ANNUAL REPORT 2016

Inuit Land Use Licence Number: KVL308C09
INAC Land Use Permit Number: N2012C0030
Nunavut Impact Review Board File Number: 08EN052

Submitted to: KIA, INAC, NIRB
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Kivalliq Energy Corporation
February 1, 2017

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CORPORATE BACKGROUND AND GENERAL INFORMATION

Kivalliq Energy Corporation (Kivalliq Energy) is a Vancouver-based uranium exploration company with Canada's highest-grade uranium resource outside of Saskatchewan's Athabasca Basin. The company has been operating in Nunavut since 2008. Its flagship project is the Angilak Property (Angilak).

Kivalliq Energy was the first company in Canada to sign a comprehensive agreement with Nunavut Tunngavik Inc. (NTI) to explore on Inuit Owned Land (IOL) for uranium. As part of this landmark partnership, Kivalliq Energy must meet certain expenditure and corporate commitments. Upon a production decision at the Angilak Property NTI can elect to have a 25% participating interest in the project, or collect a 7.5% Net Profits Royalty. The agreement not only applies to IOL RI-30, but also, extends to 91 Crown issued mineral claims. The Angilak Property totals 89,852 hectares (222,029.1 acres).

Kivalliq Energy was formed to advance the Angilak Property and other uranium opportunities in Nunavut. Management has extensive background working in Canada's north. John Robins is Chairman of the Company's board of directors, Jim Paterson is the Chief Executive Officer, Jeff Ward serves as President and Andrew Berry is Chief Operating Officer. The group is committed to the social and economic development of the north while maintaining a level of excellence in minimizing environmental impacts. Kivalliq Energy is proud to have been presented in both 2011 and 2012 with the Environmental Excellence Award from the Kivalliq Inuit Association for outstanding environmental stewardship at Kivalliq Energy's Angilak Property.

Since 1979, the property and surrounding area has been called various names (i.e. LGT, Yathkyed, Lac Cinquante) however, Kivalliq Energy collectively refers to all land holdings as the "Angilak Property". The Angilak property hosts the high-grade Lac 50 (Lac Cinquante) uranium resource and more than 150 mineral showings.

From 2007 to 2013, Kivalliq Energy evaluated the Lac 50 trend uranium deposits through a series of exploration programs that included approximately 89,600 metres of diamond drilling and reverse circulation drilling. During that time the company delineated the Lac 50 Main Zone, Western Extension, Eastern Extension, J4 Zone and Ray Zone uranium deposits. On January 15, 2013 the company released an NI 43-101 inferred mineral resource estimate for the Lac 50 trend deposits of 43.3 million pounds U_3O_8 in 2,831,000 tonnes grading 0.69% U_3O_8 (at 0.2% U_3O_8 cut-off). Smaller programs since 2013 have focused on acquiring additional property-wide geotechnical data, plus a modest 2015 drill program 25 kilometres southwest of Lac 50 at Dipole.

Kivalliq has also identified seven additional mineralized zones at Angilak through drilling that are not included in the resource estimate. The Blaze, Pulse, Spark, Forte, Southwest Extension, Hot, BIF and Dipole zones remain at an early stage of investigation. The geologic characteristics for the numerous uranium deposits within the Lac 50 trend are very similar. The deposit are basement hosted, vein-hydrothermal type. The emplacement of uranium is structurally controlled. Mineralization consists of disseminated and patchy pitchblende within fracture controlled brecciated, hematite-quartz-carbonate veins. The company is also evaluating the Angilak Property for other mineral occurrences, namely, gold, silver, copper and platinum group metals.

PROPERTY DESCRIPTION AND LOCATION

The Angilak Property consists of 91 active mineral claims and Inuit Owned Land Parcel RI-30 (IOL), comprising a total area of 89,852 hectares in the Kivalliq region of southern Nunavut Territory (**Appendix A**). The Property is located 350 kilometres west of Rankin Inlet and 225 kilometres southwest of Baker Lake (Figure 1). The property dimensions measure 55 kilometres east-west by 35 kilometres north-south.

As indicated on Figure 2, all mineral claims and the IOL are contiguous and extend north, south, east and west between 6925000m N and 6965000m N and 479300m E to 533000m E, NAD83, Zone 14, NTS Map sheets 65 J/06, 65 J/07, 65 J/09, 65 J/10, 65 J/11 and 65 J/15 (latitudes 62° 27' North and 62°48' North and longitudes 98° 21' West and 99°24' West).

Land use permits enabling exploration work to be conducted on the property have been issued, renewed and amended by the Kivalliq Inuit Association (KIA) for parts of the property covering Inuit Owned Lands (IOL) and by Indigenous and Northern Affairs Canada (INAC) for Crown Lands. Kivalliq Energy also operates under the terms and conditions of a Nunavut Water Board (NWB) licence, covering activities on both IOL and Crown Lands. 2016 was the ninth year that Kivalliq Energy operated on the lands described in this report. See Table 1 for a list of active permits and licences issued for lands that comprise the Angilak Property.

Table 1: 2016 Land Use Permits and Licences

Issuing/Screening Agency	Date Issued	File Number
KIA	August 1, 2008	KVL308C09
NIRB	July 31, 2008	08EN052
INAC	August 7, 2013	N2012C0030
NWB	March 4, 2013	2BE-ANG1318

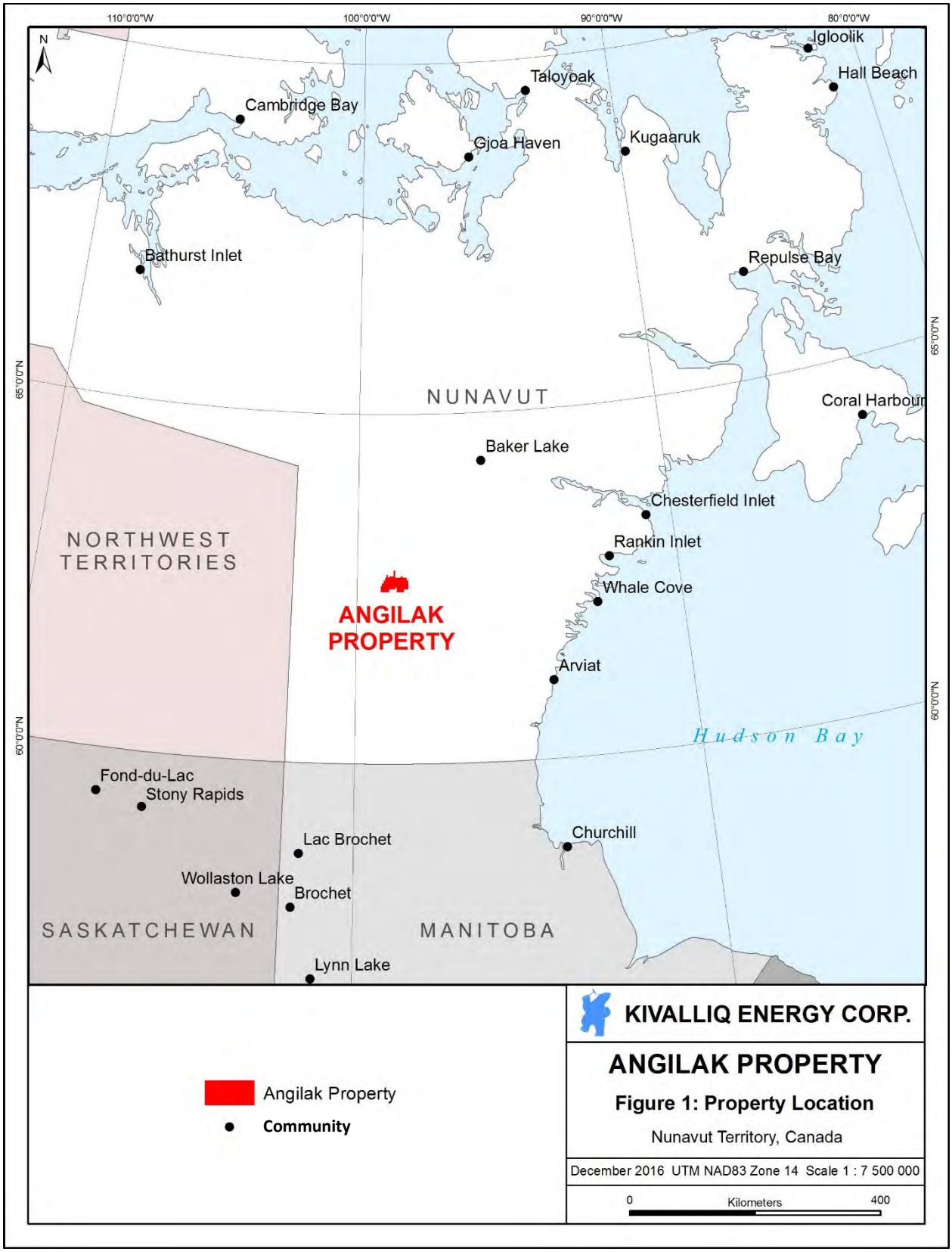


Figure 1: Angilak Property Location

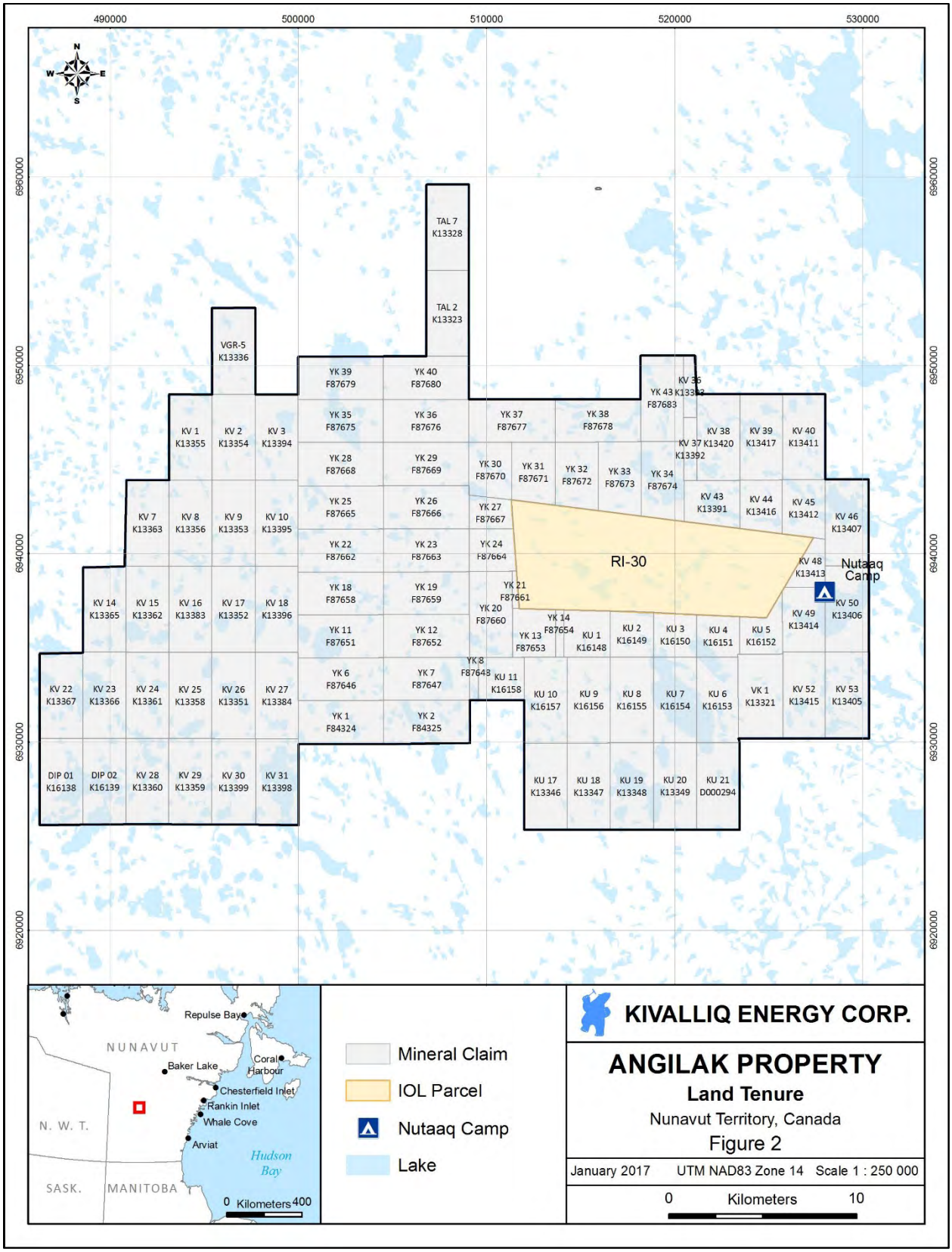


Figure 2: Angilak Property Land Tenure

2016 WORK COMPLETED

Work in 2016 included soil sampling, prospecting, trenching and channel sampling and environmental baseline monitoring.

Soil Sampling

During the 2016 summer field season, three Kivalliq Energy employees conducted a helicopter-supported soil sampling program between July 2, 2015 and July 25, 2016. A total of 704 Enzyme Leach soil samples were collected over three target zones; Yat Zone, Dipole Area and Fox Lake Area. While EL sampling at the Yat Zone, 172 conventional soil samples were also collected.

The goal of the geochemical survey was to classify and prioritize bedrock conductors for drilling by identifying those conductors which have associated surface geochemical anomalies. Enzyme Leach Analysis was chosen due to its sensitivity in detecting mineralization beneath deep overburden, which in some areas has been shown to be superior and more cost effective to that of conventional soil assays. Soil sample locations can be seen in Figures 3 to 5.

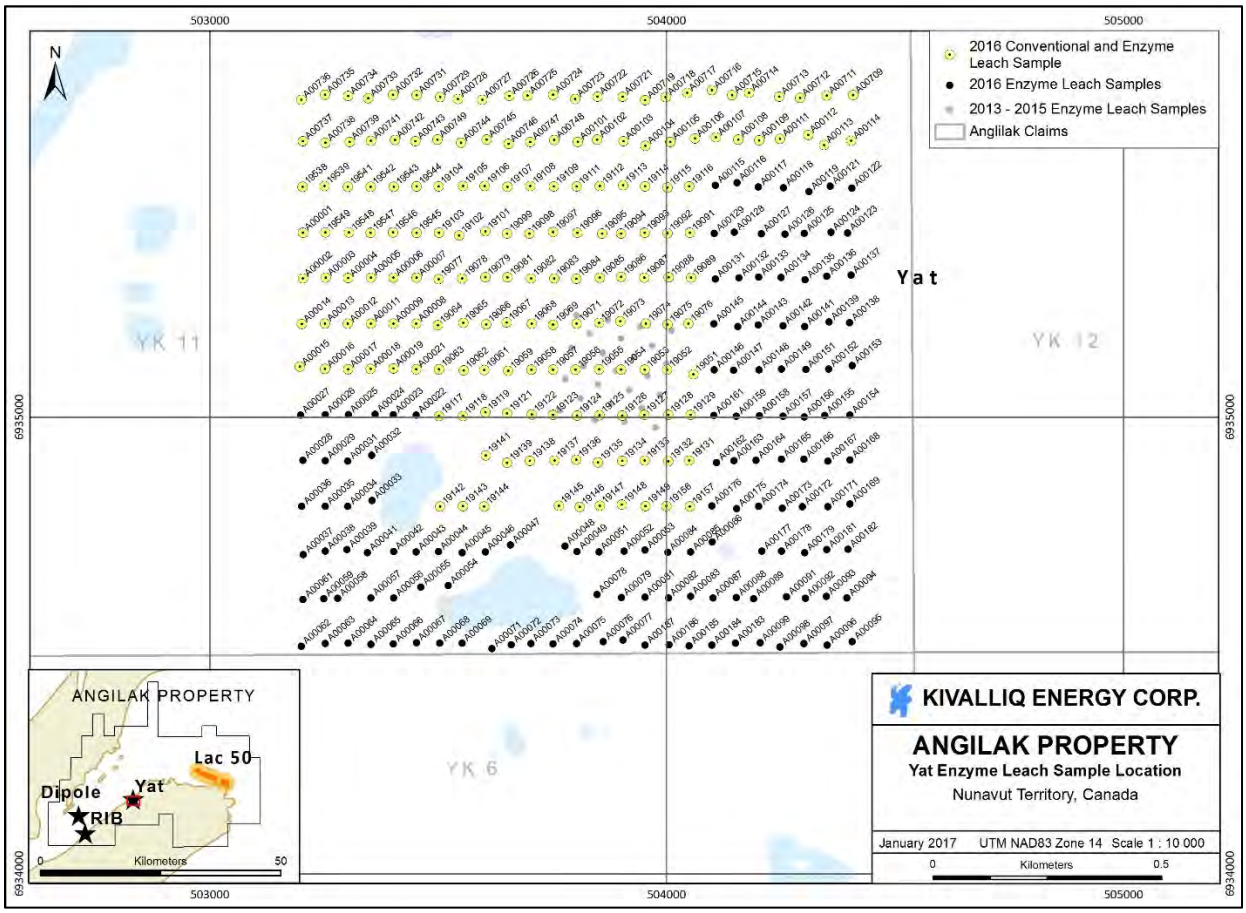


Figure 3: 2016 Yat Grid Soil Sample Locations

A total of 782 EL samples were sent to Activation Laboratories Ltd. (ActLabs) in Ancaster, Ontario for Enzyme Leach Analysis; 704 of which were soil samples and 78 QA/QC samples. Conventional soil samples totalled 172 plus 18 QAQC samples which were sent to Saskatchewan Research Council (SRC) in Saskatoon for multi element analysis.

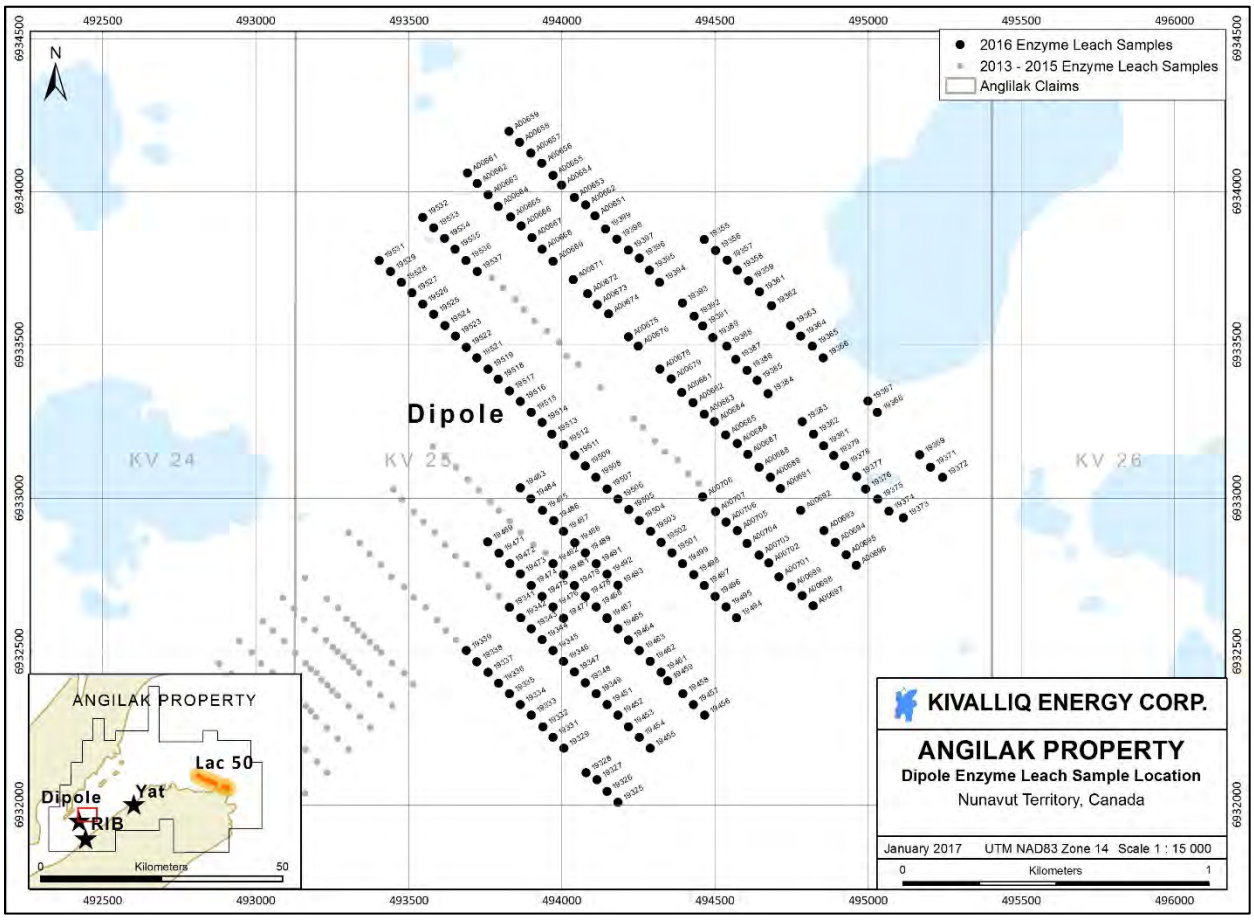


Figure 4: 2016 Dipole Grid Soil Sample Locations

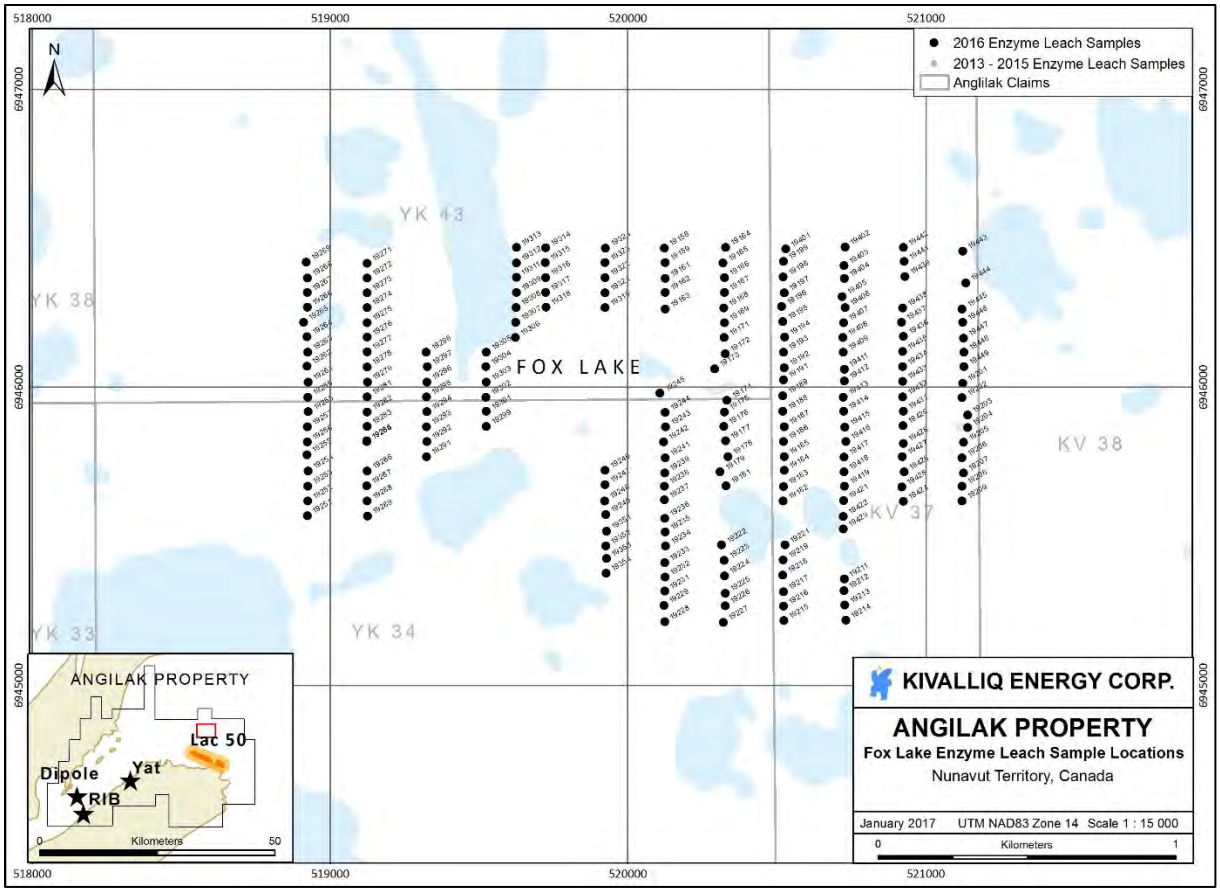
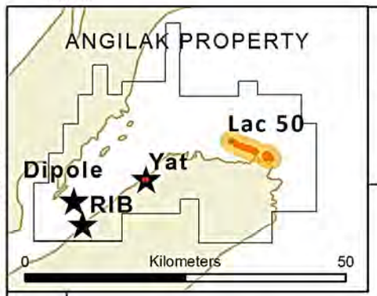


Figure 5: 2016 Fox Lake Grid Soil Sample Locations

Trenching Program

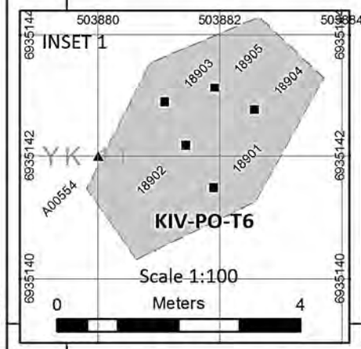
The trenching program included the excavation of three historic Pan Ocean trenches and eight new trenches. A total of 49 channel samples were collected from five individual trenches. The trenching program also included the collection of 51 rock grab sample, the majority of which were collected over the Yat target with a small number gathered from the Dipole area and Fox Lake area.

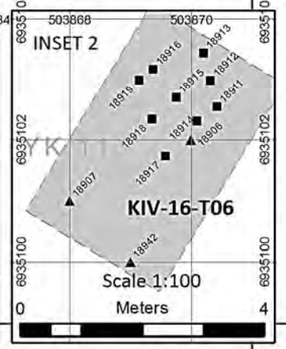
Kivalliq employees conducted the helicopter-supported program during July 2016 which ran concurrently with the soil sampling program. The channel and rock sample locations are shown on Figure 6. A total of 105 samples (channel and rock) were shipped to SRC in Saskatoon for multi-element geochemical assay, which includes 5 QAQC samples.

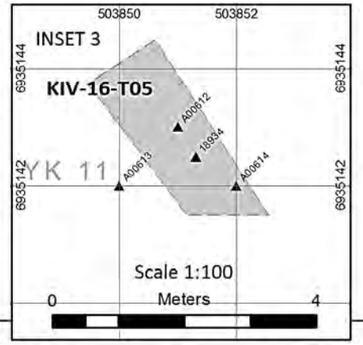


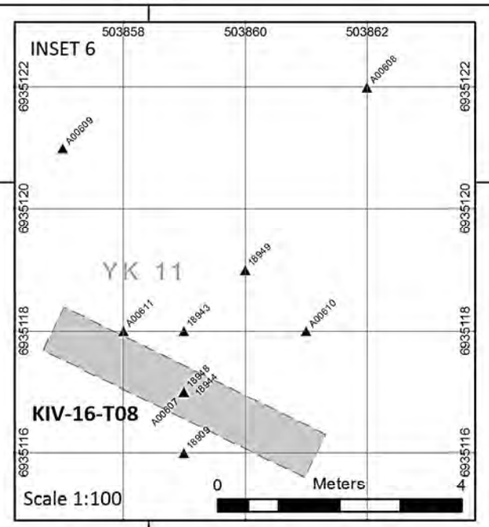
Sample 18941 18.6 km NE
518925.8 E, 6945629.1 N

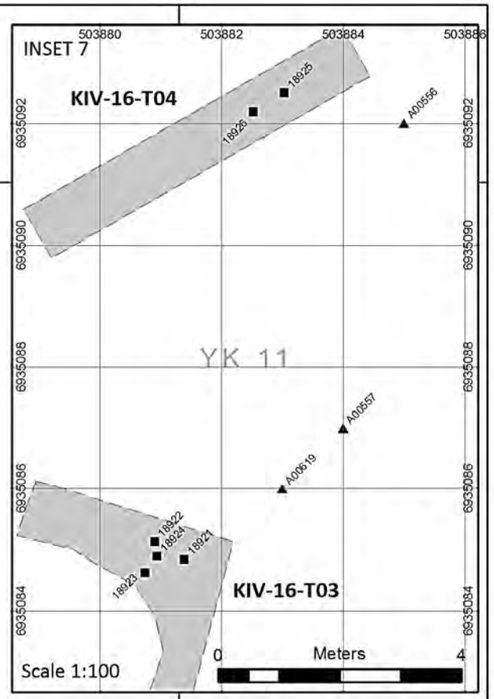
Sample A00617, 10 km WSW
493820.2 E, 6932591.9 N

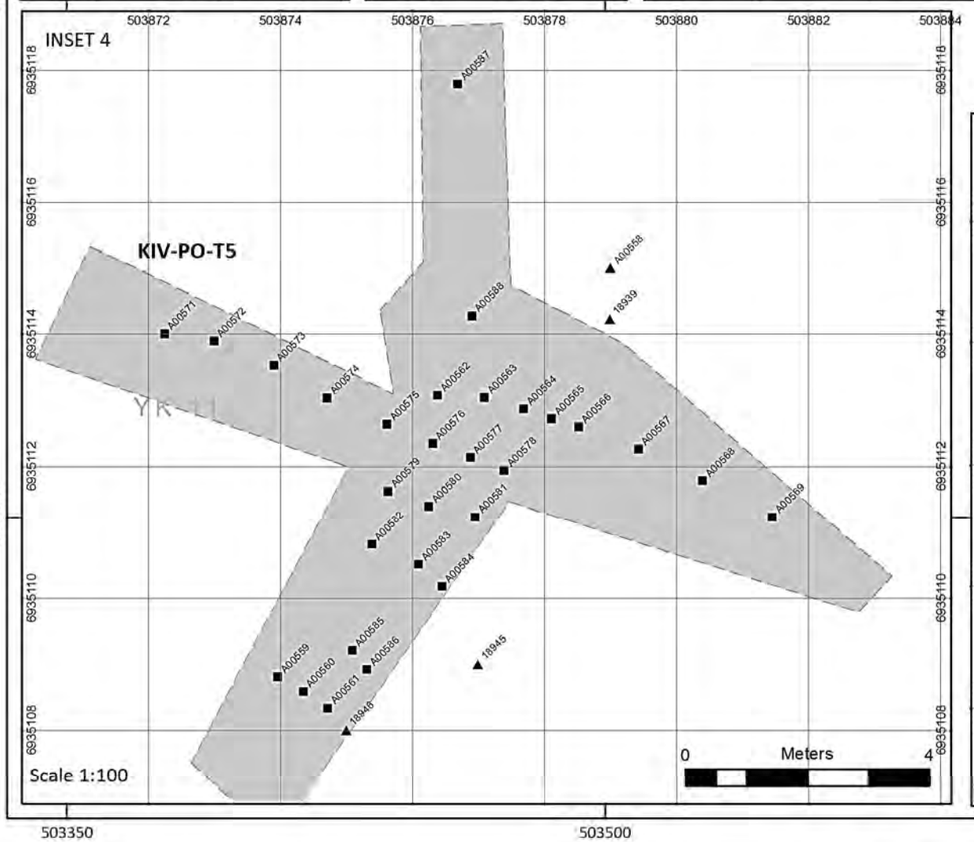


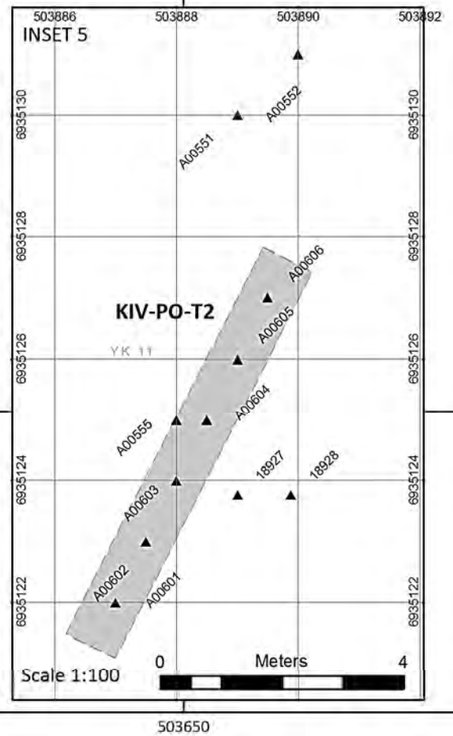




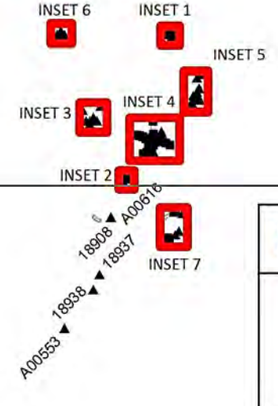








Yat



Channel
Rock
Anglilak Claims
Trench

KIVALLIQ ENERGY CORP.

ANGILAK PROPERTY

Yat Rock and Channel Sample Locations

Nunavut Territory, Canada

January 2017 UTM NAD83 Zone 14 Scale 1 : 2,750

0 Meters 100

Heavy Mineral Sampling

The 2016 reconnaissance heavy mineral sampling program included the investigation of 13 magnetic low targets with 39 till samples (Figure 7). From July 13 to July 18, 2016 the helicopter-supported heavy mineral sampling program ran concurrent to the trenching program.

The purpose of the heavy mineral sampling program was to test the heavy mineral expression in tills down ice of circular magnetic signatures to determine if they could be kimberlitic or diatremes in origin.

A total of 41 samples (39 till samples + 2 QAQC samples) were sent to CF Mineral Resources Ltd. in Kelowna, British Columbia for heavy mineral geochemistry analysis.

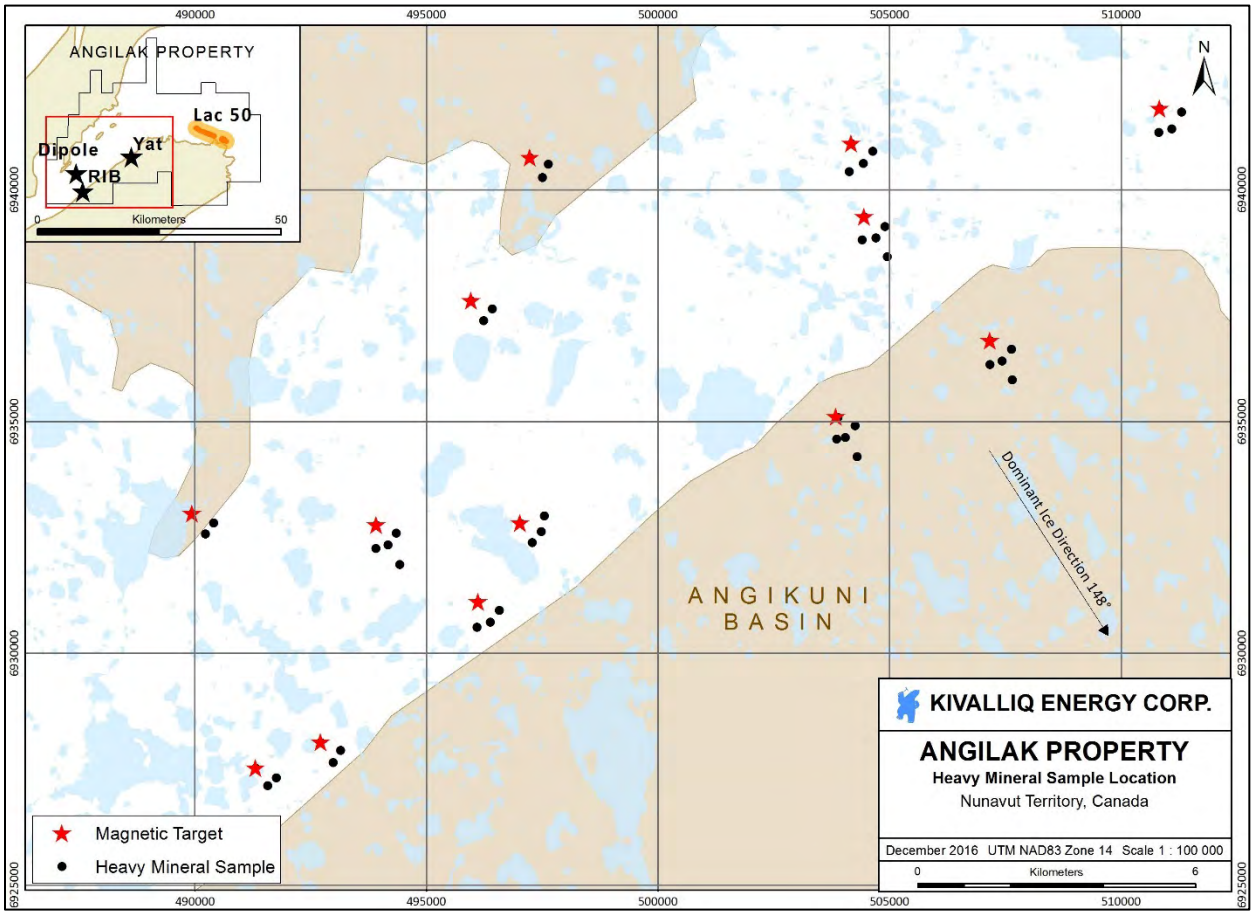


Figure 7: 2016 Heavy Mineral Sample Locations

Camp Infrastructure

The Nutaaq Camp was constructed in 2010 and expanded in 2011 and 2012 to accommodate larger exploration programs in those years. The camp was downsized in 2013 in response to a smaller exploration programs and included the removal of six Weatherport sleeper tents. No changes were made to Nutaaq Camp between 2014 and 2016. The camp is located at 527975m E, 6937950m N, NAD 83 Z14 (62° 34' 18" N Lat. And 98° 27' 19" W Long.) and is situated on an elevated flat topped gravel deposit that is part of a large trunk esker traversing the property approximately two kilometres west of the camp. The site is adjacent to Nutaaq Lake, an east west trending 1.5 kilometre wide by 4.1 kilometre long lake that supplies the camp with potable water and accommodates ski equipped and float equipped aircraft. The lake is sufficient in length to establish an ice strip in winter to accommodate larger aircraft such as Boeing 737 and Lockheed C130's. Several adjacent flat topped gravel deposits serve as an airstrip for wheeled light aircraft, helicopter landing sites, core racks and fuel storage.

In 2016 the camp comprised 22 individual structures; 1-14'x32' kitchen, 1-14'x16' kitchen overflow, 1-14'x32' wash tent, 1-14'x16' toilet shack, 1-14'x16' Level II First Aid facility, a 10'x12' generator shed, 1-14'x16' office, 1-14'x 32' core tent, 1-14'x32' core splitting tent, 1-30'x60' Sprung structure and 11-14'x16' vinyl Weatherport sleepers. A solar-operated Bearwise electric bear fence surrounds the Nutaaq Camp and the Sprung Tent. Figure 8 below shows the camp layout.

Camp infrastructure, core storage, fuel storage and the airstrip are located on crown mineral claims subject to INAC Land Use Permit N2012C0030. Temporary storage of drill cuttings and drill equipment staging areas are located on IOL Parcel RI-30, subject to KIA Land Use Licence KVL308C09.

A small crew arrived on site on June 27, 2016 to open and inspect the camp facilities and to install canvas covers on the wooden kitchen, dry and core shack tent frames. Exploration crews arrived on site on July 1 and were active to July 29, 2016. The camp was winterized and closed for the season on July 29th by a small crew of Discovery Mining Services and Kivalliq Energy employees. All canvas tent covers were removed from wooden tent frames and sent to Yellowknife for storage. All Weatherport vinyl tents were left standing and the bear fence was left operational for the winter months.

Nutaaq Camp – July 2016

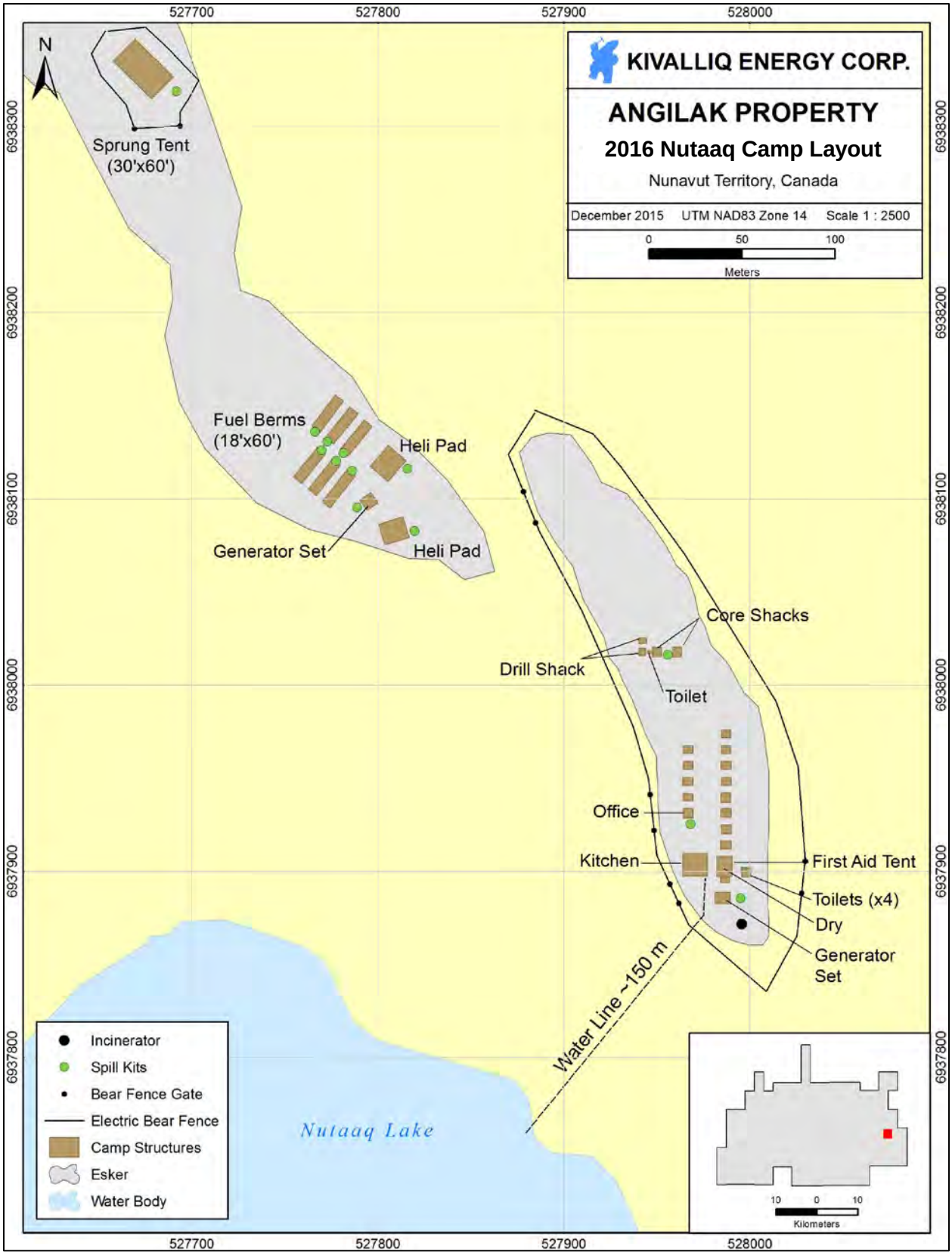


Figure 8: 2016 Nutaaq Camp Layout

Environmental Baseline Monitoring Program 2016

Hemmera Envirochem Inc. (Hemmera) was contracted by Kivalliq Energy in 2010 to design and implement a customized early stage baseline monitoring program that corresponds with the stage of current exploration, and allows for rapid expansion or downsizing of monitoring studies as the exploration program changes in scope and/or location from year to year. The program is designed to build an understanding of the local and regional environmental attributes in areas being worked that are of legislative, cultural, economic and/or scientific importance. The attributes selected for study are also those that will benefit from the longest record of data collection.

The monitoring program investigates five biophysical components:

- Water Quality
- Hydrology
- Meteorology
- Air Quality
- Non-invasive, Observational Based Wildlife Monitoring

The Angilak Property baseline environmental monitoring study area is presented in Figure 6.

In 2016, monitoring studies focused on water quality, meteorology and wildlife as described below. Refer to **Appendix B** for Kivalliq Energy's report on the Angilak Project 2016 Water Quality Sampling Program and **Appendix C** for the Angilak 2016 Wildlife Incidental Observation Log.

Water Quality

In 2010, Hemmera initiated a water quality monitoring program to generate baseline water quality data in areas of active exploration. Sample sites were established on 20 representative water bodies on the Angilak Property that were focused on the Lac 50 deposit exploration area and camp infrastructure locations. An additional six sites were added in 2012. Two more sites were added on the west side of the Property in 2015: a site at Dipole lake was established prior to commencement of the Dipole drilling program and; a site at RIB lake, a high priority exploration target approximately four kilometres south of Dipole.

In mid July 2016 water samples were collected from a total of 15 sample sites (Figure 9). This represents water samples from existing sites in areas adjacent to the Lac 50 mineral deposits, target areas at Dipole and Rib and the Nutaaq Camp. Water was analyzed for hardness, metals, pH, total suspended solids, ammonia, nitrate, cyanide and alkalinity.

Meteorology

A fully automated Onset Hobo Weather Station with an OTT Pluvial Rain Gauge was installed on the Angilak Property in June 2010. Parameters recorded include; air temperature, relative humidity, total precipitation, barometric pressure, wind speed and direction. Meteorological data was collected regularly until 2014. Since then, data has been intermittently recorded manually and/or electronically, depending on duration and scope of camp activity. Periodic interruptions are the result of damage to the station caused by extreme weather. Repairs and maintenance are planned for 2017.

Wildlife

The overall objective of the wildlife program is to describe wildlife use of the study area and produce coarse-scale population estimates for valued ecosystem components (VECs) occurring in the study area. The 2016 exploration program consisted of soil sampling, prospecting, trenching and channel sampling conducted from July 1 to July 29, 2016. The short field season with limited staff on site was not conducive to conducting dedicated wildlife surveys, therefore the 2016 wildlife program consisted of logging incidental observations of all wildlife encountered by field staff and noting any listed species or high priority VEC known to occur in the study area.

A summary of the wildlife incidental observations reported in 2016 is as follows:

Date	Time	Species	Observations / Description	Location
3-Jul-16	17:00	owl	Bird Flying low level.	1km west of camp
6-Jul-16	11:00/ 17:00	grizzly bear	Walking. Ignored us. Seen from helicopter.	7km east of Yat
6-Jul-16	20:00	grizzly bear	Walking by camp.	1km north of camp
9-Jul-16	15:00	crane	Bird Flying low level then landed on lake.	1km west of Yat
9-Jul-16	11:30	fox	Checking edges of tents, then scampered off north.	Nutaaq Camp
11-Jul-16	10:30	grizzly bear	Sow & 2 cubs. Ran away when they heard the helicopter.	Dipole Lake
14-Jul-16	15:30	owl	Bird Flying low level.	497506E/6940274N
15-Jul-16	11:00	swans	2 sitting on lake.	7km north of Yat
16-Jul-16	10:00	grizzly bear	Sow & cub. Walking.	15km west of camp
22-Jul-16	17:30	eagle	Bird Flying low level.	525735E/6939070N
24-Jul-16	10:00	caribou	Bull & cow walking around.	VGR target area
24-Jul-16	11:00	geese	Flock sitting on a lake.	5km west of Dipole
26-Jul-16	21:00	fox	North end of camp. Looking at hares.	Nutaaq Camp
27-Jul-16	9:25	grizzly bear	Ran away when it heard the helicopter.	511556E/6935942N
27-Jul-16	9:30	caribou	Standing and watching.	503920E/6934936N
27-Jul-16	10:00	owl	Bird Flying low level.	492615E/6931619N
July		hare/sik sik/ptarmigan	Camp resident population. 2 hares, 2 ptarmigan and 4 sik siks.	Nutaaq Camp

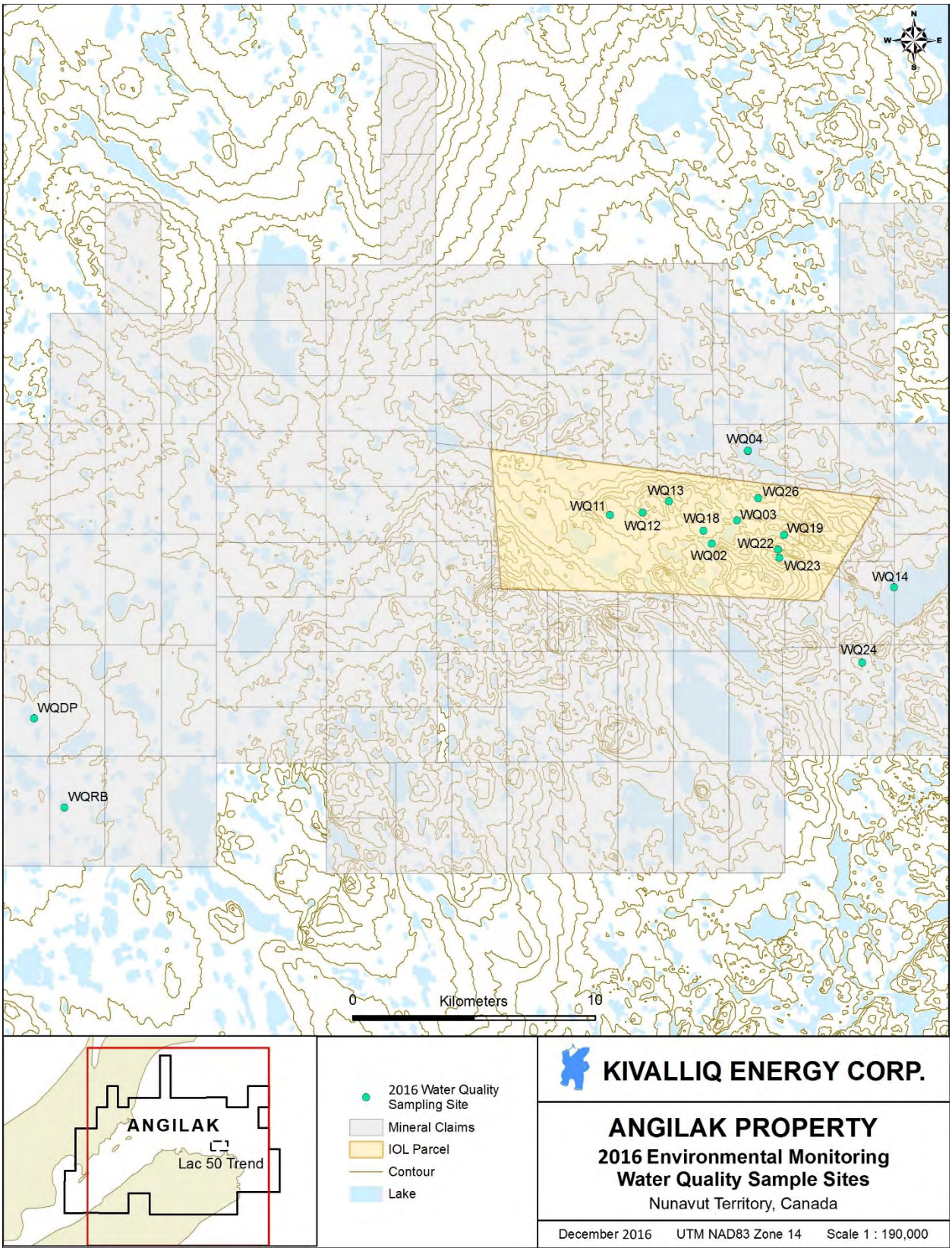


Figure 9: 2016 Water Quality Sample Sites

ENVIRONMENTAL CONSIDERATIONS

All employees and contractors working for Kivalliq Energy are made aware of the company's internal policies and procedures and are made familiar with the Terms and Conditions of the project's operational licences and permits. Every person arriving at the Angilak Property undergoes an orientation which includes information on health, safety and environmental responsibilities and stewardship. In addition to operational licences and permits, all safety manuals, internal guidelines and plans are on file with the Project Supervisor, posted at the Nutaaq Camp and include:

- Angilak Energy Field Safety Manual
- Radiation Hazard Control Plan
- Emergency Response Plan
- Spill Contingency Plan
- Fuel Management Plan
- Wildlife and Environmental Mitigation Plan
- Closure and Reclamation Plan

These documents are updated on an annual basis and are available upon request.

Orientation and training at site includes but is not limited to: radiation safety mitigation, spill response, bear safety, environmental policies (including waste management), wildlife mitigation measures and the caribou protection measures. Employees, contractors and visitors are asked to review printed materials from the orientation and acknowledge that they have received the orientation, reviewed the information materials and that they understand their individual responsibilities.

Wildlife sightings are recorded in the field and at camp (**Appendix C**). All employees and contractors are required to report sightings to a designated employee who records them daily. Information is provided to field staff to recognize high profile VECs and species at risk that could potentially occur within the project area.

Wildlife incidents, when they occur, are reported immediately to the KIA and to the GN Wildlife Biologists. Contact information for emergency situations are hung on the wall of the office and provided in Kivalliq Energy's Wildlife and Environmental Mitigation Measures. There were no wildlife incidents reported in 2016.

Water and aquatic life are protected. Water supply pumps and fuel are stored with secondary containment and all fuel is stored a minimum of 31 metres from any water body, on level ground and/or down gradient whenever possible. Waterlines for drilling and domestic use are properly placed to minimize disturbance to the shoreline and substrate and are fitted with intake screens in accordance with the "Freshwater Intake End-of-Pipe Screen Guideline" prepared by the Department of Fisheries and Oceans. A copy of this guideline document is kept at the Nutaaq Camp field office and at the head office in Vancouver.

No wastes enter water bodies. The Nutaaq Camp grey water is filtered through a grease trap then drained through a weeping tile bed buried in sand behind the camp dry/shower facility. The area of the weeping bed is inspected daily for grey water release on surface.

Visual inspections are conducted around the camp daily while the camp is in operation. Secondary containment and spill kits are established at the main camp fuel cache, all fuelling locations (camp generator, helicopter pad and drill sites) and at heating stove drums located behind tents.

Domestic camp water use was recorded daily. A summary of the water use by month is shown in Table 2. The complete water use data can be found in **Appendix D**.

Table 2: 2016 Water Use Summary

Nutaaq Camp Water Use	
Month	**Volume (m^3)**
June	3.79
July	25.35
Average Daily	0.94
2016 Total	**29.14**

Regulatory Inspections and Reporting

Notification of camp and program commencement and closure was provided to INAC, KIA, WSCC and NIRB. One regulatory inspection was conducted in 2016:

July 27, 2016 INAC Water Resource Officer Christine Wilson

No issures were noted during inspections. INAC Water Resource Officer Christine Wilson stated that Spill #14-234 was reclaimed and remediated to her satisfaction.

MITIGATION MEASURES

Caribou, Muskoxen and Other Wildlife

Migration - A one kilometre buffer is used as a measure of a safe distance for working in areas where migrating caribou are present. If migrating caribou and/or caribou cows and calves come within one kilometre of any work site, work activities must cease until the caribou have moved safely beyond the 1 kilometre buffer area.

Outside of the migration window, if caribou approach the work site, workers must remain out of sight where possible, must not approach the caribou and must cease activities that incidentally draw the attention of the caribou or cause them to flee.

Flights - Helicopter flights maintain a >300 metre altitude whenever possible. In areas where wildlife is observed helicopters are to maintain a minimum of altitude of 610 metres. Absolutely no landings are allowed in areas where there are migrating caribou, caribou cows and/or calves and/or muskox nurse groups present. Helicopter and aircraft pilots are instructed to avoid caribou calving grounds on their way to or from the project area.

Crossings – Between May 15 and September 1, no fuel cache is to be established, and no blasting is to occur within 10 kilometres of a “designated caribou crossing”. No drilling is to be conducted within five

kilometres of crossings. Absolutely no activities are to act as a block or in any way cause a diversion to migration of caribou. There are no designated caribou crossings on Angilak claims or in areas currently being worked by Kivalliq Energy.

Airborne Geophysical Surveys – Prior to conducting any low-level airborne geophysical surveys the Kivalliq Inuit Association (KIA) must be contacted and the following information must be provided; dates of surveys, location of surveys, how long the surveys will take to complete. If caribou and/or muskox are seen in the area, the geophysical survey are not to be flown until they have moved a safe distance (at least 1 kilometre) from the area to be surveyed.

Bear and other Carnivores

Known carnivore dens are to be avoided. Any new dens discovered are to be reported to the regional wildlife biologist and the KIA and avoided.

If bears are present in the area, work is to cease until the bears have moved safely out of the area. All human-bear interactions or incidents are to be reported immediately to the KIA and to the GN Wildlife Biologist.

Breeding and Nesting Birds

No eggs or nests are to be disturbed by any activities. If any employee or contractor comes across any active nests, they are to cease all activities immediately to ensure that the nest is not disturbed. Coordinates are to be recorded on the wildlife incidental observation log and these coordinates are to be reported to Environment Canada. Moving or disturbing the nest of a migratory bird is in contravention of the Migratory Birds Convention Act.

The peregrine falcon has been identified as species of Special Concern by COSEWIC. If any nests are found, a buffer must be maintained. A 1.5 kilometre buffer is recommended for the peregrine falcon. Any nests discovered will be recorded on the wildlife incidental observation log and the GPS coordinates provided to the applicable regulatory authorities and interested parties.

WASTE MANAGEMENT

The Nutaaq Camp has an A400 Inciner8 incinerator at the south end of the camp compound 25 metres south of the camp generator shed. All permittable combustible waste including food waste was incinerated daily. Incinerator ash was collected in 205 litre steel drums with locked lids. Filled ash drums are staged at the incinerator until removed from site.

All food waste was stored such that it was not accessible to any wildlife prior to incineration. Recyclable plastics and cans were separated as produced and stored in bulk bags for removal from site. Kivalliq Energy has developed a waste management plan for the site which includes incineration guidelines and recording. These guidelines were posted in the generator shed next to the incinerator for operator reference. By not incinerating items which lead to the release of dioxins, furans and mercury, Kivalliq Energy complies with Canada Wide Standards. Non-combustible waste was collected in bulk bags for removal from site for appropriate approved disposal.

During the 2016 field season Nutaaq Camp was equipped with four Pacto units in a latrine building located adjacent to the dry/shower facility. The Pacto units collect waste in durable leak-proof bags which are

then burned in the incinerator. Ash from the Pacto units is collected in resealable 205 litre drums staged outside of the building. During the 2016 program, less than 1 barrel of ash was accumulated from camp operations and is awaiting transportation to Yellowknife or Montreal for disposal at an authorized facility.

As a result of comments by INAC inspectors regarding non-compliant disposal facilities in neighbouring communities, all non-combustible waste generated in 2016 was sorted and backhauled to Baker Lake where it was containerized in preparation for shipping south to an authorized disposal site. This practice will continue until authorized waste disposal in Nunavut communities is approved. Kivalliq Energy Corporation's registered Nunavut Waste Generator Number is NUG100036. All disposals from site are arranged through waste management specialists KBL Environmental. A summary of incinerated waste is provided in Table 3.

Table 3: 2016 Incinerator Summary

Month	Kitchen (garbage bags)	Camp (garbage bags)	Pacto (garbage bags)
July	34	110	40
Total	**34**	**110**	**40**

FUEL INVENTORY

Kivalliq is permitted to cache 3000 drums of fuel on the Angilak Property. To accommodate this inventory the company has installed six 15' x 60' x 18" fuel containment berms manufactured by Raymac Industries (Raymac) in British Columbia. Each berm is equipped with a RainDrain hydrocarbon filter. All storage, fueling and staging areas are bermed (such as helicopter refueling stations and generator refueling stations) and have readily available emergency spill kits. Spill trays are located under all fuel drums behind tents and at drill sites. The first two Raymac fuel berms were installed at the beginning of the 2010 field season and four additional berms were installed in April of 2012. The fuel cache fuel berms are located on a flat topped gravel deposit directly adjacent to, and northwest of the Nutaaq Camp. The site offers an ideal smooth, sand covered, flat surface with no hazardous rocks or vegetation to perforate the berm membrane. The berms are lined with Spilfyter RailMat, a 3 ply hydrocarbon absorbent fabric from Pygmalion Environmental. Lengths of dimensional lumber were laid down upon the RailMat liner in a manner to support 4 rows of fuel drums stored horizontally. Within the berms, drums are positioned with bungs at 3 o'clock and 9 o'clock in two rows of two, running the full 60' length of the berms so the bungs are visible for inspection at all times.

Empty fuel drums are removed from site regularly as backhaul cargo and are returned to Aviation Fuel Enterprises in Baker Lake (an authorized drum distributor) where they are cached and reused for diesel fuel.

At the beginning of the 2016 program the Nutaaq Camp fuel cache contained contained 259 drums of diesel, 244 drums of jet fuel, 1 drums of gasoline and 19 propane cylinders which were left on site from the 2015 program.

The Ookpik Aviation Ltd. Turbo Otter brought in additional drums of gasoline for 2016 operations. A total of 54 drums of jet fuel, 24 drums of diesel fuel, 1 drums of gasoline and 5 propane cylinders were used over the course of the 2016 program.

At the end of the 2016 program the Nutaaq Camp fuel cache contained 235 drums of diesel, 190 drums of jet fuel, 3 drums of gasoline and 14 propane cylinders. The majority of empty drums from the 2015 season were backhauled to Baker Lake by the end of the program. Approximately 300 empty drums remain on site to be removed by the Turbo Otter flights early in the 2017 season. Refer to Table 4 for an inventory of fuel remaining and consumed over the course of the 2016 program.

Table 4: Total Fuel Consumed and Remaining in 2016

Fuel Type	Number of Drums/Cylinders Used During 2016 Program	Number of Drums/Cylinders Remaining – July 2016
Jet	54	190
Diesel	24	235
Gasoline	1	3
Propane	5	14

Nutaaq Fuel Berms

FLIGHT SUMMARY

Exploration at Angilak relies upon aircraft support. Ookpik Aviation Ltd based out of Baker Lake, Nunavut provided regular fixed wing flights from Baker Lake into the Nutaaq Camp utilizing a wheeled/ski-equipped Turbo Otter during winter and summer operations.

A total of 15 flights ferried employees, food, supplies, equipment and fuel into the Angilak Property between June 27 and July 29, 2016. All Ookpik flights utilized a gravel airstrip located 1.5 kilometres west of the Nutaaq Camp at 526450m E, 6938130m N, NAD 83 Z14 (62 34’ 20’’ N Lat., 98 29’ 10’’ W Long.)

A Bell L4 Long Ranger helicopter contracted from Great Slave Helicopters out of Yellowknife, Northwest Territories, was used to support Kivalliq Energy’s 2016 exploration program. The Great Slave helicopter arrived in camp on June 27 and remained on site until closure on July 29, 2016. The helicopter flew a total

of 88.5 hours. The helicopter flew primarily between the Nutaaq Camp, the Yat Zone, Dipole target and Fox Lake Area soil sampling grids on the Angilak Property. A tracking system on the helicopter records locational coordinates at 2 minute intervals (A digital record of these is available upon request).

RECLAMATION AND REMEDIATION

Kivalliq Energy has a policy of progressive reclamation of drill set-ups during drilling. Drill sites are reclaimed as soon as possible upon completion of each hole. When immediate or complete reclamation is not possible, these sites are recorded and re-visited at the earliest possible opportunity. No drilling was conducted in 2016.

During a wind storm in the spring of 2014 a diesel fuel drum was knocked over at the Nutaaq Camp while the camp was unoccupied. The spill was reported on June 23, 2014 (Spill #14-234), within 24 hours of its discovery, was inspected by INAC that summer and documented in 2014 Annual Reports to KIA, NIRB and INAC. Additional remediation was conducted in 2015 as recommended by the Inspector. In total, 14 205-litre drums of contaminated soil have been excavated from the spill site to a depth of 1.4 metres (4.5 feet) where permafrost was encountered and digging suspended. The pit was open to the air for two years to allow for evaporation to occur. On July 27, 2016 INAC Water Resource Officer Christine Wilson visited the Nutaaq Camp for an inspection. Upon inspection of the spill site, Ms. Wilson verbally approved the infill of the excavated pit with clean sand and recommended on-site reclamation of contaminated soils. The updated spill remediation report and pictures sent to INAC and Ms. Wilson in 2015 were included in the 2015 Annual Report. The Land Use Permit Inspection Form July 26,2016 is included in **Appendix E**. Ms. Wilson requested updates to the Spill Contigency Plan and Closure and Reclamation Plan to include the trenching activities and the shop floor (Sprung Tent). The updated documents are included in **Appendices F and G**, respectively. Her inspection of drill sites noted that the areas she inspected showed very little sign of impact from the proponents operation and were clean and tidy.

Work prior to 2010 was conducted out of the Yat Camp located 20 kilometres southwest of the Lac 50 Trend. In 2010 and 2011, the Yat Camp site was remediated. All fuel drums and tent frames were removed. During the 2016 INAC inspection, Ms. Wilson verbally informed us that she had inspected and approved the reclamation for final closure of the Yat Camp site.

SOCIO-ECONOMIC IMPACTS AND BENEFITS

Kivalliq Energy is in the early stages of exploration and evaluation. The company and its management have demonstrated a strong commitment to Nunavut with the creation of Kivalliq Energy and its mandate to explore the Angilak Property in partnership with the Inuit. By entering into a uranium exploration agreement with NTI, if a production decision is realized Nunavummiut have the option to participate directly in the project or to collect royalties. Kivalliq Energy's agreement with NTI not only covers Inuit Owned Land, but extends the same terms to a total 89,851.9 hectares that includes mineral claims held by Kivalliq Energy on Crown lands. Kivalliq Energy will hire locally whenever possible and have had multiple long term employees who have worked on the project since 2010. The company has employed up to ten Nunavummiut during seasonal programs and hired one staff from Arviat in 2016. Kivalliq Energy utilizes northern businesses and services wherever available. A list of contractors whose services were utilized in 2016 is provided in **Appendix H**.

COMMUNITY CONSULTATION

Kivalliq Energy is committed to the north and to northerners. As much as possible, on an annual basis representatives from the company travel to communities adjacent to the project to provide updates and to discuss upcoming programs. In 2011 and 2012 the company also organized Angilak site visits for community representatives and leaders from Rankin Inlet, Baker Lake and Arviat. Due to difficult financial conditions and a short 2016 field program that incorporated care and maintenance, community visits were not possible in 2016. Kivalliq Energy's community consultation log is provided in **Appendix I**.

ARCHAEOLOGICAL, TRADITIONAL KNOWLEDGE

Any archaeological sites identified during the course of exploration activities are handled with the utmost care. Site coordinates are recorded and designated off limits to all workers. Disturbance is prohibited. Kivalliq Energy contracts Points West Heritage Consultants to document, survey and record, any archaeological sites identified on the Angilak Property. As defined in the Nunavut Archaeological and Paleontological site regulations and Nunavut Archaeologist Permit requirements, final reports from Points West Heritage Consultants are submitted to the Chief Archaeologist at the Department of Culture, Language, Elders and Youth (CLEY) and the KIA.

Site protection measures apply to all archaeological sites. No new archaeological sites were identified in 2016 and no archaeological investigations were undertaken in 2016.

APPENDIX A

2016 LAND TENURE

Record Number	Claim Name	Record Date	Anniversary Date	Hectares	Acres	Owner
K16138	DIP 01	08-Nov-12	08-Nov-20	1045.1	2582.5	Kivalliq
K16139	DIP 02	08-Nov-12	08-Nov-20	1045.1	2582.5	Kivalliq
K16148	KU 01	08-Nov-12	08-Nov-22	599.74	1482	Kivalliq
K16149	KU 02	08-Nov-12	08-Nov-22	553.21	1367	Kivalliq
K16150	KU 03	08-Nov-12	08-Nov-21	529.33	1308	Kivalliq
K16151	KU 04	08-Nov-12	08-Nov-21	503.02	1243	Kivalliq
K16152	KU 05	08-Nov-12	08-Nov-22	511.12	1263	Kivalliq
K16153	KU 06	08-Nov-12	08-Nov-20	1045.1	2582.5	Kivalliq
K16154	KU 07	08-Nov-12	08-Nov-20	1045.1	2582.5	Kivalliq
K16155	KU 08	08-Nov-12	08-Nov-20	1045.1	2582.5	Kivalliq
K16156	KU 09	08-Nov-12	08-Nov-22	1045.1	2582.5	Kivalliq
K16157	KU 10	08-Nov-12	08-Nov-22	1045.1	2582.5	Kivalliq
K16158	KU 11	08-Nov-12	08-Nov-22	550.78	1361	Kivalliq
K13346	KU 17	08-Nov-12	08-Nov-22	1045.1	2582.5	Kivalliq
K13347	KU 18	08-Nov-12	08-Nov-20	1045.1	2582.5	Kivalliq
K13348	KU 19	08-Nov-12	08-Nov-21	1045.1	2582.5	Kivalliq
K13349	KU 20	08-Nov-12	08-Nov-20	1045.1	2582.5	Kivalliq
D000294	KU 21	08-Nov-12	08-Nov-21	1045.1	2582.5	Kivalliq
K13355	KV 01	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13354	KV 02	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13394	KV 03	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13363	KV 07	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13356	KV 08	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13353	KV 09	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13395	KV 10	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13365	KV 14	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13362	KV 15	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13383	KV 16	3-Sep-15	03-Sep-25	1045.1	2582.5	Kivalliq
K13352	KV 17	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13396	KV 18	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13367	KV 22	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13366	KV 23	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13361	KV 24	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13358	KV 25	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13351	KV 26	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13384	KV 27	3-Sep-15	3-Sep-25	1045.1	2582.5	Kivalliq
K13360	KV 28	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13359	KV 29	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13399	KV 30	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13398	KV 31	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13393	KV 36	26-Oct-09	26-Oct-19	244.9	605.15	Kivalliq

Record Number	Claim Name	Record Date	Anniversary Date	Hectares	Acres	Owner
K13392	KV 37	26-Oct-09	26-Oct-16	233.65	577.35	Kivalliq
K13420	KV 38	26-Oct-09	26-Oct-17	1045.1	2582.5	Kivalliq
K13417	KV 39	26-Oct-09	26-Oct-16	1045.1	2582.5	Kivalliq
K13411	KV 40	26-Oct-09	26-Oct-17	1045.1	2582.5	Kivalliq
K13391	KV 43	26-Oct-09	26-Oct-17	671.04	1658.18	Kivalliq
K13416	KV 44	26-Oct-09	26-Oct-17	594.16	1468.2	Kivalliq
K13412	KV 45	26-Oct-09	26-Oct-19	666.93	1648.07	Kivalliq
K13407	KV 46	26-Oct-09	26-Oct-18	1045.1	2582.5	Kivalliq
K13413	KV 48	26-Oct-09	26-Oct-19	408.06	1008.35	Kivalliq
K13414	KV 49	26-Oct-09	26-Oct-19	776.41	1918.54	Kivalliq
K13406	KV 50	26-Oct-09	26-Oct-18	1045.1	2582.5	Kivalliq
K13415	KV 52	26-Oct-09	26-Oct-19	1045.1	2582.5	Kivalliq
K13405	KV 53	26-Oct-09	26-Oct-16	1045.1	2582.5	Kivalliq
IOL	RI-30	01-Apr-07	01-Apr-19	7386	18251.18	Kivalliq
K13323	TAL 2	01-Nov-11	01-Nov-19	1029.52	2544	Kivalliq
K13328	TAL 7	01-Nov-11	01-Nov-19	1027.5	2539	Kivalliq
K13336	VGR 05	18-May-12	18-May-22	1045.1	2582.5	Kivalliq
K13321	VK 01	13-Sep-11	13-Sep-21	1040.85	2572	Kivalliq
F84324	YK 01	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F84325	YK 02	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87646	YK 06	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87647	YK 07	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87648	YK 08	07-Mar-07	07-Mar-17	103.75	256.37	Kivalliq
F87651	YK 11	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87652	YK 12	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87653	YK 13	07-Mar-07	07-Mar-17	623.98	1541.88	Kivalliq
F87654	YK 14	07-Mar-07	07-Mar-17	124.66	308.04	Kivalliq
F87658	YK 18	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87659	YK 19	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87660	YK 20	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87661	YK 21	07-Mar-07	07-Mar-17	49.5	122.31	Kivalliq
F87662	YK 22	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87663	YK 23	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87664	YK 24	07-Mar-07	07-Mar-17	555.31	1372.19	Kivalliq
F87665	YK 25	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87666	YK 26	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87667	YK 27	07-Mar-07	07-Mar-17	409.49	1011.86	Kivalliq
F87668	YK 28	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87669	YK 29	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87670	YK 30	07-Mar-07	07-Mar-17	629.73	1556.09	Kivalliq
F87671	YK 31	07-Mar-07	07-Mar-17	669.8	1655.11	Kivalliq

Record Number	Claim Name	Record Date	Anniversary Date	Hectares	Acres	Owner
F87672	YK 32	07-Mar-07	07-Mar-17	749.95	1853.16	Kivalliq
F87673	YK 33	07-Mar-07	07-Mar-17	824.37	2037.06	Kivalliq
F87674	YK 34	07-Mar-07	07-Mar-17	898.79	2220.97	Kivalliq
F87675	YK 35	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87676	YK 36	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87677	YK 37	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87678	YK 38	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87679	YK 39	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87680	YK 40	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
F87683	YK 43	07-Mar-07	07-Mar-17	1045.1	2582.5	Kivalliq
TOTAL	**91 claims**			**89,851.95**	**222,029.06**	

APPENDIX B

2016 SURFACE WATER QUALITY REPORT

2016 Surface Water Quality Report

Angilak Property, Nunavut

Kivalliq Energy Corporation

Prepared by:
Andrew Berry, COO
Kivalliq Energy Corporation

January 30, 2017

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Appendices

1. Introduction

Hemmera Envirochem Inc. (Hemmera) was contracted by Kivalliq Energy in 2010 to design and implement a customized water quality monitoring program that corresponds with the stage of current exploration, and allows for rapid expansion or downsizing of monitoring studies as the exploration programs change in scope and scale from year to year.

In 2010 sample sites were established on 20 representative water bodies across the Angilak Property. An additional six sites were added in 2012 and two more in 2015. A site at Dipole Lake was added prior to commencement of the 2015 Dipole drilling program. A site at RIB Lake, a high priority exploration target approximately four kilometres south of Dipole, was also selected.

2. Work Performed

On July 11, 2016 and July 12, 2016 water samples were collected from a total of 15 sample sites by Emily McNie and Andrew Berry of Kivalliq Energy Corp (Figure 1). This represents water samples from the two sites at Dipole and Rib added in 2015, WQDP and WQRB respectively, and from 13 existing sites: WQ2-WQ4, WQ11-WQ14, WQ18-WQ19, WQ22-WQ24 and WQ26 in areas adjacent to the Lac 50 mineral deposits and the Nutaaq Camp and that have been sampled annually since the water quality sampling program commenced in 2010. Coordinates of the sample sites are in Table 1 below.

Water was analyzed for hardness, metals, pH, total suspended solids, ammonia, nitrate, cyanide and alkalinity.

Table 1: 2016 Water Sample Sites

Site	Easting	Northing
WQ02	520,454	6,938,954
WQ03	521,488	6,939,906
WQ04	521,944	6,942,786
WQ11	516,261	6,940,131
WQ12	517,603	6,940,229
WQ13	518,693	6,940,705
WQ14	527,975	6,937,146
WQ18	520,119	6,939,491
WQ19	523,434	6,939,305
WQ22	523,202	6,938,705
WQ23	523,250	6,938,369
WQ24	526,672	6,934,031
WQ26	522,368	6,940,833
WQDP	492,477	6,931,732
WQRB	493,735	6,928,057

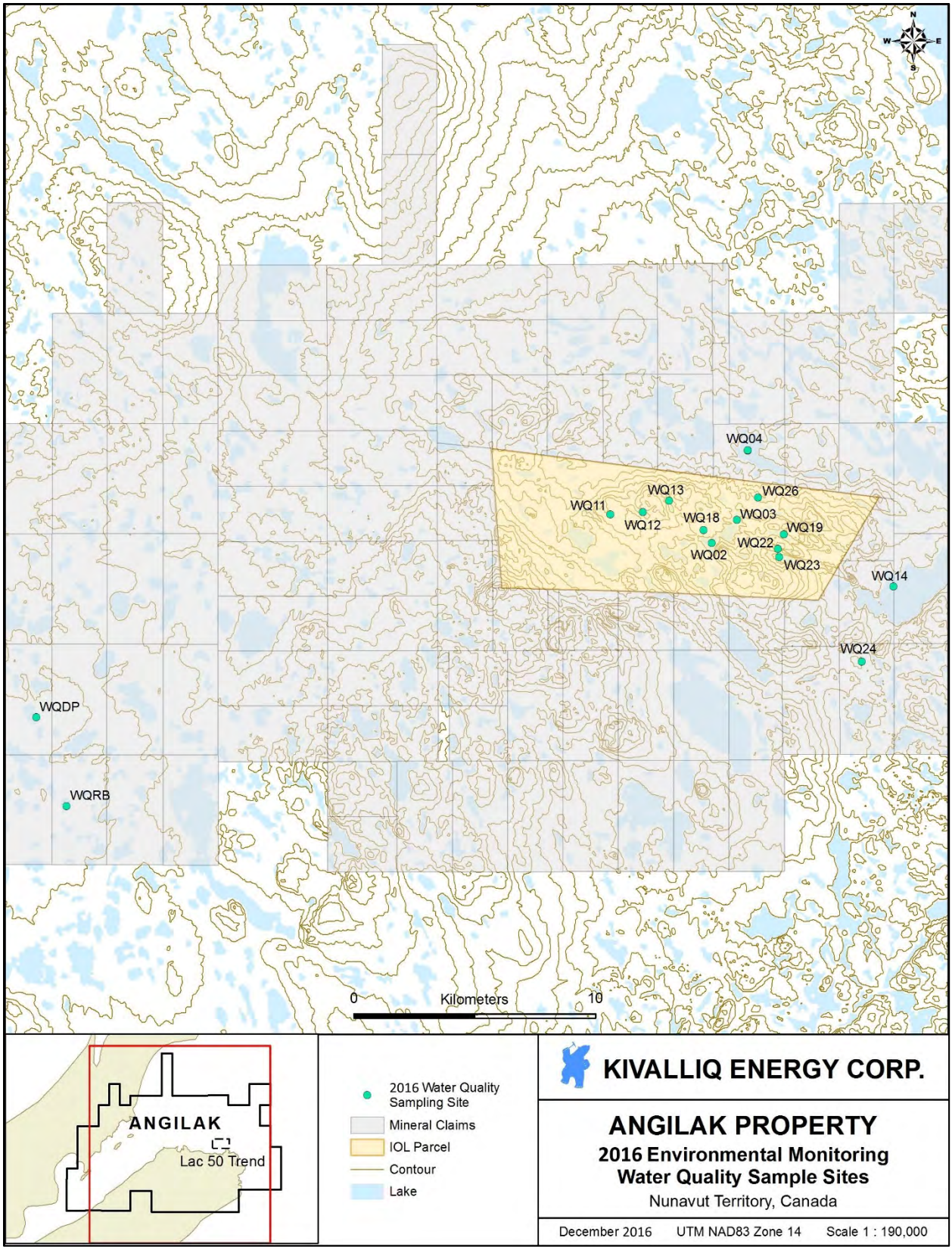

Figure 1: 2016 Environmental Monitoring Water Quality Sample Sites

3. Procedures

Excerpts from Hemmera's 2014 Surface Water Quality Report were used in this section.

Kivalliq Energy follows the water quality sampling procedures set out by Hemmera in previous years.

3.1. Water Quality Parameters and Sampling Techniques

In situ parameters (pH, temperature, redox, dissolved oxygen, and specific conductivity) were measured using an YSI multi-probe meter with the probe placed directly in the associated water body. Readings were taken when the instrument stabilized.

Water grab samples were collected from lakes and ponds approximately 0.1 metres below surface. Sample bottles arrived clean, negating the need for rinsing. Sampling containers and preservatives were obtained from ALS Vancouver and shipped to Baker Lake in July. If any bottles arrived without lids they were not used. All protocols followed the British Columbia Field Sampling Manual (2003). Dissolved metals and dissolved organic carbon samples were field filtered with a 0.45 µm filter to remove any particles and preserved with nitric acid and hydrochloric acid, respectively. Water samples were packed in ice, placed in coolers, travelled with field staff and were dropped off at ALS Vancouver for chemical analysis. Samples were sent to ALS Laboratories in Burnaby, British Columbia for water chemistry analysis.

3.2. Laboratory Analysis

Water Samples were analysed for the following parameters:

- **Physical Parameters / Dissolved Anions:** conductivity, pH, temperature, total suspended solids (TSS), total dissolved solids (TDS), hardness, total acidity and alkalinity (as CaCO3).
- **Nutrients:** ammonia nitrogen, nitrate, nitrite, dissolved organic carbon (DOC), ortho-phosphate, total phosphorous.
- **Total and Dissolved Metals:** Aluminum, Antimony, Arsenic, Barium, Beryllium, Bismuth, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Nickel, Phosphorus, Potassium, Selenium, Silicon, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Uranium, Vanadium, Zinc.

Metals analysis included the highest accuracy available at ALS using HR-ICPMS (High Resolution – Inductively Coupled Plasma Mass Spectrometry).

3.3. Quality Assurance/Quality Control (QA/QC)

A comprehensive quality assurance/quality control (QA/QC) program was incorporated into the field program and laboratory components of the water quality program. The certificate of analyses from ALS is presented in **Appendix A**. Duplicate field samples were collected to test the reproducibility of the samples, as well as laboratory precision. Duplicate samples were collected at a rate of 1:10, at WQ11 (duplicate = DS1-110716) and WQ14 (duplicate = DS2- 120716).

4. Results

Results from the water quality sampling program were compared to Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (2007)(Bryant, 2015).

The Canadian Council of Ministers of the Environment (CCME) maintain that the "guidelines are generic national recommendations that are based on the most current scientific information available at the time of their derivation"; and furthermore note that they "do not directly consider site-specific factors that may influence their implementation". The CCME document on Site Specific Guidance reports that, "it might be necessary to modify water quality guidelines to account for natural site conditions". Natural conditions can only be established through the collection of baseline data, over a number of years (Bryant, 2015).

Total metals data for the 2016 results were compared to CCME freshwater aquatic guidelines. Concentrations of aluminum were slightly above guidelines at WQ24 and WQ26. Copper concentrations were above guidelines at WQ24 and WQ26. Additionally, iron concentrations were above guidelines at WQ12, WQ13 and WQDP.

Field pH tests ranged from 6.74 to 8.6 with an average of 7.50. All sites were within guidelines (6.5<pH>9). Physical water test yielded pH values ranging between 7.35 and 7.79 with an average of 7.54. These values fall within the CCME acceptable range of pH not less than 6.5 and not above 9.

5. References

Bryant, D. 2015. Angilak Project Water Quality Summary 2014. Prepared for Kivalliq Energy Corporation by Hemmera Envirochem Inc.

Canadian Council of Ministers of the Environment (CCME). 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, 1999, Winnipeg.

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Canadian Water Quality Guideline for the Protection of Aquatic Life: Summary Table. Updated December 2012. In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environment.

Field Sampling Manual. 2003. Ministry of Water, Land and Air Protection. Province of British Columbia. British Columbia Ministry of the Environment (BC MoE). 2003. Ambient Freshwater and Effluent Sampling Manual. Resources Information Standing Committee, Ministry of the Environment. Victoria, BC.

Table 2: 2016 Water Quality Sampling Results

Parameter	Lowest Detection Limit	Units	CCME FAL*	WQ02	WQ03	WQ04	DS1-110716	WQ11	WQ12	WQ13	WQ14	DS2-120716	WQ18	WQ19	WQ22	WQ23	WQ24	WQ26	WQDP	WQRB
Field Tests (Water)																				
pH, Client Supplied	0.10	pH	6.5-9	6.74	8.1	7.37	797	7.97	7.84	7.24	7.5	7.5	6.88	7.06	6.93	6.83	7.21	7.52	8.21	8.6
Sample Info																				
Date				11-Jul-2016	11-Jul-2016	11-Jul-2016	11-Jul-2016	11-Jul-2016	11-Jul-2016	11-Jul-2016	12-Jul-2016	12-Jul-2016	11-Jul-2016	11-Jul-2016	11-Jul-2016	11-Jul-2016	12-Jul-2016	11-Jul-2016	11-Jul-2016	11-Jul-2016
Time				14:38	15:00	15:45	11:43	11:45	12:30	13:08	12:06	0:00	14:16	17:13	16:50	16:30	11:44	15:24	10:49	10:14
Lab Sample ID				L1798186-1	L1798186-2	L1798186-3	L1798186-16	L1798186-4	L1798186-5	L1798186-6	L1798186-7	L1798186-17	L1798186-8	L1798186-9	L1798186-10	L1798186-11	L1798186-12	L1798186-13	L1798186-14	L1798186-15
Duplicate of							WQ11					WQ14								
Filtration Location		-		FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD	FIELD
Physical Tests (Water)																				
Conductivity	2.0	uS/cm	-	51.0	42.1	36.1	45.6	46.0	42.9	71.7	41.0	36.8	67.3	37.2	38.5	37.0	82.5	83.0	88.7	57.5
Hardness (as CaCO3)	0.50	mg/L	-	24.2	19.7	17.2	22.6	22.7	21.4	35.9	17.1	16.8	33.9	17	19	17.3	41.4	41.3	39.2	26.3
Langelier Index Temperature	-50	C	-	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Langelier Index	-10	none	-	-1.8	-2.1	-2.4	-1.9	-1.9	-2.1	-1.5	-2.1	-2.3	-1.5	-2.2	-2.3	-2.4	-1.1	-1.6	-1.3	-1.7
pH	0.10	pH	6.5-9	7.62	7.46	7.36	7.55	7.57	7.43	7.62	7.66	7.49	7.61	7.46	7.35	7.38	7.79	7.47	7.77	7.59
Total Suspended Solids	3.0	mg/L	-	3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	5.6	<3.0
Total Dissolved Solids	10	mg/L	-	44	35	30	41	43	46	67	31	33	63	38	41	39	86	92	76	55
Anions and Nutrients (Water)																				
Acidity (as CaCO3)	1.0	mg/L	-	1.8	2.0	2.1	1.8	1.8	2.2	2.2	1.0	1.7	2.4	1.9	2.2	2.1	1.2	2.6	2.0	2.0
Alkalinity, Total (as CaCO3)	1.0	mg/L	-	24.1	20.2	15.4	22.8	22.7	21.2	33.1	16.1	15.9	32.3	16.2	15.4	14.7	33.8	27.1	39.8	27.1
Ammonia, Total (as N)	0.0050	mg/L	0.021-231	<0.0050	0.0138	<0.0050	0.0054	0.0054	<0.0050	0.0115	<0.0050	<0.0050	0.0107	<0.0050	0.0105	<0.0050	0.0108	0.0130	0.0119	0.0102
Bromide (Br)	0.050	mg/L	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	0.50	mg/L	120	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.67	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.77	<0.50
Fluoride (F)	0.020	mg/L	0.12	0.074	0.070	0.064	0.083	0.083	0.094	0.123	0.058	0.058	0.1	0.072	0.074	0.074	0.094	0.114	0.288	0.164
Nitrate and Nitrite (as N)	0.0051	mg/L	-	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	0.0059	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051
Nitrate (as N)	0.0050	mg/L	13	<0.0050	<0.0050	<0.0050	0.0051	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0059	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.0010	mg/L	0.06	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Orthophosphate-Dissolved (as P)	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4)	0.30	mg/L	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.39	0.42	2.27	8.86	1.22	<0.30
Cyanides (Water)																				
Cyanide, Total	0.0050	mg/L	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Organic / Inorganic Carbon (Water)																				
Dissolved Organic Carbon	0.50	mg/L	-	6.25	6.51	5.85	6.70	6.42	8.02	13.0	5.44	5.84	10.2	5.90	10.3	7.22	19.2	20.7	12.6	10.3
Total Metals (Water)																				
Aluminum (Al)-Total	0.0030	mg/L	0.005-0.1	0.0085	0.0250	0.0141	0.0119	0.0115	0.0189	0.0552	0.0257	0.0259	0.0116	0.0178	0.0722	0.0349	**0.1060**	**0.1620**	0.0829	0.032
Antimony (Sb)-Total	0.000030	mg/L	-	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	0.000037	<0.000030
Arsenic (As)-Total	0.000050	mg/L	0.005	0.000097	0.000114	0.000075	0.000082	0.000078	0.000132	0.000255	0.000090	0.000106	0.000140	0.000102	0.000131	0.000093	0.000225	0.000241	0.000445	0.000242
Barium (Ba)-Total	0.00010	mg/L	-	0.0721	0.0586	0.0518	0.077	0.0743	0.082	0.132	0.0447	0.0488	0.1250	0.054	0.0523	0.0418	0.0667	0.0456	0.1220	0.0665
Beryllium (Be)-Total	0.0000050	mg/L	-	<0.0000050	0.0000070	0.0000052	<0.0000050	<0.0000050	0.0000117	0.0000207	<0.0000050	0.0000056	0.0000089	<0.0000050	0.0000137	0.0000072	0.0000182	0.0000233	0.0000169	0.0000103
Bismuth (Bi)-Total	0.000050	mg/L	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	0.010	mg/L	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	0.0000050	mg/L	0.00009	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000057	<0.0000050	0.0000053	<0.0000050	0.0000086	0.0000104	<0.0000050	<0.0000050
Calcium (Ca)-Total	0.050	mg/L	-	5.57	4.36	3.94	5.70	5.57	4.67	7.81	3.74	3.89	7.94	4.06	4.93	3.97	12.50	12.4	8.5	6.1
Cesium (Cs)-Total	0.0000050	mg/L	-	<0.0000050	<0.0000050	<0.0000050	0.0000069	0.0000062	<0.0000050	0.0000056	<0.0000050	0.0000056	0.0000064	<0.0000050	<0.0000050	0.000005	0.0000115	0.0000080	0.0000097	0.0000057
Chromium (Cr)-Total	0.00050	mg/L	0.0089	<0.00050	<0.00050	0.0019	<0.00050	<0.00050	0.00149	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00072	0.00056	<0.00050	<0.00050
Cobalt (Co)-Total	0.000050	mg/L	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000077	<0.000050	<0.000050	0.000059	<0.000050	0.000058	<0.000050	0.000088	0.000100	0.000100	0.00005
Copper (Cu)-Total	0.00050	mg/L	0.002-0.004	0.00057	0.00087	0.00051	0.00091	0.00081	0.00085	0.00134	0.00057	0.00061	0.00068	0.0006	0.00163	0.00110	**0.00472**	**0.00993**	0.00139	0.0008
Gallium (Ga)-Total	0.000050	mg/L	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Iron (Fe)-Total	0.030	mg/L	0.3	0.080	0.139	0.118	0.106	0.104	**0.359**	**0.452**	0.077	0.077	0.150	0.450	0.184	0.129	0.507	0.268	**0.349**	0.275
Lead (Pb)-Total	0.000050	mg/L	0.001-0.007	<0.000050	0.000065	<0.000050	<0.000050	<0.000050	0.000056	0.000206	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00013	0.000130	0.000214	0.00006

Total Metals (Water)																				
Lithium (Li)-Total	0.00040	mg/L	-	0.00066	0.00053	<0.00040	0.00052	0.00048	0.00101	0.00167	0.00049	0.00046	0.00089	0.00047	0.00056	0.00066	0.00102	0.00076	0.00328	0.00187
Magnesium (Mg)-Total	0.10	mg/L	-	2.62	2.07	1.86	2.15	2.13	2.38	4.02	1.82	1.86	3.41	1.62	1.64	1.80	2.43	2.51	4.57	2.88
Manganese (Mn)-Total	0.00020	mg/L	-	0.0128	0.01240	0.00419	0.00401	0.00367	0.0101	0.0156	0.01050	0.0105	0.01620	0.0156	0.0133	0.0202	0.02090	0.0077	0.0154	0.015
Mercury (Hg)-Total	0.0000050	mg/L	0.026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	0.000050	mg/L	0.073	0.000155	0.000187	0.000104	0.000215	0.000211	0.000137	0.000304	0.000089	0.000085	0.000244	0.000098	0.000135	0.000083	0.000281	0.001850	0.000752	0.0002
Nickel (Ni)-Total	0.00020	mg/L	0.025-0.150	0.00061	0.00059	0.00052	0.00051	0.00049	0.00097	0.00146	0.00048	0.00049	0.00112	0.00041	0.00100	0.00094	0.00165	0.00110	0.00078	0.00044
Phosphorus (P)-Total	0.30	mg/L	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total	2.0	mg/L	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Rhenium (Re)-Total	0.0000050	mg/L	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000085	<0.0000050	<0.0000050
Rubidium (Rb)-Total	0.000020	mg/L	-	0.000850	0.000944	0.000763	0.00069	0.000650	0.000842	0.00129	0.000850	0.00091	0.000873	0.000850	0.000568	0.000866	0.001430	0.00094	0.00169	0.00128
Selenium (Se)-Total	0.00020	mg/L	0.001	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Silicon (Si)-Total	0.050	mg/L	-	0.619	0.379	0.441	0.252	0.243	0.325	0.593	0.330	0.339	0.890	0.289	0.250	0.909	0.275	0.266	0.167	0.17
Silver (Ag)-Total	0.0000050	mg/L	0.0001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000089	0.0000169	<0.0000050	<0.0000050
Sodium (Na)-Total	2.0	mg/L	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.8	<2.0
Strontium (Sr)-Total	0.00020	mg/L	-	0.0622	0.0512	0.0421	0.058	0.0557	0.0679	0.108	0.0554	0.0584	0.0774	0.0384	0.0356	0.0385	0.0538	0.0573	0.1030	0.064
Tellurium (Te)-Total	0.000010	mg/L	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thallium (Tl)-Total	0.0000050	mg/L	0.0008	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000062	0.0000064	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000072	0.0000091	0.0000079	<0.0000050
Thorium (Th)-Total	0.0000050	mg/L	-	0.0000071	0.0000159	0.0000135	0.0000101	0.0000093	0.0000212	0.0000406	0.0000179	0.0000167	0.0000169	0.0000132	0.0000568	0.0000290	0.0000697	0.0000852	0.0000415	0.000019
Tin (Sn)-Total	0.00020	mg/L	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti)-Total	0.00020	mg/L	-	<0.00020	0.00049	0.00021	<0.00020	<0.00020	0.00043	0.00091	0.00048	0.00047	0.00021	0.0003	0.00053	0.00053	0.00073	0.00086	0.00162	0.00052
Tungsten (W)-Total	0.000010	mg/L	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000027	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000016	<0.000010
Uranium (U)-Total	0.0000020	mg/L	0.015	0.000175	0.0001380	0.0000973	0.00025	0.000240	0.000115	0.000276	0.0000711	0.000075	0.0004070	0.000053	0.0002460	0.000080	0.0003590	0.003770	0.001350	0.000
Vanadium (V)-Total	0.000050	mg/L	-	0.000076	0.000173	0.000086	0.000124	0.000123	0.000200	0.000414	0.000101	0.000100	0.000135	0.000091	0.000173	0.000122	0.000207	0.000253	0.000841	0.000239
Yttrium (Y)-Total	0.0000050	mg/L	-	0.0000245	0.0000436	0.0000373	0.0000294	0.0000296	0.0000566	0.0001160	0.0000415	0.0000426	0.0000429	0.0000320	0.0001200	0.0000822	0.0002430	0.000420	0.000106	0.00005
Zinc (Zn)-Total	0.0030	mg/L	0.03	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	**0.0032**	<0.0030	<0.0030
Zirconium (Zr)-Total	0.000050	mg/L	-	0.000067	0.000100	0.000083	0.000067	0.000067	0.000143	0.000309	0.000096	0.000100	0.000150	0.000068	0.000347	0.000197	0.000389	0.000614	0.000290	0.00014
Dissolved Metals (Water)																				
Aluminum (Al)-Dissolved	0.0010	mg/L	.005-.1	0.0056	0.0155	0.0110	0.0089	0.0090	0.0136	0.0456	0.0148	0.0116	0.0096	0.0109	0.0663	0.0216	0.0828	**0.1560**	0.0357	0.0207
Antimony (Sb)-Dissolved	0.000010	mg/L	-	<0.000010	0.000012	<0.000010	<0.000010	<0.000010	<0.000010	0.000015	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000028	0.000024	0.000031	0.000013
Arsenic (As)-Dissolved	0.000050	mg/L	0.005	0.000092	0.000114	0.000077	0.000086	0.000083	0.000135	0.000271	0.000095	0.000098	0.000146	0.000111	0.000158	0.000096	0.000242	0.000249	0.000365	0.000229
Barium (Ba)-Dissolved	0.00010	mg/L	-	0.0725	0.0604	0.0519	0.076	0.0764	0.081	0.125	0.0477	0.0467	0.1210	0.053	0.0514	0.0408	0.0679	0.0461	0.1110	0.0651
Beryllium (Be)-Dissolved	0.0000050	mg/L	-	<0.0000050	0.0000052	0.0000053	<0.0000050	<0.0000050	0.0000089	0.0000190	<0.0000050	<0.0000050	0.0000071	<0.0000050	0.0000124	0.0000073	0.0000196	0.0000238	0.0000085	0.0000079
Bismuth (Bi)-Dissolved	0.000050	mg/L	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	0.0050	mg/L	1.5	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Dissolved	0.0000050	mg/L	0.00009	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000108	0.0000113	<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	0.050	mg/L	-	5.48	4.46	3.91	5.59	5.59	4.64	7.78	3.81	3.76	7.95	4.11	4.91	3.96	12.50	12.4	8.3	5.9
Cesium (Cs)-Dissolved	0.0000050	mg/L	-	<0.0000050	<0.0000050	<0.0000050	0.0000062	0.0000059	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000055	<0.0000050	<0.0000050	<0.0000050	0.0000121	0.0000069	<0.0000050	<0.0000050
Chromium (Cr)-Dissolved	0.00050	mg/L	0.0089	<0.00050	<0.00050	0.00056	<0.00050	0.00063	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Dissolved	0.000050	mg/L	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000054	<0.000050	<0.000050	<0.000050	0.000075	0.000087	0.000054	<0.000050
Copper (Cu)-Dissolved	0.00020	mg/L	0.002-0.004	0.00047	0.00059	0.00044	0.00079	0.00080	0.00058	0.00126	0.00052	0.00073	0.00059	0.00044	0.00163	0.00097	**0.00487**	**0.00975**	0.00118	0.0007
Gallium (Ga)-Dissolved	0.000050	mg/L	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Iron (Fe)-Dissolved	0.030	mg/L	0.3	0.05	0.082	0.088	0.079	0.078	0.251	**0.370**	0.048	0.047	0.117	**0.366**	0.126	0.073	**0.351**	0.218	0.129	0.156
Lead (Pb)-Dissolved	0.000050	mg/L	0.001-0.007	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000168	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000104	0.000087	0.000079	<0.000050
Lithium (Li)-Dissolved	0.00020	mg/L	-	0.00064	0.00056	0.00039	0.00050	0.00047	0.00087	0.00169	0.00047	0.00051	0.00091	0.00049	0.00058	0.00064	0.00098	0.00073	0.00322	0.00192
Magnesium (Mg)-Dissolved	0.10	mg/L	-	2.55	2.09	1.81	2.10	2.11	2.39	3.99	1.85	1.80	3.41	1.64	1.62	1.80	2.45	2.53	4.46	2.80
Manganese (Mn)-Dissolved	0.00020	mg/L	-	0.00314	0.00404	0.00119	0.00137	0.00128	0.0027	0.00702	0.00551	0.00520	0.01290	0.00628	0.00627	0.00610	0.01370	0.0072	0.0021	0.0093
Mercury (Hg)-Dissolved	0.0000050	mg/L	0.026	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	0.000050	mg/L	0.073	0.000137	0.000164	0.000086	0.000196	0.000204	0.000092	0.000267	0.000075	0.000098	0.000217	0.000086	0.000121	0.000074	0.000272	0.001720	0.000664	0.0001
Nickel (Ni)-Dissolved	0.00020	mg/L	.025-.150	0.00065	0.00062	0.00051	0.00050	0.00053	0.00088	0.00160	0.00065	0.00060	0.00121	0.00040	0.00111	0.00089	0.00163	0.00105	0.00066	0.00042
Phosphorus (P)-Dissolved	0.30	mg/L	-	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved	2.0	mg/L	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Rhenium (Re)-Dissolved	0.0000050	mg/L	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000087	<0.0000050	<0.0000050
Rubidium (Rb)-Dissolved	0.000020	mg/L	-	0.000834	0.000897	0.000759	0.00065	0.000663	0.000811	0.00127	0.000842	0.00087	0.000858	0.000850	0.000560	0.000842	0.001720	0.00095	0.00157	0.00120
Selenium (Se)-Dissolved	0.00020	mg/L	0.001	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

Dissolved Metals (Water)																				
Silicon (Si)-Dissolved	0.050	mg/L	-	0.605	0.348	0.428	0.233	0.238	0.306	0.562	0.311	0.306	0.888	0.276	0.237	0.878	0.252	0.254	0.073	0.15
Silver (Ag)-Dissolved	0.0000050	mg/L	0.0001	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000068	0.0000131	<0.0000050	<0.0000050
Sodium (Na)-Dissolved	2.0	mg/L	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	2.7	<2.0
Strontium (Sr)-Dissolved	0.000050	mg/L	-	0.0622	0.0510	0.0430	0.056	0.0573	0.0665	0.105	0.0579	0.0577	0.0767	0.0388	0.0350	0.0380	0.0630	0.0596	0.0988	0.063
Tellurium (Te)-Dissolved	0.000010	mg/L	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thallium (Tl)-Dissolved	0.0000020	mg/L	0.0008	<0.0000020	<0.0000020	<0.0000020	0.0000029	0.0000032	0.0000039	0.0000055	<0.0000020	<0.0000020	0.0000038	<0.0000020	0.0000044	<0.0000020	0.000008	0.0000075	0.0000065	0.0000034
Thorium (Th)-Dissolved	0.0000050	mg/L	-	<0.0000050	0.0000088	0.0000088	0.0000058	0.000006	0.0000155	0.0000349	0.0000088	0.0000119	0.0000118	0.0000089	0.0000528	0.0000213	0.0000579	0.0000804	0.0000127	0.0000092
Tin (Sn)-Dissolved	0.00020	mg/L	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti)-Dissolved	0.00020	mg/L	-	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.0003	0.00069	0.00026	<0.00020	<0.00020	<0.00020	0.0004	0.00022	0.00046	0.00073	0.00027	<0.00020
Tungsten (W)-Dissolved	0.000010	mg/L	-	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000024	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000012	<0.000010
Uranium (U)-Dissolved	0.0000020	mg/L	0.015	0.000169	0.0001280	0.0000913	0.00024	0.000238	0.0001100	0.000256	0.0000656	0.000067	0.0003910	0.000047	0.0002400	0.000076	0.0003810	0.003440	0.001170	0.0002
Vanadium (V)-Dissolved	0.000050	mg/L	-	0.000064	0.000138	0.000077	0.000109	0.000108	0.000175	0.000374	0.000077	0.000074	0.000137	0.000078	0.00015	0.000092	0.000159	0.000236	0.000406	0.000174
Yttrium (Y)-Dissolved	0.0000050	mg/L	-	0.0000195	0.0000334	0.0000323	0.0000266	0.0000274	0.0000491	0.0001050	0.0000359	0.0000329	0.0000405	0.0000286	0.0001160	0.0000723	0.0002320	0.000398	0.000044	0.000037
Zinc (Zn)-Dissolved	0.0010	mg/L	0.03	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0026	<0.0010	<0.0010
Zirconium (Zr)-Dissolved	0.000050	mg/L	-	0.00007	0.000096	0.000099	0.000077	0.000076	0.000167	0.000382	0.000092	0.000080	0.000170	0.000074	0.000394	0.000205	0.000337	0.000703	0.000196	0.000126

*CCME FAL=Canadian Council of Ministers of the Environment, Canadian Water Quality Guidelines for the Protection of Aquatic Life, Freshwater

Table 1 Notes

Aluminum varies with pH:
0.005 if pH <6.5,
0.1 if pH>=6.5

Copper varies with Hardness in mg/L:
0.002 if H<120
0.003 if H>=120 and H<180
0.004 if H>=180

Lead varies with Hardness in mg/L:
0.001 if H<60
0.002 if H>=60 and H<120
0.004 if H>=120 and H<180
0.007 if H>=180

Nickel varies with Hardness in mg/L:
0.025 if H<60
0.065 if H>=60 and H>120
0.11 if H>=120 and H<180
0.15 if H>=180

Appendix A

ALS Environmental Analytical Report #L1798186

KIVALLIQ ENERGY CORP.
ATTN: Andrew Berry
1020-800 W. Pender Street
Vancouver BC V6C 2V6

Date Received: 13-JUL-16
Report Date: 11-AUG-16 10:33 (MT)
Version: FINAL

Client Phone: 604-765-1892

Certificate of Analysis

Lab Work Order #: L1798186

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 15-567485, 15-567486
Legal Site Desc:

Shane Ramos
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1798186-1	L1798186-2	L1798186-3	L1798186-4	L1798186-5
Description	Water	Water	Water	Water	Water
Sampled Date	11-JUL-16	11-JUL-16	11-JUL-16	11-JUL-16	11-JUL-16
Sampled Time	14:38	15:00	15:45	11:45	12:30
Client ID	WQ02	WQ03	WQ04	WQ11	WQ12
Grouping / **Analyte**					
WATER					
Field Tests pH, Client Supplied (pH)	7.62	7.46	7.36	7.57	7.43
Physical Tests Conductivity (uS/cm)	51.0	42.1	36.1	46.0	42.9
Hardness (as CaCO3) (mg/L)	24.2	19.7	17.2	22.7	21.4
Langelier Index Temperature (C)	4.15	4.15	4.15	4.15	4.15
Langelier Index (none)	-1.8	-2.1	-2.4	-1.9	-2.1
pH (pH)	7.62	7.46	7.36	7.57	7.43
Total Suspended Solids (mg/L)	3.0	<3.0	<3.0	<3.0	<3.0
Total Dissolved Solids (mg/L)	44	35	30	43	46
Anions and Nutrients Acidity (as CaCO3) (mg/L)	1.8	2.0	2.1	1.8	2.2
Alkalinity, Total (as CaCO3) (mg/L)	24.1	20.2	15.4	22.7	21.2
Ammonia, Total (as N) (mg/L)	<0.0050	0.0138	<0.0050	0.0054	<0.0050
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F) (mg/L)	0.074	0.070	0.064	0.083	0.094
Nitrate and Nitrite (as N) (mg/L)	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051
Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
Cyanides Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Organic / Inorganic Carbon Dissolved Organic Carbon (mg/L)	6.25	6.51	5.85	6.42	8.02
Total Metals Aluminum (Al)-Total (mg/L)	0.0085	0.0250	0.0141	0.0115	0.0189
Antimony (Sb)-Total (mg/L)	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
Arsenic (As)-Total (mg/L)	0.000097	0.000114	0.000075	0.000078	0.000132
Barium (Ba)-Total (mg/L)	0.0721	0.0586	0.0518	0.0743	0.0817
Beryllium (Be)-Total (mg/L)	<0.0000050	0.0000070	0.0000052	<0.0000050	0.0000117
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Total (mg/L)	5.57	4.36	3.94	5.57	4.67
Cesium (Cs)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	0.0000062	<0.0000050
Chromium (Cr)-Total (mg/L)	<0.00050	<0.00050	0.00190	<0.00050	0.00149
Cobalt (Co)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)-Total (mg/L)	0.00057	0.00087	0.00051	0.00081	0.00085
Gallium (Ga)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Iron (Fe)-Total (mg/L)	0.080	0.139	0.118	0.104	0.359

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1798186-6 Water 11-JUL-16 13:08 WQ13	L1798186-7 Water 12-JUL-16 12:06 WQ14	L1798186-8 Water 11-JUL-16 14:16 WQ18	L1798186-9 Water 11-JUL-16 17:13 WQ19	L1798186-10 Water 11-JUL-16 16:50 WQ22
WATER						
Field Tests	pH, Client Supplied (pH)	7.62	7.66	7.61	7.46	7.35
Physical Tests	Conductivity (uS/cm)	71.7	41.0	67.3	37.2	38.5
	Hardness (as CaCO3) (mg/L)	35.9	17.1	33.9	17.0	19.0
	Langelier Index Temperature (C)	4.15	4.15	4.15	4.15	4.15
	Langelier Index (none)	-1.5	-2.1	-1.5	-2.2	-2.3
	pH (pH)	7.62	7.66	7.61	7.46	7.35
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	67	31	63	38	41
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	2.2	1.0	2.4	1.9	2.2
	Alkalinity, Total (as CaCO3) (mg/L)	33.1	16.1	32.3	16.2	15.4
	Ammonia, Total (as N) (mg/L)	0.0115	<0.0050	0.0107	<0.0050	0.0105
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	0.67	<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.123	0.058	0.100	0.072	0.074
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	<0.0051	0.0059	<0.0051	<0.0051
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.0059	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	<0.30	<0.30	<0.30	<0.30	0.39
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	13.0	5.44 M	10.2	5.90	10.3
Total Metals	Aluminum (Al)-Total (mg/L)	0.0552	0.0257	0.0116	0.0178	0.0722
	Antimony (Sb)-Total (mg/L)	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
	Arsenic (As)-Total (mg/L)	0.000255	0.000090	0.000140	0.000102	0.000131
	Barium (Ba)-Total (mg/L)	0.132	0.0447	0.125	0.0536	0.0523
	Beryllium (Be)-Total (mg/L)	0.0000207	<0.0000050	0.0000089	<0.0000050	0.0000137
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050	0.0000057	<0.0000050	0.0000053
	Calcium (Ca)-Total (mg/L)	7.81	3.74	7.94	4.06	4.93
	Cesium (Cs)-Total (mg/L)	0.0000056	<0.0000050	0.0000064	<0.0000050	<0.0000050
	Chromium (Cr)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Total (mg/L)	0.000077	<0.000050	0.000059	<0.000050	0.000058
	Copper (Cu)-Total (mg/L)	0.00134	0.00057	0.00068	0.00060	0.00163
	Gallium (Ga)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Iron (Fe)-Total (mg/L)	0.452	0.077	0.150	0.450	0.184

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1798186-11	L1798186-12	L1798186-13	L1798186-14	L1798186-15
Description	Water	Water	Water	Water	Water
Sampled Date	11-JUL-16	12-JUL-16	11-JUL-16	11-JUL-16	11-JUL-16
Sampled Time	16:30	11:44	15:24	10:49	10:14
Client ID	WQ23	WQ24	WQ26	WQDP	WQRB
Grouping / **Analyte**					
WATER					
Field Tests pH, Client Supplied (pH)	7.38	7.79	7.47	7.77	7.59
Physical Tests Conductivity (uS/cm)	37.0	82.5	83.0	88.7	57.5
Hardness (as CaCO3) (mg/L)	17.3	41.4	41.3	39.2	26.3
Langelier Index Temperature (C)	4.15	4.15	4.15	4.15	4.15
Langelier Index (none)	-2.4	-1.1	-1.6	-1.3	-1.7
pH (pH)	7.38	7.79	7.47	7.77	7.59
Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	5.6	<3.0
Total Dissolved Solids (mg/L)	39	86	92	76	55
Anions and Nutrients Acidity (as CaCO3) (mg/L)	2.1	1.2	2.6	2.0	2.0
Alkalinity, Total (as CaCO3) (mg/L)	14.7	33.8	27.1	39.8	27.1
Ammonia, Total (as N) (mg/L)	<0.0050	0.0108	0.0130	0.0119	0.0102
Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.77	<0.50
Fluoride (F) (mg/L)	0.074	0.094	0.114	0.288	0.164
Nitrate and Nitrite (as N) (mg/L)	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051
Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Sulfate (SO4) (mg/L)	0.42	2.27	8.86	1.22	<0.30
Cyanides Cyanide, Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Organic / Inorganic Carbon Dissolved Organic Carbon (mg/L)	7.22	19.2	20.7	12.6	10.3
Total Metals Aluminum (Al)-Total (mg/L)	0.0349	0.106	0.162	0.0829	0.0323
Antimony (Sb)-Total (mg/L)	<0.000030	<0.000030	<0.000030	0.000037	<0.000030
Arsenic (As)-Total (mg/L)	0.000093	0.000225	0.000241	0.000445	0.000242
Barium (Ba)-Total (mg/L)	0.0418	0.0667	0.0456	0.122	0.0665
Beryllium (Be)-Total (mg/L)	0.0000072	0.0000182	0.0000233	0.0000169	0.0000103
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total (mg/L)	<0.0000050	0.0000086	0.0000104	<0.0000050	<0.0000050
Calcium (Ca)-Total (mg/L)	3.97	12.5	12.4	8.53	6.10
Cesium (Cs)-Total (mg/L)	0.0000050	0.0000115	0.0000080	0.0000097	0.0000057
Chromium (Cr)-Total (mg/L)	<0.00050	0.00072	0.00056	<0.00050	<0.00050
Cobalt (Co)-Total (mg/L)	<0.000050	0.000088	0.000100	0.000100	0.000050
Copper (Cu)-Total (mg/L)	0.00110	0.00472	0.00993	0.00139	0.00081
Gallium (Ga)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Iron (Fe)-Total (mg/L)	0.129	0.507	0.268	0.349	0.275

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1798186-16	L1798186-17			
	Description	Water	Water			
	Sampled Date	11-JUL-16	12-JUL-16			
	Sampled Time	11:43				
	Client ID	DS1-110716	DS2-120716			
Grouping	**Analyte**					
WATER						
Field Tests	pH, Client Supplied (pH)	7.55	7.49			
Physical Tests	Conductivity (uS/cm)	45.6	36.8			
	Hardness (as CaCO3) (mg/L)	22.6	16.8			
	Langelier Index Temperature (C)	4.15	4.15			
	Langelier Index (none)	-1.9	-2.3			
	pH (pH)	7.55	7.49			
	Total Suspended Solids (mg/L)	<3.0	<3.0			
	Total Dissolved Solids (mg/L)	41	33			
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	1.8	1.7			
	Alkalinity, Total (as CaCO3) (mg/L)	22.8	15.9			
	Ammonia, Total (as N) (mg/L)	0.0054	<0.0050			
	Bromide (Br) (mg/L)	<0.050	<0.050			
	Chloride (Cl) (mg/L)	<0.50	<0.50			
	Fluoride (F) (mg/L)	0.083	0.058			
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	<0.0051			
	Nitrate (as N) (mg/L)	0.0051	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Sulfate (SO4) (mg/L)	<0.30	<0.30			
Cyanides	Cyanide, Total (mg/L)	<0.0050	<0.0050			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	6.70	5.84			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0119	0.0259			
	Antimony (Sb)-Total (mg/L)	<0.000030	<0.000030			
	Arsenic (As)-Total (mg/L)	0.000082	0.000106			
	Barium (Ba)-Total (mg/L)	0.0770	0.0488			
	Beryllium (Be)-Total (mg/L)	<0.0000050	0.0000056			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (mg/L)	<0.0000050	<0.0000050			
	Calcium (Ca)-Total (mg/L)	5.70	3.89			
	Cesium (Cs)-Total (mg/L)	0.0000069	0.0000056			
	Chromium (Cr)-Total (mg/L)	<0.00050	<0.00050			
	Cobalt (Co)-Total (mg/L)	<0.000050	<0.000050			
	Copper (Cu)-Total (mg/L)	0.00091	0.00061			
	Gallium (Ga)-Total (mg/L)	<0.000050	<0.000050			
	Iron (Fe)-Total (mg/L)	0.106	0.077			

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1798186-1	L1798186-2	L1798186-3	L1798186-4	L1798186-5
	Description	Water	Water	Water	Water	Water
	Sampled Date	11-JUL-16	11-JUL-16	11-JUL-16	11-JUL-16	11-JUL-16
	Sampled Time	14:38	15:00	15:45	11:45	12:30
	Client ID	WQ02	WQ03	WQ04	WQ11	WQ12
Grouping	**Analyte**					
WATER						
Total Metals	Lead (Pb)-Total (mg/L)	<0.000050	0.000065	<0.000050	<0.000050	0.000056
	Lithium (Li)-Total (mg/L)	0.00066	0.00053	<0.00040	0.00048	0.00101
	Magnesium (Mg)-Total (mg/L)	2.62	2.07	1.86	2.13	2.38
	Manganese (Mn)-Total (mg/L)	0.0128	0.0124	0.00419	0.00367	0.0101
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.000155	0.000187	0.000104	0.000211	0.000137
	Nickel (Ni)-Total (mg/L)	0.00061	0.00059	0.00052	0.00049	0.00097
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Rhenium (Re)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Rubidium (Rb)-Total (mg/L)	0.000850	0.000944	0.000763	0.000650	0.000842
	Selenium (Se)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Silicon (Si)-Total (mg/L)	0.619	0.379	0.441	0.243	0.325
	Silver (Ag)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Strontium (Sr)-Total (mg/L)	0.0622	0.0512	0.0421	0.0557	0.0679
	Tellurium (Te)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Thallium (Tl)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000062
	Thorium (Th)-Total (mg/L)	0.0000071	0.0000159	0.0000135	0.0000093	0.0000212
	Tin (Sn)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Titanium (Ti)-Total (mg/L)	<0.00020	0.00049	0.00021	<0.00020	0.00043
	Tungsten (W)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Uranium (U)-Total (mg/L)	0.000175	0.000138	0.0000973	0.000240	0.000115
	Vanadium (V)-Total (mg/L)	0.000076	0.000173	0.000086	0.000123	0.000200
	Yttrium (Y)-Total (mg/L)	0.0000245	0.0000436	0.0000373	0.0000296	0.0000566
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	0.000067	0.000100	0.000083	0.000067	0.000143
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0056	0.0155	0.0110	0.0090	0.0136
	Antimony (Sb)-Dissolved (mg/L)	<0.000010	0.000012	<0.000010	<0.000010	<0.000010
	Arsenic (As)-Dissolved (mg/L)	0.000092	0.000114	0.000077	0.000083	0.000135
	Barium (Ba)-Dissolved (mg/L)	0.0725	0.0604	0.0519	0.0764	0.0808
	Beryllium (Be)-Dissolved (mg/L)	<0.0000050	0.0000052	0.0000053	<0.0000050	0.0000089
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1798186-6	L1798186-7	L1798186-8	L1798186-9	L1798186-10
Description	Water	Water	Water	Water	Water
Sampled Date	11-JUL-16	12-JUL-16	11-JUL-16	11-JUL-16	11-JUL-16
Sampled Time	13:08	12:06	14:16	17:13	16:50
Client ID	WQ13	WQ14	WQ18	WQ19	WQ22
Grouping / **Analyte**					
WATER					
Total Metals Lead (Pb)-Total (mg/L)	0.000206	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total (mg/L)	0.00167	0.00049	0.00089	0.00047	0.00056
Magnesium (Mg)-Total (mg/L)	4.02	1.82	3.41	1.62	1.64
Manganese (Mn)-Total (mg/L)	0.0156	0.0105	0.0162	0.0156	0.0133
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	0.000304	0.000089	0.000244	0.000098	0.000135
Nickel (Ni)-Total (mg/L)	0.00146	0.00048	0.00112	0.00041	0.00100
Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
Rhenium (Re)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Rubidium (Rb)-Total (mg/L)	0.00129	0.000850	0.000873	0.000850	0.000568
Selenium (Se)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Silicon (Si)-Total (mg/L)	0.593	0.330	0.890	0.289	0.250
Silver (Ag)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
Strontium (Sr)-Total (mg/L)	0.108	0.0554	0.0774	0.0384	0.0356
Tellurium (Te)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thallium (Tl)-Total (mg/L)	0.0000064	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Thorium (Th)-Total (mg/L)	0.0000406	0.0000179	0.0000169	0.0000132	0.0000568
Tin (Sn)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti)-Total (mg/L)	0.00091	0.00048	0.00021	0.00030	0.00053
Tungsten (W)-Total (mg/L)	0.000027	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)-Total (mg/L)	0.000276	0.0000711	0.000407	0.0000528	0.000246
Vanadium (V)-Total (mg/L)	0.000414	0.000101	0.000135	0.000091	0.000173
Yttrium (Y)-Total (mg/L)	0.000116	0.0000415	0.0000429	0.0000320	0.000120
Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium (Zr)-Total (mg/L)	0.000309	0.000096	0.000150	0.000068	0.000347
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0456	0.0148	0.0096	0.0109	0.0663
Antimony (Sb)-Dissolved (mg/L)	0.000015	<0.000010	<0.000010	<0.000010	<0.000010
Arsenic (As)-Dissolved (mg/L)	0.000271	0.000095	0.000146	0.000111	0.000158
Barium (Ba)-Dissolved (mg/L)	0.125	0.0477	0.121	0.0531	0.0514
Beryllium (Be)-Dissolved (mg/L)	0.0000190	<0.0000050	0.0000071	<0.0000050	0.0000124
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1798186-11	L1798186-12	L1798186-13	L1798186-14	L1798186-15
Description	Water	Water	Water	Water	Water
Sampled Date	11-JUL-16	12-JUL-16	11-JUL-16	11-JUL-16	11-JUL-16
Sampled Time	16:30	11:44	15:24	10:49	10:14
Client ID	WQ23	WQ24	WQ26	WQDP	WQRB
Grouping / **Analyte**					
WATER					
Total Metals Lead (Pb)-Total (mg/L)	<0.000050	0.000130	0.000130	0.000214	0.000057
Lithium (Li)-Total (mg/L)	0.00066	0.00102	0.00076	0.00328	0.00187
Magnesium (Mg)-Total (mg/L)	1.80	2.43	2.51	4.57	2.88
Manganese (Mn)-Total (mg/L)	0.0202	0.0209	0.00770	0.0154	0.0152
Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total (mg/L)	0.000083	0.000281	0.00185	0.000752	0.000154
Nickel (Ni)-Total (mg/L)	0.00094	0.00165	0.00110	0.00078	0.00044
Phosphorus (P)-Total (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
Rhenium (Re)-Total (mg/L)	<0.0000050	<0.0000050	0.0000085	<0.0000050	<0.0000050
Rubidium (Rb)-Total (mg/L)	0.000866	0.00143	0.000944	0.00169	0.00128
Selenium (Se)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Silicon (Si)-Total (mg/L)	0.909	0.275	0.266	0.167	0.173
Silver (Ag)-Total (mg/L)	<0.0000050	0.0000089	0.0000169	<0.0000050	<0.0000050
Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	2.8	<2.0
Strontium (Sr)-Total (mg/L)	0.0385	0.0538	0.0573	0.103	0.0639
Tellurium (Te)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thallium (Tl)-Total (mg/L)	<0.0000050	0.0000072	0.0000091	0.0000079	<0.0000050
Thorium (Th)-Total (mg/L)	0.0000290	0.0000697	0.0000852	0.0000415	0.0000190
Tin (Sn)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti)-Total (mg/L)	0.00053	0.00073	0.00086	0.00162	0.00052
Tungsten (W)-Total (mg/L)	<0.000010	<0.000010	<0.000010	0.000016	<0.000010
Uranium (U)-Total (mg/L)	0.0000796	0.000359	0.00377	0.00135	0.000204
Vanadium (V)-Total (mg/L)	0.000122	0.000207	0.000253	0.000841	0.000239
Yttrium (Y)-Total (mg/L)	0.0000822	0.000243	0.000420	0.000106	0.0000540
Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	0.0032	<0.0030	<0.0030
Zirconium (Zr)-Total (mg/L)	0.000197	0.000389	0.000614	0.000290	0.000135
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Aluminum (Al)-Dissolved (mg/L)	0.0216	0.0828	0.156	0.0357	0.0207
Antimony (Sb)-Dissolved (mg/L)	<0.000010	0.000028	0.000024	0.000031	0.000013
Arsenic (As)-Dissolved (mg/L)	0.000096	0.000242	0.000249	0.000365	0.000229
Barium (Ba)-Dissolved (mg/L)	0.0408	0.0679	0.0461	0.111	0.0651
Beryllium (Be)-Dissolved (mg/L)	0.0000073	0.0000196	0.0000238	0.0000085	0.0000079
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	0.0000108	0.0000113	<0.0000050	<0.0000050

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1798186-16	L1798186-17			
	Description	Water	Water			
	Sampled Date	11-JUL-16	12-JUL-16			
	Sampled Time	11:43				
	Client ID	DS1-110716	DS2-120716			
Grouping	**Analyte**					
WATER						
Total Metals	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Total (mg/L)	0.00052	0.00046			
	Magnesium (Mg)-Total (mg/L)	2.15	1.86			
	Manganese (Mn)-Total (mg/L)	0.00401	0.0105			
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000215	0.000085			
	Nickel (Ni)-Total (mg/L)	0.00051	0.00049			
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30			
	Potassium (K)-Total (mg/L)	<2.0	<2.0			
	Rhenium (Re)-Total (mg/L)	<0.0000050	<0.0000050			
	Rubidium (Rb)-Total (mg/L)	0.000685	0.000905			
	Selenium (Se)-Total (mg/L)	<0.00020	<0.00020			
	Silicon (Si)-Total (mg/L)	0.252	0.339			
	Silver (Ag)-Total (mg/L)	<0.0000050	<0.0000050			
	Sodium (Na)-Total (mg/L)	<2.0	<2.0			
	Strontium (Sr)-Total (mg/L)	0.0582	0.0584			
	Tellurium (Te)-Total (mg/L)	<0.000010	<0.000010			
	Thallium (Tl)-Total (mg/L)	<0.0000050	<0.0000050			
	Thorium (Th)-Total (mg/L)	0.0000101	0.0000167			
	Tin (Sn)-Total (mg/L)	<0.00020	<0.00020			
	Titanium (Ti)-Total (mg/L)	<0.00020	0.00047			
	Tungsten (W)-Total (mg/L)	<0.000010	<0.000010			
	Uranium (U)-Total (mg/L)	0.000245	0.0000747			
	Vanadium (V)-Total (mg/L)	0.000124	0.000100			
	Yttrium (Y)-Total (mg/L)	0.0000294	0.0000426			
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030			
	Zirconium (Zr)-Total (mg/L)	0.000067	0.000100			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0089	0.0116			
	Antimony (Sb)-Dissolved (mg/L)	<0.000010	<0.000010			
	Arsenic (As)-Dissolved (mg/L)	0.000086	0.000098			
	Barium (Ba)-Dissolved (mg/L)	0.0761	0.0467			
	Beryllium (Be)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.0050	<0.0050			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050	<0.0000050			

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1798186-1	L1798186-2	L1798186-3	L1798186-4	L1798186-5
Description	Water	Water	Water	Water	Water
Sampled Date	11-JUL-16	11-JUL-16	11-JUL-16	11-JUL-16	11-JUL-16
Sampled Time	14:38	15:00	15:45	11:45	12:30
Client ID	WQ02	WQ03	WQ04	WQ11	WQ12
Grouping / **Analyte**					
WATER					
Dissolved Metals Calcium (Ca)-Dissolved (mg/L)	5.48	4.46	3.91	5.59	4.64
Cesium (Cs)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	0.0000059	<0.0000050
Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	0.00056	0.00063	<0.00050
Cobalt (Co)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)-Dissolved (mg/L)	0.00047	0.00059	0.00044	0.00080	0.00058
Gallium (Ga)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Iron (Fe)-Dissolved (mg/L)	0.050	0.082	0.088	0.078	0.251
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.00064	0.00056	0.00039	0.00047	0.00087
Magnesium (Mg)-Dissolved (mg/L)	2.55	2.09	1.81	2.11	2.39
Manganese (Mn)-Dissolved (mg/L)	0.00314	0.00404	0.00119	0.00128	0.00268
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000137	0.000164	0.000086	0.000204	0.000092
Nickel (Ni)-Dissolved (mg/L)	0.00065	0.00062	0.00051	0.00053	0.00088
Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
Rhenium (Re)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Rubidium (Rb)-Dissolved (mg/L)	0.000834	0.000897	0.000759	0.000663	0.000811
Selenium (Se)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Silicon (Si)-Dissolved (mg/L)	0.605	0.348	0.428	0.238	0.306
Silver (Ag)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
Strontium (Sr)-Dissolved (mg/L)	0.0622	0.0510	0.0430	0.0573	0.0665
Tellurium (Te)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thallium (Tl)-Dissolved (mg/L)	<0.0000020	<0.0000020	<0.0000020	0.0000032	0.0000039
Thorium (Th)-Dissolved (mg/L)	<0.0000050	0.0000088	0.0000088	0.0000060	0.0000155
Tin (Sn)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	0.00030
Tungsten (W)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)-Dissolved (mg/L)	0.000169	0.000128	0.0000913	0.000238	0.000110
Vanadium (V)-Dissolved (mg/L)	0.000064	0.000138	0.000077	0.000108	0.000175
Yttrium (Y)-Dissolved (mg/L)	0.0000195	0.0000334	0.0000323	0.0000274	0.0000491
Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	0.000070	0.000096	0.000099	0.000076	0.000167

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1798186-6	L1798186-7	L1798186-8	L1798186-9	L1798186-10
Description	Water	Water	Water	Water	Water
Sampled Date	11-JUL-16	12-JUL-16	11-JUL-16	11-JUL-16	11-JUL-16
Sampled Time	13:08	12:06	14:16	17:13	16:50
Client ID	WQ13	WQ14	WQ18	WQ19	WQ22
Grouping / **Analyte**					
WATER					
Dissolved Metals Calcium (Ca)-Dissolved (mg/L)	7.78	3.81	7.95	4.11	4.91
Cesium (Cs)-Dissolved (mg/L)	<0.0000050	<0.0000050	0.0000055	<0.0000050	<0.0000050
Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Dissolved (mg/L)	<0.000050	<0.000050	0.000054	<0.000050	<0.000050
Copper (Cu)-Dissolved (mg/L)	0.00126	0.00052	0.00059	0.00044	0.00163
Gallium (Ga)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Iron (Fe)-Dissolved (mg/L)	0.370	0.048	0.117	0.366	0.126
Lead (Pb)-Dissolved (mg/L)	0.000168	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.00169	0.00047	0.00091	0.00049	0.00058
Magnesium (Mg)-Dissolved (mg/L)	3.99	1.85	3.41	1.64	1.62
Manganese (Mn)-Dissolved (mg/L)	0.00702	0.00551	0.0129	0.00628	0.00627
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000267	0.000075	0.000217	0.000086	0.000121
Nickel (Ni)-Dissolved (mg/L)	0.00160	0.00065	0.00121	0.00040	0.00111
Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
Rhenium (Re)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Rubidium (Rb)-Dissolved (mg/L)	0.00127	0.000842	0.000858	0.000850	0.000560
Selenium (Se)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Silicon (Si)-Dissolved (mg/L)	0.562	0.311	0.888	0.276	0.237
Silver (Ag)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
Strontium (Sr)-Dissolved (mg/L)	0.105	0.0579	0.0767	0.0388	0.0350
Tellurium (Te)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thallium (Tl)-Dissolved (mg/L)	0.0000055	<0.0000020	0.0000038	<0.0000020	0.0000044
Thorium (Th)-Dissolved (mg/L)	0.0000349	0.0000088	0.0000118	0.0000089	0.0000528
Tin (Sn)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti)-Dissolved (mg/L)	0.00069	0.00026	<0.00020	<0.00020	0.00040
Tungsten (W)-Dissolved (mg/L)	0.000024	<0.000010	<0.000010	<0.000010	<0.000010
Uranium (U)-Dissolved (mg/L)	0.000256	0.0000656	0.000391	0.0000473	0.000240
Vanadium (V)-Dissolved (mg/L)	0.000374	0.000077	0.000137	0.000078	0.000150
Yttrium (Y)-Dissolved (mg/L)	0.000105	0.0000359	0.0000405	0.0000286	0.000116
Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	0.000382	0.000092	0.000170	0.000074	0.000394

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1798186-11	L1798186-12	L1798186-13	L1798186-14	L1798186-15
Description	Water	Water	Water	Water	Water
Sampled Date	11-JUL-16	12-JUL-16	11-JUL-16	11-JUL-16	11-JUL-16
Sampled Time	16:30	11:44	15:24	10:49	10:14
Client ID	WQ23	WQ24	WQ26	WQDP	WQRB
Grouping / **Analyte**					
WATER					
Dissolved Metals Calcium (Ca)-Dissolved (mg/L)	3.96	12.5	12.4	8.34	5.92
Cesium (Cs)-Dissolved (mg/L)	<0.0000050	0.0000121	0.0000069	<0.0000050	<0.0000050
Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Dissolved (mg/L)	<0.000050	0.000075	0.000087	0.000054	<0.000050
Copper (Cu)-Dissolved (mg/L)	0.00097	0.00487	0.00975	0.00118	0.00069
Gallium (Ga)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Iron (Fe)-Dissolved (mg/L)	0.073	0.351	0.218	0.129	0.156
Lead (Pb)-Dissolved (mg/L)	<0.000050	0.000104	0.000087	0.000079	<0.000050
Lithium (Li)-Dissolved (mg/L)	0.00064	0.00098	0.00073	0.00322	0.00192
Magnesium (Mg)-Dissolved (mg/L)	1.80	2.45	2.53	4.46	2.80
Manganese (Mn)-Dissolved (mg/L)	0.00610	0.0137	0.00723	0.00214	0.00925
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000074	0.000272	0.00172	0.000664	0.000128
Nickel (Ni)-Dissolved (mg/L)	0.00089	0.00163	0.00105	0.00066	0.00042
Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
Rhenium (Re)-Dissolved (mg/L)	<0.0000050	<0.0000050	0.0000087	<0.0000050	<0.0000050
Rubidium (Rb)-Dissolved (mg/L)	0.000842	0.00172	0.000951	0.00157	0.00120
Selenium (Se)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Silicon (Si)-Dissolved (mg/L)	0.878	0.252	0.254	0.073	0.147
Silver (Ag)-Dissolved (mg/L)	<0.0000050	0.0000068	0.0000131	<0.0000050	<0.0000050
Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0	<2.0	2.7	<2.0
Strontium (Sr)-Dissolved (mg/L)	0.0380	0.0630	0.0596	0.0988	0.0626
Tellurium (Te)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thallium (Tl)-Dissolved (mg/L)	<0.0000020	0.0000080	0.0000075	0.0000065	0.0000034
Thorium (Th)-Dissolved (mg/L)	0.0000213	0.0000579	0.0000804	0.0000127	0.0000092
Tin (Sn)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti)-Dissolved (mg/L)	0.00022	0.00046	0.00073	0.00027	<0.00020
Tungsten (W)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000012	<0.000010
Uranium (U)-Dissolved (mg/L)	0.0000755	0.000381	0.00344	0.00117	0.000171
Vanadium (V)-Dissolved (mg/L)	0.000092	0.000159	0.000236	0.000406	0.000174
Yttrium (Y)-Dissolved (mg/L)	0.0000723	0.000232	0.000398	0.0000443	0.0000367
Zinc (Zn)-Dissolved (mg/L)	<0.0010	<0.0010	0.0026	<0.0010	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	0.000205	0.000337	0.000703	0.000196	0.000126

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1798186-16	L1798186-17			
	Description	Water	Water			
	Sampled Date	11-JUL-16	12-JUL-16			
	Sampled Time	11:43				
	Client ID	DS1-110716	DS2-120716			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Calcium (Ca)-Dissolved (mg/L)	5.59	3.76			
	Cesium (Cs)-Dissolved (mg/L)	0.0000062	<0.0000050			
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050			
	Cobalt (Co)-Dissolved (mg/L)	<0.000050	<0.000050			
	Copper (Cu)-Dissolved (mg/L)	0.00079	0.00073			
	Gallium (Ga)-Dissolved (mg/L)	<0.000050	<0.000050			
	Iron (Fe)-Dissolved (mg/L)	0.079	0.047			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.00050	0.00051			
	Magnesium (Mg)-Dissolved (mg/L)	2.10	1.80			
	Manganese (Mn)-Dissolved (mg/L)	0.00137	0.00520			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000196	0.000098			
	Nickel (Ni)-Dissolved (mg/L)	0.00050	0.00060			
	Phosphorus (P)-Dissolved (mg/L)	<0.30	<0.30			
	Potassium (K)-Dissolved (mg/L)	<2.0	<2.0			
	Rhenium (Re)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Rubidium (Rb)-Dissolved (mg/L)	0.000650	0.000866			
	Selenium (Se)-Dissolved (mg/L)	<0.00020	<0.00020			
	Silicon (Si)-Dissolved (mg/L)	0.233	0.306			
	Silver (Ag)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0			
	Strontium (Sr)-Dissolved (mg/L)	0.0559	0.0577			
	Tellurium (Te)-Dissolved (mg/L)	<0.000010	<0.000010			
	Thallium (Tl)-Dissolved (mg/L)	0.0000029	<0.0000020			
	Thorium (Th)-Dissolved (mg/L)	0.0000058	0.0000119			
	Tin (Sn)-Dissolved (mg/L)	<0.00020	<0.00020			
	Titanium (Ti)-Dissolved (mg/L)	<0.00020	<0.00020			
	Tungsten (W)-Dissolved (mg/L)	<0.000010	<0.000010			
	Uranium (U)-Dissolved (mg/L)	0.000237	0.0000673			
	Vanadium (V)-Dissolved (mg/L)	0.000109	0.000074			
	Yttrium (Y)-Dissolved (mg/L)	0.0000266	0.0000329			
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0012			
	Zirconium (Zr)-Dissolved (mg/L)	0.000077	0.000080			

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

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Rubidium (Rb)-Total	MB-LOR	L1798186-10, -11, -12, -13, -14, -15, -16, -17, -5, -6, -7, -8, -9
Method Blank	Manganese (Mn)-Total	MB-LOR	L1798186-1, -2, -3, -4
Method Blank	Strontium (Sr)-Total	MB-LOR	L1798186-1, -2, -3, -4
Method Blank	Yttrium (Y)-Total	MB-LOR	L1798186-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Ammonia, Total (as N)	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Dissolved Organic Carbon	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1798186-1, -10, -11, -12, -13, -14, -15, -16, -17, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
M	A peak has been manually integrated.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 "Acidity"

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

Samples of industrial wastes, acid mine drainage, or other solutions that contain appreciable amounts of hydrolyzable metal ions such as aluminum, iron, and manganese may require hot peroxide treatment to ensure oxidation and hydrolysis of reduced forms of polyvalent cations. Acidity results may be highly variable if this procedure is not followed. Results in this report for 'Acidity (as CaCO3)' have not been peroxide treated.

ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

Samples of industrial wastes, acid mine drainage, or other solutions that contain appreciable amounts of hydrolyzable metal ions such as aluminum, iron, and manganese may require hot peroxide treatment to ensure oxidation and hydrolysis of reduced forms of polyvalent cations. Acidity results may be highly variable if this procedure is not followed. Results in this report for 'Acidity (as CaCO3)' have not been peroxide treated.

ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ANIONS-N+N-CALC-VA Water Nitrite & Nitrate in Water (Calculation) EPA 300.0

Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

BR-L-IC-N-VA Water Bromide in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

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

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

CL-IC-N-VA Water Chloride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

CN-T-CFA-VA Water Total Cyanide in water by CFA ISO 14403:2002

This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.

EC-PCT-VA Water Conductivity (Automated) APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

F-IC-N-VA Water Fluoride in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-VA Water Hardness APHA 2340B

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

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-CVAA-VA Water Total Mercury in Water by CVAAS or CVAFS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

LANGELIER-CALC-VA Water Langelier Index APHA 2330B

Langelier Index provides an indication of scale formation potential at a given pH and temperature. Field pH is used where provided. Positive values indicate oversaturation with respect to CaCO3. Negative values indicate undersaturation of CaCO3. Langelier Index is calculated as per APHA 2330B Saturation Index.

LANGELIER-TEMP-VA Water Langelier Index Temperature Temperature

MET-D-L-HRMS-VA Water Diss. Metals in Water by HR-ICPMS EPA 200.8

Trace metals in water are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The procedures may involve laboratory sample filtration modified from APHA Method 3030B.

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

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

MET-T-L-HRMS-VA Water Total Metals in Water by HR-ICPMS EPA 200.8

Trace metals in water are analyzed by high resolution inductively coupled plasma mass spectrometry (HR-ICPMS) modified from US EPA Method 200.8, (Revision 5.5). The procedures may involve preliminary sample treatment by acid digestion modified from APHA Method 3030E.

MET-TOT-ICP-VA Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

Reference Information

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PO4-DO-COL-VA	Water	Diss. Orthophosphate in Water by Colour	APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

15-567485 15-567486

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 15 - 567486

Page 1 of 2

Report To	Contact and company name below will appear on the final report
Company:	KIVALLIQ ENERGY CORP
Contact:	Andrew Berry
Phone:	604-765-1892
	Company address below will appear on the final report
Street:	1020-800 W. Pender St
City/Province:	Vancouver BC
Postal Code:	V6C 2V6

Report Format / Distribution	
Select Report Format:	PDF EXCEL EDD (DIGITAL)
Quality Control (QC) Report with Report	YES NO
Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	EMAIL MAIL FAX
Email 1 or Fax	andrewb@kivalliqenergy.com
Email 2	
Email 3	

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] 3 day [P3] 2 day [P2]

EMERGENCY: 1 Business day [E1] Same Day, Weekend or Statutory holiday [E0]

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To		
	Same as Report To	YES NO
	Copy of Invoice with Report	YES NO
Company:		
Contact:		

Invoice Distribution	
Select Invoice Distribution:	EMAIL MAIL FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	
LSD:	
ALS Lab Work Order #	L1798186-COFC

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

Sampler:

ALS Sample # (lab use only)	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Acidity / Alk Sp(pCT)	Anion Scan NO2+NO3	Total Cyanide (P)	EC, pH, TDS, TSS, ortho PO4 (P)	Ammonia (P)	Total Metals (P)	Dissolved Metals (F/P)	Total Mercury (P)	Dissolved Mercury (F/P)	Long temp tung calc (F/P)	DOC (F/P)	Number of Containers
	WQ02	11-JUL-16	14:38	Water	X	X	X	X	X	X	X	X	X	X	X	8
	WQ03	11-JUL-16	15:00		X	X	X	X	X	X	X	X	X	X	X	8
	WQ04	11-JUL-16	15:45		X	X	X	X	X	X	X	X	X	X	X	8
	WQ11	11-JUL-16	11:45		X	X	X	X	X	X	X	X	X	X	X	8
	WQ12	11-JUL-16	12:30		X	X	X	X	X	X	X	X	X	X	X	8
	WQ13	11-JUL-16	13:08		X	X	X	X	X	X	X	X	X	X	X	8
	WQ14	12-JUL-16	12:06		X	X	X	X	X	X	X	X	X	X	X	8
	WQ18	11-JUL-16	14:16		X	X	X	X	X	X	X	X	X	X	X	8
	WQ19	11-JUL-16	17:13		X	X	X	X	X	X	X	X	X	X	X	8
	WQ22	11-JUL-16	16:50		X	X		X	X	X	X	X	X	X	X	7
	WQ23	11-JUL-16	16:30		X	X	X	X	X	X	X	X	X	X	X	8
	WQ24	12-JUL-16	11:44		X	X	X	X	X	X	X	X	X	X	X	8

Rush Processing ●

Short Holding Time

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? YES NO	CCME WQ22 NO cyanide
Are samples for human drinking water use? YES NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			3.8,	5.4,	7.3, 0.1

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: Shaun	Date: July 13	Time: 1930	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 15 - 567485

Page 2 of 2

Report To	Contact and company name below will appear on the final report
Company:	Kwalliq Energy Corp
Contact:	Andrew Berry
Phone:	604 765 1892
	Company address below will appear on the final report
Street:	1020-800 W. Pender St
City/Province:	Vancouver BC
Postal Code:	V6C 2V6
Invoice To	Same as Report To: YES NO
	Copy of Invoice with Report: YES NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	PDF EXCEL EDD (DIGITAL)
Quality Control (QC) Report with Report	YES NO
Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	EMAIL MAIL FAX
Email 1 or Fax	andrew@kwalliqenergy.com
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	EMAIL MAIL FAX
Email 1 or Fax	
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	
PO / AFE:	
LSD:	
ALS Lab Work Order #	L1798186-COFC

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R]: Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4]; 3 day [P3]; 2 day [P2]

EMERGENCY: 1 Business day [E1]; Same Day, Weekend or Statutory holiday [E0]

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	(This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Acidity, Alk, Sp(PCT)	Anion Scan NO2/NO3	Total Cyanide F	EC, pH, TDS, TSS, Ortho PO4	Ammonia F	Total Metals (ICP/MS) F/P	Dissolved Metals (ICP/MS) F/P	Total Mercury (low level) F/P	Dissolved Mercury (low level) F/P	Lang temp + lang calc F/P	DOC F/P	Number of Containers
	WQ26	11-JUL-16	15:24	Water	X	X	X	X	X	X	X	X	X	X	X	8
	WQDP	11-JUL-16	10:49		X	X	X	X	X	X	X	X	X	X	X	8
	WQRB	11-JUL-16	10:14		X	X	X	X	X	X	X	X	X	X	X	8
	DS1-110716	11-JUL-16	11:43		X	X	X	X	X	X	X	X	X	X	X	8
	DS2-120716	12-JUL-16			X	X	X	X	X	X	X	X	X	X	X	8

Short Holding Time

- *Rush Processing*

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? YES NO	
Are samples for human drinking water use? YES NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen; SIF Observations Yes No

Ice Packs; Ice Cubes; Custody seal intact Yes No

Cooling Initiated

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	3.8, 5.4, 7.3, 0.1

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
				July 13	1930			

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

APPENDIX C

2016 ANGILAK PROPERTY WILDLIFE OBSERVATION LOG

2016 ANGILAK PROPERTY - WILDLIFE LOG				
Date	**Time**	**Species**	**Observations / Description**	**Location**
3-Jul-16	17:00	owl	Flying low level.	1km west of camp
6-Jul-16	11:00/17:00	grizzly bear	Walking. Ignored us. Seen from helicopter.	7km east of Yat
6-Jul-16	20:00	grizzly bear	Walking by camp.	1km north of camp
9-Jul-16	15:00	crane	Flying low level then landed on lake.	1km west of Yat
9-Jul-16	11:30	fox	Checking edges of tents, then scampered off north.	Nutaaq Camp
11-Jul-16	10:30	grizzly bear	Mama & 2 cubs. Ran away when they heard the helicopter.	Dipole Lake
14-Jul-16	15:30	owl	Flying low level.	497506E/6940274N
15-Jul-16	11:00	swans	2 sitting on lake.	7km north of Yat
16-Jul-16	10:00	grizzly bear	Mama & cub. Walking.	15km west of camp
22-Jul-16	17:30	eagle	Flying low level.	525735E/6939070N
24-Jul-16	10:00	caribou	Bull & cow walking around.	VGR target area
24-Jul-16	11:00	geese	Flock sitting on a lake.	5km west of Dipole
26-Jul-16	21:00	fox	North end of camp. Looking at hares.	Nutaaq Camp
27-Jul-16	9:25	grizzly bear	Ran away when it heard the helicopter.	511556E/6935942N
27-Jul-16	9:30	caribou	Standing and watching.	503920E/6934936N
27-Jul-16	10:00	owl	Flying low level.	492615E/6931619N
July		hare/sik sik/ptarmigan	Camp resident population. 2 hares, 2 ptarmigan and 4 sik siks.	Nutaaq Camp

APPENDIX D

2016 WATER USE RECORDS

2016 Nutaaq Camp Water Use				
Date	**Nutaaq Camp**		**Employee**	**Time**
	Gallons/day	**m3/day**		
June-29-16	1000	3.79	Vincent Hernot	15:30
June-30-16	0	0		
July-01-16	0	0		
July-02-16	600	2.27	Vincent Hernot	9:30
July-03-16	0	0		
July-04-16	500	1.89	Vincent Hernot	12:30
July-05-16	0	0		
July-06-16	600	2.27	Leroy Okotak	15:40
July-07-16	0	0		
July-08-16	700	2.65	Leroy Okotak	9:15
July-09-16	0	0		
July-10-16	700	2.65	Leroy Okotak	15:20
July-11-16	0	0		
July-12-16	500	1.89	Vincent Hernot	10:30
July-13-16	0	0		
July-14-16	0	0		
July-15-16	700	2.65	Vincent Hernot	9:00
July-16-16	0	0		
July-17-16	0	0		
July-18-16	600	2.27	Vincent Hernot	11:30
July-19-16	0	0		
July-20-16	0	0		
July-21-16	500	1.89	Vincent Hernot	14:30
July-22-16	0	0		
July-23-16	0	0		
July-24-16	600	2.27	Vincent Hernot	9:30
July-25-16	0	0		
July-26-16	700	2.65	Vincent Hernot	10:00
July-27-16	0	0		
July-28-16	0	0		
July-29-16	0	0		
Total	**7700.00**	**29.14**		
Daily Average	**248.39**	**0.94**		

APPENDIX E

N2012C0030 LAND USE PERMIT INSPECTION FORM JULY 26, 2016

Indigenous and Northern Affairs Canada | Affaires autochtones et du Nord Canada

☒ **Original**
☐ **Follow-Up Report**

LAND USE PERMIT INSPECTION FORM

Permittee	**Representative**
Kivalliq Energy	Jeff Ward
Permit No. / Expiry	**Representative's Title**
N2012C0030	President
Other Authorizations	**Land / Other Authorizations**
2BE-ANG1318	KVL308C09 (Exploration)
Date of Inspection	**Inspector**
26-27/07/2016	WRO Wilson

Activities Inspected

☒ Camp ☒ Drilling ☐ Mining ☐ Construction ☒ Reclamation ☒ Fuel Storage
☒ Roads/hauling ☒ :Other ☐ Other:

Conditions: **A- Acceptable** **U-Unacceptable** **C-Concern** **NI-Not Inspected** **NA- Not applicable**

Section:	**Term No.**	**Condition**	**Observation No.**
31 (1)(a) Location and Area	1,2	A	1
31 (1)(b) Time	--	A	4
31 (1)(c) Equipment	10	A	3
31 (1)(d) Methods and Techniques	--	A	--
31 (1)(e) Type location, capacity and operation of facility	30	A	7
31 (1)(f) Control or prevent of flooding, erosion, and subsidence of Land	39	A	1
31 (1)(g) Use, storage, handling and disposal of chemical or toxic materials	43, 48	A	3,7
31 (1)(h) Wildlife and fisheries habitat	--	A	-----
31 (1)(i) Objects and places of recreation, scenic and ecological value	--	A	-----
31 (1)(k) Petroleum fuel storage	74, 78	A	8
31 (1)(m) Matters not inconsistent with the regulations	79, 80	A	9

SECTION 1 ☒ **Comments** ☐ Non-Compliance with Act or Licence ☐ Action Required

On July 26-27 2016 a land use permit inspection of Kivalliq Energy Corporation, Angilak Lake Project was conducted with the assistance of Jeff Ward, President, Kivalliq Energy Corporation. *The Nutaaq camp, fuel cache and airstrip are located on crown land authorized by this permit. Additional authorized activities include drilling, a small trenching program, construction and maintenance of the airstrip, use of motorized equipment and over land winter hauling.*

Observations

1. *The Nutaaq Camp is located on an esker- durable ground- approximately 62 34' 17.59"N, 98 27' 21.52"W. A wooden walk ways is used in a wet area between the fuel cache and lay down, approximately 62 34' 21.5"N, 98 27' 33.5"W. This adequately prevents rutting and allows for natural drainage.*
2. *A small amount of erosion has occurred on the esker near the hill to the camp from the fuel cache and the grey water sump. The sumps performance has been impeccable in the previous years; the proponent suggested some regular maintenance was needed to improve the performance.*
3. *The following motorized equipment is noted; 1 all-terrain vehicle, six snowmobiles, one bull dozer, 2 loaders, bob cat, helicopter, and small kabota.*
4. *Seven staff is onsite for approximately two weeks (98 man days) completing a exploration program at the Yat Target which is located on crown land.*
5. *11 trenches will be excavated down to bedrock at the Yat target located at approximately 62 32' 48.3"N , 98 55' 27.7"W. No issues were noted.*
6. *Two drill holes located at the VGR target were inspected. No issues were noted; the area showed very little sign of impact from the proponents operation, clean and tidy work.*
7. *Spill # 14-234 is reclaimed the company has proposed storage of the soil until a viable disposal method is determined.*
8. *All fuel containers are marked and kept within adequate secondary containment.*
9. *A copy of the permit is available for review.*

SECTION 2 ☐ Comments ☒ **Non-Compliance with Act or Regulations** ☐ Action Required

NONE

SECTION 3 ☐ Comments ☐ Non-Compliance with Act or Regulations ☒ **Action Required**

The Proponent will update the Abandonment and Reclamation plan to include trenching activities, reclamation of the shop floor.

Licensee or Representative	**Inspector's Name**
	WRO Wilson
Signature	**Signature**
	Original signed on file
Date	**Date**
	July 7th, 2015

Office Use Only: Follow-up report to be issued by Inspector ☐ Yes ☒ No

Canada

APPENDIX F

SPILL CONTIGENCY PLAN

SPILL CONTINGENCY PLAN
ANGILAK PROPERTY
KIVALLIQ ENERGY CORPORATION

Submitted To: NWB, INAC, KIA
Submitted By: Andrew Berry, Chief Operating Officer
Originally Submitted: January 2008
Updated: January 2017

SUMMARY OF AMENDMENTS

PAGE #	DESCRIPTION	DATE
12	6.3 Spill Response Actions - Bioremediation	01/30/2017
Appendix II	Figures updated	01/05/2015
2	2.0 Facilities – updated	01/12/2013
Appendix II	Figures updated	01/12/2013
Appendix II	Figures updated	01/11/2012
9	6.2 Emergency contacts updated	01/01/2012
8	5.3 Contacts updated	01/11/2012
7	5.1 Spill Response Contacts updated	01/01/2012
4	2.0 Facilities – updated	01/11/2012
4	1.0 Introduction – updated	01/01/2012
5	5.1 Additions to the Spill Response Contact List	30/08/2008
6	5.3.1 Phone numbers corrected	30/08/2008
7	6.2 Additions to the Emergency Contact Table	30/08/2008
7	6.2 Explanation of 24 hour Emergency Contact #	30/08/2008
3	2.0 New camp coordinates	01/03/2009
Appendix II	New maps and photos for new camp location	01/03/2009

Table of Contents

Appendices

1. Introduction

This Spill Contingency Plan shall be in effect from February 1, 2017. This Plan has been specifically prepared for the Angilak Property, Kivalliq Region, Nunavut. A copy of this plan will be kept in the office at site and at the head office in Vancouver.

Kivalliq Energy Corporation (Kivalliq Energy) has been exploring in Nunavut since 2008. Kaminak Corporation, a predecessor to Kivalliq Energy, signed an exploration agreement with Nunavut Tunngavik Inc. (NTI) in September 2007 that granted uranium rights on 18,000 acres of Inuit Owned Land (IOL RI-30), located in the Kivalliq Region of Nunavut on the Angilak Property. In discussions with NTI, it was decided cooperatively that Kaminak spin-out all of its uranium interests in Nunavut into a new, uranium exploration and development company called Kivalliq Energy Corporation (KIV: TSX-V). Kivalliq Energy was specifically formed to focus on projects in Nunavut.

Kivalliq Energy endeavours to take every reasonable precaution toward ensuring the protection and conservation of the natural environment and the safety and health of all employees and contractors from any potential harmful effects of stored materials and operations. All plans, licences and permits will be reviewed with employees and contractors when hired and copies of the plans will be available in the office tent for reference.

2. Facilities

All mineral claims are contiguous and extend north, south, east and west between latitudes 62° 27’ and 62°48’ North and longitudes 98° 21’ and 99° 24’ West in NTS map areas 65 J/06, 65 J/09, 65 J/10, 65 J/11 and 65 J/15 (UTM coordinates: 6925500N to 6962000N and 479300E to 533000E, NAD83, Zone 14). The camp is located at 527975m E, 6937950m N. See Appendix II for figures.

The main fuel cache has been established at the camp. All fuel stored on site is contained in Instaberm secondary containment, manufactured by Raymac Industries in British Columbia. Drums of fuel are stored in neat, orderly rows and are inspected daily. Bungs will face 3 and 9 o’clock. A spill kit is located at the fuel cache. Empty drums are removed from site regularly and returned to Aviation Fuel Enterprises in Baker Lake.

Smaller caches are established temporarily to support drilling activities and sampling/survey programs. Spill kits are located at every fuel cache.

Currently Kivalliq Energy is permitted to cache 3000 drums of fuel on site at a time.

This will include:

- 1500 – 205 L drums of diesel
- 1490 – 205 L drums of Jet fuel
- 10 – 205 L drums of gasoline
- 50 – 100 lb cylinders of propane

Most of this fuel will be used by the end of each season. However, enough fuel will be left on site over winter to ensure a supply for a safe re-opening of the camp in the spring. Kivalliq Energy is currently investigating the purchase and use of double-walled enviro tanks. Please refer to the Fuel Management Plan for more information.

The camp currently consists of:

- 15 – 14' x 16' insulated tents on wood frames. These tents function as sleep tents, an office, core tent and first aid station
- 4 – 14' x 32' insulated tent on wood frames. These tents function as the kitchen mess, core tent, core splitting tent and the dry
- 1 toilet facilities
- A generator building to house a 20 kW diesel generator as well as a 12 kW backup generator
- A helicopter landing area,
- A garbage incineration area, and
- A 30'x 60' Sprung Tent

3. Petroleum and Chemical Product Storage and Inventory

3.1. Remote Location Fuel Inventory, Storage & Handling Procedures

These remote fuel caches will be stored in accordance with approved methods of storage of drummed product. Inspections of the fuel caches will be conducted during each visit. There will be a spill kit at each fuel cache location.

3.2. Petroleum Product Transfer

Manual and automatic pumps are used for the transfer of all petroleum products. Smoking, sparks, or open flames are **prohibited** in fuel storage and fuelling areas at all times.

A spill kit will always be stored in areas of storage and re-fuelling. Refueling and storage of drums will always be completed within secondary containment berms.

4. Risk Assessment and Mitigation of Risk

4.1. Petroleum Products and Other Fuels

Following, is a list of sources:

1) Drummed product: Leaks or ruptures may occur. This includes drums of Jet A, Diesel, Gasoline, Waste Fuel, and Waste Oil.

2) Fuel cylinders: Propane, leaks may occur at the valves. All cylinders are secured at all times. Full fuel cylinders are always stored in the upright position.

3) Wheeled vehicles and equipment, aircraft (fixed and rotary wing), snowmobiles, generators, pumps. Incidents involving leaking or dripping fuels and oils may occur due to malfunctions, impact damage, and lack of regular maintenance, improper storage, or faulty operation.

Regular inspection and maintenance in accordance with recognized and accepted standard practices at all camps and fuel caches, reduces risks associated with the categories listed above. Large fuel caches of 20 drums or more will be inspected daily.

Spill response training is provided to all personnel with particular attention to those personnel who handle fuels and other petroleum products. This training will include a presentation, review of spill kit contents and their use and reporting.

Spill Kits will be located at all camps, fuel caches and drill shacks. A description of contents is listed in Section 7.0.

5. Responding to Failures and Spills

5.1. Spill Response Team Contact List

24 Hour Spill Line
(867) 920-8130

GN-DOE
(867) 975-7700

INAC Water Resources Inspector
Iqaluit, Nunavut
(867) 975-4295

Manager of Pollution Control &
Air Quality
(867) 975-7748

Environment Canada
Iqaluit, Nunavut
(867) 975-4644
24 hour pager – (867) 766-3737

Kivalliq Inuit Association
Rankin Inlet
(867) 645-2800

Kivalliq Energy Corp.
Jeff Ward, President
and/or Andrew Berry, Chief Operating Officer
Suite 1020 – 800 West Pender Street
Vancouver BC V6C 2V6
Tel: 604-646-4527, Fax: 604-646-4526
Email: jward@kivalliqenergy.com

5.2. Basic Steps-Spill Procedure

In the case of any spill or other environmental emergency, it is necessary to react in the most immediate, safe, and environmentally responsible manner. No spill or incident is so minor that it can be ignored and every spill must be reported.

The basic steps of the response plan are as follows:

1. *Ensure* the safety of all persons at all times.

2. *Identify* and find the spill substance and its source, and, if possible, stop the process or shut off the source.

3. *Inform* the on-site coordinator or his/her designate at once, so that he/she may take the appropriate actions. Appropriate action includes the notification of the spill to the 24 hour Spill Line and INAC Water Resource Officer, a copy of the Spill Report form can be found in Appendix I.

4. *Contain* the spill or environmental hazard, as per its nature, and as per the advice of the Spill Line and the INAC Water Resource Officer as required.

5. *Implement* any necessary cleanup and/or remedial action.

5.3. Basic Steps-Chain of Command

1) *Immediately* notify and report to the 24-Hour Spill Line at (867) 920-8130, the INAC Water Resources Inspector in Nunavut at (867) 975-4295, Environment Canada personnel at 867-766-3737, Kivalliq Inuit Association Land Inspector at (867) 645-2800.

2) ***A Spill Report Form (Appendix I)*** is filled out as completely as possible before or after contacting the 24 Hour Spill Line. A copy of the guidelines for completing the spill report form can be found in Appendix III.

3) Notify Jeff Ward, President at (604) 646-4527.

5.4. Other Contacts for Spill Response/Assistance

Nunavut Water Board	(867) 360-6338
Fisheries and Oceans Canada Habitat Impact Assessment Biologist	(867) 979-8007
Government of Nunavut Department of Environment	(867) 975-5910
Kivalliq Inuit Association, Land Use Inspector	(867) 645-2800

6. Taking Action

6.1. Preventative Measures

The following actions illustrate a proactive approach to environmental stewardship. In addition, these actions minimize the potential for spills during fuel handling, transfer and storage:

1. Fuel transfer hoses with cam lock mechanisms are used. Use and placement of fuel absorbent material to protect from drips and spills.

2. Carefully monitor fuel content in the receiving vessel during transfer. Always have additional absorbent pads on hand while transferring fuel.

3. Clean up drips and minor spills immediately.

4. Regularly inspect drums, tanks and hoses for leaks or potential to leak and for proper storage.
5. Create fuel caches in natural depressions that are located a **minimum** of 31 metres from the normal high-water mark of any water body.

6. Train personnel, especially those who will be operators, in proper fuel handling and spill response procedures.

6.2. Mitigation Measures

1. First steps to take when a spill occurs:
    a) Ensure your own safety and that of others around you, beginning with those nearest to the scene.
    b) Control danger to human and aquatic life.
    c) Identify the source of the spill.
    d) Notify your supervisor, request assistance if needed.
    e) Assess whether or not the spill can be readily stopped.
    f) Contain or stop the spill at the source.

2. Secondary steps to take:
    a) Determine status of the spill event.
    b) If necessary, pump fuel from a damaged and/or leaking tank or drum into a refuge container.

c) Notify the 24-hour Spill Report Line, and receive further instructions from the appropriate contact agencies listed in *Section 5.3.* (Disposal of contaminated soil or ice/snow in sealed containers for removal from site, etc.).

d) Complete and Fax a copy of the Spill Report Form *(Appendix I).*

e) Notify permitting authorities.

f) If possible, resume cleanup and containment.

Emergency Contact Information

CONTACT	TELEPHONE NUMBER
INAC Water Resource Officer, Iqaluit	(867) 975-4295
Environment Canada	(867) 975-4644, 24hr page (867) 766-3737
Nunavut Department of Environment	(867) 975-7700
Manager Pollution Control/Air Quality	(867) 975-7748
Kivalliq Inuit Association – Land Use Inspector	(867) 645-2800
DFO	(867) 979-8007
Kivalliq Energy Corp., Jeff Ward, President	(604) 646-4527
Air Tindi	(867) 669-8212
Yellowknife Fire Department	(867) 873-2222
Baker Lake RCMP	(867) 793-0123
Stanton Regional Hospital – Yellowknife	(867) 920-4111
Discovery Mining Services	(867) 920-4600

The Project Manager will be available **24 hours a day** at camp at 604-759-4750 during operations.

6.3. Spill Response Actions

Take action only if safety permits – stop the source flow if safe to do so and eliminate all ignition sources. **Never smoke** when dealing with these types of spills.

Diesel Fuel, Hydraulic Oil and Lubricating Oil

On Land

Build a containment berm using soil material or snow and place a plastic tarp at the foot of the berm for easy capture of the spill after all vapours have dissipated.

Remove the spill by using absorbent pads or excavating the soil, gravel or snow. Remove spill splashed on vegetation using particulate absorbent material.

Contact regulatory agencies for approval before commencing removal of any soil, gravel, or vegetation.

On Muskeg

Do not deploy personnel and equipment on marsh or vegetation.

Remove pooled oil with sorbent pads and/or skimmer.

Flush with low pressure water to herd oil to collection point. Burn only in localized areas, e.g., trenches, piles or windrows. Do not burn if root systems can be damaged (low water table). Minimize damage caused by equipment and excavation.

On Water

Contain spill as close to release point as possible.

Use containment boom to capture spill for recovery after vapours have dissipated. Use absorbent pads to capture small spills.

Use skimmer for larger spills.

On Ice and Snow

Build a containment berm around spill using snow.

Remove spill using absorbent pads or particulate sorbent material.

The contaminated ice and snow must be scraped and shovelled into plastic buckets with lids, 205 litre drums, and/or polypropylene bags.

Storage and Transfer

All contaminated water, ice, snow, soil, and clean up supplies will be temporarily stored in closed, labelled containers. All containers will be stored in a well-ventilated area away from incompatible materials.

Disposal

Any contaminated material will be shipped from site to an appropriate and approved facility. The DOE monitors the movement of hazardous wastes from generators, carriers to receivers, through a tracking document (Waste Manifest). A Waste Manifest will accompany all movements. Kivalliq Energy Corp. has a waste generator number (NUG 100036) and is registered at DOE with Robert Eno at reno@gov.nu.ca or (867) 975-7748

Bioremediation

At the advice, discretion and approval of land use inspectors and the permitting agencies bioremediation or land farming may be implemented to treat certain contaminated soils temporarily contained in sealed drums on the property. Bioremediation is performed in the upper soil zone or in biotreatment cells. Contaminated soils, sediments, or sludges are incorporated into the existing soil surface and periodically turned over or tilled to aerate the mixture.

This technique has been successfully used for years in the management and disposal of oily sludge and other petroleum refinery wastes. In situ systems have been used to treat near surface soil contamination for hydrocarbons. The equipment employed in land farming is typical of that used in agricultural operations. These land farming activities cultivate and enhance microbial degradation of hazardous compounds.

Land treatment of petroleum products has been successfully utilized at numerous contaminated sites. It has been demonstrated that gasoline, jet fuel, and heating oil are extensively degraded when affected soils were treated with fertilizer, lime, and simulated tilling. Hydrocarbon compounds that are not readily degraded by land farming include creosote, pentachlorophenol (PCP), and bunker C oil.

Propane

On Land

Do not attempt to contain the propane release.

On Water

Do not attempt to contain the propane release.

On Ice and Snow

Do not attempt to contain the propane release.

General

It is not possible to contain vapours when released.

Water spray can be used to knock down vapours if there is no chance of ignition. Small fires can be extinguished with dry chemical of CO_2.

Personnel should withdraw immediately from area unless a small leak is stopped immediately after it has been detected.

If tanks are damaged, gas should be allowed to disperse and no recovery attempt should be made. Personnel should avoid touching release point on containers since frost forms very rapidly.

Keep away from tank ends.

Storage and Transfer
It is not possible to contain vapours when released.

7. Spill Equipment

Complete spill kits are kept on hand at all camps and drill shacks. Spill kits contain:

1 – 360 litre/79 gallon polyethylene over-pack drum
4 – Oil sorbent booms (5" X 10')
100 – Oil sorbent sheets (16.5" X 20" X 3/8")
1 – Drain cover (36" X 36" X 1/16")
1 – Caution tape (3" X 500')
1 – 1 lb. plugging compound
2 – Pairs Nitrile gloves
2 – Pairs Safety goggles
2 – Pairs Tyvek coveralls
1 – Instruction booklet
10 – Printed disposable bags (24" X 48")
1 – Shovel

In addition, at least one empty fuel drum will be located at each fuel cache in the event of damaged or leaking drums. Extra absorbent pads will be kept with the helicopter, drill and any area where re-fueling, transferring and/or handling is done.

8. Training

All employees and contractors will be familiar with the spill response resources at hand, this Contingency Plan, and will also be trained for initial spill response methods. Involvement of other employees may be required, from time to time. Annual refreshers will be conducted to review the procedures within this plan.

Appendix I
Nunavut Spill Report Form

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR ☐ UPDATE # _____ TO THE ORIGINAL SPILL REPORT	REPORT NUMBER ____-_____
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME		

C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR OCEAN
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS

F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION	
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION	
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR ENVIRONMENT
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS		

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

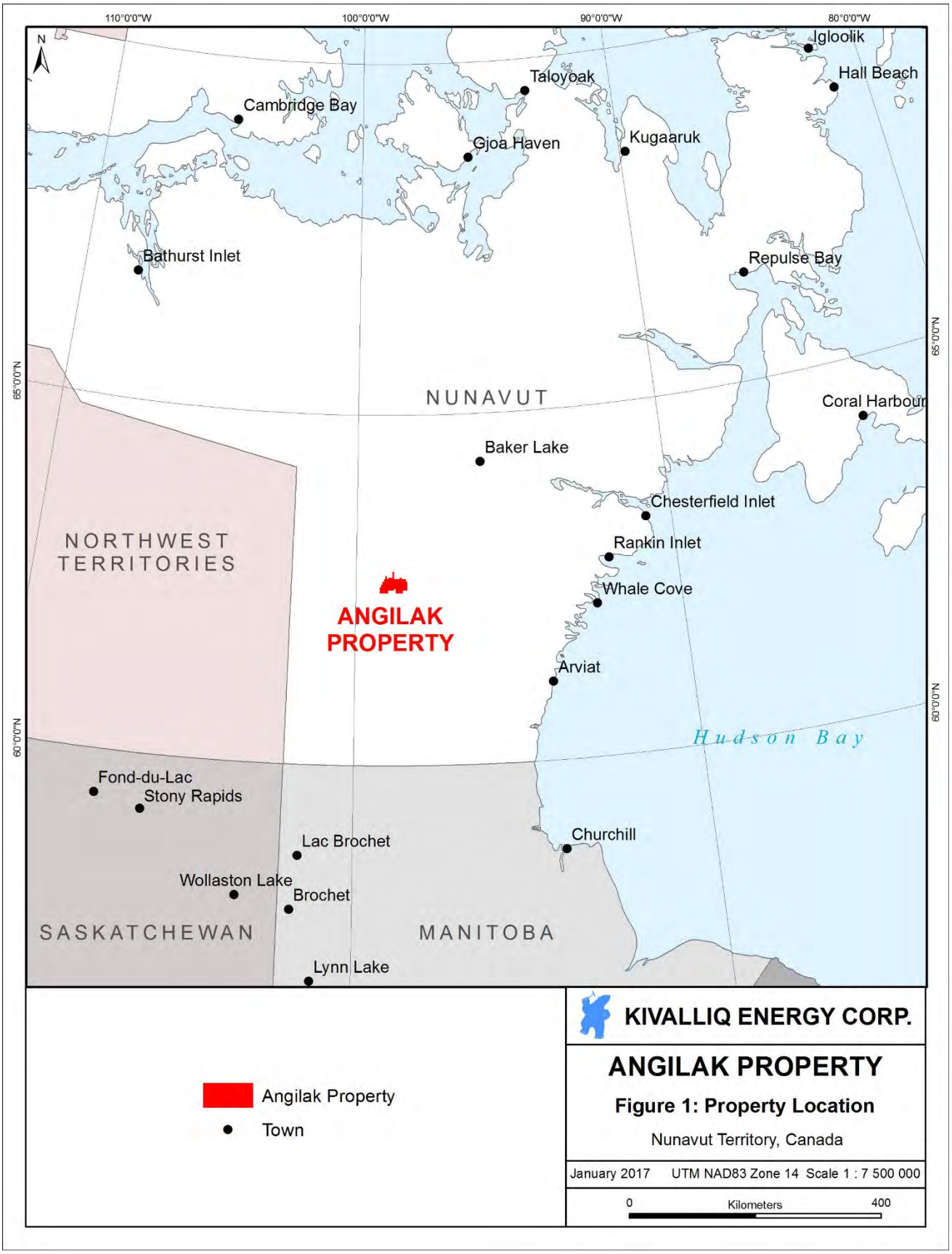
REPORT LINE USE ONLY

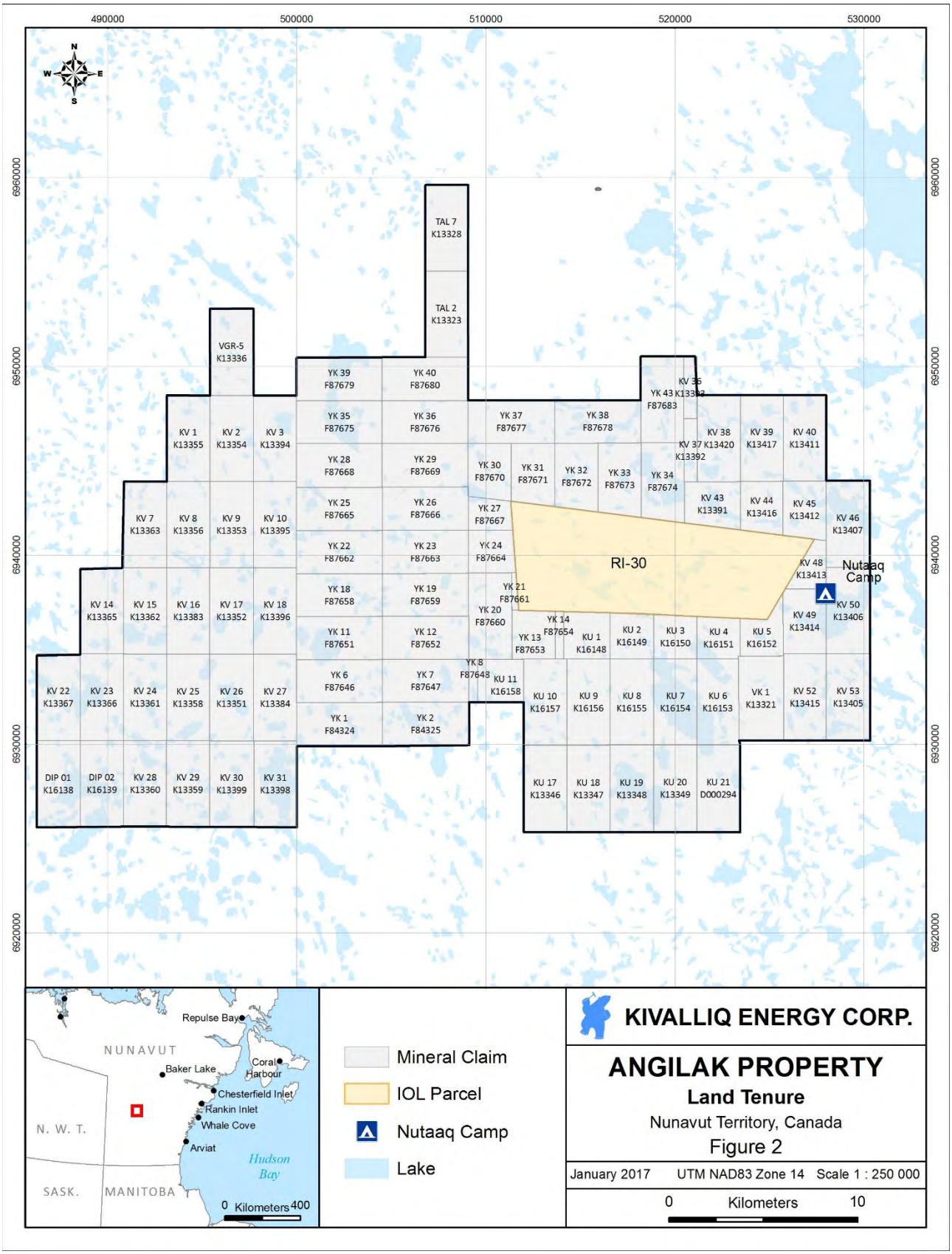
N	RECEIVED AT SPILL LINE BY	POSITION STATION OPERATOR	EMPLOYER	LOCATION CALLED YELLOWKNIFE, NT	REPORT LINE NUMBER (867) 920-8130

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ INAC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Appendix II
Location Map


110°0'0"W
100°0'0"W
90°0'0"W
80°0'0"W
N
Igloolik
Hall Beach
Taloyoak
Cambridge Bay
Gjoa Haven
Kugaaruk
Bathurst Inlet
Repulse Bay
68°0'0"N
66°0'0"N
NUNAVUT
Coral Harbour
Baker Lake
Chesterfield Inlet
NORTHWEST TERRITORIES
Rankin Inlet
Whale Cove
ANGILAK PROPERTY
Arviat
Hudson Bay
Fond-du-Lac
Stony Rapids
Churchill
Lac Brochet
Wollaston Lake
Brochet
SASKATCHEWAN
MANITOBA
Lynn Lake
Angilak Property
Town
KIVALLIQ ENERGY CORP.
ANGILAK PROPERTY
Figure 1: Property Location
Nunavut Territory, Canada
January 2017
UTM NAD83 Zone 14
Scale 1 : 7 500 000
0
Kilometers
400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6940000
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6920000
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W
E
S
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TAL 2 K13323
VGR-5 K13336
YK 39 F87679
YK 40 F87680
KV 1 K13355
KV 2 K13354
KV 3 K13394
YK 35 F87675
YK 36 F87676
YK 37 F87677
YK 38 F87678
YK 43 F87683
KV 36 K13393
KV 37 K13392
KV 38 K13420
KV 39 K13417
KV 40 K13411
YK 28 F87668
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YK 30 F87670
YK 31 F87671
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KV 8 K13356
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KV 10 K13395
YK 25 F87665
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YK 27 F87667
KV 43 K13391
KV 44 K13416
KV 45 K13412
KV 46 K13407
YK 22 F87662
YK 23 F87663
YK 24 F87664
RI-30
KV 48 K13413
Nutaaq Camp
KV 14 K13365
KV 15 K13362
KV 16 K13383
KV 17 K13352
KV 18 K13396
YK 18 F87658
YK 19 F87659
YK 21 F87661
YK 20 F87660
YK 14 F87654
YK 13 F87653
KU 1 K16148
KU 2 K16149
KU 3 K16150
KU 4 K16151
KU 5 K16152
KV 49 K13414
KV 50 K13406
YK 11 F87651
YK 12 F87652
YK 8 F87648
KU 11 K16158
KV 22 K13367
KV 23 K13366
KV 24 K13361
KV 25 K13358
KV 26 K13351
KV 27 K13384
YK 6 F87646
YK 7 F87647
KU 10 K16157
KU 9 K16156
KU 8 K16155
KU 7 K16154
KU 6 K16153
VK 1 K13321
KV 52 K13415
KV 53 K13405
YK 1 F84324
YK 2 F84325
DIP 01 K16138
DIP 02 K16139
KV 28 K13360
KV 29 K13359
KV 30 K13399
KV 31 K13398
KU 17 K13346
KU 18 K13347
KU 19 K13348
KU 20 K13349
KU 21 D000294
Repulse Bay
NUNAVUT
Baker Lake
Coral Harbour
Chesterfield Inlet
Rankin Inlet
Whale Cove
Arviat
N. W. T.
Hudson Bay
SASK.
MANITOBA
0 Kilometers 400
Mineral Claim
IOL Parcel
Nutaaq Camp
Lake
KIVALLIQ ENERGY CORP.
ANGILAK PROPERTY
Land Tenure
Nunavut Territory, Canada
Figure 2
January 2017
UTM NAD83 Zone 14
Scale 1 : 250 000
0
Kilometers
10

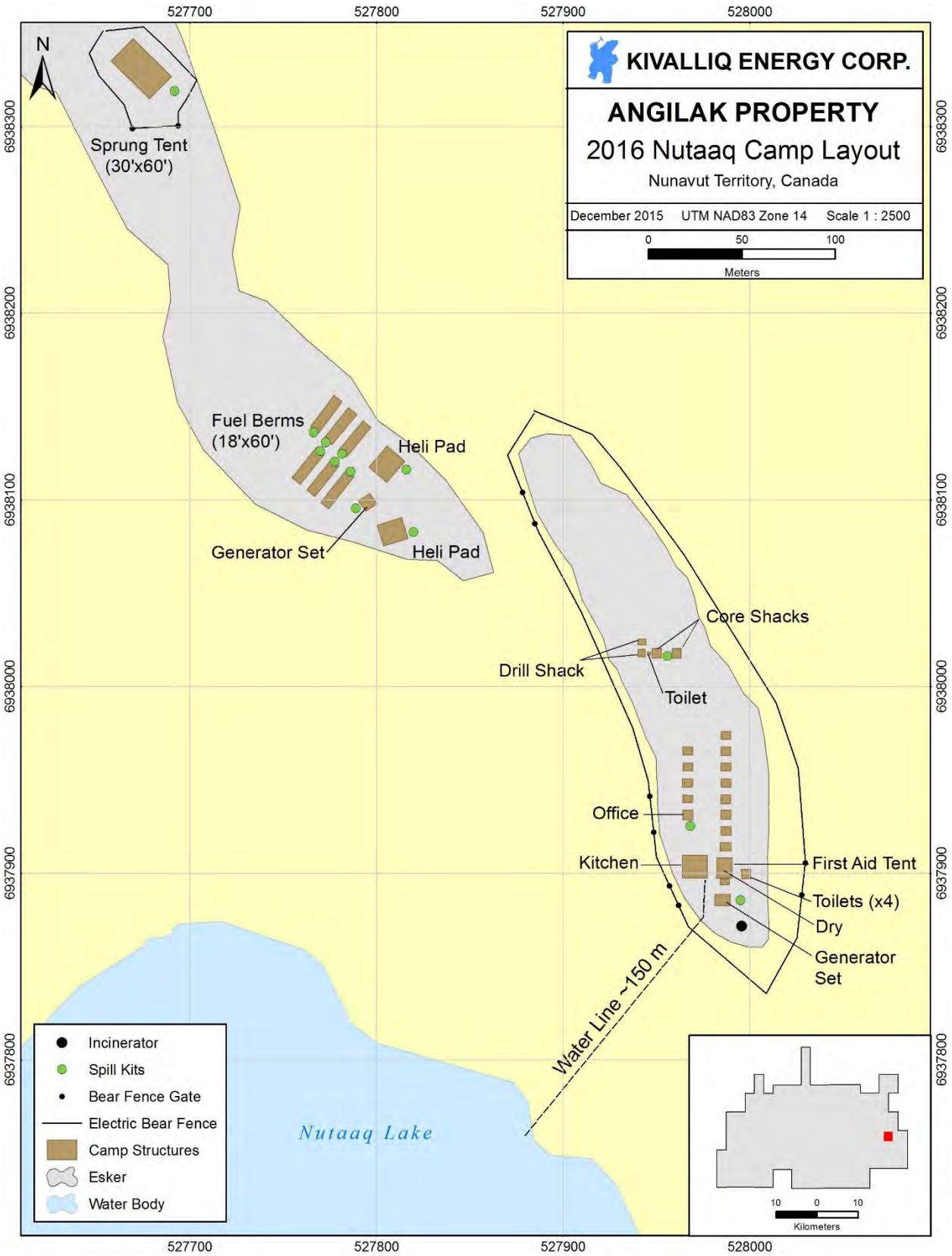

Figure 3: Nutaaq Camp Layout

Appendix III
Instructions for Completing the NU Spill Report Form

Instructions for Completing the NT-NU Spill Report Form

This form can be filled out electronically and e-mailed as an attachment to spills@gov.nt.ca. Until further notice, please verify receipt of e-mail transmissions with a follow-up telephone call to the spill line. Forms can also be printed and faxed to the spill line at 867-873-6924. 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 e- mail. 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 m^2)
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**.

Appendix IV
MSDS Sheets

Esso Imperial Oil

MATERIAL SAFETY DATA SHEET

Date Prepared: April 06, 2002
Supersedes: January 08, 1999
MSDS Number: 08259

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1. PRODUCT INFORMATION

Product Identifier: UNIVIS N 32

Application and Use:
Hydraulic fluid

Product Description:

Mixture of paraffinic and naphthenic hydrocarbons (saturated and unsaturated), and additives.

REGULATORY CLASSIFICATION

WHMIS:
Not a controlled product

CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT
All components of this product are either on the Domestic Substances List (DSL) or are exempt.

TDG INFORMATION (RAIL/ROAD): Not Regulated in Canada.

Please be aware that other regulations may apply.

TELEPHONE NUMBERS

Emergency 24 hr. (519) 339-2145
Technical Info. (800) 268-3183

MANUFACTURER/SUPPLIER:

IMPERIAL OIL
Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(416) 968-4441

---

2. REGULATED COMPONENTS

The following components are defined in accordance with sub-paragraph 13(a) (i) to (iv) or paragraph 14(a) of the Hazardous Products Act:

NAME	%	CAS #
Not applicable		

---

3. TYPICAL PHYSICAL & CHEMICAL PROPERTIES

Physical State: Liquid Specific gravity: not available Viscosity: 32.00 cSt at 40 deg C Vapour Density: not available
Boiling Point: 229 to 512 deg C
Evaporation rate: <0.1 (1= n-butylacetate)
Solubility in water: negligible
Freezing/Pour Point: -42 deg C ASTM D97
Odour Threshold: not available Vapour Pressure: <1 kPa at 38 deg C Density: 0.87 g/cc at 15 deg C
Appearance/odour: Yellow oil, petroleum odour

---

4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION:

Negligible hazard at normal temperatures (up to 38 deg C).
Elevated temperatures or mechanical action may form vapours, mists or fumes which may be irritating to the eyes, nose, throat and lungs. Avoid breathing vapours or mists.

EYE CONTACT:

Slightly irritating, but will not injure eye tissue.

SKIN CONTACT:

Low toxicity.
Frequent or prolonged contact may irritate the skin.

INGESTION:

Low toxicity.

ACUTE TOXICITY DATA:

Based on animal testing data from similar materials and products, the acute toxicity of this product is expected to be:

Oral	:	LD50 > 5000 mg/kg (Rat)
Dermal	:	LD50 > 3160 mg/kg (Rabbit)
Inhalation	:	LC50 > 5000 mg/m3 (Rat)

OCCUPATIONAL EXPOSURE LIMIT:

ACGIH recommends:
For oil mists, 5 mg/m3.

Local regulated limits may vary.

---

5. FIRST AID MEASURES

INHALATION:

Vapour pressure of this material is low and as such inhalation under normal conditions is usually not a problem. If overexposed to oil mist, remove from further exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.

EYE CONTACT:

Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.

SKIN CONTACT:

Flush with large amounts of water. Use soap if available.
Remove severely contaminated clothing (including shoes) and launder before reuse.
If irritation persists, seek medical attention.

INGESTION:

If swallowed, DO NOT induce vomiting. Keep at rest. Get prompt medical attention.

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6. PREVENTIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

The selection of personal protective equipment varies, depending upon conditions of use.
In open systems where contact is likely, wear safety goggles, chemical-resistant overalls, and chemically impervious gloves.
Where only incidental contact is likely, wear safety glasses with side shields. No other special precautions are necessary provided skin/eye contact is avoided.

Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.

HANDLING, STORAGE AND SHIPPING:

Keep containers closed. Handle and open containers with care.
Store in a cool, well ventilated place away from incompatible materials. In keeping with good personal hygiene practices, wash hands thoroughly after handling the material.
Empty containers may contain product residue. Do not pressurize cut, heat, or weld empty containers. Do not reuse empty containers without commercial cleaning or reconditioning.

LAND SPILL:

Eliminate source of ignition. Keep public away. Prevent additional discharge of material, if possible to do so without hazard.
Prevent spills from entering sewers, watercourses or low areas. Contain spilled liquid with sand or earth.
Recover by pumping or by using a suitable absorbant.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately. Take all additional action necessary to prevent and remedy the adverse effects of the spill.

WATER SPILL:

Remove from surface by skimming or with suitable absorbents. If allowed by local authorities and environmental agencies, sinking and/or suitable dispersants may be used in unconfined waters.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately. Take all additional action necessary to prevent and remedy the adverse effects of the spill.

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7. FIRE AND EXPLOSION HAZARD

Flashpoint and method: 165 deg C COC ASTM D92

Autoignition: NA Flammable Limits: LEL: NA UEL: NA

GENERAL HAZARDS:

Low Hazard; liquids may burn upon heating to temperatures at or above the flash point.
Toxic gases will form upon combustion.

FIRE FIGHTING:

Use water spray to cool fire exposed surfaces and to protect personnel.
Shut off fuel to fire.

Use foam, dry chemical or water spray to extinguish fire.
Respiratory and eye protection required for fire fighting personnel. Avoid spraying water directly into storage containers due to danger of boilover.
A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.

HAZARDOUS COMBUSTION PRODUCTS:

Smoke, carbon monoxide, carbon dioxide and traces of oxides of sulphur

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8. REACTIVITY DATA

STABILITY:

This product is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Strong oxidizing agents

HAZARDOUS DECOMPOSITION:

none

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9. NOTES

All components of this product are listed on the U.S. TSCA inventory.

THREE YEAR WHMIS REVIEW.

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10. PREPARATION

Date Prepared: April 06, 2002
Prepared by: Lubricants & Specialties
IMPERIAL OIL Products Division
111 St Clair Avenue West
Toronto, Ontario

M5W 1K3
(800) 268-3183

Esso Imperial Oil

MATERIAL SAFETY DATA SHEET

Date Prepared: April 06, 2002
Supersedes: January 08, 1999
MSDS Number: 08258

1. PRODUCT INFORMATION

Product Identifier: UNIVIS N 22

Application and Use:
Hydraulic fluid

Product Description:

Mixture of paraffinic and naphthenic hydrocarbons (saturated and unsaturated), and additives.

REGULATORY CLASSIFICATION

WHMIS:
Not a controlled product

CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT
All components of this product are either on the Domestic Substances List (DSL) or are exempt.

TDG INFORMATION (RAIL/ROAD): Not Regulated in Canada.

Please be aware that other regulations may apply.

TELEPHONE NUMBERS

Emergency 24 hr. (519) 339-2145
Technical Info. (800) 268-3183

MANUFACTURER/SUPPLIER:

IMPERIAL OIL
Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(416) 968-4441

2. REGULATED COMPONENTS

The following components are defined in accordance with sub-paragraph 13(a) (i) to (iv) or paragraph 14(a) of the Hazardous Products Act:

NAME	%	CAS #
Not applicable		

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3. TYPICAL PHYSICAL & CHEMICAL PROPERTIES

Physical State: Liquid Specific gravity: not available Viscosity: 22.00 cSt at 40 deg C Vapour Density: not available
Boiling Point: 229 to 512 deg C
Evaporation rate: <0.1 (1= n-butylacetate)
Solubility in water: negligible
Freezing/Pour Point: -48 deg C ASTM D97
Odour Threshold: not available Vapour Pressure: <1 kPa at 38 deg C Density: 0.87 g/cc at 15 deg C
Appearance/odour: Yellow oil, petroleum odour

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4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION:

Negligible hazard at normal temperatures (up to 38 deg C).
Elevated temperatures or mechanical action may form vapours, mists or fumes which may be irritating to the eyes, nose, throat and lungs.
Avoid breathing vapours or mists.

EYE CONTACT:

Slightly irritating, but will not injure eye tissue.

SKIN CONTACT:

Low toxicity.
Frequent or prolonged contact may irritate the skin.

INGESTION:

Low toxicity.

ACUTE TOXICITY DATA:

Based on animal testing data from similar materials and products, the acute toxicity of this product is expected to be:

Oral	:	LD50 > 5000 mg/kg (Rat)
Dermal	:	LD50 > 3160 mg/kg (Rabbit)
Inhalation	:	LC50 > 5000 mg/m3 (Rat)

OCCUPATIONAL EXPOSURE LIMIT:

ACGIH recommends:
For oil mists, 5 mg/m3.

Local regulated limits may vary.

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5. FIRST AID MEASURES

INHALATION:

Vapour pressure of this material is low and as such inhalation under normal conditions is usually not a problem. If overexposed to oil mist, remove from further exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.

EYE CONTACT:

Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.

SKIN CONTACT:

Flush with large amounts of water. Use soap if available.
Remove severely contaminated clothing (including shoes) and launder before reuse.
If irritation persists, seek medical attention.

INGESTION:

If swallowed, DO NOT induce vomiting. Keep at rest. Get prompt medical attention.

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6. PREVENTIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

The selection of personal protective equipment varies, depending upon conditions of use.
In open systems where contact is likely, wear safety goggles, chemical-resistant overalls, and chemically impervious gloves.
Where only incidental contact is likely, wear safety glasses with side shields. No other special precautions are necessary provided skin/eye contact is avoided.

Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.

HANDLING, STORAGE AND SHIPPING:

Keep containers closed. Handle and open containers with care.
Store in a cool, well ventilated place away from incompatible materials. Do not handle or store near an open flame, sources of heat, or sources of ignition.
In keeping with good personal hygiene practices, wash hands thoroughly after handling the material.
Empty containers may contain product residue. Do not pressurize cut, heat, or weld empty containers. Do not reuse empty containers without commercial cleaning or reconditioning.

LAND SPILL:

Eliminate source of ignition. Keep public away. Prevent additional discharge of material, if possible to do so without hazard.
Prevent spills from entering sewers, watercourses or low areas. Contain spilled liquid with sand or earth.
Recover by pumping or by using a suitable absorbant.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

WATER SPILL:

Remove from surface by skimming or with suitable absorbents. If allowed by local authorities and environmental agencies, sinking and/or suitable dispersants may be used in unconfined waters.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

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7. FIRE AND EXPLOSION HAZARD

Flashpoint and method: 150 deg C COC ASTM D92

Autoignition: NA Flammable Limits: LEL: NA UEL: NA

GENERAL HAZARDS:

Low Hazard; liquids may burn upon heating to temperatures at or above the flash point.
Toxic gases will form upon combustion.

FIRE FIGHTING:

Use water spray to cool fire exposed surfaces and to protect personnel.
Shut off fuel to fire.
Use foam, dry chemical or water spray to extinguish fire.
Respiratory and eye protection required for fire fighting personnel. Avoid spraying water directly into storage containers due to danger of boilover.
A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.

HAZARDOUS COMBUSTION PRODUCTS:

Smoke, carbon monoxide, carbon dioxide under thermal decomposition.

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8. REACTIVITY DATA

STABILITY:

This product is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Strong oxidizing agents

HAZARDOUS DECOMPOSITION:

none

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9. NOTES

All components of this product are listed on the U.S. TSCA inventory.

THREE YEAR WHMIS REVIEW.

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10. PREPARATION

Date Prepared: April 06, 2002
Prepared by: Lubricants & Specialties
IMPERIAL OIL Products Division

111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(800) 268-3183

Imperial Oil

MATERIAL SAFETY DATA SHEET

Date Prepared: November 14, 2003
Supersedes: September 17, 1998
MSDS Number: 08366

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1. PRODUCT INFORMATION

Product Identifier: UNIREX LOTEMP MOLY GREASE

Application and Use:
Lubricating grease

Product Description:

A grease, a mixture of lubricating oil, soap and additives.

REGULATORY CLASSIFICATION

WHMIS:
Not a controlled product

CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT
All components of this product are either on the Domestic Substances List (DSL), exempt, or have been notified under CEPA.

TDG INFORMATION (RAIL/ROAD): Not Regulated in Canada.

Please be aware that other regulations may apply.

TELEPHONE NUMBERS

Emergency 24 hr. (519) 339-2145
Technical Info. (800) 268-3183

MANUFACTURER/SUPPLIER:

IMPERIAL OIL
Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(416) 968-4441

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2. REGULATED COMPONENTS

The following components are defined in accordance with sub-paragraph 13(a) (i) to (iv) or paragraph 14(a) of the Hazardous Products Act:

NAME	%	CAS #
Not applicable		

3. TYPICAL PHYSICAL & CHEMICAL PROPERTIES

Physical State: Liquid Specific gravity: not available Viscosity: <20.00 cSt at 40 deg C Vapour Density: not available
Boiling Point: not available
Evaporation rate: <1 (1= n-butylacetate)
Solubility in water: negligible
Freezing/Pour Point: 245 deg C ASTM D97
Odour Threshold: not available
Vapour Pressure: 0.002 kPa at 20 deg C Density: 0.92 g/cc at 15 deg C
Appearance/odour: Black paste, petroleum odour.

4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION:

Negligible hazard at normal temperatures (up to 38 deg C).
Elevated temperatures or mechanical action may form vapours, mists or fumes which may be irritating to the eyes, nose, throat and lungs. Avoid breathing vapours or mists.

EYE CONTACT:

Slightly irritating, but will not injure eye tissue.

SKIN CONTACT:

Low toxicity.
Frequent or prolonged contact may irritate the skin.
High pressure greasing equipment is capable of injecting grease under the skin which may have severe health consequences.

INGESTION:

Low toxicity.
Small amounts of this liquid drawn into the lungs from swallowing or vomiting may cause severe health effects (e.g. bronchopneumonia or pulmonary edema).

ACUTE TOXICITY DATA:

Based on animal testing data from similar materials and products, the acute toxicity of this product is expected to be:

Oral	:	LD50 > 5000 mg/kg (Rat)
Dermal	:	LD50 > 3160 mg/kg (Rabbit)
Inhalation	:	LC50 > 5000 mg/m3 (Rat)

OCCUPATIONAL EXPOSURE LIMIT:

ACGIH recommends:
For insoluble Molybdenum compounds, 10 mg/m3. For oil mists, 5 mg/m3.

Local regulated limits may vary.

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5. FIRST AID MEASURES

INHALATION:

In case of adverse exposure to vapours, mists and/or fumes formed at elevated temperature, or by mechanical action, immediately remove the affected victim from exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.

EYE CONTACT:

Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.

SKIN CONTACT:

Flush with large amounts of water. Use soap if available.
Remove severely contaminated clothing (including shoes) and launder before reuse.
If irritation persists, seek medical attention.
Consult a physician immediately if the material is injected under the skin from the misuse of high pressure greasing equipment.

INGESTION:

DO NOT induce vomiting since it is important that no amount of the material should enter the lungs (aspiration). Keep at rest. Get prompt medical attention.

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6. PREVENTIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

The selection of personal protective equipment varies, depending upon

conditions of use.
In open systems where contact is likely, wear safety goggles, chemical-resistant overalls, and chemically impervious gloves.
Where only incidental contact is likely, wear safety glasses with side shields. No other special precautions are necessary provided skin/eye contact is avoided.
Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.

HANDLING, STORAGE AND SHIPPING:

Keep containers closed. Handle and open containers with care.
Store in a cool, well ventilated place away from incompatible materials. In keeping with good personal hygiene practices, wash hands thoroughly after handling the material.
Store and load at normal (up to 38 deg C) temperature and at atmospheric pressure.
Empty containers may contain product residue. Do not pressurize cut, heat, or weld empty containers. Do not reuse empty containers without commercial cleaning or reconditioning.

LAND SPILL:

Eliminate source of ignition. Keep public away. Prevent additional discharge of material, if possible to do so without hazard.
Prevent spills from entering sewers, watercourses or low areas. Contain spilled liquid with sand or earth.
Allow material to solidify and scrape up. Place material in suitable containers for recycle or disposal.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

WATER SPILL:

Remove from surface by skimming or with suitable absorbents. If allowed by local authorities and environmental agencies, sinking and/or suitable dispersants may be used in unconfined waters.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

7. FIRE AND EXPLOSION HAZARD

Flashpoint and method: >110 deg C COC ASTM D92 est.baseoil

Autoignition: NA Flammable Limits: LEL: NA UEL: NA

GENERAL HAZARDS:

Low Hazard; liquids may burn upon heating to temperatures at or above the flash point.
Decomposes; flammable/toxic gases will form at elevated temperatures (thermal decomposition).

Toxic gases will form upon combustion.

FIRE FIGHTING:

Use water spray to cool fire exposed surfaces and to protect personnel.
Shut off fuel to fire.
Use foam, dry chemical or water spray to extinguish fire.
Respiratory and eye protection required for fire fighting personnel.
A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.

HAZARDOUS COMBUSTION PRODUCTS:

Smoke, carbon monoxide, carbon dioxide and traces of oxides of sulphur

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8. REACTIVITY DATA

STABILITY:

This product is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Strong oxidizing agents

HAZARDOUS DECOMPOSITION:

Fumes, smoke, carbon monoxide and sulphur oxides in case of incomplete combustion

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9. NOTES

All components of this product are listed on the U.S. TSCA inventory.

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REVISION SUMMARY:

Since 17 September 1998, this MSDS has been revised in Section(s):
1, 7

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10. PREPARATION

Date Prepared: November 14, 2003
Prepared by: Lubricants & Specialties
IMPERIAL OIL Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(800) 268-3183

CAUTION: " The information contained herein relates only to this product or material and may not be valid when used in combination with any other product or material or in any process. If the product is not to be used for a purpose or under conditions which are normal or reasonably foreseeable, this information cannot be relied upon as complete or applicable. For greater certainty, uses other than those described in Section 1 must be reviewed with the supplier. The information contained herein is based on the information available at the indicated date of preparation. This MSDS is for the use of Imperial Oil customers and their employees and agents only. Any further distribution of this MSDS by Imperial Oil customers is prohibited without the written consent of Imperial Oil."

MATERIAL SAFETY DATA SHEET

SECTION 1 – PRODUCT INFORMATION

Product Name: Propane
Trade Name: LPG (Liquified Petroleum Gas), LP-Gas
Chemical Formula: C_3H_8

WHMIS CLASSIFICATION
Class A - Compressed Gas

Class B, Division 1 - Flammable Gas

Supplier: Superior Propane Inc.
1111 - 49th Avenue N.E.
Calgary, AB T2E 8V2
Business: (403) 730-7500
Local Market

Emergency Number: _____
(Non Medical)

Application and Use: Propane is commonly used as a fuel for heating, cooking, automobiles, forklift trucks, crop drying and welding and cutting operations. Propane is used in industry as a refrigerant, solvent and as a chemical feedstock.

SECTION 2 – HAZARDOUS INGREDIENTS

COMPONENTS	CAS NO.	% Volume (v/v)	LD50
Propane Propylene	74 -98-6	90% - 99%	Not Applicable
Ethane	115 -07-1	0% - 5%	Not Applicable
Butane and heavier hydro carbons	74 -84-0	0% - 5%	Not Applicable
Occupational Exposure Limit:	106 -97-8	0% - 2.5%	Not Applicable

Based upon animal test data, the acute toxicity of this product is expected to be inhalation: 4 hour LC50 = 280,000 ppm (Rat). ***Note:*** Composition is typical for HD-5 Propane per The Canadian General Standard Board CGSB 3.14 National Standard of Canada. Exact composition will vary from shipment to shipment.

SECTION 3 – CHEMICAL AND PHYSICAL DATA

Form: Liquid and vapour while stored under pressure.
Boiling Point: -42°C @ 1 atm.
Freezing Point: -188°C
Evaporation Rate: Rapid (Gas at normal ambient conditions).
Vapour Pressure: 1435 kPa (maximum) @ 37.8°C
Vapour Density: 1.52 (Air = 1)
Coefficient of Water/Oil Distribution: Not available.
pH: Not available.

Solubility in water: Slight, 6.1% by volume @ 17.8°C
Specific Gravity: 0.51 (water = 1)
Appearance/Odour: Colourless liquid and vapour while stored under pressure. Colourless and odourless gas in natural state at any concentration. Commercial propane has an odourant added, ethyl mercaptan, which has an odour similar to boiling cabbage.*
Odour Threshold: 4800 ppm

* With proper handling, transportation and storage, adding a chemical odourant such as eth-merc has proven to be a very effective warning device, but all odourants have certain limitations. The effectiveness of the odourant may be diminished by a person's sense of smell, by competing odours and by oxidation which may cause a potentially dangerous situation.

SECTION 4 – FIRE OR EXPLOSION HAZARD

Flash Point: -103.4°C
Method: Closed cup.
Flammable Limits: Lower 2.4%, Upper 9.5%
Auto Ignition Temperature: 432°C
Products Evolved Due To Heat Or Combustion: Carbon monoxide can be produced when primary air and secondary air are deficient while combustion is taking place.
Fire and Explosive Hazards: Explosive air-vapour mixtures may form if allowed to leak to atmosphere.
Sensitivity To Impact: No.
Sensitivity To Static Discharge: Yes.

SECTION 5 – REACTIVITY DATA

Stability: Stable.
Conditions To Avoid: Keep separate from oxidizing agents. Gas explodes spontaneously when mixed with chloride dioxide.
Incompatibility: Remove sources of ignition and observe distance requirements for storage tanks from combustible material, drains and openings to building.

Fire Extinguishing Precautions: Use water spray to cool exposed cylinders or tanks. Do not extinguish fire unless the source of the escaping gas that is fueling the fire can be turned off. Fire can be extinguished with carbon dioxide and/or dry chemical (BC). Container metal shells require cooling with water to prevent flame impingement and the weakening of metal. If sufficient water is not available to protect the container shell from weakening, the area will be required to be evacuated. If gas has not ignited, liquid or vapour may be dispersed by water spray or flooding.
Special Fire Fighting Equipment: Protective clothing, hose monitors, fog nozzles, self-contained breathing apparatus.

Hazardous Decomposition Products: Deficient primary and secondary air can produce carbon monoxide.
Hazardous Polymerization: Will not occur.

SECTION 6 – TOXICOLOGICAL PROPERTIES OF MATERIAL

ROUTES OF ENTRY:

Inhalation: Simple asphyxiant. No effect at concentrations of 10,000 ppm (peak exposures). Higher concentrations may cause central nervous system disorder and/or damage. Lack of oxygen may cause dizziness, loss of coordination, weakness, fatigue, euphoria, mental confusion, blurred vision, convulsions, breathing failure, coma and death. Breathing high vapour concentrations (saturated vapours) for a few minutes may be fatal. Saturated vapours may be encountered in confined spaces and/or under conditions of poor ventilation. Avoid breathing vapours or mist.
Skin and Eye Contact: Exposure to vapourizing liquid may cause frostbite (cold burns) and permanent eye damage.

Ingestion: Not considered to be a hazard.
Acute Exposure: The acute toxicity of this product is expected to be inhalation: 4 hour LC50=280,000ppm (Rat).
Chronic Exposure: There are no reported effects from long term low level exposure.
Sensitization to Product: Skin–unknown, Respiratory–unknown.
Occupational Exposure Limits: American Conference of Governmental Industrial Hygienists (ACGIH) lists as a simple asphyxiant. ACGIH TLV: 1000 ppm.
Carcinogenicity, Reproductive Toxicity, Teratogenicity, Mutagenicity: No effects reported.

SECTION 7 – PREVENTIVE MEASURES

Eyes: Safety glasses, are recommended when transfer- ring product.
Skin: Insulated gloves required if contact with liquid or liquid cooled equipment is expected. Wear gloves and long sleeves when transferring product.

Inhalation: Where concentration in air would reduce the oxy- gen level below 18% air or exceed occupational exposure limits in section 6, self-contained breathing apparatus is required.
Ventilation: Explosion proof ventilation equipment required in confined spaces.

SECTION 8 – EMERGENCY AND FIRST AID PROCEDURES

FIRST AID:

Eyes: Should eye contact with liquid occur, flush eyes with lukewarm water for 15 minutes. Obtain immediate medical care.
Skin: In case of “Cold Burn” from contact with liquid, immedi- ately place affected area in lukewarm water and keep at this temperature until circulation returns. If fingers or hands are frostbitten, have the victim hold his hand next to his body such as under the armpit. Obtain immediate medical care. **Ingestion:** None considered necessary.
Inhalation: Remove person to fresh air. If breathing is diffi- cult or has stopped, administer artificial respiration. Obtain immediate medical care.

SPILL OR LEAK:

Eliminate leak of possible.
Eliminate source of ignition.
Ensure cylinder is upright.
Disperse vapours with hose streams using fog nozzles. Monitor low areas as propane is heavier than air and can settle into low areas. Remain upwind of leak. Keep people away. Prevent vapour and/or liquid from entering into sewers, basements or confined areas.

SECTION 9 – TRANSPORTATION, HANDLING AND STORAGE

– Transport and store cylinders and tanks secured in an upright position in a ventilated space away from ignition sources (so the pressure relief valve is in contact with the vapour space of the cylinder or tank).
– Cylinders that are not in use must have the valves in the closed position and be equipped with a protective cap or guard.
– Do not store with oxidizing agents, oxygen, or chlorine cylinders.

– Empty cylinders and tanks may contain product residue. Do not pressurize, cut, heat or weld empty containers.
– Transport, handle and store according to applicable federal and provincial codes and regulations.

Transportation of Dangerous Goods (TDG)
– TDG Classification: Flammable Gas 2.1
– TDG Shipping Name: Liquified Petroleum Gas (Propane)
– TDG Special Provisions: 56, 90, 102
– PIN Number: UN1075

SECTION 10 – PREPARATION

Superior Propane Inc., Regulations & Safety Department. (403) 730-7500 Date prepared: November 2001.
Supersedes: September 1999.

MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Portland Cement, GU (General use hydraulic cement, formerly Normal Portland Cement), HE (High early-strength hydraulic cement) and HS (High sulphate-resistant hydraulic cement).

CAS #: 65997-15-1

Product Use: Preparation of concrete and mortar.

MSDS Information: This MSDS was produced in November, 2002, and replaces any previous versions. This MSDS covers all types of portland cement. Individual composition of constituents will vary within the range shown in Section 2.

Product Code: Not Applicable.

Chemical Family: Calcium compounds. Calcium silicate compounds and other calcium compounds containing iron and aluminum make up the majority of this product.

Chemical Name And Synonyms: Portland cement. Portland cement is also known as hydraulic cement and/or normal portland cement.

Formula: This product consists of finely ground portland cement clinker, gypsum and limestone (for some products).

Supplier/Manufacturer: Lehigh Inland Cement Limited
P.O. Box 3961, Station D,
12640 - 156 Street
Edmonton, Alberta, Canada, T5L 4P5 Telephone (780) 420 2500

Emergency Contact Information: Lehigh Inland Cement Limited
P.O. Box 3961, Station D,
12640 - 156 Street
Edmonton, Alberta, Canada, T5L 4P5 Telephone (780) 420 2541

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

Portland Cement Exposure Limits:

ACGIH TLV-TWA	10 mg total dust/m^3
OSHA PEL-TWA	15 mg total dust/m^3
OSHA PEL-TWA	5 mg respirable dust/m^3

Portland Cement Ingredients & Their Exposure Limits:

Ingredient	CAS#	% By Weight	ACGIH TLV-TWA	OSHA PEL-TWA
Calcium Silicates	various	60-80%	10 mg total dust/m^3	15 mg total dust/m^3 5 mg respirable dust/m^3
Gypsum	7778-18-9	3-7%	10 mg total dust/m^3	15 mg total dust/m^3 5 mg respirable dust/m^3
Crystalline Silica	14808-60-7	less than 0.1%	0.10 mg respirable quartz/m^3	(10 mg respirable dust/m^3)/(percent silica+2)
NIOSH REL (8-hour TWA) = 0.05 mg respirable quartz dust/m^3				
Calcium Carbonate	1317-65-3	0-5%	10 mg total dust/m^3	15 mg total dust/m^3 5 mg respirable dust/m^3
Magnesium Oxide	1309-48-4	1-4%	10 mg total dust/m^3	10 mg total dust/m^3
Calcium Oxide	1305-78-8	0.5-1.5%	2 mg total dust/m^3	5 mg total dust/m^3

Trace Elements:

Portland cement is made from materials mined from the earth and is processed using energy provided by fuels. Trace amounts of chemicals, some of which may be potentially harmful, might be detected during chemical analysis. For example, in addition to the ingredients listed above, portland cement may contain potassium and sodium sulfate compounds, chromium compounds (including up to 0.003% hexavalent chromium) and nickel compounds.

MATERIAL SAFETY DATA SHEET

SECTION 3 - HAZARDS IDENTIFICATION

Emergency Overview:

Portland cement is a light gray powder that poses little immediate hazard. A single short term exposure to the dry powder is not likely to cause serious harm. However, exposure of sufficient duration to wet portland cement can cause serious, potentially irreversible tissue (skin or eye) destruction in the form of chemical (caustic) burns, including third degree burns. The same type of tissue destruction can occur if wet or moist areas of the body are exposed for sufficient duration to dry portland cement.

Potential Health Effects:

- **Relevant routes of exposure are:**

Eye contact, skin contact, inhalation, and ingestion.

Effects Resulting From EYE CONTACT:

Exposure to airborne dust may cause immediate or delayed irritation or inflammation.

Eye contact by larger amounts of dry powder or splashes of wet portland cement may cause effects ranging from moderate eye irritation to chemical burns and blindness. Such exposures require immediate first aid (see Section 4) and medical attention to prevent significant damage to the eye.

Effects Resulting From SKIN CONTACT:

Discomfort or pain cannot be relied upon to alert a person to a hazardous skin exposure. Consequently, the only effective means of avoiding skin injury or illness involves minimizing skin contact, particularly contact with wet cement. Exposed persons may not feel discomfort until hours after the exposure has ended and significant injury has occurred.

Exposure to dry portland cement may cause drying of the skin with consequent mild irritation or more significant effects attributable to aggravation of other conditions. Dry portland cement contacting wet skin or exposure to moist or wet portland cement may cause more severe skin effects including thickening, cracking, or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of (caustic) chemical burns.

Some individuals may exhibit an allergic response upon exposure to portland cement, possibly due to trace amounts of chromium. The response may appear in a variety of forms ranging from a mild rash to severe skin ulcers. Persons already sensitized may react to their first contact with the product. Other persons may first experience this effect after years of contact with portland cement products.

Effects Resulting From INHALATION:

Portland cement may contain trace amounts of crystalline silica. Prolonged exposure to respirable free crystalline silica may aggravate other lung conditions. It also may cause delayed lung injury including silicosis, a disabling and potentially fatal lung disease, and/or other diseases. (Also see “Carcinogenic Potential” below.)

Exposure to portland cement may cause irritation to the moist mucous membranes of the nose, throat, and upper respiratory system. It may also leave unpleasant deposits in the nose.

Effects Resulting From INGESTION:

Although small quantities of dust are not known to be harmful, ill effects are possible if larger quantities are consumed. Portland cement should not be eaten.

- **Carcinogenic Potential:**

Portland cement is not listed as a carcinogen by NTP, OSHA, or IARC. It may, however, contain trace amounts of substances listed as carcinogens by these organizations.

Crystalline silica, a potential trace level contaminant in portland cement, is now classified by IARC as a known human carcinogen (Group 1). NTP has characterized respirable silica as “reasonably anticipated to be [a] carcinogen”.

- **Medical Conditions That May Be Aggravated By Inhalation Or Dermal Exposure:**

Pre-existing upper respiratory and lung diseases.
Unusual (hyper) sensitivity to hexavalent chromium (chromium^{+6}) salts.

MATERIAL SAFETY DATA SHEET

SECTION 4 - FIRST-AID MEASURES

Eyes:

Immediately flush eyes thoroughly with water. Continue flushing for at least 15 minutes, including under lids, to remove all particles. Call physician immediately.

Skin:

Wash skin with cool water and pH-neutral soap or a mild detergent intended for use on skin. Seek medical treatment in all cases of prolonged exposure to wet cement, cement mixtures, liquids from fresh cement products, or prolonged wet skin exposure to dry cement.

Inhalation Of Airborne Dust:

Remove to fresh air. Seek medical help if coughing and other symptoms do not subside. ("Inhalation" of gross amounts of portland cement requires immediate medical attention.)

Ingestion:

Do not induce vomiting. If conscious, have the victim drink plenty of water and call a physician immediately.

SECTION 5 - FIRE-FIGHTING MEASURES

Flammability:	Not Flammable.
Flash Point:	Not Applicable.
Lower Explosive Limit:	Not Applicable.
Upper Explosive Limit:	Not Applicable.
Auto ignition Temperature:	Not Applicable.
Sensitivity To Static Discharge:	Not Applicable.
Sensitivity To Impact:	Not Applicable.
Extinguishing Media:	Not Applicable.
Special Fire-Fighting Procedures:	None.
Hazardous Combustion Products:	Not Applicable.
Unusual Fire And Explosion Hazards:	Not Applicable.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Collect dry material using a scoop. Avoid actions that cause dust to become airborne. Avoid inhalation of dust and contact with skin. Wear appropriate personal protective equipment as described in Section 8.

Scrape up wet material and place in an appropriate container. Allow the material to "dry" before disposal. Do not attempt to wash portland cement down drains.

Dispose of waste material according to local, provincial, state and federal regulations.

SECTION 7 - HANDLING AND STORAGE

Keep portland cement dry until used. Normal temperatures and pressures do not affect the material.

Promptly remove dusty clothing or clothing which is wet with cement fluids and launder before reuse. Wash thoroughly after exposure to dust or wet cement mixtures or fluids.

MATERIAL SAFETY DATA SHEET

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection:

When engaged in activities where cement dust or wet cement or concrete could contact the eye, wear safety glasses with side shields or goggles. In extremely dusty environments and unpredictable environments, wear unvented or indirectly vented goggles to avoid eye irritation or injury. Contact lenses should not be worn when working with portland cement or fresh cement products.

Skin Protection:

Prevention is essential to avoiding potentially severe skin injury. Avoid contact with unhardened (wet) portland cement products. If contact occurs, promptly wash affected area with soap and water. Where prolonged exposure to unhardened portland cement products might occur, wear impervious clothing and gloves to eliminate skin contact. Where required, wear boots that are impervious to water to eliminate foot and ankle exposure.

Do not rely on barrier creams; barrier creams should not be used in place of gloves.

Periodically wash areas contacted by dry portland cement or by wet cement or concrete fluids with a pH-neutral soap. Wash again at the end of work. If irritation occurs, immediately wash the affected area and seek treatment. If clothing becomes saturated with wet concrete, it should be removed and replaced with clean dry clothing.

Respiratory Protection:

Avoid actions that cause dust to become airborne. Use local or general ventilation to control exposures below applicable exposure limits.

Use NIOSH/MSHA-approved (under 30 CFR 11) or NIOSH-approved (under 42 CFR 84 after July 10, 1998) respirators in poorly ventilated areas, if an applicable exposure limit is exceeded, or when dust causes discomfort or irritation.

Ventilation:

Use local exhaust or general dilution ventilation to control exposure within applicable limits.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	White to gray powder.
Odor:	No distinct odor.
Odor Threshold:	Not applicable.
Physical State:	Solid (powder).
pH (as a solid):	Not applicable.
pH (in water) (ASTM D 1293-95):	12 to 13
Solubility In Water:	Slightly soluble (0.1 to 1.0 %).
Vapor Pressure:	Not applicable.
Vapor Density:	Not applicable.
Boiling Point:	Not applicable (i.e.,>1000^{o}C).
Freezing Point:	Not applicable.
Melting Point:	Not applicable.
Specific Gravity (H_20 = 1.0):	3.15
Evaporation Rate:	Not applicable.
Coeff. Water/Oil Dist.:	Not applicable.

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable
Conditions to avoid: Unintentional contact with water.
Incompatibility: Portland cement reacts with water to produce a caustic solution, pH 12 to pH 13. Wet portland cement is alkaline. As such it is incompatible with acids, ammonium salts and aluminum metal. Aluminum powder and other alkali and alkaline earth elements will react in wet mortar or concrete, liberating hydrogen gas. Portland cement dissolves in hydrofluoric acid producing corrosive silicon tetrafluoride gas. Silicates react with powerful oxidizers such as fluorine, chlorine, trifluoride and oxygen difluoride.

MATERIAL SAFETY DATA SHEET

SECTION 10 - STABILITY AND REACTIVITY (CONTINUED)

Hazardous Decomposition: Will not spontaneously occur. Adding water results in hydration and produces (caustic) calcium hydroxide.

Hazardous Polymerization: Will not occur.

SECTION 11 - TOXICOLOGICAL INFORMATION

Effects Of Acute Exposure:

Portland cement and wet portland cement mixtures can dry the skin, cause alkali burns and irritate the eyes and upper respiratory tract. Ingestion can cause irritation of the throat.

Effects Of Chronic Exposure:

Portland cement dust can cause inflammation of the tissue lining the interior of the nose and the cornea (white) of the eye.

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: No recognized unusual toxicity to plants or animals.
Relevant Physical And Chemical Properties: See Sections 9 and 10.

SECTION 13 - DISPOSAL CONSIDERATIONS

Dispose of waste material according to local, provincial, state and federal regulations. (Since portland cement is stable, uncontaminated material may be saved for future use.)

Dispose of bags in an approved landfill or incinerator.

SECTION 14 - TRANSPORT INFORMATION

Hazardous materials description/proper shipping name: Portland cement is not hazardous under the TDG Act (Canada) or DOT regulations (USA). **Hazard Class:** Not applicable.
Identification Number: Not applicable.
Required Label Text: Not applicable.
Hazardous substances/reportable quantities (RO): Not applicable.

SECTION 15 - REGULATORY INFORMATION

Status under USDOL-OSHA Hazard Communication Rule, 29 CFR 1910.1200:

Portland cement is considered a “hazardous chemical” under this regulation, and should be part of any hazard communication program.

Status under CERCLA/Superfund, 40 CFR 117 and 302:

Not listed.

Hazard Category under SARA (Title III), Sections 311 and 312:

Portland cement qualifies as a “hazardous substance” with delayed health effects.

Status under SARA (Title III), Section 313:

Not subject to reporting requirements under Section 313.

MATERIAL SAFETY DATA SHEET

SECTION 15 - REGULATORY INFORMATION (CONTINUED)

Status under TSCA (as of May 1997):

Some substances in portland cement are on the TCSA inventory list.

Status under the Federal Hazardous Substances Act:

Portland cement is a "hazardous substance" subject to statutes promulgated under the subject act.

Status under California Proposition 65:

This product contains chemicals (trace metals) known to the State of California to cause cancer, birth defects or other reproductive harm. California law requires the manufacturer to give the above warning in the absence of definitive testing to prove the defined risks do not exist.

Status under Canadian Environmental Protection Act:

Not listed.

Status under WHMIS:

Portland cement is considered to be a hazardous material under the Hazardous Products Act as defined by the Controlled Products Regulations and is therefore subject to the labeling and MSDS requirements of the Workplace Hazardous Materials Information System (WHMIS).

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

SECTION 16 - OTHER INFORMATION

Prepared By:	Robin Cowdrey
Approved By:	Bob Rimes
Approval Date or Revision Date:	September 1, 2004
Date Of Previous MSDS:	November 1, 2002
MSDS Number:	Not Applicable

Other Important Information:

Portland cement should only be used by knowledgeable persons. A key to using the product safely requires the user to recognize that portland cement chemically reacts with water, and that some of the intermediate products of this reaction (that is, those present while a portland cement product is "setting") pose a far more severe hazard than does portland cement itself.

While the information provided in this material safety data sheet is believed to provide a useful summary of the hazards of portland cement as it is commonly used, the sheet cannot anticipate and provide all of the information that might be needed in every situation. Inexperienced product users should obtain proper training before using this product.

In particular, the data furnished in this sheet does not address hazards that may be posed by other materials mixed with portland cement to produce portland cement products. Users should review other relevant material safety data sheets before working with this portland cement or working on portland cement products, for example, portland cement concrete.

No representations or warranties with respect to the accuracy or correctness of this information, or of any kind or nature whatsoever are given, made or intended by Lehigh Inland Cement Limited. No legal responsibility whatsoever is assumed for this information, or for any injuries or damages, however caused which may result from the use of this information. This information is offered solely for informational purposes and is subject to your own independent investigation and verification.

Material Safety Data Sheet

PETRO-CANADA

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	Not controlled		

Section 1. Chemical Product and Company Identification

Product Name	**TOOL JOINT COMPOUND**	**Code**	650-774, TOOL
		DSL	See Section 15
Synonym	Not available.	**TSCA**	See Section 15
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Tool Joint Compound is used in drilling operations as a thread compound for rotary shouldered pipe connections to prevent galling and to provide a positive seal against drilling mud pressure.		

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Proprietary ingredients.	Not available.	≥90	Not available.	Not available.	Not available.
2) Mica	12001-26-2	≤10	3 mg/m³	Not established	Not established

Section 3. Hazards Identification.

Potential Health Effects	Non irritating to slight transient irritation to skin and eyes, but no permanent damage. Relatively non-toxic via ingestion. This product has a low vapour pressure and is not expected to present an inhalation exposure at ambient conditions. Upon heating to high temperatures, or mechanical actions which may produce vapours or mists, inhalation of product may cause irritation of the breathing passages. For more information, refer to Section 11.

Section 4. First Aid Measures

Eye Contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.
Skin Contact	Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. High pressure grease gun is capable of injecting grease through the skin. Grease gun injuries require immediate physician assessment. Seek medical attention.
Inhalation	Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.
Ingestion	DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.
Note to Physician	Not available

Section 5. Fire-fighting Measures

Flammability	May be combustible at high temperature.	**Flammable Limits**	Lower: 0.9%; Upper: 7%
Flash Points OPEN CUP: 250°C (482°F)	Mineral Oil Blend: (Cleveland)	**Auto-Ignition Temperature**	>260°C (500°F)
Fire Hazards in Presence of Various Substances	Low fire hazard. This material must be heated before ignition will occur.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), hydrocarbons, metal oxides, smoke and irritating vapours as products of incomplete combustion.		
Fire Fighting Media and Instructions	NAERG96, GUIDE 171, Substances (low to moderate hazard). If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (0.5 mile) in all directions; also, consider initial evacuation for 800 meters (0.5 mile) in all directions. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. SMALL FIRE: use DRY chemicals, foam, water spray or CO2. LARGE FIRE: use water spray, fog or foam. For small outdoor fires, portable fire extinguishers may be used, and self contained breathing apparatus (SCBA) may not be required. For all indoor fires and any significant outdoor fires, SCBA is required. Respiratory and eye protection are required for fire fighting personnel.		

Section 6. Accidental Release Measures

Material Release or Spill	NAERG96, GUIDE 171, Substances (low to moderate hazard). ELIMINATE ALL IGNITION SOURCES. Avoid contact. Stop leak if without risk. Contain spill. Absorb with inert absorbents, dry clay, or diatomaceous earth. Avoid inhaling dust of diatomaceous earth for it may contain silica in very fine particle size, making this a potential respiratory hazard. Place used absorbent in closed metal containers for later disposal or burn absorbent in a suitable combustion chamber. DO NOT FLUSH TO SEWERS, STREAMS OR OTHER BODIES OF WATER. Check with applicable jurisdiction for specific disposal requirements of spilled material and empty containers. Notify the appropriate authorities immediately.

Section 7. Handling and Storage

Handling	Keep away from sources of ignition. DO NOT reuse empty containers without commercial cleaning or reconditioning. Practice good personal hygiene. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods.
Storage	Store in tightly closed containers in cool, dry, isolated, well-ventilated area, and away from incompatibles.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection - ***The selection of personal protective equipment varies, depending upon conditions of use.***	
Eyes	Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.
Exposure Limits	Consult local authorities for acceptable exposure limits. This product is not expected to form a mist based on its properties and expected use.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Smooth buttery paste.	**Viscosity**	Mineral Oil Blend: 103.3 cSt @ 40ºC, 11.5 cSt @ 100ºC, VI=98
Colour	Grey.	**Pour Point**	Mineral Oil Blend: -15ºC
Odour	Mild petroleum odour.	**Softening Point**	Not available.
Odour Threshold	Not available.	**Dropping Point**	196ºC
Boiling Point	<316°C (600°F)	**Penetration**	280 (60 strokes)
Specific Gravity	Mineral Oil Blend: 0.8741 kg/L @ 15°C (59°F).	**Oil / Water Dist. Coeff.**	Not available.
Vapor Density	Not available.	**Ionicity (in water)**	Not available.
Vapor Pressure	Negligible at ambient temperature and pressure.	**Dispersion Properties**	Not available.
Volatility	Non-volatile	**Solubility**	Insoluble in water.

Section 10. Stability and Reactivity

Corrosivity	Not available.		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents and acids.	**Decomposition Products**	May release COx, NOx, SOx, hydrocarbons, metal oxides, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation, and ingestion.
Acute Lethality	Not available.
Chronic or Other Toxic Effects	
Dermal Route:	Prolonged or repeated contact may cause skin irritation characterized by dermatitis or oil acne.
Inhalation Route:	Negligible breathing hazard at normal temperatures (up to 38°C) or recommended blending temperatures. Elevated temperatures or mechanical action may form vapours, mists or fumes. Inhalation of oil mists or vapours from hot oil may cause irritation of the upper respiratory tract.
Oral Route:	Low toxicity; has laxative effect.

Eye Irritation/Inflammation:	Repeated or prolonged contact may cause transient irritation, but no permanent damage.
Immunotoxicity:	Not available.
Skin Sensitization:	This product is not expected to be a skin sensitizer, based on the available data and the known hazards of the components.
Respiratory Tract Sensitization:	This product is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.
Mutagenic:	This product is not expected to be a mutagen, based on the available data and the known hazards of the components.
Reproductive Toxicity:	This product is not expected to be a reproductive hazard, based on the available data and the known hazards of the components.
Teratogenicity/Embryotoxicity:	This product is not expected to be a teratogen or an embryotoxin, based on the available data and the known hazards of the components.
Carcinogenicity (ACGIH):	Not available.
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as group 1, 2A or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	Not available.
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	No additional remark.

Section 12. Ecological Information

Environmental Fate	Not available.	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available.	**Products of Biodegradation**	Not available.
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal Preferred waste management priorities are: (1) recycle or reprocess; (2) incineration with energy recovery; (3) disposal at licensed waste disposal facility. Ensure that disposal or reprocessing is in compliance with government requirements and local disposal regulations. Consult your local or regional authorities.

Section 14. Transport Information

TDG Classification	Not controlled under TDG (Canada).	**Special Provisions for Transport**	Not applicable.

Section 15. Regulatory Information

Other Regulations

This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

DND/DPD (Europe) Not evaluated.

DND/DPD (Europe) (Pictograms)

NOT EVALUATED FOR EUROPEAN TRANSPORT

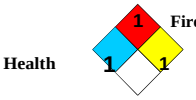
NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.

DOT (U.S.A) (Pictograms)

HMIS (U.S.A.)

Health Hazard	1
Fire Hazard	1
Reactivity	1
Personal Protection	B

NFPA (U.S.A.)



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Available in French

Section 16. Other Information

References Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada) (Europe)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

Information Contact Internet: www.petro-canada.ca

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: (780) 464-9564
Ontario & Central Canada, telephone: 1-800-268-5850 and (905) 822-4222; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 800-201-6285

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - JDW on 12/18/2002.

Data entry by Product Safety - JDW.

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	Not controlled		

Section 1. Chemical Product and Company Identification

Product Name SNOWMOBILE MOTOR OIL

Code 460-401-8, PSNOL

Synonym Not available

Validated on 5/28/2001.

Manufacturer PETRO-CANADA
P.O. Box 2844
Calgary, Alberta
T2P 3E3

In case of Emergency Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

Material Uses Low ash engine oil specifically designed to lubricate two-cycle snowmobile engine

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Severely hydrotreated paraffinic oil and additives.	Mixture	100	5 mg/m³ (oil mist)	10 mg/m³ (oil mist)	Not established

Manufacturer Recommendation Not applicable

Other Exposure Limits Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects Non irritating to slight transient irritation to skin and eyes, but no permanent damage. Relatively non-toxic via ingestion. This product has a low vapour pressure and is not expected to present an inhalation exposure at ambient conditions. Upon heating to high temperatures, or mechanical actions which may produce vapours or mists, inhalation of product may cause irritation of the breathing passages. For more information, refer to Section 11.

Section 4. First Aid Measures

Eye Contact IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.

Skin Contact Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.

Inhalation Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.

Ingestion DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.

Note to Physician Not available

Section 5. Fire-fighting Measures

Flammability	May be combustible at high temperature.	**Flammable Limits**	Not available
Flash Points	OPEN CUP: 152°C (305.6°F) (Cleveland)	**Auto-Ignition Temperature**	Not available
Fire Hazards in Presence of Various Substances	Low fire hazard. This material must be heated before ignition will occur.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.		

Fire Fighting Media and Instructions	NAERG96, GUIDE 171, Substances (low to moderate hazard). If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (0.5 mile) in all directions; also, consider initial evacuation for 800 meters (0.5 mile) in all directions. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. SMALL FIRE: use DRY chemicals, foam, water spray or CO2. LARGE FIRE: use water spray, fog or foam. For small outdoor fires, portable fire extinguishers may be used, and self contained breathing apparatus (SCBA) may not be required. For all indoor fires and any significant outdoor fires, SCBA is required. Respiratory and eye protection are required for fire fighting personnel.

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Available in French

Section 6. Accidental Release Measures

Material Release or Spill NAERG96, GUIDE 171, Substances (low to moderate hazard). ELIMINATE ALL IGNITION SOURCES. Avoid contact. Stop leak if without risk. Contain spill. Absorb with inert absorbents, dry clay, or diatomaceous earth. Avoid inhaling dust of diatomaceous earth for it may contain silica in very fine particle size, making this a potential respiratory hazard. Place used absorbent in closed metal containers for later disposal or burn absorbent in a suitable combustion chamber. DO NOT FLUSH TO SEWERS, STREAMS OR OTHER BODIES OF WATER. Check with applicable jurisdiction for specific disposal requirements of spilled material and empty containers. Notify the appropriate authorities immediately.

Section 7. Handling and Storage

Handling Avoid inhalation and skin contact especially when handling used oil. Keep away from sources of ignition. DO NOT reuse empty containers without commercial cleaning or reconditioning. Practice good personal hygiene. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods.

Storage Store in tightly closed containers in cool, dry, isolated, well-ventilated area, and away from incompatibles.

Section 8. Exposure Controls/Personal Protection

Engineering Controls For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.

Personal Protection - ***The selection of personal protective equipment varies, depending upon conditions of use.***

Eyes Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.

Body Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.

Respiratory Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.

Hands Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.

Feet Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Viscous liquid.	**Viscosity**	21.1 cSt @ 40ºC, 4.5 cSt @ 100°C, VI=127.
Colour	Blue-green	**Pour Point**	<-54°C
Odour	Mild petroleum oil like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	Not available	**Penetration**	Not applicable.
Density	0.88 kg/L @ 15°C (59°F).	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	Not available	**Ionicity (in water)**	Not available
Vapour Pressure	Negligible at ambient temperature and pressure.	**Dispersion Properties**	Not available
Volatility	Non-volatile.	**Solubility**	Insoluble in water.

Section 10. Stability and Reactivity

Corrosivity Not available

Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents, reducing agents and acids.	**Decomposition Products**	May release COx, NOx, aldehydes, methacrylate monomers, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry Skin contact, eye contact, inhalation and ingestion.

Acute Lethality Based on toxicity of components.

Acute oral toxicity (LD50): >5000 mg/kg (rat).

Acute dermal toxicity (LD50): >2000 mg/kg (rabbit). Acute inhalation toxicity (LC50): >2500 mg/m³/4h (rat).

Chronic or Other Toxic Effects

Dermal Route: Prolonged or repeated contact may cause skin irritation characterized by dermatitis or oil acne.

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Inhalation Route:	Negligible breathing hazard at normal temperatures (up to 38°C) or recommended blending temperatures. Elevated temperatures or mechanical action may form vapours, mists or fumes. Inhalation of oil mists or vapours from hot oil may cause irritation of the upper respiratory tract.
Oral Route:	Low toxicity; has laxative effect.
Eye Irritation/Inflammation:	Repeated or prolonged contact may cause transient irritation, but no permanent damage.
Immunotoxicity:	Not available
Skin Sensitization:	This product is not expected to be a skin sensitizer, based on the available data and the known hazards of the components.
Respiratory Tract Sensitization:	This product is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.
Mutagenic:	Based on actual test results of base oils and results of similar products, severely hydrotreated base oils give negative results when tested for: (a) Salmonella Typhimurium TA98 using the Modified Ames Assay for Petroleum Product; (b) Salmonella-Escherichia coli/Mammalian-Microsome Reverse Mutation Assay (Ames test) with a Confirmatory Assay; (c) Structural Chromosomal Aberrations in Chinese Hamster Ovary (CHO) Cells.
Reproductive Toxicity:	This product is not expected to be a reproductive hazard, based on the available data and the known hazards of the components.
Teratogenicity/Embryotoxicity:	This product is not expected to be a teratogen or an embryotoxin, based on the available data and the known hazards of the components.
Carcinogenicity (ACGIH):	This product is not known to contain any chemicals at reportable quantities that are listed as A1 or A2 carcinogens by ACGIH.
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as group 1, 2A or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	Not available
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	No additional remark.

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal Spent/used/waste oil may meet the requirements of a hazardous waste. Consult your local or regional authorities. Preferred waste management priorities are: (1) recycle or reprocess; (2) incineration with energy recovery; (3) disposal at licensed waste disposal facility. Ensure that disposal or reprocessing is in compliance with government requirements and local disposal regulations.

Section 14. Transport Information

TDG Classification	Not controlled under TDG (Canada)	**Special Provisions for Transport**	Not applicable

Section 15. Regulatory Information

Other Regulations This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

DSD/DPD (Europe)	Not classified under the Dangerous Substances or Dangerous Preparations Directives.	**HCS (U.S.A.)**	Not controlled under the HCS (United States).

Continued on Next Page

ADR (Europe) (Pictograms)	
DOT (U.S.A) (Pictograms)	

HMIS (U.S.A.)			**NFPA (U.S.A.)**		**Rating**	
	Health Hazard	1				0 Insignificant
	Fire Hazard	1	**Health**			1 Slight
	Reactivity	0				2 Moderate
	Personal Protection	B	**Specific hazard**			3 High
						4 Extreme

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes) DSL -
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS

Lubricants:

Western Canada, telephone: 1-800-661-1199; fax: (780) 464-9564
Ontario & Central Canada, telephone: 1-800-268-5850 and (905) 822-4222; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 800-201-6285

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - TAR on 5/28/2001.

Data entry by Product Safety - JDW.

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

PETRO-CANADA

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	Not controlled		

Section 1. Chemical Product and Company Identification

Product Name	**DRILL ROD HEAVY GREASE**	**Code**	650-265, DRODH
		DSL	See Section 15
Synonym	Not available.	**TSCA**	See Section 15
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	This product is recommended for the lubrication of diamond drill rods.		

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Mixture of severely hydrotreated and hydrocracked, and/or solvent-refined base oil (petroleum) and other proprietary, non-hazardous additives.	Mixture	100	5 mg/m³ (oil mist)	10 mg/m³ (oil mist)	Not established

Section 3. Hazards Identification.

Potential Health Effects	Non irritating to slight transient irritation to skin and eyes, but no permanent damage. Relatively non-toxic via ingestion. This product has a low vapour pressure and is not expected to present an inhalation exposure at ambient conditions. Upon heating to high temperatures, or mechanical actions which may produce vapours or mists, inhalation of product may cause irritation of the breathing passages. For more information, refer to Section 11.

Section 4. First Aid Measures

Eye Contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.
Skin Contact	Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. High pressure grease gun is capable of injecting grease through the skin. Grease gun injuries require immediate physician assessment. Seek medical attention.
Inhalation	Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.
Ingestion	DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.
Note to Physician	Not available

Section 5. Fire-fighting Measures

Flammability	May be combustible at high temperature.	**Flammable Limits**	Not available.
Flash Points	Mineral Oil Blend: OPEN CUP: 252°C (485.6°F). (Cleveland).	**Auto-Ignition Temperature**	Not available.
Fire Hazards in Presence of Various Substances	Low fire hazard. This material must be heated before ignition will occur.	**Explosion Hazards in Presence of Various Substances**	Containers may explode in heat of fire. Do not cut, weld, heat, drill or pressurize empty container.
Products of Combustion	Carbon oxides (CO, CO2), smoke and irritating vapours as products of incomplete combustion.		
Fire Fighting Media and Instructions	NAERG96, GUIDE 171, Substances (low to moderate hazard). If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (0.5 mile) in all directions; also, consider initial evacuation for 800 meters (0.5 mile) in all directions. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. SMALL FIRE: use DRY chemicals, foam, water spray or CO2. LARGE FIRE: use water spray, fog or foam. For small outdoor fires, portable fire extinguishers may be used, and self contained breathing apparatus (SCBA) may not be required. For all indoor fires and any significant outdoor fires, SCBA is required. Respiratory and eye protection are required for fire fighting personnel.		

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Section 6. Accidental Release Measures

Material Release or Spill	Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Extinguish all ignition sources. Stop leak if safe to do so. Dike spilled material. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Avoid contact with spilled material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling	Avoid contact with any sources of ignition, flames, heat, and sparks. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated.
Storage	Store in dry, cool, well-ventilated area. Keep container tightly closed. Store away from incompatible and reactive materials (See section 5 and 10).

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection - ***The selection of personal protective equipment varies, depending upon conditions of use.***	
Eyes	Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.
Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits. This product is not expected to form a mist based on its properties and expected use.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Paste of long fibred texture.	**Viscosity**	Mineral Oil Blend: 155.5 cSt @ 40°C (104ºF), 14.42 cSt @ 100°C (212ºF), VI=89
Colour	Dark greenish-brown	**Pour Point**	Mineral Oil Blend: -15ºC (5ºF)
Odour	Mild grease like.	**Softening Point**	Not available
Odour Threshold	Not available.	**Dropping Point**	201°C (394ºF)
Boiling Point	Not available.	**Penetration**	234 (60 strokes)
Specific Gravity	Mineral Oil Blend: 0.8898 kg/L @ 15°C (59°F).	**Oil / Water Dist. Coeff.**	Not available.
Vapor Density	Not available.	**Ionicity (in water)**	Not available
Vapor Pressure	Negligible at ambient temperature and pressure.	**Dispersion Properties**	Not available.
Volatility	Non-volatile.	**Solubility**	Insoluble in water.

Section 10. Stability and Reactivity

Corrosivity	Not corrosive to copper.		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents, acids and alkalis.	**Decomposition Products**	May release COx, NOx, SOx, diphenylamine, alkenes, smoke and irritating vapours when heated to decomposition.

Continued on Next Page **Available in French**

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation and ingestion.
Acute Lethality	Based on toxicity of components. Acute oral toxicity (LD50): >5000 mg/kg (rat). Acute dermal toxicity (LD50): >2000 mg/kg (rabbit).
Chronic or Other Toxic Effects	
Dermal Route:	Prolonged or repeated contact may cause skin irritation characterized by dermatitis or oil acne.
Inhalation Route:	Negligible breathing hazard at normal temperatures (up to 38°C) or recommended blending temperatures. Elevated temperatures or mechanical action may form vapours, mists or fumes. Inhalation of oil mists or vapours from hot oil may cause irritation of the upper respiratory tract.
Oral Route:	Low toxicity; has laxative effect.
Eye Irritation/Inflammation:	Repeated or prolonged contact may cause transient irritation, but no permanent damage.
Immunotoxicity:	Not available.
Skin Sensitization:	This product is not expected to be a skin sensitizer, based on the available data and the known hazards of the components.
Respiratory Tract Sensitization:	This product is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.
Mutagenic:	Based on actual test results of base oils and results of similar products, severely hydrotreated base oils give negative results when tested for: (a) Salmonella Typhimurium TA98 using the Modified Ames Assay for Petroleum Product; (b) Salmonella-Escherichia coli/Mammalian-Microsome Reverse Mutation Assay (Ames test) with a Confirmatory Assay; (c) Structural Chromosomal Aberrations in Chinese Hamster Ovary (CHO) Cells.
Reproductive Toxicity:	This product is not expected to be a reproductive hazard, based on the available data and the known hazards of the components.
Teratogenicity/Embryotoxicity:	This product is not expected to be a teratogen or an embryotoxin, based on the available data and the known hazards of the components.
Carcinogenicity (ACGIH):	This product is not known to contain any chemicals at reportable quantities that are listed as A1 or A2 carcinogens by ACGIH.
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as group 1, 2A or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	Not available.
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	No additional remark.

Section 12. Ecological Information

Environmental Fate	Not available.	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available.	**Products of Biodegradation**	Not available.
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal regulations.

Section 14. Transport Information

TDG Classification	Not controlled under TDG (Canada).	**Special Provisions for Transport**	Not applicable.

Continued on Next Page *Available in French*

Section 15. Regulatory Information

Other Regulations

This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

DSD/DPD (Europe) Not evaluated.

DSD/DPD (Europe) (Pictograms)

NOT EVALUATED FOR EUROPEAN TRANSPORT

NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.

DOT (U.S.A) (Pictograms)

HMIS (U.S.A.)

Health Hazard	1
Fire Hazard	1
Reactivity	0
Personal Protection	B

NFPA (U.S.A.)

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada) (Europe)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

Information Contact Internet: www.petro-canada.ca

Lubricants:
Western Canada, telephone: 1-800-661-1199;
fax: (780) 464-9564
Ontario & Central Canada, telephone:
1-800-268-5850 and (905) 822-4222; fax:
1-800-201-6285
Quebec & Eastern Canada, telephone:
1-800-576-1686; fax: 800-201-6285

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - JDW on 4/29/2003.

Data entry by Product Safety - JDW.

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	**Not controlled**		

Section 1. Chemical Product and Company Identification

Product Name **PETRO-CANADA SUPREME 5W-30, 10W-30, 10W-40, 20W-50 MOTOR OIL**

Code 410-344, MOSP53
410-341, MOSP13
410-342, MOSP14
410-343, MOSP25

Synonym Not available.

Validated on 8/31/2004.

Manufacturer PETRO-CANADA

P.O. Box 2844
Calgary, Alberta
T2P 3E3

In case of Emergency Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

Material Uses Supreme is designed for the lubrication of all gasoline, propane and CNG engines where the manufacturer recommends the use of API SM quality oils. SAE 5W-30 and 10W-30 grades also meet the requirements of ILSAC GF-4.

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
Mixture of severely hydrotreated and hydrocracked base oil (petroleum) and other proprietary, non-hazardous additives.	Mixture	100	5 mg/m³ (oil mist)	10 mg/m³ (oil mist)	Not established

Manufacturer Recommendation Not applicable

Other Exposure Limits Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects Prolonged or repeated contact may cause skin irritation, defatting, drying and dermatitis. Not expected to cause more than slight skin or eye irritation. With its relatively low vapour pressure, this product is not expected be inhaled in any appreciable quantity at ambient conditions. If heated to high temperatures or subjected to mechanical actions which produce vapours or mists, inhalation may cause respiratory tract irritation. Ingestion may produce a laxative effect. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.

Skin Contact Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.

Inhalation Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.

Ingestion DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.

Note to Physician Not available

Section 5. Fire-fighting Measures

Flammability	May be combustible at high temperature.	**Flammable Limits**	Not available.
Flash Points	OPEN CUP: 223°C (433.4°F) (Cleveland)	**Auto-Ignition Temperature**	Not available

Fire Hazards in Presence of Various Substances	Low fire hazard. This material must be heated before ignition will occur.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire.

Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), calcium oxides (CaOx), phosphorus compounds (POx), zinc oxides, boron oxides and molybdenum, smoke and irritating vapours as products of incomplete combustion.
Fire Fighting Media and Instructions	NAERG96, GUIDE 171, Substances (low to moderate hazard). If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (0.5 mile) in all directions; also, consider initial evacuation for 800 meters (0.5 mile) in all directions. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. SMALL FIRE: use DRY chemicals, foam, water spray or CO2. LARGE FIRE: use water spray, fog or foam. For small outdoor fires, portable fire extinguishers may be used, and self contained breathing apparatus (SCBA) may not be required. For all indoor fires and any significant outdoor fires, SCBA is required. Respiratory and eye protection are required for fire fighting personnel.

Section 6. Accidental Release Measures

Material Release or Spill	Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Extinguish all ignition sources. Stop leak if safe to do so. Dike spilled material. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Avoid contact with spilled material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling	Avoid contact with any sources of ignition, flames, heat, and sparks. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated.
Storage	Store away from incompatible and reactive materials (See section 5 and 10). Keep container tightly closed. Store in dry, cool, well-ventilated area.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection - *The selection of personal protective equipment varies, depending upon conditions of use.*	
Eyes	Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Viscous liquid.	**Viscosity**	5W-30: 62.3 cSt @ 40°C (104°F), 10.6 cSt @ 100ºC (212ºF). VI=160 10W-30: 67.4 cSt @ 40°C (104°F), 10.5 cSt @ 100ºC (212ºF). VI=143 10W-40: 97.2 cSt @ 40°C (104°F), 14.1 cSt @ 100ºC (212ºF). VI=143 20W-50: 170 cSt @ 40°C (104°F), 19.0 cSt @ 100ºC (212ºF). VI=127
Colour	Light amber.	**Pour Point**	5W-30: -36°C (-33ºF) 10W-30: -36°C (-33ºF) 10W-40: -30°C (-22ºF) 20W-50: -24°C (-11ºF)
Odour	Mild petroleum oil like.	**Softening Point**	Not applicable.
Odour Threshold	Not available.	**Dropping Point**	Not applicable.
Boiling Point	Not available.	**Penetration**	Not applicable.

Density	0.8566 - 0.8775 kg/L @ 15°C (59°F).	**Oil / Water Dist. Coefficient**	Not available.
Vapour Density	Not available.	**Ionicity (in water)**	Not available
Vapour Pressure	Negligible at ambient temperature and pressure.	**Dispersion Properties**	Not available
Volatility	Non-volatile	**Solubility**	Insoluble in water.

Section 10. Stability and Reactivity

Corrosivity	Copper corrosion, 3h, 121°C (ASTM D0130): 1a		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents and acids.	**Decomposition Products**	May release COx, H2S, methacrylate monomers, alkyl mercaptans, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry Skin contact, eye contact, inhalation, and ingestion.

Acute Lethality Acute toxicity information is not available for the product as a whole, therefore, data for some of the ingredients is provided below:
Acute oral toxicity (LD50): >5000 mg/kg (rat).
Acute dermal toxicity (LD50): >2000 mg/kg (rabbit). Acute inhalation toxicity (LC50): >2500 mg/m³/4h (rat).

Chronic or Other Toxic Effec ts

Dermal Route:	Prolonged or repeated contact may defat and dry skin, and cause dermatitis. Short-term exposure is expected to cause only slight irritation, if any.
Inhalation Route:	With its relatively low vapour pressure, this product is not expected be inhaled in any appreciable quantity at ambient conditions. If heated to high temperatures or subjected to mechanical actions which produce vapours or mists, inhalation may cause respiratory tract irritation.
Oral Route:	Ingestion of this product may lead to aspiration of the liquid, especially if vomiting occurs. This may result in chemical pneumonitis (inflammation of the lungs) and/or pulmonary edema (an accumulation of fluid in the lungs). May produce a laxative effect.
Eye Irritation/Inflammation:	Short-term exposure is expected to cause only slight irritation, if any.
Immunotoxicity:	Not available.
Skin Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.
Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.
Mutagenic:	This product is not known to contain any components at >= 0.1% that have been shown to cause mutagenicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a mutagen.
Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause teratogenicity and/or embryotoxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a teratogen/embryotoxin.
Carcinogenicity (ACGIH):	This product is not known to contain any chemicals at reportable quantities that are listed as Group A1 or A2 carcinogens by ACGIH.
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as Group 1, 2A, or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by IRIS.
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.

Other Considerations No additional remark.

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available.	**Products of Biodegradation**	Not available.
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal regulations.

Section 14. Transport Information

TDG Classification Not a hazardous material for transport according to the TDG Regulations. (Canada)	**Special Provisions for Transport** Not applicable.

Section 15. Regulatory Information

Other Regulations This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

DSD/DPD (Europe) Not evaluated.	**HCS (U.S.A.)** Does not meet the definitions of a health or physical hazard according to the OSHA - Hazard Communication Standard. (United States)
ADR (Europe) (Pictograms) NOT EVALUATED FOR EUROPEAN TRANSPORT / NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.	**DOT (U.S.A) (Pictograms)** 

HMIS (U.S.A.)		**NFPA (U.S.A.)**		**Rating**
Health Hazard	1	**Health**		0 Insignificant
Fire Hazard	1			1 Slight
Reactivity	0	**Specific hazard**		2 Moderate
Personal Protection	B			3 High
				4 Extreme

Section 16. Other Information

References Available upon request.

*Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations
IRIS - Integrated Risk Information System LD50/LC50 - Lethal Dose/Concentration kill 50% LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes) TDG - Transportation Dangerous Goods (Canada) TDLo/TCLo - Lowest Published Toxic Dose/Concentration

Directives (Europe)

DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazard Communication Standard
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
TLm - Median Tolerance Limit

TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS

Prepared by Product Safety - TLM on 8/31/2004.

Data entry by Product Safety - RS.

The Canadian Controlled Products Regulations (CPR) (Under the Hazardous Products Act, part of the WHMIS legislation) only apply to WHMIS Controlled (i.e., hazardous) products. Therefore, the CPR and the 3-year update rule specified therein do not apply to WHMIS Non-Controlled products. Although this is true, customarily Petro-Canada reviews and updates Non-Controlled product MSDS if a customer requests such an update. These Non-Controlled product updates are given a lower priority than Controlled products but are handled as soon as practicable. If you would like to verify if the MSDS you have is the most current, or you require any further information, please contact:

Internet: www.petro-canada.ca

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: (780) 464-9564
Ontario & Central Canada, telephone: 1-800-268-5850 and (905) 822-4222; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 800-201-6285

For Product Safety Information: (905) 804-4752

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	B-2, D-2A, D-2B		

Section 1. Chemical Product and Company Identification

Product Name JET B AVIATION TURBINE FUEL

Code W219
SAP: 150, 151, 152

Synonym Jet B; Jet B DI; JP-4; Jet F-40; NATO F-40; Turbine Fuel, Aviation, Wide Cut Type (CAN/CGSB-3.22).

Validated on 12/3/2001.

Manufacturer PETRO-CANADA
P.O. Box 2844
Calgary, Alberta
T2P 3E3

In case of Emergency Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

Material Uses Used as aviation turbine fuel. May contain a fuel system icing inhibitor.

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (V/V)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Complex mixture of petroleum hydrocarbons (C6-C14).	64741-41-9	>99	Not established	Not established	Not established
2) Benzene	71-43-2	<0.5	0.5 ppm	2.5 ppm	Not established
3) Fuel System Icing Inhibitor (FSII) (if added*):					
Diethylene Glycol Monomethyl Ether	111-77-3	≤0.15	Not established	Not established	Not established
4) Anti-static, antioxidant and metal deactivator additives.	Not applicable	<0.1	Not applicable	Not applicable	Not applicable
* Please note that Jet B DI, JP-4, Jet F-40 and NATO F-40 all contain Fuel System Icing Inhibitor (FSII).					

Manufacturer Recommendation Not applicable

Other Exposure Limits Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects Skin and eye contact can cause irritation. Inhalation of vapours can cause irritation of the respiratory tract and CNS depression with symptoms of nausea, headaches, vomiting, dizziness, fatigue, light-headedness, reduced coordination, unconciousness and possibly death. Aspiration into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure. This product contains a cancer causing agent. For more information, refer to Section 11.

Section 4. First Aid Measures

Eye Contact IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.

Skin Contact Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.

Inhalation Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.

Ingestion DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.

Note to Physician Not available

Section 5. Fire-fighting Measures

Flammability	Flammable liquid (NFPA).	**Flammable Limits**	LOWER: 1.3% UPPER: 8% (NFPA)
Flash Points	CLOSED CUP: -31ºC (-24°F) (NFPA)	**Auto-Ignition Temperature**	240°C (464°F) (NFPA)
Fire Hazards in Presence of Various Substances	Flammable in presence of open flames, sparks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite. May accumulate in confined spaces.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire.

Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), aldehydes, ketones, smoke and irritating vapours as products of incomplete combustion.

Continued on Next Page

Available in French

Fire Fighting Media and Instructions

NAERG96, GUIDE 128, Flammable liquids (Non-polar/Water-immiscible).
CAUTION: This product has a very low flash point: Use of water spray when fighting fire may be inefficient.

If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions.

SMALL FIRES: Dry chemical, CO2, water spray or regular foam.
LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk.
Fires Involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.

Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Section 6. Accidental Release Measures

Material Release or Spill

NAERG96, GUIDE 128, Flammable Liquids (Non-polar/ Water-immiscible). ELIMINATE ALL IGNITION SOURCES. Avoid contact. Stop leak if without risk. Contain spill. Absorb with inert absorbents, dry clay, or diatomaceous earth. Avoid inhaling dust of diatomaceous earth for it may contain silica in very fine particle size, making this a potential respiratory hazard. Place used absorbent in closed metal containers for later disposal or burn absorbent in a suitable combustion chamber. DO NOT FLUSH TO SEWERS, STREAMS OR OTHER BODIES OF WATER. Check with applicable jurisdiction for specific disposal requirements of spilled material and empty containers. Notify the appropriate authorities immediately.

Section 7. Handling and Storage

Handling

Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk. DO NOT reuse empty containers without commercial cleaning or reconditioning. Ground/bond line and equipment during pumping or transfer to avoid accumulation of static charge. DO NOT ingest. Do not breathe gas/vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately. Avoid contact with skin and eyes. Practice good personal hygiene. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods.

Storage

Store in tightly closed containers in cool, dry, isolated, well-ventilated area, and away from incompatibles. Ground all equipment containing material. Keep away from direct sunlight.

Section 8. Exposure Controls/Personal Protection

Engineering Controls For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.

Personal Protection ***-The selection of personal protective equipment varies, depending upon conditions of use.***

Eyes Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.

Body Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.

Respiratory Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.

Hands Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.

Feet Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Clear liquid.	**Viscosity**	Not available (similar to gasoline)
Colour	Clear and colourless.	**Pour Point**	Freezing Point: <-51ºC (<-60ºF) for Jet B/Jet B DI; <-58ºC (<-72ºF) for Jet Fuel F-40.
Odour	Gasoline like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	50 to 270°C (122 to 518°F)	**Penetration**	Not applicable.
Density	0.75 to 0.80 kg/L @ 15ºC (59ºF).	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	3.5 (Air = 1)	**Ionicity (in water)**	Not available
Vapour Pressure	21 kPa (158 mmHg) @ 37.8ºC (100ºF).	**Dispersion Properties**	Not available
Volatility	Volatile.	**Solubility**	Insoluble in water. Partially miscible in some alcohols. Miscible in other petroleum solvents.

Continued on Next Page

Section 10. Stability and Reactivity

Corrosivity	Not available		
Stability and storage conditions.	The product is stable under normal handling	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents and acids.	**Decomposition Products** decomposition.	May release COx, NOx, SOx, aldehydes, ketones, smoke and irritating vapours when heated to

Section 11. Toxicological Information

Routes of Entry Skin contact, eye contact, inhalation and ingestion.

Acute Lethality **Based on toxicity of similar product.**

Acute oral toxicity (LD50): >20000 mg/kg (rat).
Acute dermal toxicity (LD50): >5000 mg/kg (rabbit). Acute inhalation toxicity (LC50): >5000 mg/m³/4h (rat).

Benzene
Acute oral toxicity (LD50): 930 mg/kg (rat).
Acute dermal toxicity (LD50): >9400 mg/kg (rabbit). Acute inhalation toxicity (LC50): 13200 ppm/4h (rat).

Diethylene Glycol Monomethyl Ether
Acute oral toxicity (LD50): 4140-5180 mg/kg (rat). Acute dermal toxicity (LD50): >2000 mg/kg (rabbit). Acute inhalation toxicity (LC50): >50000 mg/m³/4h (rat).

Chronic or Other Toxic Effects

Dermal Route:	Skin contact can cause irritation.
Inhalation Route:	Inhalation of vapours can cause irritation of the respiratory tract and CNS depression with symptoms of nausea, headaches, vomiting, dizziness, fatigue, light-headedness, reduced coordination, unconciousness and possibly death.
Oral Route:	Aspiration into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure.
Eye Irritation/Inflammation:	Eye contact can cause irritation.
Immunotoxicity:	Not available
Skin Sensitization:	This product is not expected to be a skin sensitizer, based on the available data and the known hazards of the components.
Respiratory Tract Sensitization:	This product is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.
Mutagenic:	Benzene is tumorigenic by RTECS criteria.
Reproductive Toxicity:	This product is not expected to be a reproductive hazard, based on the available data and the known hazards of the components.
Teratogenicity/Embryotoxicity:	Fetotoxicity, embryotoxicity and/or teratogenicity have been observed in rats or rabbits following oral or dermal administration, in the absence of maternal toxicity. [Diethylene Glycol Monomethyl Ether]
Carcinogenicity (ACGIH):	ACGIH A1: confirmed human carcinogen. [Benzene]
Carcinogenicity (IARC):	IARC Group 1: carcinogenic to Humans. [Benzene]
Carcinogenicity (NTP):	NTP Group 1: known to be a carcinogen. [Benzene]
Carcinogenicity (IRIS):	Not available
Carcinogenicity (OSHA):	Benzene is an OSHA known carcinogen.

Other Considerations No additional remark.

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available

Additional Remarks No additional remark.

Section 13. Disposal Considerations

Waste Disposal Preferred waste management priorities are: (1) recycle or reprocess; (2) incineration with energy recovery; (3) disposal at licensed waste disposal facility. Ensure that disposal or reprocessing is in compliance with government requirements and local disposal regulations. Consult your local or regional authorities.

Section 14. Transport Information

TDG Classification	Currently: Fuel, aviation, turbine engine, 3, UN1863, PGII As of August 15, 2002: FUEL, AVIATION, TURBINE ENGINE, 3, UN1863, PGII	**Special Provisions for Transport**	Not applicable.

Section 15. Regulatory Information

Other Regulations This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS). This product has been

classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

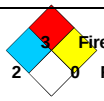
Please contact Product Safety for more information.

DSD/DPD (Europe) Not evaluated.	**HCS (U.S.A.)** CLASS: Contains material which may cause cancer. CLASS: Flammable liquid having a flash point lower than 37.8°C (100°F). CLASS: Toxic. CLASS: Irritating substance. CLASS: Target organ effects.
ADR (Europe) (Pictograms) **NOT EVALUATED FOR EUROPEAN TRANSPORT** **NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.**	**DOT (U.S.A) (Pictograms)** 

HMIS (U.S.A.)

Health Hazard	2*
Fire Hazard	3
Reactivity	0
Personal Protection	H

NFPA (U.S.A.)



Health

Specific hazard

Rating
0 Insignificant
1 Slight
2 Moderate
3 High
4 Extreme

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada) (Europe)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS	**Prepared by Product Safety - TAR on 12/3/2001.**

Continued on Next Page *Available in French*

Western Canada, telephone: 403-296-4158; fax: 403-296-6551 Ontario &Central Canada, telephone: 1-800-668-0220; fax: 1-800-837-1228 Quebec & Eastern Canada, telephone: 514-640-8308; fax: 514-640-8385 For Product Safetv Infonnation: (905) 804-4752	Data entry by Product Safety - JDW.

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we *cannot guarantee that these are the only hazards that exist.*

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	Not controlled		

Section 1. Chemical Product and Company Identification

Product Name TRAXON* XL SYNTHETIC BLEND 75W-90, 80W-140

Code TRXL759, 470-499-0
TRXL814, 470-500-0

Synonym Not available

Validated on 5/29/2003.

Manufacturer PETRO-CANADA
P.O. Box 2844
Calgary, Alberta
T2P 3E3

In case of Emergency Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

Material Uses These products are multipurpose automotive hypoid gear lubricants, suitable for use in lower temperatures in passenger cars, trucks and off-highway vehicles.

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	CAS #	% (W/W)	TLV-TWA(8 h)	STEL	CEILING
1) Mixture of severely hydrotreated and hydrocracked and/or solvent-refined base oil (petroleum), synthetic hydrocarbons and other proprietary, non-hazardous additives.	Mixture	100	5 mg/m³ (oil mist)	10 mg/m³ (oil mist)	Not established

Manufacturer Recommendation Not applicable

Other Exposure Limits Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects Non irritating to slight transient irritation to skin and eyes, but no permanent damage. Relatively non-toxic via ingestion. This product has a low vapour pressure and is not expected to present an inhalation exposure at ambient conditions. Upon heating to high temperatures, or mechanical actions which may produce vapours or mists, inhalation of product may cause irritation of the breathing passages. For more information, refer to Section 11.

Section 4. First Aid Measures

Eye Contact IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.

Skin Contact Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.

Inhalation Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.

Ingestion DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.

Note to Physician Not available

Section 5. Fire-fighting Measures

Flammability	May be combustible at high temperature.	**Flammable Limits**	Not available
Flash Points	OPEN CUP: ≥183°C (361.4°F) (Cleveland)	**Auto-Ignition Temperature**	Not available
Fire Hazards in Presence of Various Substances	Low fire hazard. This material must be heated before ignition will occur.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.		

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Fire Fighting Media and Instructions	NAERG96, GUIDE 171, Substances (low to moderate hazard). If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (0.5 mile) in all directions; also, consider initial evacuation for 800 meters (0.5 mile) in all directions. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. SMALL FIRE: use DRY chemicals, foam, water spray or CO2. LARGE FIRE: use water spray, fog or foam. For small outdoor fires, portable fire extinguishers may be used, and self contained breathing apparatus (SCBA) may not be required. For all indoor fires and any significant outdoor fires, SCBA is required. Respiratory and eye protection are required for fire fighting personnel.

Section 6. Accidental Release Measures

Material Release or Spill	Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Extinguish all ignition sources. Stop leak if safe to do so. Dike spilled material. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Avoid contact with spilled material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling	Avoid contact with any sources of ignition, flames, heat, and sparks. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated.
Storage	Store in dry, cool, well-ventilated area. Keep container tightly closed. Store away from incompatible and reactive materials (See section 5 and 10).

Section 8. Exposure Controls/Personal Protection

Engineering Controls For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.

Personal Protection ***-The selection of personal protective equipment varies, depending upon conditions of use.***

Eyes	Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Viscous liquid.	**Viscosity**	75W90: 106.7 cSt @ 40ºC (104ºF), 16.52 cSt @ 100ºC (212ºF), VI=168 80W140: 254.8 cSt @ 40ºC (104ºF), 25.24 cSt @ 100ºC (212ºF), VI=127
Colour	Colourless to pale yellow.	**Pour Point**	75W90: -42ºC (-44ºF) 80W140: -36ºC (-33ºF)
Odour	No odour or slight petroleum oil like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	Not available	**Penetration**	Not applicable.
Density	0.8699 - 0.878 kg/L @ 15°C (59°F).	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	Not available	**Ionicity (in water)**	Not available
Vapour Pressure	Negligible at ambient temperature and pressure.	**Dispersion Properties**	Not available
Volatility	Non-volatile	**Solubility**	Insoluble in water.

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Section 10. Stability and Reactivity

Corrosivity	Copper corrosion, 3h, 121°C (ASTM D0130): 1b		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents.	**Decomposition Products**	May release COx, NOx, SOx, H2S, POx, SiOx, methacrylate monomers, aldehydes, alkyl mercaptans, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry Skin contact, eye contact, inhalation and ingestion.

Acute Lethality Based on toxicity of components.
Acute oral toxicity (LD50): >5000 mg/kg (rat).
Acute dermal toxicity (LD50): >2000 mg/kg (rabbit). Acute inhalation toxicity (LC50): >2500 mg/m³/4h (rat).

Chronic or Other Toxic Effects

Dermal Route:	Prolonged or repeated contact may cause skin irritation characterized by dermatitis or oil acne.
Inhalation Route:	Negligible breathing hazard at normal temperatures (up to 38°C) or recommended blending temperatures. Elevated temperatures or mechanical action may form vapours, mists or fumes. Inhalation of oil mists or vapours from hot oil may cause irritation of the upper respiratory tract.
Oral Route:	Low toxicity; has laxative effect.
Eye Irritation/Inflammation:	Repeated or prolonged contact may cause transient irritation, but no permanent damage.
Immunotoxicity:	Not available
Skin Sensitization:	This product is not expected to be a skin sensitizer, based on the available data and the known hazards of the components.
Respiratory Tract Sensitization:	This product is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.
Mutagenic:	This product is not expected to be a mutagen, based on the available data and the known hazards of the components.
Reproductive Toxicity:	This product is not expected to be a reproductive hazard, based on the available data and the known hazards of the components.
Teratogenicity/Embryotoxicity:	This product is not expected to be a teratogen or an embryotoxin, based on the available data and the known hazards of the components.
Carcinogenicity (ACGIH):	This product is not known to contain any chemicals at reportable quantities that are listed as A1 or A2 carcinogens by ACGIH.
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as group 1, 2A or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by IRIS.
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.

Other Considerations No additional remark.

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available

Additional Remarks No additional remark.

Section 13. Disposal Considerations

Waste Disposal Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal regulations.

Section 14. Transport Information

TDG Classification	Not controlled under TDG (Canada).	**Special Provisions for Transport**	Not applicable.

Section 15. Regulatory Information

Other Regulations This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS). This product has been

classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

DSD/DPD (Europe)	Not classified under the Dangerous Substances or Dangerous Preparations Directives.	**HCS (U.S.A.)**	Not controlled under the HCS (United States).
ADR (Europe) (Pictograms)	**NOT EVALUATED FOR EUROPEAN TRANSPORT** **NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.**	**DOT (U.S.A) (Pictograms)**	

HMIS (U.S.A.)

Health Hazard	1
Fire Hazard	1
Reactivity	0
Personal Protection	B

NFPA (U.S.A.)

Health

Specific hazard

Rating

0 Insignificant
1 Slight
2 Moderate
3 High
4 Extreme

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada) (Europe)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS

The Canadian Controlled Products Regulations (CPR) (Under the Hazardous Products Act, part of the WHMIS legislation) only apply to WHMIS Controlled (i.e., hazardous) products. Therefore, the CPR and the 3-year update rule specified therein do not apply to WHMIS Non-Controlled products. Although this is true, customarily Petro-Canada reviews and updates Non-Controlled product MSDS if a customer requests such an update. These Non-Controlled product updates are given a lower priority than Controlled products but are handled as soon as practicable. If you would like to verify if the MSDS you have is the most current, or you require any further information, please contact:

Internet: www.petro-canada.ca

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: (780) 464-9564

Prepared by Product Safety - JDW on 5/29/2003.

Data entry by Product Safety - JDW.

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Ontario & Central Canada, telephone: 1-800-268-5850 and (905) 822-4222; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 800-201-6285

For Product Safety Information: (905) 804-4752

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we *cannot guarantee that these are the only hazards that exist.*

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	**B-2, D-2A, D-2B**		

Section 1. Chemical Product and Company Identification

Product Name **GASOLINE, UNLEADED**

Code W102E

Validated on **6/9/2004.**

Synonym Regular, Unleaded Gasoline (US Grade), Mid-Grade, Plus, Super, WinterGas, SummerGas, Supreme, SuperClean WinterGas, ~~RegularClean, PlusClean, Premium, marked or dyed gasoline, Super~~ Premium (94 RO)

Manufacturer PETRO-CANADA

P.O. Box 2844
Calgary, Alberta
T2P 3E3

In case of Petro-Canada:

Emergency 403-296-3000
Canutec Transportation:
613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

Material Uses Unleaded gasoline is used in spark ignition engines including motor vehicles, inboard and outboard boat engines, small engines such as chain saws and lawn mowers, and recreational vehicles.

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (V/V)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
Gasoline	8006-61-9	85-100	300 ppm (890 mg/m³)	500 ppm (1480 mg/m³)	Not established
Methyl tert-butyl ether	1634-04-4	0-15	40 ppm (144mg/m³)	Not established	Not established
Note: Petro-Canada does not use MTBE in the manufacturing of its gasoline, however MTBE can be introduced from time to time through the use of external gasoline blendstocks.					

Manufacturer Recommendation Not applicable

Other Exposure Limits Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects Possible cancer hazard. Inhalation of vapours can be irritating to respiratory tract and cause CNS depression with symptoms of nausea, headaches, vomiting, dizziness, fatigue, light-headedness, reduced coordination, unconciousness and possibly death. Skin and eye contact can cause irritation. Toxic if ingested. For more information, refer to Section 11.

Section 4. First Aid Measures

Eye Contact IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention if irritation persists.

Skin Contact Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.

Inhalation Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.

Ingestion DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.

Note to Physician Not available

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Section 5. Fire-fighting Measures

Flammability	Flammable liquid (NFPA).	**Flammable Limits**	Lower: 1.3%; Upper: 7.6% (NFPA).
Flash Points ASTM D56 Standard Tester.	Closed Cup: -50 to -38°C (-58 to -36°F), Test Method for Flash Point by Tag Closed	**Auto-Ignition Temperature**	257°C (495°F) (NFPA).
Fire Hazards in Presence of Various Substances	Extremely flammable in presence of open flames, sparks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. Rapid escape of vapour may generate static charge causing ignition.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire. Vapours may form explosive mixtures with air.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), polynuclear aromatic hydrocarbons, phenols, smoke and irritating vapours as products of incomplete combustion.		
Fire Fighting Media and Instructions	NAERG96, GUIDE 128, flammable/combustible liquid (non-polar/water-immiscible). CAUTION: This product has a very low flash point, use of water spray when fighting fire may be inefficient. SMALL FIRE: Use DRY chemicals, CO2, water spray or foam. LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet.		

If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. DO NOT extinguish a leaking gas flame unless leak can be stopped. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. Avoid flushing spilled material into sewers, streams or other bodies of water. Self-contained breathing apparatus (SCBA) will be required if approaching the fire from downwind, or to enter enclosed areas or buildings.

Section 6. Accidental Release Measures

Material Release or Spill

NAERG96, GUIDE 128, flammable/combustible liquid (non-polar/water-immiscible). Evacuate in a downwind direction for at least 300 meters (1000 feet). ELIMINATE ALL IGNITION SOURCES. Ventilate closed spaces before entering. By forced ventilation, maintain concentration of vapour below the range of explosive mixture. Avoid contact, fully-encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire. Stop leak if without risk. Use vapour suppressing foam or water spray to reduce vapours; it may reduce vapour, but it may not prevent ignition in closed spaces; isolate area until vapour has dispersed. Contain spill. Absorb with inert absorbents such as dry clay, or diatomaceous earth, or recover using electrically grounded explosion-proof pumps. Avoid inhaling dust of diatomaceous earth for it may contain silica (very fine particle size), making this a potential respiratory hazard. Place used absorbent in closed metal containers for later disposal or burn absorbent in a suitable combustion chamber. DO NOT FLUSH TO SEWERS, STREAMS OR OTHER BODIES OF WATER. Check with applicable jurisdiction for specific disposal requirements of spilled material and empty containers. Notify the appropriate authorities immediately.

Section 7. Handling and Storage

Handling

Keep away from heat, spark and other sources of ignition. Empty container may contain flammable/explosive residues or vapours. DO NOT reuse empty containers without commercial cleaning or reconditioning. Ground/bond line and equipment during pumping or transfer to avoid accumulation of static charge. DO NOT USE AS CLEANING FLUID OR SIPHON BY MOUTH. Wear proper protective equipment. Avoid inhalation and contact with skin or eyes. Practice good personal hygiene. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods.

Storage

Store in cool, dry, isolated, well-ventilated area, and away from direct sunlight, sources of ignition and incompatibles. Flammable materials should be stored in a separate safety storage cabinet or room. Ground all equipment containing material.

Section 8. Exposure Controls/Personal Protection

Engineering Controls

For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.

Personal Protection - *The selection of personal protective equipment varies, depending upon conditions of use.*

Eyes Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.

Body Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.

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Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Clear liquid.	**Viscosity**	Not available
Colour	Clear to slightly yellow, undyed liquid. May be dyed red for taxation purposes.	**Pour Point**	Not applicable.
Odour	Gasoline. MTBE has a terpene-like odour.	**Softening Point**	Not applicable.
Odour Threshold	Less than 1 ppm.	**Dropping Point**	Not applicable.
Boiling Point	25 to 220°C (77 to 428°F) Initial boiling point by ASTM D86 Standard Test Method.	**Penetration**	Not applicable.
Density	0.7 kg/L @ 15ºC (59ºF).	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	3 to 4 (Air = 1) (NFPA).	**Ionicity (in water)**	Insoluble in water.
Vapour Pressure	<107 kPa @ 37.8ºC (100ºF)	**Dispersion Properties**	Not available
Volatility	Volatile.	**Solubility**	Hydrocarbon components virtually insoluble in water. Soluble in alcohol, ether, chloroform, and benzene. Dissolves fats, oils and natural resins.

Section 10. Stability and Reactivity

Corrosivity	Non corrosive.		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents, acids.	**Decomposition Products**	May release COx, NOx, phenols, polynuclear aromatic hydrocarbons, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry Skin contact, eye contact, inhalation, and ingestion.

Acute Lethality Gasoline: Acute oral toxicity (LD50): 13 600 mg/kg (rat).
Acute dermal toxicity (LD50): >5000 mg/kg (rabbit).
Acute inhalation toxicity (LC50): >300 000 mg/m³/4h (rat).

MTBE: Acute oral toxicity (LD50): 29630 mg/kg (rat).
Acute dermal toxicity (LD50): >6800 mg/kg (rabbit). Acute inhalation toxicity (LC50): 23 576 ppm/4h (rat).

Chronic or Other Toxic Effec ts

Dermal Route:	This product can cause skin irritation. Prolonged or repeated contact with skin may cause dermatitis.
Inhalation Route:	Inhalation of vapours can be irritating to repiratory tract and cause CNS depression with symptoms of nausea, headaches, vomiting, dizziness, fatigue, light-headedness, reduced coordination, unconciousness and possibly death.
Oral Route:	Swallowing or vomiting of the liquid may result in aspiration into the lungs. Can cause CNS depression. (See Inhalation Route for symptoms).
Eye Irritation/Inflammation:	Can cause irritation to the eyes.
Immunotoxicity:	Not available

Skin Sensitization:	This product is not expected to be a skin sensitizer, based on the available data and the known hazards of the components.
Respiratory Tract Sensitization:	This product is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.
Mutagenic:	This product is not considered to be a mutagen, based on the available data and the known hazards of the components.
Reproductive Toxicity:	This product is not considered to be a reproductive hazard, based on the available data and the known hazards of the components.
Teratogenicity/Embryotoxicity:	This product is not considered to be a teratogen or an embryotoxin, based on the available data and the known hazards of the components.
Carcinogenicity (ACGIH):	ACGIH A3: animal carcinogen. [Gasoline, MTBE]
Carcinogenicity (IARC):	IARC Group 2B: possibly carcinogenic to humans. [Gasoline]
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	Not available
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	Unleaded gasoline caused kidney effects in male rats and liver effects in female mice.

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	Not available		

Section 13. Disposal Considerations

Waste Disposal Preferred waste management priorities are: (1) recycle or reprocess; (2) incineration with energy recovery; (3) disposal at licensed waste disposal facility. Ensure that disposal or reprocessing is in compliance with government requirements and local disposal regulations. Consult your local or regional authorities.

Section 14. Transport Information

TDG Classification	GASOLINE, 3, UN1203, PGII (CL-TDG)	**Special Provisions for Transport**	See Transportation of Dangerous Goods Regulations.

Section 15. Regulatory Information

Other Regulations CEPA: This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List). EPA: All components of this formulation are listed on the US EPA-TSCA Inventory.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR. Please contact Product Safety for more information.

DSD/DPD (Europe)	Not evaluated.	**HCS (U.S.A.)**	CLASS: Contains material which may cause cancer. CLASS: Flammable liquid having a flash point lower than 37.8°C (100°F). CLASS: Irritating substance. CLASS: Target organ effects.
ADR (Europe) **(Pictograms)**	NOT EVALUATED FOR EUROPEAN TRANSPORT NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.	**DOT (U.S.A) (Pictograms)**	

HMIS (U.S.A.)	**Health Hazard**	2*	**NFPA (U.S.A.)**	**Rating**	0 Insignificant
	Fire Hazard	4	**Health** 4 **Fire Hazard**		1 Slight
	Reactivity	0	2 0 **Reactivity**		2 Moderate

	Personal Protection H	Specific hazard	3 High 4 Extreme

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes) DSCL -
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS
Fuels & Solvents:
Western Canada, telephone: 403-296-4158; fax: 403-296-6551
Ontario & Central Canada, telephone: 1-800-668-0220; fax: 1-800-837-1228
Quebec & Eastern Canada, telephone: 514-640-8308; fax: 514-640-8385

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - JDW on 6/9/2004.

Data entry by Product Safety - RS.

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	B-2, D-2A, D-2B		

Section 1. Chemical Product and Company Identification

Product Name FUEL SYSTEM TREATMENT

Code FST

Synonym Not available

Validated on 5/12/2004.

Manufacturer PETRO-CANADA
P.O. Box 2844
Calgary, Alberta
T2P 3E3

In case of Emergency Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

Material Uses A fuel system treatment that cleans fuel systems to improve performance in gasoline engines.

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	CAS #	% (W/W)	TLV-TWA(8 h)	STEL	CEILING
1) Stoddard Solvent	8052-41-3	30-60%	100ppm	Not established	Not established
2) Isopropanol	67-63-0	30-60%	200ppm	400ppm	Not established
3) 1, 2, 4-Trimethylbenzene	95-63-6	0.01-0.1%	Not established	Not established	Not established
4) Xylene (mixed isomers)	1330-20-7	0.01-0.1%	100ppm	150ppm	Not established

Manufacturer Recommendation Not applicable

Other Exposure Limits Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects Flammable liquid. Exercise caution when handling this material. Contact with this product may cause skin irritation. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure, coma and death. May cause teratogenicity/embryotoxicity. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact Quickly and gently blot or brush away chemical. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 5 minutes or until the chemical is removed, while holding the eyelid(s) open. Obtain medical attention immediately.

Skin Contact Quickly and gently, blot or brush away excess chemical. Wash gently and thoroughly with warm water and non-abrasive soap for 5 minutes or until the chemical is removed. Remove contaminated clothing, shoes, and leather goods (e.g. watchbands, belts, etc.). If breathing is stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Immediately transport victim to an emergency care facility.

Inhalation If breathing is stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Immediately transport victim to an emergency care facility.

Ingestion NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Have victim drink 240 to 300 mL (8 to 10 oz.) of water to dilute material in stomach. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. If breathing is stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Immediately transport victim to an emergency care facility.

Note to Physician Not available

Section 5. Fire-fighting Measures

Flammability	Flammable.	**Flammable Limits**	LOWER: 0.9% UPPER: 12%
Flash Points	CLOSED CUP: 13°C (55.4°F) (TCC)	**Auto-Ignition Temperature**	Unknown

Fire Hazards in Presence of Various Substances	Flammable in presence of open flames, sparks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. May accumulate in confined spaces.
Explosion Hazards in Presence of Various Substances	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire. Vapours may form explosive mixtures with air. Sensitive to static discharge.
Products of Combustion	Carbon oxides (CO, CO2), acrid smoke and irritating vapours as products of incomplete combustion.
Fire Fighting Media and Instructions	NAERG2000, GUIDE 128, Flammable liquids (Non-polar/Water-immiscible). CAUTION: This product has a moderate flash point above 40ºC: Use of water spray when fighting fire may be inefficient. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions. SMALL FIRES: Dry chemical, CO2, water spray or regular foam. LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk. Fires Involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Section 6. Accidental Release Measures

Material Release or Spill	Evacuate non-essential personnel. Ventilate area. Ensure clean-up personnel wear appropriate personal protective equipment. If spilled in a confined space, ensure appropriate confined space entry protocols are followed. Extinguish all ignition sources. Stop leak if safe to do so. Avoid breathing vapours or mists of material. Avoid contact with spilled material. Use appropriate inert absorbent material to absorb spilled product. Do not use paper or other flammable materials to absorb product. Collect used absorbent for later disposal. Ground and bond all equipment used to clean up the spilled material, as it may be a static accumulator. Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Do not allow spilled material to enter sewer systems as vapours may accumulate and may cause an explosion/fire hazard. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling	FLAMMABLE MATERIAL. Handle with care. Avoid contact with any sources of ignition, flames, heat, and sparks. Ensure all equipment is grounded/bonded. Avoid contact with any incompatible or reactive materials. Wear proper personal protective equipment (See Section 8). Avoid confined spaces and areas with poor ventilation. Remove severely contaminated clothing. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated. Exercise caution when washing/drying clothing contaminated with flammable materials. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Do not ingest this product. Avoid generating mists. Ensure container is securely closed when not in use. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning.
Storage	Store as flammable material. Store away from heat and sources of ignition. Avoid direct sunlight. Store away from incompatible and reactive materials (See section 5 and 10). Ensure the storage containers are grounded/bonded. Store in a dry, cool and well-ventilated area.

Section 8. Exposure Controls/Personal Protection

Engineering Controls For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Use explosion-proof ventilation equipment. Ensure that eyewash station and safety shower are close to work-station.

Personal Protection ***-The selection of personal protective equipment varies, depending upon conditions of use.***

Eyes	Chemical splash goggles should be worn when handling this material.
Body	If this material may come into contact with the body during handling and use, we recommend wearing appropriate protective clothing to prevent contact with the skin. (Contact your PPE provider for more information).
Respiratory	A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister with particulate filter (R and/or P series) may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator or self contained breathing apparatus if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.
Hands	If this material may come in contact with the hands during handling and use, we recommend wearing gloves of the following material(s): Polyvinyl alcohol (PVA), or Fluoro-elastomer. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Liquid.	**Viscosity**	Not available
Colour	Yellow.	**Pour Point**	Not applicable.
Odour	Alcohol like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	83°C (181.4°F)	**Penetration**	Not applicable.
Density	0.79 @ 15ºC	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	>1	**Ionicity (in water)**	Not available
Vapour Pressure Evaporation rate: <1 (Ether=1)	Not available	**Dispersion Properties**	Not available
Volatility	>95% (VOCs)	**Solubility**	Negligible.

Section 10. Stability and Reactivity

Corrosivity Not available

Stability and storage conditions.	The product is stable under normal handling	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents, peroxides, nitric acid, strong alkalis, strong mineral acids, and oleum.	**Decomposition Products**	May release COx, acrid smoke, and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry Skin contact, eye contact, inhalation and ingestion.

Acute Lethality Acute toxicity information is not available for the product as a whole, therefore, data for the hazardous ingredient is provided below:

Stoddard Solvent (8052-41-3):
Acute Oral toxicity (LD50): >5000 mg/kg (rat)
Acute Dermal toxicity (LD50): >3000 mg/kg (rabbit) Acute Inhalation toxicity (LC50): >1300 ppm/4h (rat)

Isopropanol (67-63-0):
Acute Oral toxicity (LD50): 5000 mg/kg (rat)
Acute Dermal toxicity (LD50): 12,800 mg/kg (rabbit) Acute Inhalation toxicity (LC50): 17,000 ppm/4h (rat)

1, 2, 4-Trimethylbenzene (95-63-6):
Acute Oral toxicity (LD50): 5000 mg/kg (rat)
Acute Inhalation toxicity (LC50): 18,000 mg/m³/4h (rat)

Xylene (mixed isomers) (1330-20-7):
Acute Oral toxicity (LD50): 1590 mg/kg (rat)
Acute Dermal toxicity (LD50): >1,700 mg/kg (rabbit) Acute Inhalation toxicity (LC50): 4785 ppm/4h (mouse)

Chronic or Other Toxic Effects

Dermal Route:	This product contains a component (at >= 1%) that can cause skin irritation. Therefore, this product is considered to be a skin irritant.
Inhalation Route:	Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Frequent or prolonged inhalation of this product may lead to absorption of this product in harmful amounts which may have adverse effects on the: kidneys.
Oral Route:	Ingestion of this product may cause gastro-intestinal irritation. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Ingestion of this product may lead to aspiration of the liquid, especially if vomiting occurs. This may result in chemical pneumonitis (inflammation of the lungs) and/or pulmonary edema (an accumulation of fluid in the lungs).
Eye Irritation/Inflammation:	This product contains a component (at >= 1%) that can cause eye irritation. Therefore, this product is considered to be an eye irritant.
Immunotoxicity:	Not available
Skin Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.

Continued on Next Page

Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.
Mutagenic:	This product is not known to contain any components at >= 0.1% that have been shown to cause mutagenicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a mutagen.
Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	This product contains a component(s) at >= 0.1% that has been shown to cause teratogenicity and/or embryotoxicity in some laboratory tests at non-maternally toxic doses. Therefore, this product is considered to be a teratogen/embryotoxin.
Carcinogenicity (ACGIH):	This product is not known to contain any chemicals at reportable quantities that are listed as Group A1, A2, or A3 carcinogens by ACGIH.
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as Group 1, 2A, or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by IRIS.
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	No additional remark.

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal regulations.

Section 14. Transport Information

TDG Classification	FLAMMABLE LIQUIDS, N.O.S. (Isopropanol), Class 3, UN 1993, PGII (CL-TDG)	**Special Provisions for Transport**	This product may be shipped as a Limited Quantity if the volume is ≤1L and in accordance with the Limited Quantity Provisions, (CL-TDG).

Section 15. Regulatory Information

Other Regulations This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

DSD/DPD (Europe)	Not evaluated.	**HCS (U.S.A.)**	CLASS: Combustible liquid. CLASS: Irritating substance. CLASS: Target organ effects.
ADR (Europe) (Pictograms) **NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.**	**NOT EVALUATED FOR EUROPEAN TRANSPORT**	**DOT (U.S.A) (Pictograms)**	

HMIS (U.S.A.)

Health Hazard	2*
Fire Hazard	3
Reactivity	0
Personal Protection	n, p, u

NFPA (U.S.A.)

Health

Specific hazard

Rating: 0 Insignificant; 1 Slight; 2 Moderate; 3 High; 4 Extreme

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

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NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
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NPRI - National Pollutant Release Inventory
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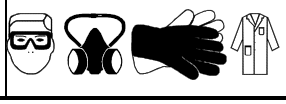
Quebec & Eastern Canada, telephone: 514-640-8308; fax: 514-640-8385

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - TLM on 5/12/2004.

Data entry by Product Safety - RS.

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	B-3, D-2B		

Section 1. Chemical Product and Company Identification

Product Name **DIESEL FUEL**

Code W104, W293
SAP: 120, 121, 122, 287

Validated on **2/6/2004.**

Synonym Diesel 50, Diesel 50 LS, #1 Diesel , #1 Diesel LS, Diesel LC, Seasonal Diesel, Seasonal Diesel LS, Diesel AA, Domestic Marine Diesel, International marine Diesel, Seasonal Diesel Locomotive, Domestic Marine diesel LS, diesel -20°C (LS), LSD, Low Sulphur Diesel, dyed diesel, marked diesel, coloured diesel, Naval Distillate, Ultra Low Sulphur Diesel, ULS Diesel, Mining Diesel, Mining Diesel Special, Mining Diesel Special LS, High Flash Mining Diesel, Furnace Oil, Stove Oil.

Manufacturer PETRO-CANADA
P.O. Box 2844
Calgary, Alberta
T2P 3E3

In case of Emergency Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

Material Uses Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining Diesel has a higher flash point requirement, for safe use in underground mines.

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (V/V)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Diesel oil.	68334-30-5	>99.9	100 mg/m³ (as total hydrocarbons) *	Not established	Not established
2) Proprietary additives.	Not available	<0.1	Not established	Not established	Not established
Aromatic content is 50% maximum (benzene: nil). Sulphur content is 0-0.50%.					

Manufacturer Recommendation * Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer.

Other Exposure Limits Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects Combustible liquid. Exercise caution when handling this material. Contact with this product may cause skin and eye irritation. Prolonged or repeated contact may cause skin irritation, defatting, drying and dermatitis. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.

Skin Contact Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.

Inhalation Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.

Ingestion DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.

Note to Physician Not available

Section 5. Fire-fighting Measures

Flammability	Class II - combustible liquid (NFPA).	**Flammable Limits**	LOWER: 0.7%, UPPER: 6% (NFPA)
Flash Points	Diesel Fuel: Closed Cup: >40ºC (>104ºF) Marine Diesel Fuel: Closed Cup: >60ºC (>140ºF) Mining Diesel: Closed Cup: 52ºC (126ºF)	**Auto-Ignition Temperature**	225ºC (437ºF)
Fire Hazards in Presence of Various Substances	Flammable in presence of open flames, sparks, or heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite. May accumulate in confined spaces.	**Explosion Hazards in Presence of Various Substances**	Containers may explode in heat of fire. Do not cut, weld, heat, drill or pressurize empty container. Vapour explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard.

Products of Combustion Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), water vapour (H2O), smoke and irritating vapours as products of incomplete combustion.
See Section 11 (Other Considerations) for information regarding the toxicity of the combustion products.

Fire Fighting Media and Instructions NAERG96, GUIDE 128, Flammable liquids (Non-polar/Water-immiscible).
CAUTION: This product has a moderate flash point above 40ºC: Use of water spray when fighting fire may be inefficient.
If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also consider initial evacuation for 800 meters (1/2 mile) in all directions.

SMALL FIRES: Dry chemical, CO2, water spray or regular foam.
LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk.
Fires Involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.

Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Section 6. Accidental Release Measures

Material Release or Spill Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. IN THE EVENT OF A LARGE SPILL CONSIDER THE FOLLOWING CONTROL MEASURES: Extinguish all ignition sources. Stop leak if safe to do so. Ventilate area. Dike spilled material. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Avoid contact with spilled material. Avoid breathing vapours or mists of material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Evacuate non-essential personnel. Ensure clean-up personnel wear appropriate personal protective equipment. Ground and bond all equipment used to clean up the spilled material, as it may be a static accumulator. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling COMBUSTIBLE MATERIAL. Handle with care. Avoid contact with any sources of ignition, flames, heat, and sparks. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated. Avoid confined spaces and areas with poor ventilation. Ensure all equipment is grounded/bonded. Wear proper personal protective equipment (See Section 8).

Storage Store away from heat and sources of ignition. Store in dry, cool, well-ventilated area. Store away from incompatible and reactive materials (See section 5 and 10). Ensure the storage containers are grounded/bonded.

Section 8. Exposure Controls/Personal Protection

Engineering Controls For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.

Personal Protection ***-The selection of personal protective equipment varies, depending upon conditions of use.***

Eyes Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.

Body Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.

Respiratory Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.

Hands Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.

Feet Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Bright oily liquid.	**Viscosity**	1.3 - 4.1 cSt @ 40ºC (104ºF)
Colour	Clear to yellow / brown (may be dyed for taxation purposes).	**Pour Point**	Variable, -50ºC to 0ºC (-58ºF to -32ºF)
Odour	Petroleum oil like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	150 - 371ºC (302-700ºF)	**Penetration**	Not applicable.
Density	0.80 - 0.85 kg/L @ 15ºC (59ºF)	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	4.5 (Air = 1)	**Ionicity (in water)**	Not applicable.
Vapour Pressure	Not available	**Dispersion Properties**	Not available
Volatility	Semivolatile to volatile.	**Solubility**	Insoluble in cold water, soluble in non-polar hydrocarbon solvents.

Section 10. Stability and Reactivity

Corrosivity	Not available		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents and acids.	**Decomposition Products**	May release COx, NOx, SOx, H2S, H2O, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation, and ingestion.
Acute Lethality	Acute oral toxicity (LD50): 7500 mg/kg (rat).
Chronic or Other Toxic Effects	
Dermal Route:	This product contains a component (at >= 1%) that can cause skin irritation. Therefore, this product is considered to be a skin irritant. Prolonged or repeated contact may defat and dry skin, and cause dermatitis. (See Other Considerations)
Inhalation Route:	Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Oral Route:	Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Eye Irritation/Inflammation:	This product contains a component (at >= 1%) that can cause eye irritation. Therefore, this product is considered to be an eye irritant.
Immunotoxicity: Skin	Not available
Sensitization:	Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.
Respiratory Tract Sensitization:	Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.
Mutagenic:	This product is not known to contain any components at >= 0.1% that have been shown to cause mutagenicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a mutagen.
Reproductive Toxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause reproductive toxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a reproductive toxin.
Teratogenicity/Embryotoxicity:	This product is not known to contain any components at >= 0.1% that have been shown to cause teratogenicity and/or embryotoxicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a teratogen/embryotoxin.
Carcinogenicity (ACGIH):	ACGIH A3: animal carcinogen. [Diesel oil] (See Other Considerations)
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as Group 1, 2A, or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by IRIS.

Continued on Next Page

Carcinogenicity (OSHA): This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.

Other Considerations Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer.

Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal regulations.

Section 14. Transport Information

TDG Classification	DIESEL FUEL, 3, UN1202, PGIII (CL-TDG)	**Special Provisions for Transport**	See Transportation of Dangerous Goods Regulations.

Section 15. Regulatory Information

Other Regulations This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS). This product has been

classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

DSD/DPD (Europe)	Not evaluated.	**HCS (U.S.A.)**	CLASS: Irritating substance. CLASS: Target organ effects. CLASS: Combustible liquid having a flash point between 37.8°C (100°F) and 93.3°C (200°F).
ADR (Europe) (Pictograms)	**NOT EVALUATED FOR EUROPEAN TRANSPORT** **NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.**	**DOT (U.S.A) (Pictograms)**	

HMIS (U.S.A.)		**NFPA (U.S.A.)**		**Rating**	
Health Hazard	2*	**Health**		0	Insignificant
Fire Hazard	2			1	Slight
Reactivity	0	**Specific hazard**		2	Moderate
Personal Protection	H			3	High
				4	Extreme

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
IRIS - Integrated Risk Information System LD50/LC50 - Lethal Dose/Concentration kill 50% LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)

DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS
Internet: www.petro-canada.ca/msds

Western Canada, Ontario & Central Canada, telephone: 1-800-668-0220; fax: 1-800-837-1228
Quebec & Eastern Canada, telephone: 514-640-8308; fax: 514-640-8385

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - JDW on 2/6/2004. Data entry by Product Safety - JDW.

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	Not controlled		

Section 1. Chemical Product and Company Identification

Product Name **CHAIN OIL (SUMMER, WINTER)**

Code CHAS, 490-431
CHAW, 490-430

Validated on **5/6/2003.**

Synonym Not available

Manufacturer PETRO-CANADA
P.O. Box 2844
Calgary, Alberta
T2P 3E3

In case of Emergency Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

Material Uses These products are designed for lubrication of chain saw chains in both high and low ambient temperatures.

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (V/V)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Mixture of severely hydrotreated and hydrocracked and/or solvent-refined base oil (petroleum) and other proprietary, non-hazardous additives.	Mixture	100	5 mg/m³ (oil mist)	10 mg/m³ (oil mist)	Not established

Manufacturer Recommendation Not applicable

Other Exposure Limits Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects Non irritating to slight transient irritation to skin and eyes, but no permanent damage. Relatively non-toxic via ingestion. This product has a low vapour pressure and is not expected to present an inhalation exposure at ambient conditions. Upon heating to high temperatures, or mechanical actions which may produce vapours or mists, inhalation of product may cause irritation of the breathing passages. For more information, refer to Section 11.

Section 4. First Aid Measures

Eye Contact IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.

Skin Contact Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.

Inhalation Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.

Ingestion DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.

Note to Physician Not available

Section 5. Fire-fighting Measures

Flammability	May be combustible at high temperature.	**Flammable Limits**	Not available
Flash Points	OPEN CUP: ≥168°C (334.4°F) (Cleveland)	**Auto-Ignition Temperature**	Not available
Fire Hazards in Presence of Various Substances	Low fire hazard. This material must be heated before ignition will occur.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container. Containers may explode in heat of fire.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), phosphorus compounds (POx), smoke and irritating vapours as products of incomplete combustion.		

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Available in French

Fire Fighting Media and Instructions	NAERG96, GUIDE 171, Substances (low to moderate hazard). If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (0.5 mile) in all directions; also, consider initial evacuation for 800 meters (0.5 mile) in all directions. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build-up, autoignition or explosion. SMALL FIRE: use DRY chemicals, foam, water spray or CO2. LARGE FIRE: use water spray, fog or foam. For small outdoor fires, portable fire extinguishers may be used, and self contained breathing apparatus (SCBA) may not be required. For all indoor fires and any significant outdoor fires, SCBA is required. Respiratory and eye protection are required for fire fighting personnel.

Section 6. Accidental Release Measures

Material Release or Spill	Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Extinguish all ignition sources. Stop leak if safe to do so. Dike spilled material. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Avoid contact with spilled material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling	Avoid contact with any sources of ignition, flames, heat, and sparks. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated.
Storage	Store in dry, cool, well-ventilated area. Keep container tightly closed. Store away from incompatible and reactive materials (See section 5 and 10).

Section 8. Exposure Controls/Personal Protection

Engineering Controls For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.

Personal Protection ***-The selection of personal protective equipment varies, depending upon conditions of use.***

Eyes	Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Stringy liquid.	**Viscosity**	CHAS: 155 cSt @ 40ºC (104ºF), 16.2 cSt @ 100ºC (212ºF), VI=109 CHAW: 32 @ 40ºC (104ºF), 6.29 cSt @ 100ºC (212ºF), VI=151
Colour	Dark red.	**Pour Point**	CHAS: -21ºC (-6ºF) CHAW: -42ºC (-44ºF)
Odour	Slight petroleum oil like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	Not available	**Penetration**	Not applicable.
Density	0.831 - 0.88 kg/L @ 15°C (59°F).	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	Not available	**Ionicity (in water)**	Not available
Vapour Pressure	Negligible at ambient temperature and pressure.	**Dispersion Properties**	Not available
Volatility	Non-volatile.	**Solubility**	Insoluble in water.

Continued on Next Page *Available in French*

Section 10. Stability and Reactivity

Corrosivity	Copper corrosion, 3h, 100°C (ASTM D0130): 1a		
Stability and storage conditions.	The product is stable under normal handling	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents, reducing agents and acids.	**Decomposition Products** decomposition.	May release COx, NOx, SOx, H2S, POx, smoke and irritating vapours when heated to

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation and ingestion.
Acute Lethality	Not available
Chronic or Other Toxic Effects	
Dermal Route:	Prolonged or repeated contact may cause skin irritation characterized by dermatitis or oil acne.
Inhalation Route:	Negligible breathing hazard at normal temperatures (up to 38°C) or recommended blending temperatures. Elevated temperatures or mechanical action may form vapours, mists or fumes. Inhalation of oil mists or vapours from hot oil may cause irritation of the upper respiratory tract.
Oral Route:	Low toxicity; has laxative effect.
Eye Irritation/Inflammation:	Repeated or prolonged contact may cause transient irritation, but no permanent damage.
Immunotoxicity:	Not available
Skin Sensitization:	This product is not expected to be a skin sensitizer, based on the available data and the known hazards of the components.
Respiratory Tract Sensitization:	This product is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.
Mutagenic:	This product is not expected to be a mutagen, based on the available data and the known hazards of the components.
Reproductive Toxicity:	This product is not expected to be a reproductive hazard, based on the available data and the known hazards of the components.
Teratogenicity/Embryotoxicity:	This product is not expected to be a teratogen or an embryotoxin, based on the available data and the known hazards of the components.
Carcinogenicity (ACGIH):	This product is not known to contain any chemicals at reportable quantities that are listed as A1 or A2 carcinogens by ACGIH.
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as group 1, 2A or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	Not available
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	No additional remark

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal regulations.

Continued on Next Page

Section 14. Transport Information

TDG Classification	Not controlled under TDG (Canada).	**Special Provisions for Transport**	Not applicable.

Section 15. Regulatory Information

Other Regulations This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory. All components of this

formulation are listed on EINECS or are exempt.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

DSD/DPD (Europe)	Not classified under the Dangerous Substances or Dangerous Preparations Directives.	**HCS (U.S.A.)**	Not controlled under the HCS (United States).
ADR (Europe) (Pictograms)		**DOT (U.S.A) (Pictograms)**	

HMIS (U.S.A.)

Health Hazard	1
Fire Hazard	1
Reactivity	0
Personal Protection	B

NFPA (U.S.A.)

Health

Specific hazard

Rating

0 Insignificant
1 Slight
2 Moderate
3 High
4 Extreme

Section 16. Other Information

References Available upon request.

* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives

DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada) (Europe)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS
Internet: www.petro-canada.ca

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: (780) 464-9564
Ontario & Central Canada, telephone: 1-800-268-5850 and (905) 822-4222; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 800-201-6285

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - JDW on 5/6/2003.

Data entry by Product Safety - JDW.

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PETRO-CANADA

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
CD	D-2A, D-28	8—	@

Section 1. Chemical Product and Company Identification

Product Name **ANTIFREEZE**

Code W269

Validated on 7/6/2004.

Synonym Universal Antifreeze, Radiator Antifreeze, Diesel Antifreeze, Petro-Canada Antifreeze-Coolant, Petro-Canada Heavy Duty Antifreeze-Coolant, Pre-Mix Antifreeze, Petro-Canada Premium Radiator Antifreeze, Diesel Engine Coolant.

Manufacturer PETRO-CANADA
P.O. Box 2844
Calgary, Alberta
T2P 3E3
Emergency403-296-3000

In case of Petro-Canada:

Canutec Transportation:
613-996-6666
Poison Control Centre:
Consult local telephone

Material Uses Used as an engine antifreeze coolant.

directory for emergency number(s).

Section 2. Composition and Information on Ingredients

			Exposure Limits "ACGIH		
Name	CAS#	%(W/W)	TLV-TWA(8 h)	STEL	CEILING
Ethylene glycol	107-21-1	::_90	Not established	Not established	100 mg/m³ (aerosol)
Sodium tetraborate pentahydrate (Diesel Engine Coolant only)	12179-04-3	::_5	1 mg/m³	Not established	Not established

Manufacturer Recommendation: Not applicable

other Exposure Limits: Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects: Contact with this product may cause eye irritation. Not expected to cause more than slight skin irritation. Inhalation of this product may cause respiratory tract irritation. Ingestion may be extremely hazardous.May cause teratogenicity/embryotoxicity. May cause damage to reproductive organs. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact: IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.

Skin Contact: Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.

Inhalation: Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.

Ingestion: DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.

Note to Physician: Not available

Section 5. Fire-fighting Measures

Flammability: May be combustible at high temperature.	Flammable Limits: Lower: 3.2%, Upper: 15.3%
Flash Points: Closed Cup: 116°C (241°F) (Tagliabue) Open Cup: 116°C (241°F) (Cleveland)	Auto-Ignition Temperature: 413°C (775°F)

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Fire Hazards in Presence of Various Substances	Low fire hazard. This material must be heated before ignition will occur.	**Explosion Hazards in Presence of Various Substances**	Do not cut, weld, heat, drill or pressurize empty container.
Products of Combustion	Carbon oxides (CO, C02), smoke and irritating vapours as products of incomplete combustion.		
Fire Fighting Media and Instructions	NAERG96, GUIDE 171, Substances (low to moderate hazard). If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (0.5 mile) in all directions; also, consider initial evacuation for 800 meters (0.5 mile) in all directions. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from area and let fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire. Cool containing vessels with water spray in order to prevent pressure build up, autoignition or explosion. SMALL FIRE: use DRY chemicals, foam, water spray or C02. LARGE FIRE: use water spray, fog o foam. For small outdoor fires, portable fire extinguishers may be used, and self contained breathing apparatus (SCBA) may not be required. For all indoor fires and any significant outdoor fires, SCBA is required. Respiratory and eye protection are required fo fire fighting personnel.		

Section 6. Accidental Release Measures

Material Release or Spill IN THE EVENT OF A LARGE SPILL CONSIDER THE FOLLOWING CONTROL MEASURES: Consult current National Emergency Response Guide Book (NAERG) for appropriate spill measures if necessary. Extinguish all ignition sources. Stop leak if safe to do so. Dike spilled material. Use appropriate inert absorbent material to absorb spilled product. Collect used absorbent for later disposal. Ventilate area. Ensure clean-up personnel wear appropriate personal protective equipment. Avoid breathing vapours or mists of material. Avoid contact with spilled material. Avoid contaminating sewers, streams, rivers and other water courses with spilled material. Notify appropriate authorities immediately.

Section 7. Handling and Storage

Handling Avoid contact with any sources of ignition, flames, heat, and sparks. Avoid confined spaces and areas with poor ventilation. Avoid skin contact. Avoid eye contact. Avoid inhalation of product vapours or mists. Do not ingest this product. Wear proper personal protective equipment (See Section 8). Empty containers may contain product residue. Do not pressurize, cut, heat, or weld empty containers. Do not reuse containers without commercial cleaning and/or reconditioning. Personnel who handle this material should practice good personal hygiene during and after handling to help prevent accidental ingestion of this product. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated.

Storage Store in dry, cool, well-ventilated area. Store away from heat and sources of ignition. Keep container tightly closed. Store away from incompatible and reactive materials (See section 5 and 10).

Section 8. Exposure Controls/Personal Protection

Engineering Controls For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.

Personal Protection- ***The selection of personal protective equipment varies, depending upon conditions of use.***

Eyes	Chemical splash goggles should be worn when handling this material.
Body	If this material may come into contact with the body during handling and use, we recommend wearing appropriate protective clothing to prevent contact with the skin. (Contact your PPE provider for more information).
Respiratory	A minimum of NIOSH-approved air-purifying respirator with a organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.
Hands	If this material may come in contact with the hands during handling and use, we recommend wearing gloves of the following material(s): Neoprene, Polyvinyl chloride (PVC). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Clear viscous liquid.	**Viscosity**	Not available
Colour	Green.	**Pour Point**	Not available
Odour	Odourless.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	129 to 19JDC (264 to 38JDF)	**Penetration**	Not applicable.
Density	1.115 to 1.145 (Water = 1)	**Oil/ Water Dist. Coefficient**	Not available
Vapour Density	2.1 (Air=1).	**Ionicity (in water)**	Not available
Vapour Pressure	0.06 mmHg @ 20oc (68°F).	**Dispersion Properties**	Not available
Volatility	0% (w/w)	**Solubility**	Soluble in water, methanol and diethyl ether.

Section 10. Stability and Reactivity

Corrosivity Not available

Stability	The product is stable.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents, acids, alkalis, perchloric acid, phosphorus, silvered copper wires carrying DC current, aliphatic amines, isocyantes, chlorosulfonic acid and oluem.	**Decomposition Products**	May release COx, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry Skin contact, eye contact, inhalation and ingestion.

Acute Lethality Ethylene glycol (107-21-1):
LD50: 4700 mg/kg (oral/rat).
LD50: 9530 mg/kg (dermal/rabbit).

Sodium tetraborate 12entahydrate (12179-04-3):
LD50: 3200-3500 mg/kg (oral/rat) (Boric acid). [Sodium tetraborate pentahydrate]

Chronic or other Toxic Effects

Dermal Route: Short-term exposure is expected to cause only slight irritation, if any.

Inhalation Route: Inhalation of this product may cause respiratory tract irritation.

Oral Route: Extremely dangerous in case of ingestion.

Eye Irritation/Inflammation: This product contains a component (at>= 1%) that can cause eye irritation. Therefore, this product is considered to be an eye irritant.

Immunotoxicity: Not available

Skin Sensitization: Contact with this product is not expected to cause skin sensitization, based upon the available data and the known hazards of the components.

Respiratory Tract Sensitization: Contact with this product is not expected to cause respiratory tract sensitization, based upon the available data and the known hazards of the components.

Mutagenic: This product is not known to contain any components at >= 0.1% that have been shown to cause mutagenicity. Therefore, based upon the available data and the known hazards of the components, this product is not expected to be a mutagen.

Reproductive Toxicity: Berates are possible reproductive toxins based upon available animal ingestion studies in several species. These studies usually involved high doses, over prolonged periods of time. A human study following occupational exposure to borate by inhalation concluded that, no adverse effects to reproduction were found in this population, under the conditions of this study.

Teratogenicity/Embryotoxicity: This product contains a component(s) at>= 0.1% that has been shown to cause teratogenicity and/or embryotoxicity in laboratory tests. Therefore, this product is considered to be a teratogen/embryotoxin (Ethylene glycol).

Carcinogenicity (ACGIH):	ACGIH A4: not classifiable as a human carcinogen (Ethylene glycol). This product is not known to contain any chemicals at reportable quantities that are listed as Group A1, A2, or A3 carcinogens by ACGIH.
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as Group 1, 2A, or 28 carcinoQens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by IRIS.
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA
other Considerations	The substance may be toxic to kidneys and liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 12. Ecological Information

Environmental Fate	Not available	Persistance/ Bioaccumulation Potential	Not available
BOD5and COD	Not available	Products of Biodegradation	Not available
Additional Remarks	No additional remark.		

Section 13. Disposal Considerations

Waste Disposal Spent/ used/ waste product may meet the requirements of a hazardous waste. Consult your local or regional authorities. Ensure that waste management processes are in compliance with government requirements and local disposal reQulations.

Section 14. Transport Information

TDG Classification for Transport (Canada)	Not a hazardous material for transport according to the TOG Regulations.	Special Provisions	Not applicable.

Section 15. Regulatory Information

other Regulations: All of the components of this product are on the Domestic Substances List (DSL), are considered to be on the DSL, or are exempt from the New Substance Notification (NSN) requirements.

All components of this formulation are listed on the US EPA-TSCA Inventory.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Please contact Product Safety for more information.

DSD/DPD (Europe)	Not evaluated.	HCS (U.S.A.)	CLASS: Target organ effects. CLASS: Irritating substance.
ADR (Europe) (Pictograms)	NOT EVALUATED FOR EUROPEAN TRANSPORT NON EVALUE POUR LE TRANSPORT EUROPEEN	DOT (U.S.A) (Pictograms)	

HMIS (U.S.A.)		NFPA (U.S.A.)		Rating	0 Insignificant
	Health Hazard 2*				1 Slight
Fire Hazard	1	Health			2 Moderate
Reactivity	0		Specific hazard		3 High
Personal Protection	H				4 Extreme

Continued on Next Page

Section 16. Other Information

References Available upon request.
*Marque de commerce de Petro-Canada- Trademark

Glossary

ACGIH- American Conference of Governmental Industrial Hygienists
ADR- Agreement on Dangerous goods by Road (Europe)
ASTM- American Society for Testing and Materials
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP- Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT- Department of Transport
DSCL- Dangerous Substances Classification and Labeling (Europe) - Dangerous Substances or Dangerous Preparations Directives
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS- European Inventory of Existing Commercial Chemical Substance:
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA- Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System HMIS- Hazardous Material Information System IARC- International Agency for Research on Cancer
IRIS- Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH- National Institute for Occupational Safety & Health
NPRI -National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP- National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SO - Single Dose
STEL- Short Term Exposure Limit (15 minutes) DSD/DPD
TOG - Transportation Dangerous Goods (Canada) (Europe)
TDLo/TCLo- Lowest Published Toxic Dose/Concentration
TLm- Median Tolerance Limit
TLV-TWA- Threshold Limit Value-Time Weighted Average
TSCA- Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS- Workplace Hazardous Material Information System

For Copy of MSDS
Internet: www.petro-canada.ca/msds

Fuels & Solvents:
Western Canada, Ontario & Central Canada, telephone: 1-800-668-0220; fax: 1-800-837-1228
Quebec & Eastern Canada, telephone: 514-640-8308; fax: 514-640-8385

For Product Safety Information: (905) 804-4752

Prepared by Product Safety- **TLM** on 7/6/2004.

Data entry by Product Safety- RS.

Poly-Drill Drilling Systems
1824 - 104 Avenue S.W.
Calgary, Alberta, Canada T2W-OA8 (403) 259-5112 FAX (403) 255-7185 email: polydril@telus.net
www.poly-drill.com

poly-drill.com

MATERIAL SAFETY DATA SHEET/FICHE SIGNALETIQUE

1. PRODUCT IDENTIFICATION

PRODUCT TRADE NAME(S): Poly Drill O.B.X.
WHMIS CLASSIFICATION: Non-regulated
TDG Classification: Non dangerous goods DATE:
January 17, 2004

A liquid polymer containing guar gum, mineral oil, vegetable oil, acrylamide copolymer and a surfactant: Evaluation of the ingredient(s) has found no ingredient(s) hazardous as per WHMIS regulations.

2. PHYSICAL DATA

Boiling Point: Not available
Specific Gravity: 0.9 g/cm
Solubility in Water: disperses in water(forms viscous, slippery solution).
pH: 3.8 (1% concentration)
Density (g/ml): Not available
Physical State: Liquid
Appearance and Odor: Brown. Odor slight.

3. FIRE AND EXPLOSION DATA

Flash Point (method used): (PMCC) greater than 100 C. Conditions of flammability: Very low risk.
Hazardous combustion products: None known. Upper and Lower flammable limits: Not available.
Extinguishing media: Carbon dioxide, dry chemicals, foam, in preference to water spray

4. REACTIVITY

Chemical stability: Stable under normal conditions. Hazardous Polymerization: Will not occur.
Incompatible substances: Avoid strong oxidants such as liquid chlorine, concentrated oxygen, sodium or calcium hypo chloride.
Hazardous decomposition products: None known

5. HEALTH HAZARD DATA

TOXICITY RATING: Practically non-harmful. Routes of Exposure and Effects:

SKIN: Slight irritant: prolonged contact may cause skin irritation or dermatitis in some individuals
EYE: No effects of exposure expected with the exception of possible irritation.
INHALATION: Due to low volatility of mineral distillates a small inhalation hazard exists.

INGESTION: can cause nausea, vomiting, cramps, diarrhea
Chronic exposure limits: None
Sensitization of product: Not suspected to be a sensitizer.
Teratongenicity: Not available.
Mutagenicity: Not available.
Carcinogenicity: None of the components of this product are listed as carcinogens by IARC and ACGIH

6. EMERGENCY AND FIRST AID PROCEDURES

SKIN: Wash exposed area with soap and water. Remove contaminated clothing. Launder contaminated clothing before re-use. If irritation or abnormalities persist, call a physician.

EYE: Immediately flush eyes with water for 15 minutes, lifting upper and lower lids occasionally. Get medical attention.

INHALATION: Remove to fresh air. If breathing becomes difficult, give oxygen and call a physician.

INGESTION: Do not induce vomiting: Call a physician immediately or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.

8. INDUSTRIAL HYGIENE CONTROL MEASURES

Respiratory Protection: None normally required.
Ventilation: If mist and/or vapors are present, use air purifying respirator of self-contained breathing apparatus, but this is rarely required.
Eye Protection: Safety glasses, if personally preferred
Gloves: Generally not necessary. Personal preference.

7. HANDLING AND USE PRECTIONS

Storage requirements: keep container closed when no in use. Store in a cool dry location away from oxidizing and reducing agents.
Waste Disposal: product should be disposed of in accordance with applicable local, Provincial and Federal regulations.
Steps must be taken if product is released or spilled: clean spill areas thoroughly to avoid hazardous slippery conditions.

8. TOXICOLOGICAL PROPERTIES

G50 Microtox Analysis prepared by HydroQual Laboratories, Calgary, AB--97/6/26 Test#970978:

Test Description	EC20	EC50	Pass/Fail
MTX	>91	>91	PASS

9. DEPARTMENT OF TRANSPORTATION INFORMATION

Shipping Name: Liquid Drilling Additive
Hazard Class: Not hazardous Hazardous
Substances: None Cautionary Labeling:
None required

SECTION I-MATERIAL IDENTIFICATION AND USE

Material Name/Identifier:	**Supreme Fuel Injector G.L.A.F. & Conditioner**	Stock No.	409/412/414/415/418
Manufacturer's Name:	Kleen-Flo Tumbler Industries Ltd	Street Address:	75 Advance Blvd.
City:	Brampton	Province:	Ontario
Postal Code:	L6T 4N1	Emergency Phone #:	(905) 793-4311
Chemical Name:	N/A (mixture)	Chemical Family:	Blend of aliphatic alcohol
Chemical Formula:	N/A	Trade Names & Synonyms:	& aromatic hydrocarbons
Material Use:	Solvent/Cleaner	Molecular Weight:	N/A

SECTION II-HAZARDOUS INGREDIENTS OF MATERIAL

Hazardous Ingredients	C.A.S.	Approximate Concentration	LD50 Species & Route	LC50 Species & Route
2-propanol	67-63-0	60-90%	4.72 g/kg rat-oral	>12000 ppm (8hr) rat-inh.
xylene	1330-20-7	10-30%	4300 mg/kg rabbit-derma	> 6700 ppm (4hr) rat-inh.
ethyl benzene	100-41-4	1-5%	3.5 g/kg rat-oral	N/A

SECTION III-PHYSICAL DATA FOR MATERIAL

Physical State:	Liquid	Odour/Appearance:	Alcohol odour; clear, red liquid
Specific Gravity:	0.8 @15ºC	Odour Threshold(p.p.m.):	N/A
Boiling Point:	82-137ºC	Evaporation Rate:	N/A
Freezing Point:	N/A	Solubility in Water:	40%
% Volatile(by volume):	100%	Vapour Pressure(mm)Hg:	4.4 kPa @ 20ºC
Vapour Density(Air=1):	2.2	Coefficient of Water/Oil Distribut:	N/E
pH	N.Ap.		

SECTION IV-FIRE AND EXPLOSION HAZARD OF MATERIAL

Flammability Yes/No	Yes	If yes under which conditions:	heat, open flame and sparks
Auto Ignition Temperature:	N/A	Means of Extinction:	carbon dioxide, alcohol foam
Flashpoint and Method:	11ºC TCC	Carbon dioxide or dry chemical for small fires.	
		Hazardous Combustion Products:carbon monoxide and carbon dioxide	
Upper Flammable limit		Lower Flammable Limit(% by volume):	2%
(% by volume):	12%		
Explosion Data:	Sensitivity ot mechanical impact: Yes	Sensitivity to Static Discharge: Electrical & mechanical	
		equipment should be explosion proof.	

SECTION V-REACTIVITY DATA

Chemical Stability Yes/No:	Yes	If NO under which conditions?	N.Ap.
Incompatibility to Other Substances Yes/No:	Yes	If so which ones? strong oxidizing compounds. May react	
		with aluminum at high temperature.	
Reactivity and under what conditions?	Normally stable, but can become unstable at elevated temperatures & pressure		
Hazardous Decomposition Products:	Carbon monoxide, carbon dioxide produced upon combustion.		

N/E: not established N.Ap.: not applicable N/A: not available

SECTION VI-TOXICOLOGICAL PROPERTIES OF PRODUCT

Route of Entry: ALL Routes	--SKIN CONTACT --SKIN ABSORPTION --EYE CONTACT --INHALATION --INGESTION		
Effects of Acute Exposure:	Slight eye irritation. May cause headache, dizziness, nausea, drowsiness and central nervous system depression.		
Effects of Chronic Exposure:	High exposure to dimethylbenzene in some animal studies have been reported to cause health effects on developing		
	embryo/fetus. Their effects were often at levels toxic to the mother. The significance of these findings		
to humans has not been determined.			
LD 50 of Product:	5840 mg.kg rat-oral	LC 50 of Product:	> 12000 ppm (8hr) rat
Irritancy of Product:	Skin and eye irritant	Exposure Limits of Product:	400 ppm- I.P.A.
Sensitization of Product:	N/A	2-propanol- 100 ppm, xylene- 100 ppm	
		Toxicologically Synergistic Materials:	N/A
--CARCINOGENICITY --REPRODUCTIVE EFFECTS --TERATOGENICITY --MUTAGENICITY			none known

SECTION VII-PREVENTIVE MEASURES

Personal Protective Equipment to be used:

Gloves(specify):	Nitrile, Viton, Polyethylene	Eye(specify):	Chemical safety glasses
Respiratory(specify):	Organic canister mask	Clothing:	Not required
Respiratory Protection:	If used indoors or on a continuous basis, use of cartridge type respirator is recommended		
Engineering Controls:	To maintain TLV; electrical and mechanical equipment should b spark proof.		
Leak and Spill Procedure:	Dry and contain spill. Soak residue with natural absorbent.		
Waste Disposal:	Incinerate or dispose of at an approved waste disposal facility.		
Storage Requirements:	Keep in a cool place.		
Handling Procedures and	Handle with care. Keep away from children. Do not inhale or ingest.		
Equipment:			
TDG Classification:	#409 & 412: Consumer commodity		
	#414 & 415 & 418: Flammable liquids, N.O.S.(2-propanol solution), Class 3, UN1993,Pkg. Grp. II		
WHMIS Classification:	Consumer Commodity #409/412; Class B2, D2B & D2A for #414, 415 &418		
Domestic substance list:	All components of this product are either on the DSL or exempt.		

SECTION VIII-FIRST AID MEASURES

Eye:	Wash with water for at least 15 minutes.
Skin:	Wash with soap and water.
Inhalation:	Move patient to fresh air and restore breathing if required. Call a physician.
Ingestion:	Contains petroleum distillate. Do NOT induce vomiting. Guard against aspiration. Seek medical help.

SECTION IX-PREPARATION DATE OF M.S.D.S.

Additional Info/Comments:		Sources Used: NOISH Registry of Toxic Effects of Chemical Su	b
Phone Number:	(905) 793-4311	Prepared By: Quality Control Laboratory	
Date:	March 3, 2003	Kleen-Flo Tumbler Industries Limited	

THIS SHEET SUPERSEDES ANY OTHER M.S.D.S. PREVIOUSLY PREPARED

N/A: not available N/E: not established

Poly-Drill Drilling Systems
1824 - 104 Avenue S.W.
Calgary, Alberta, Canada T2W-OA8 (403) 259-5112 FAX (403) 255-7185 email: polydril@telus.net
www.poly-drill.com

poly-drill.com

MATERIAL SAFETY DATA SHEET/FICHE SIGNALETIQUE

1. PRODUCT IDENTIFICATION

PRODUCT TRADE NAME: Poly-Drill 133-X
PRODUCT DESCRIPTION: LIQUID ANIONIC POLYMER
CHEMICAL DESCRIPTION: Polymer, Surfactant(s), Water, Hydrocarbon solvent
UPDATED: March 15, 2004

NFPA704M/HMIS RATING

HEALTH:	FLAMMABILITY:	REACTIVITY:	OTHER:
0/1	1/1	0/0	

0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme

2. COMPOSITION

A liquid polymer: Evaluation of the ingredient(s) has found no ingredient(s) hazardous as per WHMIS regulations. None of the substances in this product are hazardous.

3. PHYSICAL DATA

Flash Point: >100°C (PMCC)
Specific Gravity (@ 25°C.): 1.08
Solubility in Water: Emulsifiable
pH: 8.1 (1.0% solution)
Freeze Point: -10 °C (14 Degrees F)
Density (g/ml): 1.08 at 25 °C
Physical State: Liquid
Appearance: Blue liquid Odor: Hydrocarbon

Note: These physical properties are typical values for this product.

4. FIRE AND EXPLOSION DATA

INCOMPATIBILITY: Avoid contact with strong oxidizers (eg. Chlorine, peroxides, chromates, nitric acid, perchlorates, concentrated oxygen, permanganates) which can generate heat, fires, explosions and the release of toxic fumes.

THERMAL DECOMPOSTION PRODUCTS: In the event of combustion CO, oxides of carbon (COx), oxides of nitrogen (NOx) may be formed. Do not breathe smoke or fumes. Wear suitable protective equipment.

5. FIRE FIGHTING MEASURES

FLASH POINT: >100°C (PMCC)

EXTINGUISHING MEDIA: Based on the NFPA guide, use dry chemical, foam, carbon dioxide or other extinguishing agent suitable for Class B fires. Use water to cool containers exposed to fire. For larger fires, use water spray or fog, thoroughly drenching the burning material.

UNSUITABLE EXTINGUISHING MEDIA:
Do not use water unless flooding amounts are available.

UNUSUAL FIRE AND EXPLOSION HAZARD: May evolve oxides of nitrogen (NOx) under fire conditions.

6. HEALTH HAZARD DATA

EMERGENCY OVERVIEW:
CAUTION: May cause irritation to skin and eyes. Avoid contact with skin, eyes and clothing. Do not take internally.

Empty containers may contain residual product. Do not reuse container unless properly reconditioned.

PRIMARY ROUTE(S) OF EXPOSURE: Eye & Skin

EYE CONTACT: Can cause mild to moderate irritation
SKIN CONTACT: Can cause mild, short-lasting irritation

SYMPTOMS OF EXPOSURE: A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS: A review of available data does not identify any worsening of existing conditions.

7. EMERGENCY AND FIRST AID PROCEDURES

SKIN: Wash exposed area with soap and water. If irritation or abnormalities persist, call a physician.
EYE: Immediately flush eyes with water for 15 minutes, if irritation or abnormalities persist, call a physician.
INHALATION: Remove to fresh air. If breathing becomes difficult, give oxygen and call a physician.
INGESTION: Do not induce vomiting: Call a physician immediately.

CAUTION: If unconscious, having trouble breathing or in convulsions, do not induce vomiting or give water. Call for medical assistance immediately.

8. HANDLING, ACCIDENTAL RELEASE MEASURES & DISPOSAL CONSIDERATIONS

Storage: Keep container tightly closed when not in use.

DISPOSAL:
In Ontario, the waste class under Regulation 347 is: 233L

SMALL SPILLS:
Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area.

LARGE SPILLS:
Contain liquid using absorbent material, by digging trenches or by dyking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Contact approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated.

Dispose of wastes in an approved incinerator or waste treatment/disposal site, in accordance with all applicable regulations. Do not dispose of wastes in local sewer or with normal garbage.

ENVIRONMENTAL PRECAUTIONS
This product should NOT be directly discharged into lakes, ponds, streams, waterways or public water supplies.

As a non-hazardous liquid waste, it should be solidified with stabilizing agents (such as sand, fly ash, or cement) so that no free liquid remains before disposal to an industrial waste landfill. A non-hazardous liquid waste can also be incinerated in accordance with local, state, provincial and federal regulations.

9. INDUSTRIAL HYGIENE CONTROL MEASURES

OCCUPATIONAL EXPOSURE LIMITS:
This product does not contain any substance that has an established exposure limit.

Respiratory Protection: None normally required.

For large spills, entry into large tanks, vessels or enclosed small spaces with inadequate ventilation, a positive pressure, self-contained breathing apparatus is recommended.

Ventilation: General ventilation is recommended.

Eye Protection: Safety glasses, if personally preferred
Gloves: Generally not necessary. Personal preference. Examples of impermeable gloves available on the market are neoprene, nitrile, PVC, natural rubber, viton, and butyl (compatibility studies have not been performed).

If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

10. TOXICOLOGICAL PROPERTIES

SENSITIZATION:
This product is not expected to be a sensitizer.

A "LC50-96" Pass/Fail Bioassay test. This test determines the lethality of a fluid on young aquatic organisms . The fluid fails if 50% or more of the animals are dead after 96 hours in the fluid.

96 hour static acute LC50 to Rainbow Trout = Greater than 1,000 mg/L
96 hour no observed effect concentration = 125 mg/L based on no mortality or abnormal effects
96 hour static acute LC50 to Sheepshead Minnow = Greater than 1,000 mg/L
96 hour no observed effect concentration = 1,000 mg/L (highest concentration tested) based on no mortality or abnormal effects.
96 hour static acute LC50 to Mysid Shrimp = 400 mg/L
96 hour no observed effect concentration = 180 mg/L based on no mortality or abnormal effects.
96 hour static acute LC50 to Daphnia Magna - 400 mg/L
96 hour no observed effect concentration = 56 mg/L (lowest concentration tested) based on no mortality or abnormal effects.

Microtoxicity

The Microtox bioassay has been established as the reference test for mud additive toxicity testing.

Test Method: Luminescent Bacteria, IC50@ 15 min
Reference: Appendix 1: Microtox Bioassay Procedure, Drilling Waste Management, Guide G50. 1993. Alberta Energy and Utilities Board, Calgary, AB, Canada.
Sample: Poly Drill 1330, sample #97324-1 for test #970723, 97/05/09 by D. Lintott
Preparation: Sample was diluted to 2 g/L, which formed thick, slightly cloudy liquid. The sample was then centrifuged for 1 hour.

Test Results:

SAMPLE	TREATMENT	%CTL	IC20%	IC50	RESULT
97324-1	None	N/A	14 (9-22)	>91	PASS

The following results are for a 1% aqueous solution of product.

CARCINOGENCITY:
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Government Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION:
Based on our Hazard Characterization, the potential human hazard is: LOW

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION:
Based on our Hazard Characterization, the potential environmental hazard is: LOW.

11. DEPARTMENT OF TRANSPORTATION INFORMATION

PROPER SHIPPING NAME/HAZARD CLASS MAY VARY BY PACKAGING, PROPERTIES, AND MODE OF TRANSPORTATION. TYPICAL PROPER SHIPPING NAMES FOR THIS PRODUCT ARE:

ALL TRANSPORTATION MODES: PRODUCT IS NOT REGULATED DURING TRANSPORATION

Shipping Name: Liquid Drilling Additive
Hazard Class: Not hazardous
Cautionary Labeling: None required

14. OTHER INFORMATION

This information contained herein is given in good faith, but no warranty, expressed or implied is made

Imperial Oil

MATERIAL SAFETY DATA SHEET

Date Prepared: November 14, 2003
Supersedes: April 12, 2001
MSDS Number: 12232

1. PRODUCT INFORMATION

Product Identifier: EPIC EP MOLY GREASE

Application and Use:
Lubricating grease

Product Description:

A grease, a mixture of lubricating oil, soap and additives.

REGULATORY CLASSIFICATION

WHMIS:
Not a controlled product

CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT
All components of this product are either on the Domestic Substances List (DSL), exempt, or have been notified under CEPA.

TDG INFORMATION (RAIL/ROAD): Not Regulated in Canada.

Please be aware that other regulations may apply.

TELEPHONE NUMBERS

Emergency 24 hr. (519) 339-2145
Technical Info. (800) 268-3183

MANUFACTURER/SUPPLIER:

IMPERIAL OIL
Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(416) 968-4441

2. REGULATED COMPONENTS

The following components are defined in accordance with sub-paragraph 13(a) (i) to (iv) or paragraph 14(a) of the Hazardous Products Act:

NAME	%	CAS #
Not applicable		

3. TYPICAL PHYSICAL & CHEMICAL PROPERTIES

Physical State: Liquid
Specific gravity: 0.930 at 15.6 deg C/15.6 deg C
Viscosity: >20.00 cSt at 40 deg C
Vapour Density: not available
Boiling Point: 249 deg C
Evaporation rate: 0.1 (1= n-butylacetate)
Solubility in water: NEGLIGIBLE
Freezing/Pour Point: 230 deg C DROP
Odour Threshold: not available
Vapour Pressure: <0.01 kPa at 20 deg C
Appearance/odour: Black paste, petroleum odour.

4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION:

Negligible hazard at normal temperatures (up to 38 deg C).
Elevated temperatures or mechanical action may form vapours, mists or fumes which may be irritating to the eyes, nose, throat and lungs.
Avoid breathing vapours or mists.

EYE CONTACT:

Slightly irritating, but will not injure eye tissue.

SKIN CONTACT:

Low toxicity.
Frequent or prolonged contact may irritate the skin.
High pressure greasing equipment is capable of injecting grease under the skin which may have severe health consequences.

INGESTION:

Low toxicity.

ACUTE TOXICITY DATA:

Based on animal testing data from similar materials and products,

the acute toxicity of this product is expected to be:
Oral : LD50 > 5000 mg/kg (Rat)
Dermal : LD50 > 3160 mg/kg (Rabbit)
Inhalation : LC50 > 5000 mg/m3 (Rat)

OCCUPATIONAL EXPOSURE LIMIT:

ACGIH recommends:
For insoluble Molybdenum compounds, 10 mg/m3. For oil mists, 5 mg/m3.

Local regulated limits may vary.

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5. FIRST AID MEASURES

INHALATION:

In case of adverse exposure to vapours, mists and/or fumes formed at elevated temperature, or by mechanical action, immediately remove the affected victim from exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.

EYE CONTACT:

Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.

SKIN CONTACT:

Flush with large amounts of water. Use soap if available.
Remove severely contaminated clothing (including shoes) and launder before reuse.
If irritation persists, seek medical attention.
Consult a physician immediately if the material is injected under the skin from the misuse of high pressure greasing equipment.

INGESTION:

If swallowed, DO NOT induce vomiting. Keep at rest. Get prompt medical attention.

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6. PREVENTIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

The selection of personal protective equipment varies, depending upon conditions of use.
In open systems where contact is likely, wear safety goggles, chemical-resistant overalls, and chemically impervious gloves.
Where only incidental contact is likely, wear safety glasses with side shields. No other special precautions are necessary provided skin/eye

contact is avoided.
Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.

HANDLING, STORAGE AND SHIPPING:

Keep containers closed. Handle and open containers with care.
Store in a cool, well ventilated place away from incompatible materials. In keeping with good personal hygiene practices, wash hands thoroughly after handling the material.
Empty containers may contain product residue. Do not pressurize cut, heat, or weld empty containers. Do not reuse empty containers without commercial cleaning or reconditioning.

LAND SPILL:

Eliminate source of ignition. Keep public away. Prevent additional discharge of material, if possible to do so without hazard.
Prevent spills from entering sewers, watercourses or low areas. Contain spilled liquid with sand or earth.
Allow material to solidify and scrape up. Place material in suitable containers for recycle or disposal.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

WATER SPILL:

Remove from surface by skimming or with suitable absorbents. If allowed by local authorities and environmental agencies, sinking and/or suitable dispersants may be used in unconfined waters.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

7. FIRE AND EXPLOSION HAZARD

Flashpoint and method: 145 deg C COC ASTM D92

Autoignition: NA Flammable Limits: LEL: NA UEL: NA

GENERAL HAZARDS:

Low Hazard; liquids may burn upon heating to temperatures at or above the flash point.
Toxic gases will form upon combustion.

FIRE FIGHTING:

Use water spray to cool fire exposed surfaces and to protect personnel.
Shut off fuel to fire.
Use foam, dry chemical or water spray to extinguish fire.
Respiratory and eye protection required for fire fighting personnel. Avoid spraying water directly into storage containers due to danger of boilover.
A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.

HAZARDOUS COMBUSTION PRODUCTS:

Fumes, smoke, carbon monoxide, sulfur oxides, nitrogen oxides, phosphorus oxides, aldehydes and other decomposition products, in the case of incomplete combustion
Various metal oxides

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8. REACTIVITY DATA

STABILITY:

This product is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Strong oxidizing agents

HAZARDOUS DECOMPOSITION:

none

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9. NOTES

All components of this product are listed on the U.S. TSCA inventory.

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REVISION SUMMARY:
Since 12 April 2001, this MSDS has been revised in Section(s):
1

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10. PREPARATION

Date Prepared: November 14, 2003
Prepared by: Lubricants & Specialties
IMPERIAL OIL Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(800) 268-3183

CAUTION: " The information contained herein relates only to this product or material and may not be valid when used in combination with any other product or material or in any process. If the product is not to be used for a purpose or under conditions which are normal or reasonably foreseeable, this information cannot be relied upon as complete or applicable. For greater certainty, uses other than those described in Section 1 must be reviewed with the supplier. The information contained herein is based on the information available at the indicated date of preparation. This MSDS is for the use of Imperial Oil customers and their employees and agents only. Any further distribution of this MSDS by Imperial Oil customers is prohibited without the written consent of Imperial Oil."

Imperial Oil

MATERIAL SAFETY DATA SHEET

Date Prepared: November 14, 2003
Supersedes: May 31, 2000
MSDS Number: 08509

1. PRODUCT INFORMATION

Product Identifier: MARVELUBE WR2 GREASE

Application and Use:
Lubricating grease

Product Description:

A grease, a mixture of lubricating oil, soap and additives.

REGULATORY CLASSIFICATION

WHMIS:
Not a controlled product

CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT
All components of this product are either on the Domestic Substances List (DSL) or are exempt.

TDG INFORMATION (RAIL/ROAD): Not Regulated in Canada.

Please be aware that other regulations may apply.

TELEPHONE NUMBERS

Emergency 24 hr. (519) 339-2145
Technical Info. (800) 268-3183
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(416) 968-4441

MANUFACTURER/SUPPLIER:

IMPERIAL OIL
Products Division

2. REGULATED COMPONENTS

The following components are defined in accordance with sub-paragraph 13(a) (i) to (iv) or paragraph 14(a) of the Hazardous Products Act:

NAME	%	CAS #
Not applicable		

3. TYPICAL PHYSICAL & CHEMICAL PROPERTIES

Physical State: Liquid Specific gravity: not available Viscosity: >20.00 cSt at 40 deg C Vapour Density: >5
Boiling Point: not available
Evaporation rate: <1 (1= n-butylacetate)
Solubility in water: negligible
Freezing/Pour Point: 182 deg C DROP Odour Threshold: not available
Vapour Pressure: <1 kPa at 38 deg C Density: 0.91 g/cc at 15 deg C
Appearance/odour: Black paste, petroleum odour.

4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION:

Negligible hazard at normal temperatures (up to 38 deg C).
Elevated temperatures or mechanical action may form vapours, mists or fumes which may be irritating to the eyes, nose, throat and lungs. Avoid breathing vapours or mists.

EYE CONTACT:

Slightly irritating, but will not injure eye tissue.

SKIN CONTACT:

Low toxicity.
Frequent or prolonged contact may irritate the skin.
High pressure greasing equipment is capable of injecting grease under the skin which may have severe health consequences.

INGESTION:

Low toxicity.

ACUTE TOXICITY DATA:

Based on animal testing data from similar materials and products, the acute toxicity of this product is expected to be:

Oral	:	LD50 > 5000 mg/kg (Rat)
Dermal	:	LD50 > 3160 mg/kg (Rabbit)
Inhalation	:	LC50 > 5000 mg/m3 (Rat)

OCCUPATIONAL EXPOSURE LIMIT:

ACGIH recommends:
For oil mists, 5 mg/m3.

Local regulated limits may vary.

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5. FIRST AID MEASURES

INHALATION:

In case of adverse exposure to vapours, mists and/or fumes formed at elevated temperature, or by mechanical action, immediately remove the affected victim from exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.

EYE CONTACT:

Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.

SKIN CONTACT:

Flush with large amounts of water. Use soap if available.
Remove severely contaminated clothing (including shoes) and launder before reuse.
If irritation persists, seek medical attention.
Consult a physician immediately if the material is injected under the skin from the misuse of high pressure greasing equipment.

INGESTION:

If swallowed, DO NOT induce vomiting. Keep at rest. Get prompt medical attention.

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6. PREVENTIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

The selection of personal protective equipment varies, depending upon conditions of use.
In open systems where contact is likely, wear safety goggles, chemical-resistant overalls, and chemically impervious gloves.
Where only incidental contact is likely, wear safety glasses with side shields. No other special precautions are necessary provided skin/eye

contact is avoided.
Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.

HANDLING, STORAGE AND SHIPPING:

Keep containers closed. Handle and open containers with care.
Store in a cool, well ventilated place away from incompatible materials. In keeping with good personal hygiene practices, wash hands thoroughly after handling the material.
Empty containers may contain product residue. Do not pressurize cut, heat, or weld empty containers. Do not reuse empty containers without commercial cleaning or reconditioning.

LAND SPILL:

Eliminate source of ignition. Keep public away. Prevent additional discharge of material, if possible to do so without hazard.
Prevent spills from entering sewers, watercourses or low areas. Contain spilled liquid with sand or earth.
Allow material to solidify and scrape up. Place material in suitable containers for recycle or disposal.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

WATER SPILL:

Remove from surface by skimming or with suitable absorbents. If allowed by local authorities and environmental agencies, sinking and/or suitable dispersants may be used in unconfined waters.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

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7. FIRE AND EXPLOSION HAZARD

Flashpoint and method: 204 deg C COC ASTM D92

Autoignition: 227 deg C Flammable Limits: LEL: NA UEL: NA

GENERAL HAZARDS:

Low Hazard; liquids may burn upon heating to temperatures at or above the flash point.
Toxic gases will form upon combustion.

FIRE FIGHTING:

Use water spray to cool fire exposed surfaces and to protect personnel.
Shut off fuel to fire.
Use foam, dry chemical or water spray to extinguish fire.
Respiratory and eye protection required for fire fighting personnel.
A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.

HAZARDOUS COMBUSTION PRODUCTS:

Smoke, carbon monoxide, carbon dioxide and traces of oxides of sulphur

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8. REACTIVITY DATA

STABILITY:

This product is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Strong oxidizing agents

HAZARDOUS DECOMPOSITION:

none

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9. NOTES

All components of this product are listed on the U.S. TSCA inventory.

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REVISION SUMMARY:
Since 31 May 2000, this MSDS has been revised in Section(s):
3, 7

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10. PREPARATION

Date Prepared: November 14, 2003
Prepared by: Lubricants & Specialties

IMPERIAL OIL Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(800) 268-3183

Imperial Oil

MATERIAL SAFETY DATA SHEET

Date Prepared: November 06, 2002
Supersedes: November 01, 2002
MSDS Number: 00826

1. PRODUCT INFORMATION

Product Identifier: MIDDLE DISTILLATE
ESSO MARINE GAS OIL (DYED OR CLEAR) ESSO RAILROAD DIESEL
(DYED OR CLEAR) HEATING OIL (DYED OR CLEAR)
DIESEL (DYED OR CLEAR)
DIESEL QUALITY FURNACE FUEL (DYED OR CLEAR) DIESEL QUALITY HEATING
OIL (DYED OR CLEAR) ESSO DIESEL (DYED OR CLEAR)
ESSO DIESEL QUALITY COMMERCIAL FUEL (DYED OR CLEAR) ESSO DIESEL QUALITY
FURNACE FUEL
ESSO DIESEL QUALITY HEATING OIL ESSO FURNACE FUEL (DYED
OR CLEAR) ESSO HEATING OIL (DYED OR CLEAR)
ESSO MARINE DIESEL FUEL (DYED OR CLEAR)
ESSO RAILROAD DIESEL FUEL #3 (DYED OR CLEAR) ESSO TOBACCO CURING
OIL
FUEL OIL 75
FUEL OIL 76
DIESEL MARINE (DYED OR CLEAR)
DIESEL MARINE GAS OIL (DYED OR CLEAR) FURNACE (DYED OR
CLEAR)
DIESEL MARINE - POUR DEPRESSED (DYED OR CLEAR) NO.2 FUEL OIL
NAVAL FUEL OIL 3-GP-11M (DYED) ESSO DIESEL FUEL LS
DIESEL LOW SULFUR (DYED OR CLEAR) NO.2 FUEL OIL FOR
EXPORT
DIESEL FOR EXPORT (DYED OR CLEAR)
FURNACE TOBACCO CURING OIL
DIESEL NAVAL 3GP-11 (DYED OR CLEAR) DIESEL NAVAL 3GP-15 (DYED
OR CLEAR) DIESEL LOW SULFUR RAIL (DYED OR CLEAR) DIESEL LOW
SULFUR DYED EP
DIESEL RAIL (DYED OR CLEAR) DIESEL RAIL #3 (DYED OR CLEAR)
DIESEL RAIL #3 (HD) (DYED OR CLEAR)
DIESEL LOW SULFUR (032) (DYED OR CLEAR)

FURNACE URBAN (DYED OR CLEAR) DIESEL (032) (DYED OR CLEAR) DIESEL LOW SULFUR (EXP DYED) FURNACE FUEL (032) DYED
DIESEL LOW SULFUR (EXPORT) MARINE GAS OIL
MDO - MARINE DIESEL OIL 3 CST (CLEAR)

Application and Use:
Multi-purpose fuel

Product Description:

A complex mixture of aliphatic, olefinic, naphthenic and aromatic hydrocarbons.

REGULATORY CLASSIFICATION

WHMIS:
Class B, Division 3: Combustible Liquids.
Class D, Division 2, Subdivision B: Toxic Material

CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT
All components of this product are either on the Domestic Substances List (DSL) or are exempt. TDG

INFORMATION (RAIL/ROAD):

Shipping Name: FUEL OIL
Class: 3
Packing Group: III
PIN Number: UN1202
Marine Pollutant:N

Please be aware that other regulations may apply.

TELEPHONE NUMBERS

Emergency 24 hr. (519) 339-2145
Technical Info. (800) 268-3183

MANUFACTURER/SUPPLIER:

IMPERIAL OIL
Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(416) 968-4441

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2. REGULATED COMPONENTS

The following components are defined in accordance with sub-paragraph 13(a) (i) to (iv) or paragraph 14(a) of the Hazardous Products Act:

NAME	%	CAS #

Fuel Oil No.2 >99.9 V/V 68476-30-2

3. TYPICAL PHYSICAL & CHEMICAL PROPERTIES

Physical State: Liquid
Specific gravity: 0.820 to 0.900 at 15.5 deg C
Viscosity: 1.30 cSt at 40 deg C
to 11.00 cSt at 40 deg C Vapour Density: 4
Boiling Point: 150 to 370 deg C
Evaporation rate: <1 (1= n-butylacetate)
Solubility in water: negligible Freezing/Pour
Point: -4 deg C -39 (RANGE)
Odour Threshold: not available
Vapour Pressure: 4 kPa at 38 deg C
Appearance/odour: White or pale yellow liquid, petroleum odour

4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION:

Negligible hazard at normal temperatures (up to 38 deg C).
High vapour concentrations are irritating to the eyes, nose, throat and lungs; may cause headaches and dizziness; may be anesthetic and may cause other central nervous system effects.
Avoid breathing vapours or mists.

EYE CONTACT:

Slightly irritating, but will not injure eye tissue.

SKIN CONTACT:

Low toxicity.
Irritating.

INGESTION:

Low toxicity.
Small amounts of this liquid drawn into the lungs from swallowing or vomiting may cause severe health effects (e.g. bronchopneumonia or pulmonary edema).

CHRONIC:

Lifetime skin painting tests indicate that materials of similar composition have produced skin cancer in experimental animals. The relationship of these results to humans has not been fully established.

ACUTE TOXICITY DATA:

Based on animal testing data from similar materials and products, the acute toxicity of this product is expected to be:

Oral	:	LD50 > 5000 mg/kg (Rat)
Dermal	:	LD50 > 2000 mg/kg (Rabbit)
Inhalation	:	LC50 > 2500 mg/m3 (Rat)

OCCUPATIONAL EXPOSURE LIMIT:

Manufacturer Recommends:
100 ppm based on composition.

Local regulated limits may vary.

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5. FIRST AID MEASURES

INHALATION:

In emergency situations use proper respiratory protection to immediately remove the affected victim from exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.

EYE CONTACT:

Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.

SKIN CONTACT:

Immediately flush with large amounts of water. Use soap if available. Remove contaminated clothing, including shoes, after flushing has begun. If irritation persists, seek medical attention.

INGESTION:

DO NOT induce vomiting since it is important that no amount of the material should enter the lungs (aspiration). Keep at rest. Get prompt medical attention.

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6. PREVENTIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

The selection of personal protective equipment varies, depending upon conditions of use.
In open systems where contact is likely, wear safety goggles, chemical-resistant overalls, and chemically impervious gloves.
Where only incidental contact is likely, wear safety goggles, long sleeves, and chemical-resistant gloves.

Where concentrations in air may exceed the occupational exposure limits given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.

HANDLING, STORAGE AND SHIPPING:

Keep containers closed. Handle and open containers with care.
Store in a cool, well ventilated place away from incompatible materials. In keeping with good personal hygiene practices, wash hands thoroughly after handling the material.
Do not handle or store near an open flame, sources of heat, or sources of ignition.
Material will accumulate static charges which may cause a spark. Static charge build-up could become an ignition source. Use proper relaxation and grounding procedures.
Empty containers may contain product residue. Do not pressurize cut, heat, or weld empty containers. Do not reuse empty containers without commercial cleaning or reconditioning.

LAND SPILL:

Eliminate source of ignition. Keep public away. Prevent additional discharge of material, if possible to do so without hazard.
Prevent spills from entering sewers, watercourses or low areas. Contain spilled liquid with sand or earth. Do not use combustible materials such as sawdust.
Recover by pumping (use an explosion proof motor or hand pump), or by using a suitable absorbent.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

WATER SPILL:

Remove from surface by skimming or with suitable absorbents. If allowed by local authorities and environmental agencies, sinking and/or suitable dispersants may be used in unconfined waters.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

7. FIRE AND EXPLOSION HAZARD

Flashpoint and method: >40 deg C PMCT ASTM D93

Autoignition: NA Flammable Limits: LEL: 0.7% UEL: 6.5%

GENERAL HAZARDS:

Combustible Liquid; may form combustible mixtures at or above the flash point.
Toxic gases will form upon combustion.
Static Discharge; material may accumulate static charges which may cause a fire.

FIRE FIGHTING:

Use water spray to cool fire exposed surfaces and to protect personnel.
Shut off fuel to fire.
Use foam, dry chemical or water spray to extinguish fire.
Respiratory and eye protection required for fire fighting personnel. Avoid spraying water directly into storage containers due to danger of boilover.
A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.

HAZARDOUS COMBUSTION PRODUCTS:

Smoke, carbon monoxide, carbon dioxide and traces of oxides of sulphur

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8. REACTIVITY DATA

STABILITY:

This product is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Strong oxidizing agents

HAZARDOUS DECOMPOSITION:

none

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9. NOTES

All components of this product are listed on the U.S. TSCA inventory.

REVISED.

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10. PREPARATION

Date Prepared: November 06, 2002
Prepared by: Lubricants & Specialties
IMPERIAL OIL Products Division
111 St Clair Avenue West
Toronto, Ontario
M5W 1K3
(800) 268-3183

CAUTION: " The information contained herein relates only to this product or material and may not be valid when used in combination with any other product or material or in any process. If the product is not to be used for a purpose or under conditions which are normal or reasonably foreseeable, this information cannot be relied upon as complete or applicable. For greater certainty, uses other than those described in Section 1 must be reviewed with the supplier. The information contained herein is based on the information available at the indicated date of preparation. This MSDS is for the use of Imperial Oil customers and their employees and agents only. Any further distribution of this MSDS by Imperial Oil customers is prohibited without the written consent of Imperial Oil."

Imperial Oil

MATERIAL SAFETY DATA SHEET

Date Prepared: May 13, 2003
Supersedes: April 12, 2000
MSDS Number: 08265

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1. PRODUCT INFORMATION

Product Identifier: UNIVIS N 68

Application and Use:
Hydraulic fluid

Product Description:

A lubricating oil consisting of a mixture of saturated and unsaturated hydrocarbons derived from paraffinic distillate, and additives.

REGULATORY CLASSIFICATION

WHMIS:
Not a controlled product

CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT
All components of this product are either on the Domestic Substances List (DSL) or are exempt.

TDG INFORMATION (RAIL/ROAD): Not Regulated in Canada.

Please be aware that other regulations may apply.

TELEPHONE NUMBERS		MANUFACTURER/SUPPLIER:
Emergency 24 hr.	(519) 339-2145	IMPERIAL OIL
Technical Info.	(800) 268-3183	Products Division
111 St Clair Avenue West Toronto, Ontario M5W 1K3 (416) 968-4441		

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2. REGULATED COMPONENTS

The following components are defined in accordance with sub-paragraph 13(a) (i) to (iv) or paragraph 14(a) of the Hazardous Products Act:

NAME	%	CAS #
Not applicable		

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3. TYPICAL PHYSICAL & CHEMICAL PROPERTIES

Physical State: Liquid Specific gravity: not available Viscosity: 68.00 cSt at 40 deg C Vapour Density: not available
Boiling Point: not available
Evaporation rate: <0.1 (1= n-butylacetate)
Solubility in water: negligible
Freezing/Pour Point: -36 deg C ASTM D97
Odour Threshold: not available
Vapour Pressure: <0.1 kPa at 20 deg C Density: 0.88 g/cc at 15 deg C
Appearance/odour: Yellow oil, petroleum odour

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4. HEALTH HAZARD INFORMATION

NATURE OF HAZARD

INHALATION:

Negligible hazard at normal temperatures (up to 38 deg C).
Elevated temperatures or mechanical action may form vapours, mists or fumes which may be irritating to the eyes, nose, throat and lungs. Avoid breathing vapours or mists.

EYE CONTACT:

Slightly irritating, but will not injure eye tissue.

SKIN CONTACT:

Low toxicity.
Frequent or prolonged contact may irritate the skin.

INGESTION:

Low toxicity.

ACUTE TOXICITY DATA:

Based on animal testing data from similar materials and products,

the acute toxicity of this product is expected to be:
Oral : LD50 > 5000 mg/kg (Rat)
Dermal : LD50 > 3160 mg/kg (Rabbit)
Inhalation : LC50 > 5000 mg/m3 (Rat)

OCCUPATIONAL EXPOSURE LIMIT:

ACGIH recommends:
For oil mists, 5 mg/m3.

Local regulated limits may vary.

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5. FIRST AID MEASURES

INHALATION:

Vapour pressure of this material is low and as such inhalation under normal conditions is usually not a problem. If overexposed to oil mist, remove from further exposure. Administer artificial respiration if breathing has stopped. Keep at rest. Call for prompt medical attention.

EYE CONTACT:

Flush eyes with large amounts of water until irritation subsides. If irritation persists, get medical attention.

SKIN CONTACT:

Flush with large amounts of water. Use soap if available.
Remove severely contaminated clothing (including shoes) and launder before reuse.
If irritation persists, seek medical attention.

INGESTION:

If swallowed, DO NOT induce vomiting. Keep at rest. Get prompt medical attention.

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6. PREVENTIVE AND CORRECTIVE MEASURES

PERSONAL PROTECTION:

The selection of personal protective equipment varies, depending upon conditions of use.
In open systems where contact is likely, wear safety goggles, chemical-resistant overalls, and chemically impervious gloves.
Where only incidental contact is likely, wear safety glasses with side shields. No other special precautions are necessary provided skin/eye contact is avoided.
Where concentrations in air may exceed the occupational exposure limits

given in Section 4 and where engineering, work practices or other means of exposure reduction are not adequate, approved respirators may be necessary to prevent overexposure by inhalation.

ENGINEERING CONTROLS:

The use of local exhaust ventilation is recommended to control emissions near the source. Laboratory samples should be handled in a fumehood. Provide mechanical ventilation of confined spaces.

HANDLING, STORAGE AND SHIPPING:

Keep containers closed. Handle and open containers with care.
Store in a cool, well ventilated place away from incompatible materials. In keeping with good personal hygiene practices, wash hands thoroughly after handling the material.
Store and load at normal (up to 38 deg C) temperature and at atmospheric pressure.
Empty containers may contain product residue. Do not pressurize cut, heat, or weld empty containers. Do not reuse empty containers without commercial cleaning or reconditioning.

LAND SPILL:

Eliminate source of ignition. Keep public away. Prevent additional discharge of material, if possible to do so without hazard.
Prevent spills from entering sewers, watercourses or low areas. Contain spilled liquid with sand or earth.
Recover by pumping or by using a suitable absorbant.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

WATER SPILL:

Remove from surface by skimming or with suitable absorbents. If allowed by local authorities and environmental agencies, sinking and/or suitable dispersants may be used in unconfined waters.
Consult an expert on disposal of recovered material. Ensure disposal in compliance with government requirements and ensure conformity to local disposal regulations. Notify the appropriate authorities immediately.
Take all additional action necessary to prevent and remedy the adverse effects of the spill.

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7. FIRE AND EXPLOSION HAZARD

Flashpoint and method: 190 deg C COC ASTM D92

Autoignition: NA Flammable Limits: LEL: NA UEL: NA

GENERAL HAZARDS:

Low Hazard; liquids may burn upon heating to temperatures at or above the flash point.
Toxic gases will form upon combustion.

FIRE FIGHTING:

Use water spray to cool fire exposed surfaces and to protect personnel.
Shut off fuel to fire.
Use foam, dry chemical or water spray to extinguish fire.
Respiratory and eye protection required for fire fighting personnel.
A self-contained breathing apparatus (SCBA) should be used for all indoor fires and any significant outdoor fires. For small outdoor fires, which may easily be extinguished with a portable fire extinguisher, use of an SCBA may not be required.

HAZARDOUS COMBUSTION PRODUCTS:

Smoke, carbon monoxide, carbon dioxide and traces of oxides of sulphur

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8. REACTIVITY DATA

STABILITY:

This product is stable. Hazardous polymerization will not occur.

INCOMPATIBLE MATERIALS AND CONDITIONS TO AVOID:

Strong oxidizing agents

HAZARDOUS DECOMPOSITION:

none

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9. NOTES

All components of this product are listed on the U.S. TSCA inventory.

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REVISION SUMMARY:
Since 12 April 2000, this MSDS has been revised in Section(s):
3, 7

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10. PREPARATION

Date Prepared: May 13, 2003
Prepared by: Lubricants & Specialties
IMPERIAL OIL

Products Division
111 St Clair Avenue West
Toronto, Ontario
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(800) 268-3183

APPENDIX G

CLOSURE AND RECLAMATION PLAN

CLOSURE AND RECLAMATION PLAN

ANGILAK PROPERTY

KIVALLIQ ENERGY CORPORATION

Effective Date: February 1, 2017

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1. Preamble

This Closure and Reclamation Plan is in effect as of February 1, 2017, and applies specifically to the Angilak Property. A property map, land tenure map and camp layout figure included in Appendix I. Kivalliq Energy Corp. (Kivalliq Energy) is a uranium exploration company with a Nunavut focus. Kivalliq Energy was the first company in Canada to sign a comprehensive agreement with the Inuit of Nunavut to explore for uranium on Inuit Owned Lands. Kivalliq Energy endeavors to take every reasonable precaution toward ensuring the protection and conservation of the natural environment, and the safety and health of all employees and contractors from any potential harmful effects of stored materials and operations. All plans, licences and permits are posted for review and copies of the plans will be available in the office tent for reference.

2. Introduction

The work proposed for this project consists of diamond drilling, reverse circulation (RC) drilling, prospecting, staking, geological mapping, trenching, rock and soil/till sampling, grid establishment/line cutting, airborne geophysics, ground geophysics, possibility of trenching (non-mechanical), and fuel transport (fixed and rotary-wing, overland). No buildings, equipment or waste will remain once the project is complete.

Kivalliq Energy has been exploring in Nunavut since 2008. The property consists of both Crown and Inuit Owned Lands (IOL) in the Kivalliq Region of Nunavut. Land and water use for the purpose of exploration has been authorized by the Kivalliq Inuit Association (KIA), Indigenous and Northern Affairs Canada (INAC) and the Nunavut Water Board (NWB). In accordance with the terms and conditions of these authorizations, Kivalliq Energy will return the land to as near its original natural state as is practical and possible.

3. Project Overview

Kivalliq Energy operates two projects in Nunavut and two projects in Saskatchewan. The projects include the Angilak Property and the Baker Basin Property in Nunavut and the Genesis Property and the Hatchet Lake Property in Saskatchewan. The Angilak Property, consisting of 91 active mineral claims, is located approximately 225 kilometres south-southwest of Baker Lake and 350 kilometres west of Rankin Inlet (Figure 1).

As indicated on Figure 2, all mineral claims are contiguous and extend north, south, east and west between latitudes 62° 27’ and 62° 48’ North and longitudes 98° 21’ and 99° 24’ West in NTS map areas 65 J/06, 65 J/07, 65 J/09, 65 J/10, 65 J/11 and 65 J/15 (UTM coordinates: 6925000N to

6965000N and 479300E to 533000E, NAD83, Zone 14). The camp is located at 527975m E, 6937950m N. See Figure 3 for a layout of the camp.

4. Schedule

The final restoration of the camp site will begin once the program is complete. All work described in this plan will be completed prior to the date of expiry of the land use permits and water licence unless a renewal is applied for and granted. Empty fuel drums will be removed from site regularly. Once a fuel cache is retired, a thorough inspection will be conducted. Any contamination will be cleaned up according to the Spill Contingency Plan and debris will be removed from the site.

5. Infrastructure

Camp

The Nutaaq camp is on crown mineral claims administered by INAC and consists of:

- Insulated tents on wood frames. These tents function as sleep tents, an office, core tent, first aid station, kitchen, dry and storage.
- Toilets.
- A generator building.
- Helicopter landing area.
- Natural gravel airstrip.
- Garbage incineration area.

Nutaaq Camp Infrastructure

Existing: 15 – 14’ x 16’ tents for sleeping, an office and first aid station

4 – 14’ x 32’ tent for kitchen, core tents and dry

1 toilet facilities

A generator building to house a 20 kW diesel generator as well as a back-up generator

30’ x 60’ Sprung Type - Garage Tent

Vehicles and Equipment

Existing: 17 Snow machines
1 Polaris Side by Side Quad
1 Kubota small farm tractor
1 Candig Mini Excavator
1 D6 CAT Bull Dozer
1 CAT 928 Front End Loader
1 CAT Skid Steer
3 Cargo Sleds

Drilling Equipment

Existing: 3 Boyles 17 Core Drill Rigs

Fuel Caches

A main fuel cache has been established at the Nutaaq Camp. All fuel stored on site is contained in Instaberms secondary containment, manufactured by Raymac Industries in British Columbia. Drums of fuel are stored in neat, orderly rows and are inspected daily. All secondary containment berms are equipped Rain Drain hydrocarbon filters for water drainage and Spilfyter RailMat, a 3 ply hydrocarbon absorbent fabric. A spill kit is located at each fuel cache. Empty drums are removed from site regularly and returned to Aviation Fuel Enterprises in Baker Lake.

Smaller caches are established temporarily to support drilling activities and sampling/survey programs. Spill kits are located at every fuel cache.

Kivalliq Energy is permitted to cache 3000 drums of fuel on site at a time.
This will include:

- 1500 - 205 L drums of diesel
- 1490 - 205 L drums of Jet fuel
- 10 - 205 L drums of gasoline
- 50 - 100 lb cylinders of propane

Kivalliq endeavors to consume a majority of the cached fuel by the end of each season. However, enough fuel will be left on site over winter to ensure a supply for a safe re-opening of camp in the spring. Kivalliq Energy is investigating the purchase and use of double-walled enviro tanks. Please refer to the Fuel Management Plan for more information.

6. Seasonal Shutdowns

Buildings and Contents

Wood structures and wood floors will be kept secured. The canvas tents will be removed from site for drying and storage. Weatherhaven sleeping tents will remain in place for the winter. Wooden bed frames will be turned upside down and secured to the wooden floors for over-winter storage. The generator may be removed from site for servicing and storage. Project equipment including Kivalliq's Caterpillar D6 bulldozer, a Caterpillar 928 front end loader, a Caterpillar skid steer and Bombardier Ranger "Side by Side" quad is stored during shutdown periods in the 30'x60' shop tent. All heavy equipment in the shop tent is underlain Spilfyter RailMat, a 3 ply hydrocarbon absorbent fabric to catch drips or leaks while the equipment is inactive.

Water System

Pumps and hoses will be drained and stored inside to protect them over winter. Pumps may be removed from site for servicing and storage.

Fuel Caches and Chemical Storage

An inventory will be conducted prior to leaving at the end of the field season. A thorough inspection of all fuel caches will be completed and empty fuel drums will be removed from site. Every effort will be made to use up any partially full fuel drums. In the event that any partially full fuel drums are left once the season is over, they will be placed on an angle to ensure that snow and water do not enter the drum and no leakage from the drum occurs. Full fuel drums will be stored on their sides with the bungs in the 3 and 9 o-clock position. All chemicals, including cleaning products, will be stored in a sealed building.

Waste

Combustible Waste: All combustible waste will be incinerated. Untreated wood and large pieces of cardboard will be burned in a controlled open burn in compliance with the Municipal Solid Wastes Suitable for Open Burning Guidelines. Ash generated from the on-going incineration will be stored in sealed metal 55-gallon drums and removed from site via regularly scheduled backhaul.

Grey Water Sump: The grey water sump will be inspected and covered securely for the winter. Stakes will be placed around the sump so that it is easily identifiable when the camp is opened up again each year.

Black water: The camp uses incineration and Pacto toilets. Bags containing waste are incinerated.

Drill Sites: The drill will be partially dismantled into its main components as per the drilling contractor procedure, packaged and secured along with its ancillary equipment and rods. All drill sites will be inspected for soil contamination. Any remaining waste will be taken to camp and either incinerated if appropriate or to be flown out to an approved disposal location.

Grey water and sludge sumps will be filled and leveled as required. As much as possible, drill sites will be restored immediately after the drill has been moved to the next site.

Contamination Clean Up

Any soil around camp that has become contaminated and gone unnoticed including any contamination of soils noted on the floor of the 30'x60' shop tent used for seasonal heavy equipment storage will be treated as per the Spill Contingency Plan. Before and after photos will be taken to document the contamination and the clean-up procedures implemented. These photos will make up part of the final report to be submitted to the Water Resource Inspector and the Kivalliq Inuit Association following any spill and will also be attached as part of the Annual Report submitted to the NWB and the KIA.

Bioremediation

At the advice, discretion and approval of land use inspectors and permitting or licensing authorities' bioremediation, or land farming, may be implemented to treat certain contaminated soils temporarily contained in sealed drums on the property. Bioremediation is performed in biotreatment cells or the upper soil zone. Contaminated soils or sediments are incorporated into non contaminated soils and periodically turned over or tilled to aerate the mixture.

This technique has been successfully used for years in the management and disposal of oily sludge and other petroleum refinery wastes. In situ systems have been used to treat near surface soil contamination for hydrocarbons. The equipment employed in land farming is typical of that used in agricultural operations. These land farming activities cultivate and enhance microbial degradation of hazardous compounds.

Land treatment of petroleum products has been successfully utilized at numerous contaminated sites. It has been demonstrated that gasoline, jet fuel, and heating oil are extensively degraded when affected soils were treated with fertilizer, lime, and simulated tilling. Hydrocarbon compounds that are not readily degraded by land farming include creosote, pentachlorophenol (PCP), and bunker C oil.

7. Final Closure and Reclamation

Buildings and Contents

All buildings will be dismantled and removed. All wooden structures including floors will either be burned or removed.

Equipment

All equipment, including pumps, will be dismantled and removed from the project area.

Fuel caches and Chemical Storage

All fuel drums will be removed. All areas where there have been fuel caches will be thoroughly inspected. Any contamination will be cleaned up as well as any debris removed. Contaminated soil will be handled as per the Spill Contingency Plan. Final photos will be taken of all fuel caches for inclusion in the final report.

All chemicals will be removed from site. Areas where chemicals have been stored will be inspected to ensure that there has been no contamination.

Sumps

The Kivalliq Energy exploration program utilizes one central sump located in a naturally occurring depression free from any potential runoff contamination.

Drill Sites

The drill will be dismantled into its main components as per the drilling contractor procedure, packaged and secured along with its ancillary equipment and rods. The drill will be flown out by the drilling contractor.

All drill sites will be inspected for soil contamination. Any remaining waste will be taken to camp to be burned if possible or to be flown out to an approved disposal location.

An inspection will be conducted to ensure that all drill sites are/have been restored and sumps have been covered and leveled.

Trenching

Upon final closure of exploration activities on the Angilak Property, trench extensions and excavations created by Kivalliq Energy will be backfilled and disturbed areas re-contoured to their original state, using best efforts and best practices. In areas where the historic trenches have been cleaned out, these trenches will be returned to conditions existing prior to Kivalliq's work programs. Excavation and reclamation will be carried out using hand tools or a Candig CD21 heli-portable mini-

excavator currently authorized and on site.

Contamination Clean Up

Any contamination including any contamination noted on the floor of the 30'x60' shop tent (Sprung Tent) used for seasonal heavy equipment storage will be treated as per the Spill Contingency Plan. Before and after photos will be taken to document the contamination and the clean-up procedures implemented. These photos will make up part of the final report to be submitted to the Water Resource Inspector and the Kivalliq Inuit Association following any spill and will also be attached as part of the Annual Report submitted to the Nunavut Water Board and the Kivalliq Inuit Association.

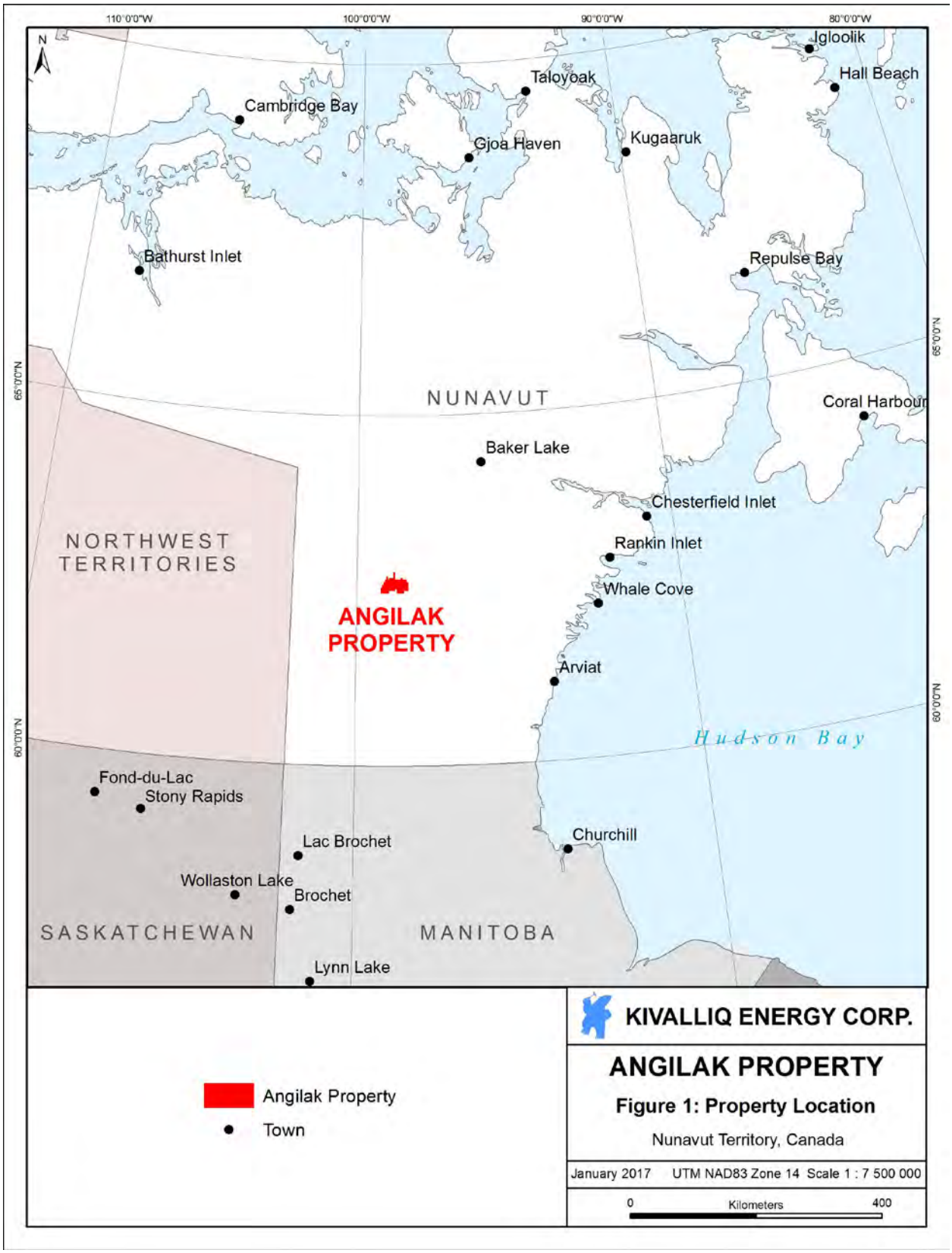
Inspection and Documentation

A complete inspection will be conducted of all areas prior to closure. Photos will be taken to document the conditions prior to leaving the site for use in the final plan. All appropriate agencies will be contacted and notified once the final clean-up has been conducted. The photos will make up part of the final closure reports to be submitted to Indigenous and Northern Affairs Canada and the Kivalliq Inuit Association.

8. Emergency Contact Information

CONTACT	TELEPHONE NUMBER
INAC Field Operations Manager, Iqaluit	867-975-4295
Kivalliq Inuit Association	867-645-5725
Environment Canada – 24 hour emergency	867-920 8130
Nunavut Government, Robert Eno	867-975-7729
Department of Fisheries and Oceans, Iqaluit	867-979-8000
Unaalik Aviation, Rankin Inlet	867-645-2535
Ookpik Aviation, Baker Lake	867-793-4720
Baker Lake RCMP	867-793-0123
Stanton Regional Hospital, Yellowknife	867-669-4111
Discovery Mining Services, Yellowknife	867-920-4600
Kivalliq Energy, Jeff Ward, President	604-646-4527
Kivalliq Energy, 24 hour emergency contact	Andrew Berry 604-765-1892 Camp Phone: 604-759-4750

APPENDIX I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N
Igloolik
Hall Beach
Taloyoak
Cambridge Bay
Gjoa Haven
Kugaaruk
Bathurst Inlet
Repulse Bay
70°0'0"N
60°0'0"N
NUNAVUT
Coral Harbour
Baker Lake
Chesterfield Inlet
NORTHWEST TERRITORIES
Rankin Inlet
Whale Cove
ANGILAK PROPERTY
Arviat
Hudson Bay
Fond-du-Lac
Stony Rapids
Lac Brochet
Churchill
Wollaston Lake
Brochet
SASKATCHEWAN
MANITOBA
Lynn Lake
Angilak Property
Town
KIVALLIQ ENERGY CORP.
ANGILAK PROPERTY
Figure 1: Property Location
Nunavut Territory, Canada
January 2017
UTM NAD83 Zone 14
Scale 1 : 7 500 000
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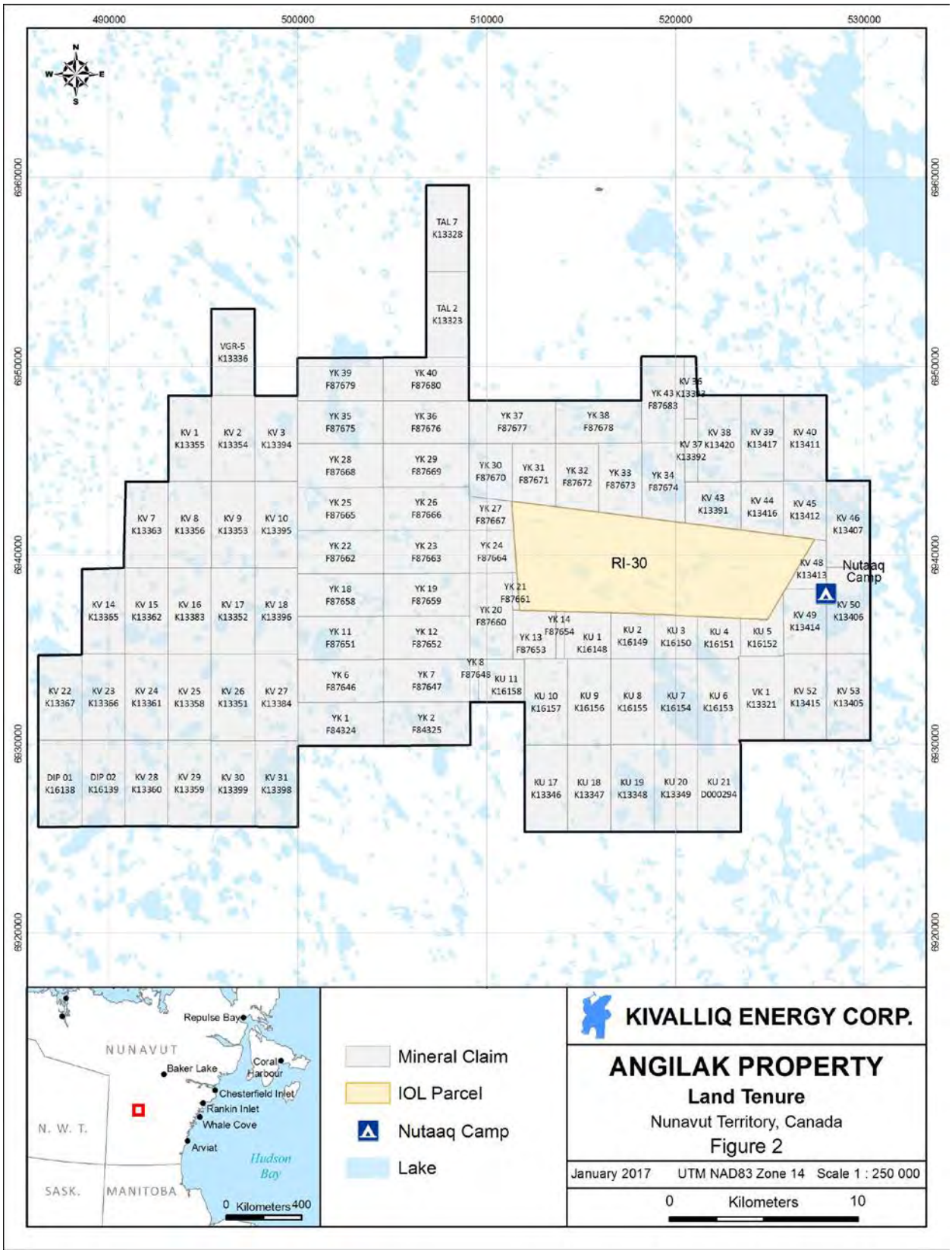
Kilometers
400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Nutaaq Camp
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KU 5 K16152
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YK 1 F84324
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KU 17 K13346
KU 18 K13347
KU 19 K13348
KU 20 K13349
KU 21 D000294
Repulse Bay
NUNAVUT
Baker Lake
Coral Harbour
Chesterfield Inlet
Rankin Inlet
Whale Cove
Arviat
N. W. T.
Hudson Bay
SASK.
MANITOBA
0 Kilometers 400
Mineral Claim
IOL Parcel
Nutaaq Camp
Lake
KIVALLIQ ENERGY CORP.
ANGILAK PROPERTY
Land Tenure
Nunavut Territory, Canada
Figure 2
January 2017
UTM NAD83 Zone 14
Scale 1 : 250 000
0
Kilometers
10

Figure 3: Nutaaq Camp Layout

APPENDIX H

2016 CONTRACTOR SERVICES

2016 Contractor Services

Baker Lake NU
Ookpik Aviation Ltd.
Aviation Fuel Enterprises
Nunamuit Lodge
Northwest Company Inc.
SK Construction Ltd
Baker Lake Lodge
Baker Lake Contracting & Supplies Ltd.

British Columbia
Raymac Environmental Services Inc.
Blender Media
Western Industrial Distributors
Ooleepeeka Consulting Ltd.

Alberta
InfoSat Communications
Vision Globetrotter Travel

Saskatchewan
SRC Geoanalytical Laboratories

Manitoba
Four Points Sheraton Hotels
Calm Air International LP

Ontario
Manitoulin Transport
ActLabs

Quebec
First Air

Yellowknife NT
Discovery/Nunavut Mining Services
Great Slave Helicopters/Kivallingmiut Aviation Inc. Medic North
Northern Communications
Force One
Ron's Auto Service and Equipment Rentals
Weaver and Devore Trading Ltd
True Value Hardware
Crother's Home Building Centre
Canadian Tire
Staples Business Depot Ltd.
Air Tindi

APPENDIX I

COMMUNITY CONSULTATION LOG

SEPTEMBER 2014 TO JANUARY 2017

Community Communication/Consultation Log
September 2014 to January 2017
Kivalliq Energy
Angilak Project

Last update: January 11, 2017 12:00PM

(Acronyms :) KIA = Kivalliq Inuit Association, CLO = Community Liaison Officer, SAO = Settlement Administrative Officer, GN = Government of Nunavut, HTO = Hunters and Trappers Association, MLA = Member of the Legislative Assembly, CEDO = Community Economic Development Officer, Community Tours/Visits

Date	Time	Contact	Details
September 24, 2014		NIRB, AANDC, KIA, NWB, WSCC	Letter of closure from Maria Egerton
January 26, 2015	2-3 pm	KIA - Jeff Tulugak, Craig Beardsaw KIV – Maria Egerton, Andrew Berry, Emily McNie	Informal meeting with KIA – discussed summer inspections, program and gave permission to use camp on snow mobile excursion to Ennadai Lake
January 28, 2015	6-10 pm	NTI - Keith Morrison, Jorgan Aitaok, Miguel Chenier, Chris Arko, Chris Kalluk, Carson Gillis, Ryan Gillis, Kate Chenier NIRB – Joe Ohokannoak KIA - Jeff Tulugak, Craig Beardsaw KIV - Jim Paterson, Jeff Ward, Andrew Berry, John Robins, Maria Egerton, Emily McNie, Reesa Meltzer	Annual Roundup dinner discussing Angilak property and Areva hearings and FEIS.
January 27, 2015	2:35-2:55 pm	KIA - Jeff Tulugak, Craig Beardsaw in attendance	CSR session – Maria Egerton (De-Risking EA studies by Conducting Early-Stage Baseline Monitoring)
March 5, 2015	3pm	Areva Final Hearing. Kiv – Maria Egerton, Jessie Oonark Gallery – Sheryl, Martha	Maria spoke to Sheryl (co-operator Jessie Oonark Art Gallery Baker Lake and Martha (artist and Baker community member) about the hearing that was taking place. Why it was taking place, where, and when and that they could attend any part and could speak during the community round table. Sheryl expressed here concerns about how mining changed the community in Manitoba where she grew up. The

			felt the introduction of strange men was a danger to young girls in the community. Martha expressed her desire for the children to have work, but was also concerned about how the Areva mine might change the community negatively with the introduction of income and use of drugs and lack of home care for children when parents were away working.
March 7, 2015	1pm	Maria met a woman (Baker community member) selling caribou fur clothing at the community center during the hearing.	Maria explained that she worked for Kivalliq Energy, a uranium exploration company in permitting and environmental, and discussed some to the observations she collects on caribou as part of baseline studies and why (to assess caribou land use in the area and predict and mitigate potential impacts to caribou). Woman introduced her mother and explained that her mother had made the clothing and was born on the land around baker. Woman and Maria sat together during 2 and a half days of the hearing. The woman occasionally interpreted comments from community members and elders for Maria when they weren't captured by interpreters.
June 6, 2015	2:30 pm	Robert Janes (Mayor Rankin Inlet), Joseph Aupaluktuq (Mayor Baker Lake), Paul Kanayok (Chairperson HTC), Peter Alareak (KIA Director), Norman Attungala (KIA Director), Alex Ishalook (Chairperson HTC)	Letter to, from JW re: request for community meeting letter and community factsheet in English and Inuktituk
June 29, 2015	7- 9:15 pm	Rankin Inlet Hamlet community visit and presentation. Andy Berry presented , Maria Egerton assisted. In attendance: Robert Janes (Mayor Rankin Inlet),Craig Beardsall (KIA),David Kanayok, Sam Twyee, Roger Subqut, Jerome Tattuinee, Willie Alogut, Jack Kabuitok, John Ayaruaq, Levi Curley, Alex Sammurtok, 2 women who chose not to provide their names	Q - Woman 1 - How can you ensure that the Uranium you sell won't end up being used for weapons? Do you have any buyers? Will you be flying yellowcake out? Its my understanding that if a plane carrying yellowcake crashed it would be an environmental disaster. A - Andy explained how Canadian Uranium is regulated by the CNSC A - Andy and Maria explained that we are an exploration company, that we are still a long way from selling or transporting yellowcake. Maria explained if and when the project ever became a mine, all aspects of it including whatever the proposed method of transportation of yellowcake would be, would have to go through a complete environmental review and related public hearings.

			Q – Jack - Does drilling release any radioactive particles to the air or soil? A - Andy explained that Kivalliq separates the hot drill cuttings from other drill muds and stores them in sealed drums. Q – Alex requested a paper copy of the entire presentation. Commented that the agreement with NTI was not favorable to the Inuit. He found the $50,000 advance royalty payments and the $1mil payment upon reaching stated resource level insufficient. A - Andy responded that Kiv has invested $55 million within the IOL to date. That there are significant costs related to exploration that are not reflected in the presentation and that he could email him a digital copy of the presentation. Comments: Jerome commented that he had seen the camp the year before and it was very clean. Also that when the helicopter landed, they saw caribou grazing on the rocks and he was concerned about stepping on uranium rock. He recalled that Andy used the scintillometer to measure radioactivity.
June 30, 2015	8:30-10 pm	Arviat Hamlet community visit and presentation. Andy Berry presenter, Maria Egerton assisted. In attendance: Emil Arnalak (interpreter), Phillip Kigusiutnak, Lucien Kabuitok, Roxanne Konek, Susan Konek, Sophie Kuksuk, Alysia Kuksuk, Martha Nutarasungnik, Laurent Pameolik, Jason Irksuk, Jason Irksuk Sr., Sandra Irksuk, Racheal Okotak, Matthew Okotak, David Illungiayok, Silis Illungiayok, John Akammak, Linda Sheetoga, Malena Sheetoga, Shanelle Sheetoga, Sarah Iblauk, Paul Iblauk, Stacey Kritaqliluk, Travis Kritaqliluk, Doyle Mukyungnik, Leo Mukyungnik, John Nungnilk, Janet Nungnilk, Charlie Alareak, Celina Iootna, Bobby Iootna, Lydia Mukyungnik, Cecelia Shamee, Ernie Sreetak, Peter Kritaqliluk, Peter Adjuk, Jonah Sewoee.	Emil Arnalak worked as interpreter and will be employed as a helper for the upcoming program. Our flight was delayed, Emil communicated our delay to community and set up hall in our absence. Former employees Martha Nutarasungnik, Ernie Sreetak, and Eugene Shamee came to greet us. Martha introduced us to her bother and sister-in –law Paul and Sandra Iblauk, both looking for work. Sandra Iblauk provided a resume – interested in work as a kitchen helper. Paul Iblauk provided a resume – has experience as a core splitter and is interested in work as a core splitter or drilling assistant. He expressed his interest in geology in general. David Illungiayok provided a resume - has experience as a core splitter and is interested in work as a core splitter or drilling assistant. Jason Irksuk Sr. commented to Andy that he was hungry. Peter Adjuk helped us carry bags back to hotel and commented that he too was hungry.
July 2, 2015	7-9 pm	Baker Lake Hamlet community visit and presentation.	Q – Victoria asked if there are jobs

		Andy Berry presenter, Maria Egerton assisted. In attendance: Alexander Alooq (interpreter), Valerie Niego, Victoria Amarook (867) 793-4892	A – Andy explained that for now we have only a few jobs and we have taken them back first. If we do well on our first few drill holes, we might have the opportunity to hire more Victoria is trained as a cook, or cook helper, and interested in working with us.
July 4, 2015		INAC, KIA, NIRB, NWB, WWSC	Notification of the Commencement of Operations letters sent.
August 7, 2016		INAC, KIA, NIRB, NWB, WWSC	Notification of the Closure of Operations letters sent
January 25, 2016	11am	Mike Beauregard, Resident Geologist, Government of Nunavut	Talked with Andrew Berry at Roundup. Company and technical update
January 27, 2016	12-2pm	Jim Paterson, Jeff Ward, Andrew Berry, Cam Barker, Chris Arko, Chris Kalluk, Jorgan Aitaok	NTI/Kivalliq Lunch. Company and technical update
June 24, 2016		INAC, KIA, NIRB, NWB, WWSC	Notification of the Commencement of Operations letters sent.
August 10, 2016		INAC, KIA, NIRB, NWB, WWSC	Notification of the Closure of Operations letters sent
November 7 to December 6, 2016		Carson Gillis	Emails and telephone calls regarding Inuit Owned Land Parcels (IOLs).
January 24, 2017	9-11am	INAC, Andrew Berry, Emily McNie	Andrew Berry and Emily McNie attended the INAC Nunavut Regulatory Engagement Session
January 24, 2017	7-9pm	Jim Paterson, Jeff Ward, Andrew Berry, Emily McNie, Carson Gillis, Jorgan Aitaok, Miguel Chenier	NTI/Kivalliq Dinner. Company and technical update.

*Community consultation logs from May 2009 to September 2014 available upon request.