

Appendix J Construction Specifications

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ITEM 1010
PROJECT REQUIREMENTS

PART 1 - GENERAL

2.01 WORK COVERED BY CONTRACT DOCUMENTS:

- A. The Work of Project is defined by the Contract Documents and generally consist of the following:
1. Stabilize the stormwater outfall and stream by replacing the wingwall for the 72-inch reinforced concrete pipe (RCP), updating the plunge pool energy dissipator to meet Design Standards.
 2. Stabilize the stormwater outfall and stream by replacing the 36-inch RCP with a new cast-in-place endwall, following Virginia Department of Transportation (VDOT) Standards.
 3. Stabilize approximately 590 linear feet (LF) of the riverbank with a combination of stabilization measures including approximately 215 linear foot (LF) gravity walls in three project locations.
 4. Install concrete encasements for two sanitary sewer pipe crossings and install boulder cascade downstream to tie into existing stream elevation.
 5. Protect sanitary sewer manhole by installing approximately 109 linear feet (LF) gravity wall.
 6. Place riprap and coir fiber matting slope stabilization where required to stabilize streambank slope.
 7. Provide all erosion and sediment control measures and sediment controls as indicated or specified and as required by the Virginia Department of Environmental Quality (DEQ).
 8. Install all associated work as required.
- B. Project will be constructed under a single prime contract.

2.02 WORK RESTRICTIONS:

- A. Normal construction activity shall take place only between the hours of 7 a.m. to 6 p.m., excluding Saturdays, Sundays, and legal holidays. Work outside the above time periods

will be permitted only on an emergency basis and only with the written approval of the City.

2.03 CARE AND PROTECTION OF PROPERTY:

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in other manner acceptable to the City.

2.04 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES:

- A. The Contractor shall assume full responsibility for the protection of all structures and utilities, public or private, including headwalls, vaults, piping, and video cables, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. Any damage resulting from the Contractor's operations shall be repaired by him at his expense.

2.05 TEMPORARY UTILITIES:

- A. Provide temporary utilities needed for the work including, but not necessarily limited to, sanitary facilities.

2.06 CLEANUP AND DISPOSAL OF EXCESS MATERIAL:

- A. During the course of the work, the Contractor shall keep the site of his operations in as clean and as neat a condition as is possible. He shall dispose of all residue resulting from the construction work and, at the conclusion of the work, he shall remove and haul away any surplus materials, lumber, equipment, temporary structures, and any other refuse remaining from the construction operations, and shall leave the entire site of the work in a neat and orderly condition.
- B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, the Contractor and his subcontractors shall comply with all applicable Federal, State, and local laws, and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and elsewhere in the Specifications.
- C. The Contractor is advised that the disposal of excess excavated material in wetlands, stream corridors, and plains is strictly prohibited even if the permission of the property

owner is obtained. Any violation of this restriction by the Contractor or any person employed by him, will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. Therefore, the Contractor will be required to remove the fill at his own expense and restore the area impacted.

PART 2 - PRODUCTS

2.07 TEMPORARY FACILITIES AND UTILITIES

- A. Provide mobile telephone for the person in charge of the project at the project site for use in connection with the work.
- B. Provide temporary sanitary facilities in the quantity required for use by all personnel. Maintain in a sanitary condition at all times.

END OF SECTION

ITEM 1020
MOBILIZATION

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This work shall consist of the construction preparatory operations, including the movement of personnel and equipment to the project site necessary to begin work. All work to be performed under this item shall be in accordance with the requirements of Section 513 of the Virginia Department of Transportation, Road and Bridge Specifications.

1.02 MEASUREMENT AND PAYMENT

- A. Mobilization will not be measured but will be paid for at the Contract lump sum price. Payment of 50% of Mobilization will be made in the first monthly invoice after the Contractor has established the necessary facilities. The remaining 50% of Mobilization will be prorated and paid in equal amounts on each of the next five monthly invoices. The payment will be full compensation for all labor, materials, equipment, tools, and incidentals necessary to complete the work.
- B. Payment of the Mobilization item will not be made more than once and no additional payment will be made for demobilization and remobilization, regardless of the reason, including stream closure periods.

END OF SECTION

ITEM 1030
CONSTRUCTION STAKEOUT

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This work shall consist of furnishing, placing, and maintaining construction layout stakes as specified in the Contract Documents or as directed by the Engineer, and shall otherwise be in accordance with Section 517 Virginia Department of Transportation, Road and Bridge Specifications, except as noted below:
1. The Contractor shall retain a professional Engineer or Land Surveyor registered in the state of Virginia to establish all lines and grades needed to construct the infrastructure stabilization.
 2. It is the Contractor's responsibility to confirm existing grades, prior to construction activities, at no additional cost to The Owner and adjust quantities, earthwork, and work efforts as necessary with approval from The Owner.
 3. The Contractor shall make all field measurements necessary to stakeout the baseline of construction and lay out the lines and grades called for in the Contract Documents or as directed by the Engineer. The Contractor shall use the horizontal and vertical survey controls as shown in the Contract Documents to lay out the lines of work, limits of grading, planting, fill placement and to stake out the location of all proposed structures.
 4. Only those benchmarks shown on the drawings shall be used for construction. The Contractor shall be held responsible for their preservation.
 5. The Contractor shall, as a part of his construction stakeout operation and before any clearing operation commences, demarcate any wetlands and the Limit of Disturbance throughout the entire project as shown on the Contract Documents and labeled as Limit of Disturbance and/or Wetlands, to the satisfaction of the Engineer. Where Limits of Disturbance are not shown on the Contract Documents, the Limit of Disturbance will be the top of cut, toe of slope or limit of ditch excavation.
 6. Trees to be protected during construction are shown on the Contract Documents in the Forest Conservation Plans. Any necessary modifications to the Contract Documents for tree protection will be identified by The Owner and the Contractor prior to clearing and grubbing. All tree protection devices shall be installed before clearing and grubbing commences. Trees to be protected during construction shall

be identified by flagging and/or fencing. No paint or other permanent markings shall be used to indicate saved trees.

7. The Contractor shall notify The Owner once the stakeout or a phase of the stakeout is completed. The Owner will inspect the construction stakeout prior to the Contractor beginning clearing and grubbing activities. The purpose of the inspection is not to verify the stakeout, but to allow The Owner an opportunity to assess the lines established by the Contractor prior to the start of construction. If there are obvious errors with or questions concerning the stakeout, the visible errors and questions will be discussed with the Contractor, prior to the Contractor proceeding with construction. **This inspection will in no way relieve the Contractor of his responsibility to construct the site as specified in the Contract Documents.**

PART 2 - MATERIALS

2.01 Flagging Tape

- A. The material for flagging the limits of disturbance shall be a 3-in. international orange vinyl material. The material for flagging wetlands shall be standard pink vinyl flagging. The material for flagging specimen trees shall standard white vinyl flagging.

PART 3 - CONSTRUCTION METHODS

3.01 LINE AND GRADE

The Contractor will provide the following:

3.02 STREAM CHANNEL STAKEOUT

- A. The Contractor shall stake the base line and proposed center line as indicated in the Contract Documents. The stakes shall be clearly labeled with appropriate stations and offset distances. The stream channel base line of construction shall be staked with 3-ft long wooden stakes. The maximum spacing of stations (stakes, nails, crosses, etc.) will be 25 ft, and the elevations on the top of each marked point will be furnished. The Contractor shall establish appropriately spaced benchmarks and the necessary references including all points of curvature (P.C.), and points of tangency (P.T.) for the preservation and control of the base line. Upon completion of grading, the Contractor will provide a staked base line or working line. An elevation for the top of each marked point will also be furnished, as well as two sets of prints of the cross sections.

3.03 IN-STREAM STRUCTURE STAKEOUT

- A. For in-stream structures, and bank protection, the Contractor shall stake out the boundaries, all breaks in slope, and the tops and toes of structures with a maximum

spacing of 25 ft. Stakes will be used to mark structure start and stop points, elevations, and offsets for the structures from the base line.

3.04 LINE AND GRADE EQUIPMENT AND PERSONNEL

- A. The Contractor shall use competent personnel and state of the art equipment with current calibration for all engineering work required to set and maintain the elevations and dimensions as specified in the Contract Documents.

3.05 CONTROL MARKERS

- A. The Contractor shall be responsible for preserving the base line of construction, working lines, and benchmarks set at the beginning of the project. The Contractor shall replace the baseline of construction, working lines, and benchmarks if they are disturbed or destroyed, at no additional cost to The Owner.

3.06 CONTROL STAKES

- A. For the base line of construction, as specified in the Contract Documents, the Contractor shall furnish, set and preserve stakes at each station along each side of the proposed channel. On each of these stakes shall be marked its offset distance from the baseline of construction and its top elevation or the cut or fill to the profile grade line. Additional stakes, as needed for horizontal and vertical controls necessary for correct layout of the work, shall be set by the Contractor.

3.07 LAYOUT

- A. For structures specified in the Contract Documents, the Contractor shall proceed with the layout work. From the field layouts, the Contractor shall check the proposed structure lengths by electronic distance measurement or chaining. When chaining is used, the measurements shall be compensated for horizontal alignment. The Contractor shall also check the location of the structure to affirm its correct location with relation to existing on-site features and conditions that are to remain in their original positions. If any discrepancies are found, the Contractor shall notify the Engineer at once in writing, otherwise, it will be assumed that all planned dimensions, grades and field measurements are correct.

3.08 UTILITIES

- A. The Contractor shall furnish to the utility companies or agencies working within the limits of the project, promptly upon request, reference to control points, alignment, and grade data, so that they may properly locate and coordinate their work and improvements in relation to the project.

1. UTILITY STAKEOUT

- a. The Contractor shall notify the appropriate agencies a minimum of 48 hours (excluding weekends and holidays) prior to the Contractor's anticipated beginning of any underground work.
 - (1) Request a MISS UTILITY stakeout and possess a valid MISS UTILITY clearance ticket number for any underground work. 1-800-257-7777
 - (2) Contact all utilities within the limits of the project that are not a member of MISS UTILITY and obtain a stakeout of their respective facilities.

3.09 RIGHT-OF-WAY, EASEMENT LINES AND PROPERTY CORNERS

- A. The Contractor shall define right-of-way and easement lines of the project for adjacent property owners, promptly upon request.
- B. The Contractor shall retain a Land Surveyor registered in the State of Virginia who shall reference all existing property corners that are within the construction area or the area to be disturbed. Upon completion of the project, any corners that have been disturbed or destroyed shall be replaced by the registered land surveyor at the expense of the Contractor. Cost of this shall be included in the lump sum price bid for Construction Stakeout.

3.010 SUBGRADE, SUBBASE AND BASE CONTROLS

- A. The Contractor shall furnish for subgrade, subbase and base courses, a string line and grade with fixed controls having a maximum longitudinal and transverse spacing of 25 feet.

3.011 FLAGGING

- A. The flagging shall be placed continuously throughout wetland areas and buffers. In areas where trees are not to be disturbed, the Contractor shall individually flag those trees in a line along the clearing limits, which are not to be moved or destroyed. If the flagging has been destroyed and the Engineer determines that its use is still required, the Contractor shall re-flag the area at no cost to The Owner.
- B. If the Contractor, after notification by the Engineer that replacement flagging is needed, does not replace the destroyed flagging within 48 hours, the Engineer may proceed to have the area re-flagged. The cost of the re-flagging by the Engineer will be charged to the Contractor and deducted from any monies due under the Contract.

3.012 MEASUREMENT AND PAYMENT

- A. Construction Stakeout will not be measured but will be paid for at the Contract lump sum

price. Payment will be full compensation for furnishing, placing, and maintaining construction layout stakes, flagging of disturbance and wetland limits, removal of flagging and stakes following project completion, and for all material, labor, equipment, tools, and incidentals necessary to complete the work. Payment of the Contract lump sum price will be prorated and paid in equal amounts on each monthly estimate. The number of months used for prorating will be the number estimated to complete the work.

END OF SECTION

ITEM 1040

CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This work shall consist of clearing and grubbing within the limits specified in the Contract Documents. All work to be performed under this item shall be in accordance with the requirements of Section 301 of the Virginia Department of Transportation, Road and Bridge Specifications, with the following additions and/or modifications.
- B. Clearing within the construction area includes removing and disposing of trees, shrubs and other vegetation within the limits of disturbance as is required for construction or as directed by The Owner. **The Limit of Disturbance (LOD) shown on the plans is not the limit of clearing and grubbing.** *Only trees designated in the Contract Documents and those trees approved by The Owner and the Engineer may be removed.*
- C. No open burning will be permitted within the construction limits for this project.
- D. The removal, stockpiling and placing of any materials labeled for re-use shall be incidental to the pay item for Clearing and Grubbing.
- E. Grubbing within the construction area includes removing from the ground and disposing of all stumps, roots, stubs, brush, trash, rubble, and debris at locations off the project site.

PART 2 - CONSTRUCTION METHODS

2.01 PROJECT STAGING

- A. To minimize the potential for erosion, sedimentation, and the degradation of water quality, clearing and grubbing will be conducted in stages. The area cleared and grubbed at any one time shall be limited to the area of active construction work.
- B. Unless noted in the Sequence of Construction, no areas will be cleared and grubbed until the areas disturbed during the previous construction stage have been stabilized (i.e. covered by fabric and/or seeded and mulched). The Engineer shall have ultimate authority in this determination.

2.02 DAMAGING OR DESTROYING VEGETATION BEYOND THE LIMIT OF DISTURBANCE

- A. The Contractor shall not damage or destroy any trees, shrubs or turf, which exist beyond

the limits of disturbance as illustrated on the Contract Documents and specified.

- B. The Contractor shall be responsible for any and all damages to trees, shrubs, or turf located beyond the limits of disturbance that occurs from his operations during the life of the Contract. The Contractor shall fully restore, at his own expense, and to the satisfaction of the Engineer, any trees, shrubs, or turf that have been damaged or destroyed.

2.03 SALVAGING AND STOCKPILING

- A. The Contractor and Engineer shall meet onsite to determine availability of boulders for use in bank protection. Boulders and riprap determined to meet the specifications shall be salvaged and stockpiled for later use on-site, at no additional cost to The Owner.
- B. Salvaged boulders which are deemed suitable for re-use as identified in the Contract Documents should be stored and elevated off the ground until use in construction.

2.04 CHIPPING

- A. Describes chipping of cut trees within the limit of disturbance and spreading or placing on the site as directed by the Engineer. Chipping shall be accomplished by use of a chipping machine to a size acceptable to the Engineer. Material deemed by the Engineer unsuitable for chipping (too large, invasive species, etc.) shall be hauled offsite to an approved disposal location at no additional cost to The Owner.

2.05 FLUSH CUTTING

- A. Describes cutting trees flush with the ground. The stump is left in place to leave the surrounding soil and infrastructure undisturbed. Flush cutting shall be accomplished by removing the whole tree that is above ground and leaving the root system in place. The stump shall be treated with a systemic herbicide applied directly to the stump to prevent the stump from resprouting from the remaining plant material. The Contractor shall use a 25% herbicide solution in water that uses glyphosate (such as Round Up) or triclopyr (such as Remedy Ultra) for cut stump applications.

2.06 MEASUREMENT AND PAYMENT

- A. Clearing and Grubbing will not be measured but will be paid for at the Contract lump sum price. The payment will be full compensation for the removal and disposal of all materials cleared and grubbed, and for all material, labor, equipment, tools, and incidentals necessary to complete the work. The chipping and spreading of chipped materials, removal of unsuitable material, vine removal, stump treatment and the salvaging and stockpiling of logs shall be incidental to this item.

END OF SECTION

ITEM 1050

MAINTENANCE OF TRAFFIC

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This item shall consist of maintenance of traffic for project access from all access points onto public or private roads, and for information signage related to ingress and egress from the work site. All work to be performed under this item shall be in accordance with the requirements of Section 512 of the Virginia Department of Transportation, Road and Bridge Specifications.
- B. All temporary sign work to be performed under this item shall be in accordance with Section 512 Virginia Department of Transportation, Road and Bridge Specifications.
- C. The Contractor shall submit, if required, a traffic control plan in writing to the City of Alexandria, Department of Transportation for approval prior to the preconstruction meeting. If the Contractor does not follow the traffic control plan; the Owner will stop all activity and charge working days until the Contractor complies with the traffic control plan.
- D. If the Contractor needs to close a lane of traffic on a state-maintained roadway to complete any work on the County roadway at its intersection with the state roadway, a Land Use Permit from the Virginia Department of Transportation will be required. The Contractor shall notify the Engineer at least fourteen (14) days prior to the anticipated lane closure for The Owner to coordinate with the Department of transportation to obtain the Land Use Permit. Any Lane Closure on a state-maintained roadway shall be in accordance with the standard details of the Virginia Department of Transportation requirements.

1.02 MEASUREMENT AND PAYMENT

- A. Maintenance of Traffic will not be measured but will be paid for at the Contract lump sum price. Payment of the Contract lump sum price will be prorated and paid in equal amounts on each monthly invoice. The number of months used for prorating will be the number estimated to complete the work as determined by the Contract documents. Payment will be full compensation for furnishing, placing, maintaining and removing traffic control measures, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

ITEM 1060

EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

2.08 DESCRIPTION:

- A. Provide all work and take all measures necessary to control soil erosion resulting from construction operations, prevent flow of sediment from construction site, and contain construction materials within protected working area as to prevent damage to any stream or wetlands.
- B. The Contractor is responsible for obtaining a Virginia Erosion and Sediment Control General Permit (9VAC25-880-70) prior to commencement of work.

2.09 REFERENCES:

- A. United States Environmental Protection Agency (USEPA):
 - 1. Guidelines for Erosion and Sediment Control, Planning and Implementation.
 - 2. Processes, Procedures and Methods to Control Pollution Resulting from all Construction Activity.
- B. Virginia Erosion and Sediment Control Handbook, latest available edition.

2.10 SUBMITTALS:

- A. Submit product data for each type of product indicated and shop drawings in accordance with Item 9100.
- B. Prior to the start of the work, submit to Engineer, a copy of the acquired E&SC General Permit.

2.11 QUALITY ASSURANCE:

- A. Use acceptable procedures, including use of water diversion structures, diversion ditches, settling basins, and sediment traps.
- B. Operations restricted to areas of work indicated on drawings and area which must be entered for construction of temporary or permanent facilities.
- C. If construction materials are washed away during construction, remove materials from fouled areas.

- D. Stabilize diversion outlets by means acceptable to Engineer.
- E. City has authority to limit surface area of erodible earth material exposed by Contractor operations and to direct immediate permanent or temporary pollution control measures to prevent contamination of any stream or wetlands, including construction of temporary berms, dikes, dams, sediment basins, sediment traps, slope drains, and use of temporary mulches, mats, or other control devices or methods to control erosion.

PART 2 - PRODUCTS

1.01 COIR MATTING:

- A. CM-700 or engineer approved equal.

1.02 WOOD STAKES:

- A. 2 inches by 2 inches by 3 feet or approved COIR Matting biodegradable stake equivalent,

1.03 GEOTEXTILE FABRIC:

- A. Geotextile/filter fabric shall be non-woven polypropylene geotextile, such as Mirafi 700x, Mirafi 70/20, Filterweave 500, or approved equal.

1.04 SUPER SILT FENCE:

- A. Geotextile fabric shall consist of Class F filter cloth or approved equal.
- B. Posts shall consist of galvanized steel poles six feet in length spaced no further than 10 feet apart. The posts shall be driven a minimum of 36 inches into the ground.
- C. Fencing shall be a minimum of 42 inches in height and constructed in accordance with the latest Virginia Department of Transportation Road and Bridge Standards for chain link fencing. Geotextile and chain link fence shall be embedded a minimum of 8 inches into the ground.
- D. Chain link fence shall be securely fastened to the fence posts with wire ties or other suitable means.

1.05 OTHER MATERIALS:

- A. As indicated on Drawings.
- B. Materials specified in the Virginia Erosion and Sediment Control Handbook, and as approved by Engineer. Applicable sections of the DEQ E&S handbook include but are not limited to the following:

1. Chapter 3.01 – Safety Fence
2. Chapter 3.02 – Construction Entrance
3. Chapter 3.19 – Riprap
4. Chapter 3.36 – Soil Stabilization Blankets and Matting

PART 3 – EXECUTION

1.06 GENERAL:

- A. Do not discharge chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste into or alongside any body of water or into natural or man-made channels.

3.02 INSTALLATION:

- A. Install all Erosion and Sediment Control devices per the Virginia Erosion and Sediment Control Handbook, latest available edition.

END OF SECTION

ITEM 1070

DEMOLITION AND DISPOSAL OF EXISTING STRUCTURES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Contractor shall furnish all labor, materials, and equipment necessary for the demolition and disposal of existing structures. The work consists of removing and properly disposing of all debris, including but not limited to fallen trees, drainage structures, existing retaining wall, concrete, and miscellaneous litter. Additionally, this item includes removal of existing riprap, where shown on the Contract Documents.

1.02 CONSTRUCTION METHODS

- A. All demolition, removal, and disposal shall be performed according to the Contract Drawings and all applicable Federal, State and local laws, regulations and guidelines. Demolition shall generally be limited to removal of fallen trees, drainage structures, concrete, the sheet pile retaining wall, and miscellaneous litter as delineated and/or directed by the Engineer or County Inspector. These materials are to be disposed of legally by the Contractor.
- B. The Contractor shall cut all existing asphalt and/or concrete surfaces with a power saw in such a manner as to create a tight, neat, straight water sealed joint. No “jack-hammering” or tearing of the existing surfaces will be allowed. The Contractor shall protect all adjacent surfaces as necessary.
- C. Perform work so adjacent structures, equipment, paving and materials, which are to remain, shall not be damaged. If damage occurs, the Contractor shall repair or replace the adjacent structures, equipment, paving and materials as directed by the Engineer or County Inspector at no additional cost to Public Works. Existing utilities damaged by demolition shall be replaced with the same material and quality as the existing utilities. Before construction begins, the Contractor shall inspect existing structures, equipment and paving that will remain in-place within and adjacent to the work area for existing defects and damage found during this inspection. All damage repairs shall be at the Contractor’s expense.
- D. The Contractor shall perform the work in a manner that will not damage parts of the structure or facility not intended for removal. If, in the opinion of the Engineer or County Inspector, the method of construction used may endanger or damage parts of the structure

or affect the satisfactory operation of the facilities, the Contractor shall promptly change the method when so notified. Perform all cutting required regardless of whether such cutting is specifically indicated. Examine the existing structures and make an estimate of cutting required and other conditions to be encountered in order to accomplish the work. No blasting will be permitted.

- E. All equipment, materials, and piping within the project limits, designated for removal, shall become the property of the Contractor.
- F. The Contractor is responsible for the removal and proper disposal of all debris and structures within the limits of disturbance as shown on the Contract Drawings. Debris shall be removed from areas of proposed grading and all other areas within the limits of disturbance. Large debris may be removed using excavator buckets, cable winch, towing strap, laborers with bags or buckets, or other methods identified by the Contractor and approved by the Engineer.
- G. The Contractor shall provide warning signs as required, for personnel and the public.

1.03 MEASUREMENT AND PAYMENT

- A. Demolition and Disposal of Existing Structures will not be measured and will be paid for at the Contract lump sum price. The payment will be full compensation for the removal and disposal of all materials, saw cutting, and for all material, labor, equipment, tools and incidentals necessary to complete the work.

END OF SECTION

ITEM 1080

CHAIN LINK FENCE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Chain link fence shall be installed as specified on the contract documents for use along and within areas of the Limits of Disturbance where trees, shrubs, and property are to be protected and as directed by the Engineer.

1.02 MATERIALS

- A. Steel Mesh – Shall be 9-gauge zinc-coated steel.
- B. Posts - Shall be zinc-coated steel pipe.
- C. Top Nails - Shall be zinc-coated steel pipe.
- D. Braces – Shall be zinc-coated steel.
- E. Gates - Shall be single- or double-swing, zinc-coated steel. Gates should be a minimum of 12 feet wide

1.03 CONSTRUCTION METHODS

- A. The Contractor shall erect the chain link fence as designated on the Contract Documents and as directed by the Engineer prior to beginning construction.
- B. Posts shall be spaced a maximum of ten (10) feet. Posts will be set in concrete and backfilled or anchored by other acceptable means. All corner posts, end posts, gate posts, and pull posts should be embedded, braced, and trussed as shown in the “Standard Fence – Chain Link” detail found in the latest version of the Virginia Department of Transportation Road and Bridge Standards.
- C. Applicable warning signs noting hazardous conditions must be installed immediately upon installation of safety fence. The safety fence and posts shall be removed at the end of the contract and with the approval of the Engineer. The fence and posts shall become the property of the Contractor at the completion of the project.

1.04 MEASUREMENT AND PAYMENT

- A. Chain Link Fence will be measured and paid for at the contract unit price per linear foot

installed. The payment will be full compensation for furnishing, installation, maintenance, and removal of the fence as shown on the Contract Documents, including all materials, labor, equipment, tree protection area signage, tools and incidentals necessary to complete the work.

END OF SECTION

ITEM 1090

TRAIL MANAGEMENT

1.01 DESCRIPTION

- A. Furnish, transport, and replace in kind existing on-site Recreation Area as specified in the Contract Documents or as directed by the Engineer.

1.02 MEASUREMENT AND PAYMENT

- A. Recreation Area will not be measured and paid for at the contract unit price but paid per lump sum (LS). Price and payment will be full compensation for all material, labor, equipment, tools and incidentals necessary to complete the work.

END OF SECTION

ITEM 2010

STREAM CHANNEL EXCAVATION (CLASS 5)

PART 1 - GENERAL

1.01 Description

- A. All work to be performed under this item shall be in accordance with the requirements of Section 303 of the Virginia Department of Transportation, Virginia Department of Transportation, Road and Bridge Specifications.
- B. All excavation specified on the plans and in the Contract Documents, unless otherwise specified, shall be classified as Class 5 Excavation. The Contractor shall use all suitable materials, including topsoil, subsoil, and channel bed material, as specified in the Contract Documents, from excavation in the construction throughout the Contract.
- C. This item includes excavation, separation, removal and disposal of debris and unsuitable materials from the stream channel, floodplain, or wetland areas and salvaging, transporting, placing, and stockpiling of suitable materials in areas designated on the plans and as outlined below. All concrete, rubble, asphalt or other unsuitable material, such as clay or wet material, removed from the channel is considered unsuitable material.

1.02 Layout

- A. The layout of the grading shall be as shown on Contract Drawings (plans and cross-sections). Grading shall transition smoothly between cross-sections, with no abrupt changes in channel geometry.

1.03 Excavation

- A. Excavation shall include the following:
 - 1. Cut areas within the boundary faces of the cross-sections specified in the Contract Documents, including excavation within the channel, banks or floodplain for stabilization activities. This shall include excavation for the installation of rock grade control structures and bank treatment techniques, as specified on the plans and in these specifications.
 - 2. Demolition and/or removal of debris from the stream channel, including trees and debris jams, tires, concrete lining, broken up concrete and other materials as designated by the Engineer.
 - 3. Additional rock encountered within the stream channel that may be handled by

the same tools and equipment used for channel or stream excavation under this Contract.

4. When excavating for infrastructure stabilization or other facilities indicated on the plans, the Contractor may encounter wet or saturated soils. The Contractor shall be prepared to dewater and transport unsuitable soil off-site in a manner that prevents discharge or spillage of soils or water onto adjacent properties or roads. Should any discharge occur, the Contractor shall be responsible for immediate and complete clean-up.
5. There shall be no overnight stockpiling of erodible material in the 100-year floodplain.

PART 2 - CONSTRUCTION

2.01 Excavation and Fill

- A. Excavation and fill for the construction of the new channel shall be as shown on the Contract Documents. Construction shall be as shown in the plan view, cross sections, and the stream profile drawings. All work to be performed under this item shall be in accordance with the requirements of Section 303 of the Virginia Department of Transportation, Virginia Department of Transportation, Road and Bridge Specifications.
- B. Due to the requirement to dewater the stream channel, all excavation and fill to construct the new channel, as well as all in-stream structures, must be done in an expeditious manner. Dewatering periods must be limited, and the stream flow returned to the new channel as soon as is reasonably possible. The Contractor is responsible to provide adequate equipment and manpower, as well as to establish a work schedule that will meet this requirement.
- C. In areas where fill is required to establish the design channel, the Contractor shall place the required fill and compact the soil by tamping it with the excavator bucket. Fill shall be placed in 8 to 12 inch lifts. Each lift shall be compacted by tamping with the excavator bucket or by tracking in by the excavator. Reasonable compaction as determined by the site engineer/city inspector shall be achieved before placement of succeeding lifts.
- D. Immediately upon completion of streambank grading and the installation of in-stream structures along a given segment, the Contractor will provide permanent stabilization of all disturbed areas. Permanent stabilization will be completed as set forth in the Standard Specifications for Permanent Seed and Mulch, and Soil Stabilization Matting

2.02 Site Clean-up

- A. Prior to undercutting any stream invert, cutting into any stream bank, or excavating the

site, the reach that is being constructed shall be cleaned of all non-desirable items such as waste concrete, metal, vegetation debris, and rubbish prior to stockpiling. The Contractor shall be responsible for removing as much unnatural or undesirable material as possible prior to salvaging and stockpiling of the suitable on-site materials. Disposal of non-desirable material shall be the responsibility of the Contractor.

2.03 Use of Salvaged Streambed Materials

- A. Material shall be salvaged from the existing channel to provide natural streambed material. The use of salvaged streambed material is defined in each treatment specification. Salvaged streambed material meeting the specifications of materials referenced in the following specifications shall be used prior to the furnished materials: Item 9020: Salvaged Streambed Material
- B. Topsoil and subsoil shall be salvaged from within the grading limits for use as specified in the Contract Documents or as directed by the Engineer. Placement of salvaged or furnished topsoil meeting the specifications of materials referenced in the following specifications shall be used prior to the furnished materials: Item 7030: Placing Salvaged Topsoil – 4” Depth and Item 7040: Placing Furnished Topsoil – 4” Depth.
- C. In addition to the specifications described for furnished material, salvaged topsoil and salvaged subsoil shall be free of any plant parts (seeds, rhizomes, stolon, roots, etc.) of noxious weeds (Johnsongrass, Canada Thistle, Phragmites, etc. as defined by the Virginia Department of Conservation and Recreation) as well as non-native, invasive plants (Multiflora rose, garlic mustard, etc.) as determined by the Engineer. Salvaged topsoil and subsoil shall be stockpiled on site and kept separate from other materials.

2.04 Disposal of Unsuitable Materials

- A. Existing debris, concrete, waste, and other unsuitable materials, as determined by these specifications or by the Engineer, shall be removed from the site and shall be disposed of in a site with an approved erosion and sediment control permit.

2.05 Rock Excavation

- A. Boulders and rock from the excavation may not be broken and used for any of the proposed in-stream or bank structures unless authorized by the Engineer or provided for in the Contract Documents.
- B. Blasting. The Contractor shall obtain prior approval from the Engineer before performing any rock blasting necessary to complete the excavation to the grades and lines indicated on the plans. All blasting shall conform to SHA standards.
- C. Pre-splitting. The Contractor shall obtain prior approval from the Engineer before

performing any pre-splitting activities, necessary to complete the excavation to the grades and lines indicated on the plans. All pre-splitting shall conform to VDOT standards.

2.06 Excavation Beyond Specified Limits.

- A. The widening of cut or excavation sections beyond the limits of the cross-sections, as specified in the Contract Documents, is prohibited in all instances except by written order from the Engineer. When so ordered by the Engineer, the procurement of additional suitable materials for fill shall conform to the following provisions.
 - 1. Finished Excavation. Refer to Section 303 of the Standard Specifications.
 - 2. Excavation Limits.
 - a. If the Engineer directs the Contractor to excavate beyond the limits of the cross-sections originally proposed, and within the limits of disturbance, then all material within the limits will be classified as Class 5 Excavation.
 - b. If the Contractor, with approval of the Engineer, elects to obtain material by widening cuts beyond the limits of the cross-sections originally proposed and within the limits of disturbance, the excavation of the materials will be classified as Class 5 Excavation.

2.07 Unsuitable Material and Undercuts.

- A. Unstable or other unsuitable material encountered at or below the lowest normal excavation limit, as specified in the Contract Documents, shall be undercut and removed to the extent directed by the Engineer. The undercutting and removal of unsuitable material shall be incidental to Class 5 Excavation. In rock areas, the limit of measurement for excavation will be at the bottom of the normal plan section. All voids created by the removal of unsuitable material and undercuts, except when rock is encountered at subgrade, shall be backfilled to the lines and grades specified in the Contract Documents. Backfill material for undercuts shall conform to materials specified and shall be incidental to the Class 5 Excavation.

2.08 Placement of Salvaged Streambed Materials

- A. Salvaged streambed materials meeting the specifications described in the Contract Documents shall be placed as described in the Contract Documents.

2.09 Stabilization

- A. The Contractor shall be responsible for temporary and permanent stabilization of all streambanks and graded or traversed floodplain areas, immediately upon completion of grading, as specified in the Contract Documents. The Contractor shall perform all care

and remediation work required to maintain stable streambanks, including erosion and sediment control.

- B. In cases where additional material is required, The Contractor is responsible for furnishing and transporting suitable fill material to the project site. The suitability of fill material is dependent on the area to be filled. If unsuitable streambed materials are available on site the use of Item 9030: 2-3" Stone for Stream Mixes will be used as described in the specifications.

PART 3 - MEASUREMENT AND PAYMENT

- 3.01 Stream Channel Excavation (Class 5) will be measured and paid for at the Contract unit price per cubic yard. The payment will be full compensation for all excavation, hauling, salvaging, separating, stockpiling, and placing of suitable materials, formation and compaction of embankments and backfill, backfilling of stream beds or otherwise disposing of excess and unsuitable materials, undercutting and backfilling of undercuts, and for all material, labor, equipment, tools, and incidentals necessary to complete the work. The cost of handling and re-handling wet soils, reuse of salvaged fill material, salvaged streambed material, salvaged topsoil, and over-excavation to construct a temporary access bridge, if necessary, shall be considered incidental to the cost of Stream Channel Excavation (Class 5), as appropriate. The cost of over excavating for the installation of structures shall be incidental to the materials necessary for construction of the structure.
- 3.02 Material will be measured in its original position and the volume computed by the Method of Average End Area. The cross-sectional area measured will not include water or other liquids. Measurement for Stream Channel Excavation (Class 5) will not include any material removed outside the limits of disturbance as specified in the Contract Documents.
- 3.03 Earthwork bid item quantities are based on existing elevations/contours and proposed grading, as shown on the Contract Document's cross-sections and profiles. Existing elevations and grades may have changed since the original survey was completed, due to erosion and sediment accumulation. Prior to the start of excavation, the Contractor may conduct surveys to confirm existing grades and verify and adjust earthwork quantities and work efforts, at no additional cost to The Owner. Because of the possibility of changes to grades following completion of an area of work due to extremes in stream flow, the Contractor may conduct surveys incrementally as a particular work area is completed for quantity verification. The survey shall be submitted to the Engineer for review to confirm incremental as-built conditions and quantities. The Contractor is solely responsible for restoring un-surveyed sections to design conditions at no additional cost to The Owner.

END OF SECTION

ITEM 2020

DISPOSAL OF EXCAVATED MATERIALS (STOCKPILE)

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Contractor shall perform disposal of unsuitable, unsatisfactory, and excess excavated material offsite at an approved stockpile location or approved disposal facility. Disposal of Excavated Unsuitable Materials shall be performed as described in Item 2010: Stream Channel Excavation (Class 5). Stockpile Construction shall be performed as described in the Contract Documents.

1.02 Suitable Material

- A. Excess suitable soil material shall be transported and disposed of as specified in the contract documents at the location of the stockpile. Disposal of unsuitable material including, but not limited to, rock, concrete, asphalt, sidewalk, curb and gutter, vegetation debris, soft soil, trash, and other miscellaneous debris shall be performed as described in Item 2010: Stream Channel Excavation (Class 5).

PART 2 - CONSTRUCTION

- 2.01 Excavation and fill for the permanent stockpile construction shall be as shown on the Contract Documents. Construction shall be as shown in the plan view.
- 2.02 In areas where fill is required to establish the design permanent stockpile, the Contractor shall place the required fill and compact the soil by tamping it with the excavator bucket. Fill shall be placed in 8 to 12 inch lifts. Each lift shall be compacted by tamping with the excavator bucket or by tracking in by the excavator before placement of succeeding lifts. The final lift placed shall not be compacted. The stockpile construction and incremental stabilization shall occur in two phases. Phase One shall not exceed 15 feet in vertical height. Once 15-foot maximum vertical height is achieved the stockpile shall be seeded and stabilized. Phase Two can then be constructed to bring the stockpile to final grade.
- 2.03 Immediately upon completion of permanent stockpile grading, the Contractor will provide permanent stabilization of all disturbed areas. Permanent stabilization will be completed as set forth in the Standard Specifications for Permanent Seed and Mulch, and Soil Stabilization Matting.

PART 3 - MEASUREMENT AND PAYMENT

- 3.01 Disposal of Excavated Material (Stockpile) will be measured and paid for at the Contract

unit price per cubic yard. The payment will be full compensation for all hauling, grading, and disposing of excess and unsuitable materials and for all material, labor, equipment, tools, and incidentals necessary to complete the work. The cost of handling, re-handling soils, and grading shall be considered incidental to the cost of Disposal of Excavated Materials (Stockpile), as appropriate.

- 3.02 Material volume for Disposal of Excavated Materials (Stockpile) will be estimated by 80% of estimated truck load volume and documented by the on-site Construction Services Manager prior to leaving the site. Measurement for Disposal of Excavated Materials will not include any material removed outside the limits of disturbance as specified in the Contract Documents.

END OF SECTION

ITEM 3010

STABILIZED CONSTRUCTION ENTRANCE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All work to be performed under this item shall be in accordance with the detail on the Contract Documents and the requirements of Section 512 of the Virginia Department of Transportation, Virginia Department of Transportation, Road and Bridge Specifications.

1.02 MATERIALS

- A. Stone shall be VDOT No. 2 aggregate.
- B. Geotextile - Nonwoven Geotextile as specified in Section 245 Virginia Department of Transportation, Road and Bridge Specifications.

1.03 CONSTRUCTION METHODS

- A. The entrance(s) shall be constructed and maintained in a condition, which will prevent tracking or flowing of sediment onto private or public right-of-way or roads. The location of entrances shall be determined in the field by the Contractor with the approval of the Engineer and the Sediment Control Inspector.
- B. Rehabilitate Stabilized Construction Entrance shall consist of periodic top dressing with additional aggregate, replacement of pipe or other repairs to the entrance.

1.04 MEASUREMENT AND PAYMENT

- A. Stabilized Construction Entrance will be measured and paid for at the Contract unit price per each. When pipe is required, it will not be measured but the cost will be incidental to the Contract unit price for Stabilized Construction Entrance. The payment will be full compensation for excavation, geotextile, aggregate, pipe, rehabilitation, relocation and removal and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

ITEM 3020

TEMPORARY ACCESS ROAD

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This work shall consist of establishing and maintaining a temporary access road as shown on the Contract Documents and the requirements of C-SCM-02 of the Virginia Department of Transportation, Virginia Department of Environmental Quality, Stormwater Management Handbook.

1.02 MATERIALS

- A. Wood Chips or Mulch - Standard Specification 605 of the Virginia Department of Transportation, Virginia Department of Transportation, Road and Bridge Specifications.
- B. Timber Matting - Timber mats shall be made from all natural select hardwood (no preservatives), 100% bolted - no nails, overlapping and designed for heavy duty construction equipment.
- C. Temporary Pipe – A temporary conduit placed to convey drainage beneath a Temporary Access Road. Temporary Pipe must be sufficiently protected from vehicle traffic by timber or bridge matting to prevent pipe collapse.

1.03 CONSTRUCTION METHODS

- A. A Temporary Access Road with a maximum width of 12' shall be installed and maintained as shown on the Contract Documents in the manner selected by the Contractor and as approved by the Engineer. The contractor shall maintain the minimum access road depth as outlined in C-SCM-02 of the Virginia Department of Transportation, Virginia Department of Environmental Quality, Stormwater Management Handbook.
- B. The Contractor may need to use additional Timber Matting or Swamp Mats in areas as directed by the Project Manager to minimize impacts to wetlands, control sediment, or facilitate movement of equipment. Moving and reuse of timber mats as needed shall be at no additional cost to the Owner.
- C. Contractor is responsible for any damage and subsequent repairs to asphalt walking paths due to temporary access road.

1.04 MEASUREMENT AND PAYMENT

- A. Temporary Access Road will be measured and paid for at the Contract unit price per linear foot installed. The payment shall be full compensation for all wood chips, mulch, stone, temporary pipe, timber matting, and all material, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

ITEM 3030

TEMPORARY ACCESS BRIDGE

PART 1 - GENERAL

1.05 DESCRIPTION

- A. This work shall consist of establishing, maintaining, and removing a temporary access bridge as shown on the Contract Documents. Work shall be executed in accordance with C-ENV-03 of the Virginia Department of Transportation, Virginia Department of Environmental Quality, Stormwater Management Handbook.

1.06 MATERIALS

- A. Materials shall conform to C-ENV-03 of the Virginia Department of Transportation, Virginia Department of Environmental Quality, Stormwater Management Handbook.

1.07 CONSTRUCTION METHODS

- A. A Temporary Access Bridge shall be installed, maintained, and removed in accordance with C-ENV-03 of the Virginia Department of Transportation, Virginia Department of Environmental Quality, Stormwater Management Handbook..

1.08 MEASUREMENT AND PAYMENT

- A. Temporary Access Bridge will not be measured but will be paid for per each (EA) at the contract unit price. The payment shall be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

ITEM 3040

CONTINGENT SILT FENCE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This work shall consist of installing and maintaining silt fence as shown on the Erosion and Sediment Control Contract Documents or as directed by the Engineer. All work to be performed under this item shall be in accordance with the requirements of Sections 242 and 245 of the Virginia Department of Transportation, Virginia Department of Transportation, Road and Bridge Specifications, with the following additions and/or modifications herein:

1.02 MATERIALS

- A. Contractor shall furnish all materials necessary to construct and install the Silt Fence as specified in Sections 242 and 245 Virginia Department of Transportation, Road and Bridge Specifications.

1.03 CONSTRUCTION METHODS

- A. This work shall include furnishing, installing and maintaining silt fence for sediment control. Silt fence shall be installed in accordance with the specifications as shown on the Erosion and Sediment Control Contract Documents or as directed by the Engineer or the Sediment Control Inspector.

1.04 MEASUREMENT AND PAYMENT

- A. Silt Fence will be measured and paid for at the Contract unit price per linear foot. The payment shall be full compensation for furnishing, installation, maintenance, and removal and for all material, labor, equipment, tools, and incidentals necessary to complete the work.
- B. Replacement or resetting of the Silt Fence, if deemed necessary by the inspector, will not be measured for payment but will be incidental to the Silt Fence.

END OF SECTION

ITEM 3050

SUPER SILT FENCE

PART 1 - GENERAL

1.05 DESCRIPTION

- A. This work shall consist of installing and maintaining silt fence as shown on the Erosion and Sediment Control Contract Documents or as directed by the Engineer. All work to be performed under this item shall be in accordance with the requirements of Section 242 and 245 of the Virginia Department of Transportation, Virginia Department of Transportation, Road and Bridge Specifications, with the following additions and/or modifications herein:

1.06 MATERIALS

- A. Contractor shall furnish all materials necessary to construct and install the Super Silt Fence as specified in Sections 242 and 245 of the Virginia Department of Transportation, Road and Bridge Specifications.

1.07 CONSTRUCTION METHODS

- A. This work shall include furnishing, installing and maintaining silt fence for sediment control. Silt fence shall be installed in accordance with the specifications as shown on the Erosion and Sediment Control Contract Documents or as directed by the Engineer or the Sediment Control Inspector. Super Silt fence shall be installed prior to the disturbance of stockpiling, staging and construction access areas shown on the Erosion and Sediment Control Contract Documents.

1.08 MEASUREMENT AND PAYMENT

- A. Super Silt Fence will be measured and paid for at the Contract unit price per linear foot. The payment shall be full compensation for furnishing, installation, maintenance, and removal and for all material, labor, equipment, tools, and incidentals necessary to complete the work.
- B. Replacement or resetting of the Super Silt Fence, if deemed necessary by the inspector, will not be measured for payment but will be incidental to the Silt Fence.

END OF SECTION

ITEM 3060

FOREST RETENTION SIGNAGE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Contractor shall furnish all labor, equipment, and materials necessary for the installation and maintenance of appropriate forest retention signs. Trees that have limited potential to be damaged by construction activities and with sufficient room to avoid during construction shall be protected with Safety Fence and Forest Retention Signage. Safety Fence with Forest Retention Signage shall be installed as described in Item 1080: Safety Fence and modified to include a forest retention signage as described below.

1.02 MATERIALS

- A. Safety Fence – Item 1080
- B. Forest Retention Signage – Signs shall be constructed using durable materials to withstand all anticipated weather conditions. The signs shall also be mounted to posts capable of withstanding possible inundation and flood conditions. Contractor shall maintain signs throughout the duration of the work, including downtime periods.

1.03 CONSTRUCTION METHODS

- A. The Contractor shall erect the Safety Fence as designated on the Contract Documents and as directed by the Engineer prior to beginning construction.
- B. In addition, tree protection fencing shall not be fastened or nailed to trees. One Forest Retention Signage, sign or equivalent, shall be posted for every 100 linear feet of tree protection high visibility fence. Signs shall be mounted to posts.

1.04 MEASUREMENT AND PAYMENT

- A. Forest Retention Signage will be measured and paid for at the contract unit price per each installed. The payment will be full compensation for furnishing, installation, maintenance, and removal of the fence as shown on the Contract Documents, including all materials, labor, equipment, signage, tools and incidentals necessary to complete the work.

END OF SECTION

ITEM 3070

MAINTENANCE OF STREAM FLOW

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This work shall consist of maintaining and diverting stream flow and installing flow diversion devices for the purpose of isolating work areas when construction activities take place within the stream channel, as specified in the Erosion and Sediment Control Contract Documents or as directed by the Engineer.

1.02 MATERIALS

- A. Sandbags - Sandbags shall consist of materials, which are resistant to ultraviolet radiation, tearing and puncture, and woven tightly enough to prevent leakage of fill material (i.e., sand, fine gravel, etc.).
- B. Sheet piling - Sheet piling shall consist of polyethylene or other material, which is impervious and resistant to puncture and tearing.
- C. Pump(s) - Pump(s) shall be large enough to maintain un-interrupted base flow to the channel downstream of the work area. The pump-around shall include a hose suitable to convey water over land to the downstream section. The minimum length of hose required (measured in linear feet) is equivalent to the maximum estimate for three workdays provided by the Contractor.
- D. Sediment Filter Bag(s) - Filter bags shall be in accordance with the plan and construction specifications per VDEQ Virginia Stormwater Management Handbook
 - 1. The filter bag will be removed and replaced at the discretion of the Engineer when the filtering rate is inadequate for the pumping rate. The bags and sediment will be disposed of off-site.
 - 2. Sediment Filter Bags should be made of nonwoven, needle-punched, polypropylene Geotextile designed to meet or exceed the mechanical properties:
 - a. Tensile Strength (ASTM D4632) - 250 lbs
 - b. Elongation @ Break (ASTM D4632) - 50%
 - c. Mullen Burst (ASTM D3786) - 350 psi

- d. Puncture Strength (ASTM D4833) - 150 lbs
- e. Trapezoidal Tear (ASTM D4533) - 80 lbs
- f. Apparent Opening Size (ASTM D4751) - 40-80 US Sieve
- g. Permittivity (ASTM D4491) - 1.30 Sec-1
- h. UV Resistance, % Retained (ASTM D4355) - 70%
- i. Flow Rate (ASTM D4491) - 70 gal/min/sf

3. The Engineer may specify any size up to 15' x 15'.

1.03 CONSTRUCTION METHODS

- A. During all operations, the Contractor shall maintain continuous flow and operation of all waterways, channels and storm drains while minimizing the discharge of sediment to any watercourse. The Contractor shall conduct their operations in a manner that reduces the amount of sedimentation introduced into the stream to an absolute minimum. Dewatering of excavation areas directly into the stream is prohibited.
- B. The Contract Documents include details and suggested sequences for maintaining channel flow during construction. The Contractor may develop his/her own plan to maintain flow and control erosion with the approval of the Engineer. The Contractor shall obtain approval from the Prince William County Soil and Water Conservation District for any significant modifications to the Contract Documents.
- C. The Contractor shall utilize sandbags, pumps, sump pits, hoses, energy dissipaters, diversion pipes, dewatering methods, and other means to divert flow around the work area, dewater work areas, and control discharges of sediment to receiving waters.
- D. Maintenance of Stream Flow measures shall be maintained throughout the duration of the work to the Engineer's satisfaction. Any discharge of sediment resulting from the Contractor's construction shall be remedied to the satisfaction of the Engineer at the Contractor's expense.
- E. Upon completion of the work, after the drainage devices have served their purposes, and with the inspector's approval, the devices shall be removed and disposed of away from the project by the Contractor at their own expense. Removal and disposal shall be done in compliance with erosion and sediment control and waste disposal requirements of the Prince William County Code.

1.04 MEASUREMENT AND PAYMENT

- A. Maintenance of Stream Flow will not be measured but will be paid for at the Contract lump sum price. The payment will include designing and providing diversion structures regardless of the type required to satisfactorily divert the stream flow, excavation, backfill, pump-around and dewater the site and excavated areas within the stream diversion area, maintenance of the diversion system, sandbags, polyethylene sheeting, dikes, sediment filter bags, excavation and cleanout of dewatering basins, diversion pipes, pumps, sump pits, hoses, connections, Geotextile, energy dissipaters for hose outfalls, resetting of the diversion system, removal of the diversion system, and all other materials, labor, equipment, tools and incidentals necessary to complete the work. This price will not be adjusted when consideration is given to an alternative stream diversion system regardless of any changes in quantities from that shown in the Contract Documents. The Contractor may make requests for partial payment of dewatering expenses monthly. Payment request shall be prorated based on the percentage of the dewatering completed to date.
- B. If the total payments made for dewatering are less than the Contract Lump Sum Price for this item, the unpaid balance will be included in the final contract payment.
- C. Payment of the Contract Lump Sum Price shall constitute full compensation for completion of the work.

END OF SECTION

ITEM 3080

TREE PROTECTION PLANKING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Contractor shall protect all trees within the limit of disturbance not designated for removal. Trees that have limited the potential to be damaged by construction activities and with sufficient room to avoid during construction shall be protected with Tree Protection Fencing. Tree Protection Fencing shall be installed as described in Item 1060: Safety Fence, and as detailed on the Construction Documents. Trees that are directly adjacent to or have the potential to be damaged by machinery that is in close operation shall be protected with Tree Protection Planking. The Contractor shall provide wooden planks as impact protection on individual trees or as directed by the Engineer.

1.02 MATERIALS

- A. Wooden planks - Wooden planks shall be hardwood and shall be a minimum of 2 inch thick.
- B. 10 Gauge Wire
- C. Burlap

1.03 CONSTRUCTION METHODS

- A. Place wooden planks around trees to a height of 8 foot or as directed by the Engineer. During installation of the wood planks, caution shall be used to avoid damaging any bark or branches. Tree bark must be protected from damage due to direct contact with wire or other anchoring materials by use of burlap.

1.04 MEASUREMENT AND PAYMENT

- A. Tree protection planking will be measured and paid for at the Contract price per each item. The payment will be full compensation for all material, labor, equipment, tools, and incidentals (including watering during the construction period) necessary to complete the work. The price must include removal from site of all related materials upon project completion. Reuse of tree protection planking shall be incidental to this item.

END OF SECTION

ITEM 3090

ROOT PRUNING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. All work to be performed under this item shall be in accordance with the detail on the Contract Documents.

1.02 CONSTRUCTION METHODS

- A. Root pruning shall be done with a trencher or vibratory plow to a depth of 12”.
- B. Root pruning shall take place prior to any clearing or grading. Exact pruning location shall be determined by a certified arborist.
- C. Avoid damage to existing structures, plants, and turfgrass. Keep turfgrass areas, paved surfaces and sidewalks clean.
- D. Promptly remove, disperse, or dispose of wood debris and other waste materials as directed.
- E. Do not injure vegetation to be preserved. Repair injuries to bark, trunks, or limbs by cutting, smoothing, and tracing the bark in accordance with ANSI A300 Standards for Tree Care Operations.

1.03 MEASUREMENT AND PAYMENT

- A. Root Pruning will be measured and paid for at the Contract unit price per linear foot. The payment will be full compensation for all labor, materials, equipment, tools, cleanup and restoration, damage repair, disposal fees, and incidentals necessary to complete the work.

END OF SECTION

ITEM 4010

BOULDER CASCADE

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This work shall consist of furnishing, transporting, stockpiling, installing, and maintaining boulder cascade structures along the stream channel, as specified in the Contract Documents.

PART 2 - Materials

A. ROCK

- a. Rock shall consist of angular flat rock imbricated? of appropriate color (e.g. green/gray, brown/gray, dark gray, and/or dark brown in color) obtained from an approved source. Any rock shall be free from laminations, weak cleavages, and shall not disintegrate from the action of air, water, and in handling and placing. Granular sedimentary rock shall generally not be acceptable.
- b. The rock shall have a minimum unit weight of 165 lbs per cubic foot.
- c. Rocks shall have a minimum width (Y-Axis) and length (X-Axis) between 2.75 feet and 3.25 feet.
- d. Rocks shall have a Minimum height (Z-Axis) between 1.5 feet and 2.5 feet.
- e. Weight of rock must be 2 tons or greater.
- f. The Contractor shall obtain from the quarry and submit to the City of Alexandria a certificate verifying the follow – 1) Rock, 2) Classification, 3) Weight per cubic foot, 4) Weight of rock being supplied, and 5) Rock Size
- g. Samples shall be delivered to the project site for approval by the City of Alexandria prior to its use in the project. Any unsuitable material shall be removed at the Contractor's expense.
- h. The Contractor shall not be granted an extension of time or extra compensation due to delay caused by sampling, testing, approval, or disapproval of rock material under the requirements of these Specifications.

- i. Rock sizes shall be as specified below:

Structure	X-Axis (Length)	Y-Axis (Width)	Z-Axis (Height)
Boulders (Footer Rock and Top Rocks)	2.75 – 3.25 feet	2.75 – 3.25 feet	1.5 – 2.5 feet

B. FOOTER ROCK

- a. Footer rock shall meet the specifications for Rock contained in the Contract Documents. Footer rock consists of rock placed below the invert of the proposed channel or underneath top rocks to provide support for the top rock and prevent toe scour.

C. TOP ROCKS (HEADER)

- a. Top rock (header rock) shall meet the specifications for Rock contained in the Contract Documents. Top rock consists of the row(s) of rock placed upon and above footer rocks.

D. GEOTEXTILE FABRIC

- a. Geotextile/filter fabric shall be non-woven polypropylene geotextile, such as Mirafi 700x, Mirafi 70/20, Filterweave 500, or approved equal.

E. SAND

- a. Sand shall meet the AASHTO-M-6 or ASTM-C-33 standard, 0.02 inches to 0.04 inches in size.

F. GRAVEL

- a. Gravel shall meet the ASTM No. 57 standard.

PART 3 -Construction

3.01 GENERAL

- A. Construction and construction tolerances shall be in accordance with the Drawings and Specifications. Grades shall be within 0.25' of the grades shown on the plans.

- B. Before beginning installation, verify site conditions are as indicated on the Drawings. Notify the Engineer if site conditions are not acceptable. Do not begin preparation or installation until unacceptable conditions have been corrected.

3.02 CONSTRUCTION OBSERVATION

- A. The City or Project Engineer should verify the materials supplied by the contractor meet all the requirements of the specification. This includes all submittals and proper installation of the system.
- B. The Contractor's field construction supervisor shall have demonstrated experience and be qualified to direct all work at the site as approved the City or Engineer.

3.03 INSTALLATION INSTRUCTIONS

- A. The contractor shall ensure that the erosion and sediment control devices specified in the contract documents are in place before any work begins on the rock cascades.
- B. Contractor shall excavate to the extents required to construct the structure. The subgrade should be smooth, firm, and free from protruding objects or voids that would affect the proper positioning of the first layer of rock and filter fabric. Contractor shall take precautions to minimize over-excavation. Over-excavation shall be filled with compacted infill material, or as directed by the Engineer, at the Contractor's expense.
- C. The Contractor shall place filter fabric under all layers of boulders. Place filter fabric loosely and evenly on the prepared slope and secure per manufacturer requirements. Adjacent strips should overlap 12 inches. The upslope filter fabric should always be placed over the downslope filter fabric. If the filter fabric is torn or damaged, it should be repaired or replaced.
- D. The contractor shall place footer rocks on the downstream end of cascade. A second or third row (as necessary) of footer boulders shall anchor the cascade boulders such that footers extend a minimum of 2 feet below the receiving pool bottom elevation. Adjacent boulders shall be placed in direct physical contact with one another. Gaps shall not exceed 2 inches unless otherwise shown on the plans or approved by the Engineer.
- E. Lay footer boulders as a gently curved rack to spread water laterally (ends of curve point downstream). Form a gentle parabolic shape to keep flow within the thalweg and shoulders. Embed boulders, a minimum of 2 feet into adjacent banks. When boulders are unable to be placed into the stream bank due to their proximity to segmental gravity block retaining walls, the contractor shall work with the selected segmental block retaining wall supplier to determine an appropriate method to ensure cascade stability with the approval of the City and Project Engineer, whether by pocket keying, grout, or similar.

- F. Secure footer boulders into soil over pinned geotextile.
- G. Stack the first layer of rock ensuring that the rocks are stacked so the placed rock rests on two rocks in the tier below it. Place in irregular offset pattern.
- H. Use smaller stones in voids between the tiers to ensure that stacked rocks rest solidly on the tier below with minimal opportunity for movement.
- I. Place filter fabric at the completion of each tier of stacked rock.
- J. Continue placing tiers of rock until the design height is achieved.
- K. Wash in smaller particles into the structure at the end of construction Start at top of cascade and use a 2-inch pump and hose to seal structures and promote surface flow.. Repeat multiple times and supply more sand and gravel at the top weirs to continue supplying materials to fill voids in subsequent storms and washes.
- L. Chink larger voids between boulders.
- M. Liberally cast sand and gravel over each finished tier to fill in voids and to supply material for the wash-in stage.
- N. Trim any excess geotextile fabric such that it is not visible.
- O. Upon completion of work, remove unsuitable and surplus rocks and excavated materials to fill areas or approved off-site locations.

END OF SECTION

ITEM 4020

CASCADE POOL

1.01 DESCRIPTION:

- A. Cascade pool structures are in-stream streambed features directly downstream of boulder cascades composed of rock constructed in steep stream reaches to provide grade control energy dissipation during storm flow events. This work shall consist of transporting, installing and maintaining step-pools within the stream channel, as specified on the Contract Documents or as directed by the Engineer.

1.02 MATERIALS

- A. Item 9070: Rip Rap for Cascade Pools

1.03 CONSTRUCTION METHODS

- A. Rock step pools shall be installed per the Contract Documents and details, and the following Construction Specifications. The Contractor shall arrange and construct rock step pools under the direction and approval of the Engineer.
- B. The structure installation area shall be graded to the general shape of the steps and pools and to a depth sufficient to allow for installation of the Rock Step Pool header and footer rocks and geotextile.
- C. Geotextile shall be placed to the upstream side of the Rock Step so that the geotextile fabric is on the backside of the rock and not visible once backfilled with proposed stream substrate mix as shown in the Contract Documents. Any excess or exposed fabric shall be trimmed.
- D. Surface elevations, widths, slopes, and dimensions should conform to those specified in the Contract Documents. Tolerances of the finished structure are as follows:

Stations and Offsets: ± 0.5 ft

Surface Elevations: ± 0.1 ft

Placed material not conforming to the specified limits shall be removed and replaced as directed by Engineer at no additional cost to the County.

1.04 MEASUREMENT AND PAYMENT

- A. Payment will be full compensation for all materials, transport, excavation, installation, and maintenance of rock step pools, and for all material, labor, equipment, tools, and incidentals necessary to complete each Pool as specified in these specifications and on the Contract Documents.
- B. Cascade Pools will not be measured and paid for separately but will be incidental to the following items:
- C. Excavating, sorting, stockpiling, and placing salvaged Streambed Material shall be incidental to Item 2010: Stream Channel Excavation.
- D. Item 9070: Rip Rap for Cascade Pools will be measured and paid for at the Contract unit price per linear ton placed and installed as part of Cascade Pool construction.
- E. Geotextile shall be considered incidental to the cost of Cascade Pools .

END OF SECTION

ITEM 4030

GRAVITY BLOCK RETAINING WALL

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes furnishing all materials and labor required for the design and construction of a precast concrete modular block (PMB) retaining wall with or without geosynthetic reinforcement. Precast modular block retaining wall blocks under this section shall be cast utilizing a wet-cast concrete mix and exhibit a final handling weight in excess of 1,000 pounds (450 kg) per unit and may utilize concrete-reinforcing steel.
- B. Scope of Work: The work shall consist of furnishing materials, labor, equipment and supervision for the construction of a precast modular block (PMB) retaining wall structure in accordance with the requirements of this section and in acceptable conformity with the lines, grades, design and dimensions shown in the project site plans.
- C. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 31, Division 32 and Division 33 also apply to this Section.

1.02 PRICE AND PAYMENT PROCEDURES

- A. Allowances. No allowance shall be made in the price of the retaining wall for excavation beyond the limits required for retaining wall construction as shown on the project plans. The cost of excavation for the purposes of site access shall be the responsibility of the Contractor. Removal of unsuitable soils and replacement with select fill shall be as directed and approved in writing by the Client or Client's representative and shall be paid under separate pay items.
- B. Unit Prices. In addition to a lump sum price pursuant to completion of the scope of work described in Part 1.01 of this Section, the Contractor shall provide a unit price per square foot of vertical wall face that shall be the basis of compensation for up to a ten (10) percent increase or reduction in the overall scope of the retaining wall work.
- C. Measurement and Payment
 - 1. The unit of measurement for furnishing the precast modular block retaining wall system shall be the vertical area of the wall face surface as measured from the top

of the leveling pad to the top of the wall including coping. The final measured quantity shall include supply of all material components and the installation of the precast modular block system.

2. The final accepted quantities of the precast modular block retaining wall system will be compensated per the vertical face area as described above. The quantities of the precast modular block retaining wall as shown on the plans and as approved by the Owner shall be the basis for determination of the final payment quantity. Payment shall be made per square foot of vertical wall face.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preconstruction Meeting. As directed by the Client, the Contractor shall schedule a preconstruction meeting at the project site prior to commencement of retaining wall construction. Participation in the preconstruction meeting shall be required of the Contractor, Retaining Wall Installation Contractor (RWIC), Grading Contractor, and Inspection Engineer. The Contractor shall provide notification to all parties at least 10 calendar days prior to the meeting.

1. Preconstruction Meeting Agenda:

- a. The Contractor shall explain all aspects of the retaining wall construction drawings.
- b. The Contractor shall explain the required bearing capacity of soil below the retaining wall structure and the shear strength of in-situ soils assumed in the retaining wall design to the Inspection Engineer.
- c. The Contractor shall explain the required shear strength of fill soil in the reinforced, retained and foundation zones of the retaining wall to the Inspection Engineer.
- d. The Contractor shall explain any measures required for coordination of the installation of utilities or other obstructions in the reinforced or retained fill zones of the retaining wall.
- e. The RWIC shall explain all excavation needs, site access and material staging area requirements to the Contractor and Grading Contractor.

1.04 SUBMITTALS

- A. Product Data. At least 14 days prior to construction, the Contractor shall submit the retaining wall product submittal package for review and approval. The submittal package shall include technical specifications and product data from the manufacturer.

- B. The Contractor shall provide certified manufacturer test reports for the geosynthetic soil reinforcement material in the manufactured roll width specified. The test report shall list the individual numbers for which the certified materials properties are valid.
- C. Installer Qualification Data. At least 14 days prior to construction, the Contractor shall submit the qualifications of the business entity responsible for installation of the retaining wall.
- D. Retaining Wall Design Calculations and Construction Drawings. At least 14 days prior to construction, the Contractor shall furnish electronic versions construction drawings and the supporting structural calculations report for review and approval. The submittal shall include
 - 1. Signed, sealed and dated drawings and engineering calculations prepared in accordance with these specifications.
 - 2. Qualifications Statements by the Contractor summarizing their experience.
 - 3. Certificate of Insurance, as specified in paragraph 1.06, subparagraph B of this section.

1.05 CONSTRUCTION DRAWING PREPARATIONS

- A. Construction drawings shall include, but is not limited to, the following:
 - 1. Current versions of the site, grading, drainage, utility, erosion control, landscape, and irrigation plans;
 - 2. Electronic CAD file of the civil site plans listed in (1);
 - 3. Report of geotechnical investigation and all addenda and any supplemental reports;
 - 4. Recommendations of the project Geotechnical Engineer regarding effective stress shear strength and total stress shear strength (when applicable) parameters for in-situ soils in the vicinity of the proposed retaining wall(s) and for any fill soil that may potentially be used as backfill in retained and/or foundation zones of the retaining wall.
- B. Contractor shall provide a certificate of professional liability insurance verifying the minimum coverage limits of \$1 million per claim and \$1 million aggregate.
- C. Design of the precast modular block retaining wall shall satisfy the requirements of this section. Where local, State, or national design or building code requirements exceed these specifications, these requirements shall also be satisfied.

- D. Contractor shall note any exceptions to the requirements of this section by listing them at the bottom right corner of the first page of the construction shop drawings.
- E. Approval or rejection of the exceptions taken by the Contractor will be made in writing as directed by the Owner.
- F. Contractor shall determine the appropriate standard(s) to be utilized, and to which the precast modular block design shall be based upon, except as noted herein. Refer to Part 1.03, Paragraph C, Part 1.
- G. In the event that a conflict is discovered between these specifications and a reasonable interpretation of the design specifications and methods referenced in paragraph F above, these specifications shall prevail. If a reasonable interpretation is not possible, the conflict shall be resolved per the requirements in paragraph 1.03, subparagraph A of this section.
- H. Soil Shear Parameters. Contractor shall prepare the construction shop drawings based upon soil shear strength parameters from the available project data and the recommendations of the project Geotechnical Engineer. If insufficient data exists to develop the retaining wall design, the Contractor shall communicate the specific deficiency of the project information or data in writing.
- I. Allowable bearing pressure requirements for each retaining wall shall be clearly shown on the construction drawings.
- J. Global Stability. Overall (global) stability shall be evaluated in accordance with the principals of limit equilibrium analysis as set forth in FHWA-NHI-10-024 Volume I and FHWA-NHI-10-025 Volume II GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, or other methods, as determined by the Contractor, as referenced in Section 1.06, Part F. The minimum factors of safety shall be as follows:

Normal Service (Static)	1.3
Seismic	1.1
Rapid Drawdown (if applicable)	1.2

Note: Contractor to select appropriate FOS

- K. Seismic Stability. Seismic loading shall be evaluated in accordance with AASHTO Load and Resistance Factor Design (LRFD) methodology, or NCMA (ASD) methodology as determined by the Contractor as referenced in Section 1.06, Part F.

PART 2 - MATERIALS

2.01 PRECAST MODULAR BLOCK RETAINING WALL UNITS

- A. All units shall be wet-cast precast modular retaining wall units conforming to ASTM C1776.
- B. All units for the project shall be obtained from the same manufacturer. The manufacturer shall be licensed and authorized to produce the retaining wall units by the precast modular block system patent holder/licensor and shall document compliance with the published quality control standards of the proprietary precast modular block system licensor for the previous three (3) years or the total time the manufacturer has been licensed, whichever is less.
- C. Concrete used in the production of the precast modular block units shall be first-purpose, fresh concrete. It shall not consist of returned, reconstituted, surplus or waste concrete. It shall be an original production mix meeting the requirements of ASTM C94 and exhibit the properties as shown in the following table:

Concrete Mix Properties

Freeze Thaw Exposure Class ⁽¹⁾	Minimum 28-Day Compressive Strength ⁽²⁾	Maximum Water Cement Ratio	Nominal Maximum Aggregate Size	Aggregate Class Designation ⁽³⁾	Air Content ⁽⁴⁾
Moderate	4,000 psi (27.6 MPa)	0.45	1 inch (25 mm)	3M	4.5% +/- 1.5%
Severe	4,000 psi (27.6 MPa)	0.45	1 inch (25 mm)	3S	6.0% +/- 1.5%
Very Severe	4,500 psi (30.0 MPa)	0.40	1 inch (25 mm)	4S	6.0% +/- 1.5%
Maximum Water-Soluble Chloride Ion (Cl⁻) Content in Concrete, Percent by Weight of Cement^(5,6)					0.15
Maximum Chloride as Cl⁻ Concentration in Mixing Water, Parts Per Million					1000
Maximum Percentage of Total Cementitious Materials By Weight ^(7,9) (Very Severe Exposure Class Only):					
Fly Ash or Other Pozzolans Conforming to ASTM C618					25
Slag Conforming to ASTM C989					50
Silica Fume Conforming to ASTM C1240					10
Total of Fly Ash or Other Pozzolans, Slag, and Silica Fume ⁽⁸⁾					50
Total of Fly Ash or Other Pozzolans and Silica Fume ⁽⁸⁾					35
Alkali-Aggregate Reactivity Mitigation per ACI 201					
Slump (Conventional Concrete) per ASTM C143⁽¹⁰⁾			5 inches +/- 1 ½ inches (125 mm +/- 40 mm)		
Slump Flow (Self-Consolidating Concrete) per ASTM C1611			18 inches – 32 inches (450 mm – 800 mm)		

⁽¹⁾Exposure class is as described in ACI 318. “Moderate” describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. “Severe” describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture. “Very Severe” describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture and exposed to deicing chemicals. Exposure class should be specified by owner/purchaser prior to order placement.

⁽²⁾Test method ASTM C39.

⁽³⁾Defined in ASTM C33 Table 3 *Limits for Deleterious Substances and Physical Property Requirements of Coarse Aggregates for Concrete*.

⁽⁴⁾Test method ASTM C231.

⁽⁵⁾Test method ASTM C1218 at age between 28 and 42 days.

⁽⁶⁾Where used in high sulfate environments or where alkali-silica reactivity is an issue, water soluble chloride shall be limited to no more than trace amounts (from impurities in concrete-making components, not intended constituents.)

⁽⁷⁾The total cementitious material also includes ASTM C150, C595, C845, C1157 cement. The maximum percentages shall include:

- (a) Fly ash or other pozzolans in type IP, blended cement, ASTM C595, or ASTM C1157.
- (b) Slag used in the manufacture of an IS blended cement, ASTM C595, or ASTM C1157.
- (c) Silica fume, ASTM C1240, present in a blended cement.

⁽⁸⁾Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials.

⁽⁹⁾Prescriptive limits shown may be waived for concrete mixes that demonstrate excellent freeze/thaw durability in a detailed and current testing program.

⁽¹⁰⁾Slump may be increased by a high-range water-reducing admixture.

- D. Concrete reinforcing steel, when required for the specified block, shall conform to ASTM A615 and have a minimum yield strength of 60,000 psi.
- E. At least 1 inch of concrete cover shall be maintained over all reinforcing steel bars.
- F. Each concrete block shall be cast in a single continuous pour without cold joints. With the exception of half-block units, corner units and other special application units, the precast modular block units shall conform to the nominal dimensions listed in the table below and be produced to the dimensional tolerances shown:

Block Type	Dimension	Nominal Value	Tolerance
28" (710 mm) Block	Height	18" (457 mm)	+/- 3/16" (5 mm)
	Length	46-1/8" (1172 mm)	+/- 1/2" (13 mm)
	Width*	28" (710 mm)	+/- 1/2" (13 mm)
41" (1030 mm) Block	Height	18" (457 mm)	+/- 3/16" (5 mm)
	Length	46-1/8" (1172 mm)	+/- 1/2" (13 mm)
	Width*	40-1/2" (1030 mm)	+/- 1/2" (13 mm)
60" (1520 mm) Block	Height	18" (457 mm)	+/- 3/16" (5 mm)
	Length	46-1/8" (1172 mm)	+/- 1/2" (13 mm)
	Width*	60" (1520 mm)	+/- 1/2" (13 mm)
52" (1320 mm) XL Block	Height	36" (914 mm)	+/- 3/16" (5 mm)
	Length	46-1/8" (1172 mm)	+/- 1/2" (13 mm)
	Width*	60" (1520 mm)	+/- 1/2" (13 mm)
72" (1830 mm) XL Block	Height	36" (914 mm)	+/- 3/16" (5 mm)
	Length	46-1/8" (1172 mm)	+/- 1/2" (13 mm)
	Width*	60" (1520 mm)	+/- 1/2" (13 mm)
96" (2440 mm) XL Block	Height	36" (914 mm)	+/- 3/16" (5 mm)
	Length	46-1/8" (1172 mm)	+/- 1/2" (13 mm)
	Width*	60" (1520 mm)	+/- 1/2" (13 mm)

* Block tolerance measurements shall exclude variable face texture

- G. With the exception of half-block units, corner units and other special application units, the precast modular block units shall have two (2), circular dome shear knobs that are 10 inches (254 mm), 7.5 inches (190 mm), or 6.75 inches (171 mm) in diameter and 4 inches (102 mm) or 2 inches (51 mm) in height. The shear knobs shall fully index into a continuous semi-cylindrical shear channel in the bottom of the block course above. The Peak interlock shear between any two (2) vertically stacked precast modular block units, with 10-inch (254 mm) diameter shear knobs, measured in accordance with

ASTM D6916 shall exceed 6,500 lb/ft (95 kN/m) at a minimum normal load of 500 lb/ft (7kN/m). as well as an ultimate peak interface shear capacity in excess of 11,000 lb/ft (160 kN/m). The peak interlock shear between any two (2) vertically stacked precast modular block units, with 7.5-inch (190 mm) or 6.75-inch (171 mm) diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 1,850 lb/ft (27 kN/m) at a minimum normal load of 500 lb/ft (7kN/m) as well as an ultimate peak interface shear capacity in excess of 10,000 lb/ft (146 kN/m). Test specimen blocks tested under ASTM D6916 shall be actual, full-scale production blocks of known compressive strength. The interface shear capacity reported shall be corrected for a 4,000 psi (27.6 MPa) concrete compressive strength. Regardless of precast modular block configuration, interface shear testing shall be completed without the inclusion of unit core infill aggregate.

- H. The 28-inch (710 mm) and 41-inch (1030 mm) precast modular block units may be cast with a continuous vertical core slot that will permit the insertion of a 12-inch (305 mm) inch wide strip of geogrid reinforcement to pass completely through the block. When installed in this manner, the geogrid reinforcement shall form a non-normal load dependent, positive connection between the block unit and the reinforcement strip. The use of steel for the purposes of creating the geogrid-to-block connection is not acceptable.
- I. Without field cutting or special modification, the precast modular block units shall be capable of achieving a minimum radius of 14 ft - 6 in (4.42 m).
- J. The precast modular block units shall be manufactured with an integrally cast shear knobs that establishes a standard horizontal set-back for subsequent block courses. The precast modular block system shall be available in the standard horizontal set-back facing batter options listed below:

18-inch High Blocks Horizontal <u>Set-Back/Blk. Course</u>	Max. <u>Facing Batter</u>	36-inch High Blocks Horizontal <u>Set-Back/Blk. Course</u>	Max. <u>Facing Batter</u>
3/8" (10 mm)	1.2°	3-1/4" (83 mm)	5.2°
1-5/8" (41 mm)	5.2°		
9-3/8" (238 mm)	27.5°		
16-5/8" (422 mm)	42.7°		

The precast modular block units shall be furnished with the required shear knobs that provide the facing batter required in the construction shop drawings.

- K. The precast modular block unit face texture shall be selected by the owner from the available range of textures available from the precast modular block manufacturer. Each textured block facing unit shall be a minimum of 5.76 square feet (0.54 square meters) with a unique texture pattern that repeats with a maximum frequency of once in any 15 square feet (1.4 square meters) of wall face.
- L. The block color shall be selected by the owner from the available range of colors available from the precast modular block manufacturer.
- M. All precast modular block units shall be sound and free of cracks or other defects that would interfere with the proper installation of the unit, impair the strength or performance of the constructed wall. PMB units to be used in exposed wall construction shall not exhibit chips or cracks in the exposed face or faces of the unit that are not otherwise permitted. Chips smaller than 1.5" (38 mm) in its largest dimension and cracks not wider than 0.012" (0.3 mm) and not longer than 25% of the nominal height of the PMB unit shall be permitted. PMB units with bug holes in the exposed architectural face smaller than 0.75" (19 mm) in its largest dimension shall be permitted. Bug holes, water marks, and color variation on non-architectural faces are acceptable. PMB units that exhibit cracks that are continuous through any solid element of the PMB unit shall not be incorporated in the work regardless of the width or length of the crack.
- N. Preapproved Manufacturers. Manufacturers of Redi-Rock Retaining Wall Systems as licensed by Redi-Rock International, LLC, 05481 US 31 South, Charlevoix, MI 49720 USA; telephone (866) 222-8400; website www.redi-rock.com.
- O. Substitutions. Technical information demonstrating conformance with the requirements of this specification for an alternative precast modular block retaining wall system must be submitted for preapproval at least 14 calendar days prior to the bid date. Acceptable alternative PMB retaining wall systems, otherwise found to be in conformance with this specification, shall be approved in writing by the owner 7 days prior to the bid date. The Client's Representative reserves the right to provide no response to submissions made out of the time requirements of this section or to submissions of block retaining wall systems that are determined to be unacceptable to the owner.
- P. Value Engineering Alternatives. The owner may evaluate and accept systems that meet the requirements of this specification after the bid date that provide a minimum cost savings of 20% to the Client. Construction expediency will not be considered as a contributing portion of the cost savings total.

2.02 DRAINAGE AGGREGATE AND WALL INFILL

- A. Drainage aggregate (and wall infill for retaining walls designed as modular gravity structures) shall be a durable crushed stone conforming to No. 57 size per ASTM C33 with the following particle-size distribution requirements per ASTM D6913:

U.S. Standard	
<u>Sieve Size</u>	<u>% Passing</u>
1-½" (38 mm)	100
1" (25 mm)	95-100
½" (13 mm)	25-60
No. 4 (4.76 mm)	0-10
No. 8 (2.38 mm)	0-5

2.03 LEVELING PAD

- A. The precast modular block units shall be placed on a leveling pad constructed from crushed stone or unreinforced concrete. The leveling pad shall be constructed to the dimensions and limits shown on the retaining wall design drawings prepared by the Contractor.
- B. Crushed stone used for construction of a granular leveling pad shall meet the requirements of the drainage aggregate and wall infill in section 2.04 or a preapproved alternate material.
- C. Concrete used for construction of an unreinforced concrete leveling pad shall satisfy the criteria for AASHTO Class B. The concrete should be cured a minimum of 12 hours prior to placement of the precast modular block wall retaining units and exhibit a minimum 28-day compressive strength of 2,500 psi (17.2 MPa).

PART 3 - EXECUTION

3.01 GENERAL

- A. All work shall be performed in accordance with OSHA safety standards, state and local building codes and manufacturer's requirements.
- B. The Contractor is responsible for the location and protection of all existing underground utilities. Any new utilities proposed for installation in the vicinity of the retaining wall, shall be installed concurrent with retaining wall construction. The General Contractor shall coordinate the work of subcontractors affected by this requirement.

- C. New utilities installed below the retaining wall shall be backfilled and compacted to a minimum of 98% maximum dry density per ASTM D698 standard proctor.
- D. The Contractor is responsible to ensure that safe excavations and embankments are maintained throughout the course of the project.
- E. All work shall be inspected by the Inspection Engineer as directed by the Owner.

3.02 EXAMINATION

- A. Prior to construction, the Contractor, Grading Contractor, RWIC and Inspection Engineer shall examine the areas in which the retaining wall will be constructed to evaluate compliance with the requirements for installation tolerances, worker safety and any site conditions affecting performance of the completed structure. Installation shall proceed only after unsatisfactory conditions have been corrected.

3.03 PREPARATION

- A. Fill Soil.
 - 1. The Inspection Engineer shall verify that reinforced backfill placed in the reinforced soil zone satisfies the criteria of this section.
 - 2. The Inspection Engineer shall verify that any fill soil installed in the foundation and retained soil zones of the retaining wall satisfies the specification of the Contractor as shown on the construction drawings.
- B. Excavation.
 - 1. The Grading Contractor shall excavate to the lines and grades required for construction of the precast modular block retaining wall as shown on the construction drawings. The Grading Contractor shall minimize over-excavation. Excavation support, if required, shall be the responsibility of the Grading Contractor.
 - 2. Over-excavated soil shall be replaced with compacted fill in conformance with the specifications of the Contractor and "Division 31, Section 31 20 00 – Earthmoving" of these project specifications.
 - 3. Embankment excavations shall be bench cut as directed by the project Geotechnical Engineer and inspected by the Inspection Engineer for compliance.
- C. Foundation Preparation.

1. Prior to construction of the precast modular block retaining wall, the leveling pad area and undercut zone (if applicable) shall be cleared and grubbed. All topsoil, brush, frozen soil and organic material shall be removed. Additional foundation soils found to be unsatisfactory beyond the specified undercut limits shall be undercut and replaced with approved fill as directed by the project Geotechnical Engineer. The Inspection Engineer shall ensure that the undercut limits are consistent with the requirements of the project Geotechnical Engineer and that all soil fill material is properly compacted in accordance with project specifications. The Inspection Engineer shall document the volume of undercut and replacement.
2. Following excavation for the leveling pad and undercut zone (if applicable), the Inspection Engineer shall evaluate the in-situ soil in the foundation and retained soil zones.
 - a. The Inspection Engineer shall verify that the shear strength of the in-situ soil assumed by the Contractor is appropriate. The Inspection Engineer shall immediately stop work and notify the Owner if the in-situ shear strength is found to be inconsistent with the retaining wall design assumptions.
 - b. The Inspection Engineer shall verify that the foundation soil exhibits sufficient ultimate bearing capacity to satisfy the requirements indicated on the retaining wall construction shop drawings per paragraph 1.06 I of this section.

D. Leveling Pad.

1. The leveling pad shall be constructed to provide a level, hard surface on which to place the first course of precast modular block units. The leveling pad shall be placed in the dimensions shown on the retaining wall construction drawings and extend to the limits indicated.
2. Crushed Stone Leveling Pad. Crushed stone shall be placed in uniform maximum lifts of 6" (150 mm). The crushed stone shall be compacted by a minimum of 3 passes of a vibratory compactor capable of exerting 2,000 lb (8.9 kN) of centrifugal force and to the satisfaction of the Inspection Engineer.
3. Unreinforced Concrete Leveling Pad. The concrete shall be placed in the same dimensions as those required for the crushed stone leveling pad. The RWIC shall erect proper forms as required to ensure the accurate placement of the concrete leveling pad according to the retaining wall construction drawings.

3.04 PRECAST MODULAR BLOCK WALL SYSTEM INSTALLATION

- A. The precast modular block structure shall be constructed in accordance with the construction drawings, these specifications and the recommendations of the retaining wall system component manufacturers. Where conflicts exist between the manufacturer's recommendations and these specifications, these specifications shall prevail.
- B. Drainage components. Pipe, geotextile and drainage aggregate shall be installed as shown on the construction shop drawings.
- C. Precast Modular Block Installation: Manufacturer's printed installation instructions. Include methods for maintaining installed products.
- D. Construction Tolerance. Allowable construction tolerance of the retaining wall shall be as follows:
 - 1. Deviation from the design batter and horizontal alignment, when measured along a 10' (3 m) straight wall section, shall not exceed 3/4" (19 mm).
 - 2. Deviation from the overall design batter shall not exceed 1/2" (13 mm) per 10' (3 m) of wall height.
 - 3. The maximum allowable offset (horizontal bulge) of the face in any precast modular block joint shall be 1/2" (13 mm).
 - 4. The base of the precast modular block wall excavation shall be within 2" (50 mm) of the staked elevations, unless otherwise approved by the Inspection Engineer.
 - 5. Differential vertical settlement of the face shall not exceed 1' (300 mm) along any 200' (61 m) of wall length.
 - 6. The maximum allowable vertical displacement of the face in any precast modular block joint shall be 1/2" (13 mm).
 - 7. The wall face shall be placed within 2" (50 mm) of the horizontal location staked.

3.05 WALL INFILL AND REINFORCED BACKFILL PLACEMENT

- A. Backfill material placed immediately behind the drainage aggregate shall be compacted as follows:
 - 1. 98% of maximum dry density at $\pm 2\%$ optimum moisture content per ASTM D698 standard proctor or 85% relative density per ASTM D4254.
- B. Compactive effort within 3' (0.9 m) of the back of the precast modular blocks should be accomplished with walk-behind compactors. Compaction in this zone shall be within

95% of maximum dry density as measured in accordance with ASTM D698 standard proctor or 80% relative density per ASTM D 4254. Heavy equipment should not be operated within 3' (0.9 m) of the back of the precast modular blocks.

- C. Backfill material shall be installed in lifts that do not exceed a compacted thickness of 9" (230 mm).
- D. At the end of each work day, the RWIC shall grade the surface of the last lift of the granular wall infill to a $3\% \pm 1\%$ slope away from the precast modular block wall face and compact it.
- E. The Contractor shall direct the Grading Contractor to protect the precast modular block wall structure against surface water runoff at all times through the use of berms, diversion ditches, silt fence, temporary drains and/or any other necessary measures to prevent soil staining of the wall face, scour of the retaining wall foundation or erosion of the reinforced backfill or wall infill.

3.06 OBSTRUCTIONS IN THE INFILL AND REINFORCED FILL ZONE – ADD ALL INFO

- A. The RWIC shall make all required allowances for obstructions behind and through the wall face in accordance with the approved construction shop drawings.
- B. Should unplanned obstructions become apparent for which the approved construction shop drawings do not account, the affected portion of the wall shall not be constructed until the Contractor can appropriately address the required procedures for construction of the wall section in question.

3.07 COMPLETION – ADD ALL INFO

- A. For walls supporting unpaved areas, a minimum of 12" (300 mm) of compacted, low-permeability fill shall be placed over the granular wall infill zone of the precast modular block retaining wall structure. The adjacent retained soil shall be graded to prevent ponding of water behind the completed retaining wall.
- B. For retaining walls with crest slopes of 5H:1V or steeper, silt fence shall be installed along the wall crest immediately following construction. The silt fence shall be located 3' to 4' (0.9 m to 1.2 m) behind the uppermost precast modular block unit. The crest slope above the wall shall be immediately seeded to establish vegetation. The Contractor shall ensure that the seeded slope receives adequate irrigation and erosion protection to support germination and growth.

- C. The Contractor shall confirm that the as-built precast modular block wall geometries conform to the requirements of this section. The Contractor shall document and notify the Client of any deviations.

3.08 MEASUREMENT AND PAYMENT

- A. Gravity Block Retaining Walls will be measured and paid for per linear foot (LF) of wall installed. The cost of drainage aggregate, leveling pad, reinforced backfill, and geotextile shall be considered incidental to the cost of Gravity Block Retaining Walls, as appropriate. The payment will be full compensation for all material, labor, equipment, tools and incidentals necessary to complete the work.

END OF SECTION

ITEM 4040

METAL RAILING

1.01 DESCRIPTION

- A. This work shall consist of furnishing and installing metal railing true to the line, grade, and dimensions shown on the plans or as established by the City or Engineer.

1.02 MATERIALS

- A. Concrete shall conform to Section 217 of the Virginia Department of Transportation, Road and Bridge Specifications. If the Engineer approves the Contractor placing concrete by the extrusion method, the slump of the concrete may be less than 2 inches, the air content shall be no less than 4 percent, and the size of the coarse aggregate shall be no less than No. 7.
- B. Steel reinforcement shall conform to Section 223 of the Virginia Department of Transportation, Road and Bridge Specifications.
- C. Hydraulic cement mortar and grout shall be nonshrinking and shall conform to Section 218 of the Virginia Department of Transportation, Road and Bridge Specifications.
- D. Aluminum railings and materials shall conform to Section 229 of the Virginia Department of Transportation, Road and Bridge Specifications.
- E. Anchor bolts shall conform to Section 226.02(c) of the Virginia Department of Transportation, Road and Bridge Specifications.
- F. Grounding materials shall conform to Section 238 of the Virginia Department of Transportation, Road and Bridge Specifications.

1.03 CONSTRUCTION

- A. Fabrication and erection shall be performed in accordance with Section 407 and Section 410 of the Virginia Department of Transportation, Road and Bridge Specifications. The Contractor shall submit working drawings in accordance with Section 407, including anticipated finish, to be approved by the City and Engineer.

1.04 MEASUREMENT AND PAYMENT

- A. Metal railing will be paid for at the contract unit price per linear foot installed. This price shall include constructing, fabricating, and furnishing rails, rail posts, post bearing pads, anchor assemblies, and sleeves; furnishing and installing grounding materials; painting; galvanizing; reinforcing steel necessary; and concrete where applicable.

ITEM 4050

PRE-CAST ENDWALL FOR PIPE CULVERTS

1.01 DESCRIPTION:

- A. This item covers the furnishing and installation of Precast Endwalls for Pipe Culverts and Precast Endwalls for Multiple Pipe Culverts.

1.02 MATERIALS

- A. 36" Precast Endwall for Pipe Culverts

1.03 CONSTRUCTION METHODS

- A. Precast Endwalls for Pipe Culverts shall be installed in accordance with the contract documents. Precast Endwalls for Pipe Culverts shall be installed in accordance with Detail 101.18 and Detail 101.06 of the Virginia Department of Transportation, Road and Bridge Specifications

1.04 MEASUREMENT AND PAYMENT

- A. Precast Endwalls for Pipe Culverts will be measured and paid for each Precast Endwalls for Pipe Culverts installed. The payment will be full compensation for all material, labor, equipment, tools and incidentals necessary to complete the work.

END OF SECTION

ITEM 4060

ARMORED UTILITY CROSSING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Armored Utility Crossings structures are used to protect existing sanitary sewer lines and provide protection from storm flows. The work includes placement of a stone structure within the proposed stream channel overtop of utilities as well as a cast-in-place concrete pipe encasement. This work shall consist of transporting material, installing and maintaining Armored Utility Cross within the stream channel and stream bank, as specified on the Contract Documents or as directed by the Engineer.

1.02 MATERIALS

- A. Class I Riprap for Armored Utility Crossing shall consist of stone of appropriate color (e.g., green/gray, brown/gray, and tan/brown in color) obtained from an approved source. All rock shall be free from laminations, weak cleavages and will not disintegrate from the action of air, salt water and in handling and placing. Granular sedimentary rock will generally be unacceptable. Concrete will not be considered as an alternative for rock. White rock is not acceptable.
- B. Concrete (3,000 P.S.I or greater) shall be used for the encasement.

1.03 CONSTRUCTION METHODS

- A. Armored Utility Crossing shall be installed per the Contract Documents and details, and the following Construction Specifications. The Contractor shall arrange and construct Armored Utility Crossings under the direction and approval of the Engineer.
- B. Contractor shall review the Armored Utility Crossing Contract documents and details with Engineer prior to construction. Any questions or concerns regarding structure placement or structure construction should be brought to the attention of the Engineer for clarification prior to proceeding with structure installation.
- C. Concrete Placement
 - 1. Do not place concrete until free water has been removed or has been diverted by pipes or other means and carried out of the forms, clear of the work. Do not deposit concrete underwater, and do not allow free water to rise on any concrete until the concrete has attained its initial set. Do not permit free or storm water to flow over surfaces of concrete so as to injure the quality or surface finish.

2. Do not place concrete during inclement weather. Protect concrete placed from inclement weather. Keep sufficient protective covering ready at all times for this purpose.
3. Deposit concrete at or near its final position to avoid segregation caused by rehandling or flowing. Do not deposit concrete in large quantities in one place to be worked along the forms with a vibrator.
4. Do not deposit partially hardened concrete in forms. Retempering of partially hardened concrete is not permitted. Remove partially hardened concrete from site at no additional compensation.
5. Do not allow concrete to fall freely in forms to cause segregation (separation of coarse aggregate from mortar). Limit maximum free fall of concrete to 4 feet. Do not move concrete horizontally more than four feet from point of discharge. Space points of deposit not more than eight feet apart.
6. Conduct vibration to produce concrete of uniform texture and appearance, free of honeycombing, streaking, cold joints or visible lift lines.

D. Encasements

1. All concrete encasements shown on the plans shall be constructed per the details on the Drawings. The earth may be used for side and bottom forms provided such sides can be excavated uniformly smooth and to the size and shape specified.
2. Care must be taken during the pouring operation to ensure that the pipe does not float or move from the buoyant effects of the concrete. Misalignments of the crossings shall be cause for total removal and replacement of the encasement and pipe at the Contractor's expense.
3. Once the concrete is set, measures shall be taken to cure the concrete by covering it with plastic. Water shall not be allowed to run over the concrete for at least 48 hours. Forms will be required if the subgrade and sides are not firm or will not hold shape.
4. Concrete encasement shall extend into existing ground 6" on either side and beneath the pipe and 6" above the pipe.
5. Placed material not conforming to the specified limits shall be removed and replaced as directed by Engineer at no additional cost to The Owner.

1.04 MEASUREMENT AND PAYMENT

- A. Armored Utility Crossing will not be measured but will be paid for at the Contract lump

sum price. Price and payment will be full compensation for all grading, excavation, stone, backfill, concrete placement, disposal of excess material, prewashing when required, and for all material, labor, equipment, tools and incidentals necessary to complete the work.

- B. Excavating, sorting, stockpiling, and placing fill material shall be incidental to Item 2010: Stream Channel Excavation (Class 5).

END OF SECTION

ITEM 4070

CAST-IN-PLACE CONCRETE ENDWALL

1.05 DESCRIPTION:

- A. All work performed under this item and payment therefore shall be in accordance with Section 302 – Drainage Structures of the Virginia Department of Public Transportation *Standard Specifications for Construction and Materials*. This work includes constructing a cast-in-place Standard Endwall as shown on the design plans.

1.06 MATERIALS

- A. Class A-3 Portland Cement Concrete – Cast-in-place concrete mix must meet the requirements of Section 214 of the Virginia Department of Transportation Road and Bridge Specifications.
- B. #4 Straight Bars – Reinforced steel bars must meet the requirements of Section 406 of the Virginia Department of Transportation Road and Bridge Specifications *Standard Specifications for Construction and Materials*.

1.07 CONSTRUCTION METHODS

- A. Standard Endwall shall be constructed in accordance with Section 302 – Drainage Structures of the Virginia Department of Public Transportation *Standard Specifications for Construction and Materials* or as directed by the County or Engineer.

1.08 MEASUREMENT AND PAYMENT

- A. Standard Endwalls for Pipe Culverts will be measured and paid for each Endwalls installed. The payment will be full compensation for all material, labor, equipment, tools and incidentals necessary to complete the work.

END OF SECTION

ITEM 4080

STAMPED CONCRETE PAVING

1.09 DESCRIPTION:

- A. All work performed under this item and payment therefore shall be in accordance with Section 217 of the VDOT Road and Bridge Specifications.

1.10 CONSTRUCTION METHODS

- A. Concrete surfaces designated to receive a stamped finish shall be imprinted with a pattern approved by the Owner and Engineer while concrete is in the plastic state.
- B. Color, pattern, release agents, curing, sealing, and acceptance shall conform to the approved manufacturer recommendations. The finished surface shall be uniform in appearance and free of defects.

1.11 MEASUREMENT AND PAYMENT

- A. Stamped concrete paving shall be incidental to Item 4050: Pre-Cast Endwall for Pipe Culverts and Item 4070: Cast-In-Place Concrete Endwall. The payment will be full compensation for all material, labor, equipment, tools and incidentals necessary to complete the work.

ITEM 7010

TYPE D SOIL STABILIZATION MATTING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This work consists of furnishing and installing Type D Soil Stabilization Matting on graded stream banks and adjacent slopes, as shown on the contract documents and as may be determined to be necessary by the Contractor and Engineer.

1.02 MATERIALS

- A. Type D Soil Stabilization Matting - A woven fabric of high strength coir twine made from well-cleaned, fresh water cured coconut fiber meeting the following minimum mechanical properties:

1. Thickness (ASTM D5199) - 0.35 in.
2. Mass per unit area (ASTM D5261) - 20.6 oz/sq.yd
3. Width Tensile Strength Dry (ASTM D4595) - 1512 x 1032 lbs/ft
4. Width Tensile Strength Wet (ASTM D4595) - 924 x 684 lbs/ft
5. Maximum Elongation Dry (ASTM D4595) - 40% x 33% lbs/ft
6. Maximum Elongation Wet (ASTM D4595) - 69% x 35% lbs/ft
7. Sheer Stress - 4.5 psf
8. Velocity - 12 fps
9. Open Area - 50%

- B. Wooden Stakes - Stakes for securing the matting shall be triangular wooden stakes with a nominal dimension of 2" x 4" at the head and tapering to a point. Stakes must be a minimum of 18" long. Staples are not allowed for use to secure matting.

1.03 CONSTRUCTION

- A. If topsoil is determined to be necessary by the Engineer, the topsoil shall be placed prior to installing the Type D Soil Stabilization matting. Soil or seedbed preparation and

permanent seeding shall be complete prior to the placement of Type D soil stabilization matting.

1.04 PLACING AND SECURING

- A. Type D Soil Stabilization Matting shall be laid smoothly and firmly in the direction of water flow. Stretching shall be avoided. Where more than one width of matting is required, the ends of each strip shall overlap at least 12 inches for vertical and 6 inches for horizontal overlaps. Overlapping shall be done with both the upslope and upstream ends of the matting overlapping the downslope and downstream ends. Type D Soil Stabilization Matting shall be installed as depicted on the typical details. In no case shall matting extend less than 12 inches beyond the top of the slope.

1.05 KEYING-IN

- A. The Contractor shall excavate a shallow trench at the top of the slope and key-in the top edge of the matting a minimum of 12-inches x 12-inches x 12-inches as shown on the construction documents. Vertical ends of the matting at both the upstream and downstream ends of the bank treatment areas shall also be keyed-in to a trench excavated into the slope a minimum of 6-inches. Following installation of stakes, the trenches shall be backfilled with topsoil and tamped firmly. The Engineer may require any other edge exposed to more than normal flow of water to be keyed-into the slope in a similar manner.
- B. The bottom edge of the matting shall be installed within a toe trench. The matting shall be secured in-place along the bottom edge one foot below the bottom of the bank using stakes.

1.06 SECURING MATTING WITH STAKES

- A. Type D Soil Stabilization matting shall be securely fastened in place with stakes driven vertically into the soil. Stakes shall be installed 24-inches apart along the upstream and downstream edges of the matting, within the key-in trench at the top of slope, and on vertical and horizontal overlapping edges. On slopes 2:1 or steeper, wooden stakes shall be installed on 3-foot centers in alternating rows throughout the remainder of the matting. On slopes of 3:1 or gentler, wooden stakes shall be installed on 4-foot centers throughout the remainder of the matting.

1.07 MAINTENANCE

- A. Areas of torn or degraded matting shall be repaired or replaced unless such degradation is within the accepted tolerances for temporary blankets. Edges or seams which are loose or frayed shall be secured with additional Stakes. Bare patches of vegetation shall be reseeded as necessary.

1.08 MEASUREMENT AND PAYMENT

- A. Type D Soil Stabilization Matting will be measured and paid for at the Contract unit price per square yard of area covered. Should the Type D Soil Stabilization Matting become unsecured or degrade before the disturbed area is fully stabilized, the Contractor shall replace the matting and re-seed the affected area at the Contractor's expense. The payment will be full compensation for all materials, labor, equipment, tools, and incidentals necessary to complete the work.
- B. Wooden Stakes will not be measured and paid for separately, but the cost will be considered incidental to the Contract unit price for Type D Soil Stabilization Matting.
- C. Seeding will be measured and paid for at the Contract unit price per pound installed for the planting zone seed mix as shown on the Contract Documents for Item 7050, 7060, 7070, and 7080.

END OF SECTION

ITEM 7020

TEMPORARY SEED AND MULCH

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This item involves the placement of temporary seed and mulch and for the purposes of temporary stabilization of disturbed areas prior to permanent vegetative establishment.
- B. This item shall be in accordance with Section 603 of the Virginia Department of Transportation, Virginia Department of Transportation, Road and Bridge Specifications, and as described in the Planting Schedule of the Contract Documents.

1.02 CONSTRUCTION METHODS

- A. Temporary seed and mulch shall be applied to any disturbed area that cannot be permanently stabilized for an extended period of time, as directed by the Engineer.

1.03 MEASUREMENT AND PAYMENT

- A. Temporary Seed and Mulch shall be measured and paid for at the Contract unit price per square yard covered. Payment shall be full compensation for all materials, labor, equipment, tools and incidentals necessary to complete the work as directed by the Engineer.

END OF SECTION

ITEM 7030

PLACING SALVAGED TOPSOIL – 4” DEPTH

PART 1 - GENERAL

1.04 DESCRIPTION

- A. The Contractor shall salvage and place topsoil to a depth of 4 inches throughout all areas that have been disturbed and require permanent seeding. The Contractor shall use salvaged topsoil prior to using furnished topsoil.
- B. This item shall be in accordance with Section 602 of the Virginia Department of Transportation, Virginia Department of Transportation, Road and Bridge Specifications, and as described in the Planting Schedule of the Contract Documents.

1.05 MATERIALS

- A. This item shall be in accordance with Section 602 of the Virginia Department of Transportation, Virginia Department of Transportation, Road and Bridge Specifications, and as described in the Planting Schedule of the Contract Documents

1.06 CONSTRUCTION METHODS

- A. The Contractor shall furnish and place topsoil to a depth of 4 inches throughout all areas that have been disturbed and require permanent seeding., as directed by the Engineer.

1.07 MEASUREMENT AND PAYMENT

- A. Placing Salvaged Topsoil - 4” Depth will be measured and paid for at the Contract unit price per square yard placed. The payment will be full compensation for all material, testing, certification, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

ITEM 7040

PLACING FURNISHED TOPSOIL – 4” DEPTH

PART 1 - GENERAL

1.08 DESCRIPTION

- A. The Contractor shall furnish and place topsoil to a depth of 4 inches throughout all areas that have been disturbed and require permanent seeding. The Contractor shall use salvaged topsoil prior to using furnished topsoil.
- B. This item shall be in accordance with Section 602 of the Virginia Department of Transportation, Virginia Department of Transportation, Road and Bridge Specifications, and as described in the Planting Schedule of the Contract Documents.

1.09 MATERIALS

- A. This item shall be in accordance with Section 602 of the Virginia Department of Transportation, Virginia Department of Transportation, Road and Bridge Specifications, and as described in the Planting Schedule of the Contract Documents

1.10 CONSTRUCTION METHODS

- A. The Contractor shall furnish and place topsoil to a depth of 4 inches throughout all areas that have been disturbed and require permanent seeding., as directed by the Engineer.

1.11 MEASUREMENT AND PAYMENT

- A. Placing Furnished Topsoil - 4” Depth will be measured and paid for at the Contract unit price per square yard placed. The payment will be full compensation for all material, testing, certification, labor, equipment, tools, and incidentals necessary to complete the work.

ITEM 7050

RIPARIAN BUFFER SEEDING

ITEM 7060

STREAMSIDE/STREAMBANK SEEDING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This work shall consist of soil preparation, and seeding all areas shown in the Contract Documents.

1.02 MATERIALS

- A. Seed shall conform to the seed mixes specified within the Contract documents.
- B. Seed tags with the seed origin, purity of the seed, germination percentage and date of germination testing shall be provided for all seed introduced into the project area.
- C. No lime, fertilizer, or other amendments are to be used, unless otherwise approved by the Engineer.

1.03 CONSTRUCTION

- A. All areas to be seeded shall conform to the finished grades as specified on the plans and be free of all weeds, trash, debris, brush, clods, loose rocks and other foreign materials larger than 3 inches in diameter or length that would interfere with seeding. All gullies, washes or disturbed areas that develop subsequent to final dressing shall be repaired prior to seeding.
- B. Seeding shall be performed within the dates specified by the Contract documents, or as directed by The Owner. No seeding shall be performed on frozen ground or when the temperature is 32°F/0°C or lower.
- C. Loosen graded soils to a depth of 1 to 2 inches with a hand rake or other approved device. Seed mixes shall be applied at the rate specified in the Contract documents. Apply seed when the soil is friable (soil should break up easily and not form clods when worked) using a broadcast seeder or hydroseeder. If a broadcast seeder is used, mix the seed with

a carrier of similar weight (perlite, vermiculite, sawdust, or similar product) and make two passes over each area. The second pass shall be made at a 90-degree angle to the first pass to ensure even seed distribution. Work seed into the soil with the back of a hand rake. Finally, press the seed into the soil with a hand roller or by simply walking on the seeded areas following raking to ensure soil to seed contact. If using a hydroseeder, no carrier is required and one pass over each area will be sufficient provided that all portions of the site to be seeded are covered.

- D. For those areas that are not to be covered by soil stabilization matting, mulch seeded areas with straw at a rate of 100 bales/acre or 16 cubic yards/acre. Immediately after seeding, the site shall be watered lightly but thoroughly, so that the top 4 inches of soil is saturated.

1.04 WARRANTY

- A. The Contractor shall maintain a minimum 85% aerial coverage of seeded areas for 1 year after final inspection. This shall include necessary care and replacement to achieve the required coverage.

1.05 MEASUREMENT AND PAYMENT

- A. Upland Native Seed Mix, Riparian Buffer Seeding, Wetland Seeding, and Streamside/Streambank seeding shall be measured and paid for at the contract unit price per pound of seed installed. Payment will be full compensation for furnishing and incorporating all seed, including all maintenance and warranty, mulch, materials, labor, equipment, tools, and incidentals necessary to complete the work as specified in Contract Documents, or as directed by The Owner.

END OF SECTION

ITEM 7070

LIVE STAKE PLANTING

PART 1 - GENERAL

2.12 DESCRIPTION

- A. This work shall consist of acquiring, transporting, and installing live stakes along the stream banks as specified on the Contract Documents, these Construction Specifications or as directed by The Owner. Acquiring, transporting, and installation shall take place when plants are dormant (December 1 through April 1, inclusive).

2.13 MATERIALS

- A. Live cuttings for live stakes shall be 0.5 inches to 1.5 inches in diameter and between 2 feet to 3 feet long. Side branches shall be removed, and the bark left intact prior to installation. Buds on the stakes shall be oriented in an upward position. The basal ends shall be tapered to a point for easy insertion into the soil. The top shall be cut smooth and square. Live stakes shall consist of a mix of three species, as shown on the planting schedule:

Cornus amomum Silky Dogwood

Cornus sericea Red Osier Dogwood

Salix sericea Silky Willow

Salix nigra Black Willow

- B. All plant material shall conform to the current issue of the American Standard for Nursery Stock published by the American Association of Nurserymen.
- C. Plant materials must be selected from certified nurseries that have been inspected by state and/or federal agencies. Nursery inspection certificates shall be furnished to The Owner upon request.
- D. Plant material collected from the “wild” is prohibited.
- E. The Owner may reject plants damaged in handling or transport.

PART 2 - CONSTRUCTION METHODS

2.01 LIVE MATERIAL PREPARATION

- F. All cuts shall be smooth, and the cut surface kept small. The use of large pruning shears or power saws may be required.
- G. Live materials must be protected against drying out and overheating before/during transport (e.g., they shall be covered transported in unheated vehicles, moistened, kept in soak pits) and on-site prior to installation (e.g., by storing in controlled conditions, storing in shade, covering with evergreen branches or plastic, placing in moist soil, or spraying with anti-transpirant chemicals). Live materials shall receive continuous shade, shall be sheltered from the wind, and shall be continuously protected from drying by being heeled into moist soils. Where water is available, live stakes shall be sprayed or immersed.
- H. Live materials shall be installed the same day that the cuttings are harvested. If installation of live materials cannot be accomplished on the same day and storage is required, live materials shall be stored for a period no longer than 3 calendar days.

2.02 LIVE STAKE INSTALLATION PREPARATION

- I. Live Stakes shall be installed according to the Sequence of Construction, Contract Documents, and the following specifications.
- J. Soil Stabilization matting should be placed on the banks prior to installing the live stakes.
- K. Use a rebar stake or other approved method to make a pilot hole at ± 45 -degree angle into firm soil, insert the point of the stake into the pilot hole and tamp it into the ground at ± 45 -angle to the slope using a hammer and wood block, dead blow hammer or with a rubber mallet.
- L. The live stakes should be installed in 2 rows that are 3.0 feet apart using triangular spacing.
- M. Buds should be oriented up.
- N. Approximately three-fourths of the length of the live stake should be installed into the ground, and soil should be firmly packed around it after installation.
- O. Do not split the stakes during installation. Stakes that split should be removed and replaced.

2.03 INSTALLATION PHASE ACCEPTANCE

- A. Installation Phase acceptance shall be granted when all Live Stakes Construction Method activities have been satisfactorily completed as determined by The Owner or a representative of The Owner.

2.04 PLANT ESTABLISHMENT

- P. The Contractor is responsible for maintaining a 50% plant establishment success rate at the end of the one-year establishment period, following Installation Phase acceptance. The Contractor is responsible for replanting all areas not meeting 50% survival.
- Q. The Contractor will not be responsible for plant material that has been damaged by vandalism, fire, or other activities beyond the Contractors' control, as determined by The Owner.

2.05 MEASUREMENT AND PAYMENT

- R. Live Stakes will be measured and paid for at the Contract price per each Live Stake installed. The payment will be full compensation for furnishing, storing, soaking, watering, and planting, and for all materials, labor, equipment, tools and incidentals necessary to complete the work specified in the Contract Documents, or by The Owner. No separate payment will be made for the replacement of Live Stakes during construction or the one-year establishment period.
- S. Live Stakes will be paid according to the Live Stakes Payment Schedule:

Live Stakes Payment Schedule		
Requirements	Percent of Total Contract Price	Payment for Completed Work
Installation Phase	70%	At Installation Phase Acceptance
Establishment Phase	30%	At Establishment Phase Acceptance
Total Payment	100%	

END OF SECTION

ITEM 7080

UPLAND TREE AND SHRUB

PART 1 - GENERAL

2.14 DESCRIPTION

- A. This work shall consist of furnishing and planting trees and shrubs and all plant establishment operations as specified in the Contract Documents and shown on the Planting Contract Documents, or as directed by The Owner. Transporting and installation of plant material shall take place March 1 to June 15, inclusive or September 15 to December 15, inclusive.
- B. Prior to the start of work on this item, the Contractor shall submit a proposed planting schedule, including source of plant material to The Owner for review. No work shall be performed until The Owner approves this schedule.

2.15 GENERAL

- A. The Contractor shall possess a Virginia Department of Agriculture and Consumer Services Commercial Pesticide Business License and a Pesticide Applicator Certificate for the pertinent pesticide application Category: (2) Forest; (3A) Ornamental Plant Exterior; (3-C) Turf; (5) Aquatic; (6) Right-of-Way and Weed.
- B. Apply pesticides in conformance with the Virginia Pesticide Applicator's Law, OSHA and VOSH regulations, and the manufacturer's label and Safety Data Sheets (SDS).
- C. Ensure that pesticides are applied by a Virginia Certified Pesticide Applicator, or by a Registered Pesticide Applicator under the supervision of a Certified Pesticide Applicator.
- D. Pesticides shall be EPA-approved and registered for use in Virginia to control plants, fungi, insects or other pests. Pesticides shall be approved for use and used at labeled application rates.
 - 1. Herbicide. Herbicide shall control or prevent regrowth of plants or vegetation.
 - 2. Insecticide. Insecticide shall control or protect against insect or other arthropod pests.
 - 3. Fungicide. Fungicide shall control or protect against fungal or bacterial pests.

- E. Record the location and details of pesticide applications on Virginia Department of Agriculture and Consumer Services Pesticide Application Records Form. Submit the Form to Prince William County within 24 hours after applying pesticides.

PART 2 MATERIALS

2.16 PLANT MATERIAL

- A. All plant materials shall meet the standards outlined in Section 605 of the Virginia Department of Transportation, Road and Bridge Specifications . The plant material shall also be inspected in accordance with Section 605.04.
- B. Plant materials must be selected from certified nurseries that have been inspected by state and/or federal agencies. Nursery inspection certificates shall be furnished to The Owner upon request.
- C. Plant material collected from the “wild” is prohibited.
- D. Container grown stock shall have been grown in a container long enough for the root system to have developed sufficiently to hold its soil. Roots shall visibly extend to the inside face of the growing container, but container grown stock shall not be root bound. All container plants shall be grouped and watered daily until they are planted.
- E. The Owner may reject plants that do not meet the standards outlined in Section 605.09 or plants that have been damaged in handling or transport.

2.17 SUBSTITUTE PLANT MATERIAL

- A. If a substitute is selected, it must be native to the Virginia Coastal Plain Region; of the same size, value, and quality; and have the same habitat requirements as the original plant. All substitution requests shall be submitted to Prince William County for review.

2.18 SHELTERS

- A. Refer to Items 7130: Deer Protection Guard – Sleeves

PART 3 - CONSTRUCTION METHODS

3.01 Preparation

- A. The live plant material shall be transported to the construction site within 3 calendar days of delivery from the nursery. Live plant materials must be protected against drying out and overheating before/during transport (e.g., they shall be covered transported in unheated vehicles, moistened, kept in soak pits) and on-site prior to installation (e.g., by storing in controlled conditions, storing in shade, covering with evergreen branches or

plastic, placing in moist soil, or spraying with anti-transpirant chemicals). Live materials shall receive continuous shade, shall be sheltered from the wind, and shall be continuously protected from drying by being heeled into moist soils.

3.02 Planting

- A. The Contractor shall refer to the Plant Schedules and Details on the Contract Documents for specific planting pit and spacing requirements. Perform the following operations when preparing planting pits for individual plants.
1. Undesirable Vegetation. Manually remove undesirable vegetation and apply an aquatic non-selective herbicide in water with wetting agent and dye at least 14 calendar days before plant installation. Cut and remove dead vegetation or debris that interferes with soil preparation, plant installation or future maintenance.
 2. Excavation. Excavate planting pits to the depth required to allow for the placement of root collars at the soil surface. Retain the excavated soil for preparation as backfill soil. Remove excess soil from the site or spread as directed. Excavate additional depth and width as shown in the detail, place furnished subsoil to the dimensions shown in the detail, and complete tree or installation using Table 1. Remove excess soil from the site or spread as directed.
 3. Planting Pit Diameter. Use Table 1 to determine the diameter of the planting pit based upon the container or root ball diameter.
 4. Compost. Use Table 1 to determine the quantity of compost to mix into backfill soil, based upon planting pit diameter. Uniformly mix compost into the backfill soil.
 5. Mulch. Spread shredded hardwood bark mulch uniformly over the soil surface to a 3-in. depth. Promptly repair damage caused by washouts or construction activities.
 6. Water. Use Table 1 to determine the quantity of water to apply for each installed plant based upon planting pit diameter.

TABLE 1 - PREPARING PLANTING PITS AND BACKFILL SOIL AND WATERING				
Container or Root Ball Diameter, In.	ANSI Z60 Container Size	Planting Pit Diameter, In.	Compost, Ft ³	Water per Event, Gal
<3	Plugs and Tubelings	2 to 4	0.01	0.10
3	#SP3	6	0.02	0.15
5	#SP4	10	0.02	0.20
6	#SP5 or #1	12	0.03	0.30
8	#2	17	0.09	0.50
10	#3	21	0.18	1.00
12	#5	24	0.28	1.50
14	#7	28	0.44	2.30
16	#10	32	0.65	3.50
18	#15	36	0.94	5.00

3.03 Plant Protection

- A. The Contractor shall install tree and shrub shelters as indicated in Items 7130: Deer Protection Guard – Single Stem Tree.

3.04 Clean Up

- A. During planting all areas shall be kept neat, clean and free of all trash and debris, and all reasonable precautions shall be taken to avoid damage to existing plants, turf, structures and private property.
- B. Remove all tags, labels, strings, and wire from the plant materials, unless otherwise directed by The Owner.
- C. Final cleanup shall be the responsibility of the Contractor and consist of removing all trash

and materials incidental to the project and disposing of them off-site.

3.05 Installation Phase Acceptance

- A. The Contractor shall submit a request for Installation Phase Inspection when operations are completed. The Installation Phase Inspection will be scheduled by The Owner or a representative of The Owner at the project site with the Contractor to verify completion. At least 7 calendar days' notice will be provided before the scheduled Inspection so that it may be completed in the company of the Contractor.
- B. The Owner or a representative of The Owner, in consultation with the Contractor, shall develop an Installation Phase punch list and list of plants to be replaced, if necessary. Installation Phase acceptance shall be granted when all the Installation Phase requirements are completed according to the Installation Phase Acceptance Table.

Installation Phase Acceptance Table	
Item	Requirement
1	Inspection is completed.
2	Damaging pests are controlled.
3	Layouts are inspected and approved.
4	Compost is mixed in soil, as required.
5	Trees and shrubs are pruned.
6	Trees are installed vertically and straight.
7	Tree and shrub shelters are installed properly.
8	Mulch is uniformly spread to the specified depth.
9	Washouts in planting pits are repaired.
10	Plants receive initial watering and follow up watering.
11	Clean up is completed, plant tags and ribbons are removed.
12	Plants are relocated to approved locations.
13	Abandoned planting pits are filled and seeded.
14	Unacceptable plants are replaced.
15	Damage repairs and Installation Phase Punch List are completed.
16	Pesticide Application Reporting Forms are completed.

3.06 Plant Establishment

- A. The Contractor is responsible for maintaining an 85% plant establishment success rate for a one-year establishment period, following Installation Phase acceptance. The Contractor is responsible for replanting all areas not meeting 85% survival during the establishment period. The plant establishment period of all replacement plants shall extend for an

additional one-year period from the date of their acceptance after replacement.

B. A plant is considered unsuccessful if:

1. The plant is dead or missing
2. 25% or more of the leaf area is dead, lost or dropped
3. a bark wound over 2-in. is present
4. 10% or more of the tree height is lost due to leader die-back
5. or 75% of the branches exhibit 6-in. or more of branch die-back.

C. Watering shall conform to Table 1, above.

D. The Contractor will not be responsible for plant material that has been damaged by vandalism, fire, or other activities beyond the Contractors' control, as determined by The Owner.

3.07 Year One Acceptance:

- A. The Owner will inspect the tree and shrub plantings one year after the Installation Phase Acceptance for Items 7100 and 7110. Year One Acceptance will be granted when the requirements of the Establishment Table are satisfactorily completed.

3.08 Establishment Phase Acceptance:

- A. The Owner will inspect the tree and shrub plantings at the end of the Item 7100 and 7110 establishment periods. Establishment Acceptance will be granted when the requirements of the Establishment Table are satisfactorily completed.

Establishment Phase Table	
Item	Requirement
1	Water sprouts are manually pruned and removed.
2	Trees are straightened.
3	Washouts in planting pits are repaired.
4	Plants are relocated to approved locations.
5	Abandoned planting pits are filled and seeded.
6	Plants are successfully established.
7	Damaging pests are controlled.
8	Planting pits are weed free.
9	Unacceptable plants are replaced.
10	Pesticide Application and Nutrient Management Reporting Forms are completed.
11	Damage repairs and Establishment Punch List are completed.

PART 4 – MEASUREMENT AND PAYMENT

- A. Planting Trees and Shrubs will be measured and paid for at the Contract price per each item specified in the Contract Documents. The payment will be full compensation for all trees, shrubs, transporting, installing, planting pit excavation, backfill, mulch, clean up, plant establishment, watering, maintenance, replanting and all material, labor, equipment, tools, and incidentals necessary to complete the work.
- B. Planting Trees and Shrubs will be paid according to the Planting Trees and Shrubs Payment Schedules.

Planting Trees and Shrubs Payment Schedule – Items 7100 and 7110		
Requirements	Percent of Total Contract Price	Payment for Completed Work
Installation Phase	70%	At Installation Phase Acceptance
Establishment Phase	30%	At Establishment Phase Acceptance
Total Payment	100%	

END OF SECTION

ITEM 7090

DEER PROTECTION

PART 1 - GENERAL

3.01 DESCRIPTION

- A. Provide, install, and maintain tree and shrub deer protection guard for newly installed trees and shrubs as directed by The Owner.
- B. Single stem trees shall be protected by sleeves. Multi-stem trees and shrubs shall be protected by wire cages.

3.02 MATERIALS

A. Deer Protection Guard (Sleeves)

- 1. The 4-ft. protection guard shall consist of 4-in. diameter, high strength / heavy duty, open weave mesh (with grid not to exceed 3/4 in. x 3/4 in.) to prohibit harboring of insects and animals, and to prevent moisture/mildew build-up. Material shall be UV stable rigid plastic, black in color, with an expected useful lifespan of a minimum of 5 years.

B. Deer Protection Guard (Wire Cages)

- 1. The 4 ft. protection guard shall consist of 14-gauge welded wire fence (with grid not to exceed 2 in. x 2 in.) to prohibit harboring of insects, and animals, and to prevent moisture/mildew build-up. Material shall be, 14-gauge welded wire fence with an expected useful lifespan of a minimum of 5 years.

C. Fastening Ties

- 1. Ties shall be approximately 3/16 in. x 11 in. in length and made of black UV treated plastic with a releasable, ratchet locking mechanism to fasten to a hardwood stake. Lock shall securely close.

D. White Oak Stakes

- 1. Stakes shall be a minimum of 1 in. x 1 in. x 47 in. in size, and shall consist of straight, rot-resistant, White Oak with a pencil point ground on one end.

3.03 CONSTRUCTION.

A. Installation of Deer Protection Guard (Sleeves)

B. Install HDPE Deer Protection Guard on single stem trees as directed.

1. Compare guard height to height of first significant scaffold branch tree or shrub to be protected.
2. Prune branch if needed to avoid wrapping branches within guard.
3. Carefully wrap the guard around the installed tree or shrub.
4. Place hardwood stake upright and outside of the guard, so that it rests alongside of the guard.
5. Drive stake vertically into the ground until the top of the stake is approximately 12 inches below the top of the guard.
6. Ensure the guard is always in full contact with the ground surface.
7. Evenly space 3 fastening ties along the guard and tighten ties to secure the guard to the hardwood stake.

C. Installation of Deer Protection Guard (Wire Cages)

D. Install Deer Protection Guard on multi stem trees and shrubs as directed.

1. Compare guard height to height of first significant scaffold branch tree or shrub to be protected. Measure and cut appropriate wire mesh length to wrap fully around the plant and leave 6 inches away from the existing growth.
2. Prune branch if needed to avoid wrapping branches within guard.
3. Carefully wrap the guard around the installed tree or shrub.
4. Install at least 2 hardwood stakes to secure the wire mesh.
5. Drive stake vertically into the ground a minimum of 12 inches and until the top of the stake is approximately 12 inches below the top of the guard to prevent deer uplift
6. Ensure the guard is always in full contact with the ground surface.
7. Evenly space 3 fastening ties along the guard and tighten ties to secure the guard to the hardwood stakes.

E. Maintenance of Guards

1. During the one-year establishment period for trees and shrubs, guards shall be

repaired or replaced if damaged or missing, at no cost to The Owner.

2. Check guards on a semi-annual basis to ensure the following:
 - a. Guards are upright, ties are tight, and hardwood stakes are providing
 - b. the designed support.
 - c. Guards are maintaining contact with the ground surface.
 - d. Guards are not girdling the plants.
 - e. Sucker growth is not growing through the guards.

3.04 MEASUREMENT AND PAYMENT

- A. Deer Protection Guards will be measured and paid for at the Contract unit price per each installed. The payment will be full compensation for installation and maintenance and for all materials, labor, equipment, tools, maintenance, removal, replacement and other incidentals necessary to complete the work.
- B. Deer Protection Guards will be paid for according to the Deer Protection Guard Schedule Payment Schedule

Deer Protection Guard Payment Schedule		
Requirements	Percent of Total Contract Price	Payment for Completed Work
Installation of Deer Protection Guards	70%	At Installation Phase Acceptance
Establishment Phase	30%	At Establishment Phase Acceptance
Total Payment	100%	

END OF SECTION

ITEM 9010

IMBRICATED ROCK

3.05 DESCRIPTION

- A. This work shall consist of furnishing and placing stone for instream structures (rock cascade) and other features as shown on the Contract Documents or as directed by the Engineer.

3.06 MATERIALS

- A. Rock shall consist of appropriate color (e.g., green/gray, brown/gray, and tan/brown in color) obtained from an approved source. Rock shall not be harvested from offsite streams or rivers outside a commercial quarry operation. All rock shall be free from laminations, weak cleavages and will not disintegrate from the action of air, water and in handling and placing. Granular sedimentary (sandstone) rock will generally be unacceptable. Concrete will not be considered as an alternative for rock. White rock is not acceptable.

Stone for Instream Structures shall meet the following Construction Specifications:

Structure		Minimum Density (lb/cu ft)	Length (ft)	Width (ft)	Height (ft)	Min. # of Flat Sides
Rock Cascade	Headers	150	2.75 - 3.25 feet	2.75 – 3.25 feet	1.5 – 2.5 feet	1
	Footers	150	2.75 – 3.25 feet	2.75 – 3.25 feet	1.5 – 2.5 feet	2

3.07 CONSTRUCTION METHODS

- A. Stone Sourcing
- a. Stone shall be salvaged from the limits of disturbance of this Contract first. If sufficient material meeting the above requirements is not available from within the limits of disturbance, the Contractor shall obtain material meeting specifications.

2. The Contractor will locate potential sources for the stone. The Contractor will not be granted an extension of time or extra compensation due to delay caused by sampling, testing, approval or disapproval of stone material under the requirements of these specifications. The Contractor shall obtain from the quarry and submit to the Engineer a certificate verifying the following:
 - a. Stone Classification
 - b. Weight per Cubic Foot
 - c. Weight of Stone Being Supplied.
 - d. Stone quality shall meet all of the above specifications.
3. It will be the contractor's responsibility to make all necessary arrangements with the source of supply in a timely fashion, so that the contractor shall maintain an adequate supply of stone material and that work shall not be unnecessarily delayed due to insufficient supply.

B. Stone Installation

1. The Contractor shall install the stone in accordance with Contract Documents and these Construction Specifications for Rock Cross Vanes and other features as shown on the Contract Documents or as directed by the Engineer.

3.08 MEASUREMENT AND PAYMENT

- A. All Stone for Instream Structures described in this section will be measured and paid for at the Contract unit price per Ton installed. Salvaging and storing stone onsite shall be incidental to Item 2010: Stream Channel Excavation. Payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

ITEM 9020

SALVAGED STREAMBED MATERIAL

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Salvage, transport, stockpile, maintain, and place Salvaged Streambed Material associated with pool substrate construction as specified in the Contract Documents or as directed by the Engineer. If salvaged streambed material is no longer available, use of furnished stream bed material must be approved by the Engineer prior to placement.

1.02 MATERIALS

- A. Salvaged Streambed Material consisting of native cobble, gravel, and stone shall be salvaged from the project site first. If sufficient streambed material is not available from the project site, the Contractor shall furnish material as described in the Item 9030: 2" – 3" Stone for Stream Mixes to the Engineer for approval prior to placement. Only approved material shall be placed at the site.

1.03 CONSTRUCTION METHODS

- A. Salvaged Streambed Material shall be used in accordance with Contract Documents and associated with pool substrate construction as shown on the Contract Documents or as directed by the Engineer.

1.04 MEASUREMENT AND PAYMENT

- A. Salvaged Streambed Material shall be incidental to Item 2010: Stream Channel Excavation (Class 5).

END OF SECTION

ITEM 9030

2" – 3" STONE FOR STREAM MIXES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish, transport, stockpile, maintain, and place 2" – 3" Stone for Stream Mixes associated with stream substrate construction as specified in the Contract Documents or as directed by the Engineer. If salvaged streambed material is no longer available, use of furnished stream bed material must be approved by the Engineer prior to placement.

1.02 MATERIALS

- A. 2 - 3" Stone for Stream Mixes shall consist of a mixture of gravel, cobble, and stone of appropriate color (e.g., green/gray, brown/gray, and tan/brown in color) obtained from an approved source. Gravel, cobble, and stone shall not be harvested from streams or rivers outside the project limits unless part of a commercial quarry operation. All rock shall be free from laminations, weak cleavages and will not disintegrate from the action of air, water and in handling and placing. Concrete will not be considered as an alternative for rock. White rock is not acceptable.

Material	Gradation	Proportion (%)
2" – 3" River Stone	2.0 to 3.0 inch; $D_{50} = 2.5\text{in}$	100%

- B. The Contractor shall provide a sample of 2" – 3" Stone for Stream Mixes to the Engineer for approval prior to placement. Only approved material shall be placed at the site.

1.03 CONSTRUCTION METHODS

- A. 2" - 3" Stone for Stream Mixes shall be used in accordance with Contract Documents and associated with stream substrate construction as shown on the Contract Documents or as directed by the Engineer.

1.04 MEASUREMENT AND PAYMENT

- A. Payment will be full compensation for all materials, transport, excavation, mixing, and installation for all material, labor, equipment, tools, and incidentals necessary to complete the work as specified in these specifications and on the Contract Documents.
- B. 2" – 3" Stone for Stream Mixes will be measured and paid for at the Contract unit bid price per CY installed.

END OF SECTION

ITEM 9040

RIPRAP FOR UTILITY PROTECTION

ITEM 9050

RIPRAP FOR ROCK PACKING

ITEM 9060

RIPRAP FOR PLUNGE POOLS

ITEM 9070

RIPRAP FOR CASCADE POOLS

ITEM 9080

RIPRAP FOR ARMORED UTILITY CROSSINGS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish, transport, stockpile, maintain, and Class 0, Class I, Class II, and Class III as specified in the Contract Documents or as directed by the Engineer.
- B. Class 0, Class I, Class II, and Class III Riprap shall meet the specifications as per Section 901.02 of Virginia Department of Transportation, Road and Bridge Specifications.

1.02 MATERIALS

- A. Class 0, Class I, Class II, and Class III Riprap shall consist of stone of appropriate color (e.g., green/gray, brown/gray, and tan/brown in color) obtained from an approved source. All rock shall be free from laminations, weak cleavages and will not disintegrate from the action of air, salt water and in handling and placing. Granular sedimentary rock will generally be unacceptable. Concrete will not be considered as an alternative for rock. White rock is not acceptable.

1.03 CONSTRUCTION METHODS

- A. Class 0, Class I, Class II, and Class III Riprap shall be used in accordance with Contract Documents and these Construction associated with stream construction and rock packing as shown on the Contract Documents or as directed by the Engineer.

1.04 MEASUREMENT AND PAYMENT

- A. Class 0, Class I, Class II, and Class III Riprap will be measured and paid for at the contract unit price per Cubic Yard. Price and payment will be full compensation for all grading, excavation, stone, backfill, placement, disposal of excess material, geotextile, prewashing when required, and for all material, labor, equipment, tools and incidentals necessary to complete the work.
- B. Salvaged Riprap shall be incidental to Item 2010: Stream Channel Excavation (Class 5).

END OF SECTION

ITEM 9080

COARSE AGGREGATE

1.01 DESCRIPTION

- A. Aggregate backfill shall include, but not necessarily be limited to, furnishing and placing granular material for the installation of gravity block retaining walls and other structures as indicated on the plans, and in accordance with the Contract Documents.

1.02 MATERIALS

- A. Aggregate fill material for the subsurface drainage behind gravity block retaining walls as noted in the Standard Details shall meet the requirements of VDOT No. 78 stone.
- B. Aggregate fill material for subgrade stabilization shall meet the requirements of VDOT No. 1 stone.

1.03 CONSTRUCTION METHODS

- A. If areas of the foundation are soft, composed of mud, or are, in the Engineer's judgement, unfit to receive the pipe, structure, concrete, or masonry, then such unacceptable material shall be removed and replaced with aggregate fill material as directed by the Engineer.
- B. The aggregate backfill material shall be carefully placed to the dimensions indicated on the plans or directed by the Engineer.
- C. Except for VDOT No. 78 stone, all aggregate backfill material shall be compacted.

1.04 MEASUREMENT AND PAYMENT

Payment for furnishing and installing aggregate fill shall be measured and paid for at the Contract unit bid price per CY installed. Payment for removal of unacceptable foundation material will be made under the pertinent contingent item. No payment will be made for any aggregate fill which is used because of any error in the Contractor's operations, such as excavating beyond specified lines or grades, etc.

END OF SECTION

ITEM 9090

GEOTEXTILE CLASS SE – NON-WOVEN FOR IN-STREAM STRUCTURES

1.05 DESCRIPTION

- A. This work shall consist of furnishing and placing Geotextile as shown on the Contract Documents for the boulder cascade, cascade pools, and gravity block retaining wall or as directed by the Engineer.

1.06 MATERIALS

Class	Type of Geotextile	Grab Strength (lb) D4632	Puncture Strength (lb) D4833	Permittivity sec ⁻¹ D4491	Apparent Opening Size, max. (mm) D4751	Trapezoid Tear Strength (lb) D4533
SE	Nonwoven	250	90	0.20	0.30	90

1.07 CONSTRUCTION METHODS

- A. Geotextile shall be used in the construction of the boulder cascade, cascade pools, and gravity block retaining wall or as directed by the Engineer.

1.08 MEASUREMENT AND PAYMENT

Geotextile will be measured based on square yards installed. The payment will be full compensation for the preparation of surfaces, loading, hauling, supplying and placement for all material, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

ITEM 9100

AS-BUILT DRAWINGS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The contractor shall prepare and submit to The Owner for approval, certified As-built Drawings of the completed infrastructure stabilization activity to fully illustrate all construction within the established limits of disturbance.
- B. The Owner shall provide the services of Construction Services Manager to verify elevations, locations, and dimensions of the grading and infrastructure stabilization structures. It is the Contractor's responsibility to coordinate, during all phases of construction, with the Construction Services Manager. The Contractor and the Construction Services Manager will document the installed features as construction is occurring.

1.02 MATERIALS

- A. The As-built Drawings shall be reproducible Mylar copies of the approved Contract documents (to be obtained from The Owner). Features to be surveyed shall consist of the following:
 - 1. Plan view
 - a. Extent of constructed grading
 - b. Identify and show extent of bioengineering
 - c. Identify elevations and dimensions of all structures
 - 2. Profile along thalweg
 - a. Elevations at design stations and at locations of any revisions
 - b. Instream structures/bioengineering controls should be identified with elevation notes.
 - 3. Cross Sections
 - a. Offset and elevation identified at inverts and grade breaks

- b. Identify and show placement of structures, bioengineering controls and any bank stabilization with elevations notes
 - c. Show existing ground and the extent of constructed grading
- B. The As-built Drawings shall be certified by a Professional Land Surveyor licensed within the State of Virginia and shall be prepared in accordance with Section 317 of Virginia Department of Transportation, Road and Bridge Specifications. During construction, the Contractor shall adhere to tolerances noted within these Contract Documents. The signed, sealed and certified reproducible mylar As-built Drawings along with 3 print copies shall be forwarded to The Owner for approval.

1.03 CONSTRUCTION METHODS

- A. NOTE: It is HIGHLY recommended the Contractor's land surveyor check grades, locations and elevations of structures throughout the construction process.
- B. It is the Contractor's responsibility to coordinate with the Construction Services Manager to verify grades, locations and elevations during the course of construction.
- C. The Contractor shall notify The Owner a minimum of 14 calendar days prior to completion of construction activities.
- D. Upon completion of construction activities, the Contractor shall have no longer than 28 calendar days to furnish The Owner with certified As-built Drawings.
- E. The Contractor may choose to submit to The Owner partial survey drawings in order to illustrate the layout of all plan features and grading; however, this submission of a partial drawing does not automatically convey approval of construction or eliminate the requirement for the Contractor to provide final As-built Drawing of the entire completed project certified by a Professional Land Surveyor.
- F. Any errors or omissions found during the course of the red-line survey and determined by The Owner, who shall be sole judge, to have occurred during construction shall be repaired by the Contractor to the satisfaction of The Owner at no additional expense. The Contractor shall make any necessary repairs or corrections required by The Owner with a re-survey of the problem area showing the original Red-line information and any modification highlighted and noted. A Professional Land Surveyor, registered in the State of Virginia, shall also certify the resurvey.
- G. Final acceptance of the project by The Owner will not occur until the certified As-built Drawings have been completed for the entire project and approved by The Owner.

1.04 Maintenance

- A. The Contractor shall be held responsible for maintaining the integrity of the project until final acceptance of the As-built Drawings and a determination by The Owner that no errors or omissions have been made by the Contractor during the course of construction. The Owner shall make every effort to notify the Contractor within 35 calendar days of receipt of the drawing as to the acceptability or rejection of the project construction; however, lapse of this time frame does not relieve the Contractor of responsibility for maintaining the integrity of the project or for correcting any errors/omissions until final acceptance or the As-built Drawings for the entire project.

1.05 MEASUREMENT AND PAYMENT

- A. Preparation of the As-built Drawings will not be measured but will be paid for at the Contract lump sum price. The payment will be full compensation for surveying, processing, preparation of the As-built Drawings, and for the Professional Land Surveyor to certify and seal the drawings. Payment shall include all materials, labor, equipment, tools, maintenance, and incidentals necessary to complete the work.

END OF SECTION

ITEM 9110
SUPPLEMENTAL WATERING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This item refers to supplemental watering during the establishment period for all plants.
- B. Apply water to permanent seeding areas and/or to trees, shrubs, sod and herbaceous plant material when weekly rainfall is less than 1 inch from May 1 through September 15, inclusive, or as directed by Prince William County.

1.02 MATERIALS

- A. Refer to Section 605 of the Virginia Department of Transportation, Road and Bridge Specifications.

1.03 CONSTRUCTION METHODS

- A. The Contractor shall notify Prince William County 3 business days prior to commencing watering operations for approval.
- B. Water using a 1-in. inside diameter hose with breaker or watering probe. Supply a minimum 1000-gallon tank, 300 feet of hose and a power-driven pump adequately powered to efficiently supply water to permanent seeding areas and trees. Provide Prince William County with measurements and capacities to provide a complete and accurate record of the quantity of water furnished and applied. Apply water at low pressure directly to seeding area or each planting pit. For permanent seeding areas, apply 1 gallon of water for every 5 SF of seeding. For planting pits, apply water as per Table 1 under Item 7110.

1.04 MEASUREMENT AND PAYMENT

- A. Supplemental Watering will be measured and paid for at the Contract Unit Price per gallon of water applied. Water will be measured by means of satisfactorily installed meters, or by measurement of tank capacities, or by acceptable documentation of tanks of predetermined capacity. The payment will be full compensation for all water, material, labor, equipment, tools, and incidentals necessary to complete the work. No compensation will be allowed for water wasted as determined by Prince William County.

END OF SECTION