Government of Yukon | Yukon Government | department of ENVIRONMENT

LAND TREATMENT FACILITIES

For Land-farming Hydrocarbon-contaminated Soils

Guidelines for Construction, Operation, and Decommissioning

These guidelines provide basic information for the siting, construction and operation of a Land Treatment Facility for land-farming soil contaminated with petroleum hydrocarbons. This guide does not replace the need for an assessment of site specific requirements by qualified staff.

What is land-farming?

The term "land-farming" refers to the treatment and clean up of petroleum hydrocarbon contaminated soils in a **Land Treatment Facility (LTF)**. Remediation is achieved by aerating the soil to encourage volatilization and microbial biodegradation of the petroleum hydrocarbons.

Under proper conditions, petroleum hydrocarbon contaminated soils can be effectively and efficiently remediated through the use of land-farming techniques. The inappropriate use of these techniques, however, can result in new contamination of soil and water near the treatment facility.

What permits do I need for a Land Treatment Facility?

A Land Treatment Facility Permit, under the Yukon Contaminated Sites Regulation (CSR), is required for all LTFs in the Yukon.

If you want to treat soil containing petroleum hydrocarbons in excess of 3% by weight (30,000 ppm hydrocarbons), a Special Waste Permit is required. A LTF Permit and **Special Waste Permit** can be combined as one permit.

The following Permits may also be required, depending on the location of the site:

- A Development Permit, from the City of Whitehorse Planning Department (867-668-8335) if the site is within City boundaries. (May also require a Zoning Bylaw Amendment)
- A Lease from the Yukon Government Lands Branch (867-667-5215) if the proposed site is on territorial land.

If the remediation process requires a large volume of water, a Water Licence may be required. To determine if a Water License is required, contact Water Resources, DIAND (867-667-3234).

Once an LTF is operational the operator must ensure that a Relocation Permit has been obtained for all incoming contaminated soil. The Relocation Permit can be obtained by any of the following people:

- The owner of the contaminated site/soil,
- The LTF operator, or
- The consultant working for either party.

For more information on obtaining a Relocation Permit, contact the Environmental Protection and Assessment Branch (867-667-5683).

A Relocation Permit is not needed to remove contaminated soil from the LTF, provided testing has been done to ensure that any residual contamination is below the criteria in the CSR, and reporting procedures have been complied with (see the "monitoring and record keeping" section below for more information).

What can I put in a Land Treatment Facility?

Soil contaminated with petroleum hydrocarbons must meet two conditions before it can be placed in a Land Treatment Facility for remediation.

- First, the soil must not be contaminated with waste engine oils or petroleum hydrocarbon mixtures containing waste engine oil. Waste engine oil contains metals from the engine. These metals are usually toxic to the soil microbes that biodegrade the petroleum hydrocarbons. For more information proper disposal/treatment soils contaminated with waste oil, contact the Environmental Protection and Assessment Branch.
- Second, the level of hydrocarbon contamination must not exceed 30,000 mg/kg soil as measured by either of the following methods: Total Petroleum Hydrocarbons (TPH) or Total Extractable Hydrocarbons (TEH.). Any soil with a petroleum hydrocarbon concentration greater than 3% by weight (30,000 mg/kg) is considered a Special Waste. Before generating, storing, transporting, disposing or otherwise handling (which includes treating) Special Waste, a person must obtain a Special Waste Permit from the Department of Environment. The application for a Special Waste Permit must contain, among other things, a description of how the special waste will be treated or disposed.

Where can I set up a Land Treatment Facility?

Land farming can be conducted on the site where the contaminated soils were excavated or at a different location. If the contaminated soil is to be moved to a different location a Relocation Authorization is needed.

The area where the Land Treatment Facility is to be located must:

- Be large enough to permit the soil to be spread out into layers less than 0.5 m in thickness or into spaced rows of small piles of greater than 0.5 m in height; and
- Have native soil that is sufficiently fine-grained (silt or clay textured) to act as a semi-impermeable barrier to the movement of liquids.

A Land Treatment Facility should not be constructed on any land where:

- The slope is greater than 6 %;
- The seasonal high water table is less than 3 metres below the surface;
- The Facility would be within 100 metres of a surface water body;
- The land is identified as being within a 25 year floodplain; or
- Residential property lines or buildings are less than 60 metres away.

How do I build a Land Treatment Facility?

A Land Treatment Facility should be built according to accepted standards for such facilities, and should include such things as:

- The use of an impermeable liner if the hydraulic conductivity of the native soil is greater than 10-5 cm/sec, and the layer of this native soil is less than one (1) metre;
- The use of natural or engineered berms of sufficiently low permeability to prevent leachate migration, and of sufficient impoundment capacity to contain any leachate;
- The use of diversion ditches, as required, to ensure that runoff cannot enter the Land Treatment Facility;
- Signs identifying that this is a Land Treatment Facility and that the soil is contaminated with petroleum hydrocarbons, and, if warranted, fencing.

Generally, these guidelines should not be applied without being reviewed by persons competent to assess their applicability to a given situation. It is recommended that the services of a qualified environmental consultant be engaged to oversee the construction and monitoring of a Land Treatment Facility.

Knowing Your Contaminated Soil

Before putting petroleum hydrocarbon contaminated soil into a Land Treatment Facility, the concentration of contaminants should be assessed. In particular the total extractable hydrocarbons (TEH) and total petroleum hydrocarbons (TPH) levels should be assessed. This information is then used to determine the viability of the land treatment option and the possible need for special treatment conditions. Lab scale or pilot tests (sometimes referred to as treatability studies) may need to be done to determine the feasibility of remediating the soil to an acceptable level.

Once the contaminated soil is remediated, it should again be tested to verify that the appropriate remediation criteria under the Contaminated Sites Regulation have been achieved. These criteria include, but are not limited to Light Extractable Petroleum Hydrocarbons (LEPH), Heavy Extractable Petroleum Hydrocarbons (HEPH), and BTEX levels (Benzene, Toluene, Ethylbenzene, and Xylene).

Whenever contaminated soils are tested, care must be taken to ensure that representative samples are collected. At a minimum, samples should be collected at several points and composited over the depth of soil, at each point. The List of References at the end of this guideline includes documents that provide guidance on how to identify contaminants and characterize contaminated soils.

Operating Your Land Treatment Facility

Your Land Treatment Facility must be operated correctly to efficiently remediate the contaminated soil and to avoid creating a new contaminated site. The following list includes some of the operating conditions that should be considered when planning and running a Land Treatment Facility:

- The operational season of a Land Treatment Facility should be limited to between April 1 and October 31 each year. No hydrocarbon-contaminated soils should be applied to the active cells of the Land Treatment Facility outside this operational season, during rainfall periods, or at any other times when the soil is saturated with water, ice-covered, snow-covered or frozen.
- The Land Treatment Facility should have a staging area where incoming contaminated soil can be stored until the operator has confirmed that the soil contains no contaminants other than petroleum hydrocarbons, and that the concentration of petroleum hydrocarbons is below 3% by weight (30,000 ppm). Soil should not be moved into cells of the Land treatment Facility until its condition is confirmed.
- The depth of the soil in the Land Treatment Facility should be no more than 0.5 metres.
- If the soil is to be placed in the Land Treatment Facility to a depth exceeding 0.15 m, the soil should be tilled at least once per month. Tilling aerates the soil, which increases the rate of microbial breakdown of the petroleum hydrocarbons.
- The pH of the soil at the Land Treatment Facility should be between 6.5 and 8.5. Soil pH levels above or below these levels are harmful to the soil microbial population.
- The addition of fertilizer may accelerate the rate of remediation, provided it is added in appropriate quantities. The "treatability studies" mentioned earlier can help determine if the remediation of the contaminated soil would be improved by the use of fertilizer or other amendments. Some commercial laboratories offer these tests.
- Care should be taken to ensure that the Land Treatment Facility does not become water saturated. Water saturation will stop the remediation process and create contaminated waters that would also have to be treated. If water drainage from elsewhere on the site is prevented from entering the Land Treatment Facility, water saturation is not usually a problem as the Yukon climate is dry enough to prevent the accumulation of persistent standing water in a Land Treatment Facility. If water saturation becomes a problem, particularly in a Land Treatment Facility with an artificial impermeable liner, a sump can be created within the Land Treatment Facility and the water pumped to a tank. Once the soil in the Land Treatment Facility dries out sufficiently, the contaminated water can be intermittently sprayed back onto the soil surface.
- Contaminated soils with different origins, different compositions and/or different contaminant concentrations should be kept and treated in separate cells within the Land Treatment Facility.

Monitoring and Record Keeping

The Land Treatment Facility should be inspected at least every two weeks during the treatment season and maintained in good working order. If there are any irregularities at the facility, appropriate remedial action should be taken, and the Environmental Protection and Assessment Branch of the Department of Environment should be notified.

A regular monitoring program should be done for all soil being treated. This program should include the kinds of testing discussed in "Knowing your Contaminated Soil" above.

Records should be kept for the Land Treatment Facility. These records should include:

- The origin of all contaminated soil;
- The current location of soil within land treatment facility;
- The volume of soil being remediated;
- All soil analysis results;
- Transportation details of any special waste;
- Nutrient information (type, dates, quantity) for any fertilizers added to the soil;
- Details of all tillage activities.

All Land Treatment Facilities may be inspected from time to time by an Environmental Protection Officer, who may also ask to see the records. Records should be kept for a minimum of three years or for as long as a particular load of contaminated soil is being remediated in the Land Treatment Facility (whichever is longer).

Decommissioning a Land Treatment Facility

Remediated soil can be removed from the Land Treatment Facility when contaminant levels fall below the applicable criteria of the Contaminated Sites Regulation, as shown in laboratory test results. The remediated soil must only be re-used for the land uses for which it has been remediated, or for which the remediation criteria are less stringent. For example, a contaminated soil remediated to a Commercial Land Use standard could not be used in Residential or Parkland sites, which have more stringent criteria. However, soil remediated to a Residential Land Use standard could be used in a Commercial or Industrial Land Use as these have less stringent criteria.

When decommissioning a Land Treatment Facility the following issues should be considered:

- The procedures used to remove any remaining soil, and all other works at the site (i.e. liners, drain lines, etc.),
- The nature and level of any residual contamination that will remain on the site. It is preferable that no contamination remains on the site, and decommissioning should aim for this. Nonetheless, any residual contamination should be below the CSR criteria for any proposed future land use of the site,
- The intended use of the site once the Land Treatment Facility has been decommissioned.

A formal Decommissioning Plan must be submitted to, and approved by, the Environmental Protection and Assessment Branch before decommissioning begins.

Additional Information

The following list may provide additional information on the design, construction, monitoring and decommissioning of Land Treatment Facilities, as well as information on the *Environment Act*, the *Contaminated Sites Regulation* and the *Special Waste Regulation*.

Guidance on Contaminated Sites Document #1: Site Characterization and Confirmation Testing, British Columbia Ministry of Environment, Lands and Parks.

Guidance on Contaminated Sites #2: Statistical Criteria for Characterizing a Volume of Contaminated Material, British Columbia Ministry of Environment, Lands and Parks.

Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites (Volumes I and II), Canadian Council of Ministers of the Environment, Report CCME EPC-NCS62E, December 1993.

Subsurface Assessment Handbook for Contaminated Sites, Report CCME EPC-NCSRP-48E, March, 1994.

Yukon Department of Environment information, including:

- Fact Sheet: The *Environment Act*

- Fact Sheet: Contaminated Sites: Information for the General Public
- Fact Sheet: The Yukon *Contaminated Sites Regulation*
- Fact Sheet: Disposal of Special Wastes
- Fact Sheet: *Special Waste Regulations*
- Waste Oil Policy
- Protocol - *Hydrocarbon Contaminated Soil Special Waste Regulations*
- Enforcement and Compliance Policy for the *Environment Act*

For greater certainty, readers should also refer to the Yukon *Environment Act* and *Regulations*.

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