

April 19, 2016

Inuvialuit Water Board PO Box 2531 Inuvik, NT X0E 0T0

Ms. Mardy Semmler Executive Director

Dear Ms. Semmler:

Camp Farewell
2015 Decommissioning and Soil Assessment Program

IEG Consultants Ltd., on behalf of Shell Canada Energy, is pleased to submit the Camp Farewell 2015 Decommissioning and Soil Assessment Program Report to the Inuvialuit Water Board.

If you have any questions, please call the undersigned at (403) 730-6809.

Yours truly, **IEG CONSULTANTS LTD.**

Nicole Wills, P.Ag. Project Manager

NW

cc: Randall Warren - Shell Canada Energy



Shell Canada Energy

Camp Farewell

Camp Farewell 2015 Decommissioning and Soil
Assessment Program Report

EXECUTIVE SUMMARY

Shell Canada Energy (Shell) retained IEG Consultants Ltd. (IEG) to provide environmental services for the 2015 Decommissioning and Soil Assessment Program at Camp Farewell (Site). Camp Farewell is located at latitude 69°12′30.0″ N and longitude 135°06′04.4″ W in the Mackenzie Delta, approximately 125 km northwest of Inuvik and approximately 135 km west of Tuktoyaktuk, Northwest Territories. This report details the activities undertaken during the 2015 Decommissioning and Soil Assessment Program.

Decommissioning, demolishing, and removal of the tank farm occurred from August 14th to 17th, 2015. Site activities included removal of the tank farm, identification and removal of buried material, and assessing Site subsurface conditions in preparation for remedial activities in 2016. The conclusions and key findings of Site activities are as follows:

- The tank farm was decommissioned and removed during August 2015. Metal from the tank farm was compressed and packaged for removal via barge;
- The EM (electromagnetic) survey identified 15 subsurface anomalies which were investigated.
 Uncovered debris was removed. Two areas of elevated conductivitiy were identified on the northern half of the Site and to the west of the former tank farm, respectively;
- IEG Site assessment activities included installation of 124 boreholes and collection of groundwater samples from the existing piezometers on-Site;
- Background soil and groundwater guidelines were established for the Site. Reported parameter concentrations for background soil samples were below the method detection limit and/or Government of Northwest Territories (GNWT) guideline for each parameter analyzed in 2015.
- pH values were reported below the guideline range in 56 samples collected from various locations across the extent of the Site. pH values reported for background samples were within the guideline range.
- EC values above the GNWT guideline were observed in three samples collected from one borehole in the airstrip. Remaining analyzed samples had reported electrical conductivity (EC) values below the GNWT guideline.
- True total barium concentrations were reported above the Alberta Environment (AENV)
 guideline in three samples collected from one borehole in the burn pit area, one borehole
 inside shed #1, and one borehole in the laydown/storage area.
- Concentrations of benzene exceeded the GNWT guideline in eight soil samples collected from eight boreholes in the tank farm area.
- Concentrations of toluene exceeded the GNWT guideline in 65 soil samples collected from three boreholes in the shed #1 area, 29 boreholes in the tank farm area, three boreholes in the airstrip, 16 boreholes in the laydown/storage area, and one borehole in the camp area.



- Concentrations of ethylbenzene exceeded the GNWT guideline in nine samples collected from two boreholes in the burn pit area, one borehole in the laydown/storage area, and five boreholes in the tank farm area.
- Concentrations of xylenes exceeded the GNWT guideline in 28 samples collected from three boreholes in the laydown/storage area, four boreholes in the burn pit area, and 13 boreholes in the tank farm area.
- Concentrations of petroleum hydrocarbon (PHC) fraction F1 exceeded the GNWT guideline in 16 samples collected from one borehole in the laydown/storage area, two boreholes in the burn pit area, and eight boreholes in the tank farm area.
- Concentrations of PHC fraction F2 exceeded the GNWT guideline in 44 samples collected from three boreholes in the shed #1 area, seven boreholes in the laydown/storage area, four boreholes in the burn pit area, and 18 boreholes in the tank farm area.
- Concentrations of PHC fraction F3 exceeded the GNWT guideline in 83 samples collected from four boreholes in the shed #1 area, five boreholes in the airstrip, 23 boreholes in the laydown/storage area, two boreholes in the camp area, four boreholes in the burn pit area, 30 boreholes in the tank farm area, and two boreholes in the tundra area.
- Concentrations of PHC fraction F4 exceeded the GNWT guideline in one sample collected from the burn pit area.
- Groundwater samples collected from two piezometers contained concentrations of total dissolved solids (TDS) that exceeded the GNWT guidelines. Groundwater samples collected from four piezometers contained concentrations of aluminum, cadmium, copper, iron, and selenium that exceeded the GNWT guidelines. One groundwater sample contained concentrations of naphthalene that exceeded the GNWT guideline.

Shell anticipates conducting a Decommissioning and Remediation Program in summer 2016, designed to remove remaining infrastructure as well as excavate, windrow, and treat impacted soil on-site. Soil that cannot be treated on-site, and/or does not meet applicable guidelines after treatment, will be packaged and transported to an appropriate facility for disposal.

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1 INTRODUCTION

Shell Canada Energy (Shell) retained IEG Consultants Ltd. (IEG) to provide environmental services for the 2015 Decommissioning and Soil Assessment Program at Camp Farewell (Site). Camp Farewell is located at latitude 69°12′30.0″ N and longitude 135°06′04.4″ W in the Mackenzie Delta, approximately 125 km northwest of Inuvik and approximately 135 km west of Tuktoyaktuk, Northwest Territories (Figure 1). This report details the activities undertaken during the 2015 Decommissioning and Soil Assessment Program.

During the 2015 Decommissioning and Soil Assessment Program, Tervita Inc. (Tervita) was the prime contractor on-Site managing and directing Site activities as well as coordinating logistical and safety aspects. Tetra Tech EBA Inc. (Tetra Tech), contracted through IEG, conducted an electromagnetic (EM) survey across the extent of the Site to identify areas of potential impact as well as buried materials. Mackenzie Delta Integrated Oilfield Services (MDIOS), contracted through Tervita, provided personnel for removal of buried debris as well as decommissioning and packaging activities. IEG conducted a soil assessment across the extent of the Site and collected groundwater samples from existing piezometers.

The field portion of the Decommissioning and Soil Assessment Program was conducted between August 13, 2015 and August 23, 2015.

1.1 Objective and Scope of Work

The objective of the 2015 Decommissioning and Soil Assessment Program was to remove the tank farm, identify and remove buried material, and assess Site subsurface conditions in preparation for remedial activities in 2016.

The scope of work for the 2015 Decommissioning and Soil Assessment Program included:

- decommission, demolish, and remove the tank farm;
- conduct an EM survey across the extent of the Site;
- remove buried material detected by the EM survey;
- load materials resulting from the demolished tank farm and buried debris onto a barge for transport to an appropriate facility for recycling;
- conduct a soil assessment across the extent of the Site;
- collect groundwater samples from existing piezometers; and,
- prepare the 2015 Decommissioning and Soil Assessment report.

IEG was responsible for conducting the following tasks within the overall scope of work:

 advance 124 boreholes across the extent of the Site to a maximum depth of 6 m below ground surface (bgs) to assess soil conditions, and submit selected soil samples for laboratory analysis of indicator and target parameters;



- collect groundwater samples from existing piezometers and submit groundwater samples for laboratory analysis of indicator and target parameters;
- collect GPS coordinates of borehole locations; and,
- prepare the 2015 Decommissioning and Soil Assessment report.



2 SETTING

2.1 Site Setting and Current Conditions

The Site is located approximately 125 km northwest of Inuvik, Northwest Territories (NT) and approximately 135 km west of Tuktoyaktuk, NT. The Site lies within the Inuvialuit Settlement Region (ISR) on the northeast bank of Middle Channel in the Kendall Island Bird Sanctuary (KIBS) (Figure 1).

The Site consists of an approximately 6.5 hectare (ha) gravel pad, a gravel airstrip, and two access roads extending from the Middle Channel of the Mackenzie River to the gravel pad. 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 Site infrastructure includes one storage shed, a 93,000 L fuel aboveground storage tank (AST), and a decommissioned bermed and lined petroleum tank farm consisting of five ASTs.

Camp Farewell is surrounded by stable tundra vegetation including patches of alder (*Alnus sp.*) and willow (*Salix sp.*) (IEG 2012a).

For a detailed Site description, refer to the report prepared by IEG for Shell entitled, "Shell Camp Farewell Project Description, 2015 Decommissioning and Soil Assessment Program", dated May 2015.

2.2 Regional Setting

2.2.1 Climate

Camp Farewell is classified as having a high subarctic eco-climate, with very cold winters and generally cool summers. Mean daily temperatures range from –22.8°C in January to 19.5°C in July (Environment Canada 2015). Winter in this area is approximately six months long and there is a period of approximately two months when the sun does not rise above the horizon. During this period, very cold conditions prevail and may last for several weeks at a time. When temperatures reach such lows, the ability of the air to contain moisture is limited and very little precipitation falls. The mean annual precipitation is 241 mm (Environment Canada 2015).

2.2.2 Physiography

Camp Farewell is within the Tuktoyaktuk Coastal Plain Ecoregion of the Southern Arctic Ecozone. This ecoregion covers the outer Mackenzie River Delta and Tuktoyaktuk Peninsula bordering the Beaufort Sea (ESWG 1996).

There are two main landscape types within the Tuktoyaktuk Coastal Plain Ecoregion. One is composed of distinctive delta landforms at the mouth of the Mackenzie River. These include wetlands, active alluvial channels, and estuarine deposits. Characteristic wetlands, which cover 25 to 50 percent of the area, are lowland polygon fens of both the low and high centre varieties. The second landscape type consists of the broadly rolling uplands. Discontinuous moraine deposits mantle much of the area, except near the coast where fine textured marine sediments cover the surface. Outwash aprons of crudely-sorted sand and gravel, and raised beach ridges along the shores



of pre-glacial lakes, occur less frequently. The resulting undulating terrain is studded with many lakes and ponds (ESWG 1996). The region is underlain by continuous permafrost with high ice content, sometimes in the form of ice wedges and pingos.

2.2.3 Soils and Permafrost

Dominant soils of the Tuktoyaktuk Coastal Plain Ecoregion consist of Organic Turbic Cryosols developed on level to rolling organic, morainal, alluvial, fluvioglacial, and marine deposits (ESWG 1996). Typically these soils are underlain by a continuous layer of permafrost (greater than 90 percent permafrost). However, more recent data describes the outer Mackenzie River Delta and portions of Richards Island as being discontinuous permafrost with about 35 to 65 percent permafrost beneath the area. In the Mackenzie River Delta, permafrost thickness is generally less than 90 m thick, and contains deep unfrozen zones (taliks), which may extend to the base of the permafrost. The depth of the active layer generally ranges from 0.3 to 1.0 m but is largely a function of ground surface insulation, vegetation cover, level of ground disturbance, and winter snow cover (Heginbottom 1998).

2.2.4 Vegetation

Permafrost detracts from soil productivity by chilling the soil and creating waterlogged conditions in the thawed active layer near the soil surface. Plant communities found in the vicinity of the project area are relatively simple and are dominated by a few species that are well adapted to poor soil (low nutrient) conditions and the harsh climate. Vegetation grows on a veneer of unfrozen organic or granular substrate overlying the permafrost boundary. Vegetation in the area is complex, and includes the following: delta shrub communities on active river terraces, sedge (*Carex sp.*) and cotton grass (*Eriophorum angustifolium*) communities in wet inactive areas, and patterned ground comprised of low centred polygons which typically develop in poorly drained conditions. Both standing and moving water are prominent features of the landscape (ESWG 1996).



2.2.5 Hydrology

The Mackenzie River Delta is a dynamic complex of lakes, islands, braided channels, and oxbows. The hydrological regime is the primary factor controlling vegetation and wildlife habitat in the area. It is an estuarine delta with poorly developed levees, formed largely from sediments transported by the Mackenzie River over the last 13,000 years. The southwest portion of the delta also receives sediment from the Peel River and Rat River. The major channels (East, Middle, and West) appear largely unchanged in the last century. The present delta is flat and dotted with numerous lakes, ponds, and river channels, but also contains land varying from stable forested areas to tidal flats (MRBC 1981).

Ice covers the waters of the delta for approximately eight months of the year and can be up to 2.5 m thick in the main stem of the Mackenzie River. Ice break-up usually begins in late April to early May, and ice movement occurs before peak spring water levels. Water levels recede during late summer and into the fall. The basic hydrology of the Mackenzie River Delta is a complex interaction of aggrading and degrading forces, with spring break-up being the major hydrological event each year (MRBC 1981).



3 BACKGROUND

3.1 Site History

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 to 70 person camp full time until 1978, after which it was in operation periodically until 1994. During full operation in the 1970s, infrastructure on-Site included a single story accommodations building and a tank farm consisting of two 5,000 barrel (bbl) ASTs, one 3,000 bbl AST, and three 2,000 bbl ASTs. In the mid-1980s, the accommodations building was replaced with a smaller building designed for approximately 32 people. Storage information included in previous WorleyParsons reports indicates the following fuel and materials have historically 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).

Information provided in the 2006 WorleyParsons Komex (now WorleyParsons) site assessment report indicates that the Site was constructed on permafrost. During construction, a layer of polyurethane (either 50 mm foam or pads) was installed prior to laying down 0.45 m of compacted gravel, to act as a thermal barrier and prevent contamination of underlying soils and groundwater (WorleyParsons Komex 2006). In 2006, WorleyParsons conducted test pitting on-Site and encountered remnants of the polyeurethane material between approximately 0.38 and 0.62 m below ground surface (bgs) in some, but not all of the test pits. This suggests that while the liner material was used during construction, the liner was not used across the extent of the Site. The gravel pad extended beyond the liner in many areas. Sand and gravel comprised the pad fill material and extended 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).

3.1.1 Historical Site Operations

The Site has been utilized by many different corporations for different activities since construction however, it has been maintained under the stewardship of Shell. Historically, the Site was utilized as a staging area for seismic and drilling operations. In addition, the Site was used for camp facilities and the storage of equipment and fuel. Recent activities at the Site have been limited to those involved in the closure and decommissioning of the Site. Activities have included dismantling and removal of infrastructure, removal of stockpiled materials and consumables, remediation and assessment activities, and environmental monitoring work.

3.1.2 Spill History

Approximately 80,000 litres of water impacted with diesel fuel was 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 during 1981 and was responsible for the two 5,000 bbl ASTs located in the tank farm where the spill originated. Investigation suggests the spill was a result of vandalism/theft that occurred in the winter of 1980 to 1981, 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 southwest, 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 ASTs, 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 (WorleyParsons 2011).

Additional detail regarding the actual spill and clean-up efforts is provided in the Komex 2001 report titled "Phase I and Phase II Environmental Site Assessment of the Shell Farewell Stockpile and Campsite" (Komex 2001).

3.2 Previous Environmental Reports

Various environmental site assessment (ESA) programs have been conducted at the Site. IEG has reviewed the available reports concerning ESA programs and provided summaries in Appendix I.

- Komex (Komex International Ltd.), 2001. Phase I and Phase II Environmental Site Assessment
 of the Shell Farewell Stockpile and Campsite. Unpublished report prepared for: Shell Canada
 Limited, July, 2001. C52360000.
- WorleyParsons Komex, 2006. 2006 Environmental Site Assessment, Camp Farewell, NT. December, 2006.
- WorleyParsons, 2008. Interim Abandonment and Restoration Program, Camp Farewell, NT.
 Unpublished report prepared for Shell Canada Energy Limited, November, 2008. C52360500.
- WorleyParsons, 2010. 2009 Interim Abandonment and Restoration Program, Camp Farewell,
 NT. Unpublished report prepared for Shell Canada Energy Limited, April, 2010. C52360500.
- WorleyParsons, 2011. 2010 Interim Abandonment and Restoration Program, Camp Farewell,
 NT. Unpublished report prepared for Shell Canada Energy Limited, March, 2011. C52360500
- IEG (IEG Consultants Ltd.), 2010. 2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report. Prepared for: Shell Canada Energy. February 24th, 2010.
- IEG (IEG Consultants Ltd.), 2012b. Summary of 2012 Camp Farewell Activities. Letter report prepared for: Shell Canada Energy and Canadian Wildlife Services in compliance with Kendall Island Bird Sanctuary Permit. December 13, 2012.



- IEG (IEG Consultants Ltd.), 2012b. Summary of 2012 Camp Farewell Activities. Letter report prepared for: Shell Canada Energy and Canadian Wildlife Services in compliance with Kendall Island Bird Sanctuary Permit. December 13, 2012.
- IEG (IEG Consultants Ltd.), 2013b. 2012 Annual Report, Type "B" Water License #N7L1-1834.
 Prepared for: Shell Canada Energy and the Northwest Territories Water Board. March 28, 2013.
- IEG (IEG Consultants Ltd.), 2014. Camp Farewell Lagoon Remediation. April, 2014.
- IEG (IEG Consultants Ltd.), 2015. Environmental Supervision during 2014 Decommissioning Program Amended. September 2015.

3.3 Previous Environmental Studies

There have been no studies requested by the Inuvialuit Water Board that relate to waste disposal, water use, or reclamation. There are no future studies planned at this time.



4 PROGRAM LOGISTICS AND PERMITTING

As part of the scope of work, several tasks concerning logistics management and permitting for the 2015 Decommissioning and Soil Assessment Program were completed. Each of these tasks is described in the following sections.

4.1 Permitting and Licensing

IEG obtained permits and licenses prior to commencement of the 2015 Decommissioning and Soil Assessment Program. The following sections provide information on each permit or license. Copies of permits and licenses are provided in Appendix II.

4.1.1 Environmental Impact Screening Committee Permission to Proceed

IEG prepared a Project Description (IEG 2015a) for the decommissioning and soil assessment activities at the Site. The Project Description was sent to the Environmental Impact Screening Committee (EISC), the Aklavik Hunters and Trappers Committee (AHTC), the Inuvik Hunters and Trappers Committee (IHTC) and the Tuktoyaktuk Hunters and Trappers Committee (THTC) on May 19, 2015. Three agencies responded with comments and/or approval to proceed. Permission to proceed with the Decommissioning and Soil Assessment Program was obtained by the EISC.

4.1.2 Water Use License

Shell applied for a Type B Water License (N7L1-1834) through the Northwest Territories Water Board (NWTWB) on February 28, 2012. The application requested withdrawal of up to 150 m³ per day from the McKenzie River to construct an ice road should remedial activities occur during winter months and up to 50 m³ for operation of the on-Site camp. Water License N7L1-1834 was granted on July 18, 2012 for the withdrawal of 150 m³ per day for industrial undertakings and associated uses. The permit expires July 18, 2017.

4.1.3 Canadian Wildlife Service Migratory Birds Sanctuary Permit

A Canadian Wildlife Services (CWS) permit (Migratory Birds Sanctuary Permit) is renewed for the Site each year. The applicable permit during the Camp Farewell 2015 Decommissioning and Soil Assessment Program was issued on January 14, 2015 and expired on December 31, 2015.

4.2 Camp Mobilization/Demobilization

A barge camp was mobilized to the Site from Hay River, NT in July 2015 via the Mackenzie River, arriving at Camp Farewell in August 13th. The barge was anchored to bollards in the boat docking area at the Site (Appendix III, Photograph 1; Figure 2). The barge comprised two levels, consisting of a kitchen and dining unit, a common lounge area, and sleeping accommodations. A fuel spill kit, generators, and a wastewater AST were also contained on the barge. Wastewater from the barge was disposed of in Inuvik. The barge was operated and maintained by a barge master for the duration of Site activities. On September 7, 2015 the barge camp was demobilized from the Site via the Mackenzie River.



5 DECOMMISSIONING AND SOIL ASSESSMENT PROGRAM

During the 2015 Decommissioning and Soil Assessment Program, Tervita was the prime contractor on-Site managing and directing Site activities as well as coordinating logistical and safety aspects. Tetra Tech conducted an EM survey across the extent of the Site to identify areas of potential impact and buried materials. MDIOS provided personnel for removal of buried debris as well as decommissioning and packaging activities. IEG conducted a soil assessment across the extent of the Site as well as collected groundwater samples from existing piezometers.

The following sections describe decommissioning and assessment activities conducted by Tervita, MDIOS, and Tetra Tech. Photographs are provided in Appendix III. A Site plan is shown on Figure 2.

5.1 Waste Disposal and Water Use

During the 2015 Decommissioning and Soil Assessment Program, approximately 760 US barrels of fresh water was obtained from a spacer barge and used for the daily operation of the camp barge. Fresh water was not obtained from other sources during the 2015 Decommissioning and Soil Assessment Program. Waste water generated at the barge camp was contained in a waste water holding AST and disposed at an approved facility by the barge operator. Domestic waste was contained in garbage bins on the barge and burned on-Site in an incinerator. Domestic waste was produced at a rate of approximately three garbage bags per day according to the barge master. Throughout the Decommissioning and Soil Assessment Program, wood debris absent of paint and/or contaminants were burned in a burn pit located on the southeast corner of the Site (Appendix III, Photograph 2; Figure 2).

There were no spills or unauthorized discharges during the 2015 Decommissioning and Soil Assessment Program. An overview of appropriate spill response actions and communications was reviewed at morning tail gate meetings. An Emergency Response Plan which includes the Spill Contingency Plan is provided in Appendix IV.

5.2 Infrastructure Decommissioning and Removal

Decommissioning, demolishing, and removal of the tank farm was conducted by MDIOS under the supervision of Tervita from August 14 to 17, 2015. The tank farm was decommissioned and removed with equipment that included a back hoe equipped with a sheer and loaders. Metal from the tank farm was compressed and packaged for removal via barge. The barge was loaded with packaged material following completion of decommissioning and rig mats were placed down to avoid rutting and protect the river shore during the loading of the barge. On August 23, 2015, one barge loaded with scrap metal and equipment departed the Site for Inuvik. The scrap steel was trucked from Inuvik to East Peace Metal Recycling in Peace River, Alberta.

5.3 Electromagnetic Survey

Tetra Tech conducted an EM survey of the Site from August 14th to 19th, 2015. The EM survey consisted of magnetics data collection, EM31 data collection, and EM38 data collection. A total of 29



geophysical anomalies were identified using the three data sets. Fourteen of the 29 anomalies were attributed to surficial objects (Tetra Tech 2015). Each anomaly was investigated for the presence of buried debris and any debris located was removed.

The EM results indicated an overall slight increase in apparent conductivity on the northern half of the Site, in comparison to rest of the site, extending to the northwest half of the runway. A single area of elevated apparent conductivity was also observed west of the former tank farm (Tetra Tech 2015). Additional details regarding the EM survey, including methodology and figures, are summarized in the report prepared by Tetra Tech and provided in Appendix V.



6 SCOPE OF WORK

The following sections describe soil and groundwater assessment activities conducted by IEG. Photographs are provided in Appendix III. A Site plan including borehole and piezometer locations is shown on Figure 2. The Soil Assessment scope of work, borehole locations, and analytical schedule were based on review of previous Phase II ESAs and current Site conditions. As part of the soil assessment program, groundwater samples were also collected from existing piezometers on-site that were found to be in functional condition.

6.1 Soil Assessment

6.1.1 Borehole Locations and Soil Sampling

A soil assessment was conducted across the extent of the Site with the Site divided into areas of investigation based on the infrastructure previously and/or currently present. Boreholes were generally advanced in a 20 m by 20 m grid across the Site with the exception of the airstrip where boreholes were advanced with approximately 60 m spacing. Additional boreholes were advanced in areas requiring further investigation based on field screening and/or laboratory analytical results.

A summary of borehole locations for each investigation area is provided in Table 4-1.

Table 6	5-1	2015	Borel	hol	le I	Locations

Area	Borehole Name
Background	BH15-001, BH10-012
Shed #1	BH15-062 to BH15-065; BH15-123, BH15-124
Air Strip	BH15-002 to BH15-011
Laydown/Storage	BH15-020 to BH15-061
Camp	BH15-066 to BH15-069
Burn Pit	BH15-013 to BH15-019; BH15-113, BH15-114
Tank Farm	BH15-070 to BH15-112; BH15-122
Tundra	BH15-115 to BH15-121

Borehole advancement and soil sampling was conducted from August 14th to 20th, 2015, with a total of 124 boreholes advanced on-site. Boreholes were advanced to a maximum depth of 6.0 m bgs using a maruka drill rig equipped with a 15 cm solid stem auger. Discrete soil samples were collected directly off the auger at pre-determined depth intervals of 0.0 m to 0.15 m bgs, 0.15 m to 0.3 m bgs, 0.3 m to 0.6 m bgs, and 0.6 m to 1.0 m bgs or according to the lithology observed on-site. At depths greater than 1.0 m bgs, soil was sampled in 0.5 m increments to the suspected maximum depth of impact and/or to a maximum depth of 6 m bgs. Borehole locations were backfilled with drilling cuttings as well as hydrated bentonite where potential impact was observed. OVA screening was conducted during soil sampling using an RKI Eagle Portable Gas Detector set on methane elimination mode and calibrated with hexane. EC field screening was conducted using a Spectrum Technologies Field Scout EC probe. Field screening measurements were recorded on the borehole logs (Appendix VI) and are provided in Table 2 for each sample increment.

6.2 Groundwater Monitoring and Sampling

6.2.1 Groundwater Monitoring

On August 20, 2016, each of the seven piezometers located on-Site were assessed for integrity and monitored for depth to liquid levels and total well depth. IEG personnel measured the depths relative to the top of the PVC casing in each well using a Heron Instruments H.01L interface probe. One piezometer (P06-4) was dry and two piezometers (P06-5 and P06-6) did not recharge prior to sampling. Groundwater piezometer details and groundwater monitoring results are included in Table 3.

6.2.2 Groundwater Sampling

Following groundwater monitoring, the piezometers were purged of three well volumes or until dry and allowed to recover prior to collecting a representative groundwater sample. After recovery from purging, groundwater samples were collected from the piezometers on August 20, 2015 using dedicated bailers. Field measured parameters including temperature, pH, EC, dissolved oxygen, and oxidation-reduction potential could not be collected at the time of sampling due to equipment malfunction.

Following purging and the recovery of groundwater, five of the seven piezometers were sampled. Piezometers P06-4 and P06-5 had insufficient groundwater for sampling. In piezometers P06-1, P06-2, P06-3, and P06-7 samples were collected for routine potability, dissolved metals, PHC, and PAH. In piezometer P06-6 samples were collected for PHC and PAH parameters only; samples were not collected for routine potability and dissolved metals due to insufficient groundwater.

6.3 Analytical Methodology

The laboratory (AGAT) utilized for this investigation is ISO/IEC 17025 accredited, is registered with the Standards Council of Canada and the Canadian Association of Environmental Analytical Laboratories for environmental analyses, and has method detection limits at or below the applicable soil quality standards. Soil and groundwater sampling containers were stored in coolers with ice packs to preserve sample integrity. The samples were transported to AGAT Laboratories (AGAT) in Edmonton, Alberta for laboratory analysis under standard chain-of-custody (COC) protocol.

6.3.1 Soil Analytical Schedule

The soil analytical schedule was developed to suit each investigation area, according to the potential contaminants of concern identified during previous investigations and/or knowledge of the former Site activities. Soil samples collected within each area were analyzed for some or all of the parameters described below:

- detailed salinity parameters including: pH, EC, calcium, magnesium, potassium, sodium, chloride, sulfate (as sulphur), sodium adsorption ratio (SAR), and saturation percentage;
- particle size by 75 μm sieve (% retained);



- trace metals including: antimony, arsenic, barium(total), beryllium, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, silver, thallium, tin, uranium, vanadium, and zinc;
- petroleum hydrocarbons (PHC) including: benzene, toluene, ethylbenzene, xylenes (BTEX), and PHC fractions F1 to F4; and,
- polycyclic aromatic hydrocarbons (PAHs) including: acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b&j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, and pyrene.

Soil analytical results are summarized in Table 1 and Table 2. Laboratory analytical reports are included in Appendix VII. Analytical data exceeding applicable guidelines have been highlighted in the summary tables. Non-regulated soil parameters such as soluble chloride, sulphate, calcium, magnesium, and sodium have been included in Table 1 and compared to background concentrations, as they are useful for assessing soil impacts related to historical Site operations.

6.3.2 Groundwater Analytical Schedule

The piezometers were sampled for one or more of the following target and indicator parameters based on potential contaminants of concern identified during previous investigations and/or knowledge of the former Site activities:

- routine potability including: pH, EC, calcium, magnesium, iron, sodium, potassium, chloride, sulphate, bicarbonate, carbonate, hydroxide, total alkalinity, hardness (as CaCO3), TDS, ionic balance, nitrate (as nitrogen), nitrite (as nitrogen), and fluoride;
- dissolved metals including: aluminum, antimony, arsenic, barium, boron, cadmium, chromium, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver, thallium, uranium, and zinc;
- benzene, toluene, ethylbenzene, and xylenes; and,
- PAHs including acenaphthene, acenaphthylene, acridine, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b&j)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, B(a)P TPE, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, 2-methylnapthalene, naphthalene, phenanthrene, pyrene, and quinoline.

Groundwater analytical results are summarized in Tables 4 to 6. Laboratory analytical reports are included in Appendix VII. Analytical data exceeding applicable guidelines have been highlighted in the summary tables.

6.4 Soil Assessment Guidelines

6.4.1 Applicable Guidelines

Guidelines for salinity, trace metals, PHC, and PAH parameters in soil are provided by the Government of Northwest Territories (GNWT) *Environmental Guideline for Contaminated Site*



Remediation (CSR), November 2003 (GNWT 2003). The GNWT CSR defines the same land uses and soil textures as Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG). The GNWT CSR further identifies guidelines for surface soil (0 m to 1.5 m depth) and subsoil (>1.5 m), and Site-specific pathways that apply to soil, including "soil ingestion", "nutrient cycling", and "ecological soil contact", among others.

The following information was used to determine the applicable assessment guidelines and exposure pathways for soil at the Site:

- the southern and western edge of the Site is adjacent to the Middle Channel of the Mackenzie River;
- the surface water bodies are capable of sustaining aquatic life;
- there are no domestic water wells on, or within a 1 km radius of the Site;
- soils at the Site consist of a very thin organic layer overlying a coarse-grained, sandy layer;
 and,
- current and likely future land uses for the Site and surrounding properties are "Residential/Parkland", by GNWT Guidelines.

Based on the current land use definitions, the Parkland guidelines are the most applicable for the Site at this time. Sieve analysis of background soil samples indicated that coarse-grained soils are present in the surface and subsurface soil at the Site and are therefore considered the dominant pathway for contaminant migration at the Site. The limiting exposure pathway is "ecological soil contact". The "protection of potable groundwater" pathway is excluded based on the depth of permafrost in the region.

Based on the land use of the Site and the surrounding properties concentrations of BTEX and inorganic parameters (salinity and metals) in soil were compared to the coarse-textured soil guidelines under Parkland land use found in the GNWT 2003 guidelines, where applicable. Barium and true total barium results were compared to the Alberta Environment (AENV) Soil Remediation Guidelines for Barite: Environmental Health and Human Health guidelines (AENV 2009).

Concentrations of PHC fractions F1 (C₆-C₁₀), F2 (C₁₀-C₁₆), F3 (C₁₆-C₃₄) and F4 (C₃₄-C₅₀) were compared to the GNWT 2003 guidelines for coarse-textured subsoil (greater than 1.5 m).

6.5 Groundwater Assessment Guidelines

6.5.1 Groundwater Guidelines

In the absence of specific groundwater quality guidelines for the Northwest Territories, the 2015 analytical results from the groundwater samples were compared to the following groundwater quality criteria:

 Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) for Freshwater Aquatic Life, 1999 as amended (CCME 2007).



6.6 Background Soil Conditions

A total of six background locations have been established to characterize background soil conditions at the Site. In 2001, two background soil samples were collected from boreholes to the northeast of the Site: one situated in native tundra (organic soil) and the second located on the gravel airstrip (mineral soil). In 2006, two background soil locations and two background groundwater locations were established and tested to the northeast of the Site, in areas not likely to have been affected by historical activities (WorleyParsons Komex 2006). During the 2015 soil assessment, two boreholes (BH15-001 and BH10-012) were advanced in background locations to the north and east of the Site. Borehole BH15-001 is situated at the north end of the air strip in tundra while borehole BH10-012 is situated north of the winter access road (Figure 2).

Tables 1 and 2 summarize parameter concentrations reported in soil collected from background boreholes in 2015. Table 4-3 summarizes parameter concentrations reported in soil collected from background boreholes that exceeded the GNWT guidelines in 2006. The highest reported concentrations for these parameters were used as the background values for the Site. There were no parameter concentration exceedances reported in soil samples collected from background boreholes in 2001 and 2015.

Table 6-2 Summary of Parameters Exceeding GNWT Guidelines in Background Boreholes

Parameter	GNWT Guideline (mg/kg)	Background Value (mg/kg)	Sample Date
Selenium	1	1.6	August 3, 2006
PHC fraction F2	150	164	August 3, 2006
PHC fraction F3	400	2,850	August 3, 2006

6.7 Quality Assurance and Quality Control

The quality assurance and quality control (QA/QC) program included field sampling methods and laboratory QA/QC protocols which are provided in Appendix VIII. QA/QC results are presented in Tables 7 and 8. Laboratory quality assurance reports and analytical methods are presented in Appendix VII.

7 ASSESSMENT RESULTS

7.1 Soil Assessment

7.1.1 Soil Stratigraphy and Field Screening Results

The soil profile observed in boreholes advanced during the soil assessment generally consisted of an upper organic layer underlain by coarse-grained sand with varying amounts of silt, and trace gravels to the maximum depth investigated (6 m bgs). Permafrost was encountered at approximately 1.5 m bgs. Boreholes were not advanced past the depth of permafrost in the absence of visual and/or field screening indications of potential impact. Borehole logs are included in Appendix VI. A cross section showing the interpreted lithology is shown on Figures 6 and 7.

Field screening results for EC ranged from 0 μ S/cm at BH15-113 (0.3 m to 0.6 m bgs and 2.5 m to 3.0 m bgs) to 1.21 μ S/cm at BH15-099 (0.3 m to 0.6 m bgs). OVA screening results ranged from less than 100 ppm for the majority of samples collected to 2050 ppm at BH15-006 (0.6 m to 1.0 m bgs), BH15-022 (0.3 m to 0.6 m bgs), and BH15-095 (0.6 m to 1.0 m bgs). Field screening results for EC and OVA are included on the borehole logs in Appendix VI and in Table 2.

7.1.2 Soil Sampling and Analytical Results

From August 14th to 20th, 2015, 124 boreholes were advanced (Appendix III, Photographs 3 and 4) to investigate soil conditions across the extent of the Site. The 2015 borehole locations and their respective areas are identified on Figure 2. Laboratory analytical results are summarized in Tables 1 and 2. Laboratory analytical reports are included in Appendix VII. Borehole locations with parameter exceedances are illustrated on Figures 3 and 4.

Detailed Salinity and Trace Metals

Historical background selenium samples contained concentrations that exceeded the GNWT guidelines. Insufficient data is available to determine the source (naturally occurring or historical activities on-site) of the selenium exceedance in the soil sample collected from the 2015 investigation, therefore selenium concentrations in 2015 boreholes are not compared to the background guidelines.

Total barium samples exceeding the GNWT guideline as shown in Table 2 were analyzed for true total barium and compared to the AENV Soil Remediation Guidelines for Barite: Environmental Health and Human Health guidelines (AENV 2009). Laboratory analytical results reported true total barium exceeding the AENV guideline in three samples collected from one borehole (BH15-014) in the burn pit area, one borehole (BH15-124) inside shed #1, and one borehole (BH15-024) in the laydown/storage area.

Detailed salinity and trace metals parameters exceeding the GNWT Guidelines are summarized in Table 7-1 along with the respective areas and boreholes. The remaining detailed salinity and trace metals constituent concentrations were less than the GNWT guidelines and/or the laboratory MDL in each soil sample submitted for analysis.



Table 7-1 Summary of Detailed Salinity and Trace Metals Parameters Exceeding GNWT Guidelines

Parameter	GNWT Guideline	Area	Boreholes Exceeding GNWT Guideline in 2015
		Tank Farm	BH15-081, BH15-101, BH15-108
		Shed #1	BH15-063, BH15-064, BH15-065
		Inside Shed #1	BH15-124
			BH15-020, BH15-028, BH15-033 to BH15-038,
pH	6 – 8	Laydown/Storage	BH15-040 to BH15-044, BH15-046, BH15-054,
μп	6-8		BH15-056 to BH15-061
		Camp	BH15-066 to BH15-069
		Tundra	BH15-116 to BH15-119, BH15-121, BH15-122
		Burn Pit	BH15-113
		Airstrip	BH15-005, BH15-006, BH15-008
EC	2 dS/m	Airstrip	BH15-009
	arium 500 mg/kg	Inside Shed #1	BH15-123, BH15-124
Total Barium		Laydown/Storage	BH15-024, BH15-025, BH15-053, BH15-054, BH15-059
		Burn Pit	BH15-014
		Inside Shed #1	BH15-124
True Total Barium	Barium 10,000 mg/kg	Laydown/Storage	BH15-024
		Burn Pit	BH15-014
Copper	63 mg/kg	Burn Pit	BH15-014
Lead	140 mg/kg	Burn Pit	BH15-014
Selenium	1 mg/kg	Airstrip	BH15-005*

Petroleum Hydrocarbons

PHC parameters exceeding the GNWT Guidelines are summarized in Table 7-2 along with the respective areas and boreholes.

Table 7-2 Summary of PHC Parameters Exceeding GNWT Guidelines

Parameter	GNWT Guideline	Area	Boreholes Exceeding GNWT Guideline in 2015
Benzene	Benzene 0.5 mg/kg		BH15-084 to BH15-089, BH15-107, BH15-108
	<u> </u>		BH15-070, BH15-071, BH15-075 to BH15-082,
		Tank Farm	BH15-085, BH15-088 to BH15-094, BH15-097,
		I diik Faiiii	BH15-099 to BH15-101, BH15-103 to BH15-108,
			BH15-110, BH15-111
Toluene	0.8 mg/kg	Shed #1	BH15-063 to BH15-065
		Laydown/Storage	BH15-033 to BH15-035, BH15-041 to BH15-052,
		Layuowii/Storage	BH15-060
		Airstrip	BH15-005, BH15-006, BH15-008
		Camp	BH15-066
		Burn Pit	BH15-013, BH15-014
Ethylbenzene	1.2 mg/kg	Tank Farm	BH15-082, BH15-085, BH15-086, BH15-088, BH15-089
		Laydown/Storage	BH15-044
		Tank Farm	BH15-082, BH15-085 to BH15-090, BH15-099,
Xylenes	1 mg/kg	Talik Fallii	BH15-105, BH15-107, BH15-108, BH15-110, BH15-111
Ayleries	I IIIg/kg	Laydown/Storage	BH15-038, BH15-044, BH15-049
		Burn Pit	BH15-013, BH15-014, BH15-017, BH15-019
	130 mg/kg	Tank Farm	BH15-082, BH15-085, BH15-086, BH15-088, BH15-089
PHC fraction F1		Laydown/Storage	BH15-049
		Burn Pit	BH15-013, BH15-014
		Tank Farm	BH15-081, BH15-082, BH15-085, BH15-086, BH15-088
			to BH15-091, BH15-098 to BH15-100, BH15-105 to
			BH15-111
PHC fraction F2	150 mg/kg	Laydown/Storage	BH15-024, BH15-029, BH15-036 to BH15-038,
			BH15-049, BH15-057
		Shed #1	BH15-062, BH15-123, BH15-124
		Burn Pit	BH15-013, BH15-014, BH15-017, BH15-114
		Tank Farm	BH15-071, BH15-073 to BH15-077, BH15-079 to
			BH15-083, BH15-086 to BH15-091, BH15-093,
			BH15-094, BH15-098 to BH15-101, BH15-103 to
			BH15-107, BH15-110, BH15-111
			BH15-020, BH15-022, BH15-023, BH15-028 to
	400 mg/kg	Laydown/Storage	BH15-030, BH15-033 to BH15-035, BH15-037,
PHC fraction F3		, ,	BH15-038, BH15-041 to BH15-047, BH15-049,
			BH15-050, BH15-052, BH15-056, BH15-060
		Shed #1	BH15-063, BH15-064, BH15-123, BH15-124
		Burn pit	BH15-013, BH15-014, BH15-019, BH15-113
		Camp	BH15-066, BH15-069
		Tundra	BH15-116 and BH15-122
		Airstrip	BH15-004 to BH15-006, BH15-008, BH15-010
PHC fraction F4	2800 mg/kg	Burn Pit	BH15-013

The remaining analyzed samples contained PHC constituent concentrations that were less than the GNWT guidelines and/or the laboratory MDL. As stated in Section 6.6, historical background soil samples contained concentrations of PHC fraction F2 and F3 that exceeded the GNWT guidelines. F2

and F3 concentrations in background soil samples are associated with naturally occurring organic material rather than petroleum hydrocarbons and onsite activities. Insufficient data is available to determine the source (naturally occurring or historical activities on-site) of F2 and F3 exceedances in soil samples collected from the 2015 investigation, therefore F2 and F3 concentrations in 2015 boreholes are not compared to the background guidelines.

7.1.3 Polycyclic Aromatic Hydrocarbons

PAH concentrations were less than the GNWT guidelines and/or the laboratory MDL in each soil sample submitted for analysis.

7.2 Groundwater Results

7.2.1 Groundwater Monitoring and Analytical Results

On August 20, 2015, each piezometer was monitored for depth to liquid levels and total well depth. Table 3 contains the groundwater monitoring results.

A summary of the groundwater laboratory analytical results are presented in Tables 4, 5, and 6. The laboratory analytical reports from AGAT are attached in Appendix VII. A site plan showing piezometers with parameters exceeding the CCME CEQG guidelines during the 2015 assessment is presented as Figure 5.

Dissolved Metals

Groundwater samples collected from piezometer P06-1 and P06-3 had concentrations of TDS that exceeded the CCME CEQG guideline in 2015. Groundwater samples collected from piezometers P06-1, P06-2, P06-3, and P06-7 had concentrations of aluminum, cadmium, copper, iron, and/or selenium that exceeded the CCME CEQG guideline in 2015. Table 7-1 summarizes the analytical results for dissolved metals parameters exceeding the CCME CEQG guidelines during the assessment.

Table 7-3 Summary of Dissolved Metals Results

Parameter	CCME CEQG Guideline (mg/L)	Piezometer Exceeding CCME CEQG Guidelines in 2015
Aluminum	0.293	P06-1, P06-7
Cadmium	0.00002	P06-1, P06-2, P06-3, P06-7
Copper	0.005	P06-2
Iron	0.3	P06-1, P06-3, P06-7
Selenium	0.001	P06-7

Petroleum Hydrocarbons and Polycyclic Aromatic Hydrocarbons

The groundwater sample collected from piezometer P06-3 contained concentrations of naphthalene that exceeded the CCME CEQG guideline. The remaining piezometers sampled during the 2015 assessment had concentrations of BTEX, fraction F1 – F2, and PAHs that were less than the CCME CEQG guidelines.



7.3 Quality Assurance and Quality Control

7.3.1 Soil Assurance and Quality Control Results

The quality assurance and quality control (QA/QC) program included field sampling methods and laboratory QA/QC protocols which are provided in Appendix VIII. For quality assurance purposes, 13 field replicate samples were collected during the soil assessment and sent to AGAT for laboratory analysis.

The laboratory results for the replicate and original samples were compared using the Zeiner Criteria (Zeiner 1994) and evaluated for quality on the basis of either relative percent difference (RPD) or absolute difference (AD). Detailed salinity parameters EC, calcium, magnesium, sodium, potassium, chloride, and sulphate, trace metals parameters arsenic, barium (total), chromium, cobalt, copper, lead, molybdenum, nickel, tin, vanadium, and zinc, and PHC parameters toluene, ethylbenzene, fractions F2, F3, and F4 were identified above the Zeiner (1994) criteria for one or more replicates in the QA/QC review and are considered estimates only.

The remainder of the analytical results are considered to be precise.

7.3.2 Groundwater Assurance and Quality Control Results

A duplicate groundwater sample was not collected due to insufficient quantity of groundwater. One field blank and one trip blank sample were collected during the sampling event. Laboratory analytical results for the trip blank and field blank reported concentrations of each parameter analyzed below the laboratory method detection limit and/or applicable guideline.

AGAT has internal QA/QC protocols and procedures to ensure accuracy and consistency of results. These procedures include COC tracking, storage and holding times, instrument calibration, and laboratory duplicates, among others (Appendix VII).



8 CONCLUSIONS

Decommissioning, demolishing, and removal of the tank farm occurred from August 14th to 17th, 2015. Site activities included removal of the tank farm, identification and removal of buried material, and assessing Site subsurface conditions in preparation for remedial activities in 2016. The conclusions and key findings of Site activities are as follows:

- The tank farm was decommissioned and removed during August 2015. Metal from the tank farm was compressed and packaged for removal via barge;
- The EM survey identified 15 subsurface anomalies which were investigated. Uncovered debris
 was removed. Two areas of elevated conductivity were identified on the northern half of the
 Site and to the west of the former tank farm, respectively;
- IEG Site assessment activities included installation of 124 boreholes and collection of groundwater samples from the existing piezometers on-Site;
- Background soil guidelines were established for the Site. Reported parameter concentrations
 for background soil samples were below the method detection limit and/or GNWT guideline
 for each parameter analyzed in 2015.
- pH values were reported below the guideline range in 56 samples collected from various locations across the extent of the Site. pH values reported for background samples were within the guideline range.
- EC values above the GNWT guideline were observed in three samples collected from one borehole in the airstrip. Remaining analyzed samples had reported EC values below the GNWT guideline.
- True total barium concentrations were reported above the AENV guideline in three samples
 collected from one borehole in the burn pit area, one borehole inside shed #1, and one
 borehole in the laydown/storage area.
- Concentrations of benzene exceeded the GNWT guideline in eight soil samples collected from eight boreholes in the tank farm area.
- Concentrations of toluene exceeded the GNWT guideline in 65 soil samples collected from three boreholes in the shed #1 area, 29 boreholes in the tank farm area, three boreholes in the airstrip, 16 boreholes in the laydown/storage area, and one borehole in the camp area.
- Concentrations of ethylbenzene exceeded the GNWT guideline in nine samples collected from two boreholes in the burn pit area, one borehole in the laydown/storage area, and five boreholes in the tank farm area.
- Concentrations of xylenes exceeded the GNWT guideline in 28 samples collected from three boreholes in the laydown/storage area, four boreholes in the burn pit area, and 13 boreholes in the tank farm area.



- Concentrations of PHC fraction F1 exceeded the GNWT guideline in 16 samples collected from one borehole in the laydown/storage area, two boreholes in the burn pit area, and eight boreholes in the tank farm area.
- Concentrations of PHC fraction F2 exceeded the GNWT guideline in 44 samples collected from three boreholes in the shed #1 area, seven boreholes in the laydown/storage area, four boreholes in the burn pit area, and 18 boreholes in the tank farm area.
- Concentrations of PHC fraction F3 exceeded the GNWT guideline in 83 samples collected from four boreholes in the shed #1 area, five boreholes in the airstrip, 23 boreholes in the laydown/storage area, two boreholes in the camp area, four boreholes in the burn pit area, 30 boreholes in the tank farm area, and two boreholes in the tundra area.
- Concentrations of PHC fraction F4 exceeded the GNWT guideline in one sample collected from the burn pit area.
- Groundwater samples collected from two piezometers contained concentrations of TDS that
 exceeded the GNWT guidelines. Groundwater samples collected from four piezometers
 contained concentrations of aluminum, cadmium, copper, iron, and selenium that exceeded
 the GNWT guidelines. One groundwater sample contained concentrations of naphthalene that
 exceeded the GNWT guideline.

Shell anticipates conducting a Decommissioning and Remediation Program in summer 2016, designed to remove remaining infrastructure as well as excavate, windrow, and treat impacted soil on-site. Soil that cannot be treated on-site, and/or does not meet applicable guidelines after treatment, will be packaged and transported to an appropriate facility for disposal.



9 CLARIFICATIONS REGARDING THIS REPORT

This report was prepared by IEG Consultants Ltd. for the account of Shell Canada Energy. The material in it reflects IEG's best judgment in light of the information available to it at the time of preparation. 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.

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10 CLOSING

We trust this report meets your approval and satisfies your current needs. Should you have any questions or comments, please contact Nicole Wills at (403) 730-6809.

Yours truly,

IEG Consultants LTD.

Nicole Wills, P. Ag. Project Manager



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TABLES



FIGURES



APPENDIX I

Previous Environmental Investigations



APPENDIX II

Permits and Licenses



APPENDIX III

Site Photographs



APPENDIX IV

Emergency Response Plan



APPENDIX V

Tetra Tech EBA Camp Farewell Buried Debris Locate Report



APPENDIX VI

Borehole Logs



APPENDIX VII

Laboratory Analytical Reports



APPENDIX VIII

Quality Assurance/Quality Control



Table 1: Soil Analytical Results for Salinity, Physical, and Trace Metal Parameters

Table 1. 3011 Allalytical Ki	esults for Salinity, Physica	i, and Trace Metal	Parameters																													
	GENERAL		1			D	etailed Sal	nity				PHYSICAL	1			_	_		1		1	1	TRACE META	LS	T	1	T 1			1		
Location	Sample Designation	Sample Depth (m bgs)	Sample Date (yyyy-mm-dd) Units	pH (CaCl ₂ Extraction)	Spectrical Conductivity, EC (dS/m)	- Sodium Adsorption Ratio, SAR Ballon Adsorption Ratio, SAR Salva Adsorption Ratio, SAR	mg/kg	Enipos Mg/kg mg	Chloride (A)	Sulphate	0,	rarticle Size -	. 75 micron sieve	mg/kg	Aksenic ga/kg	bay/ga (Total)	Banum (True Total)	Beryllium Mg/kg	Egyptini O mg/kg	Chromium mg/kg	/gm /gChromium (Hexavalent)	g/kg	addo OO mg/kg	pea mg/kg	Molybdenum mg/kg	Nicke Ba/Ba	Eningles S/kg	Ng/kg mg/kg	un illeu HE mg/kg	<u>⊑</u> mg/kg	mg/kg mg/kg	unipeueA mg/kg mg
GNWT 2003 ⁵	Residential/Parkland Area -	Coarse Soil		6 - 8	2	5 -	-	-	-	-	-	-	-	20	12	500	-	4	10.0	64	0.4	50	63	140	10	50	1	20	1	50	-	130 2
AENV 2009 ^b	Barite				-			-		-	-	-	-	-	<u> </u>	-	10,000	-	-		-	-	-	-		-	-	-	-	-	-	-
BACKGROUND SOIL DATA		0.45.0.0	2045 00 44	6.24	0.04	50 00	1 -			25	00.0			0.5	1	204		0.5	0.5	45		2		-	1 4	1	1 05	0.5	0.5	0.5	0.5	40
Background	BH15-001 BH15-001 BH15-001 BH15-001 BH15-001 BH15-001 BH15-001 BH15-001 BH15-001 BH10-012 BH10-012 BH10-012 BH10-012 BH10-012 BH10-012 BH10-012 BH10-012 BH10-012	0.15-0.3 2.0-2.5 2.5-3.0 3.5-4.0 4.0-4.5 5.0-5.5 5.5-6.0 0.0-0.15 0.15-0.3 0.3-0.6 0.6-1.0 1.0-1.5 1.5-2.0 2.0-2.5	2015-08-14 2015-08-14 2015-08-14 2015-08-14 2015-08-14 2015-08-14 2015-08-14 2015-08-14 2015-08-14 2015-08-14 2015-08-14 2015-08-14 2015-08-14 2015-08-14	7.45 7.48 7.42 7.28 7.35 7.43 7.11 7.21 7.30 7.20 7.22	0.42 1 0.50 1 0.74 1 0.64 1 1.12 1 0.48 0 0.37 0 0.29 0 0.35 0 0.38 0 1.40 1 1.12 1	.60 33 .17 11 .21 13 .43 27 .42 19 .23 16 .12 37 .79 18 .79 16 .57 18 .79 10 .87 10 .17 46 .04 51 .42 28	3 4 4 4 4 5 <2 2 2 <2 <2 <2 4 5	4 1 4 1 7 2 5 1 5 1 4 3 4 4 3 4 4 3 11 1 11 2	4 26 1 14 1 28 6 19 3 19 6 27 8 16 8 11 8 7 6 9 7 10 8 22 0 27 1 34	28 34 83 58 43 117 12 10 8 7 9 160 162	90.0 38.0 34.0 42.0 36.0 33.0 31.0 33.0 40.0 54.0 29.0 29.0 28.0 39.0	Coarse	80 - 84 87 - - 86 - - - 88 - - 88 - - 88 - - 88 - - 88 - - 88 - - 88 - - - - - - - - - - - - -	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	5.5 4.4 4.3 4.7 5.1 5.3 5.8 6.1 5.4 5.5 6.1 5.6 5.5	99.9 99.9 95.2 105 108 138 122 104 138 163 119 109 140 117		<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	15 9 9 13 12 13 9 9 9 21 7 9 11 8		3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	4 4 3 3 5 5 5 5 5 6 5 4 4 4 4 4	5 3 2 3 3 4 6 4 4 4 4 4 4 4 4 4 3 3 3	1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1	11 10 10 11 12 13 11 11 11 16 9 10 11	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	18
SOIL DATA	BH10-012	2.5-3.0	2015-08-14	7.23	0.85	.42 28	4	8 2	1 34	85	39.0	Coarse	09	<0.5	5.6	110	-	<0.5	<0.5	. 8	-	3	4	3	1	10	<0.5	<0.5	<0.5	<0.5	<0.5	11 4
SUIL DATA	BH15-081	0.6-1.0	2015-08-18	5.71	0.77 0	.70 131	29	37	26	47	120	Fine	36.0	_	T -	1 -		_	_	_		_	_		T -	_	1 _ 1	_	_	_ 1	. 1	- 1
Tank Farm	BH15-101 BH15-107 BH15-108 BH15-062 BH15-062	0.6-1.0 0.15-0.3 0.15-0.3 0.15-0.3 0.3-0.6	2015-08-19 2015-08-19 2015-08-19 2015-08-17 2015-08-17	5.69 6.68 6.29	1.31 0. 0.76 0. 0.63 0. 0.56 0.	.56 91 .53 71 .53 99 .75 25 .24 37	19 14 27 8 12	23 3 13 3 23 9 10 5	26 5 110 5 51 7 7 5	52 176 141 27	103 47 100 38 54	Fine Coarse - -	39 90 - -	<0.5 <0.5 <0.5 <0.5 <0.5	4.9 3.9 4.4 6.8 7.4	357 330 229 266 251	- - - -	<0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5	7.9 6.8 12.4 8.3 7.5	- - - -	2.6 1.7 5.2 3.9 3.6	5.7 4.1 6.1 6.1 6.2	16.0 11.1 4.4 7.1 6.6	0.8 0.6 1.3 <0.5	6.6 4.3 11.0 8.1 8.2	<0.5 <0.5 0.7 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5	0.6 1.5 <0.5 <0.5 <0.5	<0.5 <0.5 0.7 <0.5 <0.5	16.6 2 12.9 2 17.1 3 17.9 16.3
Shed #1	BH15-062 BH15-063 BH15-063 BH15-064 BH15-064 BH15-064 BH15-065 BH15-065	1.0-1.5 0.15-0.3 0.3-0.6 1.0-1.5 0.15-0.3 0.6-1.0 1.0-1.5 0.15-0.3 0.3-0.6	2015-08-17 2015-08-17 2015-08-17 2015-08-17 2015-08-17 2015-08-17 2015-08-17 2015-08-17	5.61 5.80 6.79 5.33 6.69 6.33 6.24	0.45 0. 0.29 0 0.35 0 0.21 0. 0.31 0 0.49 0 0.46 0	39 13 30 67 33 30 40 16 30 38 31 14 37 26 36 31 28 54	20 7 4 11 4 8	12 6 4 10 3 6 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 18 18 8 8 4 4 22 16 15 7 15 6 16 16 16 16 16 16 16 16 16 16 16 16 1	18 11 40 14 11 27	40 119 72 38 137 39 44 57	- - - - - - - -		<0.5	9.0			<0.5	<0.5	7.3	- - - - - - -	4.6 	4.6 	4.1 	0.9 - - - - - - -	13.7 - - - - - - - -	<0.5	<0.5	<0.5	<0.5 - - - - - - -	<0.5	15.9
	BH15-065	1.0-1.5	2015-08-17	6.87	0.31 0	.39 12	3	4 <	2 3	10	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inside Shed #1	BH15-123 BH15-124	0.0-0.15	2015-08-21	6.37		.45 50 54 87			35	144 205	29 68	=	-	0.7	7.4 5.8	937	3690 18100	<0.5	<0.5	22.6 15.1	-	3.4	48.9 11.6	43.1 49.8	2.5	13.6	0.5 <0.5	<0.5	<0.5	1.1 0.5	<0.5 <0.5	13.5
	BH15-020 BH15-020 BH15-020 BH15-021 BH15-021 BH15-021 BH15-022 BH15-022	0.3-0.6 0.6-1.0 1.0-1.5 0.6-1.0 1.0-1.5 2.5-3.0 0.3-0.6 1.0-1.5	2015-08-15 2015-08-15 2015-08-15 2015-08-15 2015-08-15 2015-08-15 2015-08-15 2015-08-15	5.88 6.02 7.43	0.65 0 0.39 0 0.44 0 0.45 0 0.40 0 0.53 0 0.40 0 0.56 0	25 144 28 40 38 19 40 36 37 18 84 15 44 57	9 8 16 7 4 15 <2	35 1 11 3 5 3 4 3 15 1	88 29 3 12 4 6 3 21 4 8 8 9 6 48	412 66 13 70 9 25	205.0 95.0 38.0 76.0 32.0 32.0 126.0 24.0	Coarse - Coarse	87.7 - - 62.1 - -	<pre><0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5</pre>	5.9 7.0 5.4 2.9 5.7 6.6 3.0 7.1	1,010 350 285 124 123 94.7 104 207		<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	12.9 12.4 9.5 7.4 6.7 8.8 7.4 10.2	- - - - - - - -	4.9 2.8 4.7 3.0 4.1 4.6 1.7 5.1	8.3 5.7 8.5 3.4 3.7 4.4 3.2 6.2	6.7 6.2 4.2 3.6 3.7 3.9 3.9 5.3	1.0 0.5 <0.5 <0.5 <0.5 <0.5 <0.5	14.4 10.6 17.0 7.5 10.2 11.5 6.4 13.5	0.7 0.9 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	2.2 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	0.8 0.6 0.6 <0.5 <0.5 <0.5 <0.5	21.8
Lay Down/Storage	BH15-022 BH15-023 BH15-023 BH15-023 BH15-024 BH15-024 BH15-025 BH15-025	2.5-3.0 0.3-0.6 0.6-1.0 1.0-1.5 0.3-0.6 0.6-1.0 1.0-1.5 0.0-0.15 0.6-1.0	2015-08-15 2015-08-15 2015-08-15 2015-08-15 2015-08-15 2015-08-15 2015-08-15 2015-08-15	6.38 7.98 7.52 6.28 6.29 7.79 6.52	0.65 0 0.36 0 0.67 0 0.38 1 0.54 0 0.52 0 0.40 0 0.64 0	.69 22 .49 84 .49 61 .00 13 .56 16 .69 42 .77 56 .61 27 .75 164	2 6 <2 <2 3 4 4 <2 27	21 2 1 3 4 1 12 1 16 2 3 55 7	6 7 81 3 24 8 10 6 6 7 26 9 48 7 12 6 124	26 8 30 63 57 41 394	31.0 192.0 64.0 28.0 29.0 73.0 133.0 28.0 303.0	- - - - Coarse - -	96.8 - - - -	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	5.6 3.9 6.5 6.2 8.4 5.9 6.0 7.8 3.2	106 260 162 104 1,990 537 330 1,810	- - - - 11800 1910 - 5730	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	7.7 9.1 10.0 8.9 11.1 10.5 12.2 10.1 8.2	- - - - - - - -	4.0 4.6 4.5 4.5 4.7 5.0 4.8 4.1	3.9 8.6 6.6 4.7 13.6 9.6 10.9 9.4 8.6	3.7 4.8 5.0 4.3 16.1 6.6 6.1 18.4 3.8	0.6 <0.5 0.5 0.5 1.0 1.0 0.7 0.8	10.5 12.2 11.9 11.8 12.4 11.7 14.4 11.0 10.9	<0.5 0.7 <0.5 <0.5 <0.5 0.6 0.6 <0.5 0.6	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 0.7 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 1.2 0.7 <0.5 0.9 0.9 0.8 <0.5 0.7	14.1 3 17.5 3 19.7 16.9 4 22.5 4 18.2 24.8 4 19.2 4 13.8
	BH15-025 BH15-026 BH15-026 DUP BH15-026 BH15-026	1.0-1.5 0.6-1.0 0.6-1.0 1.0-1.5 2.5-3.0	2015-08-15 2015-08-15 2015-08-15 2015-08-15 2015-08-15	7.67	0.45 0	.75 20 .71 12 .88 13	12 - 14	3 -	14 5 12 8 18 1 19	8 - 13	34.0 29.0 - 32.0 29.0	- - - - Coarse	- - - 89.4	<0.5 <0.5 <0.5 <0.5 <0.5	6.4 5.4 5.7 7.1	90.3 79.9 98.8 102	- - -	<0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5	8.5 7.4 7.6 8.2 7.2		4.3 3.9 3.9 4.3 4.0	5.2 3.8 3.9 4.3 3.6	4.1 3.4 3.7 4.0 3.7	<0.5 <0.5 <0.5 <0.5	13.1 10.3 10.6 11.5 10.3	<0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5	0.6 <0.5 <0.5 0.6 0.5	17.3 15.1 14.8 16.4 13.7



Notes:

1. m bgs = metres below ground surface
2. = sample not analyzed for parameter
3. Current and/or applicable guidelines are bolded

(vellow highlight) = Exceeds applicable guidelines
4. View analytical report for more comprehensive results
5. Government of Northwest Territories (GNWT), 2003. Environmental Guideline for Contaminated Site Remediation. November 2003. Applied guideline is most stringent of "Eco Soil Contact" and "Protection of Groundwater for Aquatic Life" pathway values
6. AENV 2009 Barite = AENV (Alberta Environment), 2009. Soil Remediation Guidelines for Barite: Environmental Health and Human Health. February, 2009. Pub. No. T/738.

Table 1: Soil Analytical Results for Salinity, Physical, and Trace Metal Parameters

Table 1: Soil Analytical F	Results for Salinity, Physical,	and Trace Metal	l Parameters																															
	GENERAL						Deta	ailed Salini	ity				PHYSICAL											TRACE META	LS									
Location	Sample Designation	Sample Depth (m bgs)	Sample Date (yyyy-mm-dd)	H (CaCl ₂ Extraction)	lectrical Conductivity, EC (dS/m)	odium Adsorption Ratio, SAR	alcium	lagnesium	odium	otassium hloride	ulphate	aturation Percentage	Particle Size	5 micron sieve	ийтопу	rsenic	arium (Total)	arium (True Total)	eryllium	admium	hromium	hromium (Hexavalent)	obalt	opper	pec	lolybdenum	ickel	elenium	iver	hallium	u	ranium	anadium	ווכ
			Unit	ts -	dS/cm	-	mg/kg	mg/kg i	mg/kg mg	/kg mg/kg	mg/kg	%	-	. 7	≪ mg/kg	≪ mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	⊢ mg/kg	⊢ mg/kg	⊃ mg/kg	mg/kg	mg/kg
GUIDELINES																																		
GNWT 2003 ⁵	Residential/Parkland Area - Co	oarse Soil		6 - 8	2	5	-	-	-		-	-	-	-	20	12	500	-	4	10.0	64	0.4	50	63	140	10	50	1	20	1	50	-	130	200
AENV 2009 ⁶	Barite DUAS 027	0206	2045 00 45	- 6.13	- 0.63	- 0.22	- 110	- 20	- 1		- 256	- 157.0	-	-		-	240	10,000			- 12.0	-	- 4.5	- 0.7	- 6.1	-	- 11.0	- 0.7				-	- 20.2	- 74
	BH15-027 BH15-027	0.3-0.6 0.6-1.0	2015-08-15 2015-08-15	6.13	0.63		118 23	20 16	28 1 6				-	-	<0.5 <0.5	5.0 6.3	240 210	-	<0.5 1	<0.5 <0.5	12.0 12.0	-	4.5 5.7	8.7 9.1	6.1	0.9	11.8 16.7	0.7	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	0.8	20.2 23.6	71 34
	BH15-027	1.0-1.5	2015-08-15	7.97	_	0.59	15	3	4		8	_		-	<0.5	6.8	95	-	<0.5	<0.5	8.1	-	4.5	4.4	4.2	0.5	12.1	<0.5	<0.5	<0.5	<0.5	0.5	16.1	35
	BH15-028	0.15-0.3	2015-08-15	5.83	0.73	0.12	145		32		351		=	-	<0.5	5.1	911	2230	<0.5	<0.5	9.2	-	4.7	6.8	6.9	0.7	10.2	<0.5	<0.5	<0.5	0.6	0.6	17.5	43
	BH15-028	0.3-0.6	2015-08-15	6.29	0.27	0.24	30	5	7		33	89.0	-	-	<0.5	5.5	125	-	<0.5	<0.5	8.2	-	4.3	4.3	4.1	<0.5	8.9	<0.5	<0.5	<0.5	<0.5	<0.5	17.1	24
	BH15-028	1.0-1.5	2015-08-15	7.88			13			4 8	10		-	-	<0.5	6.4	102	-	<0.5	<0.5	8.9	-	4.5	4.2	4.1	0.5	12.5	<0.5	<0.5	<0.5	<0.5	0.7	17.9	37
	BH15-029	0.3-0.6	2015-08-15	6.87			8			2 2	10	_	-	-	<0.5	8.5	172	-	<0.5	<0.5	8.4	-	3.9	5.8	5.8	0.7	8.5	<0.5	<0.5	<0.5	<0.5	0.6	17.2	29
	BH15-029	0.6-1.0	2015-08-15	6.20		0.22	43	3		5 5	111	63.0	-	-	<0.5	3.7	196	-	<0.5	<0.5	7.0	-	2.8	4.9	3.4	0.6	7.7	<0.5	<0.5	<0.5	<0.5	<0.5	12.7	29
	BH15-029 BH15-030	1.0-1.5 0.0-0.15	2015-08-15 2015-08-15	6.90	_	0.35	9 113			3 3 9 21	8 269	32.0 147.0	-	1 -	<0.5 <0.5	6.6 3.9	107 203	1 -	<0.5 <0.5	<0.5 <0.5	8.1 8.4	1 -	4.2 6.2	3.3 5.1	4.4	0.5	9.7 10.9	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	14.8 15.3	35 28
	BH15-030	0.15-0.3	2015-08-15	6.49		0.34	33			1 9	58		-	 	<0.5	5.9	151	 	<0.5	<0.5	9.7	+ -	5.2	4.9	5.0	<0.5	11.1	<0.5	<0.5	<0.5	<0.5	0.5	19.4	30
	BH15-030	1.0-1.5	2015-08-15	7.66		0.80	14	<2	4		14		-	-	<0.5	6.6	89	-	<0.5	<0.5	7.8	-	4.3	4.3	4.0	0.6	12.3	<0.5	<0.5	<0.5	<0.5	0.6	14.9	35
	BH15-031	0.15-0.3	2015-08-15	6.12	_	0.69	173	22	48 5		427	_	-	-	<0.5	6.5	481	-	<0.5	<0.5	12.0	-	5.8	8.1	6.9	1.0	13.0	0.7	<0.5	<0.5	<0.5	0.8	22.8	40
	BH15-031	0.3-0.6	2015-08-15	6.19		0.65	85			5 42	193	94.0	-	-	<0.5	6.1	305	-	<0.5	<0.5	12.8	-	5.1	6.1	6.4	0.8	11.9	0.7	<0.5	<0.5	<0.5	0.7	23.3	32
	BH15-031	1.0-1.5	2015-08-15	7.44			25			2 19	51		=	-	<0.5	5.8	97	-	<0.5	<0.5	7.0	-	4.2	4.8	4.0	0.5	12.1	<0.5	<0.5	<0.5	<0.5	0.5	14.8	32
	BH15-032	1.0-1.5	2015-08-15	7.58			18			3 23	18		-	-	<0.5	6.6	90	-	<0.5	<0.5	8.0	-	4.7	5.1	4.4	0.5	12.7	<0.5	<0.5	<0.5	<0.5	<0.5	16.9	36
	BH15-032 BH15-032	2.5-3.0 4.0-4.5	2015-08-15 2015-08-15	7.78 7.82		1.40	20	3		5 39 3 24	31 40			-	<0.5 <0.5	6.0 6.1	103 133	-	<0.5 <0.5	<0.5	8.1 7.4	-	4.8 4.4	5.0 4.4	3.9 3.7	0.6	11.9 11.6	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	0.7 <0.5	14.5 14.7	34 35
	BH15-033	0.3-0.6	2015-08-16	5.66	0.71		70			2 199			-	-	<0.5	4.7	256	-	<0.5	<0.5 <0.5	11.0	-	2.3	4.4	5.2	<0.5	8.1	0.6	<0.5	<0.5	<0.5	<0.5	17.9	16
	BH15-033	1.0-1.5	2015-08-16	6.79	_	1.53	21	<2		8 49	15		=	-	<0.5	6.6	224	-	<0.5	<0.5	22.4	-	4.0	6.2	5.2	1.7	15.6	<0.5	<0.5	<0.5	0.8	<0.5	15.9	22
	BH15-033	2.5-3.0	2015-08-16	7.24			14	4		3 14	33	38.0	-	-	<0.5	5.5	126	-	<0.5	<0.5	10.3	-	4.3	4.0	3.1	0.9	11.4	<0.5	<0.5	<0.5	<0.5	0.8	11.9	26
	BH15-034	0.15-0.3	2015-08-16	5.72	1.76	3.70	247		84 4			233.0	-	-	<0.5	1.7	147	-	<0.5	<0.5	2.9	-	1.9	3.5	1.5	<0.5	4.1	<0.5	<0.5	<0.5	<0.5	<0.5	4.4	9
	BH15-034	0.3-0.6	2015-08-16	5.52	1.28	3.99	71			58 420			3	-	<0.5	5.2	251	-	<0.5	<0.5	15.8	-	3.1	5.7	4.2	0.9	11.6	<0.5	<0.5	<0.5	<0.5	<0.5	15.6	20
	BH15-034	1.0-1.5	2015-08-16	6.83		4.20	17			3 33	45		-	-	<0.5	5.7	133	-	<0.5	<0.5	9.9	-	4.3	6.2	4.6	0.7	12.9	<0.5	<0.5	<0.5	<0.5	<0.5	16.6	25
	BH15-035 BH15-035	0.3-0.6 1.0-1.5	2015-08-16 2015-08-16	5.86 7.00			61 21			2 90 1 24	212 9			-	<0.5 <0.5	5.5 5.7	414 123	-	<0.5 <0.5	<0.5 <0.5	15.5 9.6	-	2.9 3.9	6.4 4.5	5.5 3.5	1.3 0.6	11.2 10.5	0.5 <0.5	<0.5 <0.5	<0.5 <0.5	12.0 1.8	<0.5 <0.5	14.9 13.8	20 25
	BH15-035	2.0-2.5	2015-08-16	7.00		1.37	19	3		5 19	67			 	<0.5	5.4	240	 	<0.5	<0.5	8.2	 	3.7	4.2	3.6	0.6	9.6	<0.5	<0.5	<0.5	<0.5	<0.5	12.0	22
	BH15-036	0.15-0.3	2015-08-16	7.02	_	0.62	18	5		7 6	31	_	-	-	<0.5	6.5	385	-	<0.5	<0.5	8.5	-	2.7	5.5	7.5	0.6	6.5	<0.5	<0.5	<0.5	0.8	<0.5	14.2	22
	BH15-036	0.3-0.6	2015-08-16	5.61	0.51	0.79	62	14		2 36	187		=	-	<0.5	2.8	255	-	<0.5	<0.5	12.3	-	2.8	6.8	2.8	1.1	9.3	<0.5	<0.5	<0.5	7.8	<0.5	9.9	38
	BH15-036	1.0-1.5	2015-08-16	6.79	0.37	0.64	14	3	5		14		-	-	<0.5	5.8	167	-	<0.5	<0.5	17.0	-	3.6	4.0	6.5	1.3	13.2	<0.5	<0.5	<0.5	3.2	<0.5	14.5	22
Laydown/Storage	BH15-037	0.3-0.6	2015-08-16	5.72	0.57	3.51	34	61		12 27	259		-	-	<0.5	6.6	242	-	<0.5	<0.5	14.8	-	4.1	6.2	5.4	0.9	13.3	0.7	<0.5	<0.5	<0.5	0.5	20.9	18
.,,	BH15-037	0.6-1.0	2015-08-16	6.49	0.53		23	10		2 48	37	_	-	-	<0.5	5.5	103	-	<0.5	<0.5	10.8	-	3.8	3.8	3.5	0.8	11.4	<0.5	<0.5	<0.5	<0.5	<0.5	13.2	25
	BH15-037 BH15-038	1.0-1.5 0.15-0.3	2015-08-16 2015-08-16	7.12 5.97		2.88 0.23	12 33	12 3		7 28	25 33	35.0 94.0			<0.5 <0.5	4.0 4.0	311 248	-	<0.5 <0.5	<0.5 <0.5	12.0 12.0	+	2.8	6.5 4.0	6.5 4.8	0.8	23.8 6.3	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	0.8 <0.5	<0.5 <0.5	13.1 15.5	19 18
	BH15-038	0.3-0.6	2015-08-16	5.96			14		4		13		-	_	<0.5	6.1	168	-	<0.5	<0.5	12.8	_	3.2	7.0	5.7	0.7	9.6	0.6	<0.5	<0.5	<0.5	<0.5	17.4	27
	BH15-038	1.0-1.5	2015-08-16	7.02		0.26	14	5		2 <2	8		-	-	<0.5	5.3	103	-	<0.5	<0.5	15.0	-	3.6	3.9	3.7	1.0	12.6	<0.5	<0.5	<0.5	<0.5	<0.5	12.4	24
	BH15-039	0.15-0.3	2015-08-16	6.60	0.11	0.27	6	<2	2	2 <2	6	51.0	=	-	<0.5	5.7	244	-	<0.5	<0.5	6.5	-	2.5	5.0	6.1	0.5	5.9	<0.5	<0.5	<0.5	<0.5	0.5	14.9	17
	BH15-039	0.6-1.0	2015-08-16	6.22		0.20	18	<2	6		13		-	-	<0.5	5.3	145	-	<0.5	<0.5	9.6	-	3.0	2.9	4.6	0.6	7.9	<0.5	<0.5	<0.5	<0.5	<0.5	16.1	20
	BH15-039	1.0-1.5	2015-08-16	6.78		0.21	9			2 <2	4		-	-	<0.5	7.9	123	-	<0.5	<0.5	9.4	-	5.0	4.3	4.2	0.8	12.1	<0.5	<0.5	<0.5	<0.5	<0.5	15.5	33
	BH15-040 BH15-040	0.0-0.15 0.6-1.0	2015-08-16 2015-08-16	7.07	0.29	0.19	49 14			5 9 2 <2	78 5		-	 	<0.5 <0.5	4.6 6.0	297 134	-	<0.5 <0.5	<0.5 <0.5	6.7 11.0	1 -	2.4 3.7	5.2 3.4	6.1 3.4	0.6	6.2 10.4	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	12.5 13.8	26 25
	BH15-040	1.0-1.5	2015-08-16	7.07	_	0.32	12	<2	3		7	37.0	-	1	<0.5	5.7	160		<0.5	<0.5	7.1	 	3.3	3.7	4.0	0.8	8.8	<0.5	<0.5	<0.5	<0.5	<0.5	15.0	23
	BH15-041	0.3-0.6	2015-08-16	5.82	0.43	0.38	58		20 1		136	119.0	-	-	<0.5	4.4	211	- 1	<0.5	<0.5	12.0	-	2.6	4.8	4.3	0.9	9.2	0.6	<0.5	<0.5	<0.5	0.5	18.6	20
	BH15-041	0.6-1.0	2015-08-16	6.01	0.30	0.60	22	2	7 1	1 12	32	70.0	=	-	<0.5	8.4	223	-	<0.5	<0.5	13.0	-	4.4	5.7	5.8	0.5	14.4	0.7	<0.5	<0.5	<0.5	0.6	25.5	17
	BH15-041	1.0-1.5	2015-08-16	7.26	0.40		14		4 1		14		-	-	<0.5	6.2	98	-	<0.5	<0.5	9.7	-	4.0	3.7	3.5	0.8	11.1	<0.5	<0.5	<0.5	<0.5	<0.5	15.3	27
	BH15-042	0.15-0.3	2015-08-16	7.14		0.23	23	4		3 <2	29		-	-	<0.5	6.7	468	-	<0.5	<0.5	48.9	-	2.9	5.6	18.1	0.9	23.9	<0.5	<0.5	<0.5	1.9	<0.5	15.3	19
	BH15-042 BH15-042	0.6-1.0 1.0-1.5	2015-08-16 2015-08-16	5.83	0.48	0.49	32			1 27				-	<0.5 <0.5	5.1 6.6	216 148	-	<0.5 <0.5	<0.5 <0.5	12.4 9.8	-	4.1 3.1	6.1 3.5	4.8 4.0	0.6	13.6 9.6	0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	0.5 <0.5	20.5 13.6	21 21
	BH15-043	0.3-0.6	2015-08-16		0.88					2 164				-	<0.5	4.3	300	-	<0.5	<0.5	14.6	-	3.9	7.5	5.3	1.1	12.8	0.6	<0.5	<0.5	10.1	0.6	19.4	28
	BH15-043	1.0-1.5	2015-08-16	6.78			20			1 28			-	-	<0.5	6.6	130	T -	<0.5	<0.5	9.9	-	3.5	4.3	3.6	0.9	11.5	<0.5	<0.5	<0.5	<0.5	<0.5	14.2	21
	BH15-043	2.5-3.0	2015-08-16	7.45	0.60	1.16	17	4	6 1	4 24	42	38.0	-	<u> </u>	<0.5	4.7	110		<0.5	<0.5	10.3		3.6	3.6	3.1	0.8	10.7	<0.5	<0.5	<0.5	<0.5	<0.5	13.5	26
	BH15-044	0.15-0.3	2015-08-16		0.30		13			7 8			-	-	<0.5	4.4	302	-	<0.5	<0.5	18.8	-	1.6	4.2	6.8	1.6	10.7	<0.5	<0.5	<0.5	<0.5	<0.5	14.9	12
	BH15-044	0.6-1.0	2015-08-16				97				159		-	-	<0.5	4.9	408	- 1	<0.5	<0.5	16.0	-	4.8	7.7	5.0	1.5	16.8	0.8	<0.5	<0.5	<0.5	0.7	22.0	21
	BH15-044	1.0-1.5	2015-08-16		0.31						11		•	-	<0.5	7.8	161	-	<0.5	<0.5	14.5	-	2.9	3.6	4.2	1.3	10.7	<0.5	<0.5	<0.5	<0.5	<0.5	14.9	18
	BH15-045	0.15-0.3	2015-08-16 2015-08-16		0.48		80	<2 <2	24 2	7 77 6 15	77 12		-	-	<0.5	4.2	296	-	<0.5	<0.5	13.2	-	3.3	5.6	5.2	0.6	10.6	0.9	<0.5	<0.5	<0.5	1.2	20.1	14
	BH15-045 BH15-045	0.6-1.0 1.0-1.5	2015-08-16		0.40					6 15 3 7			-	1 -	<0.5 <0.5	6.0 5.0	95 93	1 -	<0.5 <0.5	<0.5 <0.5	10.6 8.9	-	4.0 3.3	3.5 3.4	3.3 3.5	0.8	11.6 9.9	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	15.2 13.9	23 21
	BH15-046	0.15-0.3	2015-08-16		0.40					2 9			-	1	<0.5	4.7	277		<0.5	<0.5	34.9	 	2.0	5.1	7.0	3.2	17.7	<0.5	<0.5	<0.5	0.5	<0.5	19.9	16
	BH15-046	0.3-0.6	2015-08-16	5.79		0.53	44				34		-	-	<0.5	3.5	220	- 1	<0.5	<0.5	8.9	-	2.6	3.9	3.8	0.5	7.9	0.7	<0.5	<0.5	<0.5	<0.5	14.8	10
	BH15-046	1.0-1.5	2015-08-16	7.15	0.34	0.60	11	<2	4	5 7	9	32.0	-	-	<0.5	6.7	120	-	<0.5	<0.5	9.6	-	3.5	4.0	3.6	0.8	10.8	<0.5	<0.5	<0.5	<0.5	<0.5	12.7	22
	BH15-047	0.15-0.3	2015-08-16		0.36					6 21			=	-	<0.5	6.8	189	-	<0.5	<0.5	10.7	-	2.6	5.1	4.9	<0.5	10.0	0.7	<0.5	<0.5	<0.5	<0.5	21.0	13
	BH15-047	1.0-1.5	2015-08-16	7.38	0.44	0.70	14	<2	4	7 12	15	31.0	=	-	<0.5	5.9	142	-	<0.5	<0.5	8.6	-	3.7	3.8	3.5	0.7	10.2	< 0.5	<0.5	<0.5	<0.5	<0.5	13.9	23

Notes:

1. m bgs = metres below ground surface
2. - = sample not analyzed for parameter
3. Current and/or applicable guidelines are bolded

(yellow highlight) = Exceeds applicable guidelines
4. View analytical report for more comprehensive results
5. Government of Northwest Territories (GNVT), 2003. Environmental Guideline for Contaminated Site Remediation. November 2003. Applied guideline is most stringent of "Eco Soil Contact" and "Protection of Groundwater for Aquatic Life" pathway values
6. AENV 2009 Barite = AENV (Alberta Environment), 2009. Soil Remediation Guidelines for Barite: Environmental Health and Human Health. February, 2009. Pub. No. T/738.



Table 1: Soil Analytical Results for Salinity, Physical, and Trace Metal Parameters

Table 1: Soli Analytical K	esults for Salinity, Physical	I, and Trace Metal	Parameters																															
	GENERAL	1	1	+ -			Detaile	d Salinity					PHYSICAL	1		1		T		T	1	_	1	TRACE METAL	S	_		Т	1	_	1	1	1	
Location	Sample Designation	Sample Depth (m bgs)	Sample Date (yyyy-mm-dd)	pH (CaCl ₂ Extraction)	Electrical Conductivity, EC (dS/m)	Sodium Adsorption Ratio, SAR	Calcium	Magnesium	sodium Potassium	Chloride	Sulphate	Saturation Percentage	Particle Size	75 micron sieve	Antimony	Arsenic	Barium (Total)	.Barium (True Total)	Beryllium	Cadmium	Chromium	.Chromium (Hexavalent)	Cobalt	Copper	Lead	Molybdenum	Nickel	Selenium	Silver	Thallium	u E	Uranium	Vanadium	Zinc
			Unit	s -	dS/cm	- m	g/kg m	g/kg mg	/kg mg/kg	g mg/kg	mg/kg	%	-	-	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
GUIDELINES																																		
GNWT 2003 ⁵	Residential/Parkland Area -	Coarse Soil		6 - 8	2	5	-			-	-	-	-	-	20	12	500	-	4	10.0	64	0.4	50	63	140	10	50	1	20	1	50	-	130	200
AENV 2009 ⁶	Barite			-	-	-	-			-	-	-	-	-	-	-	-	10,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	BH15-047	2.5-3.0	2015-08-16					2 4			24	33.0	-	-	<0.5	5.2	115	-	<0.5	<0.5	16.5	-	3.8	4.0	3.2	1.4	13.2	<0.5	<0.5	<0.5	<0.5	<0.5	13.0	21
	BH15-048	0.15-0.3	2015-08-16					<2 1				88.0	-	-	<0.5	5.8	218	-	<0.5	<0.5	13.2	-	3.2	4.7	4.8	0.9	9.1	<0.5	<0.5	<0.5	<0.5	<0.5	17.7	21
	BH15-048	0.6-1.0	2015-08-16						5 4		7	28.0	-	-	<0.5	6.4	132	-	<0.5	<0.5	9.2	-	3.5	4.0	4.0	0.7	9.9	<0.5	<0.5	<0.5	<0.5	<0.5	14.5	23
	BH15-048	1.0-1.5	2015-08-16					<2 !			8	32.0	-	-	<0.5	7.4	139	-	<0.5	<0.5	12.3	-	3.7	3.5	4.4	1.2	12.8	<0.5	<0.5	<0.5	<0.5	<0.5	14.8	25
	BH15-049	0.15-0.3	2015-08-16	6.49					3 17		44	84.0	-	-	<0.5	5.3	286	-	<0.5	<0.5	20.4	-	3.0	5.8	7.5	1.8	11.4	<0.5	<0.5	<0.5	0.6	0.6	20.1	37
	BH15-049	0.3-0.6	2015-08-16	6.22					8 12		22	84.0	-	-	<0.5	4.9	197	-	<0.5	<0.5	9.8	-	3.0	5.3	5.3	<0.5	8.7	0.6	<0.5	<0.5	<0.5	<0.5	18.4	17
	BH15-049 BH15-050	1.0-1.5 0.3-0.6	2015-08-16 2015-08-16	7.37 6.44				<2 (c) 3 2			22	30.0 106.0	-	-	<0.5 <0.5	6.3 5.1	117	-	<0.5 <0.5	<0.5 <0.5	9.0 13.4	 	4.1 3.7	4.7 6.0	3.9 5.3	0.7 1.0	10.9 12.5	<0.5 1.0	<0.5 <0.5	<0.5 <0.5	<0.5	<0.5 0.7	16.1 14.6	27
	BH15-050 BH15-050	1.0-1.5	2015-08-16	7.19					4 6		29 8	30.0	-	-	<0.5	6.8	291 142	+ -	<0.5	<0.5	9.5	+ -	2.8	3.3	5.3 4.1	1.0	9.1	<0.5	<0.5	<0.5	<0.5 <0.5	<0.5	11.9	12 16
	BH15-050	2.5-3.0	2015-08-16	7.19					5 13		27	42.0		H -	<0.5	5.2	109	+ -	<0.5	<0.5	7.0	+ :	3.9	3.9	3.3	0.6	10.1	<0.5	<0.5	<0.5	<0.5	0.5	13.5	25
	BH15-051	0.3-0.6	2015-08-16					<2 1				58.0	-	-	<0.5	5.5	210	+ -	<0.5	<0.5	30.5	+ -	2.3	4.0	5.8	2.5	15.7	<0.5	<0.5	<0.5	<0.5	<0.5	19.7	14
	BH15-051	0.6-1.0	2015-08-16					2 1			25	79.0	_	_	<0.5	7.1	165	_	<0.5	<0.5	10.2	1 -	5.1	6.5	5.0	0.9	13.8	0.6	<0.5	<0.5	<0.5	1.6	19.7	25
	BH15-051	1.0-1.5	2015-08-16					<2			5	30.0	-	-	<0.5	6.2	125	-	<0.5	<0.5	11.2	-	3.9	3.8	3.7	1.0	11.4	<0.5	<0.5	<0.5	<0.5	<0.5	15.0	25
	BH15-052	0.3-0.6	2015-08-16	6.25				<2 1			40	134.0	_	-	<0.5	4.1	312	-	<0.5	<0.5	11.3	-	3.9	5.8	4.9	0.9	10.3	0.8	<0.5	<0.5	<0.5	0.6	17.2	21
	BH15-052	0.6-1.0	2015-08-16	6.84				<2 4			6	37.0	-	-	<0.5	5.9	127	-	<0.5	<0.5	10.2	-	3.9	4.1	3.8	0.9	12.1	<0.5	< 0.5	<0.5	<0.5	<0.5	15.0	23
	BH15-052	1.0-1.5	2015-08-16	7.58	0.40	0.85	12	<2 4	4 7	11	9	30.0	-	-	< 0.5	5.0	94.9	-	< 0.5	< 0.5	7.6	-	3.1	3.1	3.1	0.7	9.3	< 0.5	< 0.5	<0.5	< 0.5	<0.5	10.9	20
	BH15-053	0.0-0.15	2015-08-16	6.99	0.40	0.32	22	<2 4	4 4	4	25	40.0	-	-	<0.5	6.2	568	3550	<0.5	<0.5	7.5	-	3.7	5.8	5.9	0.7	10.2	<0.5	< 0.5	<0.5	<0.5	<0.5	16.2	23
	BH15-053	0.3-0.6	2015-08-16	6.82	0.35	0.55	20	<2 !	5 8	4	21	50.0	-	-	<0.5	5.6	363	-	<0.5	<0.5	7.7	-	2.5	5.6	8.6	<0.5	7.1	<0.5	<0.5	<0.5	0.8	<0.5	17.2	17
	BH15-053	1.0-1.5	2015-08-16	6.80	0.41	0.43	16	<2 4	4 4	6	9	31.0	-	-	< 0.5	6.3	127	-	<0.5	<0.5	9.1	-	3.5	4.2	4.3	0.7	12.8	<0.5	<0.5	<0.5	<0.5	<0.5	15.0	20
	BH15-054	0.15-0.3	2015-08-17	6.01	0.20	0.28	9	2 2	2 <2	3	9	37	-	-	10.1	4.9	617	816	0.7	<0.5	17.4	-	2.1	5.9	6.1	0.7	10.9	<0.5	1.0	<0.5	<0.5	1.3	14.5	13
	BH15-054	0.3-0.6	2015-08-17	5.67	0.37	0.19	74	19 8	3 <2	11	92	133	-	-	<0.5	4.2	239	-	<0.5	<0.5	9.6	-	3.1	6.9	3.9	0.9	11.5	0.5	<0.5	<0.5	<0.5	0.6	17.2	30
Laydown/Storage	BH15-054	1.0-1.5	2015-08-17	6.66		0.19	20	7 2	2 <2	2	8	39	-	-	< 0.5	6.4	100	-	<0.5	<0.5	7.5	-	3.6	4.4	3.5	0.7	10.2	<0.5	< 0.5	<0.5	<0.5	<0.5	12.9	23
	BH15-055	0.0-0.15	2015-08-17	6.09		0.21	24	6 3	3 <2	5	27	57	-	-	<0.5	5.0	218	-	<0.5	<0.5	10.2	-	2.1	4.1	5.5	0.8	7.1	<0.5	< 0.5	<0.5	<0.5	<0.5	13.6	14
	BH15-055	0.6-1.0	2015-08-17		0.10			3 <			9	38	-	-	<0.5	6.5	113	-	<0.5	<0.5	8.7	-	4.6	4.2	3.5	0.6	11.7	<0.5	<0.5	<0.5	<0.5	<0.5	14.4	27
	BH15-055	1.0-1.5	2015-08-17	6.48					2 <2		11	40	=	-	<0.5	5.3	92.9	-	<0.5	<0.5	6.3	-	3.3	3.2	3.6	0.5	8.8	<0.5	<0.5	<0.5	<0.5	<0.5	12.4	21
	BH15-056	0.3-0.6	2015-08-17	5.38				31 9			111	154	=	-	<0.5	3.8	273	-	<0.5	<0.5	9.6	-	3.4	7.9	3.6	1.0	10.4	0.6	<0.5	<0.5	<0.5	0.6	15.5	34
	BH15-056	0.6-1.0	2015-08-17	5.56					5 <2		40	125	=	-	<0.5	4.9	270	-	<0.5	<0.5	10.6	-	3.2	6.3	4.0	0.8	10.9	0.8	<0.5	<0.5	<0.5	0.7	19.3	16
	BH15-056	1.0-1.5	2015-08-17	5.93				8 3			15	49	-	-	<0.5	6.3	128	-	<0.5	<0.5	8.4	-	4.5	4.6	4.3	0.5	12.4	<0.5	<0.5	<0.5	<0.5	<0.5	16.6	27
	BH15-057	0.15-0.3	2015-08-17	5.83				3 3			11	42	-	-	<0.5	5.7	238	-	<0.5	<0.5	14.8	-	2.4	4.8	6.4	1.3	10.5	<0.5	<0.5	<0.5	<0.5	<0.5	14.7	14
	BH15-057	0.6-1.0	2015-08-17						5 <2		15	45	-	-	<0.5	4.5	202	-	<0.5	<0.5	15.6	-	2.3	4.4	5.6	1.4	11.0	<0.5	<0.5	<0.5	<0.5	<0.5	11.7	18
	BH15-057	1.0-1.5	2015-08-17					14 1			38	95	-	-	<0.5	7.0	240	-	<0.5	<0.5	11.4	-	7.2	6.2	5.3	1.0	10.3	0.6	<0.5	<0.5	<0.5	0.6	23.2	21
	BH15-058	0.3-0.6	2015-08-17						7 3		102	111	-	-	<0.5	5.5	238	-	<0.5	<0.5	15.6	-	4.4	6.4	4.7	1.5	12.1	<0.5	<0.5	<0.5	<0.5	<0.5	18.5	40
	BH15-058 BH15-058	0.6-1.0 1.0-1.5	2015-08-17	6.48				3 3			14 10	42 54	-	-	<0.5	3.0 6.1	132 103	-	<0.5	<0.5	9.2 6.3	-	2.9 3.7	3.0 3.2	3.6	<0.5	7.8 9.5	<0.5	<0.5	<0.5	<0.5	<0.5	16.8	22
	BH15-058 BH15-059	1.0-1.5 0.0-0.15	2015-08-17	6.08				2 2	3 <2		10	43	-	-	<0.5 <0.5	10.3	103 820	2450	<0.5 <0.5	<0.5 <0.5	11.6	+ -	3.7	9.7	10.7	<0.5 0.9	9.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 0.5	13.9 22.0	28 23
İ	BH15-059 BH15-059	0.0-0.15	2015-08-17	5.64				20 8			214	43 86		- -	<0.5	4.7	276	2430	<0.5	<0.5	8.3	+ :	3.6	6.4	6.3	0.9	8.7	<0.5	<0.5	<0.5	<0.5	0.5	14.9	26
İ	BH15-059	1.0-1.5	2015-08-17	6.66				3 3	3 3	_	11	40		-	<0.5	5.6	87.4	1 -	<0.5	<0.5	6.9	+ -	3.9	3.5	3.2	<0.5	11.1	<0.5	<0.5	<0.5	<0.5	<0.5	14.3	25
İ	BH15-060	0.15-0.3	2015-08-17	5,94				3 (24	43	-	-	<0.5	5.5	270	1 -	<0.5	<0.5	6.1	-	2.5	5.3	7.2	0.5	6.4	<0.5	<0.5	<0.5	0.6	<0.5	12.9	14
1	BH15-060	0.3-0.6	2015-08-17	5.16		0.00		20 2				152	-	-	<0.5	4.1	256	-	<0.5	<0.5	9.7	-	2.7	6.1	4.6	0.8	8.5	0.6	<0.5	<0.5	<0.5	0.5	14.7	18
İ	BH15-060	1.0-1.5	2015-08-17	6.75				3 6				39	-	-	<0.5	5.1	93.6	-	<0.5	<0.5	5.8	-	3.4	3.6	4.5	<0.5	8.8	<0.5	<0.5	<0.5	<0.5	<0.5	13.0	21
İ	BH15-061	0.0-0.15	2015-08-17					4 1			20	40	-	-	<0.5	6.9	269	-	<0.5	<0.5	8.0	-	3.2	5.0	8.3	0.8	6.8	<0.5	<0.5	<0.5	<0.5	0.5	16.6	14
1	BH15-061	0.3-0.6	2015-08-17	5.75	0.75			20 9			278	131	-	-	<0.5	4.2	262	-	<0.5	<0.5	9.5	-	4.2	7.9	4.4	1.3	10.7	0.7	<0.5	<0.5	<0.5	0.5	14.1	44
İ	BH15-061	1.0-1.5	2015-08-17	6.77				3 2			35	42	-	-	<0.5	5.7	108	-	<0.5	<0.5	6.4	-	4.0	4.2	3.7	<0.5	10.2	<0.5	<0.5	<0.5	<0.5	<0.5	13.5	23
	BH15-066	0.0-0.15	2015-08-17	1 - 1	-	-	- 1	- -		-	-	- 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
İ	BH15-066	0.15-0.3	2015-08-17	5.76	0.50	0.25	48	16	7 <2	9	102	76	Fine	44	<0.5	4.7	244	-	<0.5	<0.5	9.0		5.3	7.1	4.4	0.7	11.1	0.6	<0.5	<0.5	2.7	<0.5	17.2	33
1	BH15-066	0.3-0.6	2015-08-17	5.74					5 <2		41	61	Coarse	55	<0.5	5.6	180	-	<0.5	<0.5	12.2	1 -	2.7	3.4	5.8	<0.5	7.4	<0.5	<0.5	<0.5	<0.5	<0.5	22.8	17
İ	BH15-066	1.0-1.5	2015-08-17	6.34					5 <2		29	47	Course	- 33	<0.5	6.8	94.5		<0.5	<0.5	6.6	1	4.4	4.9	4.2	0.6	11.2	<0.5	<0.5	<0.5	<0.5	<0.5	16.1	27
1	BH15-067	0.3-0.6	2015-08-17	5.78				18		_	225	79	-	<u> </u>	<0.5	6.6	299	1	<0.5	<0.5	7.0	+ -	3.1	5.1	7.8	0.6	7.3	<0.5	<0.5	<0.5	<0.5	0.5	15.2	20
İ	BH15-067	0.3-0.6	2015-08-17	5.78					9 2		66	116	-	-	<0.5	4.7	78.3	+ -	<0.5	<0.5	6.5	1 -	3.4		3.3	<0.5	9.1	<0.5	<0.5	<0.5	<0.5	<0.5	12.7	23
Camp	BH15-067	1.0-1.5	2015-08-17	5.00				3 2			7	33			<0.5	6.5	137	+ -	<0.5	<0.5	5.8	+ :-	3.4	3.2 3.8	3.3	<0.5	9.1	<0.5	<0.5	<0.5	<0.5	<0.5	13.0	23
1	BH15-068	0.15-0.3	2015-08-17					2 4			37	46		-	<0.5	5.9	269	+ -	<0.5	<0.5	13.2	+ -	4.2	6.0	8.1	1.1	9.9	<0.5	<0.5	<0.5	<0.5	<0.5	14.0	21
	BH15-068	0.3-0.6	2015-08-17	5.90				35			338	88	_	-	<0.5	6.8	225	1 -	<0.5	<0.5	12.6	-	4.4	6.3	6.4	0.9	17.6	0.5	<0.5	<0.5	<0.5	<0.5	16.4	24
	BH15-068	0.6-1.0	2015-08-17	5.96				9 5			21	48	-	-	<0.5	7.1	169	1 -	<0.5	<0.5	11.2	-	5.2	6.4	5.4	0.7	12.6	<0.5	<0.5	<0.5	<0.5	<0.5	18.3	30
	BH15-069	0.3-0.6	2015-08-17	5.18				17			68	139	-	-	<0.5	4.1	145	-	<0.5	<0.5	10.2	-	3.3	6.9	4.5	0.85	10.9	0.7	<0.5	<0.5	<0.5	1.1	16.9	20
	BH15-069	0.6-1.0	2015-08-17	5.42					5 <2		14	42	-	-	<0.5	5.9	127	-	<0.5	<0.5	7.7	-	4.5	5.4	4.7	0.7	11.9	<0.5	<0.5	<0.5	<0.5	<0.5	17.8	19
İ	BH15-069	1.0-1.5	2015-08-17		0.31			4 6			10	50	-	-	<0.5	6.7	107	-	<0.5	<0.5	6.8	-	4.0	4.4	3.9	0.7	1.1	<0.5	<0.5	<0.5	<0.5	<0.5	15.1	24
Notes										•	-				•	•	•	•		•		•	•			•	•		•					



Notes:

1. m bgs = metres below ground surface
2. - = sample not analyzed for parameter
3. Current and/or applicable guidelines are bolded

| (yellow highlight) = Exceeds applicable guidelines
4. View analytical report for more comprehensive results
5. Government of Northwest Territories (GNWT), 2003. Environmental Guideline for Contaminated Site Remediation. November 2003. Applied guideline is most stringent of "Eco Soil Contact" and "Protection of Groundwater for Aquatic Life" pathway values
6. AENV 2009 Barite = AENV (Alberta Environment), 2009. Soil Remediation Guidelines for Barite: Environmental Health and Human Health. February, 2009. Pub. No. T/738.

Table 1: Soil Analytical Results for Salinity, Physical, and Trace Metal Parameters

March Marc		GENERAL		Parameters			D	etailed Salii	nity				PHYSICAL											TRACE META	IS									_
## A PART OF THE P		JEHERAL		I		1		Cancu Jalli				T	THISICAL					1			T	T		TRACE WIETA			1				1	T		_
Section Property Section Property Section Se		Sample Designation		(yyyy-mm-dd)	pH (CaCl ₂ Extraction)	Electrical Conductivity, EC (dS/m) Sodium Adsorption Ratio, SAR	Calcium Mg/kg	g mg/kg	mg/kg mg/l	gy/gg/ Chloride	Swiphate	5	Particle Size	. 75 micron sieve	Antimony mg/kg	Arsenic kg/gm	Banium (Total)	Ba //s/ Barium (True Total)	Beryllium Ma/kg	mg/kg	mg/kg	(Pa Chromium (Hexavalent)	Copart Copart Mg/kg	Jaddoo mg/kg	pea mg/kg	шпиараліо ОМ mg/kg	Nickel Mg/kg	Selenin Selenin Mg/kg	Silver Mg/kg	unilled mg/kg	⊑ mg/kg	mg/kg Uranium	mnipeus/ mg/kg	zinc mg/kg
Trans		Desidential/Darkland Area Cos	arca Cail		6 0	2 5		 			_			ı	20	12	F00			10.0	T 64	0.4	Ε0	62	140	10	F0	1	30	1			120	200
THE STATE SECTION SECT			arse 3011		0-0	2 3	-			-	-		=		20					10.0						10	50	1	- 20	1			130	200
TIME THE SECRET SHOWS A SECRET SHOW	AENV 2009	Darree	0.0.0.15	2015 00 20	6.03	0.55 0.3	122		22 2	26	F.6	22	Fine	22	-0.5	_		10,000		-0.5		+ - +				0.5	8.0	0.6	<0.F	-O.F		-0 F	17.6	30
MINOR COLOR DECOMES - MINOR COLOR - MINOR COLOR DECOMES - MINOR CO	Tundra	BH15-116 BH15-117 BH15-118 BH15-119 BH15-120 BH15-121	0.15-0.3 0.0-0.15 0.0-0.15 0.0-0.15 0.0-0.15 0.0-0.15	2015-08-20 2015-08-20 2015-08-20 2015-08-20 2015-08-20 2015-08-20	5.84 5.80 5.93 5.83 6.01	0.35 0.3 0.27 0.3 0.29 0.2 0.31 0.3 0.36 0.3 0.33 0.4	34 68 35 51 44 68 30 56 36 99 40 52	27 23 25 20 37 20	14 2 13 <2 10 <2 11 <2 21 <2 13 <2	20 22 27 21 40 17	33 23 26 33 50 22	29 - 36 - 55 -	Fine Coarse	29 - - - - 55	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5	2.1 4.0 4.8 3.6 5.0 3.5	43.6 257 246 318 181 219		<0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5	5.3 8.2 10.3 8.9 8.2 9.6		2.6 4.5 3.2 4.5 3.8 3.0	4.6 6.6 4.9 9.1 5.8 7.8	2.6 4.5 4.5 4.1 3.8 5.3	<0.5 0.6 0.7 0.7 0.6 <0.5	5.8 11.5 10.3 12.7 10.8 10.3	<0.5 <0.5 0.5 0.7 0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5	<0.5 <0.5 0.5 0.7 <0.5 1.3	9.9 15.5 20.7 17.3 16.1 17.9	15 33 25 41 23 9
## 15:00	Burn Pit	BH15-013 BH15-013 BH15-013 BH15-014 BH15-014 BH15-014 BH15-014 BH15-015 BH15-015 BH15-015 BH15-016 BH15-016 BH15-016 BH15-017 BH15-017 BH15-018 BH15-017 BH15-017 BH15-019 BH15-113 BH15-113	0.6-1.0 2.5-3.0 4.0-4.5 0.3-0.6 0.6-1.0 2.5-3.0 0.15-0.3 0.6-1.0 1.0-1.5 0.3-0.6 0.6-1.0 1.0-1.5 0.3-0.6 0.6-1.0 1.0-1.5 0.6-1.0 1.0-1.5 0.6-1.0 1.0-1.5 2.5-3.0 0.6-1.0 1.0-1.5 2.5-3.0 0.6-1.0 1.0-1.5 0.6-1.0 1.0-1.5 0.6-1.0 1.0-1.5	2015-08-15 2015-08-15	7.33 					20 	282 	31.0 - 113.0 - 37.0 		-	0.7 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	6.0 6.0 6.4 10.6 5.6 6.3 6.8 6.5 5.6 7.4 5.0 5.0 5.5 8.4 4.9 5.5 5.5 5.0 5.5 4.1 4.1 4.1 4.1 4.1 5.4 4.3 8.8 8.8 8.8 8.8 8.8 8.8 8.8 8.8 8.8 8	308 107 142 6,990 1,660 125 270 116 125 229 285 124 210 317 105 313 92.6 90.6 98.4 235 78.2 85 102 113 196 78.5	4760 	 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 	<0.5 <0.5 <0.5 <1.3 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	12 9 11 34 11 8 8 10 9 8 8 11 9 7 11 8 11 9 7 7 7 7 7 7 7 7 7 7 7 7 7		6 5 5 119 7 4 4 4 5 5 4 3 3 7 7 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	111 66 140 23 5 8 8 3 4 6 6 7 7 5 6 6 7 7 3 8 8 3 3 4 4 6 6 7 7 7 5 6 6 6 7 7 7 7 8 8 8 8 8 8 8 8 8 9 6 6 6 6 6 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8	18 4 6 534 59 4 4 7 6 6 5 6 6 4 4 4 4 4 4 4 4 4 4 4 4 4	2 1 1 1 2 1 1 1 1 1 0.5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	12 13 14 20 11 10 11 11 9 12 13 8 8 12 10 9 11 10 9 11 10 9 11 10 11 10 11 11 9 9 11 10 10 11 10 10 10 10 10 10 10 10 10	1 (0.5 (0.5 (0.5 (0.5 (0.5 (0.5 (0.5 (0.5	 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 40.5 <li< td=""><td><0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5</td><td> 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 </td><td>1 1 1 1 1 1 1 1 1 0 0 5 1 1 1 1 1 1 1 1</td><td>22 17 19 26 20 15 20 18 16 18 21 19 16 22 18 20 18 31 41 15 16 20 18 19 10 11 10 11 11 11 12 13 14 15 16 17 18 18 18 19 10 10 10 10 10 10 10 10 10 10</td><td>70 58 39 45 472 68 33 38 36 33 28 42 26 42 26 37 30 64 31 33 33 28 28 37 39 40 41 42 42 42 42 42 42 42 42 42 42</td></li<>	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 	1 1 1 1 1 1 1 1 1 0 0 5 1 1 1 1 1 1 1 1	22 17 19 26 20 15 20 18 16 18 21 19 16 22 18 20 18 31 41 15 16 20 18 19 10 11 10 11 11 11 12 13 14 15 16 17 18 18 18 19 10 10 10 10 10 10 10 10 10 10	70 58 39 45 472 68 33 38 36 33 28 42 26 42 26 37 30 64 31 33 33 28 28 37 39 40 41 42 42 42 42 42 42 42 42 42 42
BH10-011	Air Strip	BH15-002 BH15-002 BH15-002 BH15-003 BH15-003 BH15-003 BH15-003 BH15-004 BH15-004 BH15-005 BH15-005 BH15-005 BH15-005 BH15-005 BH15-006 BH15-006 BH15-006 BH15-006 BH15-008 BH15-007 BH15-007 BH15-008 BH15-009 BH15-009 BH15-009 BH15-009 BH15-009 BH15-009 BH15-009 BH10-010 BH10-010 BH10-010	0.3-0.6 1.0-1.5 2.5-3.0 0.3-0.6 0.6-1.0 1.0-1.5 0.6-1.0 1.5-2.0 2.5-3.0 0.6-1.0 1.0-1.5 2.5-3.0 0.6-1.0 1.0-1.5 2.0-2.5 0.15-0.3 0.6-1.0 1.0-1.5 0.3-0.6 0.6-1.0 1.0-1.5 0.3-0.6 0.6-1.0 1.0-1.5 0.3-0.6 0.6-1.0 1.0-1.5 0.3-0.6 0.6-1.0 1.0-1.5 0.3-0.6 0.6-1.0 1.0-1.5 0.3-0.6 0.6-1.0 0.6-1.0 0.5-3.0 0.6-1.0 0.5-3.0	2015-08-14 2015-08-14	6.99 7.3 7.24 6.15 7.02 6.98 7.59 7.28 7.24 6.0 6.7 6.19 7.51 7.14 6.13 6.1 5.99 6.12 5.88 7.35 7.07 7.25 6.53 6.19 7.53	0.15 0.2 0.25 0.4 1.22 0.7 0.27 0.1 0.22 0.2 0.31 0.5 0.30 0.31 0.5 0.30 0.34 0.8 0.34 0.8 0.34 0.8 0.32 0.2 0.29 0.3 0.35 1.5 0.29 0.2 0.39 0.2 0.39 0.2 0.39 0.2 0.39 0.2 0.39 0.2 0.39 0.2 0.44 0.8 0.8 0.30 0.2 0.30 0.2 0.30 0.2 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30	33 13 13 13 13 13 13 13 13 13 13 13 13 1	<2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2 <2<	4 3 3 4 4 13 14 14 15 15 10 15 16 16 17 15 10 16 16 17 16 17 17 17 17 17 17 17 17 17 17 17 17 17	6 5 5 10 2 6 6 11 9 8 8 28 76 6 15 28 28 4 4 4 9 9 2 6 6 15 2 7 6 6 15 2 8 6 15 15 15 15 15 15 15 15 15 15 15 15 15	7 6 210 9 6 10 38 16 22 56 86 24 72 25 9 3 25 9 167 76 299 167 76 2550 1440 45 33 33 35 54	55.0 33.0 38.0 31.0 44.0 40.0 100.0 40.0 42.0 42.0 42.0 155.0 331.0 56.0 147.0 112.0 41.0 331.0 96.0 303.0 177.0 176.0 177.0 176.0 177.0 176.0 177.0 176.0 177.0	- Coarse	-	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	4.9 5.5 4.6 6.2 6.3 5.9 5.0 5.3 6.2 4.7 6.0 3.6 3.7 5.1 5.7 3.6 2.4 2.9 2.0 1.2 4.2 3.6 4.4 3.6 4.6 4.6 4.6 4.6 4.6 4.7 4.7 4.7 4.7 5.9 4.7 5.9 5.9 5.9 5.9 5.9 5.9 5.9 5.9	120 108 107 160 116 117 239 135 152 337 181 142 319 271 231 339 314 243 220 200 88.7 225 273 207 279 178		 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5<	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	10 8 11 10 8 9 16 10 10 11 10 18 17 20 18 20 36 13 10 5 20 17 23 29 9 13 14		5 4 4 5 4 4 4 4 3 3 4 7 7 3 4 5 4 2 2 2 2 1 1 3 3 2 2 2 2 2 2 2 2 2 2 2 2	3 3 4 7 7 5 5 5 4 5 13 7 4 6 6 10 4 5 5 6 6 4 4 7	3 3 4 4 3 3 5 5 3 4 4 5 6 6 6 8 8 4 4 3 3 2 6 6 6 6 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	1 1 1 1 0.05 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 1	10 11 10 13 13 13 11 11 11 11 24 10 13 13 13 13 13 15 11 11 11 11 11 11 18 9 8 6 6 11 11 11 13 16 7 7 11 11	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 1 <0.5 1 <0.5 1 <0.5 1 <0.5 1 <0.5 1 <0.5 1 <0.5 <0.5 1 <0.5 <0.5 <0.5 1 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 </td <td> 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 </td> <td><0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5</td> <td> 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 </td> <td><0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5</td> <td>16 16 16 17 18 20 17 15 21 16 16 16 16 25 11 14 25 17 18 16 16 12 12 10 10 16 18 19 13 13 13 13</td> <td>28 24 24 22 22 24 25 23 18 21 24 17 10 24 15 63 13 12 12 8 6 6 6 6 6 19 19 19 19 19 19 19 19 19 19 19 19 19</td>	 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 	<0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5	16 16 16 17 18 20 17 15 21 16 16 16 16 25 11 14 25 17 18 16 16 12 12 10 10 16 18 19 13 13 13 13	28 24 24 22 22 24 25 23 18 21 24 17 10 24 15 63 13 12 12 8 6 6 6 6 6 19 19 19 19 19 19 19 19 19 19 19 19 19

BH10-U11 4.5-5.0 2U15-U6-14 7.07 0.49 0.53 13 4 0.55 12 0.55 13 15 0.55 12 0.5



Table 2: Soil Analytical Results for PHC and PAH Parameters

	GENERAL			FIELD PAR	AMETERS			DFT	ROLFIIM	HYDROCAF	RRONS								POLYC	YCHC ARC	OMATIC HY	/DROCARE	RONS					
	GENERAL			FILLD FAIN	AIVILTERS			FLI	KOLLOW	IIIDROCAL	(DONS				T	T			I OLIC	Telle Aite	Julianem	DIOCAIL	0113			, I		T
Location	Sample Designation	Sample Depth (m bgs)	Sample Date (yyyy-mm-dd)	OVA (Field Screening)	EC (Field Screening)	Benzene	Toluene	Ethylbenzene	Xylenes	7.	F2	F3	F4	Acenapthene	Acenaphthlene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
			Units	ppm	dS/cm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
GNWT 2003 Residential/Parkla	and	Coarse Surface Soil (0-1.5	5 m bgs)	-	-	0.5	0.8	1.2	1	130	150	400	2800	l -	Ι.	Τ.	1	0.7	Τ.	1	Ι.	1	I -	-	1	0.6	5	10
,		Coarse Subsoil (> 1.5 m		-	-	0.5	0.8	1.2	1	230	150	2,500	10,000	-	-	-	1	0.7	-	1	-	1	-	-	1	0.6	5	10
BACKGROUND SOIL DATA	DUI45 004	0.45.0.2	2045 00 44		0.16	-0.005	-0.05	-0.04	-0.05	1 .40	1.10	200	0.4	ı	1	1		ı	T	1	1	ı	1		ı			_
	BH15-001 BH15-001	0.15-0.3 1.5-2.0	2015-08-14 2015-08-14	0	0.16	<0.005	<0.05 <0.05	<0.01	<0.05 <0.05	<10 <10	<10 <10	296 <10	94 <10	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-001	2.5-3.0	2015-08-14	50	0.18	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	BH15-001	3.0-3.5	2015-08-14	40	0.41	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-		-
Background	BH15-001 BH15-001	3.5-4.0 5.5-6.0	2015-08-14 2015-08-14	45 5	0.53 0.29	<0.005	<0.05 <0.05	<0.01	<0.05 <0.05	<10 <10	<10 <10	<10 <10	<10 <10	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH10-012	0.3-0.6	2015-08-14	20	-	<0.005	<0.05	<0.01	<0.05	<10	<10	20	19	-	-	-	-	-	-	-	-	-	-	-	-			-
	BH10-012	0.6-1.0	2015-08-14	15	-	<0.005	<0.05	<0.01	<0.05	<10	<10	16	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH10-012	1.0-1.5	2015-08-14	20	-	<0.005	<0.05	<0.01	<0.05	<10	<10	22	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SOIL DATA	BH10-012	2.5-3.0	2015-08-14	5	_	<0.005	<0.05	<0.01	<0.05	<10	<10	12	<10	-	-	<u> </u>		-	-	-	-	-	-	-	_			-
00.12 571.71	BH15-062	0.15-0.3	2015-08-17	15	-	<0.005	<0.05	<0.01	<0.05	<10	<10	25	15	-	-	-	-	-	-	-	-	-	-	-	-	- 1	-	T -
	BH15-062	0.3-0.6	2015-08-17	45	0.19	<0.005	<0.05	<0.01	<0.05	<10	690	307	168	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	BH15-062	1.0-1.5	2015-08-17	30	0.23	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-063 BH15-063	0.15-0.3 0.3-0.6	2015-08-17 2015-08-17	55 45	0.21	<0.005	2.34 12.1	<0.01	<0.05 <0.05	<10 12	<10 37	155 467	117 340	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH15-063	1.0-1.5	2015-08-17	40	0.19	<0.005	0.08	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Shed #1	BH15-064	0.15-0.3	2015-08-17	75	0.25	<0.005	11.9	<0.01	<0.05	12	47	865	616	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
51104 112	BH15-064	0.6-1.0	2015-08-17	80	0.30	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-064 BH15-065	1.0-1.5 0.15-0.3	2015-08-17 2015-08-17	70 55	0.13 0.38	<0.005	<0.05 <0.05	<0.01	<0.05 <0.05	<10 <10	<10 <10	<10 77	<10 90	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH15-065	0.3-0.6	2015-08-17	70	0.30	<0.005	5.63	<0.01	<0.05	<10	<10	261	197	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-065	1.0-1.5	2015-08-17	45	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-123 BH15-124	0.0-0.15 0.0-0.15	2015-08-21 2015-08-21	-	-	<0.005	<0.05 <0.05	<0.01	<0.05 <0.05	<10 <10	651 217	3430 1440	1030 348	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-002	0.3-0.6	2015-08-21	170	0.11	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	<u> </u>	+
	BH15-002	0.6-1.0	2015-08-14	150	0.10	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-002	1.0-1.5	2015-08-14	115	0.13	<0.005	<0.05	<0.01	<0.05	<10	<10	14	<10	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	<0.01
	BH15-002	2.5-3.0	2015-08-14	70	0.30	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-003 BH15-003	0.3-0.6 0.6-1.0	2015-08-14 2015-08-14	250 80	0.13 0.20	<0.005	<0.05 <0.05	<0.01	<0.05 <0.05	<10 <10	<10 <10	21 18	<10 <10	-	-	-	-	-	-	-	-	-	-	-	-			-
	BH15-003	1.0-1.5	2015-08-14	75	0.21	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-004	0.6-1.0	2015-08-14	870	0.22	<0.005	<0.05	<0.01	<0.05	<10	22	436	219	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-004	1.5-2.0	2015-08-14	155	0.16	<0.005	<0.05	< 0.01	< 0.05	<10	<10	46	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-004 DUP BH15-004	1.5-2.0 2.5-3.0	2015-08-14 2015-08-14	25	0.04	< 0.005	< 0.05 < 0.05	< 0.01	< 0.05 < 0.05	< 10 <10	<10 <10	32 12	<10 <10	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-005	0.6-1.0	2015-08-14	1850	0.35	<0.005	0.22	<0.01	<0.05	<10	59	1060	657	-	-	-	-	-	-	-	-	-	-	-	-	<u> </u>	-	-
	BH15-005	1.0-1.5	2015-08-14	400	0.24	<0.005	1.66	<0.01	<0.05	<10	<10	425	383	-	-	-	-	-	-	-	-	-	-	-	-	- 1	<u> </u>	-
	BH15-005 BH15-006	2.5-3.0 0.6-1.0	2015-08-14 2015-08-14	70 2050	0.22	<0.005	<0.05 0.41	<0.01	<0.05 <0.05	<10 <10	<10 <10	<10 173	<10 180	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	BH15-006	1.0-1.5	2015-08-14	630	0.22	<0.005	4.45	<0.01	<0.05	<10	<10	437	374	-	-	-	-	-		-	-		-	-	-			-
Airstrip	BH15-006 DUP	1.0-1.5	2015-08-14	-	-		-		-	-	<10	314	281	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	BH15-006	2.0-2.5	2015-08-14	30	-	<0.005	0.14	<0.01	<0.05	<10	<10	36	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-007 BH15-007	0.15-0.3 0.6-1.0	2015-08-14 2015-08-14	15 770	0.50	<0.005	<0.05 <0.05	<0.01	<0.05 <0.05	<10 <10	<10 <10	17 30	19 14	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-007	1.0-1.5	2015-08-14	1450	0.50	<0.005	<0.05	<0.01		<10	<10	136	95	-	-	-	-	-	-	-	-	-	-	-	-			-
	BH15-008	0.15-0.3	2015-08-14	630	-	<0.005	<0.05	<0.01	<0.05	<10	11	1140	<10	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	BH15-008	0.3-0.6	2015-08-14	800	0.26	<0.005	8.14	<0.01		<10	<10	184	130	-	-	-	-	-	-	-	-	-	-	-	-	<u> </u>		-
	BH15-008 BH15-009	1.0-1.5 0.3-0.6	2015-08-14 2015-08-14	400 300	0.22	<0.005	52.9 <0.05	<0.01	<0.05 <0.05	53 <10	<10 13	1160 182	829 163	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-009	0.6-1.0	2015-08-14	340	0.89	<0.005	<0.05	<0.01	<0.05	<10	<10	70	72	-	-	-	-	-	-	-	<u> </u>	-	-	-	-		<u> </u>	 -
	BH15-010	0.3-0.6	2015-08-14	1550	-	<0.005	<0.05	<0.01	<0.05	<10	<10	180	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-010	0.6-1.0	2015-08-14	690	-	<0.005	<0.05	<0.01		<10	<10	446	309	-	-	-	-	-	-	-	-	-	-	-	-	-]		-
	BH15-010 BH15-011	2.5-3.0 0.6-1.0	2015-08-14 2015-08-14	110 530	0.30	<0.005	<0.05 <0.05	<0.01	<0.05 <0.05	<10 <10	<10 <10	15 198	<10 181	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-011	1.0-1.5	2015-08-14	300	0.30	<0.005	<0.05	<0.01		<10	<10	54	50	-	-	-	-	-	-	-	-		-	-	-		-	-
	BH15-011	2.5-3.0	2015-08-14	210	-	<0.005	<0.05	<0.01	<0.05	<10	<10	12	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 -

Notes:
1. m bgs = metres below ground surface
2. - = sample not analyzed for parameter

2. - sample not analyzed for parameter

3. Current and/or applicable guidelines are bolded

[Vellow highlight] = Exceeds applicable guidelines

4. View analytical report for more comprehensive results

5. Government of Northwest Territories (GNWT), 2003. Environmental Guideline for Contaminated Site Remediation . November 2003. Applied guideline is most stringent of "Eco Soil Contact" and "Protection of Groundwater for Aquatic Life" pathway values



Table 2: Soil Analytical Results for PHC and PAH Parameters

	GENERAL			FIELD PAR	AMETERS			PFT	ROLFLIM	HYDROCAF	RBONS								POLYC	YCLIC ARO	MATIC H	YDROCARE	BONS					
	GENERAL	T	T	TILED FAR	J. HILTERS			FEI	- OFFOIAL	DROCAL	.50.43								. 5210	JEI O ARO		J. J. J.						
Location	Sample Designation	Sample Depth (m bgs)	Sample Date (yyyy-mm-dd)	OVA (Field Screening)	EC (Field Screening)	Benzene	Toluene	. Ethylbenzene	, Xylenes	17	, F2	£.	, F4	Acenapthene	, Acenaphthlene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	, Dibenz(a,h)anthracene	, Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	, Naphthalene	, Phenanthrene	Pyrene
GUIDELINES			Units	ppm	dS/cm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
GNWT 2003 Residential/Parkla	and	Coarse Surface Soil (0-1.5	5 m bgs)	-		0.5	0.8	1.2	1	130	150	400	2800		١.	۱ .	1	0.7	-	1	١.	1			1	0.6	5	10
		Coarse Subsoil (> 1.5 m		-	-	0.5	0.8	1.2	1	230	150	2,500	10,000	-	-	-	1	0.7	-	1	-	1	-	-	1	0.6	5	10
	BH15-020	0.3-0.6	2015-08-15	140	-	< 0.005	< 0.05	< 0.01	<0.05	<10	<10	202	88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-020	0.6-1.0	2015-08-15	240	-	<0.005	<0.05	_		<10	35	979	465	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	BH15-020	1.0-1.5	2015-08-15	60	- 0.10	<0.005	<0.05	<0.01	<0.05	<10	<10	31	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-021 BH15-021	0.6-1.0 1.0-1.5	2015-08-15 2015-08-15	690 130	0.18 0.31	<0.005 <0.005	<0.05 <0.05	_	<0.05 <0.05	<10 <10	<10 <10	149 <10	68 <10		-	-	-	-	-	-		-	-	-	-	-	-	-
-	BH15-021	2.5-3.0	2015-08-15	35	-	<0.005	<0.05	_	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-022	0.3-0.6	2015-08-15	2050	31	<0.005	< 0.05	<0.01	<0.05	<10	56	1470	694	-	-	-	1	-		-	-	-	-	-		-	-	-
[BH15-022	1.0-1.5	2015-08-15	600	23	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-		-	-	-	-	-	-		-		-	-
	BH15-022	2.5-3.0	2015-08-15	220	0.24	<0.005	<0.05			<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	BH15-023 BH15-023	0.3-0.6 0.6-1.0	2015-08-15 2015-08-15	1300 1050	0.34	<0.005 <0.005	<0.05 <0.05	<0.01	<0.05 <0.05	<10 <10	<10 <10	698 <10	334 10	-	-	-		-	-	-	-	-	-	-	-		-	-
=	BH15-023	1.0-1.5	2015-08-15	60	0.31	<0.005	<0.05		<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-024	0.3-0.6	2015-08-15	100	-	<0.005	< 0.05	<0.01	<0.05	<10	256	33	23	-	-	-	1	-		-	-	-	-	-		-	-	-
	BH15-024	0.6-1.0	2015-08-15	220	-	<0.005	<0.05	<0.01	<0.05	<10	519	182	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	BH15-024	1.0-1.5	2015-08-15	190	-	<0.005	<0.05	<0.01	<0.05	<10	39	182	96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	BH15-025 BH15-025	0.0-0.15 0.6-1.0	2015-08-15 2015-08-15	40 1250	0.29	<0.005 <0.005	<0.05 0.08	<0.01	<0.05 <0.05	<10 <10	<10 <10	30 287	19 82		-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	BH15-025	1.0-1.5	2015-08-15	40	0.20	<0.005	<0.05			<10	<10	<10	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	BH15-026	0.6-1.0	2015-08-15	560	0.22	<0.005	< 0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-026	1.0-1.5	2015-08-15	140	0.37	<0.005	<0.05			<10	<10	<10	<10	-	-	-	-	-		-	-	-	-		-	-	-	-
	BH15-026	2.5-3.0	2015-08-15	95	-	<0.005	<0.05	_	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
=	BH15-027 BH15-027	0.3-0.6 0.6-1.0	2015-08-15 2015-08-15	180 280	0.29	<0.005 <0.005	0.08 <0.05	<0.01	<0.05	<10 <10	18 <10	68 61	71 78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F	BH15-027	1.0-1.5	2015-08-15	20	0.38	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
=	BH15-028	0.15-0.3	2015-08-15	120	0.31	<0.005	<0.05			<10	<10	165	186	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-028	0.3-0.6	2015-08-15	510	0.14	<0.005	<0.05	0.05	0.07	<10	<10	494	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
=	BH15-028	1.0-1.5	2015-08-15	55	0.29	<0.005	<0.05			<10	<10	<10	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	BH15-029	0.3-0.6	2015-08-15	25	- 0.10	<0.005	<0.05	<0.01	<0.05	<10	296	734	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	BH15-029 BH15-029	0.6-1.0 1.0-1.5	2015-08-15 2015-08-15	105 0	0.18	<0.005 <0.005	<0.05 <0.05	_	<0.05 <0.05	<10 <10	<10 <10	300 <10	231 <10		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Laydown/Storage	BH15-030	0.0-0.15	2015-08-15	420	-	<0.005	<0.05	0.03	0.28	<10	<10	98	95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
,	BH15-030	0.15-0.3	2015-08-15	310	0.27	<0.005	<0.05		<0.05	<10	<10	589	494	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-030	1.0-1.5	2015-08-15	35	0.39	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
=	BH15-031	0.15-0.3	2015-08-15	160	0.57	<0.005	<0.05			<10	<10	80	91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	BH15-031 BH15-031	0.3-0.6 1.0-1.5	2015-08-15 2015-08-15	145 70	0.25 0.25	<0.005 <0.005	<0.05 <0.05	<0.01	<0.05 <0.05	<10 <10	<10 <10	61 249	61 210	-	-	-	-	-		-		-	-	-	-	-	-	-
	BH15-032	1.0-1.5	2015-08-15	530	0.23	<0.005	<0.05		<0.05	<10	<10	<10	<10	-	-	-	-	-		-					-		-	-
	BH15-032	2.5-3.0	2015-08-15	210	-	<0.005	<0.05	_	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-032	4.0-4.5	2015-08-15	80	-	<0.005	<0.05		<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-		-	-	-	-
	BH15-033	0.3-0.6	2015-08-16	660	0.51	0.052	4.16	0.07	0.22	<10	42	948	446	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
}	BH15-033 DUP BH15-033	0.3-0.6 1.0-1.5	2015-08-16 2015-08-16	420	0.30	<0.005	<0.05	<0.01	<0.05	<10	58 <10	1090 <10	571 <10	-	-		-	-	-	-	-	-	-	-	-	-	-	-
	BH15-033	2.5-3.0	2015-08-16	40	-	<0.005	<0.05			<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-034	0.15-0.3	2015-08-16	155	1.10	<0.005	5.17	<0.01	<0.05	<10	<10	207	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-034	0.3-0.6	2015-08-16	450	0.81	<0.005	2.21	<0.01		<10	60	1940	904	-	-	-	-	-	-	-	-	-	-		-	-	-	-
<u> </u>	BH15-034	1.0-1.5	2015-08-16	70	0.50	<0.005	<0.05 3.56	<0.01		<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
}	BH15-035 BH15-035	0.3-0.6 1.0-1.5	2015-08-16 2015-08-16	70 155	-	<0.005 <0.005	0.15	_		<10 <10	<10 <10	434 <10	209 <10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-035	2.0-2.5	2015-08-16	25	-	<0.005	<0.05			<10	<10	<10	<10	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	BH15-036	0.15-0.3	2015-08-16	15	-	<0.005	<0.05	<0.01	<0.05	<10	329	60	<10	-	-	-		-	-	-	-	-	-		-	-	-	-
	BH15-036	0.3-0.6	2015-08-16	45	0.51	<0.005	0.27		0.88	<10	40	322	194	-	-	-	-	-	-	-	-	-	-		-	-	-	-
	BH15-036	1.0-1.5	2015-08-16	15	0.22	<0.005	0.09		<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-037 BH15-037	0.3-0.6 0.6-1.0	2015-08-16 2015-08-16	85 90	0.33	<0.005 <0.005	<0.05 <0.05		0.11 <0.05	<10 <10	207 14	354 442	84 218	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	BH15-037	1.0-1.5	2015-08-16	45	0.37	<0.005	<0.05			<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-038	0.15-0.3	2015-08-16	200	0.20	<0.005	<0.05	0.05	1.3	<10	240	647	343	-	-	-	-	-	-	-	-	-	-		-	-	-	-
<u> </u>	BH15-038	0.3-0.6	2015-08-16	80	-	<0.005	<0.05		0.12	<10	32	322	160	-	-	-	-	-	-	-	-	-	-		-	-	-	-
	BH15-038 BH15-039	1.0-1.5 0.15-0.3	2015-08-16 2015-08-16	70 30	0.18	<0.005 <0.005	<0.05 <0.05			<10	<10 116	<10 58	<10 10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<u> </u>	BH15-039	0.15-0.3	2015-08-16	45	0.14	<0.005	<0.05			<10 <10	<10	17	<10	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH15-039	1.0-1.5	2015-08-16	0	-	<0.005		<0.01			<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
														•				•				•						

Notes:
1. m bgs = metres below ground surface
2. - = sample not analyzed for parameter

2. - - sample for analyzed on parameter
3. Current and/or applicable guidelines are bolded

[(yellow highlight) = Exceeds applicable guidelines
4. View analytical report for more comprehensive results
5. Government of Northwest Territories (GNWT), 2003. Environmental Guideline for Contaminated Site Remediation . November 2003. Applied guideline is most stringent of "Eco Soil Contact" and "Protection of Groundwater for Aquatic Life" pathway values



Table 2: Soil Analytical Results for PHC and PAH Parameters

	GENERAL			FIELD PAR	RAMETERS			PET	ROLEUM I	HYDROCAF	RBONS								POLYC	YCLIC ARO	MATIC HY	/DROCARE	BONS					
Location	Sample Designation	Sample Depth (m bgs)	Sample Date (yyyy-mm-dd)	OVA (Field Screening)	EC (Field Screening)	Benzene	Toluene	Ethylbenzene	Xylenes	F1	F2	F3	F4	Acenapthene	Acenaphthlene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
			Units	ppm	dS/cm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
GUIDELINES GNWT 2003 Residential/Parkla	and	Coarse Surface Soil (0-1.5	E m has)		1	0.5	0.0	1.2	1	130	150	1 400	2800	Ι.	1 -	ı	1	0.7	T -	1	T	1	T		1	0.6	5	10
GIVVI 2003 Residential/Parkis	anu	Coarse Subsoil (> 1.5 m		-		0.5 0.5	0.8	1.2	1	230	150 150	400 2,500	10,000	H :	+ -		1	0.7	H -	1	-	1	-	-	1	0.6	5	10
T T	BH15-040	0.0-0.15	2015-08-16	80		<0.005	<0.05	<0.01		<10	17	176	83				-	-		-	<u> </u>	-			-		Ť	-
	BH15-040	0.6-1.0	2015-08-16	15	-	<0.005	<0.05	<0.01	<0.05	<10	<10	18	<10	-	-	_	-	-	-	-	-		-	-	_	+	-	-
	BH15-040	1.0-1.5	2015-08-16	35	-	<0.005	<0.05	<0.01		<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-041	0.3-0.6	2015-08-16	390	-	< 0.005	1.44	0.01	0.11	27	17	366	186	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-041	0.6-1.0	2015-08-16	300	-	< 0.005	2.70	<0.01	<0.05	<10	20	890	515	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-041	1.0-1.5	2015-08-16	20	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-042	0.15-0.3	2015-08-16	15	-	<0.005	<0.05	<0.01	<0.05	<10	<10	363	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-042	0.6-1.0	2015-08-16	45	0.35	<0.005	2.51	<0.01	<0.05	<10	<10	895	519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-042	1.0-1.5 0.3-0.6	2015-08-16	15	0.27	<0.005 0.005	<0.05	<0.01	<0.05	<10 <10	<10	<10	<10 250	-	 	-	-	-	-	-	-	-	-	-	-	 -	-	-
	BH15-043 BH15-043	1.0-1.5	2015-08-16 2015-08-16	80 135	0.71 0.48	<0.005	7.63 0.15	<0.01	<0.05 <0.05	<10 <10	<10 <10	468 50	250 35	-	-		-	-	-	-	1	1	-	-	-	$+$ \pm $ ^{\prime}$	-	-
	BH15-043	2.5-3.0	2015-08-16	70		<0.005	<0.05	<0.01		<10	<10	16	12		-		-				<u> </u>	 		-	- -	+	<u> </u>	-
	BH15-044	0.15-0.3	2015-08-16	20	-	<0.005	<0.05	<0.01	<0.05	<10	<10	44	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-044	0.6-1.0	2015-08-16	45	0.44	0.023	8.04	3.54	20	31	<10	842	320	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-044	1.0-1.5	2015-08-16	10	0.23	< 0.005	0.31	0.09	0.5	<10	<10	331	125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-045	0.15-0.3	2015-08-16	75	-	<0.005	9.34	<0.01	<0.05	<10	11	463	225	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-045	0.6-1.0	2015-08-16	25	-	< 0.005	<0.05	< 0.01		<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-045	1.0-1.5	2015-08-16	25	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH15-046	0.15-0.3	2015-08-16	60	-	<0.005	<0.05	<0.01		<10	14	40	18	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH15-046	0.3-0.6	2015-08-16	300	0.56	<0.005	8.2	<0.01	<0.05	<10	64	1210	583	-	-	-	-	-	-	-	-	-	-	-	-			-
-	BH15-046	1.0-1.5 0.15-0.3	2015-08-16	95	0.45	<0.005	<0.05 7.2	<0.01	<0.05 <0.05	<10 14	<10 <10	<10	29 471	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH15-047 BH15-047	1.0-1.5	2015-08-16 2015-08-16	310 230	0.45	<0.005	<0.05	<0.01	<0.05	<10	<10	892 <10	<10		1	-					-					+		-
	BH15-047	2.5-3.0	2015-08-16	80	0.24	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-		-	-	-	-	-	-		-	-		-	-	-
	BH15-048	0.15-0.3	2015-08-16	70	0.40	<0.005	4.91	<0.01	<0.05	<10	<10	249	68	-	-	-	-	-	-	-	-	-	-	-	-	<u> </u>	-	-
	BH15-048	0.6-1.0	2015-08-16	80	-	<0.005	0.10	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-048	1.0-1.5	2015-08-16	50	0.24	< 0.005	<0.05	< 0.01	< 0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-049	0.15-0.3	2015-08-16	220	-	< 0.005	2.62	0.27	31.8	320	8709	520	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-049	0.3-0.6	2015-08-16	130	0.82	< 0.005	1.09	0.04	0.98	<10	371	852	463	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-049	1.0-1.5	2015-08-16	70	0.28	<0.005	<0.05	0.03	0.27	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-050	0.3-0.6	2015-08-16	440	-	<0.005	2.17	<0.01	<0.05	<10	<10	682	280	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-050	1.0-1.5 2.5-3.0	2015-08-16	260	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-			-
Laydown/Storage	BH15-050 BH15-051	0.3-0.6	2015-08-16 2015-08-16	20 155	0.50	<0.005 <0.005	<0.05 4.28	<0.01	<0.05 <0.05	<10 <10	21 <10	22 393	11 220	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH15-051	0.6-1.0	2015-08-16	205	0.50	<0.005	<0.05	<0.01		<10	<10	<10	<10						-		-	-	-			$+$ \pm $+$	-	-
	BH15-051	1.0-1.5	2015-08-16	110	0.29	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-052	0.3-0.6	2015-08-16	880	0.38	< 0.005	0.11	<0.01		<10	21	1480	682	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-052	0.6-1.0	2015-08-16	115	0.05	< 0.005	0.82	<0.01	<0.05	<10	<10	261	133	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-052	1.0-1.5	2015-08-16	40	0.23	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-053	0.0-0.15	2015-08-16	70	-	<0.005	<0.05	<0.01	<0.05	<10	<10	76	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-053	0.3-0.6	2015-08-16	50	-	<0.005	<0.05	<0.01	<0.05	<10	<10	147	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-053 BH15-054	1.0-1.5 0.15-0.3	2015-08-16 2015-08-17	55 0	 -	<0.005	<0.05 <0.05	<0.01	<0.05 <0.05	<10 <10	<10 <10	<10 17	<10 13	-	1	-	-	-	-	-	 -	-	-	-	-	+	-	-
1	BH15-054	0.15-0.3	2015-08-17	15	0.29	<0.005	0.11	<0.01	<0.05	<10	<10	244	174	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	
	BH15-054	1.0-1.5	2015-08-17	0	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-			-		-	-0.03			-	-	-	-	- 0.01
	BH15-055	0.0-0.15	2015-08-17	30	-	< 0.005	<0.05	<0.01		<10	<10	105	83	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH15-055	0.6-1.0	2015-08-17	5	-	< 0.005	<0.05	< 0.01		<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-055	1.0-1.5	2015-08-17	5	-	<0.005	<0.05	<0.01		<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-056	0.3-0.6	2015-08-17	55	0.35	<0.005	1.01	<0.01		<10	<10		98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-056	0.6-1.0	2015-08-17	55	0.33	<0.005	<0.05	<0.01	<0.05	<10	<10	434	320	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	<0.01
	BH15-056	1.0-1.5	2015-08-17	15	-	<0.005	<0.05	<0.01		<10	<10		<10	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH15-057	0.15-0.3	2015-08-17	25	- 0.20	<0.005	<0.05	<0.01		<10	20	14	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	BH15-057 BH15-057	0.6-1.0 1.0-1.5	2015-08-17 2015-08-17	35 55	0.29	<0.005	<0.05	<0.01 0.08	<0.05 0.48	<10 <10	294 113		14 108	-	-	- 1	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-058	0.3-0.6	2015-08-17	70		<0.005	0.08	0.08	0.48	<10	<10	350	235		-						1			-				-
	BH15-058	0.6-1.0	2015-08-17	50	0.32	<0.005	<0.05	<0.01		<10	<10		22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-058	1.0-1.5	2015-08-17	20	-	< 0.005	<0.05	<0.01		<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-059	0.0-0.15	2015-08-17	20	-	<0.005	<0.05	<0.01	<0.05	<10	<10		21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-059	0.15-0.3	2015-08-17	40	-	< 0.005	<0.05	<0.01	<0.05	<10	<10	203	161	-	-	-	-	-	-	-	-	-	-	-	-			-
	BH15-059	1.0-1.5	2015-08-17	15	-	<0.005	<0.05			<10	<10		<10	-	-	-	-	-	-	-	-	-	-	-	-	- '	-	-
	BH15-060	0.15-0.3	2015-08-17	45	-	<0.005	<0.05	<0.01		<10	17	24	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-060	0.3-0.6	2015-08-17	65 15	0.33	<0.005	6.14	<0.01		<10	83	1690	<10			-0.004	-0.02	-0.02	-0.05	-0.05		-0.005	-0.01	-0.02	-0.05		-0.02	
	BH15-060 BH15-061	1.0-1.5 0.0-0.15	2015-08-17 2015-08-17	15 30	+ -	<0.005	<0.05 <0.05	<0.01		<10 <10	<10 <10	<10 <10	<10 <10	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	<0.01
	BH15-061	0.3-0.6	2015-08-17	80	+ -	<0.005	0.08	<0.01		<10	<10	354	268	-	-		-	-	-	-	-	-		-			-	+ -
	BH15-061	1.0-1.5	2015-08-17	50	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					•									•	•	•						•		•	•			

m bgs = metres below ground surface
 - = sample not analyzed for parameter

2. - - Sample not analyzed for parameter

3. □ Trent and/or applicable guidelines are bolded
□ (yellow highlight) = Exceeds applicable guidelines

4. View analytical report for more comprehensive results

5. Government of Northwest Territories (GNWT), 2003. Environmental Guideline for Contaminated Site Remediation. November 2003. Applied guideline is most stringent of "Eco Soil Contact" and "Protection of Groundwater for Aquatic Life" pathway values



Table 2: Soil Analytical Results for PHC and PAH Parameters

	GENERAL			FIELD PAI	RAMETERS			PET	ROLEUM	HYDROCAF	RBONS								POLYC	YCLIC ARC	MATIC H	DROCARE	BONS					
	OLIVE OF THE PARTY																											
Location	Sample Designation	Sample Depth (m bgs)	Sample Date (yyyy-mm-dd)	OVA (Field Screening)	B)/Sp EC (Field Screening)	Benzene 8//8	Zoluene	3 Kg Ethylbenzene	xylenes mg/kg	E mg/kg	C mg/kg	က္ mg/kg	mg/kg	Acenapthene	Acenaphthlene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	공 용enzo(g, h,i) perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	bay/Fluoranthene	mg/kg	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Mg/kg Pyrene
GUIDELINES			Office	ppm	us/ciii	IIIg/kg	IIIg/kg	IIIg/kg	IIIg/kg	IIIg/kg	IIIg/ kg	IIIg/kg	IIIg/ kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	під/кд	mg/kg	під/кд	mg/kg	mg/kg	mg/kg
GNWT 2003 Residential/Parkla	nd	Coarse Surface Soil (0-1.	5 m bgs)	-	-	0.5	0.8	1.2	1	130	150	400	2800	-	-	-	1	0.7	-	1	-	1	-	-	1	0.6	5	10
		Coarse Subsoil (> 1.5 m	-	-	-	0.5	0.8	1.2	1	230	150	2,500	10,000	-	-	-	1	0.7	-	1	-	1	-	-	1	0.6	5	10
	BH15-066	0.15-0.3	2015-08-17	30	0.17	<0.005	1.09	<0.01	<0.05	<10	<10	159	112	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-066 BH15-066	0.3-0.6 1.0-1.5	2015-08-17 2015-08-17	90 40	0.20	<0.005 <0.005	0.70 <0.05	<0.01		<10 <10	14 <10	669 40	492 36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-067	0.3-0.6	2015-08-17	150	0.28	<0.005	0.063	<0.01		<10	<10	219	165	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-067	0.6-1.0	2015-08-17	115	0.28	<0.005	<0.05	<0.01		<10	<10	368	164	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Camp	BH15-067	1.0-1.5	2015-08-17	45	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-068	0.15-0.3	2015-08-17	15	-	<0.005	<0.05	<0.01		<10	<10	92	29	-	-	-	-	-	-	-	-	-	-	-	-	- '	<u> </u>	-
	BH15-068 BH15-068	0.3-0.6 0.6-1.0	2015-08-17 2015-08-17	105 25	0.33	<0.005 <0.005	<0.05 <0.05	<0.01	<0.05 <0.05	<10 <10	<10 <10	297 40	118 <10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-069	0.3-0.6	2015-08-17	300	-	<0.005	0.25	<0.01	_	<10	15	670	321	-	-	-	-	-	-	-	-	-	-	-	-	-		-
1	BH15-069	0.6-1.0	2015-08-17	450	-	<0.005	0.13	< 0.01	< 0.05	<10	<10	93	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-069	1.0-1.5	2015-08-17	110	-	<0.005	< 0.05	<0.01		<10	<10	<10	<10	-	-	-	-		-	-	-	-	-	-		-	-	-
	BH15-013	0.3-0.6	2015-08-15	310	0.86	0.094	0.21	0.34	6.34	364	17700	9390	3770	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	BH15-013 BH15-013	0.6-1.0 2.5-3.0	2015-08-15 2015-08-15	830 70	-	0.138 <0.005	0.08 <0.05	15.8 <0.01	88.2 <0.05	568 <10	4720 <10	2260 <10	821 <10	-	-	-	-	-	-	-	-	-	-	-	-	-	<u> </u>	-
	BH15-013	4.0-4.5	2015-08-15	90	0.29	0.003	<0.05	0.01		29	426	60	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	BH15-014	0.3-0.6	2015-08-15	630	-	0.094	0.43	0.36	28.3	566	10200	931	126	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-014	0.6-1.0	2015-08-15	990	0.32	0.120	0.15	3.98	87.6	819	26000	5470	763	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-014	2.5-3.0	2015-08-15	5	-	<0.005	<0.05	<0.01	_	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-015	0.15-0.3	2015-08-15	40	-	<0.005	<0.05	<0.01		<10	<10	347	172	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-015 BH15-015 DUP	0.6-1.0 0.6-1.0	2015-08-15 2015-08-15	45	0.04	<0.005 < 0.005	<0.05 < 0.05	< 0.01	< 0.05	<10 < 10	<10 <10	20 <10	<10 <10		-		-		-	- 1	-	1	- 1	-	-		-	-
	BH15-015	1.0-1.5	2015-08-15	15	0.06	< 0.005	<0.05	<0.01	_	<10	<10	<10	<10	-	-	-	-		-	-	-	<u> </u>	-	-	-	-	-	-
	BH15-016	0.3-0.6	2015-08-15	10	0.18	<0.005	<0.05	<0.01		<10	64	343	158	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-016	0.6-1.0	2015-08-15	55	0.29	<0.005	<0.05	0.03	0.33	<10	55	141	59	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I	BH15-016	1.0-1.5	2015-08-15	15	0.60	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burn Pit	BH15-017 BH15-017	0.3-0.6 0.6-1.0	2015-08-15 2015-08-15	65 185	0.21	<0.005 <0.005	<0.05 <0.05	<0.01 0.11	<0.05 1.85	67 <10	4560 279	365 282	44 91	-	-	-	-	-	-	-	-	-	-	-	-	-	<u> </u>	-
	BH15-017	1.0-1.5	2015-08-15	15	0.17	<0.005	<0.05	<0.11		<10	48	282	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-018	0.6-1.0	2015-08-15	150	0.12	<0.005	<0.05	<0.01		<10	<10	196	78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-018	1.0-1.5	2015-08-15	300	0.11	<0.005	<0.05	<0.01	< 0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-018	2.5-3.0	2015-08-15	10	-	<0.005	<0.05	<0.01		<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-019	0.6-1.0	2015-08-15	230	0.26	<0.005	<0.05	0.25	1.69	<10	<10	997	402	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-019	1.0-1.5 2.5-3.0	2015-08-15 2015-08-15	690 40	0.10	<0.005 <0.005	<0.05	<0.01	_	<10 <10	<10 <10	134 <10	60 <10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-019 BH15-113	0.3-0.6	2015-08-20	15	0.25	0.0060	<0.05	<0.01		<10	16	540	328	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	<0.01
	BH15-113	0.6-1.0	2015-08-20	25	0	<0.005	<0.05	<0.01	_	<10	<10	69	44	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	<0.01
	BH15-113	1.0-1.5	2015-08-20	85	0	<0.005	<0.05	<0.01	<0.05	<10	<10	18	18	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	<0.01
	BH15-114	0.3-0.6	2015-08-20	35	0.04	<0.005	<0.05	<0.01		<10	232	73	64	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	<0.01
	BH15-114 BH15-114	0.6-1.0 1.0-1.5	2015-08-20 2015-08-20	10 15	0.13 0.27	<0.005	<0.05	<0.01	<0.05 <0.05	<10 <10	71 <10	32 22	27 <10	<0.005 <0.005	<0.005 <0.005	<0.004	<0.03	<0.03	<0.05 <0.05	<0.05 <0.05	<0.05 <0.05	<0.005	<0.01	<0.02	<0.05 <0.05	<0.005	<0.02	<0.01
	BH15-070	0.3-0.6	2015-08-17	35	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	BH15-070	0.6-1.0	2015-08-17	95	0.36	<0.005	2.02	<0.01		<10	<10	279	54	< 0.005	<0.005	<0.004	< 0.03	< 0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	0.024	<0.02	<0.01
	BH15-070	1.0-1.5	2015-08-17	25	-	<0.005	<0.05	<0.01	<0.05	<10	<10	190	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-071	0.3-0.6	2015-08-17	150	0.31	<0.005	2.58	<0.01	_	<10	<10	538	184	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-071	0.6-1.0 1.0-1.5	2015-08-17 2015-08-17	110 95	0.21	<0.005 <0.005	<0.05 <0.05	<0.01		<10 <10	<10 <10	31	13 <10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-071 BH15-072	0.6-1.0	2015-08-17	360	0.28	<0.005	0.18	<0.01			<10	<10 55	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-072	1.0-1.5	2015-08-17	310	0.25	<0.005	<0.05	<0.01		<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tank Farm	BH15-072	2.5-3.0	2015-08-17	100	-	<0.005		<0.01	<0.05		<10		<10	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	<0.01
I GIIN FGIIII	BH15-073	0.3-0.6	2015-08-17	680	0.20	0.0180	0.70	<0.01		<10	<10	517	168	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-073	1.0-1.5	2015-08-17	410	0.23	<0.005	<0.05	_			<10		<10	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH15-073 BH15-074	2.5-3.0 0.3-0.6	2015-08-17 2015-08-17	340 610	0.70	<0.005 <0.005	<0.05 <0.05	<0.01	_	<10 <10	<10 87	71 2510	21 1370	-	-	 	-		-	-	-	 	-	-	-	 -	-	-
	BH15-074	1.0-1.5	2015-08-17	470	0.30	<0.005	<0.05			<10	<10		14		-		-	-	-		-	1		-	-			-
	BH15-074	4.0-4.5	2015-08-17	160	-	<0.005	<0.05	<0.01		<10	<10	<10	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-075	0.3-0.6	2015-08-18	710	-	<0.005	4.61				<10		74	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH15-075	0.6-1.0	2015-08-18	920	0.31	<0.005	15.2	<0.01		30	51	1610	761	-	-	-	-	-	-	-	-	-	-	-	-		-	-
	BH15-075	1.0-1.5	2015-08-18	75	0.22	<0.005	0.100	<0.01	<0.05	<10	<10	19	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Table 2: Soil Analytical Results for PHC and PAH Parameters

	GENERAL			FIELD PA	RAMETERS			PET	ROLEUM I	HYDROCAF	RBONS								POLYC	YCLIC ARC	OMATIC H	DROCAR	BONS					
																												T
Location	Sample Designation	Sample Depth (m bgs)	Sample Date (yyyy-mm-dd)	OVA (Field Screening)	EC (Field Screening)	Benzene	Toluene	Ethylbenzene	Xylenes	FI.	72	£	F4	Acenapthene	Acenaphthlene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(g,h,i)perylene	Benzo (k) fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene
			Unit	s ppm	dS/cm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
GUIDELINES GNWT 2003 Residential/Parkla	and	Coarse Surface Soil (0-1.	5 m bgs)	-	-	0.5	0.8	1.2	1	130	150	400	2800	Τ.	Ι.	Ι -	1	0.7	-	1	Ι -	1	Τ -	-	1	0.6	5	10
		Coarse Subsoil (> 1.5 m	0 ,	-	-	0.5	0.8	1.2	1	230	150	2,500	10,000	-	-	-	1	0.7	-	1	-	1	-	-	1	0.6	5	10
	BH15-076 BH15-076	0.3-0.6 3.5-4.0	2015-08-18 2015-08-18	860 35	0.82	<0.005 <0.005	4.42 <0.05	<0.01	<0.05 <0.05	<10 <10	53 <10	1280 <10	716 <10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-076	4.0-4.5	2015-08-18	155	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-077	0.3-0.6	2015-08-18	1550	0.28	<0.005	29.5	<0.01	<0.05	30	20	1560	712	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-077 BH15-077	1.0-1.5 2.5-3.0	2015-08-18 2015-08-18	180 85	-	<0.005 <0.005	<0.05 0.100	<0.01	<0.05 <0.05	<10 <10	<10 <10	<10 <10	<10 <10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-078	0.3-0.6	2015-08-18	200	0.65	0.0290	6.97	0.08	0.20	20	103	353	164	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-078	0.6-1.0	2015-08-18	460	0.23	<0.005	1.93	<0.01	<0.05	<10	<10	276	137	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-078 BH15-079	2.5-3.0 0.15-0.3	2015-08-18 2015-08-18	15 630	0.85	<0.005 <0.005	<0.05	<0.01	<0.05	<10 40	<10 99	<10 2630	13 1180	-	-	-	-	-	-	-	-	-	-	-	-		<u> </u>	-
	BH15-079	0.6-1.0	2015-08-18	260	0.83	<0.005	0.33	<0.01	_	<10	<10	<10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-079	1.0-1.5	2015-08-18	90	0.18	<0.005	0.13	<0.01	<0.05	<10	<10	<10	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-080	0.3-0.6 1.0-1.5	2015-08-18	1150	0.72	<0.005	9.17	<0.01	<0.05	<10	<10	599	272	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-080 BH15-080	2.5-3.0	2015-08-18 2015-08-18	380 45	0.24	<0.005 <0.005	<0.05 <0.05	<0.01	<0.05	<10 <10	<10 <10	<10 <10	14 10	-	-	-	-	-	-	-	-	-	-	-	-	+-	-	-
	BH15-081	0.15-0.3	2015-08-18	500	-	<0.005	<0.05	<0.01		<10	695	1010	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-081	0.6-1.0	2015-08-18	1300	-	<0.005	4.09	0.06	0.39	20	326	850	267	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	0.1	<0.05	0.069	0.11	<0.01
	BH15-081 BH15-082	2.5-3.0 0.0-0.15	2015-08-18 2015-08-18	5 1050	0.77	<0.005 0.0170	<0.05	<0.01 3.09	<0.05	<10 610	<10 24700	<10 13700	<10 189	-	-	-	-	-	-	-	-	-	-	-	-	+-	-	-
	BH15-082	0.6-1.0	2015-08-18	120	-	<0.005	<0.05	<0.01	-	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-082	1.0-1.5	2015-08-18	15	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-083	0.3-0.6	2015-08-18	2000	0.31	<0.005	0.09	0.15	0.52	<10	126	943	362	-	-	-	-	-	-	-	-	-	-	-	-	-	<u> </u>	-
	BH15-083 BH15-083	0.6-1.0 2.5-3.0	2015-08-18 2015-08-18	1550 185	0.32	<0.005 <0.005	0.49 <0.05	0.01 <0.01	<0.05 <0.05	<10 <10	49 43	161 41	51 <10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-084	0.3-0.6	2015-08-18	700	0.39	0.764	0.11	<0.01		<10	20	310	101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-084	1.0-1.5	2015-08-18	320	-	<0.005	<0.05	0.02	<0.05	<10	20	11	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-084 BH15-085	2.5-3.0 0.6-1.0	2015-08-18 2015-08-18	30 510	-	<0.005	<0.05 1.38	<0.01 0.53	<0.05	<10 10	<10 1120	<10 <10	<10 <10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-085	1.5-2.0	2015-08-18	660	-	2.680	12.8	6.99	31.5	480	3690	284	39	-	-	-	-	-	-	-	-	-	-	-	-	+-	-	-
Tank Farm	BH15-085	4.0-4.5	2015-08-18	125	-	0.017	<0.05	0.02	0.08	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-086	0.6-1.0	2015-08-18	640	-	1.220	0.58	10.2	20.3	150	6320	1560	113	-	-	-	-	-	-	-	-	-	-	-	-	-	<u> </u>	-
	BH15-086 BH15-086	1.0-1.5 2.5-3.0	2015-08-18 2015-08-18	610 15	-	0.055 <0.005	<0.05 <0.05	0.09 <0.01	0.12 <0.05	<10 <10	<10 <10	<10 <10	<10 <10	-	-	-	-	-	-	-	-	-	-	-	-	+-	-	-
	BH15-087	0.3-0.6	2015-08-18	1300	-	1.720	0.100	0.29	1.280	10	85	1720	788	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-087	2.5-3.0	2015-08-18	400	-	0.012	<0.05	<0.01	_	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-087 BH15-087	2.5-3.0 5.5-6.0	2015-08-18 2015-08-18	590 300	-	0.010	<0.05	<0.01		<10 <10	<10 <10	<10 <10	<10 <10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-088	0.3-0.6	2015-08-18	1700	-	1.76	4.55	10.8	55.9	1410	2470	1440	612	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-088	1.0-1.5	2015-08-18	135	-	0.08	<0.05	0.22	0.59	<10	11	17	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-088	2.5-3.0	2015-08-18	70	-	0.02	<0.05	0.07	0.21	<10	48	11	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-089 BH15-089	0.0-0.15 0.6-1.0	2015-08-18 2015-08-18	230 970	-	<0.005 0.022	<0.05 <0.05	0.05	2.84 1.86	690 420	10100 5410	1820 1300	29 14	-	-	-	-	-	-	-	-	-	-	-	-	+-	-	-
	BH15-089	1.0-1.5	2015-08-18	1050	-	3.26	7.16	14.5	61.7	2610	10900	2000	109	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-090	0.3-0.6	2015-08-18	860	-	0.035	4.91	0.04	0.12	<10	515	577	240	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-090 BH15-090	1.0-1.5 2.5-3.0	2015-08-18 2015-08-18	390 65	-	0.075 <0.005	0.24 <0.05	0.32 <0.01	<0.05	<10 <10	18 <10	10 11	<10 <10	-	-	-	-	-	-	-	-	-	-	-	-	+-	-	-
	BH15-091	0.3-0.6	2015-08-19	140	0.51	0.046	6.85	<0.01		<10	449		316	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-091	0.6-1.0	2015-08-19	70	0.38	0.083	0.45	0.10	0.36	<10	19	41	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-091	1.0-1.5	2015-08-19	125	-	0.036	<0.05	0.06		<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-092 BH15-092	0.3-0.6 0.6-1.0	2015-08-19 2015-08-19	300 210	0.31	0.021	1.58 0.06	<0.01		<10 <10	<10 <10	281 63	127 31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-092	1.0-1.5	2015-08-19	110	0.26	0.006	<0.05		<0.05		<10		<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[BH15-093	0.3-0.6	2015-08-19	790	0.50	0.013	5.44	<0.01		<10	20	1090	474	-	-	-	-	-	-	-	-	-	-	-	-	<u> </u>	-	-
1	BH15-093 BH15-093	0.6-1.0 1.0-1.5	2015-08-19 2015-08-19	145 115	0.25 0.16	<0.005 <0.005	<0.05 <0.05	<0.01		<10 <10	<10 <10	<10 15	<10 <10	-	-	-	-	-	-	-	1	-	-	-	-	+-		-
	BH15-094	0.3-0.6	2015-08-19	290	0.10	0.035	6.14			<10	12	513	230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-094	0.6-1.0	2015-08-19	310	0.27	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-094	1.0-1.5	2015-08-19	100	-	< 0.005	< 0.05	< 0.01	< 0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

- m bgs = metres below ground surface
 = sample not analyzed for parameter



Table 2: Soil Analytical Results for PHC and PAH Parameters

	GENERAL			FIELD PAR	AMETERS			PET	ROLEUM	HYDROCAF	RBONS								POLYC	YCLIC ARO	MATIC HY	DROCARB	ONS					
												ĺ																
Location	Sample Designation	Sample Depth (m bgs)	Sample Date (yyyy-mm-dd)	OVA (Field Screening)	EC (Field Screening)	enzene	oluene	thylbenzene	ylenes	1	2	3	4	cenapthene	cenaphthlene	nthracene	enzo(a)anthracene	enzo(a)pyrene	enzo(g,h,i)perylene	enzo(k)fluoranthene	hrysene	vibenz(a,h)anthracene	luoranthene	luorene	ndeno(1,2,3-c,d)pyrene	laphthalene	henanthrene	yrene
		I	Units	ppm	dS/cm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
GUIDELINES																												
GNWT 2003 Residential/Parkla	and	Coarse Surface Soil (0-1.5		-	-	0.5	0.8	1.2	1	130	150	400	2800	-	-	-	1	0.7	-	1	-	1	-	-	1	0.6	5	10
1	BH15-095	Coarse Subsoil (> 1.5 m l	ogs) 2015-08-19	2050	0.25	0.5 <0.005	0.8 <0.05	1.2 <0.01	1 <0.05	230 <10	150 <10	2,500	10,000	-	-	-	1	0.7	-	1	-	1	-	-	1	0.6	5	10
	BH15-095	0.6-1.0 1.5-2.0	2015-08-19	2050 10	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10 <10	<10 <10	-	-	-	-		-	-	-	-	-	-	-	-		-
	BH15-095	2.5-3.0	2015-08-19	15	-	<0.005	<0.05			<10	<10	29	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-096	0.3-0.6	2015-08-19	35	-	<0.005	<0.05	<0.01	<0.05	<10	<10	51	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-096	0.6-1.0	2015-08-19	5	-	<0.005	<0.05		<0.05	<10	<10	35	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-096	1.0-1.5	2015-08-19	15	- 0.55	<0.005	<0.05	<0.01	<0.05	<10	28	110	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	BH15-097 BH15-097	0.3-0.6 0.6-1.0	2015-08-19 2015-08-19	360 510	0.55	<0.005 <0.005	<0.05	<0.01	<0.05	<10 <10	11 <10	188 11	73 <10	-	-	-	-	-	-	-	-	-	-	-	- :	-		-
	BH15-097	1.0-1.5	2015-08-19	120	0.41	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-		-		-	-	-	-	-					
	BH15-098	0.6-1.0	2015-08-19	155	0.41	<0.005	0.50	0.030	0.25	10	648	555	<10	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-098	1.5-2.0	2015-08-19	35	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-098	2.5-3.0	2015-08-19	75	-	<0.005	<0.05		<0.05	<10	18	32	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-099	0.3-0.6	2015-08-19	520	1.21	<0.005	6.94	0.23	1.48	<10	611	1500	181	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-099 BH15-099	1.0-1.5 2.5-3.0	2015-08-19 2015-08-19	420 10	0.22	<0.005 <0.005	0.08 <0.05	<0.01	<0.05 <0.05	<10 <10	27 13	30 38	<10 <10	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-100	0.3-0.6	2015-08-19	1550	-	<0.005	6.75	0.04	0.30	<10	162	1440	497	-	-	1 -	-	-	-	-	-	-	-			-		-
	BH15-100	0.6-1.0	2015-08-19	820	0.71	0.011	6.55	<0.01	<0.05	<10	95	1400	626	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-100	2.5-3.0	2015-08-19	60	-	<0.005	<0.05	<0.01	<0.05	<10	15	42	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-101	0.6-1.0	2015-08-19	1400	1.17	0.006	4.49	<0.01	<0.05	<10	30	1240	520	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-101	1.0-1.5	2015-08-19	510	0.27	<0.005	0.09	<0.01	<0.05	<10	17	67	98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-101	2.5-3.0	2015-08-19	50	- 0.27	<0.005	<0.05		<0.05	<10	<10	36	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-102 BH15-102	1.0-1.5 1.5-2.0	2015-08-19 2015-08-19	790 25	0.27	<0.005 <0.005	<0.05 <0.05	0.02 <0.01	<0.05 <0.05	<10 <10	28 10	28 10	36 18	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-102	2.5-3.0	2015-08-19	115	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-		-	-	-	-	-	-	-	-		-	-	-
	BH15-103	0.3-0.6	2015-08-19	850	0.58	<0.005	9.73	<0.01	<0.05	10	20	906	515	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-103	0.6-1.0	2015-08-19	340	0.43	<0.005	0.30	<0.01	<0.05	<10	<10	36	34	-	-	-	-	-	-	-	-	-	-		-		-	-
	BH15-103	1.0-1.5	2015-08-19	40	0.05	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-104	0.15-0.3	2015-08-19	1250	-	0.0200	1.98	<0.01	<0.05	<10	16	913	518	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tank Farm	BH15-104 BH15-104	0.3-0.6 1.0-1.5	2015-08-19 2015-08-19	1050 45	-	<0.005 <0.005	1.17 <0.05	<0.01	<0.05 <0.05	10 <10	<10 <10	1190 12	685 14	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-105	0.15-0.3	2015-08-19	300	-	0.018	6.30	0.26	1.93	20	123	511	305	-	-	1 -	-	-	-	-	-	-	-			-		-
	BH15-105	0.3-0.6	2015-08-19	680	0.50	0.009	2.30	0.04	0.18	<10	37	1410	747	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-105	1.0-1.5	2015-08-19	25	0.45	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-106	0.3-0.6	2015-08-19	430	0.20	0.005	6.43	0.06	0.39	10	118	627	327	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-106	0.6-1.0	2015-08-19	350	-	<0.005	0.46	<0.01	<0.05	<10	<10	60	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-106	1.0-1.5 0.15-0.3	2015-08-19 2015-08-19	70 105	-	0.011 <0.005	<0.05 0.17	<0.01 0.15	<0.05	<10 10	<10	<10 122	<10 51	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-107 BH15-107	0.15-0.3	2015-08-19	1050	-	0.776	25.5	0.15	1.29 4.40	70	204 59	2450	1120	-	-	+ -	-	-	-	-		-	-	-		-		-
	BH15-107	2.5-3.0	2015-08-19	0	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	37	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-108	0.15-0.3	2015-08-19	590	-	0.103	2.09	0.57	9.61	330	9420	167	67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-108	1.0-1.5	2015-08-19	1850	0.27	0.527	0.44	3.38	18.4	130	652	<10	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-108	2.5-3.0	2015-08-19	10	-	<0.005	<0.05	<0.01	<0.05	<10	<10	<10	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-109 BH15-109	1.0-1.5 2.0-2.5	2015-08-19 2015-08-19	510 290	0.30	0.012	<0.05	0.01 <0.01	0.100 <0.05	<10 <10	226	36 <10	<10 <10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-109	9.0-9.5	2015-08-19	260	-	<0.005 0.029	0.09	0.02	<0.05	<10	<10 <10	14	36	-	-	-	-	-	-	-	-	-	-	-		-		-
	BH15-110	0.15-0.3	2015-08-19	200	-	0.023	0.65	0.72	3.56	140	3280	115	44	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-110	0.3-0.6	2015-08-19	890	0.33	0.421	3.71	0.78	4.48	70	718	1930	989	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-110	1.0-1.5	2015-08-19	105	-	<0.005	<0.05		<0.05	<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-111	0.0-0.15	2015-08-19	220	-	0.034	0.94		2.88	160	1540	239	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-111	0.3-0.6	2015-08-19	700	-	0.055	1.32	0.01	<0.05	<10	44	1160	544	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-111 BH15-112	1.0-1.5 0.6-1.0	2015-08-19 2015-08-19	15 1050	-	<0.005 0.026	<0.05 0.050		<0.05 0.34	<10 <10	<10 <10	<10 <10	<10 <10	-	-	-	-	-	-	-	-	-	-	-		-		-
	BH15-112	1.0-1.5	2015-08-19	195	-	0.021	<0.05			<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-112	2.5-3.0	2015-08-19	5	-	<0.005	<0.05			<10	<10	<10	<10	-	-	-	-	-	-	-	-	-	-	-	_	_		-
	BH15-122	0.0-0.15	2015-08-20	30	0.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-122	0.3-0.6	2015-08-20	40	0.20	<0.005	<0.05			<10	44	2090	1770	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	<0.01
	BH15-122	0.6-1.0	2015-08-20	40	0.20	<0.005	<0.05		<0.05	<10	<10	22	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	BH15-122 BH15-115	1.0-1.5 0.0-0.15	2015-08-20 2015-08-20	30 20	0.39	<0.005 <0.005	<0.05 <0.05			<10 <10	<10 <10	20 243	19 201	-	-	-	-	-	-	-	-	-	-	-		-		-
	BH15-116	0.0-0.15	2015-08-20	5	- 0.31	<0.005	<0.05			<10	<10	133	111	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	<0.01
	BH15-116	0.15-0.3	2015-08-20	45	-	<0.005	<0.05		<0.05	<10	35	771	613	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	<0.01
Tundra	BH15-117	0.0-0.15	2015-08-20	5	-	<0.005	<0.05			<10	<10	282	228	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tullula	BH15-118	0.0-0.15	2015-08-20	0	-	<0.005	<0.05		<0.05	<10	<10	152	114	-	-	-	-	-	-	-	-	-	-	-	-	-		-
	BH15-119	0.0-0.15	2015-08-20	0	-	<0.005	<0.05		<0.05	<10	<10	244	226	0.005	0.005			-			-	0.005	0.01	0.00		0.00=		
	BH15-120 BH15-121	0.0-0.15 0.0-0.15	2015-08-20 2015-08-20	5	-	<0.005 <0.005	<0.05	<0.01	<0.05 <0.05	<10 <10	76 <10	215 160	174 123	<0.005	<0.005	<0.004	<0.03	<0.03	<0.05	<0.05	<0.05	<0.005	<0.01	<0.02	<0.05	<0.005	<0.02	<0.01
	DU13-171	0.0-0.15	2013-08-20	5		\U.UU5	~∪. 05	\U.U1	VU.U5	<10	<10	100	123			<u> </u>								-	-	-		

m bgs = metres below ground surface
 - = sample not analyzed for parameter

2. - - Sample not analyzed for parameter

3. □ Trent and/or applicable guidelines are bolded
□ (yellow highlight) = Exceeds applicable guidelines

4. View analytical report for more comprehensive results

5. Government of Northwest Territories (GNWT), 2003. Environmental Guideline for Contaminated Site Remediation. November 2003. Applied guideline is most stringent of "Eco Soil Contact" and "Protection of Groundwater for Aquatic Life" pathway values



Table 3: Summary of Groundwater Monitoring Well Details

Monitoring Well ID	Date (yyyy-mm-dd)	Ground Elevation (m bgs) ⁽¹⁾	Casing Elevation (m)	Groundwater Elevation (m)	Top of Screen (m bgs)	Bottom of Screen (m bgs)	Total Depth (m btoc)	Depth to Groundwater (m btoc) ⁽³⁾	Notes
P06-1	2015-08-20	13.57	14.35	13.31	0.15	0.56	0.924	0.483	-
P06-2	2015-08-20	12.56	13.36	12.22	0.24	0.65	0.617	0.225	-
P06-3	2015-08-20	10.21	11.01	9.44	0.39	0.80	1.079	0.421	-
P06-4	2015-08-20	11.25	11.25	-	1.07	1.80	2.485	-	Dry
P06-5	2015-08-20	10.43	10.43	8.90	0.29	0.70	2.700	2.391	Insufficient amount of water for sample collection.
P06-6	2015-08-20	14.32	14.32	12.69	0.20	0.93	2.372	1.851	Insufficient amount of water for sample collection.
P06-7	2015-08-20	14.73	14.73	13.56	0.15	0.56	1.425	0.905	-

Notes:

bgs - below ground surface
 btoc - below top of casing



Table 4: Groundwater Analytical Results for Routine Parameters

Table 4. Gloundwater And	•																					
GENERAL												Routine P	arameters									
Location	Sample Date (yyyy-mm-dd)	Н	EC	SAR	Total Alkalinity	Hardness	Total Dissolved Solids (TDS)	Bicarbonate	Carbonate	Hydroxide	Fluoride	Chloride	Sulphate	Calcium	Magnesium	Sodium	Potassium	Fluoride	Nitrate (as nitrogen) ⁽⁴⁾	Nitrite (as nitrogen)	Nitrate + Nitrite (as nitrogen)	Ionic Balance
	Units	-	dS/m	-	mg/L	mg/L CaCO ₃	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%
GUIDELINES																						
CEQG - Freshwater	Aquatic Life	6.5-8.5	-	-	-	-	500	•	-	-	0.12	120	-	-	-	200	-	0.12	13	0.06	-	-
GROUNDWATER DATA																						
P06-1	2015-08-20	6.97	888	1.55	475	358	554	580	<5	<5	<0.05	10	3	84.4	35.7	67.3	<0.6	<0.05	<0.02	<0.05	<0.02	105
P06-2	2015-08-20	6.97	571	2.54	262	165	347	319	< 5	<5	<0.05	14	6	41.8	14.8	75.2	1.1	<0.05	<0.02	<0.05	<0.02	115
P06-3	2015-08-20	6.95	1020	0.542	459	353	616	560	<5	<5	<0.05	30	31	94.4	28.4	23.4	66.4	<0.05	0.16	<0.05	0.16	96
PO6-7	2015-08-20	6.96	729	1.18	371	310	448	452	<5	<5	<0.05	13	6	75.9	29.2	47.7	0.9	<0.05	<0.02	<0.05	<0.02	106
FEILD BLANK	2015-08-20	5.91	<1	0	<5	<1	<0.6	<5	<5	<5	<0.05	<1	<1	<0.3	<0.2	<0.6	<0.6	<0.05	<0.02	<0.05	<0.02	13
TRIP BLANK	2015-08-20	5.35	<1	0	<5	<1	<0.6	<5	<5	<5	<0.05	<1	<1	<0.3	<0.2	<0.6	<0.6	<0.05	<0.02	< 0.05	<0.02	13

Notes:

1. Current and/or relevant guidelines are bolded

2. (yellow highlight) = Exceeds applicable guidelines

3. View analytical report for more comprehensive results

4. Guidelines are based on the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) for Freshwater Aquatic Life, 1999 as amended (CCME 2007)

Table 5: Groundwater Analytical Results for Dissolved Metals Parameters

GENER	Dissolved Metals																		
Location	Sample Date (yyyy-mm-dd)	Aluminum ⁽⁷⁾	Antimony	Arsenic	Barium	Boron	Cadmium ⁽³⁾	Chromium	Copper	Iron	Lead ⁽⁴⁾	Manganese	Molybdenum	Nickel ⁽⁵⁾	Selenium	Silver	Thallium	Uranium	Zinc
Units	Units		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
GUIDELINES																			
CEQG - Freshwate	r Aquatic Life	0.1	-	0.005	-	-	0.00002	-	0.004	0.3	0.007	-	0.073	0.15	0.001	0.0001	0.0008	-	0.03
GROUNDWATER DA	ITA																		
P06-1	2015-08-20	0.293	0.003	0.003	0.24	0.3	0.000063	<0.001	0.003	6.8	0.0026	0.182	0.020	0.01	0.001	<0.00006	<0.0005	0.001	<0.01
P06-2	2015-08-20	0.087	0.002	0.002	0.16	0.22	0.000128	0.001	0.005	0.2	0.0011	0.283	0.007	0.01	<0.0005	<0.00006	<0.0005	0.002	0.02
P06-3	2015-08-20	0.063	0.001	0.005	0.33	0.21	0.000028	0.001	0.001	13.1	<0.0005	1.22	0.005	<0.01	<0.0005	<0.00006	<0.0005	<0.001	<0.01
PO6-7	2015-08-20	0.124	<0.001	0.003	0.25	0.05	0.000216	0.001	0.004	1.8	0.0011	0.718	0.002	0.01	0.0018	<0.00006	<0.0005	0.003	0.02
FEILD BLANK	2015-08-20	<0.004	<0.001	<0.001	<0.05	<0.01	<0.000016	<0.001	0.002	<0.1	<0.0005	<0.005	<0.001	<0.01	<0.0005	<0.00006	<0.0005	<0.001	<0.01
TRIP BLANK	2015-08-20	<0.004	<0.001	<0.001	<0.05	<0.01	<0.000016	<0.001	<0.001	<0.1	<0.0005	<0.005	<0.001	<0.01	<0.0005	<0.00006	<0.0005	<0.001	<0.01

Notes:

- 1. Current and/or relevant guidelines are bolded
- 2. (yellow highlight) = Exceeds applicable guidelines
- 3. View analytical report for more comprehensive results
- 4. data not available and/or analyzed
- 5. Guidelines are based on the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) for Freshwater Aquatic Life, 1999 as amended (CCME 2007)
- 6. Aluminum guideline is 0.005 mg/L at pH < 6.5; 0.1 mg/L at pH > 6.5
- 7. CCME Cadmium guideline(mg/L) = $0.001*10^{(0.86(log(hardness))-3.2)}$
- 8. CCME Lead guideline is 0.001 mg/L at hardness of 0 to 60 mg/L; 0.002 mg/L at hardness of 60 to 120 mg/L; 0.004 mg/L at hardness of 120 to 180 mg/L; 0.007 mg/L at hardness > 180 mg/L
- 9. CCME Nickel guideline is 0.025 mg/L at hardness of 0-60 mg/L; 0.065 mg/L at hardness of 60-120 mg/L; 0.11 mg/L at hardness of 120-180 mg/L; 0.15 mg/L at hardness > 180 mg/L



Table 6: Groundwater Analytical Results for PHC and PAH Parameters

GENERAL	GENERAL Petroleum Hydrocarbons				Polycyclic Aromatic Hydrocarbons																				
Location	Sample Date (yyyy-mm-dd)	Benzene	Toluene	Ethylbenzene	Xylenes	Acenapthene	Acenaphthylene	Acridine	Anthracene	Benzo[a]anthracene	benzo[b+j]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Benzo[g,h,i]perylene	B(a)P TPE ⁽²⁾	Chrysene	Dibenz[a,h]anthracene	Fluoranthene	Fluorene	Ideno[1,2,3-c,d]pyrene	2-Methylnapthalene	Naphthalene	Phenanthrene	Pyrene	Quinoline
Units		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
GUIDELINES																									
CEQG - Freshwater A	Aquatic Life	0.37	0.002	0.09	-	0.0058	-	0.0044	0.000012	0.000018	-	-	0.000015	-	-	-	-	0.00004	0.003	-	-	0.0011	0.0004	0.000025	0.0034
GROUNDWATER DATA																									
P06-1	2015-08-20	<0.0005	0.0004	<0.0005	0.0006	<0.00001	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00005
P06-2	2015-08-20	<0.0005	<0.0003	<0.0005	<0.0005	<0.00001	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00005
P06-3	2015-08-20	0.0062	0.0003	0.0161	0.0217	0.00002	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.0119	0.0192	<0.00001	<0.00001	<0.00005
PO6-6	2015-08-20	<0.0005	<0.0003	<0.0005	<0.0005	<0.00001	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00005
PO6-7	2015-08-20	<0.0005	<0.0003	<0.0005	0.001	<0.00001	<0.00001	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	<0.00001	<0.00005
FEILD BLANK	2015-08-20	<0.0005	<0.0003	<0.0005	<0.0005	<0.00001	<0.00001			<0.00001				<0.00001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00005
TRIP BLANK	2015-08-20	<0.0005	< 0.0003	< 0.0005	< 0.0005	< 0.00001	< 0.00001	< 0.00005	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001	< 0.00001	< 0.00001	<0.00001	< 0.00001	<0.00001	<0.00001	<0.00001	<0.00001	< 0.00001	< 0.00005

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- 1. Current and/or relevant guidelines are bolded
- 2. (yellow highlight) = Exceeds applicable guidelines
- 3. View analytical report for more comprehensive results
- 4. Guidelines are based on the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) for Freshwater Aquatic Life, 1999 as amended (CCME 2007)



Table 7: Summary of Quality Assurance / Quality Control Results for Salinity, Physical, and Trace Metal Parameters

GENERAL	DETAILED SALINITY	PHYSICAL TRACE METALS
Location Sample Depth (m bgs) Sample Depth (m bgs) Sample Depth (yyyy-mm-dd)	pH (CaCl ₂ Extr Electrical Conc Sodium Adsor Magnesium Potassium Potassium Sulphate	Saturation Percentage Tamicron sieve Antimony Antimon
Residential/Parkland Area - Coarse Surface Soil Residential/Parkland Area - Coarse Surface Soil Residential/Parkland Area - Coarse Subsoil Residenti	6-8	- - 20 12 500 4 10.0 64 50 63 140 6.6 10 50 1 20 1 50 - 130 200 - - 20 12 500 4 10.0 64 50 63 140 6.6 10 50 1 20 1 50 - 130 200 -
Detection Limits	- 0.05 - 1 1 2 2 2 2 - 0.38 0.93 61 24 24 52 90 212 - 0.43 0.94 50 18 35 6 83 44	- - 0.5
Relative Percent Difference (RPD) (%) Absolute Difference	- 12% 1% 20% 29% 37% 159% 8% 131% - 0.05 0.01 11 6 11 46 7 168	- - - 20% 56% - - 1% 27% 44% 14% - 60% 19% - - - 131% - 21% 50% - - 1 182 - - 0.2 0.7 2.3 0.7 - 0.6 1.9 - - - 9.5 - 3.5 8
BH15-037 0.6-1.0 2015-08-16 DUP B 2015-08-16	- 0.53 4.21 23 10 5 72 48 37 - 0.56 4.33 24 4 75 11 61 52	71 - <0.5 5.5 103 <0.5 <0.5 11 4 4 4 - 1 11 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5
Relative Percent Difference (RPD) (%) Absolute Difference	- 6% 3% 4% 86% 175% 147% 24% 34% - 0.03 0.12 1 6 70 61 13 15	- - 7% 61% - - 11% 10% 8% 35% - 46% 9% - - - - 40% 33% - - 0.4 90 - - 1.3 0.4 0.3 1.5 - 0.3 1 - - - - 6.6 7
BH15-040 0.6-1.0 2015-08-16 DUP C 2015-08-16	- 0.26 0.2 14 <2 2 2 <2 5 - 0.28 0.24 11 2 <2 <2 <2 5	39 - <0.5 6 134 <0.5 <0.5 11 4 3 3 3 - 1 10 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 14 25 <0.5 6.3 103 <0.5 <0.5 5 4 4 3 - 1 10 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.
Relative Percent Difference (RPD) (%) Absolute Difference	- 7% 18% 24% 0% - 0.02 0.04 3 0	- - 5% 26% - - 70% 3% 3% 0% - 46% 8% - - - - 8% 13% 13% - - - 0.3 31 - - 5.7 0.1 0.1 0 - 0.3 0.8 - - - - - 1 3
BH15-044 0.6-1.0 2015-08-16 DUP D 2015-08-16	- 0.39 0.5 97 5 25 32 92 159 - 0.29 0.45 65 16 22 <2 86 53	230 - <0.5
Relative Percent Difference (RPD) (%) Absolute Difference	- 29% 11% 40% 105% 13% - 7% 100% - 0.1 0.05 32 11 3 - 6 106	10% 22% 44% 9% 12% 60% - 31% 19% 0% 0% 0% 9% 5.8 0.4 0.9 4.3 - 0.4 2.9 0 0 0 0 2
BH15-045 0.6-1.0 2015-08-16 DUP E 2015-08-16	- 0.4 2.11 10 <2 3 16 15 12 - 0.32 0.57 12 4 5 <2 6 9	31 - <0.5 6 94.5 <0.5 <0.5 11 4 4 3 - 1 11 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 15 23 <0.5 5.8 92.2 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5
Relative Percent Difference (RPD) (%) Absolute Difference	- 22% 115% 18% - 50% - 86% 29% - 0.08 1.54 2 - 2 - 9 3	3% 2% 41% 0% 3% 3% - 13% 10% 13% 4% 0.2 2.3 3.6 0 0.1 0.1 - 0.1 1.1 1.8 1
BH15-055 0.6-1.0 2015-08-17 DUP F 2015-08-17	6.72	38 - <0.5 6.5 113 <0.5 <0.5 9 5 4 4 - 1 12 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 14 27 38 - <0.5 6.4 100 <0.5 <0.5 6 4 4 4 - <0.5 10 <0.5 10 <0.5 <0.5 <0.5 <0.5 <0.5 <0.5 13 25
Relative Percent Difference (RPD) (%)	0% 35% 27% 33% 5 0% 0 %	0% 2% 12% 32% 14% 13% 0% 18% 11% 8%
Absolute Difference BH15-065 0.3-0.6 2015-08-17	0.03	114 0.1 13 2.4 0.6 0.5 0 1.9 1.5 2
DUP G 2015-08-17 Relative Percent Difference (RPD) (%)	5.59 0.33 0.30 43 18 10 2 16 41 2% 11% 7% 23% 15% 0% 0% 0% 48%	106 - <0.5 4 318 <0.5 <0.5 11 4 6 5 - 1 12 1 <0.5 <0.5 1 1 22 31 7% -
Absolute Difference BH15-069 0.3-0.6 2015-08-17	0.13 0.04 0.02 11 3 0 0 0 26 5.18 0.27 0.18 54 17 7 6 14 68	8
DUP H 2015-08-17 Relative Percent Difference (RPD) (%)	5.32 0.33 0.14 64 21 6 5 12 152 3% 20% 25% 17% 21% 15% 18% 15% 76%	152 - <0.5 3.9 209 <0.5 <0.5 11 3 4 4 - 1 9 1 <0.5 <0.5 1 1 1 13 10 9% 55% 36% 55% 16% 44% 5% - 52% 20% 35% 44% 24% 67%
Absolute Difference BH15-081 0.6-1.0 2015-08-18		13 0.2 64 0.5 0.5 0.5 2.5 0.2 - 0.35 2 0.3 0.4 3.6 10
DUP J 2015-08-18 Relative Percent Difference (RPD) (%)	5.86 1.64 5.89 71 22 205 7 34 544 3% 72% 158% 59% 27% 139% 15% 27% 168%	85 - <0.5 5.1 138 <0.5 <0.5 7 6 5 5 - 1 17 <0.5 <0.5 <0.5 <0.5 1 14 24 34%
Absolute Difference Notes:	0.15 0.87 5.19 60 7 168 1 8 497	35



^{1.} Applicable values (RPD or AD) are bolded. RPD is applicable if parameter concentrations in both samples are greater than or equal to 5x the detection limit; otherwise AD is applicable.

2. (yellow highlight) = Exceeds Zeiner criteria (RPD must be less than or equal to 20%, or AD is greater than method detection limit).

3. View analytical report for more comprehensive results

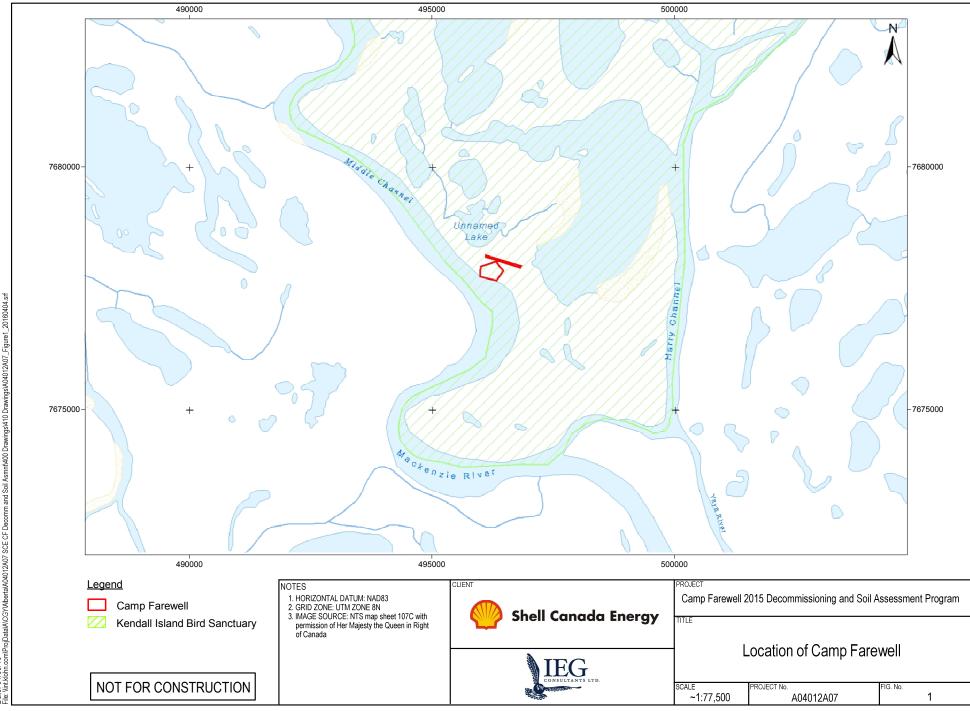
Table 8: Summary of Quality Assurance / Quality Control Results for PHC and PAH Parameters

	GENERAL					PETROLEUM HYDROCARBONS											
Location	Sample Designation	Sample Depth (m bgs)	Sample Date (yyyy-mm-dd) Units	mg/kg	Toluene mg/kg	Ethylbenzene	X/lenes mg/kg	T. mg/kg	C mg/kg	₩ mg/kg	mg/kg						
METHOD DETECTION LIMITS GNWT 2003 Residential/Parklan	d	Surface (0-1.5		0.5	0.8	1.2	1	130	150	400	2800						
ANALYTICAL	<u> </u>	Subsurface	5 280/	0.5	0.8	1.2	1	230	150	2,500	10,000						
	BH15-035	0.3-0.6	2015-08-16	0.005 < 0.005	0.05 3.56	0.01 <0.01	0.05 <0.05	10 <10	10 <10	10 434	10 209						
	DUP A		2015-08-16	<0.005	11	2.48	<0.05	13	102	2,040	1,030						
	Percent Difference Absolute Difference			-	102% 7.44	-	-	-	-	130% 1606	133% 821						
	BH15-037 DUP B	0.6-1.0	2015-08-16 2015-08-16	<0.005 <0.005	<0.05 <0.05	<0.01 <0.01	<0.05 <0.05	<10 <10	14 <10	442 59	218 <10						
Relative	Percent Difference	(RPD) (%)	2010 00 10	-	-	-	-	-	-	153%	-						
	Absolute Difference	e		-	-	-	-	-	-	383	-						
	BH15-040 DUP C	0.6-1.0	2015-08-16 2015-08-16	<0.005 <0.005	<0.05 <0.05	<0.01 <0.01	<0.05 <0.05	<10 <10	<10 <10	18 <10	<10 <10						
	Percent Difference Absolute Difference			-	-	-	-	-	-	-	-						
	BH15-044	0.6-1.0	2015-08-16	0.023	8.04	3.54	20	31	<10	842	320						
	DUP D		2015-08-16	<0.005	3.52	2.48	17.7	24	16	381	89						
	Percent Difference Absolute Difference			-	78% 4.52	35% 1.06	12% 2.3	25% 7	-	75% 461	113% 231						
	BH15-045 DUP E	0.6-1.0	2015-08-16 2015-08-16	<0.005 <0.005	<0.05 <0.05	<0.01 <0.01	<0.05 <0.05	<10 <10	<10 <10	<10 <10	<10 <10						
	Percent Difference Absolute Difference			-	-	-	-	-	-	-	-						
	BH15-055 DUP F	0.6-1.0	2015-08-17 2015-08-17	<0.005 <0.005	<0.05 <0.05	<0.01 <0.01	<0.05 <0.05	<10 <10	<10 <10	<10 <10	<10 <10						
	Percent Difference		2013-08-17	-	-	-	-	-	-	-	-						
	Absolute Difference BH15-065	0.3-0.6	2015-08-17	<0.005	5.63	<0.01	<0.05	<10	<10	261	197						
	DUP G		2015-08-17	<0.005	4.89	<0.01	<0.05	<10	12	386	225						
	Percent Difference Absolute Difference			-	14% 0.74	-	-	-	-	39% 125	13% 28						
	BH15-069 DUP H	0.3-0.6	2015-08-17 2015-08-17	<0.005 <0.005	0.25 <0.05	<0.01 <0.01	<0.05 <0.05	<10 <10	15 28	670 851	321 449						
	Percent Difference Absolute Difference			-	-	-	-	-	60% 13	24% 181	33% 128						
	BH15-071 DUP I	0.3-0.6	2015-08-17 2015-08-17	<0.005 <0.005	2.58 0.52	<0.01 <0.01	<0.05 <0.05	<10 <10	<10 15	538 661	184 319						
	Percent Difference Absolute Difference			-	133% 2.06	-	-	-	-	21% 123	54% 135						
	BH15-081 DUP J	0.6-1.0	2015-08-18 2015-08-18	<0.005 <0.005	4.09 10	0.06 2.88	0.39 24.3	20 450	326 8910	850 6,260	267 159						
	Percent Difference Absolute Difference			-	84% 5.91	192% 2.82	194% 23.91	183% 430	186% 8584	152% 5410	51% 108						
	BH15-092 DUP K	0.6-1.0	2015-08-19 2015-08-19	0.009 <0.005	0.06 0.16	<0.01 <0.01	<0.05 <0.05	<10 <10	<10 <10	63 46	31 <10						
	Percent Difference Absolute Difference			-	91% 0.1	-	-	-	-	31% 17	-						
	BH15-112 DUP L	0.6-1.0	2015-08-19 2015-08-19	0.026 0.033	0.05	0.06 0.04	0.34 0.27	<10 <10	<10 <10	<10 <10	<10 <10						
	Percent Difference			24%	143%	40%	23%	-	-	-	-						
	Absolute Difference	_		0.007	0.25	0.02	0.07	-	-	-	-						
	BH15-119 DUP M	0.0-0.15	2015-08-20 2015-08-20	<0.005 <0.005	<0.05 <0.05	<0.01 <0.01	<0.05 <0.05	<10 <10	<10 <10	244 150	226 140						
	Percent Difference Absolute Difference			-	-	-	-	-	-	48% 94	47% 86						
Notes: 1 Applicable values (RPD or AD) are hold																	

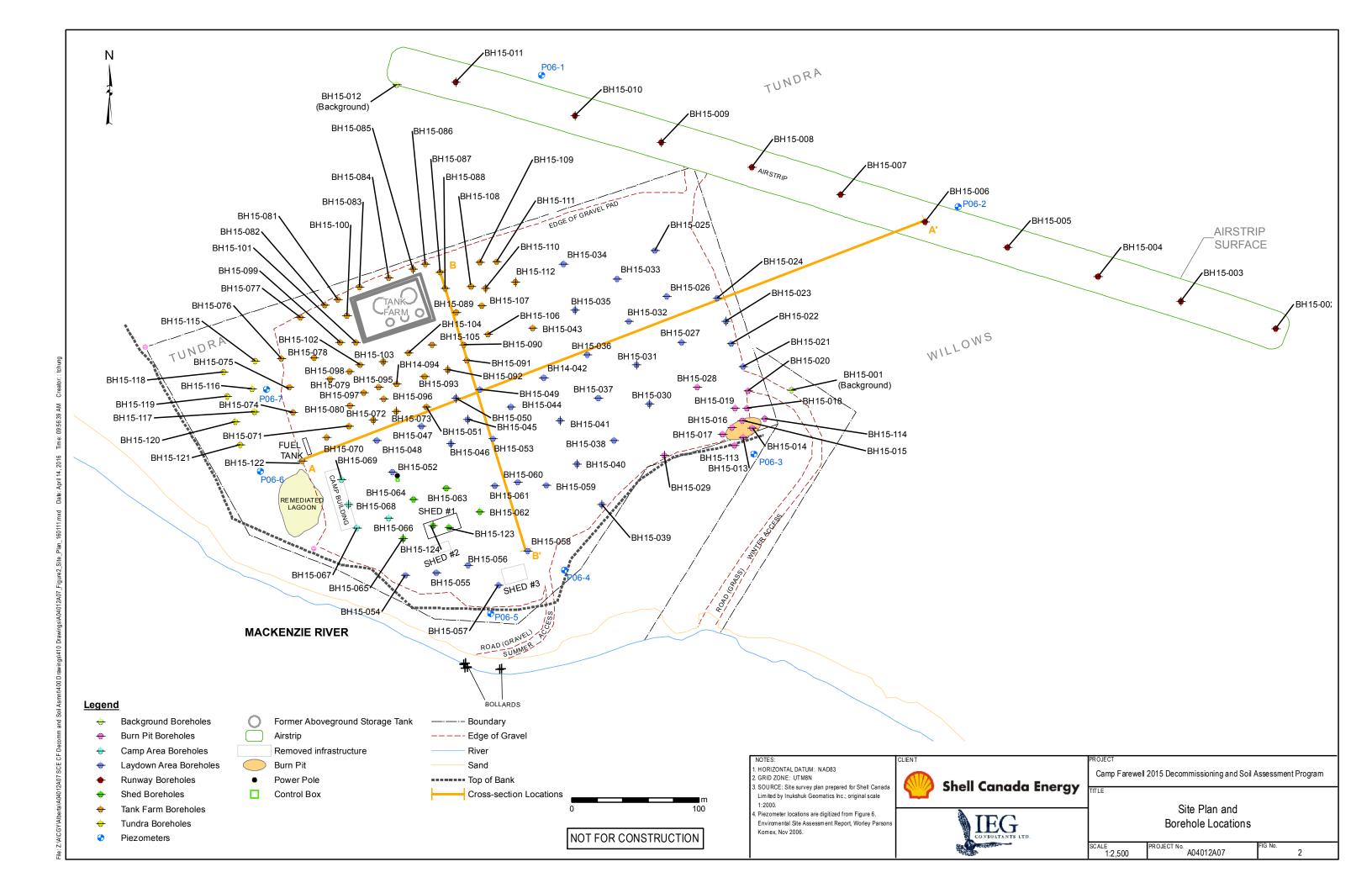
- Applicable values (RPD or AD) are bolded. RPD is applicable if parameter concentrations in both samples are greater than or equal to 5x the detection limit; otherwise AD is applicable.
 (yellow highlight) = Exceeds Zeiner criteria (RPD must be less than or equal to 20%, or AD is greater than method detection limit).

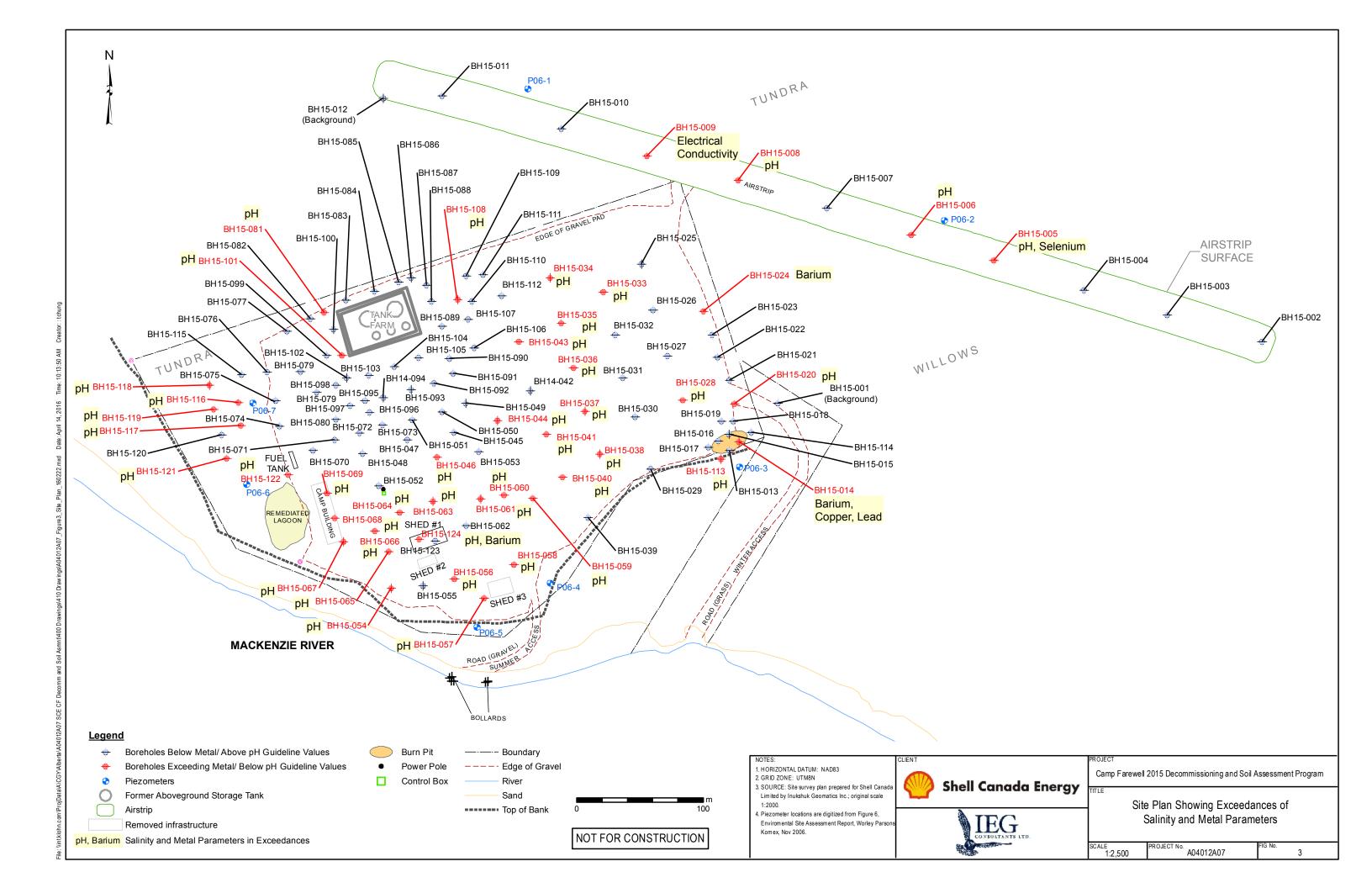


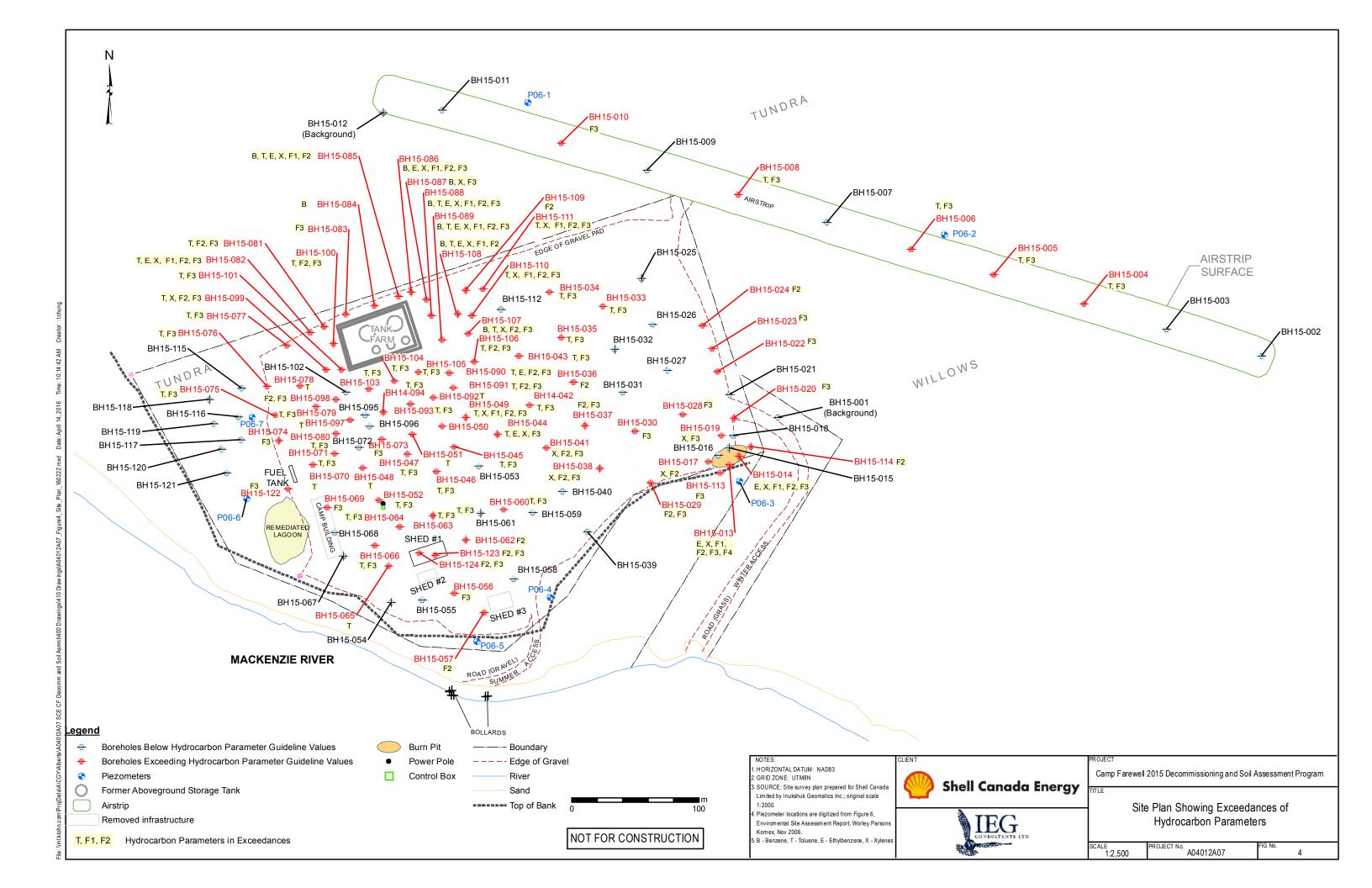
 $^{{\}bf 3.\ View\ analytical\ report\ for\ more\ comprehensive\ results}$

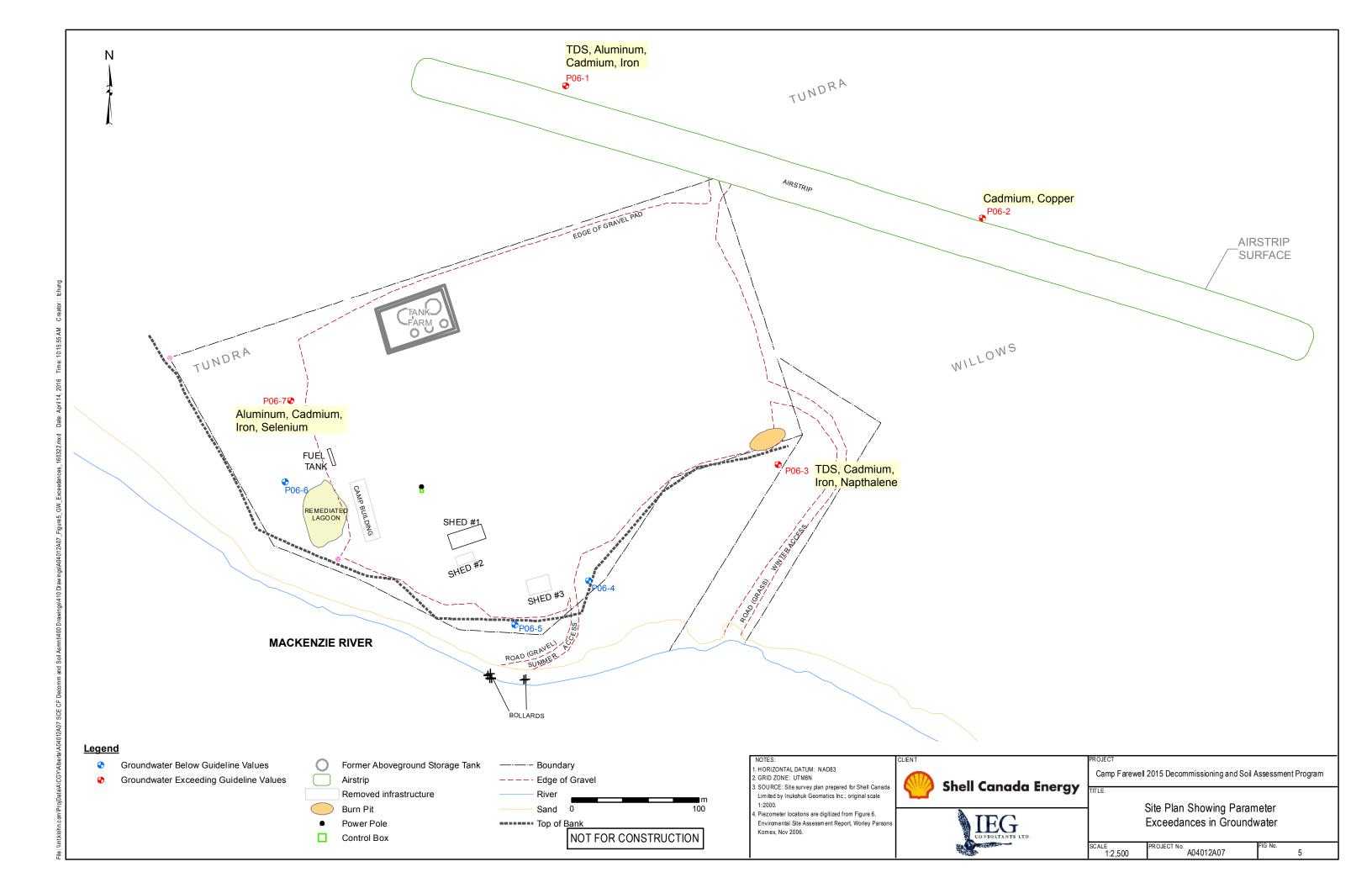


Time: 17:35:19 Date: 04/05/16

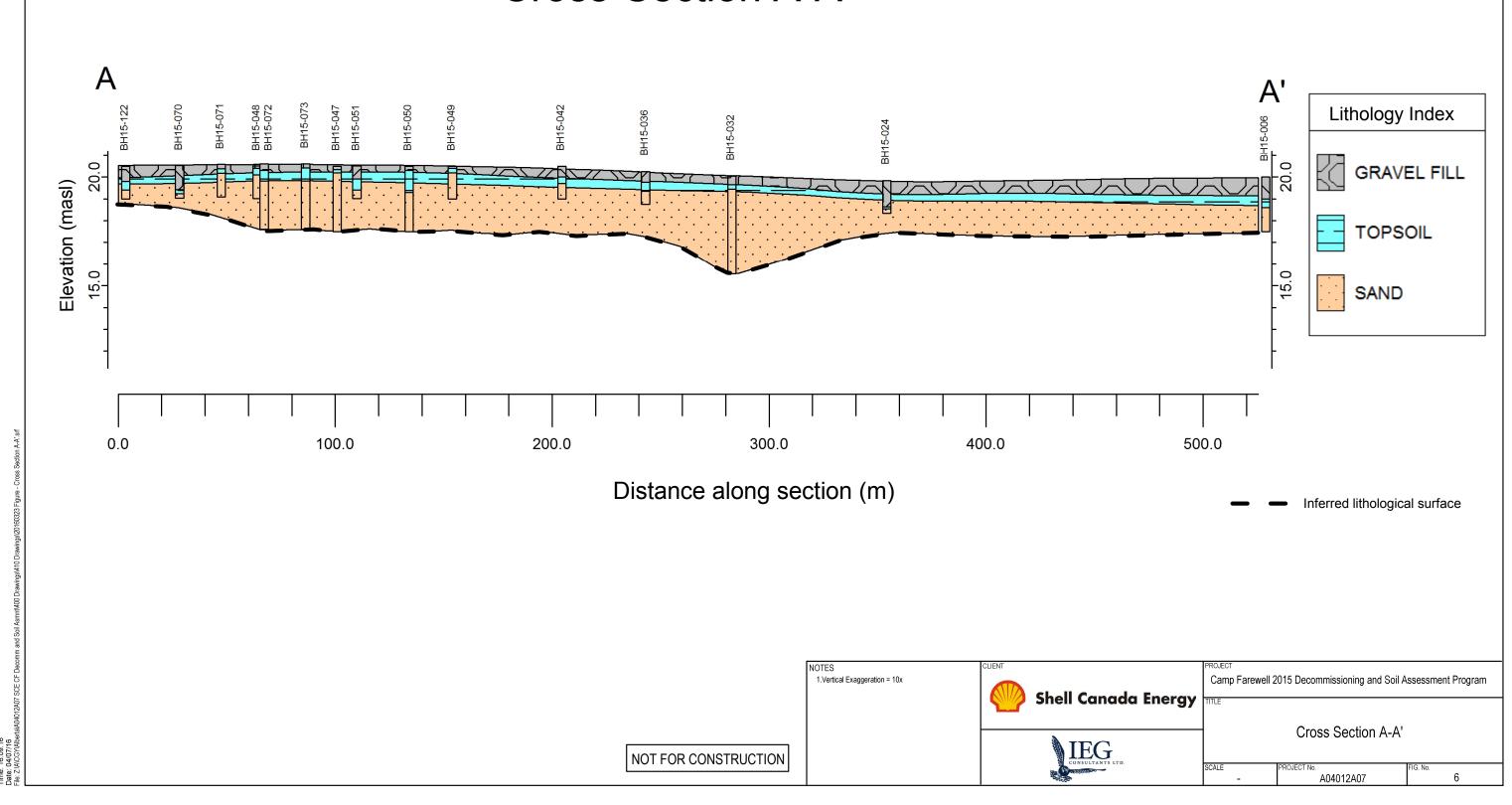








Cross-Section A-A'



Cross-Section B-B' В B' BH15-089 BH15-049 BH15-053 BH15-058 Lithology Index 15.0 20.0 Elevation (masl) Elevation (masl) **GRAVEL FILL TOPSOIL** SAND Inferred lithological surface 0.0 100.0 200.0 Distance along section (m) NOTES Camp Farewell 2015 Decommissioning and Soil Assessment Program 1.Vertical Exaggeration = 10x **Shell Canada Energy** Cross Section B-B' Time: 16:03:08 Date: 04/07/16 File: Z:W\CGY\Albert IEG CONSULTANTS LT NOT FOR CONSTRUCTION A04012A07

I-1 PREVIOUS ENVIRONMENTAL SITE ASSESSMENT PROGRAMS

I-1.1.1 2000

In 2000, Golder and Associates (Golder) conducted a baseline environmental assessment of the Site and Geco-Prakla, a division of Schlumberger Canada, conducted a baseline assessment prior to sub-leasing a portion of the Site from shell. The area of the sub-lease included the main camp accommodations, associated accommodation trailers, the lagoon area and the area south of the storage crates and racks (including Shed #1), and extended to the east of the lease (Worley Parsons, 2011).

I-1.1.2 2001

Phase I and Phase II Environmental Site Assessments (ESAs) were conducted by Komex in 2001. Analyzed parameters reported to exceed applicable guidelines included: total petroleum hydrocarbons (TPHs), polycyclic aromatic hydrocarbons (PAHs), and selected trace metals within (and down gradient of) the burn pit; xylenes and TPHs in the area of the tank farm and the area of the historical tank release; TPHs 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.

In addition, two background samples were collected from locations located to the northeast of the Site; one situated in native tundra (organic soil) and the second located on the gravel airstrip (mineral soil). Salinity parameters, including EC (180 to 360 uS/cm), pH (6.3 to 8.0) and sodium adsorption ratio (SAR) (0.9 to 1.1) were reported within the applicable guidelines for residential/parkland and industrial land uses for both locations. Concentrations of metals parameters were reported below applicable guidelines (WorleyParsons Komex, 2006).

Following the ESAs conducted in 2001, Komex submitted an Interim Abandonment and Restoration Plan to the NWTWB (Komex, 2002).

I-1.1.3 2006

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

Two background soil and groundwater sample locations were established and tested to the northeast of the Site, in areas not likely to have been affected by historical operations. Background soil locations were advance to 0.4 m bgs, to the depth of permafrost. Findings for the background soil and groundwater locations indicated concentrations of hydrocarbons which were attributed to naturally occurring organic material. Salinity parameters EC, pH, and SAR were reported at 251 uS/cm, 6.7, and 0.6, respectively, within and/or below applicable guidelines (WorleyParsons Komex, 2006). Metals parameters were not analyzed.

Hydrocarbon impacts were identified in the vicinity of the burn pit, tank farm, above ground fuel storage tanks, and across the gravel pad including the perimeter. Salinity and barium impacts were identified on the gravel pad (WorleyParsons Komex, 2006).

I-1.1.4 2008

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

I-1.1.5 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 (IEG, 2010). The 2006 Phase II ESA results were summarized, and the remediation activities were described in detail, including the sampling schedule and results.

I-1.1.6 2012

IEG conducted required Site inspections and collected water samples from the lagoon. Site inspections indicated no sign of spills, leaks, and animal or human activity on the Site. Laboratory analytical results for water samples reported values below applicable guidelines and lagoon water was subsequently discharged to the Mackenzie River in accordance with licence number N7L1-1762 (IEG 2012b, IEG 2013a, and IEG 2013b).

I-1.1.7 2013

In 2013, IEG conducted a remediation program at the former lagoon at Camp Farewell. The lagoon excavation was located on the west side of the camp building with the Mackenzie River bordering the south and east sides. The dimensions of the excavation were approximately 52 m by 34 m. The maximum depth of the excavation was approximately 7.5 m. Prior to remedial activities, the lagoon had a depth of approximately 2.5 m. Domestic waste debris was observed in the excavated material, including metal cans, fragments, and plastic debris. Water supply facilities and sewage treatment facilities were also decommissioned and removed during the 2013 Remediation Program.

A total of 96 soil samples were taken from the lagoon excavation: 25 interim soil samples and 71 confirmatory soil samples.

Petroleum Hydrocarbon (PHC) affected soil resulting from previous operations was effectively removed from the lagoon area during the 2013 Remediation Program based on laboratory analytical data. Approximately 1,900 m³ of excavated soil was barged to Hay River and hauled to and disposed at the Tervita Rainbow Lake Landfill in Rainbow Lake, AB. The last load of the barged impacted soil arrived at the landfill on October 16, 2013. Approximately 100 m³ remained on-site in a secured metal shed, to be barged to the landfill during 2014 decommissioning activities (IEG, 2014).

I-1.1.8 2014

Decommissioning activities occurred from August 6, 2014 to September 18, 2014. During the 2014 Decommissioning Program, infrastructure was decommissioned and removed along with miscellaneous materials on-Site, minor investigative soil sampling was conducted, and remaining waste from the 2013 Remediation Program was packaged and removed.

Shed #2, Shed #3, and the camp building were disassembled. Materials that could be recycled such as metals were separated from debris and waste material, for shipment to appropriate facilities. Other materials stored on-Site including rig mats, piping, hoses, wooden crates, and miscellaneous parts were also removed. Materials removed were transported off-Site via barge.

Approximately 18 m³ of remaining waste soil from the 2013 remediation program was packed into soil bags or wooden crates provided by Tervita. Each soil bag and wooden crate contained approximately 1 m³ of impacted soil.

On August 14, 2014, two composite soil samples were collected from the dirt floor of Shed #1 to assess for contaminants. The dirt floor of Shed #1 was compacted and the sampling device could only penetrate to a depth of approximately 0.1 m bgs. Measured concentrations of EC, SAR, sodium, and chloride were reported above background conditions in the two composite soil samples collected. The concentration of total barium and PHC parameter F3 exceeded the applicable guidelines in both composite samples. The concentration of PHC parameter F2 exceeded the applicable guideline in one composite sample.





Environment Environmement Canada Canada

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

DATE:

January 15, 2015

FROM: Paul Latour

CWS

TO:

Randall Warren

Yellowknife,

Shell Canada

Calgary, AB

TEL: 867-669-4769

TEL: FAX:

867-403-269-7948

FAX: 867-873-8185

TOTAL # OF PAGES: 4

SUBJECT: EC/CWS Migratory Bird

Sanctuary Permit

MESSAGE:

Randall:

Attached is a Migratory Bird Sanctuary Permit authorizing you to conduct care, maintenance, and remediation work at the Camp Farewell Stockpile and Lease. Please note Special Conditions 1.(4.) and 6.(1.) which are specific to this permit.

Please sign the "Permittee" line on page 4 and return to me.

Thanks.

Paul L.



Environment Canada Environnement Canada

ENVIRONMENT CANADA

Migratory Birds - Sanctuary	PERIVI		NWT-MBS-15-01	
Permit for Northwest Territories			Permit no.	
province(s), territories		ist.	Issued under section	
Randall Warren Shell Canada Ltd., P.O. Box 100 Station "M"			Migratory Bird Sanctuary Regula	ations
Calgary, AB T2P 2H5			PRIF	-0
Permittee/			10000	4) (g
Date of issue: January 14, 2015			For the Minister	B. 0. 00 0.00
Date of expire: December 31, 2015				** * * * * * * *

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

GENERAL CONDITIONS

- 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.
- 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.
- 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
- 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.
- 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

- 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.
- The Permittee shall, during the cutting up and removal of fuel tanks, ensure that all residual fuel or sludge does not escape or come into contact with the surrounding earth.



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

- 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

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

The Permittee shall submit a report within thirty (30) days of the expiration date of this permit. The report shall describe all activities
that occurred at Camp Farewell during 2015 including the time period of the Permittee's activities on site, location of soil sampling
and laboratory results (if available) as well as remaining infrastructure and photos showing the current state of the Camp Farewell
lease area in particular the former tank location.





Environment Canada Environnement Canada

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

RANDACC WARREN





WATER REGISTER: N7L1-1834

July 18, 2012

Mr. Randal Warren
Manager; DAR and Drilling Waste
Projects and Technology
Shell Canada Energy
400- 4th Avenue S.W.
P.O. Box 100, Station M
Calgary, Alberta T2P 2H5

Dear Mr. Warren:

Re: Issuance of a Type "B" Water Licence- Camp Farewell

Attached is Water Licence N7L1-1834 granted by the Northwest Territories Water Board (the Board) in accordance with the *Northwest Territories Waters Act*. A copy of this Licence has been filed in the Public Registry at the Board offices in Yellowknife and in Inuvik. Water Licence N7L1-1834 has been approved for a period of five years commencing July 18, 2012 and expiring July 17, 2017. Also attached are the general procedures for the administration of Licences in the Northwest Territories. Please review these carefully and address any questions to one of the Board offices.

Please be advised that this letter, with attached procedures, all inspection reports and correspondence related thereto are part of the Board public registry and are intended to keep all interested parties informed of the manner in which the Licence requirements are being met. All public registry material will be considered if an amendment to the Licence or its renewal is requested.

In accordance with the Northwest Territories Water Regulations (NTWR) section 6(1) and 9(1)(b) there will be a requirement for a further payment of the water use fee based on the approved water use of 150 cubic metres per day. The annual water use fee has been calculated to be \$547.50 and is payable to the Receiver General of Canada on the anniversary of the date of issuance of the licence as per section 9(6)(b)(ii) of the NTWR. At the time of your Water Licence application there was a payment of \$30.00 for the first year fee payment and there remains a balance of \$517.50 to be paid for the water use fee at the time the Licence is issued.

Please note for future Water Licence applications in accordance with NTWR section 6(1) an application for a Licence or for the amendment or renewal of a Licence shall be accompanied by a deposit equal to any water use fee that would be payable in respect of the first year of the Licence that is being applied for.

Please read all the conditions carefully and note that in accordance with the attached Water Licence Part B, condition 10, a security deposit in the amount of \$2,000,000.00 shall be posted with the Minister and copied to the Board prior to the start of the operation pursuant to section 17 of the *Northwest*

Territories Waters Act. Submit payment of the security, made out to the Receiver General for Canada in the amount of \$2,000,000.00, to: Aboriginal Affairs and Northern Development Canada, P.O. Box 1500, Yellowknife, NT, X1A 2R3 Attention: Robert Jenkins.

Supplemental information to be submitted by Licensee as required through Licence conditions:

- post and maintain security deposit (by August 17, 2012)
- an Annual Report (by March 31, 2013-2017);
- a map or drawing of SNP sampling locations (by August 17, 2012)
- post signs to identify SNP sampling stations (by August 17, 2012)
- an updated operation and maintenance plan for the Waste Disposal Facilities (by August 17, 2012)
- an updated Emergency Response & Spill Contingency Plan (by August 17, 2012)
- an updated Abandonment and Restoration Plan (by July 17, 2013)
- submit to an Analyst for approval a Quality Assurance/Quality Control Plan (by August 17, 2012)

The full cooperation of Shell Canada Energy is anticipated and appreciated.

Should you have any further questions or concerns, please communicate with the Northwest Territories Water Board by telephone at (867) 678-2942 or via e-mail at info@nwtwb.com.

Sincerely,

Eddie Dillon Chairperson

NWT Water Board

Attached:

Water Licence N7L1-1834

General Procedures for the administration of licences issued under the Northwest

Territories Waters Act in the Northwest Territories

Distribution:

Conrad Baetz, AANDC-NMDO Robert Jenkins, AANDC-WRD

Krista Beavis, Klohn Crippen Berger

Patrick Clancy, GNWT-ENR

Rick Walbourne, DFO Stacey LeBlanc, EC

GENERAL PROCEDURES FOR THE ADMINISTRATION OF LICENCES ISSUED UNDER THE NORTHWEST TERRITORIES WATERS ACT IN THE NORTHWEST TERRITORIES

- At the time of issuance, a copy of the Licence is placed on the Northwest Territories Water Board public registry in the Yellowknife and Inuvik Offices, and is then available to the public.
- 2. To enforce the terms and conditions of the Licence, the Minister of Aboriginal Affairs and Northern Development Canada has appointed Inspectors in accordance with Section 35(1) of the Northwest Territories Waters Act. The Inspectors coordinate their activities with officials of the Water Resources Division of Aboriginal Affairs and Northern Development Canada. The Inspector responsible for Licence N7L1-1834 is located in the North Mackenzie District Office in Inuvik.
- 3. To keep the Northwest Territories Water Board and members of the public informed of the Licensee's conformity to Licence conditions, the Inspectors prepare reports which detail observations on how each item in the Licence has been met. These reports are forwarded to the Licensee with a covering letter indicating what action, if any, should be taken. The inspection reports and covering letters are places on the Northwest Territories Water Board public registry, as are any responses received from the Licensee pertaining to the inspection reports. It is therefore of prime importance that you react in all areas of concern regarding all inspection reports so that these concerns may be clarified.
- 4. If the renewal of Licence N7L1-1834 is contemplated it is the responsibility of the Licensee to apply to the Northwest Territories Water Board for renewal of the Licence. The past performance of the Licensee, new documentation and information, and points raised during a public hearing, if required, will be used to determine the terms and conditions of any Licence renewal. Please note that if the Licence expires and another has not been issued, then water and Waste disposal must cease, or you, the Licensee, would be in contravention of the Northwest Territories Waters Act. An application for renewal of Licence N7L1-1834 should be made at least eight (8) months in advance of the Licence expiry date.
- 5. If, for some reason, Licence N7L1-1834 requires amendment, then a public hearing may be required. You are reminded that applications for amendments should be submitted as soon as possible to provide the Northwest Territories Water Board with ample time to go through the amendment process. The process may take up to six (6) months or more depending on the scope of the amendment requested.

6. Specific clauses of your Licence make reference to the Board, Analyst or Inspector. The contact person, address, phone and fax number of each is:

Board: Executive Director

Northwest Territories Water Board

P.O. Box 2531 Inuvik, NT X0E 0T0

Phone No: (867) 678-2942 Fax No: (867) 678-2943

Analyst: Analyst

Taiga Environmental Laboratory

Aboriginal Affairs and Northern Development Canada

P.O. Box 1500, 4601 – 52nd Avenue

Yellowknife, NT X1A 2R3 Phone No: (867) 669-2788 Fax No: (867) 669-2718

Inspector: Water Resource Officer

North Mackenzie District Office

Aboriginal Affairs and Northern Development Canada

P.O. Box 2100 Inuvik, NT X0E 0T0 Phone No: (867) 777-8900 Fax No: (867) 777-2090

7. Your Licence requires a security deposit be submitted. Should the security deposit be submitted in the form of a "letter of credit", recommended wording is outlined below. It is advised that a "draft" letter of credit be forwarded to Water Resources Division for review. The contact person, address, phone and fax number of the individual administering security deposits is:

Manager

Water Resources Division

Aboriginal Affairs and Northern Development Canada

P.O. Box 1500, 4923 – 52nd Street YELLOWKNIFE, NT X1A 2R3 Phone No: (867) 669-2654

Fax No: (867) 669-2716

[BANK

ADDRESS]

IRREVOCABLE LETTER OF CREDIT

[The term "DOCUMENTARY CREDIT" may also be used instead of "Letter of Credit"]

DATE OF ISSUE: [Date] **OUR REFERENCE NUMBER:** [Bank's reference

number

AMOUNT: CAD\$########.00

MAXIMUM ########.00

CANADIAN DOLLARS ONLY

APPLICANT: BENEFICIARY:

["Customer" can be used instead

of "Applicant"]

[Company's Name]

[Company's Address]

RECEIVER GENERAL FOR CANADA ON BEHALF OF THE MINISTER OF INDIAN AFFAIRS AND NORTHERN

DEVELOPMENT

4923 - 52nd STREET, 2nd FLOOR

P.O. BOX 1500

YELLOWKNIFE, NT X1A 2R3

ATTENTION: REGIONAL DIRECTOR GENERAL DIAND - NT REGION

RE: SECURITY PURSUANT TO [the Water Licence Type and Number]

AT THE REQUEST AND FOR THE ACCOUNT OF [Company's Name] (THE "APPLICANT"), WE, [Bank's Name], HEREBY ESTABLISH IN YOUR FAVOUR OUR IRREVOCABLE LETTER OF CREDIT NO. [Bank's Reference Number] ("CREDIT") FOR SUMS NOT EXCEEDING IN THE AGGREGATE [Amount of Security required stated in Canadian Dollars].

THIS CREDIT IS AVAILABLE WITH US FOR DRAWING AT SIGHT, WITHOUT ENQUIRY AS TO WHETHER YOU HAVE RIGHT AS BETWEEN YOURSELF AND THE APPLICANT TO MAKE SUCH DEMAND AND WITHOUT RECOGNIZING ANY CLAIM OF THE APPLICANT, AGAINST PRESENTATION TO US, BY YOU OR YOUR DULY AUTHORIZED REPRESENTATIVE OR AGENT, OF THE FOLLOWING DOCUMENTS:

- A SIGHT DRAFT DRAWN ON [Bank's Name and Address of the Branch that the security can be drawn at, usually one of the Bank's larger commercial banking centres]; AND
- 2. THE ORIGINAL OF THIS IRREVOCABLE LETTER OF CREDIT NO. [Bank's Reference Number] FOR ENDORSEMENT OF PAYMENT THEREON; AND

- 3. A STATEMENT SIGNED BY AN OFFICIAL OF THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT CERTIFYING
- A) THAT THE SIGNATORY IS AN OFFICIAL OF THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT AND HAS AUTHORITY TO SIGN THE STATEMENT ON BEHALF OF THE MINISTER OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT (THE "MINISTER"), AND
- B) EITHER
- THAT THE MINISTER IS ENTITLED TO APPLY THE AMOUNT DRAWN, BEING ALL OR PART OF THE SECURITY POSTED AND MAINTAINED PURSUANT TO [the Water Licence Type and Number] ISSUED BY THE NORTHWEST TERRITORIES WATER BOARD, WHETHER AS ORIGINALLY ISSUED OR AS AMENDED OR RENEWED FROM TIME TO TIME, OR
- II THAT THIS LETTER OF CREDIT IS DUE TO EXPIRE IN THIRTY (30) DAYS OR LESS AND THAT THE APPLICANT HAS NOT REPLACED THIS CREDIT BY POSTING WITH THE MINISTER OTHER SECURITY SATISFACTORY TO THE MINISTER.

PARTIAL DRAWINGS ARE PERMITTED.

THIS CREDIT IS EFFECTIVE FROM [Time] .AM. ON [Effective Date as required by Water Licence] AND SHALL EXPIRE AT OUR COUNTERS AT [Time] P.M. [Expiry Date] (THE "INITIAL EXPIRATION DATE"). THIS CREDIT SHALL BE RENEWED AUTOMATICALLY FOR AN ADDITIONAL ONE-YEAR PERIOD FROM THE INITIAL EXPIRATION DATE, AND FOR AN ADDITIONAL ONE-YEAR PERIOD FROM EACH FUTURE EXPIRATION DATE, UNLESS AT LEAST NINETY (90) DAYS PRIOR TO THE OPERATIVE EXPIRATION DATE WE NOTIFY YOU IN WRITING BY REGISTERED MAIL OR COURIER THAT WE ELECT NOT TO CONSIDER THIS CREDIT RENEWED FOR SUCH ADDITIONAL PERIOD.

WE HEREBY AGREE THAT ALL DRAFTS DRAWN UNDER AND IN COMPLIANCE WITH THE TERMS OF THIS CREDIT SHALL BE DULY HONOURED BY US IF PRESENTED FOR PAYMENT ON OR BEFORE THE OPERATIVE EXPIRATION DATE.

EXCEPT SO FAR AS IS OTHERWISE EXPRESSLY STATED HEREIN, THIS CREDIT IS SUBJECT TO THE UNIFORM CUSTOMS AND PRACTICE FOR DOCUMENTARY CREDITS (1993 REVISION), INTERNATIONAL CHAMBER OF COMMERCE, PUBLICATION NO. 500. NOTWITHSTANDING ARTICLE 17 OF SAID PUBLICATION, IS THIS CREDIT EXPIRES DURING AN INTERRUPTION OF BUSINESS AS DESCRIBED IN ARTICLE 17, WE AGREE TO EFFECT PAYMENT IF THIS CREDIT IS

DRAWN ON BUSINESS.	US WI	THIN	FIFTEEN	(15)	DAYS	AFTER	THE	RESUMPTION	OF
[Bank's Name]								
Official's Nam	ne and P	ositior	<u></u>		<u>[O</u>	fficial's N	ame a	and Position]	

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	ENERGY
(Licensee) 400- 4 Avenue S.W., P.O of <u>CALGARY, ALBER</u> (Mailing Address)	
to the restrictions and conditions conta	ght to alter, divert or otherwise use water subject ained in the <i>Northwest Territories Waters Act</i> and ubject to and in accordance with the conditions
Licence Number	N7L1-1834
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 INDUSTRIAL UNDERTAKINGS AND ASSOCIATED USES
Description	OIL AND GAS EXPLORATION AND DEVELOPMENT
Quantity of Water Not To Be Exceeded	150 CUBIC METRES DAILY
Effective Date of Licence	JULY 18 TH , 2012
Expiry Date of Licence	JULY 17 TH , 2017
This Licence issued and recorded a conditions.	t Inuvik includes and is subject to the annexed
	NODTHWEST TERRITORIES WATER BOARD

NORTHWEST TERRITORIES WATER BOARD

Witness

PART A: SCOPE AND DEFINITIONS

1. Scope

- a) This Licence entitles Shell Canada Energy to use water and dispose of Waste as an industrial undertaking 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 conforming to 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.
- d) This Licence is issued subject to the conditions contained herein with respect to the use of Waters as prescribed in Section 8 of the *Act* and the deposit of Waste to any Waters as prescribed in Section 9 of the *Act*.

2. <u>Definitions</u>

In this Licence: N7L1-1834

"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" means the discrete average of up to four (4) 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 the lowest elevation of the effective water containment crest on a dam or dyke's upstream slope;
- <u>"Geotechnical Engineer"</u> means a professional engineer registered with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists whose principal field of specialization 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 Waste;
- "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;
- "Minister" means the Minister of Aboriginal Affairs and Northern Development Canada (AANDC);
- "<u>Modification</u>" means an alteration to a physical work that introduces a new structure or replaces an existing structure and does not alter the purpose or function of the work, but does not include an expansion;
- "Regulations" mean Regulations proclaimed pursuant to Section 33 of the Northwest Territories Waters Act;
- "Sewage" means all toilet Wastes and Greywater;
- "Sewage Treatment Facilities" comprises the area and engineered structures designed to contain Sewage as identified in the project description and also include 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;

- "<u>Waste Disposal Facilities</u>" mean all facilities designated for the disposal of Waste and include the Sewage disposal facilities, solid Waste disposal facilities, and bagged toilet Wastes disposal facilities;
- "Water Supply Facilities" mean all facilities designed to collect, treat and supply water for industrial purposes; and
- "<u>Waters</u>" 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 monthly and annual quantities in cubic metres of fresh water obtained from all sources;
 - b) the monthly and annual quantities in cubic metres of each and all Waste discharged;
 - c) the location and direction of flow of all Waste discharged to the water or the land:
 - d) a summary of the monthly and annual quantities of Waste stored on site and transported off site;
 - e) the results of sampling carried out under the "Surveillance Network Program";
 - f) a summary of any Modifications carried out on the Water Supply Facilities and Sewage Treatment Facilities, including all associated structures;
 - g) a list of any spills and unauthorized discharges;
 - h) details on the restoration of any Sumps;
 - a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

- j) a summary of any studies requested by the Board that relate to Waste disposal, water use, or reclamation, and a brief description of any future studies planned;
- k) notation of updates and/or revisions to the approved Spill Contingency Plan, Waste Disposal Facilities operations and maintenance plan, and sewage treatment plan;
- an outline of any spill training and communications exercises carried out;
 and
- m) any other details on water use or Waste disposal requested by the Board within forty-five (45) days before the annual report is due.
- 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 this Licence, submit to the Board for approval a map or drawing indicating the location of all Surveillance Network Program sampling stations.
- 5. The Licensee shall, within thirty (30) days of the issuance of this 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.
- 6. Any meters, devices or other such methods used for measuring the volumes of water used or Waste disposed and discharged shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.
- 7. The Licensee shall immediately report to the 24 Hour Spill Report Line (867-920-8130) any spills which are reported to, or observed by, the Licensee within the project boundaries.
- 8. 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.
- 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.

- 10. Within thirty (30) days of issuance of this Licence, the Licensee shall have posted and shall maintain a security deposit in the amount of Two Million (\$2,000,000.00) Dollars pursuant to Section 17 of the Act and Section 12 of the Regulations, in a form suitable to the Minister. The security deposit shall be maintained until such time as it is fully or in part refunded by the Minister pursuant to Section 17 of the Act.
- 11. 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

- 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. The daily quantity of water used for all purposes shall not exceed 150 cubic metres.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

- 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 Waste Disposal 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.
- All Waste discharged from the onsite Sewage lagoon shall be directed to the channel of the Mackenzie River at a location approved by an Inspector.
- 5. There should be no discharge of floating solids, garbage, grease, free oil or foam.

6. All effluent discharged by the Licensee from the Sewage lagoon at "Surveillance Network Program" Station Number 1834-1 shall meet the following effluent quality requirements:

Sample Parameter	Average Concentration	
BOD₅	70.0 mg/L	
Total Suspended Solids	70.0 mg/L	
Faecal Coliforms	1 X 10 ⁴ CFU/dL	
Oil and Grease	5.0 mg/L	
Total Residual Chlorine (TRC)	0.1 mg/L	

- 7. The effluent discharged shall have a pH between six (6) and nine (9) and no visible sheen of oil and grease.
- 8. Introduction of water to Waste for the purpose of achieving effluent quality requirements in Part D, Item 7 is prohibited.
- A Freeboard limit of 1.0 metre shall be maintained at all times in the Sewage lagoon, or as recommended by a qualified Geotechnical Engineer and/or as approved by the Board.
- 10. The Licensee shall advise an Inspector at least five (5) days prior to initiating and decant of the Sewage lagoon.
- 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.
- 12. The Licensee shall contain all contaminated soil or contaminated snow in such a manner as to minimize the potential for migration of contaminants into any Waters, to the satisfaction of an Inspector.
- 13. The Licensee shall store, segregate and dispose of all solid and hazardous Wastes in a manner acceptable to the Inspector.
- 14. Unless authorized by this Licence, the Licensee shall ensure that any Wastes associated with this undertaking do not enter any water body.
- 15. The Licensee shall submit to the Board a copy of each agreement(s) between third parties to store, transport or dispose of Wastes. The copy submitted to the Board shall include, at a minimum, the following:

- a. type of Waste;
- b. quantities of Waste;
- c. disposal location(s), and
- d. proof of acceptance from third parties.

PART E: CONDITIONS APPLYING TO MODIFICATIONS

- 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 the 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 F, Item 1 have not been met may be carried out only with written approval from an Inspector.
- 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 issuance of this Licence an updated Emergency Response & Spill Contingency Plan in accordance, for example, with the *Guidelines for Spill Contingency Planning, April 2007*, developed by AANDC-Water Resources Division.

- 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 unauthorised 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

- 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, located both on and off the gravel base pad.
- 2. The Licensee shall implement this Plan as and when approved by the Board.
- Following approval of the Plan, the Licensee shall review the 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

Chairman

NORTHWEST TERRITORIES WATER BOARD

LICENSEE: Shell Canada Energy

LICENCE NUMBER: N7L1-1834

EFFECTIVE DATE OF LICENCE: July 18, 2012

EFFECTIVE DATE OF

SURVEILLANCE NETWORK PROGRAM: July 18, 2012

SURVEILLANCE NETWORK PROGRAM

A. Location of Sampling Stations

Station Number Description

1834-1 Discharge from the Sewage lagoon.

B. Sampling and Analysis Requirements

1. Water at Station Number 1834-1 shall be sampled prior to, and once during decanting. Each sample shall be analyzed for the following parameters:

BOD5 Total Suspended Solids

Oil and Grease Faecal Coliforms

Ammonia pH

Phosphorous Total Residual Chlorine

- 2. More frequent sample collection may be required at the request of an Inspector.
- 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 analysis shall be performed in a laboratory approved by an Analyst.
- 5. The Licensee shall, by August 17, 2012, submit to an Analyst for approval a Quality Assurance/Quality Control Plan.

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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 of discharge from the Sewage lagoon, submit to the Board and an Inspector all data and information required by the "Surveillance Network Program" including the results of the approved Quality Assurance/Quality Control Plan.

Witness

NORTHWEST TERRITORIES WATER BOARD

airman

Northwest Territories Water Board Reasons for Decision

Issued pursuant to section 26 of the Northwest Territories Waters Act. S.C. 1992 C.39

Water Licence Number: N7L1-1834(Type B)

This is the decision of the Northwest Territories Water Board (Board) for the issuance of Water Licence N7L1-1834. The project is located at Latitude 69°12'30" North and Longitude 135°06'04" West in the Northwest Territories.

The Northwest Territories Water Board issued Licence N7L1-1834 in accordance with Section 14 of the *Northwest Territories Waters Act*.

Background:

Shell Canada Energy applied to the Board on March 5th, 2012 for a Water Licence for Farewell Camp and Stockpile Site (Camp Farewell) in the Mackenzie Delta. The Board deemed the application complete on May 23, 2011.

Canadian Environmental Assessment Act (CEAA)

The Water Licence application was exempt from the Canadian Environmental Assessment Act under Section 7(1)(a), specifically under Schedule 1, Part 1, Section 3(a) of the Exclusion List Regulations.

Environmental Impact Screening Committee (EISC)

On April 20, 2012 the Board received an official notification from the Environmental Impact Screening Committee that determined the application met the definition of development and that it was exempt from the screening process, as it qualified under exclusion #1 of Environmental Impact Screening Guidelines, Appendix C.

Notice of Application

In accordance with rule 38 of the Board Rules of Procedure, the Board gave notice of the application for a Water Licence regarding Camp Farewell, on May 28, 2012 in News North in English, May 31, 2012 in the Inuvik Drum in Inuvialuktun, and May 25, 2012 in L'Aquilon in French.

Reviewers' Comments

The Board sent the Water Licence application and supporting information for review to the following agencies: AANDC-NMDO, AANDC-WRD, EC, DFO and GNWT-ENR on May 23, 2012. The Board received written comments from AANDC (June 15, 2012), EC (June 15, 2012), DFO (May 28, 2012) and GNWT-ENR (June 14, 2012).

The Board considered all submitted comments at a Board meeting held via teleconference on July 10, 2012. The Board approved a Water Licence for the applicant's review. The Licence was submitted to the applicant on July 11, 2012 and it indicated in its response on July 16, 2012 that the Licence was acceptable.

Requirements of the Northwest Territories Waters Act:

Shell Canada Energy has provided the Board with its Schedule III application and supporting information for its consideration as required by section 16 of the *Northwest Territories Waters Act*.

The Board is in accordance with Paragraph 14(4)(a) of the *Northwest Territories Waters Act* by ensuring that the granting of the Water Licence to Shell Canada Energy will not adversely affect, in a significant way, any existing Licensee, providing the conditions of Water Licence N7L1-1834 are met. There are no other applicants with precedence.

The Board does not believe that any users nor persons listed in Paragraph 14(4)(b) of the *Northwest Territories Waters Act* will be adversely affected by the use of waters or the deposit of waste proposed by the Licensee provided that the Licensee operates in accordance with the terms and conditions of Water Licence N7L1-1834.

The Board is of the view that compliance with Water Licence N7L1-1834 terms and conditions will ensure that the waste will be treated and deposited in a manner that will maintain water quality in the area and will be consistent with applicable water quality standards in accordance with Sub-Paragraph 14(4)(c) (i) of the *Northwest Territories Waters Act*.

The Board drafted the terms and conditions of Water Licence N7L1-1834 in accordance with Section 15 of the *Northwest Territories Waters Act*.

In Accordance with Sub-Section 17(1) of the *Northwest Territories Waters Act*, the Board requested that a security deposit in the amount of two million dollars (\$2,000,000.00) be posted and shall be maintained in a form suitable to the Minister of Aboriginal Affairs and Northern Development Canada.

Decision to issue Water Licence N7L1-1834:

The Board has reviewed the Camp Farewell Project Application and draft Water Licence N7L1-1834 for issuance. Upon consideration of the facts and circumstances, the purpose, scope and intent of the *Northwest Territories Waters Act*, the Board has determined that it can issue Water Licence N7L1-1834.

For the above reasons the Board has determined to issue Water Licence N7L1-1834 in accordance with Sub-Section 14(1) and Sub-Paragraph 14(6)(b)(i) of the *Northwest Territories Waters Act* for the use of water and the deposit of wastes.

SIGNED this 18 day of July, 2012 on behalf of the Northwest Territories Water Board.

Eddie Dillon

Chairperson, Northwest Territories Water Board



Photograph 1: View east of bollard (August 12, 2015).



Photograph 2: View east of wood debris burning in burn pit (August 18, 2015).



Photograph 3: View east of boreholes being advanced in laydown/storage area (August 18, 2015).



Photograph 4: Soil profile (August 14, 2015).



CAMP FAREWELL EMERGENCY RESPONSE PLAN DECEMBER, 2000

AMENDED OCTOBER, 2002
AMENDED MAY, 2003
AMENDED JULY, 2003
AMENDED JANUARY, 2006
AMENDED APRIL, 2013
AMENDED MAY, 2014
AMENDED JULY 2015

COPY#

This is a controlled document.

This general emergency response plan includes spill contingency plans for liquid, sewage and solid materials. It is effective from April 1, 2013 to March 31, 2016 or until an amendment is issued whichever is sooner. It applies to Camp Farewell which is located in the Northwest Territories along the east shore of the Mackenzie River – Middle Channel, 50 km downstream from Tununik Point at Longitude 69°-12′-30″ and Latitude 135°-06′-04″.

License number from Northwest Territories Water Board is N7L1-1834 License type B.

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1 DEFINITION OF TERMS

ERP Emergency Response Plan

WA & SO Wells, Approvals & Seismic Operations

E&P Exploration & Production

ICS Incident Command System

DAR Decommissioning, Abandonment and Reclamation

AANDC Aboriginal Affairs and Northern Development Canada

NT-NU Northwest Territories & Nunavut

MSDS Material Safety Data Sheet

WHIMIS Workplace Hazardous Materials Information System

TDG Transportation of Dangerous Goods

CANUTEC Canadian Transport Emergency Centre

MDSRC Mackenzie Delta Spill Response Corporation

2 PURPOSE

The following document is intended to serve as a template for use in the development of Site-Specific General Emergency Response Plans (ERPs) within the Wells, Approvals and Seismic Operations (WA&SO) Department within Shell Canada Limited Exploration and Production (E&P).

ERPs are to be continually revised and updated to include relevant Site-Specific Emergency Response information. Revisions/updates to the ERP will be completed prior to initiating any phase of a program (i.e. Construction, Drilling, Well Services, Seismic Operations, etc).

3 SCOPE

Emergencies other than H_2S gas (sour gas) related emergencies are addressed in this ERP template. For projects where sour gas has been determined as a potential threat (see 3.0 Hazard Assessment) the ERP for this specific threat shall be covered in separate Site-Specific Sour Gas Drilling, Completions, and Testing ERP.

WA&SO's Site-Specific General ERP is to be used in conjunction with the E&P Model ERP. The E&P Model ERP contains supporting information and forms that can be used in conjunction with this document.

4 HAZARD ASSESSMENT

Prior to developing a Site-Specific General ERP, a hazard assessment shall be conducted to determine potential emergency scenarios (hazards / threats). There are several activities within WA&SO that can provide information regarding potential emergency scenarios. Determine which activities are applicable to the project that will aid in determining potential emergency scenarios.

HSE&SD Process
DWOP
CWOP
Planning Meeting
Pre-Spud Meeting
Environmental Release

^{*}Section 11.0 shall be revised to reflect the emergency scenarios identified in the hazard assessment.

5 PUBLIC CONSULTATION AND COMMITMENTS

WA&SO conducts an extensive public consultation program as part of the licensing and approval process for all projects. Information regarding public commitments related to emergencies and special resident needs shall be included in the WA&SO Site-Specific General ERP. New information shall be captured in the space provided below.

5.1 Public Consultation and Commitments

Public data basis only.	shall be ke	ot strictly co	nfidential.	Access to t	his informatio	n is on a ne	ed to
			-				
			-				
			-				
			-				

6 GENERAL EMERGENCY RESPONSE EQUIPMENT

Emergency Response Equipment requirements shall be identified based on the realistic potential emergency scenarios identified in the Hazard Assessments. It is important to ensure that the equipment provided meet the requirements to effectively manage an emergency.

6.1	Emergency	Response	Equi	pment
-----	------------------	----------	------	-------

\boxtimes	First aid kit Level/Type-determine based on # personnel on site.
\times	First aid room
	Resuscitator
\boxtimes	Stretcher
	High angle rescue equipment
\boxtimes	Emergency conveyance vehicle
\boxtimes	Fire extinguishers
\boxtimes	Burn kit
\boxtimes	Eye wash stations
\boxtimes	Shower facilities
	Flares / flare gun
\boxtimes	Communication equipment
\times	Spill response equipment

7 MEDICAL INFORMATION

All workers should provide personal medical information to be used in the event of a medical emergency. All workers, upon arrival onsite, will fill out the medical information form (Appendix II) to be submitted to the Medic. If a Medic is not available, the Onsite Shell Representative shall keep the sensitive information in a sealed envelope. Medical information is to be kept strictly confidential and will be destroyed at the end of each project. By signing the form, the worker is authorizing this information to be released to the Medic or other medical personnel during a medical emergency. For further information, refer to Shell's Privacy Policy.

8 TRAINING

Emergency Response training requirements shall be fulfilled prior to work to ensure an effective response to potential emergency scenarios. Training will include the use of/and maintenance of emergency response equipment, spill response equipment for water and/or land, contact information, roles and responsibilities, communication equipment, etc. Each person's qualifications shall be verified on a continuous basis.

8.1 Training Log

A record of recent training in the form of a sign off sheet for employees working onsite will be utilized for any type of training provided.

Emergency first aid	Name:
Standard first aid	Name:
⊠ EMT-P	Name:
	Name:
Fire Fighting (dry chem.)	Name:
Confined Space	Name:
Spill Response	Name:
<u> </u>	Name:
L	Name:

9 TRAVEL INSTRUCTIONS

Directions to the worksite need to be documented and posted throughout the worksite to ensure the safe and timely arrival of emergency support equipment and personnel (i.e. ambulance, fire-fighting equipment, etc.). The Emergency Contact Information Sheet (Section 9) as well as Appendix II will have an area designated for directions. The directions shall be clear and concise. Contact information shall be specific to the working area of the project. Specific numbers shall be verified to ensure the proper response can be asserted.

10 EMERGENCY CONTACT INFORMATION SHEET

PROJECT: CAMP FAREWELL

Location: 110 KMS NW OF INUVIK, NWT

Latitude: 69º 12' 35.09" Longitude: 135º 06' 17.29"

Directions: BY AIR 110KMS NW OF INUVIK OR BY ICE/WATER USING EAST & MIDDLE CHANNELS OF THE

MACKENZIE RIVER. TURN LEFT AT BAR C.

Radio Frequencies: RECEIVE TRANSMIT

Air to Ground: 130.275 MHZ

NOTE: CAMP FAREWELL IS CURRENTLY DECOMMISSIONED AND UNOCCUPIED - NO ON-SITE PHONE NUMBERS AT THIS TIME.

PRIMARY OFFICE CONTACTS		Phone		Fax
SHELL CANADA LIMITED		800 661-	7378	
SHELL OFFICE BASED SUPERVISOR		403 403 403	[B] [C] [R]	403 269-7948 403 269-7895
MANAGER; DAR & DRILLING WASTE PROJECTS & TECHNOLOGY	RANDALL WARREN	403 691- 403 813- 403 230-	0408[c]	403 269-7948 403 269-7895
HSE TEAM LEADER	ROGER LEADBEATER	403 691- 403 519- 403 285-	4138[c]	403 269-7948 403 269-7895

EXTERNAL EMERGENCY RESPONSE	NUMBERS	Phone	Fax
HOSPITAL			
Inuvik	867 777-8161 EMERGENCY ROOM	867 777-8000 SWITCHBOARD	867 777-8062 FAX
RCMP			
Inuvik		867 777-1111	
FIRE			
Inuvik		867 777-2222	
AMBULANCE			
Inuvik		867 777-4444	
EXTERNAL EMERGENCY RESPONSE	NUMBERS	Phone	Fax
AIRCRAFT SUPPORT			
CANADIAN HELICOPTERS	INUVIK	867 777-2424 OR 867 678-0091	867 777-3448
AKLAK AIR	INUVIK 24HR	867 777-3555 OR	867 777-3388
	OFFICE HOURS	867 777-3777	
INFORMATION SERVICES			
ALBERTA POISON CENTER		1 800 332-1414	
CANUTEC		1 613 996-6666 EMERGENCY	1 613 992-4624 INFORMATION

WORKPLACE HEALTH AND SAFETY		Phone	Fax
NT-NU WSCC	24HR	800 661-0792 867 920-3888	866 277-3677 867 873-4596
ENVIRONMENTAL REPORTING			
NT-NU SPILL REPORTING	24HR	867 920-8130	867 873-924
ABORIGINAL AFFAIRS AND NORTH	ERN DEVELOPMENT CA	ANADA	
INUVIK DISTRICT OFFICE		866 777-8901	
AANDC PUBLIC ENQUIRIES CONTACT CENTRE		800 567 9604	866 817 3977
ENVIRONMENT CANADA			
SPILL RESPONSE - CANADIAN WILDLIFE SERVICE	Department of Environment and Natural Resources	867 920-8130	
NATIONAL ENVIRONMENTAL EMERGENCIES CENTRE		849-997-2800	
FISHERIES AND OCEANS CANADA O NORTHWEST TERRITORIES	FFICES IN THE	Phone	Fax
INUVIK DISTRICT OFFICE		867 777 7500	867 777 7501
YELLOWKNIFE AREA OFFICE		867 669 4900	867 669 4940
TRANSPORTATION SAFETY BOARD	/ NEB		
TRANSPORTATION SAFETY BOARD		800 387 3557	819 997 2239
PIPELINE EMERGENCIES	TSB 24 HR HOTLINE	819 997 7887	
NON PIPELINE EMERGENCIES		403 807 9473	
	1	I	L

SHELL CANADA GENERAL NUMBERS	Phone	
SHELL CANADA LTD.	800-661-7378	
24 HOUR CALL CENTER GENERAL EMERGENCY NUMBER		
SWITCHBOARD	403-691-3111	
SHELL CENTER SECURITY (24 HR)	403-384-5036	
SHELL CENTER OEH EMERGENCY PHONE	403-691-3815	
(0730-1200; 1300-1630 M-F)		
SHELL OPERATIONS TECHNICAL ADVISORY CENTRE		
PRIMARY SHELL CENTER, CALGARY, ROOM 1092	403-691-3104	
ALTERNATE: CALGARY PLACE 1, ROOM 1016, CLASSROOM 5	403-691-2800	
ALTERNATE:CALGARY PLACE 1, ROOM 1008, CLASSROOM 1	403-691-4018	
CRISIS MANAGEMENT TEAM NOTIFICATION		
EMERGENCY PAGING INSTRUCTIONS		

CALL THIS NUMBER: 1-888-361-8055

TELL THEM YOU WANT TO PAGE THE ON-CALL MANAGER #44204

USE THE FOLLOWING FORMAT WHEN PLACING A CALL:

TO: UA; Canada On-Call Manager

FROM: (Callers name, title)

CONTACT#: (one or more return phone numbers)

MESSAGE (optional): (e.g. Emergency Level is applicable or situation requires your attention).

EXAMPLE CALL:

TO: UA; Canada On-Call Manager. FROM: John Doe, LEOC Director. CONTACT#: 403-XXX-XXXX.

MESSAGE: Level 2 emergency at xx Complex.

NOTES:

- 1. Have paging service representative repeat the message back to you to confirm it is in the proper format.
- Shell Head Office Emergency Numbers are accessible by Shell Canada Limited 24 Hour Emergency 1-800-661-7378 operators. The use of this service can be used as an alternate method to contact the Crisis Manager if the paging service is not functioning.

RESPONSE:

The UA; Canada On-Call Manager is expected to return emergency pages immediately. If there is no response after fifteen minutes, page again. If thirty minutes elapse, have them paged again. After receiving no response, ask for the Manager; Upstream Canada Emergency Preparedness and Response (Linda Manka) or delegate, to be contacted.

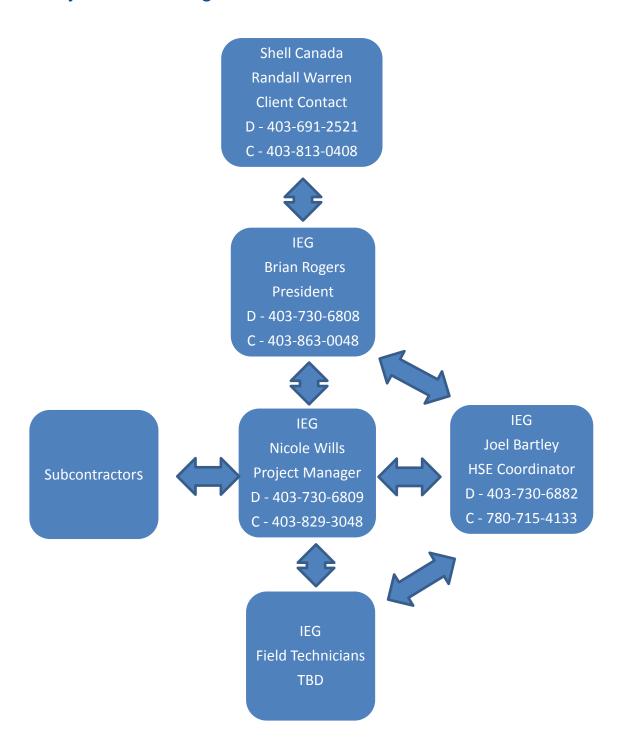
WHEN ACTIVATED – CRISIS MANAGEMENT CENTRE NUMBERS:

PRIMARY CMC NUMBER: 403-691-2800 (This is the main speaker phone serving the CMT)

SECONDARY/ BACKUP: 403-691-3816 (This is a general purpose phone)

SPILL SERVICES			
Mackenzie Delta Spill Response Corp. (MDSRC)	SPILL RESPONSE ADVISOR (TIM TAYLOR)	403 296-4014	403 296-5147
Western Canada Spill Services (WCSS)	24 HR HOTLINE	866 541 8888	
OILFIELD FIRE SERVICES			
HSE INTEGRATED	CALGARY - 24HR	1-888-346-8260	
FIREMASTER OILFIELD SERVICES INC.	RED DEER - 24HR	403-342-7500	

10.1 Project Personnel Organization Chart



11 CAMP FAREWELL SITE PLAN

During the 2014 Decommissioning Program, Shed #2, Shed #3, and the camp building were disassembled. Materials such as metals that could be recycled were separated from debris and waste material for shipment to appropriate facilities. Other materials stored on-site including rig mats, piping, hoses, wooden crates, and miscellaneous parts were also removed. Materials removed were transported off-site via barge.

Remaining infrastructure currently on-site includes Shed #1, the tank farm, and the emergency shelter.

The tank farm is empty and no chemicals will be stored on-site. In the unlikely event of a fuel spill associated with equipment for the decommissioning of remaining infrastructure, spill response equipment will be stored on the camp barge docked at the bollards.

The Camp Farewell Site Plan is provided in Figure 1.

12 EMERGENCY RESPONSE PROCEDURES

Below are templates designed to assist in the development of detailed procedures for Site-Specific Emergency Response scenarios. Note that each of these steps could require modification during any phase of the project. Refer to Section 404 of the E&P Model ERP.

In the event of an emergency response situation, all media and public enquiries will be forwarded to the Shell Camp Farewell Camp Supervisor or the Shell Project Manager.

12.1 INJURY INCIDENTS

12.1.1 Emergency Response Procedures

- 1. Ensure personal safety. Consider the following prior to responding:
 - evacuate area
 - determine safe approach
 - no approach
 - determine what happened
 - don personal protective equipment
- 2. Isolate the area and restrict/deny entry as required to prevent additional injuries:
 - establish a parameter
 - isolate/shut off energy sources, stabilize (high pressure, electrical, unstable objects, ignition sources etc.)
- 3. Notify appropriate personnel:
 - supervisor
 - rescue team
 - bystanders
- 4. Muster in designated area
- 5. Determine individual roles and responsibilities:
 - assign incident command system roles as resources become available
 - add to the ICS chart provided
 - do not rush into anything
- 6. Provide medical attention as required:
 - remove victim from danger or danger from victim
 - provide medical attention as required
- 7. Transport victim for advanced medical treatment as required. Consider to following:
 - medical conveyance via ground
 - air medivac

Conduct incident "De-brief"

Serious and dangerous occurrences shall be reported to the WSCC's 24-hour Accident Reporting Line. See Emergency Contact List. Complete Worker's Report of Accident and Employer's Report of Accident

12.2 IILLNESS

12.2.1 Emergency Response Procedures

- 1. Provide onsite medical / first aid treatment
- 2. Notify the patient's supervisor and Medic (if available) immediately
 - the onsite supervisor/Medic will consult the patients' medical information form for medical information purposes.
- 3. Contact medical care facility for instructions regarding treatment options and transportation.
- 4. Stabilize patient for transport to medical care facility as required.

12.3 WEATHER RELATED EMERGENCIES

12.3.1 Emergency Response Procedures

- 1. Notify all personnel of the weather related emergency
 - contact internal and external parties
- 2. Secure equipment from the effects of the wind / snow build-up, etc.
- 3. Suspend operations as deemed necessary
 - consider a travel ban until weather improves maintain communications with remotely located operations (i.e. seismic workers, surveyors, etc.)
- 4. Muster in designated area

12.4 WILDLIFE RELATED EMERGENCIES

To ensure the safety of people and wildlife care and caution is to be taken when working in an area where wildlife may be present. Employees must not approach and/or feed any wildlife. Litter and food items must be disposed in appropriate waste receptacles. Sightings of wildlife should be reported.

12.4.1 Emergency Response Procedure

- 1. Notify all personnel in the event an animal poses a threat
 - contact internal and external parties
- 2. Suspend operations as deemed necessary
 - consider having all employees remain indoors until a proper assessment can be done

3. Await confirmation from proper authorities prior to resuming operations

12.5 FIRES AND EXPLOSIONS

12.5.1 Emergency Response Procedure

Refer to E&P Model ERP Section 403 for additional fire response strategies

- 1. Ensure personal safety. Consider the following prior to responding
 - evacuate
 - don personal protective equipment
- 2. Isolate the area and restrict / deny entry as required to prevent injuries
 - establish a safe parameter
- 3. Notify appropriate personnel
 - sound the alarm
 - supervisor
 - rescue team
- 4. Muster in designated area
- 5. Determine individual response roles and responsibilities
 - assign incident command system roles as resources become available
- 6. Assess the hazard. Determine whether or not to fight the fire. Is there a need to fight the fire? Consider:
 - identify / isolate fuel sources if safe to do so
 - the type of fire and the equipment available to fight the fire
 - are personnel trained to fight the fire
- 7. Utilize appropriate protective equipment
 - fire retardant clothing
 - call for backup equipment
- 8. Establish / adjust control perimeters (hot, warm, cold)
 - identify additional hazards and assess the risks

12.6 CAMP FIRES

12.6.1 Emergency Response Procedure

MUSTER AREA - SHOP BUILDING

- 1. Ensure personal safety. Consider the following prior to responding:
 - Sound the fire alarm.
 - Assess the fire; if it is small enough, extinguish with fire extinguisher.
 - Shut door(s) and window(s) in the room you are evacuating.
 - If smoke builds up, stay low to the ground.

- Notify the incident commander immediately.
- Evacuate and remain at the muster area until instructed to do otherwise by incident commander.

2. Incident Commander

- Take a radio for communication.
- Ensure that the fire alarm has been sounded throughout the camp.
- Quickly go to the fire scene to assume command.
- Meet with the Emergency Response Team to assess action already taken and further action required.
- 3. Medic (on site rep if not medic)
 - Evacuate to the muster area with your first aid pack.
 - Take a radio for communication.
 - Treat any burns or other related injuries.
 - If required, transport patient(s) to hospital via ECV or helicopter, depending on nature of injury.
- 4. Emergency Response Team Members

Shell Onsite Rep:	
Camp Supervisor:	
Medic:	

- Ensure that each member has a radio for communication.
- As first line of defense, shut the breaker to the trailer(s) off.
- Check each room to ensure that all camp personnel have vacated the trailers.
- Report to the incident commander for a head count and debriefing.
- If it is safe to do so, extinguish the fire.
- Take a head count of camp personnel.
- If required and safe to do so, locate missing personnel.

12.7 SPILLS

Spills are required to be tracked internally regardless of volume. A minor spill that is not considered to be immediately reportable will be tracked internally and submitted in the form of a report to the AANDC District Inspector on a monthly basis, unless otherwise agreed upon.

For immediately reportable spills and/or any spill, regardless of product or volume, that come into contact with a water body will be reported to the NT-NU 24hr. Spill Report Line. For reportable release volumes on land see Appendix IV.

12.7.1 Sewage Spill Emergency Response Plan

In 2013, the sewage treatment facility was decommissioned and removed, and the lagoon was remediated. Material from the lagoon excavation was shipped to the appropriate facilities in Alberta. There is no longer sewage facilities, a lagoon, or impacted material on-site. There is no risk of a sewage spill at this time.

12.7.2 Bulk Material Emergency Response Plan

Camp Farewell is located between a small lake and the Middle Channel of the Mackenzie River. Bulk Materials have previously been stored in seacans and various other containers on occasion. The Site is currently in the process of decommissioning, the storage of bulk materials at the Site at this time is unlikely.

Transportation

There may be small quantities of fuel transported to and from the site.

Maintenance and control

This contingency plan is project specific and will be reviewed:

- As changes to applicable environmental legislation come into effect.
- To take into account changes in environmental factors and in facility characteristics and policy.
- During any onsite training exercises.
- After each and every incident.

Changes to phone numbers and names of those individuals identified in this contingency plan will be made on an as required and when required basis.

Prioritized Response Goals

The prioritized response goals are:

- Protect Human Life (yours, fellow worker, & public)
- Protect The Environment
- Minimize Asset and Property Loss
- Regain Steady State Operations to minimize business impact (consider both revenue & reputation).

The objectives of a spill response are:

- Safety of People, Environment, and Facilities
- Source Control
- Containment of released materials
- Recovery and Storage of released materials.

Procedure

1. SAFETY

Ensure personal safety

- Ensure your own personnel safety from existing and potential hazards and fellow worker safety.
- ♦ In addition to standard personal protective equipment, check MSDS sheets for additional requirements.

2. ISOLATE AND DENY ENTRY

Isolate the area and deny / restrict entry

- ♦ Utilize vehicles or barricades for temporary control.
- ♦ Establish / adjust control perimeters.

3. NOTIFICATIONS

Immediately notify the following organizations:

♦ Shell's Onsite Supervisor

Notify the following as soon as practical:

- ♦ Shell's DAR/Construction manager
- ♦ NT-NU 24 hr. Spill Report Line

4. COMMAND / MANAGEMENT

Order depends on specific factors

- Assign Incident Command System roles as resources become available.
- Develop the response plan.
- Ensure safety precautions and operating plans and conditions are reviewed with the crew.
- ♦ Determine a need for roadblocks.
- ◆ Ensure proper permits are executed.

5. IDENTIFICATION AND HAZARD ASSESSMENT

Identify the Hazards and Assess the Risks

- ◆ Determine chemical makeup of substance (i.e.: WHMIS, TDG Placards, PIN Nos.).
- ♦ MSDS (Material Safety Data Sheets Chemical).
- ♦ Placards and labels (colours, markings).
- ♦ Shipping papers (Bill of Lading, Way Bill, etc).
- ◆ Technical information (CANUTEC).
- Other (specialists, monitoring devices).

6. PROTECTIVE EQUIPMENT

Ensure proper personal protective equipment is utilized, and know the level of equipment available

- ♦ Visibility stripes, safety glasses, goggles, life jackets, gloves etc.
- Check MSDS sheets for additional requirements

7. CONTAINMENT AND CONTROL

Safe defensive containment

- If safe to do so, and if possible, stop the flow of material.
- Ensure that flow is contained before starting the recovery procedure. Containment and recovery may take place at the same time.
- ♦ See list of emergency spill cleanup equipment.
- Shovel spilled material into plastic lined steel drums.

- If ground is frozen, in the spring excavate surface area to ensure all spilled material is collected.
- ♦ Notify and request assistance if required from external NT-NU 24 Emergency Spill Response Line.
- Consider what resources /materials are available within close proximity; i.e.: crawler tractor, loaders, bobcats, vacuum /water trucks, fuel bladders / fibreglass tanks, lost circulation material, straw bales, absorbent booms, etc.

8. DECONTAMINATION AND CLEANUP

Collect, cleanup, and sample

- Decontaminate personnel as required if exposed to the spill.
- Priority is to highly environmentally sensitive areas (municipality water sources, waterfowl staging areas, domestic fishing areas).
- Store the spilled material in proper containers for disposal.
- ♦ Determine where the spilled material can be disposed of and ship material there.
- Develop remediation program for the area (if required).
- Conduct the remediation program.
- Monitor the progress of remediation as required.

9. DISPOSAL

Dispose of wastes, contaminated clothing and equipment if unable to decontaminate.

- ♦ Consider waste impacts in all decisions.
- Remove the contaminated material and haul to an approved disposal site.

10. DOCUMENTATION

Document all actions and complete reports

- Assign a recorder to log activities.
- ◆ Complete and submit a follow-up spill report to the NT-NU 24 hr. Spill Report line.

12.7.3 Fuel/Spill Emergency Response Plan (Water)/Coast Guard Oil Pollution Emergency Plan

Camp Farewell is located between a small lake and the Middle Channel of the Mackenzie River. Camp Farewell is 50 km downstream from Tununik Point at Longitude 69°-12′-30″ and Latitude 135°-06′-04″. There are no communities downstream of Camp Farewell.

Currently the tanks located on-Site are empty. A minor quantity of fuel will be required for the 2015 Decommissioning and Soil Assessment Program. Fuel transported to site will be stored in tanks with appropriate secondary containment. A spill could occur during unloading fuel from barges. Should a spill occur, the deployment of the barge booms will be requested as a precautionary measure to immediately contain the spill. If a land spill did occur it would be contained quickly and therefore minimize the potential for contamination of the waterway.

Transportation

Liquid fuels will be stored in closed systems during transportation. Access routes will be by barge through channels of the Mackenzie River. Should fuel be required during the winter season, it will be delivered by fuel truck to the project location.

Maintenance and Control

This contingency plan is project specific and will be reviewed updated:

- As changes to applicable environmental legislation come into effect.
- Annually, to take into account changes in environmental factors and in facility characteristics and policy.
- After every oil release incident and exercise.

Changes to phone numbers and names of those individuals identified in this contingency plan will be made on an as required and when required basis. The numbers are to be verified when the camp is opened and/or on an annual basis. MSDS sheets will be updated as required and included in Appendix VI.

Organization

Shell Canada Limited utilizes the Incident Command System for all emergencies (ICS)¹. All incident responses are modeled after the Disciplined Approach. See Section 917 of Shell's Emergency Response Plan Model for detailed guidance on the Disciplined Approach and Prioritized Response Goals.

Prioritized Response Goals

The prioritized response goals are:

- Protect Human Life (yours, fellow worker, & public)
- Protect The Environment
- Minimize Asset and Property Loss
- Regain Steady State Operations to minimize business impact (consider both revenue & reputation).

The objectives of a spill response are:

- Safety of People, Environment, and Facilities
- Source Control
- Containment of released materials
- Recovery and Storage of released materials.

Procedure

1. SAFETY

Ensure personal safety

Ensure your own personal safety from existing and potential hazards and your fellow workers' safety.

2. ISOLATE AND DENY ENTRY

Isolate the area and deny / restrict entry

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¹ ICS system description plus Roles & Responsibilities of all organizational positions are described in Shell's Emergency Response Manual - Model

- Establish / adjust control perimeters.
- Eliminate ignition sources.

3. NOTIFICATIONS

Notify the following immediately.

- ♦ Shell's onsite supervisor
- Barge Captain

Notify the following as soon as practical.

- ♦ Shell's DAR/Construction Manager
- ♦ NT-NU 24 hr. Spill Report Line

4. COMMAND / MANAGEMENT

Order depends on specific factors

- ◆ The Onsite Supervisor will assume the role of Incident Commander.
- Assign Incident Command System roles, as resources become available.
- ♦ Initiate response to incident, taking existing conditions into account.
- Ensure safety precautions and operating plans and conditions are reviewed with the crew.
- Ensure proper safe work permits are executed.

5. IDENTIFICATION AND HAZARD ASSESSMENT

Identify the Hazards and Assess the Risks

- Confirm product and determine chemical makeup of substance.
- MSDS (Material Safety Data Sheets Chemical).
- Placards and labels (colors, markings).
- Shipping papers (Bill of Lading, waybill, etc).
- ◆ Technical information (CANUTEC).
- Other (specialists, monitoring devices).

6. PROTECTIVE EQUIPMENT

Ensure proper personal protective equipment is utilized, and know the level of equipment available

- Fire retardant clothing, safety glasses, goggles, life jackets, gloves etc.
- Check MSDS sheets for additional requirements.

7. CONTAINMENT AND CONTROL

Safe defensive containment

- If safe to do so, and if possible, stop the flow of product.
- Deploy primary and secondary booms to contain or divert spill to recovery area, as identified in plan.
 (Control Point at Camp Farewell and Farewell Downstream Control Point #1). Ensure that the spill is contained before starting the recovery procedure.
- Deploy absorbent pads, socks as required. Recover oiled sorbents and place them in containers.
- Use the oil skimmer to recover spilled fuel if spill is too large to recover with sorbents.

- Store recovered small volumes of oil/water mixture in steel drums.
- Store recovered large volumes of oil/water mixture in empty fuel tank for disposal at a later time.
- ♦ Notify and request assistance, if required, from external NT-NU 24 hr. Spill Report Line.
- ♦ Place all resources/materials on standby that are available within close proximity, i.e. crawler tractor, loaders, bobcats, vacuum trucks, fuel bladders/fibreglass tanks, lost circulation material, straw bales etc.

8. DECONTAMINATION AND CLEANUP

Collect, cleanup, and sample

- Decontaminate personnel as required if exposed to the spill.
- Priority is to high environmentally sensitive areas (shore lines within the Kendall Island Migratory Bird Sanctuary).
- Store the spilled material in proper containers for disposal.
- ♦ Implement remediation program for the area as required.
- Monitor the progress of remediation as required.

9. DISPOSAL

Dispose of wastes, contaminated clothing and equipment if unable to decontaminate.

- Consider waste impacts in all decisions.
- ♦ Consider onsite incineration, movement to approved disposal sites etc.

10. DOCUMENTATION

Document all actions and complete reports

- Assign a recorder to log activities.
- ◆ Complete and submit a follow-up spill report to the NT-NU 24 hr. Spill Report Line.

11. CONTINGENCY PLAN

Acknowledge role of federal, territorial and other bodies as identified in the National Contingency Plan

- Lead Agency for pollution incident (ship to shore) is the Canadian Coast Guard.
- Resource Agency is considered to be the Canadian Coast Guard, who will request resources as required where available.
- ◆ Additional resources can be called upon by Environment Canada. Arctic Regional Environmental Emergencies Team (REET) will provide consolidated environmental advice to the Lead Agency.

12.8 Scenario

Department of Fisheries and Oceans Canada - Coast Guard require an Oil Pollution Emergency Plan and Oil Pollution Incident Procedures, Equipment and Resources Scenario as required by regulation SOR/95-405. The scenario assumption is for a Level 1, category of Oil Handling Facility with a 150m³/h maximum oil transfer rate and a Level 1 category of Oil Handling Facility with a minimum spill size of 1m³. The maximum oil transfer rate at time of unloading will be 85 m³/h and therefore falls within Level 1 category.

Nature and amount of oil

Shell will be unloading approximately 2,000,000 litres of diesel fuel from barge. Aviation fuel is transported in drums. All equipment coming to site will be diesel powered so the amount of fuel on site is about six 45-gallon drums. The most likely spill scenario is a hose leak. The volume used in this scenario for this type of spill is 2.0 m³.

Type of ship being unloaded

Series 1000 barges from NTCL will deliver the diesel fuel. The maximum pump rate is 85 m³/hour. The boat has a shut-off valve located on it for emergency shutdown of the fuel. The fill line is 150 mm.

> Tides and currents

There are no tides in this area. Current speed in this channel of the Mackenzie River is approximately 8 knots.

Meteorological conditions

Unloading of fuel will take place during late fall at above- or near-freezing conditions. Some winds may be encountered (prevailing winds are from the northwest)

Environmental Sensitivities

There are no communities near Camp Farewell. The camp is located within the Kendall Island Bird Sanctuary and a Migratory Bird Sanctuary Permit will be obtained prior to initiating any activity within the area. Whenever possible, unloading of fuel will take place in the fall when there is a decreased number of waterfowl in the area. A wildlife monitor is to be onsite at all times and equipped with a firearm that can be discharged to scare away any waterfowl in the vicinity if it is deemed necessary. Any requirement for long-term bird hazing will be accomplished by setting up automatic bird scare cannons as well as having the wildlife monitor patrol the channel with a boat to assist in scaring away any waterfowl.

There will be approximately 600 meters of fuel filling line. It will go from dock, across 200 meters of gradually rising ground to a hill. From there the line will go to the fuel tanks.

Measures to minimize spill

The measures taken to minimize the possibility of a spill are as follows:

- Five on-site supervisors have received the two-day "Oil Spill Containment and Recovery Training (Open Water) "course and the two-day "Response to Oil Spills in Ice conditions" course. Any new Supervisors will also receive the training if not already done so.
- The Shell site supervisor for the unloading will become the Incident Commander if there is a spill.
- Hoses, connections and valves will be inspected on the fill line prior to use.
- Drip pans will be installed under each connection.
- There will be quick shutting shut-off valves at each end.
- During diesel fuel filling operations, the fill line will be patrolled. There will be personnel at each shutoff valve. All personnel will be equipped with radios. In the event of a line break, the valves will be
 shut off immediately to minimize the spill.

• A spill kit, including shovels, barrels and absorbents will be in the vicinity of all locations where fuel is being stored or transferred to provide immediate spill response.

Training

The two-day "Oil Spill Containment and Recovery Training (Open Water)" course held in 2002 at Camp Farewell included classroom instruction, dry land equipment deployments and a Conventional and BoomVane deployment in the Mackenzie River.

Note: Fuel has not been unloaded at Camp Farewell since 2002.

Day 1

- Formal classroom training using a PowerPoint presentation and covering strategies and tactics of oil spill response.
- Description of Response Management System used by Shell Canada, Camp Farewell.
- Description and illustration of equipment usage.
- Safety briefing.
- > Dry Land deployment of equipment which gave participants hands-on experience as to how the components fitted together and operated.

Day 2

- Briefings
 - Safety
 - Communications
 - Commander's (describing "spill" and deployments to be effected during the field deployment exercise
- Organizational Structure to be used in the field
 - Assignment to crews
 - Crew responsibilities
- > Field Deployment
 - Conventional deployment of 400 feet of river boom
 - BoomVane deployment of 400 feet of river boom
- Debriefing

The two-day training courses "Oil Spill Containment and Recovery Training (Open Water)" and "Response to Oil Spills in Ice Condition" are normally held annually and sponsored by the Mackenzie Delta Spill Response Corporation (MDSRC) and the Aurora College.

- Training attended by various staff from the MDSRC participants, local Contractors, Inuvik Fire Department and individuals from the General Public. *Shell last participated in the open water session in 2005.*

 The sessions include components on cold weather safety, material properties in cold climates, strategies and tactics for spill containment and recovery in winter conditions and waste management requirements.

Day1

- Safety
- Material Properties
- Environmental Awareness
- Regulatory Requirements
- Strategies, Tactics & Equipment Waste Management Considerations

- <u>Day 2</u>

- Introductions of Commander
- Description of "Problem"
- Safety Briefing
- Communications Briefing
- Assignment of Crews & duties
- Deployment Briefing
- Field Deployment
- Debriefing

Training and Exercises

- Additional training and exercises are being planned by the MDSRC for subsequent years.
 Activity in the Mackenzie Delta will determine frequency of training required.
- Shell staff at the field location will support the trained supervisory staff in areas of labour, equipment operation and administrative duties in the event of an oil spill.
- If required, the trained MDSRC member companies and contractor staff will supplement Shell staff in a supervisory or other capacity when and where required.
- All personnel will be required to attend a Safety Briefing and Orientation prior to commencement of any activities associated with an oil spill response.
- Prior to unloading of fuel barges, a meeting will be held to review the Oil Pollution Emergency Plan.

Response Time Control and Containment

- Prior to start of unloading of diesel fuel, a boom will be, under the Captain's decision, set up around the unloading barge.
- An oil spill containment and clean up boat will be on site. This boat is from Mackenzie Delta Spill Response Corporation.

- Based on environmental regulations and the nature of the soil a berm cannot be installed along the shoreline.
- Prior to start of unloading of diesel fuel a line of 3 meter long booms will be constructed on shore ready for deployment as a primary containment. If required it will be immediately deployed.
- Prior to start of unloading of diesel fuel a line of 1.6 meter booms will be constructed on shore further downstream for deployment as a secondary containment. If required, it will be immediately deployed.
- Prior to start of unloading of diesel fuel, a meeting will be held of all participants to review the
 oil spill plan and their responsibilities and roles to both prevent a spill and contain and clean up
 a spill.
- Prior to start of unloading of diesel fuel Shell owned sorbents and skimmers will be set out and ready for use.
- Responsibility for the pre-transfer work will be the Shell "Site Supervisor".

Response Time Clean up

An onsite spill control boat will commence clean-up operations as soon as the spill is controlled and contained. If additional resources are required they will be obtained from the trained MDSRC member companies. This group will have equipment, material and trained staff to assist in the event of any spills. Current participation in the Mackenzie Delta Spill Response Corporation includes, but is not limited to, BP Canada Energy, Chevron Canada Resources, ConocoPhillips Canada, Husky Energy Inc., MGM Energy Corp. and Shell Canada Ltd. If necessary, the trained contractor community will be requested to respond as well. Unless and until MDSRC is fully ready to respond to large operational spills, the Coast Guard is the default responder to be contacted in case of such a spill.

Scenario Details

The oil spill control boat will come complete with sorbents, boom, vane boom deployer and skimmers.

Time	Description	Person responsible
Pre Transfer	 Barge booms deployed Spill Equipment readied Product, hazards & controls identified Prejob safety meeting held 	Barge Captain Incident Commander Incident Commander Incident Commander
Zero	 Spill occurs & discovered Shut down pumps on barge Radio order to shut valves on hoses 	Barge Captain Incident commander
5 minutes	Closing of valves on line	Source Control (Personnel

		located at each valve)
15 minutes	Primary boom will be deployed.First Aid (if required)	Spill Group Supervisor Medic
45 minutes	If necessary, secondary boom will be deployed	Spill Group Supervisor
60 minutes	 Oil spill boat will start cleaning up spill Land group will start cleaning up spill Notifications 	Spill Group Supervisor Spill Group Supervisor Incident Commander
Post Recovery	 Follow-up notifications Decon. & Cleanup Disposal Incident Debrief Documentation 	Incident Commander

Response Authorization

Response will be in accordance with Shell's Emergency Response plan for Camp Farewell. The onsite *Incident Commander* will be the senior Shell Onsite Representative (or alternate) with backup as required from Calgary. The onsite Spill Group Supervisor will be selected from the trained personnel available.

Restart of unloading

Unloading will not be restarted until the causes of the spill have been determined and remedies to prevent a similar incident are in place. The spill will either have been cleaned-up or there will be sufficient workers to clean up the spill and unload before unloading is restarted.

Oil Handling Facility Exercise Program

- The Shell Farewell Facility consists of a small camp, maintenance shop, airstrip, tank farm with a capacity of two million litres and a designated area for storage of drilling equipment and products. All fuel is stored in tanks within secondary containment. The bulk of the fuel is received by barge and transferred via pipeline from shore to the tank farm.
- Current plans include transfer of fuel from shore to tank farm on a per annum basis providing facility is
 in operation, and therefore any onsite training and exercise programs will only be conducted on an
 annual basis prior to receiving any vessels for the purpose of fuel transfer.
- Standard operating practices are to pre-boom all vessels delivering product prior to commencing transfer. Each boom deployment activity is considered an operational drill for the purpose of this exercise program.
- The Shell Farewell Facility is not open on a continuous basis. Staff may be temporarily assigned to
 other operating areas until such time as Camp Farewell commences operation again. Shell Canada will
 make every effort to ensure personnel familiar with the facility and who have participated in the
 training and onsite exercises are reassigned to their previous positions.
- Training will be comprised of a management tabletop session onsite on an annual basis with the second day being devoted to an operational drill and training exercise.
- An Internal Notification Exercise will be completed during the 1st Q after start up of the Camp Farewell Facility and on an annual basis thereafter.
- An External Notification Exercise will be done on an annual basis.
- Exercises with vessels delivering fuel to the Camp Farewell Facility are an integral part of this plan and are reflected in the exercise program matrix. The Canadian Coast Guard and other outside agencies will be invited to participate.
- All exercises will be evaluated and reported on a critique facilitation and incident assessment ICS Form # 115. All discrepancies will be noted and assigned as action items. Post-exercise critiques will be filed and available for audit if so required.
- This plan will be updated with amendments reflecting changes noted during exercises.
- Actual responses to spills of a product will be evaluated and reported, and will be considered as part of this program.
- The Oil Handling Facility Exercise Program will be conducted over a three-year period commencing on the date of compliance.

• Prior to unloading of any fuel barges, the Oil Pollution Emergency Plan will be reviewed.

Training Program Matrix

Activity Description	Year 1	Year 2	Year 3
Internal Notification Exercise	During 1 st quarter after start-up of facility	Annually*	Annually*
External Notification Exercise	Annually*	Annually*	Annually*
Operational Drill with Vessels and Contractors	Annually*	Annually*	Annually*
Management and Supervisory Table Top	Annually*	Annually*	Annually*

Full Scale Functional Exercise

One, over the three-year cycle

^{*}When the site is operational training will resume for onsite employees. Mock spill exercises will be initiated and AANDC Inspectors will be notified prior to initiation of exercises.

Control Point Identifier:

Farewell (Shell Canada Camp)

Lat. 69° 12.451 N

Long. 135° 05.932' W

Location: On the East bank of Richards Island on the middle channel of the Mackenzie

River. Site is operated by Shell Canada Limited.

Land Owner/Tenant Contact: Crown/Shell Canada Limited

Distance to Confluence: 9.5 km* **Waterbody:** Mackenzie Bay, Beaufort Sea

• In this case, interpreted to be at the downstream Control Point

Next Downstream Control Point: Farewell Downstream Control Point #1 (9.5 km)

Waterway Details:

Width: 0.5 km

Bed Description: Sand and gravel

Bank Height/Slope: Steep bluffs behind beach. Vehicle ramp to camp plateau from

Control Point beach.

Work Space Details:

Size & Location: Size will vary depending on river height. There will normally be

sufficient workspace at most times of the year. August 2002 an area

10 m wide and 120 m long was available.

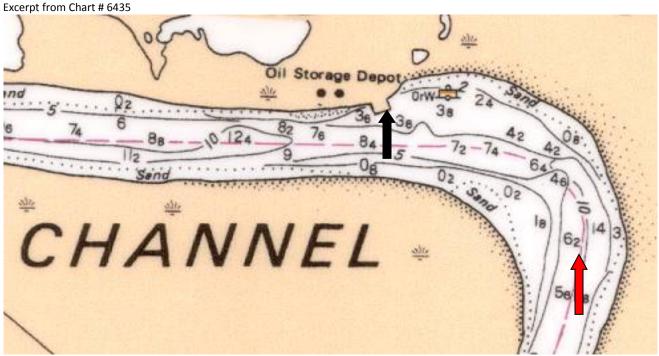
Helicopter Pad: Helicopter pad on camp plateau above site. Helicopter fuel is

normally available at this site.

Recommended Deployment Strategy/Equipment Requirement: Boom to contain and recover at the downstream portion of the Control Point beach. 350 m of boom can be deployed at most stages of river level. Deflection booms in a cascade can be deployed upstream of the site, if required. Permanent shore anchors are located at various points along the beach at this Control Point.

Other Comments: The river flow at the site is affected by tidal influences. There is a well maintained 700m gravel airstrip at this site. Survey conducted August 2002.

Control Point Identifier: Control Point Name: Issued: DRAFT #5
Farewell (Shell Canada Camp) Lat. 69° 12.451 N
Long. 135° 05.932′ W



Red arrow indicates flow. Black arrow indicates position and direction of photograph (August 2002). Photograph below shows orange river boom on the beach at the Control Point and ramp to camp plateau.



Control Point Identifier:

Point #1

Control Point Name:
Farewell Downstream Control

Lat. 69° 16.138' N
Long. 135° 12.331 W

Location: On a prominent point on the east bank of Richards Island on the middle channel of the

Mackenzie River where the river widens as it flows into Mackenzie Bay.

Land Owner/Tenant Contact: Crown/ILA

Distance to Confluence: 0* **Waterbody:** Mackenzie Bay, Beaufort Sea

This Control Point is interpreted to be at the confluence.

Next Downstream Control Point:None. Open water containment and recovery or treatment would

be required downstream of this location.

Waterway Details:

Width: 1 km

Bed Description: Sand and Gravel

Bank Height/Slope: Pebble and cobble beach with dense brush behind on a gently rising

slope.

Work Space Details:

Size & Location: Size will vary depending on river height. There will normally be sufficient

workspace at most times of the year. During August 2002 an area 10 m

wide and 120 m long was available.

Helicopter Pad: A helicopter could operate from the beach, if required.

Recommended Deployment Strategy/Equipment Requirement: Boom to contain and recover spill at the point as it is swept round the upstream bay. A cascade of deflection booms could be placed to divert a spill from the main channel, if required. 500' containment boom will be required to guide spill from anchor point to beach for recovery.

Other Comments: This site is affected by tidal influences and is exposed to winds. The point on which the Control Point stands is difficult to differentiate from the one immediately upstream. This one has a 0.3 meter square white blank sign on a metal post in the bush at the back of the beach. It can be seen in the center of the photograph. This Control Point is 9.5 km downstream of Farewell, computed at river centerline. Survey conducted August 2002.

Control Point Identifier:

Point #1

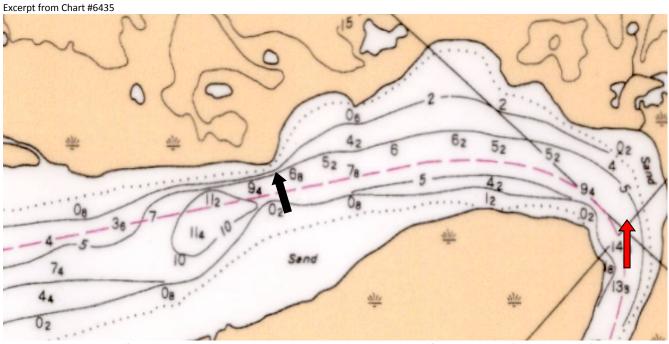
Control Point Name:

Farewell Downstream Control

Issued: DRAFT #4

Lat. 69° 16.138' N

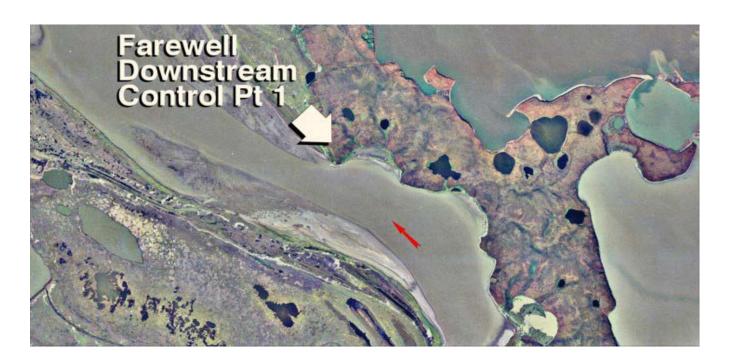
Long. 135° 12.331' W



Red arrow indicates flow. Black arrow indicates position and direction of photograph (August 2002) This Control Point is 9.5 km downstream of Farewell computed on the river's centerline.







12.8.1 Fuel Spill Emergency Response Plan (Land)

The campsite is located between a small lake and a channel of the Mackenzie River. All fuel on site is stored in tanks within secondary containment. This ERP also applies to non-fuel spills. A minor spill to water could develop if a land spill is not contained immediately.

Transportation

Liquid fuels will be stored in a closed system during transportation. Diesel fuel will be delivered from Camp Farewell by fuel truck. Aviation fuel will be transported in drums. All equipment coming on site will be diesel powered so the amount of gasoline on site is minimal.

Maintenance and Control

This contingency plan is project specific and will be 1) reviewed & 2) updated:

- As changes to applicable environmental legislation come into effect
- Annually, to take into account changes in environmental factors and in facility characteristics and policy
- After every oil pollution incident and exercise.

Changes to phone numbers and names of those individuals identified in this contingency plan will be made on an as required and when required basis. The numbers are to be verified when the camp is opened and/or on an annual basis.

Organization

Shell Canada Limited utilizes the ICS for all emergencies². All incident responses are modeled after the Disciplined Approach. See Section 917 of Shell's Emergency Response Plan Model for detailed guidance on the Disciplined Approach and Prioritized Response Goals.

Prioritized Response Goals

The prioritized response goals are:

- Protect Human Life (yours, fellow worker, & public)
- Protect The Environment
- Minimize Asset and Property Loss
- Regain Steady State Operations to minimize business impact (consider both revenue & reputation).

The objectives of a spill response are:

- Safety of People, Environment, and Facilities
- Source Control
- Containment of released materials
- Recovery and Storage of released materials.

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² ICS system description plus Roles & Responsibilities of all organizational positions are described in Shell's Emergency Response Manual - Model

Procedure

1. SAFETY

Ensure personal safety

Ensure your own personal safety from existing and potential hazards and fellow worker safety.

2. ISOLATE AND DENY ENTRY

Isolate the area and deny / restrict entry

- Utilize vehicles or barricades for temporary control.
- ♦ Establish / adjust control perimeters.

3. NOTIFICATIONS

Immediately notify the following:

♦ Shell's Onsite Supervisor

Notify the following as soon as practical:

- Shell's DAR/Construction Manager
- ♦ NT-NU 24 hr. Spill Report Line

4. COMMAND / MANAGEMENT

Order depends on specific factors

- Assign Incident Command System roles as resources become available.
- Initiate the response to incident, taking existing conditions into account.
- Ensure safety precautions and operating plans and conditions are reviewed with the crew.
- ♦ Determine a need for roadblocks.
- Ensure proper permits are executed.

5. IDENTIFICATION AND HAZARD ASSESSMENT

Identify the Hazards and Assess the Risks

- Determine chemical makeup of substance (i.e.: WHMIS, TDG Placards, PIN Nos.).
- ♦ MSDS (Material Safety Data Sheets Chemical).
- Placards and labels (colors, markings).
- Shipping papers (Bill of Lading, Way Bill, etc).
- ◆ Technical information (CANUTEC).
- Other (specialists, monitoring devices).

6. PROTECTIVE EQUIPMENT

Ensure proper personal protective equipment is utilized, and know the level of equipment available

- Fire retardant clothing, safety glasses, goggles, life jackets, gloves etc.
- ♦ Check MSDS sheets for additional requirements.

7. CONTAINMENT AND CONTROL

Safe defensive containment

- If safe to do so, and if possible, stop the flow of material.
- Ensure that flow is contained before starting the recovery procedure.

- Construct dikes, dams or drainage trenches to limit size of spill and prevent fuel from migrating. Contain as close to source as safe and practical to do.
- In winter, areas are usually snow covered so spill areas are easily seen. Build dikes using plastic sheeting to line face of dike. Use mechanical and hand equipment to scrape up snow/liquid mixture and place it in containers.
- See list of emergency spill cleanup equipment for clean-up materials.
- ♦ Isolate (deny entry via keeping safe distance from spilled material.
- ♦ Divert, disperse, dilute, and cover.
- Pump as much liquid product as possible into empty drums or tanks for disposal.
- ♦ Deploy absorbent pads, socks as required.
- Recover oiled sorbents and place them in steel drums for burning in onsite incinerator. Sorbents should be incinerated as soon as possible to avoid spontaneous combustion.
- Immediate burning may be required to prevent the spread of fuel into water courses. If burning is done, ensure the after-burn residue is picked up.
- Notify and request assistance, if required, from external NT-NU 24 hr. Spill Report Line.
- Place all resources/materials on standby that are available within close proximity, i.e. crawler tractor, loaders, bobcats, vacuum trucks, fuel bladders/fibreglass tanks, lost circulation material, straw bales etc.

8. DECONTAMINATION AND CLEANUP

Collect, cleanup, and sample

- Decontaminate personnel as required if exposed to the spill.
- Priority is to high environmentally sensitive areas (municipality water sources, waterfowl staging areas, domestic fishing areas).
- Store the spilled material in proper containers for disposal.
- ♦ Implement remediation program for the area, as required.
- ♦ Collect and analyze soil samples from the remaining spill area, if required.
- Monitor the progress of remediation as required.

9. DISPOSAL

Dispose of wastes, contaminated clothing and equipment if unable to decontaminate.

- Consider waste impacts in all decisions.
- Remove the contaminated material and haul to an approved disposal site.

10. DOCUMENTATION

Document all actions and complete reports

- Assign a recorder to log activities.
- Complete and submit a follow-up spill report to the NT-NU 24 hr. Spill Report Line.

12.8.2 Fuel/Oil Spill Emergency Response Plan (Ice)

The campsite is located between a small lake and a channel of the Mackenzie River. All fuel on site is stored in tanks within secondary containment. This ERP also applies to non-fuel spills. Spills on or under ice are most likely to occur during transport or due to vehicle or equipment falling through the ice.

Transportation

Liquid fuels will be stored in a closed system during transportation. Diesel fuel will be delivered from Camp Farewell by fuel truck. Aviation fuel will be transported in drums. All equipment coming on site will be diesel powered so amount of gasoline on site is minimal.

Maintenance and Control

This contingency plan is project specific and will be 1) reviewed & 2) updated:

- As changes to applicable environmental legislation come into effect.
- Annually, to take into account changes in environmental factors and in facility characteristics and policy.
- After every oil pollution incident and exercise.

Changes to phone numbers and names of those individuals identified in this contingency plan will be made on an as required and when required basis. The numbers are to be verified when the camp is opened and/or on an annual basis.

Organization

Shell Canada Limited utilizes the Incident Command System for all emergencies³. All incident responses are modeled after the Disciplined Approach. See Section 917 of Shell's Emergency Response Plan Model for detailed guidance on the Disciplined Approach and Prioritized Response Goals.

Prioritized Response Goals

The prioritized response goals are:

- Protect Human Life (yours, fellow worker, & public)
- Protect The Environment
- Minimize Asset Loss
- Regain Steady State Operations to minimize business impact (consider both revenue & reputation).

The objectives of a spill response are:

Safety of People, Environment, and Facilities

³ ICS system description plus Roles & Responsibilities of all organizational positions are described in Shell's Emergency Response Manual - Model

- > Source Control
- > Containment of released materials
- > Recovery and Storage of released materials.

Procedure

1. SAFETY

Ensure personal safety

• Ensure your own personal safety from existing and potential hazards and fellow worker safety.

2. ISOLATE AND DENY ENTRY

Isolate the area and deny / restrict entry

- Utilize vehicles or barricades for temporary control.
- Establish / adjust control perimeters.

3. NOTIFICATIONS

Immediately notify the following:

◆ Shell's Onsite Supervisor

Notify the following as soon as practical:

- ♦ Shell's DAR/Construction Manager
- ♦ NT-NU 24 hr. Spill Report Line

4. COMMAND / MANAGEMENT

Order depends on specific factors

- Assign Incident Command System roles as resources become available.
- Initiate the response to incident, taking existing conditions into account.
- Ensure safety precautions and operating plans and conditions are reviewed with the crew.
- ♦ Determine a need for roadblocks.
- ♦ Ensure proper permits are executed.

5. IDENTIFICATION AND HAZARD ASSESSMENT

Identify the Hazards and Assess the Risks

- Determine chemical makeup of substance (i.e.: WHMIS, TDG Placards, PIN Nos.).
- MSDS (Material Safety Data Sheets Chemical).
- ◆ Placards and labels (colors, markings).
- Shipping papers (Bill of Lading, Way Bill, etc).
- ◆ Technical information (CANUTEC).
- Other (specialists, monitoring devices).

6. PROTECTIVE EQUIPMENT

Ensure proper personal protective equipment is utilized, and know the level of equipment available

- Fire retardant clothing, safety glasses, goggles, life jackets, gloves etc.
- Check MSDS sheets for additional requirements.

7. CONTAINMENT AND CONTROL

Safe defensive containment

- If safe to do so, and if possible, stop the flow of material.
- Ensure that flow is contained before starting the recovery procedure.
- Construct snow/ice dikes dams to limit size of spill and prevent fuel from migrating. Contain as close to source as safe and practical to do.
- ♦ In winter, areas are usually snow covered so spill areas are easily seen. Build dikes using plastic sheeting to line face of dike. Use mechanical and hand equipment to scrape up snow/liquid mixture and place it in containers.
- See list of emergency spill cleanup equipment for clean-up materials.
- Isolate (deny entry via keeping safe distance from spilled material).
- Pump as much liquid product as possible into vacuum trucks, empty drums or tanks for disposal.
- Deploy absorbent pads, socks as required.
- Recover oiled sorbents and place them in steel drums for disposal or burning in onsite incinerator. Sorbents should be incinerated as soon as possible to avoid spontaneous combustion.
- Scrape up all contaminated ice.
- ♦ Notify and request assistance, if required, from external NT-NU 24 hr. Spill Report Line.
- Place all resources/materials on standby that are available within close proximity, i.e. crawler tractor, loaders, bobcats, vacuum trucks, fuel bladders/fibreglass tanks, lost circulation material, straw bales etc.

8. DECONTAMINATION AND CLEANUP

Collect, cleanup, and sample

- ♦ Decontaminate personnel as required if exposed to the spill.
- Priority is to high environmentally sensitive areas (municipality water sources, waterfowl staging areas, domestic fishing areas).
- ♦ Store the spilled material in proper containers for disposal.
- ♦ Collect and analyze soil samples from the remaining spill area, if required.
- ♦ Monitor the progress of remediation as required.

9. DISPOSAL

Dispose of wastes, contaminated clothing and equipment if unable to decontaminate.

- ♦ Consider waste impacts in all decisions.
- Remove the contaminated material and haul to an approved disposal site.

10. DOCUMENTATION

Document all actions and complete reports

- Assign a recorder to log activities.
- ◆ Complete and submit a follow-up spill report to the NT-NU 24 hr. Spill Report Line.

12.8.3 Spills in Broken Ice

Like all spill responses, this very much depends on the conditions at the time of the event.

Consideration should be given to in-situ burning, which will be done and assessed on a case by case basis, so as to minimize impact to the environment and property, and in accordance with regulation. Regulatory approval will be required for in-situ burning.

If operating from shore or a secure location on the ice, a skimmer may be used to recover the spill.

12.8.4 Spills Under Ice

Oil under ice will attempt to follow the fastest river flows, which occur in the deepest sections of the river. Reference to a navigation chart for the river downstream of the spill site will show the location of the deep channel.

The fastest way to determine the progress of the oil under the ice is to auger holes and look for a sheen rising.

Note that as soon as the ice is penetrated this will also permit gases to escape from the oil.

The aim is to get sufficiently ahead of the oil that equipment can be staged at the site, an ice slot can be dug and, if necessary, wooden deflector walls installed prior to the arrival of the spill.

The ice slot creates an area for the spill to rise to the water surface and be retained there for recovery or, in some cases, ignition. The deflector walls are usually made of plywood sheets that stick down into the river through the ice and deflect the oil towards the slot for recovery. They serve the same purpose under the ice as deflection booms do in open water deployments.

The slot will be placed at an angle across the channel or part of the channel that the spill is expected to run through. 30° to the current flow is an optimum angle. The slot length will usually be that of the distance across the deep channel. The slot width may vary but is usually dictated by the width of the skimmer to be inserted at the downstream end. The surfaced oil will be carried to the downstream end of the slot by the water flow.

12.8.5 Oil Recovery

Oil may be recovered in several ways or a combination of methods. If conditions permit, a vacuum truck can skim the surfaced oil.

In good quality ice of 1 meter thickness there should be no difficulty cutting the slot wide enough to accommodate the MDSRC Canadyne Model 1230 /1 Multi Skimmer (1.22m) at the downstream end. This skimmer has a recovery capacity in excess of 20 cubic meters of oil per hour.

The MDSRC Aquaguard Model 40D rope mop skimmer is capable of recovering up to 4.5 cubic meters per hour. The rope mop can be placed to operate in long arm of the slot.

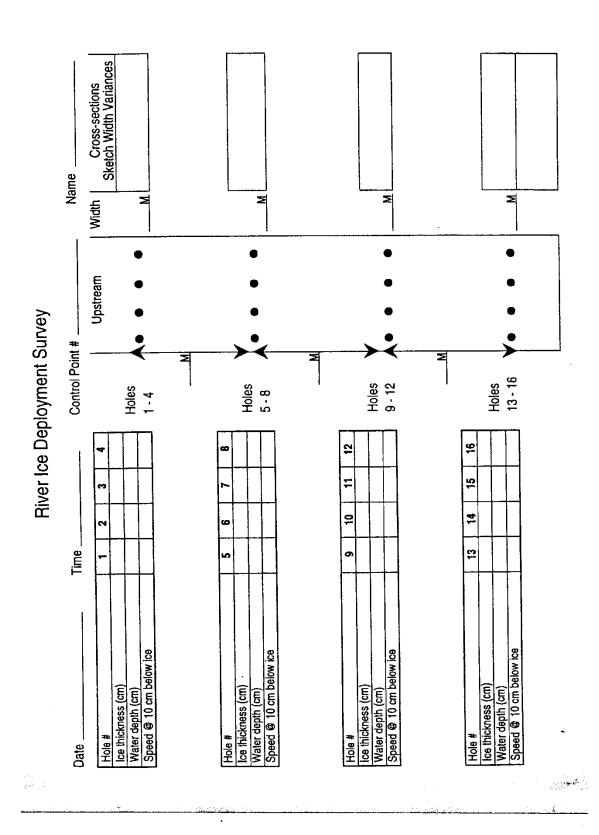
The MDSRC Morris MI-30 disc skimmer can also be utilized. It has a maximum recovery capacity of 30 cubic meters per hour. It may be placed at the funnel mouth end of the slot.

The following steps are taken to result in an ice deployment:

- Perform Ice Safety Assessment.
- Deploy ice rescue crew/package.
- Perform Ice Deployment Survey (Use Form shown in this Chapter) Ice auger and stream speed meter will be required.
- Determine location, angle, length and width of slot.
- Mark slot outline on ice.
- Compute required size of ice blocks to be pulled from slot.
- Mark block outlines on ice in the slot.
- Auger a hole through the centre of each block to the water below the ice
- Cut slot outline.
- Cut each block.
- Pull blocks from slot using "T" bar and chain, starting at downstream end of slot. Spread withdrawn blocks if on ice storage area to prevent stressing ice.
- A skimmer may be installed at the downstream slot end as soon as space is available. This speed the commencement of recovery operations.
- Determine the location, angle & length of deflector walls.
- Install deflector walls.

Tips

- Plywood may be used to cover the length of the slot in extremely cold weather that causes the slot to refreeze.
- Recovery hoses should be held above the ice surface by blocks of wood as this helps prevent the liquid in the hoses from freezing.
- All equipment fuelling should be performed at a designated fuelling station prepared to prevent and capture any spill or leak.



12.8.6 Mackenzie Delta Spill Response Corporation (MDSRC)

The Mackenzie Delta Spill Response Corporation is a non-profit organization operating within the Mackenzie Delta to protect the environment by providing spill preparedness and safe, effective response services to Member Companies.

A list of equipment on hand from MDSRC is provided in Appendix V. The equipment list has been updated July 16, 2012. MDSRC has initiated a project for 2013 to update the inventory list.

For more detailed response tactics and execution techniques, consult the MDSRC Spill Response Plan (currently being updated).

The MDSRC Spill Response Plan can be found online at:

http://deltaspillresponse.ca/logon.asp

Login Info:

Username: MDSR2009 Password: Delta123

12.9 TRANSPORTATION RELATED EMERGENCIES

12.9.1 Emergency Response Procedure - Automotive

- 1. Ensure personal safety
- 2. Call for help
 - use others involved
 - · warn oncoming traffic
- 3. Notifications
 - ambulance if required
 - local police (if damage over \$1,000.00)
 - supervisor
- 4. Fill out the shell automotive accident report form carried in all shell vehicles
- 5. Do not
 - admit fault or accept liability
 - make settlements
 - argue about the accident

12.9.2 Emergency Response Procedure – Aircraft

- 1. Consider an aircraft overdue when reported as such by Air Traffic Control (ATC) or the affected Shell destination when no information is received from it or about it.
 - 30 minutes after its last notified estimated time of arrival (ETA)
 - 15 minutes after the estimated time of landing, after having received landing clearance or landing information
 - 15 minutes after takeoff
- 2. There can be two phases of response to an overdue aircraft
 - uncertainty attempt to make contact or to find
 - alert missing aircraft
- 3. An aircraft is considered missing when its position is unknown and with the supply of fuel carried, it can no longer be airborne.

12.9.3 Emergency Response Procedure -External / Civil Disturbance

Note: Activities or hazards outside of your area of influence could result in an emergency situation requiring response. Examples include

- nearby industry
- transportation accident with spill or fire
- sabotage
- non work related accident of injury
- civil disturbances / actions
- 1. Ensure personnel safety
- 2. Confirm situation and location

- 3. Isolate and deny entry to site
- 4. Notifications
 - supervisor
 - police
 - onsite personnel
- 5. Initiate Incident Command System (ICS)
 - develop an action plan
 - shutdown equipment as deemed necessary in an organized safe manor
 - evacuate to a safe muster area, ensure everyone is accounted for
 - monitor and assist
 - resume operation when it is safe to do so

12.10 Classification of an Incident

12.10.1 Purpose

Classifying an incident provides a common understanding by Company, Industry and Government Agencies as to the severity of the incident and its potential impact on People, Property, Environment and Reputation. It is important that the Incident Commander (IC) determine the Level of Incident and its potential Level if it escalates. The Levels need to be adjusted depending on the emergency situation/status.

When the Onsite Shell Representative is unsure of the situation, then communication should take place with the Office Based Superintendent / Supervisor to determine the Level of Incident.

12.10.2 Classification Matrix

		INCIDENTS						
RISK	ALERT	LEVEL 1: LOW	LEVEL 2: MEDIUM	LEVEL 3: HIGH				
IMPACT			<u>'</u>	<u> </u>				
Worker Safety	Near Miss	People Actual severity consequence 2 on the RAM	Multiple worker injury an/or life threatening worker injury People Actual severity consequence 3 on the RAM	Worker fatality - Actual severity consequence 4 to 5 on the RAM				
Public Safety	Onsite event only. No risk to public but public has a perception that they are at risk.	Onsite, with possible impact off-site Reputation Actual or Potential severity consequence 2 on the RAM	Onsite, with possible impact off-site Reputation Actual or Potential severity consequence 3 on the RAM	Potential for public safety to be jeopardized Reputation Actual or Potential severity consequence 4 to 5 on the RAM				
Environmental	Onsite event only	Onsite, with possible impact off-site Environmental Actual severity consequence 2 on the RAM	Onsite, with possible impact off-site Environmental Actual severity consequence 3 on the RAM	Onsite, with significant off- site Environmental Actual severity consequence 4 to 5 on the RAM / Long term				
TYPES OF INCIDENTS				-				
Fire / Explosion	Small gas leak or fuel spill that can be immediately contained.	Gas or fuel leak with some risk of fire.	Contained equipment fire (i.e., camp, trailers or rig equipment), no risk to life.	Major equipment / rig fire and or explosion.				
Camp Fire	Potential of camp fire, false fire alarms, electrical problems in the fire system	Refuse, fuel, dry vegetation or other material out of control around the camp	Contained camp fire	Major camp fire or explosion				

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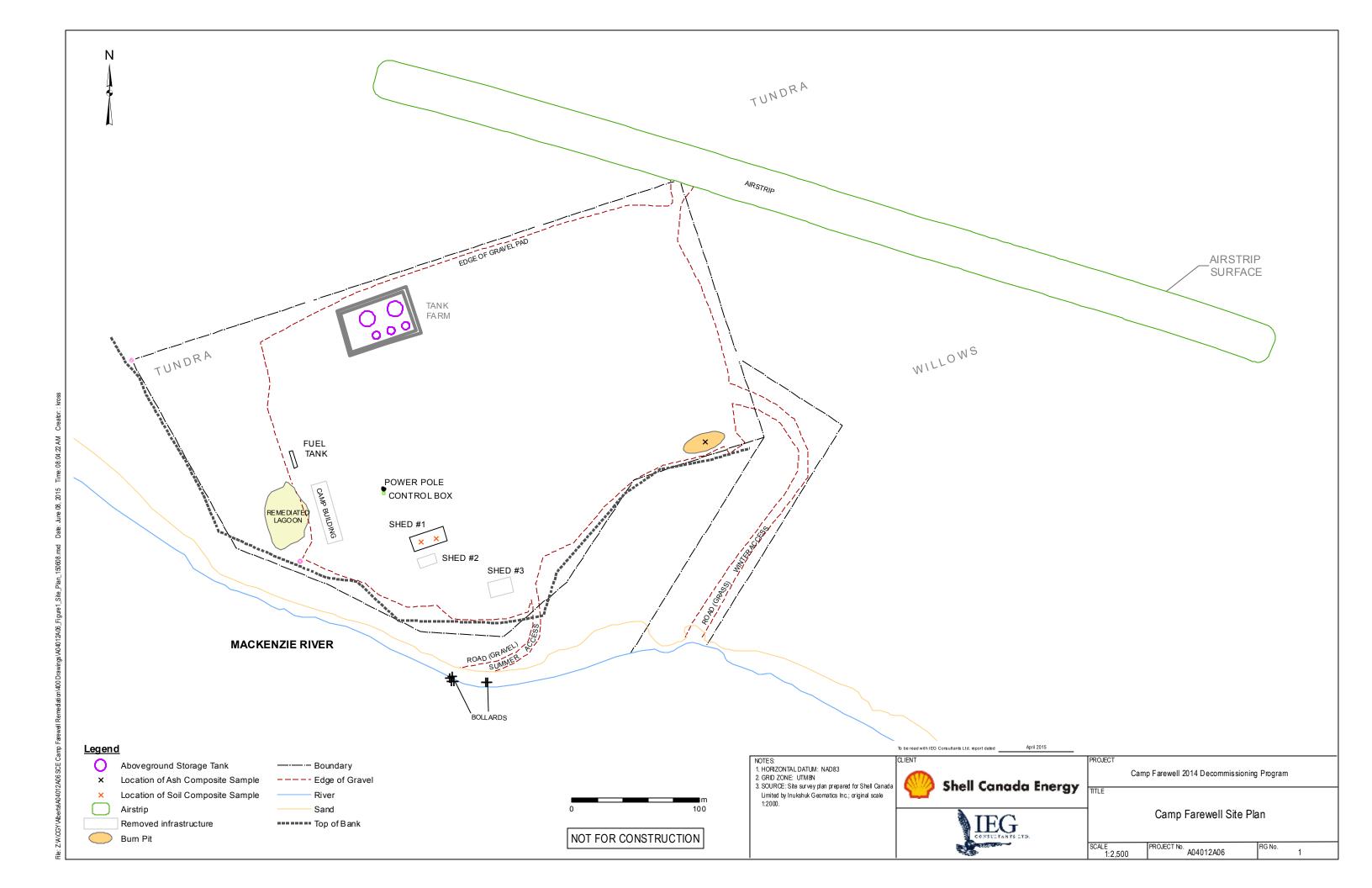
Hazardous Spill (chemicals, hydrocarbons or produced water)	Spill but within a containment system No hazard of fire	Onsite spill but outside containment system	Spill migrates off-site and or potential of fire and or explosion	Off-site sensitive environment (ie. wildlife wet lands, river or water body)
Transportation of Dangerous Goods (TDG)	TDG violation warning (no ticket issued)	TDG violation / accident, no damage to container and no product release	Accident with damage to container with potential of failure and/or fuel spill to sensitive area	Accident with fire and/or significant loss of product in sensitive area
Natural Event				
Severe Weather	Severe weather warning of area.	Travel becomes hazardous / potential for worker injury.	Restriction on travel / potential for worker injury.	No visibility, roads are impassable, significant build up of ice in equipment
External Events				
Sabotage	Targeting industry in the area.	Unconfirmed.	Onsite damage.	Sever damage that disrupts the safety of the operations.
Bomb Threat	Targeting industry in the area.	Unsubstantiated threat.	Credible threats.	Explosive located onsite and/or has detonated.

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12.10.3 Action Plan Checklist

	LEVEL 1: LOW	LEVEL 2: MEDIUM	LEVEL 3: HIGH
Commander (IC) Onsite Shell Representative	Activate Site Specific ERP Alert the Office Based Superintendent/Supervisor or Operations Manager who will: Consider proceeding to the worksite Mobilize Sr. Construction Foremar (if not on site) and HSE Team Leader Alert the Manager WA&SO and E&P Crisis Manager as needed. Establish an Incident Command Post Establish initial Staging Area Notify local regulators (AANDC, WSCC, etc) Alert / Stand by: Aircraft Support Fire Services MDSRC if required Emergency Medical Services	 □ Order additional communication equipment if req'd □ Mobilize resources to the Staging Area: Additional personnel from local contractors Fire services (if required) 	Establish road blocks Notify public (as required) Activate Corporate EOC (if required) Up-date AANDC ROC WSCC AANDC DFO RCMP Environment Canada E&P Crisis Manager

FIGURES



APPENDIX I TRANSPORTATION & MEDIVAC PLAN

EMERGENCY NUMBERS	Inuvik Hospital (867) 777- 8161 Emergency (867) 777-8000 Switchboard Inuvik Ambulance Emergency (867) 777-4444 RCMP (867) 777-1111 Air: Canadian Helicopters (867) 777-2424 Aklak Air (867) 777-3777 (867) 777-3555 - 24hr
GENERAL INFORMATION	Type of accident likely to occur: Lacerations, Slips/Trips/Falls
Note- If travel distance to Health care facility is:	Number of workers at site: 15 - 35
CLOSE (< 20 min.) or	Distance from a Health Care Facility: greater than 40 min
DISTANT (20 min to 40 min)	Availability of Ambulance Service: Air evacuation Ambulance emergency response time: Approximately 40min
You may rely on ambulance service from that Health care facility, <u>HOWEVER</u> , if the travel distance of the worksite is greater then 40 min, then it is deemed:	Time of day work is in progress: Day-time
ISOLATED (>40 min)	Type of transportation needed to get to the worksite: Helicopter or fixed wing
Therefore, you shall have transportation that meets the following criteria: Clean	Route to site: Flying 110km Northwest of Inuvik Lat: 69 12 35.09 Long: 135 06 17.286
 Protects from weather Equipped with communication Accommodate a 200 cm stretcher HELICOPTER RESPONSE TIME WILL QUALIFY 	Does change in weather effect type of travel? Explain. Increase time by: Depends upon weather. Could be next day.
CONTACTS: LOCATION OF PHONES AND RADIOS	 phones located in offices hallway radios on specific personnel radios in office specific personnel have cell phones/satellite phones
EMERGENCY CALL RESPONSIBILITY	Primary responsibility: Medic Secondary responsibility: Shell Site Supervisor Site phane number: 967,777
	Site phone number: 867 777- 867 777- Radio Frequency: Receive: Transmit: Tra
INFORMATION YOU NEED TO HAVE	CALL AIR EVACUATION CHARTER Tell them

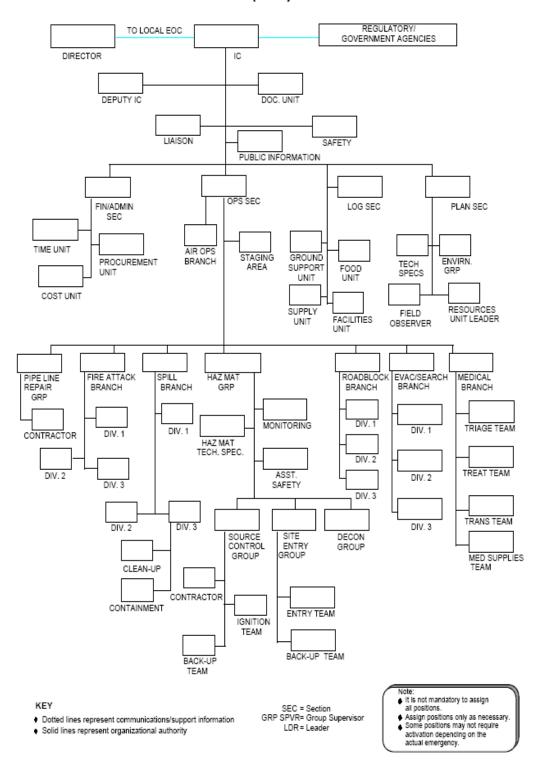
	 Medivac required Your location –Camp Farewell Lat: 69 12 35.09 Long: 135 06 17.286 Landing (airstrip) condition include lighting, wind speed, wind direction and local weather conditions Any obstructions or hazards to be aware of in landing Phone numbers of camp Radio frequencies of camp Upon contact to charter, medical contact is mandatory to ensure that proper facilities and attention is given to patient(s). Number of injuried: Extent of injuries:
	 What is being done (patient talking, seated, no response, etc): Obtain confidential medical file to accompany patient CALL TO HOSPITAL AND AMBULANCE If available and possible, medic shall call the local hospital and ambulance Tell them Medivac in progress and that evacuation charter has been notified Number of injured: Extent of injuries: What is being done (patient talking, seated, no response, etc) Age, sex of patient Brief description of accident Description of injuries or illness Medic position and qualifications Type of medical aid already administered Site phone number
EXPECTATIONS	Estimated time of arrival: What the paramedic should expect when he arrives on site: OR What you can expect when the conveyance vehicle arrives: ———————————————————————————————————
COMMUNICATION OF PLAN	FIRST AIDERS ON SITE ALL WORKERS ON SITE AS PART OF ORIENTATION

APPENDIX II PERSONAL MEDICAL INFORMATION SHEET

THE INFORMATION BELOW IS CONFIDENTIAL - TO BE VEI	EIWED BY MEDICAL PERSONNEL ONLY POSITION:
NAME:	DATE:
ADDRESS:	
PHONE NO.: ()	OR ()
BIRTHDATE: AG	GE HEIGHT: WEIGHT:
HEALTH CARE NUMBER:	PROVINCE:
FAMILY DOCTOR: MEDICAL HISTORY	CITY:
ARE YOU TAKING MEDICATION FOR THE FOL	LLOWING?
□ Diabetes□ Asthma□ Angina□ Thyroid	☐ Epilepsy ☐ High Blood Pressure ☐ Heart Disease
Allergies to Penicillin?	□ No □ Other Drugs
Do you suffer from allergies	□ No If so, explain
	ed above?
Have you had a tetanus shot in the past five y	years?
Do you wear Glasses? Contact Yes No Lenses?	☐ Yes ☐ No Dentures? ☐ Yes ☐ No
Do you have any medical problems, disabilit ability to conduct your job in a safe efficient If Yes please explain:	ties or previous injuries that may affect your t manner?
EMERGENCY CONTACT NUMBERS	
Name:	Relationship:
Address:	
Phone Number: ()	Cell Number: ()
Employee Signature	This form is to be used only in an emergency. By signing you are authorizing this information to be released to medical personnel.

APPENDIX III FIELD BASED INCIDENT COMMAND POST

COMPOSITE ORGANIZATION CHART - INCIDENT COMMAND POST (ICP)



\M/FIIS	ADDROVALS.	VNID	SEISMIC	OPERATIONS	(1)

APPENDIX IV NT-NU SPILL REPORT FORM & SPILL PROTOCOLS

Te	rritories Nunavut		NT-NU OIL, GASOLINE, C	A IEMIONE			an in Et in its		EMAIL: spills@gov.i
Λ.	REPORT DATE: MONTH - DAY - Y	/EAR		REPORT	TIME	-	ORIGINAL SPILL REF	NOT.	REPORT LINE USE O
A							R		REPORT NUMBE
В	OCCURRENCE DATE: MONTH - I	JAY - YEAR		OCCURR	ENCE TIME		THE ORIGINAL SPIL	L REPORT	
0	LAND USE PERMIT NUMBER (IF	APPLICABLE)		WATER LICENCE NUMBER (IF APPL		F APPLICABLE)			
5	GEOGRAPHIC PLACE NAME OR	DISTANCE AND DIREC	CTION FROM NAMED L	CCATION	REGION				
-	LATITUDE			T	LONGITUDE	□ NUNAVUT	☐ ADJACENT JUF	RISDICTION	OR OCEAN
E	DEGREES M	IINUTES	SECONDS	7	DEGREES		MINUTES	8	ECONDS
F	RESPONSIBLE PARTY OR VESS	EL NANE	RESPONSIBLE	PARTY AD	DRESS OR OF	FICE LOCATIO	N		
G	ANY CONTRACTOR INVOLVED		CONTRACTOR	ADORESS	OR OFFICE LO	CATION			
	PRODUCT SPILLED		QUANTITY IN LI	ITRES, KILI	OGRANS OR (UBIC METRES	U.N. NUNBER		
Н	SECOND PRODUCT SPILLED (F	APPLICABLE)	QUANTITY IN U	ITRES, KILI	OGRANS OR O	UBIC METRES	U.N. NUMBER		
ı	SPILL SOURCE		SPILL CAUSE				AREA OF CONTAN	AREA OF CONTAMINATION IN SQUARE METRES	
-	FACTORS AFFECTING SPILL OR	FACTORS AFFECTING SPILL OR RECOVERY DESCRIBE ANY			ASSISTANCE REQUIRED		HAZARDS TO PERSONS, PROPERTY OR EQUIPMEN		
J	ADDITIONAL INFORMATION, CON	UNENTS, ACTIONS PE							
J	ADDITIONAL INFORMATION, CON	MNENTS, ACTIONS PI							
<	ADDITIONAL INFORMATION, CON	MNENTS, ACTIONS PR			N, RECOVER C	R DISPOSE O		AND CONTR	
K				TO CONTAIN	N, RECOVER C	R DISPOSE O	CATION CALLING FR	AND CONTR	ANINATED MATERIALS
\ \	REPORTED TO SPILL LINE BY	POSITION		ENPLOYE	N, RECOVER C	R DISPOSE O	SPILLED PRODUCT.	AND CONTR	ANINATED MATERIALS
<	REPORTED TO SPILL LINE BY	POSITION POSITION	REPORT LIN	ENPLOYE	N, RECOVER C	L L	DOATION CALLING FROM THE CONTROL OF	AND CONTR	ANINATED MATERIALS TELEPHONE ALTERNATE TELEPHO
\ \ \	REPORTED TO SPILL LINE BY ANY ALTERNATE CONTACT	POSITION POSITION STATION OPERATO	REPORT LIN	EMPLOYE EMPLOYE EMPLOYE EMPLOYE	N, RECOVER C	L L	DOCATION CALLING FR LITERNATE CONTACT DOCATION	AND CONTR	ANINATED MATERIALS
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J	REPORTED TO SPILL LINE BY ANY ALTERNATE CONTACT RECEIVED AT SPILL LINE BY AGENCY DEC DCGG DGN	POSITION POSITION POSITION STATION OPERATO	REPORT LIN	EMPLOYE EMPLOYE EMPLOYE SIGN	ER ER FICANCE II	L L	DOCATION CALLING FR LITERNATE CONTACT DOCATION DOCATION CALLED BLICOWKNIFE, NT	AND CONTR	TELEPHONE ALTERNATE TELEPHO REPORT LINE NUMBE (367) 020-81:30
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PAGE 1 OF _

Instructions for Completing the NT-NU Spill Report Form

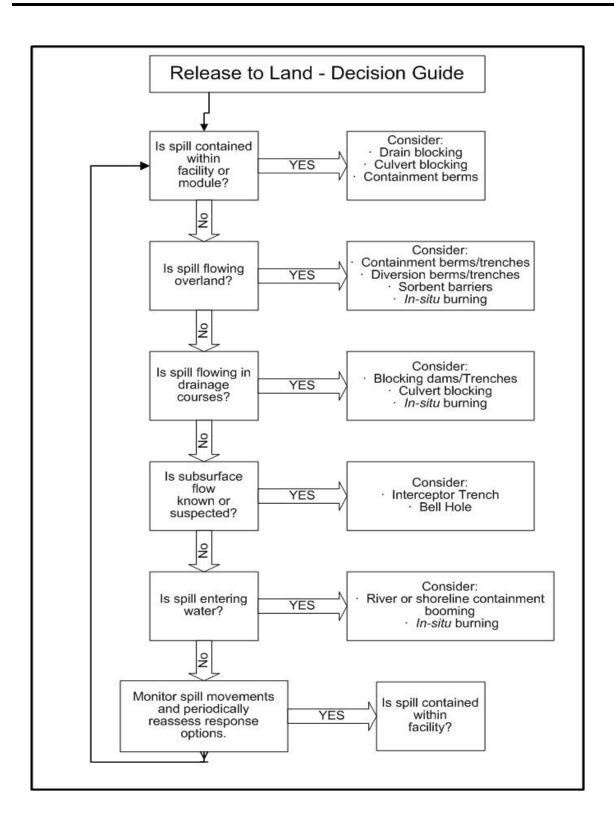
This form can be filled out electronically and faxed to the spill line at 867-873-6924. Commencing on January 2, 2007, the form can also be e-mailed as an attachment to spills@qov.nt.ca. Until further notice, please verify receipt of e-mail transmissions with a follow-up telephone call. Spills can still be phoned in by calling collect at 867-920-8130.

A. Report Date/Time	The actual date and time that the spill was reported to the spill line. If the spill is phoned in, the Spill Line will fill this out. Please do not fill in the Report Number: the spill line will assign a number after the spill is reported.
B. Occurrence Date/Time	Indicate, to the best of your knowledge, the exact date and time that the spill occurred. Not to be confused with the report date and time (see above).
C. Land Use Permit Number /Water Licence Number	This only needs to be filled in if the activity has been licenced by the Nunavut Water Board and/or if a Land Use Permit has been issued. Applies primarily to mines and mineral exploration sites.
D. Geographic Place Name	In most cases, this will be the name of the city or town in which the spill occurred. For remote locations – outside of human habitations – identify the most prominent geographic feature, such as a lake or mountain and/or the distance and direction from the nearest population center. You must include the geographic coordinates (Refer to Section E).
E. Geographic Coordinates	This only needs to be filled out if the spill occurred outside of an established community such as a mine site. Please note that the location should be stated in degrees, minutes and seconds of Latitude and Longitude.
F. Responsible Party Or Vessel Name	This is the person who was in management/control/ownership of the substance at the time that it was spilled. In the case of a spill from a ship/vessel, include the name of the ship/vessel. Please include full address, telephone number and email. Use box K if there is insufficient space. Please note that, the owner of the spilled substance is ultimately responsible for any spills of that substance, regardless of who may have actually caused the spill.
G. Contractor involved?	Were there any other parties/contractors involved? An example would be a construction company who is undertaking work on behalf of the owner of the spilled substance and who may have contributed to, or directly caused the spill and/or is responding to the spill.
H. Product Spilled	Identify the product spilled; most commonly, it is gasoline, diesel fuel or sewage. For other substances, avoid trade names. Wherever possible, use the chemical name of the substance and further, identify the product using the four digit UN number (eg: UN1203 for gasoline; UN1202 for diesel fuel; UN1863 for Jet A & B)
I. Spill Source	Identify the source of the spill: truck, ship, home heating fuel tank and, if known, the cause (eg: fuel tank overfill, leaking tank; ship ran aground; traffic accident, vandalism, storm, etc.). Provide an estimate of the extent of the contaminated/impacted area (eg: 10 m²)
J. Factors Affecting Spill	Any factors which might make it difficult to clean up the spill: rough terrain, bad weather, remote location, lack of equipment. Do you require advice and/or assistance with the cleanup operation? Identify any hazards to persons, property or equipment: for example, a gasoline spill beside a daycare centre would pose a safety hazard to children. Use box K if there is insufficient space.
K. Additional Information	Provide any additional, pertinent details about the spill, such as any peculiar/unique hazards associated with the spilled material. State what action is being taken towards cleaning up the spill; disposal of spilled material; notification of affected parties. If necessary, append additional sheets to the spill report. Number the pages in the same format found in the lower right hand corner of the spill form: eg. "Page 1 of 2", "Page 2 of 2" etc. Please number the pages to ensure that recipients can be certain that they received all pertinent documents. If only the spill report form was filled out, number the form as "Page 1 of 1".
L. Reported to Spill Line by	Include your full name, employer, contact number and the location from which you are reporting the spill. Use box K if there is insufficient space.
M. Alternate Contact	Identify any alternate contacts. This information assists regulatory agencies to obtain additional information if they cannot reach the individual who reported the spill.
N. Report Line Use Only	Leave Blank. This box is for the Spill Line's use only.

REPORTABLE SPILL QUANTITIES

TDG	Substance for NT-NU 24 Hour Spill Line	Immediately Reportable Quantities
Class		
1 2.3	Explosives Compressed gas (toxic)	Any amount
2.4 6.2	Compressed gas (corrosive) Infectious	
7	substances Radioactive Unknown	
None	substance	
2.1 2.2	Compressed gas (flammable)	Any amount of gas from containers
	Compressed gas (non-corrosive, non-	with a capacity greater than 100 L
	flammable)	
3.1 3.2	Flammable liquids	> 100 L
3.3		
4.1 4.2	Flammable solids Spontaneously	> 25 kg
4.3	combustible solids Water reactant	
5.1 9.1	Oxidizing substances Miscellaneous	> 50 L or 50 kg
	products or substances excluding PCB	
	mixtures	
5.2 9.2	Organic peroxides Environmentally	> 1 L or 1 kg
3.2 3.2	hazardous	
6.18	Poisonous substances Corrosive	> 5 L or 5 kg
9.3	substances Dangerous wastes	
9.1	PCB mixtures of 5 or more ppm	> 0.5 L or 0.5 kg
None	Other contaminants (e.g. crude oil,	> 100 L or 100 kg
	drilling fluid, produced water, waste or	
	spent chemicals, used or waste oil,	
	vehicle fluids, waste water, etc.)	
None	Sour natural gas (i.e. contains H2S)	Uncontrolled release or sustained flow
	Sweet natural gas	of 10 minutes or more

In addition, all releases of harmful substances, regardless of quantity, are to be reported to the NT-NU spill line if the release is near or into a water body, is near or into a designated sensitive environment or sensitive wildlife habitat, poses imminent threat to human health or safety, poses imminent threat to a listed species at risk or its critical habitat, or is uncontrollable.



APPENDIX V MDSRC SPILL EQUIPMENT LISTING

APPENDIX VI MSDS SHEETS