Shell Canada Energy

Camp Farewell NWT

Closure and Reclamation Plan

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Shell Canada Energy
400 - 4 Avenue SW
Calgary, Alberta
T2P 0J4

Mr. Randall Warren
Manager, DAR and Drilling Waste

Dear Mr. Warren:

Closure and Reclamation Plan
Camp Farewell, NWT

IEG Consultants Ltd. (IEG) is pleased to provide consulting services to Shell Canada Energy (Shell) regarding the Closure and Reclamation Plan for the Camp Farewell (Site). The enclosed document is intended to meet the requirements for Shell to update the interim Closure and Reclamation Plan for the site bi-annually.

This plan update is submitted in confidence and its contents may not be divulged to third parties without express written consent of IEG.

We appreciate this opportunity to continue to offer our services and assistance to Shell Canada Energy. If you have any questions, please call the undersigned at (403) 648-4320.

Yours truly,
IEG CONSULTANTS LTD.

Damian Cox, B.Sc., P.Eng.
Senior Environmental Scientist/Project Manager

DC:bl

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Shell Canada Energy

Camp Farewell NWT

Closure and Reclamation Plan

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EXECUTIVE SUMMARY

IEG Consultants Ltd. (IEG) was retained by Shell Canada Energy (Shell) to update the Closure and Reclamation Plan (CRP) for Shell's Camp Farewell (Site) located at 69◦12' 30" N, 135◦ 06' 04" W, approximately 95 km northwest of the town of Inuvik in the Northwest Territories (NWT).

Camp Farewell is located within the Inuvialuit Settlement Region on the northeast bank of the Middle Channel near Harry Channel in the Kendall Island Bird Sanctuary (KIBS), NWT. It has been used as a staging site for various activities such seismic operations, preliminary development assessment work, and drilling operations. Currently the site provides crew accommodations related to current closure activities and is used to store equipment.

This plan includes a summary of the existing conditions at the Site and the temporary closure activities that have been conducted to date. The plan also includes details regarding the permanent closure and reclamation activities that are expected to occur at the site in subsequent years. Requirements of federal, territorial, and other regulations have been considered and applied throughout this plan.

Primary temporary closure activities were initiated in 2008 and 2009 and have continued with the removal and responsible management of materials and equipment that are no longer required at the Site. In 2012, activities related to the decommissioning, remediation, and reclamation of the former sewage lagoon were initiated and are expected to continue in 2013.

Permanent site closure activities are expected to begin in 2013; however, a schedule for the completion of permanent closure activities at the Site is undefined at this time.

TABLE OF CONTENTS

TABLE OF CONTENTS

(continued)

TABLE OF CONTENTS

(continued)

List of Figures

List of Appendices

1 INTRODUCTION

IEG Consultants Ltd. (IEG) was retained by Shell Canada Energy (Shell) to update the Closure and Reclamation Plan (CRP) for Shell's Camp Farewell (Site) located at 69◦12' 30" N, 135◦ 06' 04" W, approximately 95 km northwest of the town of Inuvik in the Northwest Territories (NWT) (Figures 1 and 2).

1.1 Purpose of Closure and Reclamation Plan (CRP)

The purpose of the CRP is to summarize the existing site operational and environmental conditions of Camp Farewell and summarize Shell's plans for closure and reclamation at this Site. This CRP is intended to meet the requirements associated with closure and reclamation planning in accordance with both federal and territorial regulations.

1.2 Planning Team

This CRP has been prepared on behalf of Shell by IEG. The following individuals were involved in the preparation and submission of this Plan.

Company	Responsibility	Individual	Role
Shell Canada Energy	Owner	Randall Warren	Decommissioning, Abandonment & Reclamation Manager
IEG Consultants	Environmental Planning	Damian Cox	Sr. Environmental Scientist
IEG Consultants	Environmental Planning	Breann Lamnek	Environmental Technologist

1.3 Approach of the Closure and Reclamation Plan

1.3.1 Applicable Regulatory Bodies

Regulatory bodies maintain jurisdiction over the Site, as outlined below.

1.3.1.1 Northwest Territories Water Board (NWTWB)

The NWTWB enforces the Northwest Territories Water Act.

This Plan has been updated in partial fulfillment of the requirements outlined in licence # N7L1-1762 (Appendix I) as issued by the NWTWB. Item 1 of Part G of the Licence states:

"The Licensee shall submit to the Board for approval within one (1) year of issuance of this Licence, an updated Interim Abandonment and Restoration Plan including plans for the abandonment and

restoration of the Sewage lagoon and a complete Phase II Environmental Site Assessment of Camp Farewell. This assessment will include the full delineation of contamination (soil and water) associated with Camp Farewell operations, both on and off the gravel base pad."

1.3.1.2 Aboriginal Affairs and Northern Development Canada (AANDC)

The AANDC, formerly known as Indian and Northern Affairs Canada (INAC), is the ministry that enforces the *Mine Site Reclamation Guidelines for the Northwest Territories*. This guideline was developed in consultation with aboriginal community members, scientific experts, mine representatives, regulatory authorities, and other affected parties to support the environment and provide regulation of mining activities occurring in Canada's north.

This guideline is the most recent publication and therefore the most appropriate regulatory guideline for the Camp Farewell site. As such, it has been used in the development of this Closure and Reclamation Plan. Specific considerations of the guideline have been made as Camp Farewell has a unique history and distinct characteristics that may justify the potential continued use of the site as a staging and/or storage area following decommissioning of camp operations.

Camp Farewell is located on federal Crown land and is under lease to Shell. The lease, No. 107 C/4-2-15 (Appendix II), was re-issued in 2009 and is valid until 2028. The general requirements regarding reclamation of the Site and the airstrip are outlined in the lease. Part 12 (Termination) states:

"Upon the termination or expiration of this lease, the lessee shall deliver up possession of the land in a condition satisfactory to the Minister."

And; Part 14 (Restoration) of both Leases state:

"Where the lessee fails to restore the land as required and within the time allowed by the Regulations or by the Minister, the Minister may order the restoration of all or any part of such land and any expenses thus incurred by the Minister shall be recoverable from the lessee as a debt due to Her Majesty."

Where appropriate, potential restoration and reclamation options have been presented to Shell to assist in closure planning, however; specific plans will require review and consent of the applicable regulatory bodies.

1.3.1.3 Environment Canada – Canadian Wildlife Service (CWS)

The Site lies within the Kendall Island Bird Sanctuary (KIBS), under jurisdiction of Environment Canada. Shell holds permit # NWT-MBS-13-01 (Appendix III). Further detail regarding this permit is discussed in Section 2.2.4.

1.3.1.4 Applicable Regulatory Guidelines

Remediation guidelines utilized during the assessments of the Site have been based on the *Environmental Guideline for Contaminated Site Remediation, 2003*, as enforced by the NWT government (the Minister of Environment and Natural Resources [ENR]) as identified by the *NWT*

Environmental Protection Act (EPA). The applicable guidelines that have been applied to assessments at the Site are discussed in Section 4.5.2.3.

1.3.2 Project Understanding

The following activities have been conducted as part of this plan:

- review of the applicable regulatory requirements and issued licenses and approvals as they relate to Camp Farewell, including direct communications with appropriate regulators;
- review of the current site status and Shell's future intentions for the site, including past, present and potential future land use considerations;
- review of Site history;
- review of existing Environmental Site Assessments (ESAs) conducted at Camp Farewell, including existing analytical data resulting from recent soil and water quality monitoring programs and documentation related to dismantling/remediation programs; and
- review of the 2011 Abandonment and Restoration Plan, submitted by Worley Parsons Canada (WorleyParsons) to Shell in March, 2011.

1.4 Definition of Terms

The following list of terms are used throughout this document and are consistent with those identified in the Mine Site Reclamation Guidelines:

Abandonment: The permanent dismantlement of a facility so it is incapable of its intended use. This includes the removal of associated equipment and structures.

Active layer: The layer of ground above the permafrost which thaws and freezes annually.

Backfill: Material excavated from a site and reused for filling the surface or underground void created by mining or excavating.

Background: An area near the site under evaluation not influenced by chemicals released from the site, or other impacts created by onsite activity.

Berm: A mound or wall, usually of earth, used to retain substances or to prevent substances from entering an area.

Biodiversity: The variety of plants and animals that live in a specific area.

Bioremediation: The use of microorganisms or vegetation to reduce contaminant levels in soil or water.

Closure: When Camp Farewell ceases operations without the intent to resume activities in the future.

Closure Criteria: Detail to set precise measures of when a closure objective has been satisfied.

Contaminant: Any physical, chemical, biological or radiological substance in the air, soil or water that has an adverse effect. Any chemical substance with a concentration that exceeds background levels or which is not naturally occurring in the environment.

Contouring: The process of shaping the land surface to fit the form of the surrounding land.

Decommissioning: The process of permanently closing a site; removing equipment, buildings and structures. Rehabilitation and plans for future maintenance of affected land and water are also included.

Disposal: The relocation and containment of unwanted materials in an approved facility.

Drainage: The removal of excess surface water or groundwater from land by natural runoff and permeation, or by surface or subsurface drains.

Erosion: The wearing away of rock, soil or other surface material by water, rain, waves, wind or ice; the process may be accelerated by human activities.

Groundwater: All subsurface water that occurs beneath the water table in rocks and geologic formations that are fully saturated.

In Situ Treatment: A method of managing or treating contaminated soils, sludges and waters “in place” in a manner that does not require the contaminated material to be physically removed or excavated from where it originated.

Landfill: An engineered waste management facility at which waste is disposed by placing it on or in land in a manner that minimizes adverse human health and environmental effects.

Monitoring: Observing the change in geophysical, hydrogeological or geochemical measurements over time.

Objectives: Objectives describe what the reclamation activities are aiming to achieve. The goal of Site closure is to achieve the long-term objectives that are selected for the Camp Farewell Site.

Permafrost: Ground that remains at or below zero degrees Celsius for a minimum of two consecutive years.

Reclamation: The process of returning a disturbed site to its natural state or one for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.

Rehabilitation: Activities to ensure that the land will be returned to a form and productivity in conformity with a prior land use, including a stable ecological state that does not contribute substantially to environmental deterioration and is consistent with surrounding aesthetic values.

Remediation: The removal, reduction, or neutralization of substances, wastes or hazardous material from a site in order to prevent or minimize any adverse effects on the environment and public safety now or in the future.

Restoration: The renewing, repairing, cleaning-up, remediation or other management of soil, groundwater or sediment so that its functions and qualities are comparable to those of its original, unaltered state.

Revegetation: Replacing original ground cover following a disturbance to the land.

Risk Assessment: Reviewing risk analysis and options for a given site, component or condition. Risk assessments consider factors such as risk acceptability, public perception of risk, socio-economic impacts, benefits, and technical feasibility. It forms the basis for risk management.

Temporary Closure: When Camp Farewell ceases operations with the intent to resume activities in the future. Temporary closures can last for a period of weeks, or for several years, based on economical, environmental, political, or social factors.

Traditional Knowledge: A cumulative, collective body of knowledge, experience, and values built up by a group of people through generations of living in close contact with nature. It builds upon the historic experiences of a people and adapts to social, economic, environmental, spiritual and political change.

2 SITE DESCRIPTION

Camp Farewell is located within the Inuvialuit Settlement Region (ISR) on the northeast bank of the Middle Channel near Harry Channel in the KIBS.

2.1 Background and Construction

Camp Farewell was constructed in the winter of 1970 and summer of 1971 and was operated as a staging and storage site in support of the Shell Mackenzie Delta Drilling Program. The site consisted of a self-contained camp, providing electrical and heating services and facilities for accommodation, meals, fuel storage, equipment handling, water withdrawal and wastewater storage. The camp operated as a 60-70 person camp full time until 1978, after which it was in operation periodically until 1994. During full operation in the 1970's, infrastructure on-site included: a single story accommodations building, two 5,000 barrel (bbl) tanks, one 3,000 bbl tank, and three 2,000 bbl tanks. In the mid 1980's, the accommodations building was replaced with a smaller building, designed for approximately 32 people, that remains on-site. Storage information included in previous WorleyParsons reports indicates the following has been stored on-site: up to 6.8 million litres of fuel (including gasoline, diesel and aviation fuel), building materials, drilling mats, piping, and drilling additives (including barite, Aqua Seal™, and caustic soda).

The Site was constructed on permafrost, and based on site history the preservation of this layer was considered. A layer of polyurethane (either 50 mm foam or pads) was installed, including 450 mm of compacted gravel to act as a thermal barrier and prevent contamination of underlying soils and groundwater. In 2006, WorleyParsons conducted test pitting on-site and encountered remnants of liner between approximately 0.38 and 0.62 metres below ground surface (m bgs) in some, but not all of the test pits. This suggests that while liner was used, the gravel pad extended beyond the liner.

Sand and gravel comprised the pad fill material and extended to between approximately 0.5 and 1 m bgs. Clay mineral additive (bentonite) appears to have been mixed with gravel as well to aid in compaction and adhesion of gravel throughout the site (WorleyParsons, 2011).

2.1.1 Spill History

Approximately 800,000 litres of water contaminated diesel fuel was unintentionally released from the tank farm in 1981 according to a search of the Government of Northwest Territories (GNWT) Hazardous Spills Database. Canadian Marine Drilling (CanMar, a subsidiary of Dome Petroleum), was occupying Camp Farewell and responsible for the two 5,000 bbl tanks located in the tank farm. Investigation suggests the spill was a result of vandalism/theft that occurred in the winter of 1980-81, resulting in the spring release, which was reported to authorities on May 24, 1981 (WorleyParsons, 2011).

Released fluids overtopped the berm and flowed with site topography to the south-west, over the steep banks of the site and onto the frozen Mackenzie River. Free fuel within the berm and camp area was collected and pumped into holding tanks, while residual fuel was collected using sorbent pads. Fuel that spilled onto the frozen river was also collected using the sorbent pads. These pads were incinerated in a Sacke Portable Burner over the 4 to 6 week clean-up period (WorleyParsons, 2011).

Additional detail regarding the actual spill and clean-up efforts is documented in Komex, 2001.

2.1.2 Site Operations

The Site has been utilized by many different corporations for different activities; however, it is under the stewardship of Shell. The Site is currently inactive. It has been utilized as a staging area for seismic and drilling operations. The camp facilities have been used, and the site has been used for storage of equipment and fuel. Currently one fuel storage facility (93,000 L white tank) exists on site adjacent to the camp building.

Recent site activities have been limited to those involved in the Temporary Closure and include dismantling, removal of stockpiled materials and consumables, remediation and assessment activities, decommissioning of the lagoon, and required environmental monitoring work.

2.1.3 On-Site Facilities

The following facilities exist at the Site:

- bermed tank farm with five tanks;
- fuel trailer;
- three storage sheds (sheds 1, 2, and 3);
- metal storage tanks (empty);
- a burn pit area containing an open top metal bin for incineration of construction debris; and,

- the airstrip (occasionally aviation fuel has been stored in tanks on the airstrip for regional helicopter operations).

Several water-related facilities exist at the site, including:

- intake system;
- storage system;
- distribution system;
- toilets, sinks, showers (and associated piping);
- gravity collection system;
- lift station tank and pump;
- treatment system (no longer in use) including a primary treatment system, a UV disinfection unit, and a chlorine dosing system;
- final transport tank, pump and piping (no longer in use); and,
- a sewage lagoon.

AANDC and the CWS have been known to occasionally store fuel within a secondary containment on the west side of the site.

In 2010, WorleyParsons conducted dismantling and material removal activities and conducted a detailed audit of the materials and structures on site. A list of materials and equipment prepared by WorleyParsons is included in Appendix IV.

In 2012, IEG conducted site visits and confirmed that the buildings were noted to be secure and in good condition, with the exception of a piece of siding missing from the camp building. A summary of the 2012 site inspections are available in Appendix V.

2.2 Setting

Camp Farewell is located within the Mackenzie Delta, the area where the Mackenzie River meets the Beaufort Sea. The nearest municipal centers are the town of Inuvik, located approximately 95 km southeast of Site, and the hamlet of Tuktoyaktuk, located approximately 75 km northeast of the Site (Figure 1).

2.2.1 Climate

Environment Canada (2006) reported that historical climatic data from Inuvik identified that the mean daily temperature between 1971 and 2000 was -8.8 degrees Celsius (˚C), with a temperature exceeding 0˚C occurring an average of 156 days per year. During the same period, the average annual precipitation is reported as 248.2 mm, including approximately 117 mm of rainfall and 167.9 cm of snowfall (WorleyParsons, 2011).

Environment Canada reported that historical climatic data from Tuktoyaktuk reported an average temperature between 1971 and 2000 to be -10.6˚C with the temperature exceeding 0˚C an average of 137 days a year. Average annual precipitation for this period was 167.8 mm, consisting of 75.3 mm of rainfall and 95.3 cm of snowfall (WorleyParsons, 2011).

2.2.2 Local and Regional Geology

The Mackenzie Delta outwash plain that Camp Farewell is located on is bordered by the Mackenzie River to the west and southwest with the nearest camp boundary located approximately 20 m northwest. Shallow lakes and intermittent ponds surround the east, north (nearest camp boundary approximately 360 m), and south (nearest camp boundary approximately 660 m) sides of the site. Surface drainage is predominantly to the south and southwest (WorleyParsons, 2011).

Documentation suggests that surficial geology near the site consists of silty sand overlying sand and interbedded sand and gravel deposits. These deposits are typically associated with the Toker Member, Melloch Till, or Buckland Glaciation deposits. These sediments are overlain by organic deposits. Outwash plains and valley trains identified in the Mackenzie Delta and Tuktoyaktuk Coastal lands are reported to be between 3 m and 30 m thick and include North Star Outwash, Garry Island Member, Cape Dalhousie Sands, and Turnabout Member. Geology observed at Camp Farewell indicates the outwash plain is approximately 15 m thick (WorleyParsons, 2011).

An extensive discontinuous permafrost layer with a low to moderate ice content extending to approximately 95 m bgs has been documented in the region surrounding the Site. This region is reportedly characterized by sparse ice wedges and pingo ice and no massive ground ice. The active layer (layer of soil subject to seasonal thaw cycles) depth is typically less than 1.0 m bgs and may be as little as 0.28 m bgs (WorleyParsons, 2011).

Groundwater flow is typically highest in the active layer and above the permafrost, and has been reported at depths ranging from 0.26 to 0.83 m bgs with depths increasing toward the south. The depth to groundwater is dependent on the amount of gravel overburden and is a light brown color as a result of the organic rich soils (WorleyParsons, 2011).

2.2.3 Vegetation

Ice wedges result in the formation of polygon-shaped depressions which have been identified in the area to the north and west of the site. These depressions result in conditions favorable for the growth of willow (*Salix* species) and alder (*Alnus* species) woody vegetation. Dwarf shrubs, moss and lichen ground cover characterizes the remaining areas surrounding the site (WorleyParsons, 2011).

2.2.4 Sensitive Area

The KIBS was established in 1961 to protect the staging and breeding grounds of over 100 species of songbirds, shorebirds, and waterfowl, including the protected Lesser Snow Goose. The sanctuary includes 620 km^2 of the Mackenzie River Delta. The habitat within the delta inlet consists of coastal marshes, wet meadows, and seasonal flats, and provides seasonal refuge for several thousand

migratory birds including Greater White-Fronted Geese, Brants, and Tundra Swans (WorleyParsons, 2011).

The sanctuary is adjacent to the migration and summering area of marine mammals, including beluga whales. The outer islands of the sanctuary are known to be indigenous to the Barren-ground grizzly bear (WorleyParsons, 2011).

2.2.5 Land Use

Two indigenous populations are native to the Mackenzie Delta, the Gwich'in and the Inuvialuit. These populations, both currently and historically, utilize the Mackenzie Delta for traditional hunting and trapping activities.

Since the establishment of the KIBS in 1961 and the involvement of the CWS, the land surrounding Camp Farewell is protected. There are no industrial settlements within 95 km of the site. Seismic exploration and exploratory drilling activities have occurred intermittently since the 1960's yet there are few oil and gas related activities currently occurring (WorleyParsons, 2011).

2.2.6 Community

Consultation with local stakeholders is an important initiative pursued by Shell. Periodic sessions have been held with local community groups, residents, community leadership and special interest groups planned appropriately based on the level of Shell's activities in the region, Shell's plans and the communities desire to discuss issues. Historically, consultation programs have had participation from the Aklavik, Inuvik and Tuktoyaktuk communities, including the Aklavik Hunters and Trappers Committee.

In 2005 and 2006, a formal consultation process was initiated regarding the renewal of the Water Licence for Camp Farewell. Shell's plans for continual development in the region were also addressed. It is understood that the community stakeholders were supportive of the Temporary Closure and Permanent Closure plans for Camp Farewell and of the following efforts:

- improving the visual aesthetics of the Site;
- initiating treatment of hydrocarbon impacts on-site;
- minimizing disturbance of the tundra (provided the historical spill would not cause risk of adverse environmental effects); and,
- protect traditional land use in the area.

2.3 Previous Environmental Programs

2.3.1 2000

In 2000, Golder and Associates (Golder) conducted a baseline environmental assessment of the site. A division of Schlumberger Canada, Geco-Prakla, conducted a baseline assessment prior to sub-leasing a portion of the site from shell. Areas included in the assessment were the main camp

accommodations and associated trailer, the lagoon area, the area south of the storage crates and to the east boundary (WorleyParsons, 2011).

2.3.2 2002

A Phase I and Phase II ESAs were conducted by Komex in 2001. Analyzed parameters were reported to be exceed the applicable guidelines, including: total petroleum hydrocarbon (PHC), polycyclic aromatic hydrocarbons (PAHs) and selected trace metals within (and down gradient) of the burn pit; xylenes and total petroleum hydrocarbons (TPH) in the area of the tank farm and the area of the historical tank release; TPH and barium concentrations from surface stained areas and throughout the gravel base pad; and electrical conductivity (EC) and pH on the base pad where mud additives were reportedly stored.

Following the 2000 ESAs, Komex submitted an Interim Abandonment and Restoration Plan to the NWTWB (Komex, 2002).

2.3.3 2006

A more detailed Phase II ESA was conducted by WorleyParsons Komex in 2006. The purpose of the additional Phase II was to further delineate previously identified soil impact and potential groundwater impact.

2.3.4 2008

WorleyParsons submitted a second Interim Abandonment and Restoration Plan in 2008 following the 2006 Phase II. A summary of the 2006 results was included as well as specific Progressive Reclamation plans to be conducted in 2009 and 2010 (WorleyParsons, 2008).

2.3.5 2010

WorleyParsons submitted an updated Interim Abandonment and Restoration Program Report that described the activities that were conducted in 2008 and 2009 (WorleyParsons, 2010).

IEG also summarized the 2008 and 2009 site activities in the 2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report DRAFT (February, 2010). The 2006 Phase II ESA results were summarized, and the remediation activities were described in detail, including the sampling schedule and results.

2.3.6 2012

IEG conducted required site inspections, sampled the former sewage lagoon and discharged the lagoon water into the Mackenzie River in accordance with licence number N7L1-1762 (IEG 2012, IEG 2013a and IEG 2013b).

2.4 Current Conditions

2.4.1 Former Sewage Lagoon

On June 17, 2012, IEG personnel travelled to the site, collected a surface water sample from the former sewage lagoon, and submitted the sample for chemical analyses. Surface water parameters analyzed were reported to be within the applicable guidelines. The Northwest Territories Water Board issued a type "B" water license (N7L1-1762 – Appendix I) on July 18, 2012 to allow for discharge of the lagoon water into the Mackenzie River in 2012. On July 29, 2012 the lagoon water was discharged. An additional surface water sample (SW12-002) was collected during discharge and submitted for chemical analyses during discharge in August, 2012. Surface water parameters analyzed were reported to be within the applicable guidelines with the exception of a chlorine concentration (0.18 mg/L). The reported chlorine concentration is within an order of magnitude of the detection limit and the final receptor (The Beaufort Sea) is a salt water body. As well, most disinfected drinking water contains chlorine concentrations that may range between 0.2 mg/L to 1.0 mg/L (WHO, 1996). The chloride concentration reported from the surface water sample collected during discharge is not considered to be an environmental concern with respect to the site or nearby water bodies (IEG 2013b).

2.4.2 Gravel Pad

WorleyParsons conducted assessment and remediation activities of the on-site gravel pad in 2008 and 2009. Approximately 1,300 m^3 of soil was excavated for on-site ex-situ soil treatment from the gravel pad area: EX 1 – in the western corner of the pad, EX 2 and 3 – independent locations south of the tank farm, EX 4 – in the centre of the pad between the rows of storage, and EX 5 – south of the main camp building. Excavation locations are identified in Appendix VI on the site diagram created by IEG.

Hydrocarbon concentrations from soil samples from EX 1, EX 4 and EX 5 were reported to be less than the applicable guidelines, though additional confirmatory sampling was recommended by WorleyParsons in 2011. The south and southeast excavation walls from EX 2 and EX 3 were reported to meet guidelines, however the north walls and the historical fuel spill area were determined to require additional remediation.

It was estimated that approximately 600 m^3 of the 1,300 m^3 of soil being treated on-site still contained F2 and F3 hydrocarbon fractions exceeding the NWT industrial and residential/parkland guidelines at the end of 2009. Soils within the treatment area were reported to have pH, sodium adsorption ratio (SAR) and EC values exceeding the NWT industrial guidelines.

Further details are discussed in Section 3.4.2.

2.4.3 Burn Pit

Since 2000 the burn pit has been investigated including: eight soil sampling locations, one piezometer installation, and two surface water sampling locations.

Based on previous investigations, it has been confirmed that the pit was used for the disposal of hydrocarbon contaminated material, scrap metal and empty bags of drilling mud additives (barite). This is apparent in the reported elevated pH and elevated concentrations of barium, copper, lead, and zinc, as well as detectable concentrations of PAH's within and down-gradient of the burn pit.

Shallow groundwater samples have been reported to have detectable concentrations of benzene, toluene, ethylbenzene and xylene (BTEX) and PHCs down-gradient of the burn pit.

While metals concentrations that exceeded guidelines were reported from surface water samples collected from water bodies down-gradient of the burn pit, they are likely a result of natural conditions. Hydrocarbon and PAH concentrations were not detected in these samples.

Shell personnel supervised the excavation of hydrocarbon stained gravel adjacent to the burn pit. Confirmatory soil samples were reported to have hydrocarbon parameters within the applicable guidelines and/or detection limits and has been adequately remediated (WorleyParsons, 2011).

2.4.4 Tank Farm Area

Since 2000, soil samples have been collected from ten locations within the above ground storage tank (AST) areas.

Adjacent to the Day Tank, a F2 hydrocarbon fraction concentration from a surface sample was reported to exceed the residential/parkland guideline. Investigation of deeper soils and surrounding soils (test pitting) resulted in PHC concentrations that were reported to be less than the applicable guidelines, suggesting the elevated F2 concentration is limited to the gravel pad and isolated to the one location.

Visual indications of surface fuel spills were noted and four soil samples collected from these locations. Two of the four samples were reported to have BTEX or PHC concentrations exceeding the applicable guidelines. The remaining two soil samples were reported to have PHC concentrations exceeding the detection limit, but less than the guidelines. The depth of impact was not confirmed, but WorleyParsons suspected it extended to the base of the gravel pad (2011).

Soils sampled from the sampling location adjacent to the Heating Oil AST were reported to have PHC concentrations exceeding the applicable guidelines. An F3 concentration was reported from the gravel pad and an F2 concentration in the underlying organic layer was reported to be greater than background and/or the guideline value (WorleyParsons, 2011).

2.4.5 Surrounding Tundra

As part of the implementation of the 2009 Interim Abandonment and Restoration Program outlined by WorleyParsons, an assessment of the soil quality, soil invertebrates and vegetation health of the tundra surrounding and including the historical spill area was conducted. Differences were not identified between the surrounding tundra and the fuel spill site related to vegetation, invertebrate population or relative abundance or hydrocarbon concentrations measurable in soil (WorleyParsons, 2011).

3 TEMPORARY CLOSURE

3.1 Legislation

As defined by the Mine Site Reclamation Guidelines for the NWT (AANDC, 2007) a Temporary Closure is defined as *the scenario where a mine ceases operations with the intent to resume mining activities in the future*.

The main principle of the temporary closure legislation is to ensure activities occur that maintain all operating facilities in a manner that protects humans, wildlife and the environment. Section 1.4 of the guideline lists measures that should be implemented or completed upon temporary mine closure:

- *"access to the site, buildings, and all other structures are secured and restricted to authorized personnel only;*
- *appropriate signs are posted;*
- *soil treatment, and soil and groundwater monitoring programs are continued according to the requirements of this Plan;*
- *all waste management systems are secured;*
- *an inventory of chemicals and reagents, petroleum products, and other hazardous materials is conducted and these materials are secured appropriately or removed;*
- *fluid levels in all fuel tanks (currently empty) are recorded and monitored regularly for leaks or fuel is removed from the site;*
- *wastewater impoundment structures are stable and maintained in an appropriate manner;*
- *the Site is inspected and maintained regularly during the Temporary Closure period; and*
- *the reclamation security deposit is kept up to date."*

Sufficient equipment and supplies/reagents should be left on site (will be made available) for maintenance or reclamation activities that may need to take place.

3.2 Temporary Closure Management and Accountability

Randall Warren is the Manager of Shell's Decommissioning, Abandonment and Reclamation (DAR) programs. WorleyParsons was responsible for the assessment of the Site, the preparation of the Plan, the assessment of the off-site tundra areas and the preparation of reports, prior to 2012, under the direction of Gordon Johnson in conjunction with IEG under the direction of David Wells. IEG was also involved in ongoing site monitoring work under the direction of Sam Bird. Site activities since 2012 have been conducted by IEG (Damian Cox). Kevin Erickson with Tervita Corporation (Tervita, formerly Hazco Environmental Services Ltd.) has provided contractor services related to the dismantling, remediation and waste/materials transfer and disposal. A number of local Inuvik companies have been retained by Tervita to assist in site work.

3.3 General Closure Activities

Temporary closure activities have been occurring on-site since 2006 under the direction of WorleyParsons, Tervita and IEG.

The objectives of the program in 2009 included decommissioning, removal and responsible management of facilities and materials that were either no longer required or were no longer usable at Camp Farewell. These objectives were to reduce cost and scope of future reclamation work, remove substances and materials that had the potential to cause adverse effects on the environment, and maintain a tidy site. Efforts have been made to re-use and recycle materials where practical throughout this process.

Prior to 2012, the following materials were dismantled (as necessary), removed, and responsibly managed:

- unused facilities;
- drilling equipment and materials;
- construction materials;
- fuel and fuel tanks; and,
- drilling consumables.

3.4 Temporary Closure Program Summary

3.4.1 General

Initial activities were conducted in two phases: the winter of 2008/2009, and the summer of 2009. Below is a summary of the activities that occurred during this time:

- The camp support facilities were dismantled and removed from site as they were no longer operational or required. These facilities were inspected for potentially hazardous materials including mercury, switches, asbestos and lead-based paints. While hazardous materials were not identified, the facilities were determined to have little salvage value due to their age and condition. The dismantled facilities were transferred to Inuvik to be either recycled or disposed of at the municipal landfill.
- Drilling materials, such as pipes, that were still in operable condition were stored on-site. These were transferred to Inuvik and sold for re-use. Other drilling materials that were not salvageable were transferred to Inuvik for recycling or disposal.
- Drilling consumables such as drilling mud additives including mud, barite, and cement were removed from site.
- Fuel storage was minimized to only what was required for future operations. Usable fuel was transferred to Inuvik for reuse and excess storage tanks were transported for recycling or disposal.

- Construction materials that could be reused were transferred to Inuvik for re-sale. Non-reusable construction materials were transferred for recycling or disposal. Additional miscellaneous metal and pipe materials were also transported for recycling or disposal. Materials in sufficient condition were transferred for re-use (WorleyParsons, 2011).

3.4.2 Soil Remediation

3.4.2.1 Excavation

During previous environmental assessments, various locations which were reported to contain hydrocarbon concentrations in soil exceeding the applicable guidelines were identified. During the 2009 assessment activities, remediation of some of these areas was initiated in an attempt to support progressive restoration and to remove potential sources of additional soil and groundwater contamination. The following activities were conducted in 2009:

- construction of a soil treatment area;
- excavation of the easily accessible hydrocarbon impacted gravel;
- transfer of excavated material to the soil treatment area;
- active aerobic bio-treatment of the hydrocarbon impacted gravel, that involved treatment with an oxidizer (RegenOx®); and,
- sampling and analytical testing of the treated gravel.

Five remedial excavations were advanced based on areas of impact identified in the 2006 ESA (See figure in Appendix VI):

- Ex 1 - Historical Fuel Spills Area (1,260 m^3);
- Ex 2 - Southwest Corner of Tank Farm (8.4 m^3);
- Ex 3 - Midway on South Side of Tank Farm (10.5 m^3);
- Ex 4 - Storage Area on Pad (8.6 m^3); and,
- Ex 5 - Camp Day Tank (12 m^3).

Three additional areas were identified during the 2006 ESA that were not remediated at this time:

1. Herc tank – at the time of the 2009 remediation, the tank was still in use;
2. burn pit – at the time of the 2009 remediation, the pit was still in use; and,
3. vegetated area – the area of the gravel pad supporting extensive vegetation was not considered a remediation priority in 2009.

3.4.2.2 Treatment

Hydrocarbon impacted soils were transferred to the soil treatment area (in the central portion of the gravel pad) where it was treated in three separate windrows. An attempt was made to keep the windrows separated based on source to reduce excessive mixing and allow the material to return to the point of origin.

The treatment cells were constructed by grading the area flat and constructing an earthen berm to control water. The berm measured approximately 0.5 m high and was approximately 1.5 m wide at the base and extended around the outside perimeter of the treatment area. Final measurement of the treatment area was approximately 70 m by 140 m.

The intent of the soil treatment method was to utilize volatilization and bioremediation to promote the biodegradation of the hydrocarbon concentrations. An Allu bucket was used to promote mixing and aeration, while the volatilization and enhancement of bioremediation was facilitated by the use of an oxidizing additive, RegenOx® (IEG, 2010).

Confirmatory soil samples were collected from the remedial excavations. Samples were submitted for BTEX and F1 to F4 hydrocarbon fraction analysis from locations representative of no more than 400 m^2 and no less than 200 m^2 areas.

Soils were treated and placed back in the originating excavations. Analytical results reported elevated pH, SAR and EC values associated with elevated sodium and sulphate concentrations. Elevated F2 concentrations were also reported from Windrow 1. Windrow 1 was replaced into EX-1. Further details are contained in the 2010 IEG petroleum hydrocarbon soil remediation report included as Appendix VII.

3.5 Temporary Closure Monitoring, Maintenance and Reporting Program

Previous assessment reports are available for the Site as discussed in Section 2.3.

It is required that the Site be inspected every 50 days (approximately) to assess the integrity of the buildings, record visual signs of wildlife and assess any fuel on-site. IEG conducted site visits in March, April, June, July, August, October and December 2012 (see Site Activities summary, Appendix V) as was documented in IEG's December 2012 Summary Activities letter submitted to the CWS and Shell.

Ongoing soil and groundwater monitoring is also recommended. Groundwater sampling is expected to occur on an annual basis, as well as sampling and analytical testing of the treated soils. It is suggested that the following analytical parameters be tested:

- BTEX, PHC fractions (F1 to F4 in soil, F1 and F2 in groundwater);
- Heavy metals (total metals in soil, dissolved metals in groundwater); and,
- Major ions and general chemistry (detailed salinity in soil, routine potability in groundwater).

Surface water was sampled by IEG in 2012 from the sewage lagoon and a type "B" water licence was obtained from the NWTWB that allowed the surface water to be discharged.

Reporting requirements, as outlined by specific permits and licenses, are submitted as required in addition to an annual report summarizing yearly activities.

3.6 Temporary Closure Contingency Program

A contingency program is not required as the primary activities associated with the Temporary Closure of the Site have been completed.

3.7 Updated Temporary Closure Schedule and Costs

The Temporary Closure schedule has been completed and costs associated with the Temporary Closure have been incurred.

4 PERMANENT CLOSURE AND RECLAMATION

A Permanent Closure and Reclamation Plan (the Plan) is a summary of activities intended to be implemented in a manner that is protective of people and the environment, to return the lands associated with the mine (Camp Farewell) to a condition comparable to its surrounding, and undisturbed lands. This plan is consistent with the *Mine Site Reclamation Guidelines for the Northwest Territories* (Guideline) (INAC, 2007) which is the latest, and therefore most applicable, published literature associated with the abandonment and restoration of similar sites in the NWT.

4.1 Reclamation Principles

The Guideline acknowledges that every site is unique and that site-specific challenges, issues, and characteristics should be considered. Camp Farewell is a unique situation, as it may continue to be used for staging and storage purposes following the decommissioning of camp operations. Restoration of the Site, is considered separately from the reclamation of the Site. Restoration requirements are included to provide an inclusive understanding of potential site requirements; however, implementation of restoration options will require review by Shell as well as various regulatory bodies.

The Plan adheres to the principles adopted and adhered to by the federal government, and industry, within the existing regulatory framework of the NWT. The Guideline defines reclamation as the *process of returning a disturbed site to its natural state or one for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.*

As identified in the Guideline, the Plan incorporates:

- both traditional knowledge and scientific information;
- the application of adaptive management principles making use of the best available information and technology;
- the promotion of environmental protection; and,
- the application of precautionary principles in the absence of conclusive information.

4.2 Permanent Closure Management and Accountability

The management and accountability structure of the Permanent Closure and Reclamation of Camp Farewell will be similar to that described in Section 3.2. Ultimately Shell is responsible for permanent closure of the site even though individuals and companies involved may change. Shell will assign a project manager to implement the Shell approved program. Permanent closure activities will be supervised and designed by an environmental consulting company that is permitted to provide such services in the NWT and that is experienced in similar activities. As well, contractor services will be provided by a company that utilizes local resources (people and equipment).

4.3 Community Values

Shell has worked to develop positive community relations through the consideration of community values and feedback during the design of plans pertaining to Camp Farewell, as well as by involving local people and services during the operation and closure phases of the Site.

As discussed in Section 2.2.6, Shell values the involvement of community stakeholders, and will repeat similar consultations with the community if activities are to be re-established at Camp Farewell and/or when Permanent Closure (enforcement of this plan) are implemented.

An agreement exists between Shell and the Inuvialuit Regional Corporation (IRC) which Shell continues to honor and comply with. As part of this agreement, Shell reports the commitments and involvements including the local people on an annual basis. Shell continues to meet or exceed the commitments as defined in the agreement.

4.4 Reclamation Components

Reclamation activities have been divided into the following, based on the Guideline, and the specific purposes of this plan:

- Water Facility Management – dismantling and reclamation of water related facilities;
- Infrastructure, Buildings, and Equipment – dismantling and removal of camp facilities, supplies, and equipment;
- Contaminated Soil (and Water) – remediation of soil and water impacts; and,
- Surrounding Land – reclamation of the lands associated with Camp Farewell.

4.5 Reclamation Objectives and Applicable Criteria

4.5.1 Dismantling

The facilities, consumable materials, and equipment existing at Camp Farewell will be removed. It is possible that additional materials, equipment, and consumables may be stored at this site following the dismantling of current material, as the Site may be used as a staging/storage area in the future.

4.5.2 Soil Remediation Guidelines

Remediation guidelines utilized during the assessments of the Site have been based on background soil conditions and the *Environmental Guideline for Contaminated Site Remediation, 2003*, as enforced by the NWT government (ENR) as identified by the *NWT EPA.* Where NWT specific guidelines do not exist, Alberta Environment (AENV) guidelines have been applied where applicable.

4.5.2.1 Background Conditions

As organic matter decays, an interference with the analysis of PHC compounds occurs at the laboratory level. It is important to have a comprehensive understanding of the naturally occurring middle to heavy end hydrocarbon fractions (F2, F3, and F4) that may exist on-site when considering if laboratory reported parameters are a result of anthropogenic sources. Chromatograms are useful in identifying background "signatures" that occur as a result of natural conditions rather than historical site activities. Hydrocarbon fraction F1 and BTEX generally do not occur naturally due to organic decay and therefore are compared directly to guideline values and not determined background concentrations.

The 2006 assessment conducted by WorleyParsons Komex included an evaluation of the textural differences of the site soil, and the effects the texture had on soil chemistry and the influence of the rich organics on the measurements of middle to heavy end hydrocarbon fractions concentrations naturally occurring in the soil.

WorleyParsons used a 95% confidence interval to calculate the measured F2, F3, and F4 expected as a result of natural conditions to be as follows:

- F2 – 176 mg/kg;
- F3 – 3,127 mg/kg; and
- F4 – 2,016 mg/kg (WorleyParsons, 2011).

Background salinity parameters were assessed in one soil sample collected from north and east of the airstrip from 0.2 – 0.4 m bgs in 2006. Reported parameters met the NWT Industrial and Residential/Parkland guideline.

4.5.2.2 Land Use

The 2003 NWT Tier 1 guidelines are intended to be protective of human and environmental health based on the intended future use of the land. Land use at the Camp Farewell site is considered currently to be classified as Industrial, with a likely future use as Residential/Parkland.

"Land uses in which the primary activity is related to the production, manufacture or storage of materials" constitutes an Industrial land use. It is assumed that *"the public does not usually have uncontrolled access to this type of land"*, and while access is not actually limited, the remoteness of the Site is considered restrictive (NWT, 2003).

"Land in which dwelling on a permanent, temporary or seasonal basis is the primary activity" constitutes a Residential/Parkland land use. "*This includes activity that is recreational in nature, and requires the natural or human designed capability of the land to sustain that activity* (and) *is often readily accessible to the public".* This land use considers the traditional access and aboriginal harvesting activities that may occur (NWT, 2003).

Should the base pad material (sandy gravel) be removed from the site surface to be reused or sold as an industrial substrate, the Industrial land use guideline will be applied to this material.

Exposure pathways are considered based on definitions provided by the Canadian Council of Ministers of the Environment (CCME) and adopted by the NWT 2003 contaminated sites guidelines. The most restrictive pathways associated with the above mentioned land uses for coarse-grained soils are the protection of groundwater for aquatic life and the ecological soil contact pathways.

4.5.2.3 Regulatory Guidelines

Currently NWT Tier 1 guidelines (generic) are considered for the Site. In the future, site specific (Tier 2) or risk based (Tier 3) guidelines may be more appropriate. At the time of Permanent Closure, the selected applicable guidelines will be reassessed and formally approved.

Historically and currently, the guidelines that have been applied to the Site, for site assessment and confirmation of remediation, include:

- NWT Tier 1 PHC – hydrocarbon fractions F1 to F4 in fine or coarse-grained surface soil (<1.5 m bgs) and subsoil (>1.5 m bgs).
- Remediation Criteria for other Contaminants in soil including: general parameters, inorganic parameters, and PAHs – Residential/Parkland and Industrial land use categories.
- AENV Soil Quality Guidelines for Barite (AENV, 2009) – barium (total and extractable) concentrations.
- AENV Salt Contamination and Remediation Guidelies (AENV, 2001) – adaptation of SAR and EC guidelines.

Previous soil analytical reports have included EC and SAR values exceeding the guideline values included in the Remediation Criteria for other Contaminants in Soil from the NWT Tier 1 guidelines. The sodium and sulphate concentrations related to these elevated values suggest natural conditions. Application of the AENV Salt Contamination Guidelines may be more appropriate at this site if natural saline conditions are identified at the site. Further assessment of background conditions is required to establish if the AENV guideline is more appropriate.

4.5.3 Surface Water and Groundwater Remediation Criteria

Currently, the NWT does not employ specific water quality guidelines. The CCME developed guidelines for freshwater aquatic life (FWAL) and Marine Aquatic Life (MAL) are used for comparative values (CCME, 1999a), although an exceedance does not necessarily indicate a contamination concern.

4.5.4 Reclamation Guidelines

Site specific information will be considered during determination of restoration activities that will return the site to a state comparable with original conditions. The *Mine Site Reclamation Policy for the Northwest Territories* (INAC, 2007) is the regulatory driver from which the reclamation plan is developed.

4.6 Listing and Assessment of Possible Reclamation Activities

Due to the remote site location, limited options regarding reclamation activities exist.

Excavated base pad gravel and soils may be treated in one of two ways:

- On-site Ex Situ treatment of hydrocarbon impacted material and reuse as backfill; or,
- Excavation, transportation, and disposal of materials at an appropriate off-site landfill facility.

Both options are discussed further in Section 4.8.3.1.

4.7 Selection of Preferred Reclamation Activities

While the selection of these options is dependent on the type of impact (for example, chloride contamination reduces treatability), the preferred option is to treat and reuse impacted soils/gravels for similar purposes, as gravel and backfill material is a limited resource in the Mackenzie Delta region.

4.8 Reclamation Plan (incorporation of selected activities)

This section is structured to reflect the components as identified in Section 4.4, Reclamation Components.

4.8.1 Water Facility Management (WFM)

The restoration of on-site water facilities will include:

- decommissioning of the facilities related to water collection, distribution, use, treatment and disposal, including dismantling and removal activities;
- treatment of lagoon sediments/sludge following the decommissioning (dewatering and remediation) of the lagoon; and
- the management of wastes generated by the completion of the above mentioned activities.

4.8.1.1 WFM Dismantling and Decommissioning

An audit of the existing materials and structures will be updated prior to decommissioning and dismantling activities. There are no water related systems that will remain on-site. Efforts will be made to re-use and recycle materials where practical and possible. The dismantling and decommissioning will include the following:

- Facilities related to the collection, transfer, and treatment of water will likely be sold for re-use.
- Metal and piping materials will be segregated. Materials in good condition may be sold for re-use, while remaining material will be transported south for recycling or disposal.

Costs associated with these activities will be for the equipment to conduct the removal and sorting activities, and for the cost of transportation to either a recycling facility or alternate location for re-use.

4.8.1.2 WFM Remediation

Remediation activities at the Former Sewage Lagoon have been initiated. Accumulated water in the lagoon met criteria set out in the NWTWB Licence # N7L1-1834, Part D prior to discharging to the Mackenzie River as summarized in the March, 2013 letter submitted to the NWTWB by IEG (IEG, 2013b).

In August, 2012 an assessment was conducted by IEG to assess the sediment lining the sides and bottom of the excavation in the area of the lagoon. Based on assessment activities, approximately 1,700 m^3 of chloride and hydrocarbon impacted soil/sediments and waste require off-site disposal. Analytical reports from the 2012 assessment are included in Appendix VIII. The following activities will be required:

- excavation of impacted soils and placement in soil bags; and,
- transport of the soil bags from the Site to Hay River, NWT (via barge) where they will be loaded into trucks and hauled to the Tervita Rainbow Lake Landfill for disposal.

4.8.1.3 WFM Reclamation

Following remediation activities, the lagoon will be backfilled with clean on-site fill material, which will be compacted with the use of a dozer, or equivalent piece of equipment, and mounded to account for settling of backfill material.

Re-vegetation will be conducted of the entire site in one event, and is discussed in Section 4.8.4.2.

4.8.2 Infrastructure, Equipment and Buildings (IEB)

The infrastructure, buildings and equipment included in this portion of the plan include:

- accommodation buildings and associated utility buildings;
- storage sheds;
- stored equipment and drilling materials;
- metal storage tanks;
- bermed tank farm;
- burn pit; and

- fuel storage.

Contaminated soils associated with the above mentioned infrastructure is considered in Section 4.8.3.

4.8.2.1 IEB Dismantling and Decommissioning

An audit of the existing infrastructure will be performed prior to decommissioning activities. No infrastructure is expected to remain on-site. Efforts will be made to re-use and recycle materials where practical and possible. The dismantling and decommissioning will include the following:

- Drilling materials (pipes, etc.) that are still in sufficient condition will be sold for re-use on other related exploration/production projects in the area. Drilling materials that are no longer salvageable will be transferred for recycling or disposal.
- Fuel on-site will be removed and reused locally. Storage tanks will be transported for re-use, recycling or disposal.
- Miscellaneous materials (construction materials) will be salvaged for resale and re-use if possible. Unsalvageable materials will be transported for recycling or disposal.
- The current camp facilities were built in 1985, resulting in a low risk of mercury switches, asbestos and lead paint; however, a comprehensive survey for the potential of these hazardous materials will be conducted. Due to the age and present condition of the facilities, there is little salvage value. The facilities will be removed from the Site and recycled and/or disposed of at an appropriate facility.
- Metal and piping materials will be segregated. Materials in good condition may be sold for re-use, while remaining material will be shipped south for recycling.

Costs associated with these activities will be for the equipment to conduct the removal and sorting activities, and for the cost of transportation to either a recycling facility or alternate location for re-use.

4.8.2.2 IEB Remediation

Upon removal of the infrastructure, soil sampling of the underlying soil may be required to confirm that impacts to the subsurface have not resulted from the infrastructure itself.

4.8.2.3 IEB Reclamation

Should active remediation of impacted soil be required, excavations will be backfilled with confirmed clean on-site fill material and contoured to match the surrounding ground levels.

Re-vegetation will be conducted of the entire site in one event, and is discussed in Section 4.8.4.2.

4.8.3 Contaminated Soil and Water (CSW)

Impacted soils previously identified at Camp Farewell include:

- Treated gravel fill – approximately 600 m^3 of treated gravel re-used as fill (Windrow 1 in excavation 1 in Appendix VII) continues to contain reported elevated F2 hydrocarbon fraction concentrations despite soil treatment on-site.
- Fuel tank Area – approximately 370 m^3 of gravel fill material and underlying natural soil exists to an approximate depth of 1.2 m bgs and requires excavation.
- Burn pit soil – approximately 75 m^3 of gravel fill material requires excavation to approximately 0.5 m bgs (or to the expected liner or layer of organic material).
- Burn pit groundwater – an un-quantified volume of ethylbenzene and PHC impacted groundwater has been identified down-gradient of the burn pit.
- Fuel spill soil – an un-quantified volume of native tundra soil affected as a result of the historical fuel spill (1981).
- Fuel spill groundwater – detectable concentrations (below guidelines) of xylenes and F2 hydrocarbon fractions were reported from a groundwater monitoring well located down-gradient of the historical fuel spill (1981).
- Former sewage lagoon – 1,700 m^3 of soil/sediment and garbage associated with the lagoon as discussed in Section 4.8.1.

Areas of environmental concern are identified in Appendix VII.

4.8.3.1 CSW Remediation

Impacted soils associated with the treated gravel fill, the fuel tank area, and the burn pit will be excavated. Required equipment will be transported to site via barge (in the summer) or ice road (in the winter). Confirmatory soil samples will be collected and analyzed for appropriate parameters at appropriate intervals to ensure remediation objectives have been met.

Prior to excavation additional characterization of the impacted soils will be conducted. This will include analysis of organic and inorganic parameters to determine the best route of soil management. Two options for the remediation of impacted soils exist:

- On-site ex-situ treatment – This option is only applicable if the contaminant of concern is limited to PHC concentrations. Chloride, pH, EC, and SAR have not been proven to be effectively remediated using bio-treatment methods.
- Off-site disposal – Soils impacted with multiple contaminants of concern, or inorganic contaminants, will be removed from site and disposed of at an appropriate landfill facility.

Prior to remediation activities, a thorough assessment of background site soil salinity conditions is required to determine if the previously reported pH, EC and SAR values are a result of anthropogenic or natural conditions.

Impacted soils associated with the historical fuel spill (1981) will not be actively remediated. Previous assessment (WorleyParsons, 2010) has indicated that natural attenuation is occurring. Active remediation would be damaging to the land and is not warranted considering the lack of adverse

effect on environmental receptors. Continued monitoring of the natural attenuation is recommended.

CSW On-Site Ex-Situ Treatment

An on-site soil treatment program will include the following:

- construction of an appropriate soil treatment area, including sampling of receiving soils and proper construction (berm, liner, etc.);
- excavation of hydrocarbon impacted soils and transport to the treatment cell area;
- employment of aerobic bio-remediation and volatilization methods including the addition of an oxidizing agent and possible use of an allu bucket; and,
- analysis of treated soils to confirm the effectiveness of the treatment program.

CSW Off-Site Disposal

Should impacted soils contain multiple contaminants of concern, or inorganic contaminants, the following activities will be required:

- excavation of impacted soils and placement in soil bags; and,
- transport of the soil bags from the Site to Hay River, NWT (via barge) where they will be loaded into trucks and hauled to the Tervita Rainbow Lake Landfill for disposal.

4.8.3.2 CSW Reclamation

Excavations will be backfilled with confirmed clean on-site fill material and contoured to match the surrounding ground levels.

Re-vegetation will be conducted of the entire site in one event, and is discussed in Section 4.8.4.2.

4.8.3.3 CSW Groundwater

Following removal of the source material (impacted soil) from the burn pit area, subsequent groundwater monitoring will continue to determine the extent of groundwater impact. Excavation of impacted soil may result in the natural attenuation of elevated contaminant levels within the associated groundwater. If natural attenuation is not identified, an active groundwater remediation plan may be required.

Groundwater monitoring results from groundwater wells near the historical fuel spill indicate that while PHC concentrations have been detected, they are not greater than the guideline concentrations. Monitoring of natural attenuation is therefore applicable for the groundwater near the historical fuel spill.

4.8.4 Site and Surrounding Lands (SSL)

Reclamation and re-vegetation plans are based on the entire Camp Farewell Site rather than individual components.

The Site is delicate and a comprehensive understanding of natural northern conditions is required to restore the site to a level compatible with the surrounding undisturbed land. The soils of the Mackenzie Delta are subject to extreme conditions, by way of thawing and freezing cycles. These cycles can result in reduced soil stability and depressions.

The Site was constructed with gravel pad and urethane layers to act as protection for the underlying native soils and provide stability to the Site. Removal of this layer could prove detrimental to the Site. Removal of this layer would expose the natural subsurface, which has been compromised due to subsistence resulting from the static loading of camp activities and the accelerated seasonal melting resulting from the gravel/urethane layer. This natural surface would lack vegetation, resulting in a dark absorbent surface that would thaw easily and depressions of the site base would likely result. Associated with these depressions, soils could become compacted, the ground temperature would elevate and ponding would occur. Maintenance of the base pad will result in stability of the site and the topography will remain relatively unchanged.

WorleyParsons included an assessment of the biodegradation of polyurethane (PU) that makes up the foam urethane layer of the site pad (included in Appendix IX). The assessment summarized that the foam is not susceptible to degradation and that if degradation does occur; the by-products are not particularly soluble. Should degradation occur, a by-product would be nitrogen, and therefore; total nitrogen (as well as nitrate and nitrite) should be target parameters considered in the annual groundwater monitoring program. WorleyParsons concluded that the potential for environmental impact associated with leaving the foam layer in place is less than that associated with removing it.

4.8.4.1 SSL Reclamation Activities

The current reclamation plan includes:

- grading the area to match surrounding topography;
- reducing soil compaction and enhancing micro-topography via ‘ripping and scarifying’ activities;
- covering the site with a thin layer of natural alluvial soil consistent with surrounding soil cover;
- assist re-vegetation with appropriate species and amendments.

If excess gravel is identified on-site, it may be beneficial for re-use, as gravel is scarce in the area.

Current remediation plans depend on the availability of clean fill material on-site. Should remediation activities result in a deficit of clean soil on-site, a designed wetland/water body, may be considered. Land use altering plan would have to be carefully considered and stakeholder and regulatory buy-in and participation in planning would be required.

4.8.4.2 SSL Re-vegetation Activities

Active re-vegetation is required for this site. Due to the shorter growing season of northern Canada, gradual encroachment of native species from the surrounding land is not likely. Appropriate amendments (fertilizer) will be applied along with a native seed mixture to encourage successful germination. The final application rate and seed mix will be developed with assistance from the local Government Land Use Inspector. The purpose of the seed mix is to:

- help stabilize the soil on-site;
- provide a habitat equivalent to the surrounding lands;
- allow the natural succession of native vegetation and therefore minimize additional maintenance; and,
- provide consistent vegetation across the entire area (by utilizing an appropriate seed mix).

4.9 Uncertainties and Required Information

Previous environmental assessments exist that summarize the level of investigation completed to date and the site conditions (Section 2.4). Additional site assessment may be required as decommissioning and dismantling activities occur. As additional assessment activities are conducted, further remediation requirements may be identified resulting in uncertainties. Until final reclamation activities are completed, uncertainties will remain to exist.

4.10 Monitoring, Maintenance and Reporting Program

4.10.1 Monitoring and Maintenance Program

Following remediation, restoration, and abandonment activities, Site inspections will be conducted on an annual basis for the first five years or until vegetation is well established. The growth status of both desirable and non-desirable species will be documented. Unusual soil conditions (ie. erosion, bare areas, etc.) will be identified and addressed. The site will be maintained, as required, until reclamation is considered complete and sustainable.

Soil and groundwater monitoring will be required following excavation and remediation activities at one, two, and five year intervals following completion of Permanent Closure activities.

Parameters that should be analyzed for each groundwater sample include:

- BTEX, PHC F1-F4 hydrocarbon fractions;
- routine water chemistry parameters; and
- total nitrogen (in addition to nitrogen included in routine parameters) as identified in Section 4.8.4.

Parameters that should be analyzed for soil samples will be based on contaminants of concern previously identified and may include some or all of the following:

- BTEX, PHC F1-F4 hydrocarbon fractions;
- detailed soil salinity; pH, EC, SAR, soluble anions and cations;
- total metals (CCME metals); and,
- PAHs.

Soil and vegetation quality will be assessed in areas that were previously identified as areas of concern, as well as areas surrounding the gravel pad. Soil samples may be submitted for laboratory analysis, and vegetation will be monitored for signs of stress or scarcity.

Annual inspections will be completed at a minimum of once per year until Permanent Closure is accepted. Inspections will focus on the stability and health of the reclaimed area. Required maintenance will be conducted until the Site is comparable to the surrounding natural tundra. Issues that may arise at the site and will be identified and addressed during these annual inspections include: vegetation stress, invasive species colonies, permafrost degradation, development of depressions or subsidence, and unfavorable run-off patterns or surface erosion.

4.10.2 Reporting Program

Program Completions Reports will be created and submitted to the applicable authorities as Permanent Closure activities occur. Annual inspections and monitoring will be summarized and submitted in annual reports.

4.11 Contingency Program

Should future assessments result in information that differs from that used in the development of this plan, additional planning will be conducted. Additional assessment data will be considered in the subsequent interim Permanent Closure and Reclamation Plans until final closure activities can be conducted.

4.12 Costs

Costs associated with the implementation of the CRP have not been calculated. As plans regarding individual components of this plan are finalized, cost estimates will be created. Further detail regarding financial security is discussed in Section 5.

4.13 Progressive Reclamation

Progressive reclamation includes the activities undertaken during operation to assist in the subsequent reclamation activities upon closure. This does not apply to the Camp Farewell Site.

4.14 Permanent Closure and Reclamation Schedule

Presently it is estimated that Permanent Closure activates will be conducted in a staged approach and take 5 to 10 years following Shell's final decision to close the camp, and acceptance of the closure

plan by applicable regulators. An expected time of final camp closure has not been identified; therefore the Permanent Closure schedule is un-defined at this time.

4.15 Post-Closure Conditions and Potential Risks to Human and Environmental Health

Following completion of permanent closure and reclamation activities, site specific conditions will be assessed to verify that the Site has been restored to a state comparable with undisturbed conditions. It will be confirmed that the Site has been restored in a manner that is consistent with current licenses and permits, and that is protective of human health and the environment. Though not expected, potential remaining risks will be identified and addressed as required.

5 FINANCIAL SECURITY

As mentioned in Section 4.12, specific costs associated with implementing the CRP have not been identified, and are not required at this time. Shell has posted financial security for Camp Farewell, in the form of a letter of credit, totaling $2 million as required by AANDC.

6 SUPPORTING DOCUMENTATION

The following is a list of documents utilized in the development of past and current Camp Farewell Closure and Remediation Plans.

Regional Environmental Studies

AANDC (Aboriginal Affairs and Northern Development Canada), 2007. Mine Site Reclamation Guidelines for the Northwest Territories. Ottawa, 2007.

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7 CLOSING

We trust this plan meets the requirements of Shell. Inquiries can be directed to the IEG Project Manager, at (403) 648-4320.

Yours truly,
IEG CONSULTANTS LTD.

Damian Cox, B.Sc., P.Eng.
Senior Environmental Scientist/Project Manager

FIGURES

Legend

☆ Site Location

NOT FOR CONSTRUCTION

To be read with IEG report dated June 2013

NOTES:
1. IMAGE SOURCE: Worley Parsons

CLIENT: Shell Canada Energy

IEG CONSULTANTS LTD.

PROJECT: SHELL CANADA ENERGY - Closure and Reclamation Plan
Camp Farewell, NT

TITLE: Site Location Map

SCALE: NTS | PROJECT No.: A04050A01 | FIG No.: 1

Time: 15:42:29 PM
Date: June 03, 2013
File: Z:\AICGY\Alberta\A04050A01 - SCE - Closure and Reclamation Plan\400 Drawings\402 Drawing Set 21130530 Site Location Map.mxd

Legend

- Site Digitized from Farewell Stock Site & Access Road Data April 09, 1973
- Building
- Gravel Pad
- Road
- Tank

NOT FOR CONSTRUCTION

To be read with IEG report dated June 2013

0 250 Metres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM Zone 8N
3. SOURCE: Worley Parsons
4. Image provided by Worley Parsons
5: Map scale is 1:5,000 on 11" x 17" paper.

CLIENT: Shell Canada Energy

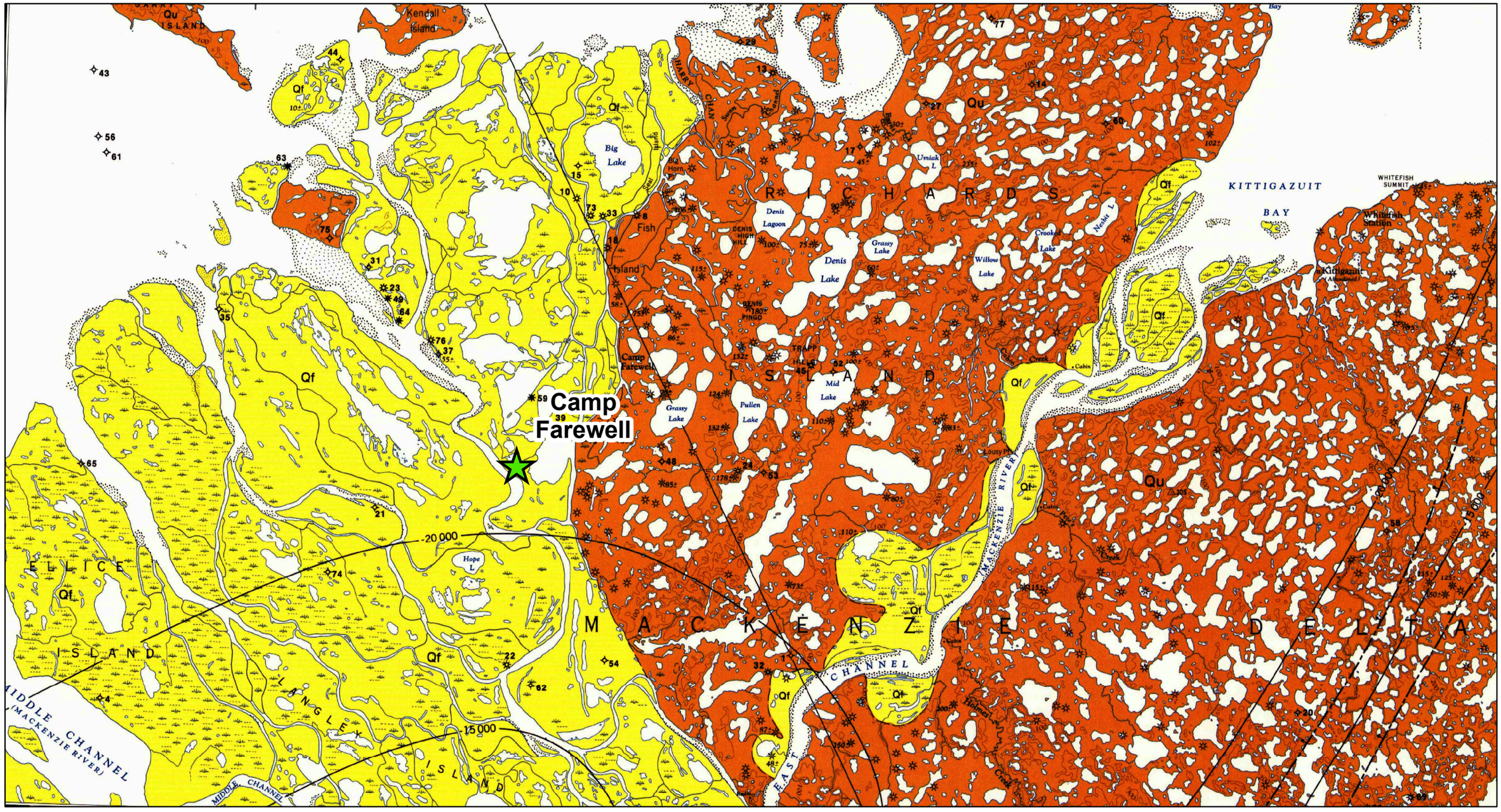
IEG CONSULTANTS LTD.

PROJECT: SHELL CANADA ENERGY Closure and Reclamation Plan
Camp Farewell, NT

TITLE: Aerial Photograph with Site Map

SCALE	PROJECT No.	FIG No.
1:5,000	A04050A01	2

File: Z:\A\CGY\Alberta\A04050A01 - SCE - Closure and Reclamation Plan\400 Drawings\402 Drawing Set 21130530 Aerial Photograph with Site Map.mxd Date: June 03, 2013 Time: 15:36:53 PM Creator: : kyiu



Legend

★ Site Location

NOT FOR CONSTRUCTION

To be read with IEG report dated June 2013

NOTES:
1. IMAGE SOURCE: Map 1515A Geology - Mackenzie Delta, District of Mackenzie, Geology by D.K. Norris, 1975.
2. Image provided by Worley Parsons

CLIENT: Shell Canada Energy

IEG CONSULTANTS LTD.

PROJECT: SHELL CANADA ENERGY - Closure and Reclamation Plan
Camp Farewell, NT

TITLE: Area Geology

SCALE	PROJECT No.	FIG No.
NTS	A04050A01	3

Time: 12:23:46 PM
Date: June 25, 2013
File: Z:\AICGY\Alberta\A04050A01 - SCE - Closure and Reclamation Plan\400 Drawings\402 Drawing Set 2\130530 Area Geology.mxd

Camp Farewell

Legend

☆ Site Location

See Figure 4B for Surficial Geology legend.

NOT FOR CONSTRUCTION

To be read with IEG report dated June 2013

NOTES:
1. IMAGE SOURCE: Map 32-1979 Surficial Geology - Mackenzie Delta, District of Mackenzie, Geology by V.N. Rampton,1974.
2. Image provided by Worley Parsons

CLIENT: Shell Canada Energy

IEG CONSULTANTS LTD.

PROJECT: SHELL CANADA ENERGY - Closure and Reclamation Plan
Camp Farewell, NT

TITLE: Area Surficial Geology

SCALE	PROJECT No.	FIG No.
NTS	A04050A01	4A

Time: 12:19:08 PM
Date: June 25, 2013
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DESCRIPTION OF TERRAIN UNITS

SYMBOL	NAME	MATERIALS AND THICKNESS	PERMAFROST DISTRIBUTION[1] AND ICE CONTENTS	GEOMORPHOLOGY[2] AND DRAINAGE	ORIGIN AND AGE
$\frac{{}_{s}C_{v}}{R_{n}}$	Sandy colluvium over bedrock	Sand; possibly contains few interbeds of silt clay and gravel; 0.5-4 m thick. Swales contain peat up to 3 m thick.	Continuous permafrost; variable ice contents.	Moderate to steep escarpments; moderately well to well drained. Undisturbed slopes are stable.	Scarps probably result from glacial and stream erosion along edge of Caribou Hills (underlain by poorly consolidated Tertiary rocks at their northern end).
$\frac{{}_{s}E_{vr}}{{}_{s}G_{p}}$	Sand dune on glaciofluvial plain	Fine to medium sand, in places silty, isolated peaty layers. Local veneer of silt and few patches of thin peat present on surface. Windblown sand up to 4 m thick, generally 1.5-3 m thick; glaciofluvial sand, 3-10 m thick.	Continuous permafrost. Sand generally has low ice contents. Silt and peat have medium to high ice contents due to abundance of ice lenses.	Broad linear sand dunes range from 1.5-3 m in height; variable drainage with small thaw pools common on extensive flat areas. Blowouts common along banks of streams and lakes.	Dunes formed subsequent to outwash deposition during early Wisconsin(?) glaciation. Dunes presently stable, except where blowouts form.
${}_{f}A_{p}$	Alluvial plain	Silt, fine sand, and clayey silt, commonly organic; generally more than 6 m thick. Thin local accumulations of peat present.	Irregular distribution of permafrost; medium ice contents in frozen sediment due to presence of ice lenses.	Flat floodplains and low terraces near sea or stream level; thaw pools, lakes, and marshy areas common; low surfaces occasionally inundated.	Alluvium deposited by streams in recent past.
${}_{f}A_{p-A}$	Alluvial plain; actively forming	Silt, fine sand, and clayey silt, commonly organic; coarse sand and gravel possibly underlie fine alluvium in some areas. Fine alluvium is 2 to more than 6 m thick.	Isolated islands of permafrost within unit; medium ice contents in frozen sediments due to presence of ice lenses.	Flat floodplain with many marshy areas on poorly drained surface; inundated annually.	Floodplain alluvium presently being deposited.
${}_{f}A_{d-A}$	Alluvial delta; actively forming	Silt, fine sand, and clayey silt, commonly organic; 10 to more than 30 m thick.	Permafrost present under part of unit; many irregularly shaped taliks; low to medium ice contents in frozen sediments; ice contents decrease with depth.	Flat surface marked by numerous distributaries, islands, lakes, and marshes. Poorly drained and subject to flooding by sea or river water. Some lakes expanding due to thermokarst.	Alluvium deposited primarily by Mackenzie River with minor silt and clay being deposited following storm tides at outer edge of delta. Delta formed during Holocene and graded to present sea level.
${}_{f}M_{p-A}$	Tidal flats	Interbedded silt, clayey silt, and sand; 1-8 m thick.	Irregular distribution of permafrost; ice lenses in frozen sediments.	Flat; poorly drained and marshy surface; frequently inundated by sea water.	Deposition continuing at present. Most of underlying marine sediment deposited during last 5000 years.
$\frac{{}_{f}M_{v}}{{}_{f}L_{p}}{}_{-A}$	Intertidal lagoons	Interbedded silt, clayey silt, and sand; predominantly sand on northeastern part of Richards Island. Marine veneer generally 1-3 m thick.	Irregularly shaped taliks present within permafrost; ice contents probably low in sandy sediments, medium to high in fine sediments.	Flat basins; poorly drained and marshy; frequently inundated by sea water.	Lagoons are lake basins whose seaward edges have been breached during the postglacial rise in sea level; deposition has continued subsequently, mainly during last 5000 years.
${}_{s}M_{r-A}$ ${}_{a}M_{r-A}$	Beaches, spits and bars	Sand (sM) or gravel and sand (aM), 0.5-3 m thick; mainly sand features along northern edge of Tuktoyaktuk Peninsula.	Irregular distribution of thin permafrost; low ice contents in frozen sediment.	Low broad ridges rising up to 3 m a.s.l.	Ridges formed and continuously modified by wave action.
${}_{f}L_{p}$	Lacustrine plain and pond	Interbedded silt, clayey silt, and silty sand with peaty layers; predominantly silty sand and sand in areas of outwash and till-veneered sandy deposits; sediment 1.5-8 m thick.	Rare isolated taliks present within continuous permafrost; ice contents generally low to medium in sandy sediments and medium to high in silty and clayey sediments due to presence of ice lenses; massive ice under pingos and domes.	Flat to gently sloping; in places benches are separated by small scarps. Surface commonly marshy with many thaw pools. Pingos and small domes, both inactive and presently forming, within unit.	Lake basins formed by thermokarst development mainly during last 10 000 years and subsequently infilled and drained through normal stream development. Pingos and domes have formed during aggradation of permafrost in drained lake basins. Lacustrine plain lying below mapped strandline in Eskimo Lakes basin formed during blockage of outlet to Liverpool Bay by late Wisconsin glaciofluvial deposition along Kugaluk River estuary.
${}_{f}L_{m-\bar{A}}$	Rolling lacustrine plain; modified by thermokarst	Interbedded clayey silt and clay; generally 3-10 m thick. Surface patches of peat 1.5-3 m thick.	Isolated taliks present within continuous permafrost; ice contents medium to high due to presence of ice lenses; massive ice at base of unit and in underlying sediments at depths of 7-70 m.	Rolling surface with local relief to 30 m; summits of hills are generally accordant. Slopes moderately well drained; flat hill tops and depressions imperfectly drained.	Sediment deposited in glacially fed basin of probable early Wisconsin age.
${}_{f/s}G_{p}$ ${}_{s}G_{p}$ ${}_{a}G_{p}$	Outwash plain	Silty sand over sand (f/sG), sand (sG), and interbedded sand and gravel (aG), local veneer of fine sand and silt and surface patches of thin peat. Outwash generally 3-10 m thick.	Continuous permafrost; ice contents of sand and gravel generally low, but silt has high ice content; massive ice may be present in underlying sediments at depths of 7-70 m.	Flat plain with some relief due to terracing, inset channels, and thermokarst basins; drainage moderately good to good, but imperfect to poor in channel traces and on extensive broad flat areas where ice-thaw pools are common.	Outwash plain making up major part of Tuktoyaktuk Peninsula formed when early Wisconsin(?) glacier stood at its maximum extent; remainder of outwash on Tuktoyaktuk Peninsula, Richards Island, and adjacent areas deposited during deglaciation. Outwash in Eskimo Lakes basin deposited during late Wisconsin time.
${}_{s}G_{p-\bar{A}}$ ${}_{a}G_{p-\bar{A}}$	Outwash plain; modified by thermokarst	Sand with few pebbly beds and channels of gravel (sG) and interbedded sand and gravel (aG); generally 10-20 m thick. Local veneer of fine sand and silt and patches of thin peat on surface. Depressions contain 2-5 m of sandy and gravelly lacustrine sediment and peat.	Rare taliks in depressions within continuous permafrost; ice contents in near-surface outwash low, but massive ice may be present at depths of 7-70 m.	Rolling to hummocky surface with local relief to 50 m; summits of hills are generally flat and accordant; well drained.	Outwash plains formed during early Wisconsin(?) glaciation, except in Eskimo Lakes basin where outwash plains are late Wisconsin in age. Most ground ice formed concurrent with deglaciation; relief results from thermokarst during last 10 000 years.
${}_{s}G_{m-\bar{A}}$ ${}_{a}G_{m-\bar{A}}$	Hummocky thermokarst-modified outwash	Sand (sG) or interbedded sand and gravel (aG); extensive unmapped areas of morainal deposits may be present in unit. Outwash generally 10-30 m thick; depressions contain 2-5 m of lacustrine sediment and peat.	Rare taliks in depressions within continuous permafrost; ice contents in near surface low, but morainal deposits have higher ice contents, and massive ice may be present at depths of 7-70 m, especially under hills and ridges.	Hummocky with local relief to 50 m; well drained, but depressions imperfectly to moderately well drained.	Outwash deposited during early Wisconsin(?) glaciation. Most ground ice formed concurrent with deglaciation; thermokarst, modifying unit morphology, occurred mainly during last 10 000 years.
${}_{g}G_{r}$ ${}_{a}G_{r}$	Esker	Gravel with sandy interbeds (gG) or interbedded sand and gravel (aG); generally 5-30 m thick.	Continuous permafrost; ice contents in near surface low, but massive ice may be present at depths of 7-70 m.	Linear features 60-600 m wide; locally multiple ridges and hummocky topography; well drained.	Eskers formed during retreat of early Wisconsin(?) glacier.
$M_{m-\bar{A}}$	Rolling and hummocky moraine; modified by thermokarst	Clayey diamicton containing pockets of sorted silty and clayey material; diamicton is 4-12 m thick; depressions contain 2-8 m of lacustrine sediment and peat; isolated areas of unmapped outwash within unit.	Rare taliks in depressions within continuous permafrost; ice contents of diamicton low to medium due to presence of ice lenses (generally having reticulate pattern); massive ice common at base of till and at depths of 7-70 m especially under hills and ridges	Hummocky to rolling with local relief between 30 and 50 m. Many hills around Tuktoyaktuk show an "involuted" pattern of ridges with 1-4 m relief. Slopes moderately well drained; hill crests imperfectly to moderately well drained; depressions poorly drained. Inactive and active retrogressive thaw flow slides along hill slopes.	Till deposited during maximum extent of Laurentide glaciers during early Wisconsin(?) time. Most ground ice formed concurrent with deglaciation; thermokarst, modifying unit morphology, mainly during last 10 000 years.
$\frac{M_{v}}{{}_{s}M_{p}}{}_{-\bar{A}}$ $\frac{M_{v}}{{}_{s}A_{p}}{}_{-\bar{A}}$ $\frac{M_{v}}{{}_{s}X_{p}}{}_{-\bar{A}}$	Hummocky till-veneered sand; modified by thermokarst	Clayey diamicton or poorly sorted gravel over fine grained marine sand (sM), medium grained fluvial (glaciofluvial?) sand (sA), or interbedded marine and fluvial sand (sX). Diamicton extremely variable in thickness, generally 1-5 m but thin or absent in areas between Kittigazuit and Pete's Creek, and between Cabin Creek and Pullen Island, where sand is commonly capped by thin poorly sorted gravel; sands generally 10-20 m thick. Depressions contain 2-8 m of lacustrine sediment and peat. Isolated unmapped outwash in unit.	Rare taliks in depressions within continuous permafrost; ice contents of diamicton low to medium due to presence of ice lenses;near-surface sands have low to medium ice contents, but massive ice may be present at depths of 7-70 m, especially at the base of till and in sediments under hills and ridges.	Hummocky to rolling with local relief between 30 and 70 m; hills and slopes moderately well drained, depressions imperfectly drained. Stabilized retrogressive thaw flow slides on slopes where till is thick, active slides on recently steepened slopes. Cliff-top dunes and blowouts common along eroding coast lines where till is thin.	Deposition of thick marine sands in deltaic foresets appears to have been preceded and followed by the deposition of fluvial sand, apparently in proglacial outwash plains. The upper outwash sands possibly correlate with units formed on Tuktoyaktuk Peninsula during early Wisconsin(?) time. Till deposited during maximum extent of Laurentide glaciers during early Wisconsin(?) time. Most ground ice formed concurrent with deglaciation; thermokarst, modifying unit morphology, mainly during last 10 000 years.
$\frac{M_{v}}{{}_{f}M_{p}}{}_{-\bar{A}}$	Hummocky till-veneered silt and clay; modified by thermokarst	Clayey diamicton over marine clay, silt, and fine sand. Diamicton generally varies from 0.5-2.5 m thick, rarely to 6 m. Depressions contain 1.5-8 m of lacustrine deposits and peat.	Rare isolated taliks present under depressions within continuous permafrost. Ice contents variable in diamicton; massive ice present in places near base of diamicton. Marine sediments have low to high ice contents; ice lenses commonly form reticulate network; isolated layers of massive ice.	Rolling topography with 10-30 m local relief; hills and slopes moderately well drained; depressions imperfectly to poorly drained and marshy. Stabilized retrogressive thaw flow slides on slopes where till is thick, active slides on recently steepened slopes.	Till deposited during maximum extent of Laurentide glaciers during early Wisconsin(?). Most ground ice formed concurrent with deglaciation. Thermokarst, modifying unit morphology, mainly during last 10 000 years.
$\frac{M_{v}}{c,{}_{s}X_{p}}{}_{-\bar{A}}$	Hummocky till-veneered clay and sand; modified by thermokarst	Clayey diamicton or poorly sorted gravel over marine clay (c) and marine and fluvial sand (s). Diamicton generally less than 5 m thick. Depressions contain 2-8 m of lacustrine sediment and peat.	Rare taliks in depressions within continuous permafrost; ice content of diamicton low to medium due to presence of ice lenses; near-surface sands commonly have low to medium ice contents; clay has low to high ice content with ice lenses commonly forming a reticulate network; massive ice may be present at depths of 7-70 m.	Hummocky with local relief between 30 and 70 m. Hills and slopes moderately well drained; depressions imperfectly drained.	Deposition of marine clay and sand and fluvial (glaciofluvial?) sand preceded the early Wisconsin(?) glaciation that deposited the till. Most ground ice formed concurrent with deglaciation; thermokarst, modifying unit morphology, mainly during last 10 000 years.
$\frac{M_{v}}{R_{n}}$	Till veneer on bedrock	Clayey diamicton over poorly consolidated Tertiary rocks; diamicton up to 5 m thick. Low areas may contain 2-8 m of lacustrine sediment and peat.	Rare isolated taliks present under depressions within continuous permafrost; ice contents variable in diamicton; massive ice present in places near base of diamicton.	Rolling broad hills with 10-30 m local relief; hills and slopes moderately well drained; depressions imperfectly drained. Few stabilized retrogressive thaw flow slides on slopes where till is thick.	Till deposited during maximum extent of Laurentide glaciers during early Wisconsin(?). Most ground ice formed concurrent with deglaciation. Thermokarst, modifying unit morphology, occurred mainly during last 10 000 years.

[1] See Mackay (1962) for distribution of pingos.

[2] See Mackay (1966a) for distribution of retrogressive thaw flow slides.

To be read with IEG report dated June 2013

NOTES:

1. IMAGE SOURCE: Map 32-1979 Surficial Geology - Mackenzie Delta, District of Mackenzie, Geology by V.N. Rampton,1974.
2. Image provided by Worley Parsons

CLIENT

Shell Canada Energy

IEG CONSULTANTS LTD.

PROJECT

SHELL CANADA ENERGY - Closure and Reclamation Plan
Camp Farewell, NT

TITLE

Area Surficial Geology Legend

SCALE	PROJECT No.	FIG No.
-	A04050A01	4B

Time: 15:40:20 PM
Date: June 03, 2013
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APPENDIX I

Water Licence N7L1-1762

NORTHWEST TERRITORIES WATER BOARD
NUNAPPA SIVUNIUKPAIT IMMAKUN

WATER LICENCE: N7L1-1762

January 25th, 2011

Randall Warren
DAR/ Construction Manager
Shell Canada Limited
400- 4th Avenue S.W.
P.O. Box 100, Station M
Calgary, Alberta, Canada
T2P 2H5

Dear Mr. Warren:

Re: Amendment of Water Licence N7L1-1762

This letter is to inform you that at a January 25th, 2011 teleconference meeting of the Northwest Territories Water Board (NWTWB), the NWTWB evaluated Shell Canada Ltd's water licence N7L1-1762 which is due to expire on January 31st, 2011. Below you will find a summary of the decision made by the NWTWB concerning this licence.

- The expiry date of licence N7L1-1762 was amended to June 30th, 2011 to make sure the licensing process is completed before the NWT Water Board can decide on the renewal of licence N7L1-1762.

If you have any questions or comments please contact Mike Harlow via e-mail at harlowm@nwtwb.com or by telephone at 867-678-8609.

Sincerely,

Eddie Dillon
Chairperson
NWT Water Board

Attached : Licence renewal cover page

Copy to: Water Resources Division, INAC, Yellowknife, NT
District Manager, North Mackenzie District, INAC, Inuvik, NT

NORTHWEST TERRITORIES WATER BOARD

Pursuant to the *Northwest Territories Waters Act* and Regulations the Northwest Territories Water Board, hereinafter referred to as the Board, hereby grants to

SHELL CANADA LIMITED
(Licensee)

400- 4 Avenue S.W.
P.O. Box 100, Station M
of CALGARY, ALBERTA T2P 0J4
(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the *Northwest Territories Waters Act* and Regulations made thereunder and subject to and in accordance with the conditions specified in this Licence.

Licence Number	N7L1-1762 (AMENDMENT)
Licence Type	"B"
Water Management Area	NORTHWEST TERRITORIES 07
Location	Within a two kilometre radius of Latitude 69°12'30" N. Longitude135°06'04" W. MACKENZIE RIVER DELTA, N.W.T
Purpose	TO USE WATER AND DISPOSE OF WASTE FOR MUNICIPAL UNDERTAKINGS AND ASSOCIATED USES
Description	OIL AND GAS EXPLORATION
Quantity of Water Not To Be Exceeded	150 CUBIC METRES DAILY
Effective Date of Licence	NOVEMBER 1ST, 2005
Expiry Date of Licence	JUNE 30th, 2011

This Licence issued and recorded at Inuvik includes and is subject to the annexed conditions.

NORTHWEST TERRITORIES WATER BOARD

Witness

Chairperson (Eddie Dillon)

NORTHWEST TERRITORIES WATER BOARD

Pursuant to the *Northwest Territories Waters Act* and Regulations the Northwest Territories Water Board, hereinafter referred to as the Board, hereby grants to

SHELL CANADA LIMITED
(Licensee)

of 400 - 4 Avenue S.W.
P.O. Box 100, Station M
CALGARY, ALBERTA T2P 0J4
(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the *Northwest Territories Waters Act* and Regulations made thereunder and subject to and in accordance with the conditions specified in this Licence.

Licence Number	N7L1-1762 RENEWAL
Licence Type	"B"
Water Management Area	NORTHWEST TERRITORIES 07
Location	"Camp Farewell" Latitude 69°12'30" North Longitude 135°06'04" West MACKENZIE RIVER DELTA, N.W.T.
Purpose	TO USE WATER AND DISPOSE OF WASTE FOR MUNICPAL UNDERTAKINGS AND ASSOCIATED USES
Description	OIL AND GAS EXPLORATION
Quantity of Water Not to be Exceeded	150 CUBIC METRES DAILY
Effective Date of Licence	NOVEMBER 1, 2005
Expiry Date of Licence	OCTOBER 31, 2010

This Licence issued and recorded at Yellowknife includes and is subject to the annexed conditions.

NORTHWEST TERRITORIES WATER BOARD

Witness

Chairman

PART A: SCOPE AND DEFINITIONS

1. Scope

a) This Licence entitles Shell Canada Limited to use Water and dispose of Waste for municipal undertakings associated with oil and gas exploration and development in the Mackenzie Delta at Farewell Camp and Stockpile Site (Camp Farewell) located at Latitude 69°12'30" North, and Longitude 135°06'04" West, Northwest Territories;

b) This Licence is issued subject to the conditions contained herein with respect to the taking of Water and the depositing of Waste of any type in any Waters or in any place under any conditions where such Waste or any other Waste that results from the deposits of such Waste may enter any Waters. Whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the *Northwest Territories Waters Act*, or other statutes imposing more stringent conditions relating to the quantity or type of Waste that may be so deposited or under which any such Waste may be so deposited this Licence shall be deemed, upon promulgation of such Regulations, to be automatically amended to conform with such Regulations; and

c) Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of all applicable Federal, Territorial and Municipal legislation.

2. Definitions

In this Licence: **N7L1-1762**

"Act" means the *Northwest Territories Waters Act;*

"Analyst" means an Analyst designated by the Minister under Section 35(1) of the *Northwest Territories Waters Act*;

"Average Concentration For Faecal Coliform" means the geometric mean of any four consecutive analytical results submitted to the Board in accordance with the sampling and analysis requirements specified in the "Surveillance Network Program";

"Board" means the Northwest Territories Water Board established under Section 10 of the *Northwest Territories Waters Act*;

"Freeboard" means the vertical distance between water line and crest on a dam or dyke's upstream slope;

"Geotechnical Engineer" means a professional engineer registered with the Association of Professional Engineers, Geologists, and Geophysicists of the Northwest Territories and whose experience is the design and construction of earthworks in a permafrost environment;

"Greywater" means all liquid Wastes from showers, baths, sinks, kitchens and domestic washing facilities, but does not include toilet Wastes;

"Inspector" means an Inspector designated by the Minister under Section 35(1) of the *Northwest Territories Waters Act;*

"Licensee" means the holder of this Licence;

"Maximum Average Concentration" means the running average of any four (4) consecutive analytical results, or if less than four analytical results collected, and submitted to the Inspector in accordance with the sampling and analysis requirements specified in the "Surveillance Network Program";

"Minister" means the Minister of Indian Affairs and Northern Development;

"Modification" means an alteration to a physical work that introduces a new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does include an expansion;

"Permeability" means the capacity to transmit water through a medium;

"Sewage" means all toilet Waste and greywater;

"Toilet Wastes" mean all human excreta and associated products, but does not include greywater;

"Regulations" mean Regulations proclaimed pursuant to Section 33 of the *Northwest Territories Waters Act;*

"Sewage Treatment Facilities" comprises the area and engineered structures designed to contain sewage as identified in the Project Description and also includes a Sump constructed of impervious material and/or with an impervious liner;

"Sump" means an excavation for the purpose of catching or storing Water and/or Waste;

"Waste" means Waste as defined by Section 2 of the *Northwest Territories Waters Act*; and

"Waters" mean Waters as defined by Section 2 of the *Northwest Territories Waters Act*.

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report with the Board not later than March 31st of the year following the calendar year reported which shall contain the following information:

   a) the total quantity in cubic metres of fresh Water obtained from all sources;

   b) the total quantities in cubic metres of each and all Waste discharged;

   c) the location and direction of flow of all Waste discharged to the Water;

   d) the results of sampling carried out under the Surveillance Network Program;

   e) a summary of any modifications carried out on the Water supply and Sewage Treatment Facilities, including all associated structures;

   f) a list of spills and unauthorized discharges;

   g) details on the restoration of any sumps;

   h) any revisions to the approved Contingency Plan; and,

   i) any other details on Water use or Waste disposal requested by the Board within forty-five (45) days before the annual report is due.

2. The Licensee shall comply with the "Surveillance Network Program" annexed to this Licence, and any amendment to the said "Surveillance Network Program" as may be made from time to time, pursuant to the conditions of this Licence.

3. The "Surveillance Network Program" and compliance dates specified in the Licence may be modified at the discretion of the Board.

4. The Licensee shall, within thirty (30) days of the issuance of the Licence, post the necessary signs to identify the stations of the "Surveillance Network Program". All postings shall be located and maintained to the satisfaction of an Inspector.

5. Meters, devices or other such methods used for measuring the volumes of Water used and Waste discharged shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.

6. All monitoring data shall be submitted in printed form and electronically in spreadsheet format on a diskette or other electronic forms acceptable to the Board.

7. All reports shall be submitted to the Board in printed format accompanied by an electronic copy in a common word processing format on diskette or other electronic forms acceptable to the Board.

8. Within thirty (30) days of issuance of this Licence, pursuant to Section 17(1) of the *Act* and Section 12 of the Regulations, the Licensee shall have posted and shall maintain a security deposit of Two Million ($2,000,000.00) Dollars in a form suitable to the Minister.

9. The Licensee shall ensure a copy of this Licence is maintained at the site of operation at all times.

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain Water from the Middle Channel of the Mackenzie River in winter or the unnamed lake north of the camp in summer as described in the project description, or as otherwise approved by an Inspector.

2. For lakes used as a Water source, a representative dissolved oxygen/temperature profile must be obtained prior to the initial Water withdrawal and prior to demobilization of the project for the year.

3. The Licensee is not permitted to remove more than five (5%) percent of the available under ice Water volume per lake as calculated using a maximum expected ice thickness of two (2) meters during a single winter season.

4. The daily quantity of Water used for all purposes shall not exceed 150 cubic metres.

5. The Water intake hose used on the Water pumps shall be equipped with a screen with a mesh size sufficient to ensure no entrainment of fish (2.54 mm).

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall within thirty (30) days of the issuance of this Licence, submit to the Board for approval an updated Operation and Maintenance Plan for the Sewage and Solid Waste Treatment Facilities. This Plan shall include but not necessarily be limited to details on the design, operational capacity, management and maintenance, and disposal of sludges.

2. All Sewage shall be directed to the onsite Sewage Treatment Facilities as approved by an Inspector.

3. The Sewage Treatment Facilities shall be maintained and operated in such a manner as to prevent structural failure to the satisfaction of the Inspector.

4. All Waste discharged from the onsite Sewage Treatment Facilities shall be directed to the channel of the Mackenzie River at a location approved by an Inspector.

5. There shall be no discharge of floating solids, garbage, grease, free oil or foam.

6. All Sewage effluent discharged by the Licensee from the Sewage Treatment Facilities at "Surveillance Network Program" Station Number 1762-1 shall meet the following effluent quality requirements:

Sample Parameter	Maximum Average Concentration
Biological Oxygen Demand (BOD_5)	70.0 mg/L
Total Suspended Solids (TSS)	70.0 mg/L
Faecal Coliforms	10E4 CFU/dL
Oil and Grease	5.0 mg/L
Total Residual Chlorine (TRC)	0.1 mg/L

The Waste discharged shall have a pH between 6 and 9.

7. Introduction of Water to Waste for the purpose of achieving effluent quality requirements in Part D, Item 5 is prohibited.

8. The Licensee shall dispose of all solid Wastes in a manner acceptable to the Inspector.

9. A freeboard limit of 1.0 metre shall be maintained at all times in the Sump, part of the Sewage Treatment Facilities, or as recommended by a Geotechnical Engineer and or as approved by the Board.

10. The Licensee may commence decanting upon receipt of an Inspector's approval.

11. All analyses shall be conducted in accordance with methods prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater" or by such other methods as may be approved by an Analyst.

PART E: CONDITIONS APPLYING TO MODIFICATIONS

1. The Licensee may, without written approval from the Board, carry out Modifications to the planned undertakings provided that such Modifications are consistent with the terms of this Licence and the following requirements are met:

   a) the Licensee has notified an Inspector in writing of such proposed Modifications at least five (5) days prior to beginning the Modifications;

   b) such Modifications do not place the Licensee in contravention of either this Licence or the *Act;*

   c) an Inspector has not, during the five (5) days following notification of the proposed Modifications, informed the Licensee that review of the proposal will require more than five (5) days; and

   d) an Inspector has not rejected the proposed Modifications.

2. Modifications for which all of the conditions referred to in Part E, Item 1 have not been met may be carried out only with written approval from an Inspector.

3. The Licensee shall provide to the Board as-built plans and drawings of the Modifications referred to in this Licence within ninety (90) days of completion of the Modifications.

PART F: CONDITIONS APPLYING TO CONTINGENCY PLANNING

1. The Licensee shall submit to the Board for approval within thirty (30) days of the issuance of this Licence an updated Emergency Response & Spill Contingency Plan.

2. The Licensee will maintain a copy of the approved Emergency Response & Spill Contingency Plan onsite in a readily available location, to the satisfaction of an Inspector.

3. The Licensee shall ensure that petroleum products, hazardous material and other Wastes associated with the project do not enter any Waters.

4. The Licensee shall ensure that all containment berms are constructed of an impermeable material, to the satisfaction of an Inspector.

5. The Licensee shall ensure that fuel stored in each tank within the tank farm be no greater than 85% of the tank's capacity to allow for expansion and avoid overflows.

6. If, during the period of this Licence, an unauthorized discharge of Waste occurs, or if such a discharge is foreseeable, the Licensee shall:

   a) report the incident immediately via the 24 Hour Spill Reporting Line (867) 920-8130; and

   b) submit to an Inspector a detailed report on each occurrence not later than thirty (30) days after initially reporting the event.

PART G: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION

1. The Licensee shall submit to the Board for approval within one (1) year of issuance of this Licence, an updated Interim Abandonment and Restoration Plan including a complete Phase II Environmental Assessment of Camp Farewell. This assessment will include the full delineation of contamination (soil and Water) associated with Camp Farewell operations, located both on and off the gravel base pad. The Licensee shall implement this Plan as and when approved by the Board.

2. The Licensee shall review the Interim Abandonment and Restoration Plan every two (2) years and shall modify the Plan as necessary to reflect changes in operations and technology. All proposed modifications to the Plan shall be submitted to the Board for approval.

NORTHWEST TERRITORIES WATER BOARD

Witness

Chairman

NORTHWEST TERRITORIES WATER BOARD

LICENSEE: Shell Canada Limited

LICENCE NUMBER: N7L1-1762

EFFECTIVE DATE OF LICENCE: November 1, 2005

EFFECTIVE DATE OF SURVEILLANCE NETWORK PROGRAM: November 1, 2005

SURVEILLANCE NETWORK PROGRAM

A. **Location of Sampling Stations**

Station Number	Description
1762-1	Treated Sewage at the Point of Discharge

B. **Sampling and Analysis Requirements**

1. Water at Station Number 1762-1, shall be sampled every two weeks, and analyzed for the following parameters:

BOD_5	Total Suspended Solids
Oil and Grease	Faecal Coliforms
Ammonia	pH - Method 4500
Phosphorous Method 4500	Total Residual Chlorine Method 4500 - Cl

2. More frequent sample collection maybe required at the request of an Inspector.

3. All sampling, sample preservation, and analyses shall be conducted in accordance with methods prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater", or by such other methods approved by an Analyst.

4. All analyses shall be performed in a laboratory approved by an Analyst.

5. The Licensee shall, by December 31st, 2005, submit to an Analyst for approval a Quality Assurance/Quality Control Plan.

6. The Plan referred to in Part B, Item 5 shall be implemented as approved by an Analyst.

C. **Reports**

1. The Licensee shall, within thirty (30) days following the month being reported, submit to the Board all data and information required by the "Surveillance Network Program" including the results of the approved Quality Assurance Plan.

NORTHWEST TERRITORIES WATER BOARD

Witness **Chairman**

APPENDIX II

Lease - No. 107 C/4-2-15

N.W.T. Lease No.: **107 C/4-2-15**

File No.: **107 C/4-2**

THIS LEASE made this 7 day of April 2009.

BETWEEN: Her Majesty the Queen in right of Canada,

Hereinafter called "Her Majesty"

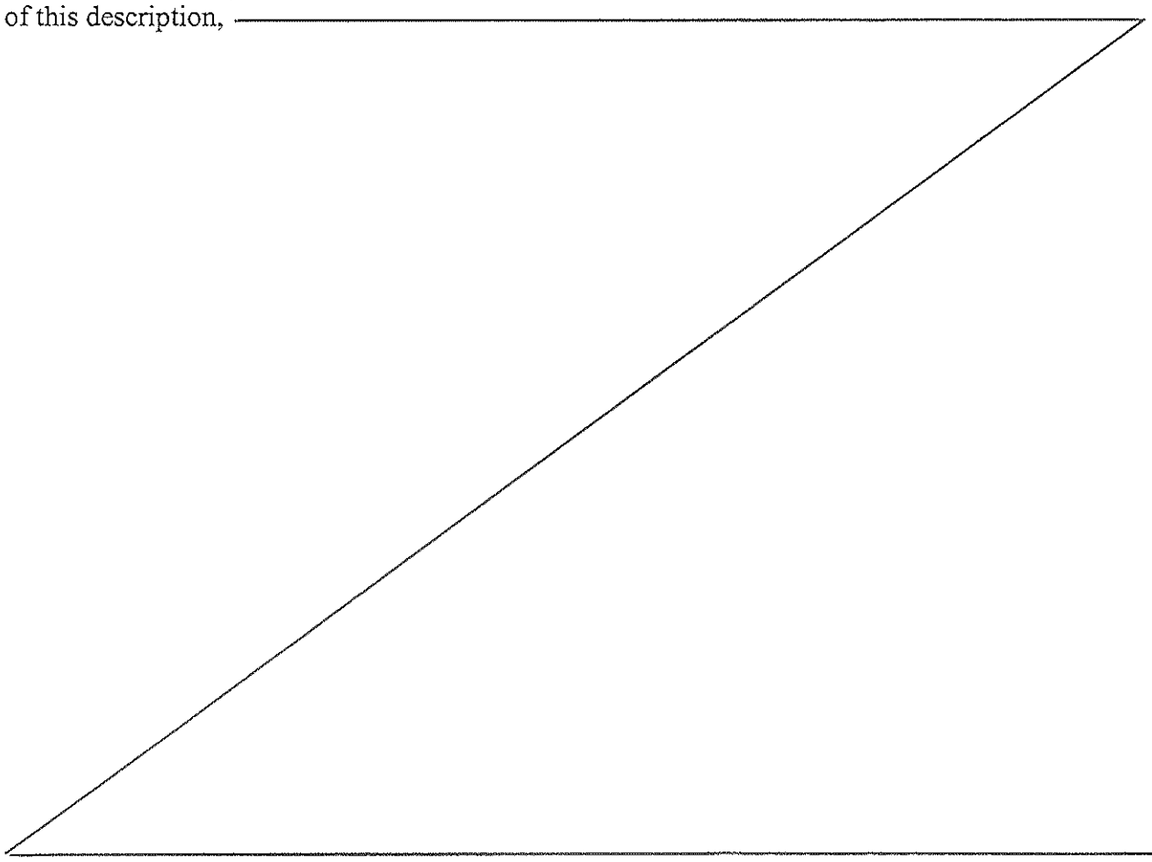
OF THE FIRST PART

AND: **SHELL CANADA LIMITED** a body corporate, incorporated under the Laws of Canada, having a registered office in the City of Calgary in the Province of Alberta,

Hereinafter called "the lessee"

OF THE SECOND PART

WITNESSETH that in consideration of the rents, covenants and agreements herein reserved and contained on the part of the lessee to be paid, observed and performed, and subject to the Territorial Lands Act and the Territorial Lands Regulations, Her Majesty demises and leases unto the lessee all that certain parcel or tract of land situate, lying and being composed of all those parcels of land at Farewell designated as Parcels A, B and C, in QUAD 107 C/4, in the Northwest Territories, as said parcels are shown outlined in red on the sketch annexed hereto and forming part of this description,



hereinafter called "the land", SUBJECT to the following reservations:

Initial(s) PC

Canada

SHELL'S COPY

(a) all mines and of all minerals whether solid, liquid or gaseous which may be found to exist within, upon, or under such lands together with the full powers to work the same and for that purpose to enter upon, use and occupy the lands or so much thereof and to such an extent as may be necessary for the effectual working and extracting of the said minerals;

(b) the rights of the recorded holders of mineral claims and any other claims or permits affecting the land;

(c) all timber that may be on the land;

(d) the right to enter upon, work and remove any rock outcrop required for public purposes;

(e) such right or rights-of-way and of entry as may be required under regulations in force in connection with the construction, maintenance and use of works for the conveyance of water for use in mining operations; and

(f) the right to enter upon the land for the purpose of installing and maintaining any public utility;

THE PARTIES COVENANT AND AGREE AS FOLLOWS:

DEFINITIONS:

1. In this lease:

(a) "Minister" means the Minister of Indian Affairs and Northern Development and any person authorized by him in writing to act on his behalf;

(b) "facilities" means all physical structures or appurtenances placed in or upon the land;

(c) "construction" means all manner of disturbance of the natural state of the surface of the land, including the sub-surface and sub-strata;

(d) "Surveyor General" means the Surveyor General as defined in the Canada Lands Surveys Act;

(e) "body of water" means any lake, river, stream, swamp, marsh, channel, gully, coulee or draw that continuously or intermittently contains water;

TERM:

2. The term of this lease shall be for a period of **twenty (20)** years commencing on the **1st day of January A.D. 2009 AD.** and terminating on the **31st day of December A.D. 2028 AD.**

RENT AND TAXES:

3. Subject to Clause 4 the lessee shall pay to the lessor yearly and every year in advance the rental of **six hundred and twenty ($620.00)** dollars.

4. The Minister may, not less than three (3) months before the expiration of the first five (5) year period of the said term, or of any succeeding five (5) year period during the term, notify the lessee in writing of an amended rental payable for the following five (5) year period and, failing further notification, for the remainder of the term, the said amended rental to be based upon the fair appraised value of the land at the time of such notification but without taking into account the value of any improvements placed thereon by and at the expense of the lessee.

5. The lessee shall during the term of this lease, pay all taxes, rates and assessments charged upon the land or upon the lessee in respect thereof.

USE:

6. The lessee shall use the land for **STAGING AREA, FUEL STORAGE, EQUIPMENT AND MATERIAL STORAGE AND BASE CAMP** purposes only.

SUBLETTING OR ASSIGNMENTS:

7. The lessee shall not sublet the land or assign or transfer this lease without the consent of the Minister in writing , which consent shall not be unreasonably withheld. Such consent shall not be required in the event of the lessee mortgaging or pledging the rights and privileges granted herein to secure the payment of any bonds or other indebtedness of the lessee, or to any assignment made to or by any securing holder as a result of default by the lessee under any mortgage or pledge; however, copies of such instruments must be forwarded to the Minister.

8. No Sublease, assignment or transfer of this lease to any party will receive the consent of the Minister unless Lease number 107 C/4-1-8 is sublet, assigned or transferred to the same party.

BREACH:

9. Where any portion of the rental herein reserved is unpaid for more than thirty (30) days after it becomes due, whether formally demanded or not, the Minister may by notice in writing terminate this lease and on the day following the mailing of such notice, this lease is cancelled.

10. Where the lessee breaches or fails to perform or observe any of the covenants, terms, conditions or agreements herein contained, other than the covenant to pay rent, the Minister may so advise the lessee by written notice and if the lessee fails to remedy the breach or non-performance within a reasonable time thereafter or within the time granted in the said notice, the Minister may, by notice in writing, terminate this lease and on the day following the mailing of such notice, this lease is cancelled.

11. Unless a waiver is given in writing by the Minister, Her Majesty will not be deemed to have waived any breach or non-performance by the lessee of any of the covenants, terms, conditions or agreements herein contained and a waiver affects only the specific breach to which it refers.

TERMINATION:

12. Upon the termination or expiration of this lease, the lessee shall deliver up possession of the land in a restored condition and, where there are no arrears of rent or taxes, the lessee may, within three (3) months after the termination or expiration, remove any buildings or other structures owned by him that may be on the land.

13. Termination or expiration of this lease will not prejudice Her Majesty's right to unpaid rental or any other right with respect to a breach or non-performance of any covenant, term, condition or agreement herein contained nor will the lessee be relieved of any obligation contained herein.

RESTORATION:

14. Where the lessee fails to restore the land as required and within the time allowed by the Regulations or by the Minister, the Minister may order the restoration of all or any part of such land and any expenses thus incurred by the Minister shall be recoverable from the lessee as a debt due to Her Majesty.

WASTE DISPOSAL:

15. The lessee shall dispose of all combustible garbage and debris by burning in an incinerator approved by the Land Agent and remove all noncombustible garbage and debris to an authorized dumping site.

16. The lessee shall dispose of human waste in a manner satisfactory to the Minister.

17. The lessee shall not discharge or deposit any refuse substances or other waste materials in any body of water, or the banks thereof, which will, in the opinion of the Minister, impair the quality of the waters or the natural environment and any areas designated for waste disposal shall not be located within thirty-one (31) metres of the ordinary high water mark of any body of water, unless otherwise authorized by the Minister.

ENVIRONMENTAL:

18. The lessee shall at all times keep the land in a condition satisfactory to the Minister.

19. The lessee shall not do anything which will cause erosion of the banks of any body of water on or adjacent to the land, and shall provide necessary controls to prevent such erosion.

20. The lessee shall not unduly interfere with the natural drainage pattern of the land, except with the permission of the Minister.

FUEL AND HAZARDOUS CHEMICALS:

21. The lessee shall take all reasonable precautions to prevent the possibility of migration of spilled petroleum fuel over the ground surface or through seepage in the ground by:

    (i) constructing a dyke around any stationary petroleum fuel container where the container has a capacity exceeding four thousand (4,000) litres; and

    (ii) ensuring that the dyke(s) and the area enclosed by the dyke(s) is impermeable to petroleum products at all times; and

    (iii) ensuring that the volumetric capacity of the dyked area shall, at all times, be equal to the capacity of the largest petroleum fuel container plus ten (10) percent of the total displacement of all other petroleum fuel containers placed therein; or

    Such other alternative specifications submitted by the lessee that may be approved, in writing, by the Minister.

22. The lessee shall ensure that fuel storage containers are not located within thirty-one (31) metres of the ordinary high water mark of any body of water unless otherwise authorized by the Minister.

23. The lessee shall mark with flags, posts or similar devices all petroleum fuel storage facilities, including fill and distribution lines, such that they are clearly visible at all times.

24. The lessee shall immediately report all spills of petroleum and hazardous chemicals in accordance with the Government of the Northwest Territories Spill Contingency Planning and Reporting Regulations and any amendments thereto, or in a manner satisfactory to the Minister.

25. The lessee shall prevent the possibility of migration of spilled fuel over the ground surface or through seepage in the ground.

26. The lessee shall take all reasonable precautions to prevent the migration of petroleum products into bodies of water.

27. The lessee shall, within six (6) months of the execution of this lease deliver to the Minister, for his approval, an Oil Spill Contingency Plan and shall maintain the provisions of the said Plan, and any modifications approved by the Minister, throughout the term of this lease.

28. The lessee shall handle, store, dispose and keep records of all hazardous and toxic chemicals in a manner satisfactory to the Minister.

29. The fuel storage facilities of the lessee, including all tanks, bladders, hoses, pumps, fuel transfer lines and associated mechanical connections and valves shall be installed and maintained to the satisfaction of the Minister and the lessee agrees to make such reasonable modifications and improvements as are deemed necessary by the Minister.

BOUNDARIES AND SURVEYS:

30. Her Majesty is not responsible for the establishment on the ground of the boundaries of the land.

31. The boundaries of the land are subject to such adjustment and alteration as may be shown to be necessary by survey.

32. The Minister may, during the term herein granted, by notice in writing, order the lessee to survey the boundaries of the land and the lessee shall, at its own expense, within one (1) year from the date of said notice, make or cause to be made a survey of the land, such survey to be made in accordance with the instructions of the Surveyor General, and upon completion of the survey and the production of survey plans suitable for recording in the Canada Lands Surveys Records and filing in the Land Titles Office for the Northwest Territories Land Registration District, Her Majesty will execute an Indenture in amendment of this lease for the purpose of incorporating herein descriptions of the land based on the said plans.

IMPROVEMENTS:

33. The lessee is responsible for ensuring that all improvements to the land are made within the boundaries of the land.

34. The lessee shall not erect any building or structure nearer than a distance of three (3) metres from any boundary of the land.

35. The lessee shall not construct any facilities within thirty-one (31) metres of the ordinary high water mark of any body of water without the written approval of the Minister.

36. The lessee shall maintain the existing improvements now situated on the land on the effective date of this lease, or any similar improvements which may be constructed, in a manner and condition satisfactory to the Minister.

ACCESS:

37. Her Majesty assumes no responsibility, express or implied, to provide access to the land.

38. It shall be lawful for Her Majesty or any person duly authorized at all reasonable times to enter upon the land for the purpose of examining the condition thereof.

39. The Minister may grant to such persons as he may consider fit, rights-of-way or access across, through, under or over all or any portion of the land for any purpose whatsoever, but such rights-of-way or access will not unreasonably interfere with the rights granted to the lessee hereunder, or with any improvements made by the lessee on the land.

INDEMNIFICATION:

40. The Lessee shall at all times hereafter indemnify and keep Her Majesty indemnified against all claims, demands, actions or other legal proceedings by whomsoever made or brought against Her Majesty by reason of anything done or omitted to be done by the lessee, his officers, servants, agents or employees arising out of or connected with the granting of this lease.

41. The lessee will not be entitled to compensation from Her Majesty by reason of the land or any portion thereof being submerged, damaged by erosion, or otherwise affected by flooding.

42. Her Majesty will not be liable for damages caused by vandalism or interference by others with the lessee's facilities and equipment.

REVIEW:

43. At the request of the lessee, any decision of the Minister will be reviewable by the Trial Division of the Federal Court of Canada; costs of such review are the responsibility of the lessee unless otherwise ordered by the Court.

NOTICES:

44. All written notices respecting the land or the covenants, terms, conditions or agreements contained in this lease shall, unless otherwise stipulated herein, be deemed to have been received by the lessee ten (10) days after the mailing thereof or, if hand delivered, on the day of delivery.

45. Any notice affecting this lease which Her Majesty may desire to serve upon the lessee, or any notice which the lessee may desire to serve upon Her Majesty shall, unless otherwise stipulated herein, be sufficiently served if posted by registered mail to the last known address of the opposite party as follows:

To Her Majesty: Director of Operations,
Northwest Territories Region,
Department of Indian Affairs and Northern Development
P. O. Box 1500
Yellowknife, N.T.
X1A 2R3

Initial(s)_____

To the Lessee: **SHELL CANADA LIMITED**
P.O. Box 100 Station Main
Calgary, AB T2P 2H5

Either party may change its address for service during the term of this lease by notifying the other party in writing.

46. No notice of breach or default given herein by Her Majesty shall be valid or of any effect unless it is also given to any mortgagee of the lessee, in respect of the leased lands, of which Her Majesty shall have received written notice.

GENERAL:

47. The Lessee shall abide by and comply with all applicable lawful rules, acts, regulations and by-laws of the Federal Government, Territorial Government, Municipal Government or any other governing body whatsoever that have been or may be enacted or amended from time to time and in any manner affect the said land.

48. This lease enures to the benefit of and is binding upon Her Majesty, Her Heirs and Successors and the lessee, its successors and assigns.

49. No implied covenant or implied liability on the part of Her Majesty is created by the use of the words "demises and leases" herein.

50. If an archaeological site is discovered within the land, the lessee shall immediately advise the Minister in writing of such a discovery and shall take all reasonable precautions necessary to prevent any further disturbance or destruction of such site.

DUPLICATE

IN WITNESS WHEREOF the Director of Operations, Northwest Territories Region, Department of Indian Affairs and Northern Development, has hereunto set his hand and seal on behalf of Her Majesty the Queen in right of Canada; and **SHELL CANADA LIMITED** has hereunto affixed its corporate seal attested to by its duly authorized officers.

SIGNED, SEALED AND DELIVERED)
on behalf of Her Majesty by the)
Director of Operations, Northwest)
Territories Region, Department of)
Indian Affairs and Northern)
Development in the presence of)

Director's Witness)

(SEAL)
Director's Signature

SIGNED SEALED AND DELIVERED)
on behalf of **SHELL CANADA LIMITED**)

(C/S)
Signature **Richard W. Riegert**
Assistant Secretary

Name and title of Director or Officer

(C/S)
Signature

Name and title of Director or Officer

APPROVALS
LAND RGM
J.V. ____
LEGAL 26
FORWARD FOR EXECUTION
RGM

APPENDIX III

CWS Permit # NWT-MBS-13-01

Environment Canada Environnement Canada

Canadian Wildlife Service
Prairie and Northern Region
Box 2310, 5019 – 52 Street
Yellowknife NT X1A 2P7

DATE: March 26, 2013

FROM: Paul Latour,
CWS,
Yellowknife, NT

TO: Randall Warren,
Shell Canada Ltd.,

TEL:

FAX: 403-234-5947

TEL: 867-669-4769

FAX: 867-873-8185

TOTAL # OF PAGES: 3

SUBJECT: EC/CWS Sanctuary Permit

MESSAGE:

Attached is Sanctuary Permit NWT-MBS-13-01.

Please sign the 'Permittee' line on the last page and fax back to me.

Regarding the fuel tanks and fuel storage at Camp Farewell I am sending via regular mail information related to the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (http://www.gazette.gc.ca/rp-pr/p2/2008/2008-06-25/html/sor-dors197-eng.html) under the *Canadian Environmental Protection Act*, as they pertain to your operations at Camp Farewell.

Paul Latour

Canada

Environment Canada | Environnement Canada

ENVIRONMENT CANADA
PERMIT

Migratory Birds - Sanctuary | **NWT-MBS-13-01**

Permit for: **Northwest Territories** (province(s), territories) | Permit no.

9. (Issued under section)

Migratory Bird Sanctuary Regulations

Randall Warren
Shell Canada Ltd.,
P.O. Box 100 Station "M"
Calgary, AB
T2P 2H5

Permittee

For the Minister

Date of issue : **March 26, 2013**

Date of expire: **December 31, 2013**

The Permittee is authorized to enter the Kendall Island Migratory Bird Sanctuary to conduct care and maintenance of the Camp Farewell and Stockpile lease area.

Canada

GENERAL CONDITIONS

1. The permit is not valid unless signed by the Permittee (holder) or authorized representative, in the space designated as "Permittee".

2. By signing this document you bind yourself to respect all terms and conditions of this permit.

3. The Permittee must comply with all other applicable Canadian laws and regulations.

4. Copy of signed permit must be carried by nominees and Permittee when conducting this work and will be presented if asked by Police or Game Officer.

5. The Permittee shall display a copy of this permit in a conspicuous place in each campsite established to carry out this program.

6. The conditions of this permit apply to all employees, agents, contractors, volunteers, and visitors of the Permittee.

7. The Permittee shall ensure that a copy of this Permit, operating conditions and definitions is provided, understood and adhered to by all contractors and sub-contractors prior to the start-up of the permitted activity

8. Additional restrictions may be required and may be added to this permit by the Minister if it is deemed necessary to ensure compliance with the Migratory Birds Convention Act and the Regulations.

9. Issuance of this permit does not supersede the necessity or legal requirement to acquire any other pertinent Territorial or Municipal license and or permit which may otherwise be applicable. This permit is not transferable to any other person(s) or organization(s) and is not valid if altered in any way.

10. If the Permittee proposes to conduct any activities that are not identified in the original permit application, the Permittee shall notify the Manager and, if necessary, apply for a new or amended permit to conduct the new activities.

11. The Permittee is authorized to possess firearms in the Kendall Island Migratory Bird Sanctuary for protection from dangerous wildlife only.

12. This permit may be revoked at any time at the discretion of the Minister.

SPECIAL CONDITIONS

1. PROTECTION OF TERRESTRIAL HABITAT

1. The Permittee shall not conduct any activities in the Kendall Island Bird Sanctuary outside the Camp Farewell and Stockpile lease area.

2. The Permittee shall use portable ramps during loading or unloading ships or barges.

3. The Permittee shall not remove or relocate earth, except contaminated soils collected as part of a clean-up program.

3. PROTECTION OF AQUATIC HABITAT

1. The Permittee shall not place dirt or debris into streams to serve as ramps for loading or unloading ships or barges.

2. The Permittee shall not cut any bank of a waterbody.

2. WILDLIFE DISTURBANCE AND INTERACTION

1. The Permittee shall not feed wildlife or attempt to attract wildlife.

2. The Camp Farewell airstrip is not permitted to be used from 10 May – 20 June and 25 August – 30 September, except for emergencies.

3. Aircraft activity is restricted to flights necessary to carry out care and maintenance of the Camp Farewell and Stockpile lease area.

4. Aircraft shall maintain a minimum horizontal distance of 1.5 km from any observed concentrations of migratory birds.

5. The Permittee shall notify the Manager of any birds nesting on the infrastructure within the lease area.

3. FUEL STORAGE AND HANDLING

1. The Permittee shall not allow oil, oil wastes or any other substance harmful to migratory birds to be deposited in waters or other areas frequented by migratory birds, or in a place from which the substances may enter waters frequented by migratory birds.

2. The Permittee shall permanently mark all fuel containers, including 205 L drums, with the Permittee's name.

4. HAZARDOUS MATERIALS AND CONTAMINANTS – HANDLING AND DISPOSAL

1. The Permittee shall have the appropriate Workplace Hazardous Material Information System, 'Material Safety Data Sheets' identification available on site.

2. The Permittee shall remove and dispose of all hazardous materials at an approved facility.

3. The Permittee shall conduct maintenance, oil changes, refueling and lubricating of mobile equipment no closer than 100 m from waterbodies (lakes, ponds and streams).

5. GARBAGE AND WASTE WATER HANDLING AND REMOVAL

1. The Permittee shall ensure that all domestic garbage and other wildlife attractants are inaccessible to wildlife at all times.

2. The Permittee shall regularly collect all waste, debris and domestic garbage and dispose of it using appropriate technology and accepted practices.

3. The Permittee shall inventory and dispose of any waste materials, construction materials, drilling materials or other materials on at least an annual basis to minimize accumulation within the permit area. The inventory of materials disposed and materials remaining within the permit area must be reported to the Manager.

6. REPORTING

1. The Permittee shall submit a detailed report within thirty (30) days of the expiration date of this permit. The report shall include all activities that occurred at Camp Farewell during 2012, the number and species name of all wildlife observed, and other items of interest.

DEFINITIONS

Manager: 'The Manager', Northern Conservation Section, Canadian Wildlife Service, Environment Canada or his/her designate.

Minister: The Minister of the Environment.

Permittee: The party to whom a CWS Sanctuary Permit is issued for conducting activities in a Migratory Bird Sanctuary.

Waterbody: Any river, stream, creek, lake, or pond.

Camp: A collection of accommodations, maintenance, transportation, and storage facilities located either permanently or temporarily at a site.

Sub-permit holder and/or nominee(s):

I declare that I have read and understand this Permit, including all the conditions attached.

Signature of Permittee

APPENDIX IV

Worley Parsons 2009 Site Inventory

WorleyParsons
resources & energy

Table 1

FAREWELL INVENTORY 2009

Quantity	Description	Condition	Container Type	Size	Location
49	Wooden Timbers	Some Rough	None	12x12 - 12/14/16 ft.	Disposed
25	Wooden Timbers	Fair	None	12x12 - Shorter Lengths	Disposed
35	Wooden Timbers	Fair	None	12x12 - 6/8/10 ft.	Disposed
20	Pipe	Rusty	Bundles	3 packs of 5 inch - 18 ft.	Yard
436	Seacans (left for cement summer 2002)	Good	Seacan		CCS landfill
56	Cement (Secan Rebanded)	Bad	Seacan	4x4	CCS landfill
18	Potash	Good	Seacan	4x6	MGM
138	Potash	Good	Seacan	4x6	MGM
33	Potash	Good	Seacan	2x4	MGM
22	Potash	Bad	Seacan	4x6	CCS landfill
222	Barite	Good	Seacan	4x4/4200 lb. Each	MGM/CCS Landfill
377	Barite	Bad	Seacan	4x4/4200 lb. Each	CCS landfill
13	Barite	Bad	Seacan	4x6	CCS landfill
32	Bentonite	Good	Seacan	4x4	CCS landfill
1	Bentonite	Good	Seacan	4x2	CCS landfill
5	Bentonite	Bad	Seacan	4x6	CCS landfill
31	Caustic Soda	Bad	Seacan	Needs to be overpacked.	CCS landfill
5	Spercene		Seacan	4x6	CCS landfill
37	Sawdust	Good	Seacan	4x4/4x6	Inuvik Landfill/ NW
632	Cement (Go through summer 2002)	Unkown	Seacan		CCS landfill
1	Batteries-Dead	Waste	Seacan		ETS Hazco
3	Banding-Garbage	Garbage	Seacan		CCS landfill
80 ft	Armored 4 Wire 2 Gauge	Fair	None		Lower Shop C
1	Tank-Stove Oil with 1" Fuel	Junk	Tank	150 gallon	Inuvik Landfill/ NW
7	Solvent-Shell Indusol	Good	Drum	45 gallon	Disposed
5	Methanol	Waste (Outdated)	Drum	45 gallons	Lower Shop C
15	Dresser Magcobar Pipe Lax	Fair	Pails	5 gallon	Lower Shop C
4	Methanol	Waste (Outdated)	Drum	45 gallons	Lower Shop C
~30	Lumber	Good	None	2x6/12 feet	Lower Shop C
1	Waste Oil Tank-Round (with some oil in it)	Waste	Tank	500 gallons	Lower Shop C

Table 1

FAREWELL INVENTORY 2009

Quantity	Description	Condition	Container Type	Size	Location
2	Ends for Hallway/Sin Sleigh Camp	Junk	None		Lower Shop C
2	Tarp Pieces(Blue)	Junk	None		Lower Shop C
7	Sleighs: Steps for Sleigh Camp	Good	None		Lower Shop C
100	Wood Chips	Good	Bags		Lower Shop C
9	Samples: Wooden Insulated Seacans	Fair	Seacan	4x4x1.5 feet	Lower Shop C
100	Samples: Metal Boxes	Good	Pallet	3x1x1 feet	Lower Shop C
1	Hole Plugs (Red)	Good	Box - Broken		Lower Shop C
~32	Samples: Wooden Boxes (No Tops)	Fair	Pallet	3x1ftx4in	Lower Shop C
1	Hydraulic Fluid-Shell Aircraft	Waste	Pail	5 gallon (0.5full)	Lower Shop C
1	Rimula Shell ct 20w	Waste	Pail	5 gallon	Lower Shop C
40	Culvert Couplers	Good	Seacan	12 inch	Lower Shop C
20	Sleighs: Runners (Unit Nos. 9132, 9136, 913, 9138)	Good	None		Lower Shop C
10	Sleighs: Bunks	Good	None		Lower Shop C
3	Sleighs: Hitches	Good	None		Lower Shop C
1	Sleighs:Box with Pins, 10 hitch ends 2	Good	Box		Lower Shop C
1	TV Dish	Junk	None	12 foot	Lower Shop C
1	Power Cable	Junk	Box	3x3	Lower Shop C
2	Oil Sorbant for Containment	Fair		20 ft.	Lower Shop C
2	Pipe for lifting camp trailers	Good	None	8 inches x 12 feet	Lower Shop C
10	ABS Pipe	Fair	Pieces	4 inch	Lower Shop C
7	Samples: Bottles Wide Mouth	Good	Cases		Lower Shop C
1	Samples: Bottles	Good	Bag (Yellow)		Lower Shop C
~10	Radio Antennas	Outdated	None		Mid Shop B

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Table 1

FAREWELL INVENTORY 2009

Quantity	Description	Condition	Container Type	Size	Location
Several	Radio Cables	Fair	None		Mid Shop B
	Communication Supplies Misc.	Outdated	None		Mid Shop B
1	Rotela 15-40	Good	Drum	45 gallon	Mid Shop B
1	Air Strip Lights (broken)	Junk	Seacan	4x4	Mid Shop B
1	Solvent-Shell Indusol	Good	Drum	45 gallon	Mid Shop B
1	Bolts & Nuts (5'8"x2")	Rusty	Drum	45 gallon	Mid Shop B
8	Fuel Hoses	Garbage	None	50 feet	Mid Shop B
36	Structural Bolts 5'8"x2" with Nuts	Rusty	Pails	5 gallon (3 secans)	Mid Shop B
1	Washers, Nuts & Studs	Rusty	Seacan	2 inch	Mid Shop B
2	5/8" Lag Bolts	Rusty	Pails	5 gallon	Mid Shop B
	Pipe Fittings (Assortment)	Rusty			Mid Shop B
11	Roof Sections for Sleigh Camp	Garbage			Mid Shop B
	Drilling Tools (Assortment)	Old			Mid Shop B
	Wipers & Rat Hole Bits (Assortment)	Old			Mid Shop B
	Seals and Gaskets (Assortment)	Old			Mid Shop B
	Tank Farm Hose (Assortment)	Garbage			Mid Shop B
~75	Air Strip Light Cones				Mid Shop B
2	Gas (Put in for start-up May 4, 2001)	Good	Drum	45 gallon	Oil Spill Container
1	Skimmer	Fair			Oil Spill Container
1	Engine and Pump	Parts Missing			Oil Spill Container
100	Hydraulic Hose	Poor		feet	Oil Spill Container
3	Life Jackets	Junk			Oil Spill Container
2	Shovels	Good			Oil Spill Container
5	Anchors	Good			Oil Spill Container
2	Sorbant (Rolls)	Poor			Oil Spill Container
34	Floats	Fair			Oil Spill Container
2	Life Buoys	Fair			Oil Spill Container

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Table 1

FAREWELL INVENTORY 2009

Quantity	Description	Condition	Container Type	Size	Location
12	Cables with Clevises	Good		2 feet - 1/4 inch	Oil Spill Container
1	Fire Hose with Camlock	Outdated		50 feet	Oil Spill Container
27	Containment Booms (Vinyl Covered, 4 Rolls)	Fair		100 feet	Oil Spill Container
	Cable	Good		1/4 inch	Oil Spill Container
1	Rag Wringer	Good			Oil Spill Container
	Suction Hose (2 inch)	Good		50 feet	Oil Spill Container
8	Boards for Oil Sorbant Container	Good		10 feet	Oil Spill Container
2	Sorbant (Rolls)	Fair			Oil Spill Container
	Sorbant (6 inch) in Fish Net Material	Fair		200 feet	Oil Spill Container
1	Sleigh Irrigation Pipe (375)	Good		20 feet	Yard
1	Sleigh Irrigation Pipe (300)	Good		20 feet	Yard
3	Sleighs: Assembled (Newer), Wide Runners with Thongs; No Deck; Unit Nos. 9134, 9139 & 9140	Good SOLD		SOLD to GDC Civil Construction	
1	Incinerator Pipe Runners on Sleigh	Junk			Inuvik Landfill/ NW
1	Incinerator Narrow Runners on Sleigh	Junk			Inuvik Landfill/ NW
2	Gravel Boxes - One Full of Steel; other Aluminum	Scrap			Inuvik Landfill/ NW
1	Sleigh (5 - 500 gallon Fuel Tanks)	Sold		500 gallon	MDIOS
1	Skid with 3 - 500 gallon gas Tanks; No Berm	Sold		500 gallon	MDIOS
4	Narrow Runner Sleighs with Rig Mat on Bunks	Sold			MDIOS
9	Tanks - Upright Primered	Sold	Tank	300 bbl	MDIOS
2	Tanks - Heli	Sold	Tank	100 gallon	MDIOS
1	Tank 1/2 - bolted	Sold	Tank	1000 bbl	MDIOS
2	Tanks - Welded in Bermed Area	Good	Tank	5000 bbl	Yard Norh Side

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Table 1

FAREWELL INVENTORY 2009

Quantity	Description	Condition	Container Type	Size	Location
3	Tanks - Welded in Bermed Area	Good	Tank	2000 bbl	Yard Norh Side
11	Tanks - Bolted (one with old camp roof garbage in it)	Sold	Tank	1000 bbl	MDIOS
5	Tanks - Welded on Skids; can be moved by bed truck	Sold	Tank	800 bbl	MDIOS
100	Culverts	New		13 inch x 21 feet	Yard Norh Side
3	Culverts	New		24 inch x 20 feet	Yard Norh Side
2	Culverts	New		6 inch x 20 feet	Yard Norh Side
5	Culverts - Insulated	Fair		8 inch x 20 feet	Yard Norh Side
3	Pipe	Rusty		40 inch/10 and 15 feet	Inuvik Landfill/ NW
2	Pipe	Rusty		34 inch/10 & 15 feet	Inuvik Landfill/ NW
	Assorted Pipe	Scrap	Pile		Inuvik Landfill/ NW
5	Pile Caps	Rusty Moss and Dirt in Several	Basket		Inuvik Landfill/ NW
27	Rig Mats	Couple Damaged		8x35 feet	Yard Norh Side
47	Pipe	Fair		3 1/4 inch, 24 feet	Inuvik Landfill/ NW
30	Pipe	Fair		4 1/4 inch, 24 feet	Inuvik Landfill/ NW
50	I-Beam	Good		30 feet	Yard East End
29	I-Beam	Good		20 feet	Yard East End
50	I-Beam	Good		15 feet	Yard East End
7	I-Beam	Good		10 feet	Yard East End
2	I-Beam	Good		8 feet	Yard East End
49	I-Beam	Good		40 feet	Yard East End
230	Rig Mats	Good		8x35 feet	Yard East End
8	Tank - 1 Square Hex Top	Sold	Tank	500 gallon	MDIOS
1	Tank - Top Missing	Sold	Tank	1000 gallon	MDIOS
1	Tank - Water Truck	Sold	Tank	2000 gallon	MDIOS

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Table 1

FAREWELL INVENTORY 2009

Quantity	Description	Condition	Container Type	Size	Location
200	Pile Caps	Good	Basket	12 inch	Yard East End
500	Pile Caps	Good	Rig Box	in 2 large rig boxes	Yard East End

APPENDIX V

2012 IEG Site Inspection Summary

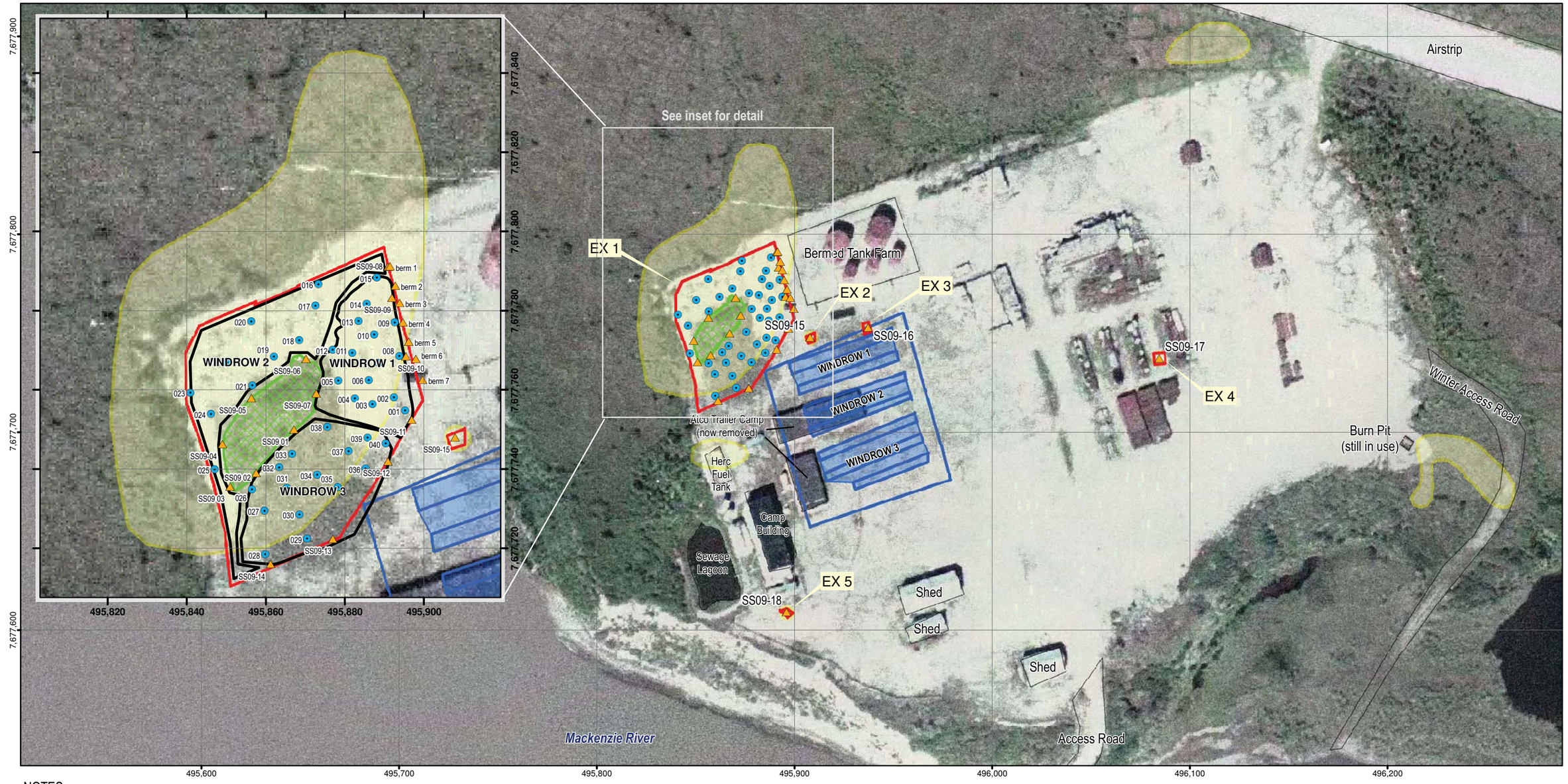
Table 1: Summary of 2012 Site Activities

Location	Date on Site	Personnel	Transportation	Wildlife/Tracks on Site	Activities	Notes
Camp Farewell	7-Mar-12	Ryan Lennie (IEG) WL Monitor	Snowmobile	Fox tracks	CWS inspection	None
Camp Farewell	24-Apr-12	Ryan Lennie (IEG) WL Monitor	Snowmobile	None	CWS inspection	None
Camp Farewell	17-Jun-2012 23-Jun-2012	Ryan Lennie (IEG) WL Monitor	Boat	None	CWS inspection / Sample lagoon water	Surface water sample collected from the lagoon, 15 test pits were dug to 0.6 m bgs.
Camp Farewell	29-Jul-12	Ryan Lennie (IEG) WL Monitor	Boat	None	CWS inspection / Discharge lagoon	Lagoon discharged.
Camp Farewell	22-Aug-12	Krista Beavis (IEG) WL Monitor	Helicoptor	None	CWS inspection	None
Camp Farewell	11-Oct-12	Ryan Lennie (IEG) WL Monitor	Snowmobile	None	CWS inspection	None
Camp Farewell	7-Dec-12	Ryan Lennie (IEG) WL Monitor	Snowmobile	None	CWS inspection	None

Notes:
IEG - IEG Consultants Ltd.
WL Monitor - Wildlife Monitor
CWS - Canadian Wildlife Service

APPENDIX VI

IEG 2010 Remediation Site Diagram



NOTES

1. Horizontal Datum: NAD83
2. Grid Zone UTM ZONE 8
3. Vertical Datum: MEAN SEA LEVEL
4. Scale 1 : 2,000

0 25 50 75 100 Metres

N

EX 1

- July Sampling Locations
- September Sampling Locations
- CampInfrastructure
- Excavated Extent
- Unexcavated Vegetated Extent
- Original Windrows
- Consolidated Windrows
- Interpreted Spill Extent (WPK, 2006)
- Backfilled Areas

Sources:
1. Indian and Northern Affairs Canada, (2005) Mackenzie Delta and Valley Airphoto Mapping Program. OrthoTile 490767. 1:30,000. Yellowknife, NWT.

2. WorleyParsons Komex (WPK) and IEG Consultants Ltd (2006) 2006 Environmental Site Assessment, Camp Farewell NT.

NOT FOR CONSTRUCTION

TO BE READ WITH IEG REPORT DATED: DEC 2009

CLIENT: Shell Canada Energy

PROJECT: CAMP FAREWELL MAINTENANCE

TITLE: Petroleum Hydrocarbon Remediation - 2009

PROJECT No.: A04012A01

FIG. No.: FIGURE 2

APPENDIX VII

IEG 2009 Camp Farewell PHC Soil Remediation Report

Shell Canada Energy

2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report – *DRAFT*

IEG CONSULTANTS LTD.

A04012A01

February 24, 2010

Shell Canada Energy
400 - 4th Street SW
PO Box 100, Station Main
Calgary, Alberta
T2P 2H5

Mr. Randall Warren

Dear Mr. Warren;

2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report

Please find enclosed two hard copies of IEG Consultants Ltd. report entitled, *2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report*. A PDF electronic copy of the same report has been delivered on a CD with these hard copy reports.

Your comments or questions regarding this report are welcomed and you can contact Sam Bird (sbird@ieg.ca or 403-731-6851) at your convenience.

Yours truly,

IEG CONSULTANTS LTD.

Sam Bird, B. Sc.
Project Manager

100210R2 Camp Farewell PHC Soil Remediation_PDF.doc
File: A04012A01

Shell Canada Energy

2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report - *DRAFT*

February 2010

IEG Consultants Ltd.

EXECUTIVE SUMMARY

IEG Consultants Ltd (IEG) was retained by Shell Canada Energy (Shell) to provide on-site supervision and support for clean-up activities at the Camp Farewell staging site located on the Mackenzie Delta in the Kendall Island Bird Sanctuary at 69° 12' 30.0" N latitude, 135° 06' 04.4" W longitude, approximately 110 km northwest of Inuvik, Northwest Territories (Figure 1).

The objectives of the 2009 clean-up program were to remove stockpiled supplies, conduct building maintenance and remediate hydrocarbon impacted soils from within the site's gravel pad. The remediation program was designed by WorelyParsons and carried out by Hazco and IEG. The objective of this report is to describe activities involving the remediation of hydrocarbon impacted soils that took place from July to September 2009.

An Environmental Site Assessment (ESA) conducted in 2006 identified hydrocarbon impacted soil at several locations on the gravel pad and on adjacent tundra. The 2009 remediation program targeted the treatment of soil from the gravel pad at a historical fuel spill area (excavation 1) and at small localized impacts near the tank farm and camp day tank (excavations 2 through 5) (Figure 2).

Approximately 1300 m^3 of hydrocarbon impacted soil was excavated from the historical spill area on the gravel pad and placed in a treatment cell to be remediated. Soil was generally excavated to a depth where a geomembrane of polyurethane foam insulation was encountered. The soil in the treatment cell was placed in windrows, aerated with an Allu bucket and treated with an oxidizing compound called RegenOx. RegenOx was also added to the base and sidewalls of the main open excavation to encourage the remediation of residual hydrocarbons near the geomembrane. Following the final application of RegenOx to the windrows, the soil was placed back into the excavations.

Soil samples were collected for analysis of BTEX and F1 to F4 hydrocarbons midway through the treatment process and approximately six weeks following replacement of soil in the excavations. Laboratory analysis indicates that BTEX and F1 hydrocarbon concentrations were reduced and are below Government of the Northwest Territories (GNWT) Contaminated Site Remediation (CSR) guidelines for industrial and residential/parkland land use sites. Fraction 2 hydrocarbon concentrations in approximately 600 m^3 of soil backfilled in excavation 1 remain above GNWT CSR industrial and residential/parkland guidelines while fraction 3 hydrocarbons exceed only the residential/parkland land use guidelines (Table 3).

An attempt was made to treat soil at the side of excavation 1 in situ (along the west side of the tank farm berm). However, hydrocarbon concentrations in soil along west side of the tank farm berm likely remain above GNWT CSR industrial guidelines.

pH levels of treated soil measured following treatment indicate that the soil is basic, ranging from pH 9.78 to pH 9.97 and is above industrial and residential/parkland guidelines (pH 6-8). Both sulphate and sodium concentrations from the treated soil were elevated these elevated concentrations resulted in electrical conductivity (EC), pH and sodium adsorption ratios (SAR) above industrial and residential/parkland land uses (Table 4).

IEG recommends that EC, SAR and pH levels in the treated soil be monitored and compared to untreated hydrocarbon impacted soil to determine the source of the elevated sodium and sulphate concentrations.

DISCLAIMER

This report is an instrument of service of IEG Consultants Ltd. The report has been prepared for the exclusive use of Shell Canada Energy for the specific application to the Hydrocarbon Impacted Soil Remediation at Camp Farewell, NT. The material in it reflects IEG Consultants best judgment in light of the information available to it at the time of preparation. The report's contents may not be relied upon by any other party without the express written permission of IEG Consultants. In this report, IEG Consultants has endeavoured to comply with generally accepted practice common to the local area. IEG Consultants makes no other warranty, express or implied.

Any and all recommendations, reports, plans, specifications, drawings and designs furnished by IEG Consultants has been prepared on the assumption that any and all information supplied to IEG Consultants by Shell Canada Energy, or by others on behalf of or on the instructions of Shell Canada Energy, is correct and accurate, and IEG Consultants shall not be liable for any loss, cost, expense or damage arising from or as a result of the incorrectness or inaccuracy of such information. Shell Canada Energy shall, upon such incorrectness or inaccuracy coming to its attention, notify IEG Consultants thereof and IEG Consultants shall be entitled to make any corrections, alterations or changes in the plans, specifications, drawings or designs, prepared on the basis of such incorrect or inaccurate information, at Shell Canada Energy's expense.

The analyses, conclusions and recommendations contained in this report are based on data derived from a limited number of test holes obtained from widely spaced subsurface explorations. The methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. The samples and tests cannot be relied on to accurately reflect the nature and extent of variations that usually exist between sampling or testing locations.

The recommendations included in this report have been based in part on assumptions about variations between test holes. IEG Consultants cannot assume responsibility or liability for the adequacy of its recommendations when they are used in the field without IEG Consultants being retained to observe construction.

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

TABLE OF CONTENTS

PAGE

TABLE OF CONTENTS
(continued)

PAGE

List of Figures

List of Tables

List of Photographs

List of Appendices

1. INTRODUCTION

Camp Farewell is a gas exploration base camp and staging area located within the Inuvialuit Settlement Region (ISR) in the Kendall Island Bird Sanctuary (KIBS), Northwest Territories at latitude 69˚ 12' 30.0" N, longitude 135˚ 06' 04.4" W. Camp Farewell is on the northeast bank of the Middle Channel near Harry Channel, approximately 109 km northwest of Inuvik and approximately 85 km west of Tuktoyaktuk (Figure 1).

Camp Farewell has been used by Shell as a base camp and staging area for over thirty years. A Phase II environmental site assessment (ESA) was conducted in 2006 by WorleyParsons Komex and IEG Consultants Ltd (IEG). The ESA identified petroleum hydrocarbon (PHC) concentrations in soil exceeding applicable guidelines in several areas of the gravel pad and adjacent tundra (WorelyParsons Komex, 2006a). The areas interpreted as impacted soil are shown in Figure 2. An Interim Abandonment and Restoration Plan for the site were developed by WorleyParsons Komex in 2006 as required by the existing Northwest Territories Water License N7L1-1762 (WorelyParsons Komex, 2006b).

In 2009, Shell Canada Energy undertook a program to clean-up Camp Farewell. The program involved removal of stockpiled supplies, building maintenance and remediation of hydrocarbon impacted soil as specified in a July 6, 2009 memorandum from WorleyParsons (Appendix I). IEG was retained by Shell Canada Energy to provide on-site supervision and support for the 2009 clean-up activities. This report describes the hydrocarbon impacted soil remediation work undertaken during the summer of 2009.

2. SITE DESCRIPTION

Camp Farewell is located on a small plateau in the outer Mackenzie Delta. The surrounding area is tundra composed of peat and low lying shrubs. The site consists of a gravel pad of approximately 6.5 ha, a gravel airstrip and two access roads from the Middle Channel of the Mackenzie River to the pad. The majority of the gravel pad is approximately 0.5 m to 0.7 m thick and was constructed on a foam and fibre geomembrane which overlays native tundra.

Existing infrastructure at Camp Farewell includes a two storey 32 man camp, a large mechanical garage, two storage sheds, fuel storage for the camp, a disused sewage lagoon and a disused bermed petroleum tank farm.

3. ASSESSMENT GUIDELINES

The site is remote and currently used for industrial purposes with occasional use of the camp facilities. The treated soils are coarse-textured sands and gravels and are surface soil less than 1.5 m deep (WorleyParsons Komex , 2006a).

The regulatory guidelines used for comparison in this report are as follows:

- **Hydrocarbons, salinity, sodicity and pH:** Coarse surface soils for an industrial land use (GNWT, 2003). The applicable exposure pathways are eco soil contact and protection of groundwater for aquatic life.

Although industrial land use guidelines are applied, future environmental assessments may require the use of other guidelines. Residential/parkland guidelines have also been included for comparison. In particular, residential/parkland land use guidelines may apply following site decommissioning.

4. SOIL REMEDIATION PROGRAM

4.1 Areas of Hydrocarbon Impacted Soil

The areas of hydrocarbon impacted soils at Camp Farwell were identified during the 2006 Phase II ESA (WorleyParsons Komex, 2006a). The ESA identified four main areas of hydrocarbon impacted soil (Figure 2):

- Historical fuel spill (adjacent to west side of the existing tank farm), containing toluene, xylenes and F1 to F4 hydrocarbons;
- Tundra area close to the airstrip access road the between the gravel pad and the airstrip containing toluene and F2 to F4 hydrocarbons;
- New fuel spill area (adjacent to west and east side of existing "Herc" tank northwest of the camp building) containing F2 and F3 hydrocarbons; and,
- The burn pit area containing ethylbenzene, F1 and F2 hydrocarbons as well as other compounds.

Four small, localized areas of impacted soil (approximately 9 m^2 to 16 m^2) were also identified (Figure 2).

- Outside the southwest corner of the tank farm containing F3 hydrocarbons and barium;
- Midway along the south berm of the tank farm containing toluene, ethybenzene, xylenes, and F1 to F3;
- On the pad area between former storage racks containing F3 hydrocarbons; and,
- Near the camp building day tank containing F2 hydrocarbons.

4.2 Hydrocarbon Impacted Soil Treatment

Hydrocarbon impacted soil from portions of the gravel pad at Camp Farewell was excavated, treated within an on-site treatment cell and used to backfill the excavations

following treatment. WorelyParsons designed the remediation program and outlined the specifications in a July 6, 2009 memorandum to the prime contractor (Hazco), Shell, and IEG (Appendix I). Deviations from the memorandum are outlined in an IEG memorandum from July 17, 2009 (Appendix I).

As part of the strategy, approximately 3,300 m^2 of the historical fuel spill area was excavated. Only unvegetated portions of the area located on the gravel pad were excavated. Based on sampling results, a vegetated island on the gravel pad within the suspected plume was determined to be free of contamination and was not excavated. Portions of the spill located on healthy, well vegetated tundra were not excavated. The eastern extent of the excavation was limited to avoid damage to the integrity and liner of the berm at the tank farm. An area of soil approximately 2.5 m x 32 m between the historical fuel spill excavation and the western tank farm berm was left in place to maintain stability of the berm.

Only impacted areas on the gravel pad were targeted for remediation in 2009. Areas where hydrocarbon impacts were identified within native tundra (at the historic fuel spill area and between the pad and the airstrip) were left untouched.

The impacted soil around the Herc tank and new spill area was not excavated because the tank is currently in use and there were concerns that work in the area would have the potential to damage infrastructure.

Impacted soil around the burn pit was not excavated because the burn pit is still in use. It was determined that the best course of action is to remediate this area following the active service life of the burn pit.

Soil from the four small impacted areas were excavated, treated in the treatment cell and used as backfill in the excavations.

4.3 Soil Sampling Methodology

Soil samples were collected from the soil undergoing treatment twice during the remediation program to monitor the progress of hydrocarbon degradation. Samples were collected either directly from the windrows or from the backfilled soil (locations on Figure 2).

Each soil sample was collected from approximately 0.5 m below the surface of the windrow using a dutch auger. The samplers wore new nitrile gloves and decontaminated the dutch auger with Alconox soap, methanol and distilled water between composite sampling locations to avoid cross contamination of the samples.

Approximately four samples were taken for each 200 m^3 of soil undergoing treatment. The discrete samples were placed in new, laboratory supplied ziplock bags and glass jars with Teflon lined lids and minimum headspace. Samples were analysed at the laboratory for volatile hydrocarbons (BTEX and F1) from the glass jars. Soil from within the bags was used to field screen volatile organic compounds using an RKI Eagle organic vapour analyzer (OVA) with methane elimination mode turned on. For each group of four discrete samples, the corresponding jarred sample with the highest OVA reading was sent for analysis of BTEX and F1 hydrocarbons.

Following field screening, soil from the bagged samples was blended to form composite samples for laboratory analysis of non-volatile hydrocarbons. Soil from four discrete samples was blended to form a composite sample representing approximately 200 m^3. Following blending, the composite samples were then placed in appropriate glass jars

with minimum headspace and sent to the laboratory for analysis of F2 to F4 hydrocarbons.

While most mid-treatment samples were taken directly from the windrows, samples from Windrow 3 were delayed during transport to the laboratory and were replaced by collecting new soil samples from the same windrow after it had been placed in the excavation. In this case, the soil was collected from depths of 0.1 m to 0.4 m below ground surface. Samples were kept as discrete and composite samples using the same methodology used for the windrows.

On September 16, approximately six weeks following placement of soil back into the excavations, 40 soil samples were collected from the historical spill area in order to characterise the post treatment conditions of the soil. The soil samples were collected following the same methodology described above. Eight discrete samples were analysed for BTEX and F1 hydrocarbons. Eight composite samples were analysed for F2 to F4 hydrocarbons. Five of the composite samples were analysed for pH and salinity parameters.

For each of the small excavations, confirmatory samples were a composite of soil taken from the four sides of the excavation. Where a liner was not encountered (near the day tank), the sample also contained material from the base of the excavation.

Confirmatory samples from excavation 1 were taken from a depth of 0 m to 0.5 m around the vegetated island and along southern and western walls.

Samples for analytical analysis were shipped to Maxxam Laboratories in Edmonton.

4.4 Ex Situ Remediation Methodology

The methodology followed for ex situ hydrocarbon contaminated soil remediation is outlined in the July 6, 2009 memorandum from WorleyParsons to the prime contractor (Hazco), Shell, and IEG (Appendix I). Areas of hydrocarbon contaminated soil were excavated to a depth where impacts were below criteria or until a geomembrane was encountered (generally 0.5 m to 0.7 m), placed in windrows in a bermed treatment cell and aerated with an Allu bucket (Photograph 1). The treatment cell was located between the tank farm and the camp accommodation building.

Following the initial aeration, the soil was treated with a two part hydrocarbon oxidizing agent called RegenOx. The RegenOx was added to the windrows following the manufacturer's instructions (Photograph 2). Part B of the oxidizing agent (the activator complex) was mixed with water and sprayed on each of the windrows. The windrow soils were then mixed using the Allu bucket and Part A (the oxidizing agent supplied as a powder) was distributed over the surface of the windrows. The Part A was then mixed into the windrows with the Allu bucket (Photograph 3). After mixing of both Part A and Part B into the soil on July 24 and 25, 2009, water from a nearby lake was applied to the windrows until the soil was saturated to a point where water pooled on the surface of the soil (Photograph 4). Water was generally applied to the windrows daily to maximize the moisture content of the windrows.

To complete the process, RegenOx was added to the windrows a second time following the same procedures between July 29 and August 1. For the second application, water was not added to the windrows after the final pass with the Allu bucket. Instead, the soil was placed as backfill in the excavations. The areas where each windrow was placed were mapped using a GPS (Figure 2). Following placement of the soil back in the

excavations, water was pumped onto the surface of the main excavation at the historic fuel spill area until water pooled on the surface.

4.5 In Situ Surface Treatment Methodology

Parts A and B of RegenOx were added to the base of the historic fuel spill excavation on July 24 and July 25, 2009 to deal with residual hydrocarbon impacts near the geomembrane. The RegenOx was mixed into the upper layer of base soils using a metal drag pulled behind an all terrain vehicle. For areas where the drag was ineffective, or might damage the geomembrane, hand rakes were used to mix the RegenOx into the soil. Approximately 3000 L of water was applied to the base of the excavation to increase moisture content and in an attempt to leach some of the RegenOx through the foam and fibre geomembrane into the underlying soil.

4.6 In Situ Subsurface Treatment Methodology

The subsurface in situ system was primarily set up to determine the mechanical effectiveness and limiting factors that this sort of system may encounter at the site. Observations and discussion on the findings are in Section 5.3.

Using equipment and supplies available on-site, aqueous solutions of Part A and Part B RegenOx were applied through subsurface piping to the shallow subsurface soils located between the historical fuel spill excavation and the west side tank farm berm. An area of soil approximately 2.5 m x 32 m was left in place between the toe of the berm and the excavation to maintain the stability of the berm. A shallow trench was dug approximately 0.4 m deep and 1 m from the toe of the berm (Photograph 5 and Photograph 6). Seven bagged samples (berm 1 to berm 7) were collected from the base of the trench to field screen with the OVA. Perforated 50 mm PVC pipe was placed at the base of the trench. The three meter sections of perforated pipe were alternating lengths of factory produced

size 0.020 slotted pipe and solid pipe that was perforated on-site with 7 mm holes drilled through it at approximately 100 mm intervals (Photograph 7). The perforated pipe was attached to four vertical pipes which rose to approximately one meter above grade. The trench was backfilled with soil and solutions of Part A and Part B were added via the vertical pipes. The piping system was flushed with water following the application of each RegenOx solution.

Table 1: Subsurface Application of RegenOx in situ

Date	Part	# of Pails	Volume of solution	Volume of flushing water	Notes
July 26	B	4	1600 L	700 L	Some water surfacing at 2 points.
July 26	A	2	1100 L	300 L	1/3rd added to surface due to saturation/preferential surfacing of solution.
Aug 1	B	2	600 L	200 L	Solution surfacing after ~300 L of water added. Shallow trench and berm dug to impound surface water at location. Vigorous reaction at surface.
Aug 3	A	2	600 L	100 L	Same as Aug 1. The horizontal pipe was exposed with a shovel. The RegenOx was observed to be flowing freely through the perforations.

The vertical pipes were removed following the final application of RegenOx. The perforated pipe within the trench was left in place.

5. RESULTS AND DISCUSSION

Analytical results for samples taken from excavation walls and the treated soils are summarized in Tables 3 and 4.

5.1 Historical Fuel Spill Area

Laboratory results from soil samples collected during mid treatment (early August) and post treatment (mid September) reported a slight decrease in hydrocarbon concentrations. However, concentrations of F2 hydrocarbons remain above NWT industrial and

residential parkland guidelines for soils treated in Windrow 1. The same soil contained concentrations of F3 hydrocarbons below industrial guidelines but above residential/parkland guidelines.

Results for one soil sample from Windrow 2 reported an F2 hydrocarbon concentration above industrial and residential/parkland guidelines. All remaining hydrocarbon parameters from soil samples collected from Windrows 1 and 2 were below the applicable guidelines for both land uses. All reported hydrocarbon concentrations from Windrow 3 were below NWT guidelines for industrial and residential/parkland land uses (Table 3).

To determine if the treatment strategy was effective, there are a number of sample location results from the 2006 ESA that may be used to compare pre-treatment hydrocarbon exceedance characteristics. Soil sample S06-23 was taken from near the northeast corner of the excavation and contained F2 concentrations up to 4220 mg/kg and F3 concentrations up to 3980 mg/kg (WorleyParsons Komex, 2006a). These results were greater than five times the highest 2009 post treatment analytical results. In 2006, soil sample S06-40 contained F2 concentrations up to 787 mg/kg and F3 concentrations up to 754 mg/kg (WorleyParsons Komex, 2006a). For this sample, the 2006 and post treatment 2009 results for F3 hydrocarbons are similar while the 2006 F2 result is 1.3 times higher than the highest post treatment 2009 result. The 2006 ESA had determined that a soil sample in this area contained xylenes and two samples contained toluene above guidelines (WorleyParsons Komex, 2006a). Analytical results for treated soils in 2009 reported concentrations of BTEX below NWT industrial and residential/parkland guidelines.

Confirmatory samples (SS09-01 to SS09-07) taken from 0 m to 0.5 m depths along the perimeter of the unexcavated vegetated island were below guidelines for BTEX and F1 to

F4 hydrocarbons (Table 3). This supports the field assessment that this 400 m^2 portion of vegetated pad material is not impacted by hydrocarbons.

Laboratory results from characterization samples (SS09-08 to SS09-10) taken from the eastern wall of the excavation adjacent to the tank farm berm reported concentrations of F2 and F3 hydrocarbons above both NWT industrial and residential/parkland guidelines with the exception of the F3 hydrocarbon concentration reported in SS09-08 below industrial guidelines but above residential/parkland (Table 3).

Two soil samples (SS09-11 and SS09-12) were collected from the southeast wall. Soil sample SS09-11 exceeded both industrial and residential/parkland guidelines while reported hydrocarbons in SS09-12 were below both land use guidelines. The excavation was not enlarged near these sample locations so that the integrity of the adjacent tank farm and treatment cell berms would not be compromised.

A reported F2 hydrocarbon concentration from soil sample SS09-14 collected from the south wall of the excavation exceeded both the industrial and residential/parkland land use guidelines. All other hydrocarbon parameters from this sample and SS09-15 were below the applicable guidelines for both land uses (Table 3).

Confirmatory soil sample SS09-15 was collected from excavation 2, approximately 12 m towards the southwest. Results from this sample were below guidelines for BTEX and F1 to F4 hydrocarbons, indicating that at least 30 m^3 of hydrocarbon impacted soil may remain between excavation 1, 2 and the tank farm berm. However, delineation of impacts in this area is incomplete.

5.2 Small Localized Excavations

Four small localized areas of hydrocarbon impacts were excavated and later sampled for BTEX and F1 to F4 hydrocarbons.

- Outside the southwest corner of the tank farm (Excavation 2);
- Midway along the south berm of the tank farm (Excavation 3);
- On the pad area between former storage racks (Excavation 4); and,
- Near the camp building day tank (Excavation 5).

All hydrocarbon concentrations were below industrial and residential/parkland guidelines for the samples taken from excavation 2 at the southwest corner of the tank farm (SS09-15) and excavation 5 at the day tank area (SS09-18).

Fraction 2 hydrocarbon concentrations exceeded both NWT industrial guidelines and residential/parkland for excavation 3 (SS09-16) south of the tank farm. Reported F3 hydrocarbon concentrations were below the industrial criteria but exceeded the residential/parkland guidelines. In excavation 4 in the storage area of the pad, reported concentrations of F3 hydrocarbons from soil sample SS09-17 were also below NWT industrial guidelines and above residential/parkland guidelines. All other hydrocarbon parameters were below the applicable guidelines for both land uses (Table 3).

After receiving initial laboratory results, both of these excavations were subsequently enlarged by 0.5 m on all four sides. The confirmatory samples from the sidewalls of the enlarged excavations were lost in transport between Camp Farewell and Canadian North's cargo facility. However, soil from the side walls of the enlarged excavations showed no visible signs of staining and low OVA readings.

5.3 In Situ Subsurface Treatment

It was anticipated that the porous gravel soil on the pad would allow the solutions of RegenOx to be transmitted laterally through the soil. However, the primary observation from the installed system was that pathways of preferential flow developed from the perforated piping, through the backfilled soil, to the surface. The solution did not seep through the soil into the adjacent open excavation (less than two meters to the west).

Solutions of Part A and Part B RegenOx that pooled on the surface reacted vigorously for several hours after application and the resulting solution turned brown. A brown staining on the soil remained following infiltration/evaporation of the solution.

Laboratory samples were not collected from the area where soils were treated in situ. Field screening OVA results indicated that initial volatile hydrocarbon concentrations were similar along the length of the trench (10 ppm to 25 ppm).

5.4 Remediation Observations

Following treatment, five soil samples from the ex situ treated soil were submitted and analysed for a salinity package. The reported pH results ranged from 9.78 to 9.97 and therefore exceeded the NWT guideline of pH 8 (Table 4). The elevated pH is a result of the high concentrations of sodium (up to 2600 mg/L) reported in the soil. The high concentration of sodium in the treated soil also impacted the sodium adsorption ratio (SAR). The SAR values reported from the treated soil exceed both the NWT industrial and residential/parkland land use guidelines.

Electrical conductivity (EC) from the treated soil was also elevated above industrial and residential/parkland land use guidelines. Reported EC results from the treated soil ranged from 3.7 dS/m to 8.7 dS/m. Only one sample from windrow 2 did not exceed the NWT

industrial guidelines. The elevated EC reported in the treated soil is a result of elevated concentrations of soluble sulphate (up to 770 mg/L).

Soil in this area was not characterized for salinity and sodicity parameters during the 2006 Phase II ESA (WorleyParsons Komex, 2006a) and soil samples were not submitted prior to treatment therefore the source of the elevated sodium and sulphate cannot be determined. However, material safety data sheets from the RegenOx indicate the active ingredient contains sodium.

5.5 Backfilling Excavations

The backfill in the large excavation west of the tank farm was placed in approximately 0.5 m lifts over a newly placed woven geotextile. Placement in thinner, compacted lifts of 0.15 m to 0.3 m was not possible with the equipment available on-site. This, along with the geotechnical properties of the soil, resulted in a soft, uncompacted backfill. Heavy equipment on the newly backfilled pad caused visible deflection of the surface during and immediately following soil placement.

The original contours of the pad in this area were difficult to replicate during backfilling and some shallow ponding of water on the backfilled material was observed during the site visit on September 16, 2009. The areas of ponded water also displayed the same brown soil staining associated with soils that were treated in situ.

5.6 Treatment Summary

The soil in the treatment cell was treated with aeration by approximately five passes of an Allu bucket and one complete treatment of RegenOx applied separately as parts A and B in two applications each.

Details of the soil treatment are shown in Table 2 below.

Table 2: 2009 Ex Situ Soil Treatment Summary Table

Location	Exc. # on Fig 2	Soil Volume Excavated & Treated	Soil Backfilled in Area	PHC Result below Guideline?	Industrial or Residential/ Parkland Guideline Exceedances
Historical Fuel Spill (On Pad)	1	410 m^3	Windrow 1 Location (700 m^2)	No	pH, salinity F1 and F2
		410 m^3	Windrow 2 Location (1600 m^2)	No	pH, salinity, F2
		440 m^3	Windrow 3 Location (1000 m^2) 4 small excavations.	Yes	pH, salinity
Southwest Corner of Tank Farm	2	~ 8.4 m^3 (3 x 4 x 0.7 m)	Windrow 3 Location (12 m^2)	Yes	pH, salinity
Midway Along South Side of Tank Farm	3	~ 10.5 m^3 (5 x 3 x 0.7 m)	Windrow 3 Location (15 m^2)	Confirmatory samples missing	pH, salinity, formerly F2 and F3
Storage Area on Pad	4	~ 8.6 m^3 (3.5 x 3.5 x 0.7 m)	Windrow 3 Location (12.25 m^2)	Confirmatory samples missing	pH, salinity formerly F3
Camp Day Tank	5	~ 12 m^3 (3 x 4 x 1 m)	Windrow 3 Location (12 m^2)	Yes	pH, salinity

Previously identified areas of hydrocarbon impacted soil that were not treated in 2009 are: the tundra portions of the historic fuel spill; tundra between pad and airstrip; the Herc tank area; and, the burn pit area.

6. CONCLUSIONS

Lab results reported that confirmatory soil samples collected from the vegetated island within the historical spill area, south and southeast wall were below applicable hydrocarbon criteria. Hydrocarbon impacts above NWT industrial and

residential/parkland guidelines remain in the soil adjacent to the tank farm berm and in the unexcavated plume locations identified in the 2006 ESA.

Reported hydrocarbon concentrations from soil samples collected from excavations 2 and 5 were below the applicable guidelines. Prior to excavation enlargement, F2 hydrocarbons exceeded both land use guidelines in excavation 3 and F3 hydrocarbons exceeded the residential/parkland guidelines in both excavations 3 and 4. New samples should be collected from these areas to confirm that impacted soil was successfully removed and hydrocarbons are below guidelines.

The BTEX and F1 hydrocarbon concentrations in the ex situ treated soils were reduced below NWT industrial and residential/parkland guidelines in all three windrows. All hydrocarbon parameters are below both land use guidelines far all samples collected from windrow 3. Laboratory results reported that only Fraction 2 hydrocarbon concentrations from one soil sample exceeded both NWT industrial and residential/parkland guidelines in windrow 2. Hydrocarbon impacts in the soil from windrow 1 exceed both NWT industrial and residential/parkland for F2 and residential/parkland guidelines for F3 hydrocarbons (Table 3).

Soil samples collected from windrows 1-3 following RegenOx treatment reported pH, SAR and EC values that exceeded the residential/parkland land use guidelines. All of the samples also exceeded the industrial land use guidelines for pH, SAR and EC with the exception of EC from soil collected from windrow 2 (Table 4).

IEG estimates that approximately 600 m^3 of the approximately 1300 m^3 of soils treated ex situ, still contain concentrations of F2 hydrocarbons above NWT industrial and residential/parkland guidelines as well as F3 hydrocarbons above residential/parkland guidelines. The in situ treated soil along the western side of the tank farm berm remains

above guidelines for both land uses and will require delineation and remediation following site decommissioning.

7. RECOMMENDATIONS

The treated soil that remains above applicable guidelines should be re-sampled prior to site decommissioning and if hydrocarbon concentrations remain above guidelines be remediated in conjunction with impacted soil from other areas of the pad.

Soil samples should be collected from the periphery of excavations 3 and 4 for analysis of F2 and F3 hydrocarbons to confirm that hydrocarbon impacts at these locations were successfully remediated.

The pH, salinity and sodicity of the backfilled excavations and surrounding soils should be monitored to determine if the treated soils remain constant or are influencing surrounding soil. Methods of reducing the pH of the treated soils to between pH 6 and 8 should be examined if results indicate that pH levels are impacting surrounding soils.

The backfilled areas should be contoured to limit pooling of water and promote drainage of surface water off of the pad. Drainage from the treated soils should be directed away from adjacent marshy areas to limit salinity impacts in adjacent standing water.

If the backfilled portion of the pad is to be used for material storage or vehicle traffic during periods when it is not frozen, the area should be compacted to improve surface stability. If available, fine silt or clay could be added to the soil to improve compaction.

8. CLOSURE

If you have any questions regarding this report or any further requests, please contact Sam Bird at (403) 731-6851, or by e-mail at sbird@ieg.ca.

Yours truly,

IEG CONSULTANTS LTD.

Sam Bird, B.Sc.
Project Manager

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TABLES

Table 3: 2009 CAMP FAREWELL SOIL HYDROCARBON ANALYTICAL RESULTS

SAMPLE INFORMATION					HYDROCARBONS										
					Benzene	Toluene	Ethylbenzene	Xylenes (total)	F1- BTEX (C6 - C10)	F2 (C10 - C16)	F3 (C16 - C34)	F4 (C34 - C50)	Moisture	pH	Sieve (>0.075mm)
Sample ID	Sample Date	Sample Type	Depth (m)	Location	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%		%
NWT Industrial Coarse Grained Surface Soil Guidelines					**5**	**0.8**	**20**	**20**	**230**	**150**	**1700**	**3300**	**-**	**6-8**	**-**
NWT Residential/Parkland Coarse Grained Surface Soil Guidelines					**0.5**	**0.8**	**1.2**	**1**	**130**	**150**	**400**	**2800**	**-**	**6-8**	**-**
HISTORICAL FUEL SPILL AREA															
SS09-01	22-Jul-09	Discrete	0-0.5	Vegetated Island	<0.0050	<0.020	<0.010	<0.040	<12	68	61	<10	8	-	-
SS09-02	22-Jul-09	Discrete	0-0.5	Vegetated Island	<0.0050	<0.020	<0.010	<0.040	<12	<10	26	<10	6.2	-	97
SS09-03	22-Jul-09	Discrete	0-0.5	Vegetated Island	<0.0050	<0.020	<0.010	<0.040	<12	16	52	11	7.1	-	-
SS09-04	22-Jul-09	Discrete	0-0.5	Vegetated Island	<0.0050	<0.020	<0.010	<0.040	<12	<10	65	19	8.3	-	-
SS09-05	22-Jul-09	Discrete	0-0.5	Vegetated Island	<0.0050	<0.020	<0.010	<0.040	<12	<10	110	29	9.1	-	-
SS09-06	22-Jul-09	Discrete	0-0.5	Vegetated Island	<0.0050	<0.020	<0.010	<0.040	<12	56	100	<10	4.3	-	97
SS09-07	22-Jul-09	Discrete	0-0.5	Vegetated Island	<0.0050	<0.020	<0.010	<0.040	<12	<10	11	<10	4.8	-	-
SS09-08	22-Jul-09	Discrete	0-0.5	Tank Farm Exc.Wall	<0.0050	<0.020	<0.010	<0.040	<12	**400**	**920**	13	5.4	-	-
SS09-09	22-Jul-09	Discrete	0-0.5	Tank Farm Exc.Wall	<0.0050	<0.020	<0.010	<0.040	66	**2500**	**2900**	36	5.4	-	99
SS09-10	22-Jul-09	Discrete	0-0.5	Tank Farm Exc.Wall	<0.0050	<0.020	<0.010	<0.040	110	**3700**	**3800**	30	5.3	-	-
SS09-11	22-Jul-09	Discrete	0-0.5	SE Wall of Exc.	<0.0050	<0.020	<0.010	<0.040	<12	**1300**	**2900**	64	7.8	-	-
SS09-12	22-Jul-09	Discrete	0-0.5	SE Wall of Exc.	<0.0050	<0.020	<0.010	<0.040	<12	<10	24	<10	5.6	-	96
SS09-13	22-Jul-09	Discrete	0-0.5	S Wall of Exc.	<0.0050	<0.020	<0.010	<0.040	<12	<10	17	<10	5.6	-	-
SS09-14	22-Jul-09	Discrete	0-0.5	S Wall of Exc.	<0.0050	<0.020	<0.010	<0.040	<12	**170**	35	<10	5.1	-	97
SMALL LOCALIZED EXCAVATIONS															
SS09-15	22-Jul-09	Discrete	0-0.5	Exc.#2, SW of TF	<0.0050	<0.020	<0.010	<0.040	<12	22	210	13	6	-	-
SS09-16	22-Jul-09	Discrete	0-0.5	Exc.#3, S of TF	<0.0050	<0.020	<0.010	<0.040	<12	**240**	**580**	<10	5.9	-	-
SS09-17	22-Jul-09	Discrete	0-0.5	Exc.#4, Old Storage Area	<0.0050	<0.020	<0.010	<0.040	<12	<10	**440**	150	6.2	-	92
SS09-18	22-Jul-09	Discrete	0-0.5	Exc.#5, Day Tank	<0.0050	<0.020	<0.010	<0.040	<12	<10	26	<10	2.9	-	-
WINDROW 1															
SS09-CWR1-1	2-Aug-09	Composite	N/A	Windrow 1	<0.0050	<0.020	<0.010	0.10	<12	**700**	**910**	45	7.1	-	-
SS09-CWR1-2	2-Aug-09	Composite	N/A	Windrow 1	<0.0050	<0.020	<0.010	<0.040	14	**600**	**780**	30	7.7	-	-
SS09-WR1-3	2-Aug-09	Discrete	N/A	Windrow 1	<0.0050	<0.020	<0.010	<0.040	23	-	-	-	8.7	-	-
SS09-WR1-7	2-Aug-09	Discrete	N/A	Windrow 1	<0.0050	<0.020	<0.010	<0.040	100	-	-	-	6.8	-	-
0916-SS09-05	16-Sep-09	Discrete	0.1-0.4	Windrow 1	<0.0050	0.043	<0.010	<0.040	<12	-	-	-	8.3	-	-
0916-SS09-10	16-Sep-09	Discrete	0.1-0.4	Windrow 1	<0.0050	<0.02	<0.010	<0.040	26	-	-	-	7.6	-	-
0916-SS09-11	16-Sep-09	Discrete	0.1-0.4	Windrow 1	<0.0050	0.05	<0.010	0.17	40	-	-	-	8.3	-	-
0916-SS09-WR1-1	16-Sep-09	Composite	0.1-0.4	Windrow 1	-	-	-	-	-	**450**	**600**	<10	7.5	**9.78**	-
0916-SS09-WR1-2	16-Sep-09	Composite	0.1-0.4	Windrow 1	-	-	-	-	-	**530**	**630**	<10	6.7	-	-
0916-SS09-WR1-3	16-Sep-09	Composite	0.1-0.4	Windrow 1	-	-	-	-	-	**590**	**780**	<10	7.6	**9.9**	-
WINDROW 2															
SS09-CWR2-1	2-Aug-09	Composite	N/A	Windrow 2	<0.0050	<0.020	<0.010	<0.040	36	120	190	22	8.2	-	-
SS09-CWR2-2	2-Aug-09	Composite	N/A	Windrow 2	<0.0050	<0.020	<0.010	<0.040	22	140	180	13	7.5	-	-
SS09-WR2-12	2-Aug-09	Discrete	N/A	Windrow 2	<0.0050	0.022	<0.010	<0.040	47	-	-	-	6.8	-	-
SS09-WR2-3	2-Aug-09	Discrete	N/A	Windrow 2	<0.0050	<0.020	<0.010	<0.040	110	-	-	-	6.7	-	-
SS09-WR2-6	2-Aug-09	Discrete	N/A	Windrow 2	<0.0050	<0.020	<0.010	<0.040	49	-	-	-	7.2	-	-
0916-SS09-18	16-Sep-09	Discrete	0.1-0.4	Windrow 2	<0.0050	0.044	<0.010	<0.040	50	-	-	-	9	-	-
0916-SS09-25	16-Sep-09	Discrete	0.1-0.4	Windrow 2	<0.0050	<0.02	<0.010	<0.040	20	-	-	-	9.2	-	-
0916-SS09-WR2-1	16-Sep-09	Composite	0.1-0.4	Windrow 2	-	-	-	-	-	**160**	190	<10	9.5	**9.88**	-
0916-SS09-WR2-2	16-Sep-09	Composite	0.1-0.4	Windrow 2	-	-	-	-	-	76	110	<10	10	-	-
WINDROW 3															
SS09-CWR3-3	4-Aug-09	Composite	0.1-0.4	Windrow 3	-	-	-	-	-	95	100	20	6.3	-	-
SS09-CWR3-4	4-Aug-09	Composite	0.1-0.4	Windrow 3	-	-	-	-	-	85	120	13	7.3	-	-
SS09-CWR3-5	4-Aug-09	Composite	0.1-0.4	Windrow 3	-	-	-	-	-	110	120	12	12	-	-
SS09-WR3-13	4-Aug-09	Discrete	0.1-0.4	Windrow 3	<0.0050	0.025	<0.010	<0.040	<12	-	-	-	14	-	-
SS09-WR3-18	4-Aug-09	Discrete	0.1-0.4	Windrow 3	<0.0050	0.057	<0.010	<0.040	<12	-	-	-	9	-	-
SS09-WR3-25	4-Aug-09	Discrete	0.1-0.4	Windrow 3	<0.0050	0.023	<0.010	<0.040	<12	-	-	-	7.8	-	-
0916-SS09-28	16-Sep-09	Discrete	0.1-0.4	Windrow 3	<0.0050	0.043	<0.010	<0.040	12	-	-	-	8.3	-	-
0916-SS09-33	16-Sep-09	Discrete	0.1-0.4	Windrow 3	<0.0050	0.032	<0.010	<0.040	<12	-	-	-	7.8	-	-
0916-SS09-40	16-Sep-09	Discrete	0.1-0.4	Windrow 3	<0.0050	0.031	<0.010	<0.040	<12	-	-	-	8.1	-	-
0916-SS09-WR3-1	16-Sep-09	Composite	0.1-0.4	Windrow 3	-	-	-	-	-	55	49	<10	7.9	**9.97**	-
0916-SS09-WR3-2	16-Sep-09	Composite	0.1-0.4	Windrow 3	-	-	-	-	-	27	27	<10	8.5	-	-
0916-SS09-WR3-3	16-Sep-09	Composite	0.1-0.4	Windrow 3	-	-	-	-	-	110	160	<10	8.3	**9.85**	-

N/A = Not Applicable

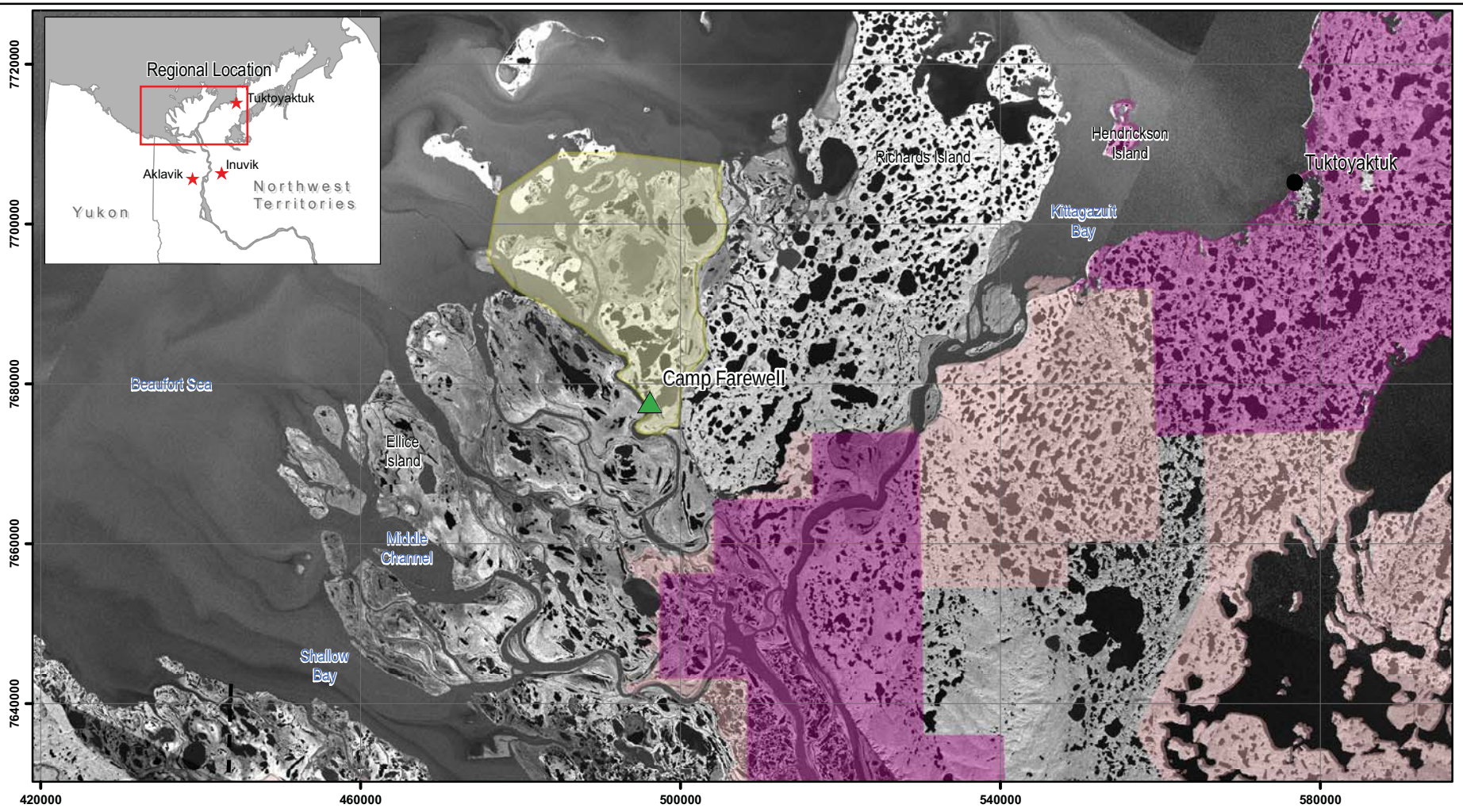
Highlighted Bold	Sample exceeds NWT Industrial Land Use Guideline (Eco Soil Contact and Protection of Groundwater for Aquatic Life Exposure Pathways)
Bold	Sample exceeds NWT Residential/Parkland Land Use Guideline (Eco Soil Contact and Protection of Groundwater for Aquatic Life Exposure Pathways)

Table 4: 2009 CAMP FAREWELL SOIL SALINITY ANALYTICAL RESULTS

SAMPLE INFORMATION															
					Soluble Conductivity	Soluble (CaCl2) pH	pH	Sodium Absorption Ratio	Soluble Chloride	Soluble Calcium	Soluble Magnesium	Soluble Sodium	Soluble Potasium	Soluble Sulphate	% Saturation	Theoretical Gypsum Requirement
Sample ID	Sample Date	Sample Type	Depth (m)	Location	dS/m	-		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	tons/ac
NWT Industrial Coarse Grained Surface Soil Guidelines					**4**	-	**6-8**	**12**	-	-	-	-	-	-	-	-
NWT Residential/Parkland Coarse Grained Surface Soil Guidelines					**2**	-	**6-8**	**5**	-	-	-	-	-	-	-	-
WINDROW 1																
0916-SS09-WR1-1	16-Sep-09	Composite	0.1-0.4	Windrow 1	**6.8**	8.27	**9.78**	**70**	19	43	15	2100	4	580	61.0	98
0916-SS09-WR1-3	16-Sep-09	Composite	0.1-0.4	Windrow 1	**8.7**	8.47	**9.90**	**62**	48	93	26	2600	10	770	40.0	99
WINDROW 2																
0916-SS09-WR2-1	16-Sep-09	Composite	0.1-0.4	Windrow 2	**3.7**	8.21	**9.88**	**30**	72	79	22	1200	6.4	480	44.1	14
WINDROW 3																
0916-SS09-WR3-1	16-Sep-09	Composite	0.1-0.4	Windrow 3	**7.5**	8.63	**9.97**	**56**	46	89	26	2400	7.1	700	44.0	86
0916-SS09-WR3-3	16-Sep-09	Composite	0.1-0.4	Windrow 3	**5.9**	8.43	**9.85**	**50**	24	65	23	1800	4.7	590	48.5	57

Highlighted Bold	Sample exceeds NWT Industrial Land Use Guideline (Eco Soil Contact and Protection of Groundwater for Aquatic Life Exposure Pathways)
Bold	Sample exceeds NWT Residential/Parkland Land Use Guideline (Eco Soil Contact and Protection of Groundwater for Aquatic Life Exposure Pathways)

FIGURES



LEGEND/NOTES

- Kendall Island Bird Sanctuary
- 7(1)a Inuvialuit (Private) Lands
- 7(1)b Inuvialuit (Private) Lands

1. Horizontal Datum: NAD83
2. Grid Zone: UTM ZONE 8
3. Vertical Datum: MEAN SEA LEVEL
4. Scale: 1 : 750,000

0 5,000 10,000 20,000 30,000 40,000 Metres

N

TO BE READ WITH IEG REPORT DATED: DEC 2009

CLIENT: Shell Canada Energy

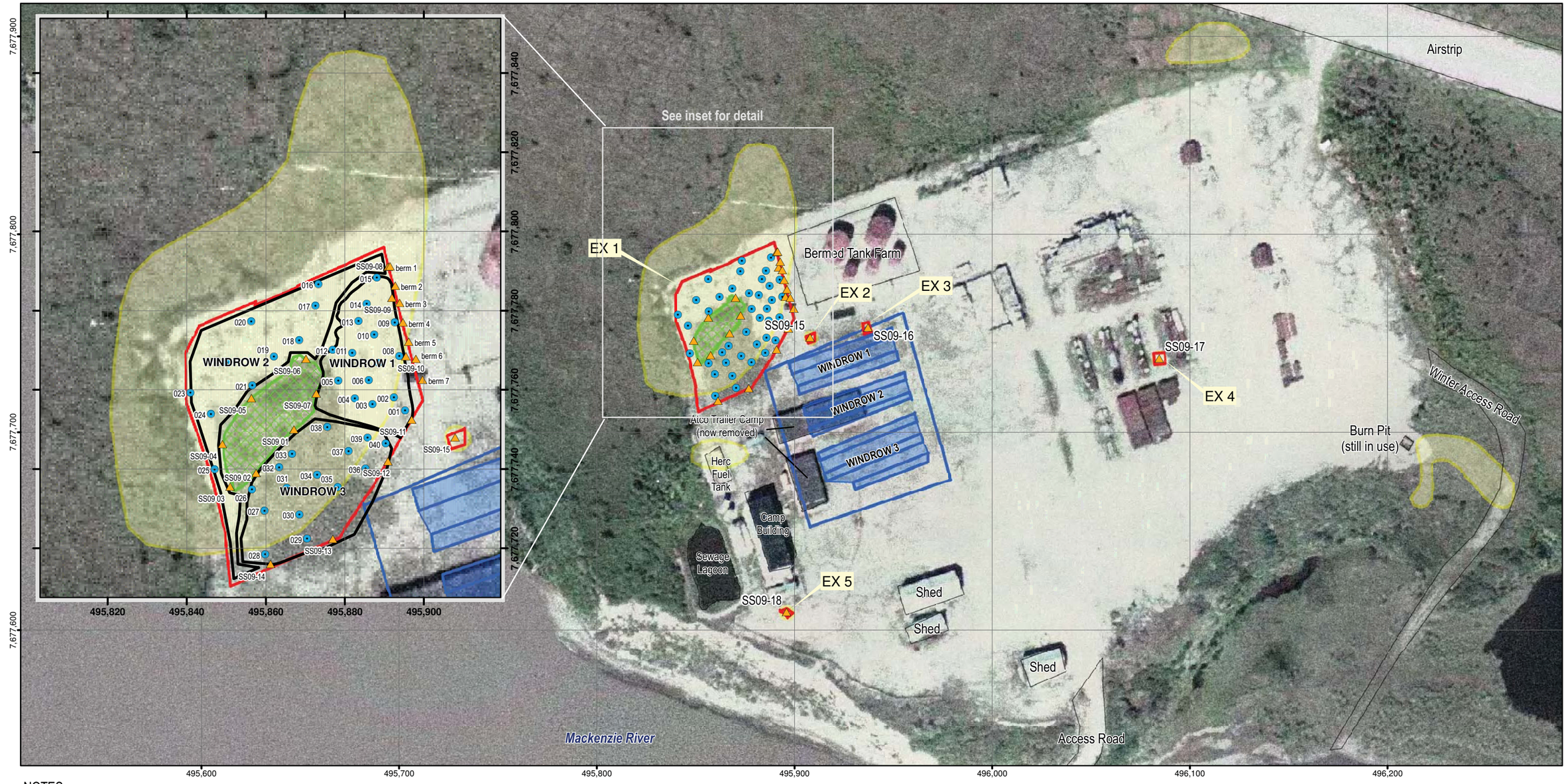
PROJECT: CAMP FAREWELL MAINTENANCE

TITLE: Camp Farewell Location

IEG CONSULTANTS LTD.

PROJECT No.: A04012A01

FIG No.: FIGURE 1



NOTES

1. Horizontal Datum: NAD83
2. Grid Zone UTM ZONE 8
3. Vertical Datum: MEAN SEA LEVEL
4. Scale 1 : 2,000

0 25 50 75 100 Metres

N

EX 1

- July Sampling Locations
- September Sampling Locations
- CampInfrastructure
- Excavated Extent
- Unexcavated Vegetated Extent
- Original Windrows
- Consolidated Windrows
- Interpreted Spill Extent (WPK, 2006)
- Backfilled Areas

Sources:
1. Indian and Northern Affairs Canada, (2005) Mackenzie Delta and Valley Airphoto Mapping Program. OrthoTile 490767. 1:30,000. Yellowknife, NWT.

2. WorleyParsons Komex (WPK) and IEG Consultants Ltd (2006) 2006 Environmental Site Assessment, Camp Farewell NT.

NOT FOR CONSTRUCTION

TO BE READ WITH IEG REPORT DATED: DEC 2009

CLIENT: Shell Canada Energy

PROJECT: CAMP FAREWELL MAINTENANCE

TITLE: Petroleum Hydrocarbon Remediation - 2009

PROJECT NO.: A04012A01

FIG. NO.: FIGURE 2

APPENDIX I

Memorandums

MEMORANDUM

TO:	Randall Warren – Shell Canada Gord Johnson – Worley Parsons Kevin Ericson – Hazco Project Manager Davide Careddu – Hazco Onsite Supervisor	**DATE:**	July 17, 2009
FROM:	David Wells – IEG Consultants Ltd.	**FILE NO:**	A04012A01.02.01
		LOG NO:	090717M
SUBJECT:	UPDATE – PHC Contaminate Soils Camp Farewell		

1. BACKGROUND

A Phase II ESA was conducted by Worley Parsons (WP) at the Camp Farewell site in 2006. Camp Farewell is owned and operated by Shell Canada. The site is located in the Mackenzie Delta, Northwest Territories. The ESA found petroleum hydrocarbon (PHC) concentrations in soil exceeding applicable guidelines in several areas of the gravel pad and adjacent tundra. An Interim Abandonment and Restoration Plan for the site was developed by WP in 2006 as required by the existing Northwest Territories Water License N7L1-1762.

2. SCOPE OF WORK

A scope of work was developed by WP for the treatment of PHC contaminated soils located within the gravel pad area of the site (attached). The scope of work details the areas of PHC contaminated soil. In total approximately 2500 cubic meters of PHC soils were identified for excavation and onsite treatment. Four areas at the site were identified for excavation and onsite treatment. These areas include:

- Historical fuel spill (adjacent to west side of existing tank farm);
- New fuel spill area (adjacent to west and east side of existing “Herc” tank);
- Burn pit; and,
- Remaining areas throughout the site.

3. DEVIATIONS FORM THE SCOPE OF WORK

Gord Johnson (GJ) and Kevin Ericson (KE) visited the site on Monday July 13, 2009. David Wells (DW) of IEG and GJ inspected the historical fuel spill area and the burn pit area. During the inspection it was noted that the majority of the PHC contaminated soils surrounding the burn pit are either located off of the existing lease, or are located within the adjacent tundra. GJ decided that the PHC contaminated soils located at the burn pit area will not be excavated, as the burn pit continues to be used for onsite activities, and as mentioned above the majority of the soils are located off lease and/or in the tundra. It is recommended that the burn pit PHC contaminated soils should be removed during facility decommissioning.

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867-777-8520 t • 867-777-2747 f • www.ieg.ca

A large area of willow/alder is present within the historical fuel spill area. GJ decided that the trees should be removed. DW reviewed the Phase II ESA and determined that soil samples collected within the treed area did not contain PHC concentrations exceeding the guidelines with the exception of Toluene. KE and DW discussed the trees with Randall Warren (RW). It was determined that the treed area would not be excavated, but that soil samples would be collected from the excavation side walls and analyzed using an Organic Vapour Analyzer (OVA) and submitted for confirmatory analysis at an accredited analytical laboratory.

The western portion of the new fuel spill area is currently inaccessible to the excavator due to the proximity of adjacent tunda, vegetation, and the fuel tank which currently holds approximately 160,000 L of diesel fuel. While the eastern portion of the new fuel spill area is accessible, it was discussed by DW, KE, and Davide Careduu (DC) that the excavation not proceed due to the proximity of the fuel tank. If excavation is required it is recommended that a geotechnical engineer access the situation as the granular material used for the berm and gravel pad construction does not contain many fine grained materials, and hence does not compact adequately.

Excavation of the PHC contaminated soils throughout the remainder of the gravel pad will continue as per the original scope of work.

4. WORK UPDATE

As of end of day Thursday July 16, 2009 approximately 1200 cubic meters of PHC contaminated soils have been excavated from the historical fuel spill area and transported to the treatment area. Polyurethane insulation has been encountered throughout the excavation area ranging in depth from 15 to 60 cm below ground surface. Soil has been placed in windrows in the treatment area. Each windrow contains approximately 200 cubic meters.

The current plan is to mix each windrow using the Allu bucket attached to the excavator. KE has contacted the supplier of the RegenOx oxidation additives. The supplier recommends that the Type B material be added first, the soil mixed again using the Allu bucket. Afterwards the Type A material would be added and mixed using the Allu bucekt. Application methods are presently under consideration by onsite staff. The soils will sit in windrows for approximately 1 week while being hydrated. Following the one week hydration period the RegenOx would be added as per the above description and then placed back into the excavation area.

Because of the presence of the polyurethane foam, PHC contaminated soils remain on the floor of the excavation. It is recommended that the RegenOx be applied to the excavation floor to reduce the concentration of PHC in the remaining soils.

Finally it is recommended that “Filter Cloth” Geotextile be laid on the floor of the excavation prior to backfilling. It is anticipated that the Geotextile will help alleviate the surface subsidence

that has occurred in the area of the historical spill. The onsite contractor, MDIOS, will supply onsite staff with the cost of Geotextile which will be forwarded to RW for approval.

5. CLOSURE

If you have any questions or concerns regarding the above, please contact the undersigned via email at dwells@klohn.com.

Yours truly,

IEG CONSULTANTS LTD.

David Wells, M.A.Sc
Northern Manger

Encl. Worley Parsons Memorandum: Camp Farewell – 2009 Remediation Program

WorleyParsons
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www.worleyparsons.com

MEMORANDUM

DATE	6 July 2009
TO	Randall Warren, Shell
FROM	Gordon Johnson
COPY	David Wells, IEG Keith, HAZCO
PROJECT NAME	Camp Farewell - 2009 Remediation Program
PROJECT NO.	C5236-05-00
SUBJECT	Work Plan and Safety Interface Document
FILE LOC.	Calgary

Introduction

This document summarizes the scope and nature of the 2009 Remediation Program for the Camp Farewell Site, referred to herein as the 2009 Program. A detailed description of the basis of the 2009 Program is provided in the following documents:

- Interim Abandonment and Restoration Plan, Camp Farewell NT (WorleyParsons, 2008)
- 2006 Environmental Site Assessment, Camp Farewell NT (WorleyParsons, 2006)

These documents should be consulted to understand the nature of the site conditions, the goals of the 2009 Program, and the constraints that are imparted on the 2009 Program. Activities described in the Interim Abandonment and Restoration Plan have been reviewed and accepted by the appropriate federal and territorial regulators and for the purpose of the 2009 Program may be considered regulatory commitments. For the purpose of this document, activities have been grouped as follows:

- removal and packaging of surplus materials and debris
- remedial excavations
- construction of the treatment area
- handling and treatment of contaminated soils
- soil testing

- draining and reclamation of the sewage lagoon

Removal of Materials and Debris

The materials and debris that are currently present in the areas of the remedial excavations and soil treatment area will encumber efficient execution of the work and, in the case of drilling consumables and like materials, represent a potential source of additional soil contamination. Hence, these materials must be carefully removed and either stored or disposed properly prior to execution of remedial works. The following procedures are recommended for this work.

a. All inert materials (steel, wood, packaging, etc.) should be removed from the remedial excavation and soil treatment areas, and either removed from the Site or stockpiled at an appropriate, out of the way, on-Site location.

b. All contained materials (e.g. drilling consumables in C-Cans) should be removed from the work area and either removed from the Site or stockpiled at an appropriate, out of the way location.

c. Spilled materials, such as drilling consumables, that have the potential to contaminate soils, should be excavated and placed in sealed containers such as C-Cans. Mechanical equipment can be used provided that the spilled materials can be collected without incorporating excessive quantities of underlying materials and without mixing spilled materials into the underlying soils. Otherwise, hand shovels should be used to collect spilled materials.

d. Collected spilled materials and inert debris that serve no further function at Camp Farewell should be transferred to Inuvik for ongoing storage or disposal at an approved facility licensed to accept the wastes in question.

Remedial Excavations

The areas of the planned remedial excavations are illustrated in the Interim Abandonment and Restoration Plan. The principles of the remedial excavation program are summarized as follows.

1. Areas planned for remedial excavation that are located within the proposed soil treatment area should be excavated first. Then the historical fuel spill area, which comprises the largest proportion of the contaminated materials, should be excavated and transferred to the treatment area once the treatment area is established.
2. The remaining areas should be remediated in the following order
    a. The new fuel spill area
    b. The burn pit
    c. Remaining areas
3. Remedial excavations should be initiated at one edge of the inferred area of contamination as shown in the Interim Abandonment and Restoration Plan. Once a clean edge has been determined, the remedial excavation would be expanded to include the entire contaminated mass.

4. Gravel soils containing visible evidence of contamination by drilling consumables should be removed and stockpiled separately to prevent potential additional mineral contamination (salts or metals). Samples of these materials should be collected to determine whether these materials can be effectively treated or whether they need to be disposed separately to prevent cross-contamination by metals and/or salts.
5. The remedial excavation will be advanced based on the presence of visible contamination, hydrocarbon odours, or elevated organic vapour measurements. Based on WorleyParsons experience on similar projects, diesel contamination is evidenced by OVA readings in excess of 80 ppm.
6. The remedial excavation should be advanced vertically until either native tundra or polyurethane foam insulation is encountered. Care should be taken to prevent damage to the underlying polyurethane insulation.

Contaminated materials from each individual source area should be transferred directly to the soil treatment area. These materials should be treated separately (to as reasonable a degree as practically possible) as the plan is to return the treated soils to their approximate point of origin.

The underlying text provides a summary of the OVA testing protocol to be implemented for the 2009 Program.

Field Organic Vapour Analyzer Procedure

Field Organic Vapour Analyzer (OVA) measurements can provide a reliable indicator of hydrocarbon contamination levels, provided that the hydrocarbons are in the volatile range (approximately C_{16} and below). Procedures for implementing OVA screening of hydrocarbon contaminated soils in the field are as follows:

1. *Collect representative soil samples at selected locations, within a depth of 150 mm of the soil surface. Place soils in sealed ziplock bags (minimum size 2 L) such that the bag is approximately 1/3 full.*
2. *Collect representative samples of the soils at the limits of the excavations using judgement of typical conditions based on visual characteristics and odour. Collect representative samples of the stockpiled or treated soils using the pre-set grid pattern.*
3. *Allow the samples to come to equilibrium at room temperature (usually 20 minutes) with the ziplock bag sealed.*
4. *Measure the organic vapours using a Gastech organic vapour analyzer (OVA). Charge and calibrate the unit before each shift. Turn the OVA on and allow to equalize in a fresh air environment over a period of approximately 5 minutes prior to use. Once the read-out is stable, zero the unit prior to initiating each test.*
5. *Position the methane eliminator button to "on".*
6. *Measure the air in the bag head-space by inserting the vacuum tube while taking care to avoid venting the head-space of the sample while completing the test.*

Verification sampling in accordance with the Soil Sampling methodology will be completed once the remedial excavation has been completed. Where the base of the remedial excavation encounters foam insulation, no verification sampling is required.

Treatment Pad Construction

Treatment of hydrocarbon contaminated soils will occur in the central portion of the Camp Farewell gravel pad, as close as practical to the location of the large historical fuel spill. The desired area for treatment is approximately 1 hectare (100 m by 100m, or equivalent). No preparation of the treatment pad is required other than grading flat and filling in any remedial excavations that may have occurred in the treatment area.

The outside perimeter of the treatment area will be established by constructing perimeter berms a minimum of 0.4 m high and 2 metres wide at the base. Perimeter berms should be constructed using a thin lift of gravel soils obtained from the base of the treatment area to form a smooth, competent and firm surface.

The outer perimeter of the berm should be sloped to drain into the surrounding lands. If pooling water occurs around the outside of the perimeter berms, a drainage ditch should be constructed to promote free outer drainage of the Site. Water that may collect on the inside of the treatment cell can be used to moisten the soils in the treatment process.

Soil Treatment

The goal is to achieve remediation of the soils in question through volatilization and bioremediation of the hydrocarbon contaminated soils. Mixing and aeration will be achieved through the use of an Allu Bucket. Enhancement of longer term bioremediation will be achieved by inoculating the mixed soils using an oxidizing additive, RegenOx (see Appendix 1). The following procedure should be used to optimize the effect of the remedial effort.

- Contaminated soils should be mixed on a continuous basis, throughout the duration of the 2009 Program, using an Allu Bucket. Continuous mixing will be achieved by cycling the treatment around and around the contaminated soils.
- Contaminated soils should be placed in windrows oriented east-west and approximately 1 m high. The grade of the windrow on the south facing side should be about 5H:1V. The grade of the windrow on the north facing side should be about 1.5H:1V. This arrangement will optimize thermal adsorption from the sun.
- Rocks having sizes greater than 100 mm diameter should be removed from the gravel to prevent damage to the Allu Bucket.
- The oxidizing additive should be introduced to the soils after they have been mixed at least once and preferably twice. The RegenOx should be mixed into the soils in accordance with the manufacturer's instructions, which are attached as Appendix 1. Once these soils have been amended and placed, the treated soils should be kept moist by pumping water from the sewage lagoon onto the amended mass or by using water that collects in the treatment area.
- The base plan is to mix the soils once or twice, in their dry state, prior to amending using RegenOx. The soils would then be re-mixed in a dry state, between the first and second application of RegenOx. Ideally, the mass of soil would be retreated with RegenOx just prior to

demobilization from the Site. This planned treatment schedule is subject to change depending on progress and weather.

Soil Sampling

Sampling of the remedial excavations will be completed following the remedial excavation. Composite samples of the perimeter of the excavation should be collected in accordance with the underlying protocol and should be analyzed for BTEX and F1 to F4 PHC Fractions by Maxxam Analytics. Samples should be collected to represent minimum 200 m^2 and maximum 400 m^2 areas, including the base and sidewalls.

Sampling of the treated soils will be completed following the final stage of treatment, one week following the second RegenOx application. Composite samples of the treated soils should be collected in accordance with the underlying protocol and should be analyzed for BTEX and F1 to F4 PHC Fractions by Maxxam Analytics. Samples should be collected to represent minimum 100 m^3 and maximum 200 m^3 volumes of soil undergoing treatment and those zones of soil should be managed separately so that the sample results remain relevant to the treated soils in question.

Soil Sampling Protocol

Soil samples should be collected as follows:

- *Prior to sampling, appropriate jars, bags and coolers should be ordered from the laboratory ahead of time.*
- *For treated soils, select discrete and discernible windrows or stockpiles of treated soils.*
- *Representative composite samples should be taken for discrete and discernible windrows or stockpiles of treated soils.*
- *For remedial excavations, select an area for sampling equivalent to between 200 m^2 and 400 m^2.*
- *Collect samples for field testing of OVA measurements in a sealable ziplock bag. Collect jarred samples for laboratory analysis of organic parameters (wide mouth, 250 mL, glass container with teflon lined plastic lid).*
- *Label each bag and jar in accordance with the identification included on the Chain of Custody form.*
- *Collect enough soil (using a clean trowel) to fill 1 jar and 1 sealable bag.*
- ***For discrete samples**, do not mix soil from sampling locations.*
- ***For composite samples**, mix soil samples in a clean container before filling containers. Composite samples should consist of a minimum of 5 discrete samples collected and mixed to fairly represent the soils in question. These samples should be homogenized and quartered. The sample for laboratory testing will comprise the combined sample generated by each of these quarters. Composite sampling is valid only for analysis of non-volative compounds. Analysis of volatile compounds (BTEX, F1 and F2 hydrocarbon fractions) should be completed on the composite soil sample representing the highest OVA readings of the samples that are collected to form the composite.*
- *Fill jars completely, compressing soil to remove air pockets and screw the lids on tightly. Ensure soil is removed from the threads of the jar and does not cause the lid to bulge.*
- *Place jars and bags in cooler with ice or freezer packs, to ensure samples stay cold until arrival at laboratory. Packing material inserted around the sample jars should prevent breakage in transit.*
- *Deliver all samples to the laboratory in a manner consistent with the requisite hold times for each analysis. Samples should be analyzed by Maxxam Analytics.*

In sampling stockpiles and windrows samples will be collected throughout the pile in order to properly characterize the soil.

Lagoon Decommissioning

The following procedure should be followed for drainage and decommissioning of the sewage lagoon:

1. Collect a sample of the water impounded in the lagoon. This sample should be tested for the following parameters:
    a. Routine potability parameters
    b. Dissolved hydrocarbons (BTEX, F1 and F2 PHC)
2. Once results verify that the water in the sewage lagoon complies with the release criteria for the lagoon, pump this into a natural drainage course.
3. Once the water in the sewage lagoon is entirely removed, scrape the accumulated sediments in the lagoon so that these sediments stack against the inner slopes of the lagoon.
4. Once these sediments have dried to achieve a solid consistency, remove the dried sediments and stockpile inside the soil treatment area.
5. Sample the dried and stockpiled sediments and analyze for heavy metals, salinity parameters, BTEX, and F1 to F4 PHCs.
6. If the dried and stockpiled sediments comply with the Tier 1 standard for the NWT, maintain these soils for ultimate reclamation of the ground surface of the lagoon.

It is assumed that some impounded water will remain in the lagoon following use of this water in the soil treatment and RegenOx amendment process. Hence, sampling to verify that this water is suitable for discharge is also required, at least as a contingency measure.

Responsibilities

Shell Canada Limited: Funding and budgeting, provision of a safe work Site, regulatory interface, safety audit.

HAZCO Environmental Services Ltd: Project execution, implementation of safety program, mobilization and demobilization of equipment and materials, safe handling of all products and wastes, record keeping related to project implementation and safety.

IEG: Monitoring of remedial excavations and soil treatment. Record keeping related to same.

E. Gruben Transport: Provision of a working, fit for purpose camp.

WorleyParsons: Site characterization, development of the 2009 Program plan, and final reporting.

Acknowledged:

Randall Warren, Shell Canada Limited

Kevin Erickson, HAZCO Environmental Services

David Wells, IEG

Gordon Johnson, WorleyParsons

Camp Farewell - 2009

Safety Interface Document

By: Gordon Johnson

Date: 5/30/2009

The objectives of this document are to describe how the safety and environmental elements of the 2009 Camp Farewell Remediation Program (2009 Program) will be handled and to describe each party's responsibility for implementing safe work procedures during project execution. HAZCO Environmental Services Ltd. is the Prime Contractor as defined by applicable Health and Safety Legislation and has primary responsibility for all site activities and safety for the 2009 Program.

Health and Safety Procedures and Requirements

Shell Canada has entered into Master Services Agreements with each of the parties involved in the 2009 Program. As Prime Contractor, HAZCO is responsible for ensuring that all activities are completed in accordance with its own corporate health and safety procedures as well as specific safety and environmental requirements developed for the 2009 Program. Each member of the project team is required to be familiar with HAZCO corporate health and safety procedures as well as the following documents.

- Shell's Alcohol and Drug Policy
- Tool and Equipment Use and Inspection

This document elaborates on the following additional requirements related to health, safety and environmental protection that are specific to this project:

- Personal Protective Equipment (PPE) and Training Requirements
- Response to / Preparation for Inclement Weather
- First Aid / Medical Care Response and Provisions
- Safety Coverage and Call-Out
- Site Access Requirements / Work Permitting
- Accident / Incident Investigation
- Safety Observations and Audits
- Workforce Accountability

Personal Protective Equipment (PPE) and Training Requirements

The following PPE must be worn at all times while working on the Camp Farewell site and surrounding lands:

- Hardhat
- Safety glasses with side shields
- Gloves Steel toed safety shoes/boots
- Hearing protection (if required)
- High visibility vest
- Flotation vest (when working on or immediately adjacent to water)

The following training is required, at a minimum, for all Site workers:

- Workplace Hazards Information System
- Industrial First Aid
- Shell 12 Life Saving Rules
- Appropriate training in equipment operation (for operators)

Response to / Preparation for Inclement Weather

In the event of severe weather work crews shall:

- Monitor weather reports
- Stop work before severe weather is incurred
- Secure equipment and materials
- Move any vehicles as required
- Shelter in the Permanent Work Camp.

First Aid / Medical Care Response and Provisions

First aid, medical care response, and other provisions are addressed in the HAZCO Safe Work Procedures. In addition to these standard first aid requirements, the following first aid equipment and facilities shall be mobilized to the Site.

- 2 Standard First Aiders
- No. 3 First Aid Kit
- 3 Blankets, stretcher, splints

The Program Manager, Randall Warren, is ultimately responsible for the safety of this project. In the event of an injury or safety / environmental incident HAZCO will make the following communications:

Name	Company	Role	Cell Phone or Pager	E-mail	Maximum Duration After Event
Randall Warren	Shell Canada	Project Manager	(403) 813 0408	randall.warren@shell.com	1 hour
Gordon Johnson	Worley Parsons	Environmental Consultant	403 473 8371	gord..johnson@worleyparsonscom	24 hours
Kevin Erickson	HAZCO	Site Manager	403 297 0444	kerickson@hazco.com	1 hour
Randall Warren or Kevin Erickson will, In-turn, contact the following individuals					
	Shell Canada	Safety Manager			4 hours

HAZCO's Site supervisor will, at a minimum, contact the Shell Canada Project Manager (or his back-up). The Shell Project Manager (or his back-up) will then contact the remaining people on the list if required.

Site Activities/Work Permitting

Shell Canada does not currently operate or occupy the Camp Farewell Site. Accordingly, Site Activities and permitting is the responsibility of the HAZCO Site Supervisor. The following permitting process will be completed by HAZCO's Site Supervisor on a daily basis, prior to executing remediation work.

- All site workers must complete a Site Orientation prior to initiating work on the Site.
- HAZCO's Site Supervisor will issue a Daily Work Permit which will describe the activities to be completed that day and the safe work procedures that will be implemented for each of those tasks.
- The scope of the day's activities and the safe work procedures to be implemented by all site workers will be described and documented in a daily safety meeting that will be completed before work commences that day.

- If site activities deviate (in a significant manner) from that contemplated in the daily work permit, work shall stop and the permitting and safety meeting process shall be repeated prior to resuming work.
- Documentation of orientation, permitting, safety meetings, incidents and near misses is the responsibility of the HAZCO Site Supervisor.

Shell Canada is responsible for authorizing the safe work procedures for the 2009 Program prior to mobilizing to the Site. This authorization is provided by the written acknowledgement of this document, as provided above. In issuing this authorization, Shell acknowledges that the safe work and environmental protection procedures outlined in this document comprise the Contractors' responsibilities and authorities for the 2009 Program. Specifically, Shell acknowledges the following with respect to the 2009 Program.

- There are no below ground hazards at the Camp Farewell Site and that remedial excavations can be completed without the requisite ground clearance and line locating surveys that would typically be required for similar work completed in the south.
- The Site is vacant, but is otherwise fit for safe execution of the 2009 Program in accordance with this Work Plan and Safety Interface Document.
- HAZCO is primarily responsible for safety and environmental protection for the 2009 Program. All other Contractors working on the Site are required to follow the direction of HAZCO respecting these aspects of execution of the 2009 Program.

Accident / Incident Investigations

All incidents, regardless of severity, must be thoroughly investigated to identify the basic and indirect causes. The Shell Project Manager must be notified per the above call out protocol and should receive a written preliminary report from HAZCO by the end of the workday. A follow-up investigation will be scheduled. Lessons learned and corrective actions from each incident must be reviewed and communicated in order to avoid similar incidents in the future.

Safety Observations and Audits

Any and all personnel have the responsibility and duty to intervene in any field activity which, in the view of the observer, is being conducted or planned in an unsafe or in a questionable manner.

The Shell Project Manager will organize and lead formal safety audits of the job site when and as deemed appropriate. Given the remote location of the work, no more than one audit would be conducted over the duration of the 2009 Program.

Work Force Accountability

At the start of each work shift all Site workers who plan on working on that day or shift must:

- Have received Site Orientation

- Sign the Daily Work Permit
- Attend the daily safety meeting
- Have the requisite training
- Don the required PPE
- Be trained and familiar with their assigned tasks for that day's work
- Have read and be familiar with this Work Plan and Safety Interface Document as well as HAZCO's corporate safe work procedures

Environmental Protection

The following environmental controls must be implemented throughout the execution of the 2009 Program.

- Schedule work in accordance with the permissible work window for the Kendall Island Bird Sanctuary.
- Contain all precipitation runoff water within the soil treatment area, preventing direct discharge of this water into the Mackenzie River.
- Prevent spills or accidental releases to the environment of any materials and wastes associated with or generated by implementation of the 2009 Program. This includes industrial wastes, domestic wastes and sewage.

AIRSTRIP as per SITE SURVEY AMENDED JUNE 12, 1974

AIRSTRIP EXTENDS ~160m

TUNDRA

WILLOWS

ROAD

EDGE of GRAVEL PAD

BERM

METAL STORAGE TANKS

PALLET PILE

METAL SLEDS

FUEL TANKS

DRILLING CEMENT SEACANS

DRILLING PRODUCTS SEACANS

STORAGE RACK PILE

STORAGE RACK PILE

STORAGE RACKS

VERTICAL PIPE

NORTH TRAILER

SOUTH TRAILER

FUEL TANK

POLE

CONTROL BOX

SEWAGE TREATMENT (2-SEACANS)

CAMP

LAGOON

SHED #1

SHED #2

SHED #3

WINTER ACCESS ROAD (GRASS)

TOP of BANK

MACKENZIE RIVER

ROAD (GRAVEL) SUMMER ACCESS

BOLLARDS

BOLLARDS

P06-1 P06-2 P06-3 P06-4 P06-5 P06-6 P06-7

S06-1 S06-2 S06-3 S06-4 S06-5 S06-6 S06-7 S06-8 S06-9 S06-10 S06-11 S06-12 S06-13 S06-14 S06-15 S06-16 S06-17 S06-18 S06-19 S06-20 S06-21 S06-22 S06-23 S06-24 S06-25 S06-26 S06-27 S06-28 S06-29 S06-30 S06-31 S06-32 S06-33 S06-34 S06-35 S06-36 S06-37 S06-38 S06-39 S06-40 S06-41 S06-42 S06-43 S06-44 S06-45 S06-46 S06-47 S06-48 S06-49 S06-50 S06-51 S06-52 S06-53 S06-54 S06-55 S06-56 S06-57 S06-58 S06-59 S06-60 S06-61 S06-62 S06-63 S06-64 S06-65 S06-66 S06-67 S06-68

WS06-1 WS06-2

7678000 N 7677950 N 7677900 N 7677850 N 7677800 N 7677750 N 7677700 N 7677650 N 7677600 N 7677550 N 7677500 N

495750 E 495800 E 495850 E 495900 E 495950 E 496000 E 496050 E 496100 E 496150 E 496200 E 496250 E 496300 E 496350 E 496400 E 496450 E

LEGEND

- BOUNDARY OF SITE AS PER SITE SURVEY AMENDED JUNE 12, 1974
- SURFACE WATER SAMPLE
- P06-3 PIEZOMETER
- S06-11 SOIL SAMPLE – GPS SURVEY
- INTERPRETED AREA OF SOIL WITH HYDROCARBON PARAMETERS EXCEEDING SELECTED GUIDELINES

SOURCES:
1. PLAN SHOWING SITE SURVEY OF CAMP FAREWELL MACKENZIE DELTA NORTHWEST TERRITORIES; PREPARED FOR SHELL CANADA LIMITED BY INUKSHUK GEOMATICS INC.; 04/08/2006; ORIGINAL SCALE 1:2000.
2. PIEZOMETER AND SOIL SAMPLES LOCATED USING WORLEYPARSONS KOMEX GPS SURVEY DATA.

N

0 10 20 30 40 50m

SCALE 1 : 1,000

UTM NAD83 ZONE 08

Infrastructure & Environment

SHELL CANADA LIMITED
ENVIRONMENTAL SITE ASSESSMENT AT CAMP FAREWELL, NWT

INTERPRETED AREAS OF SOIL WITH HYDROCARBON PARAMETERS EXCEEDING REFERENCE GUIDELINES

WorleyParsons resources & energy

07-JUL-09	date	B.M.F.	edited by	OTHERS	drawn by		app by

PROJECT NUMBER:	FIGURE:
C52360500	12

FILE: J:\52360500\PLAN.DWG Issued By: Calgary CAD

APPENDIX II

Site Photographs

Photograph 1: Impacted soils being aerated with an allu bucked inside the treatment cell.

Photograph 2: RegenOx (Part B) being applied to a windrow

Photograph 3: RegenOx (Part A) being mixed into windrow 3.

Photograph 4: North end of Camp Farewell treatment cell, water is being applied to windrow 2. Excavation 1, the largest area of excavation is visible in the right background.

Photograph 5: In situ subsurface treatment trench looking south.

Photograph 6: In situ subsurface treatment trench and 50 mm piping system prior to backfilling looking north. Tank farm berm at right, excavation #1 at left.

Photograph 7: Perforations made on-site. Holes are spaced around all sides of the pipe.

Photograph 8: Excavation #1 following backfilling.

Photograph 9: Panorama looking north from camp building. Herc fuel tank at left, backfilled excavation #1 at centre and tank farm at far right.

Photograph 10: Panorama looking northeast from camp building. Portion of backfilled excavation #1 at left and regraded treatment cell area in centre.

APPENDIX III

Laboratory Analytical Results

Your P.O. #: 47001127 005 OD
Your Project #: A04012A01
Site: CAMPFAREWELL,NT
Your C.O.C. #: 81063, 81064, 81065, 81066, 81067

Attention: DAVID WELLS
IEG CONSULTANTS
PO Box 3178
INUVIK, NT
CANADA X0E0T0

Report Date: 2010/02/08
This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A941973
Received: 2009/08/07, 8:35

Sample Matrix: Soil
Samples Received: 9

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS (MeOH extract)	9	2009/08/10	2009/08/12	EENVSOP-00005 EENVSOP-00002	EPA 8260C/CCME
CCME Hydrocarbons (F2-F4 in soil)	4	2009/08/14	2009/08/15	EENVSOP-00007 EENVSOP-00006	CCME PHC-CWS
Moisture	9	N/A	2009/08/11	EENVSOP-00139	Carter SSMA 51.2

Encryption Key

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

ALAINA HUNTER, Project Manager
Email: alaina.hunter@maxxamanalytics.com
Phone# (780) 577-7100

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 1

Maxxam Job #: A941973
Report Date: 2010/02/08

IEG CONSULTANTS
Client Project #: A04012A01
Site Reference: CAMPFAREWELL,NT
Your P.O. #: 47001127 005 OD
Sampler Initials: RL

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		Q17445	Q17446	Q17447	Q17448		
Sampling Date		2009/08/02	2009/08/02	2009/08/02	2009/08/02		
COC Number		81063	81063	81063	81063		
	Units	**SS09-CWR1-1**	**SS09-CWR1-2**	**SS09-CWR2-1**	**SS09-CWR2-2**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	7.1	7.7	8.2	7.5	0.3	3338854

RDL = Reportable Detection Limit

Maxxam ID		Q17453	Q17457	Q17466	Q17469	Q17475		
Sampling Date		2009/08/02	2009/08/02	2009/08/02	2009/08/02	2009/08/02		
COC Number		81064	81064	81065	81065	81066		
	Units	**SS09-WR1-3**	**SS09-WR1-7**	**SS09-WR2-3**	**SS09-WR2-6**	**SS09-WR2-12**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	8.7	6.8	6.7	7.2	6.8	0.3	3338854

RDL = Reportable Detection Limit

Maxxam Job #: A941973
Report Date: 2010/02/08

IEG CONSULTANTS
Client Project #: A04012A01
Site Reference: CAMPFAREWELL,NT
Your P.O. #: 47001127 005 OD
Sampler Initials: RL

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		Q17445	Q17446	Q17447	Q17448		
Sampling Date		2009/08/02	2009/08/02	2009/08/02	2009/08/02		
COC Number		81063	81063	81063	81063		
	Units	**SS09-CWR1-1**	**SS09-CWR1-2**	**SS09-CWR2-1**	**SS09-CWR2-2**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	700	600	120	140	10	3350172
F3 (C16-C34 Hydrocarbons)	mg/kg	910	780	190	180	10	3350172
F4 (C34-C50 Hydrocarbons)	mg/kg	45	30	22	13	10	3350172
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3350172
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	87	84	84	84	N/A	3350172

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A941973
Report Date: 2010/02/08

IEG CONSULTANTS
Client Project #: A04012A01
Site Reference: CAMPFAREWELL,NT
Your P.O. #: 47001127 005 OD
Sampler Initials: RL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		Q17445	Q17446	Q17447		
Sampling Date		2009/08/02	2009/08/02	2009/08/02		
COC Number		81063	81063	81063		
	Units	**SS09-CWR1-1**	**SS09-CWR1-2**	**SS09-CWR2-1**	**RDL**	**QC Batch**
Volatiles						
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	0.0050	3337322
Toluene	mg/kg	<0.020	<0.020	<0.020	0.020	3337322
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	0.010	3337322
Xylenes (Total)	mg/kg	0.10	<0.040	<0.040	0.040	3337322
m & p-Xylene	mg/kg	0.10	<0.040	<0.040	0.040	3337322
o-Xylene	mg/kg	<0.020	<0.020	<0.020	0.020	3337322
F1 (C6-C10) - BTEX	mg/kg	<12	14	36	12	3337322
(C6-C10)	mg/kg	<12	14	36	12	3337322
Surrogate Recovery (%)						
4-BROMOFLUOROBENZENE (sur.)	%	107	113	98	N/A	3337322
D10-ETHYLBENZENE (sur.)	%	81	120	96	N/A	3337322
D4-1,2-DICHLOROETHANE (sur.)	%	87	87	89	N/A	3337322
D8-TOLUENE (sur.)	%	103	105	105	N/A	3337322

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A941973
Report Date: 2010/02/08

IEG CONSULTANTS
Client Project #: A04012A01
Site Reference: CAMPFAREWELL,NT
Your P.O. #: 47001127 005 OD
Sampler Initials: RL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		Q17447	Q17448	Q17453	Q17457		
Sampling Date		2009/08/02	2009/08/02	2009/08/02	2009/08/02		
COC Number		81063	81063	81064	81064		
	Units	**SS09-CWR2-1 Lab-Dup**	**SS09-CWR2-2**	**SS09-WR1-3**	**SS09-WR1-7**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3337322
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3337322
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3337322
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3337322
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3337322
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3337322
F1 (C6-C10) - BTEX	mg/kg	37	22	23	100	12	3337322
(C6-C10)	mg/kg	37	22	23	100	12	3337322
Surrogate Recovery (%)							
4-BROMOFLUOROBENZENE (sur.)	%	98	100	100	97	N/A	3337322
D10-ETHYLBENZENE (sur.)	%	89	96	98	87	N/A	3337322
D4-1,2-DICHLOROETHANE (sur.)	%	84	87	87	89	N/A	3337322
D8-TOLUENE (sur.)	%	104	104	105	107	N/A	3337322

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A941973
Report Date: 2010/02/08

IEG CONSULTANTS
Client Project #: A04012A01
Site Reference: CAMPFAREWELL,NT
Your P.O. #: 47001127 005 OD
Sampler Initials: RL

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		Q17466	Q17469	Q17475		
Sampling Date		2009/08/02	2009/08/02	2009/08/02		
COC Number		81065	81065	81066		
	Units	**SS09-WR2-3**	**SS09-WR2-6**	**SS09-WR2-12**	**RDL**	**QC Batch**
Volatiles						
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	0.0050	3337322
Toluene	mg/kg	<0.020	<0.020	0.022	0.020	3337322
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	0.010	3337322
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	0.040	3337322
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	0.040	3337322
o-Xylene	mg/kg	<0.020	<0.020	<0.020	0.020	3337322
F1 (C6-C10) - BTEX	mg/kg	110	49	47	12	3337322
(C6-C10)	mg/kg	110	49	47	12	3337322
Surrogate Recovery (%)						
4-BROMOFLUOROBENZENE (sur.)	%	114	105	104	N/A	3337322
D10-ETHYLBENZENE (sur.)	%	97	92	106	N/A	3337322
D4-1,2-DICHLOROETHANE (sur.)	%	88	96	95	N/A	3337322
D8-TOLUENE (sur.)	%	108	102	102	N/A	3337322

N/A = Not Applicable
RDL = Reportable Detection Limit

Package 1	9.3°C

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

General Comments

Results relate only to the items tested.

IEG CONSULTANTS
Attention: DAVID WELLS
Client Project #: A04012A01
P.O. #: 47001127 005 OD
Site Reference: CAMPFAREWELL,NT

Quality Assurance Report

Maxxam Job Number: EA941973

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3337322	CC6	Matrix Spike						
		[Q17448-01]	4-BROMOFLUOROBENZENE (sur.)	2009/08/12		98	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/08/12		87	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/08/12		89	%	60 - 140
			D8-TOLUENE (sur.)	2009/08/12		103	%	60 - 140
			Benzene	2009/08/12		84	%	60 - 140
			Toluene	2009/08/12		91	%	60 - 140
			Ethylbenzene	2009/08/12		95	%	60 - 140
			m & p-Xylene	2009/08/12		99	%	60 - 140
			o-Xylene	2009/08/12		94	%	60 - 140
			(C6-C10)	2009/08/12		103	%	60 - 140
		Spiked Blank	4-BROMOFLUOROBENZENE (sur.)	2009/08/12		97	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/08/12		91	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/08/12		88	%	60 - 140
			D8-TOLUENE (sur.)	2009/08/12		102	%	60 - 140
			Benzene	2009/08/12		85	%	60 - 140
			Toluene	2009/08/12		89	%	60 - 140
			Ethylbenzene	2009/08/12		96	%	60 - 140
			m & p-Xylene	2009/08/12		96	%	60 - 140
			o-Xylene	2009/08/12		94	%	60 - 140
			(C6-C10)	2009/08/12		109	%	80 - 120
		Method Blank	4-BROMOFLUOROBENZENE (sur.)	2009/08/12		98	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/08/12		88	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/08/12		87	%	60 - 140
			D8-TOLUENE (sur.)	2009/08/12		104	%	60 - 140
			Benzene	2009/08/12	<0.0050		mg/kg	
			Toluene	2009/08/12	<0.020		mg/kg	
			Ethylbenzene	2009/08/12	<0.010		mg/kg	
			Xylenes (Total)	2009/08/12	<0.040		mg/kg	
			m & p-Xylene	2009/08/12	<0.040		mg/kg	
			o-Xylene	2009/08/12	<0.020		mg/kg	
			F1 (C6-C10) - BTEX	2009/08/12	<12		mg/kg	
			(C6-C10)	2009/08/12	<12		mg/kg	
		RPD [Q17447-01]	Benzene	2009/08/12	NC		%	50
			Toluene	2009/08/12	NC		%	50
			Ethylbenzene	2009/08/12	NC		%	50
			Xylenes (Total)	2009/08/12	NC		%	50
			m & p-Xylene	2009/08/12	NC		%	50
			o-Xylene	2009/08/12	NC		%	50
			F1 (C6-C10) - BTEX	2009/08/12	NC		%	50
			(C6-C10)	2009/08/12	NC		%	50
3338854	SR7	Method Blank	Moisture	2009/08/11	<0.3		%	
		RPD	Moisture	2009/08/11	4.0		%	20
3350172	LD2	Matrix Spike	O-TERPHENYL (sur.)	2009/08/15		78	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2009/08/15		104	%	50 - 130
			F3 (C16-C34 Hydrocarbons)	2009/08/15		104	%	50 - 130
			F4 (C34-C50 Hydrocarbons)	2009/08/15		100	%	50 - 130
		Spiked Blank	O-TERPHENYL (sur.)	2009/08/15		77	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2009/08/15		117	%	80 - 120
			F3 (C16-C34 Hydrocarbons)	2009/08/15		119	%	80 - 120
			F4 (C34-C50 Hydrocarbons)	2009/08/15		116	%	80 - 120
		Method Blank	O-TERPHENYL (sur.)	2009/08/15		94	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2009/08/15	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2009/08/15	<10		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2009/08/15	<10		mg/kg	

IEG CONSULTANTS
Attention: DAVID WELLS
Client Project #: A04012A01
P.O. #: 47001127 005 OD
Site Reference: CAMPFAREWELL,NT

Quality Assurance Report (Continued)

Maxxam Job Number: EA941973

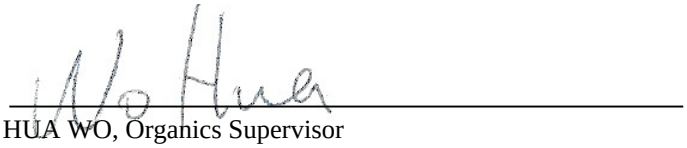
QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3350172	LD2	RPD	F2 (C10-C16 Hydrocarbons)	2009/08/15	NC		%	50
			F3 (C16-C34 Hydrocarbons)	2009/08/15	12.3		%	50
			F4 (C34-C50 Hydrocarbons)	2009/08/15	NC		%	50

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

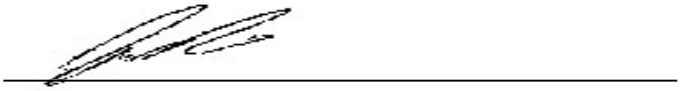
Validation Signature Page

Maxxam Job #: A941973

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



HUA WO, Organics Supervisor



JIM TJATHAS, Analyst 2

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

286

Maxxam Analytics

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Edmonton: 9331 – 48 Street, T6B 2R4 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll free: (877) 465-8889
www.maxxamanalytics.com

81063 **CHAIN OF CUSTODY**

A941973611/JA Page 1 of 5

Invoice To: Require Report? Yes ☐ No ☒

Company Name: Shell Canada
Contact Name: Randall Warren
Address: PO Box 100, Stn main Calgary
Prov: Alta PC: T2P 2H5
Contact #s: Ph: Fax:

Report To:
David Wells
IEG Consultants Ltd
Inuvik
Prov: NT PC: X0E 0T0
Ph: 867 777-8521 Fax: 867 777-2747

PO # / AFE #:
Quotation #:
Project #: A04012A01
Project Name: Camp farewell
Location: Camp farewell, NT
Sampler's Initials: RL, SB

DETECTION LIMIT REQUIREMENTS:
Check the applicable criterion and indicate land use
☐ AT1 ☐ CCME ☐ OTHER

REPORT DISTRIBUTION:
EMAIL ADDRESS(S):
dwells@ieg.ca
Sbird@ieg.ca

SERVICE REQUESTED:
☐ **RUSH** (Please ensure you contact the lab to reserve)
Date Required:
☒ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS: BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals	F2-F4	WATERS: ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	REGULATED METALS (CCME / AT1)[3]	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	Sed09-01 0-0.3m	S	2009/08/03	X		X	X																
2	02 0.3-0.5m	S		X		X	X																
3	03 0.-0.3m	S		X		X	X																
4	04 0.3-0.5m	S		X		X	X																
5	05 0-0.3m	S		X		X	X																
6	06 0.3-0.5m	S		X		X	X																
7	07 0.5-0.75m	S		X		X	X																
8	SS09-CWR1-1	S	2009/08/02								X												
9	SS09-CWR1-2	S									X												
10	SS09-CWR2-1	S									X												
11	SS09-CWR2-2	S									X												
12	SS09-CWR3-1	S		~~DO NOT ANALYSE~~																			

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: SAM BIRD Date/Time: Aug 6, 2009
Sign and Print: Sam Bird

COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED	Received By	Temperature	Ice
	Aug 7 '09 MC 8:35	9 11 8	
	CUSTODY SEAL YES / NO		

2566

Maxxam Analytics

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Edmonton: 9331 – 48 Street, T6B 2R4 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll free: (877) 465-8889
www.maxxamanalytics.com

81064 **CHAIN OF CUSTODY**

A941973 GH/JA Page 3 of 5

Invoice To: Require Report? Yes ☐ No ☒
Company Name: Shell Canada
Contact Name:
Address:
Prov: PC:
Contact #s: Ph: Fax:

Report To: David Wells
Prov: PC:
Ph: Fax:

PO # / AFE #:
Quotation #:
Project #: A04012A01
Project Name:
Location:
Sampler's Initials:

DETECTION LIMIT REQUIREMENTS:
Check the applicable criterion and indicate land use
☐ AT1
☐ CCME
☐ OTHER

REPORT DISTRIBUTION:
EMAIL ADDRESS(S):
dwells@ieg.ca
Sbird@ieg.ca

SERVICE REQUESTED:
☐ **RUSH** (Please ensure you contact the lab to reserve)
Date Required:
☒ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS: BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	☐ Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals	F2-F4	BTEX F1	WATERS: ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	REGULATED METALS (CCME / AT1)[3]: Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	SS09-CWR3-2	S	2009/08/02	~~DO NOT ANALYSE~~																		
2	SS09-WR1-1	S																				
3	2	S																				
4	3	S										X										
5	4	S																				
6	5	S																				
7	6	S																				
8	7	S										X										
9	8	S																				
10	9	S																				
11	10	S																				
12	11	S																				

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By:
Date/Time: Aug 4, 2009
Sign and Print: Sam Bird
COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED	Received By	Temperature			Ice
	Aug 7 '09 MG 8:35	9	11	8	
	CUSTODY SEAL YES / NO				

256

Maxxam Analytics

Calgary: 4000 19st St. NE, T2E 6P8 | Ph: (403) 291-3077 | Fax: (403) 735-2240 | Toll free: (800) 386-7247
Edmonton: 9331 – 48 Street, T6B 2R4 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll free: (877) 465-8889
www.maxxamanalytics.com

81065 **CHAIN OF CUSTODY**

A941913 Page 13A of 5

Invoice To: Require Report? Yes ☐ No ☒

Company Name: Shell Canada
Contact Name:
Address:
Prov: PC:
Contact #s: Ph: Fax:

Report To: David Wells
Prov: PC:
Ph: Fax:

PO # / AFE #:
Quotation #:
Project #: A04012A01
Project Name:
Location:
Sampler's Initials:

DETECTION LIMIT REQUIREMENTS:
Check the applicable criterion and indicate land use
☐ AT1 ☐ CCME ☐ OTHER

REPORT DISTRIBUTION:
EMAIL ADDRESS(S):
dwells@ieg.ca
Sbird@ieg.ca

SERVICE REQUESTED:
☐ **RUSH** (Please ensure you contact the lab to reserve)
Date Required:
☒ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS: BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals	BTEX F1	WATERS: ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	REGULATED METALS (CCME / AT1)[3]: Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	SS09-WR1-12	S	2009/08/02																			
2	SS09-WR2-1	S	2009/08/02																			
3	2	S																				
4	3	S									X											
5	4	S																				
6	5	S																				
7	6	S									X											
8	7	S																				
9	8	S																				
10	9	S																				
11	10	S																				
12	11	S																				

Maxxam Job #:

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Relinquished By: Date/Time: Aug 6, 2009
Sign and Print: Sam Baird
COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED	Received By	Temperature	Ice
	Aug 7/09 8:35 MC	9 11 8	
	CUSTODY SEAL YES / NO		

286

Maxxam Analytics

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www.maxxamanalytics.com

81066 **CHAIN OF CUSTODY** (Page: 4 of 5)

A941973 GH/JA

Invoice To: Require Report? Yes ☐ No ☒
Company Name: Shell Canada
Contact Name:
Address:
Prov: PC:
Contact #s: Ph: Fax:

Report To: David Wells
Prov: PC:
Ph: Fax:

PO # / AFE #:
Quotation #:
Project #: A04012A01
Project Name:
Location:
Sampler's Initials:

DETECTION LIMIT REQUIREMENTS:
Check the applicable criterion and indicate land use
☐ AT1
☐ CCME
☐ OTHER

REPORT DISTRIBUTION:
EMAIL ADDRESS(S):
dwells@ieg.ca
dwells@ieg.ca

SERVICE REQUESTED:
☐ **RUSH** (Please ensure you contact the lab to reserve)
Date Required:
☒ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS: BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	☐ Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals	BTEX F1	WATERS: ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	REGULATED METALS (CCME / AT1)[3] Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	SS09-WR2-12	S	2009/08/02								X											
2	SS09-WR3-1	S	2009/08/01																			
3	2	S																				
4	3	S																				
5	4	S																				
6	5	S																				
7	6	S									X											
8	7	S						NO														
9	8	S									X											
10	9	S																				
11	10	S																				
12	11	S																				

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By:
Date/Time: Aug 6, 2009
Sign and Print:
COMMENTS/SPECIAL INSTRUCTIONS:

JARS USED & NOT SUBMITTED

Received By: Aug 7 '09 8:35 MC
CUSTODY SEAL YES / NO

Temperature: 9 11 8
Ice

256

Maxxam Analytics

Calgary: 4000 19st St. NE, T2E 6P8 | Ph: (403) 291-3077 | Fax: (403) 735-2240 | Toll free: (800) 386-7247
Edmonton: 9331 – 48 Street, T6B 2R4 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll free: (877) 465-8889
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81067 **CHAIN OF CUSTODY**

A941973 GH/SA Page 5 of 5

Invoice To: Require Report? Yes ☐ No ☒

Company Name: Shell Canada
Contact Name:
Address:
Prov: PC:
Contact #s: Ph: Fax:

Report To: David Wells
Prov: PC:
Ph: Fax:

PO # / AFE #:
Quotation #:
Project #: A04012A01
Project Name:
Location:
Sampler's Initials:

DETECTION LIMIT REQUIREMENTS:
Check the applicable criterion and indicate land use
☐ AT1
☐ CCME
☐ OTHER

REPORT DISTRIBUTION:
EMAIL ADDRESS(S):
dwells@ieg.ca
Sbird@ieg.ca

SERVICE REQUESTED:
☐ **RUSH** (Please ensure you contact the lab to reserve)
Date Required:
☒ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS: BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals	WATERS: ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	REGULATED METALS (CCME / AT1)[3]: Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	SS09-WR3-12	S	2009/08/01																		
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12																					

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: SAM BIRD Date/Time: Aug 6, 2009
Sign and Print: Sam Bird
COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED	Received By	Temperature	Ice
	Aug 7 '09 8:35 MD CUSTODY SEAL YES / NO	9 11 8	

Your P.O. #: 47001127 005 OD
Your Project #: A04012A01 CAMP FAREWELL
Site: CAMP FAREWELL,NT
Your C.O.C. #: 81068, 81069

Attention: DAVID WELLS
IEG CONSULTANTS
PO Box 3178
INUVIK, NT
CANADA X0E0T0

Report Date: 2009/08/15

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A941971
Received: 2009/08/07, 8:35

Sample Matrix: Soil
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS (MeOH extract)	3	2009/08/10	2009/08/12	EENVSOP-00005 EENVSOP-00002	EPA 8260C/CCME
CCME Hydrocarbons (F2-F4 in soil)	3	2009/08/10	2009/08/14	EENVSOP-00007 EENVSOP-00006	CWS PHCS Tier 1
Moisture	6	N/A	2009/08/11	EENVSOP-00139	Carter SSMA 51.2

Encryption Key

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

ALAINA HUNTER, Project Manager
Email: alaina.hunter@maxxamanalytics.com
Phone# (780) 577-7100

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 1

Maxxam Job #: A941971
Report Date: 2009/08/15

IEG CONSULTANTS
Client Project #: A04012A01 CAMP FAREWELL
Site Reference: CAMP FAREWELL,NT
Your P.O. #: 47001127 005 OD
Sampler Initials: SB

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		Q17410	Q17415	Q17422	Q17425		
Sampling Date		2009/08/04	2009/08/04	2009/08/04	2009/08/04		
COC Number		81068	81068	81069	81069		
	Units	**SS09-WR3-13**	**SS09-WR3-18**	**SS09-WR3-25**	**SS09-CWR3-3**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	14	9.0	7.8	6.3	0.3	3337922

RDL = Reportable Detection Limit

Maxxam ID		Q17426	Q17426	Q17427		
Sampling Date		2009/08/04	2009/08/04	2009/08/04		
COC Number		81069	81069	81069		
	Units	**SS09-CWR3-4**	**SS09-CWR3-4 Lab-Dup**	**SS09-CWR3-5**	**RDL**	**QC Batch**
Physical Properties						
Moisture	%	7.3	7.6	12	0.3	3338854

RDL = Reportable Detection Limit

Maxxam Job #: A941971
Report Date: 2009/08/15

IEG CONSULTANTS
Client Project #: A04012A01 CAMP FAREWELL
Site Reference: CAMP FAREWELL,NT
Your P.O. #: 47001127 005 OD
Sampler Initials: SB

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		Q17425	Q17426	Q17427		
Sampling Date		2009/08/04	2009/08/04	2009/08/04		
COC Number		81069	81069	81069		
	Units	**SS09-CWR3-3**	**SS09-CWR3-4**	**SS09-CWR3-5**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon						
F2 (C10-C16 Hydrocarbons)	mg/kg	95	85	110	10	3337697
F3 (C16-C34 Hydrocarbons)	mg/kg	100	120	120	10	3337697
F4 (C34-C50 Hydrocarbons)	mg/kg	20	13	12	10	3337697
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	N/A	3337697
Surrogate Recovery (%)						
O-TERPHENYL (sur.)	%	99	120	118	N/A	3337697

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A941971
Report Date: 2009/08/15

IEG CONSULTANTS
Client Project #: A04012A01 CAMP FAREWELL
Site Reference: CAMP FAREWELL,NT
Your P.O. #: 47001127 005 OD
Sampler Initials: SB

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		Q17410	Q17415	Q17422		
Sampling Date		2009/08/04	2009/08/04	2009/08/04		
COC Number		81068	81068	81069		
	Units	**SS09-WR3-13**	**SS09-WR3-18**	**SS09-WR3-25**	**RDL**	**QC Batch**
Volatiles						
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	0.0050	3337322
Toluene	mg/kg	0.025	0.057	0.023	0.020	3337322
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	0.010	3337322
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	0.040	3337322
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	0.040	3337322
o-Xylene	mg/kg	<0.020	<0.020	<0.020	0.020	3337322
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	12	3337322
(C6-C10)	mg/kg	<12	<12	<12	12	3337322
Surrogate Recovery (%)						
4-BROMOFLUOROBENZENE (sur.)	%	98	99	98	N/A	3337322
D10-ETHYLBENZENE (sur.)	%	91	85	87	N/A	3337322
D4-1,2-DICHLOROETHANE (sur.)	%	86	94	86	N/A	3337322
D8-TOLUENE (sur.)	%	104	102	102	N/A	3337322

N/A = Not Applicable
RDL = Reportable Detection Limit

Package 1	9.3°C

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

General Comments

Results relate only to the items tested.

IEG CONSULTANTS
Attention: DAVID WELLS
Client Project #: A04012A01 CAMP FAREWELL
P.O. #: 47001127 005 OD
Site Reference: CAMP FAREWELL,NT

Quality Assurance Report

Maxxam Job Number: EA941971

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3337322	CC6	Matrix Spike	4-BROMOFLUOROBENZENE (sur.)	2009/08/12		98	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/08/12		87	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/08/12		89	%	60 - 140
			D8-TOLUENE (sur.)	2009/08/12		103	%	60 - 140
			Benzene	2009/08/12		84	%	60 - 140
			Toluene	2009/08/12		91	%	60 - 140
			Ethylbenzene	2009/08/12		95	%	60 - 140
			m & p-Xylene	2009/08/12		99	%	60 - 140
			o-Xylene	2009/08/12		94	%	60 - 140
			(C6-C10)	2009/08/12		103	%	60 - 140
		Spiked Blank	4-BROMOFLUOROBENZENE (sur.)	2009/08/12		97	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/08/12		91	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/08/12		88	%	60 - 140
			D8-TOLUENE (sur.)	2009/08/12		102	%	60 - 140
			Benzene	2009/08/12		85	%	60 - 140
			Toluene	2009/08/12		89	%	60 - 140
			Ethylbenzene	2009/08/12		96	%	60 - 140
			m & p-Xylene	2009/08/12		96	%	60 - 140
			o-Xylene	2009/08/12		94	%	60 - 140
			(C6-C10)	2009/08/12		109	%	80 - 120
		Method Blank	4-BROMOFLUOROBENZENE (sur.)	2009/08/12		98	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/08/12		88	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/08/12		87	%	60 - 140
			D8-TOLUENE (sur.)	2009/08/12		104	%	60 - 140
			Benzene	2009/08/12	<0.0050		mg/kg	
			Toluene	2009/08/12	<0.020		mg/kg	
			Ethylbenzene	2009/08/12	<0.010		mg/kg	
			Xylenes (Total)	2009/08/12	<0.040		mg/kg	
			m & p-Xylene	2009/08/12	<0.040		mg/kg	
			o-Xylene	2009/08/12	<0.020		mg/kg	
			F1 (C6-C10) - BTEX	2009/08/12	<12		mg/kg	
			(C6-C10)	2009/08/12	<12		mg/kg	
		RPD	Benzene	2009/08/12	NC		%	50
			Toluene	2009/08/12	NC		%	50
			Ethylbenzene	2009/08/12	NC		%	50
			Xylenes (Total)	2009/08/12	NC		%	50
			m & p-Xylene	2009/08/12	NC		%	50
			o-Xylene	2009/08/12	NC		%	50
			F1 (C6-C10) - BTEX	2009/08/12	NC		%	50
			(C6-C10)	2009/08/12	NC		%	50
3337697	KO	Matrix Spike	O-TERPHENYL (sur.)	2009/08/14		106	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2009/08/14		107	%	50 - 130
			F3 (C16-C34 Hydrocarbons)	2009/08/14		110	%	50 - 130
			F4 (C34-C50 Hydrocarbons)	2009/08/14		122	%	50 - 130
		Spiked Blank	O-TERPHENYL (sur.)	2009/08/14		92	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2009/08/14		104	%	80 - 120
			F3 (C16-C34 Hydrocarbons)	2009/08/14		106	%	80 - 120
			F4 (C34-C50 Hydrocarbons)	2009/08/14		114	%	80 - 120
		Method Blank	O-TERPHENYL (sur.)	2009/08/14		115	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2009/08/14	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2009/08/14	<10		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2009/08/14	<10		mg/kg	
		RPD	F2 (C10-C16 Hydrocarbons)	2009/08/14	NC		%	50
			F3 (C16-C34 Hydrocarbons)	2009/08/14	8.0		%	50
			F4 (C34-C50 Hydrocarbons)	2009/08/14	11.7		%	50

IEG CONSULTANTS
Attention: DAVID WELLS
Client Project #: A04012A01 CAMP FAREWELL
P.O. #: 47001127 005 OD
Site Reference: CAMP FAREWELL,NT

Quality Assurance Report (Continued)

Maxxam Job Number: EA941971

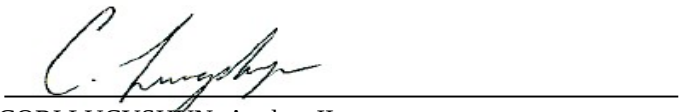
QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3337922	SR7	Method Blank	Moisture	2009/08/11	<0.3		%	
		RPD	Moisture	2009/08/11	6.1		%	20
3338854	SR7	Method Blank	Moisture	2009/08/11	<0.3		%	
		RPD [Q17426-01]	Moisture	2009/08/11	4.0		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

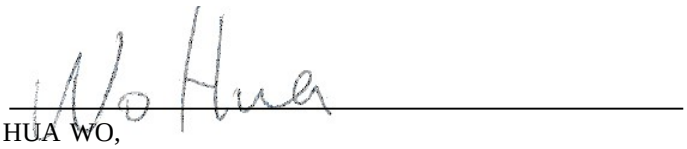
Validation Signature Page

Maxxam Job #: A941971

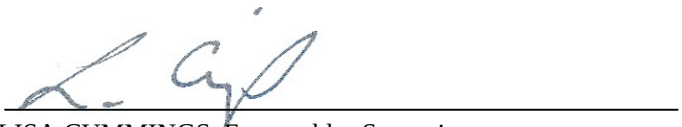
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



CORI LUCYSHYN, Analyst II



HUA WO,



LISA CUMMINGS, Extractables Supervisor

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

286

Maxxam Analytics

Calgary: 4000 19st St. NE, T2E 6P8 | Ph: (403) 291-3077 | Fax: (403) 735-2240 | Toll free: (800) 386-7247
Edmonton: 9331 – 48 Street, T6B 2R4 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll free: (877) 465-8889
www.maxxamanalytics.com

81068 **CHAIN OF CUSTODY**

A94197 (GM) / JA Page 1 of 2

Invoice To: Require Report? Yes ☐ No ☒

Company Name: Shell Canada
Contact Name: Randall Warren
Address: PO Box 100, Stn main Calgary
Prov: Alta PC: T2P 2H5
Contact #s: Ph: Fax:

Report To: David Wells
IEG Consultants - Ltd
Inuvik
Prov: NWT PC: X0E 0T0
Ph: 867 777-8521 Fax: 867 777-2747

PO # / AFE #:
Quotation #:
Project #: A04012A01
Project Name: Camp Farewell
Location: Camp Farewell, NT
Sampler's Initials: SB, RL

DETECTION LIMIT REQUIREMENTS:
Check the applicable criterion and indicate land use
☐ AT1
☐ CCME
☐ OTHER

REPORT DISTRIBUTION:
EMAIL ADDRESS(S):
dwells@ieg.ca
Sbird@ieg.ca

SERVICE REQUESTED:
☐ **RUSH** (Please ensure you contact the lab to reserve)
Date Required:
☒ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS: BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals	BTEX F1	WATERS: ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	REGULATED METALS (CCME / AT1)[3]: Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	SS09-WR3-13	S	2009/08/04								X											
2	14	S																				
3	15	S																				
4	16	S																				
5	17	S																				
6	18	S									X											
7	19	S																				
8	20	S																				
9	21	S																				
10	22	S																				
11	23	S																				
12	24	S																				

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: SAM BIRD Date/Time: Aug 6, 2009
Sign and Print: Sam Bird
COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED	Received By	Temperature			Ice
	Aug 7 '09 MG 8:35	9	11	8	
	CUSTODY SEAL YES / NO				

286

Maxxam Analytics

Calgary: 4000 19st St. NE, T2E 6P8 | Ph: (403) 291-3077 | Fax: (403) 735-2240 | Toll free: (800) 386-7247
Edmonton: 9331 – 48 Street, T6B 2R4 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll free: (877) 465-8889
www.maxxamanalytics.com

81069 **CHAIN OF CUSTODY**

A94197HGH/JA

Page 2 of 2

Invoice To: Require Report? Yes ☐ No ☒

Company Name: Shell Canada
Contact Name:
Address:
Prov: PC:
Contact #s: Ph: Fax:

Report To: David Wells

Prov: PC:
Ph: Fax:

PO # / AFE #:
Quotation #:
Project #: A04012A01
Project Name:
Location:
Sampler's Initials:

DETECTION LIMIT REQUIREMENTS:
Check the applicable criterion and indicate land use
☐ AT1
☐ CCME
☐ OTHER

REPORT DISTRIBUTION:
EMAIL ADDRESS(S):
dwells@ieg.ca
sbird@ieg-ca

SERVICE REQUESTED:
☐ RUSH (Please ensure you contact the lab to reserve)
Date Required:
☒ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS: BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals	BTEX F1	F2-F4	WATERS: ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	REGULATED METALS (CCME / AT1)[3] Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	SS09-WR3-25	S	2009/08/04								X												
2	26	S																					
3	27	S																					
4	SS09-CWR3-3	S										X											
5	4	S										X											
6	5	S										X											
7																							
8																							
9																							
10																							
11																							
12																							

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: Sam Baird Date/Time: Aug 6, 2009
Sign and Print:
COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED	Received By	Temperature			Ice
	Aug 7 '09 MG 8:35	9	11	8	
	CUSTODY SEAL YES / NO				

Your P.O. #: 47001127 005 OD
Your Project #: A04012A01.02.01
Site: CAMP FAREWELL, NT
Your C.O.C. #: 116865, 116864

IEG CONSULTANTS
PO Box 3178
INUVIK, NT
CANADA X0E0T0

Report Date: 2009/07/30

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A938607
Received: 2009/07/24, 12:40

Sample Matrix: Soil
Samples Received: 18

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS (MeOH extract)	18	2009/07/27	2009/07/29	EENVSOP-00005 EENVSOP-00002	EPA 8260C/CCME
CCME Hydrocarbons (F2-F4 in soil)	18	2009/07/27	2009/07/29	EENVSOP-00007 EENVSOP-00006	CWS PHCS Tier 1
Moisture	18	N/A	2009/07/28	EENVSOP-00139	Carter SSMA 51.2
Particle Size by Sieve (75 micron)	6	N/A	2009/07/28	EENVSOP-00077	SSMA 47.4

Encryption Key

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

ALAINA MAXXAM, account for job confirmation summary
Email: alaina.hunter@maxxamanalytics.com
Phone# (780) 577-7100

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 1

Maxxam Job #: A938607
Report Date: 2009/07/30

IEG CONSULTANTS
Client Project #: A04012A01.02.01
Site Reference: CAMP FAREWELL, NT
Your P.O. #: 47001127 005 OD
Sampler Initials: DW

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		P93796	P93796	P93797	P93798		
Sampling Date		2009/07/22	2009/07/22	2009/07/22	2009/07/22		
COC Number		116865	116865	116865	116865		
	Units	**SS09-01**	**SS09-01 Lab-Dup**	**SS09-02**	**SS09-03**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	8.0	7.8	6.2	7.1	0.3	3306462
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	68	40	<10	16	10	3306597
F3 (C16-C34 Hydrocarbons)	mg/kg	61	39	26	52	10	3306597
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	11	10	3306597
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3306597
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3305703
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3305703
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	3305703
(C6-C10)	mg/kg	<12	<12	<12	<12	12	3305703
Surrogate Recovery (%)							
4-BROMOFLUOROBENZENE (sur.)	%	106	104	104	107	N/A	3305703
D10-ETHYLBENZENE (sur.)	%	97	103	99	100	N/A	3305703
D4-1,2-DICHLOROETHANE (sur.)	%	113	115	109	107	N/A	3305703
D8-TOLUENE (sur.)	%	100	100	97	101	N/A	3305703
O-TERPHENYL (sur.)	%	111	112	108	109	N/A	3306597

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A938607
Report Date: 2009/07/30

IEG CONSULTANTS
Client Project #: A04012A01.02.01
Site Reference: CAMP FAREWELL, NT
Your P.O. #: 47001127 005 OD
Sampler Initials: DW

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		P93799	P93800	P93801	P93802		
Sampling Date		2009/07/22	2009/07/22	2009/07/22	2009/07/22		
COC Number		116865	116865	116865	116865		
	Units	**SS09-04**	**SS09-05**	**SS09-06**	**SS09-07**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	8.3	9.1	4.3	4.8	0.3	3306462
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	56	<10	10	3306597
F3 (C16-C34 Hydrocarbons)	mg/kg	65	110	100	11	10	3306597
F4 (C34-C50 Hydrocarbons)	mg/kg	19	29	<10	<10	10	3306597
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3306597
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3305703
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3305703
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	3305703
(C6-C10)	mg/kg	<12	<12	<12	<12	12	3305703
Surrogate Recovery (%)							
4-BROMOFLUOROBENZENE (sur.)	%	107	109	110	112	N/A	3305703
D10-ETHYLBENZENE (sur.)	%	106	105	104	104	N/A	3305703
D4-1,2-DICHLOROETHANE (sur.)	%	110	115	113	114	N/A	3305703
D8-TOLUENE (sur.)	%	102	97	101	101	N/A	3305703
O-TERPHENYL (sur.)	%	101	105	99	107	N/A	3306597

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A938607
Report Date: 2009/07/30

IEG CONSULTANTS
Client Project #: A04012A01.02.01
Site Reference: CAMP FAREWELL, NT
Your P.O. #: 47001127 005 OD
Sampler Initials: DW

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		P93803	P93804	P93805	P93806		
Sampling Date		2009/07/22	2009/07/22	2009/07/22	2009/07/22		
COC Number		116865	116865	116865	116865		
	Units	**SS09-08**	**SS09-09**	**SS09-10**	**SS09-11**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	5.4	5.4	5.3	7.8	0.3	3306462
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	400	2500	3700	1300	10	3306597
F3 (C16-C34 Hydrocarbons)	mg/kg	920	2900	3800	2900	10	3306597
F4 (C34-C50 Hydrocarbons)	mg/kg	13	36	30	64	10	3306597
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3306597
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3305703
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3305703
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
F1 (C6-C10) - BTEX	mg/kg	<12	66	110	<12	12	3305703
(C6-C10)	mg/kg	<12	66	110	<12	12	3305703
Surrogate Recovery (%)							
4-BROMOFLUOROBENZENE (sur.)	%	103	113	108	98	N/A	3305703
D10-ETHYLBENZENE (sur.)	%	105	100	83	82	N/A	3305703
D4-1,2-DICHLOROETHANE (sur.)	%	112	118	115	116	N/A	3305703
D8-TOLUENE (sur.)	%	102	96	86	97	N/A	3305703
O-TERPHENYL (sur.)	%	105	98	107	88	N/A	3306597

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A938607
Report Date: 2009/07/30

IEG CONSULTANTS
Client Project #: A04012A01.02.01
Site Reference: CAMP FAREWELL, NT
Your P.O. #: 47001127 005 OD
Sampler Initials: DW

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		P93807	P93808	P93809	P93810		
Sampling Date		2009/07/22	2009/07/22	2009/07/22	2009/07/22		
COC Number		116865	116864	116864	116864		
	Units	**SS09-12**	**SS09-13**	**SS09-14**	**SS09-15**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	5.6	5.6	5.1	6.0	0.3	3306462
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	170	22	10	3306597
F3 (C16-C34 Hydrocarbons)	mg/kg	24	17	35	210	10	3306597
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	13	10	3306597
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3306597
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3305703
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3305703
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	3305703
(C6-C10)	mg/kg	<12	<12	<12	<12	12	3305703
Surrogate Recovery (%)							
4-BROMOFLUOROBENZENE (sur.)	%	107	113	105	112	N/A	3305703
D10-ETHYLBENZENE (sur.)	%	81	100	96	104	N/A	3305703
D4-1,2-DICHLOROETHANE (sur.)	%	116	111	112	113	N/A	3305703
D8-TOLUENE (sur.)	%	96	101	102	100	N/A	3305703
O-TERPHENYL (sur.)	%	107	99	107	104	N/A	3306597

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A938607
Report Date: 2009/07/30

IEG CONSULTANTS
Client Project #: A04012A01.02.01
Site Reference: CAMP FAREWELL, NT
Your P.O. #: 47001127 005 OD
Sampler Initials: DW

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		P93811	P93812	P93813		
Sampling Date		2009/07/22	2009/07/22	2009/07/22		
COC Number		116864	116864	116864		
	Units	**SS09-16**	**SS09-17**	**SS09-18**	**RDL**	**QC Batch**
Physical Properties						
Moisture	%	5.9	6.2	2.9	0.3	3306462
Ext. Pet. Hydrocarbon						
F2 (C10-C16 Hydrocarbons)	mg/kg	240	<10	<10	10	3306597
F3 (C16-C34 Hydrocarbons)	mg/kg	580	440	26	10	3306597
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	150	<10	10	3306597
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	N/A	3306597
Volatiles						
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	0.0050	3305703
Toluene	mg/kg	<0.020	<0.020	<0.020	0.020	3305703
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	0.010	3305703
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	0.040	3305703
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	0.040	3305703
o-Xylene	mg/kg	<0.020	<0.020	<0.020	0.020	3305703
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	12	3305703
(C6-C10)	mg/kg	<12	<12	<12	12	3305703
Surrogate Recovery (%)						
4-BROMOFLUOROBENZENE (sur.)	%	104	97	109	N/A	3305703
D10-ETHYLBENZENE (sur.)	%	103	110	106	N/A	3305703
D4-1,2-DICHLOROETHANE (sur.)	%	113	113	117	N/A	3305703
D8-TOLUENE (sur.)	%	101	105	101	N/A	3305703
O-TERPHENYL (sur.)	%	102	80	81	N/A	3306597

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A938607
Report Date: 2009/07/30

IEG CONSULTANTS
Client Project #: A04012A01.02.01
Site Reference: CAMP FAREWELL, NT
Your P.O. #: 47001127 005 OD
Sampler Initials: DW

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		P93797	P93801	P93804	P93807		
Sampling Date		2009/07/22	2009/07/22	2009/07/22	2009/07/22		
COC Number		116865	116865	116865	116865		
	Units	**SS09-02**	**SS09-06**	**SS09-09**	**SS09-12**	**RDL**	**QC Batch**
Physical Properties							
Sieve - Pan	%	3.0	3.2	1.4	3.9	0.2	3306318
Sieve - #200 (>0.075mm)	%	97	97	99	96	0.2	3306318
Grain Size	%	COARSE	COARSE	COARSE	COARSE	0.2	3306318

RDL = Reportable Detection Limit

Maxxam ID		P93809	P93812		
Sampling Date		2009/07/22	2009/07/22		
COC Number		116864	116864		
	Units	**SS09-14**	**SS09-17**	**RDL**	**QC Batch**
Physical Properties					
Sieve - Pan	%	2.8	7.8	0.2	3306318
Sieve - #200 (>0.075mm)	%	97	92	0.2	3306318
Grain Size	%	COARSE	COARSE	0.2	3306318

RDL = Reportable Detection Limit

Package 1	14.3°C

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

General Comments

Results relate only to the items tested.

IEG CONSULTANTS
Attention:
Client Project #: A04012A01.02.01
P.O. #: 47001127 005 OD
Site Reference: CAMP FAREWELL, NT

Quality Assurance Report

Maxxam Job Number: EA938607

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3305703	CC6	MATRIX SPIKE						
		[P93797-01]	4-BROMOFLUOROBENZENE (sur.)	2009/07/29		106	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/07/29		101	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/07/29		110	%	60 - 140
			D8-TOLUENE (sur.)	2009/07/29		99	%	60 - 140
			Benzene	2009/07/29		93	%	60 - 140
			Toluene	2009/07/29		91	%	60 - 140
			Ethylbenzene	2009/07/29		101	%	60 - 140
			m & p-Xylene	2009/07/29		104	%	60 - 140
			o-Xylene	2009/07/29		93	%	60 - 140
			(C6-C10)	2009/07/29		120	%	60 - 140
		SPIKE	4-BROMOFLUOROBENZENE (sur.)	2009/07/29		103	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/07/29		97	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/07/29		111	%	60 - 140
			D8-TOLUENE (sur.)	2009/07/29		102	%	60 - 140
			Benzene	2009/07/29		90	%	60 - 140
			Toluene	2009/07/29		90	%	60 - 140
			Ethylbenzene	2009/07/29		100	%	60 - 140
			m & p-Xylene	2009/07/29		103	%	60 - 140
			o-Xylene	2009/07/29		93	%	60 - 140
			(C6-C10)	2009/07/29		115	%	80 - 120
		BLANK	4-BROMOFLUOROBENZENE (sur.)	2009/07/29		107	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/07/29		108	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/07/29		112	%	60 - 140
			D8-TOLUENE (sur.)	2009/07/29		103	%	60 - 140
			Benzene	2009/07/29	<0.0050		mg/kg	
			Toluene	2009/07/29	<0.020		mg/kg	
			Ethylbenzene	2009/07/29	<0.010		mg/kg	
			Xylenes (Total)	2009/07/29	<0.040		mg/kg	
			m & p-Xylene	2009/07/29	<0.040		mg/kg	
			o-Xylene	2009/07/29	<0.020		mg/kg	
			F1 (C6-C10) - BTEX	2009/07/29	<12		mg/kg	
			(C6-C10)	2009/07/29	<12		mg/kg	
		RPD [P93796-01]	Benzene	2009/07/29	NC		%	50
			Toluene	2009/07/29	NC		%	50
			Ethylbenzene	2009/07/29	NC		%	50
			Xylenes (Total)	2009/07/29	NC		%	50
			m & p-Xylene	2009/07/29	NC		%	50
			o-Xylene	2009/07/29	NC		%	50
			F1 (C6-C10) - BTEX	2009/07/29	NC		%	50
			(C6-C10)	2009/07/29	NC		%	50
3306318	ST6	BLANK	Sieve - Pan	2009/07/28	<0.2		%	
			Sieve - #200 (>0.075mm)	2009/07/28	<0.2		%	
		RPD	Sieve - Pan	2009/07/28	1		%	35
			Sieve - #200 (>0.075mm)	2009/07/28	2.0		%	35
3306462	JP6	BLANK	Moisture	2009/07/28	<0.3		%	
		RPD [P93796-01]	Moisture	2009/07/28	2.5		%	20
3306597	LD2	MATRIX SPIKE						
		[P93797-01]	O-TERPHENYL (sur.)	2009/07/29		97	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2009/07/29		106	%	50 - 130
			F3 (C16-C34 Hydrocarbons)	2009/07/29		109	%	50 - 130
			F4 (C34-C50 Hydrocarbons)	2009/07/29		106	%	50 - 130
		SPIKE	O-TERPHENYL (sur.)	2009/07/29		84	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2009/07/29		102	%	80 - 120
			F3 (C16-C34 Hydrocarbons)	2009/07/29		106	%	80 - 120

IEG CONSULTANTS
Attention:
Client Project #: A04012A01.02.01
P.O. #: 47001127 005 OD
Site Reference: CAMP FAREWELL, NT

Quality Assurance Report (Continued)

Maxxam Job Number: EA938607

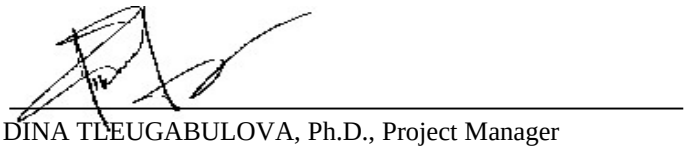
QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3306597	LD2	SPIKE	F4 (C34-C50 Hydrocarbons)	2009/07/29		102	%	80 - 120
		BLANK	O-TERPHENYL (sur.)	2009/07/29		115	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2009/07/29	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2009/07/29	<10		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2009/07/29	<10		mg/kg	
		RPD [P93796-01]	F2 (C10-C16 Hydrocarbons)	2009/07/29	NC		%	50
			F3 (C16-C34 Hydrocarbons)	2009/07/29	NC		%	50
			F4 (C34-C50 Hydrocarbons)	2009/07/29	NC		%	50

NC = Non-calculable
RPD = Relative Percent Difference

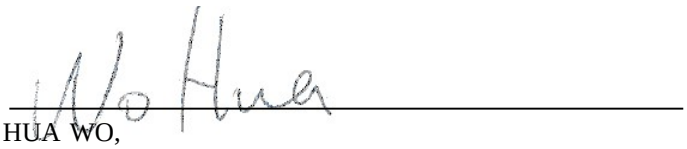
Validation Signature Page

Maxxam Job #: A938607

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



DINA TLEUGABULOVA, Ph.D., Project Manager



HUA WO,

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

257

Maxxam Analytics Inc

Calgary: 2021 – 41st Ave. NE, T2E 6P2 | Ph: (403) 291-3077 | Fax: (403) 291-9468 | Toll-free: (800) 386-7247
Edmonton: 9619 – 42 Ave., T6E 5R2 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll-free: (877) 465-8889
www.maxxamanalytics.com

A938607 RT/TD

ANALYTICAL REQUEST FORM

Page: 1 of 2

Invoice To: Require Report? Yes ☐ No ☒

Company Name: Shell Canada
Contact Name: Randall Warren
Address: 4000th - 4th St SW
Calgary, AB PC: T2P2H5
Phone / Fax #: Ph: 403 Fax:

Report To:

IEG Consultants Ltd.
PO Box 3178
Inuvik, NT PC: X0E0T0
Ph: 8677778521 Fax: 8677772747

PO # / AFE #:
Quotation #:
Project #: A040128A01.02.01
Project Name: Camp Farewell
Location: Camp Farewell, NT
Sampler's Initials: DW

REGULATORY REQUIREMENTS:

☐ AT1 - Soil Contamination ☐ PST
☒ CCME ☐ CDWQG
☐ CCME FWAL ☐ G50
☐ Regulatory Limits to appear on Final report

REPORT DISTRIBUTION:

☐ Mail ☐ Fax
☒ PDF ☒ Excel ☐ Other:
☒ Email: dwells@ieg.ca
Sbird@kldw.com

SERVICE REQUESTED:

☐ RUSH (Please ensure you contact the lab)
Date Required:
☒ REGULAR Turnaround

METALS: (WATERS):

☐ Total ☐ Extractable ☐ Dissolved

ANALYSIS REQUESTED

	Sample Identification	Matrix	Date/Time Sampled	Sample Type Grab/Comp	Hold > 60 Days	Sample Container #	CCME F1-F4	~~Hold~~	Particle size 75um
1	SS09-01	Soil	July 22	Comp		1	X		
2	-02						X		X
3	-03						X		
4	-04						X		
5	-05						X		
6	-06						X		X
7	-07						X		
8	-08						X		
9	-09						X		X
10	-10						X		
11	-11						X		
12	-12						X		X

**For water samples, please indicate if sample container has been preserved (P) and/or filtered (F).

Relinquished By: David Wells
Signature:
Date/Time: July 23 / 8:40

COMMENTS/SPECIAL INSTRUCTIONS:

Received 24/07/09 12:40h RT

Temperature 16/12/15°C

C of C # 116865

KEREQUESTFORMN-05/05

257

Maxxam Analytics Inc

☐ Calgary: 2021 – 41st Ave. NE, T2E 6P2 Ph: (403) 291-3077 Fax: (403) 291-9468 Toll-free: (800) 386-7247
☐ Edmonton: 9619 – 42 Ave., T6E 5R2 Ph: (780) 465-1212 Fax: (780) 450-4187 Toll-free: (877) 485-8889
www.maxxamanalytics.com

ANALYTICAL REQUEST FORM

A45807 RT / D

Invoice To: Require Report? Yes ☐ No ☐

Company Name:
Contact Name:
Address:
PC:
Phone / Fax #: Ph: Fax:

Report To:

PC:
Ph: Fax:

PO # / AFE #:	
Quotation #:	
Project #:	
Project Name:	
Location:	
Sampler's Initials:	

REGULATORY REQUIREMENTS:

☐ AT1 - Soil Contamination ☐ PST
☐ CCME ☐ CDWQG
☐ CCME FWAL ☐ G50
☐ Regulatory Limits to appear on Final report

REPORT DISTRIBUTION:

☐ Mail ☐ Fax
☐ PDF ☐ Excel ☐ Other:
☐ Email:

SERVICE REQUESTED:

☐ RUSH (Please ensure you contact the lab)
Date Required:
☐ REGULAR Turnaround

METALS: (WATERS):

☐ Total ☐ Extractable ☐ Dissolved

ANALYSIS REQUESTED

	Sample Identification	Matrix	Date/Time Sampled	Sample Type Grab/Comp	Hold > 60 Days	Sample Container #	CCME F1-F4	Particle Size
1	SS09-13	Soil	July 22	Comp		1	X	X
2	-14						X	
3	-15						X	X
4	-16						X	
5	-17						X	
6	SS09-18							
7								
8								
9								
10								
11								
12								

**For water samples, please indicate if sample container has been preserved (P) and/or filtered (F).

Relinquished By: **Date/Time:**

Signature:

COMMENTS/SPECIAL INSTRUCTIONS:

Received 24/07/09 12:40 RT

Temperature 16/12/15°C

C of C # 116864

KEREQUESTFORMN-05/05

Your Project #: A04012A01.02 CAMP FARE WELL
Site: MACKENZIE DELTA NWT
Your C.O.C. #: 81098, 81099, 81096, 81097

Attention: S BIRD
IEG CONSULTANTS
PO Box 3178
INUVIK, NT
CANADA X0E0T0

Report Date: 2009/09/28

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: A951752
Received: 2009/09/19, 11:15

Sample Matrix: Soil
Samples Received: 16

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS (MeOH extract)	8	2009/09/20	2009/09/23	EENVSOP-00005 EENVSOP-00002	EPA 8260C/CCME
Chloride (soluble)	2	2009/09/23	2009/09/23	EENVSOP-00055	SM 4110-B
Chloride (soluble)	3	2009/09/25	2009/09/25	EENVSOP-00055	SM 4110-B
Conductivity (Soluble)	5	2009/09/23	2009/09/23	EENVSOP-00052	SSMA 18.3
CCME Hydrocarbons (F2-F4 in soil)	8	2009/09/20	2009/09/21	EENVSOP-00007 EENVSOP-00006	CCME PHC-CWS
Ion Balance	5	N/A	2009/09/24	CAL WI-00053	SM 1030E
Sum of Cations, Anions	5	N/A	2009/09/24		
Moisture	16	N/A	2009/09/25	EENVSOP-00139	Carter SSMA 51.2
pH (1:2 Calcium Chloride Extract)	5	2009/09/22	2009/09/22	AB SOP-00006	SSMA 16.3
pH (1:1 extract, solid waste)	5	2009/09/21	2009/09/21	AB SOP-00006	SSMA 16.3
Sodium Adsorption Ratio	5	N/A	2009/09/24		
Ca,Mg,Na,K,SO4 (Soluble)	5	2009/09/23	2009/09/23	CAL SOP-00192	EPA SW846/6010B
Soluble Paste	5	2009/09/23	2009/09/23	CAL SOP-00029	MSA No9, Part2
Theoretical Gypsum Requirement	5	N/A	2009/09/24	CAL WI-00087	SSMA 18.4.4

Encryption Key

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

ABDULKADIR DAKANE, Project Manager
Email: Abdulkadir.Dakane@MaxxamAnalytics.com
Phone# (780) 577-7100

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 1

Maxxam Job #: A951752
Report Date: 2009/09/28

IEG CONSULTANTS
Client Project #: A04012A01.02 CAMP FARE WELL
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: SB

SOIL SALINITY 4 (SOIL)

Maxxam ID		Q83653	Q83653		
Sampling Date		2009/09/16	2009/09/16		
COC Number		81097	81097		
	Units	**0916-SS09-WR1-1**	**0916-SS09-WR1-1 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters					
Anion Sum	meq/L	13	N/A	N/A	3430465
Cation Sum	meq/L	94	N/A	N/A	3430465
Ion Balance	N/A	7.4	N/A	0.01	3430464
Soluble Parameters					
Soluble Chloride (Cl)	mg/L	19	N/A	5	3438510
Soluble Conductivity	dS/m	6.8	N/A	0.02	3437781
Soluble (CaCl2) pH	N/A	8.27	8.44	N/A	3435122
Sodium Adsorption Ratio	N/A	70	N/A	0.1	3430466
Soluble Calcium (Ca)	mg/L	43	N/A	1.5	3439366
Soluble Magnesium (Mg)	mg/L	15	N/A	1.0	3439366
Soluble Sodium (Na)	mg/L	2100	N/A	2.5	3439366
Soluble Potassium (K)	mg/L	4.2	N/A	1.3	3439366
Saturation %	%	61.0	N/A	N/A	3437774
Soluble Sulphate (SO4)	mg/L	580	N/A	5.0	3439366
Theoretical Gypsum Requirement	tons/ac	98	N/A	0.1	3430467

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A951752
Report Date: 2009/09/28

IEG CONSULTANTS
Client Project #: A04012A01.02 CAMP FARE WELL
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: SB

SOIL SALINITY 4 (SOIL)

Maxxam ID		Q83655		Q83656		
Sampling Date		2009/09/16		2009/09/16		
COC Number		81097		81097		
	Units	**0916-SS09-WR1-3**	**QC Batch**	**0916-SS09-WR2-1**	**RDL**	**QC Batch**
Calculated Parameters						
Anion Sum	meq/L	17	3430465	12	N/A	3430465
Cation Sum	meq/L	120	3430465	57	N/A	3430465
Ion Balance	N/A	7.0	3430464	4.7	0.01	3430464
Soluble Parameters						
Soluble Chloride (Cl)	mg/L	48	3446226	72	5	3438510
Soluble Conductivity	dS/m	8.7	3437781	3.7	0.02	3437781
Soluble (CaCl2) pH	N/A	8.47	3435122	8.21	N/A	3435122
Sodium Adsorption Ratio	N/A	62	3430466	30	0.1	3430466
Soluble Calcium (Ca)	mg/L	93	3439366	79	1.5	3439366
Soluble Magnesium (Mg)	mg/L	26	3439366	22	1.0	3439366
Soluble Sodium (Na)	mg/L	2600	3439366	1200	2.5	3439366
Soluble Potassium (K)	mg/L	10	3439366	6.4	1.3	3439366
Saturation %	%	40.0	3437774	44.1	N/A	3437774
Soluble Sulphate (SO4)	mg/L	770	3439366	480	5.0	3439366
Theoretical Gypsum Requirement	tons/ac	99	3430467	14	0.1	3430467

RDL = Reportable Detection Limit

Maxxam Job #: A951752
Report Date: 2009/09/28

IEG CONSULTANTS
Client Project #: A04012A01.02 CAMP FARE WELL
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: SB

SOIL SALINITY 4 (SOIL)

Maxxam ID		Q83658	Q83660		
Sampling Date		2009/09/16	2009/09/16		
COC Number		81097	81097		
	Units	**0916-SS09-WR3-1**	**0916-SS09-WR3-3**	**RDL**	**QC Batch**
Calculated Parameters					
Anion Sum	meq/L	16	13	N/A	3430465
Cation Sum	meq/L	110	85	N/A	3430465
Ion Balance	N/A	6.9	6.6	0.01	3430464
Soluble Parameters					
Soluble Chloride (Cl)	mg/L	46	24	5	3446226
Soluble Conductivity	dS/m	7.5	5.9	0.02	3437781
Soluble (CaCl2) pH	N/A	8.63	8.43	N/A	3435122
Sodium Adsorption Ratio	N/A	56	50	0.1	3430466
Soluble Calcium (Ca)	mg/L	89	65	1.5	3439366
Soluble Magnesium (Mg)	mg/L	26	23	1.0	3439366
Soluble Sodium (Na)	mg/L	2400	1800	2.5	3439366
Soluble Potassium (K)	mg/L	7.1	4.7	1.3	3439366
Saturation %	%	44.0	48.5	N/A	3437774
Soluble Sulphate (SO4)	mg/L	700	590	5.0	3439366
Theoretical Gypsum Requirement	tons/ac	86	57	0.1	3430467

RDL = Reportable Detection Limit

Maxxam Job #: A951752
Report Date: 2009/09/28

IEG CONSULTANTS
Client Project #: A04012A01.02 CAMP FARE WELL
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: SB

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		Q83617	Q83617	Q83622	Q83623		
Sampling Date		2009/09/16	2009/09/16	2009/09/16	2009/09/16		
COC Number		81098	81098	81098	81098		
	Units	**0916-SS09-05**	**0916-SS09-05 Lab-Dup**	**0916-SS09-10**	**0916-SS09-11**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	8.3	8.1	7.6	8.3	0.3	3444662

RDL = Reportable Detection Limit

Maxxam ID		Q83630	Q83637	Q83640	Q83645		
Sampling Date		2009/09/16	2009/09/16	2009/09/16	2009/09/16		
COC Number		81099	81096	81096	81096		
	Units	**0916-SS09-18**	**0916-SS09-25**	**0916-SS09-28**	**0916-SS09-33**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	9.0	9.2	8.3	7.8	0.3	3444662

RDL = Reportable Detection Limit

Maxxam ID		Q83652	Q83653	Q83653	Q83654		
Sampling Date		2009/09/16	2009/09/16	2009/09/16	2009/09/16		
COC Number		81097	81097	81097	81097		
	Units	**0916-SS09-40**	**0916-SS09-WR1-1**	**0916-SS09-WR1-1 Lab-Dup**	**0916-SS09-WR1-2**	**RDL**	**QC Batch**
Soluble Parameters							
Soluble (1:1) pH	N/A	N/A	9.78	9.96	N/A	N/A	3431895
Physical Properties							
Moisture	%	8.1	7.5	N/A	6.7	0.3	3444662

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A951752
Report Date: 2009/09/28

IEG CONSULTANTS
Client Project #: A04012A01.02 CAMP FARE WELL
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: SB

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		Q83655	Q83656	Q83657		
Sampling Date		2009/09/16	2009/09/16	2009/09/16		
COC Number		81097	81097	81097		
	Units	**0916-SS09-WR1-3**	**0916-SS09-WR2-1**	**0916-SS09-WR2-2**	**RDL**	**QC Batch**
Soluble Parameters						
Soluble (1:1) pH	N/A	9.90	9.88	N/A	N/A	3431895
Physical Properties						
Moisture	%	7.6	9.5	10	0.3	3444662

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		Q83658	Q83659	Q83660		
Sampling Date		2009/09/16	2009/09/16	2009/09/16		
COC Number		81097	81097	81097		
	Units	**0916-SS09-WR3-1**	**0916-SS09-WR3-2**	**0916-SS09-WR3-3**	**RDL**	**QC Batch**
Soluble Parameters						
Soluble (1:1) pH	N/A	9.97	N/A	9.85	N/A	3431895
Physical Properties						
Moisture	%	7.9	8.5	8.3	0.3	3444662

N/A = Not Applicable
RDL = Reportable Detection Limit

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		Q83653	Q83653	Q83654		
Sampling Date		2009/09/16	2009/09/16	2009/09/16		
COC Number		81097	81097	81097		
	Units	**0916-SS09-WR1-1**	**0916-SS09-WR1-1 Lab-Dup**	**0916-SS09-WR1-2**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon						
F2 (C10-C16 Hydrocarbons)	mg/kg	450	520	530	10	3431075
F3 (C16-C34 Hydrocarbons)	mg/kg	600	730	630	10	3431075
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	10	3431075
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	N/A	3431075
Surrogate Recovery (%)						
O-TERPHENYL (sur.)	%	95	102	98	N/A	3431075

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		Q83655	Q83656	Q83657		
Sampling Date		2009/09/16	2009/09/16	2009/09/16		
COC Number		81097	81097	81097		
	Units	**0916-SS09-WR1-3**	**0916-SS09-WR2-1**	**0916-SS09-WR2-2**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon						
F2 (C10-C16 Hydrocarbons)	mg/kg	590	160	76	10	3431075
F3 (C16-C34 Hydrocarbons)	mg/kg	780	190	110	10	3431075
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	10	3431075
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	N/A	3431075
Surrogate Recovery (%)						
O-TERPHENYL (sur.)	%	111	88	83	N/A	3431075

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A951752
Report Date: 2009/09/28

IEG CONSULTANTS
Client Project #: A04012A01.02 CAMP FARE WELL
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: SB

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		Q83658	Q83659	Q83660		
Sampling Date		2009/09/16	2009/09/16	2009/09/16		
COC Number		81097	81097	81097		
	Units	**0916-SS09-WR3-1**	**0916-SS09-WR3-2**	**0916-SS09-WR3-3**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon						
F2 (C10-C16 Hydrocarbons)	mg/kg	55	27	110	10	3431075
F3 (C16-C34 Hydrocarbons)	mg/kg	49	27	160	10	3431075
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	10	3431075
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	N/A	3431075
Surrogate Recovery (%)						
O-TERPHENYL (sur.)	%	84	86	88	N/A	3431075

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A951752
Report Date: 2009/09/28

IEG CONSULTANTS
Client Project #: A04012A01.02 CAMP FARE WELL
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: SB

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		Q83617	Q83617	Q83622	Q83623		
Sampling Date		2009/09/16	2009/09/16	2009/09/16	2009/09/16		
COC Number		81098	81098	81098	81098		
	Units	**0916-SS09-05**	**0916-SS09-05 Lab-Dup**	**0916-SS09-10**	**0916-SS09-11**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3434716
Toluene	mg/kg	0.043	0.039	<0.020	0.050	0.020	3434716
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3434716
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	0.17	0.040	3434716
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	0.17	0.040	3434716
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3434716
F1 (C6-C10) - BTEX	mg/kg	<12	13	26	40	12	3434716
(C6-C10)	mg/kg	<12	13	26	40	12	3434716
Surrogate Recovery (%)							
4-BROMOFLUOROBENZENE (sur.)	%	98	106	103	114	N/A	3434716
D10-ETHYLBENZENE (sur.)	%	104	115	110	108	N/A	3434716
D4-1,2-DICHLOROETHANE (sur.)	%	82	82	80	79	N/A	3434716
D8-TOLUENE (sur.)	%	103	106	105	103	N/A	3434716

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A951752
Report Date: 2009/09/28

IEG CONSULTANTS
Client Project #: A04012A01.02 CAMP FARE WELL
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: SB

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		Q83630	Q83637	Q83640	Q83645		
Sampling Date		2009/09/16	2009/09/16	2009/09/16	2009/09/16		
COC Number		81099	81096	81096	81096		
	Units	**0916-SS09-18**	**0916-SS09-25**	**0916-SS09-28**	**0916-SS09-33**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3434716
Toluene	mg/kg	0.044	<0.020	0.043	0.032	0.020	3434716
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3434716
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3434716
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3434716
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3434716
F1 (C6-C10) - BTEX	mg/kg	50	20	12	<12	12	3434716
(C6-C10)	mg/kg	50	20	12	<12	12	3434716
Surrogate Recovery (%)							
4-BROMOFLUOROBENZENE (sur.)	%	120	94	94	94	N/A	3434716
D10-ETHYLBENZENE (sur.)	%	110	110	106	106	N/A	3434716
D4-1,2-DICHLOROETHANE (sur.)	%	77	78	77	77	N/A	3434716
D8-TOLUENE (sur.)	%	105	104	104	104	N/A	3434716

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: A951752
Report Date: 2009/09/28

IEG CONSULTANTS
Client Project #: A04012A01.02 CAMP FARE WELL
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: SB

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		Q83652		
Sampling Date		2009/09/16		
COC Number		81097		
	Units	**0916-SS09-40**	**RDL**	**QC Batch**
Volatiles				
Benzene	mg/kg	<0.0050	0.0050	3434716
Toluene	mg/kg	0.031	0.020	3434716
Ethylbenzene	mg/kg	<0.010	0.010	3434716
Xylenes (Total)	mg/kg	<0.040	0.040	3434716
m & p-Xylene	mg/kg	<0.040	0.040	3434716
o-Xylene	mg/kg	<0.020	0.020	3434716
F1 (C6-C10) - BTEX	mg/kg	<12	12	3434716
(C6-C10)	mg/kg	<12	12	3434716
Surrogate Recovery (%)				
4-BROMOFLUOROBENZENE (sur.)	%	94	N/A	3434716
D10-ETHYLBENZENE (sur.)	%	102	N/A	3434716
D4-1,2-DICHLOROETHANE (sur.)	%	78	N/A	3434716
D8-TOLUENE (sur.)	%	102	N/A	3434716

N/A = Not Applicable
RDL = Reportable Detection Limit

Package 1	6.3°C

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

General Comments

Sample Q83653-01: Ionic imbalance; some analysis performed in duplicate; possible matrix impact.

Sample Q83655-01: Ionic imbalance; some analysis performed in duplicate; possible matrix impact.

Sample Q83658-01: Ionic imbalance; some analysis performed in duplicate; possible matrix impact.

Sample Q83660-01: Ionic imbalance; some analysis performed in duplicate; possible matrix impact.

Results relate only to the items tested.

IEG CONSULTANTS
Attention: S BIRD
Client Project #: A04012A01.02 CAMP FARE WELL
P.O. #:
Site Reference: MACKENZIE DELTA NWT

Quality Assurance Report

Maxxam Job Number: EA951752

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3431075	AN4	Matrix Spike						
		[Q83654-01]	O-TERPHENYL (sur.)	2009/09/21		110	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2009/09/21		NC	%	50 - 130
			F3 (C16-C34 Hydrocarbons)	2009/09/21		NC	%	50 - 130
			F4 (C34-C50 Hydrocarbons)	2009/09/21		106	%	50 - 130
		Spiked Blank	O-TERPHENYL (sur.)	2009/09/21		76	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2009/09/21		116	%	80 - 120
			F3 (C16-C34 Hydrocarbons)	2009/09/21		99	%	80 - 120
			F4 (C34-C50 Hydrocarbons)	2009/09/21		107	%	80 - 120
		Method Blank	O-TERPHENYL (sur.)	2009/09/21		81	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2009/09/21	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2009/09/21	<10		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2009/09/21	<10		mg/kg	
		RPD [Q83653-01]	F2 (C10-C16 Hydrocarbons)	2009/09/21	13.6		%	50
			F3 (C16-C34 Hydrocarbons)	2009/09/21	19.4		%	50
			F4 (C34-C50 Hydrocarbons)	2009/09/21	NC		%	50
3431895	DS9	Calibration Check	Soluble (1:1) pH	2009/09/21		100	%	99 - 101
		RPD [Q83653-01]	Soluble (1:1) pH	2009/09/21	1.8		%	5
3434716	CD1	Matrix Spike						
		[Q83622-01]	4-BROMOFLUOROBENZENE (sur.)	2009/09/22		93	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/09/22		104	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/09/22		79	%	60 - 140
			D8-TOLUENE (sur.)	2009/09/22		103	%	60 - 140
			Benzene	2009/09/22		108	%	60 - 140
			Toluene	2009/09/22		103	%	60 - 140
			Ethylbenzene	2009/09/22		104	%	60 - 140
			m & p-Xylene	2009/09/22		102	%	60 - 140
			o-Xylene	2009/09/22		101	%	60 - 140
			(C6-C10)	2009/09/22		88	%	60 - 140
		Spiked Blank	4-BROMOFLUOROBENZENE (sur.)	2009/09/22		115	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/09/22		113	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/09/22		81	%	60 - 140
			D8-TOLUENE (sur.)	2009/09/22		100	%	60 - 140
			Benzene	2009/09/22		109	%	60 - 140
			Toluene	2009/09/22		101	%	60 - 140
			Ethylbenzene	2009/09/22		101	%	60 - 140
			m & p-Xylene	2009/09/22		100	%	60 - 140
			o-Xylene	2009/09/22		99	%	60 - 140
			(C6-C10)	2009/09/22		115	%	80 - 120
		Method Blank	4-BROMOFLUOROBENZENE (sur.)	2009/09/24		93	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/09/24		103	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/09/24		79	%	60 - 140
			D8-TOLUENE (sur.)	2009/09/24		105	%	60 - 140
			Benzene	2009/09/24	<0.0050		mg/kg	
			Toluene	2009/09/24	<0.020		mg/kg	
			Ethylbenzene	2009/09/24	<0.010		mg/kg	
			Xylenes (Total)	2009/09/24	<0.040		mg/kg	
			m & p-Xylene	2009/09/24	<0.040		mg/kg	
			o-Xylene	2009/09/24	<0.020		mg/kg	
			F1 (C6-C10) - BTEX	2009/09/24	<12		mg/kg	
			(C6-C10)	2009/09/24	<12		mg/kg	
		RPD [Q83617-01]	Benzene	2009/09/23	NC		%	50
			Toluene	2009/09/23	NC		%	50
			Ethylbenzene	2009/09/23	NC		%	50
			Xylenes (Total)	2009/09/23	NC		%	50

IEG CONSULTANTS
Attention: S BIRD
Client Project #: A04012A01.02 CAMP FARE WELL
P.O. #:
Site Reference: MACKENZIE DELTA NWT

Quality Assurance Report (Continued)

Maxxam Job Number: EA951752

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3434716	CD1	RPD [Q83617-01]	m & p-Xylene	2009/09/23	NC		%	50
			o-Xylene	2009/09/23	NC		%	50
			F1 (C6-C10) - BTEX	2009/09/23	NC		%	50
			(C6-C10)	2009/09/23	NC		%	50
3435122	SB8	Calibration Check	Soluble (CaCl2) pH	2009/09/22		100	%	97 - 103
		QC Standard	Soluble (CaCl2) pH	2009/09/22		98	%	97 - 103
		RPD [Q83653-01]	Soluble (CaCl2) pH	2009/09/22	2.1		%	5
3437774	JM9	QC Standard	Saturation %	2009/09/23		102	%	81 - 119
		Method Blank	Saturation %	2009/09/23	0.00		%	
		RPD	Saturation %	2009/09/23	0.9		%	12
3437781	AD3	Calibration Check	Soluble Conductivity	2009/09/23		98	%	95 - 105
		QC Standard	Soluble Conductivity	2009/09/23		92	%	80 - 120
		Method Blank	Soluble Conductivity	2009/09/23	<0.02		dS/m	
		RPD	Soluble Conductivity	2009/09/23	1.8		%	35
3438510	SY1	Calibration Check	Soluble Chloride (Cl)	2009/09/23		99	%	80 - 120
		Matrix Spike	Soluble Chloride (Cl)	2009/09/23		101	%	75 - 125
		QC Standard	Soluble Chloride (Cl)	2009/09/23		91	%	75 - 125
		Method Blank	Soluble Chloride (Cl)	2009/09/23	<5		mg/L	
		RPD	Soluble Chloride (Cl)	2009/09/23	NC		%	35
3439366	SG8	Calibration Check	Soluble Calcium (Ca)	2009/09/23		103	%	80 - 120
			Soluble Magnesium (Mg)	2009/09/23		102	%	80 - 120
			Soluble Sodium (Na)	2009/09/23		102	%	80 - 120
			Soluble Potassium (K)	2009/09/23		103	%	80 - 120
		QC Standard	Soluble Calcium (Ca)	2009/09/23		87	%	75 - 125
			Soluble Magnesium (Mg)	2009/09/23		81	%	75 - 125
			Soluble Sodium (Na)	2009/09/23		83	%	75 - 125
			Soluble Potassium (K)	2009/09/23		89	%	75 - 125
			Soluble Sulphate (SO4)	2009/09/23		83	%	75 - 125
		Method Blank	Soluble Calcium (Ca)	2009/09/23	<1.5		mg/L	
			Soluble Magnesium (Mg)	2009/09/23	<1.0		mg/L	
			Soluble Sodium (Na)	2009/09/23	<2.5		mg/L	
			Soluble Potassium (K)	2009/09/23	<1.3		mg/L	
			Soluble Sulphate (SO4)	2009/09/23	<5.0		mg/L	
		RPD	Soluble Calcium (Ca)	2009/09/23	20.3		%	35
			Soluble Magnesium (Mg)	2009/09/23	NC		%	35
			Soluble Sodium (Na)	2009/09/23	NC		%	35
			Soluble Potassium (K)	2009/09/23	NC		%	35
			Soluble Sulphate (SO4)	2009/09/23	NC		%	35
3444662	SR7	Method Blank	Moisture	2009/09/25	<0.3		%	
		RPD [Q83617-01]	Moisture	2009/09/25	2.4		%	20

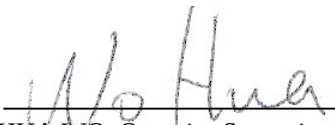
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration accuracy.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: A951752

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

DIANE ZACHARKIW, Scientific Specialist



HUA WO, Organics Supervisor

LISA CUMMINGS, Extractables Supervisor

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CALA have approved this reporting process and electronic report format.

013

A951752 / JE/MW5

Maxxam Analytics

Calgary: 4000 19st St. NE, T2E 6P8 | Ph: (403) 291-3077 | Fax: (403) 735-2240 | Toll free: (800) 386-7247
Edmonton: 9331 – 48 Street, T6B 2R4 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll free: (877) 465-8889
www.maxxamanalytics.com

81098

CHAIN OF CUSTODY

Page: 1 of 24

Invoice To:	Require Report? Yes ☐ No ☑
Company Name:	Shell Canada Energy
Contact Name:	Randall Warren
Address:	400 - 4 Ave SW Calgary
	Prov: Alta PC:
Contact #s:	Ph: 403-691-2521 Fax:

Report To:	
	Sam Bird
	IEG Consultants,
	500 - 2618 Hopewell Place NE Cal.
Prov:	Alta PC: T1Y-7J7
Ph:	403-990-1382 Fax:

PO # / AFE #:	
Quotation #:	
Project #:	A04012A01.02
Project Name:	Camp Farewell
Location:	Mackenzie Delta NWT
Sampler's Initials:	SB

DETECTION LIMIT REQUIREMENTS:

Check the applicable criterion and indicate land use

- ☐ AT1 _____
- ☑ CCME _____
- ☐ OTHER _____

REPORT DISTRIBUTION:

EMAIL ADDRESS(S):
sbird@ieg.ca
nimmel@klohn.com

SERVICE REQUESTED:

- ☐ **RUSH** (Please ensure you contact the lab to reserve)
  Date Required: _____
- ☑ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS: BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	☐ Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals	BTEX + F1 F2 - F4	WATERS: ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	REGULATED METALS (CCME / AT1)[3]: Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	0916-SS09-01	S	2009/09/16																			1
2	02																					1
3	03																					1
4	04																					1
5	05										X											1
6	06																					1
7	07																					1
8	08																					1
9	09																					1
10	10										X											1
11	11										X											1
12	12																					1

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: SAM BIRD Date/Time: Sept. 18, 2009 11:00 AM

Sign and Print: Sam Bird

COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED	Received By	Temperature			Ice
	19/09/09 11:15 D-W	6	6	7	Yes
	CUSTODY SEAL YES / NO				

013

A951752 IEG MNS

81099

Maxxam Analytics

Calgary: 4000 19st St. NE, T2E 6P8 | Ph: (403) 291-3077 | Fax: (403) 735-2240 | Toll free: (800) 386-7247
Edmonton: 9331 – 48 Street, T6B 2R4 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll free: (877) 465-8889
www.maxxamanalytics.com

CHAIN OF CUSTODY

Page: 2 of 24

Invoice To:	Report To:	
Require Report? Yes ☐ No ☐	SAM BIRD	PO # / AFE #:
Company Name:	IEG Consultants	Quotation #:
Contact Name:		Project #:
Address:		Project Name:
Prov: PC:	Prov: PC:	Location:
Contact #s: Ph: Fax:	Ph: Fax:	Sampler's Initials:

DETECTION LIMIT REQUIREMENTS:
Check the applicable criterion and indicate land use
☐ AT1
☑ CCME
☐ OTHER

REPORT DISTRIBUTION:
EMAIL ADDRESS(S):
sbird@ieg.ca

SERVICE REQUESTED:
☐ **RUSH** (Please ensure you contact the lab to reserve)
Date Required:
☑ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS: BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	☐ Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals	BTEX + F1	WATERS: ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	REGULATED METALS (CCME / AT1)[3]: Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	0916-5509-13	S	2009/09/16																			1
2	14																					1
3	15																					1
4	16																					1
5	17																					1
6	18										X											1
7	19																					1
8	20																					1
9	21																					1
10	22																					1
11	23																					1
12	24																					1

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: SAM BIRD Date/Time: Sept. 18, 2009 11am
Sign and Print: Sam Bird
COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED	Received By	Temperature			Ice
	19/09/09 11:15 D.W	6	6	7	
	CUSTODY SEAL YES / NO				

013

A951752/JE/MNS

81096

Maxxam Analytics

Calgary: 4000 19st St. NE, T2E 6P8 | Ph: (403) 291-3077 | Fax: (403) 735-2240 | Toll free: (800) 386-7247
Edmonton: 9331 – 48 Street, T6B 2R4 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll free: (877) 465-8889
www.maxxamanalytics.com

CHAIN OF CUSTODY

Page: 3 of 4

Invoice To: Require Report? Yes ☐ No ☐	Report To: SAM BIRD	
Company Name:		PO # / AFE #:
Contact Name:		Quotation #:
Address:		Project #:
Prov: PC:	Prov: PC:	Project Name:
Contact #s: Ph: Fax:	Ph: 403 9901382 Fax:	Location:
		Sampler's Initials:

DETECTION LIMIT REQUIREMENTS:
Check the applicable criterion and indicate land use
☐ AT1 _____
☑ CCME _____
☐ OTHER _____

REPORT DISTRIBUTION:
EMAIL ADDRESS(S): sbird@icg.ca

SERVICE REQUESTED:
☐ **RUSH** (Please ensure you contact the lab to reserve)
Date Required: _____
☑ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS: BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	Paint Filter ☐ Flashpoint ☐ pH (1:1)	TCLP ☐ BTEX ☐ Metals	BTEX+F1	WATERS: ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	REGULATED METALS (CCME / AT1)[3]: Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	0916-SS09-25	S	2009/09/16								X											1
2	26																					1
3	27																					1
4	28										X											1
5	29																					1
6	30																					1
7	31																					1
8	32																					1
9	33										X											1
10	34																					1
11	35																					1
12	36																					1

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: SAM BIRD Date/Time: Sept. 18, 2009 11 am
Sign and Print: Sam Bird
COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED	Received By	Temperature			Ice
	19/09/09 11:45 D.W	6	6	7	Y
	CUSTODY SEAL YES / NO				

013

A9S1752 / JE / MVS.

81097

CHAIN OF CUSTODY

Maxxam Analytics

Calgary: 4000 19st St. NE, T2E 6P8 | Ph: (403) 291-3077 | Fax: (403) 735-2240 | Toll free: (800) 386-7247

Edmonton: 9331 – 48 Street, T6B 2R4 | Ph: (780) 465-1212 | Fax: (780) 450-4187 | Toll free: (877) 465-8889

www.maxxamanalytics.com

Invoice To: Require Report? Yes ☐ No ☐			Report To: SAM BIRD / IEG Consultants.		PO # / AFE #:
Company Name:					Quotation #:
Contact Name:					Project #:
Address:					Project Name:
	Prov:	PC:	Prov:	PC:	Location:
Contact #s:	Ph:	Fax:	Ph:	Fax:	Sampler's Initials:

DETECTION LIMIT REQUIREMENTS:

Check the applicable criterion and indicate land use

- ☐ AT1 _____
- ☐ CCME _____
- ☐ OTHER _____

REPORT DISTRIBUTION:

EMAIL ADDRESS(S): sbird@ieg.ca

SERVICE REQUESTED:

- ☐ **RUSH** (Please ensure you contact the lab to reserve)
  Date Required: _____
- ☐ REGULAR Turnaround (5 to 7 Days)

	Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS: BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)[1]	Assessment ICP Metals[2]	Paint Filter ☐ Flashpoint ☒ pH (1:1)	TCLP ☐ BTEX ☐ Metals	BTEX + F1	F2-F4	WATERS: ☐ BTEX F1 ☐ VOCs	☐ BTEX F1-F2 ☐ BTEX F1-F4	Routine Water Package ☐ Turb ☐ F	REGULATED METALS (CCME / AT1)[3]: Total ☐ Preserved ☐ Not Preserved	Dissolved ☐ Preserved ☐ Not Preserved ☐ Filtered ☐ Not Filtered	Mercury ☐ Total ☐ Dissolved	☐ Ammonia ☐ TKN ☐ COD	☐ TOC ☐ DOC	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	0916-SS09-37	S	2009/09/16																			1
2	38																					1
3	39																					1
4	40										X											1
5	WR1-1					X			X			X										2
6	WR1-2											X										2
7	WR1-3					X			X			X										2
8	WR2-1					X			X			X										2
9	WR2-2											X										2
10	WR3-1					X			X			X										2
11	WR3-2											X										2
12	WR3-3					X			X			X										2

*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: SAM BIRD **Date/Time:** Sept. 18 2009 11 AM

Sign and Print: Sam Bird

COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED	Received By	Temperature			Ice
	09/09/09 11:15 D.W	6	6	7	Y
	CUSTODY SEAL YES / NO				

APPENDIX VIII

2012 IEG Analytical Results

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

CLIENT NAME: SHELL CANADA ENERGY
P.O. BOX, 480 STATION 100
Calgary, AB T2P2J1
(403) 691-3111

ATTENTION TO: Accounts

PROJECT NO: A04012A05

AGAT WORK ORDER: 12C635076

SOIL ANALYSIS REVIEWED BY: Krystyna Krauze, Senior Analyst

TRACE ORGANICS REVIEWED BY: Elena Gorobets, Senior Analyst

DATE REPORTED: Sep 05, 2012

PAGES (INCLUDING COVER): 53

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

CCME / Alberta Tier 1 Metals + HWS B + Cr6 (soil)

SAMPLE TYPE: Soil | SAMPLE ID: 3650462 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-012

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Antimony	mg/kg	1.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Arsenic	mg/kg	6.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Barium	mg/kg	1030		0.5	Aug 29, 2012	DF	Aug 28, 2012
Beryllium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Boron (Hot water extraction)	mg/kg	4.8		0.5	Aug 29, 2012	AS	Aug 29, 2012
Cadmium	mg/kg	0.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium	mg/kg	16.4		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium, Hexavalent	mg/kg	*		0.3			
Cobalt	mg/kg	4.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Copper	mg/kg	47.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Lead	mg/kg	60.3		0.5	Aug 29, 2012	DF	Aug 28, 2012
Molybdenum	mg/kg	2.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Nickel	mg/kg	14.6		0.5	Aug 29, 2012	DF	Aug 28, 2012
Selenium	mg/kg	0.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Silver	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Thallium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Tin	mg/kg	6.6		0.5	Aug 29, 2012	DF	Aug 28, 2012
Uranium	mg/kg	1.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Vanadium	mg/kg	14.1		0.5	Aug 29, 2012	DF	Aug 28, 2012
Zinc	mg/kg	122		1	Aug 29, 2012	DF	Aug 28, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
* Unable to perform Chromium Hexavalent analysis due to colour interferences. Note: Organic sample.

Certified By:

AGAT Laboratories

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CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Particle Size by Sieve

SAMPLE TYPE: Soil | SAMPLE ID: 3650462 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-012

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Sieve Analysis - 75 microns (wet)	%	79.6		N/A	Aug 31, 2012	TK	Aug 30, 2012
Sieve Texture		Coarse				SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Value reported is amount of sample retained on sieve after wash with water and represents proportion by weight particles larger than indicated sieve size.
Not sufficient quantity of sample for sieve analysis, used only 65.2g.

Certified By:

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis - Salinity (AB Tier 1 - pH Calcium Chloride)

SAMPLE TYPE: Soil | SAMPLE ID: 3650462 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-012

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH (CaCl2 Extraction)	pH Units	7.0		N/A	Aug 29, 2012	KR	Aug 29, 2012
Electrical Conductivity (Sat. Paste)	dS/m	4.35		0.01	Aug 29, 2012	AG	Aug 29, 2012
Sodium Adsorption Ratio		4.13			Aug 29, 2012	SYS	Aug 29, 2012
Saturation Percentage	%	99		N/A	Aug 29, 2012	AG	Aug 29, 2012
Chloride, Soluble	mg/L	629		5	Aug 29, 2012	NK	Aug 29, 2012
Calcium, Soluble	mg/L	515		1	Aug 29, 2012	AJ	Aug 29, 2012
Potassium, Soluble	mg/L	76		2	Aug 29, 2012	AJ	Aug 29, 2012
Magnesium, Soluble	mg/L	154		1	Aug 29, 2012	AJ	Aug 29, 2012
Sodium, Soluble	mg/L	416		2	Aug 29, 2012	AJ	Aug 29, 2012
Sulfur (as Sulfate), Soluble	mg/L	348		2	Aug 29, 2012	AJ	Aug 29, 2012
Theoretical Gypsum Requirement	tonnes/ha	0				SYS	
Chloride, Soluble (meq/L)	meq/L	17.7		0.06		SYS	
Calcium, Soluble (meq/L)	meq/L	25.7		0.05		SYS	
Potassium, Soluble (meq/L)	meq/L	1.94		0.05		SYS	
Magnesium, Soluble (meq/L)	meq/L	12.7		0.08		SYS	
Sodium, Soluble (meq/L)	meq/L	18.1		0.09		SYS	
Sulfur (as Sulfate), Soluble (meq/L)	meq/L	7.25		0.04		SYS	
Chloride, Soluble (mg/kg)	mg/kg	623		2		SYS	
Calcium, Soluble (mg/kg)	mg/kg	510		1		SYS	
Potassium, Soluble (mg/kg)	mg/kg	75		2		SYS	
Magnesium, Soluble (mg/kg)	mg/kg	152		1		SYS	
Sodium, Soluble (mg/kg)	mg/kg	412		2		SYS	
Sulfur (as Sulfate), Soluble (mg/kg)	mg/kg	345		2		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
If sodium results in mg/L are less than detection, SAR is non-calculable and is reported as 0.
Note: Organic sample.

Certified By:

AGAT Laboratories

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CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

SAMPLE TYPE: Soil | SAMPLE ID: 3650462 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-012

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/kg	0.463		0.005	Aug 27, 2012	KL	Aug 27, 2012
Toluene	mg/kg	15.7		0.05	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene	mg/kg	3.25		0.01	Aug 27, 2012	KL	Aug 27, 2012
Xylenes	mg/kg	28.4		0.05	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1)	mg/kg	350		10	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1 minus BTEX)	mg/kg	300		10	Aug 27, 2012	KL	Aug 27, 2012
C10 - C16 (F2)	mg/kg	2280		10	Aug 28, 2012	OL	Aug 27, 2012
C16 - C34 (F3)	mg/kg	5980		10	Aug 28, 2012	OL	Aug 27, 2012
C34 - C50 (F4)	mg/kg	1460		10	Aug 28, 2012	OL	Aug 27, 2012
Gravimetric Heavy Hydrocarbons	mg/kg	N/A		1000	Aug 28, 2012	OL	Aug 27, 2012
Moisture Content	%	53		1	Aug 28, 2012	OL	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	107	50-150	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene-d10 (BTEX)	%	101	50-150	Aug 27, 2012	KL	Aug 27, 2012
o-Terphenyl (F2-F4)	%	94	50-150	Aug 28, 2012	OL	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 (Ag,F)
Results are based on the dry weight of the sample.
The C6-C10 (F1) fraction is calculated using toluene response factor.
The C10 - C16 (F2), C16 - C34 (F3), and C34 - C50 (F4) fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons (F4g) are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions (if requested).
Quality control data is available upon request.
Assistance in the interpretation of data is available upon request.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
The chromatogram returned to baseline by the retention time of nC50.
Extraction and holding times were met for this sample.

Certified By: Elena Gorobets

AGAT Laboratories

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CALGARY, ALBERTA
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http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Polyaromatic Hydrocarbon Analysis - Soil

SAMPLE TYPE: Soil | SAMPLE ID: 3650462 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-012

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Naphthalene	mg/kg	3.23		0.005	Aug 28, 2012	YY	Aug 27, 2012
2-Methylnaphthalene	mg/kg	8.93		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthylene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Fluorene	mg/kg	0.96		0.02	Aug 28, 2012	YY	Aug 27, 2012
Phenanthrene	mg/kg	1.44		0.02	Aug 28, 2012	YY	Aug 27, 2012
Anthracene	mg/kg	<0.004		0.004	Aug 28, 2012	YY	Aug 27, 2012
Fluoranthene	mg/kg	0.32		0.03	Aug 28, 2012	YY	Aug 27, 2012
Pyrene	mg/kg	0.32		0.03	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]anthracene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Chrysene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[b+j]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[k]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Indeno[1,2,3-cd]pyrene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Dibenzo[ah]anthracene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Benzo[ghi]perylene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
2-Fluorobiphenyl (PAH)	%	99	50-150	Aug 28, 2012	YY	Aug 27, 2012
p-Terphenyl-d14 (PAH)	%	71	50-150	Aug 28, 2012	YY	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Results are based on the dry weight of the sample.
Based on GC/MS target ion analysis.
Isomers Benzo(b)fluoranthene and Benzo(j)fluoranthene have the same GC retention time and are reported as the sum based on the Benzo(b)fluoranthene response.

Certified By: Elena Gorobets

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
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TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

CCME / Alberta Tier 1 Metals + HWS B + Cr6 (soil)

SAMPLE TYPE: Soil | SAMPLE ID: 3650463 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-013

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Antimony	mg/kg	2.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Arsenic	mg/kg	9.2		0.5	Aug 29, 2012	DF	Aug 28, 2012
Barium	mg/kg	369		0.5	Aug 29, 2012	DF	Aug 28, 2012
Beryllium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Boron (Hot water extraction)	mg/kg	6.1		0.5	Aug 29, 2012	AS	Aug 29, 2012
Cadmium	mg/kg	0.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium	mg/kg	13.4		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium, Hexavalent	mg/kg	*		0.3			
Cobalt	mg/kg	5.3		0.5	Aug 29, 2012	DF	Aug 28, 2012
Copper	mg/kg	75.1		0.5	Aug 29, 2012	DF	Aug 28, 2012
Lead	mg/kg	67.1		0.5	Aug 29, 2012	DF	Aug 28, 2012
Molybdenum	mg/kg	2.9		0.5	Aug 29, 2012	DF	Aug 28, 2012
Nickel	mg/kg	16.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Selenium	mg/kg	0.9		0.5	Aug 29, 2012	DF	Aug 28, 2012
Silver	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Thallium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Tin	mg/kg	6.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Uranium	mg/kg	1.6		0.5	Aug 29, 2012	DF	Aug 28, 2012
Vanadium	mg/kg	14.3		0.5	Aug 29, 2012	DF	Aug 28, 2012
Zinc	mg/kg	157		1	Aug 29, 2012	DF	Aug 28, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
* Unable to perform Chromium Hexavalent analysis due to colour interferences. Note: Organic sample.

Certified By:

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis - Salinity (AB Tier 1 - pH Calcium Chloride)

SAMPLE TYPE: Soil | SAMPLE ID: 3650463 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-013

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH (CaCl2 Extraction)	pH Units	7.2		N/A	Aug 29, 2012	KR	Aug 29, 2012
Electrical Conductivity (Sat. Paste)	dS/m	7.08		0.01	Aug 29, 2012	AG	Aug 29, 2012
Sodium Adsorption Ratio		7.64			Aug 29, 2012	SYS	Aug 29, 2012
Saturation Percentage	%	128		N/A	Aug 29, 2012	AG	Aug 29, 2012
Chloride, Soluble	mg/L	1510		5	Aug 29, 2012	NK	Aug 29, 2012
Calcium, Soluble	mg/L	569		1	Aug 29, 2012	AJ	Aug 29, 2012
Potassium, Soluble	mg/L	138		2	Aug 29, 2012	AJ	Aug 29, 2012
Magnesium, Soluble	mg/L	195		1	Aug 29, 2012	AJ	Aug 29, 2012
Sodium, Soluble	mg/L	828		2	Aug 29, 2012	AJ	Aug 29, 2012
Sulfur (as Sulfate), Soluble	mg/L	356		2	Aug 29, 2012	AJ	Aug 29, 2012
Theoretical Gypsum Requirement	tonnes/ha	1.82				SYS	
Chloride, Soluble (meq/L)	meq/L	42.6		0.06		SYS	
Calcium, Soluble (meq/L)	meq/L	28.4		0.05		SYS	
Potassium, Soluble (meq/L)	meq/L	3.53		0.05		SYS	
Magnesium, Soluble (meq/L)	meq/L	16.0		0.08		SYS	
Sodium, Soluble (meq/L)	meq/L	36.0		0.09		SYS	
Sulfur (as Sulfate), Soluble (meq/L)	meq/L	7.41		0.04		SYS	
Chloride, Soluble (mg/kg)	mg/kg	1930		2		SYS	
Calcium, Soluble (mg/kg)	mg/kg	728		1		SYS	
Potassium, Soluble (mg/kg)	mg/kg	177		2		SYS	
Magnesium, Soluble (mg/kg)	mg/kg	250		1		SYS	
Sodium, Soluble (mg/kg)	mg/kg	1060		2		SYS	
Sulfur (as Sulfate), Soluble (mg/kg)	mg/kg	456		2		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
If sodium results in mg/L are less than detection, SAR is non-calculable and is reported as 0.
Note: Organic sample.

Certified By:

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

SAMPLE TYPE: Soil | SAMPLE ID: 3650463 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-013

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/kg	0.658		0.005	Aug 27, 2012	KL	Aug 27, 2012
Toluene	mg/kg	9.22		0.05	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene	mg/kg	3.85		0.01	Aug 27, 2012	KL	Aug 27, 2012
Xylenes	mg/kg	33.2		0.05	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1)	mg/kg	430		10	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1 minus BTEX)	mg/kg	380		10	Aug 27, 2012	KL	Aug 27, 2012
C10 - C16 (F2)	mg/kg	1600		10	Aug 28, 2012	OL	Aug 27, 2012
C16 - C34 (F3)	mg/kg	5800		10	Aug 28, 2012	OL	Aug 27, 2012
C34 - C50 (F4)	mg/kg	2870		10	Aug 28, 2012	OL	Aug 27, 2012
Gravimetric Heavy Hydrocarbons	mg/kg	N/A		1000	Aug 28, 2012	OL	Aug 27, 2012
Moisture Content	%	78		1	Aug 28, 2012	OL	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	97	50-150	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene-d10 (BTEX)	%	70	50-150	Aug 27, 2012	KL	Aug 27, 2012
o-Terphenyl (F2-F4)	%	88	50-150	Aug 28, 2012	OL	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 (Ag,F)
Results are based on the dry weight of the sample.
The C6-C10 (F1) fraction is calculated using toluene response factor.
The C10 - C16 (F2), C16 - C34 (F3), and C34 - C50 (F4) fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons (F4g) are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions (if requested).
Quality control data is available upon request.
Assistance in the interpretation of data is available upon request.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
The chromatogram returned to baseline by the retention time of nC50.
Extraction and holding times were met for this sample.

Certified By: Elena Gorobets

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Polyaromatic Hydrocarbon Analysis - Soil

SAMPLE TYPE: Soil | SAMPLE ID: 3650463 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-013

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Naphthalene	mg/kg	3.90		0.005	Aug 28, 2012	YY	Aug 27, 2012
2-Methylnaphthalene	mg/kg	9.53		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthylene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Fluorene	mg/kg	1.16		0.02	Aug 28, 2012	YY	Aug 27, 2012
Phenanthrene	mg/kg	1.46		0.02	Aug 28, 2012	YY	Aug 27, 2012
Anthracene	mg/kg	<0.004		0.004	Aug 28, 2012	YY	Aug 27, 2012
Fluoranthene	mg/kg	0.48		0.03	Aug 28, 2012	YY	Aug 27, 2012
Pyrene	mg/kg	0.41		0.03	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]anthracene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Chrysene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[b+j]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[k]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Indeno[1,2,3-cd]pyrene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Dibenzo[ah]anthracene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Benzo[ghi]perylene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
2-Fluorobiphenyl (PAH)	%	131	50-150	Aug 28, 2012	YY	Aug 27, 2012
p-Terphenyl-d14 (PAH)	%	116	50-150	Aug 28, 2012	YY	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Results are based on the dry weight of the sample.
Based on GC/MS target ion analysis.
Isomers Benzo(b)fluoranthene and Benzo(j)fluoranthene have the same GC retention time and are reported as the sum based on the Benzo(b)fluoranthene response.

Certified By: Elena Gorobets

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

CCME / Alberta Tier 1 Metals + HWS B + Cr6 (soil)

SAMPLE TYPE: Soil | SAMPLE ID: 3650467 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-014

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Antimony	mg/kg	1.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Arsenic	mg/kg	4.4		0.5	Aug 29, 2012	DF	Aug 28, 2012
Barium	mg/kg	3180		0.5	Aug 29, 2012	DF	Aug 28, 2012
Beryllium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Boron (Hot water extraction)	mg/kg	<0.5		0.5	Aug 29, 2012	AS	Aug 29, 2012
Cadmium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium	mg/kg	9.2		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium, Hexavalent	mg/kg	<0.3		0.3	Aug 29, 2012	MM	Aug 29, 2012
Cobalt	mg/kg	2.2		0.5	Aug 29, 2012	DF	Aug 28, 2012
Copper	mg/kg	7.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Lead	mg/kg	32.3		0.5	Aug 29, 2012	DF	Aug 28, 2012
Molybdenum	mg/kg	0.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Nickel	mg/kg	5.4		0.5	Aug 29, 2012	DF	Aug 28, 2012
Selenium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Silver	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Thallium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Tin	mg/kg	0.6		0.5	Aug 29, 2012	DF	Aug 28, 2012
Uranium	mg/kg	0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Vanadium	mg/kg	17.2		0.5	Aug 29, 2012	DF	Aug 28, 2012
Zinc	mg/kg	40		1	Aug 29, 2012	DF	Aug 28, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis - Salinity (AB Tier 1 - pH Calcium Chloride)

SAMPLE TYPE: Soil | SAMPLE ID: 3650467 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-014

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH (CaCl2 Extraction)	pH Units	7.5		N/A	Aug 29, 2012	KR	Aug 29, 2012
Electrical Conductivity (Sat. Paste)	dS/m	1.48		0.01	Aug 29, 2012	AG	Aug 29, 2012
Sodium Adsorption Ratio		0.24			Aug 29, 2012	SYS	Aug 29, 2012
Saturation Percentage	%	25		N/A	Aug 29, 2012	AG	Aug 29, 2012
Chloride, Soluble	mg/L	11		5	Aug 29, 2012	NK	Aug 29, 2012
Calcium, Soluble	mg/L	297		1	Aug 29, 2012	AJ	Aug 29, 2012
Potassium, Soluble	mg/L	15		2	Aug 29, 2012	AJ	Aug 29, 2012
Magnesium, Soluble	mg/L	42		1	Aug 29, 2012	AJ	Aug 29, 2012
Sodium, Soluble	mg/L	17		2	Aug 29, 2012	AJ	Aug 29, 2012
Sulfur (as Sulfate), Soluble	mg/L	883		2	Aug 29, 2012	AJ	Aug 29, 2012
Theoretical Gypsum Requirement	tonnes/ha	0				SYS	
Chloride, Soluble (meq/L)	meq/L	0.31		0.06		SYS	
Calcium, Soluble (meq/L)	meq/L	14.8		0.05		SYS	
Potassium, Soluble (meq/L)	meq/L	0.38		0.05		SYS	
Magnesium, Soluble (meq/L)	meq/L	3.46		0.08		SYS	
Sodium, Soluble (meq/L)	meq/L	0.74		0.09		SYS	
Sulfur (as Sulfate), Soluble (meq/L)	meq/L	18.4		0.04		SYS	
Chloride, Soluble (mg/kg)	mg/kg	3		2		SYS	
Calcium, Soluble (mg/kg)	mg/kg	74		1		SYS	
Potassium, Soluble (mg/kg)	mg/kg	4		2		SYS	
Magnesium, Soluble (mg/kg)	mg/kg	11		1		SYS	
Sodium, Soluble (mg/kg)	mg/kg	4		2		SYS	
Sulfur (as Sulfate), Soluble (mg/kg)	mg/kg	221		2		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
If sodium results in mg/L are less than detection, SAR is non-calculable and is reported as 0.

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

SAMPLE TYPE: Soil | SAMPLE ID: 3650467 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-014

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/kg	<0.005		0.005	Aug 27, 2012	KL	Aug 27, 2012
Toluene	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene	mg/kg	<0.01		0.01	Aug 27, 2012	KL	Aug 27, 2012
Xylenes	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1 minus BTEX)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C10 - C16 (F2)	mg/kg	<10		10	Aug 28, 2012	OL	Aug 27, 2012
C16 - C34 (F3)	mg/kg	60		10	Aug 28, 2012	OL	Aug 27, 2012
C34 - C50 (F4)	mg/kg	45		10	Aug 28, 2012	OL	Aug 27, 2012
Gravimetric Heavy Hydrocarbons	mg/kg	N/A		1000	Aug 28, 2012	OL	Aug 27, 2012
Moisture Content	%	3.9		1	Aug 28, 2012	OL	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	100	50-150	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene-d10 (BTEX)	%	105	50-150	Aug 27, 2012	KL	Aug 27, 2012
o-Terphenyl (F2-F4)	%	75	50-150	Aug 28, 2012	OL	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 (Ag,F)
Results are based on the dry weight of the sample.
The C6-C10 (F1) fraction is calculated using toluene response factor.
The C10 - C16 (F2), C16 - C34 (F3), and C34 - C50 (F4) fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons (F4g) are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions (if requested).
Quality control data is available upon request.
Assistance in the interpretation of data is available upon request.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
The chromatogram returned to baseline by the retention time of nC50.
Extraction and holding times were met for this sample.

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Polyaromatic Hydrocarbon Analysis - Soil

SAMPLE TYPE: Soil | SAMPLE ID: 3650467 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-014

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Naphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
2-Methylnaphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthylene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Fluorene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Phenanthrene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Anthracene	mg/kg	<0.004		0.004	Aug 28, 2012	YY	Aug 27, 2012
Fluoranthene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]anthracene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Chrysene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[b+j]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[k]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Indeno[1,2,3-cd]pyrene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Dibenzo[ah]anthracene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Benzo[ghi]perylene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
2-Fluorobiphenyl (PAH)	%	99	50-150	Aug 28, 2012	YY	Aug 27, 2012
p-Terphenyl-d14 (PAH)	%	82	50-150	Aug 28, 2012	YY	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Results are based on the dry weight of the sample.
Based on GC/MS target ion analysis.
Isomers Benzo(b)fluoranthene and Benzo(j)fluoranthene have the same GC retention time and are reported as the sum based on the Benzo(b)fluoranthene response.

Certified By: Elena Gorobets

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

CCME / Alberta Tier 1 Metals + HWS B + Cr6 (soil)

SAMPLE TYPE: Soil | SAMPLE ID: 3650471 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-015

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Antimony	mg/kg	0.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Arsenic	mg/kg	7.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Barium	mg/kg	2380		0.5	Aug 29, 2012	DF	Aug 28, 2012
Beryllium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Boron (Hot water extraction)	mg/kg	<0.5		0.5	Aug 29, 2012	AS	Aug 29, 2012
Cadmium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium	mg/kg	10.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium, Hexavalent	mg/kg	<0.3		0.3	Aug 29, 2012	MM	Aug 29, 2012
Cobalt	mg/kg	4.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Copper	mg/kg	10.9		0.5	Aug 29, 2012	DF	Aug 28, 2012
Lead	mg/kg	28.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Molybdenum	mg/kg	0.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Nickel	mg/kg	10.2		0.5	Aug 29, 2012	DF	Aug 28, 2012
Selenium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Silver	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Thallium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Tin	mg/kg	0.6		0.5	Aug 29, 2012	DF	Aug 28, 2012
Uranium	mg/kg	0.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Vanadium	mg/kg	17.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Zinc	mg/kg	41		1	Aug 29, 2012	DF	Aug 28, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis - Salinity (AB Tier 1 - pH Calcium Chloride)

SAMPLE TYPE: Soil | SAMPLE ID: 3650471 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-015

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH (CaCl2 Extraction)	pH Units	7.5		N/A	Aug 29, 2012	KR	Aug 29, 2012
Electrical Conductivity (Sat. Paste)	dS/m	0.61		0.01	Aug 29, 2012	AG	Aug 29, 2012
Sodium Adsorption Ratio		0.98			Aug 29, 2012	SYS	Aug 29, 2012
Saturation Percentage	%	27		N/A	Aug 29, 2012	AG	Aug 29, 2012
Chloride, Soluble	mg/L	45		5	Aug 29, 2012	NK	Aug 29, 2012
Calcium, Soluble	mg/L	74		1	Aug 29, 2012	AJ	Aug 29, 2012
Potassium, Soluble	mg/L	10		2	Aug 29, 2012	AJ	Aug 29, 2012
Magnesium, Soluble	mg/L	14		1	Aug 29, 2012	AJ	Aug 29, 2012
Sodium, Soluble	mg/L	35		2	Aug 29, 2012	AJ	Aug 29, 2012
Sulfur (as Sulfate), Soluble	mg/L	120		2	Aug 29, 2012	AJ	Aug 29, 2012
Theoretical Gypsum Requirement	tonnes/ha	0				SYS	
Chloride, Soluble (meq/L)	meq/L	1.27		0.06		SYS	
Calcium, Soluble (meq/L)	meq/L	3.69		0.05		SYS	
Potassium, Soluble (meq/L)	meq/L	0.26		0.05		SYS	
Magnesium, Soluble (meq/L)	meq/L	1.15		0.08		SYS	
Sodium, Soluble (meq/L)	meq/L	1.52		0.09		SYS	
Sulfur (as Sulfate), Soluble (meq/L)	meq/L	2.50		0.04		SYS	
Chloride, Soluble (mg/kg)	mg/kg	12		2		SYS	
Calcium, Soluble (mg/kg)	mg/kg	20		1		SYS	
Potassium, Soluble (mg/kg)	mg/kg	3		2		SYS	
Magnesium, Soluble (mg/kg)	mg/kg	4		1		SYS	
Sodium, Soluble (mg/kg)	mg/kg	9		2		SYS	
Sulfur (as Sulfate), Soluble (mg/kg)	mg/kg	32		2		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
If sodium results in mg/L are less than detection, SAR is non-calculable and is reported as 0.

Certified By:

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

SAMPLE TYPE: Soil | SAMPLE ID: 3650471 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-015

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/kg	<0.005		0.005	Aug 27, 2012	KL	Aug 27, 2012
Toluene	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene	mg/kg	<0.01		0.01	Aug 27, 2012	KL	Aug 27, 2012
Xylenes	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1 minus BTEX)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C10 - C16 (F2)	mg/kg	<10		10	Aug 28, 2012	OL	Aug 27, 2012
C16 - C34 (F3)	mg/kg	79		10	Aug 28, 2012	OL	Aug 27, 2012
C34 - C50 (F4)	mg/kg	53		10	Aug 28, 2012	OL	Aug 27, 2012
Gravimetric Heavy Hydrocarbons	mg/kg	N/A		1000	Aug 28, 2012	OL	Aug 27, 2012
Moisture Content	%	3.2		1	Aug 28, 2012	OL	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	108	50-150	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene-d10 (BTEX)	%	111	50-150	Aug 27, 2012	KL	Aug 27, 2012
o-Terphenyl (F2-F4)	%	84	50-150	Aug 28, 2012	OL	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 (Ag,F)
Results are based on the dry weight of the sample.
The C6-C10 (F1) fraction is calculated using toluene response factor.
The C10 - C16 (F2), C16 - C34 (F3), and C34 - C50 (F4) fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons (F4g) are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions (if requested).
Quality control data is available upon request.
Assistance in the interpretation of data is available upon request.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
The chromatogram returned to baseline by the retention time of nC50.
Extraction and holding times were met for this sample.

Certified By: Elena Gorobets

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Polyaromatic Hydrocarbon Analysis - Soil

SAMPLE TYPE: Soil | SAMPLE ID: 3650471 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-015

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Naphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
2-Methylnaphthalene	mg/kg	0.006		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthylene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Fluorene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Phenanthrene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Anthracene	mg/kg	<0.004		0.004	Aug 28, 2012	YY	Aug 27, 2012
Fluoranthene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]anthracene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Chrysene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[b+j]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[k]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Indeno[1,2,3-cd]pyrene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Dibenzo[ah]anthracene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Benzo[ghi]perylene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
2-Fluorobiphenyl (PAH)	%	103	50-150	Aug 28, 2012	YY	Aug 27, 2012
p-Terphenyl-d14 (PAH)	%	82	50-150	Aug 28, 2012	YY	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Results are based on the dry weight of the sample.
Based on GC/MS target ion analysis.
Isomers Benzo(b)fluoranthene and Benzo(j)fluoranthene have the same GC retention time and are reported as the sum based on the Benzo(b)fluoranthene response.

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

CCME / Alberta Tier 1 Metals + HWS B + Cr6 (soil)

SAMPLE TYPE: Soil | SAMPLE ID: 3650472 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-016

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Antimony	mg/kg	0.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Arsenic	mg/kg	9.2		0.5	Aug 29, 2012	DF	Aug 28, 2012
Barium	mg/kg	3140		0.5	Aug 29, 2012	DF	Aug 28, 2012
Beryllium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Boron (Hot water extraction)	mg/kg	<0.5		0.5	Aug 29, 2012	AS	Aug 29, 2012
Cadmium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium	mg/kg	11.4		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium, Hexavalent	mg/kg	<0.3		0.3	Aug 29, 2012	MM	Aug 29, 2012
Cobalt	mg/kg	4.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Copper	mg/kg	11.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Lead	mg/kg	27.9		0.5	Aug 29, 2012	DF	Aug 28, 2012
Molybdenum	mg/kg	0.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Nickel	mg/kg	11.9		0.5	Aug 29, 2012	DF	Aug 28, 2012
Selenium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Silver	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Thallium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Tin	mg/kg	0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Uranium	mg/kg	0.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Vanadium	mg/kg	20.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Zinc	mg/kg	46		1	Aug 29, 2012	DF	Aug 28, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Particle Size by Sieve

SAMPLE TYPE: Soil | SAMPLE ID: 3650472 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-016

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Sieve Analysis - 75 microns (wet)	%	94.1		N/A	Aug 29, 2012	TG	Aug 29, 2012
Sieve Texture		Coarse				SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Value reported is amount of sample retained on sieve after wash with water and represents proportion by weight particles larger than indicated sieve size.

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis - Salinity (AB Tier 1 - pH Calcium Chloride)

SAMPLE TYPE: Soil | SAMPLE ID: 3650472 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-016

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH (CaCl2 Extraction)	pH Units	7.3		N/A	Aug 29, 2012	KR	Aug 29, 2012
Electrical Conductivity (Sat. Paste)	dS/m	0.39		0.01	Aug 29, 2012	AG	Aug 29, 2012
Sodium Adsorption Ratio		0.30			Aug 29, 2012	SYS	Aug 29, 2012
Saturation Percentage	%	25		N/A	Aug 29, 2012	AG	Aug 29, 2012
Chloride, Soluble	mg/L	6		5	Aug 29, 2012	NK	Aug 29, 2012
Calcium, Soluble	mg/L	69		1	Aug 29, 2012	AJ	Aug 29, 2012
Potassium, Soluble	mg/L	6		2	Aug 29, 2012	AJ	Aug 29, 2012
Magnesium, Soluble	mg/L	9		1	Aug 29, 2012	AJ	Aug 29, 2012
Sodium, Soluble	mg/L	10		2	Aug 29, 2012	AJ	Aug 29, 2012
Sulfur (as Sulfate), Soluble	mg/L	74		2	Aug 29, 2012	AJ	Aug 29, 2012
Theoretical Gypsum Requirement	tonnes/ha	0				SYS	
Chloride, Soluble (meq/L)	meq/L	0.17		0.06		SYS	
Calcium, Soluble (meq/L)	meq/L	3.44		0.05		SYS	
Potassium, Soluble (meq/L)	meq/L	0.15		0.05		SYS	
Magnesium, Soluble (meq/L)	meq/L	0.74		0.08		SYS	
Sodium, Soluble (meq/L)	meq/L	0.43		0.09		SYS	
Sulfur (as Sulfate), Soluble (meq/L)	meq/L	1.54		0.04		SYS	
Chloride, Soluble (mg/kg)	mg/kg	<2		2		SYS	
Calcium, Soluble (mg/kg)	mg/kg	17		1		SYS	
Potassium, Soluble (mg/kg)	mg/kg	<2		2		SYS	
Magnesium, Soluble (mg/kg)	mg/kg	2		1		SYS	
Sodium, Soluble (mg/kg)	mg/kg	3		2		SYS	
Sulfur (as Sulfate), Soluble (mg/kg)	mg/kg	19		2		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
If sodium results in mg/L are less than detection, SAR is non-calculable and is reported as 0.

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

SAMPLE TYPE: Soil | SAMPLE ID: 3650472 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-016

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/kg	<0.005		0.005	Aug 27, 2012	KL	Aug 27, 2012
Toluene	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene	mg/kg	<0.01		0.01	Aug 27, 2012	KL	Aug 27, 2012
Xylenes	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1 minus BTEX)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C10 - C16 (F2)	mg/kg	<10		10	Aug 28, 2012	OL	Aug 27, 2012
C16 - C34 (F3)	mg/kg	79		10	Aug 28, 2012	OL	Aug 27, 2012
C34 - C50 (F4)	mg/kg	53		10	Aug 28, 2012	OL	Aug 27, 2012
Gravimetric Heavy Hydrocarbons	mg/kg	N/A		1000	Aug 28, 2012	OL	Aug 27, 2012
Moisture Content	%	2.5		1	Aug 28, 2012	OL	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	103	50-150	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene-d10 (BTEX)	%	102	50-150	Aug 27, 2012	KL	Aug 27, 2012
o-Terphenyl (F2-F4)	%	85	50-150	Aug 28, 2012	OL	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 (Ag,F)
Results are based on the dry weight of the sample.
The C6-C10 (F1) fraction is calculated using toluene response factor.
The C10 - C16 (F2), C16 - C34 (F3), and C34 - C50 (F4) fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons (F4g) are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions (if requested).
Quality control data is available upon request.
Assistance in the interpretation of data is available upon request.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
The chromatogram returned to baseline by the retention time of nC50.
Extraction and holding times were met for this sample.

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Polyaromatic Hydrocarbon Analysis - Soil

SAMPLE TYPE: Soil | SAMPLE ID: 3650472 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-016

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Naphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
2-Methylnaphthalene	mg/kg	0.006		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthylene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Fluorene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Phenanthrene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Anthracene	mg/kg	<0.004		0.004	Aug 28, 2012	YY	Aug 27, 2012
Fluoranthene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]anthracene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Chrysene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[b+j]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[k]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Indeno[1,2,3-cd]pyrene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Dibenzo[ah]anthracene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Benzo[ghi]perylene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
2-Fluorobiphenyl (PAH)	%	102	50-150	Aug 28, 2012	YY	Aug 27, 2012
p-Terphenyl-d14 (PAH)	%	85	50-150	Aug 28, 2012	YY	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Results are based on the dry weight of the sample.
Based on GC/MS target ion analysis.
Isomers Benzo(b)fluoranthene and Benzo(j)fluoranthene have the same GC retention time and are reported as the sum based on the Benzo(b)fluoranthene response.

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

CCME / Alberta Tier 1 Metals + HWS B + Cr6 (soil)

SAMPLE TYPE: Soil | SAMPLE ID: 3650473 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-017

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Antimony	mg/kg	0.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Arsenic	mg/kg	7.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Barium	mg/kg	2670		0.5	Aug 29, 2012	DF	Aug 28, 2012
Beryllium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Boron (Hot water extraction)	mg/kg	<0.5		0.5	Aug 29, 2012	AS	Aug 29, 2012
Cadmium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium	mg/kg	11.6		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium, Hexavalent	mg/kg	<0.3		0.3	Aug 29, 2012	MM	Aug 29, 2012
Cobalt	mg/kg	5.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Copper	mg/kg	13.2		0.5	Aug 29, 2012	DF	Aug 28, 2012
Lead	mg/kg	26.4		0.5	Aug 29, 2012	DF	Aug 28, 2012
Molybdenum	mg/kg	0.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Nickel	mg/kg	12.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Selenium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Silver	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Thallium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Tin	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Uranium	mg/kg	0.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Vanadium	mg/kg	19.9		0.5	Aug 29, 2012	DF	Aug 28, 2012
Zinc	mg/kg	49		1	Aug 29, 2012	DF	Aug 28, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis - Salinity (AB Tier 1 - pH Calcium Chloride)

SAMPLE TYPE: Soil | SAMPLE ID: 3650473 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

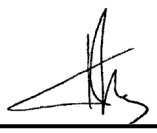
SAMPLE DESCRIPTION: SS12-017

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH (CaCl2 Extraction)	pH Units	7.3		N/A	Aug 29, 2012	KR	Aug 29, 2012
Electrical Conductivity (Sat. Paste)	dS/m	0.40		0.01	Aug 29, 2012	AG	Aug 29, 2012
Sodium Adsorption Ratio		0.33			Aug 29, 2012	SYS	Aug 29, 2012
Saturation Percentage	%	22		N/A	Aug 29, 2012	AG	Aug 29, 2012
Chloride, Soluble	mg/L	12		5	Aug 29, 2012	NK	Aug 29, 2012
Calcium, Soluble	mg/L	69		1	Aug 29, 2012	AJ	Aug 29, 2012
Potassium, Soluble	mg/L	7		2	Aug 29, 2012	AJ	Aug 29, 2012
Magnesium, Soluble	mg/L	8		1	Aug 29, 2012	AJ	Aug 29, 2012
Sodium, Soluble	mg/L	11		2	Aug 29, 2012	AJ	Aug 29, 2012
Sulfur (as Sulfate), Soluble	mg/L	59		2	Aug 29, 2012	AJ	Aug 29, 2012
Theoretical Gypsum Requirement	tonnes/ha	0				SYS	
Chloride, Soluble (meq/L)	meq/L	0.34		0.06		SYS	
Calcium, Soluble (meq/L)	meq/L	3.44		0.05		SYS	
Potassium, Soluble (meq/L)	meq/L	0.18		0.05		SYS	
Magnesium, Soluble (meq/L)	meq/L	0.66		0.08		SYS	
Sodium, Soluble (meq/L)	meq/L	0.48		0.09		SYS	
Sulfur (as Sulfate), Soluble (meq/L)	meq/L	1.23		0.04		SYS	
Chloride, Soluble (mg/kg)	mg/kg	3		2		SYS	
Calcium, Soluble (mg/kg)	mg/kg	15		1		SYS	
Potassium, Soluble (mg/kg)	mg/kg	<2		2		SYS	
Magnesium, Soluble (mg/kg)	mg/kg	2		1		SYS	
Sodium, Soluble (mg/kg)	mg/kg	2		2		SYS	
Sulfur (as Sulfate), Soluble (mg/kg)	mg/kg	13		2		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
If sodium results in mg/L are less than detection, SAR is non-calculable and is reported as 0.

Certified By:



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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

SAMPLE TYPE: Soil | SAMPLE ID: 3650473 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-017

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/kg	<0.005		0.005	Aug 27, 2012	KL	Aug 27, 2012
Toluene	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene	mg/kg	<0.01		0.01	Aug 27, 2012	KL	Aug 27, 2012
Xylenes	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1 minus BTEX)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C10 - C16 (F2)	mg/kg	<10		10	Aug 28, 2012	OL	Aug 27, 2012
C16 - C34 (F3)	mg/kg	70		10	Aug 28, 2012	OL	Aug 27, 2012
C34 - C50 (F4)	mg/kg	43		10	Aug 28, 2012	OL	Aug 27, 2012
Gravimetric Heavy Hydrocarbons	mg/kg	N/A		1000	Aug 28, 2012	OL	Aug 27, 2012
Moisture Content	%	3		1	Aug 28, 2012	OL	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	102	50-150	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene-d10 (BTEX)	%	105	50-150	Aug 27, 2012	KL	Aug 27, 2012
o-Terphenyl (F2-F4)	%	80	50-150	Aug 28, 2012	OL	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 (Ag,F)
Results are based on the dry weight of the sample.
The C6-C10 (F1) fraction is calculated using toluene response factor.
The C10 - C16 (F2), C16 - C34 (F3), and C34 - C50 (F4) fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons (F4g) are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions (if requested).
Quality control data is available upon request.
Assistance in the interpretation of data is available upon request.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
The chromatogram returned to baseline by the retention time of nC50.
Extraction and holding times were met for this sample.

Certified By: Elena Gorobets

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Polyaromatic Hydrocarbon Analysis - Soil

SAMPLE TYPE: Soil | SAMPLE ID: 3650473 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-017

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Naphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
2-Methylnaphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthylene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Fluorene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Phenanthrene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Anthracene	mg/kg	<0.004		0.004	Aug 28, 2012	YY	Aug 27, 2012
Fluoranthene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]anthracene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Chrysene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[b+j]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[k]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Indeno[1,2,3-cd]pyrene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Dibenzo[ah]anthracene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Benzo[ghi]perylene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
2-Fluorobiphenyl (PAH)	%	101	50-150	Aug 28, 2012	YY	Aug 27, 2012
p-Terphenyl-d14 (PAH)	%	88	50-150	Aug 28, 2012	YY	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Results are based on the dry weight of the sample.
Based on GC/MS target ion analysis.
Isomers Benzo(b)fluoranthene and Benzo(j)fluoranthene have the same GC retention time and are reported as the sum based on the Benzo(b)fluoranthene response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

CCME / Alberta Tier 1 Metals + HWS B + Cr6 (soil)

SAMPLE TYPE: Soil | SAMPLE ID: 3650474 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-018

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Antimony	mg/kg	0.6		0.5	Aug 29, 2012	DF	Aug 28, 2012
Arsenic	mg/kg	8.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Barium	mg/kg	1690		0.5	Aug 29, 2012	DF	Aug 28, 2012
Beryllium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Boron (Hot water extraction)	mg/kg	<0.5		0.5	Aug 29, 2012	AS	Aug 29, 2012
Cadmium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium	mg/kg	12.3		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium, Hexavalent	mg/kg	<0.3		0.3	Aug 29, 2012	MM	Aug 29, 2012
Cobalt	mg/kg	6.2		0.5	Aug 29, 2012	DF	Aug 28, 2012
Copper	mg/kg	10.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Lead	mg/kg	16.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Molybdenum	mg/kg	0.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Nickel	mg/kg	15.3		0.5	Aug 29, 2012	DF	Aug 28, 2012
Selenium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Silver	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Thallium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Tin	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Uranium	mg/kg	0.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Vanadium	mg/kg	22.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Zinc	mg/kg	40		1	Aug 29, 2012	DF	Aug 28, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis - Salinity (AB Tier 1 - pH Calcium Chloride)

SAMPLE TYPE: Soil | SAMPLE ID: 3650474 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-018

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH (CaCl2 Extraction)	pH Units	7.2		N/A	Aug 29, 2012	KR	Aug 29, 2012
Electrical Conductivity (Sat. Paste)	dS/m	0.35		0.01	Aug 29, 2012	AG	Aug 29, 2012
Sodium Adsorption Ratio		0.39			Aug 29, 2012	SYS	Aug 29, 2012
Saturation Percentage	%	28		N/A	Aug 29, 2012	AG	Aug 29, 2012
Chloride, Soluble	mg/L	5		5	Aug 29, 2012	NK	Aug 29, 2012
Calcium, Soluble	mg/L	58		1	Aug 29, 2012	AJ	Aug 29, 2012
Potassium, Soluble	mg/L	4		2	Aug 29, 2012	AJ	Aug 29, 2012
Magnesium, Soluble	mg/L	8		1	Aug 29, 2012	AJ	Aug 29, 2012
Sodium, Soluble	mg/L	12		2	Aug 29, 2012	AJ	Aug 29, 2012
Sulfur (as Sulfate), Soluble	mg/L	53		2	Aug 29, 2012	AJ	Aug 29, 2012
Theoretical Gypsum Requirement	tonnes/ha	0				SYS	
Chloride, Soluble (meq/L)	meq/L	0.14		0.06		SYS	
Calcium, Soluble (meq/L)	meq/L	2.89		0.05		SYS	
Potassium, Soluble (meq/L)	meq/L	0.10		0.05		SYS	
Magnesium, Soluble (meq/L)	meq/L	0.66		0.08		SYS	
Sodium, Soluble (meq/L)	meq/L	0.52		0.09		SYS	
Sulfur (as Sulfate), Soluble (meq/L)	meq/L	1.10		0.04		SYS	
Chloride, Soluble (mg/kg)	mg/kg	<2		2		SYS	
Calcium, Soluble (mg/kg)	mg/kg	16		1		SYS	
Potassium, Soluble (mg/kg)	mg/kg	<2		2		SYS	
Magnesium, Soluble (mg/kg)	mg/kg	2		1		SYS	
Sodium, Soluble (mg/kg)	mg/kg	3		2		SYS	
Sulfur (as Sulfate), Soluble (mg/kg)	mg/kg	15		2		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
If sodium results in mg/L are less than detection, SAR is non-calculable and is reported as 0.

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

SAMPLE TYPE: Soil | SAMPLE ID: 3650474 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-018

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/kg	<0.005		0.005	Aug 27, 2012	KL	Aug 27, 2012
Toluene	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene	mg/kg	<0.01		0.01	Aug 27, 2012	KL	Aug 27, 2012
Xylenes	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1 minus BTEX)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C10 - C16 (F2)	mg/kg	<10		10	Aug 28, 2012	OL	Aug 27, 2012
C16 - C34 (F3)	mg/kg	75		10	Aug 28, 2012	OL	Aug 27, 2012
C34 - C50 (F4)	mg/kg	43		10	Aug 28, 2012	OL	Aug 27, 2012
Gravimetric Heavy Hydrocarbons	mg/kg	N/A		1000	Aug 28, 2012	OL	Aug 27, 2012
Moisture Content	%	3.4		1	Aug 28, 2012	OL	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	100	50-150	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene-d10 (BTEX)	%	106	50-150	Aug 27, 2012	KL	Aug 27, 2012
o-Terphenyl (F2-F4)	%	81	50-150	Aug 28, 2012	OL	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 (Ag,F)
Results are based on the dry weight of the sample.
The C6-C10 (F1) fraction is calculated using toluene response factor.
The C10 - C16 (F2), C16 - C34 (F3), and C34 - C50 (F4) fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons (F4g) are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions (if requested).
Quality control data is available upon request.
Assistance in the interpretation of data is available upon request.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
The chromatogram returned to baseline by the retention time of nC50.
Extraction and holding times were met for this sample.

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Polyaromatic Hydrocarbon Analysis - Soil

SAMPLE TYPE: Soil | SAMPLE ID: 3650474 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-018

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Naphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
2-Methylnaphthalene	mg/kg	0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthylene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Fluorene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Phenanthrene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Anthracene	mg/kg	<0.004		0.004	Aug 28, 2012	YY	Aug 27, 2012
Fluoranthene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]anthracene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Chrysene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[b+j]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[k]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Indeno[1,2,3-cd]pyrene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Dibenzo[ah]anthracene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Benzo[ghi]perylene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
2-Fluorobiphenyl (PAH)	%	101	50-150	Aug 28, 2012	YY	Aug 27, 2012
p-Terphenyl-d14 (PAH)	%	85	50-150	Aug 28, 2012	YY	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Results are based on the dry weight of the sample.
Based on GC/MS target ion analysis.
Isomers Benzo(b)fluoranthene and Benzo(j)fluoranthene have the same GC retention time and are reported as the sum based on the Benzo(b)fluoranthene response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

CCME / Alberta Tier 1 Metals + HWS B + Cr6 (soil)

SAMPLE TYPE: Soil | SAMPLE ID: 3650475 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-019

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Antimony	mg/kg	0.6		0.5	Aug 29, 2012	DF	Aug 28, 2012
Arsenic	mg/kg	8.1		0.5	Aug 29, 2012	DF	Aug 28, 2012
Barium	mg/kg	930		0.5	Aug 29, 2012	DF	Aug 28, 2012
Beryllium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Boron (Hot water extraction)	mg/kg	<0.5		0.5	Aug 29, 2012	AS	Aug 29, 2012
Cadmium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium	mg/kg	12.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium, Hexavalent	mg/kg	<0.3		0.3	Aug 29, 2012	MM	Aug 29, 2012
Cobalt	mg/kg	6.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Copper	mg/kg	9.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Lead	mg/kg	14.1		0.5	Aug 29, 2012	DF	Aug 28, 2012
Molybdenum	mg/kg	0.9		0.5	Aug 29, 2012	DF	Aug 28, 2012
Nickel	mg/kg	16.3		0.5	Aug 29, 2012	DF	Aug 28, 2012
Selenium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Silver	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Thallium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Tin	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Uranium	mg/kg	0.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Vanadium	mg/kg	21.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Zinc	mg/kg	37		1	Aug 29, 2012	DF	Aug 28, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis - Salinity (AB Tier 1 - pH Calcium Chloride)

SAMPLE TYPE: Soil | SAMPLE ID: 3650475 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-019

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH (CaCl2 Extraction)	pH Units	7.5		N/A	Aug 29, 2012	KR	Aug 29, 2012
Electrical Conductivity (Sat. Paste)	dS/m	0.32		0.01	Aug 29, 2012	AG	Aug 29, 2012
Sodium Adsorption Ratio		0.28			Aug 29, 2012	SYS	Aug 29, 2012
Saturation Percentage	%	28		N/A	Aug 29, 2012	AG	Aug 29, 2012
Chloride, Soluble	mg/L	6		5	Aug 29, 2012	NK	Aug 29, 2012
Calcium, Soluble	mg/L	64		1	Aug 29, 2012	AJ	Aug 29, 2012
Potassium, Soluble	mg/L	5		2	Aug 29, 2012	AJ	Aug 29, 2012
Magnesium, Soluble	mg/L	7		1	Aug 29, 2012	AJ	Aug 29, 2012
Sodium, Soluble	mg/L	9		2	Aug 29, 2012	AJ	Aug 29, 2012
Sulfur (as Sulfate), Soluble	mg/L	38		2	Aug 29, 2012	AJ	Aug 29, 2012
Theoretical Gypsum Requirement	tonnes/ha	0				SYS	
Chloride, Soluble (meq/L)	meq/L	0.17		0.06		SYS	
Calcium, Soluble (meq/L)	meq/L	3.19		0.05		SYS	
Potassium, Soluble (meq/L)	meq/L	0.13		0.05		SYS	
Magnesium, Soluble (meq/L)	meq/L	0.58		0.08		SYS	
Sodium, Soluble (meq/L)	meq/L	0.39		0.09		SYS	
Sulfur (as Sulfate), Soluble (meq/L)	meq/L	0.79		0.04		SYS	
Chloride, Soluble (mg/kg)	mg/kg	<2		2		SYS	
Calcium, Soluble (mg/kg)	mg/kg	18		1		SYS	
Potassium, Soluble (mg/kg)	mg/kg	<2		2		SYS	
Magnesium, Soluble (mg/kg)	mg/kg	2		1		SYS	
Sodium, Soluble (mg/kg)	mg/kg	3		2		SYS	
Sulfur (as Sulfate), Soluble (mg/kg)	mg/kg	11		2		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
If sodium results in mg/L are less than detection, SAR is non-calculable and is reported as 0.

Certified By:

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

SAMPLE TYPE: Soil | SAMPLE ID: 3650475 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-019

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/kg	<0.005		0.005	Aug 27, 2012	KL	Aug 27, 2012
Toluene	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene	mg/kg	<0.01		0.01	Aug 27, 2012	KL	Aug 27, 2012
Xylenes	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1 minus BTEX)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C10 - C16 (F2)	mg/kg	<10		10	Aug 28, 2012	OL	Aug 27, 2012
C16 - C34 (F3)	mg/kg	39		10	Aug 28, 2012	OL	Aug 27, 2012
C34 - C50 (F4)	mg/kg	27		10	Aug 28, 2012	OL	Aug 27, 2012
Gravimetric Heavy Hydrocarbons	mg/kg	N/A		1000	Aug 28, 2012	OL	Aug 27, 2012
Moisture Content	%	3.5		1	Aug 28, 2012	OL	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	102	50-150	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene-d10 (BTEX)	%	105	50-150	Aug 27, 2012	KL	Aug 27, 2012
o-Terphenyl (F2-F4)	%	83	50-150	Aug 28, 2012	OL	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 (Ag,F)
Results are based on the dry weight of the sample.
The C6-C10 (F1) fraction is calculated using toluene response factor.
The C10 - C16 (F2), C16 - C34 (F3), and C34 - C50 (F4) fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons (F4g) are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions (if requested).
Quality control data is available upon request.
Assistance in the interpretation of data is available upon request.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
The chromatogram returned to baseline by the retention time of nC50.
Extraction and holding times were met for this sample.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Polyaromatic Hydrocarbon Analysis - Soil

SAMPLE TYPE: Soil | SAMPLE ID: 3650475 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-019

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Naphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
2-Methylnaphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthylene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Fluorene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Phenanthrene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Anthracene	mg/kg	<0.004		0.004	Aug 28, 2012	YY	Aug 27, 2012
Fluoranthene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]anthracene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Chrysene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[b+j]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[k]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Indeno[1,2,3-cd]pyrene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Dibenzo[ah]anthracene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Benzo[ghi]perylene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
2-Fluorobiphenyl (PAH)	%	106	50-150	Aug 28, 2012	YY	Aug 27, 2012
p-Terphenyl-d14 (PAH)	%	87	50-150	Aug 28, 2012	YY	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Results are based on the dry weight of the sample.
Based on GC/MS target ion analysis.
Isomers Benzo(b)fluoranthene and Benzo(j)fluoranthene have the same GC retention time and are reported as the sum based on the Benzo(b)fluoranthene response.

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

CCME / Alberta Tier 1 Metals + HWS B + Cr6 (soil)

SAMPLE TYPE: Soil | SAMPLE ID: 3650476 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-020

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Antimony	mg/kg	2.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Arsenic	mg/kg	9.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Barium	mg/kg	3790		0.5	Aug 29, 2012	DF	Aug 28, 2012
Beryllium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Boron (Hot water extraction)	mg/kg	<0.5		0.5	Aug 29, 2012	AS	Aug 29, 2012
Cadmium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium	mg/kg	13.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium, Hexavalent	mg/kg	<0.3		0.3	Aug 29, 2012	MM	Aug 29, 2012
Cobalt	mg/kg	4.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Copper	mg/kg	11.6		0.5	Aug 29, 2012	DF	Aug 28, 2012
Lead	mg/kg	46.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Molybdenum	mg/kg	1.1		0.5	Aug 29, 2012	DF	Aug 28, 2012
Nickel	mg/kg	11.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Selenium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Silver	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Thallium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Tin	mg/kg	1.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Uranium	mg/kg	0.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Vanadium	mg/kg	19.9		0.5	Aug 29, 2012	DF	Aug 28, 2012
Zinc	mg/kg	46		1	Aug 29, 2012	DF	Aug 28, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Particle Size by Sieve

SAMPLE TYPE: Soil

SAMPLE ID: 3650476

DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012

DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-020

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Sieve Analysis - 75 microns (wet)	%	97.0		N/A	Aug 29, 2012	TG	Aug 29, 2012
Sieve Texture		Coarse				SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Value reported is amount of sample retained on sieve after wash with water and represents proportion by weight particles larger than indicated sieve size.

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis - Salinity (AB Tier 1 - pH Calcium Chloride)

SAMPLE TYPE: Soil | SAMPLE ID: 3650476 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-020

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH (CaCl2 Extraction)	pH Units	7.4		N/A	Aug 29, 2012	KR	Aug 29, 2012
Electrical Conductivity (Sat. Paste)	dS/m	0.46		0.01	Aug 29, 2012	AG	Aug 29, 2012
Sodium Adsorption Ratio		0.25			Aug 29, 2012	SYS	Aug 29, 2012
Saturation Percentage	%	23		N/A	Aug 29, 2012	AG	Aug 29, 2012
Chloride, Soluble	mg/L	10		5	Aug 29, 2012	NK	Aug 29, 2012
Calcium, Soluble	mg/L	83		1	Aug 29, 2012	AJ	Aug 29, 2012
Potassium, Soluble	mg/L	15		2	Aug 29, 2012	AJ	Aug 29, 2012
Magnesium, Soluble	mg/L	10		1	Aug 29, 2012	AJ	Aug 29, 2012
Sodium, Soluble	mg/L	9		2	Aug 29, 2012	AJ	Aug 29, 2012
Sulfur (as Sulfate), Soluble	mg/L	82		2	Aug 29, 2012	AJ	Aug 29, 2012
Theoretical Gypsum Requirement	tonnes/ha	0				SYS	
Chloride, Soluble (meq/L)	meq/L	0.28		0.06		SYS	
Calcium, Soluble (meq/L)	meq/L	4.14		0.05		SYS	
Potassium, Soluble (meq/L)	meq/L	0.38		0.05		SYS	
Magnesium, Soluble (meq/L)	meq/L	0.82		0.08		SYS	
Sodium, Soluble (meq/L)	meq/L	0.39		0.09		SYS	
Sulfur (as Sulfate), Soluble (meq/L)	meq/L	1.71		0.04		SYS	
Chloride, Soluble (mg/kg)	mg/kg	2		2		SYS	
Calcium, Soluble (mg/kg)	mg/kg	19		1		SYS	
Potassium, Soluble (mg/kg)	mg/kg	3		2		SYS	
Magnesium, Soluble (mg/kg)	mg/kg	2		1		SYS	
Sodium, Soluble (mg/kg)	mg/kg	2		2		SYS	
Sulfur (as Sulfate), Soluble (mg/kg)	mg/kg	19		2		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
If sodium results in mg/L are less than detection, SAR is non-calculable and is reported as 0.

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

SAMPLE TYPE: Soil | SAMPLE ID: 3650476 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-020

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/kg	<0.005		0.005	Aug 27, 2012	KL	Aug 27, 2012
Toluene	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene	mg/kg	<0.01		0.01	Aug 27, 2012	KL	Aug 27, 2012
Xylenes	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1 minus BTEX)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C10 - C16 (F2)	mg/kg	<10		10	Aug 28, 2012	OL	Aug 27, 2012
C16 - C34 (F3)	mg/kg	55		10	Aug 28, 2012	OL	Aug 27, 2012
C34 - C50 (F4)	mg/kg	54		10	Aug 28, 2012	OL	Aug 27, 2012
Gravimetric Heavy Hydrocarbons	mg/kg	N/A		1000	Aug 28, 2012	OL	Aug 27, 2012
Moisture Content	%	2.3		1	Aug 28, 2012	OL	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	99	50-150	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene-d10 (BTEX)	%	92	50-150	Aug 27, 2012	KL	Aug 27, 2012
o-Terphenyl (F2-F4)	%	85	50-150	Aug 28, 2012	OL	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 (Ag,F)
Results are based on the dry weight of the sample.
The C6-C10 (F1) fraction is calculated using toluene response factor.
The C10 - C16 (F2), C16 - C34 (F3), and C34 - C50 (F4) fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons (F4g) are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions (if requested).
Quality control data is available upon request.
Assistance in the interpretation of data is available upon request.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
The chromatogram returned to baseline by the retention time of nC50.
Extraction and holding times were met for this sample.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Polyaromatic Hydrocarbon Analysis - Soil

SAMPLE TYPE: Soil | SAMPLE ID: 3650476 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-020

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Naphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
2-Methylnaphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthylene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Fluorene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Phenanthrene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Anthracene	mg/kg	<0.004		0.004	Aug 28, 2012	YY	Aug 27, 2012
Fluoranthene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]anthracene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Chrysene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[b+j]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[k]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Indeno[1,2,3-cd]pyrene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Dibenzo[ah]anthracene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Benzo[ghi]perylene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
2-Fluorobiphenyl (PAH)	%	106	50-150		Aug 28, 2012	YY	Aug 27, 2012
p-Terphenyl-d14 (PAH)	%	90	50-150		Aug 28, 2012	YY	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Results are based on the dry weight of the sample.
Based on GC/MS target ion analysis.
Isomers Benzo(b)fluoranthene and Benzo(j)fluoranthene have the same GC retention time and are reported as the sum based on the Benzo(b)fluoranthene response.

Certified By: Elena Gorobets

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

CCME / Alberta Tier 1 Metals + HWS B + Cr6 (soil)

SAMPLE TYPE: Soil | SAMPLE ID: 3650477 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-021

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Antimony	mg/kg	1.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Arsenic	mg/kg	9.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Barium	mg/kg	5060		0.5	Aug 29, 2012	DF	Aug 28, 2012
Beryllium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Boron (Hot water extraction)	mg/kg	<0.5		0.5	Aug 29, 2012	AS	Aug 29, 2012
Cadmium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium	mg/kg	10.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium, Hexavalent	mg/kg	<0.3		0.3	Aug 29, 2012	MM	Aug 29, 2012
Cobalt	mg/kg	4.1		0.5	Aug 29, 2012	DF	Aug 28, 2012
Copper	mg/kg	12.9		0.5	Aug 29, 2012	DF	Aug 28, 2012
Lead	mg/kg	91.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Molybdenum	mg/kg	0.9		0.5	Aug 29, 2012	DF	Aug 28, 2012
Nickel	mg/kg	10.1		0.5	Aug 29, 2012	DF	Aug 28, 2012
Selenium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Silver	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Thallium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Tin	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Uranium	mg/kg	0.7		0.5	Aug 29, 2012	DF	Aug 28, 2012
Vanadium	mg/kg	18.3		0.5	Aug 29, 2012	DF	Aug 28, 2012
Zinc	mg/kg	69		1	Aug 29, 2012	DF	Aug 28, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis - Salinity (AB Tier 1 - pH Calcium Chloride)

SAMPLE TYPE: Soil | SAMPLE ID: 3650477 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-021

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH (CaCl2 Extraction)	pH Units	7.3		N/A	Aug 29, 2012	KR	Aug 29, 2012
Electrical Conductivity (Sat. Paste)	dS/m	0.56		0.01	Aug 29, 2012	AG	Aug 29, 2012
Sodium Adsorption Ratio		0.40			Aug 29, 2012	SYS	Aug 29, 2012
Saturation Percentage	%	25		N/A	Aug 29, 2012	AG	Aug 29, 2012
Chloride, Soluble	mg/L	19		5	Aug 29, 2012	NK	Aug 29, 2012
Calcium, Soluble	mg/L	86		1	Aug 29, 2012	AJ	Aug 29, 2012
Potassium, Soluble	mg/L	24		2	Aug 29, 2012	AJ	Aug 29, 2012
Magnesium, Soluble	mg/L	12		1	Aug 29, 2012	AJ	Aug 29, 2012
Sodium, Soluble	mg/L	15		2	Aug 29, 2012	AJ	Aug 29, 2012
Sulfur (as Sulfate), Soluble	mg/L	101		2	Aug 29, 2012	AJ	Aug 29, 2012
Theoretical Gypsum Requirement	tonnes/ha	0				SYS	
Chloride, Soluble (meq/L)	meq/L	0.54		0.06		SYS	
Calcium, Soluble (meq/L)	meq/L	4.29		0.05		SYS	
Potassium, Soluble (meq/L)	meq/L	0.61		0.05		SYS	
Magnesium, Soluble (meq/L)	meq/L	0.99		0.08		SYS	
Sodium, Soluble (meq/L)	meq/L	0.65		0.09		SYS	
Sulfur (as Sulfate), Soluble (meq/L)	meq/L	2.10		0.04		SYS	
Chloride, Soluble (mg/kg)	mg/kg	5		2		SYS	
Calcium, Soluble (mg/kg)	mg/kg	22		1		SYS	
Potassium, Soluble (mg/kg)	mg/kg	6		2		SYS	
Magnesium, Soluble (mg/kg)	mg/kg	3		1		SYS	
Sodium, Soluble (mg/kg)	mg/kg	4		2		SYS	
Sulfur (as Sulfate), Soluble (mg/kg)	mg/kg	25		2		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
If sodium results in mg/L are less than detection, SAR is non-calculable and is reported as 0.

Certified By:

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

SAMPLE TYPE: Soil | SAMPLE ID: 3650477 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-021

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/kg	<0.005		0.005	Aug 27, 2012	KL	Aug 27, 2012
Toluene	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene	mg/kg	<0.01		0.01	Aug 27, 2012	KL	Aug 27, 2012
Xylenes	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1 minus BTEX)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C10 - C16 (F2)	mg/kg	<10		10	Aug 28, 2012	OL	Aug 27, 2012
C16 - C34 (F3)	mg/kg	65		10	Aug 28, 2012	OL	Aug 27, 2012
C34 - C50 (F4)	mg/kg	60		10	Aug 28, 2012	OL	Aug 27, 2012
Gravimetric Heavy Hydrocarbons	mg/kg	N/A		1000	Aug 28, 2012	OL	Aug 27, 2012
Moisture Content	%	1.8		1	Aug 28, 2012	OL	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	101	50-150	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene-d10 (BTEX)	%	105	50-150	Aug 27, 2012	KL	Aug 27, 2012
o-Terphenyl (F2-F4)	%	85	50-150	Aug 28, 2012	OL	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 (Ag,F)
Results are based on the dry weight of the sample.
The C6-C10 (F1) fraction is calculated using toluene response factor.
The C10 - C16 (F2), C16 - C34 (F3), and C34 - C50 (F4) fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons (F4g) are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions (if requested).
Quality control data is available upon request.
Assistance in the interpretation of data is available upon request.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
The chromatogram returned to baseline by the retention time of nC50.
Extraction and holding times were met for this sample.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Polyaromatic Hydrocarbon Analysis - Soil

SAMPLE TYPE: Soil | SAMPLE ID: 3650477 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-021

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Naphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
2-Methylnaphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthylene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Fluorene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Phenanthrene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Anthracene	mg/kg	<0.004		0.004	Aug 28, 2012	YY	Aug 27, 2012
Fluoranthene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]anthracene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Chrysene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[b+j]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[k]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Indeno[1,2,3-cd]pyrene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Dibenzo[ah]anthracene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Benzo[ghi]perylene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
2-Fluorobiphenyl (PAH)	%	100	50-150	Aug 28, 2012	YY	Aug 27, 2012
p-Terphenyl-d14 (PAH)	%	77	50-150	Aug 28, 2012	YY	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Results are based on the dry weight of the sample.
Based on GC/MS target ion analysis.
Isomers Benzo(b)fluoranthene and Benzo(j)fluoranthene have the same GC retention time and are reported as the sum based on the Benzo(b)fluoranthene response.

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

CCME / Alberta Tier 1 Metals + HWS B + Cr6 (soil)

SAMPLE TYPE: Soil | SAMPLE ID: 3650478 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-022

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Antimony	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Arsenic	mg/kg	6.8		0.5	Aug 29, 2012	DF	Aug 28, 2012
Barium	mg/kg	3170		0.5	Aug 29, 2012	DF	Aug 28, 2012
Beryllium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Boron (Hot water extraction)	mg/kg	<0.5		0.5	Aug 29, 2012	AS	Aug 29, 2012
Cadmium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium	mg/kg	9.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Chromium, Hexavalent	mg/kg	<0.3		0.3	Aug 29, 2012	MM	Aug 29, 2012
Cobalt	mg/kg	3.4		0.5	Aug 29, 2012	DF	Aug 28, 2012
Copper	mg/kg	8.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Lead	mg/kg	25.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Molybdenum	mg/kg	0.6		0.5	Aug 29, 2012	DF	Aug 28, 2012
Nickel	mg/kg	9.0		0.5	Aug 29, 2012	DF	Aug 28, 2012
Selenium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Silver	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Thallium	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Tin	mg/kg	<0.5		0.5	Aug 29, 2012	DF	Aug 28, 2012
Uranium	mg/kg	0.6		0.5	Aug 29, 2012	DF	Aug 28, 2012
Vanadium	mg/kg	18.4		0.5	Aug 29, 2012	DF	Aug 28, 2012
Zinc	mg/kg	30		1	Aug 29, 2012	DF	Aug 28, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis - Salinity (AB Tier 1 - pH Calcium Chloride)

SAMPLE TYPE: Soil | SAMPLE ID: 3650478 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-022

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH (CaCl2 Extraction)	pH Units	7.5		N/A	Aug 29, 2012	KR	Aug 29, 2012
Electrical Conductivity (Sat. Paste)	dS/m	0.41		0.01	Aug 29, 2012	AG	Aug 29, 2012
Sodium Adsorption Ratio		0.31			Aug 29, 2012	SYS	Aug 29, 2012
Saturation Percentage	%	27		N/A	Aug 29, 2012	AG	Aug 29, 2012
Chloride, Soluble	mg/L	11		5	Aug 29, 2012	NK	Aug 29, 2012
Calcium, Soluble	mg/L	64		1	Aug 29, 2012	AJ	Aug 29, 2012
Potassium, Soluble	mg/L	28		2	Aug 29, 2012	AJ	Aug 29, 2012
Magnesium, Soluble	mg/L	8		1	Aug 29, 2012	AJ	Aug 29, 2012
Sodium, Soluble	mg/L	10		2	Aug 29, 2012	AJ	Aug 29, 2012
Sulfur (as Sulfate), Soluble	mg/L	88		2	Aug 29, 2012	AJ	Aug 29, 2012
Theoretical Gypsum Requirement	tonnes/ha	0				SYS	
Chloride, Soluble (meq/L)	meq/L	0.31		0.06		SYS	
Calcium, Soluble (meq/L)	meq/L	3.19		0.05		SYS	
Potassium, Soluble (meq/L)	meq/L	0.72		0.05		SYS	
Magnesium, Soluble (meq/L)	meq/L	0.66		0.08		SYS	
Sodium, Soluble (meq/L)	meq/L	0.43		0.09		SYS	
Sulfur (as Sulfate), Soluble (meq/L)	meq/L	1.83		0.04		SYS	
Chloride, Soluble (mg/kg)	mg/kg	3		2		SYS	
Calcium, Soluble (mg/kg)	mg/kg	17		1		SYS	
Potassium, Soluble (mg/kg)	mg/kg	8		2		SYS	
Magnesium, Soluble (mg/kg)	mg/kg	2		1		SYS	
Sodium, Soluble (mg/kg)	mg/kg	3		2		SYS	
Sulfur (as Sulfate), Soluble (mg/kg)	mg/kg	24		2		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
If sodium results in mg/L are less than detection, SAR is non-calculable and is reported as 0.

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)

SAMPLE TYPE: Soil | SAMPLE ID: 3650478 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-022

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/kg	<0.005		0.005	Aug 27, 2012	KL	Aug 27, 2012
Toluene	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene	mg/kg	<0.01		0.01	Aug 27, 2012	KL	Aug 27, 2012
Xylenes	mg/kg	<0.05		0.05	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C6 - C10 (F1 minus BTEX)	mg/kg	<10		10	Aug 27, 2012	KL	Aug 27, 2012
C10 - C16 (F2)	mg/kg	<10		10	Aug 28, 2012	OL	Aug 27, 2012
C16 - C34 (F3)	mg/kg	168		10	Aug 28, 2012	OL	Aug 27, 2012
C34 - C50 (F4)	mg/kg	302		10	Aug 28, 2012	OL	Aug 27, 2012
Gravimetric Heavy Hydrocarbons	mg/kg	N/A		1000	Aug 28, 2012	OL	Aug 27, 2012
Moisture Content	%	2.6		1	Aug 28, 2012	OL	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	99	50-150	Aug 27, 2012	KL	Aug 27, 2012
Ethylbenzene-d10 (BTEX)	%	99	50-150	Aug 27, 2012	KL	Aug 27, 2012
o-Terphenyl (F2-F4)	%	85	50-150	Aug 28, 2012	OL	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ABTier1 (Ag,F)
Results are based on the dry weight of the sample.
The C6-C10 (F1) fraction is calculated using toluene response factor.
The C10 - C16 (F2), C16 - C34 (F3), and C34 - C50 (F4) fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons (F4g) are not included in and cannot be added to the Total C6-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX and PAH contributions (if requested).
Quality control data is available upon request.
Assistance in the interpretation of data is available upon request.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
The chromatogram returned to baseline by the retention time of nC50.
Extraction and holding times were met for this sample.

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CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Polyaromatic Hydrocarbon Analysis - Soil

SAMPLE TYPE: Soil | SAMPLE ID: 3650478 | DATE RECEIVED: Aug 27, 2012

DATE SAMPLED: Aug 25, 2012 | DATE REPORTED: Sep 05, 2012

SAMPLE DESCRIPTION: SS12-022

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Naphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
2-Methylnaphthalene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthylene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Acenaphthene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Fluorene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Phenanthrene	mg/kg	<0.02		0.02	Aug 28, 2012	YY	Aug 27, 2012
Anthracene	mg/kg	<0.004		0.004	Aug 28, 2012	YY	Aug 27, 2012
Fluoranthene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]anthracene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Chrysene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[b+j]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[k]fluoranthene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Benzo[a]pyrene	mg/kg	<0.03		0.03	Aug 28, 2012	YY	Aug 27, 2012
Indeno[1,2,3-cd]pyrene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012
Dibenzo[ah]anthracene	mg/kg	<0.005		0.005	Aug 28, 2012	YY	Aug 27, 2012
Benzo[ghi]perylene	mg/kg	<0.05		0.05	Aug 28, 2012	YY	Aug 27, 2012

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
2-Fluorobiphenyl (PAH)	%	103	50-150	Aug 28, 2012	YY	Aug 27, 2012
p-Terphenyl-d14 (PAH)	%	85	50-150	Aug 28, 2012	YY	Aug 27, 2012

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Results are based on the dry weight of the sample.
Based on GC/MS target ion analysis.
Isomers Benzo(b)fluoranthene and Benzo(j)fluoranthene have the same GC retention time and are reported as the sum based on the Benzo(b)fluoranthene response.

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Quality Assurance

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis

RPT Date: Sep 05, 2012			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
CCME / Alberta Tier 1 Metals + HWS B + Cr6 (soil)															
Antimony	1883	3653530	1.0	1.0	0.0%	< 0.5	119%	80%	120%				103%	80%	120%
Arsenic	1883	3653530	8.5	8.5	0.0%	< 0.5	95%	80%	120%				107%	80%	120%
Barium	1883	3653530	331	331	0.0%	< 0.5	103%	80%	120%				99%	80%	120%
Beryllium	1883	3653530	0.5	0.5	0.0%	< 0.5	99%	80%	120%				112%	80%	120%
Boron (Hot water extraction)	605	3508	<0.5	<0.5	0.0%	< 0.5	92%	80%	120%						
Cadmium	1883	3653530	< 0.5	< 0.5	0.0%	< 0.5	99%	80%	120%				107%	80%	120%
Chromium	1883	3653530	28.2	27.2	3.6%	< 0.5	100%	80%	120%				109%	80%	120%
Chromium, Hexavalent	6824	8295	< 0.3	< 0.3	0.0%	< 0.3	91%	80%	120%				100%	80%	120%
Cobalt	1883	3653530	10.1	9.94	1.6%	< 0.5	99%	80%	120%				105%	80%	120%
Copper	1883	3653530	21.3	21.1	0.9%	< 0.5	99%	80%	120%				106%	80%	120%
Lead	1883	3653530	12.3	12.2	0.8%	< 0.5	82%	80%	120%				91%	80%	120%
Molybdenum	1883	3653530	1.15	1.15	0.0%	< 0.5	103%	80%	120%				101%	80%	120%
Nickel	1883	3653530	28.8	28.7	0.3%	< 0.5	98%	80%	120%				102%	80%	120%
Selenium	1883	3653530	< 0.5	< 0.5	0.0%	< 0.5	95%	80%	120%				80%	80%	120%
Silver	1883	3653530	< 0.5	< 0.5	0.0%	< 0.5	99%	80%	120%				104%	80%	120%
Thallium	1883	3653530	< 0.5	< 0.5	0.0%	< 0.5	100%	80%	120%				105%	80%	120%
Tin	1883	3653530	0.7	0.7	0.0%	< 0.5	104%	80%	120%				98%	80%	120%
Uranium	1883	3653530	1.36	1.33	2.2%	< 0.5	105%	80%	120%				99%	80%	120%
Vanadium	1883	3653530	40.2	38.4	4.6%	< 0.5	93%	80%	120%				99%	80%	120%
Zinc	1883	3653530	57	57	0.0%	< 1	106%	80%	120%				106%	80%	120%
Soil Analysis - Salinity (AB Tier 1 - pH Calcium Chloride)															
pH (CaCl2 Extraction)	1262	0462	7.0	7.0	0.0%	N/A	99%	90%	110%						
Electrical Conductivity (Sat. Paste)	2961	3530	0.49	0.51	4.0%	< 0.01	102%	90%	110%						
Saturation Percentage	2961	3530	48	47	2.1%	N/A	102%	80%	120%						
Chloride, Soluble	328	530	9	10	10.5%	< 5	103%	80%	120%						
Calcium, Soluble	1915	3530	53	56	6.0%	< 1	98%	80%	120%						
Potassium, Soluble	1915	3530	5	6	9.6%	< 2	99%	80%	120%						
Magnesium, Soluble	1915	3530	10	11	4.6%	< 1	97%	80%	120%						
Sodium, Soluble	1915	3530	31	33	4.1%	< 2	92%	80%	120%						
Sulfur (as Sulfate), Soluble	1915	3530	40	44	9.5%	< 2	96%	80%	120%						
Particle Size by Sieve															
Sieve Analysis - 75 microns (wet)	1839	STD	99.7	99.7	0.0%	N/A	100%	80%	120%						
Particle Size by Sieve															
Sieve Analysis - 75 microns (wet)	1838	STD	99.4	99.3	0.1%	N/A	100%	80%	120%						

Comments: N/A: Not applicable

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Quality Assurance

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Soil Analysis (Continued)

RPT Date: Sep 05, 2012			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Certified By:

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Quality Assurance

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

Trace Organics Analysis

RPT Date: Sep 05, 2012			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Petroleum Hydrocarbons (BTEX/F1-F4) in Soil (CWS)															
Benzene	1936	3650473	<0.005	<0.005	NA	< 0.005	99%	80%	120%	98%	80%	120%	90%	60%	140%
Toluene	1936	3650473	<0.05	<0.05	NA	< 0.05	90%	80%	120%	97%	80%	120%	81%	60%	140%
Ethylbenzene	1936	3650473	<0.01	<0.01	NA	< 0.01	87%	80%	120%	94%	80%	120%	79%	60%	140%
Xylenes	1936	3650473	<0.05	<0.05	NA	< 0.05	84%	80%	120%	95%	80%	120%	79%	60%	140%
C6 - C10 (F1)	1936	3650473	<10	<10	NA	< 10	80%	80%	120%	91%	80%	120%	87%	60%	140%
C10 - C16 (F2)	1026	3650473	<10	<10	NA	< 10	90%	80%	120%	87%	80%	120%	87%	60%	140%
C16 - C34 (F3)	1026	3650473	70	73	4.0%	< 10	90%	80%	120%	92%	80%	120%	87%	60%	140%
C34 - C50 (F4)	1026	3650473	43	43	NA	< 10	90%	80%	120%	92%	80%	120%	88%	60%	140%
Polyaromatic Hydrocarbon Analysis - Soil															
Naphthalene	131	3643686	<0.005	<0.005	NA	< 0.005	114%	70%	130%	100%	70%	130%	100%	70%	130%
2-Methylnaphthalene	131	3643686	<0.005	<0.005	NA	< 0.005	117%	70%	130%	92%	70%	130%	92%	70%	130%
Acenaphthylene	131	3643686	<0.005	<0.005	NA	< 0.005	88%	70%	130%	77%	70%	130%	82%	70%	130%
Acenaphthene	131	3643686	<0.005	<0.005	NA	< 0.005	103%	70%	130%	93%	70%	130%	98%	70%	130%
Fluorene	131	3643686	<0.02	<0.02	NA	< 0.02	83%	70%	130%	90%	70%	130%	98%	70%	130%
Phenanthrene	131	3643686	<0.02	<0.02	NA	< 0.02	107%	70%	130%	94%	70%	130%	107%	70%	130%
Anthracene	131	3643686	<0.004	<0.004	NA	< 0.004	96%	70%	130%	73%	70%	130%	95%	70%	130%
Fluoranthene	131	3643686	<0.03	<0.03	NA	< 0.03	85%	70%	130%	97%	70%	130%	114%	70%	130%
Pyrene	131	3643686	<0.03	<0.03	NA	< 0.03	97%	70%	130%	97%	70%	130%	98%	70%	130%
Benzo[a]anthracene	131	3643686	<0.03	<0.03	NA	< 0.03	86%	70%	130%	73%	70%	130%	94%	70%	130%
Chrysene	131	3643686	<0.05	<0.05	NA	< 0.05	92%	70%	130%	104%	70%	130%	100%	70%	130%
Benzo[b+j]fluoranthene	131	3643686	<0.05	<0.05	NA	< 0.05	76%	70%	130%	89%	70%	130%	96%	70%	130%
Benzo[k]fluoranthene	131	3643686	<0.05	<0.05	NA	< 0.05	72%	70%	130%	90%	70%	130%	96%	70%	130%
Benzo[a]pyrene	131	3643686	<0.03	<0.03	NA	< 0.03	80%	70%	130%	83%	70%	130%	86%	70%	130%
Indeno[1,2,3-cd]pyrene	131	3643686	<0.05	<0.05	NA	< 0.05	119%	70%	130%	83%	70%	130%	94%	70%	130%
Dibenzo[ah]anthracene	131	3643686	<0.005	<0.005	NA	< 0.005	120%	70%	130%	96%	70%	130%	96%	70%	130%
Benzo[ghi]perylene	131	3643686	<0.05	<0.05	NA	< 0.05	130%	70%	130%	98%	70%	130%	88%	70%	130%

Certified By: Elena Gorobets

AGAT Laboratories

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Method Summary

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Arsenic	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Barium	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Beryllium	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Boron (Hot water extraction)	SOIL 0270; SOIL 0110; SOIL 0120; INST 0140	Carter 12.2.4/ EPA 6010; SHEPPARD	ICP/OES
Cadmium	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Chromium	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Chromium, Hexavalent	SPE 0101; SOIL 0600	ASA 20-4.3; REISENAUER 1982	SPECTROPHOTOMETER
Cobalt	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Copper	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Lead	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Molybdenum	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Nickel	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Selenium	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Silver	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Thallium	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Tin	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Uranium	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Vanadium	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Zinc	SOIL 0390; SOIL 0110; SOIL 0120; INST 0141	EPA SW 846-3050/6010; SHEPPARD	ICP/MS
Sieve Analysis - 75 microns (wet)	INOR-171-6009	Carter 1993	SIEVE
pH (CaCl2 Extraction)	SOIL 0110; SOIL 0120; INST 0104	CARTER & GREGORICH 2007	PH METER
Electrical Conductivity (Sat. Paste)	SOIL 0110; SOIL 0120; INST 0120	SHEPPARD 2007; MILLER 2007	CONDUCTIVITY METER
Sodium Adsorption Ratio	SOIL 200	CARTER & GREGORICH 2007	CALCULATION
Saturation Percentage	SOIL 0140; SOIL 0110; SOIL 0120	CARTER & GREGORICH 2007	GRAVIMETRIC
Chloride, Soluble	SOIL 0110; SOIL 0120; INST 0330	CARTER & GREGORICH 2007, SM 4500E	CONTINUOUS FLOW ANALYZER
Calcium, Soluble	SOIL 0110; SOIL 0120; SOIL 0140; INST 0140	CARTER & GREGORICH 2007, SM 3120B	ICP/OES
Potassium, Soluble	SOIL 0110; SOIL 0120; SOIL 0140; INST 0140	CARTER & GREGORICH 2007, SM 3120B	ICP/OES
Magnesium, Soluble	SOIL 0110; SOIL 0120; SOIL 0140; INST 0140	CARTER & GREGORICH 2007, SM 3120B	ICP/OES

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Method Summary

CLIENT NAME: SHELL CANADA ENERGY

AGAT WORK ORDER: 12C635076

PROJECT NO: A04012A05

ATTENTION TO: Accounts

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Sodium, Soluble	SOIL 0110; SOIL 0120; SOIL 0140; INST 0140	CARTER & GREGORICH 2007, SM 3120B	ICP/OES
Sulfur (as Sulfate), Soluble	SOIL 0110; SOIL 0120; SOIL 0140; INST 0140	CARTER & GREGORICH 2007, SM 3120B	ICP/OES
Trace Organics Analysis			
Benzene	TO 0570	EPA SW-846 8260	GC/MS
Toluene	TO 0570	EPA SW-846 8260	GC/MS
Ethylbenzene	TO 0570	EPA SW-846 8260	GC/MS
Xylenes	TO 0570	EPA SW-846 8260	GC/MS
C6 - C10 (F1)	TO 0570	CCME Tier 1 Method	GC/FID
C6 - C10 (F1 minus BTEX)	TO 0570	CCME Tier 1 Method	GC/FID
C10 - C16 (F2)	TO-0560	CCME Tier 1 Method	GC/FID
C16 - C34 (F3)	TO-0560	CCME Tier 1 Method	GC/FID
C34 - C50 (F4)	TO 0560	CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	TO 0560	CCME Tier 1 Method	GC/FID
Moisture Content	TO 0560	CCME Tier 1 Method	GRAVIMETRIC
Toluene-d8 (BTEX)	TO 0570	EPA SW-846 8260	GC/MS
Ethylbenzene-d10 (BTEX)	TO 0570	EPA SW-846 8260	GC/MS
o-Terphenyl (F2-F4)	TO 0560	CCME Tier 1 Method	GC/FID
Naphthalene	TO 0500	EPA SW-846 3570/8270	GC/MS
2-Methylnaphthalene	TO 0500	EPA SW-846 3570/8270	GC/MS
Acenaphthylene	TO 0500	EPA SW-846 3570/8270	GC/MS
Acenaphthene	TO 0500	EPA SW-846 3570/8270	GC/MS
Fluorene	TO 0500	EPA SW-846 3570/8270	GC/MS
Phenanthrene	TO 0500	EPA SW-846 3570/8270	GC/MS
Anthracene	TO 0500	EPA SW-846 3570/8270	GC/MS
Fluoranthene	TO 0500	EPA SW-846 3570/8270	GC/MS
Pyrene	TO 0500	EPA SW-846 3570/8270	GC/MS
Benzo[a]anthracene	TO 0500	EPA SW-846 3570/8270	GC/MS
Chrysene	TO 0500	EPA SW-846 3570/8270	GC/MS
Benzo[b+j]fluoranthene	TO 0500	EPA SW-846 3570/8270	GC/MS
Benzo[k]fluoranthene	TO 0500	EPA SW-846 3570/8270	GC/MS
Benzo[a]pyrene	TO 0500	EPA SW-846 3570/8270	GC/MS
Indeno[1,2,3-cd]pyrene	TO 0500	EPA SW-846 3570/8270	GC/MS
Dibenzo[ah]anthracene	TO 0500	EPA SW-846 3570/8270	GC/MS
Benzo[ghi]perylene	TO 0500	EPA SW-846 3570/8270	GC/MS
2-Fluorobiphenyl (PAH)	TO 0500	EPA SW-846 3570/8270	GC/MS
p-Terphenyl-d14 (PAH)	TO 0500	EPA SW-846 3570/8270	GC/MS

AGAT Laboratories

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Chain of Custody Record

Report To:
Company: KLOHN-CRIPPEN BERGER C/O SHELL
Contact: KRISTA BEAVIS
Address: 500 2618 HOPEWELL PL NE
CALGARY AB Postal Code: T1Y 7S7
Phone: 403 274 3424 Fax: 403 274 5349
LSD: —
Client Project #: A04012A05

Invoice To: Same (Y / N) – Circle
Company:
Contact:
Address:
Postal code:
Phone: Fax:
PO/AFE #:

Report Information
1. Name: KRISTA BEAVIS
Email: KBEAVIS@KLOHN.COM.
2. Name:
Email:

Report Format
- [x] Single Sample per page
- [ ] Multiple Samples per page
- [x] Excel Format Included

Regulatory Requirements (Check one):
- [x] CCME
- [ ] AB Tier 1
- [ ] Agricultural
- [ ] Residential/Park
- [ ] Commercial
- [ ] Industrial
- [ ] Drinking Water
- [ ] FWAL
- [ ] Natural Area
- [ ] Agricultural
- [ ] Residential/Park
- [ ] Commercial
- [ ] Industrial
- [ ] Other
- [ ] D50 (Drilling)
- [ ] SPIGEC

Rush Turnaround Requests
Upon filling out this section, client accepts that surcharges will be attached to this analysis. If NOT completed, regular TAT will be default.
- [x] Less than 24 hours (200%)
- [x] 24 to 48 hours (100%)
- [x] 48 to 72 hours (50%)

Date Required:
Please contact laboratory to notify

Laboratory Use Only
Date and Time: '12 AUG-27 12:35
Arrival Temperature: 11°C
AGAT Job Number: 12C 635076

'12 AUG-27 12:21

Laboratory Use (Lab ID #)	Sample Identification	Sample Matrix	Date/Time Sampled	Comments – Site/Sample Info. Sample Containment	Number of Containers	Detailed Soil Salinity (Sat. Paste)	CCME BTEX/F1-F4	Metals ☐ HWS-B, Cr6 & Hg	Routine Water Potability	Metals ☐ Diss ☐ Total ☐ Hg	AB Class 2 Landfill	Microtox	D50 Detailed Soil Salinity (As received)	PAH	TSMM PAHs Cus $12					Hold for	Contaminated/Hazardous (Y/N)
3650462	SS12-012	S	2012 08 25	11:00	3	x	x	x						x	x						Y
463	SS12-013			11:15	3	x	x	x						x							Y
467	SS12-014			11 25	3	x	x	x						x							
471	SS12-015			11 35	3	x	x	x						x							
472	SS12-016			11 45	3	x	x	x						x	x						
473	SS12-017			11 55	3	x	x	x						x							
474	SS12-018			12 05	3	x	x	x						x							
475	SS12-019			12 15	3	x	x	x						x							
476	SS12-020			12 25	3	x	x	x						x	x						
477	SS12-021			12 35	3	x	x	x						x							
478	SS12-022			12 45	3	x	x	x						x							
~~SS12-023~~					~~3~~	~~x~~	~~x~~	~~x~~						~~x~~							

Samples Relinquished by (print name & sign): ANDY LEWIS
Date/Time: 2012 08 28 12:21
Samples Received by (Print name & sign): M. DELMPOUR
Date/Time:

Samples Relinquished by (print name & sign):
Date/Time:
Samples Received by (Print name & sign):
Date/Time:

Samples Relinquished by (print name & sign):
Date/Time:
Samples Received by (Print name & sign):
Date/Time:

Pink Copy – Client
Yellow Copy – AGAT
White Copy – AGAT

Page 1 of 1
NO: 039223

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM - Calgary

RECEIVING BASICS:
Complete CoC as well where required

Date & Time: AUG. 27, 2012 12:35 am / (pm)
Courier: D/O Prepaid / Collect
Branch received from:
Received by: M. OCAMPO JR.
Relinquished by: ANDY LEWIS
Company: KLOHN-CRIPPEN
Consultant: SHELL
Client left without count verified:

COC INFORMATION:
Received (Yes) No Emailed to PM
Completed in full (Yes) No If NO, why:
Turnaround Time: 24hr 24-48hr (48-72hr) Reg Other:
COC Numbers: 039223

Workorder Number: 12C635076

SAMPLE QUANTITIES:
Coolers: 1 Bottles/Jars: 24 Bags: 9 Other: —
CoC Container Count: 33 (If this count differs from what was received please make mention under the "Additional Notes" section)

TIME SENSITIVE ISSUES:
Earliest Date Sampled: AUG. 25, 2012
Microbiology/Time Sensitive Test*:
Hydrocarbon Test: BTEX/F1-F4
ALREADY EXCEEDED? Yes (No)
Expiry:
Expiry: SEPT. 1, 2012
Are samples received more than **5 days** after sampling: Yes (No)
**Residual Chlorine, Dissolved Oxygen, Turbidity, BOD, Nitrate/Nitrite, Microtox*

SPECIALTY ISSUES:
Legal Samples: Yes (No)
International Samples: Yes (No)
Proper tape/labels applied: Yes No
Hazardous Samples:
Why hazardous:
Precaution taken:

SAMPLE REQUIREMENTS:
To be completed as samples are being logged by Logistics staff.
Correct bottles used for testing: (Yes) No
If No, explain:
Correct amount of sample for analysis: (Yes) No
If No, explain:
Are all samples labeled correctly: (Yes) No
If No, explain:

3 temperatures of samples* and average of each cooler (record differing temperatures on the COC next to sample ID'S):
use jars when available

(1) (Jar | Bag) 11 + 10 + 11 = 11 °C (2) (Jar | Bag) 18 + 16 + 17 = 17 °C (3) (Jar | Bag) ___ + ___ + ___ = ___ °C

(4) (Jar | Bag) ___ + ___ + ___ = ___ °C (5) (Jar | Bag) ___ + ___ + ___ = ___ °C (6) (Jar | Bag) ___ + ___ + ___ = ___ °C

(If more than 6 coolers are received use another sheet of paper and attach)

Was ice or ice pack present? Yes No

Additional integrity issues (Indicate issues below and on the CoC next to the sample ID):
1)
2)
3)

Account Project Manager: have they been notified of the above/below issues: Yes No
Whom spoken to: Date and Time:

ADDITIONAL NOTES:

APPENDIX IX

Worley Parsons Polyurethane Foam Assessment

APPENDIX 4: POTENTIAL BY-PRODUCTS OF INSULATION DEGRADATION

Introduction

A meeting was held on April 30th, 2009 to discuss the Interim Abandonment and Reclamation Plan for Camp Farewell (WorleyParsons 2006) and specifically the dismantling and remediation activities that were planned for 2009. As a result of that meeting a commitment was made to include degradation products of the foam insulation in future groundwater monitoring programs. Given that there are no historical environmental issues associated with the degradation of foam insulation, monitoring of groundwater is considered an appropriate safeguard for this possibility.

The underlying text identifies the potential by-products of the degradation of the foam insulation.

Foam Insulation Degradation Products

Assessment

Polyurethanes (PU) are typically produced by reacting diisocyanates with polyols. The two diisocyantes predominantly used in the manufacture of polyurethanes are methylenediphenyl diisocyanate (MDI) and toluene diisocyanate (TDI) (Allport 2003).

Degradation of PU foam under buried conditions is very slow and short term studies have found no change in PU foams tested at a disposal site and evaluated after 3 and 5 years, with no detectable alteration in leachate water composition. The rate at which degradation occurs is to a large extent dependent on the chemical base of the foam in question. Studies designed to evaluate the degradation of soft PU foams with a polyester versus polyether base have shown that polyurethane-ester foams are susceptible to chemical or microbial degradation, whereas polyurethane-ether foams are more resistant (IPCS 1987).

Filip (1978) observed that the microbial decomposition of polyurethane followed the following sequence: degradation of free isocyanate groups -> splitting of the urea and amide groups -> breaking off the urethane groups -> cleavage of the rings of the isocyanuric acid units.

Possible products of PU foam degradation in a buried state may include aromatic amines, produced when isocyanates are released from the PU foam. There is evidence that isocyanates used in the production of polyurethane foam can be released into the media (Filip 1979). Isocyanates are highly reactive in water and undergo rapid hydrolysis; toluene diisocyanate has a half life of 0.5 seconds to 3 days dependent on pH and turbidity (IPCS). Hydrolysis of diisocyanates forms amines; these amines then react further with excess isocyanate to create solid, insoluble polyurea (WHO 2000). Both these reactions are rapid.

A 700 day simulated landfill study assaying for aromatic amines using a variety of PU foams (including TDI-based flexible foams and MDI-based rigid foams) did not see the expected aromatic amines released into leachate. It was unclear as to whether the aromatic amines were becoming bound to the substrate, or metabolized (Brown cited by DeGaspari 1999).

According to the work of Filip (1978), cleavage of isocyanuric acid rings is the final stage in the microbial decomposition. Isocyanuric acid (also known as cyanuric acid) is stable in water and not readily biodegradable (OECD 1999). Once dissolved into water, cyanuric acid is not likely to volatilize or to be adsorbed by soil particles (OECD 1999). It is possible to detect and measure isocyanuric acid in water samples using a melamine solution and turbidity test.

Proposed Monitoring

Based on the above, it is evident that polyurethane foam is not susceptible to degradation and that potential degradation products are not particularly soluble. That said, potential degradation products contain significant proportions of nitrogen. Accordingly, it is proposed to include total nitrogen (as well as nitrate and nitrite) in the routine groundwater monitoring program for the site. If anomalous nitrogen concentrations are noted, then target analysis for cyanuric acid would be completed. It is also recommended that at least one round of groundwater testing include specific analysis of cyanuric acid.

References

Allport, D.C., Gilbert, D.S., Outterside, S. M. 2003. MDI and TDI: Safety, Health and the Environment: A Source Book and Practical Guide. Edition: 2. John Wiley and Sons.

DeGaspari, J. 1999. What Happens to Polyurethane Foam in a Landfill? Mechanical Engineering. Available Online: http://www.memagazine.org/backissues/membersonly/june99/features/trash/landfill.html

Filip, Z. 1978 Decomposition of Polyurethane in a Garbage Landfill Leakage Water and by Soil Microorganisms. J. Appl. Microbiol. Biotechnol. 5, 225-231. Available at: http://www.springerlink.com/content/r051311h67102j21/fulltext.pdf

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IPCS (International Programme on Chemical Safety). 1987. Environmental Health Criteria 75: Toluene Diisocyanates Available online: http://www.inchem.org/documents/ehc/ehc/ehc75.htm

OCED (Organisation for Economic Co-operation and Development). 1999. Screening Information Data Set (SIDS) for Isocyanuric Acid, CAS N°: 108-80-5. UNEP Publications. Available at: http://www.inchem.org/documents/sids/sids/108805.pdf

WHO (World Health Organization). 2000. Concise International Chemical Assessment Document 27 Diphenylmethane Diisocyanate (MDI). Geneva 2000. Available at: http://www.who.int/ipcs/publications/cicad/en/cicad27.pdf

WorleyParsons Komex, 2006. 2006 Environmental Site Assessment, Camp Farewell, NT. Unpublished report prepared for Shell Canada Limited, December 2006. C52360300.