



Petroleum Remediation Program

Minnesota Pollution Control Agency

<http://www.pca.state.mn.us/cleanup/pubs/lustpubs.html>

LAND TREATMENT OF PETROLEUM CONTAMINATED SOIL

Guidance Document 3-03

The Minnesota Pollution Control Agency (MPCA) requires that excavated petroleum contaminated soil be treated or disposed of properly. Land treatment, which is incorporation of petroleum contaminated soil into the top four to six inches of native soil, can be an effective treatment option. This method takes advantage of naturally occurring soil microorganisms to biodegrade petroleum. Some volatilization of petroleum hydrocarbons does result.

The specific technical and administrative requirements for land treatment of petroleum contaminated soil at land treatment sites are provided in **Minn. R. ch. 7037**. The purpose of this guidance document is to provide an overview of the requirements in the rules to aid in completing an application. This document, however, is **not intended as a substitute for the rules**.

The following is a step-by-step guide, which the MPCA staff has developed to assist the land treatment site owner/operator, and/or responsible party/consultant in completing Forms A, B, C, and D for land treatment of petroleum contaminated soil. For a land treatment site to be pre-approved and a batch of petroleum contaminated soil to be approved, the owner/operator of the land treatment site must submit a completed Form A and receive a written pre-approval for the land treatment site from the MPCA staff. In addition, the responsible party for the leak site must submit a completed Form B for each individual batch of petroleum contaminated soil and receive a written approval to land apply the batch of petroleum contaminated soil on the pre-approved site. The Form A Pre-approval is for the actual land treatment site and the Form B Approval is for the specific batch of petroleum contaminated soil. The site Pre-approval and batch Approval both need to be issued by MPCA staff for treatment of petroleum contaminated soil to occur. The forms may be submitted individually or together.

FORM A INSTRUCTIONS

The following instructions are intended to assist you in completing the application for a petroleum contaminated soil land treatment site (Form A).

I. Background

- Part A-B: Complete all of the land treatment site owner and operator information as outlined.
- Part C: Please indicate the name and relationship of any person who is in possession of the proposed site where land application is going to occur.
- Part D: Please indicate the name, address, and telephone number of the person completing the form in case MPCA staff need to ask questions about the application and so that a copy of the approval letter can be sent to them.
- Part E: The legal description of the pre-approved land treatment site needs to be given. Make sure to use the 1/4 of the 1/4 section.
- Part F: Please indicate the total area for proposed land treatment in square feet or acres.
- Part G: Circle yes or no if land treatment of petroleum contaminated soil has occurred within one-quarter mile of the proposed site in the last five years.

II. Site and Native Soil Characteristics

The information below is intended to provide you with a general checklist of site and soil characteristics that will help determine the suitability of the proposed land treatment plot. **Please refer to Minn. R. ch. 7037** and consult with your local Soil Conservation Service (SCS), environmental consulting firm, or a professional soil scientist in order to determine the suitability of the proposed land treatment plot for the treatment of petroleum contaminated soil. Please note that your signature at the end of the application indicates that you are taking responsibility for the contents of Minn. R. ch. 7037.

Is the proposed land treatment plot greater than the following:

- A. 200 feet of an intermittent stream, drainage ditch, tile drain inlet, and the ordinary high water level of a stream, river, lake, pond, wetland, or flowage; Yes No
- B. 200 feet from a sinkhole, exposed bedrock, and known underground cave; Yes No
- C. 200 feet from any private water supply well; Yes No
- D. 1,000 feet from any public water supply well; Yes No
- E. 200 feet from the nearest place of habitation;
(unless you have written permission to be within 200 feet) Yes No
- F. 200 feet from the nearest property line.
(unless you have written permission to be within 200 feet) Yes No
- G. 500 feet from a residential development or recreational area; Yes No
- H. Is this site located within 500 feet of the ordinary high water levels of a trout stream, trout lake, or outstanding resource value water (or an intermittent stream, drainage ditch, or tile drainage inlet that directly outlets to these features), as indicated in pt. 7037.1000, subpart 2? Yes No
- ___ If YES, is a filter strip with a minimum width of 50 feet located between the site and the above features? Yes No
- I. If the potential for run-on exists, describe the run-on control measures to be used at the site (pt. 7037.1000, subpart 3)?
- J. Has the site been used for treatment or disposal of wastes (not including petroleum contaminated soil)? Yes No
- K. Site slope: _____ percent
- L. SCS soil series name(s) at site: **Soil 1:**
Soil 2:
- M. Depth to seasonal high water table: **Soil 1:** feet
Soil 2: feet
- N. Organic matter in upper 8 in. of soil: **Soil 1:** percent
Soil 2: percent
- O. Depth to bedrock: feet

P. Depth to drainage lines: feet

Q. Please use the chart below which indicates the minimum organic matter concentration in the upper 8 inches of native soil and minimum total thickness of soil with a permeability either less than 6 inches per hour or less than 0.6 inches per hour.

Required treatment zone characteristics

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Minimum organic matter (percentage)	Minimum total thickness of soil with a permeability less than 6 inches per hour	Minimum total thickness of soil with a permeability less than 0.6 inches per hour
2 % to 4 %	4 feet	3 feet
4 % or greater	3 feet	2 feet

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III. Local Government Notification Information

Please carefully read the section pertaining to proper local notification in the application. Form A and B applications that do not have proper notifications and approvals will be returned to the applicant.

IV. Maps and Supporting Information

Attach the information that is outlined in the Form A application. **CLEARLY MARK** the exact location of the proposed land treatment site and stockpile storage area on each applicable map. Please be aware that applications that do not have all of the supporting documentation will be returned to the applicant. Consult with your local SCS, environmental consulting firms, or a professional soil scientist for assistance with the types of reports and maps.

V. Applicant Signature

The signatures of the land owner and site operator must be on the Form A. The MPCA will not process the form unless both of these signatures are given.

VI. Local Officials Mailing Addresses

Local officials mailing addresses must be given so that copies of the approval letters can be mailed to them.

FORM B INSTRUCTIONS

Following are the necessary steps to complete the Application to Land Treat Petroleum Contaminated Soil at a Pre-approved Site (Form B):

I. Background

Part A-D: Complete the responsible party, land treatment site owner/operator, consultant and leak site information. The pre-approval number is listed on the Form A approval letter.

Part E: Provide the legal description of the pre-approved land treatment site (1/4-1/4 section).

Part F: List the previous soil batches that have been spread and/or approved for the pre-approved land treatment site. Provide leak site name, leak site number, soil volume and date spread.

Part G: List the soil volume to be approved. Procedures for soil excavation are given in Guidance Document 3-01 *Excavation of Petroleum Contaminated Soil*. If a soil volume greater than indicated on the Form B is generated, notify the MPCA project manager prior to spreading.

Part H: List the tentative soil spreading date. Spreading must occur between April 1 and November 1.

II. Soil Storage Information

Petroleum contaminated soil may be stored at land treatment sites provided certain conditions are met. Storage at a pre-approved land treatment site or on an approved storage area at the land treatment site may be done prior to batch approval provided that run-off control is properly provided and a Form B application is submitted within 30 days of initial soil storage. If approval of the batch of soil is denied, the stockpiled soil must be removed within 30 days.

If the Form B application is approved, you may store the soil stockpile on the land treatment plot for up to 10 days without run-off controls. After 10 days the stockpiled soil must either be spread (if dates and climatic conditions allow) or run-off must be controlled either by properly covering the soil or placing geotextile silt dams or straw bales around the stockpile. **Soil which does not have Form B application approval and is stored at an approved soil storage area or pre-approved land treatment site must be immediately covered.**

In addition to the storage information found in Minn. R. ch. 7037.1600 which outlines proper storage on a plot and at a storage area, there is stockpiling guidance available for storage at leak sites and interim locations. If petroleum contaminated soil is stockpiled on the leak site property where the soil is originally generated (or at an interim location), adequate run-off control must be provided and the soil must be stockpiled on an impermeable surface (OR establish an impervious surface like concrete and asphalt without cracks OR synthetic liner of 40 mil thickness or greater). Also note that if petroleum contaminated soil is stockpiled at an interim location MPCA staff approval is needed and applicable requirements of the county and township/city need to be followed.

Part A: Circle or list the location where the soil is stored.

Part B: List the date the soil was excavated.

Part C: List the type of run-off controls provided, i.e. tarp, reinforced plastic (6 mil), Non-reinforced plastic (10 mil), straw bales or silt dams.

III. Petroleum Contaminated Soil Sampling Results

First, circle all types of contaminants found in the batch of petroleum contaminated soil. If the type(s) is not listed, you should specify.

Second, list the organic matter result from the native topsoil of the proposed or pre-approved land treatment site. You will have this information from your Form A application.

Third, determine how many soil samples need to be taken according to the amount of soil which will be land treated by using the table on page 21 of Minn. R. ch. 7037.2900 subp. 1. In addition, determine the type(s) of laboratory analysis which need to be run according to Minn. R. ch. 7037.0500 Subp. 2. After receiving the analytical reports from the stockpile soil sampling, determine the **average** Gasoline Range Organics (GRO) and/or Diesel Range Organics (DRO) levels in mg/kg for all required parameters, then attach the lab reports and chain of custody to the Form B.

IV. Soil Spreading Information and Soil Nutrient Information

Soil Spreading Information

The formula for determining the **acceptable spreading thickness** is:

$$\frac{4 \times [\text{allowable TPH, mg/kg}]}{[\text{average TPH in batch of soil, mg/kg}]} = \text{Acceptable spreading thickness, inches}$$

Tables 8.1 and 8.2 below indicate the maximum allowable levels of gasoline or petroleum characterized as fuel oil in contaminated soil that may be spread at a thickness of four inches: (use the correct table since the tables differ for gasoline and fuel oil/diesel.)

Table 8.1. Gasoline contaminated soil

Minimum organic matter (percentage)	Permeability (inches per hour)	Average GRO (mg/kg)		
		Minimum thickness of suitable soil within treatment zone (feet)		
		2	3	4
2 % to 3.9%	less than 6	NA	NA	1,000
	less than 0.6	NA	1,000	2,500
4 % or greater	less than 6	NA	1,000	2,500
	less than 0.6	1,000	2,500	5,000

Table 8.2 Contaminated soil characterized as fuel oil/diesel.

Minimum organic matter (percentage)	Permeability (inches per hour)	Average DRO (mg/kg)		
		Minimum thickness of suitable soil within treatment zone (feet)		
		2	3	4
2 % to 3.9 %	less than 6	NA	NA	2,000
	less than 0.6	NA	2,000	5,000
4 % or greater	less than 6	NA	2,000	5,000
	less than 0.6	2,000	5,000	10,000

In these tables "NA" means that petroleum contaminated soil may not be spread under the specified conditions. Note: Do not round up on the organic matter result, i.e. if the organic matter result is actually 3.5 percent, then it is considered to be 2 percent on the table. The permeability can be found in the Soil Survey book for the county where the land treatment site is located. The minimum thickness of suitable soil is defined as the total soil thickness within the treatment zone having a permeability as listed in these tables (this value was determined in Form A).

EXAMPLE

Petroleum contaminated soil data:

Type of contaminant: gasoline

Average GRO: 4,000 mg/kg

Land treatment site data:

Organic matter: 3 percent (rounded down to 2 percent)

Permeability: less than 0.6 inches/hour

Thickness of suitable soil within treatment zone: 4 feet or more

$$\frac{4 \times [2,500 \text{ mg/kg}]}{4,000 \text{ mg/kg}} = 2.5 \text{ inches}$$

****Note:** This formula is only needed when the average result for gasoline (GRO) or fuel oil/diesel (DRO) from the petroleum contaminated soil sample exceeds the allowable GRO or DRO value in the table.

The formula for determining the **land area required** is:

$$[\text{Soil volume, cubic yards}] \times \frac{0.00744}{[\text{spreading thickness, inches}]} = \text{Acres required}$$

- A. Give the proposed spreading thickness for the soil on the land treatment site.
- B. Give the amount of land that will be used in acres.

Soil Nutrient Information

An evaluation to determine the need for nitrogen and/or phosphorus addition must be done for soil with an average GRO or DRO concentration of **2,000 mg/kg or greater** (spread 4 inches thick).

Note: This requirement also applies to petroleum loading levels that are equivalent to this level (i.e. 4,000 mg/kg GRO or DRO spread 2 inches thick).

Nitrogen (N) fertilizer evaluation:

- A. [avg. GRO or DRO, mg/kg] x [spreading thickness inches] x 0.0128 = [] x [] x 0.0128 = _____
- B. [organic matter in upper 8 inches, percent] x 50 = [] x 50 = _____
- C. [result from A] - [result from B] = _____ minimum lbs. N per acre to add

Note 1: This amount can be reduced by 100 lbs. N per acre if the previous crop was alfalfa; 40 lbs. N per acres if the previous crop was soybeans, clover or other legume; or 1/3 lb. N per acre for each lb. N applied within last year.

Note 2: If the N application rate is determined to be less than 25 lbs. N per acre, then N need not be applied.

Note 3: Maximum allowable N application rates and other information are provided in pt. 7037.3600.

- D. Proposed Nitrogen application rate: _____ lbs. N per acre

Phosphorus (P) fertilizer evaluation:

A. [avg. GRO or DRO mg/kg] x [spreading thickness inches] x 0.0027 = [] x [] x 0.0027 = _____

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

C. [result from A] - [result from B] = _____ minimum lbs. P per acre to add

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

Note 2: The amount of P to apply can be reduced by 1/2 lb. P per acre for each lb. applied within the previous three years.

Note 3: If the P application rate is determined to be less than 10 lbs. P per acre, than P need not be applied.

Note 4: Maximum allowable P application rates and other information are provided in pt. 7037.3600.

D. Proposed P application rate: _____ lbs. P per acre

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

V. Site Map and Supporting Information

Attach all of the required information, such as site map, copies of laboratory reports and chain of custody forms for contaminated soil, and native soil nutrient results for phosphorus (if conducted) with the Form B. If this information is not included with the Form B, the information will be requested and there will be a delay in the processing of the application.

VI. Local Government Notification Information

Attach copies of notifications and approvals which were secured for Form A unless local government has advised the MPCA in writing that they wish to review and approve each Form B application. In this event the applicant will need to supply with this Form B application written evidence that the county has been notified of the batch and county or township has approved of this specific batch. Refer to Form A for an explanation of local government notification information.

VII. Applicant Signature

The signatures of the landowner, site operator and generator must be on the Form B in order for it to be complete. The MPCA will not process the form unless all signatures are given.

VIII. Local Officials Mailing Addresses

Local officials mailing addresses must be given so that copies of the approval letters can be mailed to them.

Operational Requirements for Approved Land Treatment Sites

- A. Dates and climatic conditions for soil spreading. Petroleum contaminated soil may be spread only when the surface soil is not frozen, is free of snow and ponded water, and is otherwise capable of being tilled. **Spreading must not occur after November 1 or before April 1.**
- B. Petroleum loading limitations. In no case may spreading thickness **exceed 4 inches** (or 540 cubic yards per acre; each inch of spreading thickness corresponds to 135 cubic yards of soil per acre if spread 4 inches thick).
- C. Petroleum contaminated soil limitation. No more than 1,500 cubic yards is allowed to be spread within a one quarter mile radius in a five year period of time.
- D. Prohibition of mixing or repeated use. Petroleum contaminated soil originating from separate releases must not be combined or spread on the same plot. Plots within a pre-approved land treatment site previously used for land treatment of petroleum contaminated soil may **NOT** receive repeat applications of petroleum contaminated soil.

Individual plots within a pre-approved site must be separated by a minimum of **2 feet** to prevent mixing of separate batches of spread soil.

- E. Maintenance of border marking. Border markings established at the land treatment site must remain in place during spreading of the contaminated soil and until all follow-up monitoring requirements are fulfilled.
- F. Removal of large rocks and debris. Rocks larger than 4 inches in diameter and debris must be removed from petroleum contaminated soil prior to incorporation into the native soil. Debris includes pieces of plastic, bricks, metal, wood, etc.
- G. Spreading and incorporation of petroleum contaminated soil. Petroleum contaminated soil must be spread uniformly. Petroleum contaminated soil must be incorporated into the upper 4 to 6 inches of native soil as soon as feasible but no later than 48 hours after spreading. In order to minimize soil moisture loss and volatile loss of the petroleum contaminants, initial incorporation must be conducted only to the degree that most soil clods are broken up and petroleum contaminated soil and native soil mixing occurs. For most land treatment applications, one or two passes with a tillage implement will result in adequate incorporation during a single tillage cycle.
- H. Tillage. Unless the plot has been seeded to a crop, tillage of the soil following the initial incorporation must be done in monthly cycles, excluding the period from November 1 to April 1, until all soil monitoring samples are **less than 10 mg/kg GRO and/or DRO** or until a **minimum of four tillage cycles** have been done, whichever is first. Tillage of the soil must be delayed until the soil moisture is increased if the soil lacks moisture such that tillage would cause wind erosion or decreased microbial activity.
- I. Cropping. Following the initial incorporation of petroleum contaminated soil into the native soil, the plot may be seeded to a crop. No root crops or crops for direct human consumption may be grown during the period of time when soil monitoring is performed. If seeding is delayed, the tillage schedule given above must be followed until seeding can be done.

FORM C INSTRUCTIONS

I. MPCA Notification of Soil Spreading.

The MPCA Guidance Document 3-06 *Notification of Spreading Petroleum Contaminated Soil at a Land Treatment Site (Form C)* must be used for this notification. The Form C must be completed and submitted to the MPCA within 10 days following spreading and incorporation of the soil.

Note: Indicate the actual soil spreading/incorporation date on Form C. Include the date the soil was spread, soil volume, spreading thickness, area of land used and a site map. In addition, please notify the MPCA as soon as possible if a pre-approved site is not utilized for land treatment following Form B approval.

FORM D INSTRUCTIONS

I. Monitoring and Reporting Requirements

Monitoring (i.e. periodic soil sampling) following soil spreading, must be done separately for each plot at the land treatment site. The number of **composite** soil samples for monitoring is the same as the number of **grab soil** samples which were required for characterizing the soil prior to treatment. Procedures for collection of soil monitoring samples are given in Chapter 7037.2700 Subp. 2.

Monitoring of a plot in the year of spreading must be done at the times specified below or until all soil analytical results in a single sampling round are 10 mg/kg GRO and/or DRO or less.

<u>Soil Spreading Date</u>	<u>Soil Sampling in First Calendar Year</u>
Before July 1	Once in August and once in October
July 1 to September 15	Once in October
After September 15	None

Monitoring in subsequent years must continue for those plots in which all soil analytical results are not 10 mg/kg GRO and/or DRO or less. These sampling events must be done in June, August and October. If the possibility of a false positive analytical detection exists due to the presence of organic matter in the soil, the GRO or DRO detection should be compared to the characterization of a known standard of diesel, fuel oil, or gasoline.

The MPCA Guidance Document 3-07 *Soil Monitoring Results for Land Treated Petroleum Contaminated Soil (Form D)* must be used for reporting the results. List the date monitoring took place at the land treatment site and the necessary number of monitoring soil samples. In addition, monitor the correct batch of petroleum contaminated soil if there is more than one batch at the site.

Mail applications to the MPCA project manager. For the correct mailing address, see the MPCA web page below. Please retain all documents that you acquired to prepare the applications, including this guidance document, in the event that the MPCA requests to review them.

Web pages and phone numbers

MPCA Staff:	http://data.pca.state.mn.us/pca/emplsearch.html
MPCA Toll Free:	(800) 657-3864
Petroleum Remediation Program Web Page:	http://www.pca.state.mn.us/programs/lust_p.html
MPCA Information Request:	http://www.pca.state.mn.us/about/inforequest.html
MPCA Petroleum Brownfields Program	http://www.pca.state.mn.us/programs/vpic_p.html
PetroFund Web Page	http://www.commerce.state.mn.us/mainpf.htm
PetroFund Phone	(651) 297-1119, or (800) 638-0418
State Duty Officer	(651) 649-5451 or (800) 422-0798

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TTY users call (651) 282-5332 or (800) 657-3864 (voice/TTY).

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