

SECTION 7-21 BIORETENTION SOIL FOR TURF AND LANDSCAPE AREAS

7-21 BIORETENTION SOIL

7-21.1 DESCRIPTION

Section 7-21 describes work consisting of the installation of Bioretention Soil in turf and landscape areas intended to receive surface runoff for infiltration.

7-21.2 MATERIALS

Materials for Bioretention Soil will be specified in the Contract and consist of one or more of the following:

Landscape Bioretention Soil	9-14.1(3)B
Turf Bioretention Soil	9-14.1(3)C

7-21.3 CONSTRUCTION REQUIREMENTS

7-21.3(1) GENERAL

Bioretention soil shall be protected from all sources of additional moisture at the Supplier, in covered conveyance, and at the Project Site until incorporated into the Work. Soil placement and compaction will not be allowed when the ground is frozen or excessively wet, or when the weather is too wet as determined by the Engineer.

When the Contract specifies testing by a Contractor provided testing laboratory, the laboratory must be an STA, AASHTO or ASTM or other designated recognized standards organization accredited laboratory with certification maintained current. The laboratory must be capable of performing all tests to the designated recognized standards specified, and will provide test results with an accompanying Manufacturer's Certificate of Compliance.

7-21.3(1)A SUBMITTALS

At least 10 Working Days in advance of construction, the Contractor must submit to the Engineer for approval:

- 1) A 10-pound minimum sample of mineral aggregate (Sections 9-03.2(2) and 9-03.2(3), as applicable);
- 2) A 100 pound sample of mixed Bioretention Soil (Sections 9-14.1(3)B and 9-14.1(3)C, as applicable);
- 3) A 10 pound minimum sample of compost (Section 9-14.4(9));
- 4) Grain size analysis results of mineral aggregate performed in accordance with ASTM D 422, Standard Test Method for Particle Size Analysis of Soils;
- 5) Quality analysis results for compost performed in accordance with Seal of Testing Assurance (STA) standards, as specified in Section 9-14.4(9);

SECTION 7-21 BIORETENTION SOIL FOR TURF AND LANDSCAPE AREAS

- 6) Organic content test results of mixed Bioretention Soil. Organic content test shall be performed in accordance with Testing Methods for the Examination of Compost and Composting (TMECC) 05.07A, "Loss-On-Ignition Organic Matter Method".
- 7) Modified Proctor compaction testing of mixed Bioretention Soil, performed in accordance with ASTM D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort;
- 8) A description of the equipment and methods proposed to mix the mineral aggregate and compost to produce Bioretention Soil;
- 9) Permeability or hydraulic conductivity testing of the Bioretention Soil, performed in accordance with ASTM D 2434, Standard Test Method for Permeability of Granular Soils. For the Landscape Bioretention Soil assume a relative compaction of 85 percent of Modified maximum dry density (ASTM D 1557);
- 10) Provide the following information about the testing laboratory(ies):
 1. name of laboratory(ies) including contact person(s),
 2. address(es),
 3. phone contact(s),
 4. e-mail address(es);
 5. qualifications of laboratory and personnel including date of current certification by STA, ASTM, AASHTO, or approved equal.

7-21.3(2) BIORETENTION SOIL CONSTRUCTION

Contractor shall not start bioretention construction until the site draining to bioretention area has been stabilized and authorization is given by Engineer.

At the locations shown on the Drawings, excavate, grade, and shape to the contours indicated to accommodate placing of Bioretention Soil to the thicknesses required. Dispose of excavated soil or reuse elsewhere as the Contract or Engineer will allow. Scarify the subgrade soil a minimum of 2 inches deep where slopes allow, as determined by the Engineer prior to placing Bioretention Soil.

Mixing or placing Bioretention Soil will not be allowed if the area receiving bioretention soil is wet or saturated or has been subjected to more than ½-inch of precipitation within 48-hours prior to mixing or placement. Engineer shall have final authority to determine if wet or saturated conditions exist.

SECTION 7-21 BIORETENTION SOIL FOR TURF AND LANDSCAPE AREAS

Place Landscape Bioretention Soil loosely. Final grade shall be measured only after the soil has been water compacted, which requires filling the cell with water, without creating any scour or erosion, to at least 1 inches of ponding. If water compaction is not an option, final grade shall be measured at X inches above the grade specified on the plans to allow for settling after the first storm. X shall be calculated by depth of soil x 0.85 and rounded up to the nearest whole number.

Place Turf Bioretention Soil in loose lifts not exceeding 8 inches. Compact Turf Bioretention Soil to a relative compaction of 85 percent of Modified maximum dry density (ASTM D 1557), where slopes allow, as determined by the Engineer. Where Turf Bioretention Soil is placed in the 2-foot road shoulder, compact to a relative compaction of 90 percent of Modified maximum dry density (ASTM D 1557).

7-21.4 MEASUREMENT

Bid items of Work completed pursuant to the Contract will be measured as provided in Section 1-09.1, Measurement of Quantities, unless otherwise provided for by individual measurement paragraphs here in this Section.

Measurement for Bioretention Soil Construction will be by the cubic yard.

7-21.5 PAYMENT

Compensation for the cost necessary to complete the work described in Section 7-21 will be made at the Bid item prices Bid only for the Bid items listed or referenced as follows:

1. "Bioretention Soil Construction" per cubic yard.

The Bid item price for "Bioretention Soil Construction" shall include all costs for the work necessary to furnish, place, compact, excavate, grade, shape, mix, dispose of, and as necessary.

9-03.2 MINERAL AGGREGATES FOR BIORETENTION SOIL

9-03.2(1) GENERAL

Mineral aggregate shall be free of wood, waste, coating, or any other deleterious material. All aggregate passing the No. 200 sieve size shall be non-plastic.

9-03.2(2) MINERAL AGGREGATE FOR TURF AND LANDSCAPE BIORETENTION SOIL

Mineral aggregate for Turf and Landscape Bioretention Soils shall be analyzed by an accredited lab using #200, #100, #60, #40 and #20. #10, #4, 3/8 inch and 1 inch sieves, and meet the following gradation:

Sieve Size	Percent Passing
3/8"	100
No. 4	95 - 100
No.10	75 - 90
No. 40	25 - 40

SECTION 7-21 BIORETENTION SOIL FOR TURF AND LANDSCAPE AREAS

No. 100	4 - 10
No. 200	2 - 5

Efforts should be made to have the mineral aggregate for Turf and Landscape Bioretention Soils meet the following gradation coefficients: Coefficient of Uniformity ($C_u = D_{60}/D_{10}$) equal to or greater than 6; and Coefficient of Curve ($C_c = D_{30}^2/D_{60}D_{10}$) greater than or equal to 1 and less than or equal to 3.

9-14.1(3) BIORETENTION SOIL

9-14.1(3)A GENERAL

Bioretention Soil shall be a well blended mixture of mineral aggregate and compost measured on a volume basis.

9-14.1(3)B LANDSCAPE BIORETENTION SOIL

Landscape Bioretention Soil shall consist of 2 parts compost, 35 to 40 percent, by volume meeting the requirements of Section 9-14.4(9) and 3 parts mineral aggregate, 60 to 65 percent, by volume meeting the requirements of Section 9-03.2(3). The mixture shall be well blended to produce a homogeneous mix. Efforts should be made to attain organic matter content as close to 8 to 10 percent as possible, with the final mix to be determined by the engineer based on samples and test results submitted.

9-14.1(3)C TURF BIORETENTION SOIL

Turf Bioretention Soil shall consist of one part compost by volume, 30 to 35 percent, meeting the requirements of Section 9-14.4(9) and 2 parts mineral aggregate, 65 to 70 percent, by volume meeting the requirements of Section 9-03.2(3). The mixture shall be well blended to produce a homogeneous mix. Efforts should be made to attain organic matter content as close to 5 to 6 percent as possible, with the final mix to be determined by the engineer based on samples and test results submitted.

9-14.4(9) COMPOSTED MATERIAL

Compost products shall be the result of the biological degradation and transformation of Type I or III Feedstocks under controlled conditions designed to promote aerobic decomposition, per WAC 173-350-220, which is available at <http://www.ecy.wa.gov/programs/swfa/compost>. Compost shall be stable with regard to oxygen consumption and carbon dioxide generation. Compost shall be mature with regard to its suitability for serving as a soil amendment or an erosion control BMP as defined below. The compost shall have a moisture content that has no visible free water or dust produced when handling the material.

Compost production and quality shall comply with Chapter 173-350 WAC, and meet the following physical criteria:

SECTION 7-21 BIORETENTION SOIL FOR TURF AND LANDSCAPE AREAS

1. Compost material shall be tested in accordance with Testing Methods for the Examination of Compost and Composting (TMECC) Test Method 02.02-B, "Sample Sieving for Aggregate Size Classification".

Compost shall meet the following:

	<u>Min.</u>	<u>Max.</u>
Percent passing 1"	99%	100%
Percent passing 5/8"	90%	100%
Percent passing 1/4"	40%	90%

2. The pH shall be between 5.5 and 8.0 when tested in accordance with TMECC 04.11-A, "1:5 Slurry pH".
3. Manufactured inert material (plastic, concrete, ceramics, metal, etc.) shall be less than 1.0 percent by weight as determined by TMECC 03.08-A "percent dry weight basis".
4. Organic matter content should be between 45 and 65 percent dry weight basis as determined by TMECC 05.07A, "Loss-On-Ignition Organic Matter Method".
5. Soluble salt contents shall be less than 6.0 mmhos/cm tested in accordance with TMECC 04.10-A, "1:5 Slurry Method, Mass Basis".
6. Maturity shall be greater than 80% in accordance with TMECC 05.05-A, "Germination and Vigor".
7. Stability shall be 7 or below in accordance with TMECC 05.08-B, "Carbon Dioxide Evolution Rate"
8. The compost product must originate a minimum of 65 percent by volume from recycled plant waste as defined in WAC 173-350-100 as "Type 1 Feedstocks." A maximum of 35 percent by volume of other approved organic waste as defined in WAC 173-350-100 as "Type III", including post-consumer food waste, but not including biosolids, may be substituted for recycled plant waste. The supplier shall provide written verification of feedstock sources.
9. Carbon to nitrogen ratio shall be less than 25:1 as determined using TMECC 04.01 "Total Carbon" and TMECC 04.02D "Total Kjeldhal Nitrogen". The engineer may specify a C:N ratio up to 35:1 for projects where the plants selected are entirely Puget Sound native species.
10. The Engineer may also evaluate compost for maturity using the Solvita Compost Maturity Test at time of delivery. Compost shall score a number 6 or above on the Solvita Compost Maturity Test.

The compost supplier shall test all compost products within 90 calendar days prior to application. Samples will be taken using the Seal of Testing Assurance (STA) sample collection protocol. (The sample collection protocol can be obtained from the U.S. Composting Council, 4250 Veterans

SECTION 7-21 BIORETENTION SOIL FOR TURF AND LANDSCAPE AREAS

Memorial Highway, Suite 275, Holbrook, NY 11741 Phone: 631-737-4931, www.compostingcouncil.org). The sample shall be sent to an independent STA Program approved lab. The compost supplier shall pay for the test. A copy of the approved independent STA Program laboratory test report shall be submitted to the Contracting Agency prior to initial application of the compost. Seven days prior to application, the Contractor shall submit a sample of each type of compost to be used on the project to the Engineer.

Compost not conforming to the above requirements or taken from a source other than those tested and accepted shall be immediately removed from the project and replaced at no cost to the Contracting Agency.

The Contractor shall submit the following information to the Engineer for approval:

1. A copy of the Solid Waste Handling Permit issued to the supplier by the Jurisdictional Health Department as per WAC 173-350 (Minimum Functional Standards for Solid Waste Handling).
2. The supplier shall verify in writing, and provide lab analyses that the material complies with the processes, testing, and standards specified in WAC 173-350 and these specifications. An independent STA Program certified laboratory shall perform the analysis.
3. A list of the feedstock by percentage present in the final compost product.
4. A copy of the producer's STA certification as issued by the U.S. Composting Council.

Acceptance will be based upon a satisfactory Test Report from an independent STA program certified laboratory and the sample(s) submitted to the Engineer.