

1 Pollution Control Agency

2

3 Adopted Permanent Rules Relating to Petroleum Contaminated Soil
4 Management

5

6 Rules as Adopted

7 7035.0300 DEFINITIONS.

8 [For text of subps 1 to 79, see M.R.]

9 Subp. 79a. Petroleum contaminated soil. "Petroleum
10 contaminated soil" has the meaning given it in part 7037.0100,
11 subpart 15.

12 Subp. 79b. Petroleum contaminated soil land treatment
13 site. "Petroleum contaminated soil land treatment site" has the
14 meaning given the term "land treatment site" in part 7037.0100,
15 subpart 8.

16 [For text of subps 80 to 99, see M.R.]

17 Subp. 100. Solid waste. "Solid waste" means garbage,
18 refuse, sludge from a water supply treatment plant or air
19 contaminant treatment facility, and other discarded waste
20 materials and sludges, in solid, semisolid, liquid, or contained
21 gaseous form, resulting from industrial, commercial, mining and
22 agricultural operations, and from community activities, but does
23 not include hazardous waste; animal waste used as fertilizer;
24 earthen fill, boulders, rock; sewage sludge; solid or dissolved
25 material in domestic sewage or other common pollutants in water
26 resources, such as silt, dissolved or suspended solids in
27 industrial waste water effluents or discharges which are point
28 sources subject to permits under section 402 of the Federal
29 Water Pollution Control Act, as amended, dissolved materials in
30 irrigation return flows; source, special nuclear, or by-product
31 material as defined by The Atomic Energy Act of 1954, as
32 amended; ~~or petroleum-contaminated-soil-that-is-stored-or-land~~
33 ~~treated-at-a-petroleum-contaminated-soil-land-treatment-site.~~

34 [For text of subps 101 to 121, see M.R.]

35 7035.0400 GENERAL REQUIREMENTS.



1 All solid waste must be stored, collected, transferred,
2 transported, used, processed, and disposed of, or reclaimed in a
3 manner consistent with requirements of parts 7035.0300 to
4 7035.2915, except that petroleum contaminated soil stored or
5 land treated at a petroleum contaminated soil land treatment
6 site shall be managed under chapter 7037. The agency is
7 responsible for enforcement of these parts and encourages
8 cooperation of municipalities which may adopt these parts for
9 use in local laws, ordinances, or regulations.

10 PETROLEUM CONTAMINATED SOIL MANAGEMENT

11 7037.0100 DEFINITIONS.

12 Subpart 1. **Scope.** For the purposes of this chapter, the
13 terms in this part have the meanings given them.

14 Subp. 2. **Agency.** "Agency" means the Minnesota Pollution
15 Control Agency.

16 Subp. 3. **Batch of petroleum contaminated soil.** "Batch of
17 petroleum contaminated soil" means the entire volume of soil
18 removed or planned to be removed from a property which has been
19 contaminated by one or more releases of petroleum.

20 Subp. 4. **Commissioner.** "Commissioner" means the
21 commissioner of the Minnesota Pollution Control Agency.

22 Subp. 5. **Generator.** "Generator" means a person who is
23 responsible or assumes responsibility for the removal of
24 petroleum contaminated soil.

25 Subp. 6. **Land treatment.** "Land treatment" means the
26 placement and incorporation of petroleum contaminated soil into
27 the native soil surface for the purpose of biodegradation of
28 organic waste components.

29 Subp. 7. **Land treatment facility.** "Land treatment
30 facility" means a facility for the land treatment of petroleum
31 contaminated soil that is permitted under chapter 7035.

32 Subp. 8. **Land treatment site.** "Land treatment site" means
33 a parcel of land which is used for land treatment of petroleum
34 contaminated soil and which operates or is proposed to operate
35 within the limits in part 7037.1000. Land treatment site

1 includes the storage areas associated with the site.

2 Subp. 9. **Native soil.** "Native soil" means the soil of a
3 land treatment site prior to the spreading of petroleum
4 contaminated soil.

5 Subp. 10. **Operator.** "Operator" means the person
6 responsible for the overall management of the land treatment
7 site.

8 Subp. 11. **Ordinary high water level.** "Ordinary high water
9 level" has the meaning given it in part 6120.2500, subpart 11.

10 Subp. 12. **Owner.** "Owner" means a person who is the fee
11 owner of real property where a land treatment site is proposed
12 or operated.

13 Subp. 13. **Person.** "Person" means an individual,
14 partnership, association, public or private corporation, or
15 other legal entity, including the United States government, an
16 interstate commission or other body, the state, or any agency,
17 board, bureau, office, department, or political subdivision of
18 the state, but does not include the agency.

19 Subp. 14. **Petroleum.** "Petroleum" has the meaning given it
20 in part 7150.0030, subpart 36. Petroleum does not include a
21 fraction of crude oil or constituents of gasoline if they were
22 used or were intended for use in virgin or pure form including
23 but not limited to benzene, toluene, and xylene.

24 Subp. 15. **Petroleum contaminated soil.** "Petroleum
25 contaminated soil" means mineral or organic soil or
26 unconsolidated earthen material into which petroleum has been
27 released.

28 Subp. 16. **Place of habitation.** "Place of habitation"
29 means a house, apartment, manufactured home, dwelling,
30 residence, or other structure, occupied or intended to be
31 occupied on a day-to-day basis by an individual or group of
32 individuals, a family unit, or group of family units.

33 Subp. 17. **Plot.** "Plot" means a subdivided area of an
34 approved land treatment site designated for a single batch of
35 petroleum contaminated soil.

36 Subp. 18. **Recreational area.** "Recreational area" means a

1 public park, trail, campground, playground, athletic field,
2 picnic ground, botanical or zoological garden, swimming beach or
3 pool, fairground, or wayside and any commercial campground,
4 resort, tourist court, amusement park, riding stable, or golf
5 course.

6 Subp. 19. **Release.** "Release" means the spilling, leaking,
7 emitting, discharging, escaping, leaching, or disposing of
8 petroleum into the environment but does not include discharges,
9 designed venting, or land treatment at an approved land
10 treatment site allowed under agency rules.

11 Subp. 20. **Residential development.** "Residential
12 development" means ten or more places of habitation concentrated
13 within ten acres of land. Residential development includes
14 schools, churches, hospitals, nursing homes, businesses,
15 offices, and apartment buildings or complexes having ten or more
16 living units.

17 Subp. 21. **Rivers and streams.** "Rivers and streams" means
18 a watercourse defined as natural watercourses, altered natural
19 watercourses, or public waters in Minnesota Statutes, section
20 103G.005, subdivisions 3, 13, and 15.

21 Subp. 22. **Run-off.** "Run-off" means a liquid that drains
22 over land from any part of an approved land treatment site or
23 area for storage of petroleum contaminated soil.

24 Subp. 23. **Run-on.** "Run-on" means a liquid that drains
25 over land onto any part of an approved land treatment site or
26 area for storage of petroleum contaminated soil.

27 Subp. 24. **Seasonal high water table.** "Seasonal high water
28 table" means the highest level the water table reaches during a
29 given year or the highest level it has reached in the recent
30 past as indicated by soil mottling or color changes. Methods
31 for determining the seasonal high water table are given in part
32 7037.3300, subpart 6 5.

33 Subp. 25. **Soil texture.** "Soil texture" means the relative
34 portion of sand, silt, and clay in a soil, as determined using
35 the methods given in part 7037.3300, subpart 4. The soil
36 textural classifications of the United States Department of

1 Agriculture are used for this chapter. These soil textural
2 classifications are provided in the publication entitled "Soil
3 taxonomy: A basic system of soil classification for making and
4 interpreting soil surveys," written and published by the United
5 States Department of Agriculture, USDA-SCS Agricultural Handbook
6 No. 436, 1975.

7 Subp. 26. Tank. "Tank" has the meaning given it in
8 Minnesota Statutes, section 115C.02, subdivision 14.

9 Subp. 27. Ten-year floodplain. "Ten-year floodplain"
10 means land that is subject to a ten percent or greater chance of
11 flooding in any given year from any source.

12 Subp. 28. Treatment zone. "Treatment zone" means the
13 total thickness of native soil above the seasonal high water
14 table or bedrock, whichever is closest to the surface of the
15 native soil. If the thickness of native soil existing above
16 both of these features exceeds five feet, then the treatment
17 zone is established as five feet. If a subsurface tile drainage
18 system is present which is designed according to or equivalent
19 to Soil Conservation Service engineering standards and criteria,
20 the depth of the treatment zone is established as the depth of
21 the tile drainage system.

22 Subp. 29. Used oil. "Used oil" has the meaning given it
23 in part 7045.0020, subpart 100a.

24 Subp. 30. Waste. "Waste" has the meaning given it in
25 Minnesota Statutes, section 115A.03, subdivision 34.

26 Subp. 31. Water table. "Water table" means the surface of
27 the groundwater at which the pressure is atmospheric. Generally
28 this is at the top of the saturated zone.

29 Subp. 32. Wetland. "Wetland" means ~~a-surface-water~~
30 ~~feature-classified-as-a-wetland-in-the-publication-entitled~~
31 ~~"Classification-of-Wetlands-and-Deep-Water-Habitats-of-the~~
32 ~~United-States,"-written-and-published-by-the-United-States~~
33 ~~Department-of-the-Interior,-Fish-and-Wildlife-Service,-~~
34 ~~FWS/OBS-79/31,-December-1979~~ "wetlands" and "public waters
35 wetlands" as defined in Minnesota Statutes, section 103G.141,
36 subdivisions 18 and 19.

1 7037.0200 PURPOSE AND SCOPE.

2 In accordance with the authority granted in Minnesota
3 Statutes, section 116.07, subdivision 4, the purpose of this
4 chapter is to provide for the protection of the public health
5 and the environment by establishing minimum standards for the
6 management and treatment of petroleum contaminated soil removed
7 from locations where a release of petroleum occurs.

8 7037.0300 VARIANCES.

9 Any person may apply for a variance from any requirement of
10 this chapter. Variances must be applied for and acted upon by
11 the agency in accordance with part 7000.0700 and Minnesota
12 Statutes, section 116.07, subdivision 5, and other applicable
13 standards and rules. However, no variance may be granted that
14 would result in noncompliance with applicable federal rules and
15 regulations.

16 7037.0400 PETROLEUM CONTAMINATED SOIL TREATMENT OPTIONS.

17 Subpart 1. **Treatment and disposal options.** A generator
18 shall treat or dispose of petroleum contaminated soil in
19 accordance with one of the methods in items A to D:

20 A. land treatment at an approved land treatment site,
21 as provided in this chapter;

22 B. land treatment at a land treatment facility which
23 has received a solid waste management permit in accordance with
24 parts 7001.0010 to 7001.0210 and chapter 7035;

25 C. thermal treatment by a soil roaster which has
26 received an agency air emission permit in accordance with parts
27 7001.0010 to 7001.0210 and chapters 7005, 7010, and 7035; or

28 D. an alternative type of treatment or disposal
29 allowed by agency rules.

30 Subp. 2. **Generator responsibility.** Nothing in this
31 chapter relieves the generator from responsibility under
32 Minnesota Statutes, section 115.061, to ensure the proper
33 treatment or disposal of petroleum contaminated soil.

34 7037.0500 SAMPLING AND ANALYSIS OF PETROLEUM CONTAMINATED SOIL.

1 Subpart 1. **Sampling procedures.** To characterize the type
 2 and level of contamination of soil that has been or will be
 3 excavated, a generator shall take soil samples from a stockpile
 4 generated during a cleanup of a release or from subsurface soil
 5 borings conducted in locations which are representative of soil
 6 contaminated by the release. Petroleum contaminated soil
 7 samples collected for analysis for the parameters with codes A
 8 to F under subpart 2 must be grab samples. Analysis for the
 9 parameters with codes G F to I H under subpart 2 requires
 10 separate composite samples. Samples must be collected in
 11 accordance with parts 7037.2900 and 7037.3000.

12 Subp. 2. **General analysis requirements.** A generator shall
 13 analyze petroleum contaminated soil for the parameters in the
 14 following table based on the contaminant or contaminants
 15 actually or potentially present in the soil using the required
 16 laboratory analysis methods given in part 7037.3100.

| 17 | Contaminant | Parameter codes |
|----|---|---------------------------------|
| 18 | | |
| 19 | Leaded gasoline, aviation gasoline | B, C, D, <u>G</u> <u>F</u> |
| 20 | | |
| 21 | Unleaded gasoline | B, C, D |
| 22 | | |
| 23 | Fuel oil, motor oil, diesel fuel, | |
| 24 | kerosene, jet fuels, mineral oil or | |
| 25 | spirits, hydraulic fluids, <u>crude oil</u> | B, E |
| 26 | | |
| 27 | Crude-oil | B-F |
| 28 | | |
| 29 | Used Oil | A, E, <u>G</u> , H-I |
| 30 | | |

31 The parameter codes listed above correspond to the
 32 parameters as follows:

33 Code A - volatile organic compounds listed in Minnesota
 34 Department of Health method 465, revision D;

35 Code B - benzene, toluene, ethyl benzene, and xylenes;

36 Code C - methyl tertiary butyl ether;

37 Code D - total petroleum hydrocarbons as gasoline;

38 Code E - total petroleum hydrocarbons as fuel oil;

39 ~~Code-F---total-petroleum-hydrocarbons-as-the-specific-crude~~
 40 ~~oil-released-to-the-soil;~~

41 Code G F - total lead;

42 Code H G - constituents with waste codes D004 to D017 in

43 part 7045.0131, subpart 8, unless the generator has personal

1 knowledge that those constituents are not present and prepares a
2 document containing the information in subpart 4; and

3 Code ~~¶~~ H - polychlorinated biphenyls (PCBs).

4 Subp. 3. **Additional evaluation of soil contaminated with**
5 **leaded petroleum products.** A generator shall perform a complete
6 toxicity characteristic leaching procedure (TCLP) on soil that
7 is contaminated with leaded gasoline and aviation gasoline if
8 total lead is present at a level equal to or greater than 20
9 times its toxicity characteristic regulatory concentration level
10 as given in part 7045.0131, subpart 8.

11 Subp. 4. **Additional evaluation of soil contaminated with**
12 **used oil.** A generator shall evaluate soil that is actually or
13 potentially contaminated with used oil to determine whether it
14 contains a hazardous waste in compliance with items A to C. If
15 personal knowledge is used to make a determination on the
16 presence of hazardous waste in the soil, the generator shall
17 prepare a written document that sets forth the reasons
18 supporting the generator's conclusion that hazardous waste is
19 not present and that states that the information included in the
20 document is true to the best of the generator's knowledge. The
21 generator must sign and notarize this document.

22 A. A generator shall determine through chemical
23 analysis or personal knowledge whether the soil is contaminated
24 with any hazardous waste listed in part 7045.0135.

25 B. A generator shall determine the total halogen
26 level of the soil by summing the halogenated compounds included
27 in the parameters of code A in subpart 2. If the halogen level
28 is equal to or greater than 1,000 parts per million, the soil is
29 presumed to contain a hazardous waste, unless the generator
30 rebuts this presumption through personal knowledge or chemical
31 analysis.

32 C. A generator shall determine whether the soil
33 exhibits the toxicity characteristic of part 7045.0131, subpart
34 7, for the constituents included in code H G in subpart 2. If
35 the total analysis for these constituents demonstrates that
36 individual constituents are present in the soil at levels equal

1 to or greater than 20 times the toxicity characteristic
2 regulatory concentration levels as given in part 7045.0131,
3 subpart 8, the generator shall perform a complete TCLP.

4 7037.0600 MANAGEMENT OF PETROLEUM CONTAMINATED SOIL CONTAINING
5 HAZARDOUS WASTE.

6 A generator shall manage petroleum contaminated soil as a
7 hazardous waste in accordance with chapter 7045 if:

8 A. the soil contaminated with a leaded petroleum
9 product displays the toxicity characteristic for lead;

10 B. the soil is contaminated with any hazardous waste
11 listed in part 7045.0135, including PCBs at a concentration
12 equal to or greater than 50 parts per million;

13 C. the total halogen level is equal to or greater
14 than 1,000 parts per million, unless the generator rebuts the
15 presumption that the soil contains a hazardous waste, as given
16 in part 7037.0500, subpart 4, item B; or

17 D. the complete TCLP of the soil displays the
18 toxicity characteristic of part 7045.0131 for any of the
19 constituents included in code H G in part 7037.0500, subpart 2.

20 7037.0700 EXEMPTIONS.

21 Subpart 1. **Small quantities of petroleum contaminated soil.**
22 For petroleum contaminated soil in volumes less than ten cubic
23 yards, the commissioner shall exempt generators and owners and
24 operators from the requirement to comply with parts of this
25 chapter if the commissioner finds that compliance with the part
26 is not needed to protect human health and the environment. In
27 determining whether to grant the exemption, the commissioner
28 shall consider the actual or potential level of contamination;
29 soil volume; proposed treatment; proposed treatment location;
30 and the potential for presence of PCBs, halogens, metals, and
31 other contaminants in the petroleum contaminated soil.

32 Subp. 2. **Emergency actions.** The commissioner shall grant
33 an exemption to this chapter for the storage, transportation,
34 and treatment or disposal of petroleum contaminated soil if the
35 commissioner determines that such an exemption is necessary to

1 expedite the proper management of the soil or spilled material
2 and to prevent, abate, or control pollution as a response to an
3 emergency, provided the requirements of parts 7037.2400,
4 7037.2500, and 7037.2700 are met.

5 7037.0800 OVERVIEW OF STANDARDS AND APPROVAL PROCEDURES FOR LAND
6 TREATMENT SITES.

7 The commissioner shall approve only those sites that meet
8 the standards and limitations established in parts 7037.0900 and
9 7037.1000. Parts 7037.1100 and 7037.1200 establish the
10 procedures for obtaining approval of a land treatment site from
11 the commissioner. The approval provided in part 7037.1100
12 constitutes a preliminary finding by the commissioner that the
13 site is suitable for the treatment of petroleum contaminated
14 soil. No person shall ~~store~~ spread petroleum contaminated
15 soil at a land treatment site that has received preliminary
16 approval under part 7037.1100 until information regarding the
17 specific batch of petroleum contaminated soil has been submitted
18 to and approved by the commissioner as provided under parts
19 7037.1300 and 7037.1400.

20 7037.0810 STORAGE OF PETROLEUM CONTAMINATED SOIL BEFORE BATCH
21 APPROVAL.

22 Following preliminary approval under part 7037.1100,
23 petroleum contaminated soil may be stored at the approved land
24 treatment site on the plot or at a storage area meeting the
25 criteria of part 7037.1000, subpart 6, provided that the
26 application required under part 7037.1300 is filed within 30
27 days of initial soil storage, and runoff control is provided in
28 accordance with part 7037.1600, subpart 1, item A. If approval
29 under part 7037.1300 is denied, the generator or the owner or
30 operator of the land treatment site shall remove the soil within
31 30 days.

32 7037.0900 PROHIBITED AREAS FOR LAND TREATMENT SITES.

33 Land treatment sites are prohibited in the following areas:

34 A. a ten-year floodplain;

1 B. within 200 feet of an intermittent stream,
2 drainage ditch, or tile drain inlet or the ordinary high water
3 level of a stream, river, lake, pond, wetland, or flowage;

4 C. within 200 feet from a sinkhole, exposed bedrock,
5 or known underground cave;

6 D. within 200 feet from any private water supply well
7 or 1,000 feet from any public water supply well;

8 E. within 200 feet from a place of habitation, unless
9 written permission to spread soil closer is obtained from the
10 owner of the place of habitation, or 500 feet from a residential
11 development or recreational area; and

12 F. within 200 feet from property lines, unless
13 written permission to spread soil closer is obtained from the
14 adjacent land owner.

15 7037.1000 CRITERIA FOR LAND TREATMENT SITES.

16 Subpart 1. **Operational limits.** To be operated as a land
17 treatment site under this chapter, a site must operate within
18 the following criteria:

19 A. no more than 1,500 cubic yards of petroleum
20 contaminated soil may be accepted for treatment;

21 B. no other land treatment site currently in
22 operation or that has been operated within the past five years
23 may be located within a radius of one-quarter mile, unless the
24 total volume of the proposed land treatment site and any land
25 treatment site within a one-quarter mile radius is less than
26 1,500 cubic yards; and

27 C. spreading or storage of petroleum contaminated
28 soil may only occur until November 1 of the year following the
29 date of the first letter of approval issued under part 7037.1300.

30 Subp. 2. **Filter strips.** A land treatment site must have a
31 downgradient filter strip with a minimum width of 50 feet if the
32 land treatment site is within 500 feet of any of the following:

33 A. the ordinary high water level of either a trout
34 stream designated by the Department of Natural Resources
35 Commissioner's Order No. 2294 or a trout lake designated by the

1 Department of Natural Resources Commissioner's Order No. 2443;
 2 B. the ordinary high water level of any outstanding
 3 resource value water as defined in part 7050.0180, subpart 2,
 4 item A; and

5 C. any intermittent stream, drainage ditch, or tile
 6 drainage inlet which directly outlets to a trout stream, trout
 7 lake, or outstanding resource value water, as referenced in this
 8 subpart.

9 The filter strip must otherwise be designed according to,
 10 or equivalent to, Soil Conservation Service standard 393
 11 (USDA-SCS-MN, April 1986).

12 Subp. 3. **Run-on prevention.** A land treatment site must
 13 have adequate controls to minimize run-on. If necessary, the
 14 owner or operator shall take measures to minimize run-on,
 15 including construction of a diversion upgradient of the land
 16 treatment site that is designed according to, or equivalent to,
 17 Soil Conservation Service standard 362 (USDA-SCS-MN, July 1989)
 18 or cropping of the land upgradient of the treatment site prior
 19 to spreading and incorporation of petroleum contaminated soil.

20 Subp. 4. **Slope.** No portion of a land treatment site may
 21 have a slope greater than six percent.

22 Subp. 5. **Treatment zone characteristics.** The treatment
 23 zone at a proposed land treatment site must meet the technical
 24 criteria of items A and B.

25 A. The native soil must meet the criteria in the
 26 following table for minimum organic matter concentration in the
 27 upper eight inches of native soil, ~~the soil permeability in the~~
 28 ~~treatment zone,~~ and the minimum total thickness of soil within
 29 the treatment zone with the specified permeability.

| 30 Minimum-organic | 31 Permeability | 32 Minimum-thickness-of |
|-----------------------------------|---------------------------------|-------------------------------------|
| 33 matter-(percentage) | 34 (inches-per-hour) | 35 treatment-zone-(feet) |
| 36 2 | 37 0.6-to-6 | 38 4 |
| 39 2 | 40 less-than-0.6 | 41 3 |
| 42 4 | 0.6-to-6 | 3 |
| 4 | less-than-0.6 | 2 |
| <u>Minimum organic</u> | <u>Minimum total</u> | <u>Minimum total</u> |
| <u>matter (percentage)</u> | <u>thickness of soil</u> | <u>thickness of soil</u> |
| | <u>with a permeability</u> | <u>with a permeability</u> |
| | <u>less than 6 inches</u> | <u>less than 0.6 inches</u> |
| | <u>per hour (feet)</u> | <u>per hour (feet)</u> |

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38

2
4

4
3

3
2

The native soil characteristics must be determined using the method given in parts 7037.3200 and 7037.3300. ~~To meet the requirements of a given permeability category, as listed in this table, 75 percent of the treatment zone must have a permeability no greater than the listed permeability, as calculated according to the method described in part 7037.3300, subpart 5. The requirement for the thickness of the treatment zone is subject to the following exceptions:~~

(1) ~~for sites in which a subsurface tile drainage system is present which is designed according to or equivalent to Soil Conservation Service engineering standards and criteria, the depth of the treatment zone is established as the depth of the tile drainage system; and~~

(2) ~~for sites in which the appearance of a seasonal high water table is caused by a zone of saturated soil that exists between zones of unsaturated soil in the upper five feet of the native soil, the depth of the treatment zone is established as the depth of bedrock or five feet, whichever is less. The total thickness of soil with the specified permeability is a sum of the thicknesses of the layers or horizons of soil with the specified permeability within the treatment zone.~~

B. The land must be capable of being tilled.

Subp. 6. Storage areas. A storage area at a proposed land treatment site must not be located in the area prohibited for land treatment sites as provided in part 7037.0900 ~~and native soil and site conditions for the storage area must be the same as those for land treatment sites in subparts 2 to 5, except subpart 5, item B.~~ A storage area must be established on a location that meets the criteria for land treatment sites as provided in subparts 2 to 4, and the location must either have a native soil that meets the criteria of subpart 5, item A, or be established on an impervious surface or a synthetic liner of 40 mil thickness or greater.

1 7037.1100 APPROVAL PROCEDURES FOR LAND TREATMENT SITES.

2 Subpart 1. **Application for approval of a land treatment**
3 **site.** An applicant who seeks approval of a land treatment site
4 must furnish the information specified in part 7037.1200 on a
5 form prescribed by the commissioner. The application must be
6 signed by the owner and operator of the proposed land treatment
7 site.

8 Subp. 2. **Incomplete applications.** The commissioner shall
9 review all applications for completeness. If the application is
10 incomplete, the commissioner shall promptly inform the applicant
11 of the deficiency or deficiencies. The commissioner shall
12 suspend further processing of the application until the
13 applicant has provided the required information.

14 Subp. 3. **Approval.** The commissioner shall issue letters
15 of approval for sites that are found to meet the criteria
16 established in parts 7037.0900 and 7037.1000. A letter of
17 approval constitutes a finding by the commissioner that the site
18 can be operated in compliance with this chapter. Approval by
19 the commissioner does not release the applicant from any duty to
20 comply with applicable federal, state, or local government
21 statutes, rules, or ordinances, including the requirements
22 established in this chapter.

23 Subp. 4. **Denial of approval.** The commissioner shall deny
24 letters of approval for sites that do not meet the criteria
25 established in parts 7037.0900 and 7037.1000. If the
26 commissioner denies a letter of approval but finds that the site
27 could be operated in compliance with chapters 7035, 7050, and
28 7060 if enforceable conditions were established in a permit, the
29 commissioner shall inform the applicant that the applicant may
30 apply for a solid waste management permit under parts 7001.0010
31 to 7001.0210 and chapter 7035. If the commissioner finds that
32 no conditions could be established that would enable the site to
33 operate in compliance with chapters 7035, 7050, and 7060, the
34 commissioner shall notify the applicant of the commissioner's
35 intent to deny the application and afford the applicant the

1 opportunity to request a contested case hearing as provided in
2 part 7000.1000.

3 7037.1200 APPLICATION REQUIREMENTS FOR LAND TREATMENT SITES.

4 Subpart 1. Land treatment site background information.

5 The application must contain the following information:

6 A. name, business name, address, and telephone number
7 for the following persons:

8 (1) the owner;

9 (2) any person who is in possession of, has the
10 right of control, or controls the use of real property,
11 including without limitation a person who may be a lessee,
12 renter, tenant, contract for deed vendee, licensee, or occupant,
13 where the land treatment site is proposed;

14 (3) the operator; and

15 (4) the person or persons who completed the
16 application;

17 B. legal description of the real property where land
18 treatment site is proposed, including quarter section, section,
19 township, range, town or city name, and county; and

20 C. area of land proposed for land treatment in square
21 feet or in acres to the nearest one-tenth acre.

22 Subp. 2. Land treatment site and native soil
23 characterization. The applicant shall demonstrate that the land
24 treatment site meets the requirements of parts 7037.0900 and
25 7037.1000 and that the petroleum contaminated soil storage area
26 meets the requirements of part 7037.1000, subpart 6. The
27 application must include the information in items A to I.

28 A. A Soil Conservation Service soil survey map if the
29 real property where land treatment site is proposed is located
30 within a county where a soil survey has been conducted. If the
31 property containing the proposed land treatment site has not
32 been mapped by the Soil Conservation Service, an applicant shall
33 submit a comparable map prepared by a soil scientist with
34 mapping experience based on an on-site investigation. The map
35 must show the borders of the land treatment site and the storage

1 areas for petroleum contaminated soil.

2 B. Information pertaining to the land treatment site
3 and petroleum contaminated soil storage areas obtained from a
4 Soil Conservation Service soil survey report, Soil Conservation
5 Service soil interpretation records, or on-site investigation by
6 a soil scientist, including:

7 (1) thickness of each soil horizon within the
8 treatment zone;

9 (2) permeability of each soil horizon within the
10 treatment zone;

11 (3) percentage of organic matter in the upper
12 eight inches of native soil;

13 (4) depth to seasonal high water table;

14 (5) depth to bedrock; and

15 (6) slope of the land surface.

16 Subitem (4) need not be included if the land treatment site
17 is drained with a subsurface tile drainage system which is
18 designed according to or equivalent to Soil Conservation Service
19 engineering standards and criteria and is installed at a minimum
20 depth equal to the minimum thickness of the treatment zone as
21 given in part 7037.1000, subpart 5.

22 When requested by the commissioner, the applicant shall
23 perform an on-site investigation. The commissioner shall
24 require an on-site investigation if the Soil Conservation
25 Service soil survey lacks adequate detail, is out of date, or
26 has historically been inaccurate.

27 The results of any on-site investigations must be
28 submitted. This information must clearly indicate the
29 methodology used to evaluate the native soil and the results.
30 For sites that are not underlain with tile drainage, this
31 documentation must include the existence, depth, and Munsell
32 color of soil mottles and Munsell color of the soil matrix.

33 C. A map of the land treatment site, petroleum
34 contaminated soil storage areas, and surrounding area within
35 one-quarter mile of the site. The map must be drawn to a scale
36 not greater than 200 feet per inch and must show the general

1 topography with contours and drainage patterns and the following
2 features, if present:

- 3 (1) lakes and ponds;
- 4 (2) rivers and streams;
- 5 (3) wetlands;
- 6 (4) intermittent streams and drainage ways;
- 7 (5) tile drainage inlets;
- 8 (6) sinkholes, caves, and exposed bedrock;
- 9 (7) potable water supply wells;
- 10 (8) places of habitation;
- 11 (9) recreational areas;
- 12 (10) property lines; and
- 13 (11) any other land treatment site used within
14 the previous five years.

15 D. A map of the tile drainage system, if present,
16 showing the borders of the land treatment site and storage areas
17 for petroleum contaminated soil.

18 E. A list of the land treatment sites under item C,
19 subitem (11), with corresponding volumes of petroleum
20 contaminated soil treated at each land treatment site.

21 F. Information pertaining to the existence of filter
22 strips, if required under part 7037.1000, subpart 2.

23 G. Information pertaining to run-on prevention, as
24 described in part 7037.1000, subpart 3.

25 H. A description of any previous use of the land
26 treatment site for treatment or disposal of wastes.

27 I. A copy of a county plat map or comparable map
28 which provides clear road directions to the land treatment site.

29 Subp. 3. Local government notification. An applicant
30 shall furnish a copy of the application to the county auditor or
31 other person designated by the county board to receive
32 notifications; the city clerk or other person designated by the
33 city council to receive notifications; and in the case of towns,
34 the town clerk or town chair as determined by resolution of the
35 town board; and in the case of tribal-owned or Indian-owned land
36 within a reservation, the appropriate official of the tribal

1 authority. An applicant shall provide the commissioner with
2 documentation that the appropriate local government officials
3 have been notified that an application will be submitted to the
4 commissioner for approval of the proposed land treatment site in
5 accordance with the following:

6 A. signatures of the appropriate local government
7 officials on the application form acknowledging notification; or

8 B. submittal of a copy of the certified mail return
9 receipt that was sent to the applicant by the appropriate local
10 government officials in response to receiving the application by
11 certified mail.

12 Subp. 4. **Border marking.** At the time an application to
13 land treat petroleum contaminated soil is submitted to the
14 commissioner, the borders of the proposed land treatment site
15 must be marked on all corners and midway between all corners
16 using conspicuous stakes or flags.

17 7037.1300 APPROVAL PROCEDURES FOR LAND TREATMENT OF BATCHES OF
18 PETROLEUM CONTAMINATED SOIL AT APPROVED LAND TREATMENT SITES AND
19 FACILITIES.

20 Subpart 1. **In general.** Subparts 2 to 4 address the
21 process for obtaining a letter of approval to land treat a batch
22 of petroleum contaminated soil at approved land treatment sites
23 and permitted land treatment facilities. An applicant who seeks
24 approval to land treat a batch of petroleum contaminated soil at
25 an approved land treatment site or a permitted land treatment
26 facility shall furnish the information specified in part
27 7037.1400 on a form prescribed by the commissioner. The
28 application must be signed by the generator and the owner and
29 operator of the approved land treatment site or facility where
30 the petroleum contaminated soil is proposed to be land treated.
31 No person shall land treat petroleum contaminated soil without
32 obtaining the letter of approval required by this part.

33 Subp. 2. **Incomplete applications.** The commissioner shall
34 review all applications for completeness. If the application is
35 incomplete, the commissioner shall promptly inform the applicant

1 of the deficiency or deficiencies. The commissioner shall
2 suspend further processing of the application until the
3 applicant has provided the required information.

4 Subp. 3. **Approval.** The commissioner shall issue letters
5 of approval for treatment of batches of petroleum contaminated
6 soil. A letter of approval for land treatment of a batch of
7 petroleum contaminated soil at a land treatment site constitutes
8 a finding by the commissioner that the batch can be treated in
9 compliance with this chapter at the proposed site. A letter of
10 approval for land treatment of a batch of petroleum contaminated
11 soil at a land treatment facility constitutes a finding by the
12 commissioner that the batch can be treated in compliance with
13 the solid waste management facility permit for the facility.
14 Approval by the commissioner does not release the applicant from
15 any duty to comply with applicable federal, state, or local
16 government statutes, rules, or ordinances, including the
17 requirements established under this chapter or a solid waste
18 management permit issued under chapter 7035.

19 Subp. 4. **Denial of approval.** The commissioner shall deny
20 approval of an application for a letter of approval if
21 acceptance of the batch of petroleum contaminated soil would
22 cause a land treatment site to operate in violation of the
23 limitations established in part 7037.1000 or other operating
24 requirement established in parts 7037.1500 to 7037.2700, or
25 cause a land treatment facility to violate a condition
26 established in its solid waste management facility permit. The
27 commissioner shall notify the applicant of the commissioner's
28 intent to deny the application and afford the applicant the
29 opportunity to request a contested case hearing as provided in
30 part 7000.1000.

31 7037.1400 APPLICATION REQUIREMENTS TO LAND TREAT A BATCH OF
32 PETROLEUM CONTAMINATED SOIL.

33 Subpart 1. **Land treatment site information.** The
34 application to land treat a batch of petroleum contaminated soil
35 at an approved land treatment site or permitted facility must

1 include the following information:

2 A. name, business name, address, and telephone number
3 for the following persons:

4 (1) the owner of the land treatment site or
5 facility;

6 (2) the operator of the approved land treatment
7 site or facility; and

8 (3) the person or persons who completed the
9 submitted application;

10 B. legal description of the approved land treatment
11 site or facility, including quarter section, section, township,
12 range, town or city name, and county;

13 C. total volume of all petroleum contaminated soil,
14 in cubic yards, from other releases currently stored or
15 previously spread at the land treatment site or facility;

16 D. area of the plot proposed for the batch of
17 petroleum contaminated soil, in square feet or in acres to the
18 nearest one-tenth acre; and

19 E. a map of the land treatment site, drawn to a scale
20 not greater than 50 feet per inch, which shows the following:

21 (1) plot proposed in the application for land
22 treatment; and

23 (2) all plots previously used for land treatment.

24 Subp. 2. Petroleum contaminated soil information. The
25 application to land treat a batch of petroleum contaminated soil
26 at an approved land treatment site or permitted facility must
27 include the following information:

28 A. the name of the generator, business name, address,
29 and county for the release site from which the petroleum
30 contaminated soil originated;

31 B. agency release site identification number, if the
32 release is from a petroleum storage tank;

33 C. volume of petroleum contaminated soil, in cubic
34 yards, to be land treated;

35 D. proposed spreading thickness, in inches;

36 E. projected dates of spreading and incorporating the

1 petroleum contaminated soil; and

2 F. analytical results for samples of the petroleum
3 contaminated soil taken and analyzed required in part 7037.0500,
4 including copies of laboratory reports and chain of custody
5 forms.

6 Subp. 3. **Soil nutrient information.** An applicant shall
7 furnish a description of the nutrient status of the land
8 treatment plot. This description must contain the information
9 required under part 7037.3600.

10 Subp. 4. **Local government notification.** An applicant
11 shall furnish a copy of the information required in subparts 2
12 to 4 to the appropriate ~~county, city, and town~~ local government
13 officials listed under part 7037.1200, subpart 3, at the same
14 time or prior to submittal of the information to the
15 commissioner.

16 Subp. 5. **Border marking.** At the time an application to
17 land treat a batch of petroleum contaminated soil is submitted
18 to the commissioner, the borders of the proposed plot must be
19 marked on all corners and midway between all corners using
20 conspicuous stakes or flags.

21 7037.1500 OPERATIONAL REQUIREMENTS FOR APPROVED LAND TREATMENT
22 SITES; SCOPE.

23 Following issuance of the approval required under part
24 7037.1300, the owner and operator of a land treatment site shall
25 comply with the operational requirements established in parts
26 7037.1600 to 7037.2700.

27 7037.1600 STORAGE OF PETROLEUM CONTAMINATED SOIL.

28 Subpart 1. **Storage on a plot.** An owner or operator may
29 store petroleum contaminated soil for up to ten days without
30 run-off controls within an approved land treatment plot. After
31 ten days an owner or operator shall spread the batch of
32 petroleum contaminated soil in accordance with part 7037.2300 or
33 take measures to control run-off as provided in items A and B:

34 A. covering with a tarpaulin, reinforced plastic
35 which is at least six mils thick, or unreinforced plastic which

1 is at least ten mils thick; or

2 B. placing ~~silt-dams~~ on the perimeter of the
3 stockpile ~~which-are~~ either straw bales or silt dams made of a
4 geotextile material and ~~are~~ secured with stakes.

5 Subp. 2. Storage at a storage area. An owner or operator
6 may store petroleum contaminated soil at a storage area that
7 meets the criteria of part 7037.1000, subpart 6, if run-off is
8 controlled as described in subpart 1, item A.

9 7037.1700 DATES AND CLIMATIC CONDITIONS FOR SOIL SPREADING.

10 Petroleum contaminated soil may be spread only when the
11 surface soil is not frozen, is free of snow and ponded water,
12 and is otherwise capable of being tilled. Spreading must not be
13 done before April 1 or after November 1.

14 7037.1800 PETROLEUM LOADING LIMITATIONS.

15 Subpart 1. In general., The loading of petroleum
16 contaminated soil on a native soil may not exceed a spreading
17 thickness of four inches, or 540 cubic yards per acre. Subparts
18 2 to 5 provide the maximum amounts of petroleum contaminated
19 soil that may be spread based on the following factors: the
20 type of petroleum released; the contaminant level of the
21 petroleum contaminated soil; and the treatment zone
22 characteristics under part 7037.1000, subpart 5, item A. If a
23 batch of petroleum contaminated soil contains gasoline and a
24 petroleum type other than gasoline then the more stringent of
25 the requirements of subpart 2 or 3 must be followed.

26 Subp. 2. Gasoline contaminated soil. The following table
27 lists the maximum allowable levels of gasoline contamination in
28 petroleum contaminated soil which may be spread at a land
29 treatment site at a spreading thickness of four inches.

| | | Average total petroleum hydrocarbons as gasoline (parts per million) | | | |
|--|---|--|-------|-------|--|
| 32 Minimum 33 organic 34 matter 35 (percentage) | 36 Permeability (inches per hour) | 37 Minimum thickness of 38 suitable soil within 39 treatment zone (feet) | | | |
| | | 2 | 3 | 4 | |
| 38 2 | 0.6-to <u>less than 6</u> | NA | NA | 1,000 | |
| 39 | less than 0.6 | NA | 1,000 | 2,500 | |
| 40 4 | 0.6-to <u>less than 6</u> | NA | 1,000 | 2,500 | |

| | | | | |
|--|---------------|-------|-------|-------|
| | less than 0.6 | 1,000 | 2,500 | 5,000 |
|--|---------------|-------|-------|-------|

2
3 In this table "NA" means that petroleum contaminated soil
4 may not be spread under the specified conditions. "Minimum
5 thickness of suitable soil" means the total soil thickness
6 within the treatment zone having a permeability as listed in
7 this table. Petroleum concentrations are based on average total
8 petroleum hydrocarbon concentration in the soil determined by
9 the sampling and analysis procedures of part 7037.0500, subparts
10 1 and 2.

11 Subp. 3. Contaminated soil characterized as fuel oil and
12 crude-oil-contaminated-soil. Where the contamination is
13 characterized as total petroleum hydrocarbons as fuel oil or
14 ~~crude-oil~~, the following table lists the maximum allowable
15 levels of contamination in petroleum contaminated soil which may
16 be spread at a land treatment site at a spreading thickness of
17 four inches.

| | | | | | |
|--|--------------------------------------|---|-------|--------|--------|
| | | Average total petroleum hydrocarbons as gasoline fuel oil (parts per million) | | | |
| Minimum organic matter (percentage) | Permeability (inches per hour) | Minimum thickness of suitable soil within treatment zone (feet) | | | |
| | | 2 | 3 | 4 | |
| 2 | 0.6 to 6 | NA | NA | 2,000 | 5,000 |
| 4 | less than 0.6 | NA | 2,000 | 5,000 | 10,000 |
| | 0.6 to 6 | NA | 2,000 | 5,000 | 10,000 |
| | less than 0.6 | 2,000 | 5,000 | 10,000 | |

18
19
20
21
22
23
24
25
26
27
28
29
30
31
32 In this table "NA" means that petroleum contaminated soil
33 may not spread under the specified conditions. "Minimum
34 thickness of suitable soil" means the total soil thickness
35 within the treatment zone having a permeability as listed in
36 this table. Petroleum concentrations are based on average total
37 petroleum hydrocarbon concentration in the soil determined by
38 the sampling and analysis procedures of part 7037.0500, subparts
39 1 and 2.

40 Subp. 4. Spreading thickness adjustments. Petroleum
41 contaminated soil with contaminant levels that exceed the listed
42 levels in subparts 2 and 3 may be spread if done at thinner
43 spreading thicknesses which result in an equivalent or a lower
44 petroleum loading level than those listed in the table. To

1 determine the acceptable spreading thicknesses for petroleum
2 contaminated soil that exceeds the listed levels in subparts 2
3 and 3, part 7037.3500 must be used.

4 Subp. 5. Petroleum contaminated soil containing lead.

5 Petroleum contaminated soil with a total lead level greater than
6 300 parts per million must be spread at a thickness that assures
7 lead levels in the mixture of petroleum contaminated soil and
8 native soil after incorporation to be below 300 parts per
9 million. To determine final projected lead levels in the
10 mixture of soil, prior to soil spreading the owner or operator
11 shall collect a composite soil sample of the upper eight inches
12 of the native soil as described in part 7037.3200, subpart 1,
13 and analyze the sample for total lead as described in part
14 7037.3100, subpart 1.

15 7037.1900 PROHIBITION OF MIXING OR REPEATED USE.

16 Petroleum contaminated soil originating from separate
17 releases must not be combined or spread on the same plot. Plots
18 within an approved land treatment site previously used for land
19 treatment of petroleum contaminated soil may not receive repeat
20 applications of petroleum contaminated soil. Individual plots
21 within an approved land treatment site must be separated by a
22 minimum of two feet to prevent mixing of separate batches of
23 spread petroleum contaminated soil.

24 7037.2000 MAINTENANCE OF BORDER MARKING.

25 The border markings established at the land treatment site
26 under parts 7037.1200, subpart 4, and 7037.1400, subpart 5, must
27 remain in place during spreading of the contaminated soil and
28 until all follow-up monitoring requirements are fulfilled under
29 part 7037.2700.

30 7037.2100 REMOVAL OF LARGE ROCKS AND DEBRIS.

31 Rocks larger than four inches in diameter and debris must
32 be removed from petroleum contaminated soil prior to
33 incorporation into the native soil. Debris includes pieces of
34 plastic, bricks, metal, and wood.

1 7037.2200 FERTILIZER APPLICATION.

2 Subpart 1. **Conditions.** A native soil must be evaluated to
3 determine if nutrient addition is required if the petroleum
4 loading level exceeds the loading level resulting from the
5 application of petroleum contaminated soil with an average total
6 petroleum hydrocarbon concentration of 2,000 parts per million
7 to be spread at a thickness of four inches, or an equivalent
8 petroleum loading level at a thinner spreading thickness. To
9 make the required evaluation, the owner or operator shall follow
10 the method established in part 7037.3600. If part 7037.3600
11 specifies that fertilizer is required, the owner or operator
12 shall add fertilizer at the rate specified in part 7037.3600.
13 The commissioner shall grant an exemption to the maximum
14 fertilizer rates under part 7037.3600 if the owner or operator
15 submits documentation which indicates that lack of nutrients may
16 be limiting petroleum biodegradation. This documentation must
17 include the results of a nutrient evaluation as given in subpart
18 2 and soil monitoring results as given in part 7037.2700.

19 Subp. 2. **Application methods and timing.** If fertilizer is
20 to be applied to the land treatment site for the purpose of
21 biodegradation of added petroleum contaminated soil, it must be
22 broadcast to assure as uniform an application as possible.
23 Fertilizers may be applied in a single application or in
24 smaller, multiple applications during the required dates and
25 conditions given for soil spreading under part 7037.1700.
26 Fertilizers must be incorporated into the native soil within ten
27 days of application.

28 7037.2300 SPREADING AND INCORPORATION OF PETROLEUM CONTAMINATED
29 SOIL.

30 Petroleum contaminated soil must be spread uniformly ~~over~~
31 ~~the-entire-designated-plot.~~ Petroleum contaminated soil must be
32 incorporated into the upper four to six inches of native soil as
33 soon as feasible but no longer than 48 hours after spreading.
34 In order to minimize soil moisture loss and volatile loss of the
35 petroleum contaminants, initial incorporation must be conducted

1 only to the degree that most soil clods are broken up and
2 petroleum contaminated soil and native soil mixing occurs. For
3 most land treatment applications, one or two passes with a
4 tillage implement will result in adequate incorporation during a
5 single tillage cycle.

6 7037.2400 TILLAGE.

7 Unless the plot has been seeded to a crop, tillage of the
8 soil following the initial incorporation must be done in monthly
9 cycles, excluding the period from November 1 to April 1, until
10 all soil monitoring samples taken under part 7037.2700 are less
11 than ten parts per million total petroleum hydrocarbons or until
12 a minimum of four tillage cycles have been done, whichever is
13 first. Tillage of the soil must be delayed until the soil
14 moisture is increased if the soil lacks moisture such that
15 tillage would cause wind erosion or decreased microbial activity.

16 7037.2500 CROPPING.

17 Following the initial incorporation of petroleum
18 contaminated soil into the native soil under part 7037.2300, the
19 plot may be seeded to a crop. No root crops or crops for direct
20 human consumption may be grown during the period of time when
21 soil monitoring under part 7037.2700 is performed. If seeding
22 is delayed, the tillage schedule given in part 7037.2400 must be
23 followed until seeding can be done.

24 7037.2600 NOTIFICATION OF SOIL SPREADING.

25 Subpart 1. In general. An owner or operator shall furnish
26 the information specified in subpart 2 to the commissioner on a
27 form prescribed by the commissioner, within ten days after
28 spreading a batch of petroleum contaminated soil.

29 Subp. 2. Notification information. The following
30 information must be submitted:

31 A. name, business name, address, and telephone number
32 for the following persons:

33 (1) the owner;

34 (2) the operator; and

1 (3) the person or persons who completed the
2 submitted information;

3 B. legal description of the approved land treatment
4 site, including quarter section, section, township, range, town
5 or city name, and county;

6 C. the generator, business name, address, and county
7 for the release site from which the petroleum contaminated soil
8 originated;

9 D. agency release site identification number, if the
10 release is from a petroleum storage tank;

11 E. area of land used for land treatment of the batch
12 of petroleum contaminated soil, in square feet or in acres to
13 the nearest one-tenth acre;

14 F. volume of the batch of petroleum contaminated soil
15 spread at the land treatment site, in cubic yards;

16 G. average spreading thickness, in inches;

17 H. dates of spreading and incorporating the petroleum
18 contaminated soil; and

19 I. a land treatment site map as described in part
20 7037.1400, subpart 1, item E, showing the actual plot area used
21 for the batch of petroleum contaminated soil.

22 Subp. 3. **Local government notification.** An applicant
23 shall furnish a copy of the information required in subpart 2 to
24 the appropriate ~~county, city, and town~~ local government
25 officials listed under part 7037.1200, subpart 3, at the same
26 time or prior to submittal of the information to the
27 commissioner.

28 7037.2700 MONITORING AND REPORTING REQUIREMENTS.

29 Subpart 1. **In general.** An owner or operator shall sample
30 the soil following the spreading and incorporation of a batch of
31 petroleum contaminated soil in accordance with the practices of
32 subparts 2 to 4. The monitoring information that must be
33 submitted to the commissioner is given in subpart 5.

34 Subp. 2. **Sampling procedures.** Soil samples must be
35 composite samples collected within a plot from the surface to a

1 depth of eight inches using the procedures described in part
 2 7037.3400. The minimum number of composite samples collected
 3 from the upper eight inches is based on the volume of the batch
 4 of petroleum contaminated soil actually spread and must follow
 5 the table in part 7037.2900, subpart 1, item A.

6 Subp. 3. Frequency of sampling. Monitoring of a plot in
 7 the year of spreading must be done at the times specified in the
 8 following table, until all soil analytical results in a single
 9 sampling round are ten parts per million total petroleum
 10 hydrocarbons or less.

| | | |
|----|------------------------|--------------------------------------|
| 11 | Soil Spreading Date | Soil Sampling in First Calendar Year |
| 12 | | |
| 13 | Before July 1 | Once in August and once in October |
| 14 | July 1 to September 15 | Once in October |
| 15 | After September 15 | None |
| 16 | | |

17 Monitoring in subsequent years must continue for those
 18 plots in which all soil analytical results are not ten parts per
 19 million total petroleum hydrocarbons or less. These sampling
 20 events must be done in June, August, and October.

21 Subp. 4. Analysis. Soil samples must be analyzed for
 22 total petroleum hydrocarbons, according to the methods under
 23 part 7037.3100, subpart 2, item C or D. The owner or operator
 24 shall analyze for additional compounds if requested by the
 25 commissioner. The commissioner shall request analysis for
 26 additional compounds if the commissioner determines that
 27 additional analysis is necessary to protect the public health
 28 and environment.

29 Subp. 5. Submittal of monitoring information. Within 30
 30 days of receipt of laboratory results for the soil samples, the
 31 owner or operator shall submit the information specified in
 32 items A to F to the commissioner on a form prescribed by the
 33 commissioner:

34 A. name, business name, address, and telephone number
 35 for the following persons:

- 36 (1) the owner;
- 37 (2) the operator; and
- 38 (3) the person or persons who completed the
- 39 submitted information;

1 B. legal description of the approved land treatment
2 site, including quarter section, section, township, range, town
3 or city name, and county;

4 C. the generator, business name, address, and county
5 for the release site from which the petroleum contaminated soil
6 originated;

7 D. agency release site identification number, if the
8 release is from a petroleum storage tank;

9 E. soil management practices since the spreading of
10 the soil or the most recent monitoring event. This includes
11 either documentation of the crops that were planted and the
12 seeding date or a list of the dates that tillage was done; and

13 F. analytical results for soil samples taken,
14 including copies of laboratory reports and chain of custody
15 forms.

16 Subp. 6. Local government notification. An applicant
17 shall furnish a copy of the information required in subpart 5 to
18 the appropriate ~~county, city, and town~~ local government
19 officials listed under part 7037.1200, subpart 3, at the same
20 time or prior to submittal of the information to the
21 commissioner.

22 7037.2800 METHODOLOGY AND REFERENCES; SCOPE.

23 Parts 7037.2900 to 7037.3600 establish the methodologies
24 that must be used when making the determinations required under
25 this chapter, including methods of sampling and analysis. Part
26 7037.3700 incorporates by reference the documents referenced in
27 this chapter.

28 7037.2900 COLLECTION OF GRAB SAMPLES OF PETROLEUM CONTAMINATED
29 SOIL.

30 Subpart 1. Soil samples collected from stockpiles. Grab
31 soil samples collected from a batch of stockpiled petroleum
32 contaminated soil must be collected as described in items A and
33 B.

34 A. The number of grab samples from a batch of
35 stockpiled petroleum contaminated soil that must be collected is

1 based on the volume of petroleum contaminated soil, as follows:

| 2 | Volume of Soil (cubic yards) | Number of Samples |
|---|------------------------------|-----------------------|
| 3 | | |
| 4 | Less than 50 | 1 |
| 5 | 51 - 500 | 2 |
| 6 | 501 - 1,000 | 3 |
| 7 | 1,001 - 2,000 | 4 |
| 8 | 2,001 - 4,000 | 5 |
| 9 | Each additional 2,000 yards | one additional sample |

10
11 B. Each soil sample must be collected from a freshly
12 exposed portion of the interior of the stockpile, taken no
13 closer than one foot from the exterior surface of the
14 stockpile. Cross-contamination of soil samples must be
15 prevented by using clean disposable gloves and other clean
16 sampling utensils at each point that a sample is collected.
17 Soil samples must be preserved prior to analysis using either
18 chemical preservation, if required for the particular laboratory
19 method as described in the laboratory methods referenced in part
20 7037.3100, or storage at a temperature of four degrees Celsius
21 or colder.

22 Subp. 2. Soil samples collected from borings. Grab soil
23 samples collected from borings must be collected as described in
24 items A and B.

25 A. A minimum of two grab samples must be collected
26 from a minimum of two different soil borings. If the estimated
27 volume of soil to be excavated exceeds 500 cubic yards, then the
28 number of samples must follow the table under subpart 1, item A.

29 B. Samples must be collected from portions of the
30 borings that represent soil that will be excavated or proposed
31 to be excavated. The methods given in subpart 1, item B, for
32 preventing cross-contamination and for preserving samples must
33 be followed.

34 7037.3000 COLLECTION OF COMPOSITE SAMPLES OF PETROLEUM
35 CONTAMINATED SOIL.

36 Subpart 1. Soil samples collected from stockpiles. For
37 contaminant parameters for which a composite sample is required,
38 a single composite sample is required. To take a composite
39 sample, 15 samples must be collected from randomly selected
40 locations within the stockpile and placed in a clean container,

1 mixed thoroughly, and a single subsample removed of sufficient
2 quantity for analysis for the required parameter or parameters.

3 Subp. 2. Soil samples collected from borings. For
4 contaminant parameters for which a composite sample is required,
5 a single composite sample is required. To take a composite
6 sample, 15 samples must be collected from randomly selected
7 locations from portions of the borings that represent soil that
8 will be excavated or proposed to be excavated and placed in a
9 clean container, mixed thoroughly, and a single subsample
10 removed of sufficient quantity for analysis for the required
11 parameter or parameters.

12 7037.3100 ANALYSIS OF PETROLEUM CONTAMINATED SOIL SAMPLES.

13 Subpart 1. General requirements. All petroleum
14 contaminated soil samples must be analyzed using a United States
15 Environmental Protection Agency approved laboratory method or
16 equivalent, unless an alternative method is specified in subpart
17 2.

18 Subp. 2. Specific analysis requirements. Specific
19 laboratory analysis requirements are given in items A to E for
20 selected parameters.

21 A. Analysis for the parameters of parameter code A in
22 part 7037.0500, subpart 2, must be done using purge-and-trap
23 laboratory methodology in conjunction with EPA method 8010,
24 Minnesota Department of Health method 466A, or an equivalent gas
25 chromatography method.

26 B. Analysis for the parameters of parameter code B in
27 part 7037.0500, subpart 2, must be done using purge-and-trap
28 laboratory methodology in conjunction with EPA method 8020 or an
29 equivalent gas chromatography method.

30 C. Total petroleum hydrocarbons as gasoline, code D
31 in part 7037.0500, subpart 2, must be done using the Wisconsin
32 Department of Natural Resources Modified Gasoline Range Organics
33 (GRO) method.

34 D. Total petroleum hydrocarbons as fuel oil, code E
35 in part 7037.0500, subpart 2, must be done using the Wisconsin

1 Department of Natural Resources Modified Diesel Range Organics
2 (DRO) method.

3 E. PCBs, code \neq H in part 7037.0500, subpart 2, must
4 be done using EPA method 8080 or an equivalent gas
5 chromatography method.

6 7037.3200 COLLECTION OF NATIVE SOIL SAMPLES.

7 Subpart 1. Native soil samples. Samples collected from
8 the native soil for determining the concentration of organic
9 matter, extractable phosphorus, and lead must be composite
10 samples. A minimum of one composite sample is necessary for a
11 three-acre area. To take a composite sample, all surface litter
12 must be scraped off and cores of the surface soil must be taken
13 to a depth of eight inches at 15 randomly selected locations
14 within the proposed land treatment site area. The cores must be
15 placed in a clean container, mixed thoroughly, and a single
16 subsample removed of sufficient quantity for analysis of the
17 required parameter or parameters. The samples must be handled
18 and prepared for analysis in accordance with the procedures
19 recommended by the soil testing laboratory to be used.

20 Subp. 2. Samples for determining native soil permeability.

21 A. Each soil horizon within the treatment zone must
22 be characterized for soil permeability.

23 B. Determination of permeability of the native soil
24 must be done at a minimum of one representative location of the
25 land treatment site.

26 7037.3300 CHARACTERIZATION OF NATIVE SOIL.

27 Subpart 1. Organic matter concentration. Organic matter
28 concentration in a native soil must be determined using a method
29 in one of the following references:

30 A. Recommended Chemical Soil Test Procedures for the
31 North Central Region, Bulletin No. 499, October 1988, issued by
32 the North Dakota State University Agricultural Experiment
33 Station, Fargo, North Dakota.

34 B. Methods of Soil Analysis, Part 2--Chemical and
35 Microbiological Properties (Second edition), edited by A.L.

1 Page, et al., issued by the American Society of Agronomy as
2 Agronomy Monograph Number 9, Madison, Wisconsin, 1982.

3 Subp. 2. **Extractable phosphorus concentration.** If the
4 extractable phosphorus concentration of a native soil is to be
5 determined, this must be determined as given in the references
6 in subpart 1.

7 Subp. 3. **Soil permeability.** Soil permeability must be
8 reported as one of the following ranges in units of inches per
9 hour: more than 6, 2.0 to 6, 0.6 to 2.0, or less than 0.6. If
10 the native soil at the land treatment site is mapped in a Soil
11 Conservation Service soil survey, the soil permeability
12 information in the soil survey or Soil Conservation Service soil
13 interpretation records may be used. If the information is not
14 available, then the soil permeability must be determined using
15 one of the methods in items A to C.

16 A. Soil texture, as obtained or determined under
17 subpart 4, may be used to estimate the soil permeability as
18 given in the following table for United States Department of
19 Agriculture textural classifications and permeabilities:

| 20 | Soil texture | Permeability |
|----|-------------------|-------------------|
| 21 | classification | (inches per hour) |
| 22 | | |
| 23 | Gravel, sand, | more than 6 |
| 24 | fine sand, loamy | |
| 25 | sand, loamy fine | |
| 26 | sand | |
| 27 | | |
| 28 | Sandy loam, | 2.0 to 6 |
| 29 | fine sandy loam | |
| 30 | | |
| 31 | Loam, silt loam, | 0.6 to 2.0 |
| 32 | sandy clay loam | |
| 33 | | |
| 34 | Clay loam, silty | less than 0.6 |
| 35 | clay loam, sandy | |
| 36 | clay, silty clay, | |
| 37 | clay. | |
| 38 | | |

39 B. Determination in a laboratory using undisturbed
40 soil samples as outlined in chapter 28, Hydraulic Conductivity
41 and Diffusivity: Laboratory Methods, in Methods of Soil
42 Analysis, Part 1--Physical and Mineralogical Methods (Second
43 edition), edited by Arnold Klute, issued by the American Society
44 of Agronomy as Agronomy Monograph Number 9, Madison, Wisconsin,
45 1986.

1 C. Determination by direct measurement in the field
 2 as outlined in chapter 29, Hydraulic Conductivity of Saturated
 3 Soils: Field Methods, in Methods of Soil Analysis, Part
 4 1--Physical and Mineralogical Methods (Second edition), edited
 5 by Arnold Klute, issued by the American Society of Agronomy as
 6 Agronomy Monograph Number 9, Madison, Wisconsin, 1986.

7 Subp. 4. Soil texture. If the native soil at the land
 8 treatment site is mapped in a Soil Conservation Service soil
 9 survey, the United States Department of Agriculture soil
 10 textural information in the soil survey or Soil Conservation
 11 Service soil interpretation records may be used. If such
 12 information is not available, then the soil texture must be
 13 determined using one of the following references:

14 A. Chapter 15, Particle-size Analysis, in Methods of
 15 Soil Analysis, Part 1--Physical and Mineralogical Methods
 16 (Second edition), edited by Arnold Klute, issued by the American
 17 Society of Agronomy as Agronomy Monograph Number 9, Madison,
 18 Wisconsin, 1986.

19 B. Soil Survey Laboratory Methods and Procedures for
 20 Collecting Soil Samples, issued by the Soil Conservation Service
 21 as Soil Survey Investigations Report 1 (revised), Washington,
 22 D.C., United States Government Printing Office, 1972.

23 ~~Subp. 5. Calculation of percent permeability in a~~
 24 ~~treatment zone. The percentage of a treatment zone having an~~
 25 ~~acceptable permeability must be calculated as follows:~~

26 ~~A. Determine the thickness of each individual native~~
 27 ~~soil layer or horizon within the treatment zone that has a~~
 28 ~~characteristic permeability.~~

29 ~~B. Sum the thicknesses of those layers or horizons~~
 30 ~~that have permeabilities less than 0.6 inches per hour, then use~~
 31 ~~the sum in the following calculation:~~

32 ~~{Sum determined in item B, inches} x 100 = Percent~~
 33 ~~----- permeability~~
 34 ~~{Thickness of treatment zone, inches} less than 0.6-~~
 35 ~~inches per hour~~
 36

37 ~~C. Sum the thicknesses of those layers or horizons~~
 38 ~~that have permeabilities less than six inches per hour, then use~~

1 ~~the sum in the following calculation:~~

2 ~~{Sum determined in item C7 inches} x 100~~ = Percent
 3 ~~-----~~ permeability
 4 ~~{Thickness of treatment zone inches}~~ less than 6
 5 inches per hour
 6

7 Subp. 6~~7~~ 5. Seasonal high water table. The depth to the
 8 seasonal high water table must be obtained or determined as
 9 described in items A and B:

10 A. The depth to the seasonal high water table for
 11 many specific soil series in Minnesota can be found in Soil
 12 Conservation Service soil surveys or Soil Conservation Service
 13 soil interpretation records.

14 Where the depth to the seasonal high water table is given
 15 as a range, the actual depth shall be considered as the average
 16 of the range.

17 B. Determination of the depth at which any one of the
 18 following is present below the topsoil as the result of
 19 saturated conditions:

20 (1) soil having a matrix or mottles with a chroma
 21 of two or less using the Munsell color system notation;

22 (2) olive-colored soil as indicated by the matrix
 23 having a hue hues of 5Y or yellower and a chroma of three or
 24 less using the Munsell color system notation; or

25 (3) soil with distinct or prominent mottles as
 26 indicated by a separation of matrix color from mottle color by
 27 several chroma or more than one hue.

28 7037.3400 COLLECTION OF SOIL MONITORING SAMPLES.

29 Prior to sample collection, the plot must be divided up
 30 into separate equal-sized subplots. The number of subplots is
 31 the total number of composite samples required, as given in part
 32 7037.2700, subpart 2. A composite sample must be collected from
 33 each subplot as follows: all surface litter must be scraped
 34 off, cores of the surface soil must be taken to a depth of eight
 35 inches at 15 randomly selected locations within the subplot and
 36 placed in a clean plastic bag, mixed thoroughly, and a single
 37 subsample removed of sufficient quantity for analysis of the
 38 required parameter or parameters. This plastic bag must be kept

1 sealed when samples are not added to it. Once the composite
2 sample is collected, the sample must be preserved for laboratory
3 analysis as described in part 7037.2900, subpart 1, item B.

4 7037.3500 SPREADING THICKNESS AND LAND AREA CALCULATIONS.

5 Subpart 1. Spreading thicknesses. The formula for
6 determining the acceptable spreading thicknesses for petroleum
7 contaminated soil that exceeds the contaminant levels in part
8 7037.1800, subparts 2 and 3, is as follows:

$$\begin{array}{l}
 9 \qquad \qquad 4 \times [\text{allowable TPH, ppm}] \qquad \qquad = \text{Acceptable} \\
 10 \qquad \qquad \text{-----} \qquad \qquad \qquad \qquad \qquad \text{spreading} \\
 11 \quad [\text{average TPH in batch of soil, ppm}] \qquad \qquad \text{thickness, inches} \\
 12
 \end{array}$$

13 In this formula "allowable TPH" refers to the maximum total
14 petroleum hydrocarbon levels listed in part 7037.1800, subparts
15 2 and 3, and "average TPH in batch of soil" refers to the
16 average total petroleum hydrocarbon level of the batch of
17 petroleum contaminated soil. Both are expressed in parts per
18 million (ppm).

19 Subp. 2. Land area. The formula for determining the
20 amount of acreage required for land treatment of a known volume
21 of petroleum contaminated soil is as follows:

$$\begin{array}{l}
 22 \quad [\text{Soil volume, X} \qquad \qquad 0.00744 \qquad \qquad = \text{Acres required} \\
 23 \quad \text{cubic yards}] \qquad \qquad \text{-----} \\
 24 \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \text{[Spreading thickness,} \\
 25 \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \text{inches]}
 \end{array}$$

26 7037.3600 DETERMINATION OF NUTRIENT ADDITION FOR PETROLEUM
27 HYDROCARBON BIODEGRADATION.

28 Subpart 1. Nutrient evaluation and addition. Nutrient
29 requirements are determined as described in items A and B:

30 A. Minimum nitrogen addition to a land treatment plot
31 must be based on the calculations and table in this item and is
32 subject to the maximum nitrogen application rates and management
33 requirements under subparts 3 and 4:

$$\begin{array}{l}
 34 \quad [(\text{average TPH in batch of soil, ppm}) \times (\text{spreading} \\
 35 \quad \text{thickness, inches}) \times 0.0128] - [\text{organic matter, percent} \times 50] = \\
 36 \quad \text{pounds of nitrogen per acre required}
 \end{array}$$

37 In this formula "average TPH in batch of soil" refers to
38 the average total petroleum hydrocarbon level of the batch of
39 petroleum contaminated soil, expressed as parts per million

1 (ppm); "organic matter, percent" refers to the value obtained or
2 determined as given in part 7037.3300, subpart 1.

3 Nitrogen application rates determined by the above
4 calculation may be reduced depending on the crop grown within
5 the previous year and whether nitrogen fertilizer was added
6 within the previous year, as given in the following table:

| 7 Condition | 8 Nitrogen Rate Reduction, 9 pounds of nitrogen per acre |
|---|---|
| 10 Previous crop--alfalfa | 11 100 |
| 12 Previous crop--soybeans, 13 clover, or other legume | 14 40 |
| 15 Nitrogen applied 16 within last year | 17 1/3 of a pound for each 18 pound of nitrogen applied |

18 If the nitrogen application rate as determined under this
19 item is less than 25 pounds of nitrogen per acre, then nitrogen
20 need not be applied.

21 B. Minimum phosphorus addition to a land treatment
22 plot must be based on the calculation below and previous
23 phosphorous fertilizer additions as given in this item and is
24 subject to the maximum phosphorus application rates and
25 management requirements under subparts 3 and 4:

26
$$[(\text{average TPH in batch of soil, ppm}) \times (\text{spreading}$$

27
$$\text{thickness, inches}) \times 0.0027] - [\text{phosphorus concentration, ppm} \times$$

28
$$2] = \text{pounds of phosphorus per acre required}$$

29 In this formula "average TPH in batch of soil" refers to
30 the average total petroleum hydrocarbon level of the batch of
31 petroleum contaminated soil, expressed as parts per million
32 (ppm); "phosphorus concentration" refers to the extractable
33 phosphorus concentration of the native soil as determined under
34 part 7037.3300, subpart 2, and expressed as ppm. If the land
35 treatment site has been soil tested within the last three years
36 for phosphorus, results from the last soil analysis may be
37 used. If the extractable phosphorus concentration is not or has
38 not been conducted, a value of five parts per million shall be
39 used in the above calculation.

40 Phosphorus application rates determined by the above
41 calculation may be reduced by one-half pound for each pound of

1 phosphorus applied within the previous three years.

2 If the phosphorus application rate as determined under this
3 item is less than ten pounds of phosphorus per acre, then
4 phosphorus need not be applied.

5 Phosphorus content of commercial fertilizer is typically
6 listed as phosphate (P₂O₅). One pound of P₂O₅ equals 0.44
7 pounds of phosphorus.

8 Subp. 2. **Maximum nutrient application rates.** The maximum
9 rates of nitrogen and phosphorus to be applied in a one-year
10 period are as follows:

| 11 Condition | 12 Maximum nitrogen 13 application rate, 14 pounds per acre | 15 Maximum phosphorus 16 application rate, 17 pounds per acre |
|--|---|---|
| 18 Land treatment 19 plot cropped 20 after spreading | 21 200 | 22 120 |
| 23 Land treatment 24 plot not cropped 25 after spreading | 26 100 | 27 60 |

28 The cropping conditions in the above table refer to part
29 7037.2400.

30 Nutrient application in subsequent years is not required.

31 Subp. 3. **Other fertilizer management considerations.**

32 Additional fertilizer management considerations are as described
33 in items A and B:

34 A. Timing and methods for fertilizer application are
35 given in part 7037.2200, subpart 2. If fertilizer is applied in
36 separate multiple applications and the monitoring requirements
37 of part 7037.2700 have been met prior to application of the
38 required amount of fertilizer, then the remainder of the
39 fertilizer need not be applied.

40 B. Acceptable nutrient sources for application
41 include compost, manure, other organic fertilizers, or inorganic
42 fertilizers.

43 7037.3700 INCORPORATIONS BY REFERENCE.

44 Subpart 1. **In general.** For purposes of this chapter, the
45 documents in subpart 2 are incorporated by reference. They can
46 be found at the Minnesota State Law Library, Minnesota Judicial

1 Center, 25 Constitution Avenue, Saint Paul, Minnesota 55155, or
2 at the addresses indicated. These documents are not subject to
3 frequent change.

4 Subp. 2. **Referenced standards.** The documents incorporated
5 by reference in this chapter are listed in items A to H G:

6 A. American Society of Agronomy, 677 South Segoe
7 Road, Madison, Wisconsin 53711.

8 (1) Methods of Soil Analysis, Part 1--Physical
9 and Mineralogical Methods (Second Edition), Agronomy Monograph
10 No. 9 (1986); and

11 (2) Methods of Soil Analysis, Part 2--Chemical
12 and Microbiological Properties (Second Edition), Agronomy
13 Monograph No. 9 (1982).

14 B. Minnesota Department of Health, Public Health
15 Laboratory Division, 717 Delaware Street Southeast, Minneapolis,
16 Minnesota 55440.

17 (1) EPA Method 8010, Halogenated Volatile
18 Organics (1986);

19 (2) EPA Method 8020, Aromatic Volatile Organics
20 (1986);

21 (3) EPA Method 8080, Organochlorine Pesticides
22 and PCBs (1986);

23 (4) Minnesota Department of Health method 465,
24 revision D, Determination of Volatile Organics in Water by
25 Purge-and-Trap Method (1989); and

26 (5) Minnesota Department of Health method 466A,
27 Determination of Volatile Organics in Liquids and Solids by
28 Purge-and-Trap Method (1984).

29 C. Minnesota Department of Natural Resources, 500
30 Lafayette Road, Saint Paul, Minnesota 55155.

31 (1) Regulations Designating Trout Lakes,
32 Superseding Commissioner's Order No. 2230 (Commissioner's Order
33 No. 2443; May 12, 1992); and

34 (2) Regulations Designating Trout Streams and
35 Regulating the Taking of Fish Therein, Superseding
36 Commissioner's Order No. 2089 (Commissioner's Order No. 2294;

1 March 18, 1988).

2 D. North Dakota State University Agricultural
3 Experiment Station, Fargo, North Dakota 58105. Recommended
4 Chemical Soil Test Procedures for the North Central Region
5 Bulletin No. 499 (October 1988).

6 E. Wisconsin Department of Natural Resources, Box
7 7921, Madison, Wisconsin 53707.

8 (1) Method for Determining Gasoline Range
9 Organics (Modified GRO Method) PUBL-SW-140 (undated); and

10 (2) Method for Determining Diesel Range Organics
11 (Modified DRO Method) PUBL-SW-141 (undated).

12 F. United States Department of Agriculture, Soil
13 Conservation Service, 600 Farm Credit Building, 375 Jackson
14 Street, Saint Paul, Minnesota 55101.

15 (1) Diversion (Standard 362, July 1989); and

16 (2) Filter strip (Standard 393, April 1986).

17 G. ~~United States Department of the Interior, Fish and~~
18 ~~Wildlife Service, Printing and Publications Branch, 1849 E~~
19 ~~Street N.W., Room 2543, Washington, D.C. 20240. -- Classification~~
20 ~~of Wetlands and Deep Water Habitats of the United States,~~
21 ~~FWS/OBS-79/31 (December 1979).~~

22 H. United States Government Printing Office,
23 Washington, D.C. 20401.

24 (1) Soil Survey Laboratory Methods and Procedures
25 for Collecting Soil Samples, Soil Survey Investigations Report 1
26 (revised) (1972); and

27 (2) Soil taxonomy: A basic system of soil
28 classification for making and interpreting soil surveys,
29 USDA-SCS Agricultural Handbook No. 436 (1975).

