Guideline for
Land Treatment of Petroleum-Contaminated Soil
Landspreading, Landfarming, and Low-Volume Land Treatment

This guideline addresses offsite land treatment of virgin petroleum-contaminated soil. **No waste oil, #4 or #6 oil contaminated soil may be land treated.** Soil saturated with product and soil contaminated with gasoline containing more than 10 percent MTBE (reformulated gasoline, RFG) cannot be land treated. (Soil classified as a hazardous waste is comprehensively regulated by the provisions of the Maine Hazardous Waste Rules, Chapter 850 et seq. No soil suspected of meeting the characteristics of hazardous waste is to be land treated.)

An Air Bureau license is required for land treatment within Air Bureau non-attainment/planning zones (York, Knox, Cumberland, Androscoggin, Sagadahoc, Kennebec, Waldo, and Hancock counties), except for "Low-Volume Land Treatment."

Treatment and disposal of petroleum-contaminated soil must be overseen by the Department of Environmental Protection (DEP). Please note that failure to handle the waste in accordance with this document may be considered a violation of statute or regulation, and such violation could result in the imposition of penalties or fines.

Land Treatment

Land Treatment involves the spreading of excavated petroleum contaminated soil in order to remove contaminants through biological degradation and evaporation. Land treatment is available, upon DEP approval, only for sites that meet the conditions listed below under "Siting Criteria," in compliance with the "Permissions and Notifications," "Landspreading or Landfarming Process" and "Monitoring Landspreading and Landfarming" requirements. Following completion of treatment, treated soil is to be seeded with a cover material.

- **Landspreading** - Landspreading involves the spreading of soil to a depth of 3 inches, with periodic tilling. Fertilizer, compost or manure may be added to the soil.

- **Landfarming -** Landfarming involves the spreading of screened soil to a depth of 3-6 inches. Fertilizer, compost or manure is added to the soil and incorporated into the native soil through disc harrowing or rototilling.

- **Low-Volume Land Treatment –** Low-Volume Land Treatment option for Landspreading or Landfarming of fewer than 50 cubic yards of soil, with reduced monitoring and operating requirements. This treatment option is available, upon DEP approval and with DEP supervision, only on property owned by the responsible party.

Siting Criteria

Landfarming, Landspreading and Low-Volume Land Treatment will only be approved if the site is not eliminated by any <u>one</u> of the following:

1. Within 300 feet of a bedrock or shallow water drinking water supply, within 1000 feet of a public water supply well. These limits may need to be extended if water supplies are shown to be hydraulically downgradient.
2. Within 300 feet of classified surface bodies of water.
3. Within 300 feet of an occupied residential dwelling, except where the owner of the residence has consented, in writing, to a smaller setback.
4. Within 100 feet of a sensitive environment such as an unclassified stream, pond, wildlife refuge, wetland, 100-year floodplain, a Maine Geological Survey mapped sand and gravel aquifer, or other similar area.
5. Within 300 feet of ledge and bedrock outcrops or on land with less than 3 feet of soil cover.
6. On sites with ponding, springs or groundwater discharge, significant gully erosion, or significant drainage area upgradient.
7. On sites whose water table is within 3' of the surface. (Saturated soil shall be considered evidence of the water table.)
8. On slopes greater than 5%.
9. On snow covered ground.
10. On sites used or to be used for production of a food chain crop within 2 years.

Permissions and Notifications

1. Land treatment sites must be approved by the DEP, in writing, before soil treatment may begin.
2. Written approval from the landowner, if different from the generator of the contaminated soil, must be obtained before treatment begins.
3. Written approval from the landowner granting DEP staff and their representatives access to the property for purposes of inspecting the soil treatment site must be obtained from the applicable landowners.
4. The local municipality and Indian nations or tribes with abutting lands must be notified in writing prior to initiating any soil treatment *(not required for Low-Volume Land Treatment.)* If applicable, local permits should be obtained. The responsible party must provide evidence to the DEP that this notification has been made.
5. Notification to additional parties may be required at the discretion of DEP personnel.
6. Public access to the treatment area must be restricted (e.g. fencing, posted, gated or cabled).
7. A written operational plan containing the following information must be submitted to the DEP
    a. street address of the land treatment site;
    b. GPS coordinates of the site;
    c. erosion control and up-gradient surface water drainage diversion;

    and *(not required for Low-Volume Land Treatment)*
    d. an area map of treatment site;
    e. a plan for handling of soil, including stockpiling and covering prior to spreading, and screening*;*
    f. a fertilizer/soil amendment regimen if Landfarming;
    g. a tilling schedule; and
    h. a monitoring schedule.

Landspreading Process

1. **Stockpiling** - Soil to be stockpiled at a landspread site for more than two days must be covered with an impermeable material such as 6-mil polyethylene with measures to protect the cover from removal or damage by wind. Soil may not be stockpiled for more than 90 days.
2. **Material Sorting –** Clay and till soils must have clumps broken up; material greater than 3"diameter must be removed prior to landspreading.
3. **Soil Spreading --** The soil must be spread to a depth not to exceed three (3) inches (400 yards/acre). The spreading of the soil must take place at the beginning of a forecasted period, of not less than 48 hours, of fair weather. Soil is not to be spread on frozen or snow covered ground.
4. **Containment** - Surface runoff must be prevented (e.g. - an earthen berm can be built around the landspread area using non-contaminated material).
4. **Tilling** - Landspread soil may need to be tilled as directed by the DEP.
5. **Stabilization –** Prior to October 1st of each year until completion of treatment, the landspread area must be seeded with a final cover material such as winter rye, clover or conservation mix, or, by November 15, must be mulched with anchored hay or straw at a rate of at least 150 lb/1000 square feet.
6. **Sampling –** Field and laboratory sampling must be performed as described below. The DEP will monitor Low-Volume Land Treatment.

Landfarming Process

1. **Stockpiling** - Soil to be stockpiled at a landfarm site for more than two days must be covered with an impermeable material. Soil may not be stockpiled at a landfarm site for more than 90 days.
2. **Material Sorting –** Clay and till soils must have clumps broken up; greater than 3-inch diameter material must be removed prior to landspreading.
3. **Soil Incorporation** - Soil must be spread to a depth not to exceed six (6) inches (800 yards/acre/season), and thoroughly incorporated into the native topsoil. The spreading of the contaminated soil must take place at the beginning of a forecasted period, of not less than 48 hours, of fair weather. The spreading of contaminated soil must not occur before **April 15 or after October 1**.
4. **Containment** - Surface runoff must be prevented (e.g. - an earthen berm can be built around the landfarm using non-contaminated material).
5. **pH Adjustment** – The pH of the native and treated soil must be adjusted by the addition of lime or sulfur to remain between 6.5 and 7.5.

6. **Fertilizer/Manure Addition -** A minimum of 1-2 inches of manure/compost, or nitrogen and phosphorus must be added to the surface of the entire landfarm area and thoroughly incorporated into the top six (6) inches of soil. Refer to the attached Landfarming Fertilizer Application Rates to calculate nitrogen and phosphorus application rates.
7. **Tilling -** Landfarmed soil must be tilled at least once a month from May through September.
8. **Stabilization –** Prior to October 1st of each year until completion of treatment, the landfarm area must be seeded with a final cover material such as winter rye, clover or conservation mix, or, by November 15, must be mulched with anchored hay or straw at a rate of at least 150 lb/1000 square feet.
9. **Sampling –** Field and laboratory sampling must be performed as described below. The DEP will monitor Low-Volume Land Treatment.

Monitoring Landspreading and Landfarming **

** (DEP will monitor Low-Volume Land Treatment)

Sampling

1. **Sampling Frequency -** Initial PID soil samples must be taken throughout the site directly following the application to establish a baseline. Subsequent sampling must be conducted at the end of the growing season. DEP recommends the collection of additional samples in mid-summer in order to measure progress, as well as to determine if operational modifications are needed. If a second year of treatment is necessary, samples must be taken in June and October.
2. **PhotoIonization Detector (PID) Sampling Round –** Treatment monitoring by PID must be conducted using DEP Jar/PolyBag Headspace Technique (Chapter 691, Appendix Q) and DEP Calibration Set Points.
3. **Spatial Frequency –** A sampling round includes samples taken from the approx centers of a 40-foot grid over the site.

Completion-of-Treatment Sampling

1. **Sampling Round** – In order to complete treatment, a PID sampling round (40-foot grid described above) must be taken with lab samples taken near any point where PID readings exceed 200 ppm.
2. **Number of Laboratory Samples -** The minimum number of lab samples required to complete treatment is dependent on the volume of contaminated soil being landspread/landfarm.

   0 – 50 cubic yards (Low-Volume Land Treatment):
   1 PID sample from within the top 3 inches of the landspread soil (top 6 inches if landfarmed) for every 15 yards treated, and 1 PID sample from 12-18 inches underneath the land treated soil. DEP may require lab samples.

   50 – 100 cubic yards:
   3 lab samples from within the top 3 inches of the landspread soil (top 6 inches if landfarmed); and 1 lab sample from 12-18 inches.

   100 - 200 cubic yards: (100 yards = ¼ acre [10,800 ft^2] @ 3")
   4 lab samples from within the top 3 inches of the landspread soil (top 6 inches if landfarmed); and 2 lab samples from 12-18 inches underneath the land treated soil.

   200 - 300 cubic yards:
   5 lab samples from within the top 3 inches of the landspread soil (top 6 inches if landfarmed); and 2 lab samples from 12-18 inches underneath the land treated soil.

   > 300 cubic yards:
   Each additional 200 cubic yards will require another lab sample within the top 3 inches of the landspread soil (top 6 inches of the landfarmed); and another lab sample from 12-18 inches underneath the land treated soil.

   Subsurface soil samples will not be required for land treatment sites set-up on an impermeable layer, such as polyethylene plastic of 8 mil or greater, unless there is indication the liner has been compromised.

3. **Analytical Methods -** All lab samples collected must be submitted to a laboratory for analysis: HETL Method 4.2.17 Gasoline Range Organics (GRO) for gasoline-contaminated sites and HETL Method 4.1.25 Diesel Range Organics (DRO) for oil-contaminated sites. All GRO samples must be preserved in the field in accordance with the DEP methanol preservation protocol for soil sampling.

Completion-of-Treatment Requirements

For soil to be left at the treatment site, completion of treatment is reached when each lab sample is less than 25 mg/kg for gasoline-contaminated soil by GRO and less than 50 mg/kg for oil-contaminated soil by DRO. The site cannot be used for growing crops for human consumption until there are no detectable petroleum hydrocarbons remaining.

For soil to be reused away from the treatment site, completion of treatment is reached when:

1. All GRO samples contain less than 10 mg/kg and all DRO samples contain less than 20 mg/kg.
2. No visible discoloration or detectable fuel odors remain in the soil.
3. Petroleum vapor concentrations must be non-detectable (< 1 ppm) using a PID.

Recordkeeping

1. The responsible party must maintain a detailed log, available to the DEP, with records of all landspread/landfarm activities and characteristics. This log is to include, but is not limited to, the following:
    a. map of treatment sites with sampling locations;
    b. volume and type of petroleum contaminated soil in the landspread;
    c. tillage dates and sample dates;
    d. fertilizer/manure/compost applications, irrigation and seeding events; and
    e. results of all laboratory analyses including chain-of-custody forms.
3. Depending on the volume of the contaminated soil, the location of the land treatment site and the degree of contamination, additional monitoring may be required on a case-by-case basis. Additional monitoring may include surface water sampling or groundwater sampling. Groundwater sampling will require the installation of monitoring wells.

Landfarming Fertilizer Application Rates

The need for nitrogen or phosphorus addition must be evaluated for soil with an average laboratory concentration of 2,000 ppm or greater (spread 4" thick). This requirement also applies to petroleum loading levels that are equivalent to this level (i.e., 4,000 ppm spread 2" thick).

Soil sample kits are available from Maine Soil Testing Service (581-1110), 5722 Deering Hall, Orono, ME 04469-5722. Or the following fertilizer evaluations may be made.

Nitrogen (N) fertilizer evaluation:

A. [avg. ppm] x spreading thickness, x 0.0128 = [ ] x [ ] x 0.0128 = _____ hydrocarbon [inches]

B. (optional) [organic matter in upper 6 inches, percent] x 50 = [ ] x 50 = _____

C. [result from A] - [result from B] = _____ minimum lb-N/acre to add

Note: This amount can be reduced by 1/3 lb-N/acre for each lb-N applied within last year. If the N application rate is determined to be less than 25 lb-N/acre, then N need not be applied.

D. Proposed Nitrogen application rate: _____ lb-N/acre

Phosphorus (P) fertilizer evaluation:

A. [average ppm] x spreading thickness, x 0.0027 = [ ] x [ ] x 0.0027 = _____inches]

B. [P concentration in native soil, ppm] x 2 = [ ] x 2 = _____

C. [result from A] - [result from B] = _____ lb-P/acre to add (minimum)

Note 1: If the P concentration in the native soil has not been tested within the previous three years a default value of 5 ppm must be used for the calculation in B above.

Note 2: The amount of P to apply can be reduced by 1/2 lb-P/acre for each pound applied within the previous three years. If the P application rate is determined to be less than 10 lb-P/acre, then P need not be applied.

D. Proposed P application rate: _____ lb-P/acre

Note: If the values in D differ from the values in C, describe the factors that resulted in the difference.

Maine Department of Environmental Protection
Land Treatment of Petroleum-Contaminated Soil

Landspread / Landfarm Treatment Request Form

Landspread: _____ Landfarm: _____ ME DEP Spill # _____ - _____ - _____

Soil Volume _____ Peak PID _____ Avg. PID: _____ Facility Name: _____

Treatment Location

Treatment Street Address: _____

_____

_____

Name of Landowner: _____

Phone Number of Landowner: _____

GPS Coordinates _____

Generator/Owner of Soil

Name: _____

Street Address: _____

_____

_____

Contact: _____

Phone Number: _____

As the party responsible for compliance with the "DEP Guideline for Land Treatment of Petroleum-Contaminated Soil" and applicable statutes, I hereby certify that the representations made on this form are true and correct to the best of my knowledge.

_____ _____
Name of Owner/Operator Representative (printed) Title

_____ _____
Signature Date

As landowner of the soil treatment location, I hereby give approval to the soil generator to treat the soil described above at the proposed location. In addition, I hereby grant property access to DEP investigators for the purpose of inspecting soil treatment at any reasonable time.

_____ _____
Signature of Land Owner Date

_____
Printed Name

As Land Treatment Operator, I have notified the following local officials in writing:

_____ _____
Town Title

_____ _____
Indian Nation or Tribe Title

_____ _____
Signature of Land Treatment Operator Date

_____ _____
Signature of DEP Technical Services Date of Approval

Copy to Technical Services

Maine Department of Environmental Protection
Land Treatment of Petroleum-Contaminated Soil

Low-Volume Land Treatment Request Form

Landspread: _____ Landfarm: _____

ME DEP Spill # ____ - ____ - ____

Soil Volume _____ Peak PID _____ Avg. PID: ____

Generator/Owner of Soil

Application dates: _____

Name: _____

Treatment Location

Treatment Street Address: _____

Facility Name: _____

_____

Street Address: _____

_____

_____

Name of Landowner: _____

_____

Phone Number of Landowner: _____

Contact: _____

GPS Coordinates _____

Phone Number: _____

As the landowner of the land treatment location, the generator of the petroleum contaminated soil, and the party responsible for compliance with the "DEP Guideline for Land Treatment of Petroleum-Contaminated Soil" and applicable statutes, I hereby certify that the representations made on this form are true and correct to the best of my knowledge. In addition, I hereby grant property access to DEP investigators for the purpose of inspecting soil treatment at any reasonable time.

_____ _____

Name of Owner/Operator Representative (printed) Title

_____ _____

Signature Date

_____ _____

Signature of DEP Manager Date of Approval

Copy to Technical Services