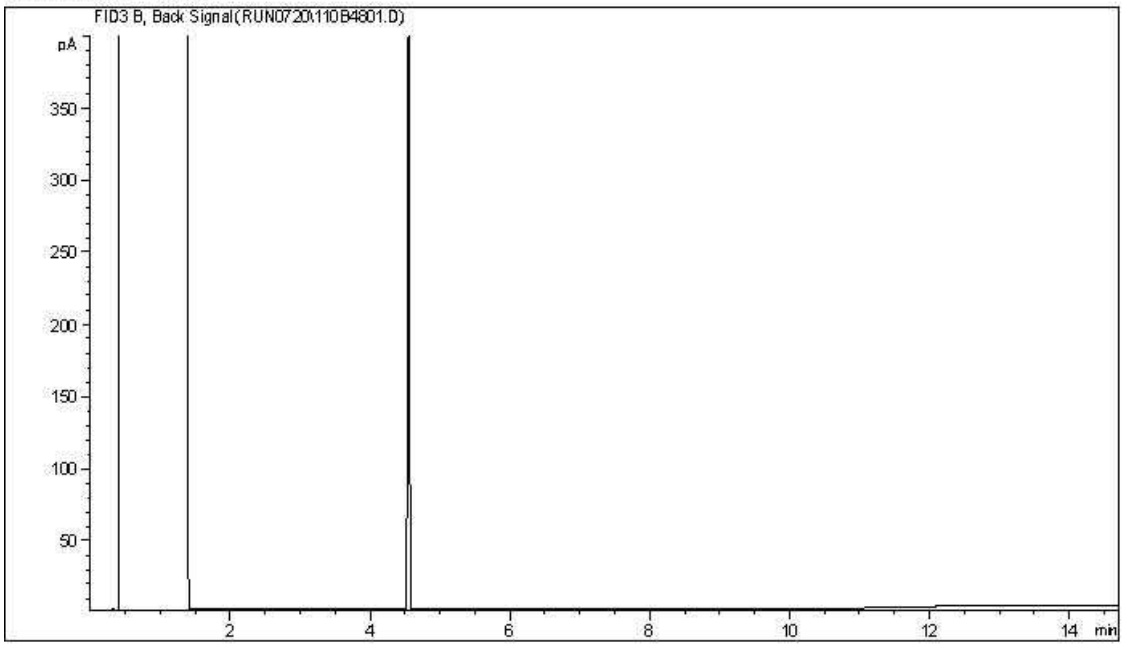
AB FCD-00331/6

BV Labs Job #: B958521
Report Date: 2019/07/25
BV Labs Sample: WD0838

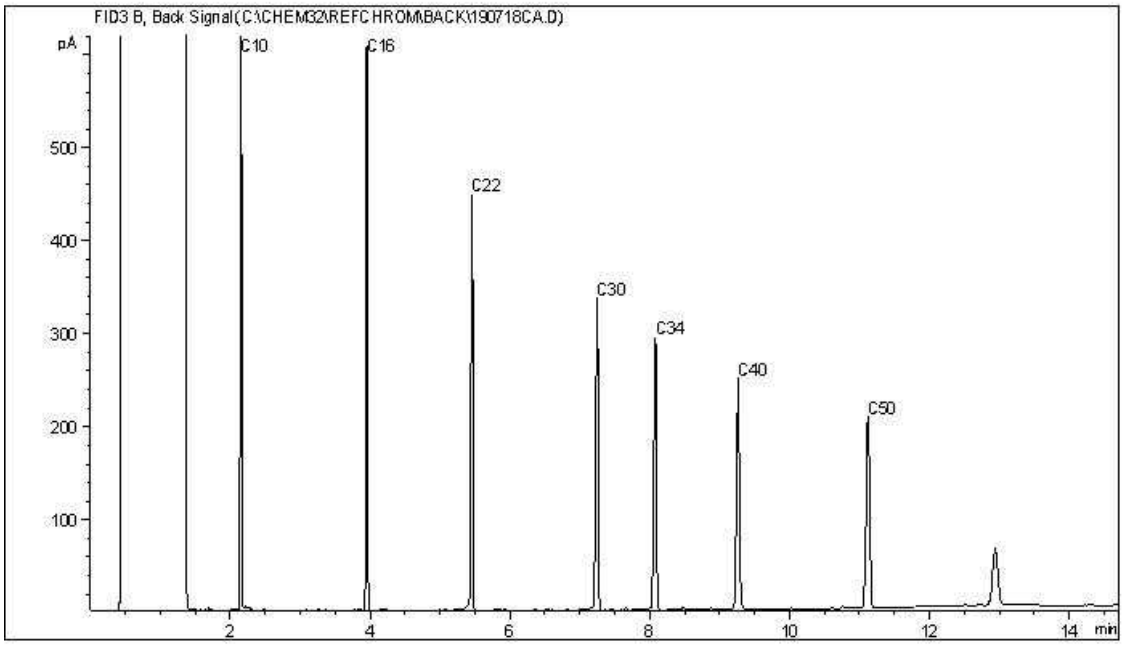
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: 19MW01

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



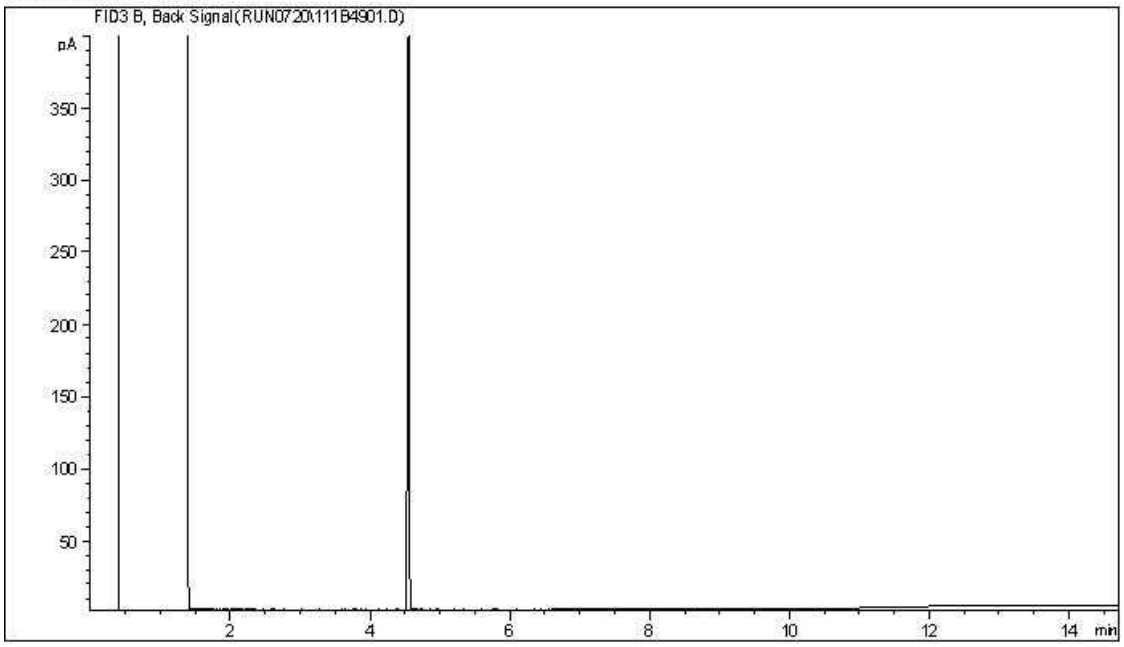
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

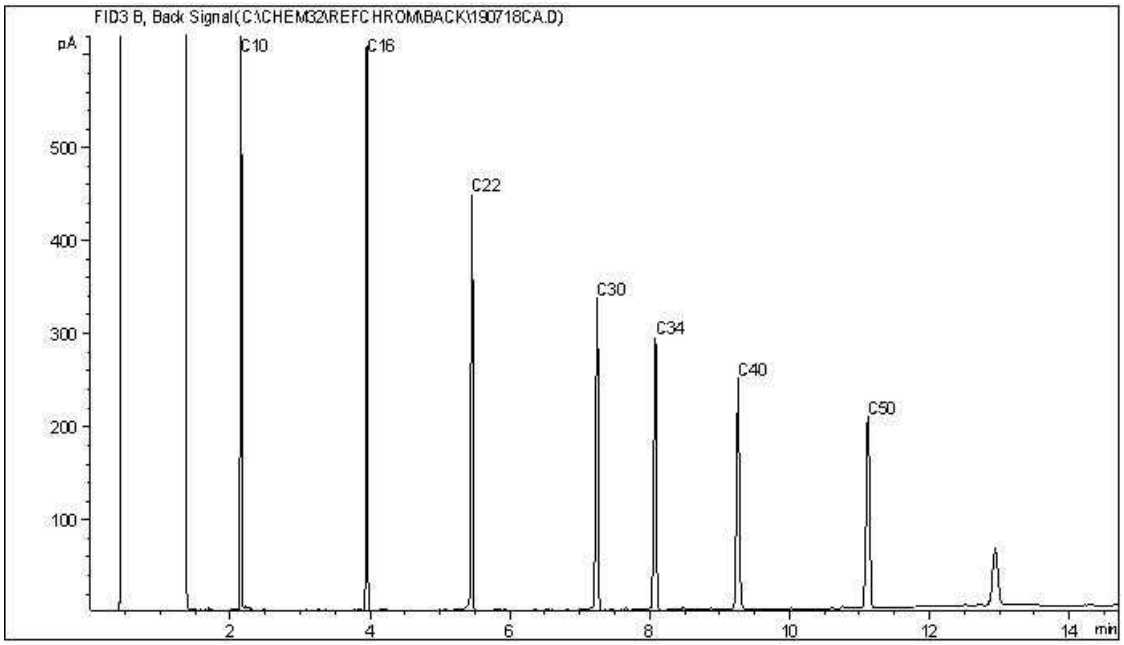
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

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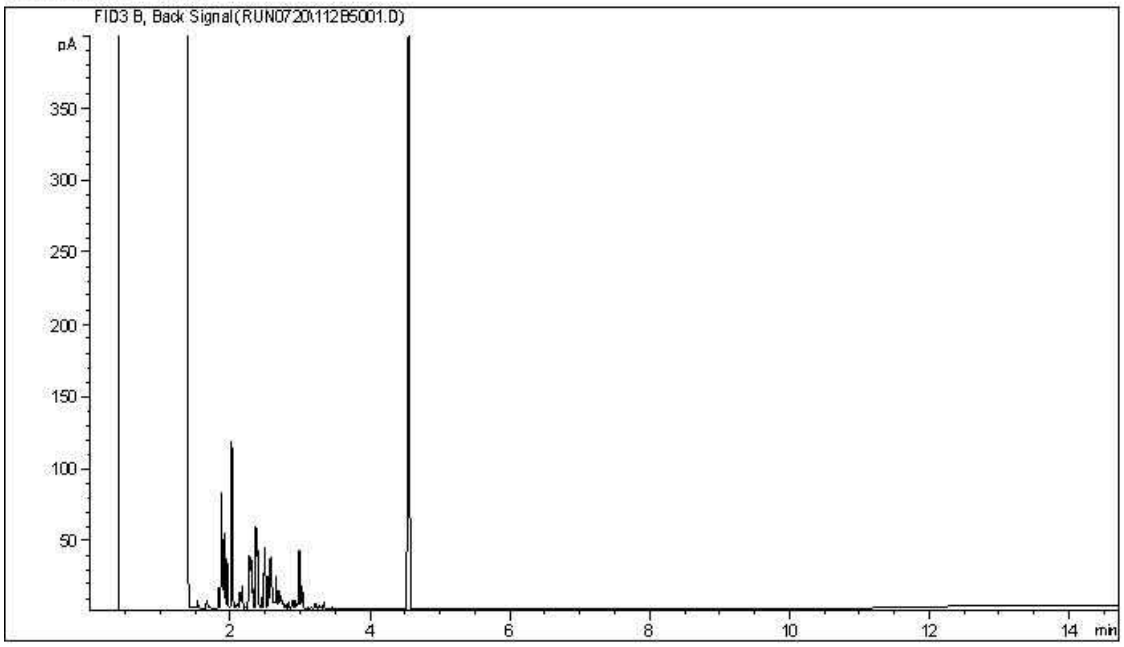
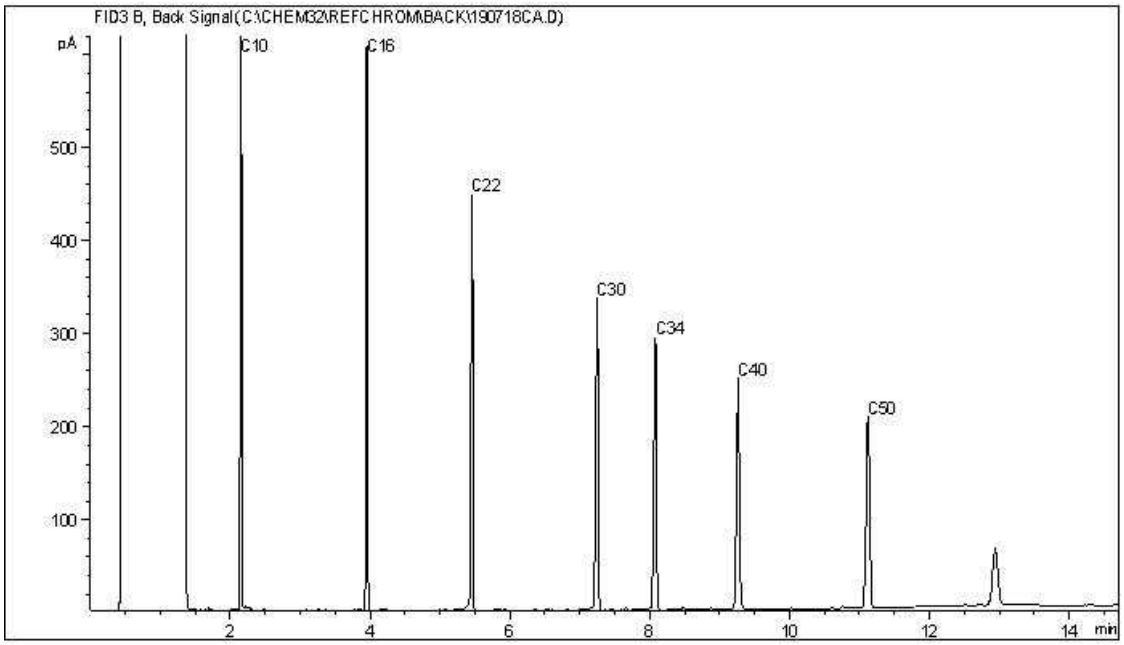
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

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Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
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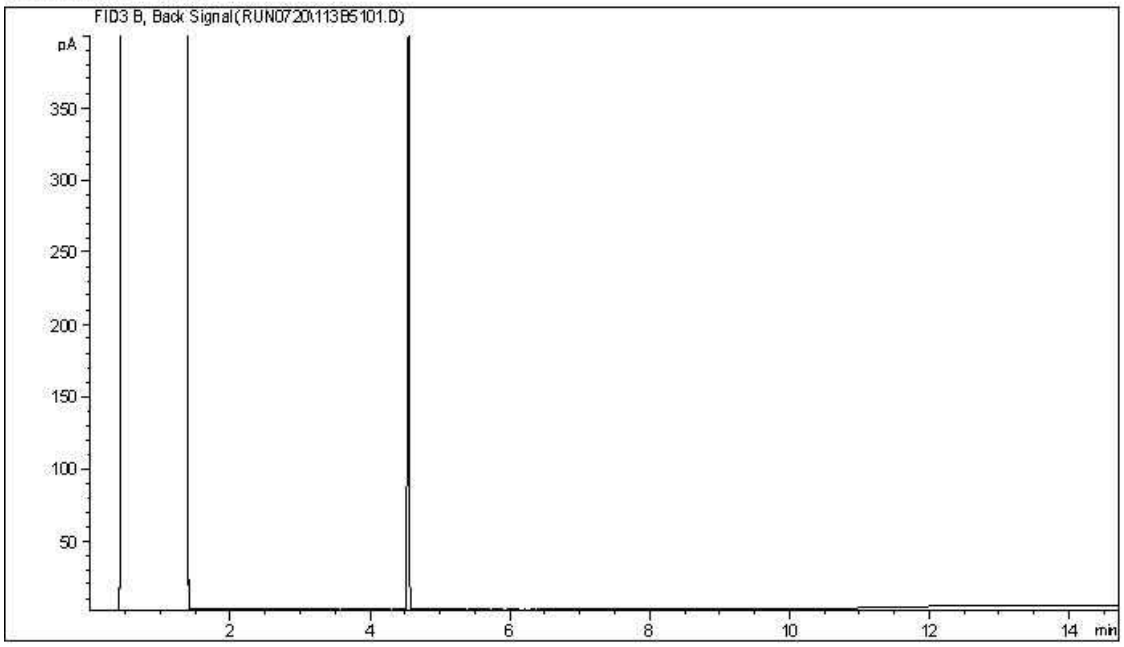
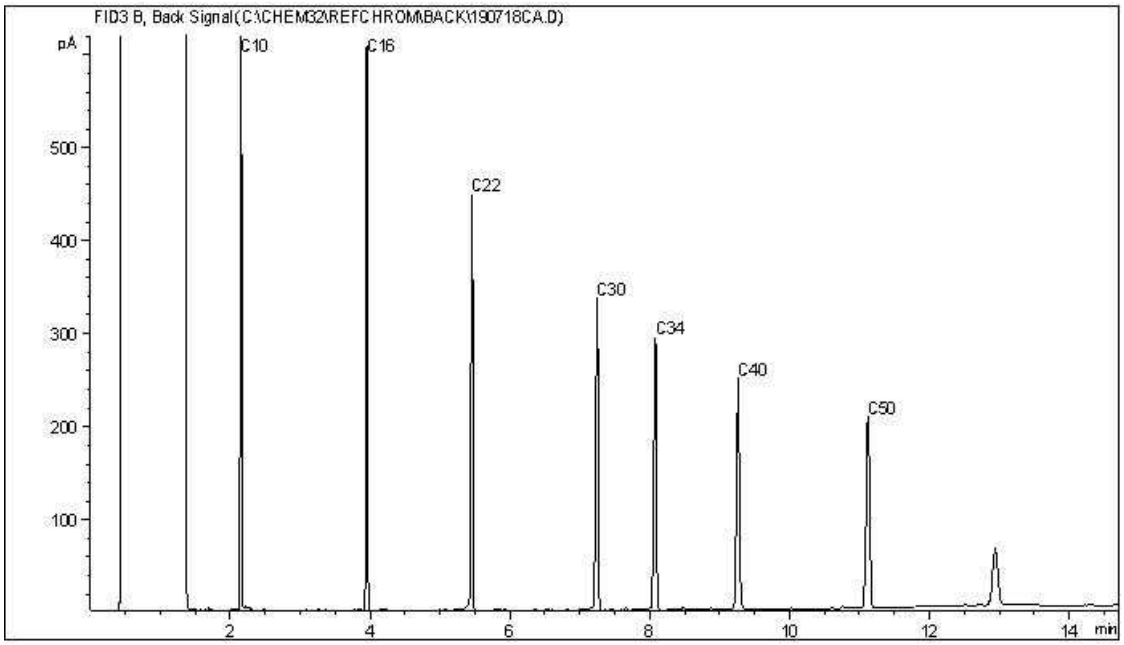
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

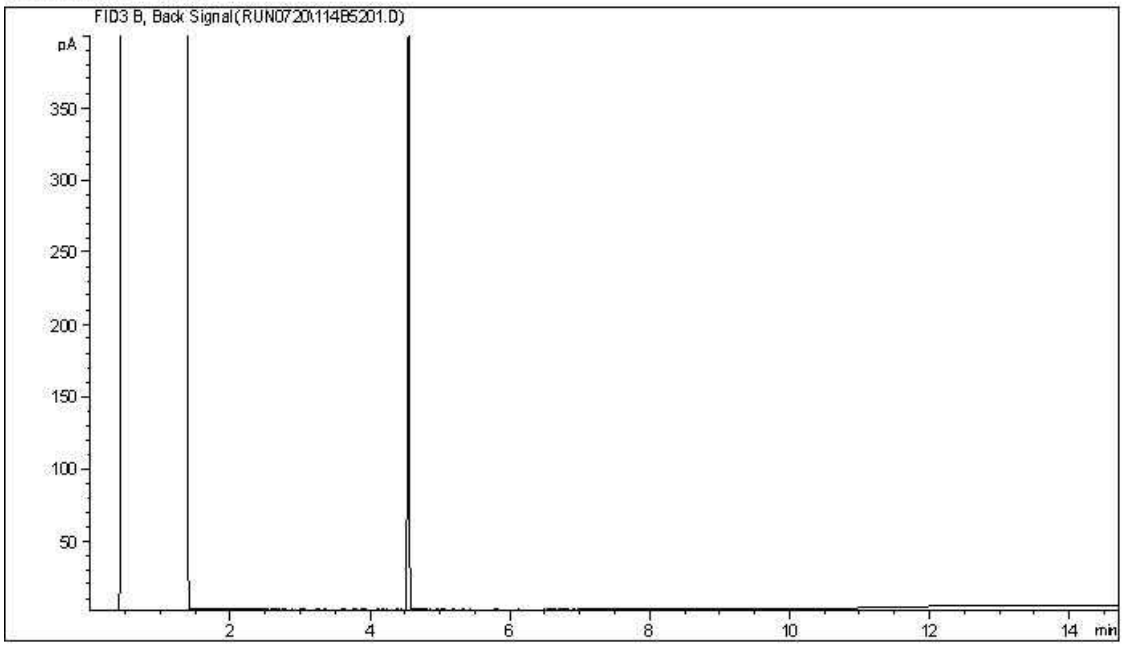
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B958521
Report Date: 2019/07/25
BV Labs Sample: WD0842

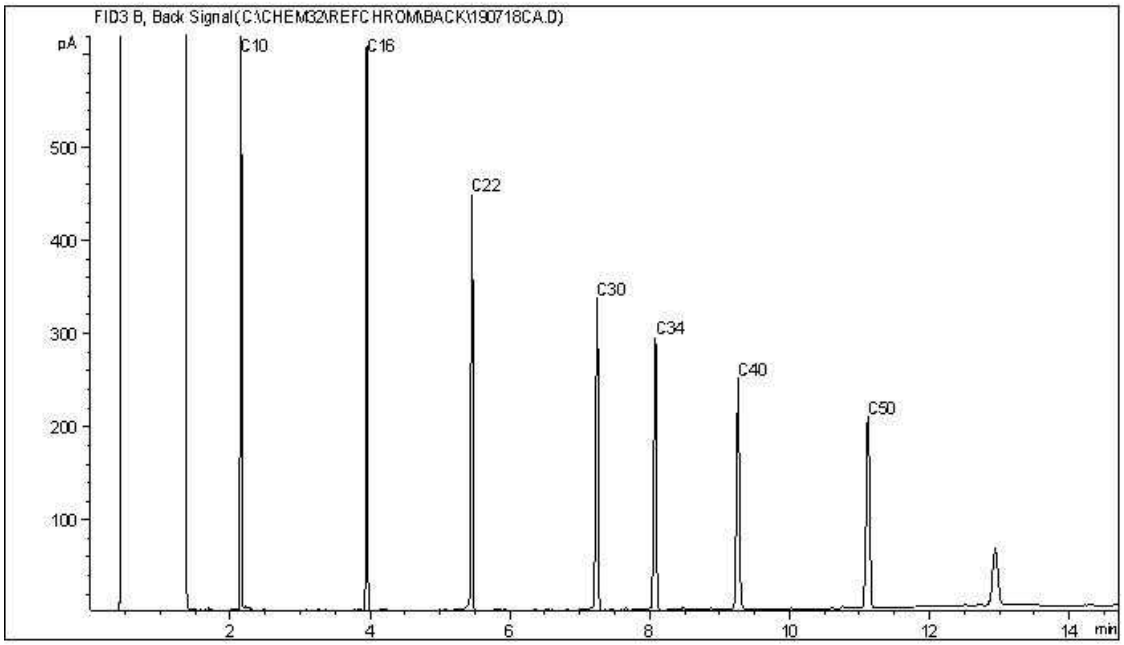
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: 19MW05

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



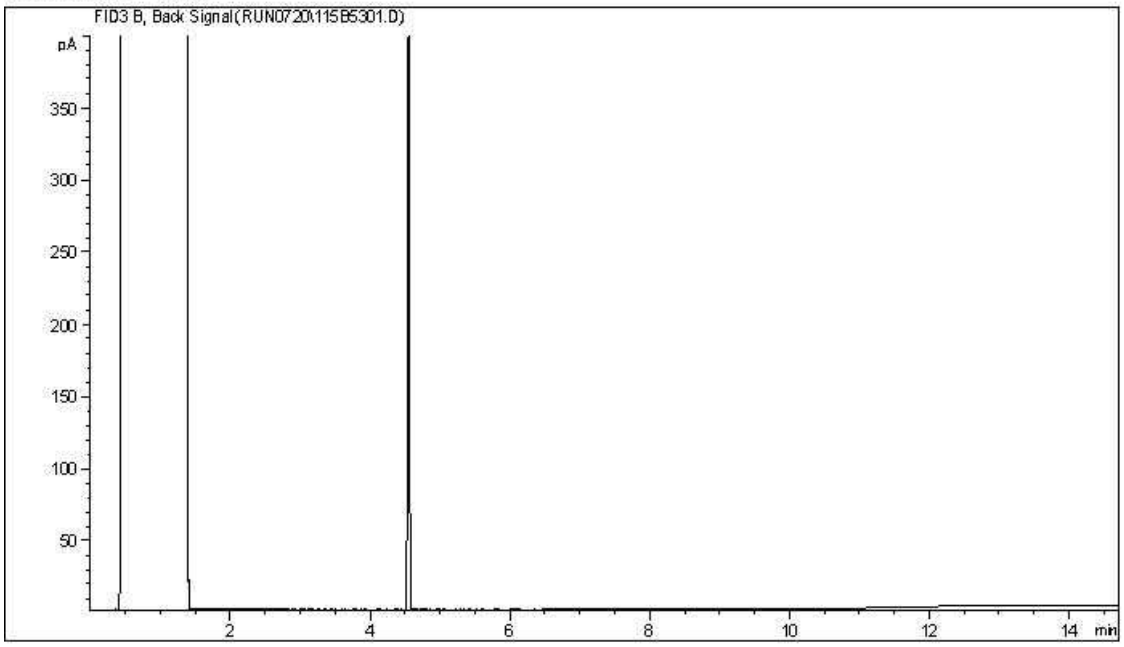
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

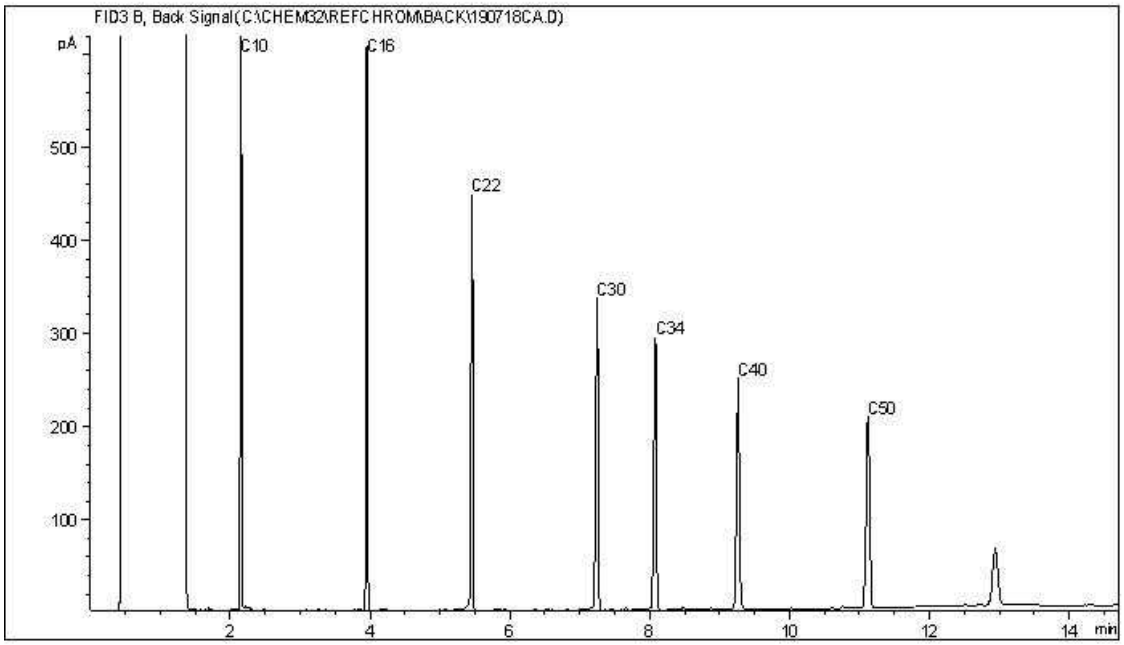
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



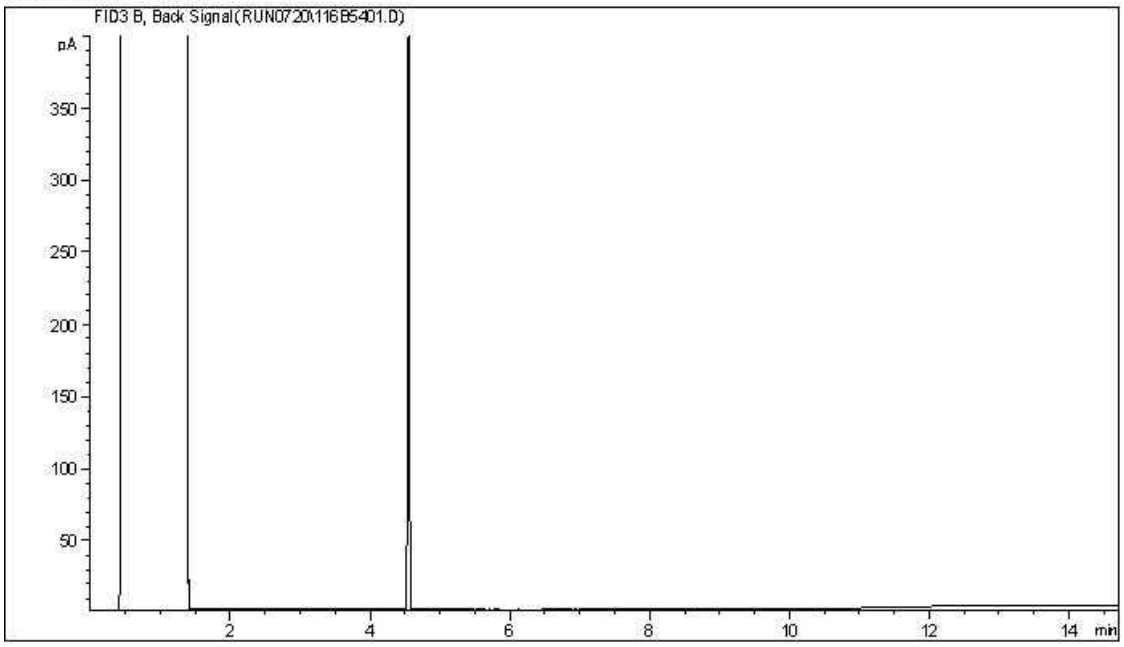
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

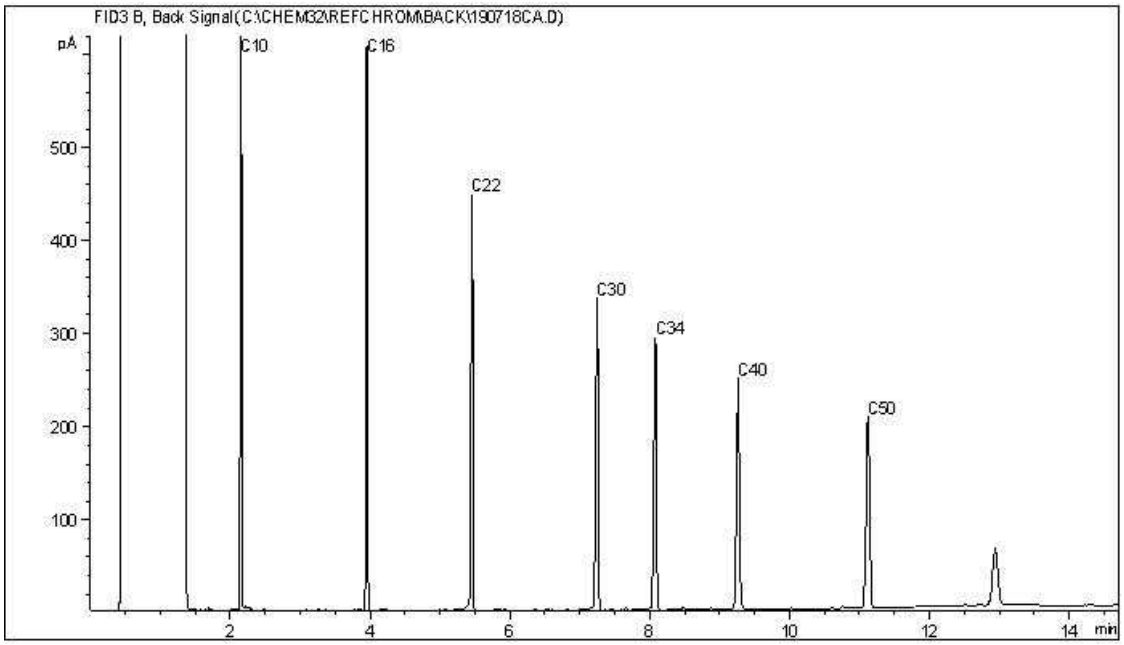
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



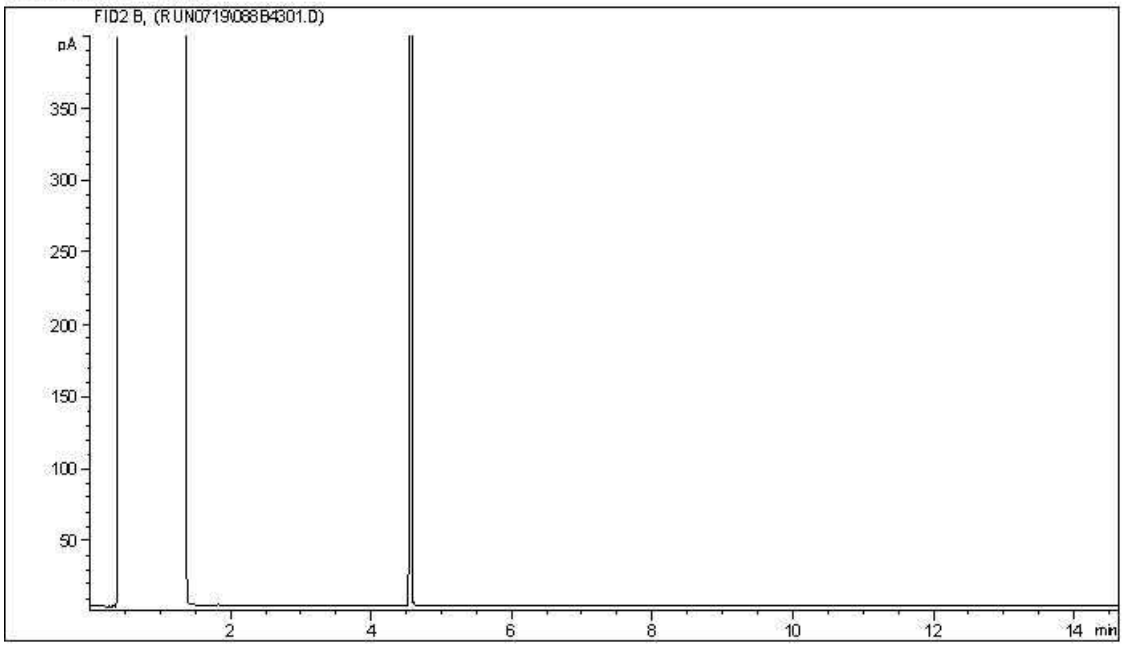
TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

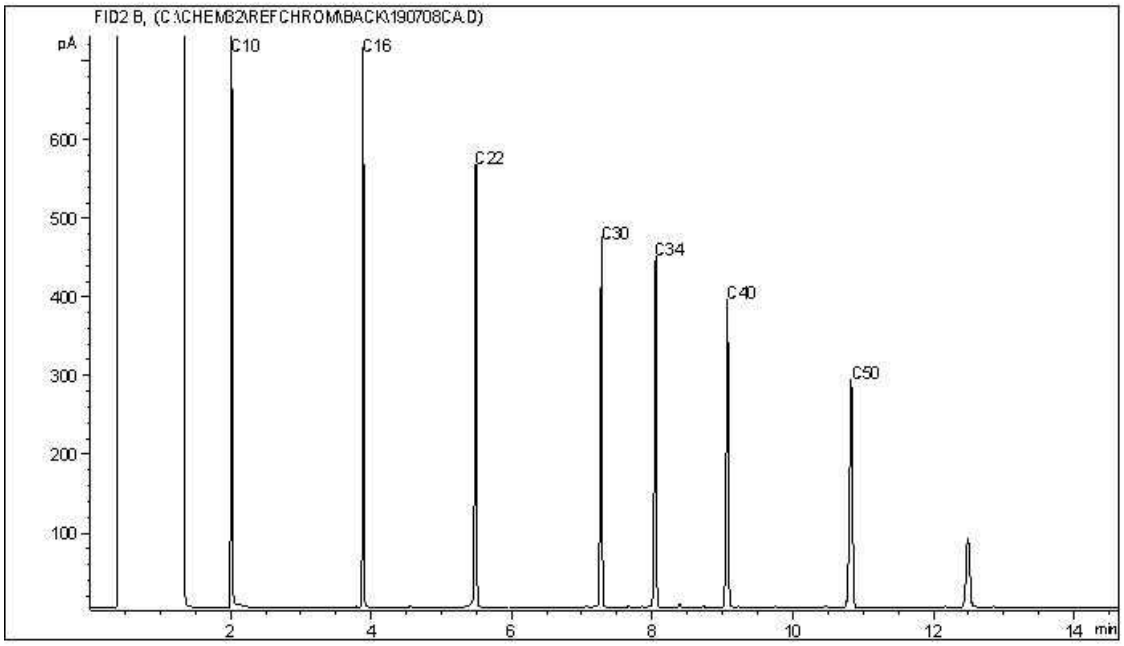
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons (F2-F4 in soil) Chromatogram

Instrument: GC10



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

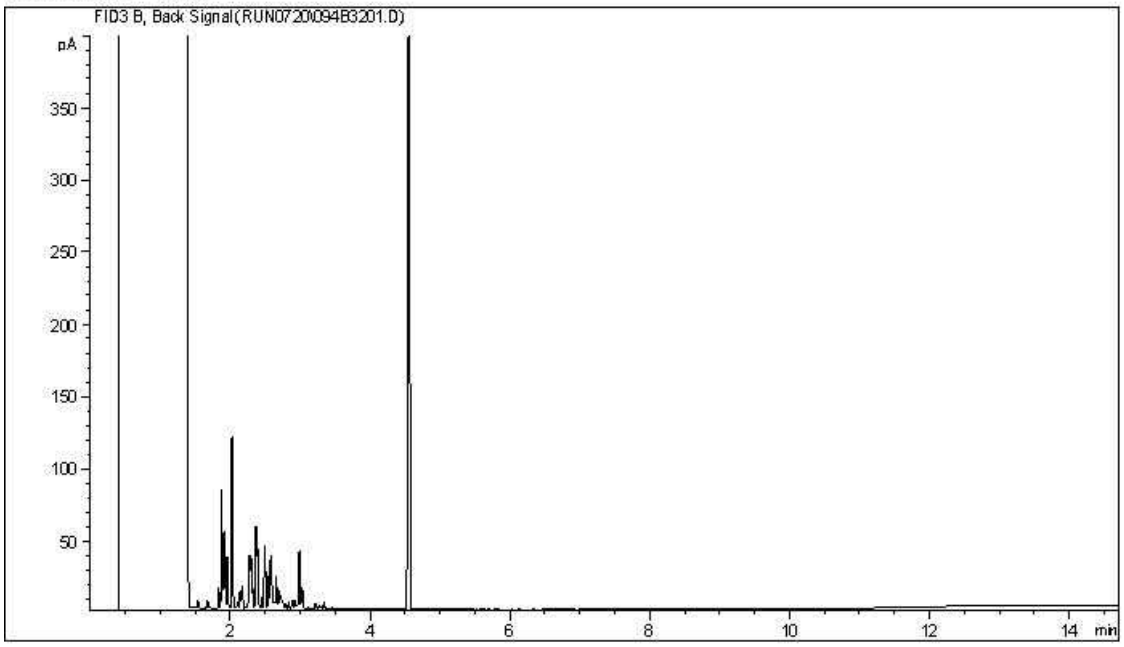
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B958521
Report Date: 2019/07/25
BV Labs Sample: WD0846

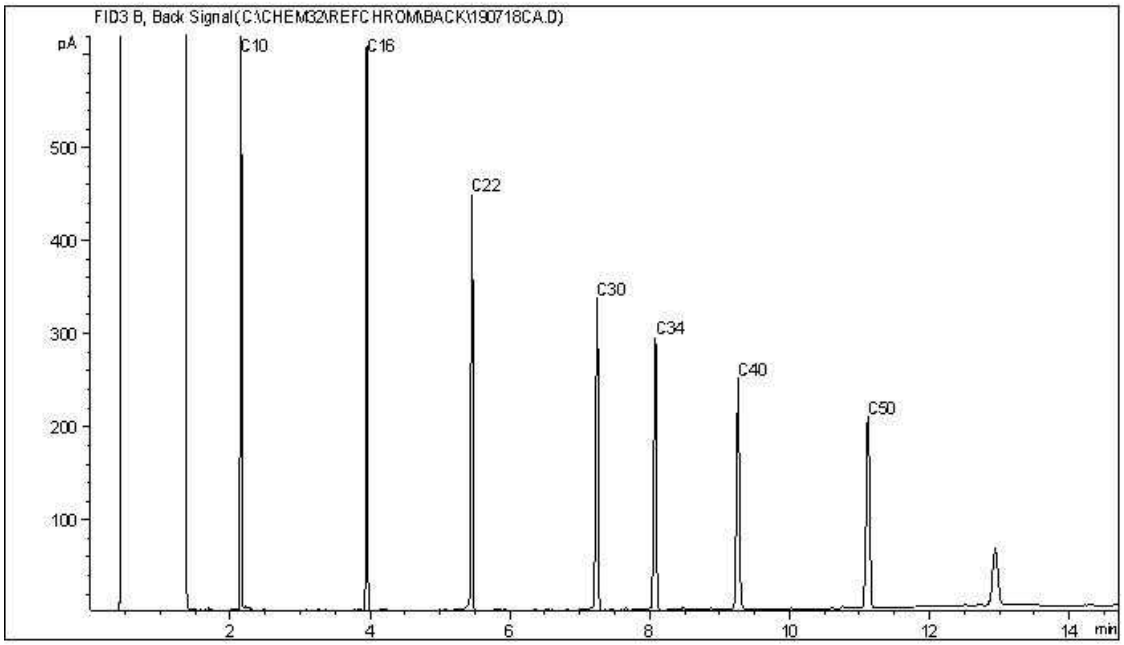
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: DUP A

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

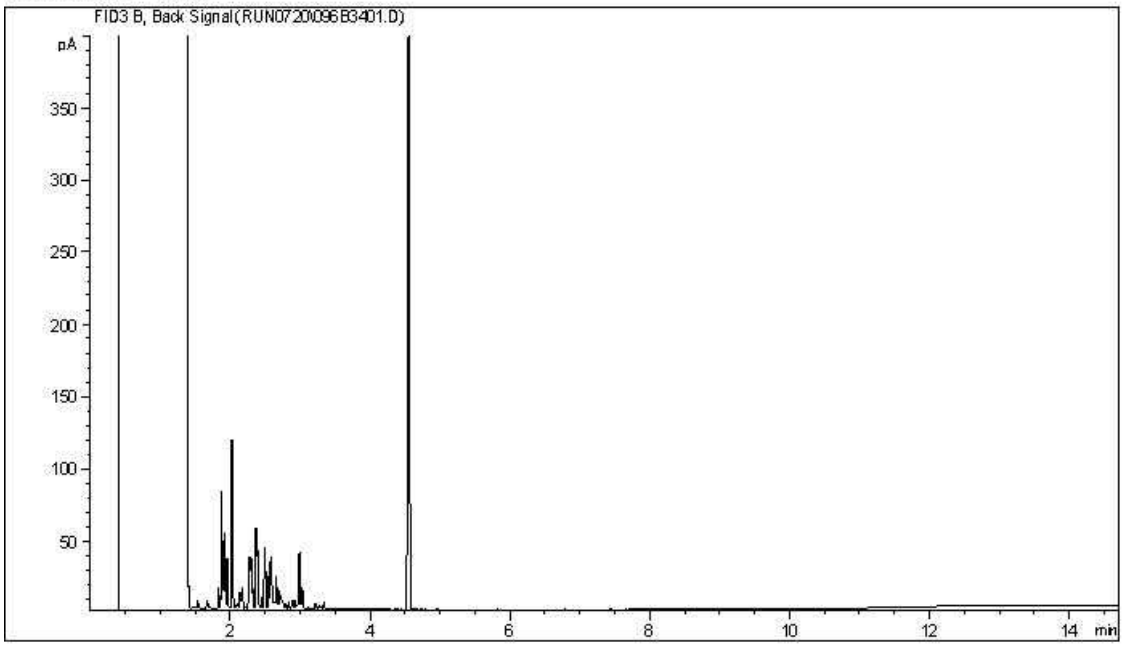
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: B958521
Report Date: 2019/07/25
BV Labs Sample: WD0846 Lab-Dup

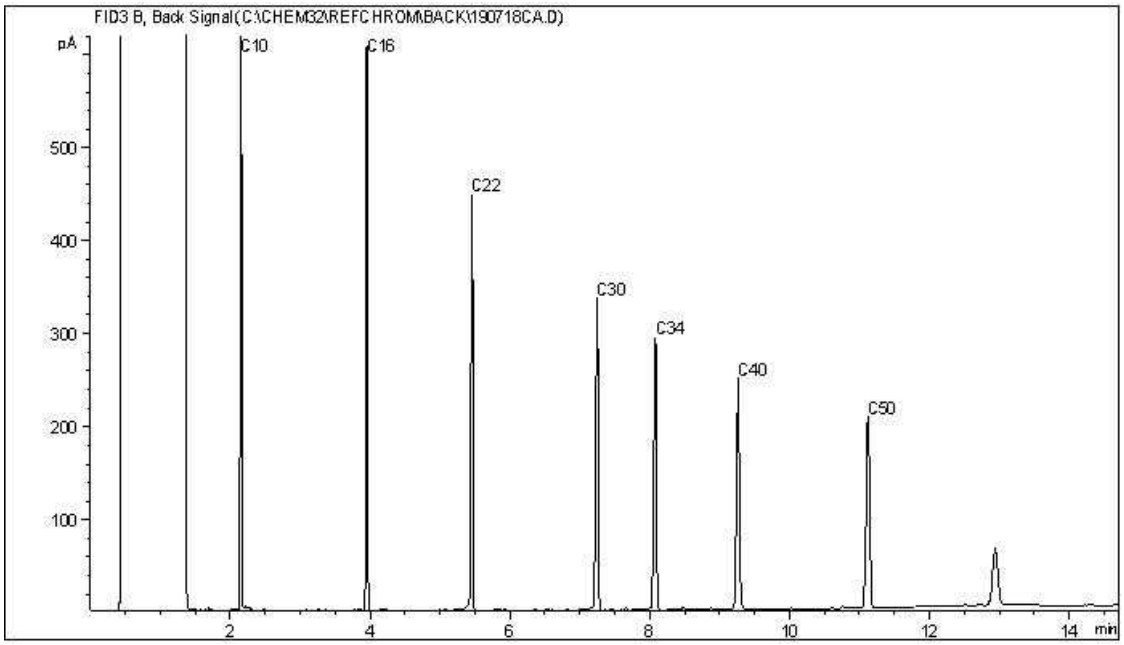
TRACE ASSOCIATES INC.
Client Project #: 400-299
Site Reference: GILBERT PLAINS, MB
Client ID: DUP A

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

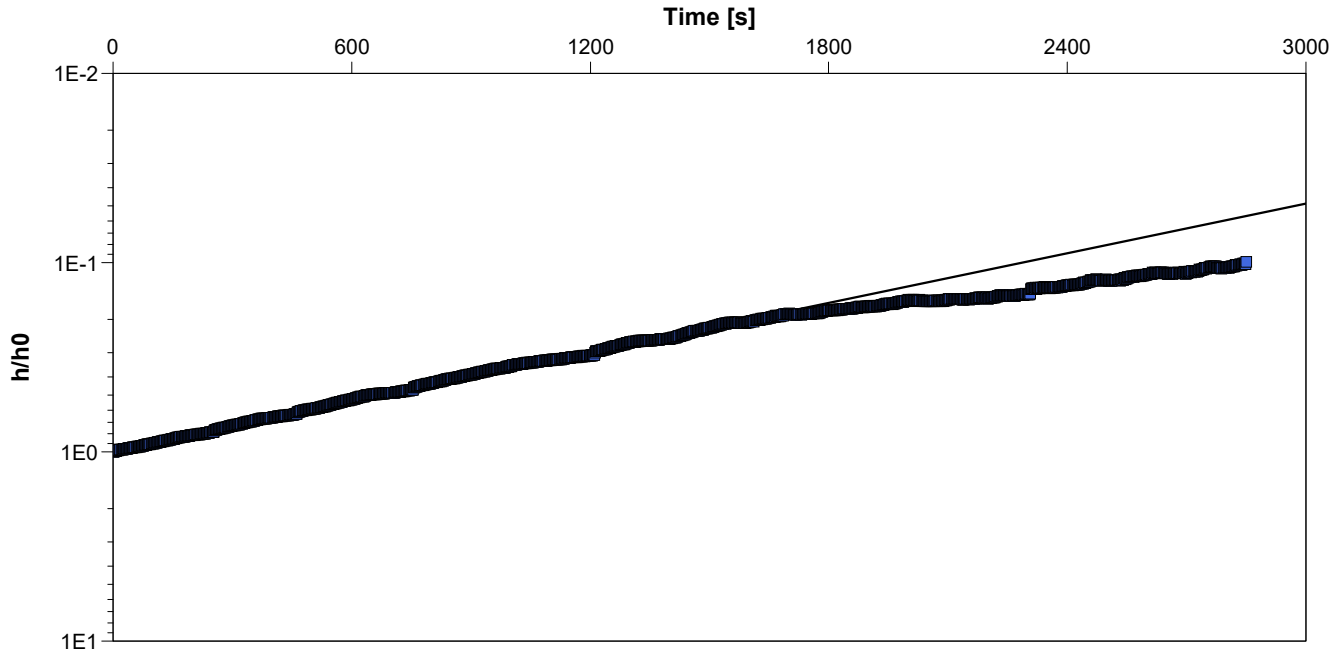
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

APPENDIX E

Hydraulic Conductivity Results

	Slug Test Analysis Report
	Project: FCL Gilbert Plains Phase II ESA
	Number: 400-299
	Client: Federated Co-operatives Limited

Location: Gilbert Plains, MB	Slug Test: 19MW01	Test Well: 19MW01
Test Conducted by: Adam Gabriel		Test Date: 7/16/2019
Analysis Performed by: Adam Gabriel	Hvorslev	Analysis Date: 7/25/2019
Aquifer Thickness: 4.50 m		

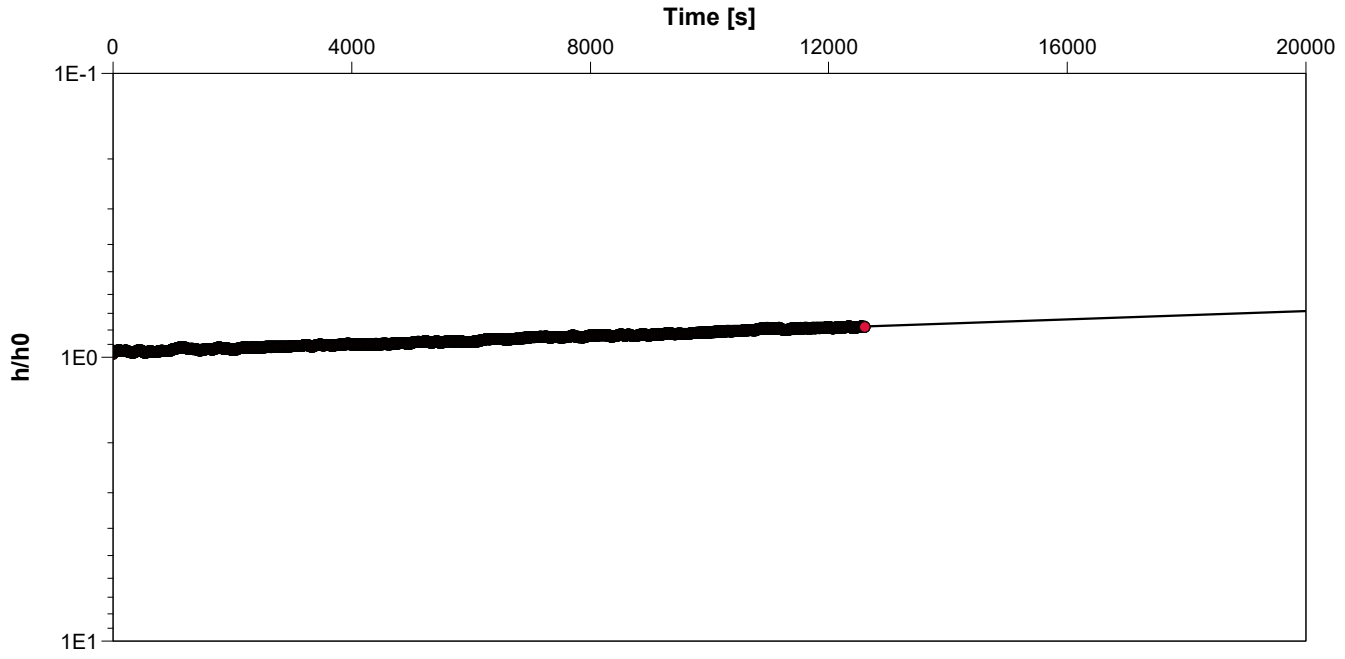


Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
19MW01	5.20×10^{-7}	

Slug Test Analysis Report	
Project: FCL Gilbert Plains Phase II ESA	
Number: 400-299	
Client: Federated Co-operatives Limited	

Location: Gilbert Plains, MB	Slug Test: 19MW06	Test Well: 19MW06
Test Conducted by: Adam Gabriel		Test Date: 7/16/2019
Analysis Performed by: Adam Gabriel	Hvorslev	Analysis Date: 7/25/2019
Aquifer Thickness: 5.70 m		



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
19MW06	2.00×10^{-8}	

APPENDIX F

National Classification System for Contaminated Sites Summary

CCME National Classification System for Contaminated Sites (2008) version 1.3
Pre-Screening Checklist

Question	Response (yes / no)	Comment
1. Are **Radioactive material**, **Bacterial contamination** or **Biological hazards** likely to be present at the site?	No	If yes, do not proceed through the NCSCS. Contact applicable regulatory agency immediately.
2. Are there **no contamination exceedances** (known or suspected)? Determination of exceedances may be based on: 1) CCME environmental quality guidelines; 2) equivalent provincial guidelines/standards if no CCME guideline exists for a specific chemical in a relevant medium; or 3) toxicity benchmarks derived from the literature for chemicals not covered by CCME or provincial guidelines/standards; or 4) background concentration.	No	If yes (*i.e.*, there are no exceedances), do not proceed through the NCSCS.
3. Have **partial/incompleted or no environmental site investigations** been conducted for the Site?	No	If yes, do not proceed through the NCSCS.
4. Is there direct and significant evidence of **impacts to humans** at the site, or off-site due to migration of contaminants from the site?	No	If yes, automatically rate the site as Class 1, a priority for remediation or risk management, regardless of the total score obtained should one be calculated.
5. Is there direct and significant evidence of **impacts to ecological receptors** at the site, or off-site due to migration of contaminants from the site?	No	Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are considered to be severe, the site may be categorized as Class 1, regardless of the numerical total NCSCS score. For the purpose of application of the NCSCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction.
6. Are there indicators of significant **adverse effects in the exposure zone** (*i.e.*, the zone in which receptors may come into contact with contaminants)? Some examples are as follows: -Hydrocarbon sheen or NAPL in the exposure zone -Severely stressed biota or devoid of biota; -Presence of material at ground surface or sediment with suspected high concentration of contaminants such as ore tailings, sandblasting grit, slag, and coal tar.	No	To answer "yes", two scenarios should be satisfied; (1) there has to be a high probability that receptors will be exposed to the contaminant source in the near future, and (2) the predicted impacts to ecological receptors after exposure must be significant (see question 5). A low probability of exposure resulting in significant impacts, or a high probability of exposure but with only low to moderate effects expected should not result in a Class 1 designation, neither would a low probability of exposure resulting in low-to-moderate effects. If yes, automatically rate the site as Class 1, a priority for remediation or risk management, regardless of the total score obtained should one be calculated.
7. Do measured concentrations of volatiles or unexploded ordnances represent an **explosion hazard**?	No	If yes, do not proceed through the NCSCS. Do not continue until the safety risks have been addressed. Consult your jurisdiction's occupational health and safety guidance or legislation on exposive hazards and measurement of lower explosive limits.

Rationale for not proceeding with NCSCS
(document any assumptions, reports, or site-specific information to support selection of "Yes" in Pre-Screening checklist)

If none of the above applies, proceed with the NCSCS scoring.

CCME National Classification System for Contaminated Sites (2008) version 1.3
Summary of Site Conditions

Site:	Site will be identified by:	Site Common Name
Civic Address: *(or other description of location)*		
Site Common Name: *(if applicable)*	Gilbert Plains Cardlock Facility	
Code identifier: *(e.g., FCSI 8-digit identifier)*		
Site Owner or Custodian: *(Organization and Contact Person)*	Gilbert Plains Consumers Cooperative Ltd.	
Legal description *or* metes and bounds:	SW-09-025-22 W1M	
Approximate Site area:	1.25 hectares (ha)	
Parcel Identifier(s) [PID]: *(or Parcel Identification Numbers [PIN] if untitled Crown land)*		
Centre of site: *(provide latitude/longitude or UTM coordinates)*	Latitude:__51_ degrees __08__ min __46.5_ secs; Longitude:_100__ degrees _29__ min __50__ secs	
	UTM Coordinate: 14U Northing ____5667154____ Easting ____395274____	
Site Land Use:	Current:	Commercial
	Proposed:	Commercial
Site Plan	**To delineate the bounds of the Site a site plan MUST be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.**	
Provide a brief description of the Site:	The Site is located within SW-09-025-22 W1M, at the western extent of the unincorporated urban community of Gilbert Plains, Manitoba. The Site is situated on the south side of Highway 5, approximately 850 metres (m) west of the junction of Highway 5 and Highway 274. The Site is comprised of an irregularly shaped lot roughly 1.25 ha in area. The Site is zoned as commercial; however, the adjacent property to the east is zoned as residential. The Site is also bordered by Highway 5 to the north, and commercial properties to the south and west. The surface at the Site is predominantly gravel. On-site infrastructure includes: three chemical storage buildings: a fenced compound enclosing two 75,000 litre (L) fuel above-ground storage tanks (ASTs), a control building, and storage space; a storage yard; three cardlock pump islands; and a satellite pump. Previously, a nest of eight 90,000 L ASTs had been present within the fenced compound. These ASTs were decommissioned in 2018.	

CCME National Classification System for Contaminated Sites (2008) version 1.3
Summary of Site Conditions

Affected media and Contaminants of Potential Concern (COPC):	Soil: PHCs including benzene and toluene. Groundwater: PHCs including benzene, toluene, PHC fraction F1, and PHC fraction F2.

Please fill in the "letter" that best describes the level of information available for the site being assessed

Site Letter Grade **C**

If letter grade is F, <u>do not</u> continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent

Scoring Completed By:	Ardis Oleksyn, B.A.I.E.M., C.E.T.
Date Scoring Completed:	11-Oct-19

CCME National Classification System (2008) version 1.3

(I) Contaminant Characteristics

Site: Gilbert Plains Cardlock Facility

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
1. Residency Media (replaces physical state)				
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? **yes** = has an exceedance or strongly suspected to have an exceedance **no** = does not have an exceedance or strongly suspected not to have an exceedance		Soil samples collected during a Phase II envionrmental site assessment (ESA) contained concentrations of benzene and toluene that were above Canadian Council of Ministers of the Environment (CCME) guidelines. Soil samples collected during a surface soil sampling program contained concentrations of benzene, toluene, ethylbenzene, xylenes (BTEX), and petroleum hydrocarbon (PHC) fractions F1 and F2 that were above CCME guidelines. Groundwater samples collected during a Phase II ESA contained concentrations of benzene, toluene, PHC fraction F1, and PHC fraction F2 that were above Health Canada guidelines. There is no surface water or sediment present at the Site.	The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline). Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at http://st-ts.ccme.ca/ For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at http://hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil	Yes			
Yes No Do Not Know				
B. Groundwater	Yes			
Yes No Do Not Know				
C. Surface water	No			
Yes No Do Not Know				
D. Sediment	No			
Yes No Do Not Know				
"Known" -score	4			
"Potential" - score	---			
2. Chemical Hazard				
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?	High	Benzene is rated as a high relative degree of chemical hazard in the reference material.	The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site. The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file. *See Attached Reference Material for Contaminant Hazard Rankings.*	Hazard as defined in the revised NCSCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
High Medium Low Do Not Know				
"Known" -score	8			
"Potential" - score	---			

CCME National Classification System (2008) version 1.3

(I) Contaminant Characteristics

Site: Gilbert Plains Cardlock Facility

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
3. Contaminant Exceedance Factor				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?	High (>100x)	The benzene concentration of 35 milligrams per kilogram (mg/kg) identified in one soil sample is more than 5000x higher than the CCME guideline of 0.0068 mg/kg.	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the *most conservative media-specific and land-use appropriate CCME* environmental quality guidelines. **Ranking should be based on contaminant with greatest exceedance of CCME guidelines.** Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines NAPL (LNAPL or DNAPL) = Contaminant is a non-aqueous phase liquid (*i.e.,* due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (*i.e.* , greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Any amount of NAPL should be scored, *i.e* . small amounts and sheens cannot be ignored. The presence of a NAPL (mobile or immoblie or regardless of amount) may be considered unnaceptable by some jurisidcations. If NAPL is present, consult jurisdiction on how to proceed with NCSCS. Other standards may include local background concentration or published toxicity benchmarks. Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria. Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (*i.e.* , CEF=>1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
NAPL (mobile or immobile)				
High (>100x)				
Medium (10x to 100x)				
Low (1x to 10x)				
Do Not Know				
"Known" -score	6			
"Potential" - score	---			
4. Contaminant Quantity (known or strongly suspected)				
What is the known or strongly suspected quantity of all contaminants?	<2 ha or 1000 m3	The Site is approximately 1.25 ha in size and the impacts have been delineated within the property.	Measure or estimate the area or quantity of total contamination (*i.e* , all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding appropriate environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances earn a higher score.
>10 hectare (ha) or 5000 m^3				
2 to 10 ha or 1000 to 5000 m^3				
<2 ha or 1000 m^3				
Do Not Know				
"Known" -score	2			
"Potential" - score	---			

CCME National Classification System (2008) version 1.3

(I) Contaminant Characteristics

Site: Gilbert Plains Cardlock Facility

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
5. Modifying Factors				
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment? Yes No Do Not Know	No	The constituents identified during the Phase II ESA do not fall into the list of persistent chemicals presented in the reference information.	Persistent chemicals, *e.g.,* PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics: (a) in air, (i) its half-life is equal to or greater than 2 days, or (ii) it is subject to atmospheric transport from its source to a remote area; (b) in water, its half-life is equal to or greater than 182 days; (c) in sediments, its half-life is equal to or greater than 365 days; or (d) in soil, its half-life is equal to or greater than 182 days. Elements do not degrade, therefore treat any metal, metalloid, or halogen COPC as persistent.	*Examples of Persistent Substances are provided in attached Reference Materials*
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location? Yes No Do Not Know	No	The types and concentrations of impacts identified would not be anticipated to cause damage to any utilities in the area.	If answered Yes, in Rationale for Score column document the location and extent of the infrastructure that is/may be damaged, verify the mode of contact between contaminants of potential concern (COPCs) and infrastructure, list the specific COPCs that could cause damage, and note the expected effect on specific infrastructure.	Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.
How many different contaminant classes have representative CCME guideline exceedances? one two to four five or more Do Not Know	two to four	Volatile PHCs: BTEX, and PHC fraction F1. Light extractable PHCs: PHC fraction F2.	For the purposes of the revised NCSCS, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, PAHs, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	*Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.*
"Known" - Score	2			
"Potential" - Score	---			

Contaminant Characteristic Total

Raw Total Score- "Known"	22	
Raw Total Score- "Potential"	---	
Raw Combined Total Score (Known + Potential)	22	
Adjusted Total Score (Raw Combined / 40 * 33)	**18.2**	maximum 33

CCME National Classification System (2008) version 1.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site: Gilbert Plains Cardlock Facility

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
1. Groundwater Movement				
A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary.				
i) For **potable groundwater environments**, 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination.	12	Concentrations of benzene and toluene that are above the Health Canada guidelines were identified in a groundwater sample collected at the Site. Review of well records indicates at least five wells listed for domestic use within 500 m of the Site. As such, the potable water exposure pathway is deemed operable.	Review chemical data and evaluate groundwater quality. The evaluation method concentrates on 1) a potable or non-potable groundwater environment; 2) the groundwater flow system and its potential to be an exposure pathway to known or potential receptors An aquifer is defined as a geologic unit that yields groundwater in usable quantities and drinking water quality. The aquifer can currently be used as a potable water supply or could have the potential for use in the future. Non-potable groundwater environments are defined as areas that are serviced with a reliable alternative water supply (most commonly provided in urban areas). The evaluation of a non-potable environment will be based on a site specific basis. Physical evidence includes significant sheens, liquid phase contamination, or contaminant saturated soils. Seeps and springs are considered part of the groundwater pathway. In Arctic environments, the potability and evaluation of the seasonal active layer (above the permafrost) as a groundwater exposure pathway will be considered on a site-specific basis.	The 1992 NCS rationale evaluated the off-site migration as a regulatory issue. The exposure assessment and classification of hazards should be evaluated regardless of the property boundaries. Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a groundwater supply source in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resources such as internet links. Note that for potable groundwater that also daylights into a nearby surface water body, the more stringent guidelines for both drinking water and protection of aquatic life should be considered. **Selected References** Potable Environments Guidelines for Canadian Drinking Water Quality: http://hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php Non-Potable Environments CCME. 1999. Canadian Water Quality Guidelines for Protection of Aquatic Life. http://ceqg-rcqe.ccme.ca/ Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations. Science Applications International Corporation (SAIC Canada), report to Environment Canada, January 4, 2002.
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	9			
iii) Meets GCDWQ for potable environments; meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for non-potable environments or Absence of groundwater exposure pathway (*i.e.,* there is no aquifer (see definition at right) at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).	0			
	12			
Score	12			
NOTE: If a score is assigned here for Known COPC Exceedances, then you should skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)				
B. Potential for groundwater pathway.				
a. Relative mobility of contaminant High Moderate Low Insignificant Do Not Know			Organics Koc (L/kg) / Metals with higher mobility at acidic conditions / Metals with higher mobility at alkaline conditions Koc < 500 (*i.e.,* log Koc < 2.7) — pH < 5 — pH > 8.5 Koc = 500 to 5000 (*i.e.,* log Koc = 2.7 to 3.7) — pH = 5 to 6 — pH = 7.5 to 8.5 Koc = 5,000 to 100,000 (*i.e.,* log Koc = 3.7 to 5) — pH > 6 — pH < 7.5 Koc > 100,000 (*i.e.,* log Koc > 5) For PHC fractions; score F1 as Moderate, F2 as Low, and F3 and F4 as Insignificant.	Reference: US EPA Soil Screening Guidance (Part 5 - Table 39) If a score of zero is assigned for relative mobility, it is still recommended that the following sections on potential for groundwater pathway be evaluated and scored. Although the Koc of an individual contaminant may suggest that it will be relatively immobile, it is possible that, with complex mixtures, there could be enhanced mobility due to co-solvent effects. Therefore, the Koc cannot be relied on solely as a measure of mobility. An evaluation of other factors such as containment, thickness of confining layer, hydraulic conductivities and precipitation infiltration rate are still useful in predicting potential for groundwater migration, even if a contaminant is expected to have insignificant mobility based on its chemistry alone.
	Do Not Know			
Score	2			
b. Presence of engineered sub-surface containment? No containment Partial containment Full containment Do Not Know			Review the existing engineered systems or natural attenuation processes for the site and determine if full or partial containment is achieved. Full containment is defined as an engineered system or natural attenuation processes, monitored as being effective, which provide for full capture and/or treatment of contaminants. All chemicals of concern must be contained for "Full Containment" scoring. Natural attenuation must have sufficient data, and reports cited with monitoring data to support steady state conditions and the attenuation processes. If there is no containment or insufficient natural attenuation process, this category is evaluated as high. If there is less than full containment or if uncertain, then evaluate as medium. In Arctic environments, permafrost will be evaluated, as appropriate, based on detailed evaluations, effectiveness and reliability to contain/control contaminant migration.	Someone experienced must provide a thorough description of the sources researched to determine the containment of the source at the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps, geotechnical reports or natural attenuation studies and other resources such as internet links. **Selected Resources:** United States Environmental Protection Agency (USEPA) 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600/R-98/128.
	Do Not Know			
Score	1.5			
c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway 3 m or less including no confining layer or discontinuous confining layer 3 to 10 m > 10 m Do Not Know			The term "confining layer" refers to geologic material with little or no permeability or hydraulic conductivity (such as unfractured clay); water does not pass through this layer or the rate of movement is extremely slow. Measure the thickness and extent of materials that will impede the migration of contaminants to the groundwater exposure pathway. The evaluation of this category is based on: 1) The presence and thickness of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as drinking water sources or 2) The presence and thickness of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated zone (*e.g.,* water table aquifer, first hydrostratigraphic unit or other groundwater pathway).	
	Do Not Know			
Score	0.5			
d. Hydraulic conductivity of confining layer >10^{-4} cm/s or no confining layer 10^{-4} to 10^{-6} cm/s <10^{-6} cm/s Do Not Know			Determine the nature of geologic materials and estimate hydraulic conductivity from published material (or use "Range of Values of Hydraulic Conductivity and Permeability" figure in the Reference Material sheet). Unfractured clays should be scored low. Silts should be scored medium. Sand, gravel should be scored high. The evaluation of this category is based on: 1) The presence and hydraulic conductivity ("K") of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as a drinking water source, groundwater exposure pathway or 2) The presence and permeability ("k") of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated water table aquifer, first hydrostratigraphic unit or other groundwater pathway.	
	Do Not Know			
Score	0.5			

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site: Gilbert Plains Cardlock Facility

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for groundwater pathway.				
e. Precipitation infiltration rate (Annual precipitation factor x surface soil relative permeability factor) High (infiltration score > 0.6) Moderate (0.4 < infiltration score ≤ 0.6) Low (0.2 < infiltration score ≤ 0.4) Very Low (0 < infiltration score ≤ 0.2) None (infiltration score = 0) Do Not Know	Do Not Know		Precipitation Refer to Environment Canada precipitation records for relevant areas (30 year average preferred). Divide annual precipitation (rainfall + snowfall) by 1000 and round to nearest tenth (*e.g.*, 667 mm = 0.7 score). Permeability For surface soil relative permeability (*i.e.*, infiltration) assume: gravel (1), sand (0.6), loam (0.3) and pavement or clay (0). Multiply the surface soil relative permeability factor with precipitation factor to obtain the score for precipitation infiltration rate (*e.g.*, precipitation factor of 0.7 from above x 0.6 (sand) = 0.42 or "Moderate").	Selected Sources: Environment Canada web page link: http://climate.weather.gc.ca/climate_normals/index_e.html Snow to rainfall conversion apply ratio of 10(snow):1(water) https://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=108C6C74-1
Score	0.4			
f. Hydraulic conductivity of aquifer >10^{-2} cm/s 10^{-2} to 10^{-4} cm/s <10^{-4} cm/s Do Not Know	Do Not Know		Determine the nature of geologic materials and estimate hydraulic conductivity of all aquifers of concern from published material (refer to "Range of Values of Hydraulic Conductivity and Permeability" in the Reference Material sheet).	
Score	1			
Potential groundwater pathway total	5.9			
Allowed Potential score	---	Note: If a "known" score is provided, the "potential" score is disallowed.		
Groundwater pathway total	**12**			
2. Surface Water Movement				
A. Demonstrated migration of COPC in surface water above background conditions				
Known concentrations of surface water: i) Concentrations exceed background concentrations and exceed CCME CWQG for protection of aquatic life, irrigation, livestock water, and/or recreation (whichever uses are applicable at the site) by >1 X; or There is known contact of contaminants with surface water based on site observations. or In the absence of CWQG, chemicals have been proven to be toxic based on site specific testing (*e.g.*, toxicity testing; or other indicator testing of exposure).	12		Collect all available information on quality of surface water near to site. Evaluate available data against Canadian Water Quality Guidelines (select appropriate guidelines based on local water use, *e.g.*, recreation, irrigation, aquatic life, livestock watering, etc.). The evaluation method concentrates on the surface water flow system and its potential to be an exposure pathway. Contamination is present on the surface (above ground) and has the potential to impact surface water bodies. Surface water is defined as a water body that supports one of the following uses: recreation, irrigation, livestock watering, aquatic life.	General Notes: Someone experienced must provide a thorough description of the sources researched to classify the surface water body in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links. Selected References: CCME. 1999. Canadian Water Quality Guidelines for the Protection of Aquatic Life http://ceqg-rcqe.ccme.ca/ CCME. 1999. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water) http://ceqg-rcqe.ccme.ca/ Health and Welfare Canada. 1992. Guidelines for Canadian Recreational Water Quality. http://www.hc-sc.gc.ca/ewh-semt/water-eau/recreat/index-eng.php
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	8		Examples of indirect evidence may include observed staining of sediment and/or river banks, but surface water has not been tested.	
iii) Meets CWQG or absence of surface water exposure pathway (*e.g.*, Distance to nearest surface water is > 5 km.)	0			
Score	Go to Potential			
Score	---			
NOTE: If a score is assigned here for Demonstrated Migration in Surface Water, then you should skip Part B (Potential for migration of COPCs in surface water) and go to Section 3 (Surface Soils)				
B. Potential for migration of COPCs in surface water				
a. Presence of containment No containment Partial containment Full containment Do Not Know	Partial containment	The areas between the Site and the closest surface waterbodies contain ditches (to the north) and trees and other vegetation (to the southeast).	Review the existing engineered systems and relate these structures to site conditions and proximity to surface water and determine if full containment is achieved: score low if there is full containment such as capping, berms, dikes; score medium if there is partial containment such as natural barriers, trees, ditches, sedimentation ponds; score high if there are no intervening barriers between the site and nearby surface water. Full containment must include containment of all chemicals.	
Score	3			
b. Distance to Surface Water 0 to <100 m 100 - 300 m >300 m Do Not Know	100 - 300 m	The closest surface waterbody is a pond located approximately 220 m southeast of the Site.	Review available mapping and survey data to determine distance to nearest surface water bodies.	
Score	2			
c. Topography Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is intermediate Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know	At/below and flat	The impacts were identified at surface and at depths of less than 1.5 m. The grade towards the nearest surface waterbody is less than 5%.	Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (*e.g.*, trench, above ground, etc.).	
Score	0			
d. Run-off potential High (run-off score > 0.6) Moderate (0.4 < run-off score ≤ 0.6) Low (0.2 < run-off score ≤ 0.4) Very Low (0 < run-off score ≤ 0.2) None (run-off score = 0) Do Not Know	Low	The Environment Canada precipitation records indicate an average annual precipitation level of 521.4 millimetres at Gilbert Plains, Manitoba. Borehole logs indicate that the surface at the Site consists of a relatively thin layer of sand and gravel fill, which is generally underlain by clay/silt above the water table. As such, loam (0.6) is assumed. 0.5 (precipitation) x 0.6 (permeability) = 0.3 (low)	Precipitation Refer to Environment Canada precipitation records for relevant areas (30 year average preferred). Divide precipitation (rainfall + snowfall) by 1000 and round to nearest tenth (*e.g.*, 667 mm = 0.7 score). Permeability For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the permeability (infiltration) factor with precipitation factor to obtain Run-off potential score (*e.g.*, precipitation factor of 0.7 from above x 0.6 (loam) = 0.42 or "Moderate").	Selected Sources: Environment Canada web page link: http://climate.weather.gc.ca/climate_normals/index_e.html Snow to rainfall conversion apply ratio of 10(snow):1(water) https://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=108C6C74-1
Score	0.4			
e. Flood potential 1 in 2 years 1 in 10 years 1 in 50 years not in floodplain Do Not Know	Do Not Know		Review published data such as flood plain mapping or flood potential (*e.g.*, spring or mountain run-off) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.	
Score	0.5			
Potential surface water pathway total	5.9			
Allowed Potential score	5.9	Note: If a "known" score is provided, the "potential" score is disallowed.		
Surface water pathway total	**5.9**			

CCME National Classification System (2008) version 1.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site: Gilbert Plains Cardlock Facility

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
3. Surface Soils (potential for dust, dermal and ingestion exposure)				
A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)				
COPCs measured in surface soils exceed the CCME soil quality guideline.	12	PHC concentrations above CCME guidelines were identified in samples collected from less than 1.5 mbgs and visible surface soil staining was observed.	Collect all available information on quality of surface soils (*i.e.,* top 1.5 metres) at the site. Evaluate available data against Canadian Soil Quality Guidelines. Select appropriate guidelines based on current (or proposed future) land use (*i.e,* agricultural, residential/parkland, commercial, or industrial), and soil texture if applicable (*i.e.,* coarse or fine).	Selected References: CCME. 1999. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. http://ceqg-rcqe.ccme.ca/
Strongly suspected that soils exceed guidelines.	9		Examples of strongly suspected exceedences of soil guidelines may include evidence of staining, odours, or significant debris infill materials.	
COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	0			
	12			
Score	12			
NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you should skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)				
B. Potential for a surface soils (top 1.5 m) migration pathway				
a. Are the soils in question covered? Exposed Vegetated Landscaped Paved Do Not Know			Consult engineering or risk assessment reports for the site. Alternatively, review photographs or perform a site visit. Landscaped surface soils must include a minimum of 0.5 m of topsoil.	The possibility of contaminants in blowing snow have not been included in the revised NCSCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.
	Do Not Know			
Score	4			
b. For what proportion of the year does the site remain covered by snow? 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know			Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).	
	Do Not Know			
Score	3			
Potential surface soil pathway total	7			
Allowed Potential score	---	Note: If a "known" score is provided, the "potential" score is disallowed.		
Soil pathway total	**12**			
4. Vapour				
A. Demonstrated COPCs in vapour.				
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12		Consult previous investigations, including human health risk assessments, for reports of vapours detected.	
Strongly suspected (based on observations and/or modelling)	9			
Vapour has not been measured (i.e. not detected) and volatile hydrocarbons have not been found in site soils or groundwater, or vapour has been measured (indoor or outdoor) in concentrations not exceeding risk based concentrations.	0		Due to the potential for significant spatial and temporal variation in soil vapour concentrations, limited vapour monitoring studies (*e.g.,* single point in time "snap-shot") that do not detect vapour at sites where volatiles are suspected, does not necessarily mean that vapours are not an issue at the site. In this case, section B " Potential for COPCs in vapour" should be completed.	
	Go to Potential			
Score	---			
NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you should skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)				

CCME National Classification System (2008) version 1.3

(II) Migration Potential (Evaluation of contaminant migration pathways)

Site: Gilbert Plains Cardlock Facility

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for COPCs in vapour				
a. Relative Volatility based on Henry's Law Constant, H' (dimensionless) High (H' > 1.0E-1) Moderate (H' = 1.0E-1 to 1.0E-3) Low (H' < 1.0E-3) Not Volatile Do Not Know	High	The listed H' for benzene is 2.28E-01, which is classified as high. In addition, PHC fraction F1, which is also classified as high, was identified in one groundwater sample collected at the Site.	Reference: US EPA Soil Screening Guidance (Part 5 - Table 36) *Provided in Attached Reference Materials* For PHC fractions; score F1 as High, F2 as Moderate, and F3 and F4 as Not Volatile. Substance is considered Not Volatile (*i.e.* , pathway not a concern) if the product of the water solubility and unitless Henry's law constant does not exceed published or derived tolerable concentration or risk-specific concentration. If NAPL is present, see Appendix D of the CCME soil vapour quality guideline protocol (CCME 2014) for further guidance.	If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section on Potential for COPCs will be automatically assigned scores of zero and you can skip to section 5. Selected References: CCME. 2014. A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours. Winnipeg, Manitoba. http://ceqg-rcqe.ccme.ca
Score	4			
b. What is the soil grain size? Fine Coarse Do Not Know	Coarse	Impacts were observed in the upper 1.5 m at the Site, which includes coarse-grained sand and gravel fill.	Review soil permeability data in engineering reports. The greater the permeability of soils, the greater the possible movement of vapours. Fine-grained soils are defined as those which contain greater than 50% by mass particles less than 75 µm mean diameter (D50 < 75 µm). Coarse-grained soils are defined as those which contain greater than 50% by mass particles greater than 75 µm mean diameter (D50 > 75 µm).	
Score	4			
c. Is the depth to the source less than 10m? Yes No Do Not Know	Yes	The depth to groundwater at the Site is generally less than 2 mbgs.	Review groundwater depths below grade for the site.	
Score	2			
d. Are there any preferential pathways? Yes No Do Not Know	No	No underground conduits are present, no bedrock outcropping is present.	Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathyways.	Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.
Score	0			
Potential vapour pathway total	10			
Allowed Potential score	10	Note: If a "known" score is provided, the "potential" score is disallowed.		
Vapour pathway total	**10**			
5. Sediment Movement				
A. Demonstrated migration of sediments containing COPCs				
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12		Review sediment assessment reports. Evidence of migration of contaminants in sediments must be reported by someone experienced in this area.	Usually not considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.
Strongly suspected (based on observations and/or modelling)	9			
Sediments have been contained and there is no indication that sediments will migrate in future. or Sediment meets CCME sediment quality guidelines or absence of sediment exposure pathway (i.e., within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0			
	Go to Potential			
Score	---			
NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you should skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)				
B. Potential for sediment migration				
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")? Yes No Do Not Know	Do Not Know 2		Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.	
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash? Yes No Do Not Know	Do Not Know 2		Review existing sediment assessments. If the sediments present at the site are in a river, select "no" for this question.	
c. For rivers, are the contaminated sediments in an area prone to sediment scouring? Yes No Do Not Know	Do Not Know 2		Review existing sediment assessments. It is important that the assessment is made under worst case flows (high yearly flows). Under high yearly flows, areas which are commonly depositional may become scoured. If the sediments present at the site are in a lake or marine habitat, select "no" for this question.	
Potential sediment pathway total	6			
Allowed Potential score	6	Note: If a "known" score is provided, the "potential" score is disallowed.		
Sediment pathway total	**6**			
6. Modifying Factors				
Are there subsurface utility conduits in the area affected by contamination? Yes No Do Not Know	No	There are no subsurface utility conduits in the area of impacts.	Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	
Known	0			
Potential	---			

Migration Potential Total		
Raw Total Score- "Known"	24	Note: If "Known" and "Potential" scores are provided, the checklist defaults to known. Therefore, the total "Potential" Score may not reflect the sum of the individual "Potential" scores.
Raw Total Score- "Potential"	21.9	
Raw Combined Total Score (Known + Potential)	45.9	
Adjusted Total Score (Raw Combined / 64 * 33)	**23.7**	maximum 33

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site: Gilbert Plains Cardlock Facility

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
1. Human				
A. Known exposure				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site*)	22		*Where adverse effects on humans are documented, the site should be automatically designated as a Class 1 site (*i.e.,* action required). Known impacts could include blood test results (*e.g.,* blood lead > 10 µg/dL) or results of other health based studies and tests. There is no need to proceed through the NCSCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired. A score of 22 can also be assigned when Hazard Quotients (or Hazard Index) >> 1.0 or incremental lifetime cancer risks considerably exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals.	Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet. Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10		The category, "Strongly suspected", can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients (or Hazard Index) > 0.2 (excluding the Estimated Daily Intake) or > 1.0 with Estimated Daily Intake and/or incremental lifetime cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this is typically either $>10^{-5}$ or $>10^{-6}$).	**Selected References:** Health Canada – Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Heath Screening Level Risk Assessments, available at http://www.hc-sc.gc.ca/ewh-semt/pubs/contamsite/index-eng.php United States Environmental Protection Agency, Integrated Risk Information System (IRIS), available at http://toxnet.nlm.nih.gov
No quantified or suspected exposures/impacts in humans.	0		The category, no exposure/impacts, can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients (or Hazard Index) of ≤ 0.2 (excluding the Estimated Daily Intake) or ≤ 1.0 with Estimated Daily Intake AND incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10^{-6} or 10^{-5}).	
	Go to Potential			
Score	---			
NOTE: If a score is assigned here for Known Exposure, then you should skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors)				
B. Potential for human exposure				
a) Land use (provides an indication of potential human exposure scenarios)		The Site is used for commercial purposes. Adjacent property to the east is residential in nature, but impacts have been delineated within the commercial property.	Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place.	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (*e.g.,* children).
Agricultural Residential / Parkland Commercial Industrial Do Not Know			Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (*e.g.,* greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Parkland includes campgrounds, but excludes wildlands such as national or provincial parks. Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	
	Commercial			
Score	1			
b) Indicate the level of accessibility to the contaminated portion of the site (*e.g.,* the potential for coming in contact with contamination)		The impacts observed during the Phase II ESA are in a portion of the Site that can be accessed by the public, but are at depths of approximately 2 m below ground; however, surface soil staining was observed at the Site, and historical information confirmed PHC concentrations at less than 1.5 m depth that were above the CCME guidelines. As such, 'not covered' was selected.	Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.	
Limited barriers to prevent site access; contamination not covered Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered. Controlled access or remote location and contaminants are covered Do Not Know				
	Access, not covered			
Score	2			
B. Potential for human exposure				
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential). i) direct contact Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know		Surface soil staining was observed at the Site and historical data indicates that PHC concentrations above CCME guidelines were observed in the upper 1.5 m.	If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2003) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.	Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated waters, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.
	Yes			
Score	3			
ii) inhalation (*i.e.,* inhalation of dust, vapour) Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)? Yes No Do Not Know		The closest buildings are more than 30 m away from the impacted areas .	If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances) relative to buildings. Refer to (II) Migration Potential worksheet, 4B.a), *Potential for COPCs in Vapour* for a definition of volatility.	Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion. Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts.
	No			
Score	0			
Dust - If there is contaminated surface soil (*e.g.,* top 1.5 m) , indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero. Fine Coarse Surface soil is not contaminated or absent (bedrock) Do Not Know Texture		Surface soil staining was observed in an area of sand and gravel fill.	Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2006)) then these soils are more likely to generate dusts.	General Notes; Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links. Selected References; Canadian Council of Ministers of the Environment (CCME). 2006. Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 1332. http://ceqg-rcqe.ccme.ca/ Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC
	Coarse			
Score	1			
inhalation total	1			

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site: Gilbert Plains Cardlock Facility

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for human exposure				
iii) Ingestion (*i.e.,* ingestion of food items, water and soils [for children]), including traditional foods.		A water well listed as being for domestic purposes is recorded as being located between 100 to 300 m from the Site.	Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (*e.g.,* provision of alternate drinking water supply) should be initiated to reduce or eliminate exposure. The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modelling of flow and contaminant transport. For aquifers, examples of "No drinking water present" includes municipal bylaws prohibiting water wells for potable water use and naturally non-potable (*e.g.,* saline) shallow groundwater. Groundwater used for drinking water may not be at risk from contamination due to a lack of hydrological connection between contaminated soil or groundwater, or the drinking water is sufficiently up-gradient of the contamination source. Selection of "No potential for aquifer contamination" must be supported with sufficient documentation, *e.g.,* lithological and contaminant properties, well capture zones (map drawn to scale), and capture zone delineation methodology.	**Selected References:** Guidelines for Canadian Drinking Water Quality: http://hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable. Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.
Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future).				
0 to 100 m				
100 to 300 m				
300 m to 1 km				
1 to 5 km				
No drinking water present				
No potential for aquifer contamination				
Do Not Know				
	100 to 300 m			
Score	2.5			
Is an alternative water supply readily available?		Municipal water is available where this well is located.		
Yes				
No				
Not Applicable			Answer Not Applicable if "No drinking water present" or "No potential for aquifer contamination" was selected in previous question.	
Do Not Know	Yes			
Score	0			
Is human ingestion of contaminated soils possible?		Soil samples that contained PHC concentrations above CCME guidelines were collected from less than 1.5 m below ground at the Site.	If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.	
Yes				
No				
Do Not Know	Yes			
Score	3			
Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings?		No plants, animals, or wildlife are harvested from the Site.	Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (*e.g.,* large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.	
Yes				
No				
Do Not Know	No			
Score	0			
Ingestion total	5.5			
Human Health Total "Potential" Score	12.5	Note if a "Known" Human Health score is provided, the "Potential" score is disallowed.		
Allowed "Potential" Score	12.5			
2. Human Exposure Modifying Factors				
a) Strong reliance of local people on natural resources for survival (*i.e.,* food, water, shelter, etc.) in contaminated area.	No	The Site is a commercial property, natural resources from the Site are not used by local people.		
Yes				
No				
Do Not Know				
Human Exposure Modifying Factors - "Known"	0			
Human Exposure Modifying Factors - "Potential"	---			
Raw Human "Known" total	0			
Raw Human "Potential" total	12.5			
Raw Combined Total Human Score	12.5			
Adjusted Total Human Score (max 22)	**12.5**			

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site: Gilbert Plains Cardlock Facility

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
3. Ecological				
A. Known exposure				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.	18		Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (*i.e.,* a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired.	CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life. CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses. http://ceqg-rcqe.ccme.ca/ Sensitive receptors- review: Canadian Council on Ecological Areas; www.ccea.org Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in *A Framework for Ecological Risk Assessment: General Guidance* (CCME 1996). Notes: Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	12		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification.	
No quantified or suspected exposures/impacts in terrestrial or aquatic organisms	0		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects, such as site observations, tissue testing, toxicity testing and quantitative community assessments.	
Score	Go to Potential ---			
NOTE: If a score is assigned here for Known Exposure, then you should skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)				
B. Potential for ecological exposure (for the contaminated portion of the site)				
a) Terrestrial i) Land use Agricultural (or Wild lands) Residential / Parkland Commercial Industrial Do Not Know	Commercial	The Site is used as a commercial property.	Review zoning and land use maps. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place (indicate in the worksheet that future land use is the consideration). Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (*e.g.,* greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Wild lands are grouped with agricultural land due to the similarities in receptors that would be expected to occur there (e.g., herbivorous mammals and birds) and the similar need for a high level of protection to ensure ecological functioning. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	
Score	1			
ii) Uptake potential Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site? Yes No Do Not Know	Yes	PHC concentrations above CCME guidelines have been identified in soil samples collected from less than 1.5 mbgs.	If contaminated soils are located within the top 1.5 m, it is assumed that direct contact of soils with plants and soil invertebrates is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely.	
Score	1			
iii) Ingestion (*i.e.,* wildlife or domestic animals ingesting contaminated food items, soils or water) Are terrestrial animals likely to be ingesting contaminated water at the site? Yes No Do Not Know	No	There is no surface waterbody present at the Site.	Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.	
Score	0			
Are terrestrial animals likely to be ingesting contaminated soils at the site? Yes No Do Not Know	No	The Site is not vegetated and the soil impacts at depths of less than 1.5 m are within an enclosed compound.	Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.	
Score	0			
Can the contamination identified bioaccumulate? Yes No Do Not Know	No	The log Kow for BTEX are all below 5, and PHC fractions F1 - F4 are not considered to be bioaccumulative.	Substances can be considered bioaccumulative if; • There is a Tissue Residue Guideline (TRG) or Soil Quality Guideline for Soil and Food Ingestion for the protection of secondary (SQG_{2C}) and/or tertiary consumers (SQG_{3C}). • Bioaccumulation factor (BAF) or bioconcentration factor (BCF) greater than 5000. • If BAF or BCF is not available, or reliable, the log Kow is equal to or greater than 5. If a literature review indicates that a substance biomagnifies, it should be treated as biomagnifying regardless of whether or not it meets the criteria above. It should also be noted that some substances with a log Kow greater than 5 do not biomagnify. If studies on a substance with a high Kow demonstrate a lack of biomagnification in upper trophic levels, then the substance can be considered not bioaccumulative. Petroleum hydrocarbons F1 to F4 are not considered bioaccumulative.	*See attached Reference Material including log(Kow)* Consult *CEPA (1999) Persistence and Bioaccumulation Regulations* for additional guidance; http://laws-lois.justice.gc.ca/eng/regulations/SOR-2000-107/page-1.html
Score	0			
Distance to sensitive terrestrial ecological area 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know	> 5 km	No sensitive area present within 5 kilometres of the Site as per the Canadian Protected and Conserved Areas Database (CPCAD).	It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: www.ccea.org	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
Score	0.5			
Raw Terrestrial "Potential" total	2.5	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
Allowed Terrestrial "Potential" total	2.5			

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site: Gilbert Plains Cardlock Facility

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for ecological exposure (for the contaminated portion of the site)				
b) Aquatic		No aquatic environment is present at the Site.	"Sensitive aquatic environments" include those in or adjacent to shellfish or fish harvesting areas, marine parks, ecological reserves and fish migration paths. Also includes those areas deemed to have ecological significance such as for fish food resources, spawning areas or having rare or endangered species.	
i) Classification of aquatic environment			"Typical aquatic environments" include those in areas other than those listed above.	
Sensitive				
Typical				
Not Applicable (no aquatic environment present)				
Do Not Know				
	Not Applicable			
Score	0			
ii) Uptake potential			Groundwater concentrations of contaminants at the point of contact with an aquatic receiving environment can be estimated in three ways: 1) by comparing collected nearshore groundwater concentrations to the CCME water quality guidelines (this will be a conservative comparison, as contaminant concentrations in groundwater often decrease between nearshore wells and the point of discharge). 2) by conducting groundwater modeling to estimate the concentration of groundwater immediately before discharge. 3) by installing water samplers, "peepers", in the sediments in the area of daylighting groundwater.	
Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact?				
Yes				
No (or Not Applicable)				
Do Not Know	Do Not Know			
Score	0.5			
Distance from the contaminated site to an important surface water resource		The closest waterbody to the Site is a pond located approximately 220 m southeast of the Site.	It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor or important water resource located within this area of the site will be subject to further evaluation. It is also considered that any environmental receptor located greater than 5 km away will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: www.ccea.org	Environmental receptors include: local, regional or provincial species of interest or significance, sensitive wetlands and fens and other aquatic environments.
0 to 300 m				
300 m to 1 km				
1 to 5 km				
> 5 km				
Do Not Know				
	0 to 300 m			
Score	3			
Are aquatic species (*i.e.,* forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues?		The log Kow for BTEX are all below 5, and PHC fractions F1 - F4 are not considered to be bioaccumulative.	Substances can be considered bioaccumulative if; • There is a Tissue Residue Guideline (TRG) • Bioaccumulation factor (BAF) or bioconcentration factor (BCF) greater than 5000. • If BAF or BCF is not available, or reliable, the log Kow is equal to or greater than 5. If a literature review indicates that a substance biomagnifies, it should be treated as biomagnifying regardless of whether or not it meets the criteria above. It should also be noted that some substances with a log Kow greater than 5 do not biomagnify. If studies on a substance with a high Kow demonstrate a lack of biomagnification in upper trophic levels, then the substance can be considered not bioaccumulative.	*See attached Reference Material including log(Kow)* Consult *CEPA (1999) Persistence and Bioaccumulation Regulations* for additional guidance; http://laws-lois.justice.gc.ca/eng/regulations/SOR-2000-107/page-1.html
Yes				
No				
Do Not Know	No			
Score	0			
Raw Aquatic "Potential" total	3.5	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
Allowed Aquatic "Potential" total	3.5			
4. Ecological Exposure Modifying Factors				
a) Known, or potential, occurrence of a species at risk.			Consult any ecological risk assessment reports. If information is not present, utilize on-line databases such as NatureServe Explorer (http://explorer.natureserve.org/). Regional, Provincial (Environment Ministries), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance.	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act, available at: http://www.sararegistry.gc.ca/species/schedules_e.cfm?id=1 Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCMWLAP. 2005. Endangered Species and Ecosystems in British Columbia. Provincial red and blue lists. Ministry of Sustainable Resource Management and Water, Land and Air Protection. http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk
Is there a potential for a species at risk to be present at the site, or a known presence?	Do Not Know		To assess the potential for a species at risk to be present, the site (or surroundings) should be located within range of a species at risk (using on-line resources and consultation with knowledgeable government departments or biologists, see above), and there should be an assessment of habitat suitability for any identified potential species at risk.	
Yes	---			
No	---			
Do Not Know	1			
b) Potential impact of aesthetics (*e.g.,* enrichment of a lake or tainting of food flavour).		No aesthetic impacts have been reported at the nearest waterbodies.		
Is there evidence of aesthetic impact to receiving water bodies?	No		Documentation may consist of environmental investigation reports, press articles, petitions or other records.	This Item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
Yes	0			
No				
Do Not Know	---			
Is there evidence of olfactory impact (*i.e.,* unpleasant smell)?	No	No olfactory impacts have been identified.	Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.	
Yes	0			
No				
Do Not Know	---			
Is there evidence of increase in plant growth in the lake or water body?	No	No increase in plant growth has been reported.	A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients *e.g.,* nitrogen or phosphorous releases to an aquatic body can act as a fertilizer.	
Yes	0			
No				
Do Not Know	---			
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different?	No	No evidence of unusual tastes or smells have been reported.	Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	
Yes	0			
No				
Do Not Know	---			
Ecological Modifying Factors Total - Known	0			
Ecological Modifying Factors Total - Potential	1			
Raw Ecological "Known" total	0			
Raw Ecological "Potential" total	7			
Raw Combined Total Ecological Score	7			
Adjusted Total Ecological Score (Max 18)	**7**			

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Site: Gilbert Plains Cardlock Facility

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
5. Other Potential Contaminant Receptors				
a) Exposure of permafrost (leading to erosion and structural concerns)		The Site is not located in a permafrost zone.		Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity?	No		Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides.	
Yes	0			
No				
Do Not Know	---			
		The Site is not located in a permafrost zone.		
Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment?	No		Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	
Yes	0			
No				
Do Not Know	---			
Other Potential Receptors Total - Known	0			
Other Potential Receptors Total - Potential	---			

Exposure Total		
Raw Human Health + Ecological Total + Other Receptors - "Known"	0	
Raw Human Health + Ecological Total + Other Receptors - "Potential"	19.5	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included.
Raw Total Exposure Score (not adjusted)	19.5	HH or Eco Total score has not yet been capped at 22 and 18, respectively.
Adjusted Total Score (Adjusted Total Exposure / 46 * 34)	**14.4**	maximum 34

CCME National Classification System (2008) version 1.3
Score Summary

Site: Gilbert Plains Cardlock Facility

Scores from individual worksheets are tallied in this worksheet.
Refer to this sheet after filling out the revised NCSCS completely.

I. Contaminant Characteristics	Known	Potential
1. Residency Media	4	---
2. Chemical Hazard	8	---
3. Contaminant Exceedance Factor	6	---
4. Contaminant Quantity	2	---
5. Modifying Factors	2	---
Raw Total Score	22	---
Raw Combined Total Score (Known + Potential)	22	
Adjusted Total Score (Raw Combined Total/40*33)	**18.2**	(max 33)

II. Migration Potential	Known	Potential
1. Groundwater Movement	12	---
2. Surface Water Movement	---	5.9
3. Soil	12	---
4. Vapour	---	10
5. Sediment Movement	---	6
6. Modifying Factors	0	---
Raw Total Score	24	21.9
Raw Combined Total Score (Known + Potential)	45.9	
Adjusted Total Score (Raw Combined Total/64*33)	**23.7**	(max 33)

III. Exposure	Known	Potential
1. Human Receptors		
A. Known Impact	---	
B Potential		
a. Land Use		1
b. Accessibility		2
c. Exposure Route		
i. Direct Contact		3
ii. Inhalation		1
iii. Ingestion		5.5
2. Human Receptors Modifying Factors	0	---
Raw Total Human Score	0	12.5
Raw Combined Total Human Score (Known + Potential)	12.5	
Adjusted Total Human Score	12.5	(maximum 22)
3. Ecological Receptors		
A. Known Impact	---	
B. Potential		
a. Terrestrial		2.5
b. Aquatic		3.5
4. Ecological Receptors Modifying Factors	0	1
Raw Total Ecological Score	0	7
Raw Combined Total Ecological Score (Known + Potential)	7	
Adjusted Total Ecological Score	7	(maximum 18)
5. Other Receptors	0	---
Total Other Receptors Score (Known + Potential)	0	
Total Exposure Score (Human + Ecological + Other)	**19.5**	
Adjusted Total Score (Total Exposure/46*34)	**14.4**	(maximum 34)

Site Score

Site Letter Grade	**C**
Certainty Percentage	**69%**
% Responses that are "Do Not Know"	**10%**
Total NCSCS Score for site	**56.2**
Site Classification Category	**2**

Site Classification Categories*:
Class 1 - High Priority for Action (Total NCS Score >70)
Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)
Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)
Class N - Not a Priority for Action (Total NCS Score <37)
Class INS - Insufficient Information (≥15% of responses are "Do Not Know", or a site letter grade of F has been assigned)

* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.