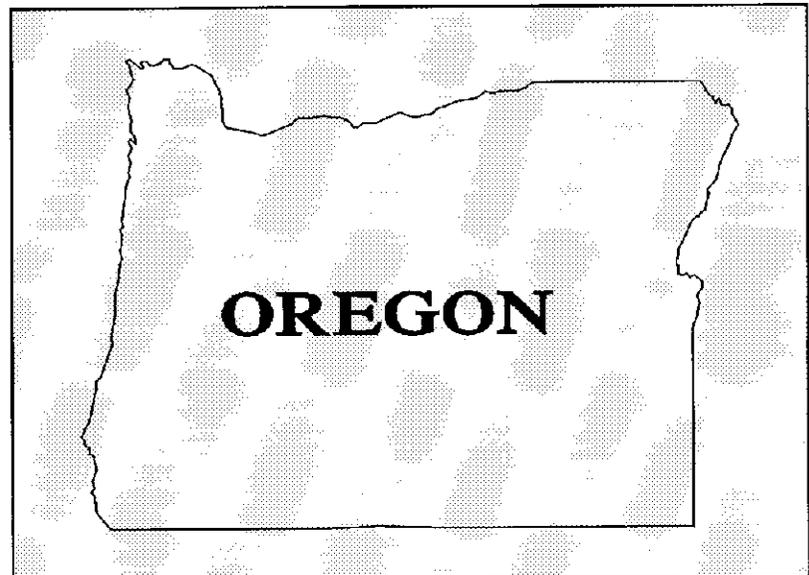


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# **GUIDELINES FOR LAND APPLICATION OF INDUSTRIAL SOLID WASTES**



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# GUIDELINES FOR LAND APPLICATION OF INDUSTRIAL SOLID WASTES

## INTRODUCTION

The guidance document encompasses land application of rather broad categories of materials generated during many industrial activities. It includes residuals formed during wastewater or drinking water treatment systems such as sludges — as well as processing raw materials or byproducts such as ashes, grits and dregs. Throughout the text, the term “solids” has been used to imply any of the above materials, with varying moisture contents. Pulp and paper mill sludges contaminated with dioxins and furans are not covered here and will be dealt with in a separate document.

As a part of National Pollutant Discharge Elimination System (NPDES) permit requirements, or Water Pollution Control Facilities (WPCF) permit, the permittee is required to submit a *Solids Management Plan* for review and approval. This guidance document is written to aid the general public and consultants with preparation of a Management Plan in securing a NPDES or WPCF permit. The guidelines reflect the general understanding of basic principles and processes that influence water pollution at the time this document is being prepared. Undoubtedly frequent revisions will be necessary in the future to alter or amend parts of the document as new knowledge is gained or some other federal and state standards become available.

Although separate sets of rules and guidelines govern land application of solids from municipal wastewater treatment systems (generally referred to as biosolids), in many cases, some parallelism is evident and is intentional. Site conditions, setbacks and cumulative loading rates for certain pollutants (particularly metals), based on 40 CFR 503 federal regulations, are prime examples. However, it is important to maintain points of emphasis and differences and not to attempt to cross-apply guidelines relating to land application of municipal and industrial solids.

## PURPOSE

The purpose of these guidelines is to protect the environment and public health by prescribing minimum conditions, criteria and limitations for the safe handling, use or land application of industrial solids or “waste” byproducts; to minimize waste disposal to landfills; to maximize and enhance recycling of wastes or byproducts and, thus, beneficial use.

## RESPONSIBILITY

It is the responsibility of the waste generator, the applicant or permittee to insure the proper storage, handling and application of the solids. Transportation of the solids to the application site shall be

made in such a manner to prevent leaking or spilling onto the highways, streets, roads, waterways, or other land surfaces not approved for solids application.

## LIMITATIONS

1. Written authorization must first be obtained from the regional office of Oregon Department of Environmental Quality (DEQ) prior to land application of any industrial solids or waste byproducts.
2. In order to secure authorization from the Department, a comprehensive *Solid Management Plan* must be prepared, and submitted to the regional office for approval. The Management Plan shall encompass and address all limitations, conditions, and criteria proposed in this guidance document.
3. The proposed solids shall not be classified as a hazardous waste, as defined and determined by recognized procedure(s) by DEQ, and has been adequately demonstrated by the generator to have a beneficial use and application.
4. Stockpiling of solids shall be limited to the property or facility where solids are being generated. Alternatively, a site can be procured by the generator, where the solids can be stored under supervision with proper siting and structural provisions to prevent any erosion or leaching of soluble constituents from the stockpile. Stockpiling in areas other than approved for the facility is restricted to the quantity needed for land application on a given site, for a short period, generally not to exceed 2 weeks.
5. Solids shall be land applied in quantities that meet following criteria:
  - Land applied in quantities not to exceed crop nutrient(s) requirement(s) and in appropriate cases, the required soil amendment rate such as liming material.
  - Application does not exceed cumulative pollutant loading rates for arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc as given in Table 2 of 40 CFR 503.13.
  - Solids with components rather resistant to microbial decay should have undergone decomposition or biodegradation with no visible residues before a given land is selected again to receive another dose of solids in a multiple-land application program.
6. Within 7 to 15 days of land application of solids, soil incorporation into the top 6 inches by disking, plowing, or other means is generally required. Mixing of the solids with the soil mass initiates more rapid biochemical and chemical reactions and prevents any risks due to erosion or runoff of soluble constituents. Nature of solids, site-specific conditions, and absence of erosional or runoff hazards due to local climatic conditions may justify surface spreading without soil incorporation.
7. Solids shall not be applied to frozen, snow-covered, saturated, or flooded land.
8. Proper and best management practices are implemented to establish and maintain full crop or vegetative cover on the applied land surface to maximize treatment and prevent soil erosion and possible movement of sediments into other land surfaces or bodies of water.

## CRITERIA FOR SITE SELECTION

1. Site should be on a stable geologic formation not subject to erosion, flooding or excessive runoff from adjacent land.

2. At the time of application, the minimum depth to permanent water table should be four (4) feet and the minimum depth to temporary water table should be one (1) foot from the lower boundary of soil incorporation. Sites approved for year-round application should be evaluated carefully to insure that water table separation distances conform with these requirements. On some sites, dry season application only may be possible.
3. Maximum slope of twelve (12) percent for solids with high moisture content is recommended. Sites with slopes up to twenty (20) percent may be used for dewatered or dried solids. In any case, on uneven topography, runoff, and erosion control measures should be constructed if necessary.
4. Soil should have a minimum rooting depth of twenty-four (24) inches. Rock, consolidated materials, claypans, compacted or cemented layers are among depth-limiting factors.
5. pH of soils west of the Cascades should be periodically adjusted to 6.5 or the recommended level for a given crop according to standard agronomic and management practices. Soil limiting conditions, such as salinity and/or sodicity that may occur east of the Cascades, should be avoided or corrected.
6. Discretion must be used in application of solids onto land that is in close proximity to residential areas. A buffer strip large enough to prevent nuisance odors or wind drift problems is needed. Size of the buffer strip will depend upon the nature of solids applied, method of application, and proximity to sensitive areas; for example, no limit for direct soil injection, and 50 feet for truck spreading.
7. Buffer strips should be provided along well traveled highways. The size of the buffer strip will vary with local conditions and should be decided on a case-by-case basis.
8. No solids should be applied at the site closer than fifty (50) feet to any ditch, channel, pond or waterway, or within two hundred (200) feet of a domestic water source or well. However, due consideration will be given for setback requirements to meet site-specific conditions.
9. Buffer zones where solids are not applied should also be protected from soil erosion by maintaining a vegetative cover or the natural vegetation.

## **LAND APPLICATION APPROVAL**

1. Prior approval shall be obtained in writing from the regional DEQ office for the application of solids on beneficial use sites.
2. The industrial waste generator shall submit a Management Plan to the DEQ regional office for review and approval.
3. The Management Plan shall be current and kept on file with the NPDES or WPCF permit and any authorization letters that will be issued following the approval of the Management Plan. The plan must include, but not be limited to:
  - a. The industry, NPDES or WPCF Permit number and a general outline of the manufacturing processes.
  - b. Description of processes involved in the generation of solids or byproducts.
  - c. Listing of chemical(s) used in the manufacturing processes or facility maintenance.
  - d. Source and quantity of solids generated.
  - e. Moisture content of solids.

- f. Location and description of storage facilities and containment of solids during the period of non-land application.
- g. Solids composition, specifying the sampling protocol and methods of analyses. A list of constituents or parameters for minimum characterization is given in the section titled "Solids Analysis". For industrial wastes of unfamiliar or mixed origins, Priority Pollutant Scan and analyses as well as toxicity characteristics tests may be required. For land application of mixed solids, the mixing ratio and the resultant characterization of the mix shall be specified and determined.
- h. Proposed application rates; calculations of nutrient or soil amendment loading rates; metal loading rates; rate limiting constituent(s) and site-life determination.
- i. Hydraulic loading rate for liquid residuals.
- j. Listing of sites. Prior to land application and for the purpose of receiving authorization from DEQ, each site shall be identified as follows:
- The name, address, and phone number of the owner and operator of the site receiving the solids.
  - The location of the site, using full legal description.
  - A detailed map showing the location and boundaries of the solids land application site, topography, and relevant physical features of the land.
  - The land area and net acreage of the site where solids would be land applied.
- The soil series as mapped by the latest SCS Soil Survey Report.
  - Pre-application soil tests report — For sites that would receive solids containing any rate-limiting constituents such as metals, an initial soil test for the same constituent(s) would be required.
  - Method of application (such as surface spraying, spreading, or injection into the soil) and soil incorporation (such as plowing and disking).
  - Planned 5-year crop rotation or type of vegetative cover to be maintained.
  - Period of solids application.
  - Frequency of solids application in a multiple applications site.
  - Management practices to be implemented, including but not limited to, fertilizing, liming, irrigation, planting, harvesting, and land-shaping activities including diversions, terraces, grassed waterways for erosion, sediment, and runoff control. For non-agricultural lands, the United States Department of Agriculture, Soil Conservation Service Practice Standard 342 is recommended.
  - Any site limitations identified (see site selection criteria), and land use compatibilities;
- k. Nutrient balance, residual nitrogen consideration, and fertilization program during and after solids application.
- l. Setbacks from waterways, wells, wetlands, roads and highways, residential areas, etc.

- m. Written contract or agreement indicating the willingness of the property owner to receive solids for land application and mutual responsibilities between the generator and land owner for adhering to the conditions, criteria, and limitations set by the approved Management Plan.
  - n. Monitoring, record keeping, and reporting.
4. Submittal of the Management Plan to the regional DEQ office for review and approval. The final copy of the Management Plan shall contain all changes and amendments deemed necessary in the review process.
  5. Once the Management Plan is approved, the permittee is required to obtain an authorization letter from Water Quality Section of the DEQ regional office for each proposed site(s) in order to proceed with land application. Usually, site(s) visit is required and site(s) evaluation is made by a trained Department representative.
  6. The regional DEQ office needs to be notified in writing of any changes in raw materials, processing, waste treatment, or land application practices by the permittee. In some cases, such changes may require and result in amendment of the Management Plan.
  7. Any subsequent addition of sites to the previously approved list does not require submittal of a new Management Plan as long as a written request with all pertinent information enumerated above is submitted to the regional DEQ office. However, before proceeding with land application of a new proposed site, an authorization letter must be secured from the regional DEQ office.

## **SOLIDS ANALYSIS**

1. Sampling Protocol:

Each facility should submit a sampling protocol in the proposed Management Plan. Unless approved otherwise, an acceptable sampling procedure is as follows:

- The impoundment, stockpile, or other storage area containing the solids which is to be used for land application shall be divided into several sampling units according to impoundment or stockpile size and any observable or conceived differences.
  - One core sample shall be drawn from the center of each sampling unit, with each core extending to the full depth of the storage or containment area.
  - The core samples from each sampling unit shall be combined into a single composite sample, which shall be thoroughly blended to produce a homogenous mixture.
  - One analytical sample shall be drawn from the composite sample, and analyzed in accordance with specific Standard Methods for the Examination of Water and Wastewater (American Public Health Association, American Water Works Association, Water Pollution Control federation) or EPA methods. Date of analyses, frequency of sampling, number of duplicate samples, type of matrix and dilution; if applicable, Standard Method or EPA methods and detection limits must be specified.
2. Constituents to be analyzed — Analyses required depend on raw materials used, manufacturing processes and nature of solids generated. For certain facilities that use raw materials and employ processes that are known or suspected to generate certain constituents, an initial screening such as TCLP and/or Priority Pollutants Tests shall be required.

In cases where various solids are mixed and land applied, the mixing ratio needs to be specified and the mixture rather than individual solids needs to be analyzed.

Minimum characterization required is as follows:

Total Solids	.....	%
Volatile Solids	.....	%
Total Organic Carbon	.....	% dry weight
Total Nitrogen	.....	% dry weight
NH4-N	.....	% dry weight
NO3-N	.....	% dry weight
Phosphorous	.....	% dry weight
Potassium	.....	% dry weight
pH	.....	standard units
Arsenic	.....	mg/kg dry weight
Cadmium	.....	mg/kg dry weight
Chromium	.....	mg/kg dry weight
Copper	.....	mg/kg dry weight
Lead	.....	mg/kg dry weight
Mercury	.....	mg/kg dry weight
Molybdenum	.....	mg/kg dry weight
Nickel	.....	mg/kg dry weight
Selenium	.....	mg/kg dry weight
Zinc	.....	mg/kg dry weight

Additional tests — Analysis for other elements and metals or various organics and pesticides, if suspected to be generated during manufacturing processes, may be required.

**MONITORING, RECORD KEEPING,  
AND REPORTING**

Each generator of industrial solids which uses, disposes of, or distributes or markets such solids for land application shall develop and maintain records on the disposition of all such land-applied solids. These records shall form the basis of an annual report prepared by each facility and sent to the appropriate DEQ regional office on February 1 of each year or other proposed date specified in the Management Plan. Generators with one or

more facilities shall maintain these records and a copy of these reports at one of the facilities that is normally occupied for 8 hours a day, provided that the identity of this facility is available at each facility that generates such solids.

The following information for each facility shall be included in the annual report:

1. The wet and dry weight of solids land applied in tons.
2. For each land application site:
  - The location of the site.
  - The land area of the site.
  - The total amount of solids by weight applied to the site in tons; and per unit land area in dry tons/acre.
  - The date(s) of land application.
  - Crop grown or harvested.
  - Yield or biomass harvested.
  - Amount, type, and date of fertilizer(s) or any soil amendment such as lime applied.
  - Pre- and post-solids application soil analyses.
  - Crop analysis if available or required.
3. Solids analysis — Sampling, selection of constituents required for analysis and analytical procedures shall be according to the approved Management Plan.
4. For all solids distributed and marketed for land application, the names, addresses, and telephone numbers of all persons receiving such solids; the amount of such solids by weight received by each person; and the full solids analysis.

5. Any spill report or public complaint.

## **SOIL SAMPLING PROTOCOL**

Soil samples shall be collected in accordance with the following procedure:

Each field at the land application site is divided into different sampling units with uniform soil types or any observable land features such as drainage, slope, or soil color and past cultivation, fertilization and other management practices. In case a field is small (generally less than 100 acres) and rather uniform with respect to soil type, land form and past management, it can comprise a sampling unit by itself.

Several core samples, usually 10 to 15, shall be drawn from each sampling unit to a specified depth. The core samples shall be combined into a single composite sample, which shall be thoroughly blended to produce a homogenous mixture. Above procedure is repeated for other sampling units and fields. One analytical sample shall be drawn from each composite samples, and shall be analyzed in accordance with specified methods.

For most purposes, required sampling depth is from the top 6 inches of the soil. However, if analyses indicate accumulation of certain constituents or pollutants, sampling depth is extended to the entire crop root-zone or beyond. In this case, composite and consequently analytical samples are collected from each sampling depth.

