Transport Canada
Iqaluit, Nunavut Land Treatment Unit
Operation and Maintenance Plan

January 1, 2010

To:

Nunavut Water Board
P.O. Box 119
Gjoa Haven, Nunavut
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Introduction

Transport Canada (TC) received a water license from the Nunavut Water Board to operate a landfarm in order to treat petroleum hydrocarbon (PHC) contaminated soil at the Iqaluit airport. The water license No. 1BR-LTU0608 was issued on August 21, 2006 which outlines the terms and conditions for the operations and maintenance of the facility. The license was renewed to license # 1BR-LTU1013. The most recent license renewal is dated April 30, 2014 # 1BR-LTU1419. The following updated operation and maintenance plan is required under the terms and conditions of the agreement. The plan will outline the types of material accepted at the facility, the procedures to be utilized in the treatment and storage of the PHC impacted soil, the criteria to be attained prior to soil being deemed remediated, and the ultimate deposition of any treated soil. The updates to the license include changes to the sampling parameters and apply to all landfarms located at the site (A & B / C & D).

History

Prior to July 1, 1995 Iqaluit Airport was owned by the Government of Canada and operated by the Quebec Region of the Department of Transport. From July 1, 1995 until April 1, 1999 the airport was owned by the Government of Northwest Territories and operated by the Arctic Airports Division of the Department of Transportation. Since April 1, 1999 the airport has been owned by the Government of Nunavut and operated by the Nunavut Airports Division of the Nunavut Department of Community Government, Housing and Transportation.

As a condition of the Arctic A Airport transfer agreement (July 1995) between GNWT and Transport Canada, the environmental issues, which existed prior to the airport transfer, are to be remediated as well as any items identified by the GN within six years of the transfer date. Works identified under this document address some of the issues identified in the transfer agreement as well as post transfer issues. For the purposes of this O&M Plan only, PHC contaminated soil will be considered from this document and the placement of this material in the LTU. Types of PHC contaminated soils encountered for disposal in the LTU are gasoline, diesel, and jet fuel (A,B) which are the main sources of fuel spills and leaks over the past 60 years at this location. The depth of contaminated soil in the LTU will not be greater then 1m and will be constructed based on the parameters outlined in the water licence application (also see attached engineered drawing).

Transport Canada is obligated to remediate all hazardous substances that are the department's responsibility that do not comply with the applicable environmental laws.

A) Operation and Maintenance Program

Sampling Program

The first objective is to conduct a comprehensive soil sampling program at the beginning of each field season to identify the levels of PHC contamination in the soil. Due to the long winter season at this location, TC anticipates initially sampling the LTU in the beginning of June depending on weather conditions. The soil criteria used for this site will be under the CCME Canada Wide Standards for Petroleum Hydrocarbon Contaminated Soils Tier 1, coarse grain soil, Industrial site. This criteria is used due to the location of the facility between Runway 18-35 and Apron I. To access the site airport security clearance is required. The location will not be used for commercial development due to the location adjacent to the runway and Apron.

1a) The sampling program will require ten (10) composite soil samples and a sample from each monitoring well from the LTU for submission to a laboratory for analysis. The sampling protocol for the LTU will require a random grid pattern covering the entire area. All sampling procedures will be in accordance with the standards contained in the CCME Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites Volume I &II. Quality assurance/quality control will be observed while conducting the sampling program and include at a minimum the following:

- Use of trip, field and equipment blanks;
- Use of duplicate and spiked samples;
- Proper sample containment, preservation, chain of custody; and
- Due regard for necessary health and safety precautions.

1b) All soil samples will be analyzed for the following parameters and compared to the Tier 1 Level of the CCME PHC Guidelines (most recent edition):

- The concentration of F1 – F4 fractions in petroleum hydrocarbon contaminated soil, according to the CCME *Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil* that is entering the Land Treatment Unit from all sources and excavations.
- BETEX – Benzene, Toluene, Ethylbenzene, Xylene
- TPH – Total Petroleum Hydrocarbon
- HM - Heavy Metals including AL, As, Cd, Co, Cu, Fe, Pb, Mo, Ni, Se, Ag, Ti, Zn
- PAH - Polycyclic Aromatic Hydrocarbons

All monitoring well and standing water in the sump area will be sampled for the following parameters and compared to the CCME Guidelines:

pH	Conductivity
Total Suspended Solids	Ammonia Nitrogen
Nitrate – Nitrite	Oil and Grease (visual)
Total Phenols	Sulphate
Total Hardness	Total Alkalinity
Sodium	Potassium
Magnesium	Calcium
Chloride	Total Cadmium
Total Copper	Total Chromium
Total Iron	Total Lead
Total Mercury	Total Nickel
Total Zinc	Total Phosphorous
Total Aluminum	Total Manganese
Total Cobalt	Total Arsenic

- TPH - Total Petroleum Hydrocarbons
- BTEX - Benzene, Toluene, Ethylbenzene, Xylene
- HM - Heavy Metals including AL, As, Cd, Co, Cu, Fe, Pb, Mo, Ni, Se, Ag, Ti, Zn
- PAH - Polycyclic Aromatic Hydrocarbons
- The concentration of F1 – F4 fractions in petroleum hydrocarbon contaminated soil, according to the CCME *Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil* that is entering the Land Treatment Unit from all sources and excavations.
- Polychronitaed Biphenils (PCB)
- Total Petroleum Hydrocarbons (PHC)

Summary of Tier 1 Levels (mg/kg) for surface soil CCME.*

Land Use	Soil Texture	F 1	F 2	F 3	F 4
Agriculture	Coarse grain soil Fine grain soil	30b 210 (170a)	150 150	300 1300	2800 5600
Residential/Parkland	Coarse grain soil Fine grain soil	30b 210(170a)	150 150	300 1300	2800 5600
Commercial	Coarse grain soil Fine grain soil	320(240a) 320(170a)	260 260(230a)	1700 2500	3300 6600
Industrial	Coarse grain soil Fine grain soil	320 (240a) 320 (170a)	260 260 (230a)	1700 2500	3300 6600

* Additional Tier 1 levels are presented in Technical Supplement.
a= Where applicable, for protection of potable groundwater.
b= assumes contamination near residence

2a) The use of a gas Photo Ionization Detector (PID) or similar equipment to monitor hydrocarbon vapours will be required to field screen the soil sample taken. The use of field screening the soil will provide an immediate representation of the conditions and levels of the PHC in the soil. This process does not replace laboratory results, however it does give a good sense of the conditions.

The results of the laboratory analysis are to be compared to the Nunavut Environmental Guidelines for Site Remediation (most current edition), CCME Canada Wide Standards Petroleum Hydrocarbon Guidelines (most current edition) and the CCME Interim Canadian Environmental Quality Criteria for Contaminated Sites (most current edition) remediation criteria for industrial zoned sites. The selected laboratory must provide quality assurance (QA) and quality control (QC) procedures. All samples are to be procured through approved methods and procedures and are to be submitted to a Certified Laboratory (CAEAL/ Standards Council of Canada) for formal analysis.

Once the laboratory and field screening results are obtained, TC can proceed with several options. The landfarm will require nutrient amendments and tilling if it does not meet the previous mentioned criteria. This process will immediately proceed the sampling program each June when the soil is able to be worked. The following procedures will be followed:

Nutrient Amendments and Tilling

Biodegradation requires micro-organisms are meeting nutritional requirements. The optimal range of carbon:nitrogen:phosphorus (C:N:P) is 100:10:1 to 100:1:0.5. Soil amendments in the form of commercially used solid fertilizers will be applied in sufficient amounts as recommended by the manufacturer to achieve this target ratio for the specified volume of soil in the LTU.

Once the nutrients have been added to the LTU the soil will be turned over with the use of a backhoe. This will expose the soil to oxygen and for micro-organisms as well as distributes nutrients and moisture in the soil, thereby aiding in biodegradation. Care must be taken by the backhoe operator not to tear the liner and report any cracks, blisters or punctures to the liner.

Leachate Management

The LTU is constructed with a 1% slope which allows any leachate to collect in the sump area. Visual monitoring of the sump ensures that water is collecting in the sump area indicates the liner is not damaged. Leachate may be recirculated

over the LTU soil surface as a means of irrigation to maintain optimal biodegradation rates. Discharge of the leachate may be required if the sump collection area rises to within 1 foot of the top of the berm. This is not likely to happen due to the height of the engineered berms taking into consideration the amount of precipitation and evaporation rates at this location. If the leachate is required to be discharged it must first meet the discharge levels within CCME EQGs and the Water License 1BR-LTU1419 agreement for LTU wastewater discharge criteria:

Parameter	Maximum Allowable Concentration (ug/l)
pH	6 to 9 (pH units)
Oil & Grease	5000
Lead (dissolved)	1
Benzyene	370
Toluene	2
Ethylbenzene	90

The area designated for leachate disposal is located adjacent to the LTU in the open field between Apron I and the runway. This area is located greater then 1 km away from any water body and potable water source.

The LTU will continue to be monitored each field season to ensure the facility is operating as it has been designed. Additional soil sampling will be conducted in the fall of each year to determine the effectiveness of the previous amendments in the spring. A soil sampling program will be conducted in August or September as described earlier including monitoring wells. The following outlines when the samples and activities will be conducted:

Activity	Time of Year	Time of Year
Soil Sample	June	August - September
Monitoring Well Sample	June	August - September
Tilling/Fertilizer	June	If Required Aug - Sept

Monitoring Well Sampling

TC will undertake sampling the monitoring wells and the sump inside the LTU as described in the Water License No. 1BR-LTU1419. The frequency and time of year are outlined in the above table. The sump will be tested prior to any required discharge and tested prior to the decommissioning of the facility. The parameters for testing the monitoring wells are as follows:

Station	Location	Parameter	Frequency
LTU -1	Sump	PTH, BTEX, HM,PAH	Discharge
LTU – MW1	Upgradient - LTU	PTH, BTEX, HM,PAH	Twice/year
LTU – MW2	Downgradient - LTU	PTH, BTEX, HM,PAH	Twice/year
LTU – MW3	Downgradient - LTU	PTH, BTEX, HM,PAH	Twice/year

B) Remediation Targets and LTU Closure

TC is required to meet the required PHC criteria under the Nunavut Environmental Guidelines for Site (most current edition), CCME Petroleum Hydrocarbon Guidelines (most current edition) and the CCME Interim Canadian Environmental Quality Criteria for Contaminated Sites (most current edition) remediation criteria for coarse grain soil, industrial zoned sites. Once the LTU has been sampled and shows PHC levels are below the required criteria, the facility will be decommissioned and restored back to its original state.

The decommissioning will be done by removing the treated soil from the liner and removing the liner from the LTU. Using a gas Photo Ionization Detector (PID) or similar equipment to monitor hydrocarbon vapours, random samples of the material below the liner will be tested to ascertain if any contamination leached beneath the liner. In addition to the portable hydrocarbon vapour testing, 10 soil samples will be taken from under the liner area and sent to a certified laboratory for analysis of the same parameters as listed earlier. The liner itself will be taken to an approved landfill site for proper disposal. If contaminated soil is found below the LTU, this material will be removed and placed in an adjacent LTU TC is operating on site (please see attached drawing).

The treated soil will be used to backfill the LTU excavation and compacting, if necessary, to match the surrounding soil conditions. All monitoring wells will remain in place for future sampling until it is determined no contamination exists (approximately one year). Once this is completed the monitoring wells will be removed and sealed with bentonite using accepted standards under the Environmental Protection Agency (EPA).

Finally, once the LTU area has been replaced with the treated soil, the soil and berms shall be leveled and compacted to match the surrounding conditions, unless the Airport Manager wishes for a different land use for the area. The former LTU area will be re-seeded with vegetation that is natural and noninvasive to the area.