Water License Application

Supplementary Information Requirements For Hydrocarbon – Impacted Soil Storage and Landfarm Treatment Facilities

Transport Canada
Prairie and Northern Region
Environmental Affairs

March 2006

Contact:

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I. General Information

1. March 30, 2006

2. Transport Canada
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5. Water License requested for 2 years

II. Technical Information

Site Assessment Considerations

1. Please see air photo (CD), topographic maps identifying:
   a. Soil, fuel storage
   b. Soil landfarm active treatment locations
   c. Site drainage patterns
   d. Adjacent surface water bodies
   e. Facility site access routes
   f. Detail of surface and subsurface monitoring site please see engineered drawing
   g. No traditional land use areas, recreation camping, fishing at this site. The airport is a fenced controlled, secured location

2. Borehole logs were completed by Dillion Consulting on Apron I, adjacent to the location of the landfarm facility. The Dillion report is included in this application with the borehole logs for determining the slope of land underlying the Facility. The underlying slope is flat with a 2.0 – 2.3 m layer

of brown medium – grained sand with some pebbles and cobbles. Permafrost was reached between 1.5–2.0 m. Please see Borehole Logs in Appendix Section II – 2. The site is underlain by discontinuous permafrost, as in other areas at Iqaluit. Bedrock at Iqaluit consists primarily of granitic gneiss for the Archean. A thin mantle of sand and gravel overlies the bedrock at the Airport, however, depth to bedrock beneath the location is unknown.

3.

a. Precipitation and temperature profile provided in Appendix Section II –3
b. Local Drainage; Please see Dillon Report Section 2.3 page 4 – Hydrogeology.
c. Hydrology Seepage; Please see Dillion Report Section 2.4 page 4 – Hydrology
d. The landfarm will be located on a developed area at the airport designed to redirect rain and snow melt away from the facility to designated drainage ditches. There is no potential for flooding to occur. No other landforms are in the vicinity to encourage flooding at the facility.

4.

a/b. The underlying soils consist primarily of medium-coarse sand and gravel. The permafrost layer undulates from 0.8 m up to 2.0 m below the surface. Therefore, the active layer may be between 0 – 0.8m and 0 – 2.0 m.

c. Earthworks are used to support, cover, protect, drain, and separate components of a goesynthetic lining system. A properly prepared base is critical as the founding surface for the lining system. Long term liner integrity is dependent upon a properly prepared base. The following should be considered when prepared:
    i. Most soils can be used as base material including sand, silty sand, clay and clay silt
    ii. The prepared surface should be uniform and well compacted. It should be free of rock or sharp materials such as tree roots, construction debris and stones
    iii. If the base surface can not be prepared from the existing material, imported suitable material should be substituted
    iv. Finished surface should ensure gentle slope grades to prevent liner stress
    v. The base of the LTU will be graded and compacted to the density of the surrounding native soil
    vi. The permafrost will not be disturbed. The surface will be graded and covered with suitable material (sand, clay, etc) protecting the permafrost, the liner will be placed over this layer and the contaminated soil spread over the liner.

5. The site is inside airport property. It is zoned as commercial and is restricted to all public access. The Government of Nunavut Department of Nunavut Airports. Legislation that regulates airport development is the TP-312 Aerodrome Standards and Recommended Practices. The development

follows the required sitting guidelines for a LTU. The Government of Nunavut has also reviewed the project and acknowledges the site is acceptable.

III Soil Storage and Landfarm Treatment Design Considerations

1. a. The LTU will be 100m X 75m with a capacity to hold 7500 m^3 of contaminated soil. Please see WEIR document page 11 - Activity 3 for detail description for LTU construction.

b. Geosynthetic liner will be used based on the contaminates being contained, duration of the project, environmental conditions and site requirements. The liner selected for the LTU will be the 30 mil unsupported polyvinyl Layfield Arctic Liner. Arctic Liner is formulated alloy hydrocarbon containment that combines chemical resistance with ease of installation. The liner has a tensile strength of 57 ppi, a minimum elongation of 500% and has been specially formulated to withstand chemical deterioration and harsh climatic conditions. Arctic Liner is suitable for multi year projects for hydrocarbon contaminated soils designed specifically for arctic and sub-arctic environments with extreme cold temperatures below –40 degrees C. Please see design drawings attached. More details regarding the liner and installation please see WEIR document page 13 –22.

c. Sump details are located in the WERI document Appendix A. The LTU will be graded with a 2% slope toward the centre and in the direction of the sump. There is a pump collection area in the corners of the sump where an oil/water separator and sparging system may be used when required. The sump area is designed for a 1 in 10 year storm event.

d. See design detail in Appendix A and engineered drawing in WERI document

e. See design details in Appendix A and engineered drawing in WERI document

2. The site is located airside and is a secured controlled location. No public access is permitted. The site is monitored by airport security and surrounded by chain link fence.

3. There are no water bodies in the vicinity due to the location of the active airport. Drainage is controlled at the site by drainage channels currently in place. The site location was used previously for petroleum hydrocarbon storage tanks which have been removed and the soil remediated.

4. There is very little to no risk of flooding at the location due to the controlled drainage system at this location. Drainage ditches have been installed to direct rain and melt water away from the site. The Government of Nunavut is also upgrading the

drainage channels as part of the improvements to the airport through funding from Transport Canada.

5. No other method of remediation is suitable due to the location, climatic conditions, cost and human resources.

IV Operations and Maintenance Considerations

1. The approach for the excavation and sampling regime is located in the WERI document page 39-42 Section 2.3. Under the CCME PHC Guidelines the site is considered industrial and will be remediated using the parameters for BETEX and F1-F4 as listed in the document on page 41.

2. The details for landfarming operations is included in the WERI document

3. The approach for the excavation and sampling regime is located in the WERI document page 39-42 Section 2.3. Under the CCME PHC Guidelines the site is considered industrial and will be remediated using the parameters for BETEX and F1-F4 as listed in the document on page 41.

4. a. Once remediation is completed the Government of Nunavut Airports Division will be consulted if fill may be required at other locations at the airport. If the Government of Nunavut does not require the remediated soil, the LTU will be decommissions, the liner removed and disposed of in the local landfill and the soil graded to match the surrounding topography.

   b. The contaminated soil can be successfully remediated to acceptable levels stipulated in the CCME PHC Guidelines with proper maintenance as described in earlier sections.

V Surface and Groundwater Monitoring Programs

1. Monitoring stations are described in WERI document Appendix A.

2. Chemical, physical and biological parameters are described in WERI document page 39-42.

3. as above #2

4/5. Please see WERI document

Table VII: Summary Information on Monitoring Program Sites

- 3 monitoring wells will be located surrounding the LTU, See Appendix A for detail drawing from WERI document. The wells will be samples annually
- GPS location N63 45 24.9 W68 33 20.8
- Surface soil samples will be collected annually to determine the effectiveness the operation and maintenance is having.

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Water License Application

Supplementary Information Requirements For Hydrocarbon-Impacted Soil Storage and Landfarm Treatment Facilities

Adopted March 2005

Preamble

This supplementary questionnaire has been provided by the Nunavut Water Board ("NWB") for the purpose of assisting Applicants in the development of water licence applications ("Applications") for the construction and operation of landfarm treatment facilities. By following this questionnaire, Applicants should be able to produce an Application that contains all the relevant information that the NWB deems necessary for a comprehensive review of a landfarm undertaking. However, according to the specific circumstances of a particular Application, the NWB may request additional information from an Applicant that goes beyond the scope of this questionnaire.

The information provided here is intended to apply to "one-off" storage or landfarm facilities and not for permanent or commercial storage or landfarm facilities. The latter will require further management and monitoring procedures to ensure the medium- to long-term landfarming activities do not impact on the environment.

Under suitable conditions, landfarming is an effective bioremediation technology for reducing concentrations of nearly all of the constituents of petroleum products typically found at petroleum storage sites. In some cases, an Applicant may decide that off-site soil storage and disposal is a better option.

Landfarming is an above ground remediation technology for hydrocarbon-contaminated soil that reduces hydrocarbon concentrations through biodegradation. This technology usually involves spreading excavated contaminated soil in a thin layer on the ground surface and stimulating aerobic microbial activity within the soils through aeration and/or the addition of minerals, nutrients and moisture. The optimal rate of application of each of these parameters to achieve efficient biodegradation will depend on a number of factors, including but not limited to: the type of petroleum hydrocarbons to be remediated; the level of hydrocarbon contamination; the hydrocarbon-degrading bacteria present; and the soil matrix.

When environmental and other conditions will not be suitable for landfarming, an Applicant may apply for on-site storage licence. Information to be submitted in support of the Application is the same as for a landfarm.

I. GENERAL INFORMATION

The following general information should be included in the Application.

1. Date of Application.
2. Name and mailing address of the Applicant.
3. Contact information including phone number(s), fax number(s) and email address(es).

4. Name(s) of Facility operator(s) and alternate management personnel.
5. Number of years the Applicant is requesting for a water license.

Applicants may be required, under various legislation, to obtain land tenure approvals or other permits from local, territorial or federal regulators.

II. TECHNICAL INFORMATION REQUIRED TO PROCESS THE APPLICATION

Current Engineered Drawings, Facility Design Plans, a Facility Operations and Maintenance Plan (including, but not limited, to a Spill Contingency Plan developed in accordance with the Board's "*Guidelines for Contingency Planning*" (1987)) and a Site Monitoring Plan will be required to process the Application. All Engineered Drawings shall be stamped by a qualified Professional Engineer registered to practice in Nunavut.

Site Assessment Considerations

The Applicant shall provide details of the site topography, hydrology and permafrost regime, including the following:

1. Current detailed topographical site survey diagrams, map(s) and/or aerial photos, of sufficient scale to clearly show all pertinent drainage features, and which clearly illustrate the location of the following:

    a. Soil, fuel and chemical storage locations;
    b. Soil landfarm active treatment locations;
    c. Site drainage patterns;
    d. Adjacent surface water bodies that could be affected by the proposed undertaking, particularly fish-bearing waters;
    e. Facility site access routes;
    f. Surface and subsurface environmental monitoring sites; and
    g. Traditional land use areas used for recreation, camping, fishing, etc.

Note: Maps, diagrams and aerial photos submitted with the Application must include an accurate scale that allows the determination of distances between the objects depicted.

2. The slope of land underlying the Facility.

3. A hydrological/climatic assessment of the site that includes the following:

   a. Precipitation and temperature profiles for the area;
   b. Details concerning the local drainage basin;
   c. Information regarding direction, path of water flow and potential seepage in area of the undertaking;
   d. A discussion concerning the likelihood of flood events that could disrupt operations or threaten water quality, and whether the local landforms may encourage or discourage such events (i.e. a Facility situated in an active flood plain).

4. A description of the soil underlying the site that includes:

   a. The physical and chemical characteristics of the material underlying Facility;
   b. The depth of the permafrost active layer; and
   c. A discussion of any permafrost characteristics that may impact on the construction and operation of the Facility (i.e. frost heaving, presence of ice lenses, evidence of permafrost degradation).

5. Information regarding the conformity of the undertaking with any applicable Municipal zoning or land use planning ordinances.

Soil Storage and Landfarm Treatment Design Considerations

The Applicant shall provide details of design and construction of all components of the Soil Storage and Landfarm Treatment Facility prior to its construction, including the following:

1. Comprehensive design details, including the dimensions, materials of construction and installation/construction procedures of all Facility components are required as part of the Application. Drawings of the design, stamped by an engineer licensed to practice in Nunavut, are also required. The design details should depict and describe the following components:

   a. Retaining structures (dimensions, materials of construction, etc.);
   b. Geo-synthetic liners (properties, installation details, etc);
   c. Sumps, pumps, storage ponds/tanks and any other devices used to manage excess runoff water and/or leachate;
   d. Existing and any proposed drainage modifications, such as berms (natural or constructed) and diversion ditches; and
   e. Water quality and environmental monitoring stations and associated equipment (design, placement, etc).

2. Information regarding the installation of barriers to prevent access to the site.

3. A discussion considering the placement of the Facility in relation to water bodies.

4. A discussion considering flood risks/maximum probably precipitation events in regards to the Facility placement and design.

5. The consideration of alternative methods of soil storage or remediation, in the event that circumstances are not suitable, for example because of environmental constraints, available human resources, etc.

Operations and Maintenance Considerations

The Applicant shall provide details of the Operations and Maintenance Plan to be implemented at the Facility regarding the acceptance of material at the Facility, the procedures to be utilized in the treatment, or storage, of the hydrocarbon-impacted soil, the criteria to be attained prior to soil being deemed remediated, and the ultimate deposition of any treated soils. This shall include the following:

1. The procedures to determine if soils may be accepted at the Facility, including but not limited to:

    a. Chemical, physical and biological characterization of the soils and the associated hydrocarbon and metal contaminant concentrations;
    b. Treatability studies, to determine the viability of landfarm treatment; and
    c. Sampling frequency and number of samples *per* volume of soil accepted

2. The procedures to be utilized during active landfarming operations in the active treatment cells, including but not limited to:

    a. Treatment cell development and material placement therein;
    b. Contaminated soil thickness in treatment cells;
    c. Method of mechanical aeration in treatment cells;
    d. Oversize material management;
    e. Surface water management, leachate containment and/or treatment, and site grade planning;
    f. Process water management, and treatment prior to discharge;
    g. Site volume and operational monitoring programs;
    h. Dust control programs; and
    i. Staff operational training programs.

3. The Applicant must provide a soil quality remedial objective, as defined by the Canadian Council of Ministers of the Environment ("CCME") or by other applicable agency, to which the Applicant is intending to achieve.

4. A conceptual decommissioning and reclamation plan is required with the Application, which should contain the following information:

   a. Details regarding the ultimate deposition of any treated soils; and
   b. A disposal plan for soils contaminated with bioremediation-unsuitable compounds, or for soils that do not respond well to the proposed landfarming treatment.

Surface and Groundwater Monitoring Programs

A comprehensive Surface and Groundwater Monitoring Plan to be implemented at the Facility is required with the Application. This Plan shall include the following:

1) Locations (including GPS coordinates) of all proposed Monitoring Stations;
2) Chemical, physical and biological parameters to be monitored;
3) Sampling frequency;
4) Baseline monitoring programs currently in progress, or contemplated during the term of the license under consideration; and
5) QA/QC Programs to be implemented as part of the Monitoring Program.

Table VII: Summary Information on Monitoring Program Sites

Monitoring Location	GPS Coordinates	Type of Monitoring Carried Out	Monitoring Frequency
		□ Surface □ Subsurface	□ Monthly □ Annually
		□ Surface □ Subsurface	□ Monthly □ Annually
		□ Surface □ Subsurface	□ Monthly □ Annually
		□ Surface □ Subsurface	□ Monthly □ Annually
		□ Surface □ Subsurface	□ Monthly □ Annually
		□ Surface □ Subsurface	□ Monthly □ Annually