Technical Specifications

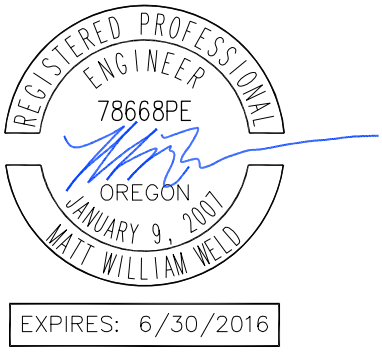
For

Milk Creek Bank Stabilization Project

Prepared for
Clackamas Soil and Water Conservation District

100% Submittal

March 28, 2016



FOR USE IN CONNECTION WITH

STATE OF OREGON, DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION, 2015

Milk Creek Bank Stabilization Project
Technical Specifications
100% Submittal

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SECTION 015000
MOBILIZATION

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SECTION 015000
TEMPORARY FACILITIES AND CONTROLS
(a.k.a. Mobilization & Demobilization)

1. GENERAL

1.1 DESCRIPTION

A. The work covered by this section consists of the construction facilities and temporary controls, including mobilization and demobilization, as specified, as shown on the Drawings, or as otherwise directed by the Engineer. Work includes traffic control, temporary fencing – type ESA, tree protection, temporary chain link fencing, and erosion control items not specifically addressed under other pay items.

B. Mobilization shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the site; for the establishment of all offices, and other facilities necessary for work on the project; and for all other work and operations which must be performed, or costs incurred prior to beginning work, on the various items on the project site.

C. Demobilization shall consist of work and operations necessary to disband all mobilized items and cleanup the site. The removal of all temporary crossings, ramps, access ways, roads, signs, and fencing; dewatering facilities; and temporary facilities or works, and the restoration of surfaces to an equal or better than existing condition shall also be included as part of demobilization.

1.2 RELATED SECTIONS

1. Section 015626, Temporary Fence – Type ESA

2. PRODUCTS

2.1 TEMPORARY CHAIN LINK FENCING

A. Unless otherwise indicated, type of temporary chain link fencing shall be Contractor's option. Following types are acceptable:

1. New materials or previously used salvaged chain link fencing in good condition.
2. Posts: Galvanized steel pipe of diameter to provide rigidity. Post shall be suitable for setting in concrete footings, driving into ground, anchoring with base plates, or inserting in precast concrete blocks.
3. Fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.

2.2 GATES

A. Provide personnel and vehicle gates of the quantity and size required for functional access to site.

B. Fabricate of same material as used for fencing.

C. Vehicle gates: minimum width of 20 feet to allow access for emergency vehicles. Capable of manual operation by one person.

3. EXECUTION

3.1 CONTRACTOR'S PLANT AND EQUIPMENT

A. Security. Contractor shall, at all times, be responsible for security of their plant and equipment. Owner shall not be responsible for missing or damaged equipment, tools, or personal belongings.

B. Construction Power and Communication Facilities. Contractor shall be responsible for providing sufficient electrical power and communication facilities to construct the work.

C. Storage Facilities.

1. Provide storage facilities for the protection of materials and supplies from weather, and shall keep the facilities clean and in proper order at all times.
2. Provide a storage area for lubricants, oils, and hazardous materials with sufficient means to contain spills. Facilities, handling, and any required cleanup will comply with all current local, state, and federal standards. Petroleum products stored on the site shall be secured from vandalism.

D. Sanitary Facilities. Maintain adequate toilet facilities at or near the work site.

E. Solid Waste Handling. Provide sufficient solid waste handling facilities to maintain site in a clean, orderly condition.

F. Water. Contractor shall provide all water necessary for construction and maintenance as specified.

3.2 MOBILIZATION AND DEMOBILIZATION

A. General. Perform mobilization and demobilization activities in accordance with the Drawings, and as specified.

3.3 PROJECT SIGNS

A. General. Erect project, safety and hard hat signs at each work site within five (5) days after commencement of work at that site.

3.4 EXCAVATION

A. The Contractor, and any subcontractor, is required to notify U.S.A. forty-eight hours in advance of performing excavation work, by calling the toll free number (800) 642-2444.

3.5 PROTECTIVE BARRIERS

A. Protective barriers shall be erected around sensitive areas as designated on the Drawings or as directed by the Engineer. Barriers shall be constructed using bright orange plastic safety fencing (type ESA), per Section 015626, Temporary Fence – Type ESA.

B. Temporary fencing shall be maintained during construction.

C. Tree Protection shall be erected around trees where standard ESA at the dripline is not feasible, as designated on the Drawings or directed by the Engineer. Refer to the Drawings for Tree Protection Details.

3.6 BULLETIN BOARD

A. Provide a bulletin board at the project site, or in a location approved by the Engineer. The bulletin board shall be easily accessible at all times and shall contain wage rates, equal opportunity notice, and other items required to be posted.

3.7 CHAIN LINK FENCING

A. Chain link posts:

1. Space as 10 foot on center, maximum.
2. Drive posts, set in holes and backfill, or anchor in precast concrete blocks.
3. For soft and unstable ground conditions, cast concrete plug around post.
4. Posts over pavement: Use steel post plates or precast concrete blocks.
5. Gate posts: Use bracing or concrete footings to provide rigidity for accommodating size of gate.

B. Fabric: Securely attach to posts.

C. Gates: Install with required hardware.

D. Maintain fencing in good condition. If damaged, immediately repair.

E. Removal:

1. When Temporary Fence is no longer required, as determined by the Engineer, it shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the State Specifications, except when reused as provided in this section.
2. Holes caused by the removal of Temporary Fence shall be backfilled in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the State Specifications.

3.8 STAGING AREAS

A. General. Staging areas at the project site are provided for the Contractor's use. By making this area available to the Contractor, the Engineer, and any other person or agency connected with the properties shall in no way be responsible or liable for any activity of the Contractor, subcontractors, or any individual or organization connected with the project.

B. Alternative Staging Areas. Alternative sites must be acceptable to Owner, and the Contractor must make all arrangements for their use at the Contractor's expense, and in accordance with all local, State and Federal regulations.

C. Additional Storage Areas. Should the Contractor require space in addition to that available on-site, the Contractor shall make arrangements for storage of materials and equipment in locations off the construction site, and shall provide the Engineer a copy of the letter of authorization for storage from the Owner.

3.9 DUST CONTROL

A. General. The Contractor shall be responsible for the control of dust within the limits of the project at all times. The Contractor shall take whatever steps are necessary to eliminate the nuisance of blowing dust. Responsibility for any damage to property, crops, or orchards from dust caused by the Contractor's operations shall be borne by the Contractor.

B. Dust Control. Periodically, water or otherwise treat access roads and haul roads, as required to suppress dust. Cover or control water content of earthen materials being hauled, as required to control dust emissions. Cover or otherwise stabilize soil stockpiles to prevent erosion by wind.

C. Cleanup. The Contractor shall keep all streets, roadways, and easements, as well as all ground adjacent to the project site, clean and free of dust, mud and debris resulting from the Contractor's operations. Daily cleanup throughout the project shall be required as the Contractor progresses with the work. Spillage of earth, gravel, concrete, asphalt, or other materials resulting from hauling operations along or across any public street or private driveway or access road shall be removed immediately by the Contractor.

3.10 HAZARDOUS MATERIALS CONTROL AND SPILL PREVENTION PLAN

A. General. Before starting work on the project, the Contractor shall submit for acceptance by the Engineer a Hazardous Materials Controls and Spill Prevention Plan. The Plan shall include provisions for preventing hazardous materials from contaminating soil or entering water courses and shall establish a Spill Prevention and Countermeasure Plan.

B. Facilities. Provide staging and storage areas for equipment, as required to contain contaminants away from water courses. Provide a contained, locked storage facility for fuels, lubricants, construction chemicals and other hazardous materials and supplies stored at site.

C. Equipment Maintenance. Clean and maintain equipment to prevent any leakage of fuel and lubricants. Establish a designated equipment refueling area. All fueling and maintenance of vehicles and other equipment and staging area shall occur at least 50 feet from any riparian habitat or water body.

D. Spills Countermeasures. Isolate work areas during in-water construction activities by using oil containment booms. Maintain a supply of oil booms, sorbent pads and other supplies to contain and clean spills. Contain and cleanup any hazardous material spills immediately and notify Engineer.

3.11 CONSTRUCTION SITE HOUSEKEEPING

A. Remove rubbish, trash, and debris from site on a regular basis. Transport and dispose of all rubbish and debris in accordance with all local regulations. Maintain staging area in an orderly manner. Regularly clean mud and debris, resulting from work at the site, from roadways; sweeping and washing construction site sediment tracked onto roadways into roadside ditches is a violation.

3.12 PROTECTION OF EXISTING IMPROVEMENTS

A. Existing facilities, utilities, and property shall be protected from damage resulting from the Contractor's operations. Roadways and other improved surfaces shall be protected from damage by vehicles with tracks or lugs. Any damage resulting from the Contractor's operations shall be repaired by the Contractor to the condition which existed prior to the damage, and to the satisfaction of the Engineer, at no additional cost to the Owner.

3.13 RESTORATION OF STRUCTURES AND SURFACES

A. Structures, Equipment, and Pipework. The Contractor shall remove such existing structures, equipment, and pipework as may be necessary for the performance of the work, and shall rebuild, or replace, the items thus removed in as good a condition as found. Contractor shall repair any existing structures that were damaged as a result of the Work.

B. Roads and Streets. Roadways used by the Contractor for hauling materials, equipment, supplies, etc., shall be cleaned and repaired if the condition of the roadway is damaged, or otherwise affected, due to the Contractor's operations.

C. Curbs, Gutters, Driveways, and Sidewalks. All curbs, gutters, driveways, sidewalks, and similar structures that are broken, or damaged, by the installation of the work shall be reconstructed by the Contractor. Reconstruction shall be of the same kind of materials with the same finish, and in not less than the same dimensions as to original work. Repairs shall be made by removing and replacing the entire portions between joints or scores, and not merely refinishing any damaged part. All restoration work shall match the appearance of the existing improvements, as nearly as possible.

D. Cultivated Areas and Other Surface Improvements. All cultivated and natural areas, either agricultural or lawns, and other surface improvements which are damaged by actions of the Contractor, shall be restored, including roadside drainage ditches, as nearly as possible, to their original conditions.

3.14 STORAGE OF MATERIALS AND EQUIPMENT

A. Materials and equipment shall be stored so as to ensure the preservation of their quality and fitness for the work. Stores of equipment and materials shall be located so as to facilitate inspection. The Contractor shall be responsible for all damages that occur in connection with the care and protection of all materials and equipment, supplied by the Contractor, until completion and final acceptance of the Work by the Owner.

3.15 TRAFFIC CONTROL

A. General. The Contractor shall be responsible for public safety and traffic control at all times.

B. The Contractor shall furnish, install, and maintain temporary construction warning signs, flaggers, barricades, and other devices necessary to safeguard the general public and the work, and to provide for the safe and proper routing of all vehicular and pedestrian traffic within and through the limits of the project during the performance of the work.

C. All work shall comply with ODOT Standard Specifications for Construction “Section 00225-Work Zone Traffic Control”

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Work under this section will be measured for payment on a lump sum basis.

4.2 PAYMENT

A. The lump sum contract price for Construction Facilities and Temporary Controls, also known as Mobilization and Demobilization**,** will include full compensation for the furnishing of all labor, materials, tools, equipment, administrative costs, and incidentals for mobilization; demobilization; and temporary facilities and controls.

B. Payment will be made under:

Pay Item	Pay Unit
Mobilization & Demobilization	Lump Sum

END OF SECTION

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SECTION 015626
TEMPORARY FENCE – TYPE ESA

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SECTION 015626
TEMPORARY FENCE – TYPE ESA

1. GENERAL

1.1 DESCRIPTION

A. Work under this section includes furnishing all labor, materials, equipment, and incidentals to install, maintain, and remove Temporary Fence – Type ESA , as shown on the Drawings, as specified, or as otherwise directed by the Engineer.

1.2 RELATED SECTIONS

1. Section 015000, Mobilization
2. Section 311100, Clearing and Grubbing
3. Section 312316, Stripping and Excavation

1.3 REFERENCES

A. Oregon Standard Specifications for Construction, Oregon Department of Transportation, current edition.

1.4 SUBMITTALS

A. Submit to the Engineer, for review, the following:

1. Manufacturer's data for proposed fencing fabric.
2. Manufacturer's data or descriptive literature for proposed fence posts.

2. PRODUCTS

2.1 MATERIALS

A. High Visibility Fabric. High visibility fabric shall be machine produced, orange colored mesh manufactured from polypropylene or polyethylene. High visibility fabric may be made of recycled materials. Materials shall not contain biodegradable filler materials that can degrade the physical or chemical characteristics of the finished fabric. High visibility fabric shall be fully stabilized ultraviolet resistant and a minimum of four feet in width with a maximum mesh opening of 2" x 2". High visibility fabric shall be furnished in one continuous width and shall not be spliced to conform to the specified width dimension.

B. Posts. Posts for temporary fence (Type ESA) shall be of one of the following:

1. Wood posts shall be fir or pine, shall have a minimum cross section of 2" x 2", and a minimum length of 5.25 feet. The end of the post to be embedded in the soil shall be pointed. Wood posts shall not be treated with wood preservative.
2. Steel posts shall have a "U," "T," "L," or other cross sectional shape that resists failure from lateral loads. Steel posts shall have a minimum weight of 0.75 pounds per linear foot and a minimum length of 5.25 feet. One end of the steel post shall be pointed and the other end shall have a high visibility colored top.

C. Fasteners. Fasteners for attaching high visibility fabric to the posts shall be as follows:

1. The high visibility fabric shall be attached to wooden posts with commercial quality nails or staples, or as recommended by the manufacturer or supplier.
2. Tie wire or locking plastic fasteners shall be used for attaching the high visibility fabric to

steel posts. Maximum spacing of tie wire or fasteners shall be 24 inches along the length of the steel post.

D. Used materials may be installed provided the used materials conform to these Specifications.

3. EXECUTION

3.1 INSTALLATION

A. All fence construction activities shall be conducted from the work side of the ESA as shown on the Drawings or as flagged in the field by the Engineer.

B. Posts shall be embedded in the soil a minimum of 16 inches. Post spacing shall be eight feet maximum from center to center and shall at all times support the fence in a vertical position.

C. Temporary fence (Type ESA) shall be constructed prior to clearing and grubbing work, shall enclose the foliage canopy (drip line) of protected plants, and shall not encroach upon visible roots of the plants.

D. Temporary fence (Type ESA) shall be located so that it is clearly visible, as determined by the Engineer.

3.2 MAINTENANCE

A. Temporary fence (Type ESA) that is damaged during the progress of the work shall be repaired or replaced by the Contractor the same day the damage occurs.

3.3 REMOVAL

A. When Type ESA fence is no longer required, as determined by the Engineer, it shall be removed and disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the State Specifications, except when reused as provided in this section.

B. Holes caused by the removal of temporary fence (Type ESA) shall be backfilled in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the State Specifications.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Temporary Fence – Type ESA will be measured by the linear foot of Temporary Fence – Type ESA installed at the locations indicated on the Drawings, as specified, or as directed by the Engineer.

4.2 PAYMENT

A. Temporary Fence – Type ESA will be paid for at the contract price per linear foot, which price will be payment in full for furnishing all labor, materials, tools, equipment, and incidentals necessary to install, maintain throughout the construction, and to remove Temporary Fence – Type ESA after site stabilization.

B. Payment shall be made under:

Pay Item	Pay Unit

Temporary Fence – Type ESA	Linear Foot

END OF SECTION

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SECTION 015713.01
FIBER ROLL

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SECTION 015713.01
FIBER ROLL

1. GENERAL

1.1 DESCRIPTION

A. Work under this Section includes furnishing all labor, materials, equipment, and incidentals to install, maintain, remove and dispose of Fiber Roll, as shown on the Drawings , as specified herein, or as otherwise directed by the Engineer.

B. Fiber Roll shall be furnished, installed, and maintained at the locations shown on the Drawings, as specified. Fiber Roll shall be installed on excavation and embankment slopes and other disturbed soil areas, active or non-active.

C. Related Sections

1. Section 015000, Mobilization
2. Section 312316, Stripping and Excavation
3. Section 313519.16, Slope Protection Fabric

1.2 SUBMITTALS

A. Submit to the Engineer, for review, the following manufacturer's data and Certification's:

1. A certificate stating the name of the Fiber Roll manufacturer, product name, style compositions of filaments or yarns and other pertinent information to fully describe the geotextile, along with the manufacturer's certification of compliance with the material specifications contained herein.

2. PRODUCTS

2.1 MATERIALS

A. Fiber Roll. Fiber Roll shall be:

1. A pre-manufactured roll made from 100% weed free rice straw and wrapped in a 100% biodegradable tubular 7 oz. Plain Burlap liner. The burlap is Medium Weight Natural Burlap with a 9 X 8 Warp & Fill, and a minimum weight of 7 oz. per square yard. Plastic netting will not be accepted as an alternate.
2. 9-inch rolls shall have a mimimum weight of approximately 1.6 pounds per foot.
3. 12-inch rolls shall have a mimimum weight of approximately 3.8 pounds per foot.

B. Stakes. Wood stakes shall be a minimum of 2" x 4" x 24" (ripped diagonally) for Type 1 installation or a minimum of 1" x 2" x 24" in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

C. Rope. Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 1/4 inch.

3. EXECUTION

3.1 INSTALLATION

A. Fiber Roll shall be installed as follows:

B. Type 1: Furrows shall be constructed to a depth between three inches and four inches, and to a sufficient width to hold the Fiber Roll. Soil excavated from the trench shall be placed on the uphill or flow side of the roll to prevent water from undercutting the roll. Stakes shall be driven through the center of the roll (perpendicular to the finished grade) at 36 inches apart along the length of the Fiber Roll and stopped at 12 inches from each end of the rolls. Stakes shall be driven to between two and three inches above the top of the roll.

C. Type 2: Rope and notched stakes shall be used to restrain the Fiber Rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the Fiber Roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the Fiber Roll tightly to the slope. Furrows will not be required.

D. Fiber Roll shall be placed 10 feet apart along the slope for slope inclination (horizontal:vertical) of 2:1 and steeper, 15 feet apart along the slope for slope inclination between 2:1 and 4:1, 20 feet apart along the slope for slope inclination between 4:1 and 10:1, and a maximum of 50 feet apart along the slope for slope inclination of 10:1 and flatter.

E. The bedding area for the Fiber Roll shall be cleared of obstructions including rocks, clods, and debris greater than one inch in diameter before installation.

F. Fiber Roll shall be installed approximately parallel to the slope contour and the terminus of rows shall be angled up-slope at 45 degrees for a distance of three feet. Where fiber rolls meet, provide an overlap of two feet, with adjacent rolls tightly abutting each other.

G. Fiber Roll shall be installed prior to seeding where used without slope protection fabric.

H. Fiber roll shall be installed over fabric (after seeding) where slope protection fabric is specified.

3.2 MAINTENANCE

A. The Contractor shall inspect all Fiber Roll immediately after each rainfall, and at least daily during prolonged rainfall. Any deficiencies shall be immediately corrected by the Contractor.

B. The Contractor shall also make a daily review of the location of Fiber Roll in areas where construction activities have altered the natural contour and drainage runoff to ensure that the Fiber Rolls are properly located for effectiveness. Where deficiencies exist as determined by the Engineer, additional Fiber Rolls shall be installed as directed by the Engineer.

C. Damaged or otherwise ineffective Fiber Roll shall be repaired or replaced promptly. Fiber Roll shall be maintained to disperse concentrated water runoff and to reduce runoff velocities. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping Fiber Roll shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred beneath the rolls shall be corrected. Fiber Roll shall be repaired or replaced within 24 hours of identifying the deficiency.

3.3 REMOVAL

A. Fiber Rolls shown on the Drawings shall remain in place after project completion, unless

otherwise specified, and be allowed to naturally degrade.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Fiber Roll will be measured by the linear foot of Fiber Roll installed at the locations indicated on the Drawings, as specified, or as directed by the Engineer

B. Fiber Roll that the Contractor installs for temporary erosion and sediment control, in addition to that shown on the Drawings, shall not be separately measured for payment.

4.2 PAYMENT

A. Fiber Roll will be paid for at the contract price per linear foot, which price will be payment in full for furnishing all labor, materials, tools, equipment, and incidentals necessary to install, maintain throughout the construction, and, where specified, to remove Fiber Roll after site stabilization.

B. Fiber Rolls required or used on a short term basis that are not permanently staked in place or are anticipated to be moved on a daily or routine basis (such as areas immediately adjacent to trench excavations, temporary stockpiles, active areas for soil processing/screening operations, spill containment devices, etc.) shall be considered as included in prices paid for the various contract items of work involved, and no additional compensation will be allowed.

C. Payment shall be made under:

Pay Item	Pay Unit
Fiber Roll	Linear Foot

END OF SECTION

INDEX
SECTION 017123.16
CONSTRUCTION SURVEYING

SECTION 017123.16
CONSTRUCTION SURVEYING

1. GENERAL

1.1 DESCRIPTION

A. The work required under this Section shall include, but is not limited to, all labor, tools, materials, equipment and incidentals required to perform construction surveying necessary to establish the lines and grades of the proposed work, as shown on the Drawings, as specified, or as directed by the Engineer.

1.2 WORK INCLUDED

A. The Contractor shall be responsible for procuring professional land surveying services as necessary to construct this project. An Oregon licensed Land Surveyor, or Civil Engineer authorized to practice land surveying as defined in Section 820 of the Oregon Administrative Rules, shall be in responsible charge of all survey work to be performed in conjunction with the scope of work of this project.

B. The Contractor shall preserve and protect all project survey control and reference points shown on the Drawings and located outside the limits of disturbance. Monuments disturbed by the Contractor shall be reestablished by the Contractor at his sole expense.

C. The Contractor shall be solely responsible for the protection and maintenance of all existing and Contractor-established survey marks and monuments.

1.3 SUBMITTALS

A. The Contractor shall provide the name, license number, and documentation for the required minimum qualifications of the Land Surveyor to be employed by the Contractor for the Project, prior to any work being completed by the Contractor or Surveyor.

1.4 REFERENCES

A. Oregon Standard Specifications for Construction, Oregon Department of Transportation (current edition).

1.5 QUALITY ASSURANCE

A. All Work shall be performed to the satisfaction of the Engineer.

B. The Engineer may, at his sole discretion, perform his own surveys for: verification of project control points, verification of lines and grades, and inspection of survey monument preservation. Contractor shall provide unrestricted access for the Engineer to spot-check the work. This does not relieve the Contractor of their responsibility to perform additional independent surveying, as need to complete the work.

C. In the event that the construction staking reveals a design inconsistency or error, Contractor shall notify the Engineer immediately and shall not proceed with the work until directed by the Engineer.

2. PRODUCTS (Not Used)

3. EXECUTION

A. The Engineer will establish a minimum of three survey control monuments, as shown on the Drawings. The Contractor's surveyor will be provided with the northing, easting and elevation of the control points existing in the field as shown on the Drawings. In addition the Engineer of Record will also provide the Contractor's surveyor with the final linework file developed in AutoCAD Civil 3D. The Contractor's surveyor will be required to access AutoCAD in order to use the electronic files. Civil 3D information does not transfer to base AutoCAD or older versions of AutoCAD and therefore will not be available to Land Surveyors who do not have this program.

B. From this information, the Contractor shall establish the baseline control points and reference points for horizontal and vertical control and make all additional detailed surveys and measurements and establish markings or monuments necessary for the construction of the work as dimensioned on the Drawings.

C. At a minimum, construction staking shall include the following:

1. Proposed clearing and grubbing limits,
2. Proposed channel alignment (centerline),
3. Proposed grading and contours for earthwork,
4. Proposed channel treatments, structures, and modifications,
5. Any other items required for a full, complete and accurately built project

D. All stakes and survey markers will be conspicuously marked with flagging tape or paint by the Contractor. The Contractor shall be responsible for protecting and maintaining all stakes from destruction.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Construction Surveying shall not be independently measured for payment.

4.2 PAYMENT

A. No separate payment will be made for the work covered under this section. Full compensation for all costs in connection with Construction Surveying shall be included in the contract price for related work.

B. The cost of resetting and verifying control points disturbed by the Contractor will be borne by the Contractor. The cost of any such verification or replacement of bench marks and/or control survey points will be deducted from any monies due to the Contractor. The Contractor will not be allowed any adjustment in working days for such verification or replacement of survey control points.

END OF SECTION

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SECTION 311100
CLEARING AND GRUBBING

SECTION 311100
CLEARING AND GRUBBING

1. GENERAL

1.1 DESCRIPTION

A. The work covered by this section consists of furnishing all labor, equipment, and materials necessary to perform the clearing and grubbing, the removal or disposal of all cleared and grubbed materials, and the filling of all grubbing holes, as specified, as shown on the Drawings, or as directed by the Engineer.

B. Related Sections

1. Section 015000, Mobilization
2. Section 312316, Excavation
3. Section 312323, Engineered Fill
4. Section 024100, Demolition and Reuse of Materials

1.2 REFERENCES

A. Oregon Standard Specifications for Construction, Oregon Department of Transportation, current edition.

2. PRODUCTS - Not Used

3. EXECUTION

3.1 CLEARING

A. General. All work shall comply with Section 00320, Clearing and Grubbing of the Standard Specifications.

B. All trees, stumps, down timber, snags, brush, vegetation, old piling, stone, concrete rubble, abandoned structures, and similar debris shall be cleared within the limits of the construction extents, unless otherwise shown on the Drawings or directed by the Engineer.

C. In areas where grubbing is not required, the clearing operations shall consist of the complete removal of all obstructions above the ground surface.

D. Contractor shall flag all vegetation to be removed for approval by County Representative prior to its removal. Once the flagging is completed, County Representative will walk the vegetation removal areas and approve them prior to Contractor initiating clearing and grubbing activities.

E. Contractor shall use hand-operated equipment for clearing and grubbing within the creek channel, (except where mechanized equipment access is provided, as shown on the Drawings) and at any protected natural resource area or tree protection zone per sub-Sections Environmentally Sensitive Area (ESA) Fencing Installation and Tree Protection Zone Fencing Installation.

F. Downed plant materials shall be removed from tree protection zones and protected natural resource areas by hand or with equipment located outside fencing. Contractor shall extract debris by lifting the material out, not skidding it across the soil surface,

G. Trees. Where trees are approved by the County's representative for removal, trees shall be felled in such a manner as to avoid damage to trees left standing, to the existing structures and installations, as well as with due regard for the safety of employees and others. Stumps shall be removed to minimum depth of 4 feet, or to a point where remaining roots are less than 1.5 inches in diameter, whichever depth is greater. Trees located beyond the limits for clearing and grubbing that are not marked for removal, shall be protected from damage, as indicated on the Drawings and as specified.

H. Vegetation. Vegetation to be removed shall consist of all heavy growth of brush and woody vegetation, unless shown otherwise on the Drawings or directed by the Engineer.

I. Debris Removal. Abandoned foundations, rip rap, drainage materials, debris, and other unsuitable material and any other debris designated for removal on the Drawings shall be removed and disposed of in accordance with this section. Buried unsuitable debris encountered during excavations shall be removed and disposed of in accordance with Section 312316, Stripping and Excavation.

3.2 GRUBBING

A. General. Grubbing shall consist of the removal of all stumps, roots, buried logs, old piling, old paving, concrete, abandoned utilities, timbers, fencing, and other objectionable matter encountered.

B. Limits. Except as noted on the Drawings, the entire area within the limits of the footprint of proposed stream repair work, including Headcut Repairs, Pond Outlet Protection, Rock Check Dams, Gully Repairs, and Coir Log Check Dams, shall be thoroughly grubbed.

C. Filling of Holes. All holes caused by grubbing operations, except in borrow areas, shall be excavated with 3 to 1 (horizontal to vertical) side slopes in conformance with Section 312316, Stripping and Excavation. The excavation shall then be backfilled with compacted embankment material in conformance with Section 312323, Engineered Fill.

3.3 DISPOSAL OF DEBRIS

A. Cleared and Grubbed Materials. Except as hereinafter specified or otherwise indicated on the Drawings, all logs, brush, strippings, concrete, asphalt, timbers, slash, and other non-organic debris which are the products of the clearing and grubbing operations shall be disposed of. Remove any or all of the products of clearing and grubbing operations from the site and dispose of the material at other locations or through other sources arranged for, by, and at the expense of the Contractor, in accordance with applicable laws and ordinances.

B. Clean woody plant material products of the clearing and grubbing operations not designated for salvage may be chipped and disposed of on site at the location shown on the Drawings, or as specified by the Engineer, subject to approval of the Owner.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Clearing and Grubbing will be measured as a lump sum pay item.

4.2 PAYMENT

A. Clearing and Grubbing will be paid for at the lump sum contract price, which price will be payment in full for furnishing all labor, materials, tools, equipment and incidentals, and doing all work necessary to complete the clearing and grubbing operation as specified, including disposal or salvage of materials, and restoration of ground surfaces.

B. Removal and disposal of buried debris, not encountered during grubbing operations, will be paid for in accordance with Section 312316, Stripping and Excavation – Unsuitable Debris.

C. Payment will be made under:

Pay Item	Pay Unit
Clearing and Grubbing	Lump Sum

END OF SECTION

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SECTION 312316
STRIPPING AND EXCAVATION

Paragraph **Page**

SECTION 312316
STRIPPING AND EXCAVATION

1. GENERAL

1.1 DESCRIPTION

A. The work covered by this section consists of furnishing all labor, equipment, materials, and performing all operations necessary to complete Stripping and Excavation, as specified, as shown on the Drawings, or as directed by the Engineer. Work includes, but is not limited to the following:

1. Stripping for removal of vegetation and surface organics.
2. Excavation for removal of unsuitable material.
3. Channel Excavation
4. Topsoil salvage, storage and replacement
5. Construction Staking
6. Other miscellaneous excavation incidental to the construction of the improvements.

B. Over-excavation for placement of Toe Boulders and Log Structures is not included within this section, but is considered incidental to the work for which it is required.

C. Related Sections

1. Section 311100, Clearing and Grubbing
2. Section 312323, Engineered Fill

1.2 REFERENCES

A. Oregon Standard Specifications for Construction, Oregon Department of Transportation, current edition.

B. Surveys. All construction staking shall be performed by the Contractor, in accordance with Section 017123.16, Construction Surveying. The Owner shall provide control points at the locations shown on the Drawings. Control points disturbed by the Contractor shall be replaced by the Contractor, at his sole expense.

1.3 QUALITY ASSURANCE

A. Comply with all applicable permits and regulations.

B. Contractor shall provide necessary construction staking and references points, as required to meet the specified tolerances for the work.

2. PRODUCTS

2.1 MATERIALS - SECTION NOT USED.

3. EXECUTION

3.1 GENERAL

A. The Contractor shall protect existing utilities in performing any excavation work.

B. The Contractor shall comply with all permit conditions in performing any excavation work.

C. Contractor shall perform an independent earthwork estimate for the purpose of preparing bid prices for earthwork. The bid price shall include costs for any necessary import and placement of earth materials or the export and proper disposal of excess or unsuitable earth materials.

D. Excess or unsuitable materials shall be disposed off-site, at locations to be arranged and paid for by the Contractor.

3.2 STRIPPING

A. Stripping. Strip surfaces of excavations and fill foundations of heavy growth of crops, grass, weeds and other vegetation as specified in Section 311100, Clearing and Grubbing. Greater depths of stripping may be necessary in selected areas to remove vegetation, as determined by the Engineer.

B. Unless otherwise specified, the stripped materials shall be disposed of off-site, at locations to be arranged and paid for by the Contractor

3.3 EXCAVATION

A. General. Excavations shall extend into firm, undisturbed native soils. Excavation shall consist of removal of material for embankment foundation preparation, mass excavation and finish grading of the channel and slope improvements, and other miscellaneous excavations to the lines and grades shown on the Drawings, or as directed by the Engineer. In the event that organic materials, yielding sub-grade (pumping) or other deleterious materials are encountered during foundation excavations, they shall be removed as directed by the Engineer.

B. Control of Water. Water control shall be performed in accordance with project permit conditions and Dewatering, Section 312319 of these Specifications. When water is encountered, either ground water or surface runoff, the Contractor shall furnish, install, maintain, and operate all necessary machinery and equipment required to keep the excavation reasonably free from water, as approved by the Engineer, until the placement of concrete or backfill material has been completed, inspected, and approved, and all danger of flotation and

other damage is removed. Water pumped from the excavation shall be disposed of in such manner as will not cause injury to public or private property, or constitute a nuisance or menace to the public, and the disposal method shall be subject to the approval of the Engineer. Water shall be controlled until work is complete.

C. Excess Excavation. Care shall be exercised by the Contractor not to excavate below the grades shown on the Drawings, except as specified herein, and as directed by the Engineer. All excavations in excess of the grades shown on the Drawings which are not directed by the Engineer shall be backfilled with compacted embankment at the Contractor's expense, per Section 312323, Engineered Fill.

D. Temporary Excavations. With exposure and drying, on-site soils may experience progressive sloughing if excavated near vertical and left un-shored during construction. Engineer suggests that the soils on-site should be considered Type C when applying OSHA regulations.

E. Tolerances. The excavation tolerance shall typically be +0.1 feet to -0.2 feet from the grades shown on the Drawings, except within the low flow channel, where excavation tolerance shall be +0.1 feet to -0.1 feet from the elevations shown on the Drawings.

3.4 UNCLASSIFIED EXCAVATION.

A. Unclassified Excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature, which is not otherwise classified and paid for under Excavation of Unsuitables or Rock Excavation described below. Unclassified Excavation includes excavation required to reach finished grade. Over-excavation for the placement of materials (e.g. Toe Boulders, Log Structures) or the removal of unsuitables, as described below under Excavation of Unsuitables, is not included in Unclassified Excavation.

3.5 EXCAVATION OF UNSUITABLES.

A. Excavation of Unsuitables. Areas of unsuitable in-place soils, as determined by the Engineer, may also be encountered. Material shall not be classified as unsuitable solely based on moisture content. Material within the limits of Excavation, as described above under Unclassified Excavation, or within the limits of over-excavation for the placement of materials (e.g. Toe Boulders, Log Structures) shall not be classified as unsuitable. The Contractor shall anticipate having to over-excavate areas of unsuitables as directed by the Engineer and dispose of materials. The actual locations of these excavations will be determined in the field by the Engineer. The side slopes of the excavations shall be no steeper than 1 to 1 (horizontal to vertical). The over-excavations shall be backfilled with embankment materials in accordance with Section 312323, Engineered Fill.

B. Disposition of Unsuitable Materials. The excavated materials that are considered unsuitable based solely on moisture content shall be processed as necessary to meet specification requirements for suitability and used as embankment material. Materials which are unsuitable based on organic content will be ordered wasted and shall be disposed of off-site in accordance to Section 7-1.13, "Disposal of Material Outside the Highway Right of Way", of the State Standard Specifications.

3.6 ROCK EXCAVATION

A. Rock Excavation. Rock excavation consists of the removal of hard igneous, metamorphic, and/or sedimentary rock in solid beds or masses in original or stratified position which can be removed only by continuous drilling, blasting or the use of pneumatic tools, and all boulders of 5 cubic yards in volume or larger. Material which can be loosened with a pick, frozen materials, soft laminated shale and hardpan, which for convenience or economy is loosened by drilling, blasting, wedging or the use of pneumatic tools, removal of concrete pavement and retaining walls, shall not be classified as rock excavation. When rock is encountered within the limits of the excavation, immediately notify the Owner and Engineer and do not proceed further until instructions are received and measurements made for the purpose of establishing the volume of rock excavation. Contractor shall note that blasting is not approved for this project. The need for specialized rock excavating equipment should be anticipated if rock is encountered.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Stripping. Stripping will not be separately measured for payment.

B. Topsoil. Topsoil will not be separately measured for payment.

C. Unclassified Excavation. Unclassified Excavation will be measured by the cubic yard of Unclassified Excavation, based on the Dimensions shown on the Drawings. Where the dimensions of any portion of the work are revised by the Engineer, or a portion of the work is eliminated, the change will be measured by the cubic yard based on the neat volume based on the Dimensions shown on the Drawings.

D. Excavation. Excavation will not be separately measured for payment.

E. Excavation - Unsuitable Materials. Excavation to remove materials that are designated by the Engineer as unsuitable for reuse will be measured by the cubic yard from the stripped foundation. Measurement will be based on surveyed cross sections before and after the excavation.

F. Rock Excavation. Rock Excavation will be measured by the cubic yard of rock excavation, as determined by cross sections surveyed before and after the excavation.

G. Other Miscellaneous Excavations. All other excavations will not be measured for payment.

H. Surveys: Construction staking will not be separately measured for payment.

4.2 PAYMENT

A. Stripping. No separate payment will be made for stripping. All costs in connection with this work will be considered incidental to the contract price per cubic yard for Excavation.

B. Topsoil. No separate payment will be made for excavating, windrowing or stockpiling, removing from windrows or stockpiles, spreading, and compacting topsoil. All costs in connection with this work will be considered incidental to the contract lump sum price for Excavation.

C. Unclassified Excavation, measured as specified above, will be paid for at the contract unit price per cubic yard, which price will be payment in full for furnishing all labor, materials, tools, equipment and incidentals, and doing all work necessary to complete Unclassified Excavation, as specified, including mass excavation and finish grading of channel banks and floodplains, to the lines and grades shown on the Drawings.

D. Excavation - Unsuitable Materials, measured as specified above, will be paid for at the contract unit price per cubic yard, which price will be payment in full for furnishing all labor, materials, tools, equipment and incidentals, and doing all work necessary to complete the excavation as specified, including dewatering, all handling of materials, and disposal of unsuitable materials.

E. Rock Excavation, measured as specified above, will be paid for at the contract unit price per cubic yard, which price will be payment in full for furnishing all labor, materials, tools, equipment and incidentals, and doing all work necessary to complete the Rock Excavation as specified, including dewatering, all handling of materials, and disposal of unsuitable materials.

F. No separate payment will be made for other miscellaneous grading incidental to the work. All costs in connection with this work will be considered incidental to the cost of construction of associated improvement.

G. Surveys: No separate payment will be made for surveys or construction staking. All costs in connection with this work will be considered incidental to the contract price per cubic yard for Excavation.

H. Mixing and offhaul of suitable materials for reuse shall be paid for under Engineered Fill, Section 02226.

I. Payment will be made under:

Pay Item	Pay Unit
Unclassified Excavation	Cubic Yard (F)
Excavation – Unsuitable Materials	Cubic Yard
Rock Excavation	Cubic Yard

END OF SECTION

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SECTION 312319
DEWATERING

Paragraph **Page**

SECTION 312319
DEWATERING

1. GENERAL

1.1 DESCRIPTION

A. Furnish all labor, materials, equipment, and incidentals necessary to design, construct, operate, maintain, and remove all cofferdams, flumes shoring, diversions, filtration systems and/or other measures, including pumping, to dewater the construction site and to divert streamflow and other surface waters through or around the project area 24 hours a day during the entire field construction period, as shown on the Drawings, as specified, or as directed by the Engineer.

B. Dewatering details on the Drawings (if provided) are schematic. The design and implementation of the Dewatering Plan is solely the responsibility of the Contractor. Contractor shall make their own independent evaluation of water sources (surface and groundwater) in preparing their Dewatering Plan.

C. Dewatering and diversion shall comply with all project permit conditions, applicable laws and local ordinances.

1.2 RELATED SECTIONS

1. Section 015713.01, Fiber Roll
2. Section 354237, Rock Slope Protection

1.3 SUBMITTALS

A. The Contractor shall submit the following for review and approval of the Engineer:

1. Dewatering Plan listing materials, method of work, equipment to be used, methods for disposal of pumped water, provisions to prevent scour and erosion, and the proposed schedule shall be submitted to the Engineer. Approval of the Engineer shall be required before the Contractor proceeds with water control measures.

2. Product data for:

- pumps
- silt control filter fabric
- washed rock
- impervious liners
- cofferdam material
- other materials used in dewatering

1.4 QUALITY ASSURANCE

A. Comply with all applicable permits and regulations.

B. Comply with approved Erosion and Sediment Control Plan and the Hazardous Materials Control and Spill Prevention Plan, in accordance with Section 01500 paragraph 3.10.

C. Notify Engineer 48 hours in advance of installation of temporary cofferdam(s) or diversion.

D. Notify Engineer 48 hours in advance of removal of temporary cofferdam(s) or diversion.

2. PRODUCTS

2.1 MATERIALS

A. General. The Contractor shall be responsible for sizing and design of temporary cofferdams, well points, pumps, drains, pipes and other diversion and dewatering facilities. Comply with Drawings and regulatory requirements.

B. Imported Rock. Use only clean washed rock. Other materials, if used, shall be removed from river channel when dewatering work is complete.

C. Dewatering Facilities. Provide and operate dewatering facilities of suitable size and capacity. The use of equipment shall be consistent with the manufacturer's recommendations.

3. EXECUTION

3.1 GENERAL

A. Contractor is solely responsible for the design, construction, and maintenance and monitoring of the diversion and dewatering facilities. Comply with the Drawings, Specifications, and applicable permit conditions.

3.2 FISH REMOVAL

A. Fish relocation to be provided by others (NIC). Provide the Owner 72 hours notice prior to dewatering operations to allow for removal of fish from the project area. Coordinate work with fish relocation experts.

3.3 SEDIMENT CONTROL

A. General. Comply with Section 401 Water Quality Certification.

B. Materials. Earthen materials shall not be used within the flowing channel, with the exception of clean, washed rock.

C. Cofferdam Construction. During construction of the cofferdam, install silt barrier(s) along the water side of the installation, as necessary to minimize mobilization and entrainment of

disturbed soils within the active flowing channel, to a level in accordance with the permit conditions.

D. Discharge of Seepage/Groundwater. Discharge of water from the dewatered construction site, either by gravity or pumping, shall be performed in a manner to prevent excessive turbidity from entering Milk Creek and to prevent scour and erosion outside of the construction site. Pumped water should be prefiltered with sand/gravel pack around sumps for subsurface flows and a silt fence or hay bales around pumps for surface flow. Pumped water shall be discharged into adjacent gravel bars, isolated local depressions, or temporary sediment basins.. Where water to be discharged into the river will create excessive turbidity, the water shall be routed through a sediment interceptor or other facilities to remove sediment from water.

E. Isolation of Construction Area. Place silt fences, hay bale barriers, or cofferdams between construction area and flowing river channel, at all locations.

3.4 HAZARDOUS MATERIAL CONTROL

A. General. Comply with the approved Hazardous Materials Control and Spill Prevention Plan (HMC&SPP) in accordance with Construction Facilities and Temporary Controls, Section 01500.

B. Equipment and Lubricants. Steam-clean all equipment prior to its use. Inspect all equipment for cleanliness and fluid leaks prior to use and monitor during its use. Maintain equipment as required. Equipment refueling shall only take place in a designated, contained area.

C. Isolation of Construction Area. Prior to performing work within flowing water, outside of cofferdams, install oil containment booms downstream of the work area. Maintain booms until completion of the work within the channel is complete.

D. Spills. Maintain a supply of oil spill booms, sorbent pads, and other supplies to contain and clean spills. Comply with approved HMC&SPP should spills occur.

3.5 COFFERDAMS

A. General. The Contractor is solely responsible for the design, construction, maintenance, and monitoring of cofferdams, dikes and other isolation facilities. Cofferdams with an exposed height greater than 10 feet shall be designed by a Professional Engineer registered in the State of California, based on available soil data.

B. Configuration. Cofferdam alignments, as shown on the Drawings, reflect the maximum allowable encroachment into the channel. Construct cofferdam alignments as shown or the Drawings, unless otherwise approved by Engineer. Provide cofferdams high enough to account for water surface fluctuations.

C. Secondary Dikes/Seepage Control. Secondary dikes within the isolated construction area can be used to control seepage and groundwater around excavations, provided all dike materials are removed from the exposed channel upon completion, prior to re-watering the work area.

3.6 FLOW BYPASS

A. Capacity. Bypass water around construction site using a cofferdam and bypass pipe as shown on the Drawings or equivalent facility, as approved by the Engineer. The bypass system shall be capable of passing the flows present at the time construction begins, with a minimum of 12 inches of freeboard (measured vertically from water surface to lowest point on dam). Bypass pipes shall have a minimum diameter of 10 inches to minimize the likelihood of clogging by debris.

B. Storm Events. During the designated period for instream work, the Contractor shall be solely responsible for the integrity of the dewatering system. If rain is predicted, the Contractor shall perform flood fighting activities as directed by the Engineer and regulatory agencies.

C. The diversion system may require adjustment to accommodate the sequence of work. No additional compensation shall be provided for any adjustments, revisions, or reinstallations of diversion elements.

D. The diversion shall result in conditions that allow the required compaction to be achieved and shall prevent sediment-laden water that exceeds the effluent discharge limits from entering the drainage ways.

E. Unless otherwise specified, a diversion must discharge into the same natural drainage way in which its headworks are located.

3.7 DEWATERING

A. General. Remove water from construction area using pumping, well points, drains, or other approved methods. Discharge of water shall comply with 3.3.D. Construction water shall be segregated from seepage water and routed through sediment interceptors or other facilities to remove contaminants and sediment. Excavated slopes in the saturated soils may need to be retained, tied back, or otherwise stabilized.

B. Well Points. Well points shall be designed to preclude the loss of fine soil by sand/gravel packing or other suitable means.

C. Pumping Facilities. Pumps and discharge piping shall be suitable for the type of service provided and shall be a sufficient size and capacity to satisfactorily dewater work areas. Engines shall be muffled to avoid excess noise and pump intakes shall be fitted with screens as required.

D. Power Supply. Contractor shall consider the availability and reliability of power sources for dewatering operation in dewatering system design, and make provisions for temporary or backup power supply as deemed necessary. Where the primary diversion is operated by pumping, a backup system shall be provided with automatic controls capable of starting the backup upon failure of the primary system.

E. Groundwater. Dewatering shall maintain water surfaces below the base of temporary excavations or trenches, to allow for visual inspection of the work, if requested by the Engineer.

Lower groundwater tables within excavations for structures to a minimum of two (2) feet below foundations or as otherwise required to establish a firm, stable foundation. Control groundwater within excavation until completion of backfill operations.

3.8 WATER LEVELS DURING THE CONSTRUCTION PERIOD

A. The Contractor shall be responsible for making an independent evaluation of site conditions. The Contractor's dewatering plan shall address all potential sources of surface and groundwater, including but not limited to streamflow (natural or managed), backwatering of the channel from downstream blockages, domestic water lines, storm drain outfalls, irrigation tailwater, industrial discharges, seepage, and direct rainfall.

3.9 CLEANUP

A. Prior to removal of the dewatering facilities, thoroughly cleanup area to remove debris and contaminated materials. Remove fine sediments and restore disturbed area. Clean, round, river run gravels or cobbles, if used in cofferdam construction, may be spread in the creek channel in lieu of removal, provided grading will not interfere with facility operation.

3.10 REMOVAL OF DEWATERING FACILITIES

A. Prior to removal of the dewatering facilities, complete the following activities:

1. Complete required tests and inspections.
2. Thoroughly cleanup work site.
3. Perform final walkthrough with Engineer.

B. Prior to removal of cofferdams and diversion, equalize the water surface levels on both sides of the dams.

3.11 REMOVAL OF BLOCK NETS

A. Block Nets shall be removed by the fisheries biologist after the dewatering facilities are removed and the in channel work area is re-watered (NIC).

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Dewatering will not be separately measured for payment.

4.2 PAYMENT

A. Dewatering will be paid for at the lump sum contract price for Dewatering, which price will include payment in full for furnishing all labor, materials, tools, equipment, and incidentals necessary to complete the dewatering operations, as specified, including temporary

cofferdams, pumping, silt control, filter fabric, sediment control, erosion control, removal of muck, disposal of materials, and removal of dewatering facilities.

Pay Item	Pay Unit
Dewatering	Lump Sum

END OF SECTION

SECTION 312323
ENGINEERED FILL

SECTION 312323
ENGINEERED FILL

1. GENERAL

1.1 DESCRIPTION

A. The work covered by this section consists of furnishing all plant, labor, and materials, and performing all operations necessary for the construction of Engineered fills (unless separately designated elsewhere), including surveying, salvage of topsoil, subgrade preparation, furnishing, loading, and on-site and off-site hauling of materials, processing, screening placement and compaction of Engineered Fill materials, construction of ramps, and other incidental earthwork as may be necessary to complete the Engineered Fills, as shown on the Drawings, as specified, or as otherwise directed by the Engineer.

B. All grading shall comply with Section 00300 of the Standard Specifications. It shall be the responsibility of the Contractor to visit the site and make his own interpretations with regard to materials, methods and equipment necessary to perform the work required for this project.

C. Temporary erosion control and BMP's shall be installed and approved by the Engineer prior to beginning Engineered Fill Construction.

D. The Contractor is responsible to locate, identify, and protect all existing utilities from damage.

1.2 RELATED SECTIONS

1. Section 312316, Stripping and Excavation
2. Section 311100, Clearing and Grubbing

1.3 REFERENCES

A. American Society for Testing of Materials (ASTM) Standards:

D1556	Test Method for Density of Soil in Place by the Sand Cone Method
D1557	Test Method for Moisture-Density Relations of Soils and Soil-Aggregate Moistures Using 10 lb (4.54 kg) Rammer and 18-inch (457 mm) Drop
D2974	Test Method for the Organic Content of Soils
D2922	Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth)
D3017	Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shall Depth)
D4318	Test Method for the Liquid Limit and Plastic Limit of Soils
D422C	Particle-Size Analysis of Soils

B. Oregon Standard Specifications for Construction, Oregon Department of Transportation, current edition.

C. Surveys. All construction staking shall be performed by the Contractor. Survey control points are shown on the Drawings.

2. PRODUCTS

2.1 MATERIALS

A. Engineered Fill Materials. To the extent they are needed, all suitable materials from the specified excavations shall be used in the construction of required permanent engineered fill. The suitability of materials for specific purposes will be subject to the approval of the Engineer, in conformance with these specifications. Materials used for engineered fill shall conform to the quality and gradation requirements as follows:

1. less than 3% organic material;
2. shall contain no rock or clods greater than 12 inches in diameter;
3. no more than 15 percent larger than 2 ½ inches;
4. The material should be predominantly granular
5. with a plasticity index of less than 15
6. liquid limit less than 35
7. not more than 15 percent passing the #200 sieve
8. shall contain no sod, brush, roots, or other perishable or unsuitable material, and
9. shall be approved by the Engineer prior to use.

B. Surplus Materials. All surplus or unsuitable excavated materials will be designated as waste and shall be disposed in accordance with Section 312316, Excavation.

C. Imported Engineered Fill. Importing of Engineered Fill material, if necessary or required to meet the grades and elevations shown on the plans, shall be considered included in the Contractor's bid for the various items of work involved and no additional compensation will be made therefore. Should such imported material be required, the Contractor shall notify the Engineer of the borrow site location at least 72 hours in advance, and provide an adequate sample size so the Engineer can verify the suitability of the material. All imported materials shall be proposed by the Contractor in writing in accordance with the submittal requirements of these Special Provisions and the Standard Specifications. The Contractor shall perform and/or submit all material testing reports and other data as necessary to provide the Engineer with established laboratory values for optimum moisture and maximum dry density, for any imported material requiring density testing. Any proposed engineered fill that deviates from the criteria stated herein, shall have written acceptance from the Engineer and geotechnical engineer prior to import or placement in the work.

D. If a disagreement between the Contractor and the Engineer occurs over the suitability of materials, the Contractor shall perform laboratory testing to demonstrate compliance with the specifications. The failure of the Contractor to perform the testing shall not relieve the Contractor from the obligation to provide suitable materials.

3. EXECUTION

3.1 ENGINEERED FILL CONSTRUCTION

A. General. Compacted Engineered Fill in Engineered Fills shall be placed in the dry and compacted as specified herein.

B. The Contractor is only permitted to use “low impact equipment” within the floodplain areas for completion of this work.

C. Subgrade Preparation. Following Clearing and Grubbing, the subgrade surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill and loosened to a minimum depth of 2 inches. The moisture content of the loosened material shall be controlled as specified for the Engineered Fill, and the surface materials of the subgrade shall be compacted and bonded with the first layer of Engineered Fill.

D. Earth abutment surfaces shall be free of loose, uncompacted earth in excess of two inches in depth normal to the slope and shall be at such a moisture content that the Engineered Fill can be compacted against them to ensure a good bond between the fill and the abutments. Subgrade and abutment surfaces shall not be steeper than 1 horizontal to 1 vertical. The sites of the borrow area shall be stripped to sufficient depth to remove all vegetation, roots, brush, sod and other objectionable material. Clearing and disposal methods shall be in accordance with applicable state and county laws with due regards to the safety of persons and property. Fill shall not be placed until the required excavation and subgrade preparation has been completed.

E. Fill shall not be placed on or in standing water, nor upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the fill.

F. If soft, wet, or pumping subgrade soils are present, the required minimum level of compaction for the initial fill lift may be adjusted to eighty-five percent (85%) of the soil’s maximum dry density as determined in accordance with ASTM D 1557, subject to approval of the Engineer. The intent of the reduction is to limit the amount of construction traffic that could lead to further deterioration and destabilization of the exposed subgrade and to build a more stable pad upon which to place subsequent fill lifts.

G. Horizontal Layer Construction. The compacted Engineered Fill shall be constructed to a sufficient section so as to achieve the required compaction throughout the finished section. Materials to be compacted shall be placed or spread in layers not more than eight (8) inches in loose thickness prior to compaction. Materials excavated to form keyways or over-excavations, and suitable for use as Engineered Fill, shall be blended uniformly with other excavated soils or disposed of. All fill placed on slopes steeper than 5 horizontal to 1 vertical shall be keyed and benched as specified in Section 00300 of the Standard Specifications. If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified parallel to the axis of the fill to a depth of not less than 2 inches before the next layer is placed. Fill placed around structures will be brought up at approximately uniform height on all sides of the structure.

H. Compaction. When, in the opinion of the State’s Representative, the surface of any compacted layer is too smooth to bond properly with the succeeding layer, it shall be scarified to a depth of 6 inches before the succeeding layer is placed thereon. The

degree of compaction required is expressed as a percentage of the maximum dry density, based on laboratory test procedure, ASTM D 1557. The Engineered Fill shall be compacted to a minimum of 90% of the maximum dry density, unless otherwise specified herein or directed by the Engineer. Construction equipment shall be operated over each layer of fill to ensure that the required compaction is obtained. Special equipment shall be used if needed to obtain the required compaction. Heavy compaction equipment shall not be operated within 2 feet of any structure. Fill adjacent to structures, pipe, conduits, and anti-seep collars shall be compacted to a density equivalent to that of the surrounding fill by means of hand tampers or plate vibrators. Hand directed tampers or compactors shall be used on areas not accessible to heavy compaction equipment, fills compacted in this manner shall be placed in layers not greater than 4 inches in thickness before compaction, and shall meet the same density requirement as for the adjacent area. All compaction testing shall be performed by the Owner, unless otherwise noted. The cost of re-testing of areas that have failed to meet specified compaction requirements shall be borne by the Contractor.

I. At the discretion of the Engineer, the top 18 inches of fill, within areas specified to receive revegetation treatments, may be compacted to between 80% and 85% of the maximum dry density, to facilitate plant establishment. Prior to seeding, the surface shall be prepared as specified in Section 329200, Seeding.

J. Compaction of backfill adjacent to structures shall not be started until after the expiration of the following minimum time interval after placement of the concrete:

1. Counterforts, vertical or near-vertical	
2. walls with earth loading on one side only	14 days
3. Walls and counterforts, backfilled on both	
4. sides simultaneously	7 days
5. Anti-seep, collars, conduits,	
6. and cantilever outlet bents	3 days

K. Moisture Control. The moisture content required is expressed as a percentage, based on laboratory test procedure ASTM D 1557. The moisture shall be uniformly distributed throughout the layer prior to compaction and shall be at least 1% above the optimum moisture content. If the material is not within the required moisture content, the Contractor will be required to moisture condition the soil. The moisture conditioning of fill materials shall be performed prior to placement in the section. The final minor moisture conditioning may be made on the fill, as required. Harrowing, or other approved methods will be required to work the moisture into the material until a uniform distribution of moisture is obtained. Water applied on a layer of fill shall be accurately controlled in amount and distribution so that free water will not appear on the surface during or subsequent to rolling. If the material is too wet for proper compaction or soft and yielding sub-grade is experienced (pumping), the Contractor will be required to aerate the material to a moisture content within the desired limits prior to compaction. If the top surface of the preceding layer of compacted fill or a subgrade or abutment surface in the zone of contact with the fill becomes too dry to permit suitable bond, it shall either be removed or scarified and moistened to an acceptable moisture content prior to placement of the next layer of fill.

L. Dressing. Engineered Fill slopes shall be dressed by over-building and cutting back to the required grade. The Contractor may compact the shoulder of each lift during the

placement of fill materials to assist in the subsequent dressing of the slopes.

3.2 CROSS SECTIONS AND ZONING OF MATERIALS

A. Standard Engineered Fill Sections. The dimensions, slopes, and zoning of materials shall conform to the sections shown on the Drawings and specified herein.

B. Zoning of Materials. Unless otherwise specified, the Engineered Fill materials shall be homogeneous. The Engineered Fill shall be free of pockets, lenses, streaks, layers, etc. of different materials.

3.3 FINISH

A. The finished grades shall transition naturally into adjacent existing grades to provide a functional and naturalistic finished surface. Due to the complex nature of the project and the desired aesthetic and functional features, not all details can be accurately represented on the Drawings. As a result, the Contractor may be directed by the Engineer to make minor adjustments to finish grades to best achieve these results. These adjustments may include smoothing or rounding conforms, or changing slope angles or daylight points as necessary to conform to the variable geometry inherent in natural topography. Compensation for this work shall be considered as included in the price paid for the various contract items of work involved, and no additional compensation will be allowed.

B. After the placement of the engineered fills and spoils, the sides and top shall be dressed by final passage of compaction equipment or by dragging to give a smooth surface. The surface area shall be graded to provide surface drainage to flow to desired locations.

3.4 ROADS AND RAMPS

A. Maintain Access. At locations where access roads to existing facilities are destroyed because of the work required under this contract, the Contractor shall provide temporary roads, if directed by the Engineer, to give access to fields and buildings during the construction period. Such facilities shall be removed to the extent required by the Engineer.

B. Temporary Haul Roads. Temporary haul roads shall be constructed as required to transport materials from borrow source or excavation to Engineered Fill site. Temporary ramps to be constructed for the Contractors convenience need not comply with these foundation preparation and Engineered Fill construction requirements. Unless otherwise directed by the Engineer, temporary ramps shall be removed prior to completion of the work.

3.5 GRADE TOLERANCES

A. Engineered Fill:

1. General. Engineered Fills shall be constructed to the net grade and cross section shown on the Drawings.
2. Grade Tolerances. At all points a tolerance of 0.2 (two-tenths) foot above, and 0.1 (zero) foot below the prescribed grade will be permitted in the final dressing, provided that any excess material is so distributed that the crown of the Engineered Fill drains in the desired direction and that there are no abrupt humps or depressions in surfaces. However, this tolerance above grade may be modified at locations where, in the opinion

of the Engineer, such modifications will not impair the design or appearance of the project.

3.6 SLIDES

A. In the event of the sliding of any part of the Engineered Fill during its construction, or during the one year period after acceptance, the Contractor shall, upon written order of the Engineer, cut out and remove the slide and then rebuild that portion of the Engineered Fill.

3.7 SPECIAL MEASURES

A. Measures and construction methods shall be incorporated as needed and practical that enhances fish and wildlife values. Special attention shall be given to protecting visual resources and maintaining key shade, food, and den trees.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Measurement. Engineered Fill will not be separately measured for payment.

4.2 PAYMENT

A. No separate payment will be made for Engineered Fill. Full compensation for all costs associated with this Work, as shown on the Drawings, or as specified herein, shall be included in the lump sum Contract Price for base bid items.

B. No payment will be made for the Engineered Fill foundation preparation, shrinkage of material or materials placed above the net grades and slopes as allowance for shrinkage.

C. No payment will be made for construction or removal of temporary roads or ramps.

D. No additional payment will be made for costs associated with stabilizing unstable materials. The cost for this work shall be included in contract Lump Sum price for compacted Engineered Fill.

END OF SECTION

SECTION 313519.16
SLOPE PROTECTION FABRIC

SECTION 313519.16
SLOPE PROTECTION FABRIC

1. GENERAL

1.1 DESCRIPTION

A. Work under this section includes furnishing all labor, materials, equipment, and incidentals to install and maintain Slope Protection Fabric to protect newly constructed or excavated and seeded soil slopes, as shown on the Drawings, and as specified herein, or as otherwise directed by the Engineer.

1.2 RELATED SECTIONS

1. Section 015000, Mobilization
2. Section 312316, Excavation
3. Section 015713.01, Fiber Rolls

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. D 1117 – Standard Guide for Evaluating Nonwoven Fabrics
2. D 6241 - Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe
3. D 6475 - Test Method for Measuring Mass Per Unit Area of Erosion Control Blankets.
4. D 6525 - Standard Test Method for Measuring Nominal Thickness of Rolled Erosion Control Products.
5. D 6567 – Standard Test Method for Measuring the Light Penetration of a Turf Reinforcement Mat (TRM)
6. D 6818 - Standard Test Method for Ultimate Tensile Properties of Rolled Erosion Control Products

1.4 SUBMITTALS

A. Submit to the Engineer, for review and approval, the following manufacturer's data and certification's:

1. A certificate stating the name of the Slope Protection Fabric manufacturer, product name, style, chemical compositions of filaments or yarns and other pertinent information to fully describe the geotextile.
2. A certificate stating that the furnished products meet requirements of the Specification as evaluated under the manufacturer's quality control program. The certificate shall be attested to by a person having legal authority to bind the Manufacturer.

B. Independent Performance Test Results shall be provided upon request.

C. The Manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the Specification. Documentation describing the quality control program shall be made available upon request.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Slope Protection Fabric labeling, shipment and storage shall follow ASTM D 4873.

B. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.

C. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

D. Each Slope Protection Fabric roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants.

E. The protective wrapping shall be maintained during periods of shipment and storage.

F. During storage, Slope Protection Fabric rolls shall be elevated off the ground and adequately covered to protect them from the following: Site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperatures in excess of 71 deg C (160 deg F)m and any other environmental condition that might damage the Slope Protection Fabric.

1.6 QUALITY ASSURANCE

A. Slope Protection Fabric shall be subject to sampling and testing to verify conformance with this Specification. Sampling for testing shall be in accordance with ASTM D 4354.

B. Acceptance shall be in accordance with ASTM D 4759 based on testing of either conformance samples obtained using Procedure A of ASTM D 4354, or based on manufacturer's certifications and testing of quality control samples obtained using Procedure B of ASTM D 4354.

C. Sewn Seams (if required):

1. For seams that are to be sewn in the field, the Contractor shall provide at least a 2 meter (six-foot) length of sewn seam for sampling by the Engineer before the geotextile is installed.
2. For seams that are sewn in the factory, the Engineer shall obtain samples of the factory seams at random from a roll of geotextile that is to be used on the project.
3. If seams are to be sewn in both directions, samples of seams from both directions shall be provided.
4. For seams that are field sewn, the seams sewn for sampling shall be sewn using the same equipment and procedures as will be used for the production seams.
5. The seam assembly description shall be submitted by the Contractor along with the sample of the seam. The description shall include the seam type, sewing thread, and stitch density.

2. PRODUCTS

2.1 SLOPE PROTECTION FABRIC

A. Fabric. Slope Protection Fabric shall be North American Green C700BN, or equivalent, meeting the following Specifications:

B. The Slope Protection Fabric shall meet requirements established by the Erosion Control Technology Council (ECTC) Specification and the U.S. Department of Transportation, Federal Highway Administration's (FHWA) Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-03 2003 Section 713.17 as a Type 4, Long-term Erosion Control Blanket.

C. Slope Protection Fabric shall be a long-term erosion control blanket, constructed of 100% biodegradable materials containing a 100% coconut fiber matrix, with a functional longevity of up to 36 months and a permissible shear stress greater than 2.25 pounds per square foot. The coconut fiber shall be evenly distributed over the entire area of the blanket. The blanket shall be covered on the top side with a 60 x 50 woven coir fiber netting with mesh openings not to exceed 0.75 in. x 0.75 in. The blanket shall be covered on the bottom with 100% biodegradable natural organic fiber jute netting woven into an approximate 0.50 x 1.00 inch (1.27 x 2.54 cm) mesh. The blanket shall be sewn together with biodegradable thread on 1.50 inch (3.81 cm) centers.

Property	**Test Method**	**Typical**
Thickness	ASTM D5199/ECTC	0.56 in (14.2 mm)
Mass per Unit Area	ASTM D6475	26.61 oz/yd² (903 g/m²)
Water Absorption	ASTM D1117/ECTC	186.8%
Swell	ECTC Guidelines	35%
Light Penetration	ECTC Guidelines	14.9%
MD Tensile Strength	ASTM D6818 ASTM D6818	1271 lbs/ft (18.84 kN/m) MD Elongation 38.7%
TD Tensile Strength	ASTM D6818	834 lbs/ft (12.34 kN/m)
TD Elongation	ASTM D6818	41.1%

**Material is smolder resistant according to specified test

MD – Machine Direction

TD – Transverse Direction

2.2 STAKES

A. Stakes shall be shaped hardwood pins designed to safely and effectively secure the slope stabilization fabric. The wood stake must exhibit ample rigidity to enable being driven into hard ground, with sufficient flexibility to resist breakage. The wood stake shall be the North American Green Eco-Stake or approved equal, with the following dimensions:

Leg Length:	11.00 in
Head Width:	1.25 in.
Head Thickness:	0.40 in.
Leg Width:	0.60 in. (tapered to a point)
Leg Thickness	0.40 in.
Total Length:	12.0 in

EXECUTION

2.3 PREPARATION

A. Grade and compact areas to be treated with Slope Protection Fabric as specified or as directed by Engineer.

B. Remove large rocks, soil clods, vegetation, and other sharp objects that could keep Slope Protection Fabric from intimate contact with subgrade.

C. Prepare seedbed by loosening 50 to 75 mm (two to three inches) of soil above final grade.

D. Select and apply soil amendments, fertilizer, and seed in accordance with Section 329200 to scarified surface prior to installation of Slope Protection Fabric.

E. Construct 150 x 150 mm (six-inch x 6-inch) anchor trench at top of slope.

2.4 INSTALLATION

A. Install Slope Protection Fabric at elevation and alignment indicated.

B. Extend Slope Protection Fabric two to three feet over crest of slope, secure into a six-inch x six-inch trench with a row of staples/stakes approximately 12 inches apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to compacted soil and fold remaining 12 inch portion of Slope Protection Fabric's back over seed and compacted soil. Secure Slope Protection Fabric over compacted soil with a row of staples/stakes spaced approximately 12 inches apart across the width of the Slope Protection Fabric . Embed the entire perimeter within a key trench.

C. Unroll Slope Protection Fabric downslope. Consecutive rolls spliced down the slope must be placed end over end (shingle style) with an approximate three inches overlap. Staple through overlapped area, approximately 12 inches apart across entire Slope Protection Fabric's width.

D. Secure Slope Protection Fabric to slope with ground anchoring devices in accordance with the manufacturer's recommendations for the application (slope or channel).

E. Where Slope Protection Fabric abuts against rock slope protection or other rock placements, the Slope Protection Fabric shall be placed under the first course of adjacent rock and also staked per section 2.4d.

F. Alternate installation methods must be approved by Engineer prior to execution.

2.5 INSPECTION AND MAINTENANCE

A. The Contractor shall inspect Slope Protection Fabric immediately after each rainfall, and at least daily during prolonged rainfall. Any deficiencies shall be immediately corrected by the Contractor.

B. The Contractor shall also make a daily review of the location of Slope Protection Fabric in areas where construction activities have altered the natural contour and drainage runoff to ensure that the Slope Protection Fabric is properly located for effectiveness. Where deficiencies exist as determined by the Engineer, repairs or replacement shall be performed as directed by the Engineer.

C. Damaged or otherwise ineffective Slope Protection Fabric shall be repaired or replaced promptly.

3. MEASUREMENT AND PAYMENT

3.1 MEASUREMENT

A. Slope Protection Fabric will be measured by the square yard of slope protection fabric installed in accordance with the Drawings, as specified, or as directed by the Engineer. Measurements will be taken parallel to the finished surface. No additional payment will be made for seams, overlaps, anchor trenches, or wastage.

3.2 PAYMENT

A. Slope Protection Fabric will be paid for at the contract unit price per square yard, which price will be payment in full for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing fabric, complete in place, including trench excavation and backfill, and maintenance, as shown on the Drawings, as specified herein, or as directed by the Engineer.

Pay Item	Pay Unit
Slope Protection Fabric	Square Yard

END OF SECTION

INDEX
SECTION 329200
SEEDING

Paragraph **Page**

SECTION 329200
SEEDING

1. GENERAL

1.1 DESCRIPTION

A. Work covered under this section consists of furnishing all labor, tools, materials, equipment and incidentals required to perform Seeding, as specified, as shown on the Drawings, or as directed by the Engineer.

1.2 RELATED WORK

A. The work described under this section is related to the following sections of the Specifications:

1. Section 312316, Excavation

1.3 SUBMITTALS

A. Submit to the Engineer, for review, the following:

1. List of origin/collection location for each seed species
2. A representative one-ounce sample of each seed mixture supplied for the job, labeled as to content, purity, and germination percentage.
3. Duplicate copies of invoices for all materials. Invoices for fertilizer shall show the grade furnished.

1.4 QUALITY ASSURANCE

A. All seed shall be labeled in accordance with the Oregon Food and Agricultural Code and shall be delivered to the site in sealed individual, unmixed bags with the vendor's certificate attached. Seed shall be sampled and tested in accordance with the State Standard Specifications Section 01030. Seed treated with mercury compounds shall not be used.

B. Fertilizer shall be delivered in containers labeled in accordance with applicable state regulations and bearing the warranty of the producer for the grade furnished.

C. Seed which has become wet, moldy, or otherwise damaged in transit or in storage, will not be acceptable.

2. PRODUCTS

2.1 MATERIALS

A. Quantities shown on the Drawings represent pure live seed (pls).

B. Seed shall be mixed on-site in the presence of the Engineer. At no time shall the seed mix contain noxious weed seed. Seed shall be maintained in optimal health and be protected at all times from animal damage; vandalism; inclement weather conditions, including drought, wind, and frost; toxic water; sunlight; moisture; or contact with vehicles, equipment, and tools and any other conditions that would damage or reduce the viability of the seed.

C. Seed Mix. The seed mix and application rates are as shown on the Drawings. No substitutions are allowed without written consent of the Engineer.

D. Straw Mulch. Straw mulch shall be derived from wheat or barley. The Contractor shall furnish evidence that clearance has been obtained from the County Agricultural Commissioner, as required by law, before straw obtained from outside the county in which it is to be used is delivered to the site of the work. Straw that has been used for stable bedding shall not be used. Straw shall be free of mold. Straw shall be cured and dry with no water added after baling. Source must meet or exceed state certification standards for "weed free"

E. Water. Water shall be furnished by the Contractor and shall be free of chemicals detrimental to the seed mixture.

3. EXECUTION

3.1 PREPARATION

A. General. Seed the areas disturbed by construction activities, as specified herein or as directed by the Engineer.

B. Debris Removal. Prior to ground surface preparation operations remove and dispose of all wire, rubbish, stones, and other material which might hinder proper grading, and subsequent maintenance.

C. Surface Preparation. Surfaces which are too hard or smooth to accept the seeding, as determined by the Engineer, shall be broken up to a minimum depth of 6 inches, by disking or other methods approved by the Engineer, until the condition of the soil is acceptable. When conditions are such, by reason of excessive moisture or other factors, that satisfactory results are not likely to be obtained, the work shall be stopped and shall be resumed only when directed. Slopes in excess of 25% shall be prepared by track-walking or equivalent method approved by the Engineer.

3.2 APPLICATION OF SEED

A. Existing Features. During seeding operations, care shall be taken to avoid damaging existing facilities, vegetation to remain, or any other items on or around the planting areas.

B. Seeding Areas: Apply seed to areas indicated on the Drawings, or as directed by the Engineer

C. Time of Seeding: Perform all seeding immediately following completion of construction activities, no later than October 1st of the year construction begins. The seeding operation shall be halted when, in the opinion of the Engineer, conditions of high winds, excessive moisture or other factors are not conducive to satisfactory results. Upon written request of the Contractor, and upon written approval of the Engineer, seeding may be done during off seasons provided that:

1. The resulting stand of grass shall be at least equal to the stand that might be expected from planting during the normal season; and
2. The establishment period shall be lengthened, as required, to produce the above specified stand at no additional cost to the Owner.
3. Perform seeding prior to placement of erosion control fabric, where erosion control fabric is specified.

D. Method of Seeding: Seeding may be performed mechanically in a dry condition.

E. Broadcast Seeding. Broadcast seeding may be used in lieu of hydro-seeding or to reseed any previously hydro-seeded areas disturbed during planting operations. Seed shall be dry-applied by the following method:

1. Broadcast seed and fertilizer (if specified), at the rates specified on the Drawings, uniformly by hand, mechanical hand seeder, combination seed spreader and cultipacker, or other approved equipment. Where seed is broadcast by hand or mechanical hand seeder, half the seed shall be sown with the sower moving in one direction, and the remainder sown with the sower moving at right angles to the first sowing. Broadcast seeding shall not be done during windy weather.
2. Rake seed into the soil to achieve a sowing depth of approximately 1/8 inch to 1/4 inch.
3. Following the application of seed, straw mulch shall be pneumatically applied or hand broadcast at the rate of 3,000 pounds per acre (typically 1.5 to 2 tons/acre), where erosion control fabric is not specified, and 500 lbs for acre where erosion control fabric will be used.

3.3 REPAIR

A. General. When any portion of the ground surface becomes gullied or otherwise damaged following seeding within the period of Contractor's responsibility, repair the affected portion to re-establish the condition and grade of the soil prior to planting and then reseed as specified for initial planting, all at no cost to the Owner.

B. Reseeding. When it becomes evident that the seeding has been unsuccessful, the Engineer will require that these areas be reseeded with the same seed and quantity as specified for the initial seeding. Complete reseeding within fifteen (15) days following notification and these areas shall be maintained by watering, as specified above, until the successful grass is

established. Prepare the area to be reseeded as directed by the Engineer, to receive the reseeding.

3.4 FIELD QUALITY CONTROL

A. During the course of work or upon completion of the project, a check of the quantities of materials will be made against the areas treated, and if the minimum rates of application have not been met, the Engineer will require the distribution of additional quantities of those materials to make up the minimum applications specified.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Seeding will be measured on a per acre basis for each acre of native seed mix furnished and installed by the Contractor and approved by the Engineer (as shown on the Drawings).

B. Areas disturbed by the Contractor and requiring seeding outside the designated limits of disturbance shall not be measured for payment.

4.2 PAYMENT

A. Seeding will be paid for at the contract unit price for each acre seeded, which price will include furnishing all labor, materials, tools, equipment, and incidentals necessary to complete the Seeding as specified, as shown on the Drawings, or as directed by the Engineer.

B. The cost of seeding areas outside the designated limits of disturbance shall be solely borne by the Contractor.

C. Payment will be made under:

Pay Item	Pay Unit
Seeding	Acre

END OF SECTION

INDEX
SECTION 329300
PLANTING

SECTION 329300

PLANTING

1. GENERAL

1.1 DESCRIPTION

A. The work required under this Section shall include, but is not limited to, all labor, tools, materials, equipment and incidentals required to supply and install all of the plants and appurtenances, as shown on the Drawings, described in these Specifications or as directed by the Engineer.

B. The intent of the Planting Plan is to establish persistent native plants growing within the vegetation types shown on the Drawings, and described in these Specifications, by the end of the maintenance period.

C. Fees. The Contractor shall pay all fees associated with the plant installation, testing and operation and maintenance, including plant replacements after the initial installation.

1.2 RELATED SECTIONS

A. The work described under this Section is related to the following Sections of the Specifications:

1. Section 313519.16, Slope Protection Fabric
2. Section 354237, Stream Substrate
3. Section 329219, Seeding

1.3 Submittals

A. Provide written description and map of the willow stake collection area to be used to harvest willow stakes for the project.

1.4 Quality Assurance

A. Proper Installation. The Contractor shall be responsible for proper installation of the native plants to ensure healthy and vigorous growth and development according to the Plans, these Specifications and the Engineer's direction.

B. Substitutions. No materials substitutions will be allowed without approval from the Engineer.

C. Responsibility. If plants are damaged before or during installation, the Contractor shall be responsible for purchasing, securing, and paying all associated costs for replacement plants of the same watershed, species and size, unless otherwise approved by the Engineer.

D. Reference. All work required under this Section and on the Drawings shall be conducted in conformance to the ODOT Specifications, latest edition.

E. Willows. ASTM International. (2003). D6765-02 Standard Practice for Live Staking.

2. PRODUCTS

2.1 GENERAL

A. Delivery. All materials and equipment delivered to the job site shall be clearly marked to identify the item or the materials. All materials shall be new and installed in accordance with the Drawings and the Specifications.

B. Handling. The Contractor shall ensure that the plants and planting supplies are not damaged at any time. After acceptance by the Engineer, handling and storage of the plants and bulk materials delivered to the site shall become the responsibility of the Contractor.

C. Plants Storage. Plants shall be maintained in optimal health and be protected at all times from animal damage; vandalism; inclement weather conditions, including drought, wind, and frost; toxic water; sunlight; moisture; or contact with vehicles, equipment, and tools and any other conditions that would damage or reduce the viability of the plants. Plants may be stored on the site in the Contractor's staging area provided a temporary fence is erected for plant protection. Shade, frost, and wind protection may be used if necessary to protect the health of the plants. Plants shall be maintained moist at all times before planting and shall be completely watered 1- hour or less before installation and shall be moist when installed.

2.2 MATERIALS

A. Willow Stakes. Willow stakes are woody plant cuttings, capable of rooting, that are taken from trees and shrubs. All plant materials must be top quality stock. Plant materials shall be of the Salix genus. They shall be sound, healthy specimens and first-class representatives of their species. Plant materials that have serious injuries, insect pests, diseases or are shriveled will be rejected. Willow stakes shall be cut from approved sources using a sharp tool. Live willow stakes shall be from 5 to 8 ft in length with a basal end of 1.5 to 2.5 in. in diameter. The top ends shall be blunt; butt ends shall be angled at 45 degrees. Stakes shall be stripped of all stems and leaves, taking care to minimize scarring or bruising of the willow stakes.

2.3 GENERAL

A. Drawings. The Drawings are partially diagrammatic for graphic clarity and, therefore, do not show the exact individual planting locations for each species to be installed. The Contractor shall be responsible for the installation of all of the plants at the typical

spacing and layouts shown on the Drawings and described in these Specifications, and as directed by the Engineer.

B. Schedule. The Contractor's strict conformance to the Project schedule is essential for the success of this Project. Unless otherwise directed by the Engineer, planting shall be conducted from September 1 through October 1. Planting shall not occur in saturated soils or while heavy rain is falling.

C. Disturbed areas. Do not disturb areas outside of the designated limits of disturbance, unless authorized in writing by the engineer. All associated restoration and revegetation of disturbed areas outside the designated limits of disturbance, as shown on the drawings, shall be borne solely by the contractor.

2.4 PREPARATION

A. Laws, Codes, Ordinances and Regulations. All local, municipal and State laws, codes, ordinances and regulations governing or relating to any part of this work are considered a part of these Specifications and shall be conformed to by the contractor. These Specifications and the Drawings shall take precedence whenever they call for a higher quality or larger size than is required by the aforementioned codes, ordinances, and regulations. The Contractor shall be responsible for conformance to all applicable codes governing the materials and work at this Project site. Manufacturer’s specifications shall govern should their directions and detailed drawings address information not included in these Specifications and the Drawings.

2.5 SITE CONDITIONS

A. Site Conditions. The contractor shall verify site conditions and be familiar with existing grade conditions, locations of existing features to be preserved, and all existing vegetation to remain. Field adjustments may be necessary to avoid disturbances to existing vegetation to remain. Before ordering materials or proceeding with work, the Contractor shall verify all dimensions and quantities between the Drawings, these Specifications and field conditions; any and all discrepancies shall be reported immediately to the Engineer.

B. Field Adjustments. Field Adjustments necessary to accommodate or to minimize disturbances to existing site conditions shall be done at the Contractor’s expense. Work shall be postponed in any area of discrepancy with the Drawings or these Specifications until the Engineer has provided a written resolution to the conflict. The Contractor shall assume full responsibility for proceeding with work without written approval.

C. Coordination. The Contractor shall coordinate the planting installation to avoid conflicts with roads, utilities, other construction, and any existing features.

D. Vandalism. Throughout the Contract period, the Contractor shall be responsible for the replacement or repair of any part of the plant installation that is damaged as a result of

vandalism; the Contractor shall be responsible for securing the Project site to minimize negative effects from vandalism.

2.6 WILLOW STAKE INSTALLATION

A. Delivery. The Contractor shall notify the Engineer of the delivery schedule in advance so the plant materials may be inspected upon arrival at the job site. The Engineer will inspect the cuttings for damage immediately upon receipt. Unacceptable cuttings will be removed from the job site immediately and disposed of at an authorized site.

B. Handling. Install willow stakes within 6 hours of collection. If planting does not occur within 6 hours, plant material must be properly stored according to the guidelines given in the following section.

C. Storage. All woody plant cuttings collected more than 6 hours prior to installation, must be carefully bound, secured, and stored submerged in clean fresh water for a period of up to one week. If stored outdoors temperatures must be less than 50 degrees F. Temperature indoors and in storage containers must be between 34 and 50 degrees F. If the willow stakes cannot be installed during the dormant season, cut during the dormant season and hold in cold storage at temperatures between 33 and 39 degrees F for up to 2 months.Location. Prior to placement or installation of willow stakes, the Contractor shall flag all plant material locations for approval by the Engineer. The Engineer may require adjustments to willow stake locations to meet field conditions.

D. Willow Stake Installation. Planting of willow stake shall be performed during above periods only when weather and soil conditions are suitable. Deviation from the above planting dates will be permitted only when approved in writing by the Engineer. Plant materials shall be placed at intervals as indicated on the Drawings, with butt end down. Installed eighty percent of the stake below ground, leaving only twenty percent of the willow stake extending above ground.

2.7 CLEAN UP

A. Daily Cleanup. Site cleanup shall occur on a daily basis. All garbage, construction debris, excess plants and dirt, other discarded materials, and extraneous equipment caused by or due to the Contractor shall be removed offsite at the Contractor’s expense and in accordance with State and local regulations.

B. Salvage. All materials designated to be salvaged shall be handled and removed with care. The Contractor shall be responsible for salvaging, removing offsite, and recycling all plant containers and racks; at no time will the Agency or the Engineer be responsible for recycling plant containers and racks.

2.8 OBSERVATION AND TESTING

A. Observations. The Contractor shall provide the Engineer with 48-hours advance notification for the following required planting stage acceptance observations.

1. Field marking of individual planting site locations,
2. Observation and acceptance of plant materials before installation,
3. Preparation for individual planting sites,
4. Planting operations. The Contractor shall be responsible for the complete installation of plants according to the Drawings and as specified herein. Any unacceptable plants or planting operations shall be corrected according to the Engineer's direction and at the Contractor's expense before the Final Acceptance observation.

3. MEASUREMENT AND PAYMENT

3.1 MEASUREMENT

A. Willow Stake Planting. Willow Stake plantings will be measured on a unit basis for each individual Willow Stake completely supplied and installed by the Contractor and approved by the Engineer.

3.2 PAYMENT

A. Willow Stake Planting. Payment for Willow Stake planting, measured as specified, will be paid at the contract unit price for each Willow Stake, which price will include all costs in connection therewith.

Pay Item	Pay Unit
Willow Stakes	Stake

END OF SECTION

INDEX
SECTION 354200
LOG STRUCTURES

Paragraph **Page**

SECTION 354200
LOG STRUCTURES

1. GENERAL

1.1 Description

A. Work within this section includes furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the Log Structures, complete in place, including excavation, and backfilling, cable connections, log and ballast boulder supply, preparation, and placement, and backfill of voids, as specified, as shown on the Drawings, or as otherwise directed by the Engineer.

B. Log structures include all Type 1 Log Structures and Type 2 Log Structures shown on the Drawings.

C. Related Sections

1. Section 312319, Dewatering
2. Section 312316, Stripping and Excavation
3. Section 354237, Rock Slope Protection

1.2 Submittals

A. Submit to the Engineer, for review and approval, the following, prior to delivering materials to the work site:

1. Product data sheet for threaded rebar connectors
2. Quarry source for the ballast boulders
3. Photos of all logs. Each log shall be tagged with a number, referenced in the photos.

2. PRODUCTS

2.1 Materials

A. Ballast Boulders. Conform to the material requirements of ***Section 354237, Rock Slope Protection.***

B. Stream Substrate. Conform to the material requirements of ***Section 354237, Rock Slope Protection.***

C. Threaded Rebar. Rebar shall be ASTM A615 Grade 75. The bar shall be #8 with ¾" UNC threads. Finish shall be black and hot-dip galvanized.

D. Steel Plates and Bolts. Steel plates and bolts shall be hot-diped galvanized. Size bolts to match rebar thread dimensions. Size steel plates per dimension shown on the Drawings.

E. Logs.

1. Logs may be imported or salvaged from the construction site, and shall meet the material specifications shown on the Drawings.

2. All logs shall be inspected for approval by the Engineer, prior to installation.

3. Refer to for the Drawings for trees available for salvage.

F. Backfill. Backfill shall consist of either "Engineered Fill" to match surrounding surface treatments shown on the Drawings.

3. EXECUTION

3.1 General

A. Prior to the start of work, the Engineer shall designate representatives authorized to observe the Contractor's placement of Log Structures. Contractor shall notify the authorized representative 72 hours prior to placement of Log Structures. Construct all Log Structures in the presence of the authorized representative.

B. Log structure designs are shown conceptually due to the inherent variability of material properties. The design requires that the Engineer will observe construction of the log structures to ensure the intent of the design is met. Observations must include log and boulder selection, placement, connections for ballasting, and placement of backfill. Any log structures constructed without the Engineer present may result in rejection of the work by the Engineer.

C. The construction of Log Structures requires equipment which can place rock and logs in precise locations. An excavator of a suitable size and containing a thumb is suggested.

D. Placement of the foundation logs and rocks is critical to the success of the Log Structures. To ensure proper placement, the Contractor shall provide a portable pump or other method to de-water excessive ground water from the excavation, as necessary.

E. Log/log connection. Each rebar connection shall be secured with two bolts, tightened to the manufacturer's recommended torque. Cut off excess rebar flush with the surface of the log.

F. Log Placement. Log placement locations shown on the Drawings are approximate. Exact locations shall be as approved by the Engineer, or his/her authorized representative.

G. Place rootwads at an elevation where the majority of the root mass is below ordinary low water, as approved by the Engineer.

H. Log Salvage. Trees shown to be removed on the Drawings shall be salvaged with their rootwad intact and placed within the Secondary Channel, as directed by the Engineer.

3.2 Field Quality Control

A. Tolerances. Log and boulder placements shall be as approved by the Engineer.

B. Logs. All logs shall be inspected for approval by the Engineer, prior to installation.

4. MEASUREMENT AND PAYMENT

4.1 Measurement

A. Log Structure Type 1 will be measured for payment on a lump sum basis

B. Log Structure Type 2 will be measured by the number of Type 2 Log Structures installed, as shown on the Drawings, as specified, and as directed by the Engineer.

C. Log/log connections will not be separately measured for payment.

D. Ballast Boulders used for log structures will not be separately measured for payment.

4.2 Payment

A. Log Structure Type 1 will be paid for at the contract lump sum price, which price will be payment in full for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing Log Structure Type 1, complete in place, including excavation and backfill, rock placement, and connections, as shown on the Drawings, as specified herein, or as directed by the Engineer.

B. Log Structure Type 2 will be paid for at the contract unit price for each Log Structure Type 2 installed including all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing each Log Structure Type 2, complete in place, including excavation and backfill, rock placement, and connections, as shown on the Drawings, as specified herein, or as directed by the Engineer.

C. No separate payment will be made for log/log connections.

D. No separate payment will be made for boulders used in log structures.

E. Payment will be made under:

Pay Item	Pay Unit
Log Structure Type 1	Lump Sum (LS)
Log Structure Type 2	Each (EA)

END OF SECTION

INDEX
SECTION 354237
ROCK SLOPE PROTECTION

SECTION 354237
ROCK SLOPE PROTECTION

1. GENERAL

1.1 DESCRIPTION

A. Work within this section shall include furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing, Rock Slope Protection (RSP), ,Toe Boulders, Engineered Streambed Material, Stream Substrate, backing layers, backfill and geotextile fabric where shown on the Drawings, as specified herein, or as otherwise directed by the Engineer. Stone protection, rock slope protection, and riprap are interchangeable in these Specifications and Drawings.

B. All loading, transport, temporary stockpiling, processing and mixing of stone materials to achieve designated gradations, washing, on-site hauling, excavation, preparation of sub-grade, placement, embedment, backfill, grading, compaction, finish grading, clean-up, and off-haul and disposal of excess materials needed to install all Rock Slope Protection work, where incorporated in the work, shall be considered as included in the applicable bid item unit price, and no additional compensation will be allowed.

C. The location, alignment, angles, elevations, grades, slopes, dimensions, etc. of the proposed creek channel improvements, treatments, and structures as described in this section are shown on the Project Plans to provide a basis for construction and bidding purposes. The Engineer is expected to make minor revisions and provide direction in the field to fit any varying field conditions. The Contractor shall include all costs for working under the direction of the Engineer in his/her bid for this work, as no additional compensation will be allow therefore.

D. The Contractor is hereby notified that the Engineer may direct the Contractor to place additional stone materials (not shown on the Plans) at select locations within the project work treatment areas to fit existing conditions at the time of construction. Any such additional stone materials and placement shall be considered as included in the unit prices paid for the designated stone materials as described elsewhere in these Technical Specifications and no additional compensation shall be allowed for.

E. Related sections:

1. Section 354200, Log Structures
2. Section 312319, Dewatering
3. Section 329000, Planting
4. Section 312316, Stripping and Excavation

1.2 SUBMITTALS

A. Submit to the Engineer, for review, the following:

1. Manufacturer's product data and installation instructions for specified geotextile fabrics.
2. Certified weights of the rock delivered to the site.
3. Certificate(s) and other material testing data as necessary to validate the source of the Rock Materials and their conformance with the Standard Specifications and these Technical Specifications. Include all applicable test results for grading, specific gravity, resistance to degradation, absorption, durability index, and soundness (as described elsewhere in these Technical Specifications).
4. A representative 5 cubic yard sample of each of the proposed Rock Materials specified herein shall be provided to the Engineer for approval, ten days prior to delivery of the

remainder of material to the project site. The Engineer reserves to the right to reject said materials.

B. Sampling and Testing Assistance. Any difference of opinion between the Engineer and the Contractor shall be resolved by dumping and checking the gradation of the two random truck loads of rock. Mechanical equipment, a sorting site and labor needed to assist in checking gradation shall be provided by the Contractor at no additional cost to the Client.

1.3 QUALITY ASSURANCE

A. Tolerances. Place rock to a vertical tolerance of minus 2 to plus 3 inches.

B. Subgrade Preparation. Prior to placement of rock, Engineer shall verify subgrade preparation, and placement of fabric for rock. Where backing is shown on the Drawings, Engineer shall verify subgrade preparation and backing placement prior to placement of outer rock course.

2. PRODUCTS

2.1 MATERIALS

A. Salvaged Rock Material. Native rock found on site may be salvaged for reuse, subject to compliance with the material requirements for the intended use, and subject to the approval by the Engineer. The Engineer may require the Contractor to provide testing (e.g. gradation curve, hardness, etc.) to ensure that materials are suitable for reuse. Salvaged creek bed material shall be placed on a hardened surface or other suitable material (i.e. steel plate, pavement, filter fabric) in order to protect the said material from contamination or mixing with other soils, earthen material and debris. The Engineer may, at his sole discretion, waive certain testing requirements to facilitate the Contractor's use of locally salvaged materials.

B. Rock materials and gradation shall conform to Section 00390.11(b) of the State Standard Specifications. Stones shall be sound, durable, hard, resistant to abrasion and free from laminations, weak cleavage planes, and the undesirable effects of weathering. It shall be of such character that it will not readily disintegrate from the action of air, water, or the typical conditions experienced during handling and placing. All aggregate material shall be clean and free from deleterious impurities, including alkali, earth, clay, refuse, and adherent coatings.

C. Rock size classes not designated below shall be as shown on the Drawings, or as directed by the Engineer. All stone, rock, aggregate materials, and soils imported to the site shall be from a certified "Weed Free" source approved by the Engineer.

1. Toe Boulders. Toe boulders shall be sub-rounded to angular with a minimum y-axis dimension of 3.5 ft., a maximum y-axis dimension of 4.5 ft. and a minimum weight of 1.75 tons.
2. Ballast Boulders. Ballast Boulders shall be sub-rounded to sub-angular with a minimum y-axis dimension of 3.5 ft., a maximum y-axis dimension of 4.5 ft. and a minimum weight of 1.75 tons.
3. Backfill. Backfill within RSP voids shall consist of "Stream Substrate" material, as specified below

D. Stream Substrate. Stream Substrate shall consist of dense, hard, durable non-friable stone free of organic debris and other deleterious substances. The rock shall have a minimum specific gravity of 2.5 and shall be sub-rounded to rounded, as derived from a natural stream or pit-run mining operation. Angular quarried material will not be acceptable. Volcanic cinder material shall not be acceptable. Stream Substrate shall conform to the gradation requirements for Size Class 150, per Table 2, below.

Table 2: Gradation requirements for Stream Substrate, inches or sieve size					
Size Class	**100% passing**	**75-85% passing**	**45-55% passing**	**12-20% passing**	**10% passing**
50	5	2	3/4	1/4	No. 10
100	10	4	1 3/4	0.530	No. 10
150	14	6	2 1/2	3/4	No. 10
225	22	9	3 1/2	1.06	No. 10
300	29.5	12	5	1 1/2	No. 10
375	35.5	14	6	1 3/4	No. 10
450	45	16.5	7	2 1/2	No. 10
600	59	23.5	10	3	No. 10
750	74	29.5	12	3 1/2	No. 10
900	88.5	35.5	14	4.24	No. 10
1050	103	45	16.5	5	No. 10

E. Rock Energy Dissipators. Conform to the rock gradation indicated on the Drawings.

3. EXECUTION

3.1 GENERAL

A. Salvaged rootwad transplants and live stakes shall be incorporated into the rock work as rock placement proceeds.

B. Rounded and smooth gravel, cobbles, and boulders shall not be placed on slopes steeper than 2:1 (horizontal: vertical) unless otherwise directed by the Engineer.

C. All rock materials shall be placed in such a manner as to smoothly conform with adjacent graded areas. Smaller rock shall be chinked into the margins of larger rock placements, as necessary to conform to earthwork and prevent migration of fines from adjacent graded areas into the rock matrix.

3.2 TOE BOULDERS

A. Install Toe Boulders to the lines and the minimum dimensions shown on the Drawings. Prior to placement ofToe Boulders, the stream substrate shall be placed, inspected and approved by the Engineer.

B. Toe Boulders shall be individually placed at the direction of the Engineer, with their long axis parallel to flow, and arranged so that each boulder above the foundation course has a 3-point bearing on underlying boulders. Boulders shall be placed such that down-slope boulders buttress up-slope boulders, as shown on the Drawings. Toe Boulders shall be placed tightly to minimize voids. After placement of lower course of Toe Boulders, place Backfill prior to placement of the subsequent course. Water-jet the backfill to eliminate voids. Backfill shall be placed in a manner that does not interfere with direct rock to rock contact of successive courses. T The Contractor shall be prepared to reposition individual boulders repeatedly, to optimize the final toe boulder configuration, as directed by the Engineer. After placement of the top row of toe boulders place Backfill and water-jet mix to eliminate voids.

C. The number of Toe Boulders shown on the Drawings is diagrammatic. Actual count shall vary, as necessary to achieve the dimensions shown on the Drawings.

3.3 STREAM SUBSTRATE.

A. Stream Substrate shall be placed to the lines, grades and depths shown on the Drawings, or as directed by the Engineer. Uniformly distribute large stones to produce the required gradation of rock. Prevent contamination of rock materials by excavation and/or earth materials. Subgrade shall be uniform with no soil clumps or rocks greater than two inches.

B. Following placement of the Stream Substrate, the finished surface shall be jetted with water until fines (material with a diameter less than 2mm) have been washed into the interstices of the mix to form a uniform plane of embedment, to the satisfaction of the Engineer. Turbid water resulting from jetting operations shall be pumped to a local depression or other sediment treatment facility.

4. MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. Toe Boulders will be measured for payment on a lump sum basis.

B. Ballast Boulders will not be separately measured for payment.

C. Stream Substrate. Stream Substrate will not be separately measured for payment.

D. Excavation and backfill for Toe Boulders and Ballast Boulders will not be separately measured for payment.

4.2 PAYMENT

A. Toe Boulders will be paid for at the contract lump sum price for Toe Boulders, which price will be payment in full for furnishing all labor, materials, tools, equipment, and incidentals necessary to complete the Toe Boulders, including subgrade preparation, backing, processing work, rock placement, excavation and backfill, and jetting.

B. No separate payment will be made for Ballast Boulders. Payment for Ballast Boulders will be considered incidental to the unit price paid for Items in Specifications Section 354200, Log Structures.

C. Stream Substrate. No separate payment will be made for Stream Substrate. Payment for Stream Substrate will be considered incidental to the unit price paid for Toe Boulders.

D. No separate payment will be made for excavation and backfill incidental to slope protection work. All costs in connection with this work will be considered incidental to the cost of construction of the associated slope protection work.

E. Payment will be made under:

Pay Item	Pay Unit
Toe Boulders	Lump Sum

END OF SECTION