STORMWATER REPAIR SPECIFICATIONS

MACON WATER AUTHORITY

790 Second Street * P.O. Box 108
Macon, GA 31202-0108
(478) 464-5600 * FAX (478) 750-2007

POPLAR STREET LN AND 3RD ST STORMWATER IMPROVEMENTS

December 15, 2023

BARGE DESIGN SOLUTIONS
Barge Design No.: 36181-19

2839 Paces Ferry Road SE, Suite 850
Atlanta, GA 30339
(770) 628-7631

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TECHNICAL SPECIFICATIONS

Part 1 General

1.1 Summary

A. The Contractor shall furnish all equipment and labor materials required to provide MWA with digital construction audio/video recordings of the Project.

B. Photos, electronic files, and audio/video recordings shall become the property of MWA, and none of which shall be published without express permission of MWA.

1.2 Pre-Construction and Post-Construction Audio/Video Recordings

A. Prior to the beginning of any work, the Contractor shall make audio/video recordings of the work area to record existing conditions.

B. Following completion of the work, another recording shall be made showing the same areas and features as in the preconstruction recording.

C. All conditions which might later be subject to a disagreement shall be shown in sufficient detail to provide a basis for decisions.

D. The recordings shall include the date and time markings on the video. All videos shall be provided with an audio narration, stating a description of what is shown, structure, area, approximate station of the area shown, and street address and property owner where appropriate.

E. Audio/video recordings quality and content shall be subject to the approval of MWA.

1.3 Disputes and Potential Claims

A. In the event a problem arises or dispute occurs, which may result in a potential Claim as defined by the General Conditions, and the problem or dispute can be illustrated by photographs and video recordings, the Contractor shall provide such photographs and video files.

1.4 Submittals

A. Formats

1. Photo files shall be provided in jpeg format.

2. Audio/Video Recordings shall be provided in Audio Video Interleave (AVI), Windows Media Video (WMV), Apple Quick Time (MOV) or MP4 format.

B. Audio/Video Recordings

1. The preconstruction recording shall be submitted prior to the first progress payment request.

2. The post-construction recording shall be submitted with the final payment request.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

Part 4 Measurement and Payment

4.1 General

A. No separate measurement and payment shall be made for any Work performed or material used for this section. Full compensation for such work shall be considered as incidental to other items of Work. Costs in connection therewith shall be considered a subsidiary obligation of the Contractor and shall be included in the overall cost of the work.

END OF SECTION

Part 1 General

1.1 Summary

A. This section includes installing, maintaining, removing and disposing of the orange barrier fencing, chain link fencing and welded wire fencing as indicated in the Contract Documents or as directed by MWA.

1.2 Submittals

A. If required by MWA, the Contractor shall submit for approval:

1. Description and dimensions for posts to be used with temporary fencing.

2. Plan detailing installation location of all temporary fencing, spacing and bury depth of posts, and openings in the temporary fencing as necessary for access.

3. Description and dimensions for all necessary temporary fencing materials.

Part 2 Products

2.1 Orange Barrier Fencing

A. Must have the following characteristics:

1. High-visibility, fluorescent orange color.

2. Lightweight and easy to handle.

3. UV stabilized fabric.

4. 48-inch height.

5. 100-foot or 300-foot length prefabricated rolls.

6. 60-inch heavy duty oak stakes or metal stakes.

B. Signage

1. Laminated signs shall be securely attached to orange barrier fencing.

2. Signs shall read in both English and Spanish, “TREE SAVE AREA” / “ÁREA DE ÁRBOLES PROTEGIDOS” and “STAY OUT” / “NO ENTRE”.

3. Sign dimension requirement is a minimum of 8.5 inches high and 11 inches wide.

2.2 Temporary Chain Link Fencing

A. Temporary chain link fencing must meet the following:

1. Fencing shall be a commercial product.

2. Posts, tubes, rails, bracing, and fence fabric shall be galvanized steel.

3. Fence fabric mesh shall have 2-inch openings.

4. Contractor shall bury fence posts or use temporary portable bases in accordance with manufacturer's recommendations.

B. Alternative fencing type and/or dimensions may be used as a replacement for chain link fencing to meet the temporary fencing needs, with prior approval from MWA.

2.3 Temporary Welded Wire Fencing

A. Temporary welded wire fencing must meet the following:

1. Welded wire fabric shall be galvanized coated one-ounce welded wire. The galvanizing shall be uniform and shall have no more than 5 percent of the joints deficient in coating as determined by ASTM A239. The welded wire fabric shall have the following specifications, unless otherwise specified in the Contract Documents.

2. Wire Size: Steel core wire is 11 gauge.

3. Fabric: 60-inch height with a mesh size of 2 inches by 4 inches.

4. Posts: Posts for welded wire fence shall be wood of the dimensions and shapes shown on the Contract Documents. Contractor shall bury fence posts or use temporary portable bases in accordance with manufacturer's recommendations.

5. Accessories: Accessories, including but not limited to tension wire, tie wire, fittings, staples and nails shall be galvanized in accordance with ASTM A153, except the minimum galvanizing shall be .60 ounce per square foot.

B. Alternative fencing type and/or dimensions may be used as a replacement for welded wire fencing to meet the temporary fencing needs, with prior approval from MWA.

Part 3 Execution

3.1 Orange Barrier Fencing

A. Contractor shall install orange barrier fencing along surveyed easement lines, right-of-way lines, property lines, and limits of disturbance and as shown in the Contract Documents.

B. Contractor shall install orange barrier fencing as necessary to exclude the entry of equipment into designated tree protection areas. No mobilization or other work shall be allowed on-site prior to installation of the orange barrier fencing by the Contractor and approval following site inspection by MWA. Contractor shall be responsible for maintaining fence for its intended purpose until directed to remove fence by MWA.

C. Contractor shall install orange barrier fencing to replace sections of existing fencing removed from private property for construction period, connecting both ends of the existing fence along the existing fence alignment. Completed Work will include replacing these sections of orange barrier fencing with permanent fencing.

3.2 Temporary Chain Link Fencing

A. Contractor shall install temporary chain link fencing in accordance with the Contract Documents or as directed by MWA. Contractor shall be responsible for maintaining fence for its intended purpose until directed to remove fence by MWA.

3.3 Temporary Welded Wire Fencing

A. Contractor shall install temporary welded wire fencing in accordance with the Contract Documents or as directed by MWA. Contractor shall be responsible for maintaining fence for its intended purpose until directed to remove fence by MWA.

Part 4 Measurement and Payment

4.1 Orange Barrier Fencing

A. Method of Measurement: Orange barrier fence shall be measured for the actual linear feet installed, measured as installed in place along the bottom of the fence or as directed by MWA.

B. Basis of Payment

1. The unit price shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

2. No additional payment shall be made for maintenance or replacement of orange barrier fence.

4.2 Temporary Chain Link Fencing

A. Method of Measurement: Temporary chain link fencing shall be measured for the actual linear feet installed, measured as installed in place along the bottom of the fence from the outside of end posts for each continuous run of fence or as directed by MWA.

B. Basis of Payment

1. The unit price shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance during construction, removal, and incidentals required to complete the Work.

2. No additional payment shall be made for maintenance or replacement of temporary chain link fencing.

4.3 Temporary Welded Wire Fencing

A. Method of Measurement: Temporary welded wire fencing shall be measured for the actual linear feet installed, measured as installed in place along the bottom of the fence from the outside of end posts for each continuous run of fence or as directed by MWA.

B. Basis of Payment

1. The unit price shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance during construction, removal, and incidentals required to complete the Work.

2. No additional payment shall be made for maintenance or replacement of temporary welded wire fencing.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnish all labor, equipment, and materials necessary to remove, salvage, and dispose of or abandon existing storm drainage pipe and structures of all types and sizes as required for the rehabilitation, replacement, and/or installation of storm drainage systems and related appurtenances, including excavation and backfill.

1.2 Submittals

A. If requested by MWA, submit

1. To MWA and other authorities having jurisdiction, if required, all working drawings and schedules of materials and methods proposed to follow in the execution of the Work under this item.

2. Photographs or videotape, sufficiently detailed, of existing conditions of project site that may be misconstrued as damage, caused by debris, or construction material removal.

3. Details of all caps, plugs, manifolds, and/or venting pipes to be installed on abandoned piping to remain in the ground.

4. Location of waste disposal facilities for all materials removed from the site.

5. Vehicle Capacity Certifications: The Contractor shall submit to MWA certifications indicating the type of container or vehicle including make and model, license plate number, equipment number, and measured maximum volume, in cubic yards, of the load bed of each piece of equipment utilized for utility line removal. The measured volume of each piece of equipment shall be calculated from actual internal physical measurement performed by the Contractor and MWA representative. Maximum volumes may be rounded to the nearest cubic yard. MWA reserves the right to re-measure trucks at any time to verify reported capacity.

6. Disposal Tickets

   a. Solid waste disposal tickets shall be submitted with gross, tare, and net weights in tons of solid waste produced from utility line removal measured off-site at the solid waste disposal facility as documentation of properly disposed solid waste for each load hauled off-site.

   b. Inert waste disposal tickets shall be submitted with truckloads in cubic yards of inert waste produced from utility line removal measured off-site at the inert waste disposal facility as documentation of properly disposed inert waste for each load hauled off-site.

c. Recycling disposal tickets shall be submitted as documentation of properly disposed recyclable materials produced from utility line removal.

Part 2 Products

(NOT USED)

Part 3 Execution

3.1 Pipe Removal and Abandonment

A. The Contractor shall be responsible for removal of any existing storm drainage pipe as directed by MWA that is to be abandoned that interferes with the installation of the proposed pipelines. Prior to removing any portion of existing pipelines, the Contractor shall obtain approval from MWA.

B. The Contractor shall follow all applicable codes and regulations for removal of hazardous materials, such as asbestos cement pipe, and dispose of in a legal and proper manner.

C. The Contractor shall load, haul away, and dispose of in a satisfactory location any debris, trash, structures, piping and similar items removed from the worksite in accordance with all applicable codes and regulations.

3.2 Drainage Structure Removal and Abandonment

A. The Contractor shall be responsible for removal of any existing storm drainage structure as directed by MWA that is to be abandoned.

B. Where drainage structures are to be removed, the Contractor shall excavate the structure, remove the structure and connecting piping, as required, and backfill the void with approved material. If the drainage structure is located within a road, parking area, driveway or other maintained area, the backfill shall be compacted to 95 percent standard proctor. If the drainage structure is located in an unmaintained area, the backfill shall be compacted to 90 percent standard proctor and slightly mounded to allow for settlement.

C. The Contractor shall load, haul away, and dispose of in a satisfactory location any debris, trash, structures, piping, etc. removed from the worksite in accordance with all applicable codes and regulations.

3.3 Non-Drainage Structure Removal and Abandonment

A. The Contractor shall be responsible for removal of any existing non-drainage structure as directed by MWA that is to be abandoned.

B. Where non-drainage structures are to be removed, the Contractor shall excavate the structure, remove the structure and connecting piping, as required, and backfill the void with approved material. If the non-drainage structure is located within a road, parking area, driveway or other maintained area, the backfill shall be compacted to 95 percent standard proctor. If the non-drainage structure is located in an unmaintained area, the backfill shall be compacted to 90 percent standard proctor and slightly mounded to allow for settlement.

C. The Contractor shall load, haul away, and dispose of in a satisfactory location any debris, trash, structures, piping, etc. removed from the worksite in accordance with all applicable codes and regulations.

Part 4 Measurement and Payment

4.1 Removal of Existing Drainage Structures

A. Method of Measurement: The removal of existing drainage structures shall be measured for each actual structure removed. There will be no additional payment for excavating and backfilling of existing drainage structures that are removed.

B. Basis of Payment

1. The unit price shall be compensation in full for all necessary tools, equipment, labor and materials to remove, backfill, load, handle, haul away, and dispose to complete the Work.

2. Payment will not be approved without submission of MWA approved Disposal Ticket from the waste disposal facility or recycling facility.

4.2 Removal of Existing Non-Drainage Structures

A. Method of Measurement: The removal of existing non-drainage structures shall be measured for each actual structure removed. There will be no additional payment for excavating and backfilling of existing non-drainage structures that are removed.

B. Basis of Payment

1. The unit price shall be compensation in full for all necessary tools, equipment, labor and materials to remove, backfill, load, handle, haul away, and dispose to complete the Work.

2. Payment will not be approved without submission of MWA approved Disposal Ticket from the waste disposal facility or recycling facility.

4.3 Removal of Existing Pipe, All Types and Sizes

A. Method of Measurement: The removal of existing pipe, shall be measured by the actual linear feet of pipe. There will be no additional payment for excavating and

backfilling of existing pipe, and there will be no distinction of types and sizes that are removed.

B. Basis of Payment

1. The unit price shall be compensation in full for all types and sizes removed shall include all necessary tools, equipment, labor and materials to remove, backfill, load, handle, haul away, and dispose to complete the Work.

2. Payment will not be approved without submission of MWA approved Disposal Ticket from the waste disposal facility or recycling facility.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnishing all labor, equipment, and materials necessary to remove all surplus and waste material, as directed by MWA.

1.2 Submittals

A. If requested by MWA, submit:

1. Photographs or videotape, sufficiently detailed, of existing conditions of project site that might be misconstrued as damage caused by removal operations.

2. Vehicle Capacity Certifications: The Contractor shall submit to MWA certifications indicating the type of container or vehicle, including make and model, license plate number, equipment number, and measured maximum volume, in cubic yards, of the load bed of each piece of equipment utilized for material removal. The measured volume of each piece of equipment shall be calculated from actual internal physical measurement performed jointly by the Contractor and a MWA representative. Maximum volumes may be rounded to the nearest cubic yard. MWA reserves the right to re-measure trucks at any time to verify reported capacity.

3. Disposal Tickets

   a. Solid waste disposal tickets shall be submitted with gross, tare, and net weights in tons of solid waste measured off-site at the solid waste disposal facility as documentation of properly disposed solid waste for each load hauled off-site.

   b. Inert waste disposal tickets shall be submitted with truckloads in cubic yards of inert waste measured off-site at the inert waste disposal facility as documentation of properly disposed inert waste for each load hauled off-site.

   c. Recycling disposal tickets shall be submitted as documentation of properly disposal of recyclable materials.

   d. Disposal tickets shall include:

      i. Date material removed from Project site.

      ii. Name of hauler (company and driver) transporting such material.

      iii. General description of material transported.

4. Waste Management Plan: Plan shall indicate anticipated types and quantities of demolition waste and construction waste and planned means and location of disposal of such waste.

1.3 Definitions

A. The definitions contained in United States Resource Conservation and Recovery Act (RCRA) Laws and Regulations and Georgia Environmental Protection Division (EPD) Rules 391-3-4-.01 shall be applicable to this Project. The term waste shall include pre-existing materials.

B. Construction/Demolition Waste, as defined by EPD Rule 391-3-4.01, means waste building materials and rubble resulting from construction, remodeling, repair, and demolition operations on pavements, houses, commercial buildings and other structures. Such waste includes, but are not limited to asbestos containing waste, wood, bricks, metal, concrete, wall board, paper, cardboard, inert waste landfill material, and other non-putrescible wastes which have a low potential for groundwater contamination.

C. Inert wastes, as defined by EPD Rule 391-3-4.01, means earth and earth-like products, concrete, cured asphalt, rock, bricks, yard trimmings, stumps, limbs, and leaves. This definition excludes industrial and demolition waste.

D. Solid Waste

1. Solid waste, as defined by EPD Rule 391-3-4.01, means any garbage or refuse; sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility; and other discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities, but does not include recovered materials; solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows or industrial discharges that are point sources subject to permit under 33 U.S.C. Section 1342; or source, special nuclear, or by-product material as defined by the federal Atomic Energy Act of 1954, as amended (68 Stat. 923).

2. Solid waste materials as defined in GDOT Standard Specifications Section 215 shall be removed and disposed in according with the GDOT Standard Specifications Section 201 and Section 215.

E. Surplus Material: Surplus material shall be defined as the excess and surplus materials imported to the Project site by the Contractor, including excess material not needed for the construction of the Project, or supplemental material used, including packaging materials, resulting from construction, renovation, or repair operations. Surplus material includes masonry and CMU, lumber, wood sheet materials, wood trim, metals, piping, electrical conduit. Surplus material is the property of and responsibility of the Contractor.

F. Demolition Waste: Existing structure and site improvement materials resulting from demolition or selective operations. Demolition waste includes asphalt paving, concrete, concrete reinforcing steel, brick, concrete masonry units, structural and miscellaneous steel, piping, supports and hangers, valves, and sprinklers.

G. Disposal: Removal and subsequent sale, recycle, reuse, or deposit in landfill or recycle center acceptable to authorities having jurisdiction.

H. Recycled Material: Recycled material shall be material that is recovered for subsequent processing in preparation for reuse by either the Contractor or disposed of at an approved recycle center.

Part 2 Products

(NOT USED)

Part 3 Execution

3.1 Plan Implementation

A. Implement waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Waste Management Conference: Conduct conference at Project site bi-weekly. Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan.

2. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

3. Review procedures for periodic collection and transportation to disposal facilities.

C. Training

1. Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

2. Distribute waste management plan to everyone concerned within three days of submittal return.

3. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls

1. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

2. Designate specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

3.2 Disposal of Waste

A. Practice efficient waste management in the use of materials in the course of the Work. Use reasonable means to divert construction and demolition waste from landfills. Facilitate recycling and salvaging of materials.

B. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of such in a manner acceptable to authorities having jurisdiction.

C. Except as otherwise specified, do not allow waste materials that are to be disposed accumulate on-site.

D. Remove and transport waste in a manner that will prevent spillage on adjacent surfaces and areas.

E. Burning: Do not burn waste materials on-site.

F. Waste removed from the Project site shall ultimately be disposed in sites permitted by the Georgia EPD for the acceptance of type of waste being disposed or recycling centers.

1. The acceptable types of permitted disposal facilities are as follows:

a. Inert Waste Landfills.

b. Municipal Solid Waste Landfills.

c. Municipal Solid Waste Landfills permitted to receive only construction and demolition wastes.

2. Recycling center locations may be obtained from www.earth911.com or other legitimate sources.

G. Exceptions to Paragraph F are as follows:

1. Hazardous waste shall be disposed of in accordance with Georgia EPD Rules 391-3-11.

2. Asbestos-containing waste shall also be handled and disposed of in accordance with Georgia EPD Rules 391-3-14.

3. Excess earth material and excess excavated rock material may be placed on sites for which the Contractor provides to MWA a signed affidavit from the property owner that the placement of such material is acceptable to the property owner. The Contractor and property owner shall be responsible for all permitting of such disposal.

H. No waste shall be placed at a transfer station facility.

I. Construction/Cemolition waste and inert waste shall not be mixed when items are hauled off-site.

J. Waste shall be loaded and hauled off-site in a manner that does not damage the existing landscape.

3.3 Recycling

A. Recycle as much material as is practical, including uncontaminated packaging materials, paper, cardboard, boxes, plastic sheet and film, polystyrene packaging, wood crates, plastic pails.

B. Prepare and maintain recyclable materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

C. Procedures

1. Separate recyclable material from waste materials, trash, and debris. Separate recyclable material by type at Project site to the maximum extent practical according to construction waste management plan.

2. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

3. Inspect containers and bins for contamination and remove contaminated materials if found.

4. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

5. Stockpile materials away from construction area. Do not store within drip line of remaining trees.

6. Store components off the ground and protect from the weather as necessary.

7. Remove recyclable waste and transport to recycling receiver or processor.

D. Demolition Waste

1. Grind and or pulverize asphalt, concrete, and masonry to maximum 1-1/2-inch size.

2. Break up and transport paving to asphalt-recycling facility.

3. Remove reinforcement and other metals from concrete and sort with other metals.

4. Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

5. Clean and stack undamaged, whole masonry units on wood pallets.

E. Surplus Material

1. Packaging: Break down cardboard and box packaging into flat sheets. Bundle and store in a dry location. Separate and bag polystyrene packaging materials. As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood. Break down crates into component wood pieces and comply with requirements for recycling wood.

2. Wood Materials: Grind or chip lumber into small pieces. Bag sawdust that does not contain painted or treated wood.

Part 4 Measurement and Payment

4.1 General

A. No additional payment shall be made for excavation or disposal of excavated material required for placement or removal of backfill placed above the foundation of the pavement and for preparation of sub grade, and the cost thereof shall be considered as being included in the Unit Prices.

B. No additional payment shall be made for removal of materials considered as being removed, loaded, hauled away, and disposed under other Pay Items.

C. No payment will be made for disposal of surplus material, whether disposed of as inert waste, solid waste, recycled material or salvaged for Contractor.

D. No payment will be made for the disposal of any material that is salvaged for Contractor.

4.2 Solid Waste Disposal

A. Method of Measurement

1. Solid waste disposal shall be measured for the actual weight in tons removed from the site.

2. Material generated from fencing removal activities are not eligible for measurement under this pay item.

3. Quantities eligible for payment includes those quantities which are disposed of as recycled material as defined above.

B. Basis of Payment

1. The unit price shall be compensation in full for all necessary tools, equipment, labor, and materials to remove, handle, load, haul away, dispose, and backfill as necessary to fill voids left by waste to complete the Work.

2. Payment will not be approved without submission of MWA approved Disposal Ticket from solid waste disposal facility.

4.3 Inert Waste Disposal

A. Method of Measurement

1. Inert waste disposal shall be measured for the actual cubic yards removed from the site and shall be measured at the time of haul away.

2. Handling and disposal of waste associated with other site clearing pay items is not included in the measurement for this pay item and shall remain separated at all times from the inert waste to be measured under this pay item.

3. Material generated from excavation and fill activities are not eligible for measurement under this pay item.

4. Quantities eligible for payment includes those quantities which are disposed of as recycled material as defined above.

B. Basis of Payment

1. The unit price shall be compensation in full for all necessary tools, equipment, labor, and materials to remove, handle, load, haul away, dispose, and backfill as necessary to fill voids left by waste to complete the Work.

2. Payment will not be approved without submission of Vehicle Capacity Certifications.

3. Payment will not be approved without submission of MWA approved Disposal Ticket from inert waste disposal facility.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnishing all the materials for and shall place all cast-in-place concrete, including all reinforcing steel and formwork, and such other concrete as may be found necessary to fully complete the Work indicated under this Contract or per MWA.

1.2 Concrete Mix Design

A. Cast-in-place concrete mix design shall meet the following requirements which are the classifications in accordance with GDOT Standard Specification Section 500:

1. Class AAA
    a. Minimum Compressive 28 Day Strength: 5,000 psi.
    b. Slump: 2-4 inches.
2. Class AA1
    a. Minimum Compressive 28 Day Strength: 4,500 psi.
    b. Slump: 2-4 inches.
3. Class A
    a. Minimum Compressive 28 Day Strength: 3,000 psi.
    b. Slump: 2-4 inches.
4. Class B
    a. Minimum Compressive 28 Day Strength: 2,200 psi.
    b. Slump: 2-4 inches.

B. Aggregate sizing and proportioning of cement, water, aggregates, air content, and use of admixtures shall be as required to meet the requirements of each class of concrete shown above and as needed to meet the requirements of the Work.

C. Use of fly ash as a cement substitute is prohibited unless specifically allowed by MWA.

D. Entrained Air: 4-7% Total Air Content, unless otherwise approved by MWA.

1.3 Submittals

A. If requested by MWA, submit

1. To MWA all working drawings and schedules of materials and methods proposed to follow in the execution of the Work under this item. Submittals shall show, in detail, the type, mix design, reinforcement layout, and location of all cast-in-place concrete and accessories to be used in construction.

2. Certification that all materials used in cast in place concrete meet the material standards specified in this specification.

1.4 Defective Work

A. Any concrete work found to be defective from any cause whatsoever, at any time before the Final Acceptance of the Work, shall be removed and either replaced or repaired at the expense of the Contractor.

Part 2 Products

2.1 Forms

A. All formwork shall conform to the requirements of ACI 347.

B. The Contractor shall furnish all labor and materials for all forms required for the construction of the Work.

C. Either metal or wood forms may be used.

D. All forms shall be true to the required shape, clean, of sufficient strength, and well braced so that they shall maintain their proper position during the placing and vibrating of the concrete.

2.2 Steel Reinforcement

A. Steel reinforcement shall be detailed, fabricated and placed in conformance with all applicable requirements of ACI 318, and the CRSI Manual of Standard Practice and GDOT Standard Specifications Section 853.

B. Steel reinforcing bars shall conform to ASTM A615, Grade 60, unless otherwise specified.

C. Welded wire fabric shall conform to ASTM A185.

D. Steel wire shall conform to ASTM A82.

E. All metal accessories for setting and fastening of reinforcement shall conform to CRSI Manual of Standard Practice.

2.3 Portland Cement

A. Portland cement used shall be Type I or II conforming to ASTM C150.

2.4 Coarse Aggregate

A. Coarse aggregates shall conform to ASTM C33, size numbers 56, 57, 67, and 68, or as otherwise approved by MWA.

2.5 Fine Aggregate

A. Fine aggregates shall conform to ASTM C33.

2.6 Joint Sealants

A. Waterstops: Polyvinyl conforming to Corp of Engineer Specification CRD-C 572, or as otherwise specified or approved by MWA.

B. Pre-molded joint filler: Cork or PVC, conforming to ASTM D1752, or as otherwise specified or approved by MWA.

C. Joint sealants: Synthetic rubber that is resistant to acids and alkalis (pH range 3.5 to 8), or as otherwise specified or approved by MWA.

2.7 Water

A. Water used shall be clean, fresh, and free from oils, acids, alkalis, organics, or other deleterious substances. Potable water will fulfill this requirement.

Part 3 Execution

3.1 Preparation

A. Measurement and Mixing: Measurement and mixing of concrete shall be subject to the review of MWA in all respects and shall be performed in accordance with the recommendations of ACI 304, as modified herein.

1. Measuring requirements: Measure cement, fine and coarse aggregates separately by weight by equipment providing accuracy within one percent of the net load weighed. Water shall be measured by a suitable device, accurate to within one percent of the total amount required for the batch.

2. Measuring equipment: The accuracy of the weighting equipment shall meet the requirements of the United States Bureau of Standards, and standard testing weights and other necessary equipment shall be available at all times for testing the equipment.

3. Mixing: Concrete shall be mixed in rotary, batch type mixer of adequate design to produce a thorough mix, homogenous in composition and uniform in color. Each batch of 1 cubic yard or less shall be mixed not less than 1-1/2 minutes after the last of the ingredients have been added to the mixer. The mixing time shall be increased 15 seconds for each additional cubic yard or fraction thereof.

B. Ready-Mixed Concrete

1. Rate of delivery: The rate of delivery of the mixed concrete shall be such that the interval between placing of fresh concrete in contact with concrete already placed from previous batches shall not exceed 45 minutes. The elapsed time between the introduction of mixing water to the cement and aggregates and depositing concrete in the Work shall not exceed 60 minutes, including mixing and agitating time.

2. Delivery equipment: Delivery of concrete in non-agitating equipment shall not be permitted.

3. Addition of water: No water shall be added to the concrete at the site unless allowed by MWA for a specific batch. Allowance of such addition to one batch shall not be construed as allowance of additions to subsequent deliveries.

3.2 Formwork

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Construct forms tight enough to prevent loss of concrete paste.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces.

E. Chamfer exterior corners and edges of permanently exposed concrete.

F. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

G. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

H. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

I. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.3 Vapor Retarders

A. Vapor Retarders shall be minimum 6 mil polyethylene sheeting and shall be utilized under any concrete poured on earth or gravel.

B. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 Steel Reinforcement

A. Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

C. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.5 Joints

A. Joints, either vertical or horizontal, shall be made only where and as permitted by MWA.

B. Construct joints shall be true to line with faces perpendicular to surface plane of concrete.

C. Construction Joints: Install such that strength and appearance of concrete are not impaired, at locations indicated or as approved by MWA.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate joints for beams, and slabs in the middle third of spans.

4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.6 Concrete Placement

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by MWA.

C. Unless permission is granted by MWA, concrete shall not be laid in water nor shall water be allowed to rise on or flow over freshly placed concrete until the concrete has set for at least twenty-four hours.

D. Concrete shall not be mixed at any time during freezing, inclement weather, or at night without explicit permission, and then only at the Contractor's risk. If permitted to build concrete structures in freezing weather, the Contractor shall provide and use proper facilities for covering and keeping warm the newly placed concrete.

E. If water is added at Project site, it shall be added before test sampling and placing concrete, and subject to limitations of ACI 301. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

F. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints. Deposit concrete to avoid segregation.

    1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

    2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

    3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

G. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

    1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

    2. Maintain reinforcement in position on chairs during concrete placement.

    3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

H. Cold-Weather Placement: Comply with ACI 306.1 and as follows:

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

2. When average high and low temperature is expected to fall below 40 degrees F for three successive days, maintain delivered concrete mixture temperature within the temperature range specified by ACI 301.

3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

4. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

I. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 degrees F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.7 Finishing Formed Surfaces

A. Rough-Form Finish

1. Rough-form finish is defined as as-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

2. Rough-form finish shall be provided only for concrete surfaces not exposed to view.

B. Smooth-Form Finish

1. Smooth form finish is defined as as-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a

minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

2. Smooth-form finish shall be provided for concrete surfaces exposed to view, from inside and out.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 Finishing Floors and Slabs

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish

1. Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

C. Trowel Finish

1. First apply float finish to surfaces to receive trowel finish.

2. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.

3. Apply a trowel finish to ground floor slab.

4. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

D. Trowel and fine-broom finish shall be applied to all pedestrian traffic surfaces other than ground floor slab. Apply a first trowel finish and while concrete is still plastic, slightly scarify surface with a fine broom.

E. Apply non-slip coating to walking surfaces where called for on the Contract Documents.

3.9 Miscellaneous Concrete Items

A. Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.10 Concrete Protecting and Curing

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft./hour before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water,

    b. Continuous water-fog spray, and

    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

b. Moisture cure any or all concrete surfaces at Contractor’s option.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.11 Removing and Reusing Forms

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that do not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, if concrete is cured enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength. Determine potential compressive strength of in-place concrete by testing field-cured specimens, representative of concrete location or members.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by MWA.

3.12 Concrete Surface Repairs

A. Defective Concrete: Repair and patch defective areas when approved by MWA. Remove and replace concrete that cannot be repaired and patched to MWA's satisfaction.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one-part Portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01-inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete, has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

6. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to MWA's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to MWA's approval.

3.13 Field Quality Control

A. Testing and Inspecting: Engage a qualified, third party independent testing and inspection agency to perform field tests and inspections and prepare test reports.

B. No concrete shall be placed until all steel reinforcement to be covered has been inspected in place and approved by MWA.

C. MWA reserves the right to conduct additional concrete field testing through the County’s materials testing annual services contract.

D. Inspections: Contractor shall perform the following inspections:

1. Steel reinforcement placement, prior to placing concrete.

2. Verification of use of required design mixture.

3. Concrete placement, including conveying and depositing.

4. Curing procedures and maintenance of curing temperature.

5. Review concrete delivery tickets at time of delivery to assure conformance to ACI 318.

6. Verification of concrete strength before removal of shores and forms from beams and slabs.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:

1. Testing Frequency

a. Obtain at least one composite sample for each 100 cubic yard or fraction thereof of each concrete mixture placed each day.

b. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump shall be tested in accordance with ASTM C143, with one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content shall be tested in accordance with ASTM C231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature shall be tested in accordance with ASTM C1064, with one test hourly when air temperature is 40 degrees F and below and when 80 degrees F and above, and one test for each composite sample.

5. Unit Weight: Perform one test for each composite sample.

6. Compression Test Specimens shall be prepared and cured in accordance with ASTM C31. Cast and field cure two sets of two standard cylinder specimens for each composite sample (minimum of four cylinders total).

7. Compressive-Strength Tests shall be performed in accordance with ASTM C39as follows:

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.

    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

9. Strength of each concrete mixture will be satisfactory if every average of any three-consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

10. Test results shall be reported in writing to MWA, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by MWA but will not be used as sole basis for approval or rejection of concrete.

12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete, as directed by MWA, when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met. Testing and inspecting agency may conduct tests to determine adequacy of

concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by MWA.

13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

14. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

F. Notify MWA at appropriate times for the performance of special inspections as required by Contract Documents.

Part 4 Measurement and Payment

4.1 Concrete Structures, Cast-In-Place (Class A, AAA, AA1, & B)

A. Method of Measurement: Cast-in-place concrete structures shall be measured per cubic yard of each separate class of concrete installed, complete-in-place.

B. Basis of Payment

The Unit Price for cast-in-place concrete structures shall include excavation, backfill, concrete, reinforcing steel, gates, covers, steps as applicable, materials testing, and all other labor, materials, equipment and other incidentals required to complete the Work.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnishing all labor, equipment, and materials necessary for hauling and properly placing classified stone at the locations and to the limits indicated on the Drawings or as directed by MWA.

1.2 Submittals

A. Certified Test Results: If requested by MWA, submit the following for all Classified Stones and Rock Types described in Part 2: gradation, abrasion resistance and bulk density.

1.3 Quality Assurance

A. Source: Quarry shall have produced Classified Stones and Rocks and has performed satisfactorily on other projects for at least 5 years. Native, on-site Classified Stones may be used pending written approval from MWA.

B. Classified Stone shall be free of unspecified sand and soil, roots and other organic or deleterious matter.

Part 2 Products

2.1 Aggregate Stone

A. No. 3, No. 4, No. 5, No. 57, No. 8 and No. 89 Stones and Crusher Run shall be in accordance with GDOT Standard Specification Section 800 – Coarse Aggregate.

B. Graded Aggregate Base shall be in accordance with GDOT Standard Specification Section 815 – Graded Aggregate.

2.2 Well Graded Rip Rap

A. Well Graded Rip Rap shall be a mixture of clean coarse aggregate and Rip Rap material in the following percentages by volume, unless otherwise specified in accordance with the design drawings:

1. 60% Type 3 Rip Rap.

2. 40% No. 3 Stone.

2.3 Slate Chips

A. Slate Chips shall be composed of angular slate pieces ranging from 1 to 3 inches across and be dark gray in color, unless otherwise specified in Contract Documents.

2.4 Flagstone

A. Flagstone shall be flat, angular sandstone with a minimum width of 12 inches and thickness ranging from 3/4 to 2-1/2 inches. No more than 5 percent of the material furnished can be less than the minimum width specified.

B. Flagstone shall be hard and durable, free from fractures, bedding planes, pronounced weathering, and earth or other adherent coatings.

2.5 Geotextiles

A. Woven and non-woven geotextiles as specified in Section 31 32 19.16 - Geotextile Soil Stabilization.

2.6 Pea Gravel

A. Pea gravel shall be smooth round stones ½-inch to 3/8-inch, varying in color.

2.7 Bentonite

A. Bentonite shall be sodium bentonite which expands when wet.

Part 3 Execution

3.1 Construction

A. Prepare the ground surface where the classified stone will be placed to conform with the correct grades before beginning the placement. Ground surface shall be smooth and free of obstructions, depressions, or debris. Ground surface shall be compacted in accordance with Drawings and Specifications.

B. Place woven geotextile on the prepared ground surface under all classified stone.

C. Place classified stone to a uniform thickness as specified in the Contract Documents.

Part 4 Measurement and Payment

4.1 Classified Stone

A. Method of Measurement

1. Classified stone shall be measured for by the number of tons, or as otherwise directed by MWA.

2. Classified stone placed beyond the limits defined in the Contract Documents will not be included in the measurement for payment.

3. Geotextiles installed with classified stone shall be measured for payment as described in Section 31 32 19.16 - Geotextile Soil Stabilization.

B. Basis of Payment

1. The unit price shall be compensation in full for all tools, equipment, labor, materials, transportation, and incidentals necessary to excavate, furnish, place, compact, and maintain classified stone, as shown in Contract Documents or field ordered.

2. Any excavation and backfill beyond the dimensions in the Contract Documents will be considered beyond the limits of measurement and will be considered incidental to the Work.

3. Payment will not be approved without submission of weighted delivery tickets.

END OF SECTION

Part 1 General

1.1 Summary

A. Section Includes furnishing all labor, equipment, and materials necessary to perform site clearing activities.

1.2 Submittals

A. Submit, in accordance with Section 01 32 33 – Photographic Documentation, photographs and/or videotape sufficiently detailed of existing conditions within the limits of construction and of trees and plantings, construction, and site improvements of the adjoining area that might be misconstrued as damage caused by site clearing.

B. The Contractor shall submit to MWA an estimation of the amount of time needed to complete brush cutting, shrub trimming, and selective tree pruning in a designated area.

1.3 Scheduling and Sequencing

A. The submittal required in Article 1.2, Paragraph B above must be approved by MWA before commencing work

B. Obtain MWA approval of staked site clearing limits prior to commencing clearing, grubbing, and stripping.

C. Prepare site only after National Pollutant Discharge Elimination System (NPDES) permit for Construction Activities has been obtained and adequate erosion and sediment controls are in-place. See Contract Documents and Construction Phasing and Erosion Control Notes.

Part 2 Products

(NOT USED)

Part 3 Execution

3.1 General

A. Contractor shall identify trees (suitable as defined in Contract Documents) that may be used for construction of in-stream structures. Trees suitable for construction of stream structures shall be approved by MWA. Trees used for in-stream structures may require that the root ball remain intact with the tree trunk. Stockpile trees suitable for construction of stream structures, as described in the Contract Documents.

B. The diameter at breast height (DBH) of a tree shall be measured at 4.5 feet above the ground.

C. MWA will identify any additional trees to be saved following staking of clearing limits and installation of tree protection fencing. Contractor shall protect trees identified to be saved during all construction activities.

D. Do not injure or deface vegetation that is not designated for removal.

E. All vegetative material from clearing and grubbing, selective tree pruning, selective tree removal, stump grinding, brush cutting, and shrub trimming activities shall be disposed off-site unless otherwise described below, identified in the Contract Documents or directed by MWA. Material removed from the site becomes property of the Contractor.

F. Removal of pre-existing non-vegetative debris shall be covered under Section 02 42 00.

G. It is the Contractor's responsibility to remove or burn all construction debris from the jobsite. All outdoor burning of natural vegetative materials is considered open burning and requires a burn permit from the Georgia Forestry Commission. Any costs incurred as a result of the burning ban are the sole responsibility of the Contractor.

3.2 Limits

A. Site clearing activities shall be confined to limits shown on the Contract Documents and as shown on the approved submittal described above.

1. Contractor shall survey and identify with field stakes the limits of clearing and grubbing and brush cutting prior to site clearing activities. Contractor shall protect all stakes during construction and replace any damaged stakes within one working day.

2. All trees, limbs, and shrubs to be cut shall be marked by the Contractor before the service is performed. The trees, limbs, and shrubs shall be marked using high visibility flagging tape.

3. Contractor shall review limits of site clearing activities with MWA prior to beginning work.

3.3 Clearing and Grubbing – Mulch On-Site

A. The term clearing and grubbing – mulch on-site as used herein shall include mulching of all trees, brush, stumps, logs, grass, weeds, roots, decayed vegetable matter, shrubs, and other vegetation within the limits shown on the Contract Documents, except that privet and other invasive species shall be separated, shall not be mulched, and hauled off-site.

B. Clear and grub as authorized by MWA.

1. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.

2. Use only hand methods for grubbing within tree protection zone.

C. Mulch shall be spread on-site as shown on the Contract Documents or as directed by MWA.

D. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

E. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.4 Clearing and Grubbing – Haul Off-Site

A. The term clearing and grubbing – haul off-site as used herein shall include clearing and removal of all trees, brush, stumps, logs, grass, weeds, roots, decayed vegetable matter, shrubs, and other vegetation within the limits shown on the Contract Documents.

B. Clear and grub as authorized by MWA.

1. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.

2. Use only hand methods for grubbing within tree protection zone.

C. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

D. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.5 Selective Tree Pruning

A. The term selective tree removal as used herein shall include trimming, pruning, cutting, removal and disposal performed in a manner that will not jeopardize the public safety or damage structures including, but not limited to, utility lines or services, private property, or adjacent trees.

B. Contractor shall utilize ropes, aerial lifts, or other suitable methods when trimming, pruning, or removing limbs and shall not use climbing spikes unless otherwise directed by MWA.

C. Limbs shall be cut off smooth, without splitting or shattering. Scars greater than one inch in diameter shall be sealed with an approved sealer asphalted tree paint. The trunks of the trees shall be carefully protected from damage, and if unavoidable

damage occurs, the injured portions shall be neatly trimmed and covered with an application of tree paint.

D. Tree pruning performed during selective tree removal, clearing and grubbing and all other work shall be considered incidental.

3.6 Selective Tree Removal

A. The term selective tree removal as used herein shall include removal and disposal of trees performed in a manner that will not jeopardize the public safety or damage structures including, but not limited to, utility lines or services, private property, or adjacent trees.

B. Removal of trees shall follow proper safety procedures with appropriate equipment, personnel.

C. Trees identified for select removal shall be measured in accordance with the DBH. Trees with multiple trunks shall measure the DBH of each trunk.

D. Unless otherwise directed by MWA, grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.

E. Fill depressions caused by tree removal operations with satisfactory soil material unless further excavation or earthwork is indicated.

F. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.7 Stump Grinding

A. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed sub-grade.

B. Stumps identified for grinding will be measured in diameter at the ground level.

C. Fill depressions caused by stump grinding operations with satisfactory soil material unless further excavation or earthwork is indicated.

D. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.8 Brush Cutting

A. The term brush cutting used herein shall include the cutting of trees (up to 4-inch DBH), brush and grasses left on-site using heavy commercial grade, self-propelled or powered rotary blade mowing equipment (Bush Hog or MWA approved equivalent) for reoccurring clearing of right of ways and easements.

B. Remove trees (up to 4-inch DBH), brush and grasses as authorized by MWA.

C. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated. When it is necessary to cut tree roots on the surface of the ground, the ends shall be cut off smooth, without splitting or shattering. Scars greater than 1 inch in diameter shall be sealed with an approved sealer asphalted tree paint. The trunks of the trees shall be carefully protected from damage, and if unavoidable damage occurs, the injured portions shall be neatly trimmed and covered with an application of tree paint.

D. Fill depressions caused by brush cutting operations with satisfactory soil material unless further excavation or earthwork is indicated.

E. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.9 Shrub Trimming

A. The term shrub cutting used herein shall include the selective trimming of shrubs as directed by MWA.

B. Shrubs will be trimmed, shaped, and sheared in accordance with the guidelines provided by the National Arborist Association for Class II, Standard Pruning to develop the natural form of the plant, and create the effect desired by MWA.

C. Shrubs will be pruned as necessary to remove dead branches as needed in a manner that will not jeopardize the public safety or damage structures including, but not limited to, utility lines or services, private property, or adjacent vegetation.

Part 4 Measurement and Payment

4.1 Clearing and Grubbing – Mulch On-Site

A. Method of Measurement: Clearing and grubbing shall be measured per acre of area cleared and/or grubbed as measured in the horizontal plane.

B. Basis of Payment: Payment shall be made at the unit price bid and shall be compensation in full for clearing and mulching the work area of all trees, shrubs, and undergrowth, grubbing the work area, all handling, on-site hauling, and all other labor, materials, equipment, and other incidentals required to complete the Work.

4.2 Clearing and Grubbing – Haul Off-site

A. Method of Measurement: Clearing and grubbing shall be measured per acre of area cleared and/or grubbed and hauled off-site as measured in the horizontal plane.

B. Basis of Payment: Payment shall be made at the unit price bid and shall be compensation in full for clearing the work area of trees, shrubs, undergrowth, grubbing the work area, all handling, on-site hauling, removal and disposal of all cleared materials from the site, and all other labor, materials, equipment, and other incidentals required to complete the Work.

4.3 Selective Tree Pruning

A. Method of Measurement

1. Tree pruning shall be measured for each hour for which tree pruning was performed, as designated by MWA.

2. Duration of tree pruning work shall be measured using the designated crew's working hours, not as a sum of the individual members' hours within the crew. For the purposes of payment, a crew shall consist of at least three persons performing work on such assignment.

3. Work outside of the defined project area where tree pruning was performed without prior approval by MWA shall not be included in measurement for payment.

4. The Contractor shall provide MWA with employee and/or crew timecards which specifically document: the project site where the work was performed, the number of hours logged at the project site where the work was performed, and the day in which the work was completed.

B. Basis of Payment: The unit price shall be compensation in full for all tools, equipment, labor, materials, handling, on-site hauling, and incidentals necessary to complete the Work. All cleared debris shall be removed, loaded, hauled away, and disposed off-site. Any removal of vegetative debris associated with this activity will be considered incidental to the cost of this activity.

4.4 Selective Tree Removal (Per Tree and Daily Rate)

A. Method of measurement: selective tree removal shall be measured per tree or daily rate as described in the Contract Documents or as directed by MWA.

1. Selective tree removal per tree shall be measured by the number of trees removed per each size classification shown on the Unit Price Schedule.

2. Selective tree removal daily rate shall be measured for each hour for which selective tree removal was performed, as designated by MWA.

a. Duration of selective tree removal shall be measured using the designated crew's working hours, not as a sum of the individual members' hours within the crew. For the purposes of payment, a crew shall consist of at least three persons performing work on such assignment.

b. Work outside of the defined project area where selective tree removal was performed without prior approval by MWA shall not be included in measurement for payment.

c. The Contractor shall provide MWA with employee and/or crew timecards

which specifically document: the project site where the work was performed, the number of hours logged at the project site where the work was performed, and the day in which the work was completed.

B. Basis of Payment: The unit price shall be compensation in full for all necessary tools, labor, equipment, materials, handling, on-site hauling and incidentals necessary to complete the Work. All selective tree removal debris shall be removed, loaded, hauled away, and disposed off-site. Any removal of vegetative debris associated with this activity will be considered incidental to the cost of this activity.

4.5 Stump Grinding

A. Method of Measurement: Stump grinding shall be measured in accordance with the number of stumps ground per each size classification shown on the Unit Price Schedule.

B. Basis of Payment: The unit price shall be compensation in full for all necessary tools, labor, equipment, and materials required to grind the stump, waste removal from the site, and all other incidentals required to complete the Work.

4.6 Brush Cutting

A. Method of Measurement

1. Brush cutting shall be measured for each hour for which brush cutting was performed, as designated by MWA.

2. Duration of brush cutting work shall be measured using the designated crew's working hours, not as a sum of the individual members' hours within the crew. For the purposes of payment, a crew shall consist of at least three persons performing work on such assignment.

3. Work outside of the defined project area where brush cutting was performed without prior approval by MWA shall not be included in measurement for payment.

4. The Contractor shall provide MWA with employee and/or crew timecards which specifically document: the project site where the work was performed, the number of hours logged at the project site where the work was performed, and the day in which the work was completed.

B. Basis of Payment: The unit price shall be compensation in full for all tools, equipment, labor, materials, and incidentals necessary to complete the Work. All cleared debris shall be removed, loaded, hauled away, and disposed off-site. Any removal of vegetative debris associated with this activity will be considered incidental to the cost of this activity.

4.7 Shrub Trimming

A. Method of Measurement

1. Shrub trimming shall be measured for each hour for which shrub trimming was performed, as designated by MWA.

2. Duration of shrub trimming work shall be measured using the designated crew's working hours, not as a sum of the individual members' hours within the crew. For the purposes of payment, a crew shall consist of at least three persons performing work on such assignment.

3. Work outside of the defined project area where shrub trimming was performed without prior approval by MWA shall not be included in measurement for payment.

4. The Contractor shall provide MWA with employee and/or crew timecards which specifically document: the project site where the work was performed, the number of hours logged at the project site where the work was performed, and the day in which the work was completed.

B. Basis of Payment: The unit price shall be compensation in full for all tools, equipment, labor, materials, and incidentals necessary to complete the Work. All cleared debris shall be removed, loaded, hauled away, and disposed off-site. Any removal of vegetative debris associated with this activity will be considered incidental to the cost of this activity.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes making all excavations and fills required for the Work, to the lines and grades as indicated on the Contract Documents, or as directed, and shall remove all excess excavated materials as otherwise specified herein.

B. The Contractor shall make all stream channel excavation and fills required to meet the lines, grades and cross-sections as indicated on the Contract Documents, or as directed, and shall remove all excess excavated materials as specified herein.

C. The Contractor shall furnish, haul and place all imported fill material as required for proper backfilling of excavations when, in the opinion of MWA or their representative, the original material is unsuitable for use as backfill as it fails to meet the requirements set forth in this section for Backfilling. This item shall also include fill material required for embankments over sewers, pipes, and elsewhere when suitable material excavated under this Contract is not available in sufficient quantity or fails to meet the requirements of this section.

D. Contract Documents indicate elevations of the existing ground and the approximate elevations of the finished grades of the backfills around structures prior to construction of the various portions of the Work. The elevations of the existing ground are believed to be reasonably correct, but do not purport to be absolutely so, and together with any schedule of quantities, are presented only as an approximation. The Contractor shall satisfy itself, however, by actual examination of the site of the Work, as to the existing elevations and the amount of work required under these items.

E. The Contractor shall furnish all the materials for and shall properly place bedding material, which may be deemed necessary by MWA and which may be required for proper completion of the Work included under this Contract.

F. Perform earthwork operations in a safe and proper manner with appropriate precautions being taken against all hazards.

G. Maintain all excavated and backfilled areas for structures, trenches, backfills, topsoil areas, embankments and channels in good condition at all times until final acceptance by MWA. Repair all damage caused by erosion or other construction operations using material of the same type as the damaged material.

H. Perform earthwork within the rights-of-way of the State Department of Transportation, the County Department of Transportation, and the respective cities in accordance with requirements and provisions of the permits issued by those agencies for the construction within their respective rights-of-way. Such requirements and provisions, where applicable, and if more stringent, shall take precedence and supersede the provisions of these Specifications.

I. Control grading in a manner to prevent water running into excavations. Avoid obstruction of surface drainage and provide means whereby stormwater can be uninterrupted in existing gutters, other surface drains, or temporary drains. Provide free access to all fire hydrants, water valves, and meters.

J. It is understood and agreed that the Contractor has made a thorough investigation of the surface and subsurface conditions of the site and any special construction problems which might arise as a result of nearby watercourses and flood plains, particularly in areas where construction activities may encounter water-bearing sands and gravels or limestone solution channels. Provide all services, labor, equipment, and materials necessary or convenient to complete the work within the time specified in these Contract Documents.

1.2 Definitions

A. The term “excavation" as used herein shall mean mechanical or hand removal of materials including earth, hardpan, all rock excavation, masonry, plain concrete, reinforced concrete, pavement, pavement foundation, ashes, rubbish, muck, rock and other material. No classification of excavated materials will be made, except for rock and removal of unsuitable material in trench bottom as described herein. Excavation work includes the removal and subsequent handling of all materials excavated or otherwise removed in performance of the contract work, regardless of the type, character, composition, or condition thereof.

B. Excavation shall include the removal of earth materials from their original location and on-site handling within a contiguous project site of any and all materials encountered in performing the Work. Excavation shall include all groundwater and surface water control (pumping, bailing, draining or other methods selected by the Contractor), protection of excavation and adjacent utilities and structures (sheeting, shoring, or other method selected by the Contractor); the support of sewers, conduits, roadways, foundations, and other piping within the limits of the excavation work or adjacent thereto; prevention of damage to structures; and all incidental Work. Moreover, the Contractor shall assume all responsibility for any obstacles or conditions, foreseen or unforeseen, encountered, or manifest during the performance of the Work.

C. The term “fill" as used herein shall mean placement of materials including select compactable material (soil or well graded crushed stone) free from all perishable and objectionable materials; no stones larger than four inches in the longest dimension. Backfill is generally considered the placement of fill material back in an excavation that has been excavated for a pipe or similar facility and shall be considered a type of fill operation. All backfill operations and materials shall meet the requirements of fill materials.

D. Fill shall include on-site handling within a contiguous project site; initial and final filling; grading of grounds; and restoration of surface and sub-surface materials disturbed. Fill shall include all groundwater and surface water control (pumping, bailing, and draining, etc.), protection of fill area and adjacent utilities and structures (sheeting, and shoring, etc); the support of sewers, conduits, roadways,

foundations, and other piping within the limits of the fill work or adjacent thereto; prevention of damage to structures; and all incidental Work. Moreover, the Contractor must assume all responsibility for any obstacles or conditions, foreseen or unforeseen, encountered, or manifest during the performance of the Work.

E. Centerline of Channel: Location in the channel that is equidistant from both the left and right top of banks.

F. Bankfull: Defined as the elevation on the bank where flows exceed the low flow channel and flooding begins (incipient point of flooding).

G. Bankfull Bench: A channel feature consisting of a break or change in the channel bank slope occurring at the bankfull elevation. The cross slope of this bank feature is typically flat or greater than 12 to 1 draining toward the channel.

H. Thalweg: Defined as the "flowline" or deepest point of the channel cross section.

I. Top of Bank: The point at which the proposed channel cross section intercepts the existing ground. Positive drainage toward the channel must be maintained beyond the top of bank.

J. Right Bank: Facing downstream, the streambank on the right.

K. Left Bank: Facing downstream, the streambank on the left.

L. Floodprone Area: The area adjacent to the stream that is inundated or saturated when the elevation of the water is at twice the maximum depth at bankfull stage.

1.3 Submittals

A. If required by MWA, submit:

1. Submittals as described below related to blasting operations.

2. Channel Construction Plan which shall detail the execution of channel construction. The Channel Construction Plan shall include, but is not limited to:

   a. Methods and sequencing of excavation.

   b. Proposed locations and extents of on-site stockpiled excavated material.

   c. Quantity, types and sizes of equipment proposed to perform the Work.

3. Progress as-built survey of constructed channel.

Part 2 Products

2.1 Pipe Bedding

A. Unless otherwise specified, bedding materials for storm drainage pipes shall be angular graded crushed stone and shall meet the requirements for Foundation Backfill Material Type II per the GDOT Standard Specifications, Section 812.

B. Bedding material when required under this contract shall be placed in the bottom of the trench after the same has been excavated. Minimum bedding material depth shall be as defined as detailed in Section 33 42 11 Stormwater Gravity Piping, on the Contract Documents, or as directed by MWA. The surface of the bedding material shall be spread to form a uniform support for the pipe and appurtenances. There shall be no separate payment for minimum required bedding.

2.2 Classified Stone

A. Graded aggregate base (GAB) material used for filling shall meet the requirements of the GDOT Standard Specifications, Section 815.

B. Coarse aggregate material shall meet the requirements of the GDOT Standard Specifications, Section 800.

2.3 Select Structural Fill

A. Select structural fill soils may be used as fill, provided they have been tested by MWA's testing contractor/agent representative and assessed to be of composition and moisture content compatible with achieving the specified degree of compaction.

Part 3 Execution

3.1 General

A. Perform all earthwork operations in compliance with the requirements of OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching, and Shoring, and Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations.

3.2 Protection of Trees and Shrubbery

A. The Contractor shall be responsible for the protection of tops, trunks, and roots of existing trees that are to remain on the project site. Existing trees, which may be subject to construction damage, shall be protected in accordance with requirements in Section 31 10 00 - Site Clearing. Heavy equipment or stockpiles will not be permitted within critical root zone. Interfering branches shall be removed in accordance with requirements in Section 31 10 00 - Site Clearing.

B. In areas beyond limits of construction, no vegetation shall be removed without the written consent of the property owner and approval of MWA.

C. In open or improved lawn areas, excavation shall be performed with extreme care to avoid any damage to adjoining lawn areas. In areas not readily accessible by machinery and where excavation is required near existing trees and shrubberies, which may be damaged by excavation equipment, the area shall be excavated with hand tools except as provided is in this section.

3.3 Clearing and Care of Surface Materials

A. Topsoil shall be removed to its entire depth from all areas to be excavated or graded. The topsoil shall be stockpiled in designated or approved locations where it will not interfere with construction operations. Topsoil as stored, shall be reasonably free of subsoil, debris, and stones larger than two inches in diameter. The stored topsoil shall be used for finished grading.

3.4 Sheeting and Shoring

A. The Contractor shall be responsible for supporting and maintaining excavations required hereunder, even to the extent of sheeting or shoring the sides and ends of excavations with timber or other supports. If the sheeting, braces, shores, stringers, or wailing timbers, or other supports are not properly placed or are insufficient, the Contractor shall provide additional or stronger supports as may be required or directed. The requirement of sheeting, shoring, or of the addition of supports shall not relieve the Contractor of its responsibility for their sufficiency.

B. Trench sheeting shall be left in place until the backfilling has been completed to elevation not less than twelve inches above the top of the pipe.

C. Where in the opinion of MWA the removal of sheeting would endanger the Work built under this Contract or any adjoining improvements, such sheeting will be ordered to be left in place and the tops cut off as directed. In removing sheeting, the Work shall be performed in such a manner as to prevent injurious caving of the sides. All voids left by sheeting along trenches shall be carefully backfilled and compacted with suitable tools. Any timber directed to be left in place will not be paid for as supplemental price. No additional payment will be made for sheeting when directed to be left in place.

D. In quicksand or soft ground, sheeting shall be driven to such depth below bottom of the trench to prevent upheaval, or as directed.

E. Failure or refusal of MWA to order sheeting, or timbering to be left in place shall in no way relieve the Contractor of responsibility placed upon him under any provisions of the Specifications or other Contract Documents.

F. The need and adequacy of sheeting, shoring, bracing, or other provisions to protect personnel and equipment in a trench or other excavation, and to meet local and

OSHA safety requirements, shall be the sole and exclusive responsibility of the Contractor.

3.5 Unauthorized Excavation

A. All excavations carried outside of the lines and grades given or specified, together with the removal of such material and all excavations, and other work resulting from slides, cave-ins, swellings, or upheavals shall be at the Contractor's own cost and expense. All spaces beneath foundations resulting from unauthorized excavations, slides, or cave-ins shall be red at the Contractor's expense, with bedding materials or concrete, as directed. This is to include all landscaping outside of the lines and grades given or specified.

3.6 Removal of Water

A. The Contractor shall pump out, or otherwise remove and dispose of, any water (including stormwater), or any other liquids which may be found or may accumulate as fast as they may collect in the excavations, regardless of source or whether it be from its own or adjacent contracts. Disposal of water must meet the requirements in Section 31 25 00 - Erosion and Sedimentation Controls and Section 31 23 19 - Dewatering.

B. All necessary precautions shall be taken to prevent disturbance and to properly drain the areas upon which concrete is to be poured and upon which pipe is to be laid.

C. The flow in sewers, drains, gutters, or water courses encountered in the Work shall be adequately accounted for by the Contractor at its own expense to ensure these flows do not interfere with performance of any and all of the Work and shall be maintained in such a manner as to ensure continuity of flow at all times.

D. Unless otherwise permitted, ground water encountered within the limits of excavation shall be lowered to an elevation not less than two feet below the bottom of such excavation before pipe laying or concreting is started and shall be maintained until concrete and joint materials have attained initial set.

3.7 Excavation Methods

A. All excavation shall be in open-cut unless otherwise indicated on the Contract Documents or approved by MWA and shall be in accordance with the GDOT Standard Specifications Sections 204, 205, 206, 207 and 208. In general, topsoil may be removed by machine methods. Excavation below topsoil may also be performed by machine but shall be supplemented by such hand dressing or leveling as may be required to conform to lines and grades as given by MWA. Material so removed shall be used in fill, making embankments, filling low areas, or as otherwise directed.

B. Hand tool excavation shall be used where necessary to protect existing utilities and structures.

C. All excavated areas shall be carefully cut or graded by hand to leave smooth (residential lawns shall be free from irregular surface change greater than ±0.10 foot), firm, even surfaces, free of rock on the surface and properly graded as detailed on the Contract Documents, and/or required by MWA, and shall be tamped or otherwise compacted to maintain the material in position. All excavated areas shall be maintained in this condition until final completion and acceptance of the Work.

D. It is the Contractor's responsibility to have all excavation conform to local and OSHA safety requirements.

E. Unless otherwise shown on the Contract Documents, the minimum trench widths shall be 4/3 the diameter of the pipe plus an additional 15 inches to allow achieving the specified compaction beside the pipe and beneath the pipe's haunches.

3.8 Trench Excavation

A. For storm drainage and utility pipelines, the maximum width of trench from an elevation twelve inches above the top of the pipe to the bottom of the trench shall be that indicated on the Contract Documents.

B. Excavation of pipe trenches with side sloping to the bottom will not be permitted.

C. Should trenches be excavated with more than the specified maximum widths, MWA may require the Contractor to furnish additional bedding, concrete cradle, or concrete encasement for the pipe at its own expense.

3.9 Trench Length

A. The length of trench to be excavated or the areas of the surface to be disturbed without stabilizing at any one time shall be limited by MWA with regard both to expeditious construction and to the convenience and safety of citizens directly and indirectly affected by the Work. The Contractor shall not have more than 300 feet of trench excavated without stabilizing at one time. New trenching will not be permitted to be excavated, if there are previously excavated trenches that require backfilling or surface areas that require restoration. Clean up and grassing shall follow a maximum of 300 feet behind pipe installation. In any event, no additional Work of any kind will be permitted if there are existing streets or roadways that require attention to return them to a safe and proper condition. In general, no trench shall be excavated more than 150 feet ahead of pipe laying. For safety, no trenches will be allowed to be left without stabilizing at night or on weekends unless approved by MWA. All required permits shall be obtained before trenching begins.

3.10 Ditch Excavation

A. This work includes excavating, shaping, compacting, handling, hauling, and properly disposing of material encountered when excavating, changing, cleaning, or widening ditches as indicated on the Contract Documents and/or directed by MWA.

3.11 Rock Excavation

A. Rock is defined as stone in original ledge or mass and boulders over one-half cubic yard in volume which cannot be excavated with a backhoe having a bucket curling force rated at not less than 26,000 pounds. Material which can be loosened with a pick, frozen materials, partially weathered rock, which for convenience or economy is loosened by drilling and blasting or by drilling coupled with wedging and material which is exterior to the limits of measurement allowed shall not be measured or classified as rock excavation.

B. Rock excavation by blasting shall be performed in advance of pipe laying or instream structure installation. Rock shall be removed to a depth of at least 6 inches below the bottom of the pipe or instream structure and this area shall be backfilled with crushed stone and lightly consolidated before installing the pipe or instream structure.

C. In removing, special care shall be taken to excavate it as closely as possible to the required shape and with no projection into the trench.

D. All rock excavated shall be disposed of off-site unless otherwise identified in the Contract Documents or as directed by MWA. Excavated rock removed from the site becomes the property of the Contractor.

3.12 Blasting

A. Requirements

1. Furnish all labor, equipment and materials required to drill, blast, loosen, excavate, and dispose material to complete the work shown on the Contract Documents and specified herein.

2. The work shall include, but not be limited to:

   a. Blast round design.

   b. Planning and execution of appropriate site-specific safety measures to be employed during all blasting operations, and the safe handling and storage of high explosives and blasting agents.

   c. Drilling blast holes, loading blast holes with explosives, and wiring and safe detonation of blast rounds.

   d. Removal from the site of all excess excavated soil, debris, and rock.

   e. Dewatering and maintenance of groundwater and surface water in all excavations.

   f. Performance of all surveys necessary to establish and verify the lines and grades and to determine the amount of material removed.

g. Implementation of monitoring program to monitor condition of existing structures and utilities in vicinity of proposed blasting operations to ensure existing features remain undamaged by blasting procedures.

3. All excavations shall be in conformity with the lines, grades, and cross sections on the Contract Documents or established by MWA. Where rock exists at planned invert elevation, blasting shall ensure removal of 6 inches of rock below the bottom of pipe. All over-blast shall be removed, and the resulting over-excavation filled with compacted structural fill soil or compacted crushed stone.

4. All blasting operations, including transporting and storing of explosives shall comply with the Georgia State Fire Commissioner's Rules and Regulations for Explosives and Blasting Agents, and all applicable local codes.

B. Submittals

1. In accordance with the procedures and requirements set forth in Section 01 33 00 - Submittal Procedures, the Contractor shall submit the following at least 30 working days prior to beginning any blasting operations:

a. Names, addresses, telephone numbers, and qualifications of the blasting subcontractor(s) and explosives supplier(s) that will be used, include the designated Blaster-In-Charge.

b. Copies of Training Certificates for the designated Blaster-In-Charge, blasting foreman and any other key personnel that will be responsible for the work, showing that they have received specialized training in the proper handling of explosives.

c. A Blasting Plan, indicating the methods, materials and equipment to be used. The Blasting Plan shall indicate the types of explosives to be used, drilling patterns, and a general layout and schedule for executing the work in accordance with state regulations.

d. A ground vibration and air blast monitoring plan, indicating structures that will be monitored, monitoring equipment that will be used, and personnel that will perform the monitoring.

2. At least 24 hours before each blast round, Contractor shall submit a detailed blast round design plan to MWA's on-site representative. The blasting plan submitted is for record keeping purposes only. Review by MWA shall not relieve the Contractor of its responsibilities as provided herein. The blast round design submittals shall include:

a. Location (state grid coordinates) and limits of the shot.

b. Number, diameter, and depth of blast holes to be detonated in the round, and a plan showing the drill hole pattern, spacing and distance to the free face.

c. Depth of overburden.

d. Total weight of explosives in the round and the types of explosives to be used.

e. Loading diagram showing the location of explosives, primers, and initiators; and location, depth, and type of stemming to be used in each hole.

f. Initiation sequence, including delay timer and delay system, total weight of explosive to be detonated on each delay, and a list of the timing of the delays.

g. Manufacturer's data sheet for all explosives, primers, and initiators to be used.

h. Planned seismic monitoring positions, distances from the blast round, and seismograph types to be used to monitor vibrations and air blast overpressures.

i. Type and amount of blasting mats and/or depth of soil cover to be used over the top surface of the shot.

j. Any other information required by applicable state and federal regulations.

3. Within 24 hours after each blast round, Contractor shall submit a blasting report to MWA. The blasting report shall include:

a. Date and time of shot.

b. Foreman's name.

c. Number and depth of holes detonated.

d. Weather conditions at the time of detonation.

e. Type of explosives and detonators used.

f. Peak particle velocity of ground motion and primary frequency for all ground vibration monitoring stations.

g. Peak air blast overpressure measured.

h. Distance from the blast round to each monitoring station for vibrations and air blast.

i. Amount of explosive used in each hole, and maximum weight of explosive detonated on any single delay in the blast round.

C. Pre-Blast Survey

1. The pre-blast survey shall be conducted by the approved vibration consultant and accompanied by a MWA representative on the residences and facilities adjacent to the proposed rock blasting in accordance with the submitted survey and monitoring plan. The survey shall include, but not be limited to the following:

   a. A site plan or drawing of the structure to be examined showing the structure in relationship to the proposed rock blasting area and a full description of the structure including type of materials and construction.

   b. Structure (interior and exterior surfaces) shall be examined by experienced and qualified personnel noting any visible structural and aesthetic flaws of structure. Existing cracks and flaws shall be noted, significant cracks measured, and all cracks and flaws photographed.

   c. Upon completion of the examination, the structure's owner shall be asked to review the report, note any corrections or omissions, and sign a statement that to the best of its knowledge, the examination report reflects the conditions of the structure prior to any rock blasting. If the structure’s owner refuses to sign said report, it shall be noted in the report by the examiner.

   d. Nothing contained herein shall relieve the Contractor of responsibility for claims arising from its construction operations. Failure to inspect any structure, whether or not required by these Contract Documents or inadequacy of the inspections shall not relieve the Contractor of its responsibility.

   e. In the event that any property owner denies access for the survey of structures and facilities, the Contractor shall, after requesting and receiving authorization from MWA, notify such property owner, by certified mail, stating that this is final notification. Submit to MWA, copies of all correspondence between the Contractor and the property owner(s). MWA, upon review of the submitted correspondence may waive requirements set forth above. However, the Contractor is fully responsible for claims and damage arising from its construction operations regardless of property location.

   f. Two sets of copies of the examination reports shall be submitted to MWA for their records.

D. Use of Explosives

1. When the use of explosives is necessary for the prosecution of the work, the Contractor shall exercise the utmost care not to endanger life or property. The Contractor shall be responsible for any and all damage or injury to persons or property resulting from the use of explosives.

2. All explosives shall be stored in a secure manner, in compliance with all laws, and all such storage places shall be marked clearly "DANGEROUS EXPLOSIVES".

3. The Contractor shall notify any public utility company having facilities in close proximity to the site of the work of its intention to use explosives. This notice shall be given sufficiently in advance to enable the utility companies to take whatever steps they may consider necessary to protect their property from injury. The Contractor shall also give MWA, all occupants of adjacent property, and all other Contractors working in or near the Project, notice of its intention to use explosives.

4. Only non-electric type initiators maybe used.

E. Blasting Operations

1. Explosives shall be of such quantity and power and shall be used in such locations as will neither open seams nor otherwise disturb the material outside the prescribed limits of excavation. As the excavation approaches its final limits, the depth of holes for blasting and the amount of explosives used for each hole shall be reduced so that the underlying or adjacent rock will not be disturbed or shattered.

2. Blasting shall not be performed within 100 feet of newly placed concrete that has cured less than 7 days. No blasting shall be permitted within 50 feet of any existing structure or any new structure in progress.

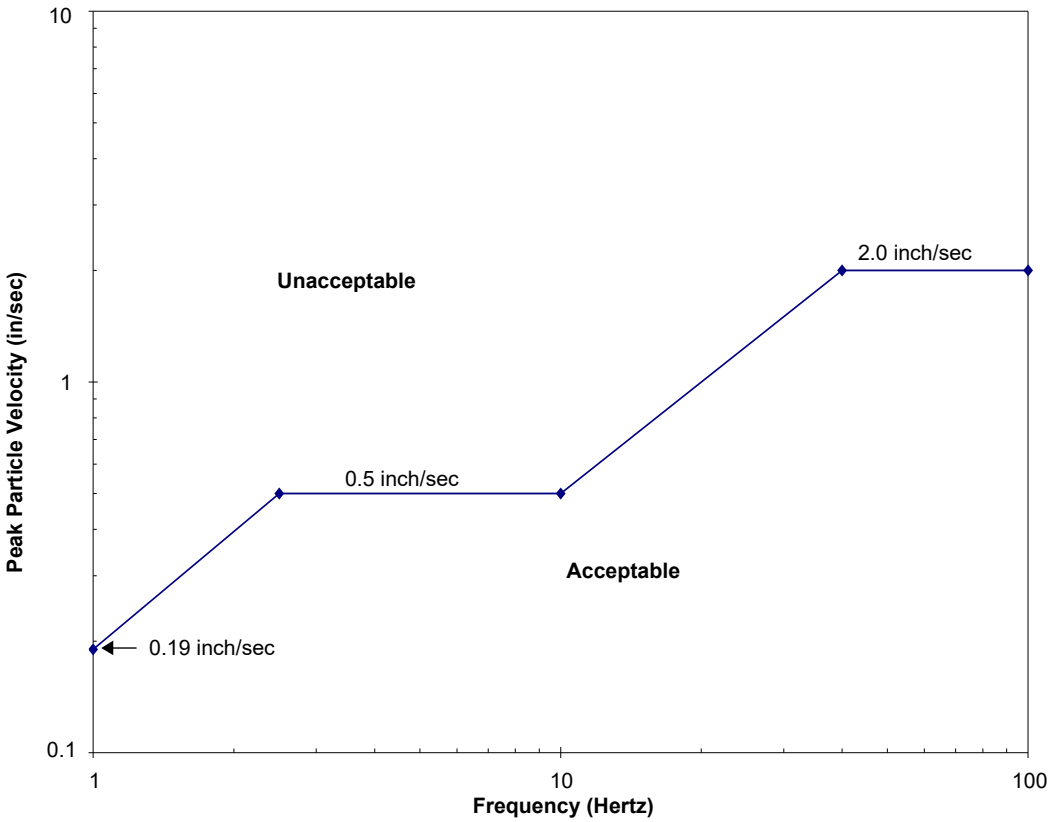
F. Blast Monitoring

1. The Contractor shall exercise the utmost care not to damage property on-site and off-site. The Contractor shall, after requesting and receiving authorization from MWA, notify each adjoining property owner within 1500 feet of the site of the anticipated ground vibrations and noise which will occur due to its blasting operations. This notice shall be given 7 days in advance to enable the adjacent property owners to take whatever precautions they may consider necessary. The Contractor shall limit its operations to minimize any disturbance to the adjacent property owners. Motorists on adjacent roadways shall be notified in accordance with state regulations. The Contractor shall be responsible for any damage to any structure or utility line, pipes, etc., on-site and off-site as a result of its operations.

2. For each blast round, Contractor shall monitor and record noise and air blast overpressures at the site perimeter nearest the blast location and at the on-site or off-site structure located nearest to the round. Peak air blast overpressure shall not exceed 140 dbl, measured at the site perimeter. The velocity/shock wave shall not exceed 2-inch PPV at 40 Hz or greater. At lower frequencies use the established limits in the vibration criteria as presented in the U.S. Bureau of Mines RI 8507.

3. The site of every blast round shall be sufficiently covered with blasting mats or other devices to prevent any flying debris. The number and type of blasting mats must be satisfactory to MWA. The Contractor shall be fully responsible for any damage caused by flying debris, both to on-site and off-site properties.

4. Whenever blasting is to be performed within 750 feet of any structure, the Contractor shall use a seismograph to measure the peak particle velocities of ground vibration resulting from each blast at the closest structure. Vibrations shall be monitored utilizing a seismograph capable of providing a record of particle velocity and frequency along three mutually perpendicular axes utilizing internal calibration. Measured peak particle velocity of ground motion at the monitored structure shall not exceed the values shown in the following graph:



G. Notification: Give twenty-four hours' notice to MWA and adjacent residences and/or businesses prior to each blast.

H. Complaints: Submit notice of blasting complaints to MWA in writing within twenty-four hours of receipt thereof. The notice shall identify the origin of complaint and shall contain a brief description of alleged damages or other circumstances upon which the complaint is predicated. Contractor shall assign a number to each complaint consecutively in the order of receipt. Each complaint shall be assigned a separate number and show in each letter complaint all previous complaint numbers registered by the same complainant. In addition, Contractor shall make a summary

report each month to MWA. The summary report shall indicate date, time and name of person investigating the complaint and amount of damages (or an estimate thereof), if any.

I. Post Blast Survey

1. The post-blast survey shall be conducted by the same vibration consultant, after requesting and receiving authorization from MWA, who performed the pre-blast survey. The consultant shall examine all structures from which a complaint has originated after the blast. The survey shall include, but not be limited to the following:

a. A full description of the alleged damage caused by the blast. Where appropriate, a sketch shall be included to more fully describe the location and type of damage. Cracks shall be measured and compared to any original measurements which may have been taken in the Pre-Blast Survey.

b. Colored photographs shall be taken of any alleged damage.

c. Two copies of the Post Blast Survey report shall be submitted to MWA. The report shall include the consultant's assessment of the alleged damage and an opinion as to its likely cause.

3.13 Spoil Removal

A. The Contractor shall remove from the site of the Work, all earth more than that required to fill the excavation and to make the necessary fills. This shall be done immediately after the fills are completed to the satisfaction of MWA.

B. Fill materials MWA may deem unfit for use on-site may be removed from the site by the Contractor.

C. All spoils removed shall be disposed of off-site unless otherwise identified in the Contract Documents or as directed by MWA. Material removed from the site becomes the property of the Contractor.

D. Any material, which may spill or drip from vehicles while being transported on public streets, drives, or other paved surfaces, shall be immediately removed and cleaned by the Contractor, to the satisfaction of MWA, or the proper officials of the municipality in which the hauling or work is being done.

E. The surface of all graded and spoil areas shall be left in a smooth and level or evenly sloped condition, free from stones, rubbish, or other debris.

F. Disturbed areas shall be left in a neat and finished appearance and either temporarily stabilized or permanently stabilized, in accordance with the requirements in Section 31 25 00 - Erosion and Sedimentation.

3.14 Storage of Materials

A. All salvageable materials, which may be removed from the site, together with all materials taken from the site, shall be stored in an approved, suitable place or as directed by MWA. The Contractor shall be responsible for any loss of or damage to salvageable materials through careless removal, neglectful or wasteful storage, or use of such material.

B. In the storing of excavated material, which is to be used as a fill, the Contractor shall exercise care so as to avoid inconveniencing the public. If, in the opinion of MWA, it is necessary to remove this excavated material from the streets or lots, the Contractor shall do so at no cost to MWA.

C. Stored materials shall be left in a neat, drainable condition and, if left for more than seven days or in an anticipated rainfall event, the areas shall be temporarily stabilized with mulch only or with temporary grassing and mulch, and must meet the requirements in the section titled Erosion and Sedimentation Controls.

3.15 Additional Excavation

A. It is expected that satisfactory foundations will be found at the elevations indicated on the Contract Documents. However, should MWA determine it necessary to go to additional depth, the excavation shall be carried to an additional depth by the removal of unsuitable material as authorized and directed by MWA. Material used for replacement of unsuitable material shall be with classified stone as directed by MWA to the foundation elevations indicated on the Contract Documents.

3.16 Trench Backfilling

A. Bottom of trenches in earth must be shaped or molded and compacted to the contour of the outside of the pipe, using bedding materials when required, as indicated on the Contract Documents, to give a full support to the lower segment of the pipe and so that the pipe is firmly supported in the excavation throughout its entire length, in such manner as to prevent any subsequent settlement of the pipe. Boulders or loose rocks, which might bear against the pipe, will not be permitted in the trench bottom or in the backfill to a depth of eighteen inches above the pipe. Bottoms of excavations which are of loose granular soils shall be compacted prior to placing bedding or pipe.

B. Except as otherwise specified or directed, all forms, bracing, and lumber shall be removed before backfilling.

C. Initial backfill in trenches where pipe has been laid shall be placed very carefully in layers not exceeding six inches in thickness and carefully and thoroughly consolidated by tamping simultaneously under the haunches and on both sides of the pipe to a height of twelve inches above the top of the pipe. Initial backfill material shall be free of rocks larger than four inches in the largest dimension. Initial backfilling must be performed properly and before any backfill is deposited in large quantities from a machine bucket or other vehicle. During initial backfill, dumping

from a bucket must not be allowed to fall from a height of more than one foot upon a pipe, and in all cases the bucket must be lowered so that the shock of the falling earth will not damage the pipe or structure. Only after the initial backfill has been placed to a point twelve inches above the top of the pipe may Work proceed in placing the remaining backfill, which must be carefully placed and compacted by tamping. In streets, other surfaced areas, or where directed, this backfill shall be placed in layers not to exceed eight inches in thickness. All precautions must be taken to avoid future settlement in these areas. Tamping shall be done by approved mechanical tampers.

D. Material under roadways and other paved areas shall be placed and compacted to a density of not less than 95 percent as determined by a standard Proctor test ASTM DD1557. Areas outside of roadways or paved areas (non-structural) shall be compacted as directed by MWA to meet existing or proposed uses of the area. MWA may, at its option, direct tests to be made to determine the density of the compacted material. The location and number of tests shall be designated by MWA as work progresses but shall not be less than one test per 100 to 150 linear feet of backfill placement for each 2 vertical feet of backfill placed.

E. Materials used for backfilling shall be free from all perishable and objectionable materials; no stones larger than four inches in the longest dimension shall be placed directly above the pipe.

F. Select compactable material (soil or well graded crushed stone) shall be used in pipe trenches under roadways and other paved areas. When required on the plans, or required by MWA, graded aggregate base backfill shall be used in pipe trenches under roadways.

G. Backfilling shall not be performed in freezing weather (below 32 degrees F) except by permission of MWA and shall not be performed with frozen material or upon frozen materials.

H. All backfilled areas shall be carefully graded by hand to leave smooth (residential lawns shall be free from irregular surface change greater than ±0.10 foot), firm, even surfaces, free of rock on the surface and properly graded as detailed on the Contract Documents, and/or required by MWA, and shall be tamped or otherwise compacted to maintain the material in position. All backfilled areas shall be maintained in this condition until final completion and acceptance of the Work.

I. Where directed by MWA, the backfill shall be mounded slightly above the adjacent ground to allow for settlement. In case of settlement after backfill, the Contractor shall correct the cause of the settlement and supply sufficient material satisfactory to MWA to make up for the deficiency. Contractor must provide to MWA, when asked, any independent material testing reports performed on behalf of the contractor.

3.17 Embankment Over Pipes

A. Where the crown of a pipe comes close to or extends above the surface of the ground, it shall be covered and protected by an embankment. Unless otherwise

ordered or indicated on the Contract Documents, this embankment shall be at least two feet deep over the top of the pipe, at least four feet wide at the top, and with side slopes of not less than two horizontal to one vertical extending to the surface of the ground. Provision shall be made for surface drainage.

B. The materials of which the embankments are to be constructed shall be the same as those permitted for backfill and shall be free from objectionable materials as defined in the section Backfilling.

C. The earth shall be placed in layers not exceeding eight inches in thickness, which shall be compacted by hand tamping or by other methods approved or directed by MWA. The embankments shall not be built during freezing weather or with frozen materials. The surface shall be brought to the true lines and grades as specified or indicated on the Contract Documents and shall be raked smooth and left free from rubbish, stones, or gravel. Placing of backfill or embankment over and around structures shall be done evenly on all sides to avoid unbalanced loading or overturning action.

3.18 Access by MWA's Material Testing Firm

A. Contractor shall allow and accommodate both scheduled and unscheduled sampling or testing of excavation materials and backfill which may include, but is not limited to excavating and setting aside directed materials for sampling, providing description, properties, moisture content, dry density, sieve analysis, Atterberg limits, compaction testing, permeability, etc. The Contractor shall give MWA's material testing firm a minimum of 24-hour notice when scheduling testing and/or evaluations.

3.19 Channel Construction

A. Contractor shall perform all earthwork and related operations, including, but not limited to, channel excavation, grading, compaction, and as-built verification of the constructed channel.

B. The Contractor shall obtain MWA approval of the staked channel alignment prior to commencing channel excavation.

C. The Contractor shall not have more than 100 feet of channel excavated without stabilizing at one time unless otherwise directed by MWA. Clean up and grassing shall follow a maximum of 100 feet behind channel construction. New channel will not be permitted to be excavated, if there are previously excavated channels that require filling or surface areas that require restoration. In any event, no additional Work of any kind will be permitted if there are existing streets or roadways that require attention to return them to a safe and proper condition.

D. The Contractor shall provide progress surveys of the constructed channel, verifying the field location of points and elevations shown on the Contract Documents.

Part 4 Measurement and Payment

4.1 Excavation and Fill

A. Method of Measurement

1. Excavation and fill shall be measured by the actual number of cubic yards excavated from the original location to complete the Work. Quantities will be measured based on initial native pre-excavation state.

2. Excavated material, while stored in temporary stockpiles on-site, will not be eligible to be measured for payment. Excavation and fill quantities will be eligible to be measured for payment following accepted placement of material as fill or removal from the site as spoil removal.

3. On-site handling and filling using excavated material is incidental to this pay item. No separate measurement for payment will be made for associated with handling or filling of material within a contiguous site from which it was excavated.

4. Material delivered to the site by MWA or MWA-authorized third party shall be handled and placed in accordance with the Contract Documents to complete the Work. Quantities will be eligible to be measured for payment under this pay item following accepted placement of material as fill.

5. The Contractor shall provide progress surveys of the Work, verifying the field location of points and elevations shown on the Contract Documents, prior to acceptance of the amount measured for payment.

6. Excavation and fill outside of the defined limits as described in the Contract Documents where excavation was performed without prior approval by MWA shall not be included in measurement for payment.

B. Basis of Payment

1. The unit price shall be compensation in full for all necessary tools, equipment, labor, and materials to control groundwater and surface water, excavate, handle materials within a contiguous site, fill, compact materials at the specified elevation in the Contract Documents, coordinate compaction testing, and prepare progress surveys to complete the Work.

2. Payment will not be approved without acceptance of a complete progress survey validating the completed Work under this pay item.

3. Separate compensation shall be provided for the removal of excess fill or unsuitable material from the site under the pay item for Spoil Removal.

4.2 Imported Fill

A. Method of Measurement

1. Imported fill shall be measured by the actual number of cubic yards of material excavated, delivered to the site, and placed as fill to complete the Work. Quantities will be measured based on initial native pre-excavation state.

2. Quantities will be eligible to be measured for payment following accepted placement of material as fill. Imported fill material stored in temporary stockpiles on-site will not become eligible to be measured for payment until final placement of material as fill.

3. The Contractor shall provide progress surveys of the Work, verifying the field location of points and elevations shown on the Contract Documents, prior to acceptance of the amount measured for payment.

B. Basis of Payment

1. The unit price shall be compensation in full for all necessary tools, equipment, labor, and materials to deliver, handle materials on-site, control groundwater and surface water, fill, compact materials at the specified elevation in the Contract Documents, coordinate compaction testing, and prepare progress surveys to complete the Work.

2. Payment will not be approved without acceptance of a complete progress survey validating the completed Work under this pay item.

3. Payment will not be approved without submission of Vehicle Capacity Certifications.

4.3 Pipe Installation – Additional Excavation, Cover is Greater Than 10 Feet

A. Method of Measurement: Additional excavation shall be measured by the actual number of linear feet along the centerline of the pipe where the vertical trench depth to top of pipe exceeds 10 feet, per excavation depth range classification in the unit price schedule.

B. Basis of Payment

1. The unit price shall be compensation in full for all controlling of groundwater and surface water, excavating, on-site handling, filling, compacting, hauling, and removal from site of materials associated with the specified extra depth of excavation, including all shoring and protective measures.

2. Extra depth must be approved if not indicated on the Contract Documents as being required.

4.4 Rock Excavation

A. Method of Measurement: Rock excavation shall be measured by the actual number of cubic yards excavated from their original location, based on measurements and calculations of the excavated area, and removed from the site to complete the Work, as authorized by MWA representative at the time of haul away.

B. Basis of Payment

1. The unit price shall be compensation in full for all excavation, blasting, hoe ramming, ripping, and all other manner of rock excavation methods, control groundwater and surface water, fill not included in other items, handling, hauling, removal from site or as otherwise directed by MWA, and all other labor, materials, equipment, and incidentals required to complete the Work.

4.5 Spoil Removal

A. Method of Measurement

1. Spoil removal shall be measured by the actual number of cubic yards of excess fill or unsuitable material removed from the site to complete the Work, as authorized by MWA representative at the time of haul away. Measurement shall be based on the actual truck volume hauled from site.

2. On-site handling is incidental to this pay item. No separate measurement for payment will be made for associated with handling material within a contiguous site from which it was excavated.

3. Material generated from rock excavation activities are not eligible for measurement under this pay item.

B. Basis of Payment

1. The unit price shall be compensation in full for all handling, dewatering of material prior to removal, hauling, removal, and all other labor, materials, equipment, and incidentals required to complete the Work.

2. Payment will not be approved without submission of Vehicle Capacity Certifications.

END OF SECTION

Part 1 General

1.1 Summary

A. This Section Includes compaction, moisture conditioning, testing and correction of the subgrade.

1.2 Definitions

A. Optimum Moisture Content

1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.

2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

B. Prepared Ground Surface: Ground surface after completion of clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and scarification and compaction of subgrade.

C. Relative Compaction

1. Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM D698.

2. Apply corrections for oversize material to either as-compacted field dry density or maximum dry density, as determined by MWA.

D. Relative Density: Calculated in accordance with ASTM D4254 based on maximum index density determined in accordance with ASTM D4253 and minimum index density determined in accordance with ASTM D4254.

E. Subgrade: Layer of existing soil after completion of clearing, grubbing, scalping of topsoil prior to placement of fill, roadway structure or base for floor slab.

F. Proof-Rolling: Testing of subgrade by comp active effort to identify areas that will not support the future loading without excessive settlement.

1.3 Sequencing and Scheduling

A. Complete applicable Work specified in Sections 31 10 00 - Site Clearing and Section 31 23 00 - Excavation and Fill, prior to subgrade preparation.

1.4 Quality Assurance

A. Notify MWA when subgrade is ready for compaction or proof-rolling or whenever compaction or proof-rolling is resumed after a period of extended inactivity.

Part 2 Products

(NOT USED)

Part 3 Execution

3.1 General

A. Keep subgrade free of water, debris, and foreign matter during compaction or proof-rolling.

B. Bring subgrade to proper grade and cross-section and uniformly compact surface.

C. Do not use sections of prepared ground surface as haul roads. Protect prepared subgrade from traffic.

D. Maintain prepared ground surface in finished condition until next course is placed.

E. Prepare subgrade when unfrozen and free of ice and snow.

3.2 Compaction

A. Under Earth Fill: Compact upper 8 inches to minimum of 90 percent relative density as determined in accordance with ASTM D698.

B. Under pavement structure, floor slabs on grade, or granular fill under structures compact the upper 8 inches to minimum of 98 percent relative density as determined in accordance with ASTM D698.

3.3 Moisture Conditioning

A. Dry Subgrade: Add water, then mix to make moisture content uniform throughout.

B. Wet Subgrade: Aerate material by blading, discing, harrowing, or other methods, to hasten drying process.

3.4 Testing

A. In-Place density test in accordance with ASTM D1556 or D6938. Contractor shall coordinate in-place testing to be performed by MWA Testing Contractor. Density testing shall be determined in accordance with the Contact Documents.

3.5 Correction

A. Soft or Loose Subgrade:

1. Adjust moisture content and recompact, or

2. Over excavate and replace with suitable material from excavation as specified in 31 23 00 - Excavation and Fill.

B. Unsuitable Material: Over excavate and replace with suitable material from excavation as specified in 31 23 00 - Excavation and Fill.

Part 4 Measurement and Payment

4.1 General

A. No separate measurement and payment shall be made for any Work performed or material used for this section. Full compensation for such work shall be considered as incidental to other items of Work. Costs in connection therewith shall be considered a subsidiary obligation of the Contractor and shall be included in the overall cost of the work.

END OF SECTION

Part 1 General

1.1 Summary

A. Section Includes furnish all the materials for and shall place all flowable fill, as required by the Contract Documents or where otherwise directed by MWA. Applications include, but are not limited to, beddings, encasements, plugging or filling abandoned utilities and structures, general backfill for trenches and abutments, and any other incidences where such work is requested by MWA.

1.2 Submittals

A. If required by MWA, submit mix design for approval by MWA.

Part 2 Products

2.1 Flowable Fill

A. Flowable fill shall meet the requirements of GDOT Standard Specification 600.

B. Alternative mix designs to that specified above may be accepted by MWA for either ready mix or volumetric on-site mixing designs at the discretion of MWA.

Part 3 Execution

3.1 Construction

A. When using as backfill for pipe, where flotation or misalignment may occur, assure correct alignment of the pipe by using straps, soil anchors, or other approved means of restraint.

B. Protect flowable fill from freezing for 36 hours after placement. All exposed surfaces of finished concrete shall be kept constantly wet in an approved manner for a minimum period of ten days.

3.2 Freezing and Inclement Weather

A. Flowable fill shall not be mixed at any time during freezing, inclement weather, or at night without explicit permission, and then only at the Contractor's risk.

3.3 Quality Assurance and Acceptance

A. Acceptance of flowable fill is based on documentation as outline in GDOT Standard Specification 500.1.03 and a minimum temperature of flowable fill at the point of delivery of 50 degrees F.

Part 4 Measurement and Payment

4.1 Flowable Fill

A. Method of Measurement: Flowable fill shall be measured and paid for per cubic yard of material placed as directed by MWA.

B. Basis of Payment: The Unit Price shall include furnishing and placing flowable fill and all other labor, materials, equipment, and incidentals required to complete the Work.

END OF SECTION

Part 1 General

1.1 Summary

The Contractor shall furnish all labor, equipment, and materials necessary for implementing best management practices (BMPs) to prevent and minimize erosion and resultant sedimentation in all cleared and grubbed areas during and after construction. The Work includes necessary work for the installation of structures and measures for the prevention and control of soil erosion. The Contractor shall furnish all material, labor, and equipment necessary for the proper installation, maintenance, inspection, monitoring, reporting, and removal (where applicable) of erosion prevention and control measures and to cause compliance with the General NPDES Permit for Stormwater Discharges from Construction Activities and Land Disturbing Permits.

1.2 References

A. Contractor shall be familiar with the current edition of the following referenced documents and keep a paper copy at the construction site at all times.

1. General NPDES Permit for Stormwater Discharges from Construction Activities (NPDES permit).

2. Manual for Erosion and Sediment Control in Georgia (Green Book).

3. Erosion, Sedimentation, and Pollution Control Plan (ESPC Plan) as required by the NPDES Permit.

4. Municipal Separate Stormwater Sewer System (MS4) Permit.

1.3 Definitions

A. Designer: For the purpose of this item the term “Designer” is synonymous with Consulting Engineer, Licensed Professional, Designer, and Consultant contracted with MWA used in permits, laws, rules, regulations, ordinances, and other soil erosion and sediment control references.

B. Contractor: For the purposes of this item the term “Contractor” is synonymous with General Contractor, Discharger, Operator, Primary Permittee, and Permittee (Permit Holder) as used in permits, laws, rules, regulations, ordinances, and other soil erosion and sediment control references.

C. Certified Personnel: For the purposes of this item, the terms Certified Personnel or Certified Person mean a person who has successfully completed an erosion and sediment controls short course eligible for continuing education units, or an equivalent course approved by Environmental Protection Division of the Georgia Department of Natural Resources and the Georgia Soil and Water Conservation Commission.

1.4 Regulatory Compliance

A. Land disturbance activities are not authorized to begin until after all required erosion and sediment control permits are obtained from the United States, the State of Georgia, and/or the County. Contractor shall be the Co-Primary Permittee and Operator under the provisions of the NPDES Permit. As such, Contractor shall be required to sign certain certifications as described in the NPDES Permit. Contractor shall also comply with all other laws, rules, regulations, ordinances, and requirements concerning soil erosion and sediment control established in the United States, the State of Georgia, and/or the County. The following documents and the documents referenced therein define the regulatory requirements for this item:

1. NPDES Permit: The Georgia National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction Activity governs land disturbance or construction activities of one acre or more. On applicable sites, Contractor is responsible for complying with terms and conditions of this permit.

2. Manual for Erosion and Sediment Control: Contractor shall follow Practices and Standards of the Georgia Soil and Water Conservation Commission Manual for Erosion and Sediment Control in Georgia.

3. SWPPP: When a Stormwater Pollution Prevention Plan (SWPPP) is provided in the Contract Documents, the Contractor shall follow the practices described in the SWPPP.

4. ESPC Plan: Erosion, Sedimentation and Pollution Control Plan.

1.5 Permitting

A. Land disturbance activity shall not commence until the Land Disturbance Permit has been issued, if required.

B. MWA’s Engineer shall be responsible for performing the following duties with respect to the Stormwater Discharge Permit.

1. Engineer shall prepare an ESPC Plan and shall submit ESPC Plan to the local issuing authority for approval.

2. Engineer shall obtain a Land Disturbance Permit from local governments.

3. Contractor will be provided with an approved copy of the ESPC Plan.

4. Engineer shall inspect the installation of the initial sediment storage requirements and perimeter control BMPs within 7 days after installation.

C. Contractor shall be responsible for performing the following duties with respect to the Stormwater Discharge Permit.

1. If applicable for the Project, Contractor shall execute the NOI as “Operator”. Contractor shall provide a copy of the submitted NOI to MWA. No work shall be started until 14 days after the Notice of Intent is submitted to EPD.

Part 2 Products

2.1 General

A. Products shall be as shown on the Drawings and as specified in the Manual for Erosion and Sediment Control in Georgia, 2016 Edition.

Part 3 Execution

3.1 General

A. Installation and maintenance of products shall be performed as shown on the Drawings and as specified in the Manual for Erosion and Sediment Control in Georgia, 2016 Edition.

3.2 Removal of Temporary Sediment Control Structures

A. At such time that temporary erosion and control structures are no longer required under this item, the Contractor shall notify MWA of its intent and schedule for the removal of the temporary structures and obtain MWA’s approval in writing prior to removal. Once the Contractor has received such written approval from MWA, the Contractor shall remove, as approved, the temporary structures and all sediments accumulated at the removed structure. In areas where temporary control structures are removed, the site shall be left in a condition that shall restore original drainage. Such areas shall be evenly graded and seeded.

3.3 Notice of Termination

A. When all construction activities have ceased, final stabilization has been implemented by the Contractor, and the site is in compliance with the NPDES permit, the Contractor, together with MWA will submit a Notice of Termination.

Part 4 Measurement and Payment

4.1 General

A. Costs associated with monitoring and maintenance, including replacement of damaged or failed erosion and sedimentation control measures, whatever the cause, shall be considered as incidental to and included in the cost of the items described below.

4.2 Construction Exit

A. Method of Measurement: Construction exits shall be measured by the actual number of entrances constructed in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

2. No additional payment shall be made for re-application or maintenance of construction exits.

4.3 Silt Fence – Type A

A. Method of Measurement: Silt Fence Type A shall be measured by the linear feet of silt fence installed in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

2. No additional payment shall be made for maintenance or replacement of Silt Fence.

4.4 Silt Fence – Type C

A. Method of Measurement: Silt Fence Type C shall be measured by the linear feet of silt fence installed in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

2. No additional payment shall be made for maintenance or replacement of Silt Fence.

4.5 Silt Bag

A. Method of Measurement: Silt bags shall be measured by the actual number of bags installed in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

2. No additional payment shall be made for re-application or maintenance of silt bags.

4.6 Rock Filter Dam

A. Method of Measurement: Rock filter dams shall be measured by the actual cubic yards constructed in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

2. No additional payment shall be made for maintenance or replacement of rock filter dams.

4.7 Rock Check Dam

A. Method of Measurement: Check dams shall be measured by the actual cubic yards constructed in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

2. No additional payment shall be made for maintenance or replacement of check dams.

4.8 Inlet Sediment Trap – Sd2

A. Method of Measurement: Inlet sediment traps shall be measured by the actual number of traps installed in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance,

removal, inspection, monitoring, and reporting on the Inlet erosion and sedimentation controls.

2. No additional payment shall be made for maintenance or replacement of inlet sediment traps.

4.9 Timber Mat

A. Method of Measurement: Timber mat shall be measured by the actual number of mats installed in place. Measurement for payment will not include timber mats used for protection of assets in the right-of-way.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, handling, on-site hauling, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls. Payment includes initial installation only.

2. No additional payment shall be made for maintenance, replacement or relocation of timber mat.

3. Timber mats used for protection of assets in the right-of-way shall be considered incidental to the Work.

4.10 Coir Wattle

A. Method of Measurement: Coir wattles shall be measured by the actual linear feet installed in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

2. No additional payment shall be made for maintenance or replacement of coir wattles.

4.11 Coir Roll

A. Method of Measurement: Coir rolls shall be measured by the actual linear feet installed in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance,

removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

2. No additional payment shall be made for maintenance or replacement of coir rolls.

4.12 Temporary Seeding

A. Method of Measurement: Temporary seeding shall be measured by the actual acreage at the coverage rate specified, sown in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

2. No additional payment shall be made for maintenance or reapplication to maintain required coverage of temporary seeding.

4.13 Straw Bale

A. Method of Measurement: Straw bales shall be measured by the actual number of bales installed in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

2. No additional payment shall be made for maintenance or replacement of straw bales.

4.14 Stream Crossing

A. Method of Measurement: Stream crossings shall be measured by the actual cubic yards of crossing constructed in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

4.15 Tackifier

A. Method of Measurement: Tackifier shall be measured by the actual pounds of material installed in place.

B. Basis of Payment

1. Payment shall be compensation in full for all work and shall include all labor, equipment, and materials necessary for furnishing, placing, maintenance, removal, inspection, monitoring, and reporting on the erosion and sedimentation controls.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnishing all labor, equipment, and materials necessary for hauling and properly placing stone rip rap at the locations and to the limits indicated on the Contract Documents or as directed by MWA.

1.2 Submittals

A. The Contractor shall submit for approval to MWA, all working drawings and schedules of materials and methods proposed to follow in the execution of the Work under this item.

B. Submittals shall show in detail the type, size, and location of all rip rap and accessories to be used in construction.

Part 2 Products

2.1 Materials

A. Type 1 Rip Rap shall be aggregate stone which meet the Type 1 gradation and other requirements of the Georgia Department of Transportation Standard Specification for Road and Bridge Construction, Section 805.

B. Type 3 Rip Rap shall be aggregate stone which meet the Type 3 gradation and other requirements of the Georgia Department of Transportation Standard Specification for Road and Bridge Construction, Section 805.

C. Grout for grouted rip rap shall meet requirements of the Georgia Department of Transportation Standard Specification for Road and Bridge Construction, Section 603.

Part 3 Execution

3.1 Rip Rap Construction

A. Prepare the ground surface where the rip rap will be placed to conform to the correct lines and grades before beginning the placement. Ground surface shall be smooth and free from obstructions, depressions, or debris. Place woven plastic filter fabric on the prepared ground surface under all rip rap. Place rip rap to a uniform thickness as specified in the Project specific scope of work and/or Contract Documents. If no thickness is specified, place rip rap to a minimum of 18 inches thick.

3.2 Stone Grouted Rip Rap Construction

A. Grout mix shall not be allowed to free fall more than 5 feet unless suitable equipment is used to prevent segregation.

B. The grout mix shall not be placed until the rock rip rap has been inspected and approved by MWA for the placement of grout.

C. Rock to be grouted shall be kept moist for a minimum of 2 hours before grouting.

D. The rock rip rap shall be flushed with water before placing the grout to remove the fines from the rock surfaces. The rock shall be kept moist before the grouting and without placing in standing or flowing water. Grout placed on inverts or other nearly level areas may be placed in one operation. On slopes, the grout shall be placed in two nearly equal applications consisting of successive lateral strips about 10 feet in width starting at the toe of the slope and progressing upward. The grout shall be delivered to the place of final deposit by approved methods and discharged directly on the surface of the rock. A metal or wood splash plate is used to prevent displacement of the rock directly under the grout discharge. The flow of grout shall be directed with brooms, spades, or baffles to prevent grout from flowing excessively along the same path and to assure that all intermittent spaces are filled. Sufficient barring shall be conducted to loosen tight pockets of rock and otherwise aid in the penetration of grout to ensure the grout fully penetrates the total thickness of the rock blanket. All brooming on slopes shall be uphill. After the grout has stiffened, the entire surface shall be rebroomed to eliminate runs and to fill voids caused by sloughing. The surface finish, following the completion of grout installation, shall consist of one-third of the rock extended above the level of grout. The exposed rock will not have a plastered appearance.

E. After completion of any strip or panel, no individual(s) or equipment shall be permitted on the grouted surface for 24 hours. The grouted surface shall be protected from injurious action by the sun, rain, flowing water, mechanical injury, or other potential damaging activity.

F. The completed finished surface shall be prevented from drying for a minimum curing period of 7 days following placement. Exposed surfaces shall be maintained in a moist condition continuously for the 7-day curing period or until curing compound has been applied as specified in this section. Moisture shall be maintained by sprinkling, flooding, or fog spraying or by covering with continuously moistened canvas, cloth mats, straw, sand, or other approved material. Water or moist covering shall be used to protect the grout during the curing process without causing damage to the grout surface by erosion or other mechanisms that may cause physical damage.

G. The grouted rock may be coated with an approved curing compound as an alternative method to maintaining a continuous moisture condition during the curing period. The compound shall be sprayed on the moist grout surface as soon as free water has disappeared and all surface finishing has been completed. The compound shall be applied at a minimum uniform rate of 1 gallon per 175 square feet of surface and shall form a continuous adherent membrane over the entire surface. Curing compound

shall not be applied to surfaces requiring bond to subsequently placed grout and/or concrete. If the membrane is damaged during the curing period, the damaged area shall be resprayed at the rate of application specified for the original treatment.

H. Grout mix shall not be placed when the daily minimum temperature is less than 40 degrees Fahrenheit unless facilities are provided to ensure that the temperature of the material is maintained at a minimum temperature of 50 degrees Fahrenheit and not more than 90 degrees Fahrenheit during placement and the curing period. Grout mix shall not be placed on a frozen surface. When freezing conditions prevail or are anticipated in next 24 hours, rock to be grouted shall be covered and heated to within a range of 50 to 90 degrees Fahrenheit for a minimum of 24 hours before placing grouting material.

I. The grout material shall be checked and tested throughout the grouting operation. Sampling of fresh grout shall be conducted in conformance with ASTM C 172. The volume of each batch will be determined by methods prescribed in ASTM C 138.

J. MWA shall have free access to all parts of the Contractor's plant and equipment used for mixing and placing grout during the period of the contract. Proper facilities shall be provided for MWA to sample material and view processes implemented in the mixing and placing of grout as well as for securing grout test samples. All tests and inspections shall be conducted so that only a minimum of interference to the contractor's operation occurs.

K. For ready-mixed grout, the contractor shall furnish to MWA a statement-of-delivery ticket for each batch delivered to the site. The ticket shall provide as a minimum: weight in pounds of cement, aggregates (fine and coarse), water; weight in ounces of air-entraining agent; time of loading; and the revolution counter reading at the time batching was started.

Part 4 Measurement and Payment

4.1 Stone Rip Rap in Place (Type 1, Type 3)

A. Method of Measurement: Stone Rip Rap shall be measured per ton based on weighted truck tickets and complete in place as in the Contract Documents.

B. Basis of Payment: The unit price shall include excavation and preparation of ground surface to the correct elevation, furnishing and placing Rip rap to the specified depth and all other labor, materials, equipment, hauling, subgrade preparation, and incidentals required to complete the Work. Fabric is to be paid per section 31 32 01 - Woven Coir Fabric.

4.2 Stone Grouted Rip Rap in Place

A. Method of Measurement: Stone Rip Rap shall be measured per ton based on weighted truck tickets and complete in place as in the Contract Documents.

B. Basis of Payment: The unit price shall include excavation and preparation of ground

surface to the correct elevation, furnishing, installation of grout and placing Rip Rap to the specified depth and all other labor, materials, equipment, subgrade preparation, and incidentals required to complete the Work.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnish all labor, equipment, and materials necessary to construct the concrete unit paving as indicated on the Drawings and as specified herein.

B. This section provides general requirements for providing labor, materials, and equipment for the installation sidewalks, walking trails, parking facilities using concrete unit pavers.

1.2 Submittals

A. If requested by MWA, submit for approval all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

B. Submittals shall show in detail the size, location, dimensions, and accessories to be used in construction. Include information for unit paver and edge restraint product data, unit paver and edge restraint product test reports, and sieve analysis for aggregate setting-bed materials indicating compliance with standards and requirements specified herein. The Contractor shall receive approval from MWA before any materials may be delivered at the jobsite.

1.3 Quality Control

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. Mockups: Build mockups to verify selections made under product data submittals for color, size, shape, joint pattern, etc., to demonstrate aesthetic effects and to set quality standards for materials and execution.

1.4 Delivery, Storage, and Handling

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.5 Field Conditions

A. Cold Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

Part 2 Products

2.1 Concrete Pavers

A. Solid interlocking paving units complying with ASTM C 936, made from normal-weight aggregates.

B. Thickness: Minimum 3-1/8 inches unless otherwise shown or indicated.

C. Face Size and Shape: Manufacturer's standard within the specified pattern designation.

D. Color: As selected by MWA.

2.2 Curbs and Edge Restraints

A. Class AA1 concrete as specified in 03 30 00 - Cast-In-Place Concrete.

2.3 Aggregate Setting-Bed Materials

A. Graded Aggregate for Subbase: Sound, crushed stone or gravel complying with ASTM D 448 for Size No. 57.

B. Graded Aggregate for Base: Sound, crushed stone or gravel complying with ASTM D 448 for Size No. 8, base material.

C. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.

D. Stone Screenings for Leveling Course: Sound stone screenings complying with ASTM D 448 for Size No. 10.

E. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.

F. Provide sand of color needed to produce required joint color.

2.4 Geotextile

A. Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured according to test methods referenced:

1. Survivability: Class 2; AASHTO M 288.

2. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D 4751.

3. Permittivity: 0.5 per second, minimum; ASTM D 4491.

4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

Part 3 Execution

3.1 Examination

A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.

C. Prepare subgrade in accordance with Section 31 23 13 – Subgrade Preparation to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for unit pavers.

3.3 Installation, General

A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable. For concrete pavers, a block splitter may be used.

D. Joint Pattern: As indicated.

E. Tolerances: Do not exceed 1/32-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet from level, or indicated slope, for finished surface of paving.

F. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

G. Install job-built concrete edge restraints to comply with requirements in Section 03 30 00 - Cast-in-Place Concrete.

3.4 Aggregate Setting-Bed Applications

A. Compact soil subgrade uniformly to at least 98 percent of ASTM D 698 laboratory density.

B. Place aggregate subbase and base, compact to 100 percent of ASTM D1557 maximum laboratory density, and screed to depth indicated.

C. Place leveling course and screed to a thickness of 1 inch, taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.

D. Treat leveling course with herbicide to inhibit growth of grass and weeds.

E. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1/8 inch, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit pavers. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit

F. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3,500 to 5,000 lb-f compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.

    1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches of uncompacted pavers adjacent to temporary edges.

    2. Before ending each day's work, compact installed concrete pavers except for 36-inch width of uncompacted pavers adjacent to temporary edges (laying faces).

    3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches of laying face.

    4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with non-staining plastic sheets to protect them from rain.

G. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

H. Do not allow traffic on installed pavers until sand has been vibrated into joints.

I. Repeat joint-filling process 30 days later.

3.5 Repairing, Pointing, and Cleaning

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

Part 4 Measurement and Payment

4.1 Concrete Unit Paving

A. Method of Measurement: The quantity to be measured in the actual number of square yards of concrete unit paving installed as shown on the Contract Documents or as directed by MWA.

B. Basis of Payment: The Unit Price for concrete unit paving shall include all materials (including all aggregate and geotextile), labor, tools, and equipment necessary to complete the Work as herein specified, as indicated on the Drawings, or as directed by MWA.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnishing of all labor, materials and equipment necessary for construction of pervious concrete pavement for streets, parking and pedestrian areas in conformance with the plans and specifications.

B. This section provides general requirements for providing labor, materials, and equipment for the installation sidewalks, walking trails, parking facilities using pervious concrete pavement.

1.2 Submittals

A. If requested by MWA, submit concrete mix design with proportions of materials, manufacturer's product data for form release agent, preformed joint filler, and sealants, and statement attesting to qualifications and experience.

1.3 Quality Control

A. Contractor Qualifications: Contractor or its specialty subcontractor shall meet one of the following criteria for the minimum certification for each placement crew and submit verification of the National Ready Mixed Concrete Association (NRMCA).

1. Contractor shall employ no less than one NRMCA Certified Pervious Concrete Craftsman who must be on-site, actively guiding and working with each placement crew during all pervious concrete placement.

2. Contractor shall employ no less than three NRMCA Certified Pervious Concrete Installers who must be on-site, actively guiding and working with pervious concrete for projects.

3. Contractor shall employ no less than three NRMCA Pervious Concrete technicians and one Pervious Installer who shall be on-site, actively guiding and working with each placement crew during all pervious concrete placement.

B. Test Panel: Contractor is to place, joint and cure two test panels, each to be a minimum of 225 sq. ft. at the required project thickness to demonstrate to MWA's satisfaction that in-place unit weights can be achieved and a satisfactory pavement can be installed at the site location.

1. Test panels may be placed at any of the specified Portland cement pervious locations. Test panels shall be tested for thickness in accordance with ASTM C 42; void structure in accordance with ASTM C 138; and for core unit weight in accordance with ASTM C 140.

2. Satisfactory performance of the test panels will be determined by:

    a. Compacted thickness no less than ¼" of specified thickness.

    b. Void Structure

        i. 20% ± 5% for low porosity, high strength

        ii. 30% ± 5% for high porosity, low strength

    c. Unit weight plus or minus 5 pcf of the design unit weight

3. If test panel is deemed satisfactory, the panel can be left in place and included in the completed work, otherwise the test panel shall be removed at the contractor's expense and disposed of in an approved landfill.

C. Source of Materials: Utilize the same source, stock, or brand of concrete materials for each class or mix of concrete which is to be exposed. Do not interchange materials or mixes until an additional mock-up shows that uniformity in finish texture and color, as compared to original mock-up will be maintained. If necessary, obtain and stockpile materials in sufficient quantity to ensure continuity and uniformity

1.4 Testing and Inspection

A. MWA reserves the right to retain an independent testing laboratory to perform inspection and testing of paving and associated work.

B. The testing laboratory shall conform to the applicable requirements of ASTM E329 "Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction" and ASTM C1077 "Standard Practice for Testing Concrete and Concrete Aggregates for use in Construction, and Criteria for Laboratory Evaluation" and shall be inspected and accredited by the Construction Materials Engineering Council, Inc. or by an equivalent recognized national authority.

C. Field tests of concrete shall be performed by an individual certified as both an NRMCA Certified Pervious Concrete Technician or equivalent and an ACI Concrete Field Testing Technician—Grade 1 or by a recognized state or national authority for an equivalent level of competence.

D. Testing responsibilities of the Contractor: Advise MWA at least 48 hours before concrete placement.

E. Testing

1. Obtain a minimum 1 ft^3 sample for acceptance tests in accordance with ASTM C172. Measure a minimum of one density test during each day's placement in accordance with C138 following the consolidation procedures described in ASTM C29, Jigging Procedure. Determine density using a minimum 0.25 ft^3 cylindrical metal measure. Fill and compact the measure in accordance with

ASTM C29. Fresh density shall be within ±5 lb/ft^3 of the specified fresh density.

2. Remove three cores from each lot of 5,000 ft^2, in accordance with ASTM C42, not less than 7 days after placement of the pervious concrete. Cores shall be a minimum nominal 4 inch diameter. Select three locations in accordance with ASTM D3665. Measure the cores for thickness (ASTM C42) and density (ASTM C140). After thickness determination, trim and measure the cores for density in the saturated condition as described in ASTM C140. Immerse the trimmed cores in water for 24 hours, drain for 1 minute, remove surface water with a damp cloth, then weigh immediately.

3. Tolerance for thickness and density reported as the average of three cores of each lot shall be as follows:

    a. The compacted thickness shall not be more than 1/4 inch less than the specified thickness, with no single core exceeding 1/2 inch less than the specified thickness; nor shall the average compacted thickness be more than 1-1/2 inch more than the specified thickness.

    b. Hardened density shall be within ±5% of the approved hardened density from the test panels.

    c. When a lot is outside one or more of the limits above, the lot shall be subject to rejection, removed, and replaced at the Contractor's expense unless accepted by MWA.

    d. Core holes shall be filled with concrete or pre-blended grout.

1.5 Field Conditions

A. Protection of Existing Improvements

1. Protect adjacent work from splashing of paving materials. Remove all stains from exposed surfaces of paving, structures, and grounds. Remove all waste and spillage.

2. Do not damage or disturb existing improvements or vegetation. Provide suitable Protection where required before starting Work and maintain protection throughout the course of the Work.

3. Restore damaged improvements, including existing paving on or adjacent to the site that has been damaged as a result of construction work, to their original condition or repair as directed to the satisfaction of MWA, and authority having jurisdiction at no additional cost.

B. Safety and Traffic Control

1. Notify and cooperate with local authorities and other organizations having Jurisdiction when construction work will interfere with existing roads and traffic.

2. Provide temporary barriers, signs, warning lights, flagmen, and other protections as required to assure the safety of persons and vehicles around the construction area and to organize the smooth flow of traffic.

C. Weather Limitations: Do not place pervious concrete pavement mixtures when the ambient temperature is 40 degrees Fahrenheit or lower, unless otherwise permitted in writing by MWA.

Part 2 Products

2.1 Materials

A. Cement: Portland Cement Type I or II conforming to ASTM C150 or Portland Cement Type IP or IS conforming to ASTM C595, or ASTM C1157.

B. Aggregates: Coarse aggregate (3/8 to No. 16) per ASTM C33 or No. 89 coarse aggregate (3/8 to No. 50) per ASTM D448. If other gradation of aggregate is to be used, submit data on proposed material to MWA for approval.

C. Air Entraining Agent: Air entraining agents shall be in accordance with ASTM C260.

D. Admixtures: The following admixtures may be used as needed:

1. Type A Water Reducing Admixtures – ASTM C494.

2. Type B Retarding – ASTM C494.

3. Type D Water Reducing/Retarding – ASTM C494.

E. Water: Potable water in accordance with ASTM C1602.

2.2 Mixture Proportions

A. The composition of the proposed concrete mixtures shall comply with the following provisions unless an alternative composition is demonstrated to comply with the project requirements.

B. Cementitious Content: For pavements subjected to vehicular traffic loading, the total cementitious material shall not be less than 600 lbs. per cu. yd.

C. Aggregate Content: The volume of aggregate per cu. yd. shall be a minimum 18 cu. ft. when calculated as a function of the unit weight determined in accordance with ASTM C29. Fine aggregate, if used, should not exceed 3 cu. ft. and shall be included in the total aggregate volume.

D. Admixtures: Shall be used in accordance with the manufacturer’s instructions and recommendations.

E. Mix Water: As appropriate for approved mix design. Mix water shall be such that the cement paste displays a wet metallic sheen without causing the paste to flow from the aggregate. (Mix water yielding a cement paste with a dull-dry appearance has insufficient water for hydration).

Part 3 Execution

3.1 Preparation

A. Areas to be paved will be compacted and brought to subgrade elevation in accordance with 31 23 13 – Subgrade Preparation before work of this section is performed.

B. Subgrade shall be compacted by a mechanical vibratory compactor to a minimum density of 92% of a maximum dry density as established by ASTM D 1557 or AASHTO T 180. Subgrade stabilization shall not be permitted.

C. If fill material (embankment) is required to bring the subgrade to final elevation, it shall be clean and free of deleterious materials. It shall be placed in 8-inch maximum layers and compacted by a mechanical vibratory compactor to a minimum density of 92% of a maximum dry density as established by ASTM D1557 or AASHTO T 180. Subgrade compaction shall extend for distance of at least 1 foot beyond pavement edge.

D. Place forms to exact elevation and location required. Visually check forms and adjust where necessary to ensure smooth curves and transitions in grade. Provide close spacing on curves to maintain a smooth curve.

E. Apply form release agent to the form face, which will be in contact with concrete, immediately before placing concrete.

3.2 Installation, General

A. MWA shall be notified of concrete placement sufficiently in advance of start of operation to allow his representative to complete preliminary inspection of the work, including subgrade and forms.

B. Concrete shall be deposited as close to its final position as practicable and such that fresh concrete enters the mass of previously placed concrete. The practice of discharging onto subgrade and pulling or shoveling to final placement is not allowed.

C. Adjacent work shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original conditions.

D. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall thoroughly damp when concrete is placed. There shall be no free water on surface.

E. Concrete which has set or partially set before placing shall not be employed. Re-tempering of concrete will not be permitted.

F. Concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.

3.3 Curing

A. Curing procedures shall begin within 20 minutes after the final placement operations. The pavement surface shall be covered with a minimum six-mil thick polyethylene sheet or other approved covering material. Prior to covering, a fog or light mist shall be sprayed above the surface when required due to ambient conditions (temperature, wind and humidity). The cover shall overlap all exposed edges and shall be secured (without using dirt or stone) to prevent dislocation due to winds or adjacent traffic conditions. Compact soil subgrade uniformly to at least 98 percent of ASTM D698 laboratory density.

B. Cure pavement for a minimum of 7 uninterrupted days, unless otherwise specified.

C. No truck traffic shall be allowed for 10 days; no passenger car/light truck for 7 days; no pedestrian traffic for 24 hours.

3.4 Jointing

A. Control (contraction) joints shall be installed at 40-foot intervals for pavements designed for vehicular traffic. They shall be installed at a depth of ¼ the thickness of the pavement. These joints can be installed in the plastic concrete or saw cut. If saw cut, the procedure should begin as soon as the pavement has hardened sufficiently to prevent raveling and uncontrolled cracking (normally after curing). Transverse construction joints shall be installed whenever placing is suspended a sufficient length of time that concrete may begin to harden. In order to assure aggregate bond at construction joints, a bonding agent suitable for bonding fresh concrete to existing concrete shall be brushed, rolled or sprayed on the existing pavement surface edge. Isolation (expansion) joints will not be used except when pavement is abutting slabs or other adjoining structures.

Part 4 Measurement and Payment

4.1 Pervious Concrete Paving

A. Method of Measurement: The quantity to be measured in the actual number of cubic yards of roadway or parking area pavement installed as shown on the Contract Documents or as directed by MWA.

B. Basis of Payment: The Unit Price for concrete unit paving shall include all permit fees, maintenance charges, testing and inspecting fees required by road departments and the furnishing of all materials, labor, tools, and equipment necessary to complete the Work as herein specified, as indicated on the Drawings, or as directed by MWA. Included in the costs of aggregate base course, curing

materials, jointing materials, forms, and all associated costs of work necessary for furnishing Pervious Concrete Paving.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnishing all labor, equipment, and materials necessary to remove, handle, haul-off, and install concrete sidewalks, curbs, and gutters, as required for the rehabilitation, replacement, and/or installation of storm drainage systems and related appurtenances.

B. This section provides general requirements for providing labor, materials, and equipment for the replacement of concrete sidewalks, curbs, and gutters disturbed by construction. However, it is the Contractor's responsibility to ensure all work meets the requirements of GDOT Standard Specifications.

1.2 Submittals

A. If required by MWA, the Contractor shall submit for approval to MWA and GDOT when work is within a state road right-of-way, all working drawings and schedules of materials and methods proposed to follow in the execution of the Work under this item.

1.3 Quality Control

A. Tolerances: Construct concrete surfaces within 0.05 feet of the indicated elevation and deviating not more than 3/8-inch from a ten-foot straightedge placed anywhere on the surface.

B. Strictly conform to requirements for compaction of subgrade, air entrainment of concrete and curing of concrete.

Part 2 Products

2.1 Materials

A. All concrete shall be Class "A" in accordance with GDOT Standard Specifications Section 500.03 and have a 28-day compressive strength of 3,000 psi.

B. Joint filler: Non-extruding joint material, furnished in a single piece for the full depth and width required for the joint unless otherwise specified by MWA.

Part 3 Execution

3.1 Preparation

A. Excavate and compact the subgrade as specified in Section 31 23 13 - Subgrade Preparation, true to the indicated grade and cross section.

B. Place forms or extrusion machine guides to exact elevation and location required. Visually check forms and machine guides and adjust where necessary to ensure smooth curves and transitions in grade. Provide close spacing on curves to maintain a smooth curve.

3.2 Joints

A. Expansion Joints: Install expansion joints at intervals as indicated, but not exceeding 40 feet for walks and curbs, and wherever new concrete abuts existing construction. Additional joints are to be placed at tangent points of circular curbs and other places where stresses may develop.

B. Contraction (Control) Joints

1. Sidewalks: Cut joints with a saw immediately after concrete reaches adequate hardness to allow sawing. Contraction joints in sidewalks shall be 3/4-inch deep and spaced at a distance equal to the width of the walk.

2. Curb and Gutter: For formed work, use full depth steel forms to achieve contraction joints. For extruded work, cut contraction joints with a saw immediately after concrete reaches adequate hardness to allow sawing. Contraction joints in curb and gutters shall be 1 ½ inch deep and spaced at 10-foot intervals.

3. Concrete flatwork: Cut joints with a saw immediately after concrete reaches adequate hardness to allow sawing. Contraction joint depth shall be ¼ of the concrete thickness. Spacing and pattern shall be as shown on plans or determined by MWA.

C. Pre-molded expansion joint filler must be cut to full cross section of the proposed construction and shall extend the full depth, width, and length of the construction. Trim expansion joint material protruding after the concrete has been finished as directed by MWA. All longitudinal expansion joints shall be placed as indicated on the drawings.

3.3 Finishes

A. Pedestrian and Wheelchair Ramps: Non-slip finish.

B. All others: Broom finish.

3.4 Construction

A. Place forms true to line, grade, and cross section.

B. Brace forms adequately before placing the concrete. Place concrete in forms and thoroughly tamp, vibrate or work it into all corners, removing air pockets. Allow forms to remain in place until the concrete has set sufficiently to hold its shape.

C. Begin each phase of screed, float, trowel and finish work as soon as the concrete can be properly worked. Completely finish sidewalks and flat work with forms in place.

D. Remove forms on the front face of curbs as soon as the concrete will hold its shape and finish the face. For gutters, a strike-off template of the form and shape of the gutter shall be used to shape the top surface of the gutter. Round top edges of curb and edges of gutter using a radius tool matching the radius shown on the Drawings. Finish the edges where templates have been removed or expansion joint material has been placed with an edging tool with a radius of not over 1/4-inch and then all lines or marks removed with a wet brush.

E. Remove all tool marks with a wetted brush or wooden float, and the finished surface shall present a uniform appearance.

3.5 Curing

A. Cure concrete as specified in Section 03 30 00 – Cast-in-Place Concrete.

Part 4 Measurement and Payment

4.1 Curb and Gutter, High Back or Roll Back

A. Method of Measurement: Measurement shall be made using the actual linear feet of curb and combination curb and gutter installed or restored in accordance with these specifications as defined in the Contract Documents, or as directed by MWA.

B. Basis of Payment

1. The unit price shall be compensation in full for the work and shall include permit fees, maintenance charges and inspection fees required by all road departments and the furnishing of all materials, labor, tools, and appliances necessary to complete the Work as herein specified, shown or ordered. Included shall be any costs of furnishing necessary work beyond the limits of measurement as defined under these Specifications.

2. Removal, handling, hauling, and disposal of existing curb and gutter material will be considered incidental to this pay item and no additional compensation will be made.

4.2 Sidewalk

A. Method of Measurement: Measurement shall be made by the actual square yards of sidewalk installed or restored per square yard of the thickness specified in accordance with the Contract Documents, or as directed by MWA.

B. Basis of Payment

1. The unit price shall be compensation in full for the work and shall include any additional permit fees, maintenance charges and inspection fees required by all

road departments and the furnishing of all materials, labor, tools, and appliances necessary to complete the Work as herein specified, shown or ordered.

2. Included shall be the costs of excavation beyond trench width to provide firm foundation and any costs of furnishing necessary work beyond the limits of measurement as defined under these Specifications.

3. Removal, handling, hauling, and disposal of existing sidewalk material will be considered incidental to this pay item and no additional compensation will be made.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnishing all labor, equipment, and materials necessary for and to properly reestablish to the satisfaction of MWA, all ground surfaces irrespective of the type, which may be disturbed in the progress of Work required under this Contract.

1.2 Submittals

A. A. If requested by MWA, submit

1. Product labels/data sheets.

2. Samples

   a. Representative of stockpiled or imported topsoil.

   b. Compost sample and a certification showing compost meets or exceeds metrics to MWA for approval prior to being used and must comply with all local, state and federal regulations.

3. Certified Topsoil Analysis Reports

   a. Indicate quantities of materials necessary to bring topsoil into compliance with textural/gradation requirements.

   b. Indicate quantity of lime, and quantity and analysis of fertilizer.

1.3 Sequencing and Scheduling

A. Perform Work specified in Section 31 10 00 - Site Clearing and 31 23 00 - Excavation and Fill prior to performing Work specified under this Section and as shown on Drawings.

Part 2 Products

2.1 Topsoil

A. General: Topsoil shall be natural, friable, sandy loam, obtained from well-drained areas, free from objects larger than 1-1/2 inches maximum dimension, and free of subsoil, roots, grass, other foreign matter, hazardous or toxic substances, and deleterious material that may be harmful to plant growth or may hinder grading, planting, or maintenance.

B. Composition: As determined in accordance with USBR 514.4.4:

1. Gravel-Sized Fraction: Maximum 75 percent by weight retained on a No. 10 sieve.

2. Sand-Sized Fraction: Maximum 65 percent passing No. 10 sieve and retained on No. 270 sieve.

3. Silt-Sized Fraction: Maximum 50 percent passing No. 270 sieve and larger than 0.002 millimeter.

4. Clay-Sized Fraction: Maximum 25 percent smaller than 0.002 millimeter.

C. Organic Matter: Minimum 2.0 percent by dry weight as determined in accordance with USBR 514.8.7 and ATSM D5268

D. pH: Range 5.0 to 7.0.

E. Textural Amendments: Amend as necessary to conform to required composition by incorporating sand, peat, manure, or sawdust.

F. Source: Stockpile material on-site, in accordance with Section 31 10 00 - Site Clearing. Import topsoil if on-site material fails to meet specified requirements or is insufficient in quantity.

2.2 Lime

A. Composition: Ground limestone with not less than 85 percent total carbonates, ASTM C602.

B. Gradation

1. Minimum 50 percent passing No. 100 sieve.

2. Minimum 90 percent passing No. 20 sieve.

3. Coarser material acceptable provided rates of application are increased proportionately on basis of quantities passing No. 100 sieve.

2.3 Sawdust or Ground Bark

A. Nontoxic, of uniform texture, and subject to slow decomposition when mixed with soil. Nitrogen-treated, or if untreated mix with minimum 0.15 pound of ammonium nitrate or 0.25 pound of ammonium sulfate per cubic foot of loose material.

2.4 Peat

A. Composition: Natural residue formed by decomposition of reeds, sedges, or mosses in a freshwater environment, free from lumps, roots, and stones.

1. Organic Matter: Not less than 90 percent on a dry weight basis as determined by USBR 514.8.7.

2. Moisture Content: Maximum 65 percent by weight at time of delivery.

2.5 Fertilizer

A. As recommended as a result of soil testing in Article 2.7 below.

2.6 Sand

A. Fine Aggregate: Clean, coarse, well-graded, ASTM C33.

2.7 Quality Control

A. Topsoil Analysis/Testing: Performed by county or state soil testing service or approved certified independent testing laboratory.

2.8 Compost Mulch

A. Compost shall be weed free and derived from a well-decomposed source of organic matter. The composted products shall be produced using an aerobic composting process meeting USEPA CFR 503 regulations, including time and temperature data indicating effective weed seed, pathogen and insect larvae kill. The composted products shall be free of any refuse, contaminants or other materials toxic to plant growth. Non-composted products will not be accepted.

B. Test methods for the items below shall follow United States Composting Council (USCC) Test Methods for the Examination of Composting & Compost (TMECC) guidelines for laboratory procedures.

1. pH: 5.0 - 8.0 in accordance with TMECC 04.11-A, “Electrometric pH Determination for Compost.”

2. Moisture content of less than 60 percent in accordance with standardized test methods for moisture determination.

3. Particle Size: 99 percent passing a 1-inch sieve, maximum of 50 percent passing a 1/2-inch sieve, in accordance with TMECC 02.02-B, “Sample Sieving for Aggregate Size Classification”.

4. Material shall be relatively free (<1 percent by dry weight) of inert or foreign man-made materials.

2.9 Planting Soil Mixes

A. Prepare soil mix as follows, unless otherwise shown in the Contract Documents. The following mix is for moderately slow draining soil for trees and shrub beds.

1. Mix of Imported Topsoil, Coarse Sand and Compost: The approximate mix ratio shall be, with mix component percent by moist volume:

    a. Imported Topsoil unscreened 45-50 percent.

    b. Coarse sand 40-45 percent.

    c. Compost 10 percent.

2. Final tested organic matter between 2.75 and 4 percent (by dry weight).

Part 3 Execution

3.1 Subgrade Preparation

A. Apply lime at the rate as prescribed in the soil test results to subgrade before tilling.

B. Scarify subgrade to minimum depth of 6 inches where topsoil is to be placed.

C. Remove stones over 2-1/2 inches in any dimension, sticks, roots, rubbish, and other extraneous material.

D. Limit preparation to areas which will receive topsoil within 2 days after preparation.

E. Preparation shall be done with mechanized equipment and hand labor.

3.2 Topsoil Placement

A. Do not place topsoil when subsoil or topsoil is frozen, excessively wet, or otherwise detrimental to the Work.

B. Mix soil amendments, lime, and fertilizer with topsoil before placement or spread on topsoil surface and mix thoroughly into entire depth of topsoil before planting or seeding. Delay mixing of fertilizer if planting or seeding will not occur within 3 days.

C. Place one half of stockpile of topsoil and work into top 4 inches of subgrade soil to create a transition layer. Place remainder of topsoil where seeding and planting are scheduled to create a topsoil layer with a minimum thickness of 6 inches including transition layer.

D. Uniformly distribute to within 1/2 inch of final grades. Fine grade topsoil eliminating rough or low areas and maintaining levels, profiles, and contours of subgrade.

E. Remove stones exceeding 1-1/2 inches, roots, sticks, debris, and foreign matter during and after topsoil placement. Soil shall be rolled to ensure a uniform surface, at the correct grade.

F. Remove surplus subsoil and topsoil from site. Grade stockpile area as necessary and place in condition acceptable for planting or seeding.

G. Preparation shall be done with mechanized equipment and hand labor.

Part 4 Measurement and Payment

4.1 Soil Amendments

A. Method of Measurement

1. Soil amendments, as listed below, shall be measured for the actual pound of material amended into the soil as required in the Contract Documents or as otherwise directed by MWA.

    a. Lime.

    b. Sawdust.

    c. Peat.

    d. Fertilizer.

    e. Sand.

    f. Perlite.

    g. Dolomite.

    h. Gypsum.

2. Soil amendments applied during performance of Temporary Seeding in accordance with Section 31 25 00 - Erosion and Sedimentation, Turfs and Grasses in accordance with Section 32 92 00 - Turfs and Grasses, and Landscaping in accordance with Section 32 97 00 - Landscaping shall not be included for measurement under this pay item.

B. Basis of Payment

1. The unit price shall be compensation in full for all tools, equipment, labor, materials, and incidentals necessary to amend soil within the defined project area or as further directed by MWA.

2. Any additional amendments added outside of the defined work area will be considered beyond the limits of measurement and will be considered incidental to the Work.

4.2 Compost Mulch

A. Method of Measurement

1. Compost mulch shall be measured for the actual cubic yards of material that is provided in place, according to the application method listed below, as in the Contract Documents or as otherwise directed by MWA:

    a. Blown.

    b. Hand placed.

2. Any additional amendments added outside of the defined work area will be considered beyond the limits of measurement and will be considered incidental to the Work.

B. Basis of Payment: The unit price shall be compensation in full for all tools, equipment, labor, materials, and incidentals necessary to apply mulch within the defined project area or as further directed by MWA.

4.3 Planting Soil Mixes

A. Method of Measurement

1. Planting soil mix shall be measured for the actual cubic yards of material that is installed in place as required in the Contract Documents or as otherwise directed by MWA.

2. Native topsoil removed from the immediate site and reused for planting soil mix shall not be included in measurement under this pay item.

3. Measurements for planting soil mix during performance of Landscaping in accordance with Section 32 97 00 - Landscaping shall not be included in measurement under this pay item.

4. Any additional soil mixes added outside of the defined work area and/or requested by MWA will be considered beyond the limits of measurement and will be considered incidental to the Work.

B. Basis of Payment: The unit price shall be compensation in full for all tools, equipment, labor, materials, and incidentals necessary to amend soil within the defined project area or as further directed by MWA.

4.4 Tilling

A. Method of Measurement

1. Tilling of soil shall be measured for the actual square yards of land tilled as specified in the Contract Documents or as otherwise directed by MWA.

2. Tilling associated with performance of Temporary Seeding in accordance with Section 31 25 00 - Erosion and Sedimentation, Turfs and Grasses in accordance with Section 32 92 00 - Turf and Grasses, and Landscaping in accordance with Section 32 97 00 - Landscaping shall not be included for measurement under this pay item.

3. Any additional tilling that occurs outside of the defined work area and/or requested by MWA will be considered beyond the limits of measurement and will be considered incidental to the Work.

B. Basis of Payment: The unit price shall be compensation in full for all tools, equipment, labor, materials, and incidentals necessary to till the soil within the defined project area or as further directed by MWA.

4.5 Topsoil

A. Method of Measurement

1. Topsoil shall be measured by the actual tons of topsoil that is installed in place as required in the Contract Documents or as otherwise directed by MWA.

2. Native topsoil removed from the immediate site and reused for planting soil mix shall not be included in measurement under this pay item.

3. Topsoil placement and final grading associated with performance of Temporary Seeding in accordance with Section 31 25 00 - Erosion and Sedimentation, Turfs and Grasses in accordance with Section 32 92 00 - Turf and Grasses, and Landscaping in accordance with Section 32 97 00 - Landscaping shall not be included for measurement under this pay item.

4. Any additional topsoil placement and final grading that occurs outside of the defined work area will be considered beyond the limits of measurement and will be considered incidental to the Work.

5. Soil amendments performed as part of topsoil placement and final grading activities under this pay item shall be paid per the Soil Preparation in accordance with Section 32 91 13 - Soil Preparation pay items.

B. Basis of Payment

1. The unit price shall be compensation in full for all tools, equipment, labor, materials, and incidentals necessary to haul topsoil to the site and complete soil testing within the defined project area or as further directed by MWA.

2. Payment will not be approved without submission of bag labels or trip tickets.

4.6 Hand Grading

A. Method of Measurement

1. Hand grading shall be measured by the actual square yards of surface area where soil is placed, moved and shaped by manual labor as directed by MWA.

2. Soil removed from the immediate site and reused will not be considered for payment.

B. Basis of Payment: The unit price shall be compensation in full for the work and shall include the furnishing of all labor, materials and appliances necessary to complete the Work as specified.

4.7 Sand Fill

A. Method of Measurement: Sand fill, sand used to fill voids in terrain but not used as soil amendment, shall be measured by the actual cubic yards installed in place as required in the Contract Documents or as otherwise directed by MWA.

B. Basis of Payment

1. The unit price shall be compensation in full for the work and shall include the furnishing of all materials and transportation, testing, labor, tools, and appliances necessary to complete the Work as herein specified, shown or ordered.

2. Included shall be the costs of excavation beyond final dimensions to provide firm foundation and any costs of furnishing necessary work beyond the limits of measurement as defined under these specifications.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnishing all labor, equipment, and materials necessary for and to properly establish to the satisfaction of MWA, all turf and grass irrespective of the type, required under this Contract.

1.2 Submittals

A. If requested by MWA, the Contractor shall submit for approval all working drawings and schedules of materials and methods proposed to follow in the execution of the Work under this item. Submittals shall include, but not be limited to soils analysis, product data for seed, fertilizer, agricultural limestone, vegetative mulch and sod.

B. If requested by MWA, the Contractor shall submit plans showing in detail the type, location, fertilizer ratios, and percentage cover of all seeding and sodding to be used in construction.

1.3 Performance Requirements

A. General

1. The Contractor shall provide a correction period of two years from the date of Substantial Completion for all native seeding and for all nonnative turf and grass material. Turf and grass which die during the correction period shall be removed and replaced under the original Specifications, no later than the following planting season, at the Contractor's expense. The Contractor shall be responsible for providing no more than the original turf and grass and one replacement under the correction period. All replacement native seeding and nonnative turf and grass replacement shall be subject to a two year correction period from the time of their acceptance.

2. The end of the original correction period does not release the Contractor from his responsibility to care for the replacement turf and grass.

B. Turf and Grass

1. Only living systems of the turf and grass areas (without open dead areas) that are healthy and properly installed, or have seed and mulch properly installed at the time of final inspection will be accepted.

2. The Contractor shall be responsible for the replacement of any nonliving systems before and immediately after the end of the first growing season.

3. Planting acceptance shall be as follows for turf and grass (in percent) based on inspections after the first growing season (late Summer/early Fall) and at the beginning of the second growing season (late Spring/early Summer):

a. 80 percent coverage.

b. No bare spots larger than 3 square feet.

c. Not more than 10 percent of total area with bare spots larger than 1 square foot.

d. Not more than 15 percent of total area with bare spots larger than 6 square inches.

1.4 Delivery, Storage and Protection

A. Seed

1. Furnish in standard containers with seed name, lot number, net weight, percentages of purity, germination, and hard seed and maximum weed seed content, clearly marked for each container of seed.

2. Keep dry during storage.

B. Sod

1. Do not harvest if sod is excessively dry or wet to the extent survival may be adversely affected.

2. Harvest and deliver sod only after laying bed is prepared for sodding.

3. Roll or stack to prevent yellowing.

4. Deliver and lay within 24 hours of harvesting.

5. Keep moist and covered to protect from drying from time of harvesting until laid.

C. Hydroseeding Mulch: Mark package of wood fiber mulch to show air dry weight.

1.5 Weather Restrictions

A. Perform Work under favorable weather and soil moisture conditions as determined by accepted local practice.

1.6 Sequencing and Scheduling

A. Complete Work specified in Section 32 97 00 - Landscaping, and prepare topsoil as specified in Section 32 91 13 - Soil Preparation, before starting Work of this section.

B. Complete Work under this section within 3 days following completion of soil preparation.

C. Notify MWA at least 3 days in advance of:

1. Each material delivery.

2. Start of planting activity.

D. Planting Season: The planting season is generally October 15 through March 15 for most species. See Section 700.3.05 of the GDOT Standard Specifications for more specific information.

1.7 Maintenance Service

A. Perform maintenance operations during warranty period to include:

1. Watering: Keep surface moist.

2. Washouts: Repair by filling with topsoil, liming, fertilizing, seeding, and mulching.

3. Mulch: Replace wherever and whenever washed or blown away.

Part 2 Products

2.1 Seed

A. Seed shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act. All seeds shall be furnished in sealed standard containers. The minimum percentage by weight of pure live seed in each lot of seed shall be as follows:

Seed Type	Percent
K31 Fescue (typical)	95
Material other than grass seed	5
Total	100

B. The Contractor shall furnish seeds according to the types and descriptions included below, or as approved by MWA. A given seeding mix shall be applied to the appropriate location given its type, specification, and by request of MWA.

1. Native Upland – typically a mix of short grasses, sedges, rushes, and forbs designed to establish in upland areas with low inundation frequency.

2. Native Wetland – typically a mix of short grasses, sedges, rushes, and forbs designed to establish in riparian and low-lying areas with high inundation frequency.

3. Ornamental – typically a mix of specialty short grasses, sedges, rushes, and forbs designed to establish in multiple terrains, given the specific application.

4. Custom – MWA-chosen seed mix of various short grasses, sedges, rushes, and forbs designed to establish in multiple terrains, given the application.

5. Turf Grass, Standard Varieties – standard seed mix which includes, but is not limited to Bermuda grass, Centipede grass, and Tall Fescue.

6. Turf Grass, Premium Varieties – premium seed mix which includes, but is not limited to Zoysia grass, St. Augustine, and other less commonly available species.

C. The aggregate percent of material other than grass seed shall include all non-viable seed, chaff, bulbs, live seed of crop plants other than those specified above, harmless inert matter, and weed seed not exceeding 1.0 percent by weight of pure live seed and other material in the mixture.

D. Commercial fertilizer shall conform to applicable Georgia fertilizer laws. Fertilizer shall conform to soil test results under Section 32 91 13 - Soil Preparation. It shall be uniform in composition, dry, and free flowing and shall be delivered to the site in the original unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer, which becomes caked or otherwise damaged making it unsuitable for use, shall not be accepted.

E. Agricultural limestone shall be an acceptable grade of ground limestone, ground dolomite, or a mixture of limestone and dolomite meeting the following physical requirements:

1. Gradation

Standard Sieve Size	Maximum Percent Retained
No 8, maximum	10
No 100, maximum	75

F. The vegetative mulch shall be the cereal straw from stalks of oats, rye, wheat, or barley. The straw shall be free of prohibited weed seeds and shall be relatively free of all other noxious and undesirable seeds. The straw shall be clean and bright, relatively free of foreign material and be dry enough to spread properly. If the above straw specifications cannot be met practicably, the foliage of the following plants may, with MWA approval, be substituted: Smooth Brome, Timothy, Orchard Grass, Red Canary Grass, Tall Fescue, Red Top, Millet, Blue Stem, Indian Grass, Red Clover, White Clover, Alfalfa, Crimson Clover, Birds Foot Trefoils, and Vetch. The foliage shall be taken relatively free of noxious and undesirable seeds and foreign material. The asphalt emulsion shall be SS-1, SS-1h, CSS-1 or CSS-1h conforming to the requirements of AASHTO M140 .

2.2 Sod

A. Turf grass Sod: Complying with “Specifications for Turfgrass Sod Materials” in Turfgrass Producers International (TPI)'s “Guideline Specifications to Turfgrass Sodding.” Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

B. Standard Turf Grass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed: Bermuda grass, Centipede grass, St. Augustine grass, and Tall Fescue.

C. Premium Turf Grass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed: Bent grass, Kentucky bluegrass, Zoysia grass, and all sand grown sod grass.

D. Refer to Contract Documents for type of sod, Standard or Premium, to be used.

E. Meshed or netted sod is not acceptable.

2.3 Hydroseeding Mulch

A. Hydroseeding Mulch shall be wood cellulose fiber mulch and shall be:

1. Specially processed wood fiber containing no growth or germination inhibiting factors.

2. Dyed a suitable color to facilitate inspection of material placement.

3. Manufactured such that after addition and agitation in slurry tanks with water, the material fibers will become uniformly suspended to form homogenous slurry.

4. When hydraulically sprayed on ground, material will allow absorption and percolation of moisture.

Part 3 Execution

3.1 Preparation of Seeded or Sodded Areas

A. The sub grade for the areas to be seeded or sodded shall be brought to a uniform grade, free of large stones. Where topsoil is required by MWA, the topsoil shall be uniformly graded, trimmed, and raked free from unsuitable material, ridges, bumps, or depressions and prepared in accordance with Section 32 91 13 - Soil Preparation.

3.2 Fertilizer

A. Apply evenly over area in accordance with manufacturer’s instructions. Mix into top 2 inches of topsoil, when applied by broad cast method.

B. Application Rate: Determined by soil test results in accordance with Section 32 91 13 - Soil Preparation.

3.3 Seeding

A. Start within 2 days of preparation completion.

B. Hydroseed slopes steeper than 3H:1V. Flatter slopes may be mechanically seeded.

C. Hydroseeding

1. The terms hydraulically applied erosion control and hydroseeding are considered synonymous as it relates to technical requirements.

2. Application Rate: as described in the Contract Documents.

3. Apply on moist soil, only after free surface water has drained away.

4. Prevent drift and displacement of mixture into other areas.

5. Upon application, allow absorption and percolation of moisture into ground.

6. Mixtures: Seed and fertilizer may be mixed together, apply within 30 minutes of mixing to prevent fertilizer from burning seed.

D. Cover Crop Seeding: Apply seed at rate as described in the Contract Documents to areas that are bare or incomplete as directed by MWA.

E. Mulching: Apply uniform cover of straw mulch at a rate of 2 tons per acre.

F. Water: Apply with fine spray after mulching to saturate top 4 inches of soil.

3.4 Sodding

A. Do not plant dormant sod, or when ground is frozen.

B. Lay sod to form solid mass with tightly fitted joints; butt ends and sides, do not overlap.

1. Stagger strips to offset joints in adjacent courses.

2. Work from boards to avoid damage to subgrade or sod.

3. Tamp or roll lightly to ensure contact with subgrade; work sifted soil into minor cracks between pieces of sod, remove excess to avoid smothering adjacent grass.

4. Complete sod surface true to finished grade, even, and firm.

C. Fasten sod on slopes to prevent slippage with wooden pins 6 inches long driven through sod into subgrade, until flush with top of sod. Install at sufficiently close intervals to securely hold sod.

D. Water sod with fine spray immediately after planting. During first week, water daily or more frequently to maintain moist soil to depth of 4 inches.

E. Apply top dress fertilizer at recommended rate.

3.5 Seeding and Sod Replacement

A. Where directed by MWA, areas shall be seeded or sodded. Seeding shall be performed using a properly proportioned mixture of inoculated seed approved for use in The Piedmont Region “Zone One” as detailed in the Manual for Erosion and Sediment Control in Georgia. Seeding shall only be permitted during the planting season listed for the Piedmont Region. All seeded areas shall be uniformly mulched immediately after seeding.

B. The Contractor shall be responsible for maintaining all areas including, watering, and reseeding defective area until a satisfactory stand of grass is accomplished and Final Acceptance of the Work by MWA is obtained. Areas showing evidence of settlement or loss of topsoil shall be rebuilt and reseeded or resodded as required.

C. In general, the Contractor shall replace existing maintained lawn areas with the same type of grass as was established prior to construction. Any deviations or alternatives proposed due to unavailability of seasonal grasses or inappropriateness of sod or seeding due to the time of year must be presented to the and approved by MWA, and in writing by the homeowner.

3.6 Sod Removal / Replacement

A. On all well-established "sod" type lawns and other improved well-established grass areas, the sod/grass shall be carefully removed, kept, watered, alive, and replaced after backfilling has been properly completed. Sod replacement shall be performed using sod of type and grade of that which was disturbed. Sod shall be carefully placed and rolled to ensure good soil contact.

3.7 Hydroseeding

A. Spread the seed, fertilizer, and wood fiber mulch in the form of a slurry. Seeds of all sizes may be mixed together. Apply hydroseeding as follows:

1. Use wood fiber mulch as a metering agent and seed bed regardless of which mulching method is chosen. Apply wood fiber mulch at approximately 500 pounds/acres.

2. Prepare the ground for hydroseeding as for conventional. Use specially designed equipment to mix and apply the slurry uniformly over the entire seeding area.

3. Agitate the slurry mixture during application.

4. Discharge slurry within one hour after being combined in the hydroseeder. Do not hydroseed when winds prevent an even application.

5. Closely follow the equipment manufacturer's directions unless Contract Documents specify otherwise.

6. Mulch the entire hydroseeded area according to the Contract Documents.

7. Native Restoration Areas, Multitrophic Native Planting Areas, Riparian Areas, Stream Restoration Areas, and Wetland and Stream Mitigation Areas may be hydroseeded. When hydroseeding in these areas only use water, seed and wood fiber mulch.

Part 4 Measurement and Payment

4.1 Grass Seeding

A. Method of Measurement

1. Grass seeding, in accordance with the following seed mix types, shall be measured for the actual square yards of land seeded at the coverage rate specified as shown in the Contract Documents or as otherwise directed by MWA.

   a. Native upland.

   b. Native wetland.

   c. Ornamental.

   d. Custom.

B. Basis of Payment

1. The unit price shall be compensation in full for all tools, equipment, labor, materials, and incidentals necessary for furnishing, placing, sowing, and maintaining grass seeding.

2. Payment shall be compensation in full for maintenance of the seed, including additional application or replacement.

3. Payment shall be compensation for all soil preparation and mulching performed as part of grass seeding activity.

4.2 Turf Grass Seeding

A. Method of Measurement

1. Turf grass seeding, in accordance with the following seed types, shall be measured for the actual square yards of land covered at the coverage rate

specified as shown in the Contract Documents or as otherwise directed by MWA.

a. Standard Varieties.

b. Premium Varieties.

B. Basis of Payment

1. The unit price shall be compensation in full for all tools, equipment, labor, materials, and incidentals necessary for furnishing, placing, sowing, maintaining, and removing turf grass seeding.

2. No additional payment shall be made for maintenance of the seed, including additional application or replacement.

3. Payment shall be compensation for all soil preparation and mulching performed as part of turf grass seeding activity.

4.3 Hydroseeding

A. Method of Measurement

1. Hydroseeding, in accordance with the following seed types, shall be measured for the actual square yards at the coverage rate specified as shown in the Contract Documents or as otherwise directed by MWA.

a. Standard Turf Grass Varieties.

b. Premium Turf Grass Varieties.

c. Native Upland.

d. Native Wetland.

e. Ornamental.

f. Custom.

B. Basis of Payment

1. The unit price shall be compensation in full for all tools, equipment, labor, materials, and incidentals necessary for furnishing, placing, sowing, maintaining, and removing hydroseed.

2. No additional payment shall be made for maintenance of the hydroseed, including additional application or replacement.

3. All grass seed, wood fiber mulch, water, or fertilizer included in the hydroseed mulch slurry shall be considered incidental to this pay item and no additional compensation will be made.

4. Payment shall be compensation for all soil preparation performed as part of hydroseeding activity.

4.4 Turf Grass Sodding

A. Method of Measurement

1. Sodding, in accordance with the following sod types, shall be measured for the actual square yards that are complete in place as required in the Contract Documents or as otherwise directed by MWA.

   a. Standard Varieties.

   b. Premium Varieties.

B. Basis of Payment

1. The unit price shall be compensation in full for all tools, equipment, labor, materials, and incidentals necessary for furnishing, placing, sowing, maintaining, and removing sodding.

2. No additional payment shall be made for maintenance of the sod, including additional installation or replacement.

3. Payment shall be compensation for all soil preparation and mulching performed as part of turf grass sodding activity.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnishing all the materials, perform all necessary excavation, and properly lay and test, at the locations indicated on the Contract Documents or directed, all storm drainage pipe and pipe appurtenances and specials of the sizes specified or indicated which are necessary for the proper completion of the Work.

1.2 Submittals

A. If required by MWA, the Contractor shall submit for approval:

1. All working drawings and schedules of materials and methods proposed to follow in the execution of the Work under this item. Submittals shall show in detail the size and location of all piping and accessories to be used in construction.

2. Samples, specifications, and manufacturer's recommendations for making joints Contractor proposes to use. No pipe shall be laid until approval has been given by MWA.

3. Shop drawings of transition joints between pipes of different materials which shall be accomplished by the use of adapters made especially for that purpose.

1.3 Warranty

A. The Contractor shall warrant for a period of twelve months from the date of final acceptance all lines, appurtenances, trenches, and other disturbed surfaces.

B. The Contractor shall be responsible for repairs to any leaking pipe, fittings, etc. Should trenches settle, Contractor shall promptly furnish and place fill to original grade. Should any leaks or trench settlement occur under the new pavement, the Contractor shall be held responsible for the cost of all repairs, including pavement replacement.

1.4 Handling and Transportation

A. Pipe shall be carefully transported, stored, and handled to prevent damage to the pipe. Damaged pipe shall be cause for rejection of the pipe. Pipe shall be stored in such manner as to keep the interior free of dirt or other foreign matter.

B. Stringing out of pipe more than two days in advance of installation shall not be permitted.

1.5 Storage

A. Store pipe on a flat surface so the barrel is evenly supported. Do not stack higher than 4 feet. For extended storage, plastic pipe must be covered with an opaque material to shield it from the sun's rays. Bells must be stacked in opposing directions on alternate rows, so they are not supporting the full load.

Part 2 Products

2.1 Flowable Fill

A. Provide in accordance with Specification 31 23 23.33 - Flowable Fill.

2.2 Smooth Lined Corrugated High-Density Polyethylene (HDPE) Pipe

A. Smooth Lined Corrugated High-Density Polyethylene Pipe shall meet the requirements of AASHTO M 294, Type S, and the GDOT Standard Specifications Section 845.

2.3 Reinforced Concrete Pipe (RCP)

A. RCP shall meet the requirements of ASTM C76/AASHTO M 170, and the GDOT Standard Specifications Section 843. RCP shall be minimum of Class III in accordance with GDOT Standard Detail 1030-D, Table No. 1, and shall be provided in lengths of not less than 8 feet each. All joints shall be bell and spigot or tongue and groove type with a rubber gasket conforming to ASTM C-443.

Part 3 Execution

3.1 Bedding

A. No pipe shall be brought into position until the preceding length has been thoroughly embedded and secured in place. The supporting of pipe on wood blocks, loose brick, or similar objects shall not be permitted. Defects due to settlement shall be corrected by the Contractor at its own expense.

B. For laying pipe in rock, the trench shall be made to conform to the general dimensions required, and the sub grade shall be brought to the required elevation by use of bedding materials. Sides and bottom of pipes shall be supported by compacting the bedding and backfill materials in place so as to ensure an even bearing for the pipe. Particular care shall be taken that pipes are not permitted to rest upon or against solid or projecting portions of rock.

C. Avoid contact between the pipe and mechanical compaction equipment. Do not use compaction equipment directly over the pipe until sufficient backfill has been placed to assure that such equipment shall not damage or disturb the pipe.

D. Bedding shall conform to the requirements shown in the Drawings.

3.2 Clean-Up

A. A thorough cleanup of the ground surface shall be made before final acceptance and final payment is made. All excess rock shall be removed, private and public property shall be restored to the general original condition, or in a manner approved by MWA, and all excess pipe and fittings shall be removed.

3.3 Connections

A. Connect to existing storm drainage structures by coring and drilling the existing structures in accordance with Specification 33 42 30 - Storm Drainage Structures.

3.4 Cutting

A. Whenever a pipe requires cutting, the pipe shall be cut in a satisfactory manner so as to leave a smooth end perpendicular to the axis of the pipe. The end shall then be beveled in accordance with manufacturer's recommendations for field beveling.

3.5 Final Inspection Preceding Acceptance

A. Final inspection may include a visual inspection of each section of pipe by looking from structure to structure with the aid of reflected sunlight or an electric light. Such light used for inspection shall be plainly visible from structure to structure. Light reflected along the pipe walls from structure to structure shall not be considered as plainly visible light and shall be reason for rejection of the section of pipe as not being laid true to line and grade. The pipe shall be true to both line and grade; shall show no leaks, shall be free from cracks and protruding joint materials and contain no deposits of sand, dirt, or other materials. All finished Work shall be neat in appearance of first-class workmanship.

3.6 Flowable Fill

A. Provide in accordance with Specification 31 23 23.33 - Flowable Fill.

3.7 Installation

A. The Contractor shall install pipe bedding and backfill in according to typical detail drawings and applicable design details in the Contract Documents or as indicated by MWA.

B. All pipe shall be thoroughly cleaned before being laid and shall be kept clean until acceptance of the completed Work. Proper and suitable tools and appliances for the safe and convenient handling and laying of pipes shall be used.

C. All trenches shall be kept free from water when pipe laying is in progress, and no water shall be allowed to rise within 12 inches of the bottom of the pipe until jointing is completed.

D. Jointing

1. When pipes are ready for jointing, bell interior and spigot surface shall be cleaned of all dirt and foreign matter, coated with manufacturer's approved lubricant, and pipes shoved home. Care shall be exercised after laying to prevent deflection or separation of the joint just made. All joints shall be made in the trench, and only one joint shall be made at a time.

2. When the joint is completed, the storm drainage piping shall have a smooth, unobstructed invert, and the pipe shall be true to grade and alignment. If the invert protrudes above the invert of adjacent pipe it shall be removed and replaced.

3. After the pipe has been properly bedded and joints made, backfill bedding materials shall be carefully tamped on each side and the centerline of the pipe between the walls of the excavation and the pipe before backfilling with excavated earth is done as specified in Specification 31 23 00 - Excavation and Fill.

4. Great care shall be used to prevent damage to or disturbing of joints during backfilling, or at any other time after the pipes have been laid and the joints have been made. There shall be no walking on or working over the pipe except as may be necessary in tamping, until there is cover no less than one foot in depth over the top of the pipe.

5. All joints showing leakage shall be uncovered and the joints remade at the Contractor's expense.

6. Laying Pipe in Freezing Weather: No pipe shall be laid upon a foundation in which frost exists, nor when MWA deems that there is a danger of the formation of ice or the penetration of frost at the bottom of the excavation.

E. Reinforced Concrete Pipe: Lay sections in a prepared trench with the socket ends pointing upstream. Join section using either rubber gasket or preformed flexible sealant, installed according to the manufacturer's recommendations. Pipe and specials shall be laid accurately to required lines and grades and shall be uniformly supported along their entire length. Bottoms of excavations shall be properly trimmed and bell holes dug for joints. Size of bell holes shall be kept to a minimum but shall be large enough to permit the proper making of joints.

F. Corrugated Polyethylene Pipe: Lay pipe according to Plan details with the perforations on the underside of the pipe, unless otherwise directed by MWA. Lay bell and spigot and tongue and groove pipe with the bell or grooved end upstream and the bells embedded in the classified stone. Firmly connect the joints. Connect pipe and butt joints securely, using the appropriate size and type of band or coupling.

G. Smooth Lined Corrugated High-Density Polyethylene Pipe, Type S: Install smooth-lined corrugated HDPE pipe according to ASTM D 2321. Use fitting and couplings that comply with the joint performance criteria of AASHTO Standard

Specifications for Highway Bridges, Division II. Ensure all joints are “silt tight” as stated in the AASHTO bridge specifications.

3.8 Pipe Invert Paving

A. Where shown on the Drawings, pave pipe inverts in accordance with the following:

1. Minimum paving thickness: 4 inches at pipe invert.

2. Taper in thickness towards sides.

3. Concrete invert paving shall cover all pipe areas that are rusted out but shall at a minimum meet minimum thickness as specified in this article.

3.9 Site Restoration

A. Replace or restore lawns and flower beds to equal or better than preconstruction conditions.

Part 4 Measurement and Payment

4.1 Reinforced Concrete Pipe

A. Method of Measurement: Reinforced concrete pipe pipe shall be measured for the actual linear feet installed in place, measured in the horizontal plane after the pipe has been connected.

B. Basis of Payment

1. The unit price shall be compensation in full for all tools, equipment, labor, materials, trenching excavation and backfill, and incidentals necessary to furnish and install pipe and connections, jointing materials, mastic fillers, stoppers, concrete work, testing and inspections as specified, indicated, or directed on the Contract Documents.

2. Any piping installed beyond the dimensions and location specified in the Contract Documents will be considered beyond the limits of measurement and will be considered incidental to the Work.

4.2 High Density Polyethylene Pipe

A. Method of Measurement: High density polyethylene pipe shall be measured for the actual linear feet of piping installed in place, in accordance with the type listed below and as measured in the horizontal plane after the pipe has been connected.

1. HDPE Single Wall, Corrugated.

2. HDPE Single Wall, Corrugated & Slotted.

3. HDPE Double Wall.

B. Basis of Payment

1. The unit price shall be compensation in full for all tools, equipment, labor, materials, trenching excavation and backfill, and incidentals necessary to furnish and install pipe and connections, jointing materials, mastic fillers, stoppers, concrete work, testing and inspections as specified, indicated, or directed on the Contract Documents.

2. Any piping installed beyond the dimensions and location specified in the Contract Documents will be considered beyond the limits of measurement and will be considered incidental to the Work.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnishing all materials, tools, labor, and equipment necessary to install precast concrete manholes, junction boxes, drop inlets, catch basins, headwalls, and appurtenances as detailed on the Drawings or Details, including excavation and foundation cushion, base sections, riser sections, cone and flat top, frame, cover, castings, coring and drilling for connections to existing structures, and all other incidentals required for the proper completion of this Work.

1.2 Submittals

A. If required by MWA, the Contractor shall submit for approval by MWA and any City transportation or public works department, as necessary, all working drawings and schedules of materials and methods proposed to follow in the execution of the Work under this item.

B. Submittals shall show in detail the size, location, dimensions, and accessories of all manholes to be used in construction. Include information for frames, covers, grates, sealants, connectors, waterproofing, steps, grout, and other materials required.

1.3 Quality Assurance

A. Should a product be brought to the site of the Work which are deemed unacceptable in quality by MWA, the Contractor shall at once remove the same and shall not offer that item again for inspection. No refurbished or repaired product specified herein shall be permitted for installation.

Part 2 Products

2.1 Precast Stormwater Manholes

A. Precast stormwater manholes shall be in accordance with GDOT Standard Specifications Sections 668 and 866.

2.2 Precast Junction Boxes

A. Precast stormwater junction boxes shall be in accordance with GDOT Standard Specifications Sections 668 and 866.

2.3 Manhole Frames and Covers

A. Manhole frames and covers shall be non-traffic rated or traffic rated as called for by MWA.

B. Manhole Frames and Covers shall be in accordance with GDOT Standard Specification Section 854.

2.4 Precast Drop Inlets

A. Precast stormwater drop inlets shall be in accordance with GDOT Standard Specifications Sections 668 and 866.

2.5 Precast Catch Basins

A. Pre-cast stormwater catch basins shall be in accordance with GDOT Standard Specifications Sections 668 and 866.

2.6 Headwalls

A. Headwalls may be precast concrete or cast-in-place concrete, as required on the plans or directed by MWA.

B. Precast concrete headwalls shall be fabricated in accordance with the following:

1. Concrete: 4,000 psi minimum 28-day compressive strength.

2. Reinforcing Bars: ASTM A 615, Grade 60.

3. Reinforcing Wire: AASHTO M 32 and AASHTO M 225, sized in accordance with plans or approved shop drawings as applicable.

4. Welded Wire Fabric: AASHTO M 55 and AASHTO M221, sized in accordance with plans or approved shop drawings as applicable.

C. Cast-in-place concrete headwalls shall be constructed to the dimensions as shown on the Drawings or Details in accordance with Specification 03 30 00 - Cast-In-Place Concrete. Concrete mixed onsite is prohibited for use in headwalls.

2.7 Brick Structures

A. Brick structures shall conform to the following, as applicable:

1. GDOT Standard Specifications 668 and 608.

2. GDOT Standard Detail 1011A.

2.8 Steps

A. Steps in Storm Drain Structures shall be equal to MA Industries # PS1 PF and shall be built into the precast concrete bases, risers and cones of the manholes as specified below.

2.9 Flared End Sections

A. Flared end sections shall be of the following types:

1. Concrete flared end sections shall conform to GDOT Standard Detail 1120.

2. Safety flared end sections shall conform to GDOT Standard Detail 1122.

3. Corrugated metal flared end sections shall conform to GDOT Standard Detail 1120.

Part 3 Execution

3.1 General

A. Manhole coring shall include all work to core and drill into an existing manhole or structure. The manhole coring shall not be backfilled until approved by MWA. Manholes must be cored using an industry standard coring machine and shall not be performed using any type of hammer, chisel, jackhammer, or other method.

B. Manholes in un-maintained areas shall be 18-inches above finish grade and in maintained areas “flush” with ground.

C. Cast manhole frames and covers shall include all manhole frames, covers, and brick work used in conjunction with pre-cast or cast-in-place concrete manholes or subsurface chambers.

D. Abandon existing structures by entirely removing and disposing of such structures.

3.2 Construction

A. Install precast concrete drainage structures in accordance with GDOT Standard Specification Sections 668 and 866.

B. Install cast in place concrete flume structure and flume structures with stone inlay in accordance with GDOT Standard Specification Sections 668 and 866.

C. Install brick structures in accordance with GDOT Standard Specifications 608 and 668.

D. Install French drain and other LID/BMP stormwater drainage features as specified within the Contract Documents or as specified by MWA.

E. Construction shall conform to the Drawings or Details.

3.3 Materials and Workmanship

A. All materials shall be new. All Work shall be performed and finished in a workmanship manor. The precast concrete structures, rings and covers, and other materials shall

conform to the standards specified in this section. Structures shall rest on a crushed stone base of a minimum of 12-inch thickness. Structures shall have a proper cut out, shape, and coring to fit the associated valve, pipe, or facility.

3.4 Frames and Covers

A. Traffic rated frames and covers shall be properly set in place in full bed of mortar and adjusted to make the top of the frame conform to the finished surfaces when located in street and public highways. In other locations, frames and covers shall adjusted to conform to such elevations as are indicated on the Drawings or as required elsewhere.

B. Manhole frames and covers in wooded, sloped, or non-maintained areas shall be a minimum of 18 inches above ground level and the frame shall be cast into the concrete cone. Manhole frames and covers in maintained grass areas shall be flush with the finished grade. Manhole frames and covers on sloped ground in unmaintained areas shall be a minimum of 18 inches above ground as measured on the uphill side of the manhole. Manhole frames shall be affixed to the associated structure with bolts or permanently with grout.

3.5 Steps

A. The uppermost step shall not be over twelve inches below the manhole frame top and these steps shall be continued downward along the interior vertical side of the manhole to a point no lower than the crown of the pipe. All steps shall be built into the precast concrete products in a manner satisfactory to MWA and shall be spaced not more than twelve inches apart. Steps shall be placed directly above each other and not staggered.

3.6 Paved Ditches

A. The Contractor shall construct paved ditches with a minimum of 4-inches of Class A Concrete.

B. Paved ditches shall be reinforced with minimum 6x6 welded wire fabric with expansion joints spaced at 30-foot maximum and construction joints at 10-foot maximum.

C. A drop section shall be constructed on both ends of the ditch to a depth of two feet.

D. Ditch shall be construction to a minimum of twelve inches depth with 2:1 side slopes or as otherwise shown or directed.

3.7 Adjusting Manhole Frame and Cover to Grade

A. Where indicated on the Drawings and/or directed by MWA, the Contractor shall adjust the elevation of manhole frames and covers to be flush with the proposed finished grade. The Contractor shall use brick and mortar or precast concrete grade rings to raise the frame and cover to the correct elevation and re-grout the frame in place to secure it to the manhole. In no case, shall more than four courses of brick or four

grade rings be used for adjustment. If adjustment requires more than four courses, a new manhole riser section shall be installed below the top cone section and the frame and cover adjusted thereafter.

Part 4 Measurement and Payment

4.1 Concrete Flared End Sections

A. Method of Measurement: Concrete flared end sections, standard type and safety type, shall be measured by the actual number installed as shown in the Contract Documents or as directed by MWA.

B. Basis of Payment: The unit price shall be compensation in full for all tools, equipment, labor, materials, excavation, bedding, backfill, installation of flared end sections, and incidentals necessary to complete the Work.

4.2 Corrugated Metal Flared End Sections

A. Method of Measurement: Corrugated metal flared end sections, standard type and safety type, shall be measured by the actual number installed as shown in the Contract Documents or as directed by MWA.

B. Basis of Payment: The unit price shall be compensation in full for all tools, equipment, labor, materials, excavation, bedding, backfill, installation of flared end sections, and incidentals necessary to complete the Work.

4.3 Concrete Flume

A. Method of Measurement: Concrete Flume shall be measured by the actual cubic yards installed in place.

B. Basis of Payment

1. The unit price shall be compensation in full for all tools, equipment, labor, materials, excavation, bedding, backfill, concrete, finishing, and incidentals necessary to furnish and install concrete flume and testing and inspections as specified, indicated, or directed on the Contract Documents.

2. Any constructed concrete flume beyond the dimensions and location specified in the Contract Documents will be considered beyond the limits of measurement and will be considered incidental to the Work.

4.4 Concrete Flume with Stone Inlay

A. Method of Measurement: Concrete Flume with Stone Inlay shall be measured by the actual cubic yards installed in place.

B. Basis of Payment

1. The unit price shall be compensation in full for all tools, equipment, labor, materials, trenching excavation, bedding, backfill, concrete, finishing, and incidentals necessary to furnish and install concrete flume and testing and inspections as specified, indicated, or directed on the Contract Documents.

2. Any installed concrete flume beyond the dimensions and location specified in the Contract Documents will be considered beyond the limits of measurement and will be considered incidental to the Work.

4.5 Headwall, Various Pipe Sizes

A. Method of Measurement: Cast-in-place concrete and pre-cast concrete headwalls shall be measured by the actual number of headwalls installed in place as shown in the Contract Documents or as directed by MWA.

B. Cast-in-place concrete shall be installed in accordance with Section 03 30 00 - Cast-In-Place Concrete. Concrete mixed onsite is prohibited for use in headwalls.

C. Basis of Payment: The unit price shall be compensation in full for all tools, equipment, labor, materials, excavation, bedding, backfill, installation of headwall, grouting, and incidentals necessary to complete the Work.

4.6 Brick Catch Basin, Group 1 or 2 (GDOT 1010/1013)

A. Method of Measurement: Complete Brick Catch Basins, Group 1 or 2, shall be measured by the actual vertical foot installed in place as measured from invert to top elevation, in accordance with the Group Type, as shown in the Contract Documents or as directed by MWA.

B. Basis of Payment: The unit price shall be compensation in full for all tools, equipment, labor, materials, excavation, backfill, bedding, frames and covers, brick masonry, top and bottom slabs, and incidentals required to complete the Work.

4.7 Precast Catch Basin, Group 1 or 2 (GDOT 1010/1013)

A. Method of Measurement: Complete Precast Catch Basins, Group 1 or 2, shall be measured by the actual vertical foot installed in place as measured from invert to top elevation, in accordance with the Group Type, as shown in the Contract Documents or as directed by MWA.

B. Basis of Payment: The unit price shall be compensation in full for all tools, equipment, labor, materials, excavation, backfill, bedding, frames and covers, brick masonry, top and bottom slabs, and incidentals required to complete the Work.

4.8 Replacement Top for Catch Basin

A. Method of Measurement: Replacement Tops for 1033/1034 Catch Basins and cast-in-place tops shall be measured by the actual number of replacement tops installed in place in accordance with each catch basin type.

B. Cast-in-place concrete shall be installed in accordance with Section 03 30 00 - Cast-In-Place Concrete.

C. Basis of Payment: The unit price shall be compensation in full for the excavation, backfill, bedding, frames and covers, precast concrete top slabs, and all other labor, materials, equipment, and incidentals required to complete the Work.

4.9 Brick Manhole, Type 1 or 2 (GDOT 1011A)

A. Method of Measurement: Brick Manholes, Type 1 or 2, shall be measured by the actual vertical linear foot installed in place as measured from invert to top elevation in accordance with the manhole type.

B. Basis of Payment: The unit price shall be compensation in full for the excavation, backfill, bedding, frames and covers, manhole bases, brick masonry, and top slabs, and all other labor, materials, equipment, and incidentals required to complete the Work.

4.10 Precast Manhole, Type 1 or 2 (GDOT 1011A)

A. Method of Measurement: Precast Manholes, Type 1 or 2, shall be measured by the actual vertical linear foot installed in place as measured from invert to top elevation in accordance with the manhole type.

B. Basis of Payment: The unit price shall be compensation in full for the excavation, backfill, bedding, frames and covers, manhole bases, wall sections, and top slabs, and all other labor, materials, equipment, and incidentals required to complete the Work.

4.11 Manhole Covers

A. Method of Measurement: Manhole covers shall be measured by the actual number of frames and covers installed in place.

B. Basis of Payment

1. The unit price shall be compensation in full for the furnishing and installing manhole covers, frames, brick work or riser rings required to adjust the rim elevation, grouting, excavation and backfill, concrete, and all other labor, materials, equipment, and incidentals required to complete the Work.

2. Payment for manhole covers under this item shall be limited to replacement of frames and covers on existing structures only. Frames and covers on new structures shall be included in the cost of the new structure and shall not be measured or paid for separately.

4.12 Brick Drop Inlet, Group 1 or 2 (GDOT 1019A/9031S/9031D)

A. Method of Measurement: Complete Brick Drop Inlets, Group 1 or 2, shall be measured by the actual vertical linear foot installed in place as measured from the invert to the

rim/throat elevation.

B. Basis of Payment: The unit price shall be compensation in full for the excavation, backfill, bedding, frames and castings, structure bases, brick masonry, and top slabs, and all other labor, materials, equipment, and incidentals required to complete the Work.

4.13 Precast Drop Inlet, Group 1 or 2 (GDOT 1019A, GDOT 9031S/9031D)

A. Method of Measurement: Complete Precast Drop Inlets, Group 1 or 2, shall be measured by the actual vertical linear foot installed in place as measured from the invert to the rim/throat elevation.

B. Basis of Payment: The unit price shall be compensation in full for the excavation, backfill, bedding, frames and castings, structure bases, wall sections, and top slabs, and all other labor, materials, equipment, and incidentals required to complete the Work.

4.14 Replacement Top for Drop Inlet, Various Types

A. Method of Measurement: Replacement Tops for Drop Inlets (GDOT Type 1019A, and GDOT 9031S/9031D) shall be measured by the actual number of replacement tops installed in place in accordance with inlet type.

B. Basis of Payment: The unit price shall be compensation in full for the excavation, backfill, bedding, frames and castings, precast concrete top slabs, and all other labor, materials, equipment, and incidentals required to complete the Work.

4.15 Replacement Throat

A. Method of Measurement: Replacement cast-in-place throats shall be measured by the actual number of replacement throats installed in place.

B. Cast-in-place concrete shall be installed in accordance with Section 03 30 00 - Cast-In-Place Concrete.

C. Basis of Payment: The unit price shall be compensation in full for the excavation, backfill, bedding, and all other labor, materials, equipment, and incidentals required to complete the Work.

4.16 Connect to Existing Structure

A. Method of Measurement: Connect to Existing Structure shall be measured by the actual number of occurrences where tie-ins occur. The cost of the piping connection to a new structure shall be included in the unit price of the pipe that is to be connected.

B. Basis of Payment: The unit price shall be compensation in full for the excavation, backfill, bedding, frames and castings, and all other labor, materials, equipment, and

incidentals required to complete the Work.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnishing all labor, equipment, and materials necessary to maintain traffic control during construction and/or employ off duty police/safety officers to aid in traffic control.

B. Traffic control operations, equipment, materials, signs, and other required items shall conform to the requirements of the Manual of Uniform Traffic Control Devices (MUTCD).

1.2 Traffic Control Classifications

A. Major: Major Traffic Control includes, but is not limited to, maintenance of traffic that warrants the use of detour plans or overnight protection, the use of barricades, barrels, portable electronic message boards, crash trucks, arrow boards, changes to normal traffic flow of duration longer than a normal working day. All work zones in the following conditions shall be considered Major Traffic Control:

1. Road Closures requiring planned detours.

2. State Routes.

3. On all roadways designated as Major Collector and above in accordance with the County Classification.

B. Minor: Minor Traffic Control is limited to maintenance of traffic operations performed under very light traffic flows and accomplished with portable signs and flagmen. All work zones in the following conditions shall be considered Minor Traffic Control:

1. Residential streets.

2. Minor Collectors as designated by County Public Works.

1.3 Submittals

A. If required by MWA, submit a proposed traffic control plan to follow in the execution of the Work under this section of the specifications for approval from MWA, the County road department, and GDOT when work is within a state road right-of-way.

Part 2 Products

(NOT USED)

Part 3 Execution

3.1 Worker Safety Apparel

A. All workers within the right-of-way who are exposed to traffic or to work vehicles and construction equipment shall wear high-visibility safety apparel that meets the performance class for the risk exposure.

3.2 Maintaining Traffic

A. All working operations of the Contractor and its subcontractors, suppliers and employees must be performed to provide the free and unobstructed use of the highway, and structures encountered in the prosecution of the Work under this item.

B. The Contractor shall proceed with the Work in such manner as shall permit regular transaction of business by the public roadway users and/or property owner without delay or danger to life or property, and shall place necessary barricades, warning signs, signals, lights, and if necessary, watchmen for the protection of the traveling public.

3.3 Traffic Control

A. When directed by MWA, under supplemental work, off duty police officers shall be utilized to assist in maintaining traffic control and providing a safer work zone for the Contractor and MWA employees. This use of police officers shall be required when directed, in areas of high traffic volume, installation in roadways, road closures, and lane closures or in areas of low visibility.

B. MWA will determine when and how many police officers shall be needed to complete the Work depending on the situation. However, the police officer on-site may request, through MWA, for additional officers to be engaged.

C. When directed by MWA, the Contractor shall contact the appropriate agency to schedule the police officers. Arrangements for police officers must be made a minimum of forty-eight hours prior to the Work to allow time for officers to be scheduled.

D. Where construction will impact signalized intersections, coordinate with the entity responsible for operating the signal system to ensure safe adjustment of the signal cycling and proper restoration of any disturbances or damage to the signalization equipment and/or traffic loops.

Part 4 Measurement and Payment

4.1 General

A. Steel plates used to open travel lanes are to be included as incidental in the work of both Major and Minor Traffic Control.

B. Mobile electronic detour signs used to redirect traffic are to be included as incidental in the work of both Major and Minor Traffic Control.

C. No separate measurement and payment shall be made for any Work performed or material used for this section. Full compensation for such work shall be considered as incidental to other items of Work. Costs in connection therewith shall be considered a subsidiary obligation of the Contractor and shall be included in the overall cost of the work.

END OF SECTION

Part 1 General

1.1 Summary

A. Section includes furnishing all materials for, and properly restore to the satisfaction of MWA, all pavements, parking areas, driveways, sidewalks and curbs, of whatever construction and irrespective of the type, which may be required to be removed, damaged or disturbed in the progress of Work required under this Contract.

B. Work under this section shall include in general, but without limitation, all necessary concrete, reinforcing steel, stone, gravel, asphalt and other bituminous material necessary for the proper completion of the Work as may be required, directed, or as specified herein.

1.2 Submittals

A. If requested by MWA, submit for approval to MWA and other jurisdictions having authority all working drawings and schedules of materials and methods proposed to follow in the execution of the Work under this section of the specifications. Such may include samples, manufacturer's product data, test reports, and material certifications as required in reference sections for concrete, joint fillers, and sealers.

1.3 Roadway Permits

A. The Contractor's attention is called to the requirements that Contractor must obtain all road opening permits from GDOT or county road department and must assist MWA in obtaining all permits required by GDOT.

B. All fees shall be borne by the Contractor.

Part 2 Products

2.1 General

A. Materials and products for asphalt and other bituminous paving shall comply with GDOT Standard Specifications.

B. Concrete and joint filler shall meet the requirements of Section 32 16 00 – Curbs, Gutters and Sidewalks. Steel welded wire reinforcement shall meet the requirements of GDOT Standard Specifications Section 853.2.07.

Part 3 Execution

3.1 General

A. The Contractor's attention is directed to the provisions of Section 31 23 00 - Excavation and Fill, requiring special backfill material and compaction of backfill under

areas to be paved. Any settlement which may occur during the warranty period shall be corrected at the Contractor's expense including repaving and/or replacing of streets, curbs, gutters, parking areas, and driveways which settle during the warranty period.

B. The Contractor shall repave all areas over excavations in public streets as defined below promptly after completion of backfill to provide full use of the street with a minimum of delay.

C. Should settlements, cracks, or other indications of failure appear in adjoining pavements, the adjoining paving shall be removed to the extent necessary to secure firm, undisturbed bearing, and shall be relayed in a satisfactory manner.

D. When directed by MWA, the Contractor shall backfill the entire excavation under a paved surface with aggregate material as specified in Section 31 05 16 – Aggregates for Earthwork as selected by MWA.

E. Where necessary to cut a sidewalk, driveway, or parking area, entire slabs or squares shall be removed and replaced, unless otherwise directed by MWA.

F. The Contractor shall replace all sidewalks removed or disturbed by the Contractor in the process of the Work. Sidewalks shall be constructed to the same dimensions and materials as were originally placed. The subbase shall be thoroughly compacted and shall be wetted just before the concrete is placed but shall show no pools of water.

G. The Contractor shall restore all curbs and combination curbs and gutters which have been removed or disturbed in the progress of the Work. Curbs and gutters shall be made to conform accurately in size, line, grade, and materials with the adjoining. In restoring curbs and gutters, the subsoil and foundation material shall be well compacted so as to prevent any settlement of new concrete.

H. The Contractor shall adjust all manhole frames and covers and valve boxes to final grade.

3.2 Materials and Workmanship

A. Materials to be used in the repair and restoration of pavements, drives, sidewalks, and curbs shall be first quality. All materials removed during the excavation of the Work shall be disposed of by the Contractor as specified elsewhere in these Contract Documents. All workmanship shall be first class.

3.3 REMOVING PAVEMENT

A. General: Remove existing pavement as necessary for installing the pipe line and appurtenances.

B. Marking: Before removing any pavement, mark the pavement neatly paralleling pipe lines and existing street lines. Space the marks the width of the trench.

C. Breaking: Break asphalt pavement along the marks using pavement shearing

equipment, jack hammers or other suitable tools. Break concrete pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.

D. Machine Pulling: Do not pull pavement with machines until the pavement is completely broken and separated from pavement to remain.

E. Where milling is shown to be performed as a method of pavement removal, milling shall be performed to the depth and width of which pavement resurfacing is required as shown on the Drawings. The widths shown are minimum dimensions and the Contractor may elect to mill at a wider dimension to suit the equipment. If milling is performed at a wider dimension than shown, resurfacing courses shall be installed to account for the additional pavement removed.

F. Damage to Adjacent Pavement: Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.

G. Sidewalk: Remove and replace any sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.

H. Curbs: Tunnel under or remove and replace any curb disturbed by construction to the nearest undisturbed joint.

3.4 Restoring Curbs, Gutters, And Sidewalks

A. Restore curbs, gutters and sidewalks as specified in Section 32 16 00 – Curbs, Gutters, Sidewalks.

3.5 Restoring Driveway and Parking Area Pavements

A. The Contractor shall restore driveway and parking area pavements removed or disturbed during construction. After the pipe, has been laid, appurtenant work constructed and backfill completed, the Contractor shall furnish, place and maintain wherever the pavements have been removed or damaged in the pursuit of the Work, bituminous concrete surfaces, stone surfaces, concrete surfaces as indicated or shown on the Drawings. Driveways and parking areas shall be constructed to the thickness of the existing, but concrete shall not be less than 4 inches thick. Surface finish is to match existing; edges to be sawn vertically; expansion joints to be used as directed. In general, Concrete driveways shall be replaced ten feet from back of curb or to the closet expansion joint. The limits of this restoration shall be approved/agreed upon by MWA for payment quantities.

B. Concrete driveways and parking areas shall be constructed with steel welded wire reinforcement and provided with contraction joints and joint fillers in accordance with Section 32 16 00 – Curbs, Gutters and Sidewalks.

3.6 Restoring Roadway Pavements

A. The Contractor shall restore roadway pavements removed or disturbed during construction. After work in excavated paved areas is complete, appurtenant work constructed, and backfill completed, the Contractor shall furnish, place, restore and maintain wherever the pavements or road surfaces have been removed or damaged in the pursuit of the Work, bituminous concrete roadways, stone road surfaces, bituminous concrete over concrete base, and complete bituminous concrete roadway resurfacing as indicated or shown on the Drawings.

B. All roadway restoration shall be performed in accordance with the requirements of the authorities within whose jurisdiction such pavement is located. All highway utilities and traffic controls are to be maintained, and Work shall conform to the rules and regulations of MWA, including the use of standard signs. The Contractor shall provide all such bonds or checks, which may be required by the highway authorities to ensure proper restoration of paved areas, at no cost to MWA. All road closures and detours must be submitted and approved with the authorities within whose jurisdiction they are located.

C. The Contractor shall resurface the entire street from curb to curb, or any other area designated by MWA. Bituminous concrete paving shall conform to GDOT requirements.

D. If, prior to the expiration of the warranty period, the bituminous concrete pavements or stone road surfaces within the lines of excavation or adjacent thereto, shall have been damaged or injured, due to undermining, or for any other cause which may be attributed to the Work of the Contractor, then the Contractor shall remove such damaged surfaces, foundations of same, and all loose earth. Contractor shall then backfill with sand properly rammed and furnish, place, and maintain a bituminous concrete pavement or stone road surface until such time as the final acceptance of the Work.

E. Bituminous concrete pavements or stone road surfaces, which the Contractor is required to replace shall, at the expiration of the warranty period be in at least as good condition as at the time of awarding the Contract, less normal expected wear.

F. Work which the Contractor may perform associated with opening up or replacing of pavements, or stone road surfaces, shall be performed at its own expense, in accordance with the rules and requirements of the authority within whose jurisdiction such pavement is located, and in accordance with the additional requirements of the Specifications, and the Contractor shall furnish evidence to MWA that the Work has been completed to the satisfaction of such authority.

G. All cuts shall be made by channeling machine, by pneumatic tools, or by such other methods as shall furnish a clean cut in the pavement and pavement base without undue shattering.

3.7 Roadway Appurtenances

A. Resetting Highway Signs: The Contractor shall reset all disturbed highway signs in

accordance with the applicable GDOT standards and specifications. The Contractor shall preserve and protect all disturbed signs during construction. Any damage to signs shall be either repaired at the Contractor's expense, or the damaged signs replaced in like and kind with new materials at no additional cost to MWA.

B. Traffic Striping, General and Gore Area: The Contractor shall restripe all disturbed pavements to meet preconstruction conditions. Striping shall be thermoplastic materials conforming to the applicable GDOT specifications or as otherwise called for in the Contract Documents.

C. Raised Traffic Markers: The Contractor shall replace all disturbed raised traffic markers in like and kind with new materials.

Part 4 Measurement and Payment

4.1 General

A. The Unit Prices for all paving and curbing items, shall include bituminous concrete repaving and/or relaying of roadways, parking areas, driveways, curbs, gutters, and sidewalks which settle during the warranty period.

B. No additional payment shall be made for excavation or disposal of excavated material required for placement or removal of backfill placed above the foundation of the pavement and for preparation of sub grade, and the cost thereof shall be considered as being included in the Unit Prices for paving and curbing items.

C. If the Contractor chooses to use uncased bores for crossing driveways, without the prior written approval of MWA, compensation will be made using the unit price for Driveway Restoration based on the allowable trench width for the respective size pipe installed.

D. Payment for replacing of pavements or stone road surfaces shall not be made until such evidence is presented that the Work has been completed to the satisfaction of the authority having jurisdiction.

4.2 Street Cut

A. Method of Measurement

1. Street cuts, in accordance with the detail types listed in the Unit Price Schedule, shall be measured for the actual linear feed of street cut surface area as shown in the Contract Documents or as otherwise directed by MWA.

2. Any damage or replacement beyond the specified limits of these items shall be the responsibility of the Contractor and shall not be measured for payment.

3. No additional measurement for payment will be made for temporary pavement, and the cost thereof shall be considered as being incidental to the Work of this Contract.

B. Basis of Payment

1. The unit price shall be compensation in full for all saw cuts, subbase, base course, and surface course pavements, concrete, prime and tack coats, compaction, resetting roadway and highway signs, permit fees, maintenance charges and inspection fees required by all road departments and the furnishing of all materials, labor, tools, and appliances necessary to complete the Work as herein specified, shown or ordered.

2. Included shall be the costs of excavation beyond trench width to provide firm foundation, graded aggregate base backfill, and any costs of furnishing necessary work beyond the limits of measurement as defined under these specifications.

3. Removal, handling, hauling, and disposal of existing roadway material will be paid according to Section 02 42 00 - Removal Of Waste Material.

4.3 Driveway/Parking Area Restoration

A. Method of Measurement

1. Driveway restoration, in accordance with the various thicknesses listed in the Unit Price Schedule, shall be measured for the actual square yards of driveway or parking area pavement surface area as shown in the Contract Documents; except in the instance where entire squares or slabs have been removed under direction of MWA.

B. Basis of Payment

1. The unit price shall be compensation in full for all permit fees, maintenance charges and inspection fees required by all road departments and the furnishing of all materials, labor, tools, and appliances necessary to complete the Work as herein specified, shown or ordered.

2. Included shall be the costs of excavation beyond trench width to provide firm foundation, crusher run backfill, and any costs of furnishing necessary work beyond the limits of measurement as defined under these specifications.

3. Removal, handling, hauling, and disposal of existing driveway material will be considered incidental to this pay item and no additional compensation will be made.

END OF SECTION

BARGE
DESIGN SOLUTIONS

2839 Paces Ferry Road SE, Suite 850
Atlanta, GA 30339
(770) 628-7631

bargedesign.com