100% PROJECT MANUAL

COMMERCE 2.0 MGD GROVE CREEK WPCP

COMMERCE, GEORGIA

for

CITY OF COMMERCE

BID DOCUMENTS

March 2025

Prepared By

Goodwyn Mills Cawood, LLC
6120 Powers Ferry Road NE
Suite 200
Atlanta, GA 30339
T: 770.952.2481
www.gmcnetwork.com

GMC PROJECT NUMBER: CATL230033

STATE OF GEORGIA
GOODWYN MILLS CAWOOD, LLC
No.PEF007898
Exp.06.30.2026
CERTIFICATE OF AUTHORIZATION

GEORGIA
REGISTERED
No. PE051452
PROFESSIONAL
Graham Sizemore
03.19.2025
ENGINEER
GRAHAM S. SIZEMORE

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Goodwyn Mills Cawood, LLC
Post Office Box 242128
Montgomery, AL 36124-2128
and
Birmingham, Alabama
Andalusia, Alabama
Auburn, Alabama
Daphne, Alabama
Eufaula, Alabama
Huntsville, Alabama
Mobile, Alabama
Vernon, Alabama
Lutz, Florida
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COMMERCE 2.0 MGD GROVE CREEK
WATER POLLUTION CONTROL PLANT

FOR

CITY OF COMMERCE

COMMERCE, GEORGIA

GMC PROJECT NO. CATL230033

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SECTION 31 05 16 - AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Coarse aggregate materials.
2. Fine aggregate materials.
3. Rip Rap materials.

B. Related Sections:

1. Section 31 20 00 Earth Moving.
2. Section 31 25 00 Erosion and Sedimentation Control: Slope protection and erosion control.
3. Section 31 50 00 Excavation Support and Protection.
4. Section 32 91 13 Soil Preparation
5. Geotechnical Report

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3).
4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
5. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

C. Georgia Department of Transportation (GDOT). *Standard Specifications for Highway Construction*, latest edition.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work according to the Georgia Department of Transportation, Standard Specifications, Construction of Roads and Bridges, latest edition.

C. Maintain one copy of each document on site.

PART 2 - PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Aggregate Designation: Graded Coarse Aggregates, Graded Fine Aggregates, Rip Rap

1. Conform to the GDOT , *Standard Specifications, Construction of Transportation Systems*, latest edition, Section 800 - Graded Coarse Aggregatess.

2. Conform to the GDOT, *Standard Specifications, Construction of Transportation Systems,* latest edition, Section 801 - Graded Fine Aggregates.

3. Conform to the GDOT, *Standard Specifications, Construction of Transportation Systems,* latest edition, Section 805 - Rip Rap.

B. Coarse Aggregate: No.3

1. Percent Passing per Sieve Size:

a.	2 1/2 inches:	100
b.	2 inches:	90 to 100
c.	1 1/2 inches:	35 to 70
d.	3/4 inch:	n/a
e.	1/2 inch:	0 - 5
f.	3/8 inches:	n/a
g.	No. 4:	n/a
h.	No. 8:	n/a
i.	No. 16:	n/a

C. Coarse Aggregate: No.57

1. Percent Passing per Sieve Size:

a.	2 inches:	n/a
b.	1 1/2 inches:	100
c.	1 inch:	95 - 100
d.	3/4 inch:	n/a
e.	1/2 inch:	25 - 60
f.	3/8 inches:	n/a
g.	No. 4:	0 - 10
h.	No. 8:	0 - 5
i.	No. 16:	n/a
j.	No. 100:	n/a

D. Coarse Aggregate: No.67
1. Percent Passing per Sieve Size:

a.	2 inches:	n/a
b.	1 1/2 inches:	n/a
c.	1 inch:	100
d.	3/4 inch:	90 - 100
e.	1/2 inch:	n/a
f.	3/8 inches:	20 - 55
g.	No. 4:	0 - 10
h.	No. 8:	0 - 5
i.	No. 16:	n/a
j.	No. 100:	n/a

E. Coarse Aggregate: No.9
1. Percent Passing per Sieve Size:

a.	1/2 inch:	n/a
b.	3/8 inch:	100
c.	No. 4:	85 - 100
d.	No.8:	10 - 40
e.	No.16:	0 - 10
f.	No.50:	0 - 5

F. Fine Aggregate: No. 10NS (Natural Concrete Sand)
1. Percent Passing per Sieve Size:

a.	3/8 inch:	100
b.	No.4:	95 - 100
c.	No.16:	45 - 95
d.	No.50:	8 - 30
e.	No.100:	1 - 10
f.	No.200:	0 - 3

G. Fine Aggregate: No. 20NS (Natural Mortar Sand)
1. Percent Passing per Sieve Size:

a.	3/8 inch:	100

b. No.4: 100
c. No.16: 90 - 100
d. No.50: 15 - 50
e. No.100: 0 - 15
f. No.200: 0 - 5

H. Fine Aggregate: No. 10SM (Standard Manufactured Concrete Sand)
1. Percent Passing per Sieve Size:

a. 3/8 inch: 100
b. No.4: 95 - 100
c. No.16: 45 - 95
d. No.50: 8 - 30
e. No.100: 1 - 10
f. No.200: 0 - 4

I. Fine Aggregate: No.10FM (Fine Manufactured Concrete Sand)
1. Percent Passing per Sieve Size:

a. 3/8 inch: 100
b. No.4: 95 - 100
c. No.16: 45 - 95
d. No.50: 15 - 42
e. No.100: 8 - 22
f. No.200: 3 - 9

J. Aggregate: Riprap Type I
1. Provide riprap conforming to the gradation classes in the following:
a. Rock Volume (ft^3): 4.2, Rock Approximate Weight (lbs): 700, Percent of Riprap Smaller Than: 100.
b. Rock Volume (ft^3): 1.8, Rock Approximate Weight (lbs): 300, Percent of Riprap Smaller Than: 50 - 90.
c. Rock Volume (ft^3): 0.8, Rock Approximate Weight (lbs): 125, Percent of Riprap Smaller Than: 20 - 65.

K. Aggregate : Riprap Type III
1. Provide riprap conforming to the gradation classes in the following:
a. Rock Volume (ft^3): 1.0, Rock Approximate Weight (lbs): 165, Percent of Riprap Smaller Than: 100.
b. Rock Volume (ft^3): 0.1, Rock Approximate Weight (lbs): 15, Percent of Riprap Smaller Than: 10 - 65.

2.2 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and inspection services.

B. Coarse Aggregate Material - Testing and Analysis: Perform according to AASHTO T96 or ASTM C131 and AASHTO T11.

C. Fine Aggregate Material - Testing and Analysis: Perform according to ASTM D1557 or AASHTO T180.

D. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.1 INSTALLATION OF RIP RAP

A. All rip-rap shall be embedded in place so that the top surfaces are at the grade established for the surface of rip-rap. The inclusion of objectionable quantities of overburden and rock dust will not be permitted. The rock fragments in rip-rap need not be compacted, but shall be dumped and graded off in a manner to ensure that the larger rock fragments are uniformly distributed and that the small rock fragments serve to fill the spaces between the layer of rip-rap of the specified thickness. Hand placing will be required only to the extent necessary to secure the results specified herein.

B. Unless otherwise specified or shown, rip-rap shall have a minimum thickness of 12”.

C. The Contractor shall maintain the rip-rap until accepted and any material displaced by any cause shall be replaced to the lines and grades shown on the plans.

D. All rip-rap shall be underlain by an approved geotextile fabric to prevent erosion.

3.2 INSTALLATION OF CRUSHED STONE

A. Crushed stone shall be placed in areas shown on the drawings. Stone shall be consolidated by mechanical means.

B. Unless otherwise specified or shown, crushed stone shall have a minimum thickness of 6”.

C. All crushed stone shall be underlain by an approved geotextile fabric to prevent erosion

3.3 STOCKPILING

A. Stockpile materials on site at locations designated by Architect/Engineer.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

E. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.4 STOCKPILE CLEANUP

A. Leave unused materials in neat, compact stockpile.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 31 05 16

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities or abandoning site utilities in place.
8. Initial erosion and sedimentation control.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; and free of weeds, roots, toxic materials, or other non-soil materials.

E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and as indicated on Drawings. Defined by a circle concentric with each tree with a radius 105 times the diameter of the drip line unless otherwise indicated.

G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct Conference at Project Site

1.5 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.

B. Topsoil stripping and stockpiling program.

C. Rock stockpiling program.

D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

E. Burning: Not allowed.

1.7 QUALITY ASSURANCE

A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.8 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's property offsite.

C. Utility Locator Service: Notify “Call Before You Dig” for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant protection measures are in place.

E. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."

1. Obtain approved borrow soil material on-site for construction area as indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

A. Contractor will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities, if required.
2. Contractor will arrange to shut off indicated utilities that cannot be cut off by contractor (gas, electric, communication).

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than 2 days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer’s written permission.

E. Excavate for and remove underground utilities indicated to be removed.

F. Arrange for temporary pumping if necessary for sewer main work.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods or air spade for grubbing within protection zones.
4. Chip removed tree branches and stockpile in areas approved by Engineer.

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

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

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 4 inches, or per Geotechnical Report, in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 1 inch in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.6 STOCKPILING ROCK

A. Remove from construction area naturally formed rocks that measure more than 1 foot across in least dimension. Do not include excavated or crushed rock.

1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

B. Stockpile rock away from edge of excavations without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.

1. Limit height of rock stockpiles to 72 inches.
2. Do not stockpile rock within protection zones.
3. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile Topsoil and reuse on lawn areas.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Burning: Not allowed.

C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for process structures and buildings walks and pavements.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:

1. Section 01 32 00 "Construction Progress Documentation" Section 01 32 33 "Photographic Documentation" for recording pre-excavation and earth-moving progress.
2. Section 03 30 00 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
3. Section 31 10 00 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
4. Section 31 23 19 "Dewatering" for lowering and disposing of ground water during construction.
5. Section 32 92 00 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch (1065-mm-) maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.
3. Blasting may be required for foundation preparation.

I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd**.** or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.

J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

M. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference:

1. Review methods and procedures related to earthmoving, including, but not limited to, the following:

a. Personnel and equipment needed to make progress and avoid delays.
b. Coordination of Work with utility locator service.
c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
d. Extent of trenching by hand or with air spade.
e. Field quality control.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Geofoam.
4. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: 12 by 12 inches.
2. Warning Tape: 12 inches long; of each color.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and off-site soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698.

C. Blasting plan approved by City of Commerce.

D. Seismic survey report from seismic survey agency.

E. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.7 QUALITY ASSURANCE

A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:

1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

C. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.8 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Engineer.

C. Utility Locator Service: Notify "Call Before You Dig" for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 31 10 00 "Site Clearing" are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

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

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:

    a. Grab Tensile Strength: 157 lbf ; ASTM D 4632.
    b. Sewn Seam Strength: 142 lbf ; ASTM D 4632.
    c. Tear Strength: 56 lbf ; ASTM D 4533.
    d. Puncture Strength: 56 lbf ; ASTM D 4833.

3. Apparent Opening Size: No. 40, No. 60 sieve, maximum; ASTM D 4751.
4. Permittivity: [**0.5**] [**0.2**] [**0.1**] per second, minimum; ASTM D 4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:

    a. Grab Tensile Strength: 247 lbf ; ASTM D 4632.
    b. Sewn Seam Strength: 222 lbf ; ASTM D 4632.
    c. Tear Strength: 90 lbf ; ASTM D 4533.
    d. Puncture Strength: 90 lbf ; ASTM D 4833.

3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
4. Permittivity: 0.02 per second, minimum; ASTM D 4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting**,** low-density, flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150, Type I.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33, 3/4-inch, or 3/8-inch nominal maximum aggregate size.
4. Foaming Agent: ASTM C 869.
5. Water: ASTM C 94.
6. Air-Entraining Admixture: ASTM C 260.

B. Produce low-density, controlled low-strength material with the following physical properties:

1. As-Cast Unit Weight: 30 to 36 lb/cu. ft., or 36 to 42 lb/cu. ft. at point of placement, when tested according to ASTM C 138.
2. Compressive Strength: 80 psi, or 140 psi, when tested according to ASTM C 495.

C. Produce conventional-weight, controlled low-strength material with 80-psi 140-psi compressive strength when tested according to ASTM C 495.

2.4 GEOFOAM (NOT USED)

2.5 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Retain one of two "Explosives" paragraphs below. Retain second paragraph if explosives are permitted.

B. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.

1. Perform blasting without damaging adjacent structures, property, or site improvements.
2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

a. 24 inches outside of concrete forms other than at footings.
b. 12 inches outside of concrete forms at footings.
c. 6 inches outside of minimum required dimensions of concrete cast against grade.
d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
e. 6 inches beneath bottom of concrete slabs-on-grade.
f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42inches.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Engineer. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.

a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

a. 24 inches outside of concrete forms other than at footings.
b. 12 inches outside of concrete forms at footings.
c. 6 inches outside of minimum required dimensions of concrete cast against grade.
d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
e. 6 inches beneath bottom of concrete slabs-on-grade.
f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to minimum 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3.8 SUBGRADE INSPECTION

A. Notify Engineer when excavations have reached required subgrade.

B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs, plant structures and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 03 30 00 - Cast-in-Place Concrete.

D. Trenches under Roadways: Provide 4-inch thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 03 30 00 - Cast-in-Place Concrete.

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

    a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 GEOFOAM FILL (NOT USED)

3.15 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 95

3.17 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1/2 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.18 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.
2. Place and compact impervious fill over drainage backfill in 6-inch thick compacted layers to final subgrade.

3.19 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase course and base course to required crown elevations and cross-slope grades.
4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.20 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.21 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material classification and maximum lift thickness comply with requirements.
3. Determine, during placement and compaction that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.22 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Engineer.
1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

SECTION 31 23 16.13 – EXCAVATION AND TRENCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating trenches for utilities
2. Compacted fill from top of utility bedding
3. Backfilling and compaction

B. Related Requirements

1. 31 10 00 – Site Clearing
2. 31 23 16.26 – Rock Removal
3. 33 05 13 – Manholes and Structures
4. 33 31 00 – Sanitary Utility Sewerage Piping
5. 33 41 16 – Public Storm Utility Drainage Piping

1.2 REFERENCE STANDARDS

A. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

B. ASTM D2487 – Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

C. ASTM D488 – Standard Sizes of Coarse Aggregate

D. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400-ft-lbf/ft^3 (600 kN-m/m^3))

E. AASHTO T 99 – Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in) Drop

F. AWWA C600 – Installation of Ductile-Iron Mains and Their Appurtenances

G. 29 CFR PART 1926 (OSHA) – Safety and Health Regulations for Construction

1.3 SUBMITTALS

A. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan. The plan shall be stamped by a qualified professional engineer registered in the state where the project is located.

B. Method of dewatering including type of systems, equipment, material, and other pertinent data of dewatering system. The system shall be designed by a qualified professional engineer registered in the state where project is located.

C. Product Data

1. Geotextile fabric
2. Bedding materials
3. Restoration materials

D. Materials Source: Name and location of imported fill materials suppliers.

E. Classification of imported materials by Laboratory analysis or other certification.

F. Submit information found from test boring and pits.

1.4 QUALITY ASSURANCE

A. Perform Work according latest requirements of OSHA excavation safety standards and all applicable state and local requirements.

B. Design of excavation support and stabilization systems shall be performed by a professional engineer, registered in the State where the project is located, with at least five (5) years of experience in design of similar excavation support systems.

C. Design of the dewatering system shall be performed by a professional engineer, registered in the State where the project is located with at least five (5) years of experience in design of similar dewatering systems.

1.5 FIELD MEASUREMENTS

A. Prior to construction, the Contractor shall be responsible for taking sufficient measurements, horizontal and vertical, to ensure that all existing facilities, which includes but is not limited to; pavements, curbs, gutters, drainage facilities, fences, gates, mailboxes, signs, guardrails, markers, and monuments are restored to their original lines and grades.

1.6 COORDINATION

A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

B. The Contractor shall comply with the requirements of all encroachment permits obtained for the work. If the Contractor wishes to deviate from the permit requirements he shall obtain a revision to the permit at no additional cost to the Owner.

C. Any additional Permit applications from State or County Highway Departments, Municipal Street Departments, Railroads, and Utility Companies shall be prepared by the Contractor.

Permit applications shall be prepared by the Contractor even though the permanent contract agreement is made between the Controlling Authority and the Owner.

D. The Contractor will be required under the terms of this contract to furnish the performance bond, insurance coverage, and any other security required by the Controlling Authority, either directly from him or indirectly from the Owner.

E. The Contractor shall include in the amount bid for this item all costs related to field staking, measurements and surveys, sketches and drawings, and permit application form completion, bonds and insurance as required by the Controlling Authority. The Contractor shall also pay the cost of any supervision by an Inspector of the Controlling Authority if such is stipulated in the permit.

PART 2 - PRODUCTS

2.1 GENERAL

A. All excavation shall be "unclassified" unless it can be classified as "rock" excavation as specified in Section 31 23 16.26 of these specifications.

B. Soils type shall be based upon ASTM D2487, Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

C. Stone or Coarse Aggregate type shall be based upon ASTM D488, Standard Sizes for Coarse Aggregates.

D. Rip rap type shall be based upon State Department of Transportation Standards.

2.2 MATERIALS

A. Structural backfill shall be imported or excavated trench material meeting the following requirements:

1. Class I through III per ASTM D2321
2. Free of clay lumps, roots, debris, rubbish, frozen material, and stones larger than one inch in diameter, have < 35% fines, and capable of being compacted to 95% density per AASHTO T-99.

B. Common backfill material shall consist of excavated materials meeting the following requirements:

1. Class I through III per ASTM D2321
2. Highly organic silts, clays and Class IV and V materials shall not be used.
3. Materials shall be free roots, stumps, debris, rubbish, frozen material, and stones larger than one inch in capable of being compacted to 85% density per AASHTO T-99.
4. Contain no stone blocks, broken concrete, masonry rubble, or other similar materials.
5. Physical properties such that it can be readily spread and compacted during filling.
6. Snow, ice, and frozen soil will not be permitted.

C. Crushed Stone:

1. Crushed stone for pipe bedding, structure bases, and other used indicated on the Drawings shall be angular, clean-washed, crushed stone graded in accordance with size #5 or #5 in ASTM D488.

D. Foundation Conditioning Material: Crusher-run rock, conforming to ASTM D448.

E. Geotextile Fabric shall be used as directed by the Engineer or as indicated on the Drawings and shall conform to the following requirements:

1. Geotextile fabric shall be non-woven Mirafi, Type HP570, Type 140N; Dupont, Type PAR, Style 3401; or approved equal.

F. Trench Plugs:

1. Trench plugs shall be concrete filled sacks, Bentonite Clay or material having a "GC" soil rating per ASTM D2487 and shall have a coefficient of permeability no greater than 0.001 CM/SEC per ASTM D2434.
2. If excavated material is to be used the contractor shall submit verification and test results from a qualified laboratory that the material meets the classification and permeability specification above.

PART 3 - EXECUTION

3.1 LINES AND GRADES

A. Excavate trench as necessary to install pipes at indicated lines and grades at the depths specified on the drawings.

1. The Engineer may make changes in lines, grades, and depths of utilities when changes are required for Project conditions

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

A. Ensure sediment and erosion control measures are installed per the Drawings and Section 31 25 00 prior to performing any disturbing activity.

B. Complete site clearing operations per the Drawings and Section 31 10 00.

C. Contact local utility line information service not less than three (3) working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.

D. Identify required lines, levels, contours, and datum locations.

E. All trees, telephone and power line poles along the line of the work must be protected, and at night a sufficient number of barricades and lights to prevent accidents shall be provided. Where sewers are laid between the curb and the sidewalk or in other places where shrubbery and grass lawns are encountered, the Contractor shall carefully remove and replace the shrubbery and cut the grass sod in sections, laying it to the side and replacing it after the trench has been backfilled and allowed to settle.

F. Unless otherwise indicated on the Drawings, protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

G. Maintain and protect above and below grade utilities indicated to remain.

H. Establish temporary traffic control and detours when trenching is performed in public rights-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. All sheeting and shoring shall be furnished and placed in accordance with the requirements of OSHA Standards, Subpart P, Part 1926, of the Code of Federal Regulations.

C. Design sheeting and shoring to be left in place as part of completed Work, cut off minimum of 6” above the top of pipe and 18 inches below finished grade.

D. No sheeting installed closer than one (1) pipe diameter or two (2) feet (whichever is greater) from the outside edge of the pipe shall be withdrawn if driven below mid-diameter of any pipe. Any sheeting beyond these limits which is withdrawn shall be done in a manner in which the sheeting slides smoothly out of position without any disturbance of adjacent bedding. The remaining hole shall immediately be filled by hand with sand.

E. If trench sloping is substituted for shoring, the slope shall be in accordance with all OSHA requirements. Sloping of the pipe trench shall only be allowed at depths of ten (10) feet or less below existing grade. The sloping of the trench wall shall terminate twelve inches above the top of the pipe and, from that point to the trench bottom, the trench wall shall be vertical.

F. All excavations deeper than ten (10) feet below grade shall have appropriate excavation support systems from the bottom of the excavation to within a minimum of ten (10) feet from the top of the excavation.

G. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing at no additional cost to the Owner.

H. The Contractor may, at his option, use movable earth retaining devices (trench boxes) to stabilize excavations for pipes where these devices can be effectively used. Trench boxes shall not be considered as a substitute for sheeting systems specifically called out on the drawings. Trench boxes shall not be used for tunnel launch and exit shafts.

I. Where movable earth retaining devices such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and backfill.

J. Trench box systems shall be designed by a professional engineer registered in the State of Georgia. Design drawings and computations for non-commercial trench boxes shall be submitted to the Engineer for information prior to construction.

3.4 DEWATERING

A. The Contractor shall, at all times during construction, provide and maintain ample means and devices with which to promptly remove and properly dispose of all water entering the excavation or other parts of the work and shall keep said excavation and work dry until the structures to be built therein are completed, or until the Engineers direct the Contractor to discontinue dewatering operations. Wherever judged necessary by the Engineer, the Contractor shall employ well points to insure a dry excavation. No claims for an amount of money in excess of the bid price for the work will be entertained or allowed on account of the character of the ground in which the trench or other excavations are made.

B. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the sub-grade soils at the proposed bottom of the excavation. Groundwater shall be lowered to at least two (2) feet below the excavation level at all times.

C. The Contractor shall provide for the disposal of the water removed from the excavation in such a manner as not to cause erosion, siltation, or turbidity increases in any water course; injury to public health; degradation or damage to private or public property, to any portion of the work completed or in progress, or to roads or streets; or cause any impediment to the reasonable use of the site by others.

3.5 EXCAVATION & TRENCHING

A. Underpin adjacent structures which may be damaged by excavation work.

B. Trenches and excavations shall be open cut to proper depth and alignment for the installation of pipe, structures, and appurtenances as shown on the plans.

C. The minimum trench width shall be at least the nominal pipe diameter plus twenty-four (24) inches.

D. Remove lumped subsoil, boulders, and rock up of six (6) feet in diameter.

E. Slope banks with machine to angle of repose or less until shored.

F. Grade top perimeter of excavations to prevent surface water from draining into excavation.

G. Excavated material shall be stockpiled within the construction easement of the work.

1. The excavated material shall be piled on the side of the trench at least four (4) feet (horizontally) extending away from the top of the excavated trench so that a clear walkway will be maintained at the edge. Excavated material shall be kept clear of the sidewalks except where unusual conditions prevent this being done. All driveways shall be backfilled as soon as the pipe is laid and no driveway shall remain inaccessible at the end of the day's work.
2. Excavated material which has suitable characteristics for backfill shall be stockpiled in such a manner that it will not collect either surface water or rainwater. The stockpile top surface shall be sloped to drain away from the excavation site and graded smooth and compacted to drain rainwater rapidly. It shall be the Contractor's responsibility to control or adjust the moisture content of excavated materials to the requirements for common fill before such materials may be used for backfill at no additional cost to the Owner.

H. Excess excavation shall be disposed of offsite by the Contractor. All handling, hauling, and disposal costs shall be considered incidental to the work. Disposal shall be in compliance with all applicable regulations. Excess excavation shall be as described below:

1. All rocks, stumps, roots, and organic muck, clay, or silt lenses removed in the preparation of the excavation for common fill.
2. Soils which cannot qualify as common fill after preparation such as muck soils, high organic soil, or non-granular soil high in silt and clay content.
3. Excavated material remaining at the end of the work after all stockpiles, and prepared backfill has been utilized as needed.

I. Do not advance open trench more than fifty (**50)** feet ahead of the pipe laying unless prior approval is given by the Engineer

J. Excavate trenches to the bottom elevation of the bedding for structures and pipes. The width shall be at least two (2) feet beyond the neat lines of structure footings and as shown on the Drawings for pipelines. Over-excavation that is not directed in writing by the Engineer shall be backfilled with structural fill at no additional cost to the Owner.

K. Do not interfere with 45-degree bearing splay of foundations.

L. When subsurface materials at bottom of trench are loose or soft, excavate to; a depth of no more than one (1) foot below the trench bottom, unless additional depth is authorized by Architect/Engineer, or until suitable material is encountered. Backfill with foundation conditioning material to the original trench bottom compacted to 95% maximum density.
Underlay foundation conditioning material with geotextile overlapping each seam by a minimum eighteen (18) inches.

3.6 FOUNDATION, BEDDING AND EMBEDMENT

A. Foundation stone for structures and pipe shall be #5 or #57 stone placed to the minimum excavation widths as shown on the Drawings, and shall be at least 6 inches deep below the bottom of footings, base slabs, and to a depth as shown on the drawings below the bottoms of pipe.

B. Foundation stone shall be placed only on dry, stable, compacted subgrade or on rock.

C. Loose earth in the sub-grade shall not be acceptable. Where required, sub-grade compaction shall be with a vibratory type mechanical compactor.

D. Trim excavation. Hand trim for bell and spigot pipe joints.

E. No foundation contamination with earth shall be allowed. Immediately remove any earth mat that falls into the foundation during placement or compaction.

3.7 TRENCH PLUGS

A. An impervious clay ditch check or trench plug shall be required on the downstream side of all stream crossings, on both sides of all wetland crossings, where shown on the Drawings or as directed by the Engineer.

B. The trench plug shall be constructed for a length of three (3) feet as measured along the centerlines of the pipe and the full width of the trench excavation from the trench bottom to six (6) inches above the top of the pipe.

3.8 BACKFILLING

A. All trenches and excavations shall be backfilled immediately after the pipe has been laid and inspected. Backfill material shall be approved in all cases by the Engineer and shall be free of objectionable debris. Backfilling shall include the refilling and compacting the fills in the trenches or excavation to the existing ground surface or to the existing road subgrade.

B. Following the laying of the pipe, the pipe shall be centered in the trench, adjusted to line and grade and the initial bedding material shall be carefully placed on both sides of the pipe so as not to disturb the alignment and grade of the pipeline. The bedding material shall be sliced under the haunches of the pipe and compacted to fill all voids.

C. Backfill structures carefully, bringing the fill up evenly on all sides.

D. Bedding material shall consist of #5 or #57 to the depths shown on the plans.

E. Backfill material shall consist of crushed stone, structural, or common backfill depending upon location as detailed on the Drawings.

F. Cut out soft areas of subgrade not capable of compaction in place. Backfill with common backfill and compact to density equal to or greater than requirements for subsequent backfill material.

G. Maintain optimum moisture content of fill materials to attain required compaction density.

H. Do not leave trench or excavation open at end of working day.

3.9 COMPACTION

A. Foundation and bedding stone shall be installed in maximum 6-inch lifts, as placed, and compacted with suitable compaction equipment to at least 90% of maximum dry density or as

required by pipe manufacturers. Lift thickness shall be reduced to 4 inches in confined areas accessible only to hand-guided compaction equipment.

B. Structural backfill shall be placed in maximum 6-inch level layers and compacted to at least 95% of maximum dry density as determined by ASTM D698.

C. Common backfill shall be placed in maximum 12-inch layers and compacted to at least 90% of maximum dry density or as shown on the Drawings.

D. Trench Plugs shall be placed in maximum 6 inch lifts and compacted to 95% density per ASTM D698.

E. Compaction shall be by a vibratory-type mechanical compactor adjacent to structures and including between the pipe and trench sides, sheeting or trench box. Larger compaction equipment may be used as desired after backfill has reached at least two feet above the top of the pipe. For structures, the mechanical compactor shall be used between the structures and sheeting until the elevation at which sheeting is withdrawn, at which elevation the entire excavated area may be compacted with larger equipment if desired.

3.10 PROTECTION OF UTILITIES

A. The Contractor shall locate and protect all utilities which could be affected by the Work including but not limited to; overhead cables, poles, buried cables, duct banks, wastewater pipes, gas pipes, water pipes, and drainage pipes and appurtenances. Before working in any area, the Contractor shall contact the local utility locating service to mark the locations of underground utilities. Any underground utilities that could interfere with the work shall be staked and flagged.

B. Underground pipes and cables which cross the excavations shall be carefully exposed and temporarily supported by the Contractor to the satisfaction of the utility owner. The utility shall be carefully incorporated in the backfill with full support and protection. Length of utility support shall be based on actual field conditions.

C. Utility relocation shall be discussed at a meeting with the Engineer and utility owner.

D. Before operating any equipment near a buried or overhead electric cable, the contractor shall contact the owner of the cable to arrange for protection of the cable and the Contractor’s personnel and equipment.

E. At least 48 hours prior to operating any equipment near a buried gas pipe line that Contractor shall contact the owner of the line and inform them of the work.

F. Compliance with the conditions of the Owner of an electric or gas utility shall be considered a subsidiary obligation under the Contract.

G. The Engineer shall be invited to attend all meetings between the Contractor and utility owner for information only.

3.11 FIELD QUALITY CONTROL

A. The Contractor shall retain and pay for compaction tests performed by an independent testing firm acceptable to the Owner on the compacted backfill to verify compliance with these specifications.

B. Perform laboratory material tests according to ASTM D698, or AASHTO T 99 Method A.

C. Perform in place compaction tests according ASTM D2167 for density and ASTM D3017 for moisture content.

D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

E. Frequency of Tests:

1. Trenches: One location every 500 feet.
2. Structures (Manholes): Two locations around each manhole in separate lifts.
3. Structures: At least two-density test shall be made beneath each structure, or as directed by the Engineer.

3.12 MAINTENANCE

A. The Contractor shall maintain all project areas during the specified warranty period. Maintenance shall include the following:

1. Immediately filling and reseeding any eroded areas.
2. Reseeding any areas where a full stand of grass does not develop.
3. Removal and replacement of any trees which die or show distress.
4. Refilling and reseeding any backfilled areas which settle and develop depressions.

END OF SECTION 31 23 16.13

SECTION 31 23 16.26 – ROCK REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removing identified and discovered rock during excavation.
2. Expansive tools and blasting excavation to assist rock removal.

B. The use of explosives during construction shall be as specified herein. However, no blasting will be permitted which, in the blasting supervisor's judgment or the judgment of the Owner, may be detrimental to existing facilities or pipelines.

C. The Contractor shall be liable for all injuries to, or death of, persons, or damage to property caused by a blast or explosive, and he agrees by submission of a bid to indemnify and hold the Owner, its officers, agents, employees, volunteers and project consultants harmless from any and all liability claims, costs, expenses including expenses of investigation and defending against the same in regard thereto.

D. Controlled Blasting may be proposed by the Contractor as a means of excavating rock, but may not be allowed by the Owner. At least 30 calendar days in advance of any proposed blasting, Contractor shall submit to the Owner/Engineer a request for permission to blast that includes a general description of the proposed blasting activities, and the approximate location(s) and volume(s) of rock to be removed by blasting as well as a safety plans and blast plan as specified herein. The request shall be submitted in accordance with Specification Section 01 33 00 for approval by the Owner/Engineer. If the request for blasting is not approved by the Owner/Engineer, then rock must be removed by means other than blasting. If the request for blasting is approved by the Owner/Engineer, then the procedures for blasting shall conform to the requirements described herein.

E. Comply with the applicable rules, regulations and standards established by the Regulatory Agencies, codes and professional societies listed herein, including rules and regulations for storage, transportation, and use of explosives.

F. The Contractor shall employ the services of a Blast Control Specialist to design and approve all blasting procedures used in the removal of rock.

G. The Contractor shall employ a Seismic Survey Firm to conduct blast monitoring.

1.2 DEFINITIONS

A. Site Rock: Solid mineral material with volume in excess of 1 CY requiring blasting for removal or boulders in excess of 6 feet in diameter.

B. Trench Rock shall comprise of solid rock in the original bed, or well-defined ledges for which trenching cannot be accomplished by a ¾ - yard track type 320 CAT excavator equipped with a rock excavation bucket or penetrated with a D9 Cat w/ ripper or equivalent.

C. Controlled blasting is defined as the establishment of a free surface or shear plane in rock along the lines of the specified backslope by the controlled usage of explosives and blasting accessories in appropriately aligned and spaced drill holes.

1.3 SUBMITTALS

A. Request to Blast per Section 1.1.D.

B. Contractor shall submit the following:

1. Safety Plan for the Use of Explosives that meets all requirements of Section 1.6.
2. Blasting Control Plan meeting requirements of Section 1.6.
3. Post blast reports meeting all requirements of Section 1.6.
4. Copies of all required blasting permits.

C. Quality Control Submittals:

1. Qualifications of Blast Control Specialist: Submit at least thirty (30) days prior to blasting work.
2. Rock excavation plan describing details for Contractor's proposed rock excavation methods. Submit at least thirty (30) days prior to start of work.
3. Detailed blasting plan for each blast shall be submitted at least 48 hours prior to beginning any work for that blast.
4. Vibration and air-blast monitoring plan. Submit at least thirty (30) days prior to blasting work.
5. Qualifications of Blast Consultant. Submit at least thirty (30) days prior to blasting work.

D. Project Closeout Submittals.

E. Summary Report: Submit within thirty (30) days of completion of blasting.

1.4 QUALITY ASSURANCE

A. Blast Control Specialist: Must have a minimum of ten (10) years of experience with blast design and vibration and air-blast monitoring, and significant involvement as the Blast Control Specialist in a minimum of ten (10) previous projects of similar nature. The Blast Control Specialist shall be a licensed blaster in the State of Georgia and shall be subject to the approval of the Blast Consultant.

B. Blast Consultant: a licensed Seismic Survey Company specializing in seismic surveys with **five** years' experience.

1.5 SAFETY PLAN, BLAST PLAN AND RECORDS

A. General

1. No drilling or blasting work shall be performed until the Contractor's Safety Plan and Blasting Control Plan for such operations has been submitted and approved by the Owner/Engineer.
2. Prior to any blasting by the Contractor for the work, obtain the blasting permits required by Georgia and any applicable agency having jurisdiction. Notify the local fire department, local police department, and utilities having jurisdiction located in the general blast area. A copy of all permits required shall be submitted to the Owner/Engineer prior to drilling for blasting.
3. The transporting, handling, storage, and use of explosives shall conform to the governing state regulations.
4. If required by Owner, notify neighboring properties of blasting schedule.

B. Safety Plan

1. At a minimum of fourteen (14) days prior to the commencement of any work involving explosives, including drilling, submit a complete Safety Plan For The Use Of Explosives. A Blasting Safety Plan simply stating: “all regulations will be followed” will not be acceptable. Blasting Safety Plan shall include:

    a. Copies of all required blasting permits regarding explosive use and storage.
    b. Copies of Georgia Blasting Licenses, including proper initiation system and construction blasting endorsements, for all blasters overseeing blasting operations.
    c. A list of at least three previous projects of similar character, successfully completed. List shall include contact names and phone numbers of the Owner’s responsible project manager or Engineer.
    d. A complete description of the clearing and guarding procedures that will be employed to ensure personnel, staff, visitors, and all other persons are at safe locations during blasting. This information shall include details regarding visible warning signs or flags, audible warning signals, method of determining blast areas (all areas affected by any potentially harmful blast effects), access blocking methods, guard placement and guard release procedures, primary initiation method, and the system by which the blaster-in-charge will communicate with site security guards.
    e. Detailed contingency plans for handling of misfires caused by cutoffs or other causes.

2. A minimum of fourteen (14) days prior to commencement of any blasting operations, the Contractor shall be responsible for all notification required by his permits, but shall at a minimum notify all residences within 1200 feet of any blast at least 24 hours prior to the blast. Contractor shall be responsible for inspection of structures as required by his permits prior to the blast.
3. A blasting supervisor licensed by the State of Georgia and acceptable to the Owner/Engineer shall be on the site, and in immediate charge of the blasting operations. The license of the supervising blaster(s) shall contain endorsements for construction blasting and use of non-electric initiation systems. Such supervisor shall have no less than three years of continuous experience in controlled blasting on projects of similar character. A written description of the education and experience of this supervisor shall

be submitted to the Owner/Engineer. The description shall be specific and include references who are able to verify the details.

4. The Contractor shall retain the services of an outside Consultant regarding the prediction and control of ground vibration and air-overpressure. Such Consultant shall not be in the employ of the Contractor and shall be subject to the approval of the Owner. Consultant's qualifications shall be submitted to the Owner/Engineer in writing as part of the Blasting Control Plan.
5. Proper criteria and blast effects limitations for any given location and any given structures, residences, utilities, and any other facilities shall be evaluated and determined by the Contractor and by the approved Blasting Consultant.

C. Blasting Control Plan

1. Submit a Blasting Control Plan to the Owner/Engineer. No blasting operation, including drilling, shall start until the Owner/Engineer has reviewed and approved the Blasting Control Plan. Allow not less than two weeks for Owner/Engineer review of the Plan. In the event that additional or revised Blasting Control Plans are required, provide at least two weeks for the review of each additional plan. Approval of the Contractor's Blasting Control Plan or blasting procedures shall not relieve the Contractor of any of his responsibility for assuring the complete safety of his operations or for the successful completion of the work in conformity with the requirements of the Drawings and Standard Specifications. The Blasting Control Plan shall include:

    a. Details of controlled blasting techniques. Include plan and vertical section drawings showing hole locations, spacing, diameter and loading details for typical blastholes charges.
    b. All blast plan drawings shall indicate explosive types, amounts, priming method, initiator types, delay periods, and locations, charge firing times, stemming type and quantities, and typical charge weights.
    c. Plans for preventing overbreak or ground shifting that could threaten adjacent buried utilities. Plan shall include calculations showing predicted levels of vibration not exceeding 5.0 in/s at the nearest buried pipe.
    d. Methods of drilling, including equipment descriptions, and hole placement and alignment techniques.
    e. Hole Charging Methods: Primer make-up, placement of charges and inert stemming and method of securing detonators until tie-in.
    f. Initiation system hook-up methods and method of primary initiation.
    g. Methods for preventing spills or losses of explosives, drilling fluids, oil, or any other pollutants to ground during all handling and hole charging operations. Include details of all containment and contingency plans for quickly and effectively cleaning up any spilled materials.
    h. Method of safe and approved disposal of all explosive packaging materials.
    i. Copies of: 1) blasting permits, 2) blasters' licenses, and 3) explosive transporters' commercial driver’s licenses with Hazmat endorsements.
    j. The Blasting Control Plan shall indicate the type and method of instrumentation proposed to determine the ground motion particle velocity and air blast overpressure. The description shall include the manufacturer and model of the instrumentation, the source of the instrumentation (rented or owned and by whom). Include copies of calibration certificates issued by the equipment maker that confirm the instruments and transducers have been calibrated within the last twelve (12) months.

D. Records

1. Keep accurate records of each blast. Blasting records shall be available to the Owner/Engineer at all times and shall contain the following data as a minimum:

   a. Blast identification by numerical and chronological sequence.
   b. Location (referenced to pipeline stationing), date and time of blast.
   c. Type of material blasted.
   d. Number of holes, burden and spacing.
   e. Diameter and depth of holes.
   f. Height or length of stemming.
   g. Types of explosives used.
   h. Types of caps and delay periods used.
   i. Total amount of explosives used.
   j. Maximum amount of explosives per delay period of nine (9) milliseconds or greater.
   k. Powder factor (pounds of explosive per cubic yard of material blasted).
   l. Method of firing and type of circuit.
   m. Weather conditions (including wind direction).
   n. Direction and distance to nearest structure or position of concern.
   o. Type and method of instrumentation.
   p. Location and placement of instruments by plotting numbered locations on scaled maps to within +/- 1 foot where the equipment was placed.
   q. Instrumentation records and calculations for determination of ground motion particle velocity or for charge size based on scaled distance.
   r. An ongoing log-log plot of both vibration and air blast data. The Contractor or his consultant shall maintain an ongoing log-log plot of both ground vibration and air blast overpressures, and shall submit an updated plot to the Owner/Engineer after each blast, highlighting the newest data.
   s. Measures taken to limit air overpressure and fly rock.
   t. Any unusual circumstances or occurrences during blast.
   u. Name of Contractor.
   v. Name, license number and signature of responsible Blasting Supervisor.
   w. Summary report of all complaints including complaints regarding blasting-related damage.
   x. Method to notify other contractors, personnel on-site of a scheduled blast.
   y. Provide a summary report of all complaints, including complaints regarding blast-related damage.
   z. Within 24 hours after each blast, Contractor shall submit to the Owner/Engineer a summary report addressing items a through y above for compilation in a three-ring binder and have the Contractor's current blast reports so compiled and available for immediate review by authorities having jurisdiction, including the Owner/Engineer.

1.6 SEQUENCING AND SCHEDULING

A. Obtain seismic survey prior to rock excavation to determine maximum charges that can be used at different locations in area of excavation without damaging adjacent properties or other Work.

B. Blasting shall be restricted to 7:00 AM to 5:00 PM during any workday Monday through Friday, unless special circumstances warrant another time or day and special approval is granted in writing by the Owner and the agency having jurisdiction. For any blasting within 1,200 feet of a residence or commercial structure, blast only between the hours of 9:00 AM and 5:00 PM.

C. A preblast structure survey shall be conducted prior to start of blasting and a post-blast structure survey upon completion of blasting as specified herein.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furnish materials and equipment required for blasting operations and monitoring. Material usage, including transportation and storage, shall conform to all applicable regulatory agency and permit requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. In utility trenches, excavate to six (6) inches below invert elevation of pipe to the width indicated on the drawings. In no case shall any rock be left nearer than 6 inches from the outside of the pipe.

B. Remove rock at excavation bottom to form level bearing.

C. Remove shale layers to provide sound and unshattered base for footings.

D. Remove excavated materials from Site or use as site landscaping as directed by the Engineer.

E. Correct unauthorized rock removal according to backfilling and compacting requirements of Section 31 23 16.13 or as directed by Engineer.

3.2 ROCK REMOVAL BY MECHANICAL METHOD

A. Excavate and remove rock by mechanical method.

1. Drill holes and use expansive tools, wedges, and mechanical disintegration compound to fracture rock.

3.3 ROCK REMOVAL BY EXPLOSIVE METHODS

A. Approval of the Contractor's Blasting Control Plan shall not relieve the Contractor of any of his responsibility under the Contract for assuring the complete safety of his operation with respect to adjacent improvements so as to not aggravate the existing structural conditions or cause damage, or for the successful completion of the work in conformity with the requirements of the

Drawings and Standard Specifications. Such approval shall not operate to waive any of the requirements of the Standard Specifications nor relieve the Contractor of any regulation or permit obligation thereunder.

B. The handling, storing, loading, and firing of explosives shall be performed only by workmen experienced in blasting work.

C. Control fly rock and debris to prevent damage to persons, structures, existing improvements, or vegetation. Clean the blasting site of debris associated with the blasting operation at the end of each working day. Use blasting mats to “mattress” the trench during blasting operations. Equipment used for drilling of holes shall have a positive means of dust control.

D. Do not perform blasting closer than eight (8) feet to existing water, gas, sewer, or other buried utilities.

E. Blasting operations shall not be conducted within 25 feet of installed pipe; and rock excavation shall be completed at least 25 feet ahead of pipe laying.

F. Use controlled blasting techniques to keep the air blast overpressure, vibrations, and noise within the limits herein specified. Use controlled blasting techniques to minimize overbreak or fracturing of rock beyond the designated excavation boundaries. Excessive blasting will not be permitted. Material outside the authorized cross-section, which may be shattered or loosened because of blasting, shall be removed at the Contractor's expense and the area repaired to the satisfaction of the Owner/Engineer. Discontinue any method of blasting which leads to overshooting, is hazardous in any way to persons, or destructive to property or habitat.

G. Notify the Owner/Engineer at least seven workdays before all blasting.

H. Fifteen minutes prior to each blast, sound an audible siren or horn capable of being heard within one-half mile of the blasting site.

I. Blasting operations may be suspended by the Owner at no additional cost for any one or more of the following:

1. Safety precautions are inadequate.
2. Ground motion vibration levels exceed specified limits of particle velocity or frequency.
3. Existing structural conditions are aggravated or adjacent improvements are damaged as a result of blasting.
4. Blasting methods adversely impact the stability of intact rock outside the prescribed limits of excavation.
5. Skilled operators and /or licensed foreman are not present.

J. Blasting operations shall not resume until modifications have been made to correct the conditions that resulted in the suspension.

K. Repair or replace any damage caused by blasting. Repair or replace any damage resulting from possession or use of explosives for the work.

3.4 PRE-BLAST CONDITION SURVEY

A. The Contractor shall arrange for a pre-blast survey of any nearby buildings, structure, or utilities that may potentially be at risk from blasting damage. The survey method used shall be acceptable to the Contractor's insurance company. The Contractor shall be responsible for any damage resulting from blasting. The pre- blast survey shall be made available to the Owner/Engineer for review thirty (30) days (to be submitted with the safety plan) before any blasting begins. Occupants of local buildings shall be notified by the Contractor prior to the commencement of blasting.

B. The pre-blast survey shall be done on all buildings and structures with 500 feet of the blasting area. The pre-blast survey shall produce the following as a minimum requirement:

1. Age and type of construction.
2. Detailed description of existing conditions of structures including, but not limited to foundation, siding, roof, chimney, porch sidewalks, mortar joints, retaining walls, driveways, and glass windows. Survey shall include a room-by-room survey to document existing conditions inside homes and dwellings.
3. Location and character of cracks.
4. Exterior and interior evaluations.
5. Evidence of settlement and leakage.
6. Evidence of broken glass, water spots, and damaged siding/gutters, nail head protrusions, and bowed walls.
7. Presence of wells and water quality.
8. Other pertinent information.

C. Pre-blast surveys shall be completed by a practicing civil engineer registered in the State of Georgia, who has experience in rock excavation, foundation design, and building design and construction.

3.5 POST-BLAST CONDITION SURVEY

A. The Contractor shall arrange for a post-blast survey of all nearby buildings, structure, or utilities after blasting is complete which shall include all buildings, structure, or utilities that were included in the pre-blast survey. The survey method shall be the same method used in the pre-blast survey. The post-blast survey shall be made available to the Owner/Engineer for review 30 days after blasting is complete.

B. The post-blast survey shall produce the items listed in 3.4.B herein.

C. Post-blast surveys shall be completed by a practicing civil engineer registered in the State of Georgia, who has experience in rock excavation, foundation design, and building design and construction.

3.6 BLASTING OPERATIONS

A. Design of drilling and blasting patterns, explosive types, and quantities shall be at the Contractor's choice; provided, that non-electric initiation devices shall be used and the ground motion limitations as specified herein are met with respect to explosive detonated per delay

period; and provided further, that non-nitroglycerin explosive types are used in wet ground conditions, unless the dynamite is phlegmatized (i.e. PowerDitch 1000)..

B. As production blasting operations progress, the drilling and blasting procedures shall be determined only by satisfactory results achieved. If a drilling and blasting program results in unacceptable results, devise and employ methods which will improve results. The revision may include special methods such as, but not limited to, zone blasting, shorter holes, different delay patterns, reduction in size of individual blasts, smaller diameter blast holes, closer spacing of blast holes, or reduction of explosives as necessary to improve results.

C. Regardless of the ground motion and air-overpressure limits set forth herein, controlled blasting shall be conducted in a manner which will produce relatively smooth and sound rock faces at the final excavation lines. The type, distribution and quantity of explosive detonated per delay period shall be such that existing rock fractures will neither be opened nor new fractures created outside of the minimum excavation limits. Whenever, in the opinion of the Owner/Engineer or Inspector, further blasting is liable to reduce rock stability or damage pipelines or other structures, the Contractor shall cease blasting and continue to excavate the rock by approved mechanical means. Excessive blasting or "overshooting" will not be permitted, and any material outside the authorized cross-section which may be shattered or loosened by blasting shall be removed and replaced with acceptable materials at the Contractor's expense.

D. Blasting shall be done only by properly trained workers under the direct supervision of a State-licensed Blasting Supervisor. Blasting shall be done only when proper precautions are taken for the protection of persons, the work, and existing structures. Any damage done to persons, private property, the work, or existing structures shall be the responsibility of the Contractor.

3.7 BLAST MONITORING

A. All blasting shall be monitored by the blasting consultant to conduct daily blast noise, vibration and overpressure surveys during the progress of blasting operations.

B. It shall be the responsibility of the Contractor to monitor and determine that the area is clear before the signal to fire is given. The area of work shall be isolated by warning signs and barricades; guards shall be stationed to prevent entry into the area; and an efficient and adequate signal system shall be employed to give warning before blasting.

C. The required duty of the Engineer or his representative to conduct construction review of the Contractor’s performance does not, and is not intended to, include review of the adequacy of the Contractor’s safety measures in, on, or near the construction site.

3.8 MAXIMUM PARTICLE VELOCITIES

Monitor vibrations by measuring the peak particle velocity in the vicinity of work. Peak particle velocity is defined as a maximum of the three velocity components, measured in three mutually perpendicular directions at any point by an instrument. The peak particle velocity of any individual components as measured on or at the locations as specified in the submitted vibration and frequency’s monitoring plan, for all blasting, or other vibration-inducing operations, shall not exceed the following levels.

Point of Concern	Maximum Allowable Peak Particle Velocity, PPV (in/sec)	Frequency Range (Hz)
Surface Structures	0.5	2-250
Buried Pipes or Utility Cables	5.0	2-250

3.9 AIR-OVERPRESSURE

A. Blast induced air-overpressure at the property or right of way lines or structures within 300 feet of the blast area shall not exceed 0.03 psi (140 dBL). Air-overpressure at residential or other occupied structures shall not exceed 0.012 psi (133 dBL).

3.10 CONSEQUENCES OF BLASTING SPECIFICATION VIOLATIONS

A. Any violations of Maximum Particle Velocities or Air- Overpressure shall obligate the Contractor to pay for all costs to the Owner caused by the violation, including by not limited to: Owners staff and consultant's time and expenses that are required, as solely determined by the Owner, to investigate such violations. This includes, but is not limited to, reviews of resubmittals by the Contractor, analyses of subsequent Blasting Control Plans submitted by the Contractor, meetings with the Contractor and his Blasting Consultant, and investigations into the condition of existing pipeline, wells, structures, etc. These costs shall be actual cost to the Owner without additional mark-up, and the Owner's decision to charge the Contractor shall be final.

END OF SECTION 31 23 16.26

SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes construction dewatering.

B. Related Requirements:

1. Section 01 32 33 - Photographic Documentation for recording preexisting conditions and dewatering system progress.
2. Section 31 20 00 - Earth Moving for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

1.3 ALLOWANCES

A. Dewatering observation wells are part of dewatering allowance.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
3. Review geotechnical report.
4. Review proposed site clearing and excavations.
5. Review existing utilities and subsurface conditions.
6. Review observation and monitoring of dewatering system.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.

1. Include plans, elevations, sections, and details.

2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

1.8 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
2. The geotechnical report is included elsewhere in Project Manual.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches 60 inches below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.

2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks regularly/monthly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION 31 23 19

SECTION 31 25 00 - EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Construction Entrance/Exits
2. Diversion Channels.
3. PAM
4. Rock Energy Dissipator.
5. Rock Barriers.
6. Sediment Control: including silt fences, inlet protection, etc.
7. Sediment Ponds.
8. Sediment Traps.
9. Silt Fences

B. Related Sections:
1. Section 03 30 00 Cast-In-Place Concrete.
2. Section 32 12 16 Asphalt Paving.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Concrete Institute:

1. ACI 301 - Specifications for Structural Concrete.

C. ASTM International:

1. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3).
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3).
4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

D. Precast/Prestressed Concrete Institute:

1. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.

E. Georgia Erosion and Sedimentation Control Act of 1975:

1. All erosion and control measures shall be designed for a 25 year storm event and installed according to the Manual for Erosion and Sediment Control in Georgia.
2. Storm water discharges shall be in strict compliance with the State of Georgia Department of Natural Resources Environmental Protection Division NPDES General Permit No. GAR100001 and GAR 100002 effective August 1, 2023.

F. The Department of Transportation, State of Georgia, Standard Specifications Construction of Roads and Bridges latest edition.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Product Data: Submit data on joint filler, joint sealer, admixtures, curing compounds, and geotextiles.

C. Submit proposed mix design of each class of concrete for review prior to commencement of Work.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

1.5 QUALITY ASSURANCE

A. Perform Work according to the Department of Transportation, State of Georgia standards.

1.6 PRE-INSTALLATION MEETINGS

A. Convene minimum one week prior to commencing work of this section.

PART 2 - PRODUCTS

2.1 ROCK AND GEOTEXTILE MATERIALS

A. Furnish materials according to Department of Transportation, State of Georgia standards.

B. Rock: As specified in Section 31 05 16 Aggregates for Earthwork. Furnish according to Department of Transportation, State of Georgia standards.

C. Geotextile Fabric: Furnish according to Department of Transportation, State of Georgia standards.

2.2 CONCRETE MATERIALS AND REINFORCEMENT

A. Cement: As specified in Section 03 30 00 Concrete.

2.3 PLANTING MATERIALS

A. Seeding and Soil Supplements: As specified in Section 32 91 13 Soil Preparation.

B. Turf and Grasses: As specified in Section 32 92 00 Turf and Grasses.

2.4 POLYACRYLAMIDE (PAM)

A. Only the anionic form of PAM shall be used. PAM and PAM mixtures shall be environmentally benign, harmless to fish, wildlife, and plants.

B. Anionic PAM in pure form shall have less than or equal to 0.05% acrylamide monomer by weight, as established by the FDA and US EPA.

2.5 Mats and Blankets (ECB's)

A. 3:1 Slopes and flatter
1. ECB must be rated for shear stresses up to 1.55 lbs/sq ft, must weigh at least 0.50 lbs/yd2, and the netting made of biodegradable polypropylene or FibreNet™ material

B. 1.5:1 to 3:1 Slopes
1. ECB must be rated for shear stresses up to 1.75 lbs/sq ft, must weigh at least 0.73 lbs/yd2, and the netting made of biodegradable polypropylene or FibreNet™ material

C. Acceptable manufacturer
1. American Excelsior Company, Arlington, TX
2. Or approved equal

D. Inlet Protection Products
1. Drop Inlets
   a. Silt Savers
   b. Dandy Sacks
2. Curb Inlet
   a. Dandy Curb
   b. Gutter Eel

3. The filter shall be a weighted sediment tube filter with a diameter of 9.5-inches at the ends and tapering to 5 inches in the center. Lengths shall be 6 to 9 feet with a build-in triangular overflow for relief during high-intensity storm events.
    a. Unit Weight: 13 lbs/ft
    b. Interior Filter
    c. Materials: Shredded, recycled tire rubber particles with less than 2% metal and the rubber shall be washed during manufacturing.
    d. Particle Size: ½ inch to ¾ inch particle size
    e. Geotextile Bag
        1) Percent Open Area: 8%
        2) Apparent Opening Size: 30 U.S. Sieve
        3) Grab Tensile Strength: 400 lbs
        4) Flow Rate: 115 gal/min/ft2
        5) Puncture Strength: 125 lbs

E. Fiber Rolls
1. Fiber rolls should be prefabricated rolls or rolled tubes of geotextile fabric. When rolling the tubes, make sure each tube is at least 8 inches in diameter. Bind the rolls at each end and every 4 feet along the length of the roll with jute-type twine

F. Silt Fence
1. The height of a silt fence shall not exceed 36 inches (0.9 m). Storage height and ponding height shall never exceed 18 inches (0.5 m).
2. The standard-strength filter fabric shall be stapled or wired to the fence, and 6 inches (0.2 m) of the fabric shall extend into the trench.
3. Type A Silt Fence
    a. A wire mesh support fence shall be fastened securely to the upslope side of the posts (between the posts and fabric) using heavy duty wire staples at least ½" (12.7mm) long and ¾" wide, tie wires or hog rings. The wire shall extend into the trench a minimum of 6 inches (51 mm) and shall not extend more than 36 inches (0.9 m) above the original ground surface.
    b. Posts shall be 4' long steel that each weigh at least 5.2 lbs.
4. Type B Silt Fence
    a. The spacing between posts shall be a maximum of 6', and the filter fabric shall be stapled or wired directly to the posts.
    b. Posts may be soft wood 2x4, oak 2x2, or steel as indicated for Type A Silt Fence

2.6 PIPE MATERIALS

A. Pipe: Corrugated steel, as specified in the Department of Transportation, State of Georgia, Highways Standards.

2.7 ACCESSORIES

A. Trash Rack: Bars welded to angles and at each intersection of bars, as specified in Section 05 12 00 - Structural Steel Framing.

2.8 SOURCE QUALITY CONTROL (AND TESTS)

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify compacted stabilized soil is acceptable and ready to support devices and imposed loads.

B. Verify gradients and elevations of base or foundation for other work are correct.

3.2 DIVERSION CHANNELS

A. Windrow excavated material on low side of channel.

B. Compact to 95 percent maximum density.

C. On entire channel area, apply soil supplements and sow seed as specified in Section 32 92 00.

D. Mulch seeded areas with hay as specified in Section 32 92 00.

3.3 POLYACRYLAMIDE (PAM)

A. The maximum application rate of PAM in pure form shall not exceed 200 lbs/ace/year. Over application of PAM can lower infiltration rates or suspend solids in water, and, therefore, over application should be avoided.

B. Users of PAM shall obtain and follow all MSDS requirements.

C. The manufacturer or supplier shall provide written application methods for PAM and PAM mixtures. The application shall provide uniform coverage to the target area.

3.4 MATS AND BLANKETS

A. After the site has been shaped and graded to the approved design, prepare a seedbed free from clods and rocks more than 1 inch in diameter, and any foreign matter that will prevent the contact of the mat with the soil surface.

B. Lime, fertilizer, and seed shall be applied in accordance with seeding or other type of planting plan as suggested by the ENGINEER.

C. Erosion control blanket products should be installed in accordance with the manufacturer’s recommendations and specifications, including check slots and stapling materials.

D. Anchor product so that a continuous, firm contact with the soil surface/seed bed is maintained. This is best accomplished on slopes by working from the bottom to the top.

3.5 SEDIMENT CONTROL

A. Filter Ring/Rock Filter Ring
   1. Mechanical or hand placement of fiber rolls/straw wattles/stone shall be required to uniformly surround the structure to be supplemented.
   2. The filter ring may be constructed on natural ground surface, excavated surface, or on machine compacted fill.
   3. When placed below a storm drain outlet, it shall be constructed so that it does not allow water to back up into the storm drain.

B. Inlet Protection Products
   1. For information on installation, refer to the manufacturers' drawings provided by the distributor. Strict adherence to the manufacturers' suggested installation procedures is required for proper inlet protection.

C. Fiber Rolls
   1. On slopes, install fiber rolls along the contour with a slight downward angle at the end of each row to prevent ponding at the midsection. Turn the ends of each fiber roll upslope to prevent runoff from flowing around the roll. Install fiber rolls in shallow trenches dug 3 to 5 inches deep for soft, loamy soils and 2 to 3 inches deep for hard, rocky soils.
   2. Determine the vertical spacing for slope installations on the basis of the slope gradient and soil type. A good rule of thumb is:
      a. 1:1 slopes = 10 feet apart
      b. 2:1 slopes = 20 feet apart
      c. 3:1 slopes = 30 feet apart
      d. 4:1 slopes = 40 feet apart
   3. For soft, loamy soils, place the rows closer together. For hard, rocky soils, place the rows farther apart. Stake fiber rolls securely into the ground and orient them perpendicular to the slope. Drive the stakes through the middle of the fiber roll and deep enough into the ground to anchor the roll in place. About 3 to 5 inches of the stake should stick out above the roll, and the stakes should be spaced 3 to 4 feet apart. A 24-inch stake is recommended for use on soft, loamy soils. An 18-inch stake is recommended for use on hard, rocky soils.

D. Rock Filter Dam
   1. The center of the rock dam should be at least 6" lower than the outer edges of the dam at the channel banks. Side slopes shall be 2:1 or flatter. The top width of the dam should be at least 6'.
   2. The dam should not be higher than the channel banks or the elevation of the upstream property line.
   3. Set a marker stake to indicate the clean out elevation.

3.6 CONSTRUCTION ENTRANCE/EXIT

A. The entrance/exit must be excavated to a depth of 3" and cleared of all vegetation and roots.

B. If the action of the vehicle travelling over the gravel pad does not sufficiently remove the mud, the tires should be washed prior to entrance onto public rights-of-way. When washing is necessary, it should be done on an area stabilized with crushed stone.

C. A geotextile fabric underliner should be placed the full length and width of the entrance.

3.7 ROCK ENERGY DISSIPATOR

A. Excavate to indicated depth of rock lining or nominal placement thickness as follows. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

1. Nominal Placement Thickness per NCSA Class:
    a. R7: 36 Inches
    b. R6: 30 Inches
    c. R5: 24 Inches
    d. R4: 18 Inches
    e. R3: 12 Inches

B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope. Provide a minimum overlap of 3 feet. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.

C. Carefully place rock on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile.

D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution.

3.8 ROCK BARRIER

A. Determine length required for ditch or depression slope and excavate, compact and foundation area to firm, even surface.

B. Produce an even distribution of rock pieces, with minimum voids to the indicated shape, height and slope.

C. Construct coarse aggregate filter blanket against upstream face of rock barrier to the indicated thickness.

3.9 SEDIMENTATION POND

A. Clear and grub storage area and embankment foundation area site as indicated and specified.

B. Excavate key trench for full length of dam. Excavate emergency spillway in natural ground.

C. Install pipe spillway, with anti-seep collar attached, at location indicated.

D. Place forms, and reinforcing for concrete footing at bottom of riser pipe with trash rack and anti-vortex device. Construction of embankment and trench prior to placing pipe is not required.

E. Mix, place, finish, and cure concrete, as specified in Section 03 30 00.

F. Do not use coarse aggregate as backfill material around pipe. Backfill pipe with suitable embankment material to prevent dam leakage along pipe.

G. Construct rock basin at outlet end of pipe. Place embankment material, as specified.

H. On entire sedimentation pond area, apply soil supplements and sow seed as specified in Section 32 92 00.

I. Mulch seeded areas with hay.

J. Apply PAM.

3.10 SEDIMENT TRAPS

A. Clear site, as indicated.

B. Construct trap by excavating and forming embankments as indicated in the drawings.

C. Place coarse aggregate or rock at outlet as indicated on Drawings.

D. Place geotextile fabric, as specified for rock energy dissipator.

E. When required, obtain borrow excavation for formation of embankment.

F. On entire sediment trap area, apply soil supplements and sow seed as specified in Section 32 92 19.

G. Mulch seeded areas with hay.

3.11 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2:1 or flatter.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.

E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.12 FIELD QUALITY CONTROL & INSPECTIONS

A. Section 01 40 00 - Quality Requirements and 017000 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. It is the CONTRACTOR'S responsibility to perform all required inspections in accordance with all Authorities having Jurisdiction.

E. CONTRACTOR is responsible for continually maintaining all temporary erosion control measures until permanent measures are properly installed and performing as required.

3.13 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

C. Do not damage the structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

E. Clean channels when the depth of sediment reaches approximately one-half channel depth.

3.14 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

C. Protect paving from elements, flowing water, or other disturbance until curing is completed.

END OF SECTION 31 25 00

SECTION 31 50 00 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Requirements:

1. Section 31 20 00 “Earthmoving”
2. Section 31 23 19 "Dewatering" for dewatering excavations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.

B. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.
3. Indicate type and location of waterproofing.
4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.

1.4 INFORMATIONAL SUBMITTALS

A. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.

C. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.5 FIELD CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Engineer no fewer than two days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without Engineer's written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection according to the performance requirements.
2. The geotechnical report is included elsewhere in Project Manual.

C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide, design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.

1. Contractor Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.
2. Prevent surface water from entering excavations by grading, dikes, or other means.
3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
4. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

2.2 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36, ASTM A 690, or ASTM A 992.

C. Steel Sheet Piling: ASTM A 328, ASTM A 572, or ASTM A 690; with continuous interlocks.

1. Corners: Site-fabricated mechanical interlock or Roll-formed corner shape with continuous interlock.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application.

E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

F. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

G. Tiebacks: Steel bars, ASTM A 722.

H. Tiebacks: Steel strand, ASTM A 416.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

3.2 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.3 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.

B. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

C. Cut tops of sheet piling to uniform elevation at top of excavation.

3.4 TIEBACKS

A. Drill, install, grout, and tension tiebacks.

B. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.

C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.

1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Engineer.
2. Install internal bracing if required to prevent spreading or distortion of braced frames.
3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 FIELD QUALITY CONTROL

A. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

B. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.7 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
2. Fill voids immediately with approved backfill compacted to density specified in Division 31 and as required by the geotechnical engineer.
3. Repair or replace, as approved by Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.

B. Leave excavation support and protection systems permanently in place.

END OF SECTION 31 50 00