DIVISION II

CONSTRUCTION AND MATERIAL SPECIFICATIONS SEWERS

SECTION 2150 EROSION AND SEDIMENT CONTROL

APPROVED AND ADOPTED THIS 21TH DAY OF MAY 2008

KANSAS CITY METROPOLITAN CHAPTER
OF THE AMERICAN PUBLIC WORKS ASSOCIATION

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DIVISION II

CONSTRUCTION AND MATERIAL SPECIFICATIONS

SECTION 2150 EROSION AND SEDIMENT CONTROL

SECTION 2151 GENERAL REQUIREMENTS

2151.1 Summary

This section describes general requirements to prevent or minimize the pollution of rivers, streams, lakes, and wetlands caused by runoff from the construction zone. Such pollution includes sediment that may migrate offsite through the action of wind, water, or traffic, as well as chemical spills or other refuse from the site.

2151.2 Contractor's Responsibility

The Contractor shall take measures to prevent or minimize the transport of sediment or pollutants from the project limits or into bodies of water that are intended for protection, in accordance with the plans, the requirements of applicable permits and regulations, and best available management practices.

2151.3 Compliance with NPDES Permits

The Owner will obtain a National Pollutant Discharge Elimination System (NPDES) permit and other similar local water pollution control permits as required. Where such permits are required, the Owner will provide the Contractor with a Stormwater Pollution Prevention Plan (SWPPP) which has been prepared by the Engineer or other qualified professional. The Contractor shall comply with all requirements of such permits and the SWPPP, and shall enforce compliance with such requirements by all Subcontractors. The Contractor and all Subcontractors shall certify in writing on the form required by the permit that they understand and shall comply with such permits.

2151.4 Projects Not Requiring a Permit

If neither NPDES permit nor other local water pollution control permits are required for a project, the Engineer may waive certain documentation and record-keeping provisions of this specification. The Contractor is required to comply with all other provisions in this specification and is required to install such measures for erosion and pollution control as may be called for in the plan or ordered by the Engineer.

2151.5 Stormwater Pollution Prevention Plan

The Stormwater Pollution Prevention Plan (SWPPP) outlines methods and controls to be used to prevent stormwater pollution from the construction activities.

The SWPPP will generally consist of the following elements: (a) a site description; (b) a site map or plan sheets showing areas of soil disturbance, an outline of areas which will not be disturbed, and a drainage area map; (c) plan sheets, tables, or other schedules detailing the location of major structural and non-structural controls and areas where stabilization practices are expected to occur; (d) a description of erosion and sediment controls to be used; (e) a description of any permanent stormwater management features which are incorporated into the project; (f) a description of other controls related to waste disposal practices; (g) a description of the timing, during the construction, of when the measures will be implemented and removed; and (h) a description of maintenance procedures for control measures identified in the plan.

Where multiple agencies have jurisdiction over erosion and sediment control, the SWPPP will be prepared to satisfy the requirements of each. The use of the term “Stormwater Pollution Prevention Plan” or “SWPPP” is not intended to limit its content to the provisions of any single permit program or jurisdiction, and this specification shall have the same meaning regardless of whether the applicable plans are referred to as a “SWPPP,” “erosion control plan,” “erosion and sediment control plan,” “temporary water pollution control plan,” or other equivalent term.

All elements of the project bid documents relating to erosion and pollution control are considered part of the SWPPP, either by direct inclusion or by reference, including plan sheets, specifications, special provisions, quantity tabulations, bid sheets, and contract documents. A copy of all NPDES and other water pollution related permits and permit applications are also part of the SWPPP. This APWA specification is an integral part of the SWPPP.

2151.6 Contractor Amendments to the SWPPP

Prior to beginning work, the Contractor shall review the SWPPP in detail and provide the Engineer with written recommendations for amendments to improve the effectiveness of the SWPPP or to bring it into better alignment with the Contractor's intended method of operations. The Contractor shall also advise the Engineer of any omissions or deficiencies they find in the SWPPP. During the progress of the job, the Contractor shall continue to monitor the effectiveness and performance of the control measures used and propose additional amendments as needed. No amendment shall be incorporated unless approved by the Engineer, and a log of such amendments shall be made by the Contractor. When required by the permit or state law, such amendments shall be developed and prepared under the supervision of a qualified professional as defined in said permit or law. A copy of the SWPPP and all amendments shall be retained by the Contractor onsite and ready for inspection without notice.

2151.7 Contractor Schedule

In addition, the Contractor shall also provide the Engineer with a detailed schedule of their work prior to beginning, which shall include information on the expected timing, duration, and sequencing of erosion and sediment control measures and overall job completion and phasing. Once approved, such schedule shall become a part of the SWPPP, and changes to the schedule shall require amendment to the SWPPP.

2151.8 Alternate Methods or Materials

The Contractor may propose alternative methods or materials for any of the specific erosion and sediment controls given in the SWPPP, provided that such methods provide equal or improved measures of control, as determined by the Engineer. The Contractor shall also make submittal to the state or local regulatory agencies for approval of alternate methods, if required by said agencies. If agreed to by the Contractor and Engineer, such alternates may be paid for at the contract unit price and quantity of the items being replaced. If such modification is not acceptable to either Contractor or Engineer, then the alternate methods or materials shall be handled in accordance with the applicable provision of the Contract for changes in work or extra work.

2151.9 Superintendent Training Required

The Contractor’s resident superintendent shall have no less than 8 hours of formal training on erosion and sediment control within the last 24 months. Such training shall include the principles of erosion and sediment control, technical information on typical and/or innovative controls, and the contents of these specifications and related Standard Drawings and Design Criteria. The training shall be taught primarily by a registered professional engineer or other professional who is considered by the applicable regulatory agencies to be qualified to prepare a SWPPP. Documentation of training shall be submitted to the Engineer upon request, prior to beginning work.

2151.10 Duration of Contractor's Responsibility

The Contractor is responsible for water pollution control and permit compliance from the issuance of Notice to Proceed until final completion of the work and during any subsequent maintenance bond period. The Contractor will be released from responsibility for erosion and sediment control for any portion of the job for which a Notice of Termination or similar release has been submitted and accepted by the state or local permit authority, provided that the Contractor does not subsequently do work in such areas that create new disturbances. The notice of termination will not be submitted by the Owner until all permit requirements are met, which includes the requirement that final stabilization be achieved on 100% of the site. Vegetation shall achieve a density of at least 70% of full turf to be considered acceptable as final stabilization.

2151.11 Installation of Controls

The Contractor shall obey all requirements for chemical and waste controls specified in Section 2152. Contractor shall provide all specific erosion and sediment controls required by the SWPPP in accordance with the requirements of Section 2153 and 2154. If the SWPPP calls out items or controls not included in this specification, refer to the project special provisions and plans for requirements. Controls shall be installed prior to or during the construction phase during which they are needed and not handled as solely a restoration or post-construction item.

2151.12 Maintenance

The Contractor shall maintain the integrity of the temporary erosion and sediment control devices as long as they are in place and necessary. Devices not functioning properly shall be corrected or replaced. Accumulated sediments shall be removed promptly as detailed in Section 2154.

2151.13 Removal

Control measures shall be completely removed from the site when they are no longer needed, unless they are approved by the Engineer to remain in place for permanent stabilization or biodegradation (i.e. erosion control blankets).

2151.14 Inspections

The Contractor shall inspect the construction site within twenty-four hours of the end of a storm which results in precipitation of 0.5 inches or greater. In addition, regular inspections shall be made weekly during active phases of construction. During inactive phases (such as winter when construction activity has temporarily ceased), an inspection of the site condition shall be made no less than once per month. All installed practices shall be checked for proper installation, operation, and maintenance. Locations where stormwater runoff leaves the site shall be inspected for evidence of erosion or sediment deposition. Deficiencies shall be noted in a report of the inspection and corrected within seven calendar days of the inspection.

A report of each inspection is to be made and shall contain the following minimum information: inspector's name, date of inspection, observations relative to the effectiveness of the practices, actions taken or necessary to correct deficiencies, and listing of areas where construction operations have permanently or temporarily stopped. The inspection report shall be signed by the Superintendent or their designee. Site inspection reports shall be maintained onsite with the SWPPP or the SWPPP shall contain written documentation of the off-site records storage location.

2151.15 Records

The Contractor shall maintain all permit required records during the job and shall transmit all necessary records to the Engineer at the completion of the work, including all Contractor and Subcontractor certifications and site inspection records, as well as other records requested by the Engineer.

2151.16 Site Access for Inspections

The Contractor shall allow authorized representatives of federal, state, or local agencies having jurisdiction of this permit, upon presentation of proper credentials, to enter the site where construction activities are located, to obtain samples of any discharge water, to have access to and copy at reasonable times, any records which shall be kept, and to inspect any facilities or equipment.

2151.17 Maximum Areas of Disturbance at One Time

The surface area of erodible earth material exposed by site operations shall be limited by the Engineer according to the Contractor's capability and progress in keeping with the approved schedule. Existing vegetation shall be preserved or retained as long as practical and the time period for soil areas to be without permanent surface or vegetative cover shall be minimized. The maximum surface area of erodible earth exposed at one time shall not exceed ten (10) acres unless approved in writing by the Engineer or otherwise provided for in the plans. The Contractor shall pay close attention to the grading and disturbance limits indicated on the plan or authorized by the Engineer.

2151.18 Measures Where Construction has Ceased

Soil stabilizing erosion control measures as detailed in Sections 2153 shall be implemented within 14 calendar days after construction activities have temporarily or permanently ceased on any portion of the site. Exceptions to this requirement are as follows: (a) if implementation of erosion controls is precluded by snow cover, such measures shall be taken as soon as practical after snowmelt, or (b) a waiver to this requirement is justified and approved by the Engineer in writing, in which case a specific deadline for installing erosion controls shall be established.

2151.19 Duration Limits for Select Activities

For certain items of work, the plans or standard sequences may contain specific time limits for the maximum duration of exposure, typically stated as "Item A construction shall have a maximum exposure time of X days." Where such limits are specified, the time shall be measured from the date in which stabilized ground cover is first disturbed in the work area until the specified construction is complete and permanent or temporary stabilization shown on the Plans is applied. Contractor shall be responsible for documenting the elapsed time on all such work, typically by noting the time in their inspection logs, taking time-stamped photographs, and/or by marking the area with a wooden stake documenting beginning and ending dates. The Engineer may grant extensions of time requested by the Contractor when justified and suitable interim stabilization measures are provided.

2151.20 Construction near Rivers, Streams, and Water Bodies

Construction operations in or near rivers, streams, and other water impoundments shall be restricted to those areas essential for construction. Unless otherwise provided for in the plans, a minimum 50 feet buffer of undisturbed vegetation shall be maintained between construction operations and defined drainage courses. Where such buffers are not provided, work shall not be initiated until all materials and equipment necessary to complete the work are on site and such operations shall be completed as quickly as possible once the work has begun. When no longer required, all falsework, pilings, temporary crossings, and other obstructions shall be promptly removed. Contractor shall not ford live streams with equipment, but shall use temporary stream crossing as detailed in the plans.

2151.21 Culverts, Ditches and Storm Sewers

Construction of major elements of the proposed storm sewer or other drainage systems shall be coordinated to minimize the duration of time over which stormwater would run through temporary, erodible channels. Unless otherwise indicated on the plans, construction of the major elements of this system shall be among the first activities on the project. Once begun, construction shall proceed expeditiously to completion, including placement of all final headwalls, end structures, rip-rap and other end treatments. Temporary or permanent ditches which are graded on the project shall either be stabilized or have temporary sediment controls installed within seven (7) days of their grading.

2151.22 Methods of Measurement

No separate measurements will be made for the general requirements covered by this Section.

2151.23 Basis of Payment

Compliance with the general requirements of this section will not be paid separately, but shall be subsidiary to other items listed in the contract.

SECTION 2152 CHEMICAL AND WASTE CONTROLS

2152.1 Summary

This section describes specific requirements to control non-sediment related pollutant discharges from chemicals and wastes from the site, including requirements for chemical handling, spill prevention, spill response, and waste disposal.

2152.2 Solid, Liquid, and Hazardous Wastes

All trash shall be placed in dumpsters or trash barrels provided by the Contractor and accumulated trash shall be hauled offsite and properly disposed. Floating debris found in any waterbody on or immediately adjacent to construction shall be removed immediately, regardless of source. Hazardous wastes shall be stored, transported offsite, and disposed of properly.

2152.3 Sanitary Wastes

Sanitary facilities shall be made available and their use enforced by the Contractor.

2152.4 Leak Prevention

All equipment used onsite shall be free of leaks, receive regular preventative maintenance, and be inspected daily to reduce chance of leakage. No fueling, servicing, maintenance, or repair of equipment shall be done within 50 feet of a stream, drainageway, lake, storm sewer manhole or other water body. Onsite fuel tanks shall be in good condition, free of leaks or drips, painted brightly for visibility, and monitored daily. All fuel tanks, including mobile trailers, shall be protected by a secondary containment system or earthen berm sized to contain 110% of the full tank volume.

2152.5 Concrete Washout

Concrete wash or rinse water from concrete mixing equipment, tools and/or ready-mix trucks, tools, etc, shall not be discharged into or be allowed to run directly into any existing water body or storm inlet. One or more locations for concrete wash out shall be designated on site, such that discharges during concrete washout shall be contained in a small area where waste concrete can solidify.

2152.6 Chemical Handling and Storage

Chemicals or materials capable of causing pollution shall only be stored onsite in their original container. Materials stored outside shall be in closed and sealed water-proof containers and located outside of drainageways or areas subject to flooding. Manufacturer's data regarding proper use and storage, potential impacts to the environment if released, spill response, and federally-defined reportable quantities for spill reporting shall be maintained by the field superintendent onsite at all times. Locks and other means to prevent or reduce vandalism shall be used.

2152.7 Herbicides, Pesticides and Fertilizers

Herbicides, pesticides and fertilizers used as part of the work shall be applied only in accordance with manufacturer recommendations. Direct spray into water bodies is prohibited. Such chemicals shall not be used if rain is forecast within 24 hours, unless they are approved for wet weather application.

2152.8 Spill Clean-up and Management

If it is safe to do so, Contractor shall stop the source of any spills or leaks and shall contain spills immediately with an appropriate device, earthen berm, sawdust, sand, kitty litter, rags or other absorbents. Manufacturer recommendations shall be followed. Leaks from broken hoses shall be immediately contained with hose clamps, plugs, or drained into leak-proof containers. Contractor shall have the tools, equipment, and supplies necessary for spill response onsite at all times and ready for immediate use. Contractor personnel shall be trained to properly respond immediately to a leak or spill. All spills shall be cleaned up and disposed of in accordance with applicable federal, state, and local regulations. Local hazardous materials response units shall be called if assistance is needed in stopping or containing the spill.

2152.9 Spill Reporting

All spills in excess of reportable quantities shall be reported to the appropriate federal, state, and local agencies within 24 hours of their occurrence. The Contractor shall maintain a listing of all such agencies onsite within the SWPPP and in easy reference for onsite personnel. Spills that pose an immediate threat to public safety or contamination of a water body shall be reported immediately to designated first response authorities.

2152.10 Methods of Measurement

No separate measurements will be made for the requirements covered by this Section.

2152.11 Basis of Payment

Compliance with the requirements of this section will not be paid separately, but shall be subsidiary to other items listed in the contract.

SECTION 2153 EROSION CONTROLS

2153.1 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used.

AASHTO:

MP 9 - Compost for Erosion/Sediment Control (Filter Berms)

MP 10 - Compost for Erosion/Sediment Control (Compost Blankets)

APWA, Kansas City Metropolitan Chapter:

Standard Drawings, Division III of Standard Specifications and Design Criteria

Erosion Control Technology Council (ECTC):

Standard Specification for Rolled Erosion Control Products (RECPs). Available in writing from ECTC, PO Box 18012, St. Paul, MN 55118 or by download from:

http://www.ectc.org/specifications.asp

Texas Department of Transportation (TxDOT):

Approved Products List (APL) for Erosion Control. Based on testing and standards cited in the report "TXDOT / TTI Hydraulics, Sedimentation and Erosion Control Laboratory: Field Performance Testing of Selected Erosion Control Products". List available by writing the Texas Department of Transportation, Maintenance Division, Vegetation Management Section, 125 East 11th Street, Austin TX 78701-2483 or by download from:

http://www.dot.state.tx.us/services/maintenance/erosion_control.htm

US Composting Council (USCC):

TMECC - Test Methods for the Examination of Composting and Compost, published jointly with US Department of Agriculture. Available from US Composting Council, 4250 Veterans Memorial Highway, Suite 275, Holbrook, NY 11741 or online at www.compostingcouncil.org. Also available for download from: http://www.tmecc.org/tmecc

STA - Seal of Testing Assurance Program. Information available from USCC at the address and website above.

2153.2 Summary

This section describes specific requirements for installation and maintenance of temporary measures to stabilize onsite soils and prevent erosion during construction.

2153.3 Materials

Materials used for erosion controls shall meet the requirements of the following subsections. Unless otherwise specified herein, the Contractor shall submit, for each material used, a certification prepared by the manufacturer which states that the materials meets all the requirements of this specification. The manufacturer shall also provide

supporting documentation and testing results to validate this certification, if requested by the Engineer. Manufacturer's instructions for installation of materials (when applicable) shall be available onsite whenever work is occurring and a copy shall be submitted to the Engineer upon request.

2153.4 Permanent Seeding and Sodding

Final stabilization with vegetation by either permanent seeding or sodding is the most effective form of erosion control and shall be achieved as early in the construction process as possible.

A. Materials, Construction Requirements and Maintenance: Permanent seeding or sodding shall be provided as specified in Section 2400 of these Standard Specifications. Contractor shall schedule work so that permanent seeding is conducted as early as practical in the construction process. Multiple mobilizations of seeding or sodding operations shall be expected.

B. Out-of-Season Special Provision: The Engineer may request that permanent seeding be conducted anytime between April 16 and August 14 and/or that sodding be conducted anytime between June 1 and September 1, even though such dates are outside the standard seasons established in Section 2400. If agreed to by the Contractor, then the Contractor shall conduct such seeding or sodding and shall be responsible for the establishment of a vigorous and healthy seed or sod cover. The Contractor will be paid, however, for all watering necessary during the period that falls outside the standard season.

C. Measurement and Payment: Shall be as specified in Section 2400. If out-of-season seeding or sodding has been authorized, then "Out of Season Watering" will be measured by the 1,000 gallon unit applied and paid for at the contract unit price.

2153.5 Temporary Seeding

Interim stabilization with annual vegetation to provide temporary cover to minimize erosion. This item only covers seeding installed by conventional drilling.

A. Materials: Seed and equipment used for temporary seeding shall meet all the criteria given for permanent seeding in Section 2400 of these Standard Specifications. Fertilizer is not required.

Mulch used for temporary seeding shall meet the same requirements as "mulch cover" in subsection 2153.6. Mulch is required unless erosion control blankets are being used instead.

The following seed mixtures and planting rates shall be used:

1. Type "TR" Seed: This mixture will normally be used when temporary seeding is conducted between February 15 and May 31, or between September 1 and October 31. The seed mixture will be as follows:

Kind of Seed	Minimum Pure Live Seed (%)	Rate of Pure Live Seed (Lbs per Acre)
Annual Rye Grass	83	90

2. Type "TM" Seed: This mixture will normally be used when temporary seeding requires heat tolerance, typically for planting anytime between May 1 and August 15. (Volunteer millet is aesthetically objectionable in turf grass lawns; therefore some jurisdictions may restrict use of this mix. Confirm local requirements before use.) The seed mixture will be as follows:

Kind of Seed	Minimum Pure Live Seed (%)	Rate of Pure Live Seed (Lbs per Acre)
Millet	77	65

3. Type "TW" Seed: This mixture will normally be used when temporary seeding requires cold tolerance, typically for planting anytime between September 15 and November 30. The seed mixture will be as follows:

Kind of Seed	Minimum Pure Live Seed (%)	Rate of Pure Live Seed (Lbs per Acre)
Winter Wheat	83	120

B. Construction Requirements: Preparation, planting and all other construction requirements for temporary seeding shall be as specified for permanent seeding in Section 2400, except as modified herein. Temporary seeding shall be drilled (see 2153.7 for hydraulic application of temporary seed). Prior to application, the soil shall be tilled to a depth of at least 2 inches and gullies, depressions, and large clods eliminated. Roller compaction of the seedbed is not required. Within 24 hours of seeding, mulch or erosion control blankets shall be applied. When mulch is used, it shall be applied in accordance with the same requirements given for "Mulch Cover" in subsection 2153.6. When erosion control blankets are used, they shall be installed in accordance with the requirements in subsection 2153.9. The Contractor shall initially water all areas of temporary seeding at least one-quarter inch as soon as the mulch is laid. Additional watering may be necessary for plant germination and adequate growth to provide cover. Contractor shall schedule work so as to provide temporary seeding as early as practical in the construction process. Contractor shall maintain a readiness to perform temporary seeding frequently during the progress of the project. No more than 7 calendar days shall elapse between the Engineer's request for temporary seeding and its application. Multiple mobilizations to seed areas as construction progresses shall be expected.

C. Maintenance: Mulch shall be replaced or repaired as needed during germination and early growth. Bare spots shall be patched, by hand seeding if necessary. Vehicle and personnel traffic shall be minimized in areas seeded.

D. Measurement and Payment: "Temporary Seeding" will be measured per acre or hundredth part thereof and paid for at the contract unit price. No differentiation shall be made for type of temporary seed used. Mulch and watering shall not be measured or paid for separately on any temporary seeding, but all such costs shall be subsidiary to the item. Erosion control blankets, when used, will be measured and paid separately as "Erosion Control Blanket."

2153.6 Mulch Cover

Mulch applied without seeding to protect the soil surface from raindrop impact and reduce wind erosion and dust. Mulch Cover (without seed) is generally used when ground cover is required and temporary or permanent seeding is not feasible.

A. Materials: Mulch shall be vegetative type only, consisting of cereal straw from stalks of oats, rye, wheat or barley and shall be free of prohibited and noxious weed seeds.

B. Construction: Prior to applying mulch, the soil shall be tilled to a depth of 2 inches to eliminate hard crust and allow rainwater intercepted by mulch to infiltrate the soil. Gullies, depressions, and large clods shall be eliminated.

Mulch shall be applied at the rate of 1.5 tons/acre (3,000 lbs/acre) and be anchored into the soil a minimum depth of 3 inches by use of a heavy disc harrow, set nearly straight, or a similar approved tool. Discs of the anchoring tool shall be set approximately 9 inches apart. Anchoring shall be accomplished by not more than two passes of the tool. If approved by the Engineer, a tackifier may be applied to the mulch to anchor it instead of using the disc harrow.

C. Maintenance: Mulch cover shall be replaced or repaired as needed. Bare spots shall be filled in, by hand if necessary. Vehicle and personnel traffic shall be minimized in areas mulched.

D. Measurement and Payment: Mulch Cover" will be measured per acre or hundredth part thereof and paid for at the contract unit price. Mulch is not measured and paid separately when laid down in conjunction with seeding operations.

2153.7 Hydrocover (Standard)

Hydraulic application of a standardized mixture of fiber mulch, tackifier, and temporary seed to provide temporary cover.

A. Materials

1. Cellulose Fiber Mulch: Shall be on the TxDOT Approved Products List for Erosion Control. All fibers used shall correspond to the prequalified list for "tight clay" soils. Dry weight shall be based on "air-dry weight" that does not contain more than 10% moisture. The manufacturer's packaging shall indicate air-dry weight for each package of mulch. The fibers shall be colored green with a non-toxic dye.

2. Tackifier: Shall be food-grade hydrolyzed guar gum powder. It shall be mixed with the cellulose fibers based on the manufacturer's recommendations, but in no case at a proportion less than 3% of the dry weight of the cellulose fiber mulch.

3. Water: Shall be clean, potable water mixed at a rate suitable for the equipment being used, typically 100 gallons per every 30 to 50 pounds dry weight of cellulose fiber.

4. Seed: Shall be Type TR, TM or TW seed as specified in Section 2153.5 and appropriate for the season. Seed shall be mixed to provide no less than the seeding rate per acre given in that section.

5. Fertilizer: Not required.

B. Construction Requirements: The cellulose fiber mulch shall be added to the hydraulic seeder after proportionate amounts of seed, tackifier, and water have been mixed. These ingredients shall be mixed to form a slurry and applied at the rate indicated above. It shall be applied to make a uniform coverage of the soil surface. Prior to application, the soil shall be tilled to a depth of at least 2 inches and smoothed to eliminate gullies, depressions, or large clods.

Hydrocover shall be applied at a rate of 2,000 pounds dry weight of cellulose fiber per acre (0.41 pounds per square yard), unless otherwise specified by the Engineer. Once applied, the area shall be allowed to dry and vehicle and personnel traffic shall be kept off the stabilized area. Water shall be applied as needed for seed germination and plant growth. The hydrocover operation shall be accomplished with hydraulic sprayers suitable for spreading and projecting the mixture. Sprayers shall be mechanically mixed or jet agitated.

Contractor shall maintain a readiness to provide hydrocover frequently during the progress of the project. No more than 7 calendar days may elapse between the Engineer's request for hydrocover and its application. Multiple mobilizations of hydrocover operations shall be expected.

C. Maintenance: Areas which are disturbed by construction shall be patched with additional application of slurry at the next available mobilization of equipment at no additional cost. Small areas of poor coverage may be stabilized through erosion control blankets, mulch for cover, straw wattle protection or other measures, at no additional cost.

D. Measurement and Payment: "Hydrocover (Standard)" will be measured by the dry-weight in pounds of cellulose fiber used in the mixture and paid for at the contract unit price. No payment will be made for that portion of an application which exceeds 5% of the application rate required in this section or the plans unless otherwise approved by the Engineer. All other ingredients in the hydrocover mixture shall be subsidiary to the cellulose fiber. The minimum payment for a single mobilization of hydrocover operations will be 50 pounds.

2153.8 Hydrocover (Specialty Mix)

Hydraulic application of specialized mixtures of fiber mulch, tackifiers, seed and other additives to provide temporary cover.

A. Materials: When specialty mixtures are used, the particular mix design and ingredient requirements shall be given in the plans or special provisions. Such specialty mixtures may include additives for improved seed germination, mixtures of special polymer tackifiers and heavier rates of cellulose fiber or other cross-linking organic fibers to produced a more continuous cover (i.e. "Bonded Fiber Matrix"), or mixtures that contain polyacrylamides that chemically stabilize the underlying soils (i.e. "Stabilized Fiber Matrix"). Seed and additives shall conform to the requirements of standard hydrocover, except as modified in the plans, special provisions or by the manufacturer's recommendations for the specialty mix.

B. Construction and Maintenance Requirements: All construction and maintenance requirements shall be the same as for standard hydrocover, except as modified by the plans or the manufacturer's recommendation for the specialty mix. Equipment for specialty mixes shall conform to manufacturer's recommendations.

C. Measurement and Payment: "Hydrocover (Named Specialty Mix)" will be measured by the dry-weight in pounds of cellulose fiber used in the mixture and paid for at the contract unit price, where the name of the specific mixture shall be as given in the plans and bid. All other provisions of the measurement and payment shall be the same as for standard hydrocover.

2153.9 Erosion Control Blankets (including Turf Reinforcing Mats)

Blankets or mats of natural, synthetic, or composite materials that can be rolled onto bare earth and anchored in place to provide temporary or permanent cover and/or to stabilize bare earth or channels subject to overland or concentrated surface flow. This item of work includes the use of Turf Reinforcing Mats.

A. Materials: Erosion control blankets of the class and type specified in the contract shall be on the TxDOT Approved Products List for Erosion Control. Blankets are categorized by expected use and application, as follows:

Class 1: For use as Cover and Slope Protection from overland flow:

Type A: On slopes 1:3 or flatter with clay soils.

Type B: On slopes 1:3 or flatter with sandy soils.

Type C: On slopes steeper than 1:3 with clay soils.

Type D: On slopes steeper than 1:3 with sandy soils.

Class 2: For use as Flexible Channel Liner under concentrated flow:

Type E. For shear stresses below 2 lb/sq. ft.

Type F. For shear stresses below 4 lb/sq. ft.

Type G. For shear stresses below 6 lbs/sq. ft.

Type H. For shear stresses below 8 lb/ sq. ft.

Type I. For shear stresses below 10 lb/ sq. ft.

Materials supplied for Type G, H and I blankets shall also meet all the requirements of the ECTC Standard Specification for Permanent Rolled Erosion Control Products (RECPs), Turf Reinforcing Mats (TRM), as follows: Type G shall conform to ECTC TRM (5.A); Type H shall conform to ECTC TRM (5.B); and Type I shall conform to ECTC TRM (5.C). Materials supplied for Type A, B, C, D, E and F blankets shall have a

minimum expected longevity of 12 months, unless otherwise stated on the plans or approved by the Engineer. Expected longevity shall be evaluated based on the manufacturer's recommendations.

B. Construction Requirements: The Contractor shall install erosion control blankets in the locations shown in the plans or as directed by the Engineer. Soil or seedbed preparation shall be complete prior to the placement of blankets. Blankets shall be installed in a directional manner, anchored, lapped, and stapled as recommended by the manufacturer.

C. Maintenance: Areas of torn or degraded blanket shall be repaired or replaced, unless such degradation is within the accepted tolerances for temporary blankets. Edges or seams which are loose or frayed shall be secured with additional staples. Bare patches of vegetation shall be reseeded.

D. Measurement and Payment: "Erosion Control Blanket (Named Type)" will be measured per square yard of sloped surface area covered by the completed mat and paid for at the contract unit price for the given type. Excess blanket used for overlap at seams, anchoring, waste, repairs, etc. will not be included in the measurement. When blankets are used in conjunction with permanent or temporary seeding, erosion control blanket will paid for at the contract unit price and the seeding operation shall be paid separately. The unit price for erosion control blanket will include any deductions for standard mulching that is no longer required.

2153.10 Compost Cover

Organic compost applied with or without seeding to protect the soil surface from raindrop impact, to absorb stormwater, to facilitate vegetation growth and to reduce wind erosion and dust.

A. Materials: (Note: The material requirements in this subsection also apply for compost filter berms and compost filter socks, described more fully in Section 2154.12 and 2154.13.)

All compost shall be mature, sanitized, well-composted organic matter free of identifiable feedstock constituents and offensive odors. Compost used for cover shall meet AASHTO MP-10. Compost used for berms or socks shall comply with AASHTO MP-9. Compost shall have been produced by the aerobic decomposition of organic material. Organic material sources may include leaves and yard trimmings, paper fiber, wood, bark, biosolids, food scraps, composted manures, or combinations of these products. Biosolids compost shall comply with the Standards for Class A biosolids outlined in 40 Code of Federal Regulations (CFR) Part 503. The compost shall be free of any refuse, contaminants, and any material toxic to plant growth. Compost must not be derived from mixed municipal solid waste. Compost shall comply with all applicable state and federal regulations regarding production and distribution.

All compost material supplied shall be certified through the USCC STA Program. All lab analysis to follow testing procedures of the USCC TMECC manual. Before delivering of the compost, the suppler shall provide a copy of the lab analysis, performed by a STA Program certified lab. The supplier shall also document the feedstocks and sources used in the compost to be supplied. Compost shall meet the following criteria:

Test Parameter	Units	Criteria	TMECC Testing Method
pH	pH	5.0 - 8.0	04.11-A
Soluble salt (electrical conductivity)	dS/m (mmhos/cm)	<5 if vegetated, otherwise n/a	04.10-A
Moisture content	%, wet weight basis	30-60	03.09-A
Organic matter content	%, dry weight basis	25-65	05.07-A

Test Parameter	Units	Criteria	TMECC Testing Method
Stability (Carbon dioxide evolution rate)	mg CO_2-C per gram of organic matter per day	<8	05.08-B
Physical contaminants (manmade inerts)	%, dry weight basis	<1	04.11-A
Particle size	% passing sieve, dry weight basis	See below	02.12-B

Compost gradation shall be as follows:

	Particle Size, % Passing Sieve (by dry weight)		
Sieve Size	Compost for Cover	Compost for Berms *	Compost for Socks *
3 inch (75 mm)	100	100	
2 inch (50 mm)	--		99
1 inch (25 mm)	90-100	90-100	
3/4 inch (19 mm)	65-100	70-100	
3/8 inch (10 mm)			30-50
1/4 inch (6.4 mm)	0-75	30-60	
Max. Particle Length	6 inch	6 inch	2 inch

** See section 2154.12 and 2154.13 for further information on compost filter berms and socks.*

B. Construction: Prior to applying compost, the soil shall be tilled to a depth of 2 inches to eliminate hard crust and allow rainwater intercepted by the compost cover to infiltrate into the soil. Gullies, depressions, and large clods shall be eliminated.

Compost shall be applied to a depth of 1.5 to 2 inches when alone or 1 to 1.5 inches when used in conjunction with seeding operations. Compost shall be uniformly applied using an approved spreader unit, which may include mechanical or pneumatic (blower) devices. Compost shall extend at least 3 feet beyond the shoulder of any slope to ensure that runoff does not flow under the cover. Once applied, the compost shall be thoroughly watered to improve settling.

C. Maintenance: Compost shall be replaced or repaired as needed. Bare spots shall be filled in, by hand if necessary. Vehicle and personnel traffic shall be minimized in areas covered.

D. Measurement and Payment: "Compost Cover" will be measured per cubic yard of compost in the vehicle at the point of delivery to the project. When compost cover is used in conjunction with permanent or temporary seeding, compost cover will be paid at the contract unit price and the seeding operation shall be paid separately. The unit price for compost cover will include any deductions for standard mulching that is no longer required.

2153.11 Surface Roughening

Any rough graded slope that is not yet ready for seeding or other treatment and which will not be disturbed by ongoing construction for a period of 7 days or more shall be roughened by grooving, tracking, disking, or ripping it with a disc, tiller, spring harrow or other suitable implement. Such grooves shall be located traverse to the slope face

and shall not be less than 3 inches deep nor spaced more than 15 inches apart. The requirement to roughen slopes by tracking or grooving shall apply to all slopes steeper than 6:1 horizontal to vertical. No measurement or payment shall be made for this item, but it shall be subsidiary to the earthwork.

2153.12 Dust Control

Contractor shall take effective measures to prevent blowing dust. Adequate moisture content shall be maintained in all exposed soils by application of water or other approved dust suppressant. Areas to be subsequently paved may be treated with asphalt emulsion. When dust produced by operations such as sand blasting, concrete grinding, and sawing of concrete or masonry would create a public nuisance, they shall be performed under a water spray or an alternate construction method shall be used. No measurement or payment shall be made for this item, but it shall be subsidiary to other work.

2153.13 Method of Measurement

Erosion controls will be measured in the manner specified in each applicable subsection.

2153.14 Basis of Payment

Erosion controls will be paid for at the contract unit price specified in each applicable subsection.

SECTION 2154 SEDIMENT CONTROLS AND DIVERSIONS

2154.1 Referenced Standards

The following standards are referenced directly in this section. The latest version of these standards shall be used.

AASHTO:

M 288 - Geotextile Specification for Highway Applications

MP 9 - Compost for Erosion/Sediment Control (Filter Berms)

APWA, Kansas City Metropolitan Chapter:

Standard Drawings, Division III of Standard Specifications and Design Criteria

ASTM:

D 3786 - Test Method for Hydraulic Bursting Strength of Textile Fabrics – Diaphragm Bursting Strength Tester Method

D 4355 - Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus

2154.2 Summary

This section describes specific requirements for installation and maintenance of temporary measures to detain, filter, or cause settlement of sediment from runoff, as well as measures used to temporarily direct or divert runoff onsite or at the site perimeter.

2154.3 Materials

Materials used for sediment controls and diversions shall meet the requirements of the following subsections. Unless otherwise specified herein, the Contractor shall submit a certification prepared by the manufacturer for each material used which states that the materials meets all the requirements of this specification. The manufacturer shall also provide supporting documentation and testing results to validate this certification, if requested by the Engineer. Manufacturer's instructions for installation of materials (when applicable) will be available onsite whenever work is occurring and a copy shall be submitted to the Engineer upon request.

2154.4 Sediment Removal and Disposal

Removal of accumulated, settled sediment from behind barriers, traps, or within basins.

A. Materials: Not applicable.

B. Construction Requirements: Accumulated sediment shall be removed when it exceeds the volumes specified for any particular measure or when ordered by the Engineer. Sediments removed shall be mixed with other onsite materials and incorporated into project fills, spread loosely across the site, or hauled offsite as necessary. Sediments shall not form an identifiable layer or seam in any fill. Sediments hauled offsite shall be dewatered first or hauled in a water tight truck. Sediments shall be located and compacted in a way which minimizes the likelihood of being re-suspended in future rainfalls. Removal shall be by machine or hand work, whichever is most feasible.

C. Maintenance: Not applicable.

D. Measurement and Payment: "Sediment Removal" will be measured per cubic yard and paid for at the contract unit price for each. When removals are made necessary due to Contractor's failure to maintain other erosion or sediment controls, including failure to properly maintain or repair damaged measures upstream or failure to install controls in a timely manner, then such sediment removal will not be measured and paid separately but shall be at the Contractor's expense.

2154.5 Silt Fence

A temporary barrier of synthetic fabric embedded in the ground and supported by posts and in some cases wire fencing, used to divert water or to maintain a trap for settlement.

A. Materials

1. Geotextile Fabric: Shall meet the requirements of AASHTO M 288, which include requirements for elongation, grab strength, permittivity, apparent opening size, and ultraviolet stability. Regardless of the actual support conditions or post spacing to be used in the field, the geotextile supplied shall meet the quality requirements given in AASHTO M 288 for "unsupported temporary silt fence, 4 foot maximum post spacing."

2. Posts: Posts shall be hardwood with a 2" by 2" nominal dimension or shall be steel posts of U, T. L, or C shape, weighing 1.33 lbs per foot minimum. Only steel posts shall be used on wire-supported fence.

3. Wire Support: When used, shall be woven-wire fencing with a minimum wire gage between 9 and 14 and a maximum mesh spacing of 6 inches in all directions.

B. Construction Requirements: Install fence as shown on the Standard Drawing. Installation shall be made by a specialized machine capable of inserting the fence securely into the ground with a slicing method and firmly compacting the slice closed. Trenching will only be allowed for small or difficult areas where the slicing-machine can not reasonably be used (i.e.: the site conditions will not allow the slicing-machine to maneuver across the jobsite, the site contains large roots, or the site is too rocky for proper installation of silt fence). Silt fence shall be firmly embedded and anchored to the ground such that runoff cannot undermine the fence. Fence material shall be free of rips and tears and shall stand securely upright. Joints in silt fence shall overlap to prevent leakage. Existing trees shall not be used as stakes, and trenches for silt fence shall avoid damaging the root zone of trees to be saved. Provide wire support for fence when specified on the plans or by the Engineer. Wire support is generally used when controlling large areas or to discourage accidental damage by vehicles. Wire-supported fence may be installed with trenching methods.

Silt fence shall be located generally as shown in the plans, but adjusted to conform to the contour based on silt fence usage, as follows:

1. When used to capture overland flow, install along the contour to provide maximum storage volume without overtopping, with ends turning to run up-slope such that the bottom of the fence at each end is

higher than the top of the fence in the middle as it runs along the contours. Additional volume may be created by excavating depressions on the upstream side of the fence. The installation shall create a broad, shallow pool of retained runoff.

2. When used for swales, drainageways or concentrated flows, extend the ends up the side slope of the ditch sufficiently to prevent bypassing of flow around the end posts.
3. When used to divert and direct water, install to create a smoothly descending flow line.
4. When used at the toe of an embankment, offset silt fence by several feet to provide silt storage capacity.
5. When used as perimeter control of a site or stockpile, loose fill or stockpiled earth shall not be placed or allowed to fall directly against the silt fence. Silt fence shall never be used to support the side of a stockpile.

C. Maintenance: Remove silt deposits when they exceed 1/3 the height of the fence. Replace all broken, ripped, degraded, or damaged sections of fence immediately with new fencing, including adequate overlap at ends to prevent leakage.

D. Measurement and Payment: Silt fence will be measured by the linear foot and will be paid for at the contract unit price for either "Silt Fence" or "Silt Fence (Wire-Supported)" as applicable. Initial excavation of depressions on the upstream side of silt fence to create added storage will be measured and paid for as "Sediment Removal."

2154.6 Straw Bales

Straw bales shall not be used.

2154.7 Rock Barriers

Small temporary stone dams used to form sediment traps or used as ditch checks in ditches with large flows. Barriers may also be used to redirect water when other measures are not sufficient.

A. Materials: Rock shall be a clean aggregate free of deleterious substances, including earth, chert, cracks, seams, soapstone, shale or other easily disintegrated materials. Rock shall come from a primary run and be screened to remove the easily separated fines. It shall meet the gradation requirements below for the nominal size specified:

2-inch Rock: Fifty percent (50%) by weight of the particles shall be larger than 1.5 inches in diameter and none shall be larger than 4 inches. Total aggregate and fines smaller than ½ inch shall not exceed 2 % by weight.

4-inch Rock: Fifty percent (50%) by weight of the particles shall be larger than 4 inches in diameter and none shall be larger than 9 inches. Total aggregate and fines smaller than 1" shall not exceed 2 % by weight.

6-inch Rock: Fifty percent (50%) by weight of the particles shall be larger than 6 inches in diameter and none shall be larger than 12 inches. Total aggregate and fines smaller than 1" shall not exceed 2 % by weight.

The Engineer may approve modifications to these gradations to accommodate readily available stockpiles from local quarries.

B. Construction Requirements: Rock barriers shall be placed as shown on the plans or Standard Details. When shown, depressions shall be excavated on the upstream side of rock barriers to increase available storage volume and create a sediment trap. All rock shall be removed from the site at the completion of work, unless suitable onsite disposal is authorized by the Engineer.

C. Maintenance: Remove silt when it accumulates 1/2 the height of the barrier. Reshape or replace rock where settlements or isolated breaches occur.

D. Measurement and Payment: "Rock Barriers (Named Size)" will be measured per ton or tenth part thereof, as placed, and paid for at the contract unit price for the nominal size indicated. Initial excavation of depressions on the upstream side of rock barriers to create added storage will be measured and paid for as "Sediment Removal."

2154.8 Open-Flow Ditch Check

A-frame ditch-checks with an open weave that allows significant flow through while lowering velocities sufficiently to cause settlement.

A. Materials

1. Frame: Structure made of strands of high-density polyethylene woven to produce rectangular openings. Frames made of metal or other plastics having equivalent strength and durability may be used. Opening sizes may vary across the frame, with generally smaller openings clustered at the bottom to screen materials and larger openings at the top to facilitate overflow. Openings shall comprise a minimum of 35% of the cross sectional area of the frame. Frames shall be fabricated in triangular “A-frame” shape with a flange at both ends on the bottom to facilitate anchoring into the soil.

2. Anchors: As recommended by the manufacturer.

3. Erosion Control Blanket: Shall be a Class 2, Type F as specified in Section 2153, unless an alternate type is indicated on the plans.

B. Construction Requirements: Prepare channel or ditch by forming the shape and grade and compacting the subgrade. Apply any soil additives, fertilizer, seed, or erosion control blankets as required before installing ditch check. Install ditch check and underlying erosion control blanket as shown in the Standard Drawing.

C. Maintenance: Remove silt when it accumulates 1/2 the height of the ditch check. If units are damaged or dislodged during the sediment removal process, repair and re-establish continuity.

D. Measurement and Payment: "Open-Flow Ditch Check" will be measured per linear foot and paid for at the contract unit price. Underlying erosion control blanket or geotextiles shall be subsidiary.

2154.9 Straw Wattles

Circular tubes of netting filled with straw fibers and used as a small height barrier for diversion of water or settlement.

A. Materials: Wattles shall consist of a rice or wheat straw fibers as filler within a containment netting. Filler shall be certified as weed free in accordance with state standards. Fibers shall have an average length greater than 3 inches. Containment netting shall be high-density polyethylene and ethyl vinyl acetate and shall contain ultraviolet inhibiters. The strand thickness shall be no less than 0.030 inches, the knot thickness no less than 0.055 inches and the netting weight no less than 0.35 ounces per foot. The entire wattle unit shall be sufficiently durable to withstand weather, construction, and installation conditions for no less than 3 months, including multiple movements and reinstallations. Wattles shall have a 9-inch diameter (1-inch tolerance) and a minimum unit weight of 1.4 lbs/ft. Wood or steel posts of sufficient strength withstand installation and weather shall be used for anchoring.

B. Construction Requirements: Wattles shall be located as shown on the plans or directed by the Engineer. Individual units shall be installed in accordance with manufacturer's recommendations and the Standard Drawings. Units shall be laid end to end and abutted firmly or overlapped against the next consecutive unit.

C. Maintenance: Remove silt when it accumulates to 1/2 the height of the wattle. Repair torn, ripped, or degraded segments. Avoid driving over wattles and repair any segments damaged by vehicles. Correct

shifts in wattle alignment. Repair rills or gullies upslope of the wattle and any undercutting that may occur. Units that do not satisfy the durability requirement shall be replaced at no extra cost.

D. Measurement and Payment: "Straw Wattles" will be measured per linear foot and paid for at the contract unit price.

2154.10 Foam Dike:

Foam strips wrapped in geotextile fabric and used as a small height barrier for diversion of water or settlement.

A. Materials: Foam dikes shall have an inner material of plastic foam with an outer covering of geotextile fabric fitted snugly. Plastic shall be urethane or other material approved by the Engineer and shall be durable, weather resistant, and flexible. The foam core shall have a triangular or rectangular cross section that is stable when placed, and shall provided for a minimum of 7" height barrier height above grade. Geotextile shall meet the same requirements as given for silt fence in this specification. The geotextile shall have flaps that extend a minimum of 3 feet beyond the base of the inner material in each transverse direction. The entire foam dike unit shall be sufficiently durable to withstand weather, construction, and installation conditions for no less than 3 months. The foam dike shall be anchored by staples.

B. Construction Requirements: Foam dikes units shall be located as shown on the plans or directed by the Engineer. Units shall be installed in accordance with manufacturer's recommendations and the Standard Drawings. Units shall be laid end to end and abutted firmly to the next consecutive unit.

C. Maintenance: Remove silt when it accumulates 1/2 the height of the foam dike. Repair torn, ripped, or degraded segments. Avoid driving over foam dikes and repair any segments damaged by vehicles. Units that do not satisfy the durability requirement shall be replaced at no extra cost.

D. Measurement and Payment: "Foam Dike" will be measured per linear foot and paid for at the contract unit price.

2154.11 Gravel Bags

Small gravel-filled durable bags that are placed, stacked, or piled to form temporary diversions, barriers, or ditch checks.

A. Materials: Bags shall be woven polypropylene, polyethylene, or polyamide fabric or burlap having a minimum unit weight of 4 ounces per square yard. The Mullen burst strength shall exceed 300 pounds per square inch per ASTM D3786 and shall have ultraviolet stability exceeding 70% per ASTM D4355. Bags shall be filled with clean, coarse aggregate from ½" to 1" diameter and securely sealed. Bags may be of any size suitable for hand placement and carrying. A typical bag size is 18-inches long, 12-inches wide, and 3-inches thick with a weight of 30-35 pounds when loosely filled.

B. Construction Requirements: Bags shall be placed tightly together with no gaps between individual bags or adjacent curbs, walls or other surfaces against which they are placed.

C. Maintenance: Sediment that is stopped by and stored behind the bag shall be removed after every rainfall.

D. Measurement and Payment: "Gravel Bags" will be measured by the pound and paid for at the contract unit price. The Contractor shall provide the Engineer with an average weight per bag of each size and type used on the project and the Engineer may verify weights. Actual measurement in the field shall be based on number of bags placed multiplied by the average weight. Relocation of bags during the progress of the work shall be subsidiary to the original payment.

2154.12 Compost Filter Berm:

A berm or dike of compost placed to trap pollutants and filter runoff from small areas of overland flow.

A. Materials: Compost to be used in filter berms shall meet the respective requirements for compost specified in Section 2153.10, including the provisions of AASHTO MP-9.

B. Construction Requirements: Compost filter berms shall be constructed using specially designed pneumatic equipment (blowers) and a berm shaping device, or other equipment as approved by the Engineer. If a blower is used, compost shall be blown directly at the soil surface to help settle, compact and shape the berm. The berm shall be formed in a trapezoidal shape, having a typical dimension of 3 feet wide at the base and 1.5 feet high. Position the berm around designated soil areas and parallel to the contour. The ends of the berm shall be pointed up slope such that the bottom elevation at each end is higher than the top elevation throughout most of the slope, so as to prevent water from flowing around the end of the berms.

C. Maintenance: Berms shall be reshaped and compost added as necessary to maintain their function and dimensions. Breaches in the berm shall be repaired promptly. Compost may be added by hand and tamped in place. Unless otherwise directed by the final landscape plans or by the Engineer, removal of the compost berm shall be made by spreading the compost in a thin layer over adjacent planted areas.

D. Measurement and Payment: "Compost Filter Berm" will be measured per linear foot and paid for at the contract unit price.

2154.13 Compost Filter Sock:

A compost filter encased in a geotextile tube that serves a similar purpose to compost filter berms, particularly in areas with more concentrated overland runoff.

A. Materials: Compost to be used in filter socks shall meet the respective requirements for compost specified in Section 2153.10, including the provisions of AASHTO MP-9 as applied to filter berms, except as modified by this specification for filter socks.

Tubes used for compost filter socks shall be produced from a 5 mil thick continuous HDPE filament, woven into a tubular mesh netting material, with openings in the knitted mesh of 3/8" (10 mm). Tubes shall have a diameter of either 12 or 18 inches, as specified. The 12 inches tubes are for general use and the 18 inch tubes are typically for steep slope protection and minor check dams.

Stakes for securing filter socks shall be hardwood with a 2" by 2" nominal dimension. Steel or other non-biodegradable stakes shall not be used.

B. Construction Requirements: Compost filter socks shall be constructed on site or delivered to the jobsite. When assembled on site, the sock shall be filled using a pneumatic blower. The sock shall be formed continuously for the length needed, up to 200 feet long. When multiple socks are needed, the end of one sock shall be pulled over the second to create a "sleeved" overlap. Once overlapped, the second section is filled with compost to create a seamless unit. Once placed, the filter sock will settle into an oval shape. Trenching is not required. Existing soil in the vicinity of the filter sock shall remain undisturbed to the extent practical. The sock shall be anchored by driving stakes through the center of the filter sock at 10 foot intervals, at all sleeved overlaps, and at each end. Where an adjustable section of filter sock is necessary (such as to permit dry weather vehicle access), the stakes may be placed on the downhill side of the sock rather than through it. Filter socks may be seeded.

C. Maintenance: Compost filter socks shall be inspected to ensure the sock material is intact and to determine if runoff is bypassing or undermining the units. Additional filter socks may be stacked as needed. Breaches in the line shall be repaired promptly. Unless otherwise directed by the final landscape plans or by the Engineer, removal of the compost sock shall be made by spreading the compost in a thin layer over adjacent planted areas. The HDPE sock tube shall be sliced open longitudinally to release the compost and the sock disposed of.

D. Measurement and Payment: "Compost Filter Sock (Named Diameter)" will be measured per linear foot and paid for at the contract unit price for the nominal diameter indicated.

2154.14 Temporary Berms:

Earthen berms temporarily graded and compacted to provide a diversion or to trap small areas of overland flow. Temporary berms can be used in conjunction with slope drains at the top of slopes to prevent sheet flow down the slope face.

A. Materials: Temporary berms shall consist of any soil material from within the project limits that is capable of being compacted.

B. Construction Requirements: Temporary berms shall be constructed to the approximate dimensions shown in the Standard Drawings. The berm shall be wheel compacted with at least one pass over the entire width of the berm. Material for the berm shall generally be drawn from a furrow excavated adjacent to the berm on the upstream side, so as to further establish the drainageway

C. Maintenance: Berms shall be reshaped and recompacted as necessary to maintain their function. Breaches in the berm shall be repaired promptly

D. Measurement and Payment: "Temporary Berm" will be measured per linear foot and paid for at the contract unit price. Such payment shall be full compensation for berm installation, maintenance, removal and any other work noted on the plans.

2154.15 Temporary Slope Drain:

A flexible tubing or conduit used to convey concentrated water from the top of a slope down to the toe and thereby preventing erosion over the slope face.

A. Materials: Temporary slope drains shall be metal, plastic, or flexible rubber pipe having a minimum 6 inch diameter. Pipe walls shall be impermeable and not slotted. Pre-formed elbows will be provided where sharp grade changes are needed. Standard flared end sections as approved by the Engineer shall be provided at both the inlet and outlet. Rock for energy dissipation at the outlet shall meet the material requirements for "Rock Barrier".

B. Construction Requirements: Temporary slope drains shall be constructed as shown in the Standard Details. Water shall be directed towards the inlets by the use of temporary berms, silt fence, gravel bags, or other barrier systems shown on the plans or approved by the Engineer. The drain will discharge onto a stabilized feature to prevent scour.

C. Maintenance: Sediment ponded at the inlet that would disrupt smooth flow shall be removed promptly. Outlet conditions shall be repaired if scour is observed. Leaking or damaged sections of pipe shall be repaired immediately. Berms or fences directing water to the inlet shall be monitored for continuity and effectiveness.

D. Measurement and Payment: "Temporary Slope Drain" will be measured per linear foot and paid for at the contract unit price. Such payment shall include installation of outlet protection.

2154.16 Inlet Protection:

Any one of a variety of devices or procedures used to allow water to enter a stormwater inlet while filtering or temporarily impeding the flow sufficiently to reduce the quantity of sediment carried.

A. Materials: When used, wattles, foam dike, silt fence, rock ditch checks and gravel bags shall meet the material requirements given by other items of this specification. All other material specifications are as shown in the Standard Details or on the plans.

B. Construction Requirements: Unless otherwise indicated by the Engineer, any of the inlet protection systems given in the Standard Details or plans may be used where appropriate. The project plans may limit the use of particular inlet treatments or specify greater detail on their use. The appropriate details for a given inlet will change during the progress of the job and adjustments shall be made as inlet construction progresses. Each inlet shall be protected continuously from initial construction until final stabilization.

When surrounding conditions are such that protection of the inlet would lead to an increased risk of flooding of adjacent structures or produce a hazard to motorists, the Engineer may authorize removal or adjustments to avoid such impacts. In those cases, extra attention shall be paid to minimizing the degree of sediment carried in the flow that reaches the inlet.

The general cases of inlet protection and the performance expected from each are as follows:

1. All Inlets at Sump Conditions: Inlets at sump conditions shall remain accessible for flow at all times. Small barriers, depressions and/or filters are used to screen larger sediments and initiate settlement of the water prior to it entering the inlet by creating a ponding zone. Generally, stormwater will enter the inlet via weir flow over the top of the barrier. Such water is generally the least-sediment laden as it is decanted from the top of the ponded area.
2. Street Inlets on Grade: On-grade inlet shall be converted into a localized sump condition by installing a barrier downstream and around the inlet of sufficient height to produce ponding and prevent bypass, while a barrier, depression, and/or filter in front of the inlet induces settlement of solids. Bypassing of water at the on-grade inlet shall not be allowed and the inlet shall remain open to accept flow without causing excessive flooding.
3. Selected Inlets Closed to Flow: In select locations, the plans may designate certain inlets as "closed to flow." In those situations, the objective is to provide sufficient blockage of permanent and temporary openings to prevent entry of stormwater into the inlet. Such locations will be clearly indicated on the plans, and the closed condition for flow may be designated for only a portion of the construction period. The Contractor shall notify the Engineer if they believe that the closure of such inlets would result in an increased risk of flooding or downstream erosion, and such concerns shall be resolved before closing an inlet to flow.

C. Maintenance: Sediment shall be removed from each inlet after every rainfall event that exceeds 1/2" or which results in a visible accumulation of sediment. Particular attention shall be paid to prevent blockage of inlets or cases where re-suspension of captured sediment is likely. Specific maintenance issues unique to each inlet protection type shall be addressed as outlined in the detail.

D. Measurement and Payment: "Inlet Protection" will be measured per each inlet protected and paid for at the contract unit price. Each inlet will be measured only one time for the duration of the project regardless of the number of phases or protection methods used to protect a single inlet. Unless otherwise specified in the plans or contract documents, inlet protection at all locations will be paid at the same unit price.

2154.17 Stabilized Stone Pad

A stabilized layer of large aggregate located in areas of high traffic and at the construction entrance, intended to prevent mud and silt from becoming embedded in tires or tracked offsite and to protect the site from rutting.

A. Materials: Stone shall meet the requirements for 4-inch rock used in rock barriers, as specified at Section 2154.7.

B. Construction Requirements: Stabilized stone pads for temporary construction entrances or other uses shall be constructed where shown on the plans or directed by the Engineer. Contractor shall avoid locating entrances on steep slopes or at curves on public roads. Where possible, entrances and pads shall be located where permanent roads will eventually be constructed. All existing vegetation and other unsuitable material shall be removed from the foundation area. The area shall be graded and crowned for positive drainage. The existing subgrade shall be compacted by three passes of heavy vehicles and the stone laid down and compacted by another three passes of heavy vehicles. Divert all surface runoff and drainage from the stone pad to a sediment trap formed by rock barrier, as described at 2154.7.

C. Maintenance: Reshape pad as needed for drainage and runoff control. Top dress with clean stone as needed.

D. Measurement and Payment: "Stabilized Stone Pad" will be measured by the ton of stone placed and paid for at the contract unit price.

2154.18 Sediment Trap

A temporary reservoir and embankment with a stone outlet that is constructed across a drainageway to intercept sediment-laden runoff and provide retention time sufficient to settle out a majority of solids. Used for smaller watersheds where the engineered outlet works of a sediment basin is not required.

A. Materials: Materials used in the sediment basin shall conform to the requirements given in the plans or Standard Details. All stone used for the outlet works shall conform to stone specified in Section 2154.7 "Rock Barriers."

B. Construction Requirements: All clearing, grubbing, demolition, excavation, embankment, compaction, or other grading necessary to construct the sediment trap shall be done in accordance with Standard Specification Sections 2100 and the Standard Drawings, unless more stringent requirements are provided for in the project plans or specifications. The embankment, reservoir, stone outlet and appurtenances shall be constructed as shown on the plans or Standard Drawing.

The construction of the sediment trap shall be carried out in a manner such that it does not result in sediment problems downstream. The embankment of the sediment trap shall be stabilized with temporary or permanent vegetation immediately after installation. Construction warning fence shall be installed around the perimeter of the basin and warning signs erected. Additional fencing shall be installed if indicated on the plans.

C. Maintenance: Check sediment traps after periods of significant runoff. Remove sediment and restore the trap to its original dimensions when sediment accumulates to one-half the design depth. Check the embankment and outlet for erosion damage, and inspect the embankment for piping and settlement. Make all necessary repairs immediately. Remove all trash and other debris from outlet and pool area.

D. Measurement and Payment: "Sediment Traps" shall be measured per each trap constructed and paid for at the contract unit price. Unless otherwise specified in the plans or contract documents, each trap shall be paid for at the same unit price.

2154.19 Sediment Basin

A temporary reservoir and embankment with engineered outlet works that is constructed across a drainageway to intercept sediment-laden runoff from large areas and provide retention time sufficient to settle out a majority of solids.

A. Materials: Materials used in the sediment basin shall conform to the requirements given in the plans or Standard Details.

B. Construction Requirements: All clearing, grubbing, demolition, excavation, embankment, compaction, or other grading necessary to construct the sediment basin shall be done in accordance with Standard Specification Sections 2100 and the Standard Drawings, unless more stringent requirements are provided for in the project plans or specifications.

The embankment, reservoir, spillway and appurtenances shall be constructed as shown on the plans or Standard Drawing.

Where the plans indicate that a temporary sediment basin is to be converted into a permanent basin, pond, or other stormwater facility, the construction, use, and removal or alterations shall be coordinated to result in a final facility that is operational in the time frame specified in the plans and which causes a minimum amount of disruption to the site work, downstream channel, or future facility and minimizes the amount of rework needed.

The construction of the sediment basin shall be carried out in a manner such that it does not result in sediment problems downstream. The embankment and emergency spillway of the sediment basin shall be stabilized with temporary or permanent vegetation immediately after installation of the basin.

Construction warning fence shall be installed around the perimeter of the pond and warning signs erected. Additional fencing shall be installed if indicated on the plans.

C. Maintenance: Check temporary sediment basins after periods of significant runoff. Remove sediment and restore the basin to its original dimensions when sediment accumulates to one-half the design depth. Check the embankment, spillways, and outlet for erosion damage, and inspect the embankment for piping and settlement. Make all necessary repairs immediately. Remove all trash and other debris from the riser and pool area.

D. Measurement and Payment: "Sediment Basin" shall be lump sum, and no measurement for payment of any item will be made. If multiple basins are used on a project, then this item shall be lump sum for all basins collectively, unless the bidding list designates individual locations.

Eighty percent (80%) of the lump sum payment shall be made once the basin is complete, in-place and operational. The final twenty percent (20%) shall be made when the basin is removed. Such payment shall be full compensation for clearing, grubbing, grading, spillway installation, stabilization, maintenance, removal, and any other work noted on the plans, including installation of outlet protection. Routine removal of sediment will be measured and paid for as “Sediment Removal.”

If the basin indicated on the plans is to be converted at the end of construction into a permanent pond, basin, or other stormwater facility, then this item shall include payment only for the incremental costs associated with its use as a temporary basin. Permanent embankments, excavations, spillways, or other appurtenances that are constructed will be handled by the other appropriate items of the Contract for the permanent facility.

2154.20 Temporary Stream Crossings

A temporary culvert constructed in a creek, river, or stream to allow construction access and crossing.

A. Materials: Materials used in the stream crossing shall conform to the requirements given in the plans or Standard Details.

B. Construction Requirements: All clearing, grubbing, demolition, excavation, embankment, compaction, or other grading necessary to construct the stream crossing shall be done in accordance with Standard Specification Sections 2100 and the Standard Drawing, unless more stringent requirements are provided for in the project plans or specifications.

The culvert, backfill, haul road, approaches, and appurtenances shall be constructed as shown on the plans or Standard Drawing. Culvert sizing, number, and orientation shall be as dictated in the plans. Care shall be taken to ensure that the stream crossing does not cause inadvertent flooding of adjacent homes, buildings, or other structures. Concerns about adequacy of culvert sizing shall be brought to the immediate attention of the Engineer and no installation made until such concerns are resolved.

C. Maintenance: Check temporary stream crossings after periods of significant runoff. Remove blockages to the inlet section and repair any scoured or damaged sections. If a temporary crossing seems to require excessive maintenance, replacement with a larger culvert or alternate design may be necessary.

D. Measurement and Payment: "Temporary Stream Crossing" shall be lump sum and no measurement for payment of any item will be made. If multiple crossings are used on a project, then this item shall be lump sum for all crossings collectively, unless the bidding list designates locations individually.

Eighty percent (80%) of the lump sum payment shall be made once the crossing is complete, in-place and operational. The final twenty percent (20%) shall be made when the crossing is removed.

2154.21 Turbidity Curtains

Floating barriers of synthetic fabric curtain suspended in the water and held in a vertical position, used in lakes and perennial rivers to slow, contain or direct the flow from disturbed areas allowing solids to settle out before spreading into the surrounding water.

A. Materials: All components shall conform to the requirements given for the specific turbidity curtain system specified in the plans.

B. Construction Requirements: Shall conform to the manufacturer's recommendations for the curtain system specified in the plans, plus such additional requirements as may be listed in the plans. A manufacturer's representative shall be onsite during installation of the system.

C. Maintenance: Anchor lines shall be kept secure and properly positioned. Fabric, cable, and other appurtenances shall be repaired immediately as needed and in accordance with manufacturer's instructions.

D. Measurement and Payment: "Turbidity Curtain" will be measured by the linear foot and paid for at the contract unit price.

2154.22 Dewatering Filter

A device for filtering sediments from water that is discharged during pumping or dewatering activities.

A. Materials: Dewatering filters shall be constructed of materials as shown on the Standard Plans. Proprietary devices that provide equal or better performance than filters in the Standard Plans may be approved by the Engineer.

B. Construction Requirements: Dewatering filters shall be used whenever sediment-laden effluent is discharged from pumps used during construction for dewatering or other activities. For proprietary devices, the manufacturer's recommendations shall be followed.

C. Maintenance: Filters shall be cleaned or replaced as necessary to maintain filtration capacity.

D. Measurement and Payment: No measurement or payment will be made for "Dewatering Filters," but the use of such devices shall be subsidiary to the dewatering activity or other items of the contract. Removal of sediments from dewatering devices shall also be subsidiary.

2154.23 Method of Measurement

Sediment controls and diversions will be measured in the manner specified in each applicable subsection.

2154.24 Basis of Payment

Sediment controls and diversions will be paid for as specified in each applicable subsection.

SECTION 2155 SCHEDULING AND STANDARD SEQUENCES

It is intended that future editions of this specification will contain guidelines and requirements for scheduling and standard sequences of work in order to minimize the duration of exposure and potential for sediment discharge. This section has been reserved for that purpose.

SECTION 2156 MEASUREMENTS AND PAYMENTS

2156.1 Summary

This section includes the method of measurement and the basis of payment, labor, equipment, tools and materials and for the performance of all related work necessary to complete any work covered in Section 2150. Unless otherwise indicated, the maintenance, repair, removal and disposal of all temporary measures shall be subsidiary to the initial installation.

2156.2 General

Unless specifically altered by the Contract Special Provisions, the methods of measurement and payment shall be as specified in each section herein, and as listed in the Proposal.

2156.3 Measurement

The Engineer or his representative will measure the work for payment. The method of measurement and computations used in determination of quantities of work performed will be those methods generally recognized as conforming to good engineering practice.

2156.4 Items not listed in the Proposal

There shall be no measurement or separate payment for any item of work not specifically identified and listed in the Proposal and all costs pertaining thereto shall be included in the contract unit prices for other items which are listed in the Proposal.

2156.5 Measurement and Payment Summary Table

Item Description	Ref. Section	Method of Measurement	Basis of Payment
General Requirements	2151	No measurement	Subsidiary to other items
Chemical and Waste Controls	2152	No measurement	Subsidiary to other items
Permanent Seeding or Sodding	2153.4	See Section 2400	See Section 2400
Out of Season Watering	2153.4	1,000 gallon unit	Unit Bid Price
Temporary Seeding	2153.5	0.01 acre	Unit Bid Price
Mulch Cover	2153.6	0.01 acre	Unit Bid Price
Hydrocover (Standard)	2153.7	1.0 lbs dry-weight of fiber	Unit Bid Price
Hydrocover (Named Specialty Mix)	2153.8	1.0 lbs dry-weight of fiber	Unit Bid Price
Erosion Control Blanket (Named Type)	2153.9	1.0 sq. yd.	Unit Bid Price
Compost Cover	2153.10	1.0 cu. yd.	Unit Bid Price
Surface Roughening	2153.11	No measurement	Subsidiary to earthwork items
Dust Control	2153.12	No measurement	Subsidiary to other items
Sediment Removal	2154.4	1.0 cu. yd.	Unit Bid Price
Silt Fence	2154.5	1.0 lin. ft.	Unit Bid Price
Silt Fence (Wire-Supported)	2154.5	1.0 lin. ft.	Unit Bid Price
Rock Barrier (Named Size)	2154.7	0.1 ton	Unit Bid Price
Open-Flow Ditch Check	2154.8	1.0 lin. ft.	Unit Bid Price
Straw Wattles	2154.9	1.0 lin. ft.	Unit Bid Price
Foam Dike	2154.10	1.0 lin. ft.	Unit Bid Price
Gravel Bags	2154.11	1.0 lbs.	Unit Bid Price

Item Description	Ref. Section	Method of Measurement	Basis of Payment
Compost Filter Berm	2154.12	1.0 lin. ft.	Unit Bid Price
Compost Filter Sock (Named Diameter)	2154.13	1.0 lin. ft.	Unit Bid Price
Temporary Berm	2154.14	1.0 lin. ft.	Unit Bid Price
Temporary Slope Drain	2154.15	1.0 lin. ft.	Unit Bid Price
Inlet Protection	2154.16	Each inlet	Unit Bid Price
Stabilized Stone Pad	2154.17	0.1 ton	Unit Bid Price
Sediment Trap	2154.18	Each trap	Unit Bid Price
Sediment Basin	2154.19	No measurement	Lump Sum
Temporary Stream Crossing	2154.20	No measurement	Lump Sum
Turbidity Curtain	2154.21	1.0 lin. ft.	Unit Bid Price
Dewatering Filter	2154.22	No measurement	Subsidiary to other items