



# Port Wentworth Fire Station

POND JOB NO: 1230237

## Project Manual

Construction Documents – Issued for Bidding  
VOLUME 3 of 3  
Civil/ Site Specifications



1230237 PORT WENTWORTH FIRE STATION

CONSTRUCTION DOCUMENTS

09/07/2023

ISSUED FOR BIDDING

(The remainder of this page left blank intentionally)

**TABLE OF CONTENTS**

		<b><u>PAGE NUMBERS</u></b>		
<b>TECHNICAL PROVISIONS</b>				
023000	Subsurface Investigation	023000-1	-	023000-1
030000	Concrete	030000-1	-	030000-10
101453	Traffic Signage	101453-1	-	101453-3
310000	Earthwork	310000-1	-	310000-5
312500GA	Erosion and Sedimentation Controls (GA)	312500GA-1	-	312500GA-14
313700	Rip-Rap	313700-1	-	313700-3
321123	Aggregate Base Courses	321123-1	-	321123-5
321216GA	Asphalt Paving	321216GA-1	-	321216GA-6
321723.13	Painted Pavement Markings	321723-1	-	321723-4
331000	Water Utilities	331000-1	-	331000-20
333000	Sanitary Sewerage Utilities	333000-1	-	333000-27
334000	Storm Drainage Utilities	334000-1	-	334000-14
334726.15	Bioretention Facilities	334726.15-1	-	334726.15-6

SECTION 002300 - SUBSURFACE INVESTIGATION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section includes subsurface data logs for information only.

1.2 SOIL INVESTIGATION DATA

- A. Subsurface data logs are available for information only. Actual conditions may vary. If bidders are not satisfied with accuracy and completeness of all available data, they are at liberty to make borings or perform soil investigation work for their own use at its expense. If Contractor chooses to perform their own investigation, work shall be coordinated with the Engineer. Any results from Contractor's investigation shall be shared promptly with the Engineer. Owner reserves the right to share Contractor's investigation data with other potential bidders if information could affect bidding process.
- B. The boring logs and test results are for information of the Contractor. Owner and Engineer assume no responsibility for the information.

PART 2 – PRODUCTS

See attached report.

PART 3 – EXECUTION

None this Section.

END OF SECTION

Our ref: 12610450-00 | City of Port Wentworth Fire Station

June 05, 2023

Mr. Steven Davis  
City of Port Wentworth  
7224 GA Highway 21  
Port Wentworth, Georgia 31407

## Report of Subsurface Exploration and Geotechnical Evaluation

Dear Mr. Davis

**GHD** is pleased to present the results of our subsurface exploration and geotechnical evaluation for the above-referenced project. Our services were performed in general accordance with our Proposal No. 12610450 dated May 15, 2023.

## 1. Site Description / Project Understanding

GHD received project information via email and telephone correspondence with Mr. Kevin Smith, P.E. of Thomas & Hutton that included a preliminary exhibit titled 'Initial Geotech Boring Locations, Port Wentworth Park' prepared by Thomas & Hutton, dated April 26, 2023, which provides specified test locations and coordinates for those locations. According to the exhibit provided, the project site is located within the northwestern portion of the future Port Wentworth Recreation Park within the City of Port Wentworth, Georgia, and includes the portion of the northern entrance road to the park from GA Highway 30 leading to and in front of the subject site. At the time of our fieldwork, the project site was heavily wooded.

It is our understanding that the project site is proposed to be developed to support a fire station with associated paved parking and driveway areas and underground utilities. The purpose of the geotechnical site investigation and evaluation was to provide 1) site preparation and foundation design recommendations for the proposed fire station building (including potential 'static' settlement estimates, seismic design parameters and potential liquefaction including settlement estimates), and 2) site preparation and preliminary cross-section design recommendations for concrete and asphalt pavements.

We have assumed for the purpose of our analyses that the structure will be constructed of structural steel framing with either metal stud walls and exterior metal wall panels or concrete masonry unit (CMU) walls. We have assumed that the structure will be supported on shallow foundation systems having isolated and/or continuous foundation loads not exceeding 60 kips and 3.0 kips, respectively. Further, we have assumed that fill thickness of up to approximately 3 to 4 feet will be required in order to bring the proposed building portion of the site to final subslab elevation. We further anticipate that top of pavement elevations will be on the order of 2 to 3 feet higher than the existing ground surface.

## 2. Subsurface Explorations

Our scope of services has included three (3) soil test borings, within the approximate proposed building footprint, and eight (8) hand-auger borings dispersed within the proposed pavement and entrance areas. A GHD professional transferred the coordinates on the provided documents to hand-held global positioning unit (GPS) devices which were utilized in the field to locate the exploration locations. Given the method of locating the explorations in the field, the locations indicated on **Figure 1** should be considered approximate. Details of the explorations performed are provided in the sections that follow.

### 2.1 Soil Test Borings

The three soil test borings (designated B-1 through B-3) were performed within the approximate footprint of the proposed structure on May 24, 2023. As current International Building Code (IBC) requirements dictate that the geotechnical evaluation/foundation design process include a seismic analysis; which requires at least one boring be performed to sufficient depth to provide the necessary subsurface soils parameter information, one of the borings (B-2) was performed to a depth of 50 feet below the existing ground surface. The remaining two borings (B-1 and B-3) were advanced to a pre-determined termination depth of 25 feet.

The soil test borings were advanced utilizing mud rotary drilling methods. Closely spaced soil sampling was performed in the upper ten feet and at five-foot intervals thereafter in each boring. During the sampling procedure, Standard Penetration Tests (SPT's) were conducted in general accordance with ASTM D1586 to obtain the standard penetration value of the soil. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling thirty inches, required to advance the split spoon sampler one foot. The sampler is lowered to the bottom of the drill hole and the number of blows recorded for each of three successive increments of six inches penetration. The "N" value is obtained by adding the second and third incremental values. The "N" values are reported on each boring log. The results of the SPT testing indicate the relative density and comparative consistency of the soils, and thereby provide a basis for estimating relative strength and compressibility of the soil profile components. The logs of each of the soil test borings are presented as **Appendix A, Soil Test Boring Logs**.

### 2.2 Hand-Auger Borings

The eight hand-auger borings (designated HA-1 through HA-8) were performed on May 22, 2023. The hand-auger borings were manually advanced to depths of approximately 4 feet below the existing ground surface using a steel auger. The soils encountered were examined by retrieving samples of the auger cuttings at regular depth intervals during boring advancement. Our personnel visually classified the soils encountered in the field. The logs of the hand-auger borings are presented as **Appendix B, Hand-Auger Boring Logs**.

### 2.3 Soil Sample Handling

The soil samples obtained from the explorations were placed in individual containers, properly sealed and marked for identification. The soils samples were then transported to our laboratory for analysis and classification by a GHD professional in general accordance with ASTM D2487 (Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)).

### 2.4 Laboratory Analyses

Selected samples of the soils collected from the borings were tested in our laboratory to determine their percent fines (ASTM D1140), natural moisture content (ASTM D2216), and Atterberg limits (ASTM D4318). The laboratory data was used to aid in the classification of the soils in accordance with ASTM D2487 and to further define their engineering properties. The laboratory test results are presented on the soil test boring logs and hand-auger boring logs in **Appendices A and B**.

### 3. Subsurface Conditions Encountered

#### 3.1 Stratigraphy

A GHD professional developed the final boring log information from the field boring logs and visual review of the recovered soil samples in our laboratory. Similar soils were grouped into strata, with each stratum described in general accordance with the nomenclature used in ASTM D2487. Although indicated on the boring logs as distinct changes, the transition from one soil type or stratum to another may be gradual or may occur at slightly differing elevations than indicated between soil samples. Soil conditions may also vary from our findings at locations in areas of the site not explored.

For reference, a generalized stratigraphic profile developed from the explorations is provided in **Table 1**. For a more detailed description, please refer to the Appendices to this report. The logs include the SPT “N” values (where applicable), Unified Soil Classification System (USCS) symbols and groundwater levels at the time of our study.

**Table 1** Generalized Stratigraphic Profile

Approximate Depth Below Ground Surface (feet)	Material Description	Relative Density / Consistency from SPT Testing
0 to 2	Up to 8 inches TOPSOIL / Very clayey and silty fine SAND (SC, SM)	Loose to Medium Dense
2 to 8	Fine sandy clay (CL, CH) and clayey fine SAND (SC)	<u>Varies</u> : Stiff to Very Stiff / Medium Dense
8 to 42	<u>Varies</u> : Fine SAND with trace to moderate amounts of silt / clay (SP, SP-SM, SM, SC) / Fine sandy CLAY (CL)	<u>Varies</u> : Very Loose to Medium Dense / Stiff to Very Stiff
42 to 50	Silty fine SAND (SM)	Dense to Very Dense

#### 3.2 Groundwater

Groundwater was measured to be at approximately 3.5 to 4 feet below the ground surface after a stabilization period of approximately 5 days. *Please note that the stabilization readings were performed after a heavy rainfall event.* We expect groundwater levels will fluctuate depending upon recent rainfall intensity and duration, the season, and other temporary factors.

### 4. Conclusions and Recommendations

The following conclusions and recommendations are based on the assumed general project characteristics as previously described, the data obtained in our field exploration, and our experience with sites having similar subsurface soil conditions. If the elevating fill heights within the proposed structures are to be significantly different from our understanding of them as stated earlier in this report, we should be notified so that we might review and possibly alter the following recommendations. Further, if structure loads exceed those assumed for our analyses, please notify us so that we can confirm the site preparation recommendations and/or foundation design parameters provided herein.

## 4.1 General

In general, it is our opinion that the subsurface conditions encountered by the explorations are suitable for support of the future development using conventional shallow foundations and conventional pavements following implementation of the site preparation and design recommendations discussed in the following sections of this report. However, the results of our study indicate that high plasticity soils (CH) which are unsuitable for direct support of structures and pavements are prevalent across the area of the proposed structure and should be removed and replaced with suitable soils at the initiation of site development to establish a separation of at least 5 feet from top of building pad elevation (or 4 feet below foundation bearing elevation, whichever is greater).

## 4.2 Site Preparation Recommendations

### 4.2.1 Moisture Control

Our explorations encountered moisture sensitive silty and clayey soils at the existing ground surface throughout the proposed development area. Strict moisture control will need to be maintained to avoid softening of the soils during site development. Failure to control moisture in silty or clayey soils may result in the need for removal and replacement of otherwise suitable soils. Moisture control methods should also be implemented even where more favorable soils are located within the upper two feet. Moisture control methods should include, but are not necessarily be limited to:

- Staging the work to avoid excessive exposure to inclement weather;
- Maintaining positive drainage at the end of each workday or prior to inclement weather;
- Using a smooth drum roller or bulldozer to seal areas to facilitate runoff;
- And minimizing/limiting rubber-tired vehicle traffic by utilizing low contact pressure or tracked equipment whenever possible across the work area.

We highly recommend that surface water across the area be managed prior to, during and after stripping and grubbing operations to avoid excessive surface moisture which can lead to an unstable working surface and thus, undue mixing of the organic debris with the underlying soils. Therefore, it may be necessary to drain ponded surface water and to reduce the moisture content of the surficial and shallow subgrade soils prior to initiating general site preparation procedures.

### 4.2.2 Stripping and Grubbing

Site preparation should include the complete clearing, stripping and removal of grasses/weeds, underbrush, surficial topsoil, surficial and shallow subgrade soils containing significant quantities of organic material, stumps, and root systems of existing trees (roots larger than finger size), and other deleterious materials from within and to a minimum distance of three (3) feet beyond the perimeter of the structure footprints and pavement areas. Although we encountered up to approximately 8 inches of surficial organic debris and topsoil in our explorations, it should be anticipated that removal of deleterious material to greater depths may be required due to major root systems of trees, as well as due to disturbance of the surface soils by site preparation equipment during stripping, grubbing, root raking, etc.

During site clearing and earthwork operations, and while excavating for site utilities and foundations, the excavated and exposed soils should be observed for the presence of excessive organic and/or deleterious materials and debris that could be detrimental to the building foundations and/or floor slabs. We recommend that an experienced soils engineering technician be present on site during the stripping and grubbing process in order to determine which surficial and/or shallow subgrade soils must be removed and replaced due to excessive organic content.



### 4.2.3 Removal of High Plasticity Clays

We recommend the removal of the high plasticity clays (CH) to establish a separation of at least 4 feet from top of building pad elevation (or 3 feet below foundation bearing elevation, whichever is greater). We strongly recommend that an experienced technician or licensed geotechnical engineer be present on the site during the remediation process to verify the complete removal of high plasticity clays and to assist in proper placement of backfill soils.

We strongly encourage the initial backfill be placed on the dry side of its optimum moisture content. If present, a qualified engineer or his representative may authorize an initial 2-foot thick bridge lift to bridge over the moist soils at the bottom of the excavation to facilitate proper densification of the initial fill lift. Backfilling should not occur within an excavation which is inundated with groundwater or rainwater. Small sump excavations may be required to remove the surface water runoff from within these excavations.

### 4.2.4 Subgrade Proofrolling

Where over-excavation of high plasticity clays to establish the recommended separation (See Section 4.2.3) is not necessary, immediately prior to fill placement, an experienced technician working under the direction of a licensed geotechnical engineer should inspect the disturbed surficial soils in structural areas. Structural areas of the site should be proofrolled utilizing a loaded tri-axle dump truck, or other heavily loaded construction equipment. The purpose of the proofrolling will be to detect any areas where unstable soils are present. Materials that yield excessively during the proofrolling should be investigated to determine the source of the instability.

Care should be taken when scheduling the proofroll to avoid inclement weather as rain will make it necessary to control shallow perched groundwater that may occur within the upper soils. The geotechnical engineer or his or her representative should observe the proofroll and recommend the nature and extent of any necessary remedial work.

### 4.2.5 Utility Installation

The soils encountered in our explorations are generally suitable for support of the anticipated utility construction, provided moisture control measures are maintained within the utility excavation. We anticipate that the soils to be excavated from utility trenches will be variable, but primarily consisting of consist of low to high plasticity clays (CL) and very clayey fine sand (SC), which are unsuitable for reuse as backfill beneath pavement areas.

Results of our exploration indicate that dewatering will likely be required for utility construction extending to 3.5 feet or more below the existing ground surface. Nevertheless, if encountered, the dewatering system should be installed and operated to maintain the groundwater level at a minimum of 2 feet below the bottom of the excavation.

### 4.2.6 Excavation Safety

All excavations should be braced in accordance with the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) guidelines (29 CFR 1926, Subpart P, Excavations) or other applicable jurisdictional codes for permissible temporary side-slope ratios and/or shoring requirements. We recommend that the Contractor determine the actual groundwater levels at the time of the construction to determine groundwater impact, if any, on the construction procedures. Groundwater levels should be maintained at least 2 feet below the excavation bottom.

We recommend that the contractor exercise extreme caution in any decision to place personnel and equipment in unbraced excavations, particularly when wetted or subjected to surcharge loads or vibrational forces.

## 4.2.7 Fill/Backfill Placement

All fill/backfill soils in building pad and roadway areas should consist of inorganic, granular soils meeting the material and compaction recommendations as summarized in **Table 2**.

**Table 2** Fill / Backfill Placement Recommendations

Location of Fill	Maximum Percent Passing the No. 200 Sieve	Compaction Effort as Determined by Modified Proctor Test (ASTM D698 / ASTM D1557)
Building Pads	20%	98% / 95%
Pavement Subbase (within 24 inches below concrete pavement or asphalt / concrete pavement base course)	20%	100% / 98%
Below Pavement Subbase (deeper than 24 inches below concrete pavement or asphalt / concrete pavement base course)	20%	98% / 95%

All fill/backfill should be placed in level lifts not to exceed 12 inches loose thickness. However, in restricted working areas, if compaction is accomplished with lightweight, hand-guided compaction equipment, then the lift thickness should be limited to a maximum of 6 inches loose thickness.

The top surface of the fill should extend a minimum of 3 feet beyond the perimeters of the structures and 2 feet beyond the limits of pavements. Fill slopes should not exceed 2 horizontal to 1 vertical to prevent possible erosion or undermining of slabs, shallow footings and/or pavements. Shallower slopes may be dictated by site grading requirements.

In-place density tests should be performed on each lift by an experienced engineering technician working under the direction of a licensed geotechnical engineer to verify that the recommended degree of compaction has been achieved.

## 4.3 Seismic Considerations

### 4.3.1 Liquefaction Potential

The subject property is located within an active seismic zone with its center in the Charleston, South Carolina area. Although the area has not experienced significant earthquake events in the recent past, evidence of seismic event induced liquefaction has been found and geologists have mapped this area as having the potential for recurrence(s) of such an event. Considerable research is ongoing to better determine which local soils are truly liquefiable and the magnitude of settlement that might occur as a result of their liquefaction during a significant seismic event.

Utilizing 'LiquefyPro' modelling software, we have performed a liquefaction analysis of the subject site considering the subsurface soil and groundwater conditions encountered and in reference to the 2018 International Building Code (2018 IBC). Our analysis of the potential magnitude of settlement due to liquefaction indicates that settlement could be on the order of 1/2 inch within the site. The potential liquefaction induced settlement would be due generally to the consolidation of the loose to medium dense sands below the water table. Due to the shallow depth below the ground surface to the upper boundary of liquefiable soils, we estimate that differential liquefaction induced settlement within the building footprint would likely be on the order of 50 to 75 percent of the total.

### 4.3.2 Seismic Design Parameters

Due to the magnitude of potential liquefaction induced settlement of the soils encountered in the soil test borings at this site, it is our interpretation of the 2018 International Building Code (IBC) that the subject site would be classified as Seismic Site Class “F”. However, based upon the soil conditions encountered, it is our understanding that the designation of the site as Seismic Site Class “D” is allowable by the 2018 IBC for structures having a design fundamental period of less than or equal to 0.5 seconds assuming the risks associated with liquefaction are considered in other design aspects of the structure. The procedure for determining the site-specific seismic design parameters follows that which is outlined in the 2018 International Building Code with reference to ASCE 7-16. Values for Spectral Response Acceleration for short periods (0.2 seconds),  $S_s$ , and for long periods (1 second),  $S_1$ , were obtained from the ‘ASCE 7 Hazard Tool’, which is an online tool that queries the United States Geological Survey (USGS) web servers and retrieves the seismic design variables in a report format. The resulting design parameters are presented in **Appendix C, Seismic Design Parameters**.

## 4.4 Shallow Foundations and Slabs

### 4.4.1 Shallow Foundation Sizing / Bearing Capacity

Once site preparation as detailed above is completed, our evaluation indicates that the proposed structure can be supported on shallow foundation system bearing in the existing in situ soils or properly compacted fill.

**Table 3** summarizes our recommendations for sizing and bearing capacity.

**Table 3** Shallow Foundation Design Parameters

Location	Maximum Allowable Bearing Capacity (psf) <sup>(a)</sup>	Foundation Minimum Sizing / Depth Requirements
All Structures	2,000	<u>Continuous Foundations</u> : 12 inches wide; 12 inches deep <u>Isolated Foundations</u> : 12 inches wide; 12 inches deep
<sup>(a)</sup> The recommended bearing pressure refers to dead and conventional live loads for a structure of the proposed design and usage and reflects a net increase in pressure over and above that due to the overburden soils. Consequently, the weight of foundation concrete and soil backfill may be neglected in the sizing computations.		

### 4.4.2 Foundation Construction Recommendations

All foundation elements should be excavated, formed if necessary, and have their concrete cast in the dry. Any fill soils at the bottom of the foundation excavations disturbed during the excavation process should be re-densified prior to placement of reinforcing steel. Softened clayey soils beneath the fill should be removed and replaced with soils meeting the requirements of **Section 4.2.7**.

Dynamic cone penetrometer (DCP) testing and inspections should be performed in the foundation excavations prior to placement of reinforcement steel to verify compliance with project specifications. The testing and inspections should be performed by an experienced engineering technician operating under the direction of a licensed professional geotechnical engineer.

### 4.4.3 Shallow Foundation “Static” Settlement Potential

Column and continuous wall foundations designed and constructed in the recommended manner are estimated to be subject to a maximum potential total settlement of less than approximately 1 inch, in the absence of a significant seismic event. In the case of structurally independent column footings, total differential settlement could be on the order of 75 percent of the estimated maximum total settlement occurring between any two footings.

#### 4.4.4 Floor Slabs

The floor slab subgrade soils should be compacted to meet the requirements of **Section 4.2.7** and should be recompacted to meet these requirements immediately prior to placement of reinforcing steel, once utility trenches are backfilled.

Based upon the soil conditions encountered at the site, the planned fill placement, and the recommended site preparation operations presented in this report, the modulus of vertical subgrade reaction (k) for the specified fill to constitute the slab bearing soils is expected to be on the order of 150 pounds per square inch per inch of vertical deflection (pci), at the recommended structural fill compaction criteria.

We recommend the installation of a vapor retarder between the base and the concrete floor slabs. The vapor retarder should conform to the requirements of ASTM E1745 (Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs), Class A.

The structural fill soils as specified herein for use in constructing the building pad are considered to be relatively free-draining soils. It is our opinion that these soils would be classified as “drainable” and that an additional aggregate top layer to act as a capillary barrier immediately below the floor slab would not be required. Note that all downspouts/roof drains should be positioned such that stormwater is directed away from the structures and that the site should be constructed to meet the civil design grading requirements.

### 4.5 Asphalt Pavement Design and Construction

We have based our design recommendations on the following assumptions:

- Site preparation procedures, including removal and replacement of unsuitable or yielding soils, have been completed where necessary.
- All pavements should be constructed in accordance with the guidelines of the latest applicable edition of the Georgia Department of Transportation (GDOT) Standard Specifications.
- Design requirements by City of Port Wentworth which are more stringent will govern over our recommendations.

Our pavement design and construction recommendations are provided below.

#### 4.5.1 Asphalt Pavement Sections

Our review of project requirements indicates two primary asphalt pavement sections are required *within the fire station parcel*: 1) route to provide access to future fire truck traffic and 2) vehicular roads, drives and parking and drives. A third asphalt pavement section is recommended to withstand heavy traffic for the development of the park complex and the future heavy truck traffic that would include fire truck traffic and other anticipated post-construction heavy truck traffic. Recommended asphalt pavement sections are summarized in **Table 4**.

**Table 4**      **Asphalt Pavement Section Recommendations**

Asphalt Pavement Location	Asphaltic Concrete Surface Course	Asphaltic Concrete Intermediate Course	Asphalt Base Course	Graded Aggregate Base Course	Sand Subbase <sup>a</sup>
Fire Truck Route <sup>b</sup>	1½ inches	2 inches		8 inches	24 inches
Vehicular Routes / Parking <sup>c</sup>	2 inches	-		6 inches	24 inches
Park Entrance Road					
Option 1	1½ inches	2 inches	6 inches	-	24 inches
Option 2	1½ inches	2 inches	-	10 inches	24 inches
<sup>a</sup> Sand subbase should consist of inorganic, granular material with a maximum of 20 percent by weight passing the No. 200 sieve. <sup>b</sup> Consideration should be given to the use of concrete pavements where fire trucks will be turning due to increased stress on the surface of the pavement. <sup>c</sup> We recommend that construction traffic be minimized on pavements constructed with this “light duty” pavement section to the extent practical, in an effort to minimize potential distress to this lighter duty pavement section.					

## 4.5.2 Concrete Pavement Sections

**Light Duty Concrete Pavement:** Following completion of the site preparation procedures for paved areas as detailed in this report, we recommend minimum thicknesses of rigid concrete pavement of 6 inches bearing directly upon a 24-inch sand subbase (with a maximum of 20 percent by weight passing the No. 200 sieve) for locations receiving occasional truck traffic (e.g. dumpster pad entrances).

**Heavy Duty Concrete Pavement:** Following completion of the site preparation procedures for paved areas as detailed in this report, we recommend minimum thicknesses of rigid concrete pavement of 6 inches and 8 inches of graded aggregate base course over a 24-inch sand subbase (with a maximum of 20 percent by weight passing the No. 200 sieve) for locations receiving frequent fire truck traffic.

## 4.5.3 Base Course / Prime Coat

The aggregate base course should comply with the GDOT Standard Specifications. The material should be compacted to at least 98 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D1557), or 100 percent of the maximum dry density as determined by the Standard Proctor test (ASTM D698).

We recommend the placement of a prime coat on the aggregate base course. A prime coat helps fill voids, stabilize the fines, protect the base course, and promotes bonding to the asphalt course.

## 4.5.4 Suitability of Shallow Subbase Soils for Impervious Pavement

Silty, very silty, clayey and very clayey sands (SM, SC) and fine sandy clays (CL, CH) having silt/clay content in excess of the recommended maximum of 20 percent will be encountered within the 24-inch subbase layer of the recommended roadways and pavements, such that removal and replacement should be anticipated if site elevating fill does not provide for the necessary separation.

Careful consideration should be given to the potential for the moisture sensitive silty and clayey sands to become unstable due to moisture intrusion from inclement weather while exposed. Where this occurs, additional undercutting would likely be required to facilitate development. We recommend that a representative of GHD be contacted to evaluate the subbase soils during construction to verify areas requiring removal and replacement.

### 4.5.5 Underdrains

We recommend 100 percent underdrains along the pavements within the project. The underdrain should be installed at a depth of 24 inches below the bottom of concrete or base course elevation. Backfill can be any granular material such as coarse sand, #57 stone or gravel. The anticipated volume of infiltrating stormwater should be evaluated to understand the effectiveness of coarse sand in lieu of more open-graded materials such as #57 stone, if that option is considered. The trench should be lined with a non-woven fabric to minimize the loss of soil fines into the trench. The purpose of the underdrain system is to minimize groundwater intrusion into the subbase section of the roadway thereby reducing the strength of the roadway soils. Therefore, the drain should be positioned above the normal water level of adjacent drainage features to avoid inundating the subbase soils with water on a regular basis.

## 5. Limitations

*This report: has been prepared by GHD for City of Port Wentworth and may only be used and relied on by City of Port Wentworth for the purpose agreed between GHD and City of Port Wentworth as set out in this report.*

*GHD otherwise disclaims responsibility to any person other than City of Port Wentworth arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

*The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.*

*The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

*The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report). GHD disclaims liability arising from any of the assumptions being incorrect.*

*GHD's scope of work for this project has not included investigation, detection, or evaluation related to the presence of any biological pollutants. The term 'biological pollutants' includes, but is not limited to, mold, fungi, spores, bacteria, and viruses, and the by products of any such biological organisms. Further, evaluation or review to determine compliance with State and/or Federal regulatory requirements, assessment of potential contamination migration from or onto the subject site, and/or any similar environmental analyses were beyond the scope of this study.*

*This report has been prepared with the intent that it not be separated. Information from this report should not be distributed or made available to designers or contractors in partial form. This report should be made available to prospective contractors for information only, and not as a warranty of subsurface conditions.*

## 6. Closure

We appreciate the opportunity to work with you on this project. We trust that the information provided in the report is clear and understandable. Should it require any clarification or amplification, however, please contact us at (912) 235-3021.

Regards

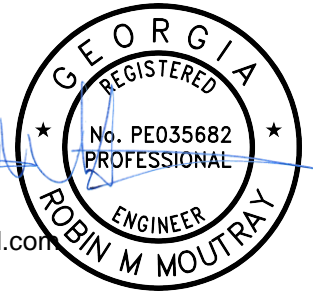


**Wesley A. Marshall**  
wesley.marshall@ghd.com

cc: Mr. Kevin Smith, P.E.; Thomas & Hutton



**Robin M. Moutray**  
robin.moutray@ghd.com



6-5-2023

# Appendices



# Appendix A

## **Soil Test Boring Logs**

# Key to Soil Classification

## Correlation of Penetration Resistance with Relative Density and Consistency

<u>Sands and Gravels</u>		<u>Silts and Clays</u>	
No. of Blows, N	Relative Density	No. of Blows, N	Relative Density
0 – 4	Very loose	0 – 2	Very soft
5 – 10	Loose	3 – 4	Soft
11 – 30	Medium dense	5 – 8	Firm
31 – 50	Dense	9 – 15	Stiff
Over 50	Very dense	16 – 30	Very stiff
		31 – 50	Hard
		Over 50	Very hard



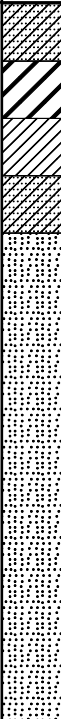
## Particle Size Identification (Unified Classification System)





























Boulders:	Diameter exceeds 8 inches
Cobbles:	3 to 8 inches diameter
Gravel:	<b>Coarse</b> - 3/4 to 3 inches diameter <b>Fine</b> - 4.76 mm to 3/4 inch diameter
Sand:	<b>Coarse</b> - 2.0 mm to 4.76 mm diameter <b>Medium</b> - 0.42 mm to 2.0 mm diameter <b>Fine</b> - 0.074 mm to 0.42 mm diameter
Silt and Clay:	Less than 0.07 mm (particles cannot be seen with naked eye)






















## Modifiers

The modifiers provide our estimate of the amount of silt, clay or sand size particles in the soil sample.

Approximate Content	Modifiers	Field Moisture Description
≤ 5%:	Trace	Saturated: Usually liquid; very wet, usually from below the groundwater table
5% to 12%:	Slightly silty, slightly clayey, slightly sandy	Wet: Semisolid; requires drying to attain optimum moisture
12% to 30%:	Silty, clayey, sandy	Moist: Solid; at or near optimum moisture
30% to 50%:	Very silty, very clayey, very sandy	Dry: Requires additional water to attain optimum moisture

PROJECT:  Port Wentworth Fire Station								LOG OF BORING:  B-1			
DATE DRILLED: 5/24/2023					DRILLER: A. Nelson			GROUND ELEVATION:			
DRILLING METHOD: Mud Rotary					BORING DEPTH: 25.00 Feet			Notes:			
WATER LEVEL:					WATER LEVEL (24-HRS): 4'						
ANALYSIS					Depth feet	BLOW COUNTS	GROUND WATER	GRAPHIC LOG	USCS	GEOLOGIC DESCRIPTION	
Moisture Content	% Passing 200 Sieve	Organic Content	Liquid Limit	Plasticity Index							
					0				SC	Loose dark brown very clayey fine SAND	
					1.4	10				CH	Very stiff brown and orange fine sandy CLAY
					2.8	16				CL	Stiff brown fine sandy CLAY
					4.2	12				SC	Medium dense gray clayey fine SAND
					5.6	20				SP	Medium dense orange fine SAND
					7	18					
					8.4						
					9.8						
					11.2						
					12.6					SP	Medium dense to loose tan and orange fine SAND
					14	22					
					15.4						
					16.8						
					18.2						
					19.6	6					
					21						
					22.4					SP	Medium dense gray fine SAND
					23.8						
					25.2	15					
21.8	4.5				26.6						
					28						
					29.4						
					30.8						
					32.2						
					33.6						
					35						
					36.4						
					37.8						
					39.2						
					40.6						
					42						
					43.4						
					44.8						
					46.2						
					47.6						
					49						
					50.4						
					51.8						
53.2											

PROJECT:  Port Wentworth Fire Station								LOG OF BORING:  B-2			
DATE DRILLED: 5/24/2023					DRILLER: A. Nelson			GROUND ELEVATION:			
DRILLING METHOD: Mud Rotary					BORING DEPTH: 50.00 Feet			Notes:			
WATER LEVEL:					WATER LEVEL (24-HRS): 4'						
ANALYSIS					Depth feet	BLOW COUNTS	GROUND WATER	GRAPHIC LOG	USCS	GEOLOGIC DESCRIPTION	
Moisture Content	% Passing 200 Sieve	Organic Content	Liquid Limit	Plasticity Index							
					0				SC	Loose dark brown very clayey fine SAND	
					1.4	10					
					2.8	17				CH	Very stiff dark brown and orange fine sandy CLAY
					4.2					SC	Medium dense tan and gray clayey fine SAND
					5.6	11					
					7	18					
					8.4					SP-SM	Medium dense orange slightly silty fine SAND
					9.8	14					
					11.2						
					12.6					SP	Medium dense gray fine SAND
					14	14					
					15.4						
					16.8						
					18.2						
					19.6	13					
					21						
					22.4				SP-SM	Medium dense dark gray slightly silty fine SAND	
					23.8						
					25.2	14					
					26.6						
					28						
					29.4	18					
					30.8						
					32.2						
					33.6						
					35	24					
					36.4						
37.8											
39.2	30										
40.6											
42											
43.4				SM	Dense to very dense gray silty fine SAND						
44.8	33										
46.2											
47.6											
49											
50.4	50/6				Boring terminated at 50 feet						
51.8											
53.2											
34.1	22.6										

PROJECT:  Port Wentworth Fire Station									LOG OF BORING:  B-3		
DATE DRILLED: 5/24/2023					DRILLER: A. Nelson				GROUND ELEVATION:		
DRILLING METHOD: Mud Rotary					BORING DEPTH: 25.00 Feet				Notes:		
WATER LEVEL:					WATER LEVEL (24-HRS): 3.5'						
ANALYSIS					Depth feet	BLOW COUNTS	GROUND WATER	GRAPHIC LOG	USCS	GEOLOGIC DESCRIPTION	
Moisture Content	% Passing 200 Sieve	Organic Content	Liquid Limit	Plasticity Index							
42.7	35.4				0				SM	Medium dense dark brown silty fine SAND	
					1.4	13			CH	Very stiff to stiff dark brown and orange fine sandy CLAY	
					2.8	20			CH		
					4.2				CL	Very stiff tan and dark brown fine sandy CLAY	
					5.6	15			CL	Stiff tan and brown fine sandy CLAY	
					7	26			CL		
					8.4				CL		
					9.8				CL		
					11.2				CL		
					12.6				SP-SM	Loose tan and orange slightly silty fine SAND	
					14	10			SP-SM		
					15.4				SP-SM		
					16.8				SM	Very loose light gray very silty fine SAND	
					18.2				SM		
					19.6	2			SM		
					21				SM		
					22.4				SM	Loose dark gray very silty fine SAND	
					23.8				SM		
					25.2	6			SM	Boring terminated at 25 feet	
					26.6						
					28						
					29.4						
					30.8						
					32.2						
					33.6						
35											
36.4											
37.8											
39.2											
40.6											
42											
43.4											
44.8											
46.2											
47.6											
49											
50.4											
51.8											
53.2											

# Appendix B

## **Log of Hand-Auger Borings**

## B-1 Log of Hand-Auger Borings

Project: Port Wentworth Fire Station

Date: May 22, 2023

Personnel: W. Marshall

Reference No: 12610450-00

Location: See Figure 1

Location	Depth Below Ground Surface	Soil Description	Suitability as Subbase
HA-1	0 – 5"	Topsoil / Pine straw cover	
	5" – 18"	Gray clayey fine SAND (SC)	
	18" – 36"	Orange and gray clayey fine SAND (SC)	
	36" – 48"	Gray and orange fine sandy CLAY (CL) <MC=17.9; -200=66.7>	
HA-2	0 – 8"	Topsoil / Pine straw cover	
	8" – 16"	Orange silty fine SAND (SM)	
	16" – 22"	Gray and orange clayey fine SAND (SC)	
	22" – 48"	Gray and orange very clayey fine SAND (SC) <MC=11.4; -200=49.6>	
HA-3	0 – 4"	Topsoil / Pine straw cover	
	4" – 10"	Dark gray silty fine SAND (SM)	
	10" – 18"	Orange clayey fine SAND (SC)	
	18" – 24"	Orange and gray very clayey fine SAND (SC) <MC=7.2; -200=43.4>	
	24" – 48"	Orange and gray fine sandy CLAY (CL)	
HA-4	0 – 6"	Topsoil / Pine straw cover	
	6" – 18"	Dark gray and gray very silty fine SAND (SM) <MC=5.2; -200=30.3>	
	18" – 48"	Gray and orange fine sandy CLAY (CL)	
HA-5	0 – 4"	Topsoil / Pine straw cover	
	4" – 10"	Dark gray clayey fine SAND (SC)	
	10" – 48"	Orange and gray fine sandy CLAY (CL) <MC=13.8; -200=68.4>	
HA-6	0 – 4"	Topsoil / Pine straw cover	
	4" – 8"	Gray clayey fine SAND (SC)	
	8" – 48"	Brown and orange fine sandy CLAY (CH) <MC=20.6; -200=79.3; LL=77; PI=60>	

Comments: MC = Moisture Content; -200 = Percent Silt / Clay; LL = Liquid Limit; PI = Plasticity Index

Yellow = Suitable as Subbase; Red = Not Suitable as Subbase

## B-1 Log of Hand-Auger Borings

Project: Port Wentworth Fire Station

Date: May 22, 2023

Personnel: W. Marshall

Reference No: 12610450-00

Location: See Figure 1

Location	Depth Below Ground Surface	Soil Description	Suitability as Subbase
HA-7	0 – 5"	Topsoil / Pine straw cover	
	5" – 12"	Dark gray silty fine SAND (SM) with clay nodules	
	12" – 48"	Orange and gray very clayey fine SAND (SC) <MC=4.9; -200=33.9>	
HA-8	0 – 6"	Topsoil / Pine straw cover	
	6" – 18"	Tan silty fine SAND (SM) <MC=2.6; -200=18.5>	
	18" – 40"	Orange and tan silty fine SAND (SM)	
	40" – 48"	Gray and orange clayey fine SAND (SC)	

Comments: MC = Moisture Content; -200 = Percent Silt / Clay; Yellow = Suitable as Subbase;  
Red = Not Suitable as Subbase



# Appendix C

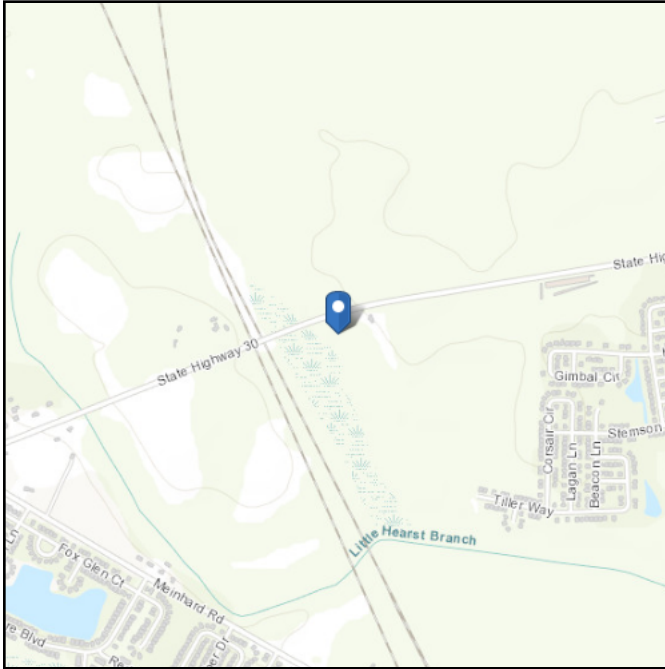
## **Seismic Design Parameters**

# ASCE 7 Hazards Report

**Address:**  
No Address at This Location

**Standard:** ASCE/SEI 7-22  
**Risk Category:** IV  
**Soil Class:** D - Stiff Soil

**Latitude:** 32.194491  
**Longitude:** -81.215949  
**Elevation:** 18.09651202593876 ft  
(NAVD 88)

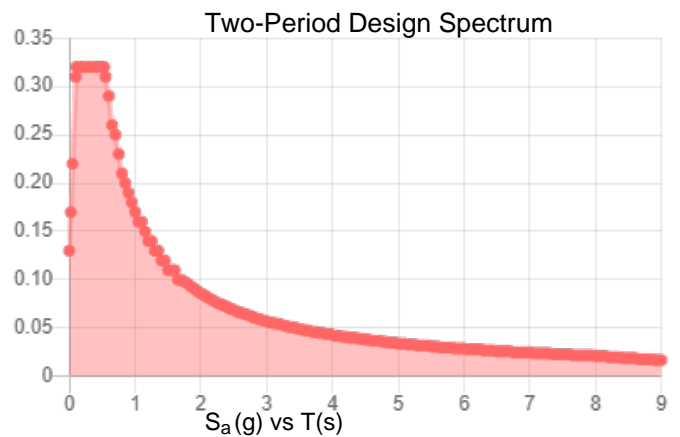
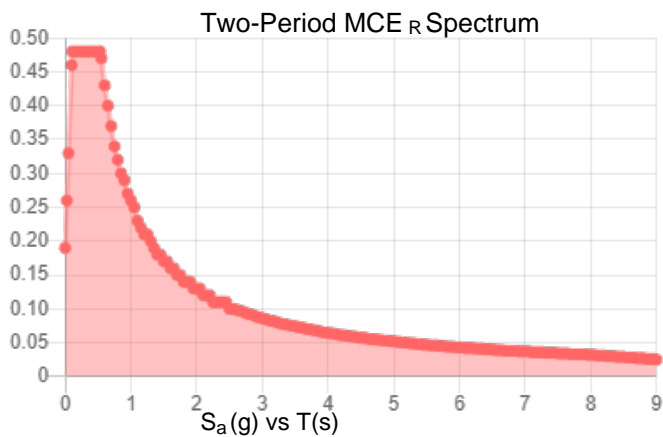
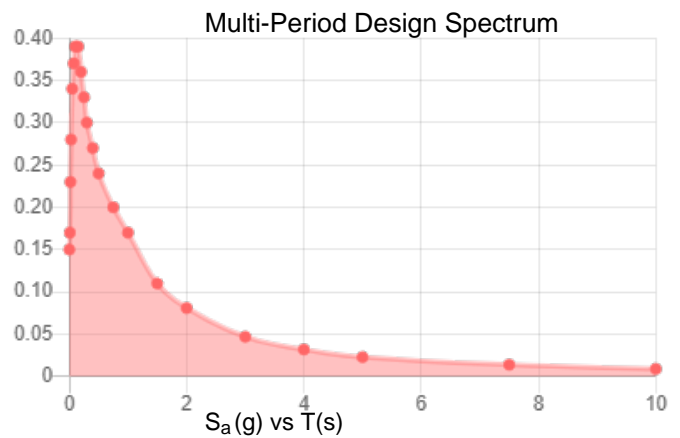
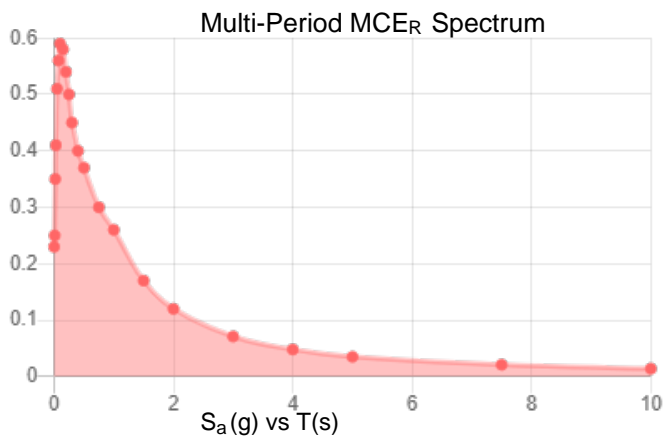


**Site Soil Class:**

**Results:**

PGA <sub>M</sub> :	0.22	T <sub>L</sub> :	8
S <sub>MS</sub> :	0.48	S <sub>S</sub> :	0.46
S <sub>M1</sub> :	0.26	S <sub>1</sub> :	0.12
S <sub>DS</sub> :	0.32	V <sub>S30</sub> :	260
S <sub>D1</sub> :	0.17		

**Seismic Design Category: D**



MCE<sub>R</sub> Vertical Response Spectrum  
Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum  
Vertical ground motion data has not yet been made available by USGS.

**Data Accessed:** Mon Jun 05 2023

**Date Source:**

**USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.**

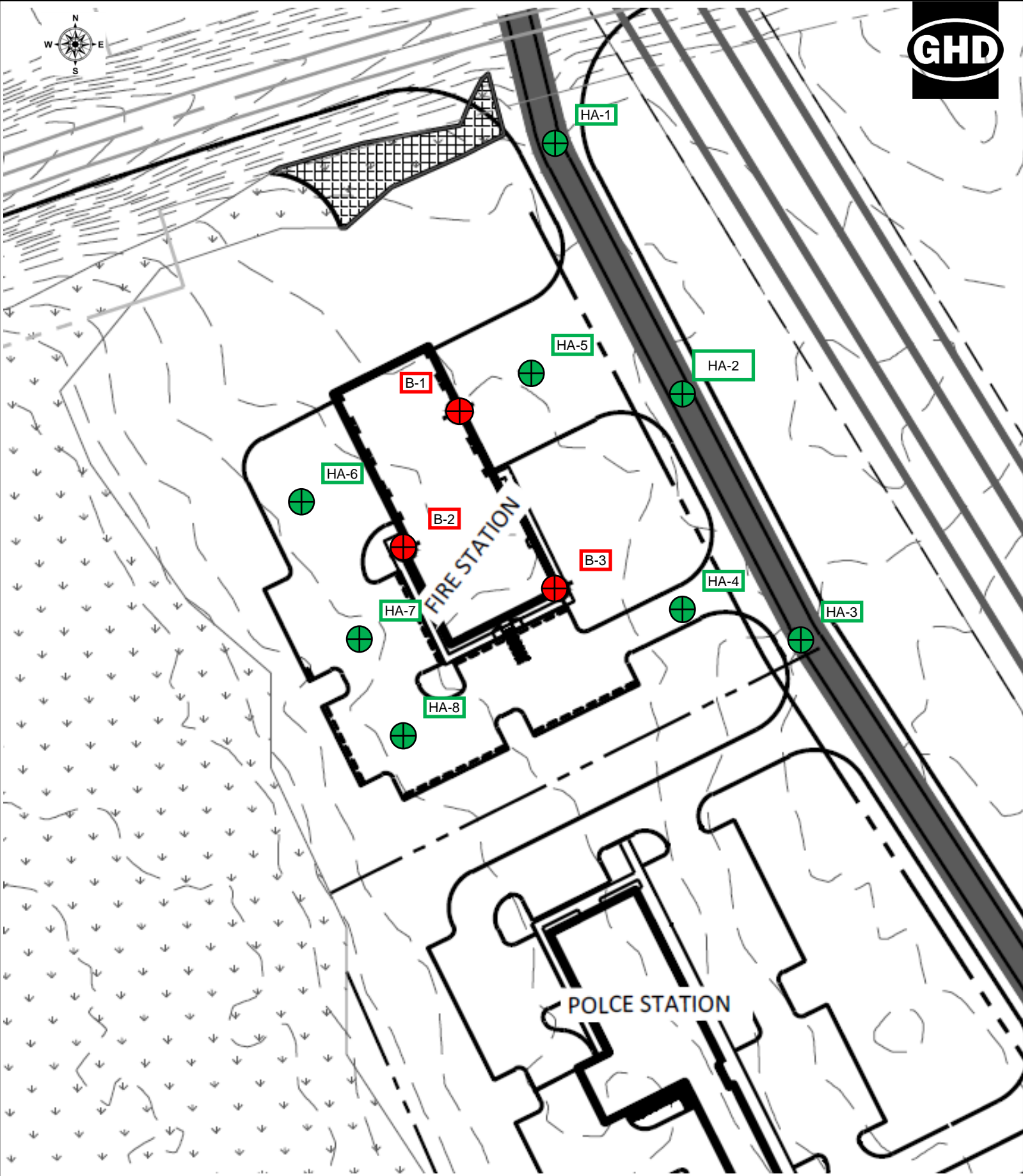
The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE 7 standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE 7 Hazard Tool.

# Appendix D

**Figure**



Designation / approximate location of  
Standard Penetration Test (SPT) Boring



Designation / approximate location of  
Hand-Auger Boring

# EXPLORATION LOCATION DIAGRAM

Port Wentworth Fire Station

SECTION 030000 - CONCRETE

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Concrete sidewalks, curbs, gutters, and parking areas.

1.2 RELATED SECTIONS

- A. Section 310000 – Earthwork.
- B. Section 321123 – Aggregate Base Courses.

1.3 MEASUREMENT AND PAYMENT

- A. Payment for all concrete work shall be included in the contract lump sum for the project.

1.4 REFERENCES (LATEST REVISION)

- A. ACI 211.1 – Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- B. ACI 211.2 – Selecting Proportions for Structural Lightweight Concrete.
- C. ACI 301 – Specifications for Structural Concrete.
- D. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
- E. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.
- F. ACI 305R – Hot Weather Concreting.
- G. ACI 306R – Cold Weather Concreting.
- H. ACI 308R – Guide to Curing Concrete.
- I. ACI 318 – Building Code Requirements for Structural Concrete.
- J. ACI 347 – Guide to Formwork for Concrete.
- K. ASTM A185 – Steel Welded Wire Reinforcement, Plain, for Concrete.
- L. ASTM A615 – Deformed and Plain Carbon – Steel Bars for Concrete Reinforcement.
- M. ASTM A 775/A 775M – Epoxy Coated Steel Reinforcing Bars.
- N. ASTM B 221 – Aluminum and Aluminum–Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- O. ASTM C 33 – Concrete Aggregates.



- P. ASTM C 39 – Compressive Strength of Cylindrical Concrete Specimens.
- Q. ASTM C 42 – Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- R. ASTM C 94 – Ready-Mixed Concrete.
- S. ASTM C 150 – Portland Cement.
- T. ASTM C 172 – Practice for Sampling Freshly Mixed Concrete.
- U. ASTM C 231 – Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- V. ASTM C 260 – Air-Entraining Admixtures for Concrete.
- W. ASTM C 309 – Liquid Membrane-Forming Compounds for Curing Concrete.
- X. ASTM C 330 – Light Weight Aggregates for Structural Concrete.
- Y. ASTM C 494 – Chemical Admixtures for Concrete.
- Z. ASTM C 618 – Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- AA. ASTM C 920 – Elastomeric Joint Sealants.
- BB. ASTM C 1116 – Fiber – Reinforced Concrete.
- CC. ASTM D 994 – Preformed Expansion Joint Filler for Concrete (Bituminous Type).
- DD. ASTM D 1751 – Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- EE. ASTM D 2103 – Polyethylene Film and Sheeting.
- FF. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- GG. ASTM E 329 – Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

#### 1.5 SUBMITTALS FOR REVIEW

- A. Section 013300 – Procedures for Submittals.
- B. Product Data: Provide data on joint filler, admixtures, and curing compounds.
- C. Concrete Design Mix.

#### 1.6 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301, ACI 318, and ACI 330R.

- B. Obtain cementitious materials from same source throughout.
- C. Conform to ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
- D. Contractor to measure for accessible route with a 24" digital smart-level will be used to measure points along the accessible route. Line of measurement shall be parallel to the long edge of ramp or accessible route, whether straight or curved. Longitudinal measurement lines shall be spaced 3 feet apart, but in no case, shall fewer than two lines be used. The horizontal measurement cross-slope will be measured every 6 feet. Engineer may request additional measurements if further investigation is necessary. The 24" Smart-level slope readings greater than specified tolerance within contract documents will be identified as non-compliant and not accepted.
- E. Engineer reserves the right to mark and reject portions of concrete not within tolerance as specified.
- F. Accessible Route Tolerance by measuring Floor Flatness and Levelness. Traffic floors (All Accessible Routes) shall conform to the following surface profile tolerances:
  - a. Floor Designation: All floor areas not specified to be part of the "defined traffic floor" (Accessible Routes) shall be part of a "random traffic floor" (Non-accessible Route). Any floor slab comprising part of the traffic floor shall be designated a "traffic slab" (Accessible Route).
  - b. Flatness and Levelness Tolerances: A traffic floor shall conform to the following surface profile tolerances:

Floor Flatness Number:  $F_F$   
Specified Overall Value = 38  
Minimum Local Value = 25  
Floor Levelness Number:  $F_L$   
Specified Overall Value = 25  
Minimum Local Value = 17
  - c. Floor Tolerance Measurements:  $F_F$  and  $F_L$  tolerances shall be tested in accordance with ASTM E 1155. Actual overall F-numbers shall be calculated using the inferior / superior area method.
  - d. Timeliness of Floor Profile Tests & Reports: All floor tolerance measurements shall be made within 48 hours after slab installation. In all cases, tolerance measurements shall precede the removal of shores and forms. Results of all floor profile tests (including a running tabulation of overall  $F_F$  and  $F_L$  values for all traffic slabs installed to date) shall be provided to the Contractor within 72 hours after each slab installation.
  - e. Remedy for Out-of-Tolerance Work: For purposes of flatness and levelness control, minimum floor section boundaries shall coincide with the control joints. Profile test compliance requirements apply to the time period specified above only. Contractor shall remedy any floor section measuring below either the minimum local  $F_F$ , or  $F_L$  number. Any floor section measuring at or above both the minimum local  $F_F$  and  $F_L$

number shall be accepted. If actual overall  $F_F$  or  $F_L$  number for entire random-traffic floor installation measures less than its specified value, then Contractor shall undertake remedial measures acceptable to the Engineer.

- G. Defined random traffic floors (Non-accessible Routes) shall conform to the following surface profile tolerances:
- a. Floor Designation: All floor areas specified as "defined random traffic floor" include only the non-accessible route.
  - b. Flatness and Levelness Tolerances: The defined traffic floor shall conform to the following surface profile tolerances:  $F_{min} = 25$
  - c. Floor Tolerance Measurements:  $F_{min}$  tolerances shall be tested in accordance with ASTM E 1486.
  - d. Timeliness of Floor Profile Tests & Reports: All floor tolerance measurements shall be made by the Contractor within 24 hours after slab installation and before saw cutting of control joints. In all cases, tolerance measurements shall precede the removal of shores and forms. Results of all floor profile tests including a running tabulation of overall  $F_{min}$  values for all of defined-traffic slabs installed to date shall be provided to the Contractor within 48 hours after each slab installation.
- H. Remedy for Out-of-Tolerance Work: For purposes of flatness and levelness control, minimum floor section boundaries shall coincide with the construction joints. Profile test compliance requirements apply to time period specified above only. Contractor shall remedy any floor section measuring below the  $F_{min}$  number, in accordance with recommendations of the Engineer. Any floor section measuring at or above the  $F_{min}$  number shall be accepted. If actual overall  $F_{min}$  number entire defined-traffic floor installation measures less than its specified value, then Contractor shall undertake remedial measures acceptable to the Engineer.
- If a portion of a floor does not meet specified F-number, the following remedies are recommended:
- a. Local value is out of spec – grind or replace floor.
  - b. Overall value is out of spec – Contractor shall pay the Owner per square foot for portion of floor not meeting F-number spec. This can be obtained by specifying a figure in project specifications in conjunction with square footage obtained from reading taken in the field.

## 1.7 REGULATORY REQUIREMENTS

- A. Conform to City of Port Wentworth standards for paving work on public property.

## 1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

## 1.9 GUARANTEE

- A. Contractor shall guarantee the quality of materials and workmanship for a period of 12 months after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

## 1.10 TESTING

- A. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- B. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any tests.
- C. Testing shall be the Contractor's responsibility and shall be performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph A above.
- D. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

## PART 2 – PRODUCTS

### 2.1 FORM MATERIALS

- A. Wood or steel form material profiled to suit conditions.
- B. Joint Filler: ASTM D1751 type; 1/2 inch thick.

### 2.2 REINFORCEMENT

- A. Reinforcing Steel: ASTM A 615, Grade 60 billet steel deformed bars; uncoated finish.
- B. Welded Steel Wire Fabric: Plain type, ASTM A 185; uncoated finish.
- C. Fiber reinforcement: Shall conform to ASTM C 1116 as manufactured by Fibermesh Company or equivalent. Concrete mix design shall utilize between 0.5% and 1.0% fiber content.

### 2.3 CONCRETE MATERIALS

- A. Cement: ASTM C 150, Type I – Normal.
- B. Fine and Coarse Mix Aggregates: ASTM C 33. Coarse aggregate shall consist of granite stone.
- C. Water: Potable, not detrimental to concrete.
- D. Air Entrainment: ASTM C 260.

- E. Chemical Admixture: ASTM C 494, Type A – Water Reducing.

## 2.4 ACCESSORIES

- A. Curing Compound: ASTM C309, clear with fugitive dye.
- B. Sealant: Joints shall be sealed per detail on project drawings, conforming to ASTM C 920, Type S or M, Grade P or NS, Class 25.

## 2.5 CONCRETE MIX – BY PERFORMANCE CRITERIA

- A. Provide concrete to the following criteria:
  - 1. Flexible Strength: 700 psi.
  - 2. Compressive Strength: 3,000 psi @ 28 days.
  - 3. Slump: 4 to 5 inches.
- B. Use accelerating admixtures in cold weather only when acceptable to Engineer. Use of admixtures will not relax cold weather placement requirements.
- C. Use calcium chloride only when accepted by Engineer.
- D. Use set retarding admixtures during hot weather only when accepted by Engineer.

## 2.6 SOURCE QUALITY CONTROL AND TESTS

- A. All sampling and testing services shall be performed, at Contractor's expense, by a testing agency operating in accordance to ASTM D 3740 and E 329 latest edition and acceptable to the Engineer.
- B. Contractor shall submit to the Engineer a design mix on each class of concrete proposed for use. The mix shall be prepared by an acceptable testing laboratory. Compressive strength of at least four specimens of the design mix shall indicate 15% higher than 28 days strengths specified. During the work, Contractor shall make three test cylinders for each 50 cubic yards, or fraction thereof, of concrete placed each day. One cylinder shall be tested at 7 days and the other two at 28 days in accordance with ASTM C 39. Copies of all test reports shall be furnished to the Engineer.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Verify subgrade conditions under provisions of Section 31 00 00 – Earthwork.
- B. Verify compacted subgrade is acceptable and ready to support concrete and imposed loads.
- C. Verify slopes and elevations of subgrade are correct.

### 3.2 CONSTRUCTION OBSERVATION

- A. Engineer or Project Representative will have the right to require any portion of work be completed in their presence and if work is covered up after such instruction, it shall be exposed by Contractor for observation. However, if Contractor notifies the Engineer such work is scheduled, and Engineer fails to appear within 48 hours, Contractor may proceed. All work completed, and materials furnished shall be subject to review by the Engineer or Project Representative. Improper work shall be reconstructed. All materials, which do not conform to requirements of specifications, shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

### 3.3 SUBGRADE

- A. Prepare subgrade in accordance with Section 31 00 00 – Earthwork.

### 3.4 PREPARATION FOR PLACING

- A. Water shall be removed from excavations before concrete is deposited. Hardened concrete debris and other foreign materials shall be removed from the interior of forms and inside of mixing and conveying equipment. The reinforcement shall be made secure in position and shall be subject to examination and acceptance.
- B. Moisten subgrade to minimize absorption of water from fresh concrete.
- C. Coat surfaces of manhole, inlet, and catch basin frames with oil to prevent bond with concrete pavement.
- D. Notify Engineer minimum 48 hours prior to commencement of concreting operations.

### 3.5 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler in position, in straight lines. Secure to formwork during concrete placement.
- D. Forms shall be constructed to the shape, line, and grade required and shall be maintained sufficiently rigid to prevent deformation under load. Form work and details of construction joints shall conform to ACI-318, Chapter 6.

### 3.6 REINFORCEMENT

- A. Place reinforcement as indicated.
- B. Interrupt reinforcement at expansion joints.

### 3.7 PLACING CONCRETE

- A. Placing of concrete shall conform to Chapter 5 of the American Concrete Institute Standard A.C.I. 318. Concrete having attained initial set or having contained water for more than 45 minutes shall not be used in the work. Concrete shall not be dropped freely more than 5 feet. Concrete shall be mixed and placed only when the temperature is at least 40 degrees F and rising. Concrete shall be placed only upon surfaces free from frost, ice, mud and other detrimental substances or conditions. When placed on dry soil or pervious material, water proof paper or polyethylene sheeting shall be laid over surfaces to receive the concrete.
- B. Ensure reinforcement, inserts, embedded parts, formed joints and forms are not disturbed during concrete placement.
- C. Place concrete continuously over the full width of panel and between predetermined construction joints. Do not break or interrupt successive pours so cold joints will not occur.
- D. Place concrete to elevations indicated on the contract drawings.

### 3.8 JOINTS

- A. Place expansion joints at 50-foot intervals and radius points.
- B. Place contraction joints at 10-foot intervals. Align curb, gutter, and sidewalk joints.
- C. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/8 inch.
- D. Saw cut contraction joints 3/16-inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

### 3.9 FINISHING

- A. Area Paving: Light broom.
- B. Sidewalk Paving: Light broom, radius to 4 inch radius, and trowel joint edges.
- C. Curbs and Gutters: Light broom parallel to gutter.
- D. Inclined Vehicular Ramps: Broomed perpendicular to slope.
- E. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.
- G. Accessible Routes: Surfaces shall be stable, firm, and slip resistant. Slab Finish Tolerances – Unless otherwise called out in the contract documents, finishes shall be true planes within 3/16 inch in 10 feet as determined by a 10-foot straightedge placed anywhere on the slab in any direction. Maximum variation in elevation for a level slab shall not exceed quarter of an inch (1/4") over the entire slab or accessible route tolerances.

### 3.10 JOINT SEALING

- A. Separate pavement from vertical surfaces with 1/2-inch thick joint filler.
- B. Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- C. Extend joint filler from bottom of pavement to within 1/8 inch of finished surface.

### 3.11 TOLERANCES

- A. Section 01 45 00 – Quality Control: Tolerances.
- B. General Site Concrete:
  - 1. Maximum Variation of Surface Flatness: 1/4 inch in 10 feet.
  - 2. Maximum Variation from True Position: 1/4 inch.
- C. Accessible Routes: Variation from design elevation shall not exceed 1/4 inch; however, accessible routes shall not exceed maximum ADA allowable slopes. Contractor shall remove and replace any and all portions of the accessible route exceeding maximum ADA allowable slopes.

### 3.12 CURB AND GUTTER SECTIONS

- A. Shall be constructed as shown on the drawings and in accordance with applicable details. Subgrade below the curb and gutter sections shall be compacted to 98% density. Curb and gutter sections shall be constructed in sections of uniform length and shall not exceed 10 feet or be less than 5 feet in length. Straight edging along the edge of gutter and top of curb shall conform to those requirements for adjacent pavement but with no irregularities to exceed 1/4 inch in 10 feet.
- B. If slip-form or extruded construction is used, contraction joints shall be located at intervals no greater than 10 feet by sawing hardened concrete at the proper time. Joints shall be sawed between 4 to 8 hours after placing of concrete. Depth of saw-cut shall be one-fourth thickness of the curb and gutter section. The maximum width of cut shall be 1/4 inch. All joints shall be sawed in succession.
- C. Half inch thick premolded expansion joints shall be installed completely through the joints at spaces not to exceed 50 feet and at all structures and walks.
- D. When curb forms are removed, backfill shall be immediately placed, tamped, and graded behind the new curb to help protect line and grade. Machine methods of placing and forming may be used provided finished product is satisfactory to the Engineer.
- E. Contractor shall place a concrete depressed curb at all driveways shown on the drawings or where a driveway is in use.
- F. Cracked curb and gutter will not be accepted.



### 3.13 CONCRETE CURING

- A. Immediately after placement and finishing, concrete shall be protected from moisture loss for not less than 7 days. For surfaces not in contact with forms, curing compound shall be uniformly applied after water sheen disappears from the concrete. Formed surfaces shall receive an application of curing compound if forms are removed during the 7-day curing period. Curing compound shall not be applied during rainfall.
- B. Curing compound shall be applied under pressure at the rate of 1 gallon per 150 square feet by mechanical sprayers. The spraying equipment shall be of the fully atomizing type. At time of use, curing compound shall be thoroughly mixed with a fugitive dye uniformly dispersed throughout the sprayer. Care shall be taken to prevent application to joints where concrete bond is required, to reinforcement steel and to joints where joint sealer is to be placed. The compound shall form a uniform continuous coherent film which will not crack or peel and shall be free from pinholes and other imperfections. Concrete surfaces subjected to heavy rainfall within 3 hours after curing compound has been applied shall be resprayed by above method and at above coverage at no additional expense to the Owner.
- C. No pedestrian or vehicular traffic shall be allowed over the surface for seven days unless surface is protected by planks, plywood, or sand. Protection shall not be placed until at least 12 hours after application of the curing compound.
- D. Protect concrete by suitable methods to prevent damage by mechanical injury or excessively hot or cold temperatures.

### 3.14 FIELD QUALITY CONTROL

- A. Section 014500 – Quality Control: Field observations and testing.
- B. Three concrete test cylinders will be taken for every 50 or less cubic yards of each class of concrete placed each day.
- C. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.
- D. One slump test will be taken for each set of test cylinders taken.
- E. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

### 3.15 PROTECTION

- A. Immediately after placement, protect pavement from premature moisture loss, excessive hot or cold temperatures, and mechanical injury.
- B. Do not permit vehicular traffic over pavement or curb for seven days minimum after finishing. Do not permit pedestrian traffic over concrete for three days.

END OF SECTION

## SECTION 101453 – TRAFFIC SIGNAGE

### PART 1 – GENERAL

#### 1.1 WORK INCLUDED

- A. Signs.
- B. Posts.
- C. Fabricating and installing traffic signs in accordance with details shown on construction plans and the Manual on Uniform Traffic Control Devices.

#### 1.2 REFERENCES (LATEST REVISION)

- A. ASTM A 123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A 153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM A 193 – Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
- D. ASTM A 307 – Carbon Steel Bolts, Studs, and Threaded Rod, 60,000 PSI Tensile Strength.
- E. ASTM A 615 – Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- F. ASTM B 209 – Aluminum and Aluminum-Alloy Sheet and Plate.
- G. ASTM B 211 – Aluminum and Aluminum-Alloy Rolled or Cold Finish Bar, Rod, and Wire.

#### 1.3 SUBMITTALS

- A. A sample of all signs and posts to be placed shall be submitted to the Engineer for review prior to ordering.

#### 1.4 QUALITY ASSURANCE

- A. Material and equipment shall be the standard product of a manufacturer who has manufactured them for a minimum of 2 years and provides published data on quality and performance.

#### 1.5 GUARANTEE

- A. Contractor shall guarantee the quality of materials and workmanship for a period of 12 months after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

#### 1.6 MEASUREMENT AND PAYMENT

- A. Payment for signs will include all necessary labor and materials to fabricate and install the sign. Payment will be made on a job lump sum basis.

## PART 2 – PRODUCTS

### 2.1 UNIFORMITY

- A. All signs shall be uniform in shape, color, dimensions, legends, and illumination or reflectorization.

### 2.2 MATERIALS AND WORKMANSHIP

- A. Signs: Shall be aluminum 0.08 inch minimum thickness and shall conform to ASTM B 209, Alloy 6061-T6 or 5053-H38. Finished sign shall be clear cut, the lines of all letters and details true, regular and free from waviness, unevenness, furry edges, or lines and shall be free from all scaling, cracking, blistering, pitting, dents, or blemishes of any kind.
- B. Sign Posts: Shall be galvanized steel flanged "U" channel section with a minimum (before punching or drilling) of two (2) pounds per foot and shall conform to the minimum yield point and tensile strength specified in ASTM A 615 Grade 60. Galvanizing shall be in accordance with ASTM A 123. Length as specified on the plans. Holes may be punched or drilled 3/8 inch in diameter and spaced one (1) inch center to center beginning one (1) inch from the top and extending the full length of post.
- C. Hardware: Bolts shall be 5/16 inch diameter with hexagonal heads and of sufficient length to extend at least 1/4 inch beyond the nut when installed. Nuts shall be hex nuts of the self-locking plastic insert type. The thread fit for nuts shall be ANSI, Class 2B. The washers shall be flat and 25/64 inch ID by 3/4 inch OD by 0.091 inch thick. These washers are to be placed between head of bolt and sign face. Bolts, nuts, washers and spacers may be aluminum, stainless steel or galvanized steel. Galvanized steel bolts and washers shall conform to ASTM A 307, galvanized in accordance with ASTM A 153. Aluminum shall conform to ASTM B 211, Alloy 2024-T4 for bolts, Alloy 2017-T4 for nuts, and ASTM B 209, Alloy 2024-T4 for washers. Stainless steel shall conform to ASTM A 193, Type B8.

### 2.3 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. The Engineer will review all products before they are ordered.

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. Sign posts and their foundations and sign mountings shall be constructed to hold signs in a proper and permanent position, to resist swaying in the wind or displacement by vandalism.

### 3.2 LOCATION

- A. Signs are to be placed as shown on the plans. Signs shall conform to height and lateral locations as shown in the Manual on Uniform Traffic Control Devices.

### 3.3 ERECTION

- A. Drive type posts may either be driven in place or placed in prepared holes. Driven posts will be limited to locations where the surrounding soil is firm and stable. When sandy or unstable soils are present, each drive post shall be placed in a prepared dry hole minimum six (6) inches in diameter. Whenever posts are placed in prepared holes, the holes shall be backfilled with a mixture of Portland Cement and sand. The resultant mixture shall be mixed with water to a moist consistency and placed around posts. All posts shall be erected in a vertical and plumb position to a depth of three (3) feet and at an angle to the roadway as shown on plans or directed by Engineer.

END OF SECTION

SECTION 310000 - EARTHWORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Grading
- B. Excavation
- C. Backfilling
- D. Compaction
- E. Remove and Replace Topsoil
- F. Dressing of Shoulders and Banks
- G. Stone Drainage Filter
- H. Water Control
- I. Testing

1.2 RELATED SECTIONS

- A. Section 311000 – Site Clearing

1.3 MEASUREMENT AND PAYMENT

- A. Earthwork – All earthwork and earthwork associated activities, including but not limited to grading, ditch construction, excavation, compaction, remove/replace of unsuitable material, proof rolling, borrow material import, and stripping, shall be included in the contract lump sum for the project..

1.4 REFERENCES (LATEST REVISION)

- A. ASTM D 448 – Sizes of Aggregate for Road and Bridge Construction.
- B. ASTM D 1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort.
- C. ASTM D 2487 – Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- D. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- E. ASTM D 6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

- F. ASTM E 329 – Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

## 1.5 SUBMITTALS

- A. Section 01 33 00 – Submittal Procedures: Procedures for submittals.
- B. Materials Source: Submit gradation analysis, proctor results, and soil classification for all borrow material.

## 1.6 QUALITY ASSURANCE

- A. Perform work in accordance with Federal, State of Georgia, and Municipality of City of Port Wentworth standards.

## 1.7 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. The testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any of the tests.
- E. Testing shall be Contractor's responsibility and performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph C above.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. Borrow shall consist of sand or sand-clay soils capable of being readily shaped and compacted to the required densities, and shall be reasonably free of roots, trash, rock larger than 2 inches, and other deleterious material.
- B. All soils used for structural fills shall have a PI (plastic index) of less than 10, and a LL (liquid limit) of less than 30. Fill soils shall be dried or wetted to appropriate moisture contents prior to compaction. Additionally, fill soils used for the top 2 feet of fill beneath roads and parking lots shall have no more than 15% passing the # 200 sieve. Fill soils used for house lots shall have no more than 25% passing the # 200 sieve.
- C. Contractor shall furnish all borrow material.
- D. Contractor shall be responsible for and bear all expenses in developing borrow sources including securing necessary permits, drying the material, haul roads, clearing, grubbing,

excavating the pits, placing, compaction and restoration of pits and haul roads to a condition satisfactory to property owners and in compliance with applicable federal, state, and local laws and regulations.

## 2.2 SOURCE QUALITY CONTROL

- A. If tests indicate materials do not meet specified requirements, change material and retest.
- B. Provide materials of each type from same source throughout the Work.

## PART 3 – EXECUTION

### 3.1 TOPSOIL

- A. Contractor shall strip topsoil and stockpile on site at a location determined by the Owner at the Contractor's expense.
- B. Topsoil shall be placed to a depth of 4 inches over all disturbed or proposed landscaped areas.
- C. Topsoil shall be provided at Contractor's expense if it is not available from site.
- D. Any remaining topsoil determined by the Owner or Engineer to be useful will be stored on site at a location determined by the Owner at the Contractor's expense.
- E. Do not excavate wet topsoil.

### 3.2 EXCAVATION

- A. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials or obstructions encountered.
- B. Suitable excavation material shall be transported to and placed in fill areas within limits of the work.
- C. Unsuitable material encountered in areas to be paved and under building pads, shall be excavated 2 feet below final grade and replaced with suitable material from site or borrow excavations. Contractor shall notify Engineer if more than 2 feet of excavation is needed to replace unsuitable material.
- D. Unsuitable and surplus excavation material not required for fill shall be disposed of off site.
- E. Proper drainage, including sediment and erosion control, shall be maintained at all times. Methods shall be in accordance with the National Pollutant Discharge Elimination System standards and other local, state, and federal regulations.
- F. Unsuitable materials as stated herein are defined as highly plastic clay soils, of the CH and MH designation, border line soils of the SC-CH description, and organic soils of the OL and OH description based on the Unified Soils Classification System. Further, any soils for the top two feet of pavement subbase shall have no more than 15% passing the # 200 sieve.

3.3 GROUND SURFACE PREPARATION FOR FILL

- A. All vegetation, roots, brush, heavy sods, heavy growth of grass, decayed vegetable matter, rubbish, and other unsuitable material within the areas to be filled shall be stripped and removed prior to beginning the fill operation.
- B. Sloped ground surfaces steeper than 1 vertical to 4 horizontal, on which fill is to be placed shall be plowed, stepped, or benched, or broken up as directed, in such a manner where fill material will bond with the existing surface.
- C. Surfaces on which fill is to be placed and compacted shall be wetted or dried as may be required to obtain the specified compaction.

3.4 FILL

- A. Shall be placed in successive horizontal layers 8 inches to 12 inches in loose depth for the full width of the cross-section and compacted as required.

3.5 FINISHED GRADING

- A. All areas covered by the project including excavated and filled sections and adjacent transition areas shall be smooth graded and free from irregular surface changes.
- B. Degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations, supplemented with hand raking and finishing, except as otherwise specified.
- C. Unpaved areas to within 0.1 feet of elevations shown on the drawings provided such deviation does not create low spots that do not drain.
- D. Paved Areas – Subgrade to within 0.05 feet of the drawing elevations less the compacted thickness of the base and paving.
- E. Building Pads – Subgrade to within 0.05 feet of the drawing elevations less the thickness of the concrete slab.
- F. Ditches and lagoon banks shall be finished graded, dressed, and seeded within 14 calendar days of work to reduce erosion and permit adequate drainage.

3.6 DISPOSAL OF WASTE MATERIAL

- A. All vegetation, roots, brush, sod, broken pavements, curb and gutter, rubbish, and other unsuitable or surplus material stripped or removed from limits of construction shall be disposed of by the Contractor.

3.7 PROTECTION

- A. Graded areas shall be protected from traffic, erosion, settlement, or any washing away occurring from any cause prior to acceptance.
- B. Contractor shall be responsible for protection of below grade utilities shown on the drawings or indicated by the Owner at all times during earthwork operations.



- C. Repair or re-establishment of graded areas prior to final acceptance shall be at the Contractors expense.
- D. Site drainage shall be provided and maintained by Contractor during construction until final acceptance of the project. Drainage may be by supplemental ditching, or pumping if necessary, prior to completion of permanent site drainage.

### 3.8 DRAINAGE

- A. Contractor shall be responsible for providing surface drainage away from all construction areas. This shall include maintenance of any existing ditches or those constructed in the immediate vicinity of the work. Contractor shall provide proper and effective measures to prevent siltation of wetlands, streams, and ditches on both the Owner's property, and those properties downstream.

### 3.9 FIELD QUALITY CONTROL

- A. Compaction testing shall be performed in accordance with ASTM D 6938. Where tests indicate the backfill does not meet specified requirements, the backfill shall be reworked or removed and replaced, and then retested at the Contractor's expense.
- B. Unpaved areas – at least 90% of maximum laboratory density within 2% optimum moisture content unless otherwise approved by the Engineer.
- C. Paved Areas and Under Structures – top 6 inch layer of subbase to at least 98% of maximum laboratory density within 2% optimum moisture content. Layers below top 6 inches shall be compacted to 95% of maximum laboratory density within 2% optimum moisture content.
- D. Rolling and compaction equipment and methods shall be subject to acceptance by the Engineer. Acceptance in no way relieves Contractor of the responsibility to perform in correct and timely means.
- E. Number of Tests – Under paved areas, no less than one density test per horizontal layer per 5,000 square feet of subbase shall be made. In unpaved areas, no less than one density test per horizontal layer per 10,000 square feet of fill area shall be made. Under curb and gutter, no less than one density test per every 300 linear feet. On building pads, no less than one density test per horizontal layer per 1,500 square feet of fill area shall be made.

### 3.10 PROOF ROLLING

- A. Shall be required on the subbase of all curb and gutter and paved areas and on the base of all paved areas where designated by the Engineer. Proof rolling shall take place after all underground utilities are installed and backfilled. The operation shall consist of rolling the subbase or base with a fully loaded 10-wheeled dump truck. A full load shall consist of 10 to 12 cubic yards of soil or rock. The dump truck shall be capable of traveling at a speed of two to five miles per hour and be in sound mechanical shape with no exhaust leaks or smoking from burning oil. The Engineer shall determine number of passes and areas rolled.

END OF SECTION

SECTION 312500GA - EROSION AND SEDIMENTATION CONTROLS (GA)

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Soil erosion, sediment, and pollution control measures shall include all temporary and permanent means of soil protection, trapping soils and containment of pollutants on the construction site during land disturbing activities. Activities covered in this section are regulated by the Manual for Erosion and Sediment Control in Georgia (latest revision) and Georgia's National Pollutant Discharge Elimination System Permit (NPDES), General Permit No. GAR100001.
- B. Reporting
- C. Sampling

1.2 RELATED SECTIONS

- A. Section 310000 – Earthwork
- B. Section 311000 – Site Clearing
- C. Section 331000 – Water Utilities
- D. Section 333000 – Sanitary Sewerage Utilities
- E. Section 334000 – Storm Drainage Utilities

1.3 PURPOSES

- A. The purpose of this section is to achieve the following goals:
  - 1. Minimize soil exposure by proper timing of clearing grading and construction.
  - 2. Retain existing vegetation whenever feasible.
  - 3. Vegetate and mulch disturbed areas as soon as possible.
  - 4. Divert runoff away from disturbed areas.
  - 5. Minimize length and steepness of slopes when it is practical.
  - 6. Reduce runoff velocities with check dams or surface roughing.
  - 7. Trap sediment on site.
  - 8. Inspect and maintain erosion, sedimentation, and pollution control measures.
  - 9. Report on condition of Best Management Practices (BMPs).

10. Sample site run off per Georgia's NPDES Permit.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of soil erosion, sedimentation and pollution control systems products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Codes and Standards: Comply with all applicable Local, State, and Federal Standards pertaining to soil erosion, sedimentation, and pollution control.

#### 1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instruction for soil erosion, sedimentation and pollution control materials and products.

#### 1.6 MEASUREMENT AND PAYMENT

- A. No unit measurements will be made for soil erosion control. Payment will be made at the lump sum price as shown on the bid proposal. The cost of soil erosion control shall include all equipment, labor, maintenance, monitoring, reporting, and materials necessary to comply with the State of Georgia NPDES Permit.

### PART 2 – PRODUCTS

#### 2.1 VEGETATIVE MATERIALS

- A. Mulch
  1. Dry straw or hay.
  2. Wood chips, sawdust or bark.
  3. Cutback asphalt.
- B. Temporary Seeding
  1. Annual Ryegrass
  2. Browntop Millet
- C. Permanent Seeding
  1. Common Bermuda
  2. Centipede
- D. Sod
  1. Common Bermuda

2. Centipede

3. St. Augustine

E. Fertilizer

1. Commercial 6–12–12

## 2.2 STRUCTURAL MATERIALS

A. Check Dam

1. Stone (2" – 10")

2. Bales of densely baled hay or straw wrapped with synthetic or wire bands (two minimum per bale).

B. Construction Exit

1. Minimum 20' x 50' x 0.5' layer of 1.5" to 3.5" stone with a geotextile underliner.

C. Filter Ring

1. Minimum 2' high stone ring. Stone shall be no smaller than 3" to 5" when utilized at storm drain inlets and pond outlets with pipe diameters less than 12".

2. Minimum 2' high stone ring. Stone shall be no smaller than 10" to 15" when utilized at storm drain inlets and pond outlets with pipe diameters greater than 12".

D. Sediment Barrier

1. Bales of densely baled hay or straw wrapped with synthetic or wire bands (two minimum per bale).

2. Silt Fence – Shall be a woven geotextile fabric sheet of plastic yarn composed of a long chain synthetic polymer with at least 85% by weight propylene, ethylene, amide, ester or vinylidene chloride, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultra-violet and/or heat exposure. The fabric shall be finished so the filaments will retain their relative position with respect to each other. The fabric shall be free of defects, rips, holes, or flaws. The manufacturer shall have either an approved color mark yarn in the fabric or label the fabricated silt fence with both the manufacturer and fabric name every 100'.

The fabric shall meet the following requirements:

Grab Strength	90 lbs.
Mullen Burst Strength	150 lbs.
UV Resistance	80 %

E. Inlet Sediment Trap

1. Silt fence (Type C) supported by steel posts.
2. Baffle Box – Constructed of 2” x 4” boards spaced a maximum of 1” apart or plywood with weep holes 2” in diameter (See detail).
3. Sod Inlet Protection – Four – 1 foot wide strips of sod on each side of the inlet (See detail).
4. Curb Inlet Protection – Eight inch concrete blocks wrapped in filter fabric, placed in front of a curb inlet.

F. Storm Drain Outlet Protection

1. Geotextile fabric equivalent to Mirafi FW700.
2. Rip-rap (See detail for size).

2.3 CHEMICAL MATERIALS

- A. Dust Control – Calcium Chloride, Anionic Asphalt Emulsion, Latex Emulsion, or Resin-in-Water Emulsion.
- B. Anionic Polyacrylamide (PAM) – Consult state and local laws concerning the regulations of this chemical.

PART 3 – EXECUTION

3.1 GENERAL

- A. All disturbed soil areas except those to support paving shall be graded and protected from erosion with vegetative materials. Sedimentation discharge from the construction site into natural drainage ways and storm drainage systems shall be prevented by means of vegetative measures and temporary structural practices. These vegetative measures and structural practices are known as Best Management Practices (BMPs). Rainfall, pollution control measures, and construction exit condition shall be monitored and reported on each day when construction activities take place. Erosion and sedimentation control measures shall be monitored and reported on every seven days and within 24 hours of a qualifying rainfall event of 0.5 inches or more. Sampling of construction site discharging water shall be sampled within 45 minutes of a qualifying rainfall event and analyzed immediately or no later than 48 hours after collection. The above reports shall be submitted to the Georgia EPD by the fifteenth day of the month following the reporting period.
- B. The Contractor (Operator) is considered a “Primary Permittee” and shall submit a Notice of Intent (NOI) in accordance with General Permit No. GAR100001 at least 14 days prior to the commencement of construction activities. Contractor shall retain a copy of the Erosion, Sedimentation, and Pollution Control Plan and Comprehensive Monitoring Program required by above permit at construction site or be readily available at a designated alternate location from date of project initiation to date of final stabilization. Copies of all Notice of Intent,

Notice of Termination, plans, monitoring reports and all other records required by above permit shall be retained by Contractor for a period of at least three years from date the site is finally stabilized. Copies of Notice of Intent (NOI), Notice of Termination (NOT) and General Permit Number GAR100001 are found at the end of this section.

### 3.2 ON-SITE OBSERVATION

- A. Engineer is required by General Permit No. GAR100001 to check the installation of Erosion, Sedimentation and Pollution Control measures within one week after initial construction activities commence. The Contractor shall notify Engineer within 24 hours of control measures installation for the above site visit. Engineer, within the above parameters, shall check subsequent installation of control measures.

### 3.3 VEGETATIVE PRACTICES

#### A. Mulch

1. Dry straw or hay shall be applied at a depth of 2 to 4 inches by hand or mechanical equipment providing complete soil coverage. Straw or hay shall be anchored immediately after application. Straw or hay can be anchored with a disk harrow, packer disk or emulsified asphalt.
2. Wood chips, sawdust, or bark shall be applied at a depth of 2 to 3 inches by hand or mechanical equipment providing complete soil coverage. Netting of the appropriate size shall be used to anchor the above materials.
3. Cutback asphalt shall be applied at 1,200 gallons per acre or 1/4 gallon per square yard.

#### B. Seeding

1. Seed shall be applied uniformly by hand, cyclone seeder, drill, cultipacker seeder, or hydraulic seeder. Drill or cultipacker seeders shall place seed 1/4" to 1/2" deep. Soil shall be raked lightly to cover seed with soil if seeded by hand.
2. During times of drought, water shall be applied at a rate not causing runoff and erosion. The soil shall be thoroughly wetted to depth insuring germination of the seed. Subsequent applications of water shall be made when needed.
3. Refer to Section 32 92 00 – Turf and Grasses for additional seeding requirements.

#### C. Sodding

1. Bring soil surface to final grade. Clear surface of trash, woody debris stones, and dirt clods larger than 1". Mix fertilizer into soil surface. Apply sod to soil when surface is not muddy or frozen. Lay sod with tight joints and in straight lines. Do not overlap joints. Stagger joints and do not stretch sod. On slopes steeper than 3:1, sod shall be anchored with pins or other approved methods. Installed sod shall be rolled or tamped to provide good contact between sod and soil. Irrigate sod and soil to a depth of 4" immediately after installation. Irrigation shall be used to supplement rainfall for a minimum of 2–3 weeks.

2. Refer to Section 32 92 00 – Turf and Grasses for additional sodding requirements.

### 3.4 STRUCTURAL MEASURES

#### A. Check Dam

1. Stone – Shall be constructed of graded size 2–10 inch stone underlayed with a geotextile fabric. Mechanical or hand placement shall be required to insure complete coverage of entire width of ditch or swale and center of dam is lower than edges. Sediment shall be removed when it reaches a depth of one-half the original dam height or before.
2. Haybale – Shall be staked and embedded a minimum of 4” and may be used as temporary check dams in concentrated flow areas while vegetation is becoming established. They should not be used where the drainage area exceeds one acre. Sediment shall be removed when it reaches a depth of one-half the original dam height or before.

#### B. Construction Exit

1. A stone stabilized pad shall be located at any point where traffic will be leaving the construction site to a public right-of-way, street, alley, sidewalk, parking area or any other area where there is a transition from bare soil to a paved area. The pad shall be constructed of 1.5” to 3.5” stone, having a minimum thickness of 6” and not less than 20’ wide and 50’ long. The pad shall be underlayed with a geotextile fabric. The pad shall be maintained in a condition, which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with 1.5” to 3.5” stone. All materials spilled, dropped, washed, or tracked from vehicles or site onto roadways or into storm drains must be removed immediately.

#### C. Filter Ring

1. Shall surround all sides of the structure receiving runoff from disturbed areas. It shall be placed a minimum of 4’ from the structure. It may also be used below storm drains discharging into detention ponds, creating a centralized area for sediment accumulation. When utilized below a storm drain outlet, it shall be placed such that it does not create a condition causing water to back-up into the storm drain and inhibit the function of the storm drain system. The larger stone can be faced with smaller filter stone on the upstream side for added sediment filtering capabilities. Mechanical or hand placement of stone shall be required to uniformly surround the structure.
2. Filter ring must be kept clear of trash and debris. This requires continuous monitoring and maintenance, which includes sediment removal when one-half full. Filter rings are temporary and should be removed when the site has been stabilized.

#### D. Sediment Barrier

1. Hay or straw bales may be used in areas of low sheet flow rates. They shall not be use if the project duration is expected to exceed three months. Bales shall be placed in a single row, lengthwise, and embedded in the soil to a depth of 4”. Bales must be

securely anchored in place by stakes or bars driven through the bales or by other acceptable means to prevent displacement. Bales shall be placed so the binding wire or twine around the bale will not touch the soil. Sediment shall be removed once it has accumulated to one-half the original height of the barrier. Barriers shall remain in place until disturbed areas have been permanently stabilized. All sediment accumulated at the barrier shall be removed and properly disposed of before the barrier is removed. The slope lengths contributing runoff to a bale barrier cannot exceed those listed below.

<u>Land Slope</u> (Percent)	<u>Maximum Slope Length</u> <u>Above Bale</u> (Feet)
< 2	75
2 to 5	50
5 to 10	35
10 to 20	20
> 20	10

2. Silt fence may be used in areas of higher sheet flow rates. The drainage area shall not exceed ¼ acre for every 100' of silt fence. Silt fence shall not be installed across streams, ditches, waterways or other concentrated flow areas. Silt fence shall be installed according to this specification, as shown on the construction drawings or as directed by the Engineer. See details on the construction drawings for installation requirements.
  - a. Type A – A 36" wide filter fabric silt fence shall be used on construction sites where the life of the project is greater than or equal to six months.
  - b. Type B – A 22" wide filter fabric silt fence shall be limited to use on minor projects, such as residential home sites or small commercial developments where permanent stabilization will be achieved in less than six months.
  - c. Type C – A 36" wide filter fabric silt fence with wire reinforcement shall be used where runoff flows or velocities are particularly high or where slopes exceed a vertical height of 10'. Along stream buffers and other sensitive areas, two rows of Type C silt fence or one row of Type C silt fence backed by hay bales shall be used.
3. Where all runoff is to be stored behind the silt fence (where no stormwater disposal system is present), the slope lengths contributing runoff to a silt fence barrier cannot exceed those listed below.

<u>Land Slope</u> (Percent)	<u>Maximum Slope Length</u> <u>Above Fence</u> (Feet)
< 2	100
2 to 5	75
5 to 10	50
10 to 20	25
> 20*	15



\*In areas where the slope is greater than 20%, a flat area length of 10' between the toe of the slope and the fence shall be provided.

4. Sediment shall be removed once it has accumulated to one-half the original height of the barrier. Filter fabric shall be replaced whenever it has deteriorated to such an extent that the effectiveness of the fabric is reduced (approximately six months). Barriers shall remain in place until disturbed areas have been permanently stabilized. All sediment accumulated at the barrier shall be removed and properly disposed of before the barrier is removed.

E. Inlet Sediment Trap

1. Shall be installed at or around all storm drain inlets receiving runoff from disturbed areas. Sediment traps must be self draining unless they are otherwise protected in an approved manner that will not present a safety hazard. The drainage area entering the inlet sediment trap shall be no greater than one acre. Sediment traps may be constructed on natural ground surface, on an excavated surface or on machine compacted fill provided they have a non-erodible outlet.
2. Type C silt fence supported by steel posts may be used where the inlet drains a relatively flat area (slope no greater than 5%) and shall not apply to inlets receiving concentrated flows, such as in street or highway medians. The stakes shall be spaced evenly around the perimeter of the inlet a maximum of 3' apart and securely driven into the ground, approximately 18" deep. The fabric shall be entrenched 12" and backfilled with crushed stone or compacted soil. Fabric and wire shall be securely fastened to the posts and fabric ends must be overlapped a minimum of 18" or wrapped together around a post to provide a continuous fabric barrier around the inlet. The trap shall be inspected daily and after each rain. Repairs are to be made as needed. Sediment shall be removed once it has accumulated to one-half the height of the trap. Sediment shall not be washed into the inlet. It shall be removed from the sediment trap and disposed of and stabilized so it will not enter the inlet again. When the contributing drainage area has been permanently stabilized, all materials and any sediment shall be removed and either salvaged or disposed of properly. The disturbed area shall be brought to proper grade, smoothed and compacted. Appropriately stabilize all disturbed areas around the inlet.
3. A baffle box shall be used for inlets receiving runoff with a higher volume or velocity. The box shall be constructed of 2" x 4" boards spaced a maximum of 1" apart or of plywood with weep holes 2" in diameter. The weep holes shall be placed approximately 6" on center vertically and horizontally. The entire box shall be wrapped in Type C filter fabric that is entrenched 12" and backfilled. Gravel shall be placed around the box to a depth of 2" to 4". The trap shall be inspected daily and after each rain. Repairs are to be made as needed. Sediment shall be removed once it has accumulated to one-half the height of the trap. Sediment shall not be washed into the inlet. It shall be removed from the sediment trap and disposed of and stabilized so it will not enter the inlet again. When the contributing drainage area has been permanently stabilized, all materials and any sediment shall be removed and either salvaged or disposed of properly. The disturbed area shall be brought to proper grade, smoothed and compacted. Appropriately stabilize all disturbed areas around the inlet.

4. Sod Inlet Protection shall be used only at the time of permanent seeding, to protect the inlet from sediment and mulch material until permanent vegetation has become established. The sod shall be placed to form a turf mat covering the soil for a distance of 4' from each side of the inlet structure. Sod strips shall be staggered so adjacent strip ends are not aligned. Re-sod areas where an adequate stand of sod is not obtained. New sod should be mowed sparingly. Grass height should not be less than 2" to 3".
5. Curb Inlet Protection shall be used on curb inlets receiving runoff from disturbed areas once pavement has been installed. Place 8" concrete blocks wrapped in filter fabric in front of the curb inlet opening. A gap of approximately 4" shall be left between the inlet filter and the inlet to allow for overflow and prevention of hazardous ponding in the roadway. This method of inlet protection shall be removed if a safety hazard is created. Sediment shall be removed from curb inlet protection immediately.

F. Storm Drain Outlet Protection

1. Outlet protection aprons shall be constructed at all storm drain outlets, road culverts, paved channel outlets discharging into natural or constructed channels. Apron will extend from end of the conduit, channel, or structure to the point of entry into an existing stream or publicly maintained drainage system. Apron length, width, and stone size shall conform to details on the construction drawings. Apron shall be constructed with no slope along its length. Invert elevation of the downstream end of apron shall be equal to the elevation of the receiving channel invert. There shall be no overfall at the end of apron. Apron shall be located so there are no bends in the horizontal alignment.
2. Subgrade for geotextile fabric and rip-rap shall follow required lines and grades shown on the construction drawings. Compact any subgrade fill required to the density of surrounding undisturbed material. Low areas in subgrade on undisturbed soil may also be filled by increasing rip-rap thickness. Geotextile fabric shall be protected from punching or tearing during installation. Repair any damage by removing rip-rap and placing another piece of fabric over the damaged area. All connecting joints shall overlap a minimum of 1'. If damage is extensive, replace entire geotextile fabric. Rip-rap shall be placed by equipment or hand. Minimum thickness of rip-rap shall be 1.5 times the maximum stone diameter. Immediately after construction, stabilize all disturbed areas around apron with vegetation.
3. Check outlet apron after heavy rains to see if any erosion around or below the rip-rap has taken or if stones have been dislodged. Immediately make all needed repairs to prevent further damage.

3.5 CHEMICAL MEASURES

A. Dust Control

1. Dust raised from vehicular traffic shall be controlled by wetting down roads with water or by the use of chemicals. Chemicals shall be applied in accordance with the manufacturer's recommendations.

B. Soil Binding

1. This temporary practice is intended for direct soil surface application to sites where the timely establishment of vegetation may not be feasible or where vegetative cover is absent or inadequate. This temporary practice is not intended for application to surface waters of the state. It is intended for application within construction storm water ditches and storm drains that feed into previously constructed sediment ponds or basins.
2. Anionic Polyacrylamide (PAM) is available in emulsions, powders, gel bars, and logs. It is required that other Best Management Practices be used in combination with anionic PAM. The use of seed and mulch for additional erosion protection beyond the life of anionic PAM is recommended. Use 50' setbacks when applying anionic PAM near natural water bodies. Never add water to PAM, add PAM slowly to water. If water is added to PAM, globs can form which can clog dispensers. This signifies incomplete dissolving of PAM and therefore increases the risk of under application. Application rates shall conform to manufacturer's guidelines. The maximum application rate of PAM, in pure form, shall not exceed 200pounds/acre/year. Contractors using anionic PAM shall obtain and follow all Material Safety Data Sheet requirements and manufacturer's recommendations. Gel bars and logs of anionic PAM mixtures may be used in ditch systems. This application shall meet the same testing requirements as anionic PAM emulsions and powders. Maintenance will consist of reapplying anionic PAM to disturbed areas, including high traffic areas, which interfere in the performance of this practice.

3.6 MONITORING AND REPORTING

- A. Each day, when any type of construction activity takes place on the construction site, Contractor's qualified personnel shall monitor and record rainfall, inspect all areas where petroleum products are stored, used or handled for spills and leaks from vehicles and equipment and check all locations where vehicles enter or exit the site for evidence of off site sediment tracking. These inspections shall be conducted until a Notice of Termination (NOT) is submitted. For linear construction where a phased activity is conducted, this paragraph applies to the active phase(s) of work.
- B. Once every seven calendar days and within 24 hours of the end of a storm 0.5 inches or greater, Contractor's qualified personnel shall inspect disturbed areas of the construction site that have not undergone final stabilization, areas used for storage of materials that are exposed to precipitation that have not undergone final stabilization and structural control measures (BMPs). Erosion and sediment control measures identified in the Erosion, Sedimentation, and Pollution Control Plan shall be observed to ensure they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving water(s). These inspections must be conducted until a Notice of Termination is submitted. For linear construction where a phase activity is conducted, this paragraph applies to the active phase(s) of work.
- C. Contractor's qualified personnel shall inspect a least once per month during the term of the General Permit, areas of the construction site having undergone final stabilization. These areas shall be inspected for evidence of, or the potential for, pollutants entering the drainage system and receiving water(s). Erosion and sediment control measure shall be observed to

ensure they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measure are effective in preventing significant impacts to receiving water(s). For linear construction, monthly inspections in accordance with this paragraph shall be made for those phases on which final stabilization has been completed.

- D. Contractor shall prepare a report summarizing the scope of inspections, name(s) of qualified personnel making the inspections, date(s) of inspections, major observations relating to the implementation of the Erosion, Sedimentation and Pollution Control Plan and any actions taken. This report shall be retained on the construction site or be readily available at a designated alternate location until the entire site or portion of a construction project that was phased, has undergone final stabilization and a Notice of Termination (NOT) is submitted to EPD. Such reports shall identify any incidents of non-compliance. Where the report does not identify any incidents of non-compliance, the re report shall contain a certification that the facility is in compliance with the Erosion, Sedimentation and Pollution Control Plan and the General Permit. The report shall be signed in accordance with the General Permit.

### 3.7 SAMPLING AND ANALYSIS

- A. Contractor must manually or automatically sample in accordance with the Comprehensive Monitoring Plan (CMP) at least once for each rainfall event described below. For a qualifying event, samples must be taken within forty-five (45) minutes of:

1. The accumulation of the minimum amount of rainfall, if the storm water discharge to a monitored receiving water or from a monitored outfall has begun at or prior to the accumulation.
2. The beginning of any storm water discharge to a monitored receiving water or from a monitored outfall, if the discharge begins after the accumulation of the minimum amount of rainfall.

However, where manual and automatic sampling are impossible (as defined in the permit), or are beyond the Contractor's control, the Contractor shall take samples as soon as possible, but in no case more than 12 hours after the beginning of the storm water discharge.

- B. Sampling shall occur for the following events:

1. For each area of the site discharging to a receiving stream, the first rain event reaching or exceeding 0.5 inch and allows for monitoring during normal business hours\* (Monday thru Friday, 8:00 a.m. to 5:00 p.m. and Saturday 8:00 a.m. to 5:00 p.m. when construction activity is being conducted by the Primary permittee) occurring after all clearing and grubbing operations are completed in the drainage area of the location selected as the sampling location;
2. In addition to (1) above, for each area of the site discharging to a receiving stream, the first rain event reaching or exceeding 0.5 inch and allows for monitoring during normal business hours\* occurring either 90 days after the first sampling event or after all mass grading operations are completed in the drainage area of the location selected as the sampling location, whichever comes first.

3. At the time of the sampling performed pursuant to (1) and (2) above, if BMPs are found to be properly designed, installed, and maintained, no further action is required. If BMPs in any area of the site discharging to a receiving stream are not properly designed, installed, and maintained, corrective action shall be defined and implemented within two business days, and turbidity samples shall be taken from discharges of the same area for each subsequent rain event reaching or exceeding 0.5 inch during normal business hours\* until the selected turbidity standard is attained, or until post-storm event inspections determine BMPs are properly designed, installed, and maintained;
4. Existing construction activities, i.e., those occurring on or before the effective date of this permit, having met the sampling required by (1) above shall sample in accordance with (2). Those existing construction activities having met the sampling required by (2) above shall not be required to conduct additional sampling other than as required by (3) above.

\* Note the Permittee may choose to meet the requirements of (1) and (2) above by collecting turbidity samples from any rain event reaching or exceeding 0.5 inch and allows for monitoring at any time of the day or week.

5. For linear construction, if at any time during the life of the project, BMPs have not been properly designed, installed or maintained for the construction activities that discharge into a receiving water which is not being sampled, the Contractor shall sample that receiving water for the first rainfall event greater than or equal to 0.5 inches thereafter and for every rainfall event greater than or equal to 0.5 inches until BMPs are properly designed, installed and maintained.
- C. Sampling shall be collected by “grab samples” and the analysis of these samples must be conducted in accordance with methodology and test procedures established in the General Permit. Sample containers shall be labeled prior to collecting the samples. Samples shall be well mixed before transferring to a secondary container. Large mouth, well cleaned and rinsed glass or plastic jars shall be used for collecting samples. The jars shall be cleaned thoroughly to avoid contamination. Manual or automatic sampling shall be utilized. Samples required by the General Permit shall be analyzed immediately, but in no case later than 48 hours after collection. However, samples from automatic samplers must be collected no later than the next business day after their accumulation, unless flow through automated analysis is utilized. Samples are not required to be cooled. Samples taken for the purpose of compliance with the General Permit shall be representative of the monitored activity and representative of the water quality of the receiving water(s) and/or the storm water outfalls using the following minimum guidelines:
1. The upstream sample for each receiving water(s) must be taken immediately upstream of the confluence of the first storm water discharge from the permitted construction site but downstream of any other storm water discharges not associated with the site. Where appropriate, several upstream samples from across the receiving water(s) may need to be taken and the average turbidity of these samples used for an upstream turbidity value.
  2. The downstream sample for each receiving water(s) must be taken downstream of the confluence of the last storm water discharge from the construction site but upstream of any other storm water discharge not associated with the site. Where

- appropriate, several downstream samples from across the receiving water(s) may need to be taken and the average turbidity of these samples used for a downstream turbidity value.
3. Samples shall be taken from the horizontal and vertical center of the receiving water(s) or the storm water outfall channel(s).
  4. Care shall be taken to avoid stirring the bottom sediments in the receiving water(s) or in the outfall storm water channel(s).
  5. Sampling container shall be held so the opening faces upstream.
  6. Samples shall be kept from floating debris.
- D. For all construction sites and common developments other than linear construction projects, the Contractor shall sample all receiving water(s), or all outfall(s) or a combination of receiving water(s) and outfall(s). For linear construction projects, the Contractor must sample all perennial and intermittent streams and other water bodies shown on an USGS topographic map and all other field verified perennial and intermittent streams and other water bodies, or all outfalls into such streams and other water bodies, or a combination thereof.
- E. Contractor shall provide and implement all safety equipment and procedures necessary for sampling during hazardous weather conditions and in the event of biological, chemical or physical hazards
- F. Contractor shall submit a summary of the monitoring results to the EPD at the address shown in the General Permit by the fifteenth day of the month following the reporting period. For a monitoring period during which no qualifying rainfall events occur, a monitoring report must be submitted stating such. Monitoring periods are calendar months beginning with the first month after the effective date of the General Permit. Monitoring reports shall be signed in accordance with the General Permit and submitted to EPD until such time as a NOT is submitted.
- G. Contractor must retain copies of all monitoring results and monitoring information reported. In addition to other record keeping requirements, the monitoring information shall include:
1. Date, exact place, and time of sampling or measurements.
  2. Name(s) of the individual(s) who performed the sampling and measurements.
  3. Date(s) analyses were performed.
  4. Time(s) analyses were initiated.
  5. Name(s) of the individual(s) who performed the analyses.
  6. References and written procedures, when available, for the analytical techniques or methods used. A quality control/quality assurance program must be included in the written procedures.

7. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, used to determine these results.
  8. Results exceeding 1,000 NTU shall be reported as "Exceeds 1,000 NTU."
- H. Suggested monitoring and report forms are found at the end of this section.

End of Section



**GEORGIA**  
DEPARTMENT OF NATURAL RESOURCES

**ENVIRONMENTAL PROTECTION DIVISION**

**Authorization To Discharge Under The  
National Pollutant Discharge Elimination System  
Storm Water Discharges Associated With Construction Activity  
For Stand Alone Construction Projects**

In compliance with the provisions of the Georgia Water Quality Control Act (Georgia Laws 1964, p.416, as amended), hereinafter called the "State Act," the Federal Clean Water Act, as amended (33 U.S.C. 1251 et seq.), hereinafter called the "Clean Water Act," and the Rules and Regulations promulgated pursuant to each of these Acts, new and existing stormwater point sources within the State of Georgia that are required to have a permit, upon submittal of a Notice of Intent, are authorized to discharge stormwater associated with construction activity to the waters of the State of Georgia in accordance with the limitations, monitoring requirements and other conditions set forth in Parts I through VI hereof.

This permit shall become effective on August 1, 2018.

This permit and the authorization to discharge shall expire at midnight, July 31, 2023.

Signed this 16<sup>th</sup> day of May 2018.



Richard E. Dunn, Director  
Environmental Protection Division



## TABLE OF CONTENTS

<b>Section</b>	<b>Page</b>
<b>Part I. COVERAGE UNDER THIS PERMIT</b>	
A. Permit Area .....	4
B. Definitions .....	4
C. Eligibility .....	9
D. Authorization .....	10
E. Continuing Obligations of Permittees .....	10
<b>Part II. NOTICE OF INTENT REQUIREMENTS</b>	
A. Deadlines for Notification .....	11
B. Notice of Intent Contents .....	12
C. Notice of Intent Submittal .....	13
D. Fees .....	13
E. Renotification .....	14
<b>Part III. SPECIAL CONDITIONS, MANAGEMENT PRACTICES, PERMIT VIOLATIONS AND OTHER LIMITATIONS</b>	
A. Prohibition on Non-Stormwater Discharges .....	14
B. Releases in Excess of Reportable Quantities .....	14
C. Discharges into, or within One Mile Upstream of and within the Same Watershed as, Any Portion of a Biota Impaired Stream Segment .....	15
D. Management Practices and Permit Violations .....	17
<b>Part IV. EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN</b>	
A. Deadlines for Plan Preparation and Compliance .....	24
B. Signature and Plan Review .....	26
C. Keeping Plans Current .....	26
D. Contents of Plan .....	26
1. Checklist .....	26
2. Site Description .....	27
3. Controls .....	27
4. Inspections .....	31

5. Maintenance .....	33
6. Sampling Requirements .....	33
7. Non-stormwater Discharges .....	37
E. Reporting .....	37
F. Retention of Records .....	38

## **Part V. STANDARD PERMIT CONDITIONS**

A. Duty to Comply .....	38
B. Continuation of the Expired General Permit .....	39
C. Need to Halt or Reduce Activity Not a Defense .....	39
D. Duty to Mitigate .....	39
E. Duty to Provide Information .....	39
F. Other Information .....	39
G. Signatory Requirements .....	39
H. Oil and Hazardous Substance Liability .....	41
I. Property Rights .....	41
J. Severability .....	41
K. Other Applicable Environmental Regulations and Laws .....	41
L. Proper Operation and Maintenance .....	41
M. Inspection and Entry .....	42
N. Permit Actions .....	42

## **Part VI. TERMINATION OF COVERAGE**

A. Notice of Termination Eligibility .....	42
B. Notice of Termination Contents .....	43
C. Notice of Termination Submittal .....	43

<b>APPENDIX A. EPD District Offices .....</b>	<b>44</b>
---	-----------

<b>APPENDIX B. Nephelometric Turbidity Unit (NTU) Table .....</b>	<b>46</b>
---	-----------

## **Part I. COVERAGE UNDER THIS PERMIT**

### **A. Permit Area.**

This permit regulates point source discharges of stormwater to the waters of the State of Georgia from construction activities, as defined in this permit.

**B. Definitions.** All terms used in this permit shall be interpreted in accordance with the definitions as set forth in the Georgia Water Quality Control Act (Act) and the Georgia Rules and Regulations for Water Quality Control Chapter 391-3-6 (Rules), unless otherwise defined in this permit:

1. “Best Management Practices” (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the “Manual for Erosion and Sediment Control in Georgia” (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted to prevent or reduce the pollution of waters of Georgia. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.
2. “Buffer” means the area of land immediately adjacent to the banks of State waters in its natural state of vegetation, which facilitates the protection of water quality and aquatic habitat.
3. “Certified Personnel” means a person who has successfully completed the appropriate certification course approved by the Georgia Soil and Water Conservation Commission.
4. “Commencement of Construction” means the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.
5. “Common Development” means a contiguous area where multiple, separate, and distinct construction activities will be taking place at different times on different schedules under one plan of development.
6. “Construction Activity” means the disturbance of soils associated with clearing, grading, excavating, filling of land, or other similar activities which may result in soil erosion. Construction activity does not include agricultural and silvicultural practices, but does include agricultural buildings.
7. “CPESC” means Certified Professional in Erosion and Sediment Control with current certification by EnviroCert International, Inc.
8. “Design Professional” means a professional licensed by the State of Georgia in the field of: engineering, architecture, landscape architecture, forestry, geology, or land surveying; or a person that is a Certified Professional in Erosion and Sediment Control (CPESC) with a current

certification by EnviroCert International, Inc. Design Professionals shall practice in a manner that complies with applicable Georgia law governing professional licensure.

9. “CWA” means Federal Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972).

10. “Director” means the Director of the Environmental Protection Division or an authorized representative.

11. “Division” means the Environmental Protection Division of the Department of Natural Resources.

12. “Erosion” means the process by which land surface is worn away by the action of wind, water, ice or gravity.

13. “Erosion, Sedimentation and Pollution Control Plan” or “Plan” means a plan for the control of soil erosion, sediment and pollution resulting from a construction activity.

14. “Filling” means the placement of any soil or solid material either organic or inorganic on a natural ground surface or an excavation.

15. “Final Stabilization” means that all soil disturbing activities at the site have been completed, and that for unpaved areas and areas not covered by permanent structures and areas located outside the waste disposal limits of a landfill cell that has been certified by EPD for waste disposal, 100% of the soil surface is uniformly covered in permanent vegetation with a density of 70% or greater, or landscaped according to the Plan (uniformly covered with landscaping materials in planned landscaped areas), or equivalent permanent stabilization measures as defined in the Manual (excluding a crop of annual vegetation and a seeding of target crop perennials appropriate for the region).

16. “General Contractor” means the operator of the stand alone construction or site.

17. “Impossible” means the monitoring location(s) are either physically or legally inaccessible, or access would cause danger to life or limb.

18. “Infeasible” means not technologically possible, or not economically practicable and achievable in light of best industry practices.

19. “Landfill” means an area of land or an excavation in which waste materials are placed for permanent disposal, and which is not a land application unit, surface impoundment, injection well or waste pile as defined by Georgia NPDES General Permit GAR050000, and which area of land or excavation must be certified by EPD before it can begin waste disposal operations.

20. “Landfill Cell(s)” means a defined area within a landfill where waste materials are permanently disposed and that must be certified by EPD for use before such cell(s) can begin

receiving waste materials after which those activities associated with waste receipt and disposal in the landfill cell(s) shall not be considered construction activity as defined by this permit.

21. "Local Issuing Authority" means the governing authority of any county or municipality which is certified pursuant to Official Code of Georgia Section 12-7-8(a).

22. "Mass Grading" means the movement of earth by mechanical means to alter the gross topographic features (elevations, slopes, etc.) to prepare a site for final grading and the construction of facilities (buildings, roads, parking, etc.).

23. "Nephelometric Turbidity Unit (NTU)" means a numerical unit of measure based upon photometric analytical techniques for measuring the light scattered by fine particles of a substance in suspension.

24. "NOI" means Notice of Intent to be covered by this permit (see Part II).

25. "Normal Business Hours" means Monday thru Friday, 8:00 AM to 5:00 PM, excluding any non-working Saturday, non-working Sunday and non-working Federal holiday.

26. "NOT" means Notice of Termination (see Part VI).

27. "Operator" means the entity that has the primary day-to-day operational control of those activities at the construction site necessary to ensure compliance with Erosion, Sedimentation and Pollution Control Plan requirements and permit conditions.

28. "Other Water Bodies" means ponds, lakes, marshes and swamps which are waters of the State.

29. "Outfall" means the location where stormwater, in a discernible, confined and discrete conveyance, leaves a facility or construction site or, if there is a receiving water on site, becomes a point source discharging into that receiving water.

30. "Owner" means the legal title holder to the real property on which is located the facility or site where construction activity takes place.

31. "Permittee" means any entity that has submitted a Notice of Intent and obtained permit coverage.

32. "Phase" or "Phased" means sub-parts or segments of construction sites where the sub-part or segment is constructed and stabilized prior to completing the entire construction site.

33. "Point Source" means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure or container from which pollutants are or may be discharged. This term also means sheet flow which is later

conveyed via a point source to waters of the State. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff.

34. "Primary Permittee" means the Owner or the Operator or both of a tract of land for a construction site subject to this permit.

35. "Proper design" and "properly designed" means designed in accordance with the design requirements and specifications contained in the "Manual for Erosion and Sediment Control in Georgia" (Manual) published by the Georgia Soil and Water Conservation Commission (GSWCC) as of January 1 of the year in which the land-disturbing activity was permitted and amendments to the Manual as approved by the GSWCC up until the date of NOI submittal.

36. "Receiving Water(s)" means all perennial and intermittent waters of the State into which the runoff of stormwater from a construction activity will actually discharge, either directly or indirectly.

37. "Roadway Project(s)" means traveled ways including but not limited to roads, sidewalks, multi-use paths and trails, and airport runways and taxiways. This term also includes the accessory components to a roadway project that are necessary for the structural integrity of the roadway and the applicable safety requirements. These accessory components include but are not limited to slopes, shoulders, stormwater drainage ditches and structures, guardrails, lighting, signage, cameras and fences and exclude subsequent landscaping and beautification projects.

38. "Sediment" means solid material, both organic and inorganic, that is in suspension, is being transported, or has been moved from its site of origin by, wind, water, ice, or gravity as a product of erosion.

39. "Sedimentation" means the action or process of forming or depositing sediment.

40. "Sheet flow" means runoff which flows over the ground surface as a thin, even layer, not concentrated in a channel.

41. "Site" or "Construction Site" means a facility of any type on which construction activities are occurring or are to occur which may result in the discharge of pollutants from a point source into the waters of the State.

42. "Stand Alone Construction" or "Stand Alone Construction Project" means construction activities that are not part of a common development where the primary permittee chooses not to use secondary permittees.

43. "Stormwater" means stormwater runoff, snow melt runoff, and surface runoff and drainage.

44. "Structural Erosion and Sediment Control Practices" means measures for the stabilization of erosive or sediment producing areas by utilizing the mechanical properties of matter for the

purpose of either changing the surface of the land or storing, regulating or disposing of runoff to prevent excessive sediment loss.

45. “Sub-contractor” means an entity employed or retained by the permittee to conduct any type of construction activity (as defined in this permit) at a stand alone construction site. Sub-contractors must complete the appropriate certification course approved by the Georgia Soil and Water Conservation Commission in accordance with the provisions of O.C.G.A. 12-7-19. Sub-contractors are not permittees unless they meet the definition of either a primary, secondary or tertiary permittee.

46. “Surface Water Drainage Area” means the hydrologic area starting from the lowest downstream point where the stormwater from the construction activity enters the receiving water(s) and following the receiving water(s) upstream to the highest elevation of land that divides the direction of water flow. This boundary will connect back with the stormwater entrance point. Boundary lines follow the middle of the highest ground elevation or halfway between contour lines of equal elevation.

47. “Trout Streams” means waters of the State classified as either primary trout waters or secondary trout waters, as designated in the Rules and Regulations for Water Quality Control, Chapter 391-3-6.

48. “Utility Company or Utility Contractor” means, for purposes of this Permit, an entity or sub-contractor that is responsible, either directly or indirectly, for the construction, installation, and maintenance of conduits, pipes, pipelines, cables, wires, trenches, vaults, manholes, and similar structures or devices for the conveyance of natural gas (or other types of gas), liquid petroleum products, electricity, telecommunications (telephone, data, television, etc.), water, stormwater or sewage.

49. “USGS Topographic Map” means a current quadrangle, 7½ minute series map prepared by the United States Department of the Interior, Geological Survey.

50. “Vegetative Erosion and Sediment Control Practices” means measures for the stabilization of erosive or sediment producing areas by covering the soil with: (1) permanent seeding, sprigging or planting, producing long-term vegetative cover; (2) temporary seeding, producing short-term vegetative cover; or (3) sodding, covering areas with a turf of perennial sod forming grass.

51. “Waters Supporting Warm Water Fisheries” means all waters of the State that sustain, or have the potential to sustain, aquatic life but excluding trout streams.

52. “Waters of Georgia” or “Waters of the State” means any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, drainage systems, springs, wells, wetlands, and all other bodies of surface or subsurface water, natural or artificial, lying within or forming a part of the boundaries of the State which are not entirely confined and retained completely upon the property of a single individual, partnership, or corporation.

### **C. Eligibility.**

#### **1. Construction Activities.** This permit authorizes, subject to the conditions of this permit:

- a. all discharges of stormwater associated with stand alone construction projects that will result in land disturbance equal to or greater than one (1) acre occurring on or before, and continuing after, the effective date of this permit, (henceforth referred to as existing stormwater discharges from construction activities) except for discharges identified under Part I.C.3.;
- b. all discharges of stormwater associated with stand alone construction projects that will result in land disturbance equal to or greater than one (1) acre occurring after the effective date of this permit, (henceforth referred to as stormwater discharges from construction activities); and
- c. coverage under this permit is not required for discharges of stormwater associated with minor land disturbing activities (such as home gardens and individual home landscaping, repairs, maintenance work, fences and other related activities which result in minor soil erosion) conducted outside of the 25 foot buffer along the banks of all State waters requiring a buffer and outside of the 50 foot buffer along the banks of all State waters classified as 'trout streams' requiring a buffer on individual residential lots sold to homeowners where all planned construction activities on that lot have been completed and have undergone final stabilization.

#### **2. Mixed Stormwater Discharges.** This permit may only authorize a stormwater discharge from a construction site or construction activities mixed with a stormwater discharge from an industrial source or activity other than construction where:

- a. the industrial source or activity other than construction is located on the same site as the construction activity and is an integral part of the construction activity;
- b. the stormwater discharges associated with industrial activity from the areas of the site where construction activities are occurring are in compliance with the terms of this permit; and
- c. stormwater discharges associated with industrial activity from the areas of the site where industrial activity other than construction are occurring are covered by a different NPDES general permit or individual permit authorizing such discharges and the discharges are in compliance with a different NPDES permit.

#### **3. Limitations on Coverage.** The following stormwater discharges from construction sites are not authorized by this permit:



- a. stormwater discharges associated with an industrial activity that originate from the site after construction activities have been completed and the site has undergone final stabilization;
- b. discharges that are mixed with sources of non-stormwater other than discharges which are identified in Part III.A.2. of this permit and which are in compliance with Part IV.D.7. (non-stormwater discharges) of this permit;
- c. stormwater discharges associated with industrial activity that are subject to an existing NPDES individual or general permit. Such discharges may be authorized under this permit after an existing permit expires provided the existing permit did not establish numeric limitations for such discharges; and
- d. stormwater discharges from construction sites that the Director (EPD) has determined to be or may reasonably be expected to be contributing to a violation of a water quality standard.

**4. Compliance with Water Quality Standards.** No discharges authorized by this permit shall cause violations of Georgia's in-stream water quality standards as provided by the Rules and Regulations for Water Quality Control, Chapter 391-3-6-.03.

**D. Authorization.**

- 1. Any person desiring coverage under this permit must submit a Notice of Intent (NOI) to the EPD and the NOI must be received by the EPD in accordance with the requirements of Part II, using the electronic submittal service provided by the EPD, in order for stormwater discharges from construction sites to be authorized.
- 2. Unless notified by the Director to the contrary, a permittee who submits an NOI in accordance with the requirements of this permit is authorized to discharge stormwater from construction sites under the terms and conditions of this permit fourteen (14) days after the date that the NOI is submitted and confirmation of submittal is received. The Director may deny coverage under this permit and require submittal of an application for an individual NPDES permit or alternative general NPDES permit based on a review of the NOI or other information. Should the Director deny coverage under this permit, coverage under this permit is authorized until the date specified in the notice of denial by the Director.
- 3. Where a new permittee is to begin work on-site after an NOI for the facility/construction site has been submitted, that new permittee must submit a new NOI in accordance with Part II.

**E. Continuing Obligations of Permittees.** Unless and until responsibility for a site covered under this permit is properly terminated or ownership changes, according to the terms of the permit, the current permittee remains responsible for compliance with all applicable terms of the permit and for any violations of said terms.

## **Part II. NOTICE OF INTENT REQUIREMENTS**

### **A. Deadlines for Notification.**

1. Except as provided in Part II.A.2., II.A.3. and II.A.5., Owners or Operators or both who intend to obtain coverage under this general permit for stormwater discharges from a construction site (where construction activities begin after issuance of this permit), shall submit a Notice of Intent (NOI) in accordance with the requirements of this Part at least fourteen (14) days prior to the commencement of construction activities.

2. For sites where construction activities, subject to this permit, are occurring on the effective date of this permit, the Owner or Operator or both shall submit a re-issuance NOI for an existing construction site in accordance with the requirements of this part no later than ninety (90) days after the effective date of this permit. Failure to comply with this requirement shall constitute a violation of the Georgia Water Quality Control Act for each day until the Owner or Operator or both submit an initial NOI for a new construction site in accordance with Part II.A.1., comply with the special conditions in Part III., prepare and submit a new Erosion, Sedimentation and Pollution Control Plan in accordance with Part IV., and pay all applicable fees in accordance with Part II.D.

3. A discharger is not precluded from submitting an NOI in accordance with the requirements of this part after the dates provided in Parts II.A.1. or II.A.2. of this permit. In such instances, EPD may bring an enforcement action for failure to submit an NOI in a timely manner or for any unauthorized discharges of stormwater associated with construction activity that have occurred on or after the dates specified in Part II.A.1. and II.A.2.

4. Where an Owner or an Operator or both changes after an NOI has been filed, the subsequent Owner or Operator or both must submit a modification NOI in accordance with this Part by the earlier to occur of (a) seven (7) days before beginning work at the facility/construction site or (b) thirty (30) days from acquiring legal title to the facility/construction site. In the event a lender or other secured creditor acquires legal title to the facility/construction site, such party must submit a modification NOI in accordance with this Part by the earlier to occur of (a) seven (7) days before beginning work at the facility/construction site; or (b) thirty (30) days from acquiring legal title to the facility/construction site. Stabilization and BMP installation and/or maintenance measures of a disturbed site, by the subsequent Owner or Operator, may occur in advance of filing a new NOI, without violation of this permit. Failure to comply with this requirement shall constitute a violation of the Georgia Water Quality Control Act for each day until the Owner or Operator or both submit an initial NOI for a new construction site in accordance with Part II.A.1., comply with the special conditions in Part III., prepare and submit a new Erosion, Sedimentation and Pollution Control Plan in accordance with Part IV., and pay all applicable fees in accordance with Part II.D.

5. For sites where construction activities will result in land disturbance equal to or greater than one (1) acre that are required as a result of storm- or emergency-related repair work, the Owner or Operator or both shall notify the appropriate EPD District Office within three (3) days of

commencement of said construction activities. The Owner or Operator or both shall submit the NOI to the appropriate EPD district office as soon as possible after the storm- or emergency-related event but no later than fourteen (14) days after the commencement of construction activities and shall submit the Plan in accordance with Part IV.A.6.

## **B. Notice of Intent Contents.**

**1. Primary Permittee.** A single Notice of Intent for the primary permittee (i.e., one NOI signed by the Owner or the Operator or both) shall be signed in accordance with Part V.G.1. of this permit and shall include the following information:

- a. The project construction site name, GPS location (decimal degrees) of construction exit, construction site location (e.g., street address), city (if applicable) and county of the construction site for which the notification is submitted. The construction site location information must be sufficient to accurately locate the construction site;
- b. The Owner's legal name, address, telephone number and email address; and if available, the Operator's legal name, address, telephone number and email address; and if applicable, the Duly Authorized Representative's legal name and/or position name, telephone number and email address;
- c. The name, telephone number and email address of the individual to whom the permittee has assigned the responsibility for the daily operational control (i.e., construction superintendent, etc.) of the construction site;
- d. The name of the initial receiving water(s) or if unnamed the first named blue line stream indicated on the appropriate USGS Topographic map, and when the discharge is through a municipal separate storm sewer system (MS4), the name of the local government operating the municipal separate storm sewer system and the name of the receiving water(s) which receives the discharge from the MS4, and the permittee's determination of whether the receiving water(s) supports warm water fisheries or is a trout stream as indicated in the Rules and Regulations for Water Quality Control, Chapter 391-3-6;
- e. The name of the receiving water(s) located within one (1) linear mile upstream of and within the same watershed as, any portion of an Impaired Stream Segment identified as "not supporting" its designated use(s) shown on Georgia's most current "305(b)/303(d) List Documents (Approved)" for the criteria violated/cause, "Bio F" (Impaired Fish Community) and/or "Bio M" (Impaired Macroinvertebrate Community), within Category 4a, 4b or 5, and the potential cause is either "NP" (nonpoint source) or "UR" (urban runoff);
- f. An estimate of project start date and completion date, a schedule for the timing of the various construction activities, the number of acres of the site on which soil will be disturbed, and the surface water drainage area (if applicable). For projects that began on

or before the effective date of this permit, the start date must be the actual start date of construction;

g. The following certification shall be signed in accordance with Part V.G.1. of this permit:

“I certify that to the best of my knowledge and belief, that the Erosion, Sedimentation and Pollution Control Plan (Plan) was prepared by a design professional, as defined by this permit, that has completed the appropriate certification course approved by the Georgia Soil and Water Conservation Commission in accordance with the provisions of O.C.G.A. 12-7-19 and that I will adhere to the Plan and comply with all requirements of this permit.”

h. The type of construction activity category (from those listed on the NOI) conducted at the site;

i. The location of the receiving water(s) or outfall(s) or a combination of receiving water(s) and outfall(s) to be sampled on a map or drawing of appropriate scale. When it is determined by the primary permittee that some or all of the outfall(s) will be sampled, the applicable nephelometric turbidity unit (NTU) selected from Appendix B (i.e., based upon the size of the construction site and the surface water drainage area) must be shown for each outfall to be sampled.

j. NOIs may be submitted for separate phases of projects with a total planned disturbance greater than 5.0 acres, provided that each phase shall not be less than 1.0 acre. Phased NOIs shall include all documentation required by this permit for each phase, including fees; and

k. Any other information specified on the NOI in effect at the time of submittal.

**C. Notice of Intent Submittal.** NOIs are to be submitted to EPD using the electronic submittal service provided by EPD and a copy to the Local Issuing Authority in jurisdictions authorized to issue a Land Disturbance Activity permit for the permittee's construction site pursuant to O.C.G.A. 12-7-1, et seq. The permittee shall retain a copy of the proof of submittal at the construction site or the proof of submittal shall be readily available at a designated alternative location from commencement of construction until such time as a Notice of Termination (NOT) is submitted in accordance with Part VI.

**D. Fees.** Any applicable fees shall be submitted by the **Primary Permittee** in accordance with Rules and Regulations for Water Quality Control (Rules) promulgated by the Board of Natural Resources. By submitting an NOI for coverage under this permit the primary permittee agrees to pay any fees required, now or in the future, by such Rules authorized under O.C.G.A. Section 12-5-23(a)(5)(A), which allows the Board of Natural Resources to establish a fee system. Fees may be assessed on land disturbing activity proposed to occur on or after the effective date of this permit and shall be paid in accordance with such Rules.

**E. Renotification.** Upon issuance of a new or different general permit for some or all of the stormwater discharges covered by this permit, the permittee is required to notify the EPD of their intent to be covered by the new or different general permit. The permittee must submit a renewal Notice of Intent in accordance with the notification requirements of the new or different general permit.

### **PART III. SPECIAL CONDITIONS, MANAGEMENT PRACTICES, PERMIT VIOLATIONS AND OTHER LIMITATIONS**

#### **A. Prohibition on Non-Stormwater Discharges.**

1. Except as provided in Part I.C.2. and III.A.2., all discharges covered by this permit shall be composed entirely of stormwater.
2. The following non-stormwater discharges may be authorized by this permit provided the non-stormwater component of the discharge is explicitly listed in the Erosion, Sedimentation and Pollution Control Plan and is in compliance with Part IV.D.7.; discharges from fire fighting activities; fire hydrant flushing; potable water sources including water line flushing; irrigation drainage; air conditioning condensate; springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials or pollutants.
3. This permit does not authorize the discharge of soaps or solvents used in vehicle and equipment washing.
4. This permit does not authorize the discharge of wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials.

#### **B. Releases in Excess of Reportable Quantities.**

1. The discharge of hazardous substances or oil in the stormwater discharge(s) from a site shall be prevented. This permit does not relieve the permittee of the reporting requirements of Georgia's Oil or Hazardous Material Spills or Releases Act (O.C.G.A. §§12-14-2, et seq.), 40 CFR Part 117 and 40 CFR Part 302. Where a release containing a hazardous substance in an amount equal to or in excess of a reporting quantity established under either Georgia's Oil or Hazardous Material Spills or Releases Act (O.C.G.A. §§12-14-2, et seq.), 40 CFR 117 or 40 CFR 302 occurs during a 24 hour period, the permittee is required to notify EPD at (404) 656-4863 or (800) 241-4113 and the National Response Center (NRC) at (800) 424-8802 in accordance with the requirements of Georgia's Oil or Hazardous Material Spills or Releases Act (O.C.G.A. §§12-14-2, et seq.), 40 CFR 117 and 40 CFR 302 as soon as he/she has knowledge of the discharge.
2. This permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill.

**C. Discharges into, or within One Mile Upstream of and within the Same Watershed as, Any Portion of a Biota Impaired Stream Segment.**

Any permittee who intends to obtain coverage under this permit for stormwater discharges associated with construction activity into an Impaired Stream Segment, or within one (1) linear mile upstream of and within the same watershed as, any portion of an Impaired Stream Segment identified as “not supporting” its designated use(s), as shown on Georgia’s most current “305(b)/303(d) List Documents (Approved)” at the time of NOI submittal, must satisfy the requirements of Part III.C. of this permit if the Impaired Stream Segment has been listed for criteria violated/cause, “Bio F” (Impaired Fish Community) and/or “Bio M” (Impaired Macroinvertebrate Community), within Category 4a, 4b or 5, and the potential cause is either “NP” (nonpoint source) or “UR” (urban runoff). Those discharges that are located within one (1) linear mile of an Impaired Stream Segment, but are not located within the watershed of any portion of that stream segment, are excluded from this requirement. Georgia’s “305(b)/303(d) List Documents (Approved)” can be viewed on the EPD website.

1. If a Total Maximum Daily Load (TMDL) Implementation Plan for sediment has been finalized at least six (6) months prior to the permittee’s submittal of the NOI, the Erosion, Sedimentation and Pollution Control Plan (Plan) must address any site-specific conditions or requirements included in the TMDL Implementation Plan that are applicable to the permittee’s discharge(s) to the Impaired Stream Segment within the timeframe specified in the TMDL Implementation Plan. If the TMDL Implementation Plan establishes a specific numeric wasteload allocation that applies to a permittee’s discharge(s) to the Impaired Stream Segment, then the permittee must incorporate that allocation into the Erosion, Sedimentation and Pollution Control Plan and implement all necessary measures to meet that allocation. A list of TMDL Implementation Plans can be viewed on the EPD website.

2. In order to ensure that the permittee’s discharge(s) do not cause or contribute to a violation of State water quality standards, the Plan must include at least four (4) of the following best management practices (BMPs) for those areas of the site which discharge into or within one (1) linear mile upstream and within the same watershed as the Impaired Stream Segment:

a. During all construction activities as defined in this permit, double the width of the 25 foot undisturbed vegetated buffer along all State waters requiring a buffer and the 50 foot undisturbed vegetated buffer along all State waters classified as “trout streams” requiring a buffer. During construction activities, EPD will not grant variances to any such buffers that are increased in width pursuant to this section.

b. Increase all temporary sediment basins and retrofitted stormwater management basins to provide sediment storage of at least 3600 cubic feet (134 cubic yards) per acre drained.

c. Use baffles in all temporary sediment basins and retrofitted stormwater management basins to at least double the conventional flow path length to the outlet structure.

- d. A large sign (minimum 4 feet x 8 feet) must be posted on site by the actual start date of construction. The sign must be visible from a public roadway. The sign must identify the following: (1) the construction site, (2) the permittee(s), (3) the contact person(s) along with their telephone number(s), and (4) the permittee-hosted website where the Plan can be viewed. The permittee-hosted website where the Plan can be viewed must be provided on the submitted NOI. The sign must remain on site and the Plan must be available on the provided website until a NOT has been submitted.
- e. Use flocculants or coagulants and/or mulch to stabilize all areas left disturbed for more than seven (7) calendar days in accordance with Part III.D.1. of this permit.
- f. Conduct turbidity sampling after every rain event of 0.5 inch or greater within any 24 hour period, recognizing the exceptions specified in Part IV.D.6.d. of this permit.
- g. Comply with the applicable end-of-pipe turbidity effluent limit, without the “BMP defense” as provided for in O.C.G.A. 12-7-6(a)(1).
- h. Reduce the total planned site disturbance to less than 50% impervious surfaces (excluding any State-mandated buffer areas from such calculations). All calculations must be included on the Plan.
- i. Limit the amount of area disturbed at any one time to no greater than 25 acres or 50% of the total planned site, whichever is less. All calculations must be included on the Plan.
- j. Use “Dirt II” techniques available on the EPD website, to model and manage all construction stormwater runoff (including sheet flow). All calculations must be included on the Plan.
- k. Add appropriate organic soil amendments (e.g., compost) and conduct pre- and post-construction soil sampling to a depth of six (6) inches to document improved levels of soil carbon after final stabilization of the construction site.
- l. Use mulch filter berms, in addition to a silt fence, on the site perimeter wherever construction stormwater (including sheet flow) may be discharged. Mulch filter berms cannot be placed in waterways or areas of concentrated flow.
- m. Use appropriate erosion control slope stabilization instead of concrete in all construction stormwater ditches and storm drainages designed for a 25 year, 24 hour rainfall event.
- n. Use flocculants or coagulants under a passive dosing method (e.g., flocculant blocks) within all construction stormwater ditches and storm drainages that feed into temporary sediment basins and retrofitted management basins.

- o. Install sod for a minimum 20 foot width (in lieu of seeding) after final grade has been achieved, along the site perimeter wherever construction stormwater (including sheet flow) may be discharged.
- p. Conduct soil tests to identify and to implement site-specific fertilizer needs.
- q. Certified personnel shall conduct inspections at least twice every seven (7) calendar days and within 24 hours of the end of the storm that is 0.5 inches rainfall or greater in accordance with Part IV.D.4.a.(3).(a)–(c) of this permit.
- r. Apply the appropriate compost blankets (minimum depth 1.5 inches) to protect soil surfaces until vegetation is established during the final stabilization phase of the construction activity.
- s. Use alternative BMPs whose performance has been documented to be superior to conventional BMPs as certified by a Design Professional (unless disapproved by EPD or the Georgia Soil and Water Conservation Commission).
- t. Limit the total planned site disturbance to less than 15% impervious surfaces (excluding any State-mandated buffer areas from such calculations). All calculations must be included in the Plan.
- u. Conduct inspections during the intermediate grading and drainage BMP phase and during the final BMP phase of the project by the design professional who prepared the Plan in accordance with Part IV.A.5. of the permit.
- v. Install Post Construction BMPs (e.g., runoff reduction BMPs) which remove 80% TSS as outlined in the Georgia Stormwater Management Manual known as the Blue Book or an equivalent or more stringent design manual.

#### **D. Management Practices and Permit Violations.**

1. Best management practices, as set forth in this permit, are required for all construction activities, and must be implemented in accordance with the design specifications contained in the "Manual for Erosion and Sediment Control in Georgia" (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted to prevent or reduce the pollution of waters of Georgia. Proper design, installation, and maintenance of best management practices shall constitute a complete defense to any action by the Director or to any other allegation of noncompliance with Part III.D.4. and Part III.D.5.
2. Except as required to install the initial sediment storage requirements and perimeter control BMPs as described in Part IV.D.3., the initial sediment storage requirements and perimeter control BMPs must be installed and implemented prior to conducting any other construction activities (e.g., clearing, grubbing and grading) within the construction site or when applicable,



within phased sub-parts or segments of the construction site. Failure to comply shall constitute a violation of this permit for each day on which construction activities occur. The design professional who prepared the Plan must inspect the initial sediment storage requirements and perimeter control BMPs in accordance with Part IV.A.5. within seven (7) days after installation.

3. Failure to properly design, install, or maintain best management practices shall constitute a violation of this permit for each day on which such failure occurs. BMP maintenance as a result of the permittee's routine inspections shall not be considered a violation for the purposes of this paragraph. If during the course of the permittees routine inspection BMP failures are observed which have resulted in sediment deposition into Waters of the State, the permittee shall correct the BMP failures and shall submit a summary of the violations to EPD in accordance with Part V.A.2. of this permit.

4. A discharge of stormwater runoff from disturbed areas where best management practices have not been properly designed, installed, and maintained shall constitute a separate violation for each day on which such discharge results in the turbidity of receiving water(s) being increased by more than ten (10) nephelometric turbidity units for waters classified as trout streams or more than twenty-five (25) nephelometric turbidity units for waters supporting warm water fisheries, regardless of a permittee's certification under Part II.B.1.i. This paragraph shall not apply to any land disturbance associated with the construction of single-family homes which are not part of a subdivision or planned common development unless five (5) acres or more will be disturbed.

5. When the permittee has elected to sample outfall(s), the discharge of stormwater runoff from disturbed areas where best management practices have not been properly designed, installed, and maintained shall constitute a separate violation for each day on which such condition results in the turbidity of the discharge exceeding the value selected from Appendix B applicable to the construction site. As set forth therein, the nephelometric turbidity unit (NTU) value shall be selected from Appendix B based upon the size of the construction site, the surface water drainage area and whether the receiving water(s) supports warm water fisheries or is a trout stream as indicated in the Rules and Regulations for Water Quality Control, Chapter 391-3-6.

6. Whenever a permittee finds that a BMP has failed or is deficient (beyond routine maintenance) and has resulted in sediment deposition into waters of the State, the permittee shall immediately take all reasonable steps to address the condition, including cleaning up any contaminated surfaces so the material will not discharge in subsequent storm events. The permittee shall submit a summary of the violations to EPD in accordance with Part V.A.2. of this permit and shall correct such BMP as follows:

- a. When the repair does not require a new or replacement BMP or significant repair, the BMP failure or deficiency must be repaired within two (2) business days from the time of discovery;
- b. When the repair requires a new or replacement BMP or significant repair, the installation of the new or modified BMP must be completed and the BMP must be operational by no later than seven (7) days from the time of discovery. If it is infeasible

to complete the installation or repair within seven (7) days, the permittee must document why it is infeasible to complete the installation or repair within the seven (7) day timeframe and document the schedule for installing or repairing the BMPs and making the BMPs operational as soon as feasible after the seven (7) day timeframe.

#### **Part IV. EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN**

A site-specific Erosion, Sedimentation and Pollution Control Plan (Plan) shall be designed, installed and maintained for the entire construction activity covered by this permit. The Erosion, Sedimentation and Pollution Control Plan must be prepared by a design professional as defined by this permit. All persons involved in Plan preparation shall have completed the appropriate certification course, pursuant to O.C.G.A. 12-7-19(b), approved by the Georgia Soil and Water Conservation Commission. The design professional preparing the Plan must include and sign the following certification in the Plan:

“I certify that the permittee’s Erosion, Sedimentation and Pollution Control Plan provides for an appropriate and comprehensive system of best management practices required by the Georgia Water Quality Control Act and the document “Manual for Erosion and Sediment Control in Georgia” (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted, provides for the sampling of the receiving water(s) or the sampling of the stormwater outfalls and that the designed system of best management practices and sampling methods is expected to meet the requirements contained in the General NPDES Permit No. GAR100001.”

The Plan shall include any additional certifications regarding the design professional's site visit in accordance with the Rules for Erosion and Sedimentation Control promulgated by the Board of Natural Resources:

“I certify under penalty of law that this Plan was prepared after a site visit to the locations described herein by myself or my authorized agent, under my supervision.”

The Plan shall include, as a minimum, best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the “Manual for Erosion and Sediment Control in Georgia” (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted and O.C.G.A. 12-7-6, as well as the following:

(i). Except as provided in Part IV.(iii). below, no construction activities shall be conducted within a 25 foot buffer along the banks of all State waters, as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, except where the Director has determined to allow a variance that is at least as protective of natural resources and the environment in accordance with the provisions of O.C.G.A. 12-7-6, or where a drainage structure or a roadway drainage structure must be constructed, provided that adequate erosion

control measures are incorporated in the project plans and specifications and are implemented, or along any ephemeral stream, or where bulkheads and seawalls must be constructed to prevent the erosion of the shoreline on Lake Oconee and Lake Sinclair. The buffer shall not apply to the following activities provided that adequate erosion control measures are incorporated into the project plans and specifications and are implemented:

- (1) public drinking water system reservoirs;
- (2) stream crossings for water lines and sewer lines, provided that the stream crossings occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream and cause a width of disturbance of not more than 50 feet within the buffer, and native riparian vegetation is re-established in any bare or disturbed areas within the buffer;
- (3) stream crossings for any utility lines of any electric membership corporation or municipal electrical system or any public utility under the regulatory jurisdiction of the Public Service Commission, any utility under the regulatory jurisdiction of the Federal Energy Regulatory Commission, any cable television system as defined in Code Section 36-18-1, or any agency or instrumentality of the United States engaged in the generation, transmission or distribution of power, provided that: (a) the stream crossings occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream and cause a width of disturbance of not more than 50 feet within the buffer, (b) native riparian vegetation is re-established in any bare or disturbed areas within the buffer and (c) the entity is not a secondary permittee for a project located within a common development or sale under this permit;
- (4) buffer crossing for fences, provided that the crossings occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream and cause a width of disturbance of not more than 50 feet within the buffer, and native riparian vegetation is re-established in any bare or disturbed areas within the buffer;
- (5) stream crossings for aerial utility lines, provided that: (a) the new utility line right-of-way width does not exceed 100 linear feet, (b) utility lines are routed and constructed so as to minimize the number of stream crossings and disturbances to the buffer, (c) only trees and tree debris are removed from within the buffer resulting in only minor soil erosion (i.e., disturbance to underlying vegetation is minimized), and (d) native riparian vegetation is re-established in any bare or disturbed areas within the buffer. The Plan shall include a description of the stream crossings with details of the buffer disturbance including area and length of buffer disturbance, estimated length of time of buffer disturbance, and justification;
- (6) right-of-way posts, guy-wires, anchors, survey markers and the replacement or maintenance of existing utility structures within the current right-of-way undertaken or financed in whole or in part by the Department of Transportation, the Georgia Highway Authority or the State Road and Tollway Authority or undertaken by any county or municipality, provided that: (a) the area of land disturbance does not exceed 100 square feet per structure, (b) the area of buffer vegetation to be cut (not grubbed) does not exceed 1,000 square feet per structure, (c) native riparian vegetation is re-established in any bare or disturbed areas within the buffer and (d) the entity is not a secondary permittee for a project located within a common development or sale under this permit;

- (7) right-of-way posts, guy-wires, anchors, survey markers and the replacement or maintenance of existing utility structures within the current right-of-way by any electric membership corporation or municipal electrical system or any public utility under the regulatory jurisdiction of the Public Service Commission, any utility under the regulatory jurisdiction of the Federal Energy Regulatory Commission, any cable television system as defined in Code Section 36-18-1, or any agency or instrumentality of the United States engaged in the generation, transmission or distribution of power, provided that: (a) the area of land disturbance does not exceed 100 square feet per structure, (b) the area of buffer vegetation to be cut (not grubbed) does not exceed 1,000 square feet per structure, (c) native riparian vegetation is re-established in any bare or disturbed areas within the buffer and (d) the entity is not a secondary permittee for a project located within a common development or sale under this permit; and
  - (8) maintenance (excluding dredging), repair and/or upgrade of Soil and Water Conservation District watershed dams when under the technical supervision of the USDA Natural Resources Conservation Service.
- (ii). No construction activities shall be conducted within a 50 foot buffer, as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, along the banks of any State waters classified as "trout streams" except when approval is granted by the Director for alternate buffer requirements in accordance with the provisions of O.C.G.A. 12-7-6, or where a roadway drainage structure must be constructed; provided, however, that small springs and streams classified as "trout streams" which discharge an average annual flow of 25 gallons per minute or less shall have a 25 foot buffer or they may be piped, at the discretion of the permittee, pursuant to the terms of a rule providing for a general variance promulgated by the Board of Natural Resources including notification of such to EPD and the Local Issuing Authority of the location and extent of the piping and prescribed methodology for minimizing the impact of such piping and for measuring the volume of water discharged by the stream. Any such pipe must stop short of the downstream permittee's property, and the permittee must comply with the buffer requirement for any adjacent trout streams. The buffer shall not apply to the following activities provided that adequate erosion control measures are incorporated into the project plans and specifications and are implemented:
- (1) public drinking water system reservoirs;
  - (2) stream crossings for water lines and sewer lines, provided that the stream crossings occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream and cause a width of disturbance of not more than 50 feet within the buffer, and native riparian vegetation is re-established in any bare or disturbed areas within the buffer;
  - (3) stream crossings for any utility lines of any electric membership corporation or municipal electrical system or any public utility under the regulatory jurisdiction of the Public Service Commission, any utility under the regulatory jurisdiction of the Federal Energy Regulatory Commission, any cable television system as defined in Code Section 36-18-1, or any agency or instrumentality of the United States engaged in the generation, transmission or distribution of power, provided that: (a) the stream crossings occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the

- stream and cause a width of disturbance of not more than 50 feet within the buffer, (b) native riparian vegetation is re-established in any bare or disturbed areas within the buffer and (c) the entity is not a secondary permittee for a project located within a common development or sale under this permit;
- (4) buffer crossing for fences, provided that the crossings occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream and cause a width of disturbance of not more than 50 feet within the buffer, and native riparian vegetation is re-established in any bare or disturbed areas within the buffer;
  - (5) stream crossings for aerial utility lines, provided that: (a) the new utility line right-of-way width does not exceed 100 linear feet, (b) utility lines are routed and constructed so as to minimize the number of stream crossings and disturbances to the buffer, (c) only trees and tree debris are removed from within the buffer resulting in only minor soil erosion (i.e., disturbance to underlying vegetation is minimized), and (d) native riparian vegetation is re-established in any bare or disturbed areas within the buffer. The Plan shall include a description of the stream crossings with details of the buffer disturbance including area and length of buffer disturbance, estimated length of time of buffer disturbance, and justification;
  - (6) right-of-way posts, guy-wires, anchors, survey markers and the replacement or maintenance of existing utility structures within the current right-of-way undertaken or financed in whole or in part by the Department of Transportation, the Georgia Highway Authority or the State Road and Tollway Authority or undertaken by any county or municipality, provided that: (a) the area of land disturbance does not exceed 100 square feet per structure, (b) the area of buffer vegetation to be cut (not grubbed) does not exceed 1,000 square feet per structure, (c) native riparian vegetation is re-established in any bare or disturbed areas within the buffer and (d) the entity is not a secondary permittee for a project located within a common development or sale under this permit;
  - (7) right-of-way posts, guy-wires, anchors, survey markers and the replacement or maintenance of existing utility structures within the current right-of-way undertaken by any electric membership corporation or municipal electrical system or any public utility under the, provided that: (a) the area of land disturbance does not exceed 100 square feet per structure, (b) the area of buffer vegetation to be cut (not grubbed) does not exceed 1,000 square feet per structure, (c) native riparian vegetation is re-established in any bare or disturbed areas within the buffer and (d) the entity is not a secondary permittee for a project located within a common development or sale under this permit; and
  - (8) maintenance (excluding dredging), repair and/or upgrade of Soil and Water Conservation District watershed dams when under the technical supervision of the USDA Natural Resources Conservation Service.

(iii). Except as provided in Part IV(iv) below, no construction activities shall be conducted within a 25 foot buffer along coastal marshlands, as measured horizontally from the coastal marshland-upland interface, as determined in accordance with Part 4 of Article 4 of Chapter 5 of Title 12, the Coastal Marshlands Protection Act of 1970, and the rules and regulations promulgated thereunder, except where the Director determines to allow a variance that is at least as protective of natural resources and the environment in accordance with the provisions of O.C.G.A. 12-7-6, or where otherwise allowed by the Director pursuant to Code Section 12-2-8,

or where an alteration within the buffer area has been authorized pursuant to Code Section 12-5-286, or for maintenance of any currently serviceable structure, landscaping, or hardscaping, including bridges, roads, parking lots, golf courses, golf cart paths, retaining walls, bulkheads, and patios, provided that adequate erosion control measures are incorporated into the project plans and specifications and such measures are fully implemented, or where a drainage structure or roadway drainage structure is constructed or maintained, provided that adequate erosion control measures are incorporated into the project plans and specifications and such measures are fully implemented, or on the landward side of any currently serviceable shoreline stabilization structure, or for the maintenance of any manmade stormwater detention basin, golf course pond, or impoundment that is located entirely within the property of a single individual, partnership, or corporation, provided that adequate erosion control measures are incorporated into the project plans and specifications and such measures are fully implemented. The buffer shall not apply to the following activities provided that adequate erosion control measures are incorporated into the project plans and specifications and such measures are fully implemented:

- (1) Public drinking water system reservoirs;
- (2) Crossings for utility lines that cause a width of disturbance of not more than 50 feet within the buffer;
- (3) Any land-disturbing activity conducted pursuant to and in compliance with a valid and effective land-disturbing permit issued subsequent to April 22, 2014, and prior to December 31, 2015;
- (4) Any lot for which the preliminary plat has been approved prior to December 31, 2015 if roadways, bridges, or water and sewer lines have been extended to such lot prior to the effective date of this Act and if the requirement to maintain a 25 foot buffer would consume at least 18 percent of the high ground of the platted lot otherwise available for development;
- (5) Buffer crossings for fences, provided that the crossings occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the Jurisdictional Line and cause a width of disturbance of not more than 50 feet within the buffer, and vegetation is re-established in any bare or disturbed areas within the buffer;
- (6) Crossings for aerial utility lines, provided that: (a) the new utility line right-of-way width does not exceed 100 linear feet, (b) utility lines are routed and constructed so as to minimize the number of crossings and disturbances to the buffer, (c) only trees and tree debris are removed from within the buffer resulting in only minor soil erosion (i.e., disturbance to underlying vegetation is minimized), and (d) vegetation is re-established in any bare or disturbed areas within the buffer. The Plan shall include a description of the crossings with details of the buffer disturbance including area and length of buffer disturbance, estimated length of time of buffer disturbance, and justification;
- (7) Right-of-way posts, guy wires, anchors, survey markers and the replacement or maintenance of existing utility structures within the current right-of-way undertaken or financed in whole or in part by the Department of Transportation, the Georgia Highway Authority or the State Road and Tollway Authority or undertaken by any county or municipality, provided that: (a) the area of land disturbance does not exceed 100 square feet per structure, (b) the area of buffer vegetation to be cut (not grubbed) does not exceed 1,000 square feet per structure, (c) vegetation is re-established in any bare or

disturbed areas within the buffer and (d) the entity is not a secondary permittee for a project located within a common development or sale under this permit;

- (8) Right-of-way posts, guy wires, anchors, survey markers and the replacement or maintenance of existing utility structures within the current right-of-way by any electric membership corporation or municipal electrical system or any public utility under the regulator jurisdiction of the Public Service Commission, any utility under the regulatory jurisdiction of the Federal Energy Regulatory Commission, any cable television system as defined in Code Section 36-18-1, or any agency or instrumentality of the United States engaged in the generation, transmission or distribution of power, provided that (a) the area of land disturbance does not exceed 100 square feet per structure, (b) the area of buffer vegetation to be cut (not grubbed) does not exceed 1,000 square feet per structure, (c) vegetation is re-established in any bare or disturbed areas within the buffer and (d) the entity is not a secondary permittee for a project located within a common development or sale under this permit; and
- (9) maintenance (excluding dredging), repair and/or upgrade of Soil and Water Conservation District watershed dams when under the technical supervision of the USDA Natural Resources Conservation Service.

(iv). Except as provided above, for buffers required pursuant to Part IV.(i). and (ii) and (iii), no construction activities shall be conducted within a buffer and a buffer shall remain in its natural, undisturbed, state of vegetation until all land-disturbing activities on the construction site are completed. During coverage under this permit, a buffer cannot be thinned or trimmed of vegetation and a protective vegetative cover must remain to protect water quality and aquatic habitat and a natural canopy must be left in sufficient quantity to keep shade on the stream bed or marsh.

The Erosion, Sedimentation and Pollution Control Plan shall identify all potential sources of pollution which may reasonably be expected to affect the quality of stormwater discharges from the construction site. In addition, the Plan shall describe and the applicable permittee shall ensure the implementation of practices which will be used to reduce the pollutants in stormwater discharges associated with construction activity at the site and to assure compliance with the terms and conditions of this permit. The applicable permittee must implement and maintain the provisions of the Plan required under this part as a condition of this permit.

Except as provided in Part IV.A.2., a single Erosion, Sedimentation and Pollution Control Plan must be prepared by the primary permittee for the stand alone construction project.

#### **A. Deadlines for Plan Preparation and Compliance.**

1. Except as provided in Part IV.A.2. and Part IV.A.6., the Erosion, Sedimentation and Pollution Control Plan shall be completed prior to submitting the NOI and prior to conducting any construction activity by any permittee.

2. For construction activities that began on or before the effective date of this permit and were subject to the regulations under the previous permit, the permittee(s) shall continue to operate under the existing Plan.

3. For construction activities that begin after the effective date of this permit, the primary permittee shall be required to prepare the Plan for that phase of the stand alone development that corresponds with the NOI being submitted and the primary permittee(s) shall implement the Plan on or before the day construction activities begin.

4. Additional Plan Submittals.

a. For all projects identified under Part I.C.1.b., which begin after the effective date of this permit, in a jurisdiction where there is no certified Local Issuing Authority regulating that project, a single copy of the Plan must be submitted to the EPD Watershed Protection Branch and a second copy of the Plan must be submitted to the appropriate EPD District Office prior to or concurrent with the NOI submittal. The second copy of the Plan must be submitted electronically as a Portable Document Format (PDF) file through the electronic submittal method provided by EPD, or by return receipt certified mail or similar service as a PDF on CD-ROM or other storage device to the appropriate EPD District Office. The permittee shall retain a copy of the proof of the submittal at the construction site or the proof of submittal shall be readily available at a designated alternative location from commencement of construction until such a time as a Notice of Termination (NOT) is submitted in accordance with Part VI. The EPD Watershed Protection Branch will review Plans for deficiencies using the applicable Erosion, Sedimentation and Pollution Control Plan Checklist established by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted.

b. For all projects where the construction activity as indicated on the existing NOI has changed, the amended Plans must be submitted in accordance with Part IV.A.4.a. In addition, the permittee must submit a modification NOI in accordance with Part II.

5. For stand alone projects that begin construction activity after the effective date of this permit, the primary permittee must retain the design professional who prepared the Erosion, Sedimentation and Pollution Control Plan, or an alternative design professional approved by EPD in writing, to inspect the installation of the initial sediment storage requirements and perimeter control BMPs which the design professional designed within seven (7) days after installation. The design professional shall determine if these BMPs have been installed and are being maintained as designed. The design professional shall report the results of the inspection to the primary permittee within seven (7) days and the permittee must correct all deficiencies within two (2) business days of receipt of the inspection report from the design professional unless weather related site conditions are such that additional time is required.

6. For storm- or emergency-related repair work, the permittee shall implement appropriate BMPs and certified personnel (provided by the primary permittee) shall inspect at least once every



seven (7) calendar days and within 24 hours of the end of a storm that is 0.5 inches rainfall or greater. If the storm- or emergency-related repair work will not be completed within sixty (60) days of commencement of construction activity, a single copy of the Plan shall be submitted to EPD and the permittee shall comply with all requirements of this permit on the sixty-first (61st) day.

**B. Signature and Plan Review.**

1. The Erosion, Sedimentation and Pollution Control Plan shall be signed in accordance with Part IV., and be retained on the site (or, if not possible, at a readily accessible location) which generates the stormwater discharge in accordance with Part IV.F. of this permit.
2. The primary permittee shall make Plans available upon request to the EPD; to designated officials of the local government reviewing soil Erosion, Sedimentation and Pollution Control Plans, grading plans, or stormwater management plans; or in the case of a stormwater discharge associated with construction activity which discharges through a municipal separate storm sewer system with an NPDES permit, to the local government operating the municipal separate storm sewer system.
3. EPD may notify the primary permittee at any time that the Plan does not meet one or more of the minimum requirements of this Part. Within seven (7) days of such notification (or as otherwise provided by EPD), the primary permittee shall make the required changes to the Plan and shall submit to EPD either the amended Plan or a written certification that the requested changes have been made.

**C. Keeping Plans Current.** The primary permittee(s) shall amend their Plan whenever there is a change in design, construction, operation, or maintenance, which has a significant effect on BMPs with a hydraulic component (i.e., those BMPs where the design is based upon rainfall intensity, duration and return frequency of storms) or if the Plan proves to be ineffective in eliminating or significantly minimizing pollutants from sources identified under Part IV.D.3. Amendments to the Plan must be certified by a design professional as provided in this permit.

**D. Contents of Plan.** The Erosion, Sedimentation and Pollution Control Plan shall include, as a minimum, best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the “Manual for Erosion and Sediment Control in Georgia” (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted, as well as the following:

1. **Checklist.** Each plan shall include a completed Erosion, Sedimentation and Pollution Control Plan Checklist established by the Georgia Soil and Water Conservation Commission (GSWCC) as of January 1 of the year in which the land-disturbing activity was permitted and amendments to the applicable Checklist as approved by the GSWCC up until the date of the NOI submittal. The applicable checklists are available on the GSWCC website.

**2. Site description.** Each site-specific Plan shall provide a description of pollutant sources and other information as indicated:

- a. A description of the nature of the construction activity;
- b. A detailed description and chart or timeline of the intended sequence of major activities which disturb soils for major portions of the site (i.e., initial sediment storage requirements and perimeter BMPs, clearing and grubbing activities, excavation activities, grading activities, infrastructure activities, immediate and final stabilization activities);
- c. Estimates of the total area of the site and the total area of the site that is expected to be disturbed by excavation, grading, or other activities;
- d. An estimate of the runoff coefficient or peak discharge flow of the site prior to the construction activities and after construction activities are completed and existing data describing the soil or the quality of any discharge from the site;
- e. A site-specific map indicating drainage patterns and approximate slopes anticipated after major grading activities, areas of soil disturbance, an outline of areas which are not to be disturbed, the location of major structural and nonstructural controls identified in the Plan, the location of areas where stabilization practices are expected to occur, surface waters (including wetlands), and locations where stormwater is discharged to a surface water; and
- f. Identify the receiving water(s) and areal extent of wetland acreage at the site;

**3. Controls.** Each Plan shall include a description of appropriate controls and measures that will be implemented at the construction site including: (1) initial sediment storage requirements and perimeter control BMPs, (2) intermediate grading and drainage BMPs, and (3) final BMPs. For construction sites where there will be no mass grading and the initial sediment storage requirements and perimeter control BMPs, intermediate grading and drainage BMPs, and final BMPs are the same, the Plan may combine all of the BMPs into a single phase Plan. The Plan will include appropriate staging and access requirements for construction equipment. Plans submitted after the effective date of this permit shall limit the amount of disturbed area to no greater than 50 acres at any one time without prior written authorization from the appropriate EPD District Office according to the schedule in Appendix A of this permit. EPD will approve or disapprove such requests within 35 days of receipt. Failure of EPD to act within 35 days shall be considered an approval of such requests. If the EPD District Office approves a request to disturb 50 acres or more at any one time, the Plan must include at least four (4) of the best management practices listed in Part III.C.2. of this permit.

The Plan will clearly describe for each major activity identified in Part IV.D.2.b. appropriate control measures and the timing during the construction process that the measures will be implemented. The primary permittee is encouraged to utilize the document, Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites, EPA 833-R-060-04, May

2007, when preparing the Plan. The description and implementation of controls shall address the following minimum components:

a. Erosion and sediment controls.

(1). Stabilization measures. A description of interim and permanent stabilization measures, including site-specific scheduling of the implementation of the measures. Site plans should ensure that existing vegetation is preserved and that disturbed portions of the site are stabilized. Stabilization measures may include: temporary seeding, permanent seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures. A record of the dates when major grading activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated shall be included in the Plan. Except as provided in paragraphs IV.D.3.(a).(1).(a). below, stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.

(a). Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently cease is precluded by snow cover or other adverse weather conditions, stabilization measures shall be initiated as soon as practicable.

(2). Structural practices. A description of structural practices to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable. Such practices may include silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. Structural practices should be placed on upland soils to the degree attainable. The installation of these devices may be subject to Section 404 of the CWA.

(3). Sediment basins. For common drainage locations a temporary (or permanent) sediment basin providing at least 1800 cubic feet (67 cubic yards) of storage per acre drained, or equivalent control measures, shall be provided until final stabilization of the site. The 1800 cubic feet (67 cubic yards) of storage area per acre drained does not apply to flows from off-site areas and flows from on-site areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin. For drainage locations where a temporary sediment basin providing at least 1800 cubic feet (67 cubic yards) of storage per acre drained, or equivalent controls is not attainable, sediment traps, silt fences, wood mulch berms or equivalent

sediment controls are required for all side slope and down slope boundaries of the construction area. When the sediment fills to a volume at most of 22 cubic yards per acre for each acre of drainage area, the sediment shall be removed to restore the original design volume. This sediment must be properly disposed. Sediment basins may not be feasible at some construction sites. Careful consideration must be used to determine when a sediment basin cannot be used and/or when 67 cubic yards of storage per acre drained is not attainable and a written justification explaining the decision(s) must be included in the Plan. Perennial and intermittent waters of the State shall not be used for temporary or permanent sediment detention.

When discharging from sediment basins and impoundments, permittees are required to utilize outlet structures that withdraw water from the surface, unless infeasible. If outlet structures that withdraw water from the surface are not feasible, a written justification explaining this decision must be included in the Plan. Outlet structures that withdraw water from the surface are temporary BMPs and must be removed prior to submitting a Notice of Termination. For construction activities where the NOI was submitted prior to January 1, 2014, this requirement of the permit is not applicable.

(4). Alternative BMPs. The use of alternative BMPs whose performance has been documented to be equivalent or superior to conventional BMPs as certified by a Design Professional may be allowed (unless disapproved by EPD or the Georgia Soil and Water Conservation Commission).

(5). High performance BMPs. The use of infiltration trenches, seep berms, sand filters, dry wells, flocculants or coagulants, etc. for minimizing point source discharges except for large rainfall events is encouraged.

b. Stormwater management. A description of measures that will be installed during the construction process to control pollutants in stormwater discharges that will occur after construction operations have been completed. Structural measures should be placed on upland soils to the degree attainable. The installation of these devices may be subject to Section 404 of the CWA. This permit only addresses the installation of stormwater management measures, and not the ultimate operation and maintenance of such structures after the construction activities have been completed and the site has undergone final stabilization. Operators are only responsible for the installation and maintenance of stormwater management measures prior to final stabilization of the site, and are not responsible for maintenance after stormwater discharges associated with construction activity have been eliminated from the site.

(1). Such practices may include: stormwater detention structures (including wet ponds); stormwater retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff on-site; and sequential systems (which combine several practices). The Plan shall include an explanation

of the technical basis used to select the practices to control pollution where flows exceed pre-development levels.

(2). Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel for the purpose of providing a non-erosive velocity flow from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g., no significant changes in the hydrological regime of the receiving water(s)).

(3). Installation and use of green infrastructure approaches and practices that mimic natural processes and direct stormwater where it can be infiltrated, evapotranspired or re-used with significant utilization of soils and vegetation rather than traditional hardscape collection, conveyance and storage structures are encouraged to the maximum extent practicable. Green Infrastructure practices or approaches include permeable or porous paving, vegetated swales instead of curbs and gutters, green roofs, tree boxes, rain gardens, constructed wetlands, infiltration planters, vegetated median strips, protection and enhancement of riparian buffers and floodplains, and the overall reduction in site disturbance and impervious area. Design information on Green Infrastructure practices and other ways to manage stormwater can be found in the Georgia Stormwater Management Manual and Coastal Stormwater Supplement. Additional information on Green Infrastructure can be found at the USEPA website.

c. Other controls.

(1). Waste disposal. Locate waste collection areas away from streets, gutters, watercourses and storm drains. Waste collection areas, such as dumpsters, are often best located near construction site entrances to minimize traffic on disturbed soils. The Plan should include secondary containment around liquid waste collection areas to further minimize the likelihood of contaminated discharges. Solid materials, including building materials, shall not be discharged to waters of the State, except as authorized by a Section 404 permit.

(2). For building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site, provide cover (e.g. plastic sheeting, temporary roofs) to minimize the exposure of these products to precipitation and to stormwater, or a similarly effective means designed to minimize the discharge of pollutants from these areas. Minimization of exposure is not required in cases where exposure to precipitation and to stormwater will not result in a discharge of pollutants, or where exposure of a specific material or product poses little risk to stormwater contamination (such as final products and materials intended for outdoor use).

- (3). Off-site vehicle tracking of dirt, soils, and sediments and the generation of dust shall be minimized or eliminated to the maximum extent practical. The Plan shall include the best management practice to be implemented at the site or construction activity.
- (4). Nothing in this permit relieves a permittee from any obligation to comply with all applicable State and local regulations of waste disposal, sanitary sewer, septic and petroleum storage systems.
- (5). The Plan shall include best management practices for the remediation of all petroleum spills and leaks as appropriate.
- (6). The Plan shall include best management practices for concrete washdown of tools, concrete mixer chutes, hoppers and the rear of vehicles. Washout of the drum at the construction site is prohibited. Additional information about best management practices for concrete washout is available at the USEPA website.
- (7). All permittees are required to minimize the discharge of pollutants from dewatering trenches and excavations. Discharges are prohibited unless managed by appropriate controls.

#### **4. Inspections.**

##### **a. Permittee requirements.**

- (1). Each day when any type of construction activity has taken place at a primary permittee's site, certified personnel provided by the primary permittee shall inspect: (a) all areas at the primary permittee's site where petroleum products are stored, used, or handled for spills and leaks from vehicles and equipment and (b) all locations at the primary permittee's site where vehicles enter or exit the site for evidence of off-site sediment tracking. These inspections must be conducted until a Notice of Termination is submitted.
- (2). Measure and record rainfall within disturbed areas of the site that have not met final stabilization once every 24 hours except any non-working Saturday, non-working Sunday and non-working Federal holiday. The data collected for the purpose of compliance with this permit shall be representative of the monitored activity. Measurement of rainfall may be suspended if all areas of the site have undergone final stabilization or established a crop of annual vegetation and a seeding of target perennials appropriate for the region.
- (3). Certified personnel (provided by the primary permittee) shall inspect the following at least once every seven (7) calendar days and within 24 hours of the end of a storm that is 0.5 inches rainfall or greater (unless such storm ends after 5:00 PM on any Friday or on any non-working Saturday, non-working Sunday or

any non-working Federal holiday in which case the inspection shall be completed by the end of the next business day and/or working day, whichever occurs first); (a) disturbed areas of the primary permittee's construction site; (b) areas used by the primary permittee for storage of materials that are exposed to precipitation; and (c) structural control measures. Erosion and sediment control measures identified in the Plan applicable to the primary permittee's site shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving water(s). For areas of a site that have undergone final stabilization or established a crop of annual vegetation and a seeding of target perennials appropriate for the region, the permittee must comply with Part IV.D.4.a.(4). These inspections must be conducted until a Notice of Termination is submitted.

(4). Certified personnel (provided by the primary permittee) shall inspect at least once per month during the term of this permit (i.e., until a Notice of Termination has been submitted) the areas of the site that have undergone final stabilization or established a crop of annual vegetation and a seeding of target perennials appropriate for the region. These areas shall be inspected for evidence of, or the potential for, pollutants entering the drainage system and the receiving water(s). Erosion and sediment control measures identified in the Plan shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving water(s).

(5). Based on the results of each inspection, the site description and the pollution prevention and control measures identified in the Erosion, Sedimentation and Pollution Control Plan, the Plan shall be revised as appropriate not later than seven (7) calendar days following each inspection. Implementation of such changes shall be made as soon as practical but in no case later than seven (7) calendar days following each inspection.

(6). A report of each inspection that includes the name(s) of certified personnel making each inspection, the date(s) of each inspection, construction phase (i.e., initial, intermediate or final), major observations relating to the implementation of the Erosion, Sedimentation and Pollution Control Plan, and actions taken in accordance with Part IV.D.4.a.(5). of the permit shall be made and retained at the site or be readily available at a designated alternate location until the entire site or that portion of a construction site that has been phased has undergone final stabilization and a Notice of Termination is submitted to EPD. Such reports shall be readily available by end of the second business day and/or working day and shall identify all incidents of best management practices that have not been properly installed and/or maintained as described in the Plan. Where the report does not identify any incidents, the inspection report shall contain a certification that the best management practices are in compliance with the Erosion,

Sedimentation and Pollution Control Plan. The report shall be signed in accordance with Part V.G.2. of this permit.

**5. Maintenance.** The Plan shall include a description of procedures to ensure the timely maintenance of vegetation, erosion and sediment control measures and other protective measures identified in the site plan.

**6. Sampling Requirements.** This permit requires the monitoring of nephelometric turbidity in receiving water(s) or outfalls in accordance with this permit. This paragraph shall not apply to any land disturbance associated with the construction of single-family homes which are not part of a subdivision or planned common development unless five (5) acres or more will be disturbed. The following procedures constitute EPD's guidelines for sampling turbidity.

a. *Sampling Requirements* shall include the following:

- (1). A USGS topographic map, a topographic map or a drawing (referred to as a topographic map) that is a scale equal to or more detailed than a 1:24000 map showing the location of the site or the stand alone construction; (a) the location of all perennial and intermittent streams and other water bodies as shown on a USGS topographic map, and all other perennial and intermittent streams and other water bodies located during mandatory field verification, into which the stormwater is discharged and (b) the receiving water and/or outfall sampling locations. When the permittee has chosen to use a USGS topographic map and the receiving water(s) is not shown on the USGS topographic map, the location of the receiving water(s) must be hand-drawn on the USGS topographic map from where the stormwater(s) enters the receiving water(s) to the point where the receiving water(s) combines with the first blue line stream shown on the USGS topographic map;
- (2). A written narrative of site specific analytical methods used to collect, handle and analyze the samples including quality control/quality assurance procedures. This narrative must include precise sampling methodology for each sampling location;
- (3). When the permittee has determined that some or all outfalls will be sampled, a rationale must be included on the Plan for the NTU limit(s) selected from Appendix B. This rationale must include the size of the construction site, the calculation of the size of the surface water drainage area, and the type of receiving water(s) (i.e., trout stream or supporting warm water fisheries); and
- (4). Any additional information EPD determines necessary to be part of the Plan. EPD will provide written notice to the permittee of the information necessary and the time line for submittal.



b. *Sample Type.* All sampling shall be collected by “grab samples” and the analysis of these samples must be conducted in accordance with methodology and test procedures established by 40 CFR Part 136 (unless other test procedures have been approved); the guidance document titled “NPDES Storm Water Sampling Guidance Document, EPA 833-B-92-001” and guidance documents that may be prepared by the EPD.

(1). Sample containers should be labeled prior to collecting the samples.

(2). Samples should be well mixed before transferring to a secondary container.

(3). Large mouth, well cleaned and rinsed glass or plastic jars should be used for collecting samples. The jars should be cleaned thoroughly to avoid contamination.

(4). Manual, automatic or rising stage sampling may be utilized. Samples required by this permit should be analyzed immediately, but in no case later than 48 hours after collection. However, samples from automatic samplers must be collected no later than the next business day after their accumulation, unless flow through automated analysis is utilized. If automatic sampling is utilized and the automatic sampler is not activated during the qualifying event, the permittee must utilize manual sampling or rising stage sampling during the next qualifying event. Dilution of samples is not required. Samples may be analyzed directly with a properly calibrated turbidimeter. Samples are not required to be cooled.

(5). Sampling and analysis of the receiving water(s) or outfalls beyond the minimum frequency stated in this permit must be reported to EPD as specified in Part IV.E.

c. *Sampling Points.*

(1). For construction activities the primary permittee must sample all receiving water(s), or all outfall(s), or a combination of receiving water(s) and outfall(s). Samples taken for the purpose of compliance with this permit shall be representative of the monitored activity and representative of the water quality of the receiving water(s) and/or the stormwater outfalls using the following minimum guidelines:

(a). The upstream sample for each receiving water(s) must be taken immediately upstream of the confluence of the first stormwater discharge from the permitted activity (i.e., the discharge farthest upstream at the site) but downstream of any other stormwater discharges not associated with the permitted activity. Where appropriate, several upstream samples from across the receiving water(s) may need to be taken and the arithmetic average of the turbidity of these samples used for the upstream turbidity value.

(b). The downstream sample for each receiving water(s) must be taken downstream of the confluence of the last stormwater discharge from the permitted activity (i.e., the discharge farthest downstream at the site) but upstream of any other stormwater discharge not associated with the permitted activity. Where appropriate, several downstream samples from across the receiving water(s) may need to be taken and the arithmetic average of the turbidity of these samples used for the downstream turbidity value.

(c). Ideally the samples should be taken from the horizontal and vertical center of the receiving water(s) or the stormwater outfall channel(s).

(d). Care should be taken to avoid stirring the bottom sediments in the receiving water(s) or in the outfall stormwater channel.

(e). The sampling container should be held so that the opening faces upstream.

(f). The samples should be kept free from floating debris.

(g). Permittees do not have to sample sheet flow that flows onto undisturbed natural areas or areas stabilized by the project. For purposes of this section, stabilized shall mean, for unpaved areas and areas not covered by permanent structures and areas located outside the waste disposal limits of a landfill cell that has been certified by EPD for waste disposal, 100% of the soil surface is uniformly covered in permanent vegetation with a density of 70% or greater, or landscaped according to the Plan (uniformly covered with landscaping materials in planned landscaped areas), or equivalent permanent stabilization measures as defined in the Manual (excluding a crop of annual vegetation and a seeding of target crop perennials appropriate for the region).

(h). All sampling pursuant to this permit must be done in such a way (including generally accepted sampling methods, locations, timing, and frequency) as to accurately reflect whether stormwater runoff from the construction site is in compliance with the standard set forth in Parts III.D.3. or III.D.4., whichever is applicable.

*d. Sampling Frequency.*

(1). The primary permittee must sample in accordance with the Plan at least once for each rainfall event described below. For a qualifying event, the permittee shall sample at the beginning of any stormwater discharge to a monitored receiving water and/or from a monitored outfall location within in forty-five (45) minutes or as soon as possible.

(2). However, where manual and automatic sampling are impossible (as defined in this permit), or are beyond the permittee's control, the permittee shall take samples as soon as possible, but in no case more than twelve (12) hours after the beginning of the stormwater discharge.

(3). Sampling by the permittee shall occur for the following qualifying events:

(a). For each area of the site that discharges to a receiving water or from an outfall, the first rain event that reaches or exceeds 0.5 inch with a stormwater discharge that occurs during normal business hours as defined in this permit after all clearing and grubbing operations have been completed, but prior to completion of mass grading operations, in the drainage area of the location selected as the sampling location;

(b). In addition to (a) above, for each area of the site that discharges to a receiving water or from an outfall, the first rain event that reaches or exceeds 0.5 inch with a stormwater discharge that occurs during normal business hours as defined in this permit either 90 days after the first sampling event or after all mass grading operations have been completed, but prior to submittal of a NOT, in the drainage area of the location selected as the sampling location, whichever comes first;

(c). At the time of sampling performed pursuant to (a) and (b) above, if BMPs in any area of the site that discharges to a receiving water or from an outfall are not properly designed, installed and maintained, corrective action shall be defined and implemented within two (2) business days, and turbidity samples shall be taken from discharges from that area of the site for each subsequent rain event that reaches or exceeds 0.5 inch during normal business hours\* until the selected turbidity standard is attained, or until post-storm event inspections determine that BMPs are properly designed, installed and maintained;

(d). Where sampling pursuant to (a), (b) or (c) above is required but not possible (or not required because there was no discharge), the permittee, in accordance with Part IV.D.4.a.(6), must include a written justification in the inspection report of why sampling was not performed. Providing this justification does not relieve the permittee of any subsequent sampling obligations under (a), (b) or (c) above; and

(e). Existing construction activities, i.e., those that are occurring on or before the effective date of this permit, that have met the sampling required by (a) above shall sample in accordance with (b). Those existing construction activities that have met the sampling required by (b) above shall not be required to conduct additional sampling other than as required by (c) above.

\*Note that the permittee may choose to meet the requirements of (a) and (b) above by collecting turbidity samples from any rain event that reaches or exceeds 0.5 inch and allows for sampling at any time of the day or week.

**7. Non-stormwater discharges.** Except for flows from fire fighting activities, sources of non-stormwater listed in Part III.A.2. of this permit that are combined with stormwater discharges associated with construction activity must be identified in the Plan. The Plan shall identify and ensure the implementation of appropriate pollution prevention measures for the non-stormwater component(s) of the discharge.

#### **E. Reporting.**

1. The applicable permittees are required to submit the sampling results to the EPD at the address shown in Part II.C. by the fifteenth day of the month following the reporting period. Reporting periods are months during which samples are taken in accordance with this permit. Sampling results shall be in a clearly legible format. Upon written notification, EPD may require the applicable permittee to submit the sampling results on a more frequent basis. Sampling and analysis of any stormwater discharge(s) or the receiving water(s) beyond the minimum frequency stated in this permit must be reported in a similar manner to the EPD. The sampling reports must be signed in accordance with Part V.G.2. Sampling reports must be submitted to EPD using the electronic submittal service provided by EPD. Sampling reports must be submitted to EPD until such time as a NOT is submitted in accordance with Part VI.

2. All sampling reports shall include the following information:

- a. The rainfall amount, date, exact place and time of sampling or measurements;
- b. The name(s) of the certified personnel who performed the sampling and measurements;
- c. The date(s) analyses were performed;
- d. The time(s) analyses were initiated;
- e. The name(s) of the certified personnel who performed the analyses;
- f. References and written procedures, when available, for the analytical techniques or methods used;
- g. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine these results;
- h. Results which exceed 1000 NTU shall be reported as "exceeds 1000 NTU;" and
- i. Certification statement that sampling was conducted as per the Plan.

3. All written correspondence required by this permit shall be submitted by return receipt certified mail (or similar service) to the appropriate District Office of the EPD according to the schedule in Appendix A of this permit. The permittee shall retain a copy of the proof of submittal at the construction site or the proof of submittal shall be readily available at a designated location from commencement of construction until such time as a NOT is submitted in accordance with Part VI.

## **F. Retention of Records.**

1. The primary permittee shall retain the following records at the construction site or the records shall be readily available at a designated alternate location from commencement of construction until such time as a NOT is submitted in accordance with Part VI:

- a. A copy of all Notices of Intent submitted to EPD;
- b. A copy of the Erosion, Sedimentation and Pollution Control Plan required by this permit;
- c. The design professional's report of the results of the inspection conducted in accordance with Part IV.A.5. of this permit;
- d. A copy of all sampling information, results, and reports required by this permit;
- e. A copy of all inspection reports generated in accordance with Part IV.D.4.a. of this permit;
- f. A copy of all violation summaries and violation summary reports generated in accordance with Part III.D.2. of this permit; and
- g. Daily rainfall information collected in accordance with Part IV.D.4.a.(2). of this permit.

2. Copies of all Notices of Intent, Notices of Termination, inspection reports, sampling reports (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) or other reports requested by the EPD, Erosion, Sedimentation and Pollution Control Plans, records of all data used to complete the Notice of Intent to be covered by this permit and all other records required by this permit shall be retained by the permittee who either produced or used it for a period of at least three years from the date that the NOT is submitted in accordance with Part VI. of this permit. These records must be maintained at the permittee's primary place of business or at a designated alternative location once the construction activity has ceased at the permitted site. This period may be extended by request of the EPD at any time upon written notification to the permittee.

## **Part V. STANDARD PERMIT CONDITIONS**

### **A. Duty to Comply.**

1. Each permittee must comply with all applicable conditions of this permit. Any permit noncompliance constitutes a violation of the Georgia Water Quality Control Act (O.C.G.A. §§12-5-20, et seq.) and is grounds for enforcement action; for permit termination; or for denial of a permit renewal application. Failure of a primary permittee to comply with any applicable term or condition of this permit shall not relieve any other primary permittee from compliance with their applicable terms and conditions of this permit.

2. Each permittee must document in their records any and all known violations of this permit at his/her site within seven (7) days of his/her knowledge of the violation. A summary of these violations must be submitted to EPD by the permittee at the addresses shown in Part II.C. within fourteen (14) days of his/her discovery of the violation.

3. Penalties for violations of permit conditions. The Federal Clean Water Act and the Georgia Water Quality Control Act (O.C.G.A. §§12-5-20, et seq.) provide that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit, makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine or by imprisonment, or by both. The Federal Clean Water Act and the Georgia Water Quality Control Act also provide procedures for imposing civil penalties which may be levied for violations of the Acts, any permit condition or limitation established pursuant to the Acts, or negligently or intentionally failing or refusing to comply with any final or emergency order of the Director.

**B. Continuation of the Expired General Permit.** This permit expires on the date shown on the cover page of this permit. However, an expired general permit continues in force and effect until a new general permit is issued, final and effective.

**C. Need to Halt or Reduce Activity Not a Defense.** It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

**D. Duty to Mitigate.** The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

**E. Duty to Provide Information.** The permittee shall furnish to the Director; a State or local agency approving soil Erosion, Sedimentation and Pollution Control Plans, grading plans, or stormwater management plans; or in the case of a stormwater discharge associated with construction activity which discharges through a municipal separate storm sewer system with an NPDES permit, to the local government operating the municipal separate storm sewer system, any information which is requested to determine compliance with this permit. In the case of information submitted to the EPD such information shall be considered public information and available under the Georgia Open Records Act.

**F. Other Information.** When the permittee becomes aware that he failed to submit any relevant facts or submitted incorrect information in the Notice of Intent or in any other report required to be submitted to the EPD, the permittee shall promptly submit such facts or information.

**G. Signatory Requirements.** All Notices of Intent, Notice of Terminations, inspection reports, sampling reports or other reports requested by the EPD shall be signed as follows:

1. All Notices of Intent and Notices of Termination shall be signed as follows:

a. For a corporation: by a responsible corporate officer. For the purpose of this permit, a responsible corporate officer means: (1) a president, secretary, treasurer, or vice-president

of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation; or (2) the manager of one or more manufacturing, production or operating facilities provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

c. For a municipality, State, Federal, or other public facility: by either a principal executive officer or ranking elected official; and

d. Changes to authorization. If an authorization under Part II.B. is no longer accurate, a modification NOI satisfying the requirements of Part II.B. must be submitted to the EPD prior to or together with any inspection reports, sampling reports, or other reports requested by the EPD to be signed by a person described above or by a duly authorized representative of that person.

2. All inspection reports, sampling reports, or other reports requested by the EPD shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person(s) described above and submitted to the EPD;

b. The authorization specifies either an individual or a position having responsibility for specified operation(s) of the regulated facility or activity, such as the position of manager, operator, superintendent, or position of equivalent responsibility or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may be either a named individual or any individual occupying a named position); and

c. *Certification.* Reports delineated in Part V.G.2. shall be signed by the permittee or duly authorized representative and shall make the following certification:

“I certify under penalty of law that this report and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that certified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those

persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

**H. Oil and Hazardous Substance Liability.** Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under the Georgia Hazardous Waste Management Act, O.C.G.A. § 12-8-60, et seq. or under Chapter 14 of Title 12 of the Official Code of Georgia Annotated; nor is the Operator relieved from any responsibilities, liabilities or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act or Section 106 of Comprehensive Environmental Response Compensation And Liability Act.

**I. Property Rights.** The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

**J. Severability.** The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

**K. Other Applicable Environmental Regulations and Laws.** Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Clean Water Act. Nothing in this permit, unless explicitly stated, exempts the permittee from compliance with other applicable local, state and federal ordinances, rules, regulations, and laws. Furthermore, it is not a defense to compliance with this permit that a local government authority has approved the permittee’s Erosion, Sedimentation and Pollution Control Plan or failed to take enforcement action against the permittee for violations of the Erosion, Sedimentation and Pollution Control Plan, or other provisions of this permit.

No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations.

**L. Proper Operation and Maintenance.** The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the required plans. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance requires the operation of backup or auxiliary facilities or similar systems, installed by a permittee only when necessary to achieve compliance with the conditions of the permit.



**M. Inspection and Entry.** The permittee shall allow the Director or an authorized representative of EPA, EPD or to designated officials of the local government reviewing soil Erosion, Sedimentation and Pollution Control Plans, grading plans, or stormwater management plans; or, in the case of a construction site which discharges through a municipal separate storm sewer system, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit; and
2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and
3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment).

**N. Permit Actions.** This permit may be revoked and reissued, or terminated for cause including but not limited to changes in the law or regulations. The filing of a request by the permittee for termination of the permit, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

## **Part VI. TERMINATION OF COVERAGE**

**A. Notice of Termination Eligibility.** Notice of Termination signed in accordance with Part V.G.1. of this permit must be submitted:

1. For construction activities, by the permittee where the entire stand alone development has undergone final stabilization, all stormwater discharges associated with construction activity that are authorized by this permit have ceased, the site is in compliance with this permit and all temporary BMPs have been removed. For construction activities where the primary permittee has elected to submit NOIs for separate phases of the stand alone development, the phase or phases of the stand alone development on the NOT shall correspond to the phase or phases on the NOI.
2. By the Owner or Operator when the Owner or Operator of the site changes. Where stormwater discharges will continue after the identity of the Owner or Operator changes, the permittee must, prior to filing the Notice of Termination, notify any subsequent Owner or Operator of the permitted site as to the requirements of this permit.

**B. Notice of Termination Contents:**

1. The NPDES permit number for the stormwater discharge associated with construction activity identified by the Notice of Termination (i.e., GAR100001 – Stand Alone);
2. The project construction site name, GPS location (decimal degrees) of construction exit, construction site location, city (if applicable) and county of the construction site for which the notification is submitted. This information must correspond to the similar information as provided on the NOI. Where an address for the construction site is not available, the construction site location information must be sufficient to accurately locate the construction site;
3. The Owner's legal name, address, telephone number and email address and the Operator's legal name, address, telephone and email address;
4. The name of the initial receiving water(s), and when the discharge is through a municipal separate storm sewer system (MS4), the name of the local government operating the municipal separate storm sewer system and the name of the receiving water(s) which receives the discharge from the MS4;
5. Copies of all sampling reports not previously submitted and/or a written justification why sampling was not conducted. Copies of all sampling reports may be submitted as a Portable Document Format (PDF) file on CD-ROM or other storage device;
6. Any other information specified on the NOT in effect at the time of submittal; and
7. The following certification signed in accordance with Part V.G.1. (signatory requirements):

“I certify under penalty of law that either: (a) all stormwater discharges associated with construction activity authorized by this permit have ceased, the site is in compliance with this permit and all temporary BMPs have been removed or (b) I am no longer an Owner or Operator at the construction site and a new Owner or Operator has assumed operational control of the permitted construction site where I previously had ownership or operational control; and that discharging pollutants in stormwater associated with construction activity to waters of Georgia is unlawful under the Georgia Water Quality Control Act and the Clean Water Act where the discharge is not authorized by a NPDES permit.”

**C. Notice of Termination Submittal.** All Notices of Termination (NOT) for this permit shall be submitted to EPD using the electronic submittal service provided by EPD and a copy to the Local Issuing Authority in jurisdictions authorized to issue a Land Disturbance Activity permit for the permittee's construction site pursuant to O.C.G.A. 12-7-1, et seq.

## **APPENDIX A**

### **EPD DISTRICT OFFICES**

**A. For facilities/construction sites located in the following counties:** Bibb, Bleckley, Chattahoochee, Crawford, Dooly, Harris, Houston, Jones, Lamar, Macon, Marion, Meriwether, Monroe, Muscogee, Peach, Pike, Pulaski, Schley, Talbot, Taylor, Troup, Twiggs, Upson

Information shall be submitted to: West Central District Office  
Georgia Environmental Protection Division  
2640 Shurling Drive  
Macon, GA 31211-3576  
(478) 751-6612

**B. For facilities/construction sites located in the following counties:** Burke, Columbia, Emanuel, Glascock, Jefferson, Jenkins, Johnson, Laurens, McDuffie, Montgomery, Richmond, Screven, Treutlen, Warren, Washington, Wheeler, Wilkinson

Information shall be submitted to: East Central District Office  
Georgia Environmental Protection Division  
3525 Walton Way Extension  
Augusta, GA 30909-1821  
(706) 667-4343

**C. For facilities/construction sites located in the following counties:** Baldwin, Banks, Barrow, Butts, Clarke, Elbert, Franklin, Greene, Hall, Hancock, Hart, Jackson, Jasper, Lincoln, Madison, Morgan, Newton, Oconee, Oglethorpe, Putnam, Stephens, Taliaferro, Walton, Wilkes

Information shall be submitted to: Northeast District Office  
Georgia Environmental Protection Division  
745 Gaines School Road  
Athens, GA 30605-3129  
(706) 369-6376

**D. For facilities/construction sites located in the following counties:** Carroll, Clayton, Coweta, DeKalb, Douglas, Fayette, Fulton, Gwinnett, Heard, Henry, Rockdale, Spalding

Information shall be submitted to: Mountain District - Atlanta Satellite  
Georgia Environmental Protection Division  
4244 International Parkway, Suite 114  
Atlanta, GA 30354-3906  
(404) 362-2671

**E. For facilities/construction sites located in the following counties:** Bartow, Catoosa, Chattooga, Cherokee, Cobb, Dade, Dawson, Fannin, Floyd, Forsyth, Gilmer, Gordon, Habersham, Haralson, Lumpkin, Murray, Paulding, Pickens, Polk, Rabun, Towns, Union, Walker, White, Whitfield

Information shall be submitted to: Mountain District - Cartersville Office  
Georgia Environmental Protection Division  
P.O. Box 3250  
Cartersville, GA 30120-1705  
(770) 387-4900

**F. For facilities/construction sites located in the following counties:** Appling, Atkinson, Bacon, Brantley, Bryan, Bulloch, Camden, Candler, Charlton, Chatham, Clinch, Coffee, Effingham, Evans, Glynn, Jeff Davis, Liberty, Long, McIntosh, Pierce, Tattnall, Toombs, Ware, Wayne

Information shall be submitted to: Coastal District - Brunswick Office  
Georgia Environmental Protection Division  
400 Commerce Center Drive  
Brunswick, GA 31523-8687  
(912) 264-7284

**G. For facilities/construction sites located in the following counties:** Baker, Ben Hill, Berrien, Brooks, Calhoun, Clay, Colquitt, Cook, Crisp, Decatur, Dodge, Dougherty, Early, Echols, Grady, Irwin, Lanier, Lee, Lowndes, Miller, Mitchell, Quitman, Randolph, Seminole, Stewart, Sumter, Telfair, Terrell, Thomas, Tift, Turner, Webster, Wilcox, Worth

Information shall be submitted to: Southwest District Office  
Georgia Environmental Protection Division  
2024 Newton Road  
Albany, GA 31701-3576  
(229) 430-4144

**H. For facilities/construction sites required to submit Plans required under Part IV.A.4.a. of this Permit:**

Information shall be submitted to: Watershed Protection Branch  
Environmental Protection Division  
2 Martin Luther King Jr. Drive  
Suite 1462 East  
Atlanta, Georgia 30334  
(404) 463-1511

## APPENDIX B

### Nephelometric Turbidity Unit (NTU) TABLES

		Trout Streams							
		Surface Water Drainage Area, square miles							
		0-4.99	5-9.99	10-24.99	25-49.99	50-99.99	100-249.99	250-499.99	500+
Site Size, acres	1.00-10	25	50	75	150	300	500	500	500
	10.01-25	25	25	50	75	150	200	500	500
	25.01-50	25	25	25	50	75	100	300	500
	50.01-100	20	25	25	35	59	75	150	300
	100.01+	20	20	25	25	25	50	60	100

		Waters Supporting Warm Water Fisheries							
		Surface Water Drainage Area, square miles							
		0-4.99	5-9.99	10-24.99	25-49.99	50-99.99	100-249.99	250-499.99	500+
Site Size, acres	1.00-10	75	150	200	400	750	750	750	750
	10.01-25	50	100	100	200	300	500	750	750
	25.01-50	50	50	100	100	200	300	750	750
	50.01-100	50	50	50	100	100	150	300	600
	100.01+	50	50	50	50	50	100	200	100

To use these tables, select the size (acres) of the construction site. Then, select the surface water drainage area (square miles). The NTU matrix value arrived at from the above tables is the one to use in Part III.D.4.

Example 1: For a site size of 12.5 acres and a “trout stream” drainage area of 37.5 square miles, the NTU value to use in Part III.D.4. is 75 NTU.

Example 2: For a site size of 51.7 acres and “waters supporting warm water fisheries” drainage area of 72 square miles, the NTU value to use in Part III.D.4. is 100 NTU.

SECTION 31 37 00 - RIP-RAP

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Material placed as bank protection and erosion control.

1.2 RELATED SECTIONS

- A. Section 312500GA – Erosion and Sedimentation Controls (GA)
- B. Section 334000 – Storm Drainage Utilities

1.3 ALLOWABLE TOLERANCES

- A. Depth of rip-rap blanket as shown on the drawings and in these specifications is a minimum depth.

1.4 MEASUREMENT AND PAYMENT

- A. Rip-Rap: Payment shall be included in the contract lump sum for the project.

1.5 REFERENCES (LATEST REVISION)

- A. ASTM C 150 – Portland Cement.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Stone Rip-Rap: Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight, or weather. Stone shall be solid and non-friable and range in weight from a minimum of 25 pounds to a maximum of 150 pounds. At least 50 percent of the stone pieces shall weigh more than 60 pounds. The stone pieces shall have a minimum dimension of 12 inches. Documents indicating stone analysis, source and other pertinent data (i.e. – filter fabric) shall be submitted for review by the Engineer prior to delivery.
- B. Sand-Cement Bag Rip-Rap:
  - 1. Bags: Shall be of cotton, burlap, or fiber-reinforced paper capable of containing the sand-cement mixture without leakage during handling and placing. Bags previously used for any purpose shall not be used. Capacity shall be not less than 0.75 cubic foot nor more than two cubic feet.
  - 2. Cement: Portland cement shall be Type I meeting requirements of ASTM C 150. Cement which has been damaged, or which is partially set, lumpy, or caked shall not be used.

3. Fine Aggregate: Shall be composed of hard, durable particles, free from injurious amounts of organic impurities and shall contain, in the material passing the No. 10 sieve, not more than 7 percent clay, and not more than 20 percent passing the No. 200 sieve.
- C. Filter Fabric: Shall be a woven fabric of monofilament and multifilament yarn equivalent to Mirafi FW700. Fabric shall be finished so the filaments will retain their relative position with respect to each other. Fabric shall contain stabilizers and/or inhibitors added to make filaments resistant to deterioration due to ultraviolet and/or heat exposure. Fabric shall be free of flaws, rips, holes, or defects.

## 2.2 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. The surface to receive rip-rap shall be prepared to a relatively smooth condition free of obstruction, depressions, debris, rises, and soft or low density pockets of material. Contours and elevations on construction drawings are to the surface of rip-rap material.

### 3.2 PLACEMENT

- A. Filter fabric shall be placed with the long dimension running up slope. The strips shall be placed to provide a minimum width of one foot of overlap for each joint. Fabric shall be anchored in place with securing pins of the type recommended by fabric manufacturer. Pins shall be placed on or within 3 inches of the over-lap. Place fabric so upstream strip will overlap the downstream strip. Fabric shall be placed loosely to give and avoid stretching and tearing during placement of the stones.
- B. Minimum depth or thickness of stone blanket shall be 12 inches with no under tolerance. Stones shall be dropped no more than three feet during construction. Placing shall begin at bottom of slope. Provide a toe trench if required as detailed on the construction drawings. Entire mass of stone shall be placed to conform with lines, grades, and thickness shown on the plans. Rip-rap shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the underlying material. Placing of rip-rap in layers, or by dumping into chutes, or by similar methods likely to cause segregation, will not be permitted.

Larger stones shall be well distributed and the entire mass of stone shall conform to gradation specified. All material used in rip-rap protection shall be placed and distributed so there will be no large accumulations of either the larger or smaller sizes of stone.

It is the intent of these specifications to produce a fairly compact rip-rap protection in which all sizes of material are placed in their proper proportions. Hand placing or rearranging of individual stones by mechanical equipment may be required to secure the results specified.

- C. Sand–Cement Bag Rip–Rap: Bags shall be uniformly filled. Bagged rip–rap shall be placed by hand with tied ends facing the same direction, with close, broken joints. After placing, bags shall be rammed or packed against one another to produce the required thickness and form a consolidated mass. The top of each bag shall not vary more than 3 inches above or below required plane. When directed by the Engineer or required by construction drawings, header courses shall be placed.

END OF SECTION



## SECTION 321123 - AGGREGATE BASE COURSES

### PART 1 – GENERAL

#### 1.1 SECTION INCLUDES

- A. Aggregate base course.

#### 1.2 RELATED SECTIONS

- A. Section 012200 – Unit Prices: Requirements applicable for the work of this section.
- B. Section 014500 – Quality Control.
- C. Section 310000 – Earthwork
- D. Section 321216 – Asphalt Paving

#### 1.3 MEASUREMENT AND PAYMENT

- A. Aggregate Base Course: Payment will be included in the contract lump sum for the project.. Payment will include supplying all material, labor, and equipment, stockpiling, scarifying substrate surface, placing where required, and compacting.
- B. Prime Coat: Bituminous prime coat will not be measured for separate payment. All costs connected with applying prime coat will be included in the unit price bid for Aggregate Base Course.

#### 1.4 REFERENCES (LATEST REVISION)

- A. ASTM C 131 – Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
- B. ASTM D 1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort.
- C. ASTM D 3740 – Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.
- D. ASTM D 6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- E. ASTM E 329 – Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

#### 1.5 QUALITY ASSURANCE

- A. Perform work in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.

## 1.6 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any tests.
- E. Testing shall be Contractor's responsibility and performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph C above.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- A. Aggregate shall consist of processed and blended crushed stone. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material and shall be durable and sound. Coarse aggregate shall have a percentage of wear not to exceed 65% after 500 revolutions as determined by ASTM C 131. Coarse aggregate shall meet applicable requirements of Section 800, Coarse Aggregate of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition. Material shall meet the following gradation requirements of Section 815.

Sieve Size	Percent by Weight Passing
2"	100
1-1/2"	97 – 100
3/4"	60 – 90
#10	25 – 45
#60	5 – 30
#200	4 – 11

- B. Prime Coat: Shall consist of low viscosity liquid asphalt such as MC-30, MC-70, MC-250, RC-30, RC-70, or RC-250, conforming to Section 412 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Verify subbase has been tested, is dry, and slopes and elevations are correct.
- B. ON SITE OBSERVATIONS OF WORK: Owner's Representative or Engineer will have the right to require any portion of the work be completed in their presence. If the work is covered up after such instruction, it shall be exposed by Contractor for observation at no additional cost to the Owner. However, if Contractor notifies Owner such work is scheduled, and the Owner fails to appear within 48 hours, Contractor may proceed. All work completed and materials furnished shall be subject to review by the Owner, Engineer, or Project Representative. Improper work shall be reconstructed. All materials, which do not conform to requirements of specifications, shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Owner, Project Engineer or Project Representative a minimum of 48 hours notice for all required observations or tests.

### 3.2 PREPARATION

- A. Subbase shall be graded and shaped conforming to the lines, grades, and cross sections required and cleaned of all foreign substances prior to constructing base course. Do not place base on soft, muddy or frozen surfaces. Correct irregularities in subbase slope and elevation by scarifying, reshaping, and recompacting.
- B. At the time of base course construction, subbase shall contain no frozen material.
- C. Surface of subbase shall be checked by the Engineer or Project Representative for adequate compaction and surface tolerances. Ruts or soft yielding spots appearing in areas of subbase course having inadequate compaction, and areas not smooth or which vary in elevation more than 3/8 inch above or below required grade established on the plans, shall be corrected to the satisfaction of the Engineer or Project Representative. Base material shall not be placed until subbase has been properly prepared and test results have so indicated.

### 3.3 AGGREGATE PLACEMENT

- A. Aggregate shall be placed with an acceptable spreader in accordance with Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition Section 310 and in accordance with all terms included in these specifications. (Spreader shall contain a hopper, adjustable screed and designed so there will be a uniform, steady flow of material from the hopper. Spreader shall be capable of laying material without segregation across full width of the lane to a uniform thickness and to a uniform loose density.) Spreaders are not required on curb and gutter road sections.
- B. Level and contour surfaces to elevations and slopes indicated.
- C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

- D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- F. While at optimum moisture ( $\pm 1-1/2\%$ ), compact base course with rollers capable of obtaining required density. Vibratory, flatwheel, and other rollers accepted by the Engineer may be used to obtain required compaction. Rolling shall continue until base is compacted to 98% of the maximum laboratory dry density as determined by ASTM D 1557. In-place density of the compacted base will be determined in accordance with ASTM D 6938.

### 3.4 PRIME COAT

- A. Bituminous material for the prime coat shall be applied uniformly and accurately in quantities of not less than 0.15 gallons per square yard nor more than 0.30 gallons per square yard of base course. All irregularities in the base course surface shall be corrected prior to application of prime coat. Clean the base course of all mud, dirt, dust, and caked and loose material
- B. Do not apply prime to a wet surface nor when temperature is below 40°F in the shade. Do not apply prime when rain threatens nor when weather conditions prevent proper construction and curing of prime coat.
- C. The primed base should be adequately cured before the binder or surface course is laid. In general, a minimum of 48 hours should be allowed for complete curing. Ordinarily, proper surface condition of the prime is indicated by a slight change in the shiny black appearance to a slightly brown color.

### 3.5 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with an acceptable 10-foot straight edge.
- B. Scheduled Compacted Thickness: Within 3/8 inch.
- C. Variation from Design Elevation: Within 3/8 inch.
- D. Depth measurements for compacted thickness shall be made by test holes through the base course. Where base course is deficient, correct such areas by scarifying, adding base material, and recompact as directed by the Engineer.

### 3.6 FIELD QUALITY CONTROL

- A. Section 01 45 00 – Quality Control: Field observation.
- B. Density and moisture testing will be performed in accordance with ASTM D 1557 and ASTM D 6938.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- D. Frequency of Tests:

1. Base Density and Thickness – One test per 5,000 square feet.

END OF SECTION

SECTION 321216GA - ASPHALT PAVING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Surface Course
- B. Binder Course

1.2 RELATED SECTIONS

- A. Section 012200 – Unit Prices
- B. Section 014500 – Quality Control
- C. Section 310000 – Earthwork
- D. Section 321123 – Aggregate Base Course

1.3 MEASUREMENT AND PAYMENT

- A. Asphaltic Concrete Binder Course: Shall be included in the contract lump sum for the project
- B. Asphaltic Concrete Surface Course: Shall be included in the contract lump sum for the project.
- C. Tack Coat: Shall be included in the contract lump sum for the project.
- D. Payment for pavement and tack coat will be in full for preparing and cleaning, providing all materials, labor and equipment including placing, compacting and testing.

1.4 REFERENCES (LATEST REVISION)

- A. ASTM D 946 – Penetration–Graded Asphalt–Cement for Use in Pavement Construction.
- B. ASTM D 1188 – Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
- C. ASTM D 1754 – Effect of Heat and Air on Asphalt Materials (Thin–film Oven Test).
- D. ASTM D 2726 – Bulk Specific Gravity and Density of Non–Absorptive Compacted Bituminous Mixtures.
- E. ASTM D 2950 – Density of Bituminous Concrete in Place by Nuclear Methods.
- F. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.
- G. ASTM E 329 – Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

## 1.5 QUALITY ASSURANCE

- A. Perform work in accordance with Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.
- B. Mixing Plant: Conform to Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.
- C. Method of Measurement for Handicap Parking and Access Aisle will be with a 24-inch digital smart-level. The 24-inch smart-level slope readings greater than specified tolerance within contract documents will be identified as non-compliant and not accepted.

## 1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt mixture when ambient air temperature is less than that indicated in the Table nor when the surface is wet or frozen.

Lift Thickness	Min. Air Temperature, Degrees F.
1" or Less	55
1.1" to 2"	45
2.1" to 3"	35
3.1" to 4"	30
4.1" to 8"	Contractor's Discretion

- B. Mixture shall be delivered to the spreader at a temperature between 250 degrees F and 325 degrees F.

## 1.7 GUARANTEE

- A. Contractor shall guarantee the quality of materials and workmanship for a period of 12 months after acceptance. Defects discovered during this period shall be repaired by the Contractor at no cost to the Owner.

## 1.8 TESTING

- A. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- B. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any tests.
- C. Testing shall be Contractor's responsibility and performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph A above.
- D. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

## PART 2 – PRODUCTS

### 2.1 TACK COAT

- A. Material: Shall be PG67–22, asphalt cement, conforming to Sections 413 and 820 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition. When the temperature in the shade exceeds 70 degrees F, an emulsion such as CRS – 2h or CRS – 3 may be used.

### 2.2 ASPHALT CEMENT AND ADDITIVES

- A. Asphalt Cement: Shall conform to the requirements of Section 820 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition. The material shall be PG67–22.
- B. Anti–Stripping: Shall be hydrated lime and conform to requirements of Section 831 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.

### 2.3 AGGREGATES

- A. General: Mineral aggregate shall be composed of fine aggregate or a combination of fine and coarse aggregate. Coarse aggregate shall be the portion of material retained on a No. 8 sieve.
- B. Fine aggregate shall be considered the portion passing a No. 8 sieve. Fine aggregate, coarse aggregate, and any additives in combination with the specified percentage of asphalt cement shall meet the requirements of tests specified, before acceptance may be given for their individual use.
- C. Fine Aggregate: Shall conform to the requirements of Section 802 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.
- D. Coarse Aggregate: Shall be granite stone and conform to the requirements of Section 802.02 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.
- E. Surface Course: Shall consist of fine and coarse aggregate and mineral filler uniformly mixed with hot asphalt cement in an acceptable mixing plant. Job mix formula and design limits shall conform to 9.5 mm Superpave requirements.
- F. Intermediate or Binder Course: Shall consist of fine and coarse aggregate and mineral filler uniform mixing with hot asphalt cement in an acceptable mixing plant. Job mix formula and design limits shall conform to 19 mm Superpave requirements.

### 2.4 SOURCE QUALITY CONTROL AND TESTS

- A. Section 014500 – Quality Control and Section 014523 – Testing and Inspecting Services.
- B. Submit proposed mix design for review prior to beginning of work.



- C. Test samples in accordance with the requirements of these specifications.

### PART 3 – EXECUTION

#### 3.1 EXAMINATION

- A. On-Site Observations: Owner's Representative or Engineer will have the right to require any portion of work be completed in their presence. If work is covered up after such instruction, it shall be exposed by the Contractor for observation at no additional cost to Owner. However, if Contractor notifies Engineer such work is scheduled, and Engineer fails to appear within 48 hours, the Contractor may proceed. All work completed and materials furnished shall be subject to review by the Engineer or Project Representative. Improper work shall be reconstructed. All materials, which do not conform to requirements of specifications, shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Owner, Project Engineer or Project Representative a minimum of 48 hours notice for all required observations or tests.

- B. Contractor shall verify base has been tested, is dry, and gradients and elevations are correct.

#### 3.2 PREPARATION

- A. Apply tack coat in accordance with Section 413 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition. Rate of application shall be 0.04 to 0.06 gallons per square yard of surface.
- B. Work shall be planned so no more tack coat than is necessary for the day's operation is placed on the surface. All traffic not essential to the work shall be kept off the tack coat.
- C. Apply tack coat to contact surfaces of curbs and gutters. Apply in manner so exposed curb or gutter surfaces are not stained.
- D. Coat surfaces of manhole frames and inlet frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

#### 3.3 PLACEMENT

- A. Construction shall be in accordance with Section 400 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition
- B. Asphaltic concrete shall not be placed on a wet or frozen surface.
- C. Compaction shall commence as soon as possible after the mixture has been spread to the desired thickness. Compaction shall be continuous and uniform over the entire surface. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks. Compaction rolling shall be complete before material temperature drops below 185° F.

- D. Areas of pavement with deficient thickness or density shall be removed and replaced at no additional cost to the Owner.

### 3.4 TOLERANCES

- A. General: All paving shall be subject to visual and straightedge evaluation during construction operations and thereafter prior to final acceptance. A 10 foot straightedge shall be maintained in the vicinity of the paving operation at all times for the purpose of measuring surface irregularities on all paving courses. The straightedge and labor for its use shall be provided by the Contractor. The surface of all courses shall be checked with the straightedge as necessary to detect surface irregularities. Irregularities such as rippling, tearing or pulling, which in the judgment of the Engineer indicate a continuing problem in equipment, mixture or operating technique, will not be permitted to recur. The paving operation shall be stopped until appropriate steps are taken by the Contractor to correct the problem.
- B. Flatness: All irregularities in excess of 1/8 inch in 10 feet for surface courses and 3/16 inch in 10 feet for intermediate and base courses shall be corrected.
  - 1. General Paving: Less than 1/4 inch.
  - 2. Accessible Routes: Shall not exceed 1/4 inch. However, accessible routes shall not exceed maximum ADA allowable slopes. Contractor shall remove and replace any and all portions of the accessible route that exceed maximum ADA allowable slopes.
  - 3. Variation from Design Elevation: Less than 1/4 inch.
  - 4. Scheduled Compacted Thickness: Less than 1/4 inch under tolerance.
  - 5. Pavement Deficient in Thickness: When measurement of any core indicates the pavement is deficient in thickness, additional cores will be drilled 10 feet either side of the deficient core along the centerline of the lane until the cores indicate the thickness conforms to the above specified requirements. A core indicating thickness deficiencies is considered a failed test. Pavement deficient in thickness shall be removed and replaced with the appropriate thickness of materials. If the Contractor believes the cores and measurements taken are not sufficient to indicate fairly the actual thickness of the pavement, additional cores and measurements will be taken, provided the Contractor will bear the extra cost of drilling the cores and filling the holes in the roadway as directed.

### 3.5 FIELD QUALITY CONTROL

- A. Acceptance of the in-place density of the surface course shall be in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition and these specifications.
- B. Density Testing: Performed in accordance with ASTM D-2726 and ASTM D-2950. Core samples for each day's operation shall be taken, tested and results reported to the Engineer the following day. The areas sampled shall be properly restored by the Contractor at no additional cost to the Owner. Nuclear gauge tests shall be taken during the asphaltic concrete placement.

- C. Density of each pavement course shall conform to one of the following:
  - 1. Average 96% of laboratory density with no test less than 94%.
  - 2. Average 92% of maximum theoretical density with no test less than 90%.
  - 3. Average 99% of control strip density.
- D. Temperature:
  - 1. Asphaltic concrete shall not exceed 325 degrees F at any time.
  - 2. Asphaltic concrete shall not be placed once the temperature of the mix falls below 250 degrees F or the delivered temperature is more than 15 degrees F below the batch plant's delivery ticket.
  - 3. Temperature at time of loading shall be recorded on the truck delivery ticket.
- E. Frequency of Tests:
  - 1. Asphaltic Concrete – One test for each 250 tons placed.
    - a. Asphalt extraction and gradation test.
    - b. Core Sample
  - 2. Field determination of density by nuclear method every 5,000 square feet during construction of the asphaltic concrete binder/surface course.

END OF SECTION

## SECTION 321723.13 - PAINTED PAVEMENT MARKINGS

### PART 1 – GENERAL

#### 1.1 WORK INCLUDED

- A. Striping shall consist of furnishing and applying traffic line paint in accordance with the contract drawings and specifications, and the requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.

#### 1.2 QUALITY ASSURANCE

- A. Material and equipment shall be standard product of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on quality and performance of the product.

#### 1.3 GUARANTEE

- A. Contractor shall guarantee the quality of materials and workmanship for a period of 12 months after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

#### 1.4 MEASUREMENT AND PAYMENT

- A. Payment for striping will include all necessary equipment, labor, and materials to apply the striping or traffic control symbols.

Payment will be made per linear foot of striping or per each traffic control symbol applied.

### PART 2 – PRODUCTS

#### 2.1 PAINT

- A. Paint shall be in conformance with Section 870 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.

#### 2.2 EQUIPMENT

- A. The traveling traffic stripe painter shall be adaptable to traveling at a uniform, predetermined rate of speed both uphill and downhill in order to produce a uniform application of paint. Paint machine shall be of the spray type, capable of satisfactorily applying paint under pressure with a uniformity of feed through nozzles spraying directly upon pavement. Each machine shall be capable of applying three separate stripes, either solid or skip, in any specified pattern by utilizing three adjacent spray nozzles at the same time. Each paint tank shall be equipped with a mechanical agitator. Each nozzle shall be equipped with satisfactory cutoff valves which will apply broken or skip lines automatically. Each nozzle shall have a mechanical bead dispenser operating simultaneously with spray nozzle and distribute beads in a uniform pattern at the rate specified. Each nozzle shall also be equipped with suitable line guides consisting of metallic shrouds or air blasts.

Hand painting equipment shall consist of suitable brushes, templates and guides necessary to produce satisfactory results.

Cleaning equipment shall consist of necessary brushes, brooms, scrapers, grinders, high pressure water jets and air blasters required to satisfactorily remove all foreign matter, from surfaces to be painted, without damage to the underlying pavement.

The traveling traffic stripe painter shall also be equipped with paint meters which will indicate amount of paint dispensed from each tank. Small, portable applicators or other special equipment may also be required.

### 2.3 GLASS BEADS

- A. Glass beads shall be in conformance with Section 652 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.

### 2.4 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. The Engineer will review all products before they are ordered.

## PART 3 – EXECUTION

### 3.1 CONSTRUCTION OBSERVATION

- A. Engineer or Project Representative will have the right to require any portion of the work be completed in their presence. If the work is covered up after such instruction, it shall be exposed by Contractor for observation. However, if Contractor notifies Engineer, or Project Representative such work is scheduled and they fail to appear within 48 hours, the Contractor may proceed. All work completed and materials furnished shall be subject to review by the Engineer. Improper work shall be reconstructed. All materials which do not conform to requirements of specifications shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such. Contractor shall give Engineer or Project Representative a minimum of 48 hours' notice for all required observations or tests.

### 3.2 STRIPING

- A. Cleaning of Surface – Surfaces to be painted shall be thoroughly cleaned of all dust, dirt, grease, oil and other foreign matter before application of the paint.
- B. Alignment – Traffic stripes shall be of the length, width and placement specified. On sections where no previously applied markings are present, Contractor shall establish control points, satisfactory to Engineer, spaced at intervals insuring accurate locations of the stripe.
- C. Application – Traffic Stripe paint shall be applied by machine except for special areas and markings not adaptable to machine application, in which case, hand application will be permitted.

No paints shall be applied to areas of pavement when:

1. Any moisture or foreign matter is present on the surface,
2. The air temperature in the shade is below 50° F, or
3. Wind conditions are such as might cause dust to be deposited on prepared areas or to prevent satisfactory application of the paint and beads.

Painting shall be completed only during daylight hours and all painted areas shall be dry enough, before sunset, to permit crossing by traffic. All protective devices shall be removed not later than sunset to allow free movement of traffic at night.

Traffic stripe paint shall be thoroughly mixed in the shipping container before placing in machine tank. The paint machine tanks, connections and spray nozzles shall be thoroughly cleaned with thinner before starting each day's work.

The minimum wet film thickness for all painted areas shall be 15 mils.

Place a layer of glass beads immediately after laying the paint. Apply beads at a minimum rate of 6 pounds per gallon of paint.

- D. Protective Measures – When painting is completed around traffic, Contractor shall furnish and place all warning and directional signs necessary to direct, control, and protect traffic during the striping operations. Warning signs shall be set up before the beginning of each operation and extra signs shall be kept well ahead of painting equipment. When necessary, a pilot car shall be used to protect both traffic and the painting operation. The freshly painted stripe shall be protected by cones or other satisfactory devices. All stripe damaged by traffic, or pavement marked by traffic crossing wet paint, shall be repaired or corrected as specified below.
- E. Tolerance and Appearance – No stripe shall be less than the specified width. No stripe shall exceed the specified width by more than 1/2 inch. Alignment of the stripe shall not deviate from intended alignment by more than one inch on tangents and on curves up to and including one degree. On curves exceeding one degree, alignment of the stripe shall not deviate from the intended alignment by more than 2 inches.

Continued deviation from stated dimensions will be cause for stopping the Work and removing nonconforming stripe.

All stripes and segments of stripes shall present a clean cut, uniform and workmanlike appearance. All markings which fail to have a uniform, satisfactory appearance, either day or night, shall be corrected at the Contractor's expense.

- F. Corrective Measures – All traffic stripe which fails to meet the Specifications, permissible tolerances and appearance requirements, or is marred or damaged by traffic or from other causes, shall be corrected at Contractor's expense. All misted areas, drip and spattered paint shall be removed to the satisfaction of Engineer. In all instances, when it is necessary to remove paint, it shall take place by means satisfactory to Engineer, which will not damage the underlying surface of pavement. When necessary to correct a deviation that exceeds permissible tolerance in alignment, the portion of stripe so affected shall be removed plus an additional 25 feet in each direction, and a new stripe then painted in accordance with these specifications.

- G. Acceptance – All sections of painted stripe, words and symbols which have dried to the extent paint will not be picked up or marred by tires of vehicles, and which have been placed in reasonably close conformity with Plans and Specifications, will be accepted, and Contractor will be relieved of responsibility of maintenance on such sections.

END OF SECTION

SECTION 331000 - WATER UTILITIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Piping
- B. Valves
- C. Fittings
- D. Connect to Existing System
- E. All necessary appurtenances to convey potable water from existing system to the location shown on plans.

1.2 RELATED SECTIONS

- A. Section 310000 – Earthwork
- B. Section 311000 – Site Clearing

1.3 OPTIONS

- A. The bid form and specifications describe several pipe materials. Where manufacturers of material or equipment are named in the specifications, Contractor may use equipment or materials of other manufacturers provided they are reviewed and accepted by Engineer as meeting specifications prior to ordering such equipment or materials.

1.4 REFERENCES (LATEST REVISION)

- A. ASTM A 53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- B. ASTM A 139 – Electric-Fusion (Arc) – Welded Steel Pipe (NPS 4 and Over).
- C. ASTM C 443 – Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- D. ASTM C 478 – Precast Reinforced Concrete Manhole Sections.
- E. ASTM D 1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
- F. ASTM D 1784 – Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- G. ASTM D 2241 – Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR – Series).
- H. ASTM D 2737 – Polyethylene (PE) Plastic Tubing.



- I. ASTM D 2774 – Underground Installation of Thermoplastic Pressure Piping.
- J. ASTM D 3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- K. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- L. ASTM D 6938 – In-Place Density and Water Content of Soil and Soil – Aggregate by Nuclear Methods (Shallow Depth).
- M. ASTM E 329 – Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- N. AWWA C 104– Cement–Mortar Lining for Ductile Iron Pipe and Fittings for Water.
- O. AWWA C 110 – Ductile–Iron and Gray–Iron Fittings.
- P. AWWA C 111– Rubber Gasket Joints for Ductile–Iron Pressure Pipe and Fittings.
- Q. AWWA C 115 – Flanged Ductile–Iron Pipe with Ductile–Iron or Gray–Iron Threaded Flanges.
- R. AWWA C 150 – Thickness Design of Ductile Iron Pipe.
- S. AWWA C 151 – Ductile Iron Pipe, Centrifugally Cast, for Water.
- T. AWWA C 153 – Ductile–Iron Compact Fittings.
- U. AWWA C 200 – Steel Water Pipe 6 Inch (150 mm) and Larger.
- V. AWWA C 500 – Metal–Seated Gate Valves for Water Supply Service.
- W. AWWA C 502 – Dry–Barrel Fire Hydrants.
- X. AWWA C 504 – Rubber–Seated Butterfly Valves, 3 inch through 72 inch.
- Y. AWWA C 509 – Resilient–Seated Gate Valves for Water Supply Service.
- Z. AWWA C 512 – Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
- AA. AWWA C 515 – Reduced–Wall, Resilient–Seated Gate Valves for Water Supply Service.
- BB. AWWA C 600 – Installation of Ductile Iron Water Mains and Their Appurtenances.
- CC. AWWA C 605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
- DD. AWWA C 651 – Disinfecting Water Mains.
- EE. AWWA C 800 – Underground Service Line Valves and Fittings.

- FF. AWWA C 900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inch through 12 inch for Water Transmission and Distribution.
- GG. AWWA C 901 – Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch through 3 inch, for Water Service.
- HH. AWWA C 905 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 inch through 48 inch (350 mm through 1,200 mm), for Water Transmission and Distribution.
- II. ASME B18.2.1 – Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (inch series).
- JJ. ASME B18.2.2 – Nuts for General Application: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (inch series).
- KK. NSF/ANSI 61 – Drinking Water System Components – Health Effects.
- LL. ASSE 1003 – Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems.

#### 1.5 QUALITY ASSURANCE

- A. Materials – Contractor will furnish the Engineer and Owner a description of all material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Manufacturer – Material and equipment shall be standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on quality and performance of the products.
- C. Subcontractor – A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with its competence.
- D. Design – If Contractor wishes to furnish devices, equipment, structures, and systems not designed by Engineer, these items shall be designed by either a Professional Engineer registered in the state of this project, or by someone Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.
- E. Testing Agencies – Soil testing shall be conducted by a testing laboratory which operates in accordance with ASTM D 3740 and E 329 latest revision and be acceptable to the Engineer prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with name of entity making the test.
- F. Hydrostatic tests on pipe shall be made by Contractor with equipment qualified by the Engineer. Engineer or Project Representative reserves the right to accept or reject testing equipment. Hydrostatic testing shall be conducted in the presence of Engineer or Project Representative and a representative of water supplier.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

- A. Water mains shall be sterilized to meet requirements of the appropriate Health Department. Sterilization shall be in accordance with AWWA Standards C-651, latest revision.

1.7 PRODUCT DELIVERY, STORAGE & HANDLING

- A. Material shall be unloaded in a manner avoiding damage and shall be stored where it will be protected and will not be hazardous to traffic. Contractor shall repair any damage caused by the storage. Material shall be examined before installation. Neither damaged nor deteriorated material shall be used in the work.

1.8 SEQUENCING AND SCHEDULING

- A. Contractor shall arrange the work so sections of mains between valves are tested, sterilized, pavement replaced, and the section placed in service as soon as reasonable after installation.

1.9 ALTERNATIVES

- A. The intention of these specifications is to produce the best system for the Owner. If Contractor suggests alternative material, equipment or procedures will improve the results at no additional cost, Engineer and Owner will examine suggestion, and if accepted, it may be used. The basis upon which acceptance of an alternative will be given is its value to the Owner, and not for the Contractor's convenience.

1.10 GUARANTEE

- A. Contractor shall guarantee the quality of materials, equipment, and workmanship for a period of 12 months after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

1.11 EXISTING UTILITIES

- A. All known utility facilities are shown schematically on the construction drawings and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown will not relieve the Contractor of responsibility under this requirement. "Existing Utilities Facilities" means any utility existing on the project in its original, relocated, or newly installed position. Contractor will be held responsible for the cost of repairs to damaged underground facilities, even when such facilities are not shown on drawings.
- B. Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at 811.

1.12 CONNECT NEW MAIN TO EXISTING SYSTEM

- A. Contractor shall furnish the necessary pipe and perform all excavation, dewatering, shoring, backfilling, etc., necessary to make the connection of a new main to existing water system. Contractor shall contact the Superintendent of Water Utility a minimum of 48 hours in advance of construction. Contractor shall be responsible for coordinating construction with the utility operator.

1.13 DAMAGE TO EXISTING WATER SYSTEM

- A. Damage to any part of the existing water system by Contractor or Subcontractors, repaired by Utility Owner's forces, shall be charged to Contractor on basis of time and material, plus 30% for overhead and administration.

1.14 MEASUREMENT AND PAYMENT

- A. Measurement – The length of mains and branch lines to be paid for will be determined by measurement along the centerline of the various sizes and types of pipe actually furnished and installed, from the center of fitting, and from the center of the main to the end of the branch connection. No deduction will be made for the space occupied by valves and fittings.
- B. Payment –
  - 1. Pipe – Payment shall be included in the contract lump sum for the project. Excavation, dewatering, installation, backfill, compaction, testing, metal detector tape, tracing wire, and all other incidentals to installation of the mains shall be considered as subsidiary obligations of the Contractor for completion of the line in place.
  - 2. Fittings – Fittings for iron and plastic pipe in the distribution system shall be included in the contract lump sum for the project.
  - 3. Valves – Payment shall be included in the contract lump sum for the project. Payment will include furnishing and installing the valve, valve boxes, extensions, or manholes.
  - 4. Fire Hydrants – Payment shall be included in the contract lump sum for the project. Payment will include the cost of furnishing, installing and connecting the hydrant, gravel sump, restrained joints, backfilling, and painting. The 6-inch pipe from the main line to the hydrant will be paid for as 6-inch pipe. Gate valve and valve box will be paid for separately.
  - 5. Cleaning and Disinfecting – No separate payment will be made for cleaning and disinfecting. Cleaning and disinfecting piping in the distribution system will be included in the lump sum and unit prices for the appropriate items.
  - 6. Grassing – There will be no separate measurement or payment. Grassing shall be considered as a subsidiary obligation of the Contractor in the restoration of disturbed areas.
  - 7. Metal Detector Tape – No separate payment will be made for tape. The cost of furnishing and placing metal detector tape shall be included in the contract unit price for installing pipe.
  - 8. Connections to Existing Mains – Payment shall be included in the contract lump sum for the project and will include all equipment, labor, and materials required to locate, excavate, cut, connect, backfill, and compact.

9. Tapping Sleeves and Crosses – Payment shall be included in the contract lump sum for the project. Payment will include all labor, materials, and equipment necessary to locate, excavate, furnish, and install the sleeve or cross, valve, valve boxes or manholes, tap the existing main, backfilling and compaction.
10. Remove and Replace Existing Pavement – Payment shall be included in the contract lump sum for the project.
11. Tracer Wire – No separate payment will be made for wire. The cost of furnishing and placing tracer wire shall be included in the contract unit price for installing pipe.
12. Restrained Joints – Payment shall be included in the contract lump sum for the project. Payment will include all labor, materials, and equipment necessary to furnish and install each restrained joint.
13. Backflow Preventer Assembly – Payment shall be included in the contract lump sum for the project. Payment will include furnishing and installing the backflow preventer assembly, vault, cover, testing, and certification.
14. Casing – Payment shall be included in the contract lump sum for the project. Payment will include dewatering, excavation, providing steel pipe, installation, casing spacers, enclosure method, backfilling, compaction, testing, and all equipment, labor, and materials necessary to complete the work.
15. Air Release Valve in Manhole – Payment shall be included in the contract lump sum for the project. Payment will include furnishing and installing the air release valve, saddle, ball valve, manhole, frame, and cover.

#### 1.15 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any tests.
- E. Testing shall be Contractor's responsibility and shall be performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph C above.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

## PART 2 – PRODUCTS

Products and materials used in work shall conform to the following:

### 2.1 PIPE

- A. Ductile Iron Pipe – Shall conform to AWWA C–150 and AWWA C–151. All pipe shall be Pressure Class 350 unless otherwise noted. It shall be cement lined in accordance with AWWA C–104.
- B. P.V.C. – All pipe shall be blue in color with factory marked homing lines. Pipe 4 inches through 12 inches shall conform to all requirements of AWWA C–900, DR 18, pressure class of 235 p.s.i. and shall have the following minimum wall thickness:

4 inches	0.267 inches
6 inches	0.383 inches
8 inches	0.503 inches
10 inches	0.617 inches
12 inches	0.733 inches

PVC pipe 14 inches through 18 inches shall conform to all requirements of AWWA C905 with CI outside diameter, DR 18, with a pressure rating of 235 p.s.i.

Pipe with diameter less than 4 inches shall conform to all requirements of ASTM D–1784 and D–2241 (SDR 21). The pipe shall have a minimum pressure rating of 200 p.s.i. Certificates of conformance with the foregoing specifications shall be furnished with each lot of pipe supplied. All P.V.C. pipe shall bear the National Sanitation Foundation Seal of Approval.

- C. Plastic Tubing – Tubing for service lines shall be:

Polyethylene Tubing: CTS PE 3408 conforming to all requirements of AWWA C–901 and ASTM D–2737 (SDR9). The tubing shall be copper tubing size and rated for a minimum working pressure of 200 p.s.i. Marking on the tubing shall include nominal tubing pipe size; type of tubing material – PE 3408; SDR 9; pressure rating – 200 p.s.i.; ASTM D–2737; manufacturer’s name and seal of the National Sanitation Foundation.

### 2.2 JOINTS

- A. Flanged Joints – Shall conform to ANSI A–21.15 (AWWA C–115). Bolts shall conform to ANSI B–18.2.1 and nuts shall conform to ANSI B–18.2.2. Gaskets shall be rubber, either ring or full face, and shall be 1/8 inch thick. Gaskets shall conform to the dimensions recommended by AWWA C–115 latest revision.
- B. Mechanical Joints – In ductile iron pipe shall conform to ANSI A–21.11 (AWWA C–111).
- C. Push–On–Joints – In ductile iron pipes shall conform to ANSI A–21.11 (AWWA C–111).
- D. Plastic Pipe – Joints in plastic pipe 4 inches through 12 inches shall meet all requirements of AWWA C–900. Joints in plastic pipe 14 inches through 18 inches shall meet all

requirements of AWWA C905. Joints in plastic pipe with a diameter less than 4 inches shall conform to ASTM D-3139.

- E. Restrained Joints – Restrained joints for pipe, valves and fittings shall be mechanical joints with ductile iron retainer glands equivalent to “Megalug” or push-on type joints equivalent to “Lok-Ring,” “TR Flex,” or “Super Lock” and shall have a minimum rated working pressure equal to the item restrained with a minimum safety factor of 2:1. The joints shall be in accordance with the applicable portions of AWWA C-111. The manufacturer of the joints shall furnish certification, witnessed by an independent laboratory, that the joints furnished have been tested without signs of leakage or failure. Restrained joints shall be capable of being deflected after assembly.
- F. Natural rubber or other material which will support microbiological growth may not be used for any gaskets, o-rings, and other products used for jointing pipes, setting meters, and valves or other appurtenances which will expose such material to water.

## 2.3 FITTINGS

- A. Fittings for Ductile Iron or Plastic Pipe – Shall be ductile iron, manufactured in accordance with ANSI A-21.53 (AWWA C-153). They shall be cement lined in accordance with ANSI A-21.4 (AWWA C-104). Fittings shall be designed to accommodate the type of pipe used.
- B. Fittings for Flanged Pipe – Shall be manufactured in accordance with ANSI A-21.10 (AWWA C-110), Class 125 flanges.
- C. Fittings for Plastic Pipe – Less than 4 inches shall be PVC with ring tite rubber joints conforming to ASTM D-3139.

## 2.4 GATE VALVES

- A. Two Inches and Larger – Shall be cast iron or ductile iron body, bronze mounted, double disc or resilient wedge design, with non-rising stems, conforming to AWWA C-500, C-509, or C-515. Valves shall have a working pressure of 200 p.s.i. and be tested at 400 p.s.i.

Valves shall be furnished with "O" ring packing. Two "O" rings shall be located above the thrust collar and one “O” ring below. The thrust collar shall be permanently lubricated and have an anti-friction washer on top of the thrust collar.

Valves installed in pits or above ground shall be furnished with hand wheels. Buried valves shall be furnished with square operating nuts.

- B. Smaller Than 2 Inches – Shall be all brass, ball valve type. The pressure rating shall be 175 p.s.i.
- C. Valve Boxes – Underground valves shall be installed in acceptable valve boxes. The valve boxes shall have a suitable base which does not damage the pipe, and shaft extension sections to cover and protect the valve and permit easy access and operation. The box, cover, and any extensions needed shall be cast or ductile iron having a crushing strength of 1,500 pounds per linear foot. Valve boxes shall conform to the detail shown.
- D. Valve Manholes

1. Masonry – Shall be new whole brick of good quality laid in masonry mortar or cement made of one part Portland cement and two parts clean sharp sand. Every brick shall be fully bedded in mortar. Manholes shall conform to the locations and details shown on the plans.
2. Precast Concrete – Shall be reinforced concrete constructed in accordance with ASTM C 478 and the details shown on the plans “Precast Concrete Manholes.” The joints shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or equivalent to Type A or B “Tylox” conforming to ASTM C 443. Mastic shall be equivalent to “Ram-nek” with primer. The primer shall be applied to all contact surfaces of the manhole joint at the factory in accordance with the manufacturer’s instructions.
3. Frames and Covers – Shall be cast iron equivalent to the following:

Neenah Foundry Co. R-1668 Type “C” Lid

- E. Flush valves – Shall conform to the details shown.

## 2.5 BUTTERFLY VALVES

- A. All butterfly valves shall be of the tight-closing, rubber seated type, with rubber seat positively locking in place sealing against flow from either direction. No metal-to-metal seating surfaces will be permitted. Valves shall be bubble-tight at rated pressures with flow in either direction. Butterfly valves shall conform to ANSI/AWWA C504, Class 150B. Butterfly valves shall not be used on pipe smaller than 14-inches unless otherwise specified.
1. Valve body end connections for buried valves shall be installed using restrained joints equivalent to those manufactured by EBAA Iron, Inc.
  2. Valve shafts shall be stainless steel and may consist of a one-piece unit or may be the “Stub Shaft” type. A stub shaft comprises two separate shafts inserted into the valve disc hubs. Each stub shaft shall be inserted into the valve disc hubs for a distance of at least 1½ shaft diameters.
  3. Valve discs shall be solid ductile iron with an epoxy coating making it corrosion resistant. The thickness of the discs shall not exceed 2¼ times the shaft diameter.
  4. Valve seats shall be natural or synthetic rubber providing 360 degrees uninterrupted seating. The resilient seat shall be adjustable or replaceable in the field without burning or grinding. The seat shall be molded over a stainless steel ring for support and secured to the disc by corrosion resistant, self locking stainless steel screws.
  5. All internal ferrous metal surfaces in the waterway shall be factory coated with a non-toxic, to-component, holiday-free, thermosetting epoxy to a nominal thickness of 4 mils.
  6. All butterfly valves shall be manually operated. Operators shall be of the traveling nut, self-locking type and shall be designed to hold the valve in any intermediate position without creeping or fluttering. Operators shall be furnished with externally



adjustable mechanical stop limiting devices. Valves shall have a 2 inch square operating nut and shall be installed with extension stem to extend the operating nut in accordance with the project details. The operator shall be integrally mounted on the valve mounting flange and shall have a gearing totally enclosed for buried service. Maximum force for operating nut shall be 40 pounds.

- B. Valve Boxes – Underground valves shall be installed in approved valve boxes. The valve boxes shall have a suitable base that does not damage the pipe, and shaft extension sections to cover and protect the valve and permit easy access and operation. The cover, box, and any extensions needed shall be cast or ductile iron having a crushing strength of 1,500 pounds per linear foot. Valve boxes shall conform to the detail shown.
- C. Valve Manholes –
  - 1. Masonry – Shall be new whole brick of good quality laid in masonry mortar or cement made of one part Portland cement and two parts clean sharp sand. Every brick shall be fully bedded in mortar. Manholes shall conform to the locations and details shown on the plans.
  - 2. Precast Concrete – Shall be reinforced concrete constructed in accordance with ASTM C 478 and the details shown on the plans “Precast Concrete Manholes.” The joints shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or equivalent to Type A or B “Tylox” conforming to ASTM C 443. Mastic shall be equivalent to “Ram-nek” with primer. The primer shall be applied to all contact surfaces of the manhole joint at the factory in accordance with the manufacturer’s instructions.
  - 3. Frames and Covers – Shall be cast iron equivalent to the following:

Neenah Foundry Co. R-1668 Type “C” Lid

## 2.6 FIRE HYDRANTS

- A. General – Hydrants shall be manufacturer's current model design and construction. All units to be complete including joint assemblies. Physical characteristics and compositions of various metal used in the hydrant components shall meet the requirements as specified in AWWA C-502 latest revision. Hydrants shall be suitable for working pressure of 150 p.s.i.
- B. Bonnet – Bonnet may have oil filled or dry reservoir. If oil filled, bonnet must have "O" ring packing so all operating parts are enclosed in a sealed oil bath. Oil filler plug shall be provided in bonnet to permit checking of oil level and adding oil when required. If dry type, hydrant top must have lubricating hole or nut for ease of lubrication. All parts must be removed through top of hydrant without moving entire barrel section from safety flange.
- C. Nozzles and Caps – The hydrant shall have two 2-1/2 inch connections and one 4-1/2 inch steamer connection, National standard threads. Nozzles shall be bronze and have interlocking lugs to prevent blowout. Nozzle caps shall be secured to fire hydrant with non-kinking type chain with chain loop on cap ends to permit free turning of caps.
- D. Seat Ring – Seat ring shall be bronze.

- E. Drain Valves and Openings – Positive operating drain valves shall be provided to assure drainage of fire hydrant when the main valve is closed. Drain openings shall have bronze bushings.
- F. Main Valve – Valve shall be designed to close with the pressure and remain closed. Valve shall be made from material resisting damage from rocks or other foreign matter. Valve shall have a full 4–1/2 inch opening.
- G. Barrel and Safety Flanges – Hydrants shall have a safety–type vertical barrel with 4–1/2 foot bury and be designed with safety flanges and/or bolts to protect the barrel and stem from damage and to eliminate flooding when hydrant is struck. Bury depth shall be cast on barrel of hydrant.
- H. Operating Stop and Nut – Hydrant shall have a positive stop feature to permit opening of hydrant without over travel of stem. Operating nut shall be bronze 1 1/2 inch, point to flat, pentagon.
- I. Bolts and Nuts – Bolts, washers and nuts shall be corrosion resistant.
- J. Inlet – Bottom inlet of hydrant shall be provided with mechanical joint connection as specified and shall be 6 inch nominal diameter.
- K. Direction of Opening – Hydrant shall be designed to close "right" or clockwise and open "left" or counter–clockwise.
- L. Coatings – All inside and outside portions of hydrant shall be coated in accordance with AWWA C–502. The exterior portion of hydrant above ground level shall be painted with two coats of best grade zinc chromate primer paint and with two coats of approved hydrant enamel. Color shall be Federal Safety Yellow unless otherwise designated by Owner.
- M. Joint Assemblies – Complete joint assemblies consisting of gland, gasket, bolts, and nut shall be furnished for mechanical joint inlets.

## 2.7 SERVICE CONNECTIONS

- A. Taps in pipe larger than 3 inches shall be made with a tapping machine. A corporation stop shall be installed at the connection to the main. The corporation stop shall be brass manufactured in conformance with AWWA C–800. Inlet and outlet threads shall conform to AWWA C–800.

Corporation stops shall be 1 inch equivalent to Mueller H–15008 or B–25008 with a stainless steel stiffener. Service saddles shall have 1 inch AWWA taps, equivalent to Ford Styles 202B or S70. Contractor shall adhere to pipe manufacturer's recommendations on maximum tap sizes for each main size.

- B. Taps for services in PVC pipe 3 inches and smaller shall be equivalent to Romac Industries Style 306 Saddle or made with a PVC Tee. The connection shall be capable of withstanding internal water pressure continuously at 150 p.s.i. House service lines will be 1 inch polyethylene tubing with a curb stop at the property line. The end of the service lateral at the property line shall be marked with a 2 x 4 stake, 36 inches long with the top 6 inches above

the ground and painted blue. The depth of the pipe shall be marked on the back of the stake. Location of service line must appear on the “as-built” information and record drawings.

## 2.8 TAPPING SLEEVES

- A. Cast or Ductile Iron – Shall be mechanical joint type sized to fit the intercepted pipe. They shall have duck-tipped end gaskets and shall be equivalent to Mueller H-615/715 with a tapping valve attached. Outlet end of valve shall have a joint suitable for type of pipe installed in the new branch. Sleeve shall be sized to fit the intercepted pipe without leaking.
- B. Stainless Steel – Shall be all stainless steel construction with full circumferential gasket equivalent to JCM 432 with a tapping valve attached. Outlet end of valve shall have a joint suitable for type of pipe installed in the new branch. Sleeve shall be sized to fit the intercepted pipe without leaking.

## 2.9 CURB STOPS

- A. At the end of the service line, where the meter is to be installed, a 1 inch brass ball valve with padlock wing shall be installed. The unconnected end shall be closed inside I.P. thread. All ball valves shall be 1/4 turn and the full open and closed position shall be controlled by check lugs. The pressure rating shall be 175 p.s.i. The ball valves shall be equivalent to Ford Ball Valve No. B41-444W.

## 2.10 METAL DETECTOR TAPE

- A. The tape shall consist of 0.35 mils thick solid foil core encased in a protective plastic jacket resistant to alkalis, acids, and other destructive elements found in the soil. The lamination bond shall be strong enough that the layers cannot be separated by hand. Total composite thickness to be 5.0 mils. Foil core to be visible from unprinted side to ensure continuity. The tape shall have a minimum 3 inch width and a tensile strength of 35 lbs. per inch.

A continuous warning message indicating “potable water” repeated every 16 inches to 36 inches shall be imprinted on the tape surface. The tape shall contain an opaque color concentrate designating the color code appropriate to the line being buried (Water Systems – Safety Precaution Blue).

## 2.11 BACKFLOW PREVENTER ASSEMBLY

- A. Reduced Pressure – Shall consist of two independently operating check valves, one differential relief valve located between the two check valves, two resilient seat gate valves, and four properly placed resilient seated test cocks. Backflow preventer 2 inches and smaller shall have a bronze valve body. Backflow preventer greater than 2 inches shall be ductile iron or stainless steel. All internal parts in the check and relief valves shall be made of series 300 stainless steel or polymer materials suitable for potable water and rated for 175 p.s.i. working pressure. The assembly shall be constructed so all internal parts can be serviced or removed while in line. Assembly must be factory assembled and tested. Backflow preventer shall be equivalent to Febco Model 860 or Ames Model 4000 SS.
- B. Double Check – Shall consist of two independently operating check valves, two resilient seat gate valves, and four properly placed resilient seated test cocks. Backflow preventer 2 inches and smaller shall have a bronze valve body. Backflow preventer greater than 2 inches shall

be ductile iron or stainless steel. All internal parts in the check valves shall be made of Series 300 stainless steel or polymer materials suitable for potable water and rated for 175 p.s.i. working pressure. The assembly shall be constructed so all internal parts can be serviced or removed while in line. Assembly must be factory assembled and tested. Backflow preventer shall be equivalent to Febco Model 805YD or Ames Model 2000 SS.

## 2.12 TRACER WIRE

- A. Tracer wire shall be #12 AWG High-Strength Copper Clad Steel (HS-CCS) Conductor, insulated with 30 mil High Density Polyethylene (HDPE) Insulation, and rated for direct burial. Insulation color shall meet APWA color code standards for identification of buried utilities.
- B. Wire connectors shall be designed for direct burial and moisture resistance. Connectors shall be equivalent to 3M DBR/Y-6 Direct Bury Splice Kit.

## 2.13 CASING

- A. Casing pipe shall be steel conforming to ASTM A 139, yield point of 35,000 p.s.i., of the diameter shown on the contract drawings for each crossing. The minimum wall thickness shall be 0.25 inches.

## 2.14 CASING SPACERS

- A. Casing spacers shall be bolt on style with a shell made in two sections of a minimum 14 gauge T-304 Stainless Steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner. All nuts and bolts shall be T-304 Stainless Steel. Runners shall be made of Ultra High Molecular Weight Polymer with inherently high abrasion resistance and a low coefficient of friction. The combined height of supports and runners shall keep carrier pipe a minimum of 0.75 inches from casing pipe at all times. Casing Spacers shall be as manufactured by Cascade Waterworks Manufacturing Company or accepted equivalent.

## 2.15 AIR RELEASE, AIR/VACUUM, AND COMBINATION AIR VALVES

- A. Shall be designed for water service with a minimum working pressure of 100 p.s.i. The valve shall be constructed of a cast iron body, stainless steel or bronze trim, and stainless steel float. The inlet shall be 2 inches, 5/16 inch orifice, and a minimum venting capacity of 35 c.f.f.a.m. It shall conform to the detail shown on the drawings. Valves shall conform to AWWA C 516 and equivalent to Crispin or Valmatic.

## 2.16 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. The Engineer will review all products before they are ordered.

## PART 3 – EXECUTION

### 3.1 ON-SITE OBSERVATION

- A. Owner's Representative or Engineer shall have the right to require any portion of work be completed in their presence. If any work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if Contractor notifies Engineer such work is scheduled, and Engineer fails to appear within 48 hours, Contractor may proceed. All work completed and materials furnished shall be subject to review by the Engineer or Project Representative. All improper work shall be reconstructed. All materials which do not conform to requirements of specifications shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations or tests.

It will also be required of Contractor to keep accurate, legible records of the location of all water lines, service laterals, valves, fittings, and appurtenances. These records will be prepared in accordance with the paragraph on "Record Data and Drawings" in Special Conditions. Final payment to the Contractor will be withheld until all such information is received and accepted.

### 3.2 INSTALLATION

- A. Ductile iron pipe shall be laid in accordance with AWWA C-600; Plastic pipe shall be laid in accordance with AWWA C 605, ASTM D 2774, UNI-Bell UNI-B 3, and the pipe manufacturer's recommendations. The standards are supplemented as follows:
1. Depth of Pipe – Contractor shall perform excavation of whatever substances are encountered to a depth providing a minimum cover over top of pipe of 36-inches from the existing or proposed finished grade.
  2. Alignment and Grade – Water mains shall be laid and maintained to lines and grades established by the plans and specifications, with fittings, valves, and hydrants at required locations unless otherwise accepted by Owner. Valve-operating stems shall be oriented in a manner to allow proper operation. Hydrants shall be installed plumb.
    - a. Prior Investigation – Prior to excavation, investigation shall be made to the extent necessary to determine location of existing underground structures, utilities, and conflicts. Care shall be exercised by the Contractor during excavation to avoid damage to existing structures and utilities. Pipe manufacturer's recommendations shall be used when the watermain being installed is adjacent to a facility cathodically protected.
    - b. Unforeseen Obstructions – When obstructions not shown on plans are encountered during progress of work and interfere so a change of the plans is required, Engineer will revise plans, or order a deviation in line and grade, or arrange for removal, relocation, or reconstruction of obstructions.

- c. Clearance – When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the acceptance of Engineer, to provide clearance as required by federal, state, and local regulations or as deemed necessary by Engineer to prevent future damage or contamination.
- 3. Trench Construction – The trench shall be excavated to alignment, depth, and width specified or shown on plans and shall be in conformance with all federal, state, and local regulations for protection of workers.
- 4. Joint Restraint – All bends, plugs, valves, caps and tees on 2-inches pipe and larger, shall be provided with stainless steel tie rods or joint restraints equivalent to Megalugs. Additional restraint shall be as indicated on the drawings.
- 5. Anchorage for Hydrants – A concrete block 1 foot x 1 foot x 2 feet shall be poured between back of hydrant and undisturbed earth of the trench side without covering weep holes and bolts. Joint restraints equivalent to Megalugs manufactured by EBAA Iron may be used in lieu of concrete blocking.
- 6. Hydrostatic and Leakage Tests – Ductile iron pipe shall be tested in accordance with AWWA Standard C 600, Section 5.2 – Hydrostatic Testing. Allowable leakage shall not exceed the formula  $L = SDP^{1/2}/148,000$ , in which L is allowable leakage in gallons per hour; S is length of pipe in feet tested; D is nominal diameter of the pipe in inches; and P is average test pressure during leakage test in pounds per square inch gauge. Test shall be conducted for at least 2 hours and a minimum pressure of 150 p.s.i. or 1-1/2 times the working pressure shall be maintained during the test. Fire lines shall be tested at 225 p.s.i. for the same duration.

P.V.C. pipe shall be tested in accordance with AWWA Standard C 605, Section 7.3 – Hydrostatic Testing. Allowable leakage shall not exceed the formula  $Q = LDP^{1/2}/148,000$ , in which Q is allowable leakage in gallons per hour; L is length of pipe in feet tested; D is nominal diameter of the pipe in inches; and P is average test pressure during leakage test in pounds per square inch gauge. Test shall be conducted for at least 2-hours and a pressure of 150 p.s.i. shall be maintained during the test. Fire lines shall be tested at 225 p.s.i. for the same duration.

Should any test of pipe laid disclose leakage greater than the above specified, Contractor shall at its own expense, locate and repair defective joints until leakage is within specified allowance. Contractor is responsible for notifying the Engineer 48 hours (minimum) prior to applying pressure for testing. Pressure test will be witnessed by the Engineer or Project Representative. All visible leaks shall be repaired regardless of the leakage amount.

- 7. Bedding, Backfilling and Compaction – Continuous and uniform bedding shall be provided for all buried pipe. All trenches and excavation shall be backfilled immediately after pipes are laid therein, unless other protection of the pipe line is directed. The backfilling material shall be selected and deposited with special reference to future safety of pipes. The material shall be completely void of rocks, stones, bricks, roots, sticks, or any other debris causing damage to pipe and tubing or preventing proper compaction of backfill. Except where special methods of bedding and tamping are provided for, clean earth or sand shall be solidly tamped about pipe up to a level at least 2 feet above top of pipes, and shall be carefully deposited to

uniform layers, each layer solidly tamped or rammed with proper tools to not injure or disturb the pipeline. The remainder of trench backfilling shall be carried on simultaneously on both sides of pipe in such manner preventing injurious side pressure. Material used shall be selected from excavations anywhere on site if any of the soil is suitable.

Under traffic areas, the top 24 inches of backfill material shall be compacted to a density of not less than 98% of maximum laboratory density at optimum moisture as determined by ASTM D 6938. Below the 24 inch line, and including area around pipe, density shall not be less than 95% of maximum laboratory density, at optimum moisture. In areas other than traffic areas, the backfill shall be compacted to 90% of maximum laboratory density at optimum moisture.

Whenever trenches have not been properly backfilled, or if settlement occurs, they shall be refilled, smoothed off, and finally made to conform to the ground surface. Backfilling shall be carefully performed, and original surface restored to the full satisfaction of Engineer immediately after installation.

Where thermoplastic (PVC) pipe is installed, Contractor shall take precautions, in accordance with ASTM D-2774, during backfilling operations not to create excessive side pressures, or horizontal or vertical deflection of the pipe, nor impair flow capacity.

8. New Service Connections – Contractor shall tap the main and install a service connection to each lot or as directed by Engineer in accordance with details shown on plans for Water Service Connections. Plastic tubing for service lines shall be installed in a manner preventing abrupt changes or bends in any direction. Contractor shall exercise extreme caution to prevent crimping of the tubing during handling, storage, and installation. Tubing shall have an absolute positive connection to the water main to prevent leakage. Taps shall be made perpendicular to the main. A water service connection shall be marked on the curb with a “W.” The mark shall be made with a branding iron on vertical face of curb and shall be a minimum of 1/4 inch in depth.
9. Detection Tape – Detection tape will be used over all pipe and tubing. The tape shall be laid 18 inches below finished grade.
10. Tracer Wire – Tracer wire will be installed on all water mains and water service laterals directly on top of the pipe. The wire shall be secured to the pipe with tape or other acceptable methods at spacings of no more than 36 inches apart. Where water service laterals connect to water mains, the wire connection shall be made with a direct bury moisture resistant connector. Installation of connector shall be per manufacturer’s instructions. The insulated wire must maintain electrical continuity. The tracer wire shall also be stubbed up into each valve box and at each fire hydrant. Stub up connections shall be installed as previously described for water service laterals. This tracer wire system shall be checked and tested by Contractor, in the presence of Engineer or water department, prior to acceptance of water main installation. All equipment, meters, detectors, etc., needed for testing shall be furnished by the Contractor.

11. Jacking and Boring – Steel casing of diameter shown on the plans shall be jacked and bored in location indicated. Joints between sections of the steel casing shall be of a continuous weld made by a certified welder. Jacking and boring shall be in accordance with the State Department of Transportation Standard Specifications. Carrier pipe shall be installed as shown on the detail. After carrier pipe has been installed, ends of the casing shall be sealed using a rubber enclosure and stainless steel straps or brick and mortar.

Where work involves a highway, Resident Engineer of the State Department of Transportation shall be notified 3 days before crossing is started. Where the work involves a railroad, installation shall conform to requirements of AREA specifications. Division Superintendent of the Railroad shall be notified three 3 days prior to beginning work. Before commencing work within right-of-way of railroads or highways, Contractor shall verify the Owner has obtained required permits.

### 3.3 AIR RELEASE, AIR/VACUUM, AND COMBINATION AIR VALVES

- A. Valves shall be installed in locations as shown on the contract drawings. The Contractor shall verify high points in the water line and notify Engineer of differing conditions from the drawings.
- B. Valves shall be opened during initial filling of the water main. Valves shall be closed during hydrostatic testing. Once tested and the system is accepted for operation, valves shall be opened when water lines are put on line.

### 3.4 CONNECTIONS OF WATER MAINS

- A. Any physical connection of untested water mains with existing water mains is prohibited except when acceptable backflow prevention devices have been installed and checked by Engineer or Engineer's Representative.
  1. Any new water main to be tested must be capped and restrained with retaining glands or thrust blocks to prevent blow out or leakage during the pressure testing.
  2. Water for filling or flushing a new water main will be obtained through a Temporary Jumper Connection to the existing main. Appropriate taps of sufficient size must be made at the end of new system to allow air to escape during filling sequence.
  3. This physical tie-in with the existing system must be physically disconnected after sufficient water for hydrostatic testing and disinfection has been obtained.
  4. Once the new water system has demonstrated adequate hydrostatic testing and has been flushed and chlorinated in accordance with paragraph 3.5, the new system or main will then be subjected to bacteriological testing.
  5. Permanent connection to the new system must be made with clean materials. The connection may be made with either solid or split ductile iron sleeves. Any connection with stainless steel or similar metal full circle clamps is prohibited. Once connection has been made, the new system must be flushed using water from existing system to insure adequate flow and velocity into new water system.



### 3.5 DISINFECTION

- A. After hydrostatic and leakage tests have been completed, water pipes shall be disinfected and tested in accordance with AWWA C 651 and Regulations of the local Health Department.

All new mains shall be thoroughly flushed then chlorinated with not less than fifty parts per million (50 ppm) of available chlorine. Chlorine gas or 70% high-test calcium hypochlorite can be used. Water from existing distribution system or other source of supply should be controlled to flow slowly into the newly laid pipeline during application of chlorine. The solution shall be retained in pipeline for not less than 24 hours and a chlorine residual of 25 ppm shall be available at this time. Then system shall be flushed with potable water and the sampling program started. The chlorine residual during sampling shall be between 0.5 and 1.5 ppm.

After final flushing and before new water main is connected to the distribution system, two consecutive sets of bacteriologically acceptable samples, taken at least 24 hours apart, shall be collected from new main. One set of samples shall be collected from every 1,200 feet of new water main, plus one set from end of the line and at least one set from each branch. All samples shall be tested for bacteriological (chemical and physical) quality in accordance with standard methods for examination of water and wastewater; and shall show the absence of coliform organisms. The results, clearly showing sample locations, non-coliform growth, coliform growth, and chlorine residuals, shall be submitted to Engineer by Contractor.

### 3.6 PARTIAL ACCEPTANCE OF THE WORK

- A. Owner reserves right to accept and use any part of the work. Engineer shall have power to direct on what line Contractor shall work and the order thereof.

### 3.7 GRASSING

- A. Grassing of areas disturbed during construction shall be in accordance with the Section 329200 "Turf and Grasses."

### 3.8 SEPARATION BETWEEN WATER AND SANITARY SEWER

- A. Parallel Installation:

1. Water mains shall be laid at least 10 feet horizontally from any existing or proposed sanitary sewer, force main, storm sewer, or sewer manhole. The distance shall be measured edge-to-edge.
2. When conditions prevent a horizontal separation of 10 feet, the water main may be laid closer to a sewer (on a case-by-case basis) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation where the bottom of the water main is at least 18 inches above the top of the sewer. It is advised the sewer be constructed of materials and with joints equivalent to water main standards of construction and be pressure tested to assure water-tightness prior to backfilling.

B. Crossing:

1. Water mains crossing house sewers, storm sewers, or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. At the crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.
2. When conditions prevent a vertical separation of 18 inches, the sewer passing over or under water mains shall be constructed of materials and with joints equivalent to water main standards of construction and shall be pressure tested to assure water-tightness prior to backfilling.
3. When water mains cross under sewers, additional measures shall be taken by providing:
  - a. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main;
  - b. Adequate structural support for the sewers to prevent excessive deflection of joints settling on and breaking the water mains;
  - c. The length of water pipe be centered at the point of crossing so the joints will be equidistant and as far as possible from the sewer; and
  - d. Both the sewer and water main shall be constructed of water pipe and subjected to hydrostatic tests, as prescribed in this document. Encasement of the water pipe in concrete shall also be considered.

3.9 REMOVE AND REPLACE PAVEMENT

- A. Pavement shall only be removed after prior written authorization by the Owner. Pavement removed and replaced shall be constructed in accordance with latest specifications of the State Department of Transportation. Traffic shall be maintained and controlled per State Department of Transportation regulations.

Edges of the pavement shall be cut to a neat straight line with a masonry saw. Backfill shall be compacted and tested and a concrete base course of 5,000 p.s.i. placed on compacted fill as shown in the details. The concrete base shall be placed within 24 hours after water line is installed. A temporary wearing surface may be used provided it presents a smooth surface. The final wearing surface shall be 1-1/2 inches of 12.5 mm Superpave asphaltic concrete.

3.10 FIELD QUALITY CONTROL

- A. Soil and density tests shall be made by a testing laboratory acceptable to Engineer. Laboratory tests of the soil shall be made in accordance with ASTM D 1557. In-place density tests shall be made in accordance with ASTM D 6938. Results of tests shall be furnished to the Engineer.

The minimum number of tests required shall be:

Backfill over pipe

in traffic areas. . . . . 1 per 100 linear feet or less for each 4 feet of depth or portion thereof.

Backfill over pipe

in non-traffic areas. . . . 1 per 500 linear feet or less for each 4 feet of depth or portion thereof.

The minimum percent of backfill, compaction, in accordance to ASTM D1557, shall be the following:

In traffic Areas. . . . . 98% of maximum laboratory density.

In non-traffic Areas. . . . . 90% of maximum laboratory density, unless otherwise accepted by the Engineer.

END OF SECTION

## SECTION 333000 - SANITARY SEWERAGE UTILITIES

### PART 1 – GENERAL

#### 1.1 SECTION INCLUDES

- A. Sewer Pipes.
- B. Manholes.
- C. Connect to existing system.
- D. All necessary appurtenances to collect the sanitary sewerage and deliver it to the existing system.
- E. Pumping Station
- F. Force Main

#### 1.2 RELATED SECTIONS

- A. Section 310000 – Earthwork.
- B. Section 331000 – Water Utilities.

#### 1.3 OPTIONS

- A. The specifications describe several materials. Where manufacturers and models of equipment are named in the specifications, it is intended these are to describe quality and function required. Contractor may use equipment or materials of other manufacturers provided they are reviewed and accepted by the Engineer and Owner as equivalent to those specified.

#### 1.4 REFERENCES (Latest Revision)

- A. ASTM A 139 – Electric-Fusion (Arc) Welded Steel Pipe (NPS 4 and Over).
- B. ASTM A 377 – Index of Specifications for Ductile Iron Pressure Pipe.
- C. ASTM A 615/A 615 M – Deformed and Plain Carbon – Steel Bars for Concrete Reinforcement.
- D. ASTM A 746 – Ductile Iron Gravity Sewer Pipe.
- E. ASTM C 39/C 39M – Compressive Strength of Cylindrical Concrete Specimens.
- F. ASTM C 443 – Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- G. ASTM C 478 – Precast Reinforced Concrete Manhole Sections.

- H. ASTM C 890 – Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
- I. ASTM C 891 – Installation of Underground Precast Concrete Utility Structures.
- J. ASTM C 913 – Precast Concrete Water and Wastewater Structures.
- K. ASTM D 714 – Evaluating Degree of Blistering of Paints.
- L. ASTM D-1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort.
- M. ASTM D 2241 – Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- N. ASTM D 2321 – Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- O. ASTM D 2774 – Underground Installation of Thermoplastic Pressure Piping.
- P. ASTM D 2794 – Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- Q. ASTM D 3034 – Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- R. ASTM D 3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- S. ASTM D 3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- T. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- U. ASTM D-6938 – In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- V. ASTM E 96 – Water Vapor Transmission of Materials.
- W. ASTM E 329 – Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- X. ASTM F 477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- Y. ASTM F 1417 – Installation Acceptance of Plastic Non-Pressure Sewer Lines Using Low-Pressure Air.
- Z. ASTM G 154 – Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for UV Exposure of Nonmetallic Materials.
- AA. AWWA C 111 – Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
- BB. AWWA C115 – Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.
- CC. AWWA C 150 – Thickness Design of Ductile Iron Pipe.

- DD. AWWA C 151 – Ductile Iron Pipe, Centrifugally Cast, for Water.
- EE. AWWA C-500 – Metal-Seated Gate Valves for Water Supply Service.
- FF. AWWA C-509 – Resilient-Seated Gate Valves for Water Supply Service.
- GG. AWWA C 600 – Installation of Ductile Iron Water Mains and their appurtenances.
- HH. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 Inches through 12 inches, for Water Transmission and Distribution.
- II. AWWA C905 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 Inches through 48 inches, for Water Transmission and Distribution.
- JJ. ACI 318 – Building Code Requirements for Structural Concrete.

#### 1.5 MEASUREMENT AND PAYMENT

- A. Measurement – Items listed in the proposal shall be considered as sufficient to complete work in accordance with plans and specifications. Any portion of work not listed in the bid form shall be deemed to be a part of item it is associated with and shall be included in costs of unit shown on bid form. Payment for unit shown on the bid form shall be considered satisfactory to cover cost of all labor, material, equipment, and performance of all operations necessary to complete work in place. Where work is to be performed at a lump sum price, the lump sum shall include all operations and elements necessary to complete work.
- B. Payment
  - 1. Gravity Sewer Pipe –Payment shall be included in the contract lump sum for the project. Payment will include cost of pipe, plugs, dewatering, excavating all material, testing, backfilling, compaction, cleaning, metal detector tape, tracing wire, and all work necessary to complete the sewer lines.
  - 2. Trench Wall Supports – No separate payment will be made for bracing and sheeting.
  - 3. Manholes – Payment for manholes will be made at the unit price for various types and depths. Manhole depths are measured from invert to proposed finish grade unless otherwise noted. Payment shall include cost of excavating, dewatering, constructing manholes in accordance with plans, furnishing and installing a frame and cover, steps, interior and exterior coatings, pipe connectors, backfilling, and compacting material around the manhole.
  - 4. Stone Bedding – Payment will include cost of removing unsuitable material and furnishing and placing the stone and structural geotextile.
  - 5. Sand Bedding – Will be measured by using the length and depth for which sand is specified by Engineer or Geotechnical Consultant, times a width of four feet wider than outside barrel of pipe. Payment will include excavating the unsuitable material below the invert, furnishing, and compacting the sand bedding.

6. Metal Detector Tape – No separate payment will be made for tape. Cost of furnishing and placing metal detector tape shall be included in the contract lump sum for the project.

Note: Wire on all pipes shall be required in Georgia after January 1, 2001.

7. Tracer Wire – No separate payment will be made for wire. The cost of furnishing and placing tracer wire shall be included in the contract price for installing force main pipe, sanitary sewer, and service laterals.
8. Laterals – Payment will include furnishing the pipe, excavation, installation, metal detector tape, tracing wire, backfilling, compaction, and all work and materials necessary to complete laterals and shall be included in the contract lump sum for the project.
9. Grassing – There will be no separate measurement or payment. Grassing shall be a subsidiary obligation of Contractor in the restoration of disturbed areas.
10. Remove and Replace Existing Pavement – Payment shall be included in the contract lump sum for the project, and in accordance with the detail shown.
11. Pumping Stations – All work except the force main covered in this subsection shall be included in the contract lump sum for the project. Work described in other sections necessary to make Pumping Station complete will also be included in the lump sum payment. Such work will include dewatering, excavation, backfilling, compaction, site preparation, access road, fencing, grassing, potable water system, electrical, hoist system, standby generator, and clean-up.
12. Force Mains – Shall be paid for at the contract unit price for various sizes. Payment will include the pipe, fittings, thrust blocking, restrained joints, excavation, backfilling, compaction, testing, grassing, metal detector tape, tracing wire, and clean-up.
13. Air Release Valve and Manhole – Payment shall be included in the contract lump sum for the project and will include furnishing and installing valve and manhole, backfilling, compacting, grassing, and clean-up.
14. Plug, Check & Gate Valves – Payment shall be included in the contract lump sum for the project and will include furnishing and installing valve, valve box or manhole, backfilling, compacting, grassing, and clean-up.
15. Connect Sewers to Existing Structures – Payment shall be included in the contract lump sum for the project. For precast structures payment shall include cost of dewatering, excavation, coring, furnishing and installing flexible sleeve, installing and connecting pipe to sleeve, backfilling, compaction, clean-up, and all work necessary to complete the connection. For brick structures, payment shall include cost of dewatering, excavation, cutting a hole, installing and grouting in pipe, backfilling, compaction, cleanup, and all work necessary to complete the connection.

## 1.6 QUALITY ASSURANCE

- A. Contractor will furnish the Engineer and Owner a description of all material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Where ductile iron pipe is indicated on the plans, or required by Engineer, it shall be used.
- C. Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of two years and provides published data on their quality and performance.
- D. A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with its competence.
- E. If Contractor wishes to furnish devices, equipment, structures, and systems not designed by Engineer, these items shall be designed by either a Professional Engineer registered in the project state or by someone Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.
- F. Testing shall be by a testing laboratory which operates in accordance to ASTM D 3740 or E 329 and shall be acceptable to Engineer prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests, spot checked by an outside laboratory, and furnishes satisfactory certificates with name of entity making test.
- G. Infiltration, line and grade of sewer, pump performance, and hydrostatic tests on force mains shall be made by Contractor with equipment qualified by Engineer and in the presence of Engineer. Engineer or Project Representative reserves the right to accept or reject testing equipment.

## 1.7 PRODUCT DELIVERY, STORAGE & HANDLING

- A. Material shall be unloaded in a manner avoiding damage and shall be stored where it will be protected and will not be hazardous to traffic. If stored on private property, Contractor shall obtain permission from property owner and shall repair any damage caused by the storage. Material shall be examined before installation. Neither damaged nor deteriorated material shall be used in the work.

## 1.8 JOB CONDITIONS

- A. Installation of sanitary sewerage utilities must be coordinated with other work on the site. Generally, sanitary sewer pipes will be installed first and shall be backfilled and protected so subsequent excavating and backfilling of other utilities does not disturb them. Contractor shall replace or repair any damaged pipe or structure at no additional expense to the Owner.



1.9 SEQUENCING AND SCHEDULING

- A. Contractor shall arrange the work so sections of sewers between manholes are backfilled and tested, lateral sewers connected, pavement replaced, and placed in service as soon as reasonable after installation.

1.10 ALTERNATIVES

- A. The intention of these specifications is to produce the best system for the Owner. If the Contractor suggests alternate material, equipment or procedures will improve results at no additional cost, Engineer and Owner will examine suggestion, and if accepted, it may be used. The basis upon which acceptance of an alternate will be given is its value to Owner, and not for Contractor's convenience.

1.11 GUARANTEE

- A. Contractor shall guarantee quality of materials, equipment, and workmanship for 12 months after acceptance of the completed Project. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

1.12 EXISTING UTILITIES

- A. All known utility facilities are shown schematically on the construction drawings and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown will not relieve the Contractor of responsibility under this requirement. "Existing Utilities Facilities" means any utility existing on the project in its original, relocated, or newly installed position. Contractor will be held responsible for cost of repairs to damaged underground facilities, even when such facilities are not shown on the drawings.
- B. The Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at 1-800-282-7411 (GA) or 811.

1.13 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours notice prior to taking any tests.
- E. Testing shall be Contractor's responsibility and shall be performed at the Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph C above.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

## PART 2 – PRODUCTS

Materials used in the work shall be those named in Bid Form. In multiple type bids, selection of material types will be at the opinion of Owner. Materials and products used in work shall conform to one of the following:

### 2.1 SEWER PIPE

- A. PVC Pipe – Shall be polyvinyl chloride plastic (PVC) and shall meet all requirements of ASTM D 3034 SDR 26, except for depths less than 3 feet where ductile iron pipe must be installed. All pipe shall be suitable for use as a gravity sewer conduit. Provisions must be made for contraction and expansion at each joint with a rubber gasket. Pipe sizes and dimensions shall be as shown below. All pipe shall be green or white in color with factory marked homing lines. Fittings shall meet the same specification requirements as pipe.

Nom. Size	Outside Diameter		Min. Wall Thickness
	Average	Tolerance	SDR-26
4	4.215	± 0.009	.162
6	6.275	± 0.011	.241
8	8.400	± 0.012	.323
10	10.500	± 0.015	.404
12	12.500	± 0.018	.481

Tests on PVC Pipe – Pipe shall be designed to pass all tests at 73 ° F. (± 3° F.).

- B. Ductile Iron – Shall conform to AWWA C 150, AWWA C 151 and ASTM A 746. All pipe shall be Pressure Class 350 unless otherwise noted. All ductile iron pipes and fittings shall be bituminous coated on the outside and lined with Protecto 401 Ceramic Epoxy or equivalent on inside.
- Coating on the outside shall be an asphaltic coating approximately 1 mil thick. Finished coating shall be continuous, smooth, neither brittle when cold or sticky when exposed to sun and shall be strongly adherent to the iron.
  - Protecto 401 Ceramic Epoxy or equivalent interior lining shall conform to ASTM E 96, ASTM D 714, ASTM D 2794 and ASTM G 53. Interior of the pipe shall receive 40 mils nominal dry film thickness of epoxy. Lining application, inspection, certification, handling, and surface preparation of area to receive the protective coating shall be in accordance with manufacturer's specifications and requirements.

### 2.2 JOINTS – GRAVITY SYSTEM

- A. Joints for Ductile Iron Pipe – Shall be slip-on rubber equivalent to "Fastite," "All-tite," or "Tyton."
- B. Joints for PVC Pipe – Shall be integral wall bell and spigot with a rubber ring gasket. Joints shall conform to ASTM D 3212 and gaskets to ASTM F 477.

## 2.3 FORCE MAIN

- A. P.V.C. – All pipe shall be green in color with factory marked homing lines. Pipe with diameter less than 4 inches shall conform to all requirements of ASTM D 2241, SDR 26, Class 160. Pipe 4 inches through 12 inches shall conform to all requirements of AWWA C900, DR 25, Pressure Class of 165 p.s.i. Pipe 14 inches through 18–inches shall conform to all requirements of AWWA C905 with C1 outside diameter, DR 25, with a pressure rating of 165 p.s.i. Joints shall be in accordance with ASTM D 3139.
- B. Ductile Iron pipe shall be in accordance with Paragraph 2.1–B and conform to ASTM A 377. Push–on–Joints shall be slip–on rubber equivalent to "Fastite," "All–tite," or "Tyton." Flanged joints shall conform to AWWA C 115. Gaskets shall conform to AWWA C 111.
- C. Thrust blocking shall be sized as detailed on the construction drawings of 3,000 p.s.i. concrete. Blocking shall be provided at all bends deflecting 11–1/4 degrees or more and bear directly against the undisturbed trench wall.
- D. Restrained Joints – Restrained joints for pipe, valves and fittings shall be mechanical joints with ductile iron retainer glands equivalent to "Megalug" or push–on type joints equivalent to "Lok–Ring," "TR Flex," or "Super Lock" and shall have a minimum rated working pressure equal to the item restrained with a minimum safety factor of 2:1. Joints shall be in accordance with the applicable portions of AWWA C–111. Manufacturer of joints shall furnish certification, witnessed by an independent laboratory, stating joints furnished have been tested without signs of leakage or failure. Restrained joints shall be capable of being deflected after assembly.

## 2.4 CASING

- A. Casing pipe shall be steel conforming to ASTM A 139, yield point of 35,000 p.s.i., of the diameter shown on drawings at each crossing. The minimum wall thickness shall be 0.25 inches.

## 2.5 CASING SPACERS

- A. Casing spacers shall be bolt on style with a shell made in two sections of a minimum 14 gauge T–304 Stainless Steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner. All nuts and bolts shall be T–304 Stainless Steel. Runners shall be made of Ultra High Molecular Weight Polymer with inherently high abrasion resistance and a low coefficient of friction. The combined height of supports and runners shall keep carrier pipe a minimum of 0.75–inches from casing pipe at all times. Casing Spacers shall be as manufactured by Cascade Waterworks Manufacturing Company or accepted equivalent.

## 2.6 MANHOLES

- A. Masonry – Shall be new whole brick of good quality laid in masonry mortar or cement mortar made of one part Portland cement and two parts clean sharp sand. Every brick shall be fully bedded in mortar. Manholes shall conform to locations and details shown on the plans.

- B. Precast Concrete – Shall be reinforced concrete constructed in accordance with ASTM C 478 and details shown on the plans "Precast Concrete Manholes." Coarse aggregate shall be granite stone. The joints shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or equivalent to Type A or B "Tylox" conforming to ASTM C 443. Mastic shall be equivalent to "Ram-nek" with primer. Primer shall be applied to all contact surfaces of manhole joint at the factory in accordance with manufacturer's instructions.
- C. Frames and Covers – Shall be cast iron equivalent to the following:

Neenah Foundry Co. R-1668 Type "C" Lid
- D. Manhole Steps – Shall be equivalent to M.A. Industries, Type PS-1 or PS-2-PF. Steps shall be installed at the manhole factory and in accordance with recommendations of step manufacturer. Manholes will not be acceptable if steps are not installed accordingly.
- E. Pipe Connections – Shall have flexible watertight joints at sewer main point of entry into the manhole. The joint shall be an EPDM or polyisoprene sleeve equivalent to "Kor-N-Seal."
- F. Coatings – New manholes shall have all interior surfaces coated with a factory applied acrylic polymer-base coating and sealant. The coating shall be ConSeal CS-55 manufactured by Concrete Sealants, New Carlisle, Ohio or an accepted equivalent. The coating shall be applied in three coats to achieve a total dry film thickness of at least 3.5 mils in accordance with manufacturer's recommendations. Surfaces shall be cleaned of all dust, form oils, curing compounds and other foreign matter prior to the coating application.

New or existing manholes requiring a force main tie-in and the next downstream manhole shall be coated with 125 wet film mils of Raven 405 ultra high build epoxy or an accepted equivalent. The interior surfaces shall be cleaned and prepared according to manufacturer's recommendations.

## 2.7 TEES AND WYES

- A. Gravity sewer tees shall be four or six inches and same diameter as the run of pipe. They shall be of same material as the sewer main.
- B. Wyes for cleanouts shall be of same material as the lateral pipe.

## 2.8 LATERALS AND CLEANOUTS

- A. Shall be Ductile Iron Pipe conforming to paragraph 2.1-B, with push-on joints or Polyvinyl Chloride pipe with bells and rubber gaskets for jointing, conforming, to Paragraph 2.1-A, PVC Pipe.
- B. Cleanout Access Box shall be equivalent to U.S. Foundry USF 7623 in pavement or Genova Products 4-inch Schedule 40 PVC-DWV cleanout fitting with threaded plug out of pavement.

2.9 STONE BACKFILL

- A. Shall be graded crushed granite with the following gradation:

Square Opening Size	Percent Passing
1 inch	100%
3/4 inch	90 to 100%
3/8 inch	0 to 65%
No. 4	0 to 25%

2.10 SAND BACKFILL

- A. Shall be clean sand free from clay and organic material. Not more than 10% shall pass the No. 100 sieve.

2.11 BORROW

- A. Where it is determined sufficient suitable material is not available from the site to satisfactorily backfill pipe to at least two feet above top of pipe, Contractor shall furnish suitable sandy borrow material to accomplish requirements. Material shall not have more than 60% passing the No. 100 sieve, nor more than 20% passing a No. 200 sieve.

2.12 AIR RELEASE VALVE

- A. Shall be designed for sewage service. The valve shall be constructed of a cast iron body, stainless steel or bronze trim, and stainless steel float. The inlet shall be 2 inches, 5/16 inch orifice, and a venting capacity of 35 c.f.f.a.m. The working pressure shall be 0 to 50 p.s.i. It shall conform to detail shown on the drawings.

2.13 METAL DETECTOR TAPE

- A. Will be installed above all pipe. Tape shall consist of 0.35 mils thick solid foil core encased in a protective plastic jacket resistant to alkalis, acids, and other destructive elements found in the soil. The lamination bond shall be strong enough so layers cannot be separated by hand. Total composite thickness shall be 5.0 mils. Foil core to be visible from unprinted side to ensure continuity. The tape shall have a minimum 3 inch width and a tensile strength of 35 lbs. per inch.

A continuous warning message indicating "sewer line" repeated every 16 inches to 36 inches shall be imprinted on the tape surface. Tape shall contain an opaque color concentrate designating color code appropriate to the line being buried (Sewer Line – Green).

Note: Wire on all pipes shall be required in Georgia after January 1, 2001.

2.14 TRACER WIRE

- A. Will be used over all force main, sanitary sewer and service lateral lines. Tracer wire shall be #12 AWG High-Strength Copper Clad Steel (HS-CCS) Conductor, insulated with 30 mil

High Density Polyethylene (HDPE) Insulation, and rated for direct burial. Insulation color shall meet APWA color code standards for identification of buried utilities.

- B. Wire connectors shall be designed for direct burial and moisture resistance. Connectors shall be equivalent to 3M DBR/Y-6 Direct Bury Splice Kit.

## 2.15 SUBMERSIBLE SEWAGE PUMPING STATION

- A. Shall be dual submersible pumps installed in a concrete wet well. Pumps shall be equivalent to Flygt or ABS conforming to characteristics shown on the drawings.
- B. Wet Well – Shall be precast reinforced concrete sections. The product design, performance, materials, manufacturing, handling, and installation shall conform to following references and project specifications:

ACI 318 – Building Code Requirements for Reinforced Concrete

ASTM C 39 – Compressive Strength of Cylindrical Concrete Specimens

ASTM C-478 – Precast Reinforced Concrete Manhole Sections

ASTM C 890 – Minimal Structural Design Loading for Precast Concrete Water and Wastewater Structures

ASTM C 891 – Installation of Underground Precast Concrete Utility Structures

ASTM C 913 – Precast Concrete Water and Wastewater Structures

Contractor or supplier shall provide for design of the precast structure. Each section of the structure shall be designed and manufactured for its individual depth, loading conditions (lateral, surcharge and hydrostatic), and opening requirements. All concrete in the precast structure shall have a minimum compressive strength of 4,500 p.s.i. after 28 days. Reinforcing steel shall comply with ASTM A 615 Grade 60 (min. fy = 60,000 p.s.i.). Bar bending and placement shall comply with the ACI latest standards.

Precast structure manufacturer shall have necessary equipment and facilities for proper manufacture of the sections and to perform compressive strength tests on concrete tests specimens. Test cylinders shall be made for each structure and test conducted in accordance with ASTM C 39, except compressive strength shall be equal to or greater than design of the concrete. Structure design computations, concrete mix design, and test reports certifying design strength has been achieved at the 28 day break shall be submitted to Engineer. Design of structure shall be performed by a Professional Engineer registered in the state of installation at Contractor's expense. The design parameters for a precast structure shall include:

Lateral load based on a water table at the surface using equivalent fluid pressure of 80 p.c.f. from surface grade down and a vehicle wheel load designation of HS20-44. Design live load for the top slab shall be 300 p.s.f. The precast concrete sections shall have a minimum wall thickness of 6 inches and minimum top and bottom slab thicknesses of 8 inches. Actual thicknesses greater than minimum shall be as required by the loading conditions.

Access hatches in the top slab of wet-well structure shall be for clear opening dimensions indicated and have a load capacity of 300 p.s.f. The material shall be Aluminum Alloy 6063-T5 and T6, minimum 1/4 inch thick plate, flush-type lock with inside spoon handle. The frame shall be complete with hinged and hasp-equipped cover, upper guide holders, chain holders and cable holder. Chain and cable holders shall be stainless steel or aluminum. Frame shall be securely mounted above the pumps. The hatch covers shall be torsion-bar loaded for ease of lifting and shall have a safety-locking handle in open position.

Contractor shall furnish and install guide bars for each pump to permit raising and lowering the pump. Guide bars shall be stainless steel and of adequate length and strength to extend from lower guide holders on the pump discharge connection to upper guide holder mounted on access frame.

The wet well shall be provided with sleeves, 24 inches below finished grade, for access of power and control conduits. The sleeves shall be of proper size and number to accommodate all necessary power and control conduits.

All interior concrete surfaces shall have either a minimum 125 mils coating of Raven 405, factory installed 5 mm Agru Sure Grip HDPE Liner, or an accepted equivalent. When using the liner, all seams shall be sealed with welded HDPE material and all penetrations shall be sealed with a welded HDPE boot.

The structure manufacturer shall prepare and submit six sets of shop drawings showing wall and slab thicknesses, structural reinforcing and opening locations. The manufacturer shall also provide design analyses and calculations to show all sections have been designed for burial depths shown on construction drawings as well as stresses incurred during transport, handling and installation. Calculations and analyses must be performed and sealed by a Licensed Professional Engineer from the state project is located and submitted for review. All shop drawings and design calculations shall be submitted to the Contractor for review. Contractor shall forward these documents to the Engineer. Such documents shall bear the stamp or written statement of Contractor indicating Contractor's review for completeness and receipt. Contractor shall be responsible for the accuracy of shop drawings and for their conformity to plans and specifications. Shop drawings with insufficient or incomplete data required to indicate compliance with these specifications are not acceptable and will be returned to the Contractor. Rejected shop drawings shall not relieve Contractor from completing the project within time allowed by Contract Documents.

- C. Pump Design – Pumps shall be capable of handling raw, unscreened sewage with the capacity to pass 3 inch diameter spheres. Pumping units shall be automatically connected to discharge piping when lowered into place on the discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts or other fastening to be removed for this purpose, and no need for personnel to enter wet well. Each pump shall be fitted with a stainless steel chain of adequate strength and length to permit raising the pump for inspection and removal.
- D. Pump Construction – The pump(s) shall be designed to pump sewage, storm water, heavy sludge and other fibrous materials without injurious damage during operation. The lifting cover, stator housing and volute casing shall be of gray iron construction with all nuts, bolts, washers and other fastening devices coming into contact with sewage, constructed of stainless steel and protected by primer coat and a coat of rubber-asphalt or epoxy paint. The

impeller shall be hard alloy gray iron construction, dynamically balanced, double shrouded, non-clogging design with a long thoroughfare and no acute angles.

The pump motor shall be of Class F Insulation, NEMA B design, watertight and positively oil cooled, filled with a transformer oil, equivalent to BP JS-HA, Shell Diala D, or housed in an air-filled watertight chamber. The pump motor shall be guaranteed to run in a totally, partially or non-submerged condition continuously for a period of 24 hours without injurious damages. Water cooled pumps shall not be considered equal. Before final acceptance, a field running test at job site demonstrating the ability to operate continuously for 24 hours under a non-submerged condition, shall be performed for all pumps being supplied, if required. The pump shall be provided with a tandem double mechanical seal running in an oil bath. The seals shall be of lapped tungsten carbide and welded to stainless steel retainers and held in contact by separate springs. Conventional double mechanical seals with a spring assembly between the rotating faces, requiring constant differential pressure to effect sealing and subject to penetration and opening by pumping forces shall not be considered equal to tandem seal specified and required. The pump shaft shall be of stainless steel and supported by a double row inboard bearing for axial thrust and a single row outboard bearing for radial thrust. The impeller shall be connected to a short sturdy shaft in order to minimize shaft deflection. Shaft shall not extend more than 2-1/2 times its diameter below the nearest support bearing.

The pump cable shall be of proper length to reach from pumps in wet well to control panel without any splices. Cable shall be the "SO" or hypalon jacketed SPC type and in compliance with industry standards for loads, resistance against sewage and of stranded construction. Cable shall enter the pump through a heavy duty entry assembly, which shall be provided with an internal grommet assembly to protect against leakage once secured and must have a strain relief assembly as part of standard construction. Power cable shall connect to a terminal board separating incoming service from pump motor, where if leakage occurs, terminal board will short out and not cause damage to the motor.

Each pump shall be supplied with a universal coupling which bolts to pump discharge flange and shall accept the discharge elbow provided by pump manufacturer. Seal of the pump at discharge flange shall be accomplished by a single downward linear motion of pump with entire weight of pump guided to and pressing against discharge connection. No part of pump shall bear directly on the sump floor and no rotary motion of pump shall be required for sealing. Sealing at the discharge shall be designed to insure a positive leakproof system and for ease of removal. Pump shall be guaranteed not to leak at the discharge flange.

- E. Pump Test – Pump manufacturer shall perform following tests on each pump before shipment from the factory:
1. Megger the pump for insulation breaks or moisture.
  2. Prior to submergence, the pump shall be run dry and be checked for correct rotation.
  3. Pump shall be run for 30 minutes in a submerged condition.
  4. Pump shall be removed from test tank, meggered immediately for moisture; oil plugs removed for checking of upper seal and possible water intrusion of stator housing.



5. A written certified test report giving above information shall be supplied with each pump at the time of shipment.
  6. All pump cable ends will then be fitted with a rubber shrink fit boot to protect cable prior to electrical installation.
- F. Pump Controls – To synchronize the operation of pumps with variations of sewage level in wet well, Contractor shall provide a liquid level sensor system equivalent to ITT Flygt MultiTrode. The system shall utilize a single piece multi-sensored probe to determine pump-on, lag pump on, pump-off, and high-level alarm conditions. Probe shall be constructed from PVC 1.25 inch tubing with molded sensor units at regular intervals along the probe. Each sensor unit will be PVC injected to prohibit ingress of moisture, and the sensor material shall be Avesta SMO 254 stainless steel.

Mounting – Probe will be mounted in a turbulent area of wet well, suspended on its own cable and connected to a 0.23 inch stainless steel hook which will be hooked to a 1.18 inch stainless steel angle containing a polyurethane squeegee pad positioned in the opening into wet well, so probe can be removed without entering wet well. The squeegee will have a 1.18 inch hole and slot, enabling probe to be pulled through and cleaned.

This installation will be in accordance with the manufacturer's instructions.

Probe shall be covered by the manufacturer's two-year warranty.

Probe and Sensors – 10 sensors will be spaced along the length of probe assembly, and each will be individually connected to a correspondingly numbered PVC/PVC 0.03 inch flexible cable.

The molded sensor unit will contain two Avesta sensors mounted on opposing sides of sensor unit. Each Avesta sensor will be 0.94 inches high and no wider than 0.08-inches and will protrude from surface of the PVC.

The probe shall be pressure injected with an epoxy resin to encapsulate all internal components and connections to form a rigid, homogenous unit.

Each sensor unit containing the two Avesta sensors will be rotated 90 degrees to previous sensor unit to eliminate tracking between sensors.

Cable – The cable will be numbered (number and text) along entirety of cable and at intervals not greater than 7.5 inches for identification. This cable will be dark blue in color, with the cores light blue.

Flexible cables shall be capable of supporting the weight of probe and cable, without need for additional support.

The cable shall be secured to top of probe by a synthetic rubber compression fitting.

MTR Relay – The conductance level control relay shall be a Din rail mounted device with supply and activation LEDs, eight programmable activation delays, charge/discharge settable and four sensitivity settings (2k, 4k, 20k, 80k) all easily carried out while installed. A green LED shall be provided on front of relay and shall remain lit while power is connected to the

unit. A red LED shall be provided on front of device and shall remain lit while the output relay is active. Each output shall be capable of a five amp resistance load at 250 VAC.

Floats – Furnish one high-level alarm float and one low-level shut off float. The low level float shall be capable of over-riding the Multi Trode Controller.

An alternator shall also be provided to change operation sequence of pumps at the completion of each pumping cycle. Provisions shall also be made for pumps to operate in parallel if level in wet well continues to rise above the "pump-on" cycle. Contractor shall furnish and install one automatic control center, equipped with individual disconnects, across-the-line magnetic starters, 3 phase, overload and phase protection, electrical alternator, automatic transfer to non-operating pump in event of overload in operating pump, overload reset, hand-off-automatic pump operation selector switch, 24 volt control circuit transformer, and terminal board with connections for high-level alarm. All components shall be housed in a NEMA 4X enclosure. Control center shall be installed on a treated timber rack next to the station. Cables provided for pump feeders and pump controls shall be installed in conduit from control center to entrance point in wet well. See detail sketch on construction drawings.

- G. Alarm – A high water alarm shall be supplied. A red flashing light shall be supplied in separate NEMA 4X enclosure for mounting at the control box. An audible alarm consisting of a weatherproof bell with automatic reset silencer switch and signal light shall be installed in addition to the flashing red light alarm.
- H. Submersible Pump Station Valve Pit – The valve pit shall be precast concrete of dimensions shown on construction drawings. Valve pit design shall meet the requirements for precast concrete specified in section 2.15, paragraph B. Each pit shall have a hatch cover. The covers shall be:

Clear Opening	3-feet-0-inches x 4-feet-0-inches
Capacity	300 lbs/sq. ft.
Material	Aluminum Alloy 6063-T5 & T6 1/4 inch plate with a Neoprene gasket to make hatch watertight

- I. Hydrants – Shall be frost-proof with 36 inch bury, 1 inch male outlet, and 1 inch male inlet, with outlet 36 inches above the ground. Water line from the main to hydrant shall be 1 inch diameter, rated for a minimum working pressure of 200 p.s.i.
- J. Backflow Preventer – Shall be a 1 inch reduced pressure zone assembly mounted in a plastic meter box. Backflow preventer shall be equivalent to Watts Regulator Model No. 009.
- K. Fencing – A new fence shall be installed at pump station site where shown on the drawing and shall be in accordance with Section 323113 – "Chain Link Fences and Gates."

A 3 inch x 5 inch, 7 gauge, stainless steel plate with an emergency phone number shall be furnished and installed at a conspicuous location on the fence or control panel.

- L. Access Road – Access road to station shall be as shown on the drawing. Stabilization shall be accomplished by constructing a base using granite crusher run stone aggregate composed of 50% screenings and 50% stone, compacted to 6-inch thickness.
- M. Shop Drawings – Contractor shall submit for review by Engineer a complete schedule and data of materials and equipment to be incorporated in the work. Submittals shall be supported by descriptive material, such as catalogs, diagrams, performance curves, and charts published by the manufacturer, to show conformance to specification and drawing requirements. Model numbers alone will not be acceptable. Complete electrical characteristics shall be provided for all equipment.

All shop drawings shall be completely checked and marked accordingly with Contractor's stamp prior to submitting drawings to the Engineer for review. Shop drawings with insufficient or incomplete data required to indicate compliance with these specifications are not acceptable and will be returned to the Contractor. Where shop drawings are "Furnished as Corrected," the reviewer has noticed deficiencies in compliance with contract specifications and drawings. It is understood corrections indicated will be incorporated by Contractor in the final product, operation and maintenance manuals and shop drawings submitted at completion of project. Rejected shop drawings shall not relieve Contractor from completing the project within time allowed by contract documents.

- N. Pump Warranty – The pump manufacturer shall warrant pumps being supplied to Owner against defects in workmanship and materials for a period of 5-years under normal use, operation, and service. In addition, the manufacturer shall replace certain parts which become defective through normal use and wear on a progressive schedule of cost for a period of 5-years. Parts included are the mechanical seal, impeller pump housing, wear ring, and ball bearings. The warranty shall be in published form and apply to all similar units.
- O. Operation and Maintenance Manual – The pump manufacturer shall furnish Owner with a minimum of six manuals for pumps installed.
- P. Electrical Service – Service to the pumping station shall be per the manufacturer's specification. Service shall be underground originating in weatherhead on service pole at site and terminating in the main breaker.

Conduits below grade shall be Schedule 40 PVC and above grade shall be rigid galvanized. Conduits shall be sealed to prevent sewer gases entering the control panel. Sealing shall be accomplished by stuffing both ends of the conduit with duct-seal, or other accepted material.

Conductor shall be copper.

The neutral conductor of each service shall be grounded to a ground rod system. Grounding conductor shall be sized in accordance with Article 250 of the N.E.C. and shall be installed in non-metallic conduit to points of ground connection.

Ground rod system shall consist of three 3/4 inch x 10 foot copper weld ground rods. Ground rods shall be installed 3 feet apart with top of rods 12 inches below grade and shall be interconnected with a bare copper grounding conductor. Connections to ground rods shall be with chemical weld connectors.

1. Running Time Meters – Shall be installed for measuring the elapsed running time for each pump. Meters shall be installed on the face of control panel with counter visible when door or panel is opened. One meter shall be provided for each starter and shall be connected to operate simultaneously with the starter it is monitoring. Meters shall be non-reset type, hermetically sealed, 115 volts, 60 hertz, with a five digit counter registering 1/10 hour and a total range of 99,999-hours.

## 2.16 CHECK VALVES

- A. Shall be designed for sewage service. The valve shall be cast iron and bronze fitted. The valve shall be a spring and lever type with neoprene seat and O-Ring seals on a stainless steel valve pin, for pipes 3 inches and larger in diameter. For check valves smaller than 3 inches, the valve shall be a fully ported 150 p.s.i. rated ball check valve with a corrosion resistant phenolic base and a rubber seat. Check valve shall be of full waterway design for quiet operation and with a flow area through the valve equal to or exceeding flow area of pipe to which it is installed.

## 2.17 GATE VALVES

- A. Two Inches and Larger – Shall be cast iron or ductile iron body, bronze mounted, double disc or resilient wedge design, with non-rising stems, conforming to AWWA C 500, C 509, or C 515. Valves shall have ends to match the pipe to which they are attached. Attachment to plastic pipe shall be made by special adapters. Valves shall have a working pressure of 200 p.s.i. and be tested at 400 p.s.i.

Valves shall be furnished with "O" ring packing. One "O" ring shall be located above the thrust collar and one below. Thrust collar shall be permanently lubricated and have an anti-friction washer on top of the thrust collar.

- B. Smaller Than 2 inches – Shall be all brass, ball valve type. The pressure rating shall be 175 p.s.i.
- C. Valve Boxes – Underground valves shall be installed in acceptable valve boxes. Valve boxes shall have a suitable base which does not damage valve or pipe, and shaft extension sections to cover and protect the valve and permit easy access and operation. The box, cover, and extensions shall be cast or ductile iron having a crushing strength of 1,500 pounds per linear foot.

## 2.18 PLUG VALVES

- A. Shall be fully ported and of the same diameter as pipes to which they are attached. They shall have semi-steel bodies, all metal plugs, stainless steel bearings, and be equivalent to DeZurik Series 100 eccentric valves, lever operated. All valves 6 inches and larger shall be equipped with gear actuator and handwheel.

## 2.19 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered by Contractor.

## PART 3 – EXECUTION

### 3.1 CONSTRUCTION OBSERVATION

- A. The line, grade, deflection, and infiltration of sewers and pump station operation shall be tested by Contractor under the direction of Engineer. Engineer or Project Representative will have the right to require any portion of work be completed in their presence. If work is covered up after such instruction, it shall be exposed by Contractor for observation. However, if Contractor notifies Engineer such work is scheduled and Engineer fails to appear within 48 hours, the Contractor may proceed. All work completed and materials furnished shall be subject to review by the Engineer or Project Representative. All improper work shall be reconstructed. All materials not conforming to requirements of specifications shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Project Engineer or Project Representative a minimum of 48 hours notice for all required observations or tests.

It will also be required by Contractor to keep accurate, legible records of the location of all sanitary lines, service laterals, manholes, force mains, valves, bends, and appurtenances. These records will be prepared in accordance with "Record Data and Drawings" paragraph in the Special Conditions. Final payment to the Contractor will be withheld until all such information is received and accepted.

### 3.2 LOCATION AND GRADE

- A. Line and grade of sewers and position of all manholes and other structures are shown on the drawings. Grade line as given on the profile or mentioned in these specifications means invert or inside bottom of pipe and price for trenching shall include trench for depth below this line necessary to lay sewer to this grade, but measurements for payment will be made only to grade line. Master control lines and bench marks have been provided by the Engineer. The Contractor shall be responsible for proper locations and grades of sewers.

### 3.3 SEWER EXCAVATION

- A. Contractor shall perform all excavations of every description and of whatever substance encountered to the depth shown on the plans or specified for all sewers, manholes, and other appurtenances. All excavations shall be properly dewatered before installations are made, by the use of well points, pumping, or other methods accepted by Engineer. Trenches shall be excavated in conformance with the Occupational and Safety Health Administration's (OSHA) Regulations.

Where the character of soil is unsuitable for pipe bedding as determined by Engineer or Geotechnical Consultant, additional excavation will be authorized. Engineer or Geotechnical Consultant shall determine the depth needed for additional bedding and whether material will be sand or stone. The unsuitable material shall be disposed of at Contractor's expense in a proper manner. Bottom of all trenches shall be rounded to conform to bottom of pipe, to afford full bearing on pipe barrel. Excavation in excess of depths and widths required for sewers, manholes, and other structures shall be corrected by pouring subfoundations of 3,000 p.s.i. concrete and half cradle at the Contractor's expense.

- B. Trenches shall not be excavated more than 400 feet in advance of pipe laying.

### 3.4 TRENCH WALL SUPPORT

- A. Bracing and Sheeting – The sides of all trenches shall be securely held by stay bracing, or by skeleton or solid sheeting and bracing, as required by soil conditions encountered, to protect adjoining property and for safety. Where shown on drawings or where directed by Engineer, the Contractor must install solid sheeting to protect adjacent property and utilities. Sheeting shall be steel or timber and Contractor shall submit design data, including the section modulus of members and arrangement for bracing at various depths, to Engineer for review before installing sheeting. It shall penetrate at least 3–feet below the pipe invert. Contractor shall ensure support of pipe and its embedment is maintained throughout installation and ensure sheeting is sufficiently tight to prevent washing out of the trench wall from behind sheeting.
- B. Sheeting Removal – Sheeting shall be removed in units and only when backfilling elevation has reached the level necessary to protect pipe, adjoining property, personnel, and utilities. Removal of sheeting or shoring shall be accomplished in a manner to preclude loss of foundation support and embedment materials. Fill voids left on removal of sheeting or shoring and compact all materials to required densities.
- C. Movable Trench Wall Supports – Do not disturb installed pipe and its embedment when using movable trench boxes and shields. Movable supports should not be used below top of pipe zone unless acceptable methods are used for maintaining the integrity of embedment material. Before moving supports, place and compact embedment to sufficient depths to ensure protection of the pipe. As supports are moved, finish placing and compacting embedment.
- D. When sheeting or shoring cannot be safely removed, it shall be left in place. Sheeting left in place shall be cut off at least 2 feet below the surface. No separate payment shall be made for bracing and sheeting except where shown on drawings or authorized by the Engineer.

### 3.5 LAYING PIPE

- A. All sewer pipe shall be laid upgrade with spigots pointing downgrade and in accordance with ASTM D 2321. The pipe shall be laid in a ditch prepared in accordance with Paragraph 3.3 "Sewer Excavation." When sewer is complete, the interior surface shall conform on bottom accurately to grades and alignment fixed or given by Engineer. Special care shall be taken to provide a firm bedding in good material, select borrow, stone backfill or 3,000 p.s.i. concrete, as authorized, for length of each joint and 1/2 of the circumference. Holes shall be provided to relieve bells from bedding strain, but not so large to allow separation of the bell from barrel by settlement after backfilling. All pipe shall be cleaned out and left clean. Every third joint shall be filled around immediately after being properly placed.
- B. Jointing – Comply with manufacturer's recommendations for assembly of joint components, lubrication, and making joints. When pipe laying is interrupted, secure piping against movement and seal open ends to prevent the entrance of water, mud, or foreign material.
- C. Placing and Compacting Pipe Embedment – Place embedment materials by methods which will not disturb or damage the pipe. Work in and tamp haunching material in area between

the bedding and underside of pipe before placing and compacting remainder of embedment in pipe zone. Do not permit compaction equipment to contact and damage the pipe. Use compaction equipment and techniques compatible with materials used and location in the trench. Before using heavy compaction or construction equipment directly over the pipe, place sufficient backfill to prevent damage, excessive deflections, or other disturbance of the pipe.

- D. Rock or Unyielding Materials in Trench Bottom – If ledge rock, hard pan, shale, or other unyielding material, cobbles, rubble, debris, boulders, or stones larger than 1.5-inches are encountered in the trench bottom, excavate a minimum depth of 6-inches below pipe bottom and replace with proper embedment material.
- E. Vertical Risers – Provide support for vertical risers as commonly found at service connections, cleanouts, and drop manholes to preclude vertical or lateral movement. Prevent the direct transfer of thrust due to surface loads and settlement and ensure adequate support at points of connection to main lines.
- F. Exposing Pipe for Making Service Line Connections – When excavating for a service line connection, excavate material from above the top of main line before removing material from sides of pipe. Materials and density of service line embedment shall conform to specifications for the main line.
- G. Manhole Connections – Use flexible water stops, resilient connectors, or other flexible systems acceptable to the Engineer making watertight connections to manholes and other structures. Fill annular space between pipe and precast concrete on inside of manhole with non-shrink grout.
- H. Jacking and Boring – Steel casing of diameter shown on the plans shall be jacked and bored in location indicated. Joints between sections of the steel casing shall be of a continuous weld made by a certified welder. Jacking and boring shall be in accordance with Georgia Department of Transportation Standard Specifications. Carrier pipe shall be installed as shown on the detail. After carrier pipe has been installed, ends of the casing shall be sealed using a rubber enclosure and stainless steel straps or brick and mortar.

Where work involves a highway, a Resident Engineer of the State Department of Transportation shall be notified 3 days before crossing is started. Where work involves a railroad, the work shall conform to requirements of AREA specifications. Division Superintendent of the Railroad shall be notified 3 days prior to beginning work. Before commencing work within the right-of-way of railroads or highways, Contractor shall verify Owner has obtained required permits.

### 3.6 SEPARATION BETWEEN WATER & SANITARY SEWER

- A. Parallel Installation:
  - 1. Water mains shall be laid at least 10 feet horizontally from any existing or proposed sanitary sewer, storm sewer, or sewer manhole. The distance shall be measured edge-to-edge.
  - 2. When conditions prevent a horizontal separation of 10 feet, water main may be laid closer to a sewer (on a case-by-case basis) provided water main is laid in a separate

trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation where bottom of water main is at least 18 inches above top of sewer. It is advised the sewer be constructed of materials and with joints equivalent to water main standards of construction and be pressure tested to assure water-tightness prior to backfilling.

B. Crossing:

1. Water mains crossing house sewers, storm sewers, or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of water main and top of sewer. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.
2. When conditions prevent a vertical separation of 18 inches, the sewer passing over or under water mains shall be constructed of materials and with joints equivalent to water main standards of construction and shall be pressure tested to assure water-tightness prior to backfilling.
3. When water mains cross under sewers, additional measures shall be taken by providing:
  - a. a vertical separation of at least 18 inches between bottom of the sewer and top of water main;
  - b. adequate structural support for sewers to prevent excessive deflection of joints settling on and breaking the water mains;
  - c. length of water pipe be centered at the point of crossing so joints will be equidistant and as far as possible from sewer; and
  - d. both sewer and water main shall be constructed of water pipe and subjected to hydrostatic tests, as prescribed in this document. Encasement of the water pipe in concrete shall also be considered.

3.7 BACKFILLING

- A. All trenches and excavation shall be backfilled immediately after pipes are laid therein, unless other protection of the pipe line is directed. Backfilling material shall be selected and deposited with special reference to the future safety of pipes. Except where special methods of bedding and tamping are provided for, clean earth or sand shall be solidly tamped about pipe up to a level at least 2 feet above top of pipes, and shall be carefully deposited to uniform layers, each layer solidly tamped or rammed with proper tools to not injure or disturb the pipeline. Remainder of the trench backfilling shall be carried on simultaneously on both sides of pipe in such a manner preventing injurious side pressure. The material used shall be selected from excavated material anywhere on site if any of this material is suitable. Backfill material shall be clean and free of rock, organic and other deleterious matter.

Under traffic areas, the top 24 inches of backfill material shall be compacted to a density of not less than 98% of maximum laboratory density at optimum moisture. Below the 24 inch line and to and including area around pipe, density shall not be less than 95% of maximum



laboratory density at optimum moisture. In non-traffic areas, the backfill material shall be compacted to a density of not less than 90% of maximum laboratory density at optimum moisture unless otherwise accepted by Engineer. Compaction tests shall be conducted in accordance with ASTM D 6938 by an independent testing laboratory. Tests are to be taken at the direction of Engineer.

Whenever trenches have not been properly backfilled, or if settlement occurs, they shall be refilled, smoothed off and finally made to conform to the ground surface. Backfilling shall be carefully performed, and original surface restored to the full satisfaction of Engineer immediately after installation.

Where thermoplastic (PVC) pipe is installed, Contractor shall take precautions in accordance with ASTM D 2321, during backfilling operations so not to create excessive side pressures, or vertical or horizontal deflection of the pipe nor impair flow capacity.

### 3.8 MANHOLES

- A. Manholes shall be constructed where shown on the drawings or where directed by Engineer. The channel in bottom of manholes shall be smooth and properly rounded. Special care must be exercised in laying the channel and adjacent pipes to grade. Manhole top elevations shall be greater than or equal to the 50 year flood elevation, unless watertight covers are provided. Tops of manholes outside of roads shall be built to grades 1-inch above ground surface in developed areas and 6 inches above ground surface in undeveloped areas unless otherwise shown on the plans. Manholes in roads shall be built to grades designated by the Engineer. Manhole sections with either honeycomb defects; exposed reinforcing; broken/fractured tongue or groove; or cracked walls will be subject to rejection by Engineer for use on the project. When mastic sealant is used, improperly applied primer will also be cause for rejection.

No leaks in any manhole will be acceptable. All repairs made from inside the manhole shall be made with mortar composed of one part Portland cement and two parts clean sand. The mixing liquid shall be straight bonding agent equivalent to "Acryl 60."

### 3.9 STONE BEDDING

- A. Where, in the Engineer's or Geotechnical Consultant's opinion, subgrade of pipe trench is unsuitable material, Contractor shall remove unsuitable material to a depth determined by Engineer or Geotechnical Consultant and furnish and place stone backfill in trench to stabilize subgrade. Presence of water does not necessarily mean stone backfill is required. If well points or other types of dewatering will remove the water, Contractor shall be required to completely dewater trench in lieu of stone backfill. Stone bedding will be limited to areas where well pointing and other conventional methods of dewatering will not produce a dry bottom. Stone shall be placed 4 feet wider than the outside diameter of pipe. The pipe shall be carefully bedded in stone as specified, or in accordance with manufacturer's recommendations.

### 3.10 SAND BEDDING

- A. Where, in the Engineer's or Geotechnical Consultant's opinion, character of soil is unsuitable for pipe bedding, even though dewatered, additional depth of excavation as determined by

Engineer or Geotechnical Consultant shall be made and replaced with clean sand furnished by Contractor.

### 3.11 DEFLECTION

- A. It is the Contractor's responsibility to assure backfill is sufficient to limit pipe deflection to no more than 5%. When flexible pipe is used, a deflection test shall be made by Contractor on the entire length of installed pipeline, not less than 30-days after completion of all backfill and placement of any fill. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 95% of the inside pipe diameter. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. The device shall be center bored and through bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of 70,000 p.s.i. or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer; a pull exerted on opposite end of shaft shall produce compression throughout remote end of ball, cylinder, or circular section. Circular sections shall be spaced so distance from the external faces of front and back sections shall equal or exceed diameter of circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through by hand or by being flushed through with water, shall be cause for rejection of individual run. When a deflection device is used for the test in lieu of a ball, cylinder, or circular sections described, such device shall be acceptable to Engineer prior to use. Device shall be sensitive to 1.0% of diameter of pipe being measured and shall be accurate to 1.0% of indicated dimension. Installed pipe showing deflections greater than 5% of the normal diameter of pipe shall be retested by a run from opposite direction. If retest also fails, the suspect pipe shall be repaired or replaced at no cost to Owner.

### 3.12 LEAKAGE

- A. In no stretch of sewer between any two adjoining manholes shall infiltration/exfiltration exceed 25 gallons/day/inch of pipe diameter per mile of pipe. In case leakage exceeds this amount, the sewer shall not be accepted until such repairs and replacements are made to comply with above requirements. Such corrections will be made at the Contractor's expense. All visible leaks shall be repaired, regardless of the amount of leakage.
- B. Lines shall be tested for leakage by low pressure air testing, infiltration tests, or exfiltration tests, as appropriate. Low pressure air testing for PVC pipe shall be as prescribed in ASTM F 1417. Prior to infiltration or exfiltration tests, trench shall be backfilled up to at least the lower half of pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When water table is 2 feet or more above top of pipe at upper end of pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to Engineer. When Engineer determines infiltration cannot be properly tested, an exfiltration test shall be made by filling the line to be tested with water so a head of at least 2 feet is provided above both water table and top of pipe at upper end of pipeline to be tested. The filled line shall be allowed to stand until pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The amount of water required to maintain this water level during a 2 hour test period shall be measured. Leakage as measured by either the infiltration

test or exfiltration test shall not exceed 25 gallons per inch diameter per mile of pipeline per day. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correction, and retesting shall be made at no additional cost to the Owner.

- C. The Contractor shall furnish equipment and plugs and subject force mains to hydrostatic tests at 100 p.s.i. for a period of 2 hours. Any leaks shall be located and repaired. Each section tested shall be slowly filled with water, care being taken to expel all air from the pipes. No pipe installation will be accepted until leakage during pressure test is less than the number of gallons listed for each 1000-feet of pipe tested:

6 inches & less – 0.9 gallons	12 inches – 1.80 gallons
8 inches – 1.20 gallons	14 inches – 2.10 gallons
10 inches – 1.50 gallons	16 inches – 2.40 gallons

### 3.13 CLEANING AND ACCEPTANCE

- A. Before acceptance of sewer system, it shall be tested and cleaned to the satisfaction of Engineer. Where any obstruction is met, Contractor will be required to clean sewers by means of rod and swabs or other instruments. The pipe line shall be straight and show a uniform grade between manholes. The Engineer shall check lines by lamping or other methods to determine final acceptance.

### 3.14 CLOSING PIPE

- A. When work or pipe installation is suspended, either for the night or at other times, end of sewer must be closed with a tight cover. Contractor will be held responsible for keeping the sewer free from obstruction.

### 3.15 PARTIAL ACCEPTANCE OF THE WORK

- A. Owner reserves right to accept and use any part of the work. Engineer shall have power to direct on what line the Contractor shall work and order thereof.

### 3.16 GRASSING

- A. Grassing of areas disturbed during construction shall be in accordance with Section 329200 – “Turf and Grasses.”

### 3.17 RECORD DATA

- A. It will be required of the Contractor to keep accurate, legible records, locating all sewers, force mains, tees, and laterals. These records will be made available to Engineer before final review for incorporation into the Engineer's Record Drawings. Final payment to the Contractor will be withheld until all such information is received and accepted.

3.18 REMOVE AND REPLACE PAVEMENT

- A. Pavement shall only be removed after prior written authorization by the Owner. Pavement removed and replaced shall be constructed in accordance with latest specifications of the State Department of Transportation. Traffic shall be maintained and controlled per State Department of Transportation regulations.

Edges of the pavement shall be cut to a neat straight line with a masonry saw. Backfill shall be compacted and tested and a concrete base course of 5,000 p.s.i. placed on the fill as shown on details. The concrete base shall be placed within 24 hours after pipeline is installed. A temporary wearing surface may be used provided it presents a smooth surface. The final wearing surface shall be 2 inches of 9.5 mm asphaltic concrete.

3.19 METALLIC DETECTOR TAPE

- A. Contractor shall place metallic detector tape, suitably coded, directly over all installed pipes at a depth of 18 inches below the finished surface.

Note: Wire on all pipes shall be required in Georgia after January 1, 2001.

3.20 TRACER WIRE

- A. Tracer wire will be installed on all force mains, sanitary sewer and service laterals directly on top of the pipe. Wire shall be secured to the pipe with tape or other acceptable methods at spacings of no more than 36-inches apart. Where service laterals connect to main lines, the wire connection shall be made with a direct bury moisture resistant connector. Installation of connector shall be per manufacturer's instructions. The insulated wire must maintain electrical continuity. This tracer wire system shall be checked and tested by the Contractor, in presence of Engineer or Owner prior to acceptance of force main sanitary sewer and service laterals. All equipment, meters, detectors, etc., needed for testing shall be furnished by the Contractor.

3.21 CONNECT SEWERS TO EXISTING STRUCTURES

- A. Contractor shall connect the system to existing structures where indicated. For brick structures, a hole not more than 4 inches larger than the outside diameter of new pipe shall be cut neatly in structure, new pipe laid so it is flush with inside face of structure, and annular space around pipe filled with a damp, expanding mortar or grout to make a watertight seal. For precast structures, core proper size hole in structure for pipe being connected, attach flexible sleeve into cored hole and connect new pipe into flexible sleeve with a stainless steel band.

3.22 FIELD QUALITY CONTROL

- A. Soil and density tests shall be made by a testing laboratory acceptable to the Engineer. Laboratory tests of the soil shall be made in accordance with ASTM D 1557. In-place density tests shall be made in accordance with ASTM D 6938. Results of the tests shall be furnished to the Engineer.  
The minimum number of tests required shall be:

Backfill over sewer in traffic areas.....	1 per 100 linear feet or less for each 4 feet of depth or portion thereof.
Backfill over sewer in non-traffic areas...	1 per 500 linear feet or less for each 6 feet of depth or portion thereof.

### 3.23 AIR RELEASE VALVE

- A. The manhole and installation of valve shall be in accordance with detail on drawings. Prior to deciding on the location of any air release valve, Contractor shall provide Engineer with an accurate profile of installed force main so high points in system can be determined.

### 3.24 SEWAGE PUMPING STATION

- A. The precast sections shall be carefully handled and placed in position undamaged. Spalled areas, cracks, or exposed reinforcing in any section shall be cause for rejection of a section. Damaged elements shall be promptly removed from the job-site.

The structure shall be installed plumb and level by Contractor on a prepared, evenly distributed and level, minimum 12 inch thick crushed-stone bed. Joints between sections shall be sealed with butyl-rubber or neoprene sealant. Asphaltic-based material or similar products shall not be used. The sealant shall be applied in accordance with sealant manufacturer's recommendation. Leakage through joints or around pipes will not be acceptable. Grout used at construction joints and around pipes shall be Five Star brand non-shrink grout or an acceptable equivalent.

Excavation shall be accomplished in a manner as required to protect adjacent property and utilities and for safety. Backfilling shall be accomplished as soon as practicable after the structure has been placed and sealed. Backfilling shall be achieved by placing material in equal lifts (max. 2 feet) and compacting each lift to maintain stability and plumbness of the structure. Backfill material shall be a select granular material with a maximum plasticity index (P.I.) of 12. Compaction shall be accomplished by means of mechanical tamping to 98% of maximum laboratory density at optimum moisture when tested by ASTM D 6938. During backfilling operation and until its completion, the wet well sections shall be maintained in an absolute plumb position. To prevent structure from possibly becoming buoyant in hydrostatic or flooded conditions, Contractor shall take necessary steps to avoid flotation of the structure.

Pumping station site shall be graded to drain to conform to the drawings. The fence, access road, and grassing shall be constructed after site has been graded.

Contractor shall connect to water main with a saddle or tee and lay water line to the hydrant per location on drawings. The hydrant shall be set in a gravel pocket with a 12 inch x 12 inch x 4 inch concrete collar at ground level. Connection shall be disinfected and tested in accordance with AWWA C 651. Water shall not be used until favorable written test results have been furnished to the Engineer.

Drawings indicate the general arrangement and location of electrical equipment, conduit, piping, transformer, and generator. Installation and location of these items shall be coordinated with the pump station operating personnel.

3.25 FORCE MAIN

- A. Ductile Iron Force Main shall be installed in accordance with AWWA C 600.
- B. PVC Force Main shall be installed in accordance with ASTM D 2774.

3.26 BYPASSING

- A. Bypassing of raw wastewater onto the ground or into a receiving stream is prohibited.
- B. Bypassing shall be accomplished with pumping equipment sufficient to maintain the flow of wastewater. Contractor shall provide pump, hoses, materials, and labor to operate and maintain the bypassing operation. A backup pump shall also be made available by the Contractor. Bypassing operations shall be reviewed and acceptable to the sewer system operator before being implemented.

END OF SECTION

## SECTION 334000 - STORM DRAINAGE UTILITIES

### PART 1 – GENERAL

#### 1.1 SECTION INCLUDES

- A. Construction of pipes, drainage inlets, manholes, headwalls, and various drainage structures.

#### 1.2 RELATED SECTIONS

- A. Section 030000 – Concrete
- B. Section 333000 – Sanitary Sewerage Utilities

#### 1.3 OPTIONS

- A. The bid form and specifications describe several pipe materials. Where manufacturers of material or equipment are named in the specifications, Contractor may use equipment or materials of other manufacturers provided they are reviewed and accepted by Engineer as equivalent to those specified.

#### 1.4 REFERENCES (Latest Revision)

- A. ASTM B 745/B 745M – Corrugated Aluminum Pipe for Sewers and Drains.
- B. ASTM C 55 – Concrete Building Brick.
- C. ASTM C 62 – Building Brick (Solid Masonry Units Made from Clay or Shale).
- D. ASTM C 76 – Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- E. ASTM C 144 – Aggregate for Masonry Mortar.
- F. ASTM C 150 – Portland Cement.
- G. ASTM C 207 – Hydrated Lime for Masonry Purposes.
- H. ASTM C 443 – Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- I. ASTM C 478 – Precast Reinforced Concrete Manhole Sections.
- J. ASTM C 913 – Precast Concrete Water and Wastewater Structures.
- K. ASTM C 1433 – Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers.
- L. ASTM D 1056 – Flexible Cellular Materials – Sponge or Expanded Rubber.

- M. ASTM D 1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
- N. ASTM D 1751 – Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- O. ASTM D 1752 – Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- P. ASTM D 2321 – Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
- Q. ASTM D 3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- R. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- S. ASTM D 6938 – In Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- T. ASTM E 329 – Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- U. ASTM F 405 – Corrugated Polyethylene (PE) Pipe and Fittings.
- V. ASTM F 477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- W. ASTM F667 – 3 through 24 in. Corrugated Polyethylene Pipe and Fittings.
- X. ASTM F 2306/F 2306M – 12 to 60-Inch (300 to 1,500 mm) Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
- Y. AASHTO M 294 – Corrugated Polyethylene Pipe, 300 to 1500-mm (12 – to 60-in.) Diameter.

#### 1.5 QUALITY ASSURANCE

- A. Material Review – Contractor will furnish the Engineer and Owner a description of all material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Manufacturer – Material and equipment shall be standard products of a manufacturer who has manufactured them for a minimum of 2 years and provides published data on their quality and performance.
- C. Subcontractor – A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with their competence.
- D. Design – Devices, equipment, structures and systems not designed by Engineer and Contractor wishes to furnish, shall be designed by either a Registered Professional Engineer



or by someone the Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before ordering.

- E. Testing Agencies – Soil tests shall be taken by a testing laboratory operating in accordance to ASTM D-3740 and E-329 and be acceptable to the Engineer prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests, spot checked by an outside laboratory and furnishes satisfactory certificates.

#### 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Material shall be unloaded in a manner avoiding damage and shall be stored where it will be protected and will not be hazardous to traffic. Contractor shall repair any damage caused by the storage. Material shall be examined before installation. Neither damaged nor deteriorated material shall be used in the work.

#### 1.7 SEQUENCING AND SCHEDULING

- A. Contractor shall arrange work so sections of pipes between structures are backfilled, checked, pavement replaced and the section placed in service as soon as reasonable after installation.

#### 1.8 ALTERNATIVES

- A. The intention of these specifications is to produce the best system for the Owner. If Contractor suggests alternate material, equipment or procedures will improve results at no additional cost, the Engineer and Owner will examine suggestion, and if accepted, it may be used. The basis upon which acceptance of an alternate will be given is its value to Owner and not for Contractor's convenience.

#### 1.9 GUARANTEE

- A. Contractor shall guarantee quality of materials, equipment and workmanship for a minimum period of 12 months or as required by the local governing agency after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

#### 1.10 EXISTING UTILITIES

- A. All known utility facilities are shown schematically on the construction drawings and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown, will not relieve the Contractor of responsibility under this requirement. "Existing Utilities Facilities" means any utility existing on the project in its original, relocated or newly installed position. Contractor will be held responsible for cost of repairs to damaged underground facilities; even when such facilities are not shown on the drawings.
- B. The Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at 1-800-282-8411 (GA) or 811.

#### 1.11 MEASUREMENT AND PAYMENT

- A. Pipe Culverts and Storm Drains – Shall be included in the contract lump sum for the project. Payment of which will constitute full payment for all pipe, joints, filter fabric and bedding, including trenching, dewatering, excavation, backfill and compaction, surface clean-up, and all incidental labor and material necessary to complete the construction of pipe as required by this section of specifications.
- B. Drainage Structures – Payment shall be included in the contract lump sum for the project. Payment will constitute full payment for all dewatering, excavation, formwork, precast concrete, backfill, compaction, frames, gratings or covers, concrete, brick and all miscellaneous materials, surface clean-up and labor necessary to complete the construction.
- C. Sheet piling and Bracing – Will not be measured for direct payment. All costs and charges in connection therewith shall be reflected and included in the item of work to which it pertains.
- D. Subgrade Drain – Payment shall be included in the contract lump sum for the project. Payment will constitute full payment for trenching, furnishing and installing perforated drain pipe with sock, furnishing and placing fine aggregate, proper backfilling, surface cleanup, acceptable connection to structures, and all work necessary to make the installation complete.
- E. Stone Foundation – Will be measured by using the length and depth for which stone is ordered by Engineer, times a width of 4 feet wider than outside diameter of pipe barrel. Payment will include the cost of removing and disposing of the unsuitable material and furnishing and placing stone.
- F. Sand Foundation – Will be measured by using the length and depth for which sand is ordered by Engineer, times a width of 4 feet wider than outside diameter of pipe barrel. Payment will include the cost of removing and disposing of the unsuitable material and furnishing and placing sand.
- G. Borrow – Borrow material shall be included in the contract lump sum for the project. The width of trench in which borrow is placed shall be limited to 4 feet wider than outside diameter of pipe barrel. If additional width is excavated, it shall be backfilled at Contractor's expense and a deduction of the extra quantity determined by truck count. Payment will include furnishing, hauling, placing, and compacting "borrow" material. Payment will also include disposing of unsuitable material in an area furnished by the Contractor.
- H. Ditch and Swale Excavation – Excavations required for the construction of new ditches or swales and regrading of existing ditches or swales will be paid for per linear foot of ditch or swale excavated.
- I. Connect Pipe to Existing Structures – Payment shall be included in the contract lump sum for the project. For precast structures, payment shall include cost of dewatering, excavation, coring, installing and grouting in pipe, backfilling, compaction and all work necessary to complete the connection. For brick structures, payment shall include cost of dewatering, excavation, cutting a hole, installing and grouting in pipe, backfilling, compaction and all work necessary to complete the connection.
- J. Pipe Video – Payment will be made at the contract unit price per linear foot. Payment will include all equipment, labor, and materials necessary to televise and video record 50% of pipes under roadways as chosen by the Engineer. Contractor shall provide Engineer with one copy of the video recording.

## 1.12 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 1556 or ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours notice prior to taking any tests.
- E. Testing shall be the Contractor's responsibility and shall be performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph C above.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

## PART 2 – PRODUCTS

### 2.1 PIPE

- A. Concrete Pipe – Shall be reinforced Class III, Class IV, or Class V and shall conform to ASTM Specification C-76. Pipe shall be manufactured without lifting holes. Gasketed single offset joints may be used in lieu of 'O' ring joints if acceptable to the Engineer.

Joint design shall be bell and spigot or tongue and groove. Joints shall be water tight using a confined gasket joint consisting of an O-ring rubber gasket conforming to requirements of ASTM C 443. Joint assemblies shall be accurately formed so when each pipe section is forced together, the assembled pipe shall form a continuous watertight conduit with smooth and uniform interior surface. Gaskets shall be the sole element of providing joint water tightness. Ends of pipe shall be in planes at right angles to the longitudinal centerline of pipe. Ends shall be finished to regular smooth surfaces.

- B. Corrugated Aluminum Alloy Pipe – Shall conform to ASTM B745. Pipe may be annular or helical.
  - 1. Joints – Coupling bands shall be one piece lap-type, having a width conforming to the pipe manufacturer's recommendations. They shall be of the angle lug, rod and lug, or U-bolt type. The type, size and gauge of bands and size of angles, bolts and rods shall be as specified in applicable standards or specifications for pipe. Exterior rivet heads in longitudinal seam under coupling band shall be countersunk or rivets shall be omitted and the seam welded.
  - 2. Gaskets – Gaskets shall be made of 3/8 inch thick by 6-1/2 inch minimum width closed cell expanded synthetic rubber, fabricated in the form of a cylinder with a diameter approximately 10% less than nominal pipe size. The gasket material shall conform to requirements of ASTM D1056, Grade Number SBE-43.

3. Bends – Where specified, shall be shop fabricated to angles and dimensions shown on the construction drawings.
- C. Polyethylene – Shall be high density polyethylene corrugated pipe having an integrally formed smooth interior, equivalent to Advanced Drainage Systems N-12WT, N-12STIB or Hancor Blue Seal or Sure-Lok ST. Pipe shall conform to ASTM F667 and F2306.
  1. Joints – Pipe shall be joined using an integral bell and spigot joint meeting ASTM F2306 specifications. The joint shall be soil and water tight and gaskets, when applicable, shall meet requirements of ASTM F477. A joint lubricant supplied by manufacturer shall be used on the gasket and bell during assembly.
- D. Subgrade Drain – Shall be heavy duty corrugated polyethylene perforated pipe manufactured by Advanced Drainage Systems (ADS) or equivalent and shall conform to ASTM F-405.
- E. Roof Drain – Shall be SDR 26 PVC pipe. Pipe shall be green or white in color.

## 2.2 DRAINAGE STRUCTURES

- A. Details – See plans.
- B. Concrete – Reinforced and non-reinforced.
  1. Minimum compressive strength = 3,000 p.s.i. at 28 days.
  2. Reinforcing shall be covered by a minimum 1 inch of concrete for top slabs and 1-1/2 inches for walls and bases and 3 inches where concrete is deposited directly against the ground.
  3. Expansion joint filler materials shall conform to ASTM D 1751 or D 1752.
- C. Mortar – Connection of pipe and drainage structures shall be composed of one part by volume of Portland cement and two parts of sand. The Portland cement shall conform to ASTM C-150, Type I or II. The sand shall conform to ASTM C-144 and shall be of an accepted gradation. Hydrated lime may be added to the mixture of sand and cement in an amount equal to 25% of cement volume used. Hydrated lime shall conform to ASTM C-207, Type S. Quantity of water in the mixture shall be sufficient to produce a workable mortar but shall in no case exceed 7 gallons of water per sack of cement. Water shall be clean and free of harmful acids, alkalies and organic impurities. The mortar shall be used within 30 minutes from time ingredients are mixed with water.
- D. Brick Masonry – Brick shall conform to ASTM Specification C-62, Grade SW or C-55, Grade S. Mortar for jointing and plastering shall consist of one part Portland cement and two parts fine sand. Lime may be added to the mortar in an amount not more than 25% of the cement volume used. Joints shall be completely filled and shall be smooth and free from surplus mortar on the inside of structure. Brick structures shall be plastered with 1/2 inch of mortar over entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course, and for round structures, brick shall be laid radially with every sixth course a stretcher course.

- E. Precast – Shall be constructed in accordance with ASTM C-478, C-913, or C-1433 and conform to details on the project drawings.
  - 1. Joints – Shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or Type A or B “Tylox” conforming to ASTM C443 and mastic shall be “Ram-nek” or equivalent with primer. Primer shall be applied to all contact surfaces of manhole joints at the factory in accordance with manufacturer’s instructions.
  - 2. Steps – Shall be polypropylene equivalent to M.A. Industries, Type PS-1 or PS-1-PF. Steps shall be installed at the manhole factory and in accordance with recommendations of step manufacturer. Manholes will not be acceptable if steps are not installed accordingly.
  - 3. Leaks – No leaks in the manhole will be acceptable. All repairs made from inside the manhole shall be made with mortar composed of one part portland cement and two parts clean sand; mixing liquid shall be straight bonding agent equivalent to “Acryl 60.”
- F. Frame, cover & grating shall conform to details shown on the project drawings. Grates in pavement and in other flush-mounted type surfaces shall be of a "bicycle-safe" configuration consisting of 45 degree diagonal bars or slotted grates with a maximum clear opening of 1 inch and a maximum length of 9-inches. In any case, the long dimension of openings should be located transverse to direction of traffic when possible.

### 2.3 FILTER FABRIC

- A. Shall be a non-woven heat-bonded fiber of polypropylene and nylon filaments equivalent to Mirafi 140 N. The fabric shall be finished so filaments will retain their relative position with respect to each other. Fabric shall contain stabilizers and/or inhibitors added to the base plastic to make filaments resistant to deterioration due to ultraviolet and/or heat exposure. The product shall be free of flaws, rips, holes, or defects.

### 2.4 SOILS AND STONE AGGREGATES

- A. Stone aggregate shall be clean crushed granite or concrete meeting the gradation requirements of grade No. 57.
- B. Soils used for bedding, haunching, and initial backfill shall be as shown in the following table and shall meet requirements and classifications of ASTM D2321 and ASTM D2487.

Class	Type	Soil Group Symbol D 2487	Description	Percentage Passing Sieve Sizes		
				1-1/2 inch (40 mm)	No. 4 (4.75 mm)	No. 200 (0.075 mm)
IB	Manufactured, Processed Aggregates; dense-graded, clean.	None	Angular, crushed stone (or other Class 1A materials) and stone/sand mixtures with gradations selected to minimize migration of adjacent soils; contain little or no fines.	100%	≤50%	<5%
II	Coarse – Grained Soils, clean	GW	Well-graded gravels and gravel-sand mixtures; little or no fines.	100%	<50% of “Coarse Fraction”	<5%
		GP	Poorly-graded gravels and gravel-sand mixtures; little or no fines.			
		SW	Well-graded sands and gravelly sands; little or no fines.		>50% of “Coarse Fraction”	
		SP	Poorly-graded sands and gravelly sands; little or no fines.			
	Coarse-Grained Soils; borderline clean to w/fines.	Eg. GW-GC, SP-SM.	Sands and gravels that are borderline between clean and with fines.	100%	Varies	5% to 12%
III	Coarse-Grained Soils with Fines	GM	Silty gravels, gravel-sand-silt mixtures.	100%	<50% of “Coarse Fraction”	5%
		GC	Clayey gravels, gravel-sand-clay mixtures.			
		SM	Silty sands, sand-silt mixtures.		>50% of “Coarse Fraction”	
		SC	Clayey sands, sand-clay mixtures.			
IVA	Fine-grained soils (inorganic)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, silts with slight plasticity.	100%	100%	>50%
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.			

## 2.5 PRODUCT REVIEW

- A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products by the submittal of shop drawings before they are ordered.

## PART 3 – EXECUTION

### 3.1 ON SITE OBSERVATIONS OF WORK

- A. The line, grade, deflection, and infiltration of storm sewers shall be tested by Contractor under direction of Engineer. Owner's Representative or Engineer will have the right to require any portion of work be completed in their presence and if work is covered up after such instruction, it shall be exposed by Contractor for observation. However, if Contractor notifies Engineer such work is scheduled and the Engineer fails to appear within 48-hours, Contractor may proceed. All work completed and material furnished shall be subject to review by the Engineer or Project Representative. All improper work shall be reconstructed. All materials not conforming to requirements of specifications shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Project Engineer or Project Representative a minimum of 48-hours' notice for all required observations or tests. Storm sewers shall be dry for observation by the Engineer. Lines under water shall be pumped out by Contractor prior to observation, at no additional cost to the Owner.

It will also be required of Contractor to keep accurate, legible records of the location of all storm sewer lines and appurtenances. These records will be prepared in accordance with paragraph on "Record Data and Drawings" in the Special Conditions. Final payment to the Contractor will be withheld until all such information is received and accepted.

### 3.2 EXCAVATION FOR PIPE AND STRUCTURES

- A. Excavated material shall be piled a sufficient distance from the trench banks to avoid overloading to prevent slides or cave-ins.
- B. Remove from site all material not required or suitable for backfill.
- C. Grade as necessary to prevent water from flowing into excavations.
- D. Remove all water accumulating in the excavation, from surface flow, seepage, or otherwise, by pumping or other acceptable method.
- E. Sheet piling, bracing or shoring shall be used as necessary for protection of the work and safety of personnel.

### 3.3 TRENCHING FOR PIPE

- A. Trenching for Pipe – The width of trenches at any point below top of pipe shall be not greater than outside diameter of pipe plus 4 feet to permit satisfactory jointing and thorough bedding, haunching, backfilling and compacting under and around pipes. Sheet piling and bracing where required shall be placed within the trench width as specified. Care shall be taken not to over-excavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures shall be necessary. Cost of this re-design and increased cost of pipe or installation shall be borne by Contractor without additional cost to the Owner. When installing pipe in a positive projecting embankment

installation, the embankment shall be installed to an elevation of at least 1 foot above top of pipe for a width of five pipe diameters on each side of pipe before installation of pipe.

- B. Removal of Unsuitable Material – Where wet or otherwise unstable soil, incapable of supporting the pipe is encountered in bottom of trench, such material shall be removed to depth required and replaced to proper grade with stone or sand foundation as determined by Engineer. This foundation shall be compacted to 95% modified proctor.

### 3.4 PROTECTION OF UTILITY LINES

- A. Existing utility lines shown on drawings or locations of which are made known to the Contractor prior to excavation, and are to be retained, as well as utility lines constructed during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired at Contractor's expense. If the Contractor damages any existing utility lines not shown on drawings or locations of which are not known to Contractor, report thereof shall be made immediately. If Engineer determines repairs shall be made by Contractor, such repairs will be ordered under the clause in GENERAL CONDITIONS of contract entitled "CHANGES." When utility lines to be removed are encountered within the area of operations, Contractor shall notify Engineer in ample time for necessary measures taken to prevent interruption of service.

### 3.5 FOUNDATION AND BEDDING

- A. Stone Foundation – Where the subgrade of pipe is unsuitable material, Contractor shall remove unsuitable material to a depth determined by Engineer or Geotechnical Consultant and furnish and place stone foundation in trench to stabilize subgrade.
- B. Sand Foundation – Where the character of soil is unsuitable, even though dewatered, additional excavation to a depth determined by Engineer or Geotechnical Consultant shall be made and replaced with clean sand furnished by Contractor.
- C. Bedding for pipe shall provide a firm surface of uniform density throughout the entire length of pipe. Before laying pipe, trench bottom shall be de-watered by the use of well points. Where well points will not remove the water, Contractor shall construct sumps and use pumps to remove all water from bedding surface. Pipe shall be carefully bedded in stone accurately shaped and rounded to conform to lowest 1/3 outside portion of circular pipe, or lower curved portion of arch pipe for the entire length of pipe. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type joint.
- D. Concrete Pipe:
  - 1. Materials for bedding concrete pipe shall be either Class II, Class III, or Class IB if processed, to minimize migration of adjacent material.
  - 2. Depth of bedding shall be equal to 1/24 the outer diameter of pipe or 3 inches, whichever is greater.
  - 3. Bedding area under the center of pipe, for a width 1/3 outer diameter of pipe, known as middle bedding, shall be loosely placed. Remainder of bedding for full width of



the trench shall be compacted to a minimum density of 85% for Class II bedding and 90% for Class III bedding as determined by ASTM D1557.

E. Polyethylene and Corrugated Aluminum Alloy Pipe

1. Materials for bedding polyethylene and corrugated aluminum alloy pipe shall be either Class II, Class III, or Class IB if processed to minimize migration of adjacent materials.
2. Depth of bedding shall be equal to 1/10 the outer diameter of pipe or a minimum of 6 inches, whichever is greater.
3. Bedding area under the center of pipe, for a width 1/3 outer diameter of pipe, known as middle bedding, shall be loosely placed. Remainder of bedding for full width of the trench shall be compacted to a minimum density of 90% for Class II bedding and 95% for Class III bedding.

3.6 HAUNCHING, INITIAL BACKFILL, AND FINAL BACKFILL

- A. Haunching – After the bedding has been prepared and pipe is installed, Class II or Class III soil shall be placed along both sides of pipe, in layers not exceeding 6 inches in compacted depth. Care shall be taken to insure thorough compaction and fill under haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers and rammers. Haunching shall extend up to the spring line of pipe and be compacted to following densities:
1. RCP: Minimum density shall be 90% as determined by ASTM D1557.
  2. PVC, HDPE, and Corrugated Aluminum Alloy Pipe: Minimum density shall be 95% as determined by ASTM D1557.
- B. Initial Backfill – PVC, HDPE, and corrugated aluminum alloy pipe require initial backfill material of either Class II or Class III soils to be placed from the spring line to a minimum of 6 inches above top of pipe in 6 inch lifts. This initial backfill shall be compacted to a minimum density of 95% as determined by ASTM D1557. Reinforced concrete pipe does not specifically require initial backfill. Initial backfill for reinforced concrete pipe can be the same as final backfill.
- C. Final Backfill – For all pipes, it should extend to the surface and shall be select materials compacted to a minimum of 98% as determined by ASTM D1557 if pipe is under pavement. If pipe is in grassed areas final backfill may be native materials compacted to a minimum density of 90% as determined by ASTM D1557.

3.7 PLACING PIPE

- A. Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipe lines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. All pipe in place shall have been checked before backfilling. When storm drain pipe terminates in a new ditch, headwall or end section,

together with ditch pavement, if specified, shall be constructed immediately as called for on the plans. Ditch slopes and disturbed earth areas shall be grassed and mulched as required. Contractor will be responsible for maintaining these newly constructed ditches and take immediate action subject to acceptance, keeping erosion of the ditch bottom and slopes to a minimum during life of contract. No additional compensation will be given to Contractor for the required diversion of drainage and/or dewatering of trenches. Grassing the trench backfill shall conform to requirements of Section 329200 – “Turf and Grasses.”

- B. Concrete Pipe: Laying shall proceed upgrade with spigot ends of bell and spigot pipe and tongue ends of tongue and groove pipe pointing in the direction of flow. Place pipe in trench with the invert conforming to required elevations, slopes and alignment. Provide bell holes in pipe bedding in order to insure uniform pipe support. Fill all voids under the pipe by working in backfill material.
- C. Corrugated Aluminum Pipe: Shall be laid with separate sections joined firmly together, with outside laps of circumferential joints pointing upstream and with longitudinal laps on the side. Lifting lugs, where used, shall be placed to facilitate moving the pipe without damage to exterior or interior coatings. Place pipe in trench with the invert conforming to required elevations, slopes and alignment. Fill all voids under the pipe by working in backfill material.
- D. Polyethylene and PVC Pipe – Laying shall proceed upgrade with spigot ends of bell and spigot pipe pointing in the direction of flow. Place pipe in trench with the invert conforming to required elevations, slopes, and alignment. Provide bell holes in pipe bedding in order to ensure uniform pipe support. Fill all voids under the pipe by working in bedding material. Pipe shall be installed in accordance with ASTM D-2321.
- E. Subgrade Drain Tubing – Shall be laid as detailed on construction drawings with the invert conforming to required elevations and alignment.

### 3.8 JOINTS IN PIPES

- A. Concrete Pipe – Maintain pipe alignment and prevent infiltration of fill material at joints during installation. Manufacturer’s recommendations and requirements shall be followed.

All joints shall receive one layer of filter fabric completely around exterior of the joint. Filter fabric shall be a minimum of 2 feet wide, centered on the joint, and overlapped a minimum of 1 foot.

- B. Corrugated Aluminum Pipe – Maintain pipe alignment and prevent infiltration of fill material at joints during installation.
  - 1. Installation of Gaskets – Shall be in accordance with recommendations of the manufacturer in regard to use of lubricants and cements and other special installation requirements. Gasket shall be placed over one end of a section of pipe for half the width of a gasket. The other half shall be doubled over end of same pipe. When adjoining section of pipe is in place, the double-over half of gasket shall then be rolled over the adjoining section. Any unevenness in overlap shall be corrected so gasket covers ends of pipe sections equally. Connecting bands shall then be centered over the adjoining sections of pipe, and rods or bolts placed in position and nuts tightened. The band shall be tightened evenly. Tension shall be kept on rods or

bolts and gasket shall be closely observed to see it is seating properly in the corrugations.

2. Installation of Filter Fabric at Joint – After the connecting band has been tightened; Contractor shall place one layer of filter fabric completely around exterior of joint, a minimum of 2 feet wide, centered on joint, and overlapped a minimum of 1 foot.
- C. Polyethylene and PVC Pipe – Maintain pipe alignment and prevent infiltration of fill material at joints during installation
1. Joints shall be gasketed soil-tight and water-tight bell and spigot meeting ASTM F2306. Gaskets shall meet the requirements of ASTM F477. A joint lubricant supplied by manufacturer shall be used on the gasket and bell during assembly. Spigot end of pipe shall be inserted into bell using methods recommended by the manufacturer. Pipe shall be kept true to line and grade during assembly.
  2. Installation of Filter Fabric at Joint – All polyethylene pipe joints shall receive one layer of filter fabric completely around exterior of the joint. Filter fabric shall be a minimum of 2 feet wide, centered on the joint, and overlapped a minimum of 1 foot.
- D. Subgrade Drain Tubing – Joints shall be joined using snap couplings. When installing sock wrapped pipe, overlap sock ends over coupling and secure with polyethylene tape.

### 3.9 FIELD QUALITY CONTROL

- A. Soil and density tests shall be made by a testing laboratory acceptable to the Engineer. Laboratory tests of the soil shall be made in accordance with ASTM D 1557. In-place density tests shall be made in accordance with ASTM D 6938. Results of tests shall be furnished to the Engineer.

The minimum number of tests required shall be:

Haunching and Initial

Backfill in all areas.... 1 per 100-linear feet of pipe, minimum of one per run of pipe for both the haunching and initial backfill zones.

Final Backfill over pipe

in traffic areas..... 1 per 100-linear feet or less for each 4-feet of depth or portion thereof.

Final Backfill over pipe

in non-traffic areas.... 1 per 500-linear feet or less for each 6-feet of depth or portion thereof.

The minimum percent of compaction of the backfill material (in accordance to ASTM D1557) shall be the following:

In traffic Areas. . . . . 98% of maximum laboratory density.

In non-traffic Areas . . . 90% of maximum laboratory density, unless otherwise accepted by the Engineer.

- B. It is the Contractor's responsibility to assure backfill is sufficient to limit pipe deflection to no more than 5%. When flexible pipe is used, a deflection test shall be made by the Contractor on entire length of installed pipeline, not less than 30-days after completion of all backfill and placement of any fill. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. The ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 95% of inside pipe diameter. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. The device shall be center bored and through bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of 70,000 p.s.i. or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer; a pull exerted on opposite end of shaft shall produce compression throughout remote end of ball, cylinder, or circular section. Circular sections shall be spaced so the distance from external faces of front and back sections shall equal or exceed diameter of circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through by hand or by being flushed through with water, shall be cause for rejection of a run. When a deflection device is used for the test in lieu of a ball, cylinder, or circular sections described, such device shall be given acceptance prior to use. Device shall be sensitive to 1.0% of pipe diameter being measured and shall be accurate to 1.0% of the indicated dimension. Installed pipe showing deflections greater than 5% of normal pipe diameter shall be retested by a run from the opposite direction. If retest also fails, the suspect pipe shall be repaired or replaced at no cost to Owner.
- C. 50% of pipes under roadways shall be televised and video recorded. The video observation shall include a complete pan view of each joint. If the video observation indicates problems, further televising may be required. Additional televising and video recording will be at no additional cost to the Owner.

### 3.10 DRAINAGE STRUCTURES

- A. Drainage structures shall be constructed of materials specified for each type and in accordance with details shown on the drawings.

### 3.11 REMOVE AND REPLACE PAVEMENT

- A. Pavement shall only be removed after prior written authorization by the Owner. Pavement removed and replaced shall be constructed in accordance with latest specifications of the State Department of Transportation. Traffic shall be maintained and controlled per State Department of Transportation regulations.

### 3.12 CONNECT PIPE TO EXISTING STRUCTURES

- A. Contractor shall connect pipe to the existing structure where indicated. For brick or precast structures, a hole not more than 4 inches larger than outside diameter of new pipe shall be cut or cored neatly in the structure, new pipe laid so it is flush with inside face of structure, and annular space around pipe filled with a damp, expanding mortar or grout to make a watertight seal.

END OF SECTION

## SECTION 334726.15 - BIORETENTION FACILITIES

### PART 1 – GENERAL

#### 1.1 DESCRIPTION

- A. The work covered in this section consists of piping, soil preparation, fine grading, protection, and maintenance of bioretention facilities until acceptance. Bioretention facilities are small landscaped basins intended to provide water quality management by filtering stormwater runoff before release into storm drain systems. This work shall consist of installing bioretention facilities as specified in the Contract Documents, including all materials, equipment, labor, and services required to perform the work.

#### 1.2 RELATED WORK

- A. Section 310000 – Earthwork
- B. Section 329000 – Planting
- C. Section 329200 – Turf and Grasses
- D. Section 334000 – Storm Drainage Utilities

#### 1.3 QUALITY ASSURANCE

- A. Qualifications of Workmen: Contractor shall provide at least one person present at all times during execution of work that is thoroughly familiar with the type of materials being installed and proper equipment and methods for their installation and who shall direct all work performed under this section.

#### 1.4 MEASUREMENT AND PAYMENT

- A. Bioretention Swale – Payment will be included in the contract lump sum price. Payment will include all equipment, labor, and materials necessary to complete the work.
- B. Bioretention Basin – Payment will be included in the contract lump sum price. Payment will include all equipment, labor, and materials necessary to complete the work.

### PART 2 – PRODUCTS

#### 2.1 MATERIALS

- A. Contractor shall, at time of delivery, furnish Engineer and/or Landscape Architect invoices of all materials received, in order the quality and source of materials may be determined.

## 2.2 BIORETENTION SOIL MIXTURE

- A. The Bioretention Soil Mixture (BSM) is a mixture of planting soil, mulch, and sand consisting of the following:

ITEM	COMPOSITION BY VOLUME	REFERENCE
Planting Soil	30%	See below
Shredded 2x Hardwood Mulch	20%	See below
Sand	50%	ASTM C33 Fine Aggregate

The USDA textural classification of the Planting Soil for the BSM shall be LOAMY SAND OR SANDY LOAM. The Planting Soil shall be salvaged or furnished. Additionally, the Planting Soil shall be tested and meet the following criteria:

ITEM	PERCENT BY WEIGHT	TEST METHOD
Sand (2.0 – 0.050 mm)	50 – 85%	AASHTO T88
Silt (0 – 0.050 – 0.002 mm )	0 – 50%	AASHTO T88
Clay (less than 0.002 mm)	10 – 20%	AASHTO T88
Organic Matter	1.5 – 10%	AASHTO T194

The textural analysis for the Planting Soil shall be as follows:

ASTM E11 SIEVE SIZE	MINIMUM PERCENT PASSING BY WEIGHT
2 in.	100
No. 4	90
No. 10	80

At least 45 days prior to starting construction of bioretention facilities, Contractor shall submit source of Planting Soil for the BSM to Engineer for acceptance. No time extensions will be granted should the proposed Planting Soil fail to meet minimum requirements stated above. Once a stockpile of Planting Soil has been sampled, no material shall be added to the stockpile.

The Bioretention Soil Mixture (BSM) shall be a uniform mix, free of stones, stumps, roots, or other similar objects larger than two inches excluding mulch. No other materials or substances shall be mixed or dumped within the bioretention area that may be harmful to plant growth, or prove a hindrance to planting or maintenance operations.

The Bioretention Soil Mixture shall be tested and meet the following criteria:

ITEM	CRITERIA	TEST METHOD
Corrected pH	5.5 – 7.5	ASTM D4972
Magnesium	Minimum 32 ppm	*
Phosphorus (Phosphate – P <sub>2</sub> O <sub>5</sub> )	Not to exceed 69 ppm	*
Potassium (K <sub>2</sub> O)	Minimum 78 ppm	*
Soluble Salts	Not to exceed 500 ppm	*

\*Use authorized soil test procedures.

Should pH fall outside of the acceptable range, it may be modified with lime (to raise) or iron sulfate plus sulfur (to lower). The lime or iron sulfate must be mixed uniformly into the BSM prior to use in bioretention facilities.

Should the BSM not meet minimum requirements for magnesium, it may be modified with magnesium sulfate. Likewise, should the BSM not meet minimum requirement for potassium, it may be modified with potash. Magnesium sulfate and potash must be mixed uniformly into the BSM prior to use in bioretention facilities.

Planting soil and/or BSM failing to meet minimum requirements shall be replaced at no additional cost to the Owner. Mixing of corrective additives to the BSM is incidental and shall be at no additional cost to Owner.

Mixing of the BSM to a homogeneous consistency shall be done to the satisfaction of the Engineer.

## 2.3 LIMESTONE

- A. Limestone shall contain not less than 85 percent calcium and magnesium carbonates. Dolomitic (magnesium) limestone shall contain at least 10 percent magnesium as magnesium oxide and 85 percent calcium and magnesium carbonates.

Limestone shall conform to the following gradation:

SIEVE SIZE	MINIMUM PERCENT PASSING BY WEIGHT
No. 10	100
No. 20	98
No. 100	50

2.4 IRON SULFATE

- A. Iron sulfate shall be a constituent of an acceptable horticultural product produced as a fertilizer for supplying iron and as a soil acidifier.

2.5 MAGNESIUM SULFATE

- A. Magnesium sulfate shall be a constituent of an acceptable horticultural product produced as a fertilizer.

2.6 POTASH

- A. Potash (potassium oxide) shall be a constituent of an acceptable horticultural product produced as a fertilizer.

2.7 MULCH

- A. Shredded hardwood bark shall consist of the bark from hardwood trees which has been milled and screened to a maximum 3–inch particle size and provide a uniform texture free from sawdust, foreign materials, and any artificially introduced chemical that would be detrimental to plant or animal life.

2.8 UNDERDRAIN

- A. Underdrains shall be heavy-duty corrugated polyethylene perforated sock pipe manufactured by Advanced Drainage Systems (ADS) or equivalent and shall conform to ASTM F405.

PART 3 – EXECUTION

3.1 CONSTRUCTION

- A. Bioretention facilities shall not be constructed until all contributing drainage areas are stabilized as shown on Contract Plans and to the satisfaction of Engineer. Bioretention facilities shall not be used as sediment control facilities. No heavy equipment shall operate within the perimeter of a bioretention facility during excavation, underdrain placement, backfilling, planting, or mulching of the facility.

3.2 EXCAVATION

- A. The bioretention facility shall be excavated to dimensions, side slopes, and elevations shown on Contract Plans. Method of excavation shall minimize compaction of the bioretention facility bottom. Excavators and backhoes, operating adjacent to the bioretention facility, shall be used to excavate facility if possible. Low ground–contact pressure equipment may also be used for excavation. No heavy equipment shall be allowed on the bioretention facility bottom. Excavated materials shall be removed from the bioretention facility site.

Prior to placing the underdrain and BSM, bottom of excavation shall be roto–tilled to a minimum depth of 6–inches to alleviate any compaction of the facility bottom. Any substitute method for roto–tilling must be accepted by the Engineer prior to use. Any ponded



water shall be removed from bottom of facility and the soil shall be friable before roto-tilling.

### 3.3 UNDERDRAIN

- A. The underdrain system shall be placed on a bed of washed No. 57 aggregate. The minimum thickness of No. 57 aggregate shall be 12 inches. Underdrain shall be covered with 6 inches No. 57 aggregate. All aggregate shall be placed according to dimensions shown on the Contract Plans.

Observation wells/cleanouts of 6-inch non-perforated pipe shall be placed vertically in the bioretention facility as shown on Contract Plans. Wells/cleanouts shall be connected to the perforated underdrain with appropriate manufactured connections as shown on the Contract Plans. Wells/cleanouts shall extend 6 inches above top elevation of the bioretention facility mulch, and shall be capped with a screw cap. The ends of underdrain pipes not terminating in an observation well/cleanout shall be capped.

### 3.4 PLACEMENT AND COMPACTION OF THE BIORETENTION SOIL MIXTURE

- A. A Bioretention Soil Mixture (BSM) shall be placed and graded using low ground-contact pressure equipment or by excavators and/or backhoes operating on ground adjacent to the bioretention facility. No heavy equipment shall be used within perimeter of the bioretention facility before, during, or after placement of BSM. BSM shall be placed in horizontal layers not to exceed 12 inches for entire area of the bioretention facility. BSM shall be compacted by saturating entire area of the bioretention facility after each lift of BSM is placed until water flows from underdrain. Water for saturation shall be applied by spraying or sprinkling. An appropriate sediment control device shall be used to treat any sediment-laden water discharged from the underdrain. If the BSM becomes contaminated during construction of facility, contaminated material shall be removed and replaced with uncontaminated material at no additional cost to Owner. Final grading of the BSM shall be performed after a 24-hour settling period. Final elevations shall be within 2 inches of elevations shown on the Contract Plans.

### 3.5 MULCHING

- A. Once plants are in place, the entire bioretention facility shall be mulched to a uniform thickness of 3 inches. Well aged (minimum age of 6 months) shredded hardwood bark mulch is the only acceptable mulch.

### 3.6 CLEAN UP

- A. Contractor is responsible for removing all trash, debris, rubbish and all other materials associated with the construction from site on a daily basis. All tags, flags, and labels will be removed from plants and trees. The site shall be left broom clean and tidy. Clean up of the site is a prerequisite to final acceptance by the Owner.

### 3.7 MAINTENANCE

- A. All Bioretention Facilities shall be protected and maintained by the Contractor immediately after installation.
- B. Maintenance shall include but is not limited to weeding, cultivating, mulch reapplication, removal of dead material, and other necessary operations.
- C. The Contractor shall repair immediately any areas damaged as a result of construction operations or erosion.
- D. The Contractor will be responsible for maintenance until time of Owner acceptance.

END OF SECTION