



GUIDELINE 26 – SOIL SURVEYS AND MANAGEMENT OF SUITABLE PLANT GROWTH MATERIAL AND PLANT ROOTING SOIL FOR SOLID WASTE DISPOSAL FACILITIES

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I. Introduction

Final reclamation and closure of solid waste facilities is one of the most important factors in minimizing long-term environmental degradation. Establishing an excellent stand of grass on closed facilities and minimizing long-term erosion hinges on the quality of soil used in the final closure. Excessive erosion will increase post-closure costs and the time of the post-closure maintenance. Erosion can expose waste and greatly increase leachate and gas generation.

Section 33.1-20-01.1-03 of the North Dakota Administrative Code (NDAC), North Dakota Solid Waste Management Rules, states in part:

“Suitable Plant Growth Material means that soil material (normally the A and the upper B horizon which are dark colored due to organic staining) which, based upon a soil survey, is acceptable as a medium for plant growth when respread on the surface of regraded areas.”

Suitable plant growth material (SPGM) is commonly referred to as “topsoil.”

The closure standards for Municipal Solid Waste Landfills, Special Waste Landfills and Industrial Waste Landfills also require that a 12-inch layer of soil capable of supporting plant roots be placed under the layer of SPGM. This plant root material is commonly referred to as “subsoil,” but if subsoil is not available or is not suitable, other material may be considered based on its characteristics.

Soil, as defined in terms of the solid waste soil survey requirements, can be considered to be the dynamic natural body or material occupying the unconsolidated portion of the earth’s surface capable of supporting plant life and having properties due to the combined effect of the five soil forming factors - climate and living organisms, as modified by topography and time, upon parent materials. A **soil survey** is the systematic examination, classification, and mapping of soils in an area. Soil surveys are classified according to the kind and intensity of field examination.

II. Professional Soil Classifier Requirements

Solid waste facilities that are required to have a soil survey of their site need to use the services of a Registered Professional Soil Classifier. Section 43-36-23 North Dakota Century Code states as follows:

“No person shall practice or offer to practice professional soil classifying as defined by this chapter unless such person is duly registered to practice under or exempt from the provisions of this chapter.”

Following is a link to a roster of the [Professional Soil Classifiers Association of North Dakota](#). For more information on registration requirements, contact the North Dakota State Board of Registration for Professional Soil Classifiers at (701) 225-3381.

III. Soil Survey Guidance

1. Soil mapping units should be established as follows:
 - Soil mapping units to be identified at the soil series or phase level;
 - Mapping units may be either consociations or complexes;
 - Similar soils five acres or more; and
 - Dissimilar soils one acre or more.
2. Collection of soil samples by genetic horizon from soil pedons at a rate of one pedon per 40 acres with an estimated 5 to 6 samples by horizon per pedon. A minimum of one pedon shall be collected per map unit, provided there are 10 or more acres of that map unit.
3. Laboratory analysis of soil samples must be performed by a state-certified laboratory. The soil parameters for analyses include pH, electrical conductivity (EC), sodium adsorption ratio (SAR) and organic matter. At minimum, a testing frequency of one soil profile per map unit shall be employed. Additional testing may be required depending on the complexity of soil types, and the best judgment of the soil scientist.
4. SPGM should have an EC of less than two millimhos per centimeter, a SAR of less than four, and an organic matter percentage of one or more. If adequate material for SPGM and the 12-inch plant root zone material is not available onsite, the Soil Classifier should be consulted and/or retained to identify potential material that is to be used, subject to approval by the Department.
5. Upon consultation with the owner/operator, the landfill design engineer, and the Department, the soil survey might also examine what material, if any, would best serve as the 12-inch plant root zone material required to be placed on the final cover, underlying the required SPGM for municipal solid waste, industrial and special waste landfills. Soil material should be clay-rich and should have an EC of less than four millimhos per centimeter and a SAR of less than 10. If suitable plant root material is not onsite, borrow sites should be identified. This should be addressed in the work plan. If volume of material is not adequate for closure, the Department may consider allowing materials with $EC < 6$ and $SAR < 12$.
6. Some testing of the Soil C horizon and the deeper geologic soil materials is advised (probably will be addressed in characterization or pedons). A Soil C horizon and deeper materials may qualify as the root zone material.
7. Field observations should be based on soil color, horizons, texture, structure, salts (if any) and vegetation. If the vegetation appears adversely affected, assessment can be visually performed for salinity, sodicity and/or low available water holding capacity (relating to texture). Field observations shall be compared, when possible, with available laboratory data to complete topsoil and subsoil estimated stripping depths.

SPGM standards must be approved by the Department when evaluations for stripping depths are compiled. E horizons in hydric soils should be included as SPGM (topsoil) if the underlying horizons meet SPGM requirements.

8. Field sheets, preferably on an aerial photo base, shall be used for initial delineation. The original field sheet shall be provided to the Department, and a copy shall be maintained as part of the operating record of the landfill as required under Section 33.1-20-04.1-04 NDAC. The field sheets shall be used as a base for transferring the mapping boundaries to Mylar base maps of the same scale. The acreage base should be established and should provide landfill ownership boundaries, permit boundaries, and the proposed soil disturbance boundaries.

A soil survey legend and map of the site (preferably on an aerial photo) at the scale of 1:4800 or 1 inch = 400 feet identifying mapping units, SPGM thickness (topsoil and subsoil), sampling locations, pertinent site features and boundaries must be provided.

The NRCS soil survey map of the site (scale 1:20,000) for the same legal description along with NRCS map unit and soil series descriptions should also be provided with the report.

As appropriate for the facility, it would be beneficial to scan both the Order 1 soil survey and the NRCS/SCS soil survey map into a Computer Aided Drafting (CAD) program for the facility to use. The NRCS map could be enlarged to the same scale, 1:4800.

9. A written report must be provided discussing quantity (in cubic yards) and quality of SPGM to be removed, map unit and soil series descriptions, along with recommendations for reclamation and any soil amendments as appropriate for a site that will be planted to native or approved adapted grasses.
10. Before any earthwork, excavation or construction, areas should be staked on at least a 200-foot grid showing soil stripping depths. During stripping, a soil monument should be left at every other stake to show inspectors and/or the soil classifier the undisturbed soil profile. This SPGM monument may be stripped and stockpiled upon approval.
11. The soil classifier should provide some training to staff/equipment operators to train them on what soil depths should be removed.
12. The landfill plans should identify where the SPGM will be stockpiled, how it will be maintained, and include a summary of removed/stockpiled amounts in its operating record. SPGM stockpiling and any other stockpiled material should be only placed in approved and surveyed areas. Soil stockpiles should be seeded to provide erosion and stormwater control.

The Department is aware that some permitted areas may have been previously disturbed. Areas outside of the disposal footprint must be surveyed by a registered professional soil classifier to determine whether SPGM remains so the SPGM and/or subsoil can be removed. Such areas should include under haul roads, areas of land application of petroleum-contaminated soils or in areas of soil stockpiles, composting activities, etc. Any borrow areas should also be surveyed.

The goal of the soil survey, SPGM removal, and stockpiling is to save as much of the material that will support adapted grasses for final cover as possible. The survey and analysis may also give important information on what amendments may be necessary to improve the soil. The soil chemistry may also provide information in determining what adapted grasses can be used for final site reclamation and for seeding disturbed areas during facility construction and operations.

IV. Soil Survey Work Plan and Approval

For efficiency and to avoid misunderstandings, the Department requests that a soil survey work plan be prepared and submitted for Departmental review and approval prior to any soil survey activities on any existing or proposed solid waste management facility. The work plan should be in accordance with these guidelines and be prepared by the Registered Professional Soil Classifier contracted to do a survey.

V. Management of SPGM

Section 33.1-20-04.1-09 NDAC states in part:

- “2. Construction and operation standards for solid waste management facilities regulated by this section:
 - f. All disposal facilities shall identify, quantify, remove, stockpile, and maintain suitable plant growth material for later use in closure.
 - k. All earthen material must be maintained onsite unless removal from the site is authorized by the department.”

SPGM (topsoil) and plant root zone material (subsoil or other approved material), when respread on closed areas, should be averaged based on the total volume of SPGM identified and salvaged. This thickness should be addressed in the plan to comply with Section 33.1-20-04.1-09 NDAC. If the amount of SPGM available exceeds the minimum 6 inches, it still must be respread on the closed facility as it is vital in reestablishing the protective vegetative cover and minimizing long term erosion and post-closure costs. The management of SPGM 12-inch root zone material and cover soil is addressed in the state rules (above) and should be reflected in the landfill plans approved as part of the permit. Soil stockpiling activities, including location, runoff control, erosion control, vegetation and conservation must be addressed as part of the landfill plans and operation.