THOMAS & HUTTON

CONTRACT DOCUMENTS

VOLUME 3 OF 3

FOR

EXIT 29 WATER PRODUCTION FACILITY & ELEVATED STORAGE TANK: DIVISION II REBID

PREPARED FOR:

BRUNSWICK – GLYNN JOINT WATER & SEWER COMMISSION:

J – 30998.0000

FEBRUARY 2025

02 TABLE OF CONTENTS

Exhibit A : "Phase I Environmental Site Assessment Report"

Brunswick-Glynn County Water & Sewer Commission Specifications Will Supersede these Specifications in Case of Discrepancies.

SECTION 02 30 00

SUBSURFACE INVESTIGATION

SECTION 02 30 00

SUBSURFACE INVESTIGATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section includes information pertaining to the subsurface data logs. Data logs can be provided for information only.

1.2 SOIL INVESTIGATION DATA

A. The Geotechnical Evaluation can be provided solely as a reference to the bidders to aid in the bidding of the project. This evaluation is not considered Technical Data, as defined by General Conditions, and therefore, may not be relied upon by the Contractor.

B. The Owner and Thomas & Hutton obtained this report as required for our own use and purposes. This report is made available to bidders to provide some basic information as to subsurface conditions but is not to be relied upon by bidders in the formulation of either their bid or their design or for any other purpose. It is not a part of the Contract Documents and is made available only as background information. The Owner and Thomas & Hutton make no guarantees or representations of any kind concerning, and assume no liability or responsibility for, the accuracy, sufficiency, or completeness of the report or any data, interpretations, opinions, or conclusions contained therein. If any bidder uses or relies on using the attached report for any reason, by doing so they adopt the report as their own and assume any and all risks associated with the accuracy of the report or any data, interpretations, opinions, or conclusions contained therein.

C. The Contractor is responsible for verifying soil conditions, characteristics, geotechnical parameters, and foundation requirements with any additional site inspections, testing, or study necessary. The Bidders are expected to perform a thorough site review, observing those features and conditions that may affect cost, progress, performance, and furnishing of the Work.

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

E. The boring logs and test results are for information of the Contractor. Owner and Engineer assume no responsibility for the information.

F. Geotechnical data has been provided solely for the purpose of aiding the Contractor in preparing his bid proposal for the proposed water system improvements. The Engineer makes no guarantees that said data accurately

describes the actual subsurface conditions for the entire depth and length of the proposed bore. Contractor is responsible for using its own experience and judgement in interpreting the data to determine means, methods, equipment, materials, and other incidentals required to complete the project as shown in the drawings.

PART 2 – PRODUCTS

See report separate from specification package.

PART 3 – EXECUTION

None this Section.

END OF SECTION

INDEX TO

SECTION 02 41 13 – SELECTIVE DEMOLITION

SECTION 02 41 13

SELECTIVE DEMOLITION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of selective demolition work is indicated on drawings.

1.3 SUBMITTALS

A. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to EOR and Owner for review prior to commencement of work. Include coordination for shut–off, capping, and continuation of utility services as required, together with details for dust and noise control protection. Include schedule and location for return of items identified on plans to be delivered to Owner of property.

1.4 JOB CONDITIONS

A. Condition of Structures: Owner assumes no responsibility for actual condition of items to be demolished.

B. Partial Demolition and Removal: Items indicated to be removed but of value to Contractor may be removed as work progresses. Transport salvaged items from site as they are removed.

Storage or sale of removed items on site will not be permitted.

C. Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.

Protect from damage existing finish work to remain in place and becomes exposed during demolition operations. Remove protections at completion of work.

1.5 DAMAGES

A. Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

1.6 TRAFFIC

A. Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

Do not close, block or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways.

1.7 EXPLOSIVES

A. Use of explosives will not be permitted.

1.8 UTILITY SERVICES

A. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

B. Coordinate any interruptions to utilities with Owner and utility company. All site utilities should be modified in accordance with site plans. This includes, but is not necessarily limited to, demolition of existing utilities, recurring utilities, the rewiring and burying of modified utility services. Any required permitting shall be obtained by the Contractor and shall be paid out under the Permitting cash allowance.

1.9 ENVIRONMENTAL CONTROLS

A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

1.10 OMITTED

PART 2 – PRODUCTS

None in this section

PART 3 – EXECUTION

3.1 PREPARATION

A. Prior to commencement of selective demolition work, check areas in which work will be performed. Photograph or video existing conditions of surfaces, equipment, or surrounding properties that could be misconstrued as damage resulting from selective demolition work. File with Owner's representative prior to starting work.

B. Cover and protect equipment and fixtures to remain from soiling or damage when demolition work is performed in areas from which such items have not been removed.

C. Contractor shall report in writing to the Owner and Engineer any condition that will prevent the proper completion of the Work.

D. No waiver of responsibility for defective adjoining work will be considered unless notice has been filed by the Contractor and agreed to in writing by the Engineer prior to the Contractor commencing any part of this Work.

3.2 DEMOLITION

A. Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on drawings in accordance with demolition schedule and governing regulations.

Demolish concrete in small sections. Cut concrete at junctures with construction to remain using power–driven masonry saw or hand tools. Do not use power–driven impact tools.

Completely fill below–grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel and sand, free of trash and debris, stones over 2" diameter, roots or other organic matter.

If unanticipated mechanical, electrical, or structural elements, which conflict with intended function or design, are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's representative in written, accurate detail. Pending receipt of directive from Owner's representative, rearrange selective demolition schedule as necessary to continue overall job progress without delay.

B. Demolish any existing foundation to a minimum of 24" below grade or more if needed to accommodate proposed piping/rerouted utilities.

C. All fences being identified as being removed as part of work require written permission from the BGJWSC prior to demolition. No demolition of existing fences may occur prior to this written permission.

3.3 SALVAGE MATERIALS

A. All existing buildings, slabs, valve vault concrete structures and miscellaneous equipment and more are to be removed and relocated to a location designated by the owner within a 2–mile radius. Any materials or equipment not retained by the owner shall be removed and disposed of legally off site.

B. Any articles of historic significance will remain the property of the Owner. Notify Owner's representative if such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.

C. Do not permit material and debris to accumulate on site.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove debris, rubbish and other materials resulting from demolition operations from site. Transport and legally dispose of materials off site.

B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

C. Burning of removed materials is not permitted on project site.

3.5 CLEAN–UP AND REPAIR

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave site clean.

Repair demolition performed in excess of required work. Return structures and surfaces to remain to the condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

Fill in all voids created by selective demolition and grade site to drain. Grass all disturbed areas for erosion control.

3.6 ENVIRONMENTAL PROTECTION

A. Protect wetlands, canals, and waterways from chemical and physical damage.

B. Do not dispose of debris in wetlands, canals, and waterways.

C. Remove debris as rapidly as it accumulates.

D. Keep debris damp enough to keep down dust.

E. Provide for off–site disposal of debris.

F. Protect existing trees from damage during the Work.

END OF SECTION

INDEX TO

SECTION 03 00 00 – SITE CONCRETE

SECTION 03 00 00

SITE CONCRETE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Concrete walkways, curbs, fence footings, parking areas, and reaction blocking.

1.2 RELATED SECTIONS

A. Section 31 00 00 – Earthwork.

B. Section 32 00 00 – Surface Restoration

C. Section 32 11 23 – Aggregate Base Course.

D. Section 33 10 00 – Water Distribution System.

1.3 OMITTED

1.4 REFERENCES (LATEST REVISION)

A. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.

B. ACI 301 – Specifications for Structural Concrete.

C. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.

D. ACI 318 – Building–Code Requirements for Structural Concrete and Commentary.

E. ACI 330R – Guide for the Design and Construction of Concrete Parking Lots.

F. ASTM A 185 – Steel Welded Wire Reinforcement, Plain, for Concrete.

G. ASTM A 497 – Steel Welded Wire Reinforcement, Deformed, for Concrete.

H. ASTM A 615 – Deformed and Plain Carbon–Steel Bars for Concrete Reinforcement.

I. ASTM C 31 – Making and Curing Concrete Test Specimens in the Field.

J. ASTM C 33 – Concrete Aggregates.

K. ASTM C 39 – Compressive Strength of Cylindrical Concrete Specimens.

L. ASTM C 94 – Ready–Mixed Concrete.

M. ASTM C 150 – Portland Cement.

N. ASTM C 172 – Sampling Freshly Mixed Concrete.

O. ASTM C 260 – Air–Entraining Admixtures for Concrete.

P. ASTM C 309 – Liquid Membrane–Forming Compounds for Curing Concrete.

Q. ASTM C 494 – Chemical Admixtures for Concrete.

R. ASTM C 920 – Elastomeric Joint Sealants.

S. ASTM E 1155 – Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.

T. ASTM C 1116 – Fiber–Reinforced Concrete.

U. ASTM D 1751 – Preformed Expansion Joint Filler for Concrete Paving and Structural Construction. (Nonextruding and Resilient Bituminous Type).

V. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

W. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.

1.5 PERFORMANCE REQUIREMENTS

A. Paving: Designed for parking, light duty commercial vehicles, and residential streets

1.6 SUBMITTALS FOR REVIEW

A. Product Data: Provide data on joint filler, admixtures, and curing compounds, and Concrete Design Mix.

B. Shop Drawings: Submit shop drawings of reinforcing steel to Engineer for review. Indicate sizes, spacing, and locations, of reinforcing steels, supporting and spacing devices, bar bending details, and bar lists.

1.7 QUALITY ASSURANCE

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

B. Obtain cementitious materials from same source throughout.

C. Conform to ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.

D. Contractor to measure accessible route with a 24" digital smart–level will be used to measure points along the accessible route. Line of measurement shall be parallel to the long edge of ramp or accessible route, whether straight or curved. Longitudinal measurement lines shall be spaced 3 feet apart, but in no case, shall

fewer than two lines be used. The horizontal measurement will be measured every 6 feet. Engineer may request additional measurements if further investigation is necessary. The 24" Smart–level slope readings greater than specified tolerance within contract documents will be identified as non–compliant and not accepted.

E. Engineer and Owner reserve the right to mark and reject portions of concrete not within tolerance as specified.

F. Accessible Route Tolerance by measuring Floor Flatness and Levelness. Traffic floors shall conform to the following surface profile tolerances:

a. Floor Designation: All floor areas not specified to be part of the "defined traffic floor" Accessible Routes shall be part of a "random traffic floor" Non–accessible Route. Any floor slab comprising part of the traffic floor shall be designated a "traffic slab" Accessible Route.

b. Flatness and Levelness Tolerances: A traffic floor shall conform to the following surface profile tolerances:

Floor Flatness Number: F_F
Specified Overall Value = 38
Minimum Local Value = 25
Floor Levelness Number: F_L
Specified Overall Value = 25
Minimum Local Value = 17

c. Floor Tolerance Measurements: F_F and F_L tolerances shall be tested in accordance with ASTM E 1155. Actual overall F–numbers shall be calculated using the inferior / superior area method.

d. Timeliness of Floor Profile Tests & Reports: All floor tolerance measurements shall be made within 48 hours after slab installation. In all cases, tolerance measurements shall precede the removal of shores and forms. Results of all floor profile tests (including a running tabulation of overall F_F and F_L values for all traffic slabs installed to date) shall be provided to the Contractor within 72 hours after each slab installation.

e. Remedy for Out–of–Tolerance Work: For purposes of flatness and levelness control, minimum floor section boundaries shall coincide with the control joints. Profile test compliance requirements apply to the time period specified above only. Contractor shall remedy any floor section measuring below either the minimum local F_F, or F_L number. Any floor section measuring at or above both the minimum local F_F and F_L number shall be accepted. If actual overall F_F or F_L number for entire random–traffic floor installation measures less than its specified value, then Contractor shall undertake remedial measures acceptable to the Engineer.

G. Defined random traffic floors Non–accessible Routes shall conform to the following surface profile tolerances:

a. Floor Designation: All floor areas specified as "defined random traffic floor" include only the Non–accessible route.

b. Flatness and Levelness Tolerances: The defined traffic floor shall conform to the following surface profile tolerances: F_{min} = 25

c. Floor Tolerance Measurements: F_{min} tolerances shall be tested in accordance with ASTM E 1486.

d. Timeliness of Floor Profile Tests & Reports: All floor tolerance measurements shall be made by the Contractor within 24 hours after slab installation and before saw cutting of control joints. In all cases, tolerance measurements shall precede the removal of shores and forms. Results of all floor profile tests including a running tabulation of overall F_{min} values for all of defined–traffic slabs installed to date shall be provided to the Contractor within [48] hours after each slab installation.

H. Remedy for Out–of–Tolerance Work: For purposes of flatness and levelness control, minimum floor section boundaries shall coincide with the construction joints. Profile test compliance requirements apply to time period specified above only. Contractor shall remedy any floor section measuring below the F_{min} number, in accordance with recommendations of the Engineer. Any floor section measuring at or above the F_{min} number shall be accepted. If actual overall F_{min} number entire defined–traffic floor installation measures less than its specified value, then Contractor shall undertake remedial measures acceptable to the Engineer.

If a portion of a floor does not meet specified F–number, the following remedies are recommended:

a. Local value is out of spec – grind or replace floor.

b. Overall value is out of spec – Contractor shall pay the Owner per square foot for portion of floor not meeting F–number spec. This can be obtained by specifying a figure in project specifications in conjunction with square footage obtained from reading taken in the field.

1.8 REGULATORY REQUIREMENTS

A. Conform to BGJWSC, County, and GDOT standards for paving work on public property.

1.9 ENVIRONMENTAL REQUIREMENTS

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

1.10 GUARANTEE

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

1.11 TESTING

A. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer and Owner.

B. Testing laboratory, Engineer, and Owner shall be given a minimum of 48 hours notice prior to taking any tests.

C. Testing shall be the Contractor's responsibility and shall be performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph A above.

D. The Contactor shall submit to the Engineer and Owner, for review, the concrete materials and the concrete mix designs for each class of concrete proposed for use. This submittal shall include the results of all testing performed to qualify the materials and establish the mix designs. All mix designs shall be propositioned in accordance with Section 3.9 of ACI 301, trial batches or field experience. The average strength used as the basis for selecting proportions shall be as specified in Paragraph 3.9.2.3 of ACI 301.

E. The testing laboratory shall conduct strength tests of the concrete during construction in accordance with Section 16.3.4 of ACI 301. At least one strength test (3 tests cylinders) shall be made for each 50 cubic years, or fraction thereof , of each mix design of concrete placed in any 1 day.

F. Slump tests shall be conducted regularly during construction in accordance with Section 16.3.5 of ACI 301.

G. The air content of the concrete sample for each strength test shall be determined in accordance with Section 16.3.6 of ACI 301.

H. Results of all test shall be submitted to the Engineer and Owner, with copies to the Contractor. The test reports shall include the exact location in the work at which the batch represented by a test was deposited.

I. Evaluation of test results and acceptance of concrete shall be in accordance with Chapter 17 of ACI 301.

PART 2 – PRODUCTS

2.1 FORM MATERIALS

A. Wood or steel form material, suitable to obtain the finish specified.

B. Shall conform to ACI 301.

C. Joint Filler: ASTM D1751 type; 1/2 inch thick.

2.2 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615, Grade 60 billet steel deformed bars; uncoated finish.

B. Welded Steel Wire Fabric: Plain type, ASTM A 185; uncoated finish.

C. Fiber reinforcement: Shall conform to ASTM C 1116 as manufactured by Fibermesh Company or equivalent. Concrete mix design shall utilize between 0.5% and 1.0% fiber content.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I – Normal.

B. Fine and Coarse Mix Aggregates: ASTM C 33. Coarse aggregate shall consist of granite stone.

C. Water: Potable, not detrimental to concrete.

D. Air Entrainment: ASTM C 260.

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

2.4 ACCESSORIES

A. Curing Compound: ASTM C309, clear with fugitive dye.

B. Sealant: Joints shall be sealed per detail on project drawings, conforming to ASTM C 920, Type S or M, Grade P or NS, Class 25.

C. Bonding Compound: Polyvinyl acetate, rewettable type: Euco Weld by the Euclid Chemical Company, or equivalent.

D. Epoxy Adhesive: Two (2) component, 100% solids, 100% reactive compound suitable for use on dry or damp surfaces; Euco N-S by the Euclid Chemical Company, or equivalent.

E. Non–Shrink Grout: CRS-D 621-80, non-metallic; Euco N-S by the Euclid Chemical Company, or equivalent.

F. Vapor Barrier: ASTM D 2103. 6 mil thick clear polyethylene film.

G. Expansion Joints: Pre-molded expansion joint filler strips conforming to ASTM D 1751.

H. Joint Sealant: Hot or cold applied, ASTM D 1190 or D 1850.

2.5 CONCRETE MIX – BY PERFORMANCE CRITERIA

A. Provide concrete to the following criteria:

1. Flexible Strength: 700 psi.

2. Compressive Strength: 3,000 psi @ 28 days.

3. Slump: 4 to 5 inches.

B. Compressive Strength:

1. Concrete for Reaction Blocking: 2,000 psi

2. Concrete for Footings: 3,000 psi

3. Concrete for Fencing: 2,000 psi

4. All other concrete: 4,000 psi at 28 days.

C. Slump: Unless otherwise permitted or specified, the concrete shall have a slump of 4–inches or less if consolidation is to by vibration, and 5–inches or less if consolidation is to be by methods other than vibration.

D. Use calcium chloride only when accepted by Engineer and Owner.

E. Use set retarding admixtures during hot weather only when accepted by Engineer.

2.6 SOURCE QUALITY CONTROL AND TESTS

A. All sampling and testing services shall be performed, at Contractor's expense, by a testing agency that operates in accordance to ASTM D 3740 and E 329 latest edition and accepted by the Engineer and Owner.

B. Contractor shall submit to the Engineer and Owner a design mix on each class of concrete proposed for use. The mix shall be prepared by an accepted testing laboratory. Compressive strength of at least four specimens of the design mix shall indicate 15% higher than 28 days strengths specified. During the work, Contractor shall make three test cylinders for each 50 cubic yards, or fraction thereof, of concrete placed each day. One cylinder shall be tested at 7 days and the other two at 28 days in accordance with ASTM C 39. Copies of all test reports shall be furnished to the Engineer and Owner.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify subgrade conditions under provisions of Section 31 00 00 – Earthwork.

B. Verify compacted subgrade is acceptable and ready to support concrete and imposed loads.

C. Verify gradients and elevations of subgrade are correct.

3.2 CONSTRUCTION OBSERVATION

A. The Engineer and Owner will have the right to require any portion of the work be completed in their presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if Contractor

notifies the Engineer such work is scheduled, and Engineer fails to appear within 48 hours, the Contractor may proceed. All work completed, and materials furnished shall be subject to review by the Engineer or Project Representative. Improper work shall be reconstructed. All materials, which do not conform to the requirements of the specifications, shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

The Contractor shall give the Engineer and Owner a minimum of 48 hours notice for all required observations or tests.

3.3 SUBGRADE

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

3.4 PREPARATION FOR PLACING

A. Water shall be removed from excavations before concrete is deposited. Hardened concrete debris and other foreign materials shall be removed from the interior of forms and inside of mixing and conveying equipment. The reinforcement shall be made secure in position and shall be subject to examination and acceptance.

B. Moisten subgrade to minimize absorption of water from fresh concrete.

C. Coat surfaces of manhole, inlet, and catch basin frames with oil to prevent bond with concrete pavement.

D. Notify Engineer minimum 48 hours prior to commencement of concreting operations.

3.5 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler in position, in straight lines. Secure to formwork during concrete placement.

D. Forms shall be constructed to the shape, line, and grade required and shall be maintained sufficiently rigid to prevent deformation under load. Form work and details of construction joints shall conform to ACI–318, Chapter 6.

E. Before placing of either the reinforcing steel or the concrete , the surfaces of the forms shall be covered with a approved coating material that will effectively percent absorption of moisture and prevent bond with the concrete and will not stain the concrete surfaces.

F. Forms shall be removed in such a manner and of such time as to ensure the complete safety of the structure. In no case supporting forms or shorting be

removed until member s have acquired sufficient strength to support their weight and imposed loads of safety.

3.6 REINFORCEMENT

A. Place reinforcement as indicated.

B. At reinforcement shall be free of mud, oil, or other materials that may adversely affect or reduce the bond. Reinforcement will rust, mill scale, or a combination of both will be accepted as being satisfactory without cleaning or brushing provided the dimensions and weights, including heights of deformations of a cleaned sample shall not be less than required by the applicable ASTM specifications.

C. Reinforcements shall be placed, supported, and secured against displacement by construction loads or the placing of concrete. Bar supports and spacers shall be made of concrete, metal, plastic, or other accepted material, and shall be subject to the review of the Engineer. Where the concrete surface will be exposed to the weather in the finished structure, the portions of all accessories within ½-inch of the concrete surface shall be noncorrosive or protected against corrosion.

3.7 PLACING CONCRETE

A. Placing of concrete shall conform to Chapter 5 of the American Concrete Institute Standard A.C.I. 318. Concrete having attained initial set or having contained water for more than 45 minutes shall not be used in the work. Concrete shall not be dropped freely more than 5 feet. Concrete shall be mixed and placed only when the temperature is at least 40 degrees F and rising. Concrete shall be placed only upon surfaces free from frost, ice, mud and other detrimental substances or conditions. When placed on dry soil or pervious material, water proof paper or polyethylene sheeting shall be laid over surfaces to receive the concrete.

B. Ensure reinforcement, inserts, embedded parts, formed joints and forms are not disturbed during concrete placement.

C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours so cold joints will not occur.

D. Place concrete to elevations indicated on the contract drawings.

3.8 JOINTS

A. Place expansion joints at 50-foot intervals and radius points.

B. Place contraction joints at 10-foot intervals. Align curb, gutter, and sidewalk joints.

C. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/8 inch.

D. Saw cut contraction joints 3/16-inch-wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.9 FINISHING

A. Typical Paving: Light broom.

B. Sidewalk Paving: Light broom, and trowel joint edges.

C. Curbs and Gutters: Light broom parallel to gutter.

D. Inclined Vehicular Ramps: Broomed perpendicular to slope.

E. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

E. Accessible Routes: Surfaces shall be stable, firm, and slip resistant. Slab Finish Tolerances – Unless otherwise called out in the contract documents, finishes shall be true planes within 3/16 inch in 10 feet as determined by a 10–foot straightedge placed anywhere on the slab in any direction. Maximum variation in elevation for a level slab shall not exceed quarter of an inch (1/4") over the entire slab or accessible route tolerances.

3.10 JOINT SEALING

A. Separate pavement from vertical surfaces with 1/2-inch thick joint filler.

B. Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

C. Extend joint filler from bottom of pavement to within 1/8 inch of finished surface.

3.11 TOLERANCES

A. Section – Quality Assurance: Tolerances.

B. General Site Concrete:

1. Maximum Variation of Surface Flatness: 1/4 inch in 10 feet.

2. Maximum Variation from True Position: 1/4 inch.

C. Accessible Routes: Variation from design elevation shall not exceed 1/4 inch; however, accessible routes shall not exceed maximum ADA allowable slopes. Contractor shall remove and replace any and all portions of the accessible route that exceeds maximum ADA allowable slopes.

3.12 CURB AND GUTTER SECTIONS

A. Shall be constructed as shown on the drawings and in accordance with applicable details. Subgrade below the curb and gutter sections shall be

compacted to 98% density. Curb and gutter sections shall be constructed in sections of uniform length and shall not exceed 10 feet or be less than 5 feet in length. Straight edging along the edge of gutter and top of curb shall conform to those requirements for adjacent pavement but with no irregularities to exceed 1/4 inch in 10 feet.

B. If slip–form or extruded construction is used, contraction joints shall be located at intervals no greater than 10 feet by sawing the hardened concrete at the proper time. Joints shall be sawed between 4 to 8 hours after placing of concrete. Depth of saw–cut shall be one–fourth thickness of the curb and gutter section. The maximum width of cut shall be 1/4 inch. All joints shall be sawed in succession.

C. Half inch thick premolded expansion joints shall be installed completely through the joints at spaces not to exceed 50 feet and at all structures and walks.

D. When the curb forms are removed, backfill shall be immediately placed, tamped, and graded behind the new curb to help protect the line and grade. Machine methods of placing and forming may be used provided the finished product is satisfactory to the Engineer.

E. Contractor shall place a concrete depressed curb at all driveways shown on the drawings or where a driveway is in use.

F. Cracked curb and gutter will not be accepted.

3.13 CONCRETE CURING

A. Immediately after placement and finishing, concrete shall be protected from moisture loss for not less than 7 days. For surfaces not in contact with forms, curing compound shall be uniformly applied after water sheen disappears from the concrete. Formed surfaces shall receive an application of curing compound if forms are removed during the 7-day curing period. Curing compound shall not be applied during rainfall.

B. Curing compound shall be applied under pressure at the rate of 1 gallon per 150 square feet by mechanical sprayers. The spraying equipment shall be of the fully atomizing type. At the time of use, the compound shall be thoroughly mixed with a fugitive dye uniformly dispersed throughout the sprayer. Care shall be taken to prevent application to joints where concrete bond is required, to reinforcement steel and to joints where joint sealer is to be placed. The compound shall form a uniform continuous coherent film which will not crack or peel and shall be free from pinholes and other imperfections. Concrete surfaces subjected to heavy rainfall within 3 hours after curing compound has been applied shall be resprayed by above method and at above coverage at no additional expense to the Owner.

C. No pedestrian or vehicular traffic shall be allowed over the surface for seven days unless surface is protected by planks, plywood, or sand. Protection shall not be placed until at least 12 hours after application of the curing compound.

D. Protect concrete by suitable methods to prevent damage by mechanical injury or excessively hot or cold temperatures.

3.14 FIELD QUALITY CONTROL

A. Contractor shall employ an Independent Testing Laboratory to perform field quality control tests specified herein at no cost to the Owner. The Contractor shall perform additional testing as considered necessary by the Owner for assurance of quality control. Retesting required as a result of failed initial tests shall be at the Contractor's expense.

B. Field testing, frequency, and methods may vary as determined by and between the Engineer and Owner and the Contractor's Testing Laboratory.

C. Review the Contractor's proposal materials and mix design for conformance with specifications.

D. Perform testing in accordance with ACI 301 and testing standards listed herein.

E. Strength Tests

1. Secure composite samples in accordance with ASTM C 172. Sample at regularly spaced intervals from middle portion of the batch. Sampling time shall not exceed 15 minutes.

2. Mold and cure specimens in accordance with ASTM C31.

a. A minimum of four concrete test cylinders shall be taken for every 50 cubic yards or less of each class of concrete placed each day and not less that once for each 5,000 square feet of paved area.

b. During the initial 24 hours (plus or minus 8 hours) after molding, the temperature immediately adjacent to the specimens shall be maintained in the range of 60 to 80 degrees F. Control loss of moisture from specimens by shielding from direct rays of the sun and from radiant heating devices.

c. Specimens transported prior to 48 hours after molding shall not be demolded but shall continue initial curing at 60 – 80 degrees F until time for testing.

d. Specimens transported after 48 hours age shall be demolded in 24 hours (plus or minus 8 hours). Curing shall then be continued but in saturated limewater at 73.4 degrees (plus or minus 3 degrees F) until the time of testing.

e. Wet cure cylinders under controlled temperature until testing.

3. Test cylinders in accordance with ASTM C 39.

a. Date test cylinders and number consecutively. Give each cylinder of each set an identifying letter (i.e. A, B, C, and D). Prepare a sketch of the building plan for each test set identifying location of placed concrete.

b. Test on cylinder (A) at 7 days for information. If the compressive strength of the concrete sample is equal to or above the 28-day specified strength, test another cylinder (B) at 7 days. The average of breaks shall constitute compressive strength of concrete sample.

c. Test two cylinders (B and C) at 28 days and the average of the breaks shall constitute compressive strength of concrete sample.

d. Retain fourth cylinder (D) for further testing if needed, but do not retain cylinder more than 60 days.

4. Evaluation and Acceptance

a. Strength level of concrete will be considered satisfactory if the average of all sets of three consecutive strength tests equal or exceed specified strength and no individual strength test (average of two cylinders) results are below specified compressive strength test by more than 500 psi.

b. Completed concrete work will not be accepted unless requirements of ACI 301, have been met, including dimensional tolerances, appearance, and strength of structure.

3.15 PROTECTION

A. Immediately after placement, protect pavement from premature moisture loss, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit vehicular traffic over pavement or curb for seven days minimum after finishing. Do not permit pedestrian traffic over concrete for three days.

END OF SECTION

INDEX TO

SECTION 03 10 00 – CONCRETE FORMING AND ACCESSORIES

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

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. Form-facing material for cast-in-place concrete.
2. Form liners.
3. Insulating concrete forms.
4. Shoring, bracing, and anchoring.

1.3 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction, movement, contraction, and isolation joints
c. Forms and form-removal limitations.
d. Shoring and reshoring procedures.
e. Anchor rod and anchorage device installation tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Exposed surface form-facing material.
2. Concealed surface form-facing material.
3. Forms for cylindrical columns.
4. Pan-type forms.

5. Void forms.
6. Form liners.
7. Insulating concrete forms.
8. Form ties.
9. Waterstops.
10. Form-release agent.

B. Sustainable Design Submittals:

C. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301 (ACI 301M).
   a. Location of construction joints is subject to approval of the Engineer
3. Indicate location of waterstops.
4. Indicate form liner layout and form line termination details.
5. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.
6. Indicate layout of insulating concrete forms, dimensions, course heights, form types, and details.

D. Samples:

1. For waterstops.
2. For Form Liners: 12-inch by 12-inch (305-mm by 305-mm) sample, indicating texture.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing and inspection agency.

B. Research Reports: For insulating concrete forms indicating compliance with International Code Council Acceptance Criteria AC353.

C. Field quality-control reports.

D. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Mockups: Formed surfaces to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.

1. Build panel approximately 100 sq. ft. (9.3 sq. m) in the location indicated or, if not indicated, as directed by Architect.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Form Liners: Store form liners under cover to protect from sunlight.

B. Insulating Concrete Forms: Store forms off ground and under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

C. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

B. Design, engineer, erect, shore, brace, and maintain insulating concrete forms in accordance with ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design cross ties to transfer the effects of the following loads to the cast-in-place concrete core:
   a. Wind Loads: As indicated on Drawings.
      1) Horizontal Deflection Limit: Not more than 1/360 of the wall height.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete", and as follows:

a. Plywood, metal, or other approved panel materials.
b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

1) APA HDO (high-density overlay).
2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces without spiral or vertical seams not exceeding specified formwork surface class.

1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation, with straight or tapered end forms.

2.3 WATERSTOPS

A. Flexible Rubber Waterstops: U.S. Army Corps of Engineers CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints, with factory fabricated corners, intersections, and directional changes.

1. Profile: Ribbed without center bulb.
2. Dimensions: 4 inches by 3/16 inch thick (100 mm by 4.8 mm thick) 6 inches by 3/8 inch thick (150 mm by 10 mm thick); nontapered.

B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals, with factory fabricate corners, intersections, and directional changes.

1. Profile: Ribbed without center bulb.
2. Dimensions: 4 inches by 3/16 inch thick (100 mm by 4.8 mm thick) 6 inches by 3/16 inch thick (150 mm by 4.8 mm thick); nontapered.

C. Flexible PVC Waterstops: U.S. Army Corps of Engineers CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints, with factory fabricate corners, intersections, and directional changes.

1. Profile: Ribbed without center bulb.
2. Dimensions: 4 inches by 3/16 inch thick (100 mm by 4.8 mm thick) 6 inches by 3/8 inch thick (150 mm by 10 mm thick); nontapered.

D. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch (10 by 19 mm).

2.4 RELATED MATERIALS

A. Reglets: Fabricate reglets of not less than 0.022-inch- (0.55-mm-) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners shall be acceptable to form liner manufacturer.

F. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

PART 3 – EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301 (ACI 301M).

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M) and to comply with the Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete" for as-cast finishes.

C. Limit concrete surface irregularities as follows:

1. Surface Finish-1.0: ACI 117 Class D, 1 inch (25 mm).
2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch (6 mm).
3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch (3.0 mm).

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips
2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
2. Locate temporary openings in forms at inconspicuous locations.

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

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches (305 mm).

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.
4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
   a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings.
   a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

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

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

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

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
5. Clean embedded items immediately prior to concrete placement.

3.3 INSTALLATION OF WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.

1. Install in longest lengths practicable.
2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 03 30 00 "Cast-In-Place Concrete."
4. Secure waterstops in correct position at 12 inches (305 mm) on center.
5. Field fabricate joints in accordance with manufacturer's instructions using heat welding.
   a. Miter corners, intersections, and directional changes in waterstops.
   b. Align center bulbs.
6. Clean waterstops immediately prior to placement of concrete.
7. Support and protect exposed waterstops during progress of the Work.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.

1. Install in longest lengths practicable.
2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
3. Protect exposed waterstops during progress of the Work.

3.4 INSTALLATION OF INSULATING CONCRETE FORMS

A Comply with ACI 301 (ACI 301M) and manufacturer's instructions.

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

C. Install forms in running bond pattern.

1. Align joints.
2. Align furring strips.

D. Construct forms tight to prevent loss of concrete mortar.

E. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.

2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

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

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

I. Shore insulating concrete forms to ensure stability and to resist stressing imposed by construction loads.

3.5 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.
1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.6 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 (ACI 318M) and ACI 301 (ACI 301M) for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.7 FIELD QUALITY CONTROL

A. Special Inspections: Contractor will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with Chapter 17 (Special Inspections and Tests) of the 2018 International Building Code, as adapted by the State of Georgia. This will be paid for through the Allowance – "Special Inspections"

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

END OF SECTION

INDEX TO

SECTION 03 20 00 – CONCRETE REINFORCING

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction contraction and isolation joints.
c. Steel-reinforcement installation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Epoxy repair coating.
3. Zinc repair material.
4. Bar supports.
5. Mechanical splice couplers.
6. Structural thermal break insulated connection system.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
3. For structural thermal break insulated connection system, indicate general configuration, insulation dimensions, tension bars, compression pads, shear bars, and dimensions.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Engineer and Owner.

D. Delegated Design Submittal: For structural thermal break insulated connection system, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For delegated design engineer.

B. Delegated Design Engineer Qualifications: Include the following:

1. Experience providing delegated design engineering services of the type indicated.
2. Documentation that delegated design engineer is licensed in the state in which Project is located.

C. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

D. Material Certificates: For each of the following, signed by manufacturers:

1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
2. Dual-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

E. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:
   a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.
2. Mechanical splice couplers.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, **acceptable to authorities having jurisdiction**, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

C. Mockups: Reinforcing for cast-concrete formed surfaces, to demonstrate tolerances and standard of workmanship.

1. Build panel approximately 100 sq. ft. (9.3 sq. m) for formed surface in the location indicated on Drawings.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Store reinforcement to avoid contact with earth.
2. Do not allow epoxy-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
3. Do not allow dual-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
4. Do not allow stainless steel reinforcement to come into contact with uncoated reinforcement.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design structural thermal break insulated connection system, including attachment to building construction.

B. Structural Performance of Structural Thermal Break Insulating Connection System: Structural thermal break insulated connection system to withstand the following loads and stresses:

1. Dead Loads: As indicated on Drawings.

a. Shear Load: As indicated on Drawings.
b. Bending Moment: As indicated on Drawings.

2. Live Loads: As indicated on Drawings.

a. Shear Load: As indicated on Drawings.
b. Bending Moment: As indicated on Drawings.

C. Seismic Performance of Structural Thermal Break Insulated Connection System: Structural thermal break Insulated connection system to withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.5.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed.

B. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.

C. Headed-Steel Reinforcing Bars: ASTM A970/A970M.

D. Galvanized Reinforcing Bars:

1. Steel Bars: ASTM A615/A615M, Grade 60 (Grade 420) ASTM A706/A706M, deformed bars.
2. Zinc Coating: ASTM A1055/A1055M Type I Type II.

E. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60 (Grade 420) ASTM A706/A706M, deformed bars, assembled with clips.

F. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

G. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

H. Galvanized-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from galvanized-steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A615/A615M, Grade 60 (Grade 420), plain-steel bars, ASTM A775/A775M epoxy coated.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
c. For dual-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
d. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
e. For stainless steel reinforcement, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

D. Mechanical Splice Couplers: ACI 318 (ACI 318M) Type 2, same material of reinforcing bar being spliced; tension-compression type.

E. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch (1.2908 mm) in diameter.

F. Stainless Steel Tie Wire: ASTM A1022/A1022M, not less than 0.0508 inch (1.2908 mm) in diameter.

H. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A775/A775M.

I. Zinc Repair Material: ASTM A780/A780M.

2.4 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 – EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

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

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

3.2 INSTALLATION OF STEEL REINFORCEMENT

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

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch (25 mm), not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318 (ACI 318M).

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

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches (610 mm), whichever is greater.
2. Stagger splices in accordance with ACI 318 (ACI 318M).
3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
4. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.

G. Install structural thermal break insulated connection system in accordance with manufacturer's instructions.

H. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches (305 mm).

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches (50 mm) for plain wire and 8 inches (200 mm) for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

I. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with ASTM D3963/D3963M.

J. Dual-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with ASTM D3963/D3963M.

K. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material in accordance with ASTM A780/A780M.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117 (ACI 117M).

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Contractor will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with Chapter 17 (Special Inspections and Tests) of the 2018 International Building Code, as adapted by the State of Georgia. This will be paid for through the Allowance – "Special Inspections"

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel-reinforcement placement.
2. Steel-reinforcement mechanical splice couplers.
3. Steel-reinforcement welding.

D. Manufacturer's Inspections: Engage manufacturer of structural thermal break insulated connection system to inspect completed installations prior to placement of concrete, and to provide written report that installation complies with manufacturer's written instructions.

END OF SECTION

INDEX TO

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 03 10 00 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 03 20 00 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete manufacturer.
    d. Concrete Subcontractor.
    e. Special concrete finish Subcontractor.
2. Review the following:

    a. Special inspection and testing and inspecting agency procedures for field quality control.
    b. Construction joints, control joints, isolation joints, and joint-filler strips.
    c. Semirigid joint fillers.
    d. Vapor-retarder installation.
    e. Anchor rod and anchorage device installation tolerances.
    f. Cold and hot weather concreting procedures.

g. Concrete finishes and finishing.
h. Curing procedures.
i. Forms and form-removal limitations.
j. Shoring and reshoring procedures.
k. Methods for achieving specified floor and slab flatness and levelness.
l. Floor and slab flatness and levelness measurements.
m. Concrete repair procedures.
n. Concrete protection.
o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
p. Protection of field cured field test cylinders.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement
7. Aggregates.
8. Admixtures:

    a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

9. Color pigments.
10. Fiber reinforcement.
11. Vapor retarders.
12. Floor and slab treatments.
13. Liquid floor treatments.
14. Curing materials.

    a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.

15. Joint fillers.
16. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.

6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Steel-fiber reinforcement content.
10. Synthetic micro-fiber content.
11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
12. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
13. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
14. Intended placement method.
15. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

a. Location of construction joints is subject to approval of the Architect.

D. Samples: For vapor retarder.

E. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Floor and slab treatments.
6. Bonding agents.

7. Adhesives.
8. Vapor retarders.
9. Semirigid joint filler.
10. Joint-filler strips.
11. Repair materials.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement.
7. Aggregates.
8. Admixtures:

a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

C. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

D. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

E. Preconstruction Test Reports: For each mix design.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

H. Consult section 01 33 00 for Submittal Procedures

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician with experience installing and finishing concrete, incorporating permeability-reducing admixtures.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

E. Mockups: Cast concrete slab-on-ground and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.

1. Slab-On-Ground: Build panel approximately 15 feet by 15 feet (3.35 meters by 3.35 meters) in the location indicated or, if not indicated, as directed by Architect.

a. Divide panel into four equal panels to demonstrate saw joint cutting.

2. Formed Surfaces: Build panel approximately 100 sq. ft. (9.3 sq. m) in the location indicated or, if not indicated, as directed by Architect.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:

a. Admixture dosage rates.
b. Slump.
c. Air content.
d. Seven-day compressive strength.

e. 28-day compressive strength.
f. Permeability.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301 (ACI 301M).

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F (1.7 deg C), other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F (35 deg C).
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

1.11 OMITTED

PART 2 – PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless modified by requirements in the Contract Documents.

B. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

C. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II, gray.
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C595/C595M, Type IP, portland-pozzolan cement.
5. Silica Fume: ASTM C1240 amorphous silica.
6. Performance-Based Hydraulic Cement: ASTM C1157/C1157M: Type GU, general use] Type HE, high early strength Type MS, moderate sulfate resistance.

D. Normal-Weight Aggregates: ASTM C33/C33M, Class 1N coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:

a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. (2.37 kg/cu. m) for moderately reactive aggregate or 3 lb./cu. yd. (1.78 kg/cu. m) for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301 (ACI 301M).

2. Maximum Coarse-Aggregate Size: 1-1/2 inches (38 mm) nominal.

3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Air-Entraining Admixture: ASTM C260/C260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
7. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C494/C494M, Type C.
8. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
9. Permeability-Reducing Admixture: ASTM C494/C494M, Type S, hydrophilic, permeability-reducing crystalline admixture, capable of reducing water absorption of concrete exposed to hydrostatic pressure (PRAH).

    a. Permeability: No leakage when tested in accordance with U.S. Army Corps of Engineers CRD C48 at a hydraulic pressure of 200 psi (1.28 MPa) for 14 days.

G. Water and Water Used to Make Ice: ASTM C94/C94M, potable or complying with ASTM C1602/C1602M, including all limits listed in Table 2 and the requirements of paragraph 5.4

2.2 OMITTED

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Sheet Vapor Retarder/Termite Barrier: ASTM E1745, Class A, except with maximum water-vapor permeance of 0.03 perms; complying with ICC AC380. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Low-Temperature Flexibility: Pass at minus 15 deg F (minus 26 deg C); ASTM D146/D146M.
2. Puncture Resistance: 224 lbf (996 N) minimum; ASTM E154/E154M.
3. Water Absorption: 0.1 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D570.
4. Hydrostatic-Head Resistance: 231 feet (70 m) minimum; ASTM D5385.

C. Bituminous Vapor Retarder: ASTM E1993/E1993M, 110-mil- (2.8-mm-) thick, semiflexible, seven-ply sheet membrane, consisting of reinforced core and carrier sheet with fortified asphalt layers, protective weather coating, and removable plastic release liner. Furnish manufacturer's accessories, including bonding asphalt, pointing mastics, and self-adhering joint tape.

1. Water-Vapor Permeance: 0.0011 grains/h x sq. ft. x inches Hg (0.063 ng/Pa x s x sq. m) when tested in accordance with ASTM E154/E154M.
2. Tensile Strength: 156 lbf/inch (27.35 kN/m) when tested in accordance with ASTM E154/E154M.
3. Puncture Resistance: 140 lbf (662N) when tested in accordance with ASTM E154/E154M.

2.4 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing 3/8-inch (10-mm) sieve.

2.5 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50 deg F (10 deg C): Black.
b. Ambient Temperature between 50 deg F (10 deg C) and 85 deg F (29 deg C): Any color.
c. Ambient Temperature Above 85 deg F (29 deg C): White.

D. Curing Paper: 8-feet- (2438-mm-) wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

E. Water: Potable or complying with ASTM C1602/C1602M.

F. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

G. Clear, Waterborne, Membrane-Forming, Nondissipating Curing Compound: ASTM C309, Type 1, Class B, certified by curing compound manufacturer to not interfere with bonding of floor covering.

H. Clear, Waterborne, Membrane-Forming, Curing Compound: ASTM C309, Type 1, Class B, 18 to 25 percent solids, nondissipating[, certified by curing compound manufacturer to not interfere with bonding of floor covering].

I. Clear, Solvent-Borne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

J. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.

C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Floor Slab Protective Covering: 8-feet- (2438-mm-) wide cellulose fabric.

2.7 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand, as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested in accordance with ASTM C109/C109M.

2.8 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301 (ACI 301M).

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Slag Cement: 50 percent by mass.
3. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
5. Use permeability-reducing admixture in concrete mixtures where indicated.

D. Color Pigment: Add color pigment to concrete mixture in accordance with manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.9 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for footings, grade beams, and tie beams.

1. Exposure Class: ACI 318 (ACI 318M) F0 S0 W0 C1.
2. Minimum Compressive Strength: 5000 psi (34.5 MPa) As indicated at 28 days.
3. Maximum w/cm: 0.45.
4. Slump Limit: 5 inches (125 mm), plus or minus 1 inch (25 mm).
5. Air Content:

a. Exposure Class F1: 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch (19-mm) nominal maximum aggregate size.

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

B. Class B: Normal-weight concrete used for foundation walls.

1. Exposure Class: ACI 318 (ACI 318M) F0 S1 W0 C0.
2. Minimum Compressive Strength: As indicated at 28 days.
3. Maximum w/cm: 0.45.
4. Air Content:

a. Exposure Class F1: 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch (19-mm) nominal maximum aggregate size 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-1/2-inch (38-mm) nominal maximum aggregate size.

4. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

C. Class C: Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 (ACI 318M) F0 W0 C0.
2. Minimum Compressive Strength: As indicated at 28 days.
3. Minimum Cementitious Materials Content: 470 lb/cu. yd. (279 kg/cu. m).
4. Air Content:

a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

5. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
6. Steel-Fiber Reinforcement: Add to concrete mixture, in accordance with manufacturer's written instructions, at a rate of 50 lb/cu. yd. (29.7 kg/cu. m).
7. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd. (0.60 kg/cu. m).
8. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 4.0 lb/cu. yd. (2.4 kg/cu. m).

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
   1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
   2. Face laps away from exposed direction of concrete pour.
   3. Lap vapor retarder over footings and grade beams not less than 6 inches (150 mm), sealing vapor retarder to concrete.
   4. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
   5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
   6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
   7. Protect vapor retarder during placement of reinforcement and concrete.
      a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches (150 mm) on all sides, and sealing to vapor retarder.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.5 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
   1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
   2. Place joints perpendicular to main reinforcement.
      a. Continue reinforcement across construction joints unless otherwise indicated.
      b. Do not continue reinforcement through sides of strip placements of floors and slabs.
   3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
   4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
   7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

C. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface, where joint sealants are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

D. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

E. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M), but not to exceed the amount indicated on the concrete delivery ticket.

   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

   1. If a section cannot be placed continuously, provide construction joints as indicated.
   2. Deposit concrete to avoid segregation.
   3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
   4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301 (ACI 301M).

      a. Do not use vibrators to transport concrete inside forms.
      b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
      c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
      d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

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

   1. Do not place concrete floors and slabs in a checkerboard sequence.
   2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   3. Maintain reinforcement in position on chairs during concrete placement.
   4. Screed slab surfaces with a straightedge and strike off to correct elevations.
   5. Level concrete, cut high areas, and fill low areas.
   6. Slope surfaces uniformly to drains where required.
   7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
   8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 (ACI 301M) Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

    a. Patch voids larger than 1-1/2 inches (38 mm) wide or 1/2 inch (13 mm) deep.
    b. Remove projections larger than 1 inch (25 mm).
    c. Tie holes do not require patching.
    d. Surface Tolerance: ACI 117 (ACI 117M) Class D.
    e. Apply to concrete surfaces not exposed to public view.

2. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

    a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
    b. Remove projections larger than 1/4 inch (6 mm).
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 (ACI 117M) Class B.
    e. Locations: Apply to concrete surfaces to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

3. ACI 301 (ACI 301M) Surface Finish SF-3.0:

    a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
    b. Remove projections larger than 1/8 inch (3 mm).
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 (ACI 117M) Class A.

C. Related Unformed Surfaces:

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

3.8 FINISHING FLOORS AND SLABS

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

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch (6 mm) in one direction.

3. Apply scratch finish to surfaces to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 (ACI A117M) tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155 (ASTM E1155M), for a randomly trafficked floor surface:

    a. Slabs on Ground:

        1) Specified overall values of flatness, FF 25; and of levelness, FL 20; with minimum local values of flatness, FF 17; and of levelness, FL 15.

    b. Suspended Slabs:
        1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch (6 mm).

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated on Drawings. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

F. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish to concrete stair treads, platforms, ramps as indicated on Drawings

1. Apply in accordance with manufacturer's written instructions and as follows:

a. Uniformly spread 25 lb/100 sq. ft. (12 kg/10 sq. m) of dampened slip-resistive aggregate over surface in one or two applications.
b. Tamp aggregate flush with surface, but do not force below surface.
c. After broadcasting and tamping, apply float finish.
d. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

2. After final floating, apply a trowel finish.
3. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

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

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

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 6 inches (150 mm) high unless otherwise indicated on Drawings, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 5000 psi (34.5 MPa) at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.

5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.

    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.10 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 (ACI 301M) and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1, before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
    e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

        1) Recoat areas subject to heavy rainfall within three hours after initial application.
        2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:

    a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

        1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

            a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
            b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

        2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.

            a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
            b) Cure for not less than seven days.

        3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

            a) Water.
            b) Continuous water-fog spray.

    b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:

        1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
            a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
            b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

        2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
b) Cure for not less than seven days.

4) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

c. Floors to Receive Polished Finish: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

d. Floors to Receive Chemical Stain:

1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
3) Butt sides of curing paper tight; do not overlap sides of curing paper.
4) Leave curing paper in place for duration of curing period, but not less than 28 days.

e. Floors to Receive Urethane Flooring:

1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches (150 mm) and sealed in place.

3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.

f. Floors to Receive Curing Compound:

1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Maintain continuity of coating, and repair damage during curing period.
4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

g. Floors to Receive Curing and Sealing Compound:

1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES

A. Conform to ACI 117 (ACI 117M).

3.12 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.
1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than three days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
4. Rinse with water; remove excess material until surface is dry.
5. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s).
2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

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

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete.

    a. Limit cut depth to 3/4 inch (19 mm).
    b. Make edges of cuts perpendicular to concrete surface.
    c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
    d. Fill and compact with patching mortar before bonding agent has dried.
    e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

    a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.

b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

    a. Correct low and high areas.
    b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

    a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
    b. Feather edges to match adjacent floor elevations.

6. Correct other low areas scheduled to remain exposed with repair topping.

    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

7. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete.

    a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.

c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
d. Place, compact, and finish to blend with adjacent finished concrete.
e. Cure in same manner as adjacent concrete.

8. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar.

a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
b. Dampen cleaned concrete surfaces and apply bonding agent.
c. Place patching mortar before bonding agent has dried.
d. Compact patching mortar and finish to match adjacent concrete.
e. Keep patched area continuously moist for at least 72 hours.

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

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

3.15 FIELD QUALITY CONTROL

A. Special Inspections: Contractor will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports. This will be paid for through the Allowance – "Special Inspections"

B. Testing Agency: Contractor will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.

7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

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

2. Slump: ASTM C143/C143M:

   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.

3. Slump Flow: ASTM C1611/C1611M:

   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.

b. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;.

   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C1064/C1064M:

   a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.

6. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.

   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

7. Compression Test Specimens: ASTM C31/C31M:

   a. Cast and laboratory cure two sets of three 6-inch (150 mm) by 12-inch (300 mm) or 4-inch (100 mm) by 8-inch (200 mm) cylinder specimens for each composite sample.
   b. Cast, initial cure, and field cure two sets of three standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C39/C39M.

   a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
   b. Test one set of three field-cured specimens at seven days and one set of two specimens at 28 days.
   c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa) if specified compressive strength is 5000 psi (34.5 MPa), or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi (34.5 MPa).
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

12. Additional Tests:

    a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

        1) Acceptance criteria for concrete strength to be in accordance with ACI 301 (ACI 301M), Section 1.6.6.3.

13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 (ASTM E1155M) within 48 hours of completion of floor finishing and promptly report test results to Architect.

3.16 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION

INDEX TO

SECTION 05 50 00 – METAL FABRICATIONS

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous metals
2. Metal bollards.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Shop primers.
2. Metal bollards.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Samples: For each type and finish of extruded nosing and tread.

D. Delegated Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design ladders.

B. Structural Performance of Aluminum Ladders: Ladders, including landings, are to withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.

D. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

E. Rolled-Stainless Steel Floor Plate: ASTM A793.

F. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface.

G. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

H. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

I. Zinc-Coated Steel Wire Rope: ASTM A741.

J. Stainless Steel Wire Rope: Wire rope manufactured from stainless steel wire complying with ASTM A492, Type 316.

1. Wire Rope Fittings: Stainless steel connectors, Type 316, with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

L. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

M. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.

N. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.

O. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

P. Bronze Extrusions: ASTM B455, Alloy UNS No. C38500 (extruded architectural bronze).

Q. Bronze Castings: ASTM B584, Alloy UNS No. C83600 (leaded red brass) or UNS No. C84400 (leaded semired brass).

R. Nickel Silver Castings: ASTM B584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

S. For all metal associated with elevated water storage tank, see specification 33 16 13.

2.3 OMITTED

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099000 " Painting."

B. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

C. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 OMITTED

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

2.7 OMITTED

2.8 OMITTED

2.9 OMITTED

2.10 OMITTED

2.11 OMITTED

2.12 METAL BOLLARDS

A. Bollards shall be removable type as indicated in plans. Fabricate metal bollards from steel shapes, as indicated.

1. Cap bollards with 1/4-inch- (6.4-mm-) thick steel.

B. Fabricate sleeves for bollard anchorage from steel or stainless steel pipe or tubing. Make sleeves not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) larger than OD of bollard.

C. Prime steel bollards with zinc-rich primer. Bollards to be painted yellow.

2.13 OMITTED

2.14 OMITTED

2.15 OMITTED

2.16 OMITTED

2.17 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

2.18 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items **not indicated to be galvanized** unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Section 09 90 00.
4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 OMITTED

3.4 INSTALLATION OF METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch (19-mm) bolts at each bollard unless otherwise indicated.

1. Embed anchor bolts at least 4 inches (100 mm) in concrete.

C. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.

D. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

3.5 OMITTED

3.6 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

INDEX TO

SECTION 09 90 00 – PAINTING

SECTION 09 90 00

PAINTING

PART 1 – GENERAL

1.1 DESCRIPTION:

A. Work covered by this section includes surface preparation and coatings on structural steel, pumps, equipment, piping, interior and exterior of building, and other places or items listed in the painting schedule herein or shown on drawings.

1.2 RELATED WORK:

A. Section 09 96 00 – Coating System for Water Storage Tanks

B. Section 33 10 00 – Water Distribution System

1.3 QUALITY CONTROL:

A. Paint Manufacturer: The paint shall be a product of a manufacturer with a record of at least 5 years of producing paint of the type specified.

B. Applicators: The paint shall be applied by skilled painters with experience in painting structures similar to those specified and with the use of the type of coatings described. If a painting contractor is used he shall furnish the Engineer with a list of similar projects he has completed and the names of the Owners and Engineers who are familiar with his capabilities.

1.4 ALLOWABLE TOLERANCES:

A. The thickness of coatings shall be at least 90% of that specified for any coat and shall be at least 100% of that specified for the total thickness.

1.5 CERTIFICATE:

A. The manufacturer shall furnish the Engineer with a certificate showing the composition and physical properties of the paint proposed for use. Proprietary formula will not be required but the information must include at least the following:

Binder	Pot Life
Resin	Theoretical Coverage Per Mil Thickness
Pigment	Solvent
Solids by Weight	Solids by Volume

B. Coatings used on water piping, tanks, pumps, and other water related materials and equipments shall be certified by the NSF that the coatings conform to NSF Standard 61–Drinking Water Components – Health Effects.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. All material must be brought to the job site in the original sealed and labeled containers. It shall be stored in a protected manner to preserve the labels and seals.

1.7 JOB CONDITIONS:

A. No paint shall be applied when the surrounding air temperature, as measured in the shade, is below 40˚ F. No paint shall be applied when the temperature of the surface to be painted is below 35˚ F. Paint shall not be applied to wet or damp surfaces and shall not be applied in rain, snow, fog or mist. No paint shall be applied when it is expected that the air temperature will drip below 40˚ F. within 18 hours after the application of the paint. Dew or moisture condensation should be anticipated and if such conditions are prevalent, painting shall be delayed until midmorning to be certain that the surfaces are dry. Further, the days painting should be completed well in advance of the probable time of day when condensation will occur, in order to permit the film an appreciable drying time prior to the formation of moisture.

All paint should be applied in strict accordance with the paint manufacturer's instructions.

1.8 PROTECTION:

A. Painted surfaces shall be protected until thoroughly dry and cured. Any damage to painted surfaces that mar or abrade the surface shall be repaired by the Contractor by sanding to a sound surface and repainting with the same paint used on surrounding surfaces. Where a repainted surface does not blend completely with the surrounding surface, the Contractor shall repaint the entire area or part or segment of the surface that will make the repair not discernable at no cost to the Owner.

1.9 SEQUENCING AND SCHEDULING:

A. The Contractor shall arrange his work so that the finish paint coat is done after all equipment has been installed and other work finished.

1.10 ALTERNATIVES:

A. The intention of these specifications is to produce the best protective coating for the Owner. If the Contractor suggests alternate material or methods that will improve the results at no additional cost, the Engineer will examine the suggestion and if it is accepted, it may be used. The basis upon which acceptance of an alternate will be given will be its value to the Owner and not for the conveniences of the Contractor.

1.11 GUARANTEE:

A. The Contractor shall guarantee the quality and performance of material and workmanship for a period of 12 months after acceptance. Defects discovered during the period shall be repaired by the Contractor at no cost to the Owner. The Performance Bond shall reflect this guarantee.

1.12 COLOR:

A. Contractor shall provide the Engineer and Owner with a color selection chart and obtain his choice on color prior to ordering.

1.13 OMITTED

PART 2 – PRODUCTS

2.1 PAINT QUALITY:

A. The paint shall be a product of a manufacturer with a record of at least 5 years of producing the type of paint specified. The quality of the paint shall be equivalent to those manufactured by the following:

Tnemec Company: Basis of Design
Sherwin Williams
Induron Coatings, Inc.

Products of other manufacturers comparable in quality and type will be acceptable, if offered by the Contractor with satisfactory data on past performance in similar installations and if accepted by the Engineer.

2.2 PRODUCT NAMES:

A. Product names of certain manufacturers are used in the following paint schedules to indicate the type, thickness, color and method of application. Products of other manufacturers that in the opinion of the Engineer are equivalent to the Products named will be accepted.

2.3 PAINT MATERIALS:

A. The painting materials to be used shall be similar and equivalent to the following products of Tnemec The painting materials to be used for the various surfaces and conditions of service shall be similar and equivalent to the following:

B. If necessary to achieve satisfactory application, thinning will be done in accordance with paint manufacturer's recommendations using thinner from same manufacturer as paint.

	Tnemec Company	**Sherwin Williams Coatings**
Exterior Structural Steel & Miscellaneous Ferrous Metal:	Shop Primer: One coat Tnemec Series 1, 2.5 dry film mils	Shop Primer: B65G00011 - Corothane® I Galvapac One Pack Zinc Primer Gray Gray Notes: Apply at 2.5 to 3.5 mils DFT
	Field Primer: One Coat Tnemec Series 66, 2.5 dry film mils	Field Primer: B58W00610 - Macropoxy® 646 Fast Cure Epoxy Part A Mill White Notes: Apply at 3.0 to 5.0 mils DFT
	Finish: One Coat Tnemec	Finish: B65W00301 - Hi Solids

	Tnemec Company	**Sherwin Williams Coatings**
	Series 1095, 2.5 dry film mils	Polyurethane Gloss Part S Pure White Pure White Notes: Apply at 3.0 to 5.0 mils DFT
Exterior Galvanized Metal:	Field Primer: One Coat Tnemec Series 66, 2.5 dry film mils	Field Primer: B58W00610 - Macropoxy® 646 Fast Cure Epoxy Part A Mill White Notes: Apply at 3.0 to 5.0 mils DFT
	Finish: One Coat Tnemec Series 1095, 2.5 dry film mils	Finish: B65W00301 - Hi Solids Polyurethane Gloss Part S Pure White Pure White Notes: Apply at 3.0 to 5.0 mils DFT
Exterior and Interior Machinery & Equipment:	Shop Primer: One coat Series 1, 2.5 dry film mils	Shop Primer: B65G00011 - Corothane® I Galvapac One Pack Zinc Primer Gray Gray Notes: Apply at 2.5 to 3.5 mils DFT
	Field Primer: One Coat Tnemec Series 66, 2.5 dry film mils	Field Primer: B58W00610 - Macropoxy® 646 Fast Cure Epoxy Part A Mill White Notes: Apply at 3.0 to 5.0 mils DFT
	Finish: One Coat Tnemec Series 1095, 2.5 dry film mils	Finish: B65W00301 - Hi Solids Polyurethane Gloss Part S Pure White Pure White Notes: Apply at 3.0 to 5.0 mils DFT
Structural Steel & Miscellaneous Ferrous Metals (submerged-non potable water):	Shop Primer: One coat Tnemec Series 1, 2.5 dry film mils	Shop Primer: B65G00011 - Corothane® I Galvapac One Pack Zinc Primer Gray Gray Notes: Apply at 2.5 to 3.5 mils DFT
	Field Primer: One Coat Tnemec Series N69, 4.0 dry film mils	Field Primer: B62W00080 - Tank Clad HS Epoxy PW (Part A) Sanitary White Sanitary White Notes: Apply at 5.0 to 8.0 mils DFT
	Finish: One Coat Tnemec Series N69, 4.0 dry film mils	Finish: B62W00080 - Tank Clad HS Epoxy PW (Part A) Sanitary White Sanitary White Notes: Apply at 5.0 to 8.0 mils DFT
Structural Steel & Miscellaneous Ferrous Metals (submerged-Potable Water):	Shop Primer: One coat Tnemec Series N140-1211, 2.5 dry film mils	Shop Primer: B58W00681 - SHPLT600 WHT A Notes: NSF Approved Apply at 4.0 to 6.0 mils DFT
	Field Primer: One Coat	Field Primer: B58W00681 - SHPLT600

	Tnemec Company	**Sherwin Williams Coatings**
	Tnemec Series L140, 4.0 dry film mils	WHT A Notes: NSF Approved Apply at 4.0 to 6.0 mils DFT
	Finish: One Coat Tnemec Series L140, 4.0 dry film mils	Finish: B58W00681 - SHPLT600 WHT A Notes: NSF Approved Apply at 4.0 to 6.0 mils DFT
Galvanized Metal (submerged-non potable water):	Field Primer: One Coat Tnemec Series 66, 3.0 dry film mils	Field Primer: B58W00610 - Macropoxy® 646 Fast Cure Epoxy Part A Mill White Notes: Apply at 3.0 mils to 5.0 mils DFT
	Finish: One Coat Tnemec Series 66, 3.0 dry film mils	Finish: B58W00610 - Macropoxy® 646 Fast Cure Epoxy Part A Mill White Notes: Apply at 3.0 mils to 5.0 mils DFT
Galvanized Metals (Submerged-Potable water):	Field Primer: One Coat Tnemec Series L140, 3.0 dry film mils	Field Primer: B58W00681 - SHPLT600 WHT A Notes: NSF Approved Apply at 3.0 mils DFT
	Finish: One Coat Tnemec Series L140, 3.0 dry film mils	Finish: B58W00681 - SHPLT600 WHT A Notes: NSF Approved Apply at 3.0 mils DFT
Exterior & Interior Cast Iron & Steel Piping & Valves (non–submerged):	Shop Primer: One coat Tnemec Series N140-1211, 4.0 dry film mils	Shop Primer: B65G00011 - Corothane® I Galvapac One Pack Zinc Primer Gray Gray Notes: Apply at 3.0 to 4.0 mils DFT
	Field Primer: One Coat Tnemec Series 66, 2.5 dry film mils	Field Primer: B58W00610 - Macropoxy® 646 Fast Cure Epoxy Part A Mill White Notes: Apply at 3.0 to 5.0 mils DFT
	Finish: One Coat Tnemec Series 1095, 2.5 dry film mils	Finish: B65W00301 - Hi Solids Polyurethane Gloss Part S Pure White Pure White Notes: Apply at 3.0 to 5.0 mils DFT
Cast Iron & Steel Piping & Valves (submerged-non potable water):	Shop Primer: One coat Tnemec Series N140-1211, 4.0 dry film mils	Shop Primer: B62W00080 - Tank Clad HS Epoxy PW (Part A) Sanitary White Sanitary White Notes: Apply at 5.0mils to 8.0 mils DFT
	Field Primer: One Coat	Field Primer: B62W00080 - Tank Clad

	Tnemec Company	**Sherwin Williams Coatings**
	Tnemec Series N69, 4.0 dry film mils	HS Epoxy PW (Part A) Sanitary White Sanitary White Notes: Apply at 5.0mils to 8.0 mils DFT
	Finish: One Coat Tnemec Series N69, 4.0 dry film mils	Finish: B62W00080 - Tank Clad HS Epoxy PW (Part A) Sanitary White Sanitary White Notes: Apply at 5.0mils to 8.0 mils DFT
Cast Iron & Steel Piping & Valves (Submerged – Potable water):	Shop Primer: One coat Tnemec Series N140-1211, 2.5 dry film mils	Shop Primer: B58W00681 - SHPLT600 WHT A Notes: Apply at 4.0 to 6.0 mils DF
	Field Primer: One Coat Tnemec Series L140, 4.0 dry film mils	Field Primer: B58W00681 - SHPLT600 WHT A Notes: Apply at 4.0 to 6.0 mils DFT
	Finish: One Coat Tnemec Series L140, 4.0 dry film mils	Finish: B58W00681 - SHPLT600 WHT A Notes: Apply at 4.0 to 6.0 mils DFT
Concrete Floors and Walks:	Primer: One coat Tnemec Series 208, 16-20.0 dry film mils	Primer: GP3831A01 - RSFLR MVB CLR A Notes: Apply at 16-20 mils DFT
	Intermediate: One Coat Tnemec Series 280, 6.0 dry film mils	Intermediate Coat: GP3741A54 - GP N FLO AC ST G A Notes: Apply at 10-15 mils DFT
	Finish: One Coat Tnemec Series 280, 6.0 dry film mils w/ added non-slip additive	Finish: GP3741A54 - GP N FLO AC ST G A Notes: Apply at 10-15 mils DFT. w/added non-slip additive
Interior Concrete Block, Concrete or Brick Walls (non–submerged):	Primer: One coat Block Filler Tnemec Series 130 applied at 80-90 sq. ft. per kit	Primer: I42W00200 - CEMENTPLX875WHT 5G Notes: Apply One Coat at 80-90 sq feet per gallon. See data page for surface prep requirements.
	N/A	Intermediate Coat: B73W00311 - Pro Industrial Waterbased Epoxy Gloss (Part A) Extra White / Tint Base Notes: Apply at 3.5 to 4.9 mils DFT
	Finish: Two coats Tnemec Series 113, 3.5 dry film mils per coat	Finish: B73W00311 - Pro Industrial Waterbased Epoxy Gloss (Part A) Extra White / Tint Base Notes: Apply at 3.5 to 4.9 mils DFT
Concrete (submerged):	First Coat: One coat Tnemec	First Coat: B58W00681 - SHPLT600

Tnemec Company	Sherwin Williams Coatings
Series 21 applied at 6-8 mils per coat	WHT A Notes: Apply at 8.0 to 10.0 mils DFT
N/A	Primer Resurfacer: B58A00320 - DURA-PLATE 230 Notes: Use to fill Bug Holes, Imperfections.
Finish: One coat Tnemec Series 21 applied at 6-8 mils per coat (color-WH16 Off White)	Finish: B58W00681 - SHPLT600 WHT A Notes: Apply at 8.0 to 10.0 mils DFT

2.4 PRODUCT REVIEW:

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

PART 3 – EXECUTION

3.1 ON SITE OBSERVATION OF WORK:

A. Surfaces shall be checked by the Engineer and Owner after cleaning. After each coat has been applied and allowed to dry for 24 hours, the dry coating thickness will be measured by the Engineer using a dry coating thickness gauge. A low voltage thickness gauge shall be furnished by the Contractor and kept on the job site. The Contractor shall give the Engineer and Owner a minimum of 48 hours notice for all required observations or tests.

3.2 SURFACE PREPARATION:

A. All surfaces shall be clean, dry and in suitable condition to receive the finish. Incidental or necessary minor cleaning, sanding and dusting of surfaces shall be done so that they are in proper condition to receive the finish. All dirt, grease and rust shall be removed from metal work with benzine, sandpaper or wire brush. All abrasions shall be rubbed smooth and edges of all paint feathered and then touched up with paint specified for finish, in such a manner that the patch will not show on completion. All metal surfaces shall be clean, free from dirt, scale, loose paint, oil and grease. In general, metal surfaces will have a priming coat before shipment. The abraded portions shall be touched up prior to applying final coats.

All surfaces to be painted shall be free form cracks, holes or other defects which will prevent obtaining a smooth unbroken paint film.

1. Steel: The steel surface must be prepared by blast cleaning.

(a) Blast Cleaning: As a minimum, all unprimed metal surfaces shall be

field sandblasted in accordance with NACE No. 2 (SSPC–SP10), near white blast for immersion service areas. A NACE No. 3 (SSPC–SP6), commercial blast, shall be required on any metal surface to be in non-immersion service areas. All blasted areas will be primed within 8 hrs. after the blast with the appropriate primer mentioned in Section 2.3 of this specification. All weld areas shall be smooth.

Blast cleaning shall not develop an anchor pattern exceeding 1/.3 the total thickness of the film used and may be obtained with a 16–30 mesh sand. All dust or grit remaining on the surfaces after blasting shall be removed by brush or vacuum.

(b) Shop Primed Coats: Certain shop coats are to be furnished for some items as specified under other parts of these specifications. Consequently, field prime coats will not be required on surfaces shop primed, except for touch–up and repair of any damage to same as the result of shipping, erecting or construction operations. Such touch–up and repair shall be with a field primer recommended by the paint manufacturer.

It shall be the responsibility of the Contractor to ensure that all field applied painting materials are compatible with the shop allied painting materials over which they will be used.

3.3 APPLICATION:

A. The Painter shall apply each coating at the rate specified by the manufacturer. If materials has thickened or must be diluted for application by spray guns, the coating shall be built up to the same film thickness achieved with undiluted material. One gallon of paint as originally furnished by the manufacturer must not cover a greater square foot area when applied by spray gun than when applied by brush unthinned.

Sufficient time shall elapse between successive coats to permit proper drying. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks and variations in color, texture and finish.

Paint coats on metal may be either brushed or sprayed on. If sprayed, the gun shall be operated by mechanics, the nozzle held perpendicular to the surface being painted and the coats applied uniformly and in a manner that will bond the paint properly to the surface. Air spray application of paint shall be followed immediately with a paint brush applied along the vertical and lower horizontal edges of members and along all abutting surfaces, edges of connections, between the rivet heads and the like points to remove all surplus paint and to smooth out all runs. All sags in paint films wherever located shall be brushed out immediately.

For submerged metal surfaces, all or part including below or above grade surfaces constantly wet or exposed to moisture and condensation must be dry, clean and free of oil and grease. Proper cleaning is essential. Sandblast to a near white blast in accordance with Steel Structures Painting Council recommended methods outlined in Specification SP10. Surfaces shall be primed immediately after sandblasting with the Primers as outlined in these specifications.

3.4 PAINTING SCHEDULE:

A. The following paint schedule indicates the surfaces to be painted using the painting materials previously specified for the type of surface and conditions of service as directed by the Owner and Engineer. The colors will be selected by the Owner from the manufacturer's standard color charts and, where required to match existing or other colors provided, the manufacturer shall obtain the same by the mixing and/or tinting of his particular products. Colors are subject to final acceptance by the owner at the time of construction.

Surfaces to be painted shall include the following:

1. Within the work area, new pumps, piping, valves, electrical conduits, panels and miscellaneous steel which will remain in service upon completion of work.

2. Pump building, concrete walls (interior & exterior), concrete floor (all rooms), ceiling, all unpainted and primed metal.

3. Existing pumps, piping, valves to remain shall be sand-blasted and repainted in accordance with schedule in this section.

4. Painting of piping and electrical conduit shall include painting of all equipment, including appurtenances in the respective piping lines and conduit runs.

If any of the above items are furnished in aluminum, bronze or stainless steel, no painting is required.

END OF SECTION

INDEX TO

SECTION 09 96 00 – COATING SYSTEMS FOR WATER STORAGE TANKS

SECTION 09 96 00

COATING SYSTEMS FOR WATER STORAGE TANKS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Coating systems for steel water storage tanks.

1.2 RELATED WORK

A. Section 01 45 23 – Testing and Inspecting Services

B. Section 33 16 13.13 – Elevated Steel Water Storage Tank

C. Section 33 16 13.16 – Prestressed Concrete Ground Water Storage Tank

D. Section 33 16 13 – Composite Elevated Water Storage Tank

1.3 REFERENCES

A. ANSI/NSF 600 – Drinking Water Systems Components – Health Effects.

B. ASTM D 16 – Terminology Relating to Paint, Varnish, Lacquer, and Related Products.

C. ASTM D 4263 – Indicating Moisture in Concrete by the Plastic Sheet Method.

D. ASTM F 1869 – Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

E. AWWA C 652 – Disinfection of Water–Storage Facilities.

F. AWWA D 102 – Painting Steel Water Storage Tanks.

G. International Concrete Repair Institute (ICRI) Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

H. SSPC–SP 3 – Power Tool Cleaning.

I. SSPC–SP 6/NACE 3 – Commercial Blast Cleaning.

J. SSPC–SP 10/NACE 2 – Near–White Metal Blast Cleaning.

K. SSPC–SP 11 – Power Tool Cleaning to Bare Metal.

L. SSPC–SP 13/NACE 6 – Surface Preparation of Concrete.

1.4 DEFINITIONS

A. Definitions of Painting Terms: ASTM D 16, unless otherwise specified.
B. Dry Film Thickness (DFT): Thickness of a coat of paint in fully cured state measured in mils (1/1000 inch).

1.5 SUBMITTALS

A. Comply with Section 01 33 00 – Submittal Procedures

B. Product Data: Submit manufacturer's product data for each coating, including generic description, complete technical data, surface preparation, and application instructions.

C. Color Samples: Submit manufacturer's color samples showing full range of standard colors.

D. Manufacturer's Quality Assurance: Submit manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.

E. Applicator's Quality Assurance: Submit list of a minimum of 5 completed projects of similar size and complexity to this work. Include for each project:

1. Project name and location.
2. Name of owner.
3. Name of contractor.
4. Name of engineer.
5. Name of coating manufacturer.
6. Approximate area of coatings applied.
7. Date of completion.

F. Warranty: Submit manufacturer's standard warranty.

G. Warranty: Submit manufacturer's 15-year exterior gloss and color retention warranty. This warranty is from the coating manufacturer to the owner.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Specialize in manufacture of coatings with a minimum of 10 years successful experience.
2. Able to demonstrate successful performance on comparable projects.
3. Single Source Responsibility: Coatings and coating application accessories shall be product of a single manufacturer.

B. Applicator's Qualifications:

1. Experienced in application of specified coatings for a minimum of 5 years on projects of similar size and complexity to this work.
2. Applicator's Personnel: Employ persons trained for application of specified coatings.

C. Mock–Ups: Prepare 6–foot x 6–foot mock–up for each coating system specified using same materials, tools, equipment, and procedures intended for actual surface preparation and application. Obtain Engineer's approval of mock–ups. Retain mock–ups to establish intended standards by which coating systems will be judged at no additional cost to Owner.

D. Preapplication Meeting: Convene a preapplication meeting two weeks before start of application of coating systems. Require attendance of parties directly affecting work of this section, including Contractor, Engineer, applicator, and manufacturer's representative. Review the following:

1. Environmental requirements.
2. Protection of surfaces not scheduled to be coated.
3. Surface preparation.
4. Application.
5. Disinfection.
6. Repair.
7. Field quality control.
8. Cleaning.
9. Protection of coatings systems.
10. One–year inspection.
11. Coordination with other work.
12. Verification of color scheme, lettering, and logo(s).

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers, and packaging, with labels clearly identifying:

1. Coating or material name.
2. Manufacturer.
3. Color name and number.
4. Bach or lot number.
5. Date of manufacture.
6. Mixing and thinning instructions.

B. Storage:

1. Store materials in a clean dry area and within temperature range in accordance with manufacturer's instructions.
2. Keep containers sealed until ready for use.
3. Do not use materials beyond manufacturer's shelf life limits.

C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Weather:

1. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with manufacturer's instructions.
2. Surface Temperature: Minimum of 5 degrees F (3 degrees C) above dew point.
3. Relative Humidity: Prepare surfaces, apply, and cure coatings within relative humidity range in accordance with manufacturer's instructions.
4. Precipitation: Do not prepare surfaces or apply coatings in rain, snow, fog, or mist.
5. Wind: Do not spray coatings if wind velocity is above manufacturer's limit.

B. Ventilation: Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with AWWA D 102.

C. Dust and Contaminants:

1. Schedule coating work to avoid excessive dust and airborne contaminants.
2. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

1.9 OMITTED

PART 2 – PRODUCTS

2.1 MANUFACTURER(S)

A. Tnemec Company Incorporated, 1875 Lockeway Drive, Suite 704 Alpharetta, GA 30004, (770) 242 – 9605. Contact is Mr. Dean Drehoff (404) 915 – 6343 or ddrehoff@tnemec.com.

B. Sherwin-Williams. Contact is Mr. Darryl Rzepka (864) 234 – 4637 or Darryl.t.rzepka@sherwin.com.

2.2 COATING SYSTEMS FOR STEEL

The coating systems for the steel tank shall be equivalent to the Tnemec Hydro–System. Coatings shall be as follows:

A. Interior, Wet:

1. System Type: Zinc/epoxy. Tnemec Hydro–System.
2. AWWA D 102 Paint System: ICS–3.
3. ANSI/NSF 61 Certified: For use inside potable water storage tanks.
4. Surface Preparation: SSPC–SP 10/NACE 2.
5. Shop Primer: Series 94–H2O Hydro–Zinc. DFT 2.5 to 3.5 mils.
6. Field Weld Seams and Abrasions: 94–H20 Hydro–Zinc. DFT 2.5 to 3.5 mils.
7. Stripe Coat: Series N140 Pota–Pox Plus. DFT 2.0 to 3.0 mils.
8. Field Finish Coat: Series 21 Plus DFT 12.0 to 14.0 mils.
9. Total DFT: 14.5 to 17.5 mils.
10. Finish Color: As selected by Owner from manufacturer's standard colors.

B. Interior, Dry:

1. System Type: Zinc/epoxy. Tnemec Hydro–System.
2. Surface Preparation: SSPC–SP 10/NACE 2.
3. Shop Primer: Series 94–H2O Hydro–Zinc. DFT 2.5 to 3.5 mils.
4. Field Weld Seams and Abrasions: 94–H20 Hydro–Zinc. DFT 2.5 to 3.5 mils.
5. Field Finish Coat: Series 21 DFT 8.0 to 12.0 mils.
6. Total DFT: 10.5 to 15.5 mils
7. Finish Color: As selected by Owner from manufacturer's standard colors.

C. Exterior:

1. System Type: Zinc/urethane/Fluropolymer.
2. AWWA D 102 Paint System: ICS–6.
3. Surface Preparation: SSPC–SP 6/NACE 3.
4. Shop Primer: Series 94–H_20 Hydro–Zinc DFT 2.5 to 3.5 mils.
5. Field Weld Seams and Abrasions: 94–H20 Hydro–Zinc. DFT 2.5 to 3.5 mils.
6. Field Intermediate Coat: Series 1095 Endura–Shield DFT 2.0 to 3.0 mils.
7. Intermediate color: As selected by the coating manufacturer from their standard colors
8. Field Finish Coat: Series 700 Hyroflon DFT 2.0 to 3.0 mils.
9. Total DFT: 6.5 to 9.5 mils.
10. Finish Color: As selected by Owner from manufacturer's standard colors.
11. Field Logos and Lettering: Series 700 Hydroflon DFT 2.0–3.0 mils. Color TBD by owner/engineer

2.3 ACCESSORIES

A. Coating Application Accessories:

1. Accessories required for application of specified coatings in accordance with manufacturer's instructions, including thinners.
2. Products of coating manufacturer.

2.4 OMITTED

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which coating systems are to be applied. Notify Engineer of areas or conditions not acceptable. Do not begin surface preparation or application until unacceptable areas or conditions have been corrected.

3.2 PROTECTION OF SURFACES NOT SCHEDULED TO BE COATED

A. Protect surrounding areas and surfaces not scheduled to be coated from damage during surface preparation and application of coatings.

B. Immediately remove coatings that fall ion surrounding areas and surfaces not scheduled to be coated.

3.3 SURFACE PREPARATION OF STEEL

A. Surfaces to be painted shall be cleaned before applying paint or surface treatments. Deposits of grease or oil shall be removed, prior to mechanical cleaning. Solvent cleaning shall be accomplished with mineral spirits or other low toxicity solvents having a flash point above 100 degrees F. Clean cloths and clean fluids shall be used to avoid leaving a thin film of greasy residue on the surfaces being cleaned. Items not to be prepared or coated shall be protected from damage by the surface preparation methods. Machinery shall be protected against entry of blast abrasive and dust into working parts. Cleaning and painting shall be so programmed that dust or other contaminants from the cleaning process do not fall on wet, newly painted surfaces, and surfaces not intended to be painted shall be suitably protected from the effects of cleaning and painting operations. Welding of, or in the vicinity of, previously painted surfaces shall be conducted in a manner to prevent weld spatter from striking the paint and to otherwise reduce coating damage to a minimum; paint damaged by welding operations shall be restored to original condition. Surfaces to be painted that will be inaccessible after construction, erection, or installation operations are completed shall be painted before they become inaccessible.

B. Ferrous Surfaces Subject to Normal Exposure:

Ferrous surfaces that are to be continuously in exterior or interior atmospheric exposure and other surfaces as directed shall be cleaned by means of power tools or by dry blasting to the brush–off grade or by dry blasting to a commercial grade. Cleaning and priming shall be done in the shop unless otherwise directed or permitted. Power tool cleaning shall conform to the requirements of SSPC SP 3. Brush–off blast cleaning shall conform to the requirements of SSPC SP 7. Regardless of the overall cleaning method used, welds and adjoining surfaces within a few hundred millimeters/inches thereof shall be cleaned of weld flux, spatter, and other harmful deposits by blasting, power impact tools, power wire brush, or such combination of these and other methods as may be necessary for complete removal of each type of deposit. The combination of cleaning methods need not include blasting when preparation of the overall surfaces is carried out by the power tool method. However, brush scrubbing and rinsing with clean water after mechanical cleaning is completed will be required unless the latter is carried out with thoroughness to remove all soluble alkaline deposits. Wetting of the surfaces during water–washing operations shall be limited to the weld area required to be treated, and such areas shall be dry before painting. Welds and adjacent surfaces cleaned thoroughly by blasting alone will be considered adequately prepared provided that weld spatter not dislodged by the blast stream shall be removed with impact or grinding tools. All surfaces shall be primed as soon as practicable after cleaning but prior to contamination or deterioration of the prepared surfaces. To the greatest degree possible, steel surfaces shall be cleaned (and primed) prior to lengthy outdoor storage to minimize breakdown of mill scale and consequent rusting.

C. Ferrous Surfaces Subject to Severe Exposure:

Ferrous surfaces subject to extended periods of immersion or as otherwise required shall be dry blast–cleaned to SSPC SP 10/NACE 2. The blast profile, unless otherwise specified, shall be 1.5 to 2.5 mils as measured by ASTM D 4417. Method appropriate abrasive blast media shall be used to produce the desired surface profile and to give an angular anchor tooth pattern. If recycled blast media is used, an appropriate particle size distribution shall be maintained so that the specified profile is consistently obtained. Steel shot or other abrasives that do not produce an angular profile shall not be used. Weld spatter not dislodged by blasting shall be removed with impact or grinding tools and the areas reblasted prior to painting. Surfaces shall be dry at the time of blasting. Blast cleaning to SSPC SP 10/NACE 2 shall be done in the field and, unless otherwise specifically authorized, after final erection. Within 8 hours after cleaning, prior to the deposition of any detectable moisture, contaminants, or corrosion, all ferrous surfaces blast cleaned to SSPC SP 10/NACE 2 shall be cleaned of dust and abrasive particles by brush, vacuum cleaner, and/or blown down with clean, dry, compressed air, and given the first coat of paint. Upon written request by the Contractor, the Contracting Officer may authorize mill or shop cleaning of assembled or partially assembled components specified to receive one of the vinyl–type paint systems or Systems Nos. 6–A–Z and 21–A–Z employing the epoxy zinc–rich primer. The surfaces, if shop blasted, shall be shop coated with the first and second coats of the specified paint system except that the epoxy zinc–rich primed surfaces shall receive an extra single spray coat of the zinc primer at the time field painting is started, as specified in the paint system instructions. The shop coating shall be maintained in good condition by cleaning and touching up areas damaged during the construction period. If pinpoint or general rusting appears, surfaces shall be reblasted and repainted at no added cost to the Government. Prior to the field application of subsequent coats, soiled areas of the shop coating shall be thoroughly cleaned and all welds or other unpainted or damaged areas shall be cleaned and coated in a manner to make them equivalent to adjacent, undamaged paint surfaces.

3.4 APPLICATION

A. Coating and paint application shall conform to the requirements of the Steel Structures Painting Council Paint Application Specification SPC–PA1, latest revision, for "Shop, Field and Maintenance Painting," and the manufacturer of the coating and paint materials.

B. Thinning shall be permitted only as recommended by the manufacturer approved by the Owner, and utilizing thinners selected by manufacturer, compatible with the complete painting system and approved by Engineer.

C. Each application of coating or paint shall be applied evenly, free of brush marks, sags, runs, with no evidence of poor workmanship. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.

D. Protective coverings or drop cloths shall be used to protect floors, fixtures, and equipment. Care shall be exercised to prevent coatings or paint from being spattered onto surfaces that are not to be coated or painted. Surfaces from which materials cannot be removed satisfactorily shall be recoated or repainted as required to produce a finish satisfactory to the Engineer and Owner.

E. When two coats of coating or paint are specified, where possible, the first coat shall contain sufficient approved color additive to act as an indicator of coverage or the two coats must be of contrasting color.

F. Film thickness per coat specified in Section 2.2 minimum required. If roller application is deemed necessary, the Contractor shall apply additional coats to achieve the specified thickness.

G. All material shall be applied as specified.

H. All welds, edges and other irregular surfaces shall receive a brush coat of the specified product prior to application of the first complete coat.

3.5 DISINFECTION

A. Disinfection of Water Contact Surfaces and Filling of Water Storage Tanks:

1. Do not disinfect water contact surfaces or fill water storage tanks until application of coating systems is complete, coatings have fully cured, and field quality control inspection is complete.
2. Allow number of days in accordance with manufacturer's instructions and as directed by Engineer for full cure of coating systems on water contact surfaces before flushing, disinfecting, or filling with water.
3. Disinfection: AWWA C 652 or as directed by Engineer.

3.6 REPAIR

A. Damaged Materials: Repair or replace damaged materials and surfaces not scheduled to be coated.

B. Damaged Coatings: Touch–up or repair damaged coatings. Touch–up of minor damage shall be acceptable where result is not visibly different from adjacent surfaces. Recoat entire surface where touch–up result is visibly different, either in sheen, texture, or color.

C. Coating Defects: Repair in accordance with manufacturer's instructions coatings that exhibit film characteristics or defects that would adversely affect performance or appearance of coating systems.

3.7 FIELD QUALITY CONTROL

A. Inspector's Services:

1. Verify coatings and other materials are as specified.
2. Verify surface preparation and application are as specified.
3. Verify DFT of each coat and total DFT of each coating system are as specified using wet film and dry film gauges.
4. Coating Defects: Check coatings or film characteristics or defects that would adversely affect performance or appearance of coating systems.

    a. Check for holidays on interior steel immersion surfaces using holiday detector.

5. Report:

   a. Submit written reports describing inspections made and actions taken to correct nonconforming work.
   b. Report nonconforming work not corrected.
   c. Submit copies of report to Engineer and Contractor.

6. Subcontractor Inspector:

   a. List of three (3) holiday testing inspectors shall be submitted post bid for Owner Approval. The Owner reserves the right to reject or accept the Contractor's recommended inspector.

B. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for surface preparation and application of coating systems.

C. The Owner's construction inspector has the right to choose the location of the holiday pin testing of coats.

3.8 CLEANING

Upon completion of the work, all staging, scaffolding, and containers shall be removed from the site or destroyed in a manner approved by the Owner. Coating or paint spots and oil or stains upon adjacent surfaces shall be removed and the jobsite cleaned. All damage to surfaces resulting from the work of this section shall be cleaned, repaired, or refinished to the satisfaction of the Engineer and Owner at no cost to the Owner.

3.9 PROTECTION OF COATING SYSTEMS

A. Protect surfaces of coating systems from damage during construction.

B. Contractor has to sand blast tank prior to coating, if coating is not performed within the schedule of construction accepted by the Owner.

3.10 ONE YEAR INSPECTION

A. Owner will set date for one year inspection of coating systems.

B. Contractor Shall wash out tank prior to inspection.

C. Contractor shall hire a third-party coating inspector for the inspection of tank conditions and repairs of the deficiencies.

D. Inspection shall be attended by Owner, Contractor, third-party Coating Inspector, and manufacturer' representative.

E. Contractor Shall be responsible for disinfection of the tank per specifications once deficiencies have been repaired and approved.

F. Repair deficiencies in coating systems as determined by Engineer in accordance with manufacturer's instructions.

3.11 SCHEDULES

A. The following paint schedule indicates surfaces to be painted using painting materials previously specified for type of surface and conditions of service as directed by Owner and Engineer. Colors will be selected by the Owner from manufacturer's standard color charts and, where required to match existing or other colors provided, manufacturer shall obtain same by mixing and/or tinting of its particular products. Colors are subject to final acceptance by the Owner at time of construction.

Surfaces to be painted shall include the following:

1. Within the work area, new piping, valves, electrical conduits, panels and miscellaneous steel which will remain in service upon completion of the work.
2. Any building, concrete wall (interior and exterior), Concrete floor (all rooms) and ceiling, unpainted and primed metal.
3. The painting of all doors and windows (if any), pipe supports and hangers.

If any of the above items are furnished in aluminum, bronze, or stainless steel, no painting is required.

END OF SECTION

DIVISION 26 - ELECTRICAL

26 00 00 – ELECTRICAL GENERAL

1.01 QUALITY ASSURANCE

A. All electrical work shall be in accordance with the following codes and agencies:

1. The National Electrical Code (NFPA-70), 2023 Edition, with Georgia Amendments
2. The International Building Code, 2018 Edition with Georgia Amendments
3. Regulations of the local utility company concerning metering and service entrance
4. State and local ordinances governing electrical work
5. NSF-61 requirements

B. All materials shall be new and shall conform to standards where such have been established for the particular material. All UL listed equipment shall bear the UL label.

1.02 PERMITS

A. Obtain all permits and inspections required for the work involved. Deliver to the engineer and owner all certificates of inspection.

1.03 WARRANTY

A. The contractor shall warrant to the owner that all work shall be free from defects and will conform to the contract documents. This warranty shall extend not less than one year from the date of beneficial occupancy.

1.04 DRAWINGS

A. The drawings indicate the general arrangement of electrical equipment, based on one manufacturer's product. Coordinate installation of equipment with all other trades. Do not scale drawings for connection locations. Bring all discrepancies to the immediate attention of the engineer and owner.

B. Contractor shall install and circuit all electrical work as indicated on drawings unless specific building construction requires a change or rerouting of this work. He shall keep a record of the location of all concealed work, including the underground utility lines. He shall document all changes in the manner specified by the General Conditions, Special Conditions and Supplementary General Conditions to the Mechanical and Electrical Work.

1.05 EQUIPMENT REQUIRING ELECTRICAL SERVICE

A. Review all specification sections and drawings for equipment requiring electrical service. Provide service to and make connections to all such equipment.

B. Drawings are based on design loads of one manufacturer. If equipment actually furnished have loads, numbers of connections, or voltages other than those indicated on the drawings, then control equipment, feeders, and overcurrent devices shall be adjusted as required, at no additional cost to the owner. Such adjustments are subject to review by the engineer.

C. Catalog numbers indicated with equipment, devices and lighting fixtures are for convenience only. Errors or obsolescence shall not relieve the furnishing of items which meet the technical description given in specifications, noted, or required by function designated.

1.06 PRODUCT DELIVERY, STORAGE, HANDLING, AND PROTECTION

A. Provide a dry, weathertight space for storing materials. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact. Handle and store material in accordance with standards to prevent damage. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable. Replace damaged materials.

1.07 CLEANING AND PAINTING

A. Remove oil, dirt, grease and foreign materials from all equipment to provide a clean surface. Touch-up scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, and equipment enclosures with paint manufactured specifically for that purpose. Paint plywood backboards used to mount electrical equipment with two coats of light gray semi-gloss enamel. All other painting shall be done under the "Painting" section of these specifications.

1.08 SUBMITTALS

A. Enclosed CB, Panels, Light Fixtures, SCADA System and Disconnect Switch.

26 01 00 BASIC MATERIALS

2.01 RACEWAYS

A. The following specifications and standards are incorporated into and become a part of this specification:

1. Underwriter's Laboratory, Inc. Publications 1, 6, 467, 651, 797, 1242.
2. American National Standards Institute C-80.1, C-80.3.

B. Raceway is required for all wiring, unless specifically indicated or specified otherwise. The minimum size of conduit shall be 1/2" but shall not be less than size indicated on the drawings or required by the NEC.

C. Conduits shall be electrical metallic tubing (EMT) except for the following conditions:

1. Exterior exposed conduits or ones subject to damage shall be rigid aluminum.
2. Conduits installed within concrete slabs shall be schedule 80 heavy wall PVC. Where transition is made from raceway in slab to any type of raceway out of slab, make transition with a PVC elbow.
3. Conduits installed in direct contact with earth and in chlorine and phosphate rooms shall be schedule 80, heavy wall PVC.
4. Use flexible conduit for connections to motors and all vibrating equipment.
    a. Length shall not exceed 18".
    b. Maintain ground continuity through flexible conduit with a green equipment grounding conductor.
    c. Liquid tight flexible metal conduit shall be used.

D. EMT conduit couplings and connectors shall be steel raintight type, compression type. All EMT connectors shall be insulated throat type. ARC fittings shall be standard threaded couplings, locknuts, bushings, and elbows. Non-metallic conduit fittings shall be of the same material as the conduit furnished and shall be the product of the same manufacturer.

E. All conduit support parts and hardware shall be 316 stainless steel or fiberglass in chemical rooms. Conduit support channels shall be 1 1/2" x 1 1/2" - 14 gauge channel, with 1/4" threaded rods used for suspension. Wire or chain is not acceptable for conduit hangers. Provide stainless steel supports and hardware.

F. Leave all empty conduits with a 200 lb. test nylon cord pull line. Complete raceway runs prior to installation of wires or cables. Deformed conduits shall be replaced. Protect conduits against dirt, plaster, and foreign debris with conduit plugs.

G. Fasten conduit support devices to structure with expansion anchors on solid masonry or concrete, and machine bolts or clamps on steel. Nails are not acceptable. Seal all conduits penetrating tank exterior with insulating electrical putty to prevent entrance of moisture.

H. Conduit shall be run parallel or at right angles to structural members. Support branch circuit conduits at intervals not exceeding 10 feet, and within 3 feet of each box or change of direction.

2.02 WIRES AND CABLES

A. The following specifications and standards are incorporated into and become a part of this specification:

1. Underwriter's Laboratories, Inc. Publications 44, 83, 486, 493.
2. Insulated Cable Engineers Association Standards S-61-402, S-66-524.
3. National Electrical Manufacturer's Standards WC-5, WC-7.

B. Conductors shall be electrically continuous and free from short circuits or grounds. All open, shorted, or grounded conductors and any with damaged insulation shall be removed and replaced with new material free from defects.

C. Conductor size shall be minimum of No. 12 AWG, unless larger size is required by the drawings or the NEC. Insulation voltage level rating shall be 600 volts. All wire and cable shall bear the UL label. Fire alarm, data, and communication conductors are not included in this specification; they shall comply with NEC requirements.

D. Conductors No. 10 and smaller shall be solid copper, 90 degrees C. type THWN/THHN. Conductors larger than No. 10 shall be stranded copper, 90 degrees C. type THWN/THHN, or XHHW. Fixture wire shall be No. 16 AWG silicone rubber insulated, stranded fixture wire type SFF-2 or No. 16 thermoplastic nylon jacketed stranded fixture wire type TFFN. Provide shielded cable for all VFD motors as shown on the drawings.

E. Color code all conductors. No. 10 and smaller shall have solid color compound or coating. No. 8 and larger shall have solid color compound or colored phase tape; tape shall be installed on conductors in every box, termination point, cabinet, or enclosure. Coding shall be as follows:

1. 230/115 volt single phase three wire system: Phase A-black, Phase B-red, neutral-white.
2. Grounding conductors shall be green or green traced. Grounding conductors for isolated ground circuits shall be green with a yellow trace.

F. Maintain phase rotation established per N.E.C. at service equipment throughout entire project.

G. Group and lace with nylon tie straps all conductors within enclosures. Make splices in conductors only within junction boxes, wiring troughs, or other NEC approved enclosures. Do not splice conductors in pull boxes, panelboards or safety switches. Identify each conductor as to circuit connection in all boxes and enclosures.

H. Terminate stranded conductors No. 10 AWG and smaller with crimp-type lug or stud. Crimp terminal shall be the configuration type suitable for terminal point.

I. Torque each terminal connection to the manufacturer's recommended torque value. A calibrated torquing tool shall be used to insure proper torque application.

2.03 BOXES

A. The following specifications and standards are incorporated into and become a part of this specification:

1. Underwriter's Laboratories, Inc. Publications 50, 467, 514.

B. Boxes shall be rustproof cast metal or PVC where PVC conduits provided. Boxes for surface and pendant mounted lighting fixtures shall be 4" octagon boxes, 1 1/2" deep. Outlet boxes for GFI receptacles shall be 2 3/4" deep.

C. Outlet boxes for switches and receptacles in exposed wiring systems shall be cast FS type with matching device plate. For exterior installations, use spring loaded hinged covers. Provide larger boxes as required for special purpose devices.

D. Dimensions of pull and junction boxes shall not be less than those required by the NEC for the number, size, and position of conductors entering the box. Wood supports within pull boxes are not acceptable. Provide box covers for all boxes.

E. All boxes shall be completely accessible and as required by the NEC. Provide an outlet box for each lighting fixture or as indicated on the drawings and for each device. Box sizes shall be increased from those outlined above if required by Article 370 of the NEC.

F. Support every box from structure. Secure to metal with sheet metal screws, solid masonry or concrete with expansion anchors, metal studs with spring steel clamp, and structure with threaded steel rod when suspended. Support outlet boxes for support of surface mounted lighting fixtures.

G. After completion, using an indelible ink wide tip marker, indicate on the cover of each junction and pull box the designation of each circuit contained therein.

2.04 WIRING DEVICES

A. The following specifications and standards are incorporated into and become a part of this specification:

1. National Electrical Manufacturer's Association Publications WD-1, WD-5.

B. Single pole, 20 amp, 277 volt toggle switches shall be Hubbell 1221. Three-way, 20 amp, 277 volt switches shall be Hubbell 1223. Equivalent switches manufactured by Arrow Hart, General Electric, Legrand, or Leviton are acceptable.

C. Fifteen amp, 125 volt grounded duplex receptacles (NEMA 5-15R) shall be Hubbell 5252. Twenty amp, 125 volt grounded duplex receptacles (NEMA 5-20R) shall be Hubbell 5352. Ground fault interrupter (GFI) receptacles shall be Hubbell GF-8200. Special purpose receptacles shall be as specified on the drawings. Equivalent receptacles manufactured by Arrow Hart, General Electric, Legrand, or Leviton are acceptable.

D. Device plates shall be one piece single or multi-gang type selected to match the device or combination of devices. Device plates for flush mounted devices shall be smooth surfaced plastic of the same finish as the devices. Device plates for use with

devices flush mounted in exposed masonry construction shall be jumbo type. All devices installed in areas exposed to the weather shall be provided with a weatherproof device plate. All device covers in exposed conduit system shall be aluminum cover. All weatherproof covers for receptacles shall be “in-use” type.

E. All devices shall be provided with ivory finish covers. Mount all devices within outlet boxes to allow device plates to be in contact with wall on all sides. Install wall switches on the strike side of doors.

2.05 CIRCUIT AND MOTOR DISCONNECTS

A. The following specifications and standards are incorporated into and become a part of this specification:

1. Underwriter's Laboratories, Inc. Publications 98, 198.2, 198.4.
2. National Electrical Manufacturer's Association Publications KS-1.

B. Products of Square D, GE/ABB or Eaton which comply with these specifications are acceptable.

C. Disconnect switches shall be heavy duty non-fusible safety switch type, unless fused type is indicated on the drawings, with the number of poles required to disconnect all ungrounded conductors serving the equipment.

1. Furnish a solid neutral when the circuit includes a neutral conductor.
2. Furnish an equipment grounding conductor lug bonded to the switch enclosure.
3. Furnish NEMA type one enclosure for all interior dry locations, and NEMA type 3R for all damp, wet, or exterior locations unless other types are indicated on the drawings.

D. Switches shall have the following features:

1. Quick-make, quick break switching mechanism.
2. Line terminal shields.
3. Provisions for padlocking in the "off" position.
4. Door interlocks to prevent door from opening when switch is closed. Provide inconspicuous means to defeat this interlock.
5. Permanent nameplate indicating all ratings.
6. Arc chute for each pole.
7. 600 volt rating for 250 to 600 volt systems, 250 volt rating for systems below 250 volts.
8. Rejection clips to accept only RK1 or RK5 fuses when switch is fusible type.
9. For switches serving service pumps, provide auxiliary contact in each switch that disconnects motor control circuit before power is interrupted to motors.

E. Disconnect switches for three phase motors rated two horsepower and above shall be three pole non-fusible type. Disconnect switches for three phase motors rated less than two horsepower shall be three pole manual motor starter switches without

overload protection. Disconnects for single phase motors shall be single or two pole horsepower rated switches without overload protection.

F. Locate switches to provide full accessibility and working clearances required by the NEC. Locate adjacent to equipment served unless drawings indicate otherwise. Mount switch directly to structure or to metal channel depending upon field conditions. Mount switch handle between 36" and 60" above finished floor.

2.06 SUPPORTING DEVICES

A. Provide and install supporting devices that comply with manufacturer's standard materials, design, and construction in accordance with published standards and as required for complete installation.

B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices. Install hangars, supports, clamps, and attachments to support piping properly from building structure only. Torque sleeve seal nuts, complying with manufacturer's recommended values. Ensure that sealing grommets expand to form water-tight seal.

2.07 ELECTRICAL IDENTIFICATION

A. Install engraved plastic - laminate sign on each major unit of electrical equipment. Provide a single line of text, 1/2" high lettering on 1 1/2" high sign (or 2" high sign if 2 lines required). Provide signs for each unit of the following:

1. Panelboards
2. Electrical cabinets and enclosures
3. Totalizers and instruments
4. Disconnect switches
5. SCADA system

B. Provide engraved nameplates were indicated on the drawings.

26 02 04 – WATER TANK CONTROLS

3.01 Provide control system including all components, conduit, wire, testing and operation and maintenance instructions and manuals for station as specified herein and as shown on the drawings. The system shall be complete and shall be provided with all components required. The contractor shall coordinate the installation with the equipment provided by the SCADA vendor. The SCADA vendor shall provide all control devices for this section and as shown on the drawings. The contractor shall provide all boxes and wiring as required. The contractor shall coordinate all work with SCADA vendor including travel. Include all costs in project.

3.02 The SCADA Vendor shall provide shop drawings for control system which show all components and a complete schematic diagram showing all interconnections, including wiring numbers and terminal numbers for all equipment. Coordinate final drawings with

equipment actually provided. Contractor shall provide 'as-built' drawings (reproducible and 3 copies) indicating all field changes. Provide two - 4 hours of training for owner's personnel to demonstrate system operation maintenance required. Two training sessions required at no additional cost to the owner.

Coordinate with each piece of equipment being controlled or interfaced with before submitting shop drawings.

3.03 Calibrate all instruments and demonstrate operation to owner and engineer.

3.04 Install complete and operational control system as specified and as shown on the drawings. Coordinate with all equipment being provided under this and other sections of the specifications.

3.05 Test all components and system before final inspection. Technical representative of SCADA vendor and contractor shall be present for startup, final programming, demonstrations, and training. Notify owner of testing schedule to allow them to attend.

3.06 Provide identification for all wiring, terminal strips and devices. Provide as-built drawings as specified.

3.07 Provide controls at elevated tank site to include pressure sensors and connections to altitude valve.

26 04 00 DISTRIBUTION EQUIPMENT

4.01 GROUNDING SYSTEMS

A. Equipment grounding system shall be established with equipment ground conductors. The use of metallic raceways for equipment grounding is not acceptable. Unless indicated otherwise, provide equipment ground the same size as phase conductors.

B. The following specifications and standards are incorporated into and become a part of this specification:

1. Underwriter's Laboratories, Inc. Publications 44, 83, 467, 486, 493.
2. National Electrical Manufacturer's Association Standards WC-5, WC-7.

C. Grounding electrode conductors shall be bare or green insulated copper sized as indicated on the drawings. Connect service grounding system to ground rods, metal piping inside building, building steel, and concrete encased electrodes per NEC 250-81c. Equipment grounding conductors shall be green insulated type THW, THWN, or XHHW sized as indicated on the drawings. Where sizes are not indicated, grounding conductor shall be sized in accordance with NEC Article 250.

D. Each receptacle and switch device shall be furnished with a grounding screw connected to the metallic device frame. Provide a conductor termination grounding lug bonded to the enclosure of each transformer, motor controller, and disconnect switch.

E. Ground all non-current carrying parts of the electrical system, i.e., wireways, equipment enclosures and frames, junction and outlet boxes, machine frames, and other conductive items in close proximity with electrical circuits.

F. Grounding conductors for branch circuits are not shown on the drawings; however, grounding conductors shall be provided in all branch circuit raceways and cables, including flexible conduit. Grounding conductors shall be the same AWG size as branch circuit conductors.

G. A feeder serving more than one panelboard shall have a continuous grounding conductor which shall be connected to each related cabinet grounding bar. The equipment grounding conductor shall be terminated with a screw or bolt used for no other purpose. Equipment grounding conductors shall terminate on panelboard, switchboard, or motor control center grounding bus only. Do not terminate on neutral bus.

4.02 PANELBOARDS

A. The following specifications and standards are incorporated into and become a part of this specification:

1. Underwriter's Laboratories, Inc. Publications 50,67,489.
2. National Electrical Manufacturer's Association Publications PB-1, AB-3.

B. Products of Square D, GE/ABB or Eaton which comply with these specifications are acceptable.

C. All panels and circuit breakers shall be UL listed and bear a UL label. Panels shall be of the dead front safety type. Provide panels complete with factory assembled circuit breakers connected to the bus bars. Number all panelboards in the following sequence: Circuits 1 and 2 - Phase A; circuits 3 and 4 - Phase B.

D. All bus bars shall be copper. Main lugs and main breaker shall be UL approved for copper or aluminum conductors and shall be of a size range for the conductors indicated on the drawings. Each panel shall contain a full size grounding bus and, when required, a full size insulated neutral bus. The neutral and ground busses shall have a sufficient number of lugs to singularly terminate each individual conductor requiring a connection. The ground bus shall be bolted to the panel enclosure, but not attached to the panel interior. Where designated, each "space' shall include all bussing, device supports and connections for future breaker installation. Where indicated, provide sub-feed or through-feed lugs and increase box height to provide additional cable bending space; lug size shall match ampacity of mains.

E. Branch circuit panelboard width shall be between 20 and 22 inches; depth shall be 5 3/4" maximum. Distribution panelboard width shall be 32" minimum and depth shall be 14" maximum. Provide gutters and bending space to conform to the NEC. Key all panels throughout the project alike. Where two section panels are required, provide a fully rated bus for each section with interconnecting copper conductors of ampacity equal to the rating of the main bus.

F. Circuit breakers shall be quick-make, quick-break, thermal magnetic type bolted to the bus. Multi-pole breakers shall be common trip and common reset type; tie handle connections are not acceptable. Interrupting ratings on 208 volt systems shall be 10,000 RMS symmetrical amps minimum; provide higher ratings when indicated on the drawings. Provide the following when specified, indicated on the drawings, or required by the NEC:

1. Ground fault interrupting circuit breaker (GFI).
2. Handle lock-off device for equipment as indicated.

G. Mount panelboards with top circuit not more than 6'-6" above finished floor. Enclosures shall be secured by a minimum of four fastening devices. Attach enclosure directly to masonry, concrete, or wood, maintaining a 1" rear clearance. Mount enclosure to metal channel for installations on steel structure.

H. Provide in each panelboard a typewritten circuit directory mounted under clear plastic in metal holder in the door of the panel reflecting all field changes and additions. Install push-in knock-out closure plugs in any unused knock-out openings.

26 05 00 LIGHTING SYSTEM

5.01 LIGHTING FIXTURES

A. All materials shall be new, free from defects, and bear a UL label. All fixtures installed in damp or wet locations shall be UL listed and labeled for that application.

B. Provide 5 year parts and labor warranty.

C. Lighting fixtures shall be installed per the manufacturer's recommended mounting methods and the provisions of the drawings. It is the contractor’s responsibility to review the building plans and specifications to verify the mounting compatibility of the lighting fixtures with the ceiling type before fixtures are released for ordering.

END OF SECTION

INDEX TO

SECTION 31 00 00 – EARTHWORK

SECTION 31 00 00

EARTHWORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Grading

B. Excavation

C. Backfilling

D. Compaction

E. Remove and Replace Topsoil

F. Dressing of Shoulders and Banks

G. Stone Drainage Filter

H. Water Control

I. Testing

1.2 RELATED SECTIONS

A. Section 01 45 00 - Quality Control

B. Section 01 45 23 – Testing and Inspection Services

C. Section 31 10 00 – Site Clearing

D. 32 90 00 – Landscaping

E. 33 16 13 – Composite Elevated Water Storage Tank

F. Section 31 25 00GA – Erosion, Sedimentation, and Pollution Control (GA)

G. Section 33 10 00 – Water Distribution System

1.3 OMITTED

1.4 REFERENCES (LATEST REVISION)

A. ASTM D 448 – Sizes of Aggregate for Road and Bridge Construction.

B. ASTM D 1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort.

C. ASTM D 2487 – Classification of Soils for Engineering Purposes (Unified Soil Classification System).

D. ASTM D 6938 – In–Place Density and Water Content of Soil and Soil–Aggregate by Nuclear Methods (Shallow Depth).

E. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

F. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.

1.5 SUBMITTALS

A. Materials Source: Submit gradation analysis, proctor results, and soil classification for all borrow material.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with Federal, State of Georgia, County of Glynn, and Brunswick-Glynn Joint Water & Sewer Commission standards.

1.7 TESTING

A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).

B. In place density tests in accordance with ASTM D 6938.

C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.

D. The testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any of the tests.

E. Testing shall be Contractor's responsibility and performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph C above.

F. Test results shall be furnished to the Engineer and Owner prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Borrow shall consist of sand or sand–clay soils capable of being readily shaped and compacted to the required densities, and shall be reasonably free of roots, trash, rock larger than 2 inches, and other deleterious material.

B. All soils used for structural fills shall have a PI (plastic index) of less than 10, and a LL (liquid limit) of less than 30. Fill soils shall be dried or wetted to appropriate moisture contents prior to compaction. Additionally, fill soils used for the top 2 feet of fill beneath roads and parking lots shall have no more than 15% passing the # 200 sieve. Fill soils used for house lots shall have no more than 25% passing the # 200 sieve.

C. Contractor shall furnish all borrow material.

D. Contractor shall be responsible for and bear all expenses in developing borrow sources including securing necessary permits, drying the material, haul roads, clearing, grubbing, excavating the pits, placing, compaction and restoration of pits and haul roads to a condition satisfactory to property owners and in compliance with applicable federal, state, and local laws and regulations.

2.2 SOURCE QUALITY CONTROL

A. If tests indicate materials do not meet specified requirements, change material and retest at no additional cost to the Owner.

B. Provide materials of each type from same source throughout the Work.

PART 3 – EXECUTION

3.1 TOPSOIL

A. Contractor shall strip topsoil and stockpile on site at a location determined by the Owner at the Contractor's expense.

B. Topsoil shall be placed to a depth of 4 inches over all disturbed or proposed landscaped areas.

C. Topsoil shall be provided at Contractor’s expense if it is not available from site.

D. Any remaining topsoil will be hauled off site at the Contractors expense.

E. Do not excavate wet topsoil.

3.2 EXCAVATION

A. Suitable excavation material shall be transported to and placed in fill areas within limits of the work.

B. Unsuitable material encountered in areas to be paved and under building pads, shall be excavated 2 feet below final grade and replaced with suitable material from site or borrow excavations. Contractor shall notify Engineer if more than 2 feet of excavation is needed to replace unsuitable material.

C. Unsuitable and surplus excavation material not required for fill shall be disposed of off site. Surplus material shall be disposed of at no additional cost to the Owner.

D. Proper drainage, including sediment and erosion control, shall be maintained at all times. Methods shall be in accordance with the National Pollutant Discharge Elimination System standards and other local, state, and federal regulations.

E. Unsuitable materials as stated herein are defined as highly plastic clay soils, of the CH and MH designation, border line soils of the SC–CH description, and organic soils of the OL and OH description based on the Unified Soils Classification System. Further, any soils for the top two feet of pavement subbase shall have no more than 15% passing the # 200 sieve.

3.3 GROUND SURFACE PREPARATION FOR FILL

A. All vegetation, roots, brush, heavy sods, heavy growth of grass, decayed vegetable matter, rubbish, and other unsuitable material within the areas to be filled shall be stripped and removed prior to beginning the fill operation.

B. Sloped ground surfaces steeper than 1 vertical to 4 horizontal, on which fill is to be placed shall be plowed, stepped, or benched, or broken up as directed, in such a manner where fill material will bond with the existing surface.

C. Surfaces on which fill is to be placed and compacted shall be wetted or dried as may be required to obtain the specified compaction.

3.4 FILL

A. For Structural Fill:

1. Shall be placed in successive horizontal layers 8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used. 4 to 6 inches in loose depth when hand guided equipment is used.

2. Minimum compaction requirements shall be 98% of max below foundations and within 1 foot of finished pavement subgrade. 95% of max above foundations, below floor slabs, and more than 1 foot below finished pavement subgrade for all structural fill.

3. Water Content Range shall be granular: -3% to +3% of optimum.

B. For General Fill:

1. Shall be placed in successive horizontal layers 8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used. 4 to 6 inches in loose depth when hand guided equipment is used.

2. Shall be 92% of max.

3. Water Content Range shall be as required to achieve minimum compaction requirements.

3.5 FINISHED GRADING

A. All areas covered by the project including excavated and filled sections and adjacent transition areas shall be smooth graded and free from irregular surface changes.

B. Degree of finish shall be that ordinarily obtainable from either blade–grader or scraper operations, supplemented with hand raking and finishing, except as otherwise specified.

C. Unpaved areas to within 0.1 feet of elevations shown on the drawings provided such deviation does not create low spots that do not drain.

D. Paved Areas – Subgrade to within 0.05 feet of the drawing elevations less the compacted thickness of the base and paving.

E. Building Pads – Subgrade to within 0.05 feet of the drawing elevations less the thickness of the concrete slab.

F. Ditches and lagoon banks shall be finished graded, dressed, and seeded within 14 calendar days of work to reduce erosion and permit adequate drainage.

G. Portland Cement Pervious Pavement:

1. Subgrade Materials – The top 6 inches shall be composed of granular or gravely soil predominantly sandy with no more than a moderate amount of silt or clay.
2. Subgrade Permeability – Prior to placement of Portland Cement Pervious Pavement, the subgrade shall be tested for rate of permeability by double ring infiltrometer, or other suitable test of subgrade soil permeability. The tested permeability must reasonably compare to design permeability.
3. Subgrade Support – Shall be compacted by a mechanical vibratory compactor to a minimum density of 92% of a maximum dry density as established by ASTM D 1557 or AASHTO T 180.
   If fill material is required to bring the subgrade to final elevation, it shall be clean and free of deleterious materials. It shall be placed in 8 inch maximum layers, and compacted by a mechanical vibratory compactor to a minimum density of 92% of a maximum dry density as established by ASTM D 1557 or AASHTO T 180.

4. Subgrade Moisture – Subgrade shall be in a moist condition (within +/– 3% of optimum moisture content as determined by modified compaction test ASTM D 1557 or AASHTO T 180).

3.6 DISPOSAL OF WASTE MATERIAL

A. All vegetation, roots, brush, sod, broken pavements, curb and gutter, rubbish, and other unsuitable or surplus material stripped or removed from limits of construction shall be disposed of by the Contractor at no additional cost to the Owner.

3.7 PROTECTION

A. Graded areas shall be protected from traffic, erosion, settlement, or any washing away occurring from any cause prior to acceptance.

B. Contractor shall be responsible for protection of below grade utilities shown on the drawings or indicated by the Owner at all times during earthwork operations.

C. Repair or re–establishment of graded areas prior to final acceptance shall be at the Contractors expense.

D. Site drainage shall be provided and maintained by Contractor during construction until final acceptance of the project. Drainage may be by supplemental ditching, or pumping if necessary, prior to completion of permanent site drainage.

3.8 DRAINAGE

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

3.9 FIELD QUALITY CONTROL

A. Compaction testing shall be performed in accordance with ASTM D 6938 and ASTM D 1557. Where tests indicate the backfill does not meet specified requirements, the backfill shall be reworked or removed and replaced, and then retested at the Contractor's expense.

B. Unpaved areas – at least 92% of maximum laboratory density moisture content as required to achieve minimum compaction requirements unless otherwise approved by the Engineer.

C. Paved Areas and Under Structures – Shall be placed in successive horizontal layers 8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used. 4 to 6 inches in loose depth when hand guided equipment is used. Minimum compaction requirements shall be 98% of max below foundations and within 1 foot of finished pavement subgrade. 95% of max above foundations, below floor slabs, and more than 1 foot below finished pavement subgrade for all structural fill. Water Content Range shall be granular: -3% to +3% of optimum.

D. Rolling and compaction equipment and methods shall be subject to acceptance by the Engineer. Acceptance in no way relieves Contractor of the responsibility to perform in correct and timely means.

E. Number of Tests – Under paved areas, no less than one density test per horizontal layer per 5,000 square feet of subbase shall be made. In unpaved areas, no less than one density test per horizontal layer per 10,000 square feet of fill area shall be made. Under curb and gutter, no less than one density test per every 300 linear feet. On building pads, no less than one density test per horizontal layer per 1,500 square feet of fill area shall be made.

3.10 PROOF ROLLING

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

3.11 TOLERANCES

A. Unpaved areas to within 0.1 feet of elevations shown on the drawings provide such deviation does not create low spots that do not drain.

B. Paved Areas – Subgrade to within 0.05 feet of the drawing elevations less the compacted thickness of the base and paving.

END OF SECTION

INDEX TO

SECTION 31 10 00 – SITE CLEARING

SECTION 31 10 00

SITE CLEARING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Removal of surface debris.

B. Removal of paving, curbs, and other materials hindering the construction of proposed piping, building, and tank.

C. Removal of trees, shrubs, and other plant life.

D. Topsoil excavation.

1.2 RELATED SECTIONS

A. Section 31 00 00 – Earthwork.

B. Section 33 16 13 – Composite Elevated Water Storage Tank.

C. Section 33 10 00 – Water Distribution System.

1.3 OMITTED

1.4 REGULATORY REQUIREMENTS

A. Conform to Glynn County and Georgia state code for environmental requirements, disposal of debris, burning debris on site, and use of herbicides.

B. Coordinate clearing Work with utility companies.

C. Use of herbicides will not be permitted under this contract unless approved by Owner and Engineer.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Provide tree protection materials as detailed on the construction drawings.

PART 3 – EXECUTION

3.1 PREPARATION

A. Contractor to tag individual trees identified in plans to be removed after acceptance of proposed clearing/access road route plan.

B. Identify a salvage area for placing removed materials. All non-salvageable materials and clearing debris shall be disposed off site by Contractor, at his expense.

3.2 PROTECTION

A. Contractor shall provide at least one person who shall be present at all times during planting and pruning, thoroughly familiar with types of plants and trees involved and direct the digging, cutting, planting and maintenance of designated plant and tree materials.

Qualifications: Repair of tree damage shall be completed or supervised by a tree surgeon who is a member of the National Arborist Association.

B. No trees, including those marked for removal on site or any other tree, may be removed prior to the preconstruction conference. All trees not to be removed will be protected from injury to their roots and to their top to a distance three feet beyond the drip–line and no grading, trenching, pruning, or storage of materials may go in this area except as provided by an Owner's representative stakeout. Contractor will pay a penalty for any tree removed from the site that has not been marked specifically for removal. Contractor also will pay for any tree that dies due to damage during construction. This applies to all trees on site whether or not they are shown on the plans.

Existing vegetation to be removed and trees to be trimmed so branches are minimum of 4' horizontal and 8' vertical away from existing and proposed fence line if trees are closer than 4', branches to be cut as close as practicable. Retain as many trees as possible to complete work as shown and specified.

C. Contractor shall not be held accountable for damages to trees resulting from placement of fill or removal of soils where such action is required by the contract documents. Any tree, the trunk of which is within 10 feet of any footing or trench, shall be exempt from these penalties except where explicitly shown in plans, unless accepted by Owner in writing. Contractor shall exercise all reasonable precautions to preserve even these trees. Contractor agrees to pay fines as established below in the event he or any of his subcontractors causes loss or removal of trees designated to be saved under provisions of this contract.

The fines are as follows:

Caliper	Fine
1" – 2"	$ 150.00
2" – 3"	$ 200.00
3" – 4"	$ 250.00
4" – 5"	$ 400.00
5" – 6"	$ 500.00
6" – 7"	$ 600.00
7" – 8"	$ 750.00

8" – 11"	$ 1,500.00
12" – 20"	$ 2,000.00
21" & larger	$ 2,500.00

The trees along Planting Hammock Boulevard shall not be held to this requirement. If trees along this road are unable to be protected as part of this work, Contractor shall replace trees in accordance with plans at no additional cost to the Owner.

E. Plans show size and species of tree. Trees shall be graded by arborist employed by Contractor as to verify variety, condition, and site importance. If Contractor chooses to not employ arborist as part of this work, the above figures shall be the absolute fine. If Contractor employs arborist, fine can be determined at the time of loss. Lowest assessment amount shall be no less than one–half of the above fine figures.

F. Protect bench marks, survey control points, and existing structures from damage or displacement.

G. Protect all remaining utilities.

H. Clearing operations shall be conducted to prevent damage by falling trees to trees left standing, to existing structures and installations, and to those under construction, and to provide for the safety of employees and others.

3.3 CLEARING

A. Clear areas required for access to site and execution of work. Clearing shall consist of felling and cutting trees into sections, and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within area to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be removed completely from the site, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within cleared areas shall be trimmed of dead branches 1–1/2 inch or more in diameter. Limbs and branches to be trimmed shall be neatly cut close to the trunk of the tree or main branches. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations, by the erection of timber barriers or by such other means as circumstances require. Such barriers must be placed and be checked by the Owner and Engineer before construction observations can proceed (See 3.2). Clearing shall also include removal and disposal of structures obtruding, encroaching upon, or otherwise obstructing the work.

3.4 REMOVAL

A. Where indicated or directed, trees and stumps shall be removed from areas outside those areas designated for clearing and grubbing. Work shall include felling of such trees and removal of their stumps and roots. Trees shall be disposed of as hereinafter specified.

B. Remove debris, rock, and other extracted plant life from site.

C. Partially remove paving, curbs, and driveways; as indicated. Neatly saw cut edges at right angle to surface.

3.5 DISPOSAL

A. Disposal of trees, branches, snags, brush, stumps, etc., resulting from clearing and grubbing shall be the Contractor's responsibility and shall be disposed of by removal from site. All costs in connection with disposing of materials will be at the Contractor's expense. Disposal of all materials cleared and grubbed will be in accordance with rules and regulations of the State of Georgia. No material will be burned on site.

3.6 GRUBBING

A. Grubbing shall consist of removal and disposal of stumps, roots larger than one inch in diameter, and matted roots from designated grubbing areas. This material, together with logs and other organic or metallic debris not suitable for building of pavement subgrade or building pads, shall be excavated and removed to a depth of not less than 18 inches below original surface level of the ground in embankment areas and not less than 2 feet below finished earth surface in excavated areas. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform to original adjacent ground.

END OF SECTION

INDEX TO

SECTION 31 25 00 – SOIL EROSION CONTROL

SECTION 31 25 00

SOIL EROSION CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions apply to this section.

B. Section 31 25 00GA – Erosion, Sedimentation, and Pollution Control (GA)

1.2 DESCRIPTION OF WORK

A. Extent of soil erosion control work includes all measures necessary to meet the requirements of this section.

Erosion and sediment control measures shall be installed prior to any construction activity.

Soil erosion and sediment control measures shall include all temporary and permanent means of protection and trapping soils of the construction site during land disturbing activity. Activity covered in this contract shall meet standards of NPDES General Permit for the state where work is performed.

1.3 PURPOSES

A. Contractor is to achieve the following goals:

1. Minimize soil exposure by proper timing of grading and construction.
2. Retain existing vegetation whenever feasible.
3. Vegetate and mulch denuded areas as soon as possible.
4. Divert runoff away from denuded areas.
5. Minimize length and steepness of slopes when it is practical.
6. Reduce runoff velocities with sediment barriers or by increasing roughness with stone.
7. Trap sediment on site.
8. Inspect and maintain erosion control measures.

1.4 QUALITY ASSURANCE

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

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

C. The 24–hour contact for erosion and sedimentation control measures is:

Name: Keith Strong

Address: 50 Park of Commerce Way
Savannah, GA 31405

Phone: Day: (912) 721-4103
Night: (912) 667-9793

1.5 SUBMITTALS

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

1.6 OMITTED

PART 2 – PRODUCTS

2.1 GRASSING MATERIALS

A. Refer to Section 32 90 00 – Landscaping.

1. General: All grass seed shall be free from noxious weeds, grade A recent crop, recleaned and treated with appropriate fungicide at time of mixture. Deliver to site in original sealed containers with dealer's guarantee as to year grown, percentage of purity, percentage of germination and date of the test by which percentages of purity and germination were determined. All seed sown shall have a date of test within six months of the date of sowing.
2. Type of Seed: Either Annual Rye or Common Bermuda Grass seed will be used depending on time of year in which seeding is to occur.
3. Mulch: Straw.
4. Fertilizer: Commercial balanced 4–12–12 fertilizer.

2.2 HAY BALES

A. Standard size, densely baled straw or hay, wrapped with synthetic or wire bands (two minimum per bale).

2.3 SILT FENCE

A. Silt fence shall be a woven geotextile fabric sheet. Fabric shall be a synthetic polymer composed of at least 85% by weight propylene, ethylene, amide, ester, or vinylidene chloride, and shall contain stabilizer and/or inhibitors added to the base plastic to make filaments resistant to deterioration due to ultra–violet and/or heat exposure. Fabric should be finished so the filaments will retain their relative position with respect to each other. Fabric shall be free of defects, rips, holes, or flaws.

Fabric shall meet the following requirements:

Woven Fabrics	
Grab Strength	90 lbs.
Burst Strength	175 PSI
UV Resistance	80%

2.4 CHEMICALS FOR DUST CONTROL

A. Calcium Chloride, Anionic Asphalt Emulsion, latex Emulsion or Resin–in–Water Emulsion may be used for dust control.

2.5 RIP–RAP

A. Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight, or weather. Stone shall range in weight from a minimum of 25 pounds to a maximum of 125 pounds. At least 50 percent of the stone shall weigh more than 60 pounds. The stone shall have a minimum dimension of 12 inches.

2.6 PRODUCT REVIEW

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

PART 3 – EXECUTION

3.1 GENERAL

A. All disturbed soil areas except those to support paving shall be graded and protected from erosion by grassing. Disturbed areas must be grassed within 14 days of work ending unless work is to begin again before 21 days. Storm water conveyance systems shall have sediment barriers installed at all entrances, intersections, change in direction and discharge points.

3.2 GRASSING

A. Refer to Section 32 90 00 – Landscaping.

3.3 SEDIMENT BARRIERS

A. Hay Bales for Sheet Flow Applications:

1. Excavate a 4 inch deep trench the width of a bale and length of proposed barrier. Barrier should be parallel to the slope. Place barrier 5 to 6 feet away from toe of slope, unless otherwise instructed.
2. Place bales in the trench with their ends tightly abutting. Corner abutment is not acceptable. A tight fit is important to prevent sediment from escaping through spaces between the bales.
3. Backfill the trench with previously excavated soil and compact it. Backfill soil should conform to ground level on downhill side of barrier and should be built up to 4 inches above ground on uphill side of bales.

4. Inspect and repair or replace damaged bales promptly. Remove hay bales when uphill sloped areas have been permanently stabilized.

B. Hay Bales for Ditch Check Applications:

1. Install hay bales as described for sheet flow with the following exceptions:

a. Place bales in a single row, lengthwise, oriented perpendicular to the flow, and with ends of adjacent bales tightly abutting one another.
b. Extend barrier to such a length so the bottoms of end bales are at a higher elevation than the top of lowest middle bale to assure sediment–laden runoff will flow either through or over barrier but not around it.

3.4 SILT FENCE

A. Silt fence shall be placed at approximate location shown and installed in accordance with the detail on the construction drawings. Contractor shall maintain silt fence as required by state regulations.

3.5 DUST CONTROL

A. Dust raised from vehicular traffic will be controlled by wetting down access road with water or by the use of a deliquescent chemical, such as calcium chloride, if relative humidity is over 30%. Chemicals shall be applied in accordance with manufacturer's recommendations.

B. Contractor shall use all means necessary to control dust on and near the work, or off–site borrow areas when dust is caused by operations during performance of work or if resulting from the condition in which any subcontractor leaves the site at no additional cost to the Owner. Contractor shall thoroughly treat all surfaces required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of work on site.

3.6 SEDIMENT BASIN

A. A sediment basin equal in volume to 3,600 cubic feet per disturbed acre is required. The sediment basin/lagoon adjacent to the outfall for the site shall be constructed and stabilized prior to any additional land disturbed activity.

3.7 RIP–RAP

A. Rip–Rap shall be placed at the locations shown and installed in accordance with the detail on the construction drawings.

3.8 CONSTRUCTION EXIT

A. Install construct exit per detail at locations shown on the construction drawings. Contractor shall maintain construction exit as required by state regulations.

3.9 INLET PROTECTION

A. Install inlet protection per detail at locations shown on the construction drawings. Contractor shall maintain inlet protection as required by state regulations until all disturbed surfaces are stabilized.

END OF SECTION

INDEX TO

SECTION 31 25 00 – EROSION, SEDIMENTATION, AND POLLUTION CONTROL (GA)

SECTION 31 25 00

EROSION, SEDIMENTATION, AND POLLUTION CONTROL (GA)

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Soil erosion, sediment and pollution control measures shall include all temporary and permanent means of soil protection, trapping soils and containment of pollutants on the construction site during land disturbing activities. Activities covered in this section are regulated by the Manual for Erosion and Sediment Control in Georgia (latest revision) and Georgia's National Pollutant Discharge Elimination System Permit (NPDES), General Permit No. GAR100002.

B. Reporting

C. Sampling

1.2 RELATED SECTIONS

A. Section 31 00 00 – Earthwork

B. Section 31 10 00 – Site Clearing

C. Section 33 10 00 – Water Distribution System

D. Section 33 40 00 – Storm Drainage

1.3 PURPOSES

A. The purpose of this section is to achieve the following goals:

1. Minimize soil exposure by proper timing of clearing grading and construction.

2. Retain existing vegetation whenever feasible.

3. Vegetate and mulch disturbed areas as soon as possible.

4. Divert runoff away from disturbed areas.

5. Minimize length and steepness of slopes when it is practical.

6. Reduce runoff velocities with check dams or surface roughing.

7. Trap sediment on site.

8. Inspect and maintain erosion, sedimentation and pollution control measures.

9. Report on condition of Best Management Practices (BMPs).

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

1.4 QUALITY ASSURANCE

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

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

1.5 SUBMITTALS

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

1.6 OMITTED

PART 2 – PRODUCTS

2.1 VEGETATIVE MATERIALS

A. Mulch

1. Dry straw or hay.
2. Wood chips, sawdust or bark.
3. Cutback asphalt.

B. Temporary Seeding

1. Annual Ryegrass
2. Browntop Millet

C. Permanent Seeding

1. Common Bermuda
2. Centipede

D. Sod

1. Common Bermuda
2. Centipede
3. St. Augustine

E. Fertilizer

1. Commercial 6-12-12

2.2 STRUCTURAL MATERIALS

A. Check Dam

1. Stone (2" – 10")

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

B. Construction Exit

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

C. Filter Ring

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

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

D. Sediment Barrier

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

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

   The fabric shall meet the following requirements:

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

E. Inlet Sediment Trap

1. Silt fence (Type C) supported by steel posts.

2. Baffle Box – Constructed of 2" x 4" boards spaced a maximum of 1" apart or plywood with weep holes 2" in diameter (See detail).

3. Sod Inlet Protection – Four - 1 foot wide strips of sod on each side of the inlet (See detail).

4. Curb Inlet Protection – Eight inch concrete blocks wrapped in filter fabric, placed in front of a curb inlet.

F. Storm Drain Outlet Protection

1. Geotextile fabric equivalent to Mirafi FW700.

2. Rip-rap (See detail for size).

2.3 CHEMICAL MATERIALS

A. Dust Control – Calcium Chloride, Anionic Asphalt Emulsion, Latex Emulsion or Resin-in-Water Emulsion.

B. Anionic Polyacrylamide (PAM) – Consult state and local laws concerning the regulations of this chemical.

PART 3 – EXECUTION

3.1 GENERAL

A. As project will disturb less than 1.0 contiguous acres, it is not subject to Georgia's National Pollutant Discharge Elimination System. However, the Contractor shall follow all measures and methods as stated and shown in the enclosed plans and specifications.

All disturbed soil areas except those to support paving shall be graded and protected from erosion with vegetative materials. Sedimentation discharge from the construction site into natural drainage ways and storm drainage systems shall be prevented by means of vegetative measures and temporary structural practices. These vegetative measures and structural practices are known as Best Management Practices (BMPs). Rainfall, pollution control measures and construction exit condition shall be monitored and reported on each day when construction activities take place. Erosion and sedimentation control measures shall be monitored and reported on every seven days and within 24 hours of a qualifying rainfall event of 0.5 inches or more. Sampling of construction site discharging water shall be sampled within 45 minutes of a qualifying rainfall event and analyzed immediately or no later than 48 hours after collection. The above reports shall be submitted to the Georgia EPD by the fifteenth day of the month following the reporting period.

B. Contractor shall retain a copy of General Permit Number GAR100002 on site.

3.2 ON-SITE OBSERVATION

A. The Contractor shall notify Engineer within 24 hours of control measures installation for a site visit. Engineer, within the above parameters, shall check subsequent installation of control measures.

3.3 VEGETATIVE PRACTICES

A. Mulch

1. Dry straw or hay shall be applied at a depth of 2 to 4 inches by hand or mechanical equipment providing complete soil coverage. Straw or hay shall be anchored immediately after application. Straw or hay can be anchored with a disk harrow, packer disk or emulsified asphalt.

2. Wood chips, sawdust or bark shall be applied at a depth of 2 to 3 inches by hand or mechanical equipment providing complete soil coverage. Netting of the appropriate size shall be used to anchor the above materials.

3. Cutback asphalt shall be applied at 1,200 gallons per acre or 1/4 gallon per square yard.

B. Seeding

1. Seed shall be applied uniformly by hand, cyclone seeder, drill, cultipacker seeder or hydraulic seeder. Drill or cultipacker seeders shall place seed 1/4" to 1/2" deep. Soil shall be raked lightly to cover seed with soil if seeded by hand. Seed to not be over a year old.

2. During times of drought, water shall be applied at a rate not causing runoff and erosion. The soil shall be thoroughly wetted to depth insuring germination of the seed. Subsequent applications of water shall be made when needed.

3. Refer to Section 32 90 00 – Landscaping for additional seeding requirements.

C. Sodding

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

2. Refer to Section 32 90 00 – Landscaping for additional sodding requirements.

3.4 STRUCTURAL MEASURES

A. Check Dam

1. Stone – Shall be constructed of graded size 2-10 inch stone underlayed with a geotextile fabric. Mechanical or hand placement shall be required

to insure complete coverage of entire width of ditch or swale and center of dam is lower than edges. Sediment shall be removed when it reaches a depth of one-half the original dam height or before.

2. Haybale – Shall be staked and embedded a minimum of 4" and may be used as temporary check dams in concentrated flow areas while vegetation is becoming established. They should not be used where the drainage area exceeds one acre. Sediment shall be removed when it reaches a depth of one-half the original dam height or before.

B. Construction Exit

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

C. Filter Ring

1. Shall surround all sides of the structure receiving runoff from disturbed areas. It shall be placed a minimum of 4' from the structure. It may also be used below storm drains discharging into detention ponds, creating a centralized area for sediment accumulation. When utilized below a storm drain outlet, it shall be placed such that it does not create a condition causing water to back-up into the storm drain and inhibit the function of the storm drain system. The larger stone can be faced with smaller filter stone on the upstream side for added sediment filtering capabilities. Mechanical or hand placement of stone shall be required to uniformly surround the structure.

2. Filter ring must be kept clear of trash and debris. This requires continuous monitoring and maintenance, which includes sediment removal when one-half full. Filter rings are temporary and should be removed when the site has been stabilized.

D. Sediment Barrier

1. Hay or straw bales may be used in areas of low sheet flow rates. They shall not be use if the project duration is expected to exceed three months. Bales shall be placed in a single row, lengthwise, and embedded in the soil to a depth of 4". Bales must be securely anchored in place by stakes or bars driven through the bales or by other acceptable means to prevent displacement. Bales shall be placed so the binding wire or twine around the bale will not touch the soil. Sediment shall be removed once it has accumulated to one-half the original height of the barrier. Barriers shall remain in place until disturbed areas have been permanently stabilized. All sediment accumulated at the barrier shall be removed and

properly disposed of before the barrier is removed. The slope lengths contributing runoff to a bale barrier cannot exceed those listed below.

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

2. Silt fence may be used in areas of higher sheet flow rates. The drainage area shall not exceed ¼ acre for every 100' of silt fence. **Silt fence shall not be installed across streams, ditches, waterways or other concentrated flow areas.** Silt fence shall be installed according to this specification, as shown on the construction drawings or as directed by the Engineer. See details on the construction drawings for installation requirements.

   a. Type A – A 36" wide filter fabric silt fence shall be used on construction sites where the life of the project is greater than or equal to six months.

   b. Type B – A 22" wide filter fabric silt fence shall be limited to use on minor projects, such as residential home sites or small commercial developments where permanent stabilization will be achieved in less than six months.

   c. Type C – A 36" wide filter fabric silt fence with wire reinforcement shall be used where runoff flows or velocities are particularly high or where slopes exceed a vertical height of 10'. Along stream buffers and other sensitive areas, two rows of Type C silt fence or one row of Type C silt fence backed by hay bales shall be used.

3. Where all runoff is to be stored behind the silt fence (where no stormwater disposal system is present), the slope lengths contributing runoff to a silt fence barrier cannot exceed those listed below.

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

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

4. Sediment shall be removed once it has accumulated to one-half the original height of the barrier. Filter fabric shall be replaced whenever it

has deteriorated to such an extent that the effectiveness of the fabric is reduced (approximately six months). Barriers shall remain in place until disturbed areas have been permanently stabilized. All sediment accumulated at the barrier shall be removed and properly disposed of before the barrier is removed.

E. Inlet Sediment Trap

1. Shall be installed at or around all storm drain inlets receiving runoff from disturbed areas. Sediment traps must be self draining unless they are otherwise protected in an approved manner that will not present a safety hazard. The drainage area entering the inlet sediment trap shall be no greater than one acre. Sediment traps may be constructed on natural ground surface, on an excavated surface or on machine compacted fill provided they have a non-erodible outlet.

2. Type C silt fence supported by steel posts may be used where the inlet drains a relatively flat area (slope no greater than 5%) and shall not apply to inlets receiving concentrated flows, such as in street or highway medians. The stakes shall be spaced evenly around the perimeter of the inlet a maximum of 3' apart and securely driven into the ground, approximately 18" deep. The fabric shall be entrenched 12" and backfilled with crushed stone or compacted soil. Fabric and wire shall be securely fastened to the posts and fabric ends must be overlapped a minimum of 18" or wrapped together around a post to provide a continuous fabric barrier around the inlet. The trap shall be inspected daily and after each rain. Repairs are to be made as needed. Sediment shall be removed once it has accumulated to one-half the height of the trap. **Sediment shall not be washed into the inlet.** It shall be removed from the sediment trap and disposed of and stabilized so it will not enter the inlet again. When the contributing drainage area has been permanently stabilized, all materials and any sediment shall be removed and either salvaged or disposed of properly. The disturbed area shall be brought to proper grade, smoothed and compacted. Appropriately stabilize all disturbed areas around the inlet.

3. A baffle box shall be used for inlets receiving runoff with a higher volume or velocity. The box shall be constructed of 2" x 4" boards spaced a maximum of 1" apart or of plywood with weep holes 2" in diameter. The weep holes shall be placed approximately 6" on center vertically and horizontally. The entire box shall be wrapped in Type C filter fabric that is entrenched 12" and backfilled. Gravel shall be placed around the box to a depth of 2" to 4". The trap shall be inspected daily and after each rain. Repairs are to be made as needed. Sediment shall be removed once it has accumulated to one-half the height of the trap. **Sediment shall not be washed into the inlet.** It shall be removed from the sediment trap and disposed of and stabilized so it will not enter the inlet again. When the contributing drainage area has been permanently stabilized, all materials and any sediment shall be removed and either salvaged or disposed of properly. The disturbed area shall be brought to proper grade, smoothed and compacted. Appropriately stabilize all disturbed areas around the inlet.

4. Sod Inlet Protection shall be used only at the time of permanent seeding, to protect the inlet from sediment and mulch material until permanent vegetation has become established. The sod shall be place to form a turf mat covering the soil for a distance of 4' from each side of the inlet structure. Sod strips shall be staggered so adjacent strip ends are not aligned. Re-sod areas where an adequate stand of sod is not obtained. New sod should be mowed sparingly. Grass height should not be less than 2" to 3".

5. Curb Inlet Protection shall be used on curb inlets receiving runoff from disturbed areas once pavement has been installed. Place 8" concrete blocks wrapped in filter fabric in front of the curb inlet opening. A gap of approximately 4" shall be left between the inlet filter and the inlet to allow for overflow and prevention of hazardous ponding in the roadway. **This method of inlet protection shall be removed if a safety hazard is created.** Sediment shall be removed from curb inlet protection immediately.

F. Storm Drain Outlet Protection

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

3. Check outlet apron after heavy rains to see if any erosion around or below the rip-rap has taken or if stones have been dislodged. Immediately make all needed repairs to prevent further damage.

3.5 CHEMICAL MEASURES

A. Dust Control

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

B. Soil Binding

1. This temporary practice is intended for direct soil surface application to sites where the timely establishment of vegetation may not be feasible or where vegetative cover is absent or inadequate. **This temporary practice is not intended for application to surface waters of the state.** It is intended for application within construction storm water ditches and storm drains that feed into previously constructed sediment ponds or basins.

2. Anionic Polyacrylamide (PAM) is available in emulsions, powders, gel bars and logs. It is required that other Best Management Practices be used in combination with anionic PAM. The use of seed and mulch for additional erosion protection beyond the life of anionic PAM is recommended. Use 50' setbacks when applying anionic PAM near natural water bodies. Never add water to PAM, add PAM slowly to water. If water is added to PAM, globs can form which can clog dispensers. This signifies incomplete dissolving of PAM and therefore increases the risk of under application. Application rates shall conform to manufacturer's guidelines. **The maximum application rate of PAM, in pure form, shall not exceed 200pounds/acre/year.** Contractors using anionic PAM shall obtain and follow all Material Safety Data Sheet requirements and manufacturer's recommendations. Gel bars and logs of anionic PAM mixtures may be used in ditch systems. This application shall meet the same testing requirements as anionic PAM emulsions and powders. Maintenance will consist of reapplying anionic PAM to disturbed areas, including high traffic areas, which interfere in the performance of this practice.

3.6 MONITORING AND REPORTING

A. Each day, when any type of construction activity takes place on the construction site, Contractor's qualified personnel shall monitor and record rainfall, inspect all areas where petroleum products are stored, used or handled for spills and leaks from vehicles and equipment and check all locations where vehicles enter or exit the site for evidence of off site sediment tracking. These inspections shall be conducted until site is determined to be stabilized. For linear construction where a phased activity is conducted, this paragraph applies to the active phase(s) of work.

B. Once every seven calendar days and within 24 hours of the end of a storm 0.5 inches or greater, Contractor's qualified personnel shall inspect disturbed areas of the construction site that have not undergone final stabilization, areas used for storage of materials that are exposed to precipitation that have not undergone final stabilization and structural control measures (BMPs). Erosion and sediment control measures identified in the Erosion, Sedimentation and Pollution Control Plan shall be observed to ensure they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving water(s). These inspections must be conducted until site is determined to be stabilized. For linear construction where a phase activity is conducted, this paragraph applies to the active phase(s) of work.

C. Contractor's qualified personnel shall inspect a least once per month during the term of the General Permit, areas of the construction site having undergone final stabilization. These areas hall be inspected for evidence of, or the potential for,

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

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

3.7 SAMPLING AND ANALYSIS

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

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

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

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

B. Sampling shall occur for the following events:

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

2. In addition to (1) above, for each area of the site discharging to a receiving stream, the first rain event reaching or exceeding 0.5 inch and allows for monitoring during normal business hours* occurring either 90 days after the

first sampling event or after all mass grading operations are completed in the drainage area of the location selected as the sampling location, whichever comes first.

3. At the time of the sampling performed pursuant to (1) and (2) above, if BMPs are found to be properly designed, installed, and maintained, no further action is required. If BMPs in any area of the site discharging to a receiving stream are not properly designed, installed, and maintained, corrective action shall be defined and implemented within two business days, and turbidity samples shall be taken from discharges of the same area for each subsequent rain event reaching or exceeding 0.5 inch during normal business hours* until the selected turbidity standard is attained, or until post-storm event inspections determine BMPs are properly designed, installed, and maintained;

4. Existing construction activities, i.e., those occurring on or before the effective date of this permit, having met the sampling required by (1) above shall sample in accordance with (2). Those existing construction activities having met the sampling required by (2) above shall not be required to conduct additional sampling other than as required by (3) above.

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

5. For linear construction, if at any time during the life of the project, BMPs have not been properly designed, installed or maintained for the construction activities that discharge into a receiving water which is not being sampled, the Contractor shall sample that receiving water for the first rainfall event greater than or equal to 0.5 inches thereafter and for every rainfall event greater than or equal to 0.5 inches until BMPs are properly designed, installed and maintained.

C. Sampling shall be collected by "grab samples" and the analysis of these samples must be conducted in accordance with methodology and test procedures established in the General Permit. Sample containers shall be labeled prior to collecting the samples. Samples shall be well mixed before transferring to a secondary container. Large mouth, well cleaned and rinsed glass or plastic jars shall be used for collecting samples. The jars shall be cleaned thoroughly to avoid contamination. Manual or automatic sampling shall be utilized. Samples required by the General Permit shall be analyzed immediately, but in no case later than 48 hours after collection. However, samples from automatic samplers must be collected no later than the next business day after their accumulation, unless flow through automated analysis is utilized. Samples are not required to be cooled. Samples taken for the purpose of compliance with the General Permit shall be representative of the monitored activity and representative of the water quality of the receiving water(s) and/or the storm water outfalls using the following minimum guidelines:

   1. The upstream sample for each receiving water(s) must be taken immediately upstream of the confluence of the first storm water discharge from the permitted construction site but downstream of any other storm water discharges not associated with the site. Where appropriate, several

upstream samples from across the receiving water(s) may need to be taken and the average turbidity of these samples used for an upstream turbidity value.

2. The downstream sample for each receiving water(s) must be taken downstream of the confluence of the last storm water discharge from the construction site but upstream of any other storm water discharge not associated with the site. Where appropriate, several downstream samples from across the receiving water(s) may need to be taken and the average turbidity of these samples used for a downstream turbidity value.

3. Samples shall be taken from the horizontal and vertical center of the receiving water(s) or the storm water outfall channel(s).

4. Care shall be taken to avoid stirring the bottom sediments in the receiving water(s) or in the outfall storm water channel(s).

5. Sampling container shall be held so the opening faces upstream.

6. Samples shall be kept from floating debris.

D. For all construction sites and common developments other than linear construction projects, the Contractor shall sample all receiving water(s), or all outfall(s) or a combination of receiving water(s) and outfall(s). For linear construction projects, the Contractor must sample all perennial and intermittent streams and other water bodies shown on an USGS topographic map and all other field verified perennial and intermittent streams and other water bodies, or all outfalls into such streams and other water bodies, or a combination thereof.

E. Contractor shall provide and implement all safety equipment and procedures necessary for sampling during hazardous weather conditions and in the event of biological, chemical or physical hazards

F. Contractor shall submit a summary of the monitoring results to the EPD at the address shown in the General Permit by the fifteenth day of the month following the reporting period. For a monitoring period during which no qualifying rainfall events occur, a monitoring report must be submitted stating such. Monitoring periods are calendar months beginning with the first month after the effective date of the General Permit. Monitoring reports shall be signed in accordance with the General Permit and submitted to EPD until such time as a NOT is submitted.

G. Contractor must retain copies of all monitoring results and monitoring information reported. In addition to other record keeping requirements, the monitoring information shall include:

1. Date, exact place and time of sampling or measurements.

2. Name(s) of the individual(s) who performed the sampling and measurements.

3. Date(s) analyses were performed.

4. Time(s) analyses were initiated.

5. Name(s) of the individual(s) who performed the analyses.

6. References and written procedures, when available, for the analytical techniques or methods used. A quality control/quality assurance program must be included in the written procedures.

7. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, used to determine these results.

8. Results exceeding 1,000 NTU shall be reported as "Exceeds 1,000 NTU." H.

Contractor shall supply copies of the monitoring results to Owner and Engineer.

END OF SECTION

GENERAL NPDES
PERMIT NO. GAR100002

GEORGIA
DEPARTMENT OF NATURAL RESOURCES

ENVIRONMENTAL PROTECTION DIVISION

Authorization To Discharge Under The National Pollutant Discharge Elimination System Stormwater Discharges Associated With Construction Activity For Infrastructure Construction Projects

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

This permit shall become effective on August 1, 2023.

This permit and the authorization to discharge shall expire at midnight, July 31, 2028.

Signed this 06/20/2023

Richard E. Dunn, Director
Environmental Protection Division

TABLE OF CONTENTS

Part I. COVERAGE UNDER THIS PERMIT

A. Permit Area.

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

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

1. "Best Management Practices" (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the "Manual for Erosion and Sediment Control in Georgia" (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted to prevent or reduce the pollution of waters of Georgia. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

2. "Buffer" means the area of land immediately adjacent to the banks of State waters in its natural state of vegetation, which facilitates the protection of water quality and aquatic habitat.

3. "Certified Personnel" means a person who has successfully completed the appropriate certification course approved by the Georgia Soil and Water Conservation Commission.

4. "Commencement of Construction" means the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

5. "Construction Activity" means the disturbance of soils associated with clearing, grading, excavating, filling of land, or other similar activities which may result in soil erosion. Construction activity does not include agricultural and silvicultural practices, but does include agricultural buildings.

6. "CPESC" means Certified Professional in Erosion and Sediment Control with current certification by EnviroCert International, Inc.

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

8. "Design Professional" means a professional licensed by the State of Georgia in the field of: engineering, architecture, landscape architecture, forestry, geology, or land surveying; or a person that is a Certified Professional in Erosion and Sediment Control (CPESC) with a current certification by EnviroCert International, Inc and that has completed the appropriate certification course approved by the Georgia Soil and Water Conservation Commission in accordance with

O.C.G.A 12-7-9. Design Professionals shall practice in a manner that complies with applicable Georgia law governing professional licensure.

9. "Director" means the Director of the Environmental Protection Division or an authorized representative.

10. "Division" or "EPD" means the Environmental Protection Division of the Department of Natural Resources.

11. "Drainage Structure" means a device composed of virtually nonerodible material such as concrete, steel, plastic, or other such material that conveys water from one place to another by intercepting the flow and carrying it to a release point for storm water management, drainage control, or flood control purposes.

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

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

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

15. "Final Stabilization" means that all soil disturbing activities at the site have been completed, and that for unpaved areas and areas not covered by permanent structures, 100% of the soil surface is uniformly covered in permanent vegetation with a density of 70% or greater, or landscaped according to the Plan (uniformly covered with landscaping materials in planned landscaped areas), or equivalent permanent stabilization measures as defined in the Manual (excluding a crop of annual vegetation and a seeding of target crop perennials appropriate for the region). For infrastructure construction projects on land used for agricultural or silvicultural purposes, final stabilization may be accomplished by stabilizing the disturbed land for its agricultural or silvicultural use.

16. "General Contractor" means the operator of the infrastructure construction or site.

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

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

19. "Infrastructure Construction" or "Infrastructure Construction Project" means construction activities that are not part of a common development that include the construction, installation and maintenance of roadway and railway projects and conduits, pipes, pipelines, substations, cables, wires, trenches, vaults, manholes and similar or related structures for the conveyance of natural

gas (or other types of gas), liquid petroleum products, electricity, telecommunications (telephone, data, television, etc.), water, stormwater or sewage. "Infrastructure Construction" or "Infrastructure Construction Project" does not include the construction of solar farms.

20. "Infrastructure Company" or "Infrastructure Contractor" means, for the purposes of this Permit, an entity or sub-contractor that is responsible, either directly or indirectly, for infrastructure construction or an infrastructure construction project.

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

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

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

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

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

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

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

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

29. "Owner" means the legal title holder to the real property on which is located the facility or site where construction activity takes place. For purposes of this permit, this definition does not include the legal title holder to property on which the only construction activity planned and being conducted is by an infrastructure company or infrastructure contractor and the legal title holder has no significant control over design and implementation of the construction activity.

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

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

32. “Point Source” means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure or container from which pollutants are or may be discharged. This term also means sheet flow which is later conveyed via a point source to waters of the State. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff.

33. “Primary Permittee” means the Owner and/or the Operator of a tract of land for a construction site subject to this permit.

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

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

36. “Roadway Drainage Structure” means a device, such as a bridge, culvert, or ditch, composed of a virtually nonerodible, material such as concrete, steel, plastic, or other such material that conveys water under a roadway by intercepting the flow on one side of a traveled way consisting of one or more defined lanes, with or without shoulder areas, and carrying water to a release point on the other side.

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

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

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

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

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

42. “Stormwater” means stormwater runoff, snow melt runoff, and surface runoff and drainage.

43. “Structural Erosion and Sediment Control Practices” means measures for the stabilization of erosive or sediment producing areas by utilizing the mechanical properties of matter for the purpose of either changing the surface of the land or storing, regulating or disposing of runoff to prevent excessive sediment loss.

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

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

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

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

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

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

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

C. Eligibility.

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

a. all discharges of stormwater associated with infrastructure construction projects that will result in contiguous land disturbances equal to or greater than one (1) acre occurring on or before, and continuing after, the effective date of this permit, (henceforth referred to as existing stormwater discharges from construction activities) except for discharges identified under Part I.C.3. Contiguous means areas of land disturbances that are in actual contact to create a connected, uninterrupted area of land disturbance. However, for the purposes of this permit, contiguous areas of land disturbances include those areas of land disturbances solely separated by drilling and boring activities, waters of the State and adjacent State-mandated buffers, roadways and/or railways. In addition, contiguous areas of land disturbances include all areas of land disturbances at a sole roadway intersection and/or junction;

b. all discharges of stormwater associated with infrastructure construction projects that will result in contiguous land disturbances equal to or greater than one (1) acre occurring after the effective date of this permit, (henceforth referred to as stormwater discharges from construction activities), except for discharges identified under Part I.C.3. Contiguous means areas of land disturbances that are in actual contact to create a connected, uninterrupted area of land disturbance. However, for purposes of this permit, contiguous areas of land disturbances include those areas of land disturbances solely separated by drilling and boring activities, waters of the State and adjacent State-mandated buffers, roadways and/or railways. In addition, contiguous areas of land disturbances include all areas of land disturbances at a sole roadway intersection and/or junction;

c. coverage under this permit is not required for discharges of stormwater associated with infrastructure construction projects that consist solely of routine maintenance for the original purpose of the facility that is performed to maintain the original line and grade and the hydraulic capacity, as applicable. The construction activity shall, as a minimum, implement and maintain best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the "Manual for Erosion and Sediment Control in Georgia" (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity is being conducted. In order to be eligible for this exemption the project must comply with the following conditions: (1) no mass grading shall occur on the project, (2) the project shall be stabilized by the end of each day with temporary or permanent stabilization measures, (3) the project shall have a duration of less than 120 calendar days, and (4) final stabilization must be implemented at the end of the maintenance project; and

d. coverage under this permit is not required for discharges of stormwater associated with infrastructure road construction projects that consist solely of routine maintenance for the original purpose of the facility that is performed to maintain the original line and grade and vehicular capacity, as applicable. The construction activity shall, as a minimum, implement and maintain best management practices, including sound conservation and

engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the "Manual for Erosion and Sediment Control in Georgia" (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity is being conducted. In order to be eligible for this exemption the project must comply with the following conditions: (1) no mass grading shall occur on the project, (2) the project shall be stabilized by the end of each day with temporary or permanent stabilization measures, (3) the project shall have a duration of less than 120 calendar days, and (4) final stabilization must be implemented at the end of the maintenance project; and

e. coverage under this permit is not required for discharges of stormwater associated with railroad construction projects and emergency re-construction conducted pursuant to the Federal Railway Safety Act, the Interstate Commerce Commission Termination Act and which consist solely of routine maintenance for the original purpose of the facility that is performed to maintain the original line and grade and the hydraulic capacity, as applicable. The construction activity shall, as a minimum, implement and maintain best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation consistent with the requirements of the Federal Railway Safety Act and applicable requirements of the Clean Water Act.

f. coverage under this permit is not required for discharges of stormwater associated with infrastructure road construction projects that consist solely of the installation of cable barriers and guard rail for an existing facility within the existing rights-of-way. The construction activity shall, as a minimum, implement and maintain best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the "Manual for Erosion and Sediment Control in Georgia" (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity is being conducted. In order to be eligible for this exemption the project must comply with the following conditions: (1) no mass grading shall occur on the project, (2) the project shall be stabilized by the end of each day with temporary or permanent stabilization measures, and (3) final stabilization must be implemented at the end of the project.

g. coverage under this permit is not required for discharges of stormwater associated with infrastructure construction projects that consist of the installation of buried utility lines and comply with the following conditions: (1) solely installed via vibratory plow, (2) the conduit does not exceed 4 inches in diameter, and (3) occurs within an existing stabilized right-of-way. The construction activity shall, as a minimum, implement and maintain best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the "Manual for Erosion and Sediment Control in Georgia" (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity is being conducted. In order to be eligible for this exemption the project must comply with the following conditions: (1)

no mass grading shall occur on the project, (2) no clearing of trees with greater than a 6-inch Diameter at Breast Height (DBH), (3) no change in grade, (4) the project shall be stabilized by the end of each day with temporary or permanent stabilization measures and (5) final stabilization must be implemented at the end of the project.

h. coverage under this permit is not required for discharges of stormwater associated with infrastructure construction projects that consist solely of the installation of buried fiber optic utility lines. The facility must be collocated within an existing stabilized right-of-way (with minor diversions to avoid obstacles within the right-of-way for engineering purposes), The construction activity shall, as a minimum, implement and maintain best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the "Manual for Erosion and Sediment Control in Georgia" (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity is being conducted. In order to be eligible for this exemption the project must comply with the following conditions: (1) no mass grading shall occur on the project, (2) no change in grade, (3) the project shall be stabilized by the end of each day with temporary or permanent stabilization measures, (4) final stabilization must be implemented at the end of the project, and (5) stream crossings and buffer disturbances are minimized to the fullest extent practicable.

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

a. the industrial source or activity other than construction is located on the same site as the construction activity and is an integral part of the construction activity;

b. the stormwater discharges associated with industrial activity from the areas of the site where construction activities are occurring are in compliance with the terms of this permit; and

c. stormwater discharges associated with industrial activity from the areas of the site where industrial activity other than construction are occurring are covered by a different NPDES general permit or individual permit authorizing such discharges and the discharges are in compliance with a different NPDES permit.

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

a. stormwater discharges associated with an industrial activity that originate from the site after construction activities have been completed and the site has undergone final stabilization;

b. discharges that are mixed with sources of non-stormwater other than discharges which are identified in Part III.A.2. of this permit and which are in compliance with Part IV.D.7. (non-stormwater discharges) of this permit;

c. stormwater discharges associated with industrial activity that are subject to an existing NPDES individual or general permit. Such discharges may be authorized under this permit after an existing permit expires provided the existing permit did not establish numeric limitations for such discharges; and

d. stormwater discharges from construction sites that the Director (EPD) has determined to be or may reasonably be expected to be contributing to a violation of a water quality standard.

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

D. Authorization.

1. Any person desiring coverage under this permit must submit a Notice of Intent (NOI) to the EPD and the NOI must be received by the EPD in accordance with the requirements of Part II, using the electronic submittal service provided by the EPD, in order for stormwater discharges from construction sites to be authorized.

2. Unless notified by the Director to the contrary, a permittee who submits an NOI in accordance with the requirements of this permit is authorized to discharge stormwater from construction sites under the terms and conditions of this permit fourteen (14) days after the date that the NOI is submitted and confirmation of submittal is received. The Director may deny coverage under this permit and require submittal of an application for an individual NPDES permit or alternative general NPDES permit based on a review of the NOI or other information. Should the Director deny coverage under this permit, coverage under this permit is authorized until the date specified in the notice of denial by the Director.

3. Where a new permittee is to begin work on-site after an NOI for the facility/construction site has been submitted, that new permittee must submit a new NOI in accordance with Part II.

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

Part II. NOTICE OF INTENT REQUIREMENTS

A. Deadlines for Notification.

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

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

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

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

5. For sites where construction activities will result in land disturbance equal to or greater than one (1) acre that are required as a result of storm- or emergency-related repair work, the Owner or Operator or both shall notify the appropriate EPD District Office within three (3) days of commencement of said construction activities. The Owner or Operator or both shall submit the NOI to the appropriate EPD District Office as soon as possible after the storm- or emergency-related event but no later than fourteen (14) days after the commencement of construction activities and shall submit the Plan in accordance with Part IV.A.6.

B. Notice of Intent Contents.

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

a. The project construction site name, GPS locations (decimal degrees) of the beginning and end of the infrastructure project, construction site location, city (if applicable) and county of the construction site for which the notification is submitted. The construction site location information must be sufficient to accurately locate the construction site;

b. The Owner's legal name, address, telephone number and email address; and if available, the Operator's legal name, address, telephone number and email address; and if applicable, the Duly Authorized Representative's legal name and/or position name, telephone number and email address;

c. The name, telephone number and email address of the individual to whom the permittee has assigned the responsibility for the daily operational control (i.e., construction superintendent, etc.) of the construction site;

d. The name of the initial receiving water(s) or if unnamed, the first named blue line stream indicated on the appropriate USGS Topographic map, and when the discharge is through a municipal separate storm sewer system (MS4), the name of the local government operating the municipal separate storm sewer system and the name of the receiving water(s) which receives the discharge from the MS4, and the permittee's determination of whether the receiving water(s) supports warm water fisheries or is a trout stream as indicated in the Rules and Regulations for Water Quality Control, Chapter 391-3-6.

e. The name of the receiving water(s) located within one (1) linear mile upstream of and within the same watershed as, any portion of an Impaired Stream Segment identified as "not supporting" its designated use(s) shown on Georgia's most current "305(b)/303(d) List Documents (Approved)" for the criteria violated/cause, "Bio F" (Impaired Fish Community) and/or "Bio M" (Impaired Macroinvertebrate Community), within Category 4a, 4b or 5, and the potential cause is either "NP" (nonpoint source) or "UR" (urban runoff);

f. An estimate of project start date and completion date, a schedule for the timing of the various construction activities, the number of acres of the site on which soil will be disturbed, and the surface water drainage area (if applicable). For projects that began on or before the effective date of this permit, the start date must be the actual start date of construction;

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

> "I certify that to the best of my knowledge and belief, that the Erosion, Sedimentation and Pollution Control Plan (Plan) was prepared by a design professional, as defined by this permit, that has completed the appropriate

certification course approved by the Georgia Soil and Water Conservation Commission in accordance with the provisions of O.C.G.A. 12-7-19 and that I will adhere to the Plan and comply with all permit requirements."

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

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

j. A single NOI with multiple phases or multiple NOIs for multiple phases may be submitted for construction sites with a total planned disturbance greater than 5.0 acres, provided that each phase shall not be less than 1.0 acre. Phased NOIs shall include all documentation required by this permit for each phase, including fees; and

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

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

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

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

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

A. Prohibition on Non-Stormwater Discharges.

1. Except as provided in Part I.C.2. and III.A.2., all discharges covered by this permit shall be composed entirely of stormwater.

2. The following non-stormwater discharges may be authorized by this permit provided the non-stormwater component of the discharge is explicitly listed in the Erosion, Sedimentation and Pollution Control Plan and is in compliance with Part IV.D.7.; discharges from firefighting activities; fire hydrant flushing; potable water sources including water line flushing; irrigation drainage; air conditioning condensate; springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials or pollutants.

3. This permit does not authorize the discharge of soaps or solvents used in vehicle and equipment washing.

4. This permit does not authorize the discharge of wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials.

B. Releases in Excess of Reportable Quantities.

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

This permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill.

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

Any permittee who intends to obtain coverage under this permit for stormwater discharges associated with construction activity into an Impaired Stream Segment, or within one (1) linear mile upstream of and within the same watershed as, any portion of an Impaired Stream Segment identified as “not supporting” its designated use(s), as shown on Georgia’s most current “305(b)/303(d) List Documents (Approved)” at the time of NOI submittal, must satisfy the requirements of Part III.C. of this permit if the Impaired Stream Segment has been listed for criteria violated/cause, “Bio F” (Impaired Fish Community) and/or “Bio M” (Impaired Macroinvertebrate

Community), within Category 4a, 4b or 5, and the potential cause is either "NP" (nonpoint source) or "UR" (urban runoff). Those discharges that are located within one (1) linear mile of an Impaired Stream Segment, but are not located within the watershed of any portion of that stream segment, are excluded from this requirement. Georgia's "305(b)/303(d) List Documents (Approved)" can be viewed on the EPD website.

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

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

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

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

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

d. A large sign (minimum 4 feet x 8 feet) must be posted on site by the actual start date of construction. The sign must be visible from a public roadway. The sign must identify the following: (1) the construction site, (2) the permittee(s), (3) the contact person(s) along with their telephone number(s), and (4) the permittee-hosted website where the Plan can be viewed. The permittee-hosted website where the Plan can be viewed must be provided on the submitted NOI. The sign must remain on site and the Plan must be available on the provided website until a NOT has been submitted.

e. Use tackifiers and/or mulch to stabilize all areas left disturbed for more than seven (7) calendar days in accordance with Part III.D.1. of this permit.

f. Conduct turbidity sampling after every rain event of 0.5 inch or greater within any 24 hour period, recognizing the exceptions specified in Part IV.D.6.d. of this permit.

g. Comply with the applicable end-of-pipe turbidity effluent limit, without the "BMP defense" as provided for in O.C.G.A. 12-7-6(a)(1).

h. Reduce the total planned site disturbance to less than 50% impervious surfaces (excluding any State-mandated buffer areas from such calculations). All calculations must be included on the Plan.

i. Limit the amount of disturbed area at any one time to no greater than 25 acres or 50% of the total planned site, whichever is less. All calculations must be included on the Plan.

j. Use "Dirt II" techniques available on the EPD website, to model and manage all construction stormwater runoff (including sheet flow). All calculations must be included on the Plan.

k. Conduct soil tests representative of conditions at the time of planting to identify and to implement site-specific fertilizer needs and/or add appropriate organic soil amendments (e.g., compost) and conduct pre- and post-construction soil sampling to a depth of six (6) inches to document improved levels of soil carbon after final stabilization of the construction site.

l. Use mulch filter berms, in addition to a silt fence, on the site perimeter wherever construction stormwater (including sheet flow) may be discharged. Mulch filter berms cannot be placed in waterways or areas of concentrated flow.

m. Use appropriate erosion control slope stabilization instead of concrete in all construction stormwater ditches and storm drainages designed for a 25 year, 24 hour rainfall event.

n. Use flocculants or coagulants under a passive dosing method (e.g., flocculant blocks) within all construction stormwater ditches and storm drainages that feed into temporary sediment basins and retrofitted management basins.

o. Install sod for a minimum 20 foot width (in lieu of seeding) after final grade has been achieved, along the site perimeter wherever construction stormwater (including sheet flow) may be discharged.

p. Certified personnel shall conduct inspections at least once every seven (7) calendar days and within 24 hours of the end of the storm that is 0.5 inches rainfall or greater in accordance with Part IV.D.4.a.(3)(a)–(c) of this permit.

q. Apply the appropriate compost blankets (minimum depth 1.5 inches) to protect soil surfaces until vegetation is established during the final stabilization phase of the construction activity.

r. Use alternative BMPs whose performance has been documented to be superior to conventional BMPs as certified by a Design Professional (unless disapproved by EPD or the Georgia Soil and Water Conservation Commission).

s. Limit the total planned site disturbance to less than 15% impervious surfaces (excluding any State-mandated buffer areas from such calculations). All calculations must be included on the Plan.

t. Conduct inspections during the intermediate grading and drainage BMP phase and during the final BMP phase of the project by the design professional who prepared the Plan in accordance with Part IV.A.5. of the permit.

u. Install Post Construction BMPs (e.g., runoff reduction BMPs) which remove 80% TSS as outlined in the Georgia Stormwater Management Manual known as the Blue Book or an equivalent or more stringent design manual.

D. Management Practices and Permit Violations.

1. Best management practices, as set forth in this permit, are required for all construction activities, and must be implemented in accordance with the design specifications contained in the "Manual for Erosion and Sediment Control in Georgia" (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted to prevent or reduce the pollution of waters of Georgia. Proper design, installation, and maintenance of best management practices shall constitute a complete defense to any action by the Director or to any other allegation of noncompliance with Part III.D.4. and Part III.D.5.

2. Except as required to install the initial sediment storage requirements and perimeter control BMPs as described in Part IV.D.3., the initial sediment storage requirements and perimeter control BMPs must be installed and implemented prior to conducting any other construction activities (e.g., clearing, grubbing and grading) within the construction site or when applicable, within phased sub-parts, sections or segments of the construction site. Failure to comply shall constitute a violation of this permit for each day on which construction activities occur. The design professional who prepared the Plan must inspect the initial sediment storage requirements and perimeter control BMPs in accordance with Part IV.A.5. within seven (7) days after installation.

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

BMP failures and shall submit a summary of the violations to EPD in accordance with Part V.A.2. of this permit.

4. A discharge of stormwater runoff from disturbed areas where best management practices have not been properly designed, installed, and maintained shall constitute a separate violation for each day on which such discharge results in the turbidity of receiving water(s) being increased by more than ten (10) nephelometric turbidity units for waters classified as trout streams or more than twenty-five (25) nephelometric turbidity units for waters supporting warm water fisheries, regardless of a permittee's certification under Part II.B.1.i.

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

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

> a. When the repair does not require a new or replacement BMP or significant repair, the BMP failure or deficiency must be repaired within two (2) business days from the time of discovery;
>
> b. When the repair requires a new or replacement BMP or significant repair, the installation of the new or modified BMP must be completed and the BMP must be operational by no later than seven (7) days from the time of discovery. If it is infeasible to complete the installation or repair within seven (7) days, the permittee must document why it is infeasible to complete the installation or repair within the seven (7) day timeframe and document the schedule for installing or repairing the BMPs and making the BMPs operational as soon as feasible after the seven (7) day timeframe.

Part IV. EROSION, SEDIMENTATION AND POLLUTION CONTROL PLAN

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

Conservation Commission. The design professional preparing the Plan must include and sign the following certification in the Plan:

> "I certify that the permittee's Erosion, Sedimentation and Pollution Control Plan provides for an appropriate and comprehensive system of best management practices required by the Georgia Water Quality Control Act and the document "Manual for Erosion and Sediment Control in Georgia" (Manual) published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted, provides for the sampling of the receiving water(s) or the sampling of the stormwater outfalls and that the designed system of best management practices and sampling methods is expected to meet the requirements contained in the General NPDES Permit No. GAR100002."

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

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

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

(i). Except as provided in Part IV.(iii). below, no construction activities shall be conducted within a 25 foot buffer along the banks of all State waters, as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, except where the Director has determined to allow a variance that is at least as protective of natural resources and the environment in accordance with the provisions of O.C.G.A. 12-7-6, or where a drainage structure or a roadway drainage structure must be constructed, provided that adequate erosion control measures are incorporated in the project plans and specifications and are implemented, or along any ephemeral stream, or where bulkheads and seawalls must be constructed to prevent the erosion of the shoreline on Lake Oconee and Lake Sinclair. The buffer shall not apply to the following activities provided that adequate erosion control measures are incorporated into the project plans and specifications and are implemented:

(1) public drinking water system reservoirs;
(2) fences;
(3) stream crossings for water lines and sewer lines, provided that the stream crossings occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream and cause a width of disturbance of not more than 50 feet within the buffer, and native riparian vegetation is re-established in any bare or disturbed areas within the buffer;

(4) stream crossings for any utility lines of any electric membership corporation or municipal electrical system or any public utility under the regulatory jurisdiction of the Public Service Commission, any utility under the regulatory jurisdiction of the Federal Energy Regulatory Commission, any cable television system as defined in Code Section 36-18-1, or any agency or instrumentality of the United States engaged in the generation, transmission or distribution of power, provided that: (a) the stream crossings occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream and cause a width of disturbance of not more than 50 feet within the buffer, (b) native riparian vegetation is re-established in any bare or disturbed areas within the buffer and (c) the entity is not a Secondary Permittee for a project located within a common development or sale under this permit;

(5) stream crossings for aerial utility lines, provided that: (a) the new utility line right-of-way width does not exceed 200 linear feet, (b) utility lines are routed and constructed so as to minimize the number of stream crossings and disturbances to the buffer, (c) only trees and tree debris are removed from within the buffer resulting in only minor soil erosion (i.e., disturbance to underlying vegetation is minimized), and (d) native riparian vegetation is re-established in any bare or disturbed areas within the buffer. The Plan shall include a description of the stream crossings with details of the buffer disturbance including area and length of buffer disturbance, estimated length of time of buffer disturbance, and justification;

(6) right-of-way posts, guy-wires, anchors, survey markers and the replacement or maintenance of existing utility structures within the current right-of-way undertaken or financed in whole or in part by the Department of Transportation, the Georgia Highway Authority or the State Road and Tollway Authority or undertaken by any county or municipality, provided that: (a) the area of land disturbance does not exceed 100 square feet per structure, (b) the area of buffer vegetation to be cut (not grubbed) does not exceed 1,000 square feet per structure, (c) native riparian vegetation is re-established in any bare or disturbed areas within the buffer and (d) the entity is not a Secondary Permittee for a project located within a common development or sale under this permit; and

(7) right-of-way posts, guy-wires, anchors, survey markers and the replacement or maintenance of existing utility structures within the current right-of-way undertaken by any electric membership corporation or municipal electrical system or any public utility under the regulatory jurisdiction of the Public Service Commission, any utility under the regulatory jurisdiction of the Federal Energy Regulatory Commission, any cable television system as defined in Code Section 36-18-1, or any agency or instrumentality of the United States engaged in the generation, transmission or distribution of power, provided that: (a) the area of land disturbance does not exceed 100 square feet per structure, (b) the area of buffer vegetation to be cut (not grubbed) does not exceed 1,000 square feet per structure, (c) native riparian vegetation is re-established in any bare or disturbed areas within the buffer and (d) the entity is not a Secondary Permittee for a project located within a common development or sale under this permit.

(ii). No construction activities shall be conducted within a 50 foot buffer, as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, along the banks of any State waters classified as 'trout streams' except when approval is granted by the Director for alternate buffer requirements in accordance with the provisions of O.C.G.A. 12-7-6, or where a roadway drainage structure must be constructed; provided, however, that small springs

and streams classified as 'trout streams' which discharge an average annual flow of 25 gallons per minute or less shall have a 25 foot buffer or they may be piped, at the discretion of the permittee, pursuant to the terms of a rule providing for a general variance promulgated by the Board of Natural Resources including notification of such to EPD and the Local Issuing Authority of the location and extent of the piping and prescribed methodology for minimizing the impact of such piping and for measuring the volume of water discharged by the stream. Any such pipe must stop short of the downstream permittee's property, and the permittee must comply with the buffer requirement for any adjacent trout streams. The buffer shall not apply to the following activities provided that adequate erosion control measures are incorporated into the project plans and specifications and are implemented:

(1) public drinking water system reservoirs;
(2) fences;
(3) stream crossings for water lines and sewer lines, provided that the stream crossings occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream and cause a width of disturbance of not more than 50 feet within the buffer, and native riparian vegetation is re-established in any bare or disturbed areas within the buffer;
(4) stream crossings for any utility lines of any electric membership corporation or municipal electrical system or any public utility under the regulatory jurisdiction of the Public Service Commission, any utility under the regulatory jurisdiction of the Federal Energy Regulatory Commission, any cable television system as defined in Code Section 36-18-1, or any agency or instrumentality of the United States engaged in the generation, transmission or distribution of power, provided that: (a) the stream crossings occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream and cause a width of disturbance of not more than 50 feet within the buffer, (b) native riparian vegetation is re-established in any bare or disturbed areas within the buffer and (c) the entity is not a Secondary Permittee for a project located within a common development or sale under this permit;
(5) stream crossings for aerial utility lines, provided that: (a) the new utility line right-of-way width does not exceed 200 linear, (b) utility lines are routed and constructed so as to minimize the number of stream crossings and disturbances to the buffer, (c) only trees and tree debris are removed from within the buffer resulting in only minor soil erosion (i.e., disturbance to underlying vegetation is minimized), and (d) native riparian vegetation is re-established in any bare or disturbed areas within the buffer. The Plan shall include a description of the stream crossings with details of the buffer disturbance including area and length of buffer disturbance, estimated length of time of buffer disturbance, and justification;
(6) right-of-way posts, guy-wires, anchors, survey markers and the replacement or maintenance of existing utility structures within the right-of-way undertaken or financed in whole or in part by the Department of Transportation, the Georgia Highway Authority or the State Road and Tollway Authority or undertaken by any county or municipality, provided that: (a) the area of land disturbance does not exceed 100 square feet per structure, (b) the area of buffer vegetation to be cut (not grubbed) does not exceed 1,000 square feet per structure, (c) native riparian vegetation is re-established in any bare or disturbed areas within the buffer and (d) the entity is not a Secondary Permittee for a project located within a common development or sale under this permit; and

(7) right-of-way posts, guy-wires, anchors, survey markers and the replacement or maintenance of existing utility structures within the current right-of-way undertaken by any electric membership corporation or municipal electrical system or any public utility under the regulatory jurisdiction of the Public Service Commission, any utility under the regulatory jurisdiction of the Federal Energy Regulatory Commission, any cable television system as defined in Code Section 36-18-1, or any agency or instrumentality of the United States engaged in the generation, transmission or distribution of power, provided that: (a) the area of land disturbance does not exceed 100 square feet per structure, (b) the area of buffer vegetation to be cut (not grubbed) does not exceed 1,000 square feet per structure, (c) native riparian vegetation is re-established in any bare or disturbed areas within the buffer and (d) the entity is not a Secondary Permittee for a project located within a common development or sale under this permit.

(iii). Except as provided in Part IV(iv) below, no construction activities shall be conducted within a 25 foot buffer along coastal marshlands, as measured horizontally from the coastal marshland-upland interface, as determined in accordance with Part 4 of Article 4 of Chapter 5 of Title 12, the Coastal Marshlands Protection Act of 1970, and the rules and regulations promulgated thereunder, except where the Director determines to allow a variance that is at least as protective of natural resources and the environment in accordance with the provisions of O.C.G.A. 12-7-6, or where otherwise allowed by the Director pursuant to Code Section 12-2-8, or where an alteration within the buffer area has been authorized pursuant to Code Section 12-5-286, or for maintenance of any currently serviceable structure, landscaping, or hardscaping, including bridges, roads, parking lots, golf courses, golf cart paths, retaining walls, bulkheads, and patios, provided that adequate erosion control measures are incorporated into the project plans and specifications and such measures are fully implemented, or where a drainage structure or roadway drainage structure is constructed or maintained, provided that adequate erosion control measures are incorporated into the project plans and specifications and such measures are fully implemented, or on the landward side of any currently serviceable shoreline stabilization structure, or for the maintenance of any manmade stormwater detention basin, golf course pond, or impoundment that is located entirely within the property of a single individual, partnership, or corporation, provided that adequate erosion control measures are incorporated into the project plans and specifications and such measures are fully implemented. The buffer shall not apply to the following activities provided that adequate erosion control measures are incorporated into the project plans and specifications and such measures are fully implemented:

(1) Public drinking water system reservoirs;
(2) Crossings for utility lines that cause a width of disturbance of not more than 50 feet within the buffer;
(3) Any land-disturbing activity conducted pursuant to and in compliance with a valid and effective land-disturbing permit issued subsequent to April 22, 2014, and prior to December 31, 2015;
(4) Any lot for which the preliminary plat has been approved prior to December 31, 2015 if roadways, bridges, or water and sewer lines have been extended to such lot prior to the effective date of this Act and if the requirement to maintain a 25 foot buffer would consume at least 18 percent of the high ground of the platted lot otherwise available for development;

(5) Fences;
(6) Crossings for aerial utility lines, provided that: (a) the new utility line right-of-way width does not exceed 200 linear feet, (b) utility lines are routed and constructed so as to minimize the number of crossings and disturbances to the buffer, (c) only trees and tree debris are removed from within the buffer resulting in only minor soil erosion (i.e., disturbance to underlying vegetation is minimized), and (d) vegetation is re-established in any bare or disturbed areas within the buffer. The Plan shall include a description of the crossings with details of the buffer disturbance including area and length of buffer disturbance, estimated length of time of buffer disturbance, and justification;
(7) Right-of-way posts, guy wires, anchors, survey markers and the replacement and maintenance of existing utility structures within the current right-of-way undertaken or financed in whole or in part by the Department of Transportation, the Georgia Highway Authority or the State Road and Tollway Authority or undertaken by any county or municipality, provided that: (a) the area of land disturbance does not exceed 100 square feet per structure, (b) the area of buffer vegetation to be cut (not grubbed) does not exceed 1,000 square feet per structure, (c) vegetation is re-established in any bare or disturbed areas within the buffer and (d) the entity is not a Secondary Permittee for a project located within a common development or sale under this permit; and
(8) Right-of-way posts, guy wires, anchors, survey markers and the replacement and maintenance of existing utility structures within the current right-of-way by any electric membership corporation or municipal electrical system or any public utility under the regulator jurisdiction of the Public Service Commission, any utility under the regulatory jurisdiction of the Federal Energy Regulatory Commission, any cable television system as defined in Code Section 36-18-1, or any agency or instrumentality of the United States engaged in the generation, transmission or distribution of power, provided that (a) the area of land disturbance does not exceed 100 square feet per structure, (b) the area of buffer vegetation to be cut (not grubbed) does not exceed 1,000 square feet per structure, (c) vegetation is re-established in any bare or disturbed areas within the buffer and (d) the entity is not a Secondary Permittee for a project located within a common development or sale under this permit.

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

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

Except as provided in Part IV.A.2., a single Erosion, Sedimentation and Pollution Control Plan must be prepared by the Primary Permittee for the infrastructure construction project.

A. Deadlines for Plan Preparation and Compliance.

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

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

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

4. Additional Plan Submittals.

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

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

5. For infrastructure projects that begin construction activity after the effective date of this permit, the Primary Permittee must retain the design professional who prepared the Erosion, Sedimentation and Pollution Control Plan, or an alternative design professional approved by EPD

in writing, to inspect and certify the installation of the initial sediment storage requirements and perimeter control BMPs within seven (7) days after installation. Alternatively, for linear infrastructure projects, the Primary Permittee must retain the design professional who prepared the Erosion, Sedimentation and Pollution Control Plan, or an alternative design professional approved by EPD in writing, to inspect and certify (a) the installation of the sediment storage requirements and perimeter control BMPs for the *"initial segment"* of the linear infrastructure project and (b) all sediment basins within the entire linear infrastructure project within seven (7) days after installation. For the purposes of the specific requirements in Part IV.A.5., the disturbed acreage of the *"initial segment"* of a linear infrastructure project must be equal to or greater than 10% of the total estimated disturbed acreage for the linear infrastructure project but not less than one (1) acre. The design professional shall determine if these BMPs have been installed and are being maintained as designed. The design professional shall report the results of the inspection to the Primary Permittee within seven (7) days and the permittee must correct all deficiencies within two (2) business days of receipt of the inspection report from the design professional unless weather related site conditions are such that additional time is required.

6. For storm- or emergency-related repair work, the permittee shall implement appropriate BMPs and certified personnel (provided by the Primary Permittee) shall inspect at least once every seven (7) calendar days and within 24 hours of the end of a storm that is 0.5 inches rainfall or greater. If the storm- or emergency-related repair work will not be completed within sixty (60) days of commencement of construction activity, a single copy of the Plan shall be submitted to EPD and the permittee shall comply with all requirements of this permit on the sixty-first (61st) day.

B. Signature and Plan Review.

1. The Erosion, Sedimentation and Pollution Control Plan shall be signed in accordance with Part IV., and be retained on the site (or, if not possible, at a readily accessible location) which generates the stormwater discharge in accordance with Part IV.F. of this permit.

2. The Primary Permittee shall make Plans available upon request to the EPD; to designated officials of the local government reviewing soil Erosion, Sedimentation and Pollution Control Plans, grading plans, or stormwater management plans; or in the case of a stormwater discharge associated with construction activity which discharges through a municipal separate storm sewer system with an NPDES permit, to the local government operating the municipal separate storm sewer system.

3. EPD may notify the Primary Permittee at any time that the Plan does not meet one or more of the minimum requirements of this Part. Within seven (7) days of such notification (or as otherwise provided by EPD), the Primary Permittee shall make the required changes to the Plan and shall submit to EPD either the amended Plan or a written certification that the requested changes have been made.

C. Keeping Plans Current. The Primary Permittee(s) shall amend their Plan whenever there is a change in design, construction, operation, or maintenance, which has a significant effect on BMPs with a hydraulic component (i.e., those BMPs where the design is based upon rainfall intensity,

duration and return frequency of storms) or if the Plan proves to be ineffective in eliminating or significantly minimizing pollutants from sources identified under Part IV.D.3. of this permit. Amendments to the Plan must be certified by a design professional as provided in this permit.

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

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

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

a. A description of the nature of the construction activity;

b. A description of normal business hours as established by the Permittee;

c. A detailed description and chart or timeline of the intended sequence of major activities which disturb soils for major portions of the site (i.e., initial sediment storage requirements and perimeter BMPs, clearing and grubbing activities, excavation activities, grading activities, infrastructure activities, immediate and final stabilization activities);

d. Estimates of the total area of the site and the total area of the site that is expected to be disturbed by excavation, grading, or other activities;

e. An estimate of the runoff coefficient or peak discharge flow of the site prior to the construction activities and after construction activities are completed and existing data describing the soil or the quality of any discharge from the site;

f. A site-specific map or series of drawings indicating drainage patterns and approximate slopes anticipated after major grading activities, areas of soil disturbance, an outline of areas which are not to be disturbed, the location of major structural and nonstructural controls identified in the Plan, the location of areas where stabilization practices are expected to occur, surface waters (including wetlands), and locations where stormwater is discharged to a surface water; and

g. Identify the receiving water(s) and areal extent of wetland acreage at the site;

3. Controls. Each Plan shall include a description of appropriate controls and measures that will be implemented at the construction site including: (1) initial sediment storage requirements and perimeter control BMPs, (2) intermediate grading and drainage BMPs, and (3) final BMPs. For construction sites where there will be no mass grading and the initial sediment storage requirements and perimeter control BMPs, intermediate grading and drainage BMPs, and final BMPs are the same, the Plan may combine all of the BMPs into a single-phase Plan. The Plan will include appropriate staging and access requirements for construction equipment. The Plan will clearly describe for each major activity identified in Part IV.D.2.b., appropriate control measures and the timing during the construction process that the measures will be implemented. The Primary Permittee is encouraged to utilize the document, Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites, EPA 833-R-060-04, May 2007, when preparing the Plan. The description and implementation of controls shall address the following minimum components:

a. Erosion and sediment controls.

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

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

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

(3). Sediment basins. For common drainage locations a temporary (or permanent) sediment basin providing at least 1800 cubic feet (67 cubic yards) of storage per acre drained, or equivalent control measures, shall be provided until final stabilization of the site. The 1800 cubic feet (67 cubic yards) of storage area per acre drained does not apply to flows from off-site areas and flows from on-site areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin. For drainage locations where a temporary sediment basin providing at least 1800 cubic feet (67 cubic yards) of storage per acre drained, or equivalent controls is not attainable, sediment traps, silt fences, wood mulch berms or equivalent sediment controls are required for all side slope and down slope boundaries of the construction area. When the sediment fills to a volume at most of 22 cubic yards per acre for each acre of drainage area, the sediment shall be removed to restore the original design volume. This sediment must be properly disposed. Sediment basins may not be feasible at some construction sites. Careful consideration must be used to determine when a sediment basin cannot be used and/or when 67 cubic yards of storage per acre drained is not attainable and a written justification explaining the decision(s) must be included in the Plan. Perennial and intermittent waters of the State shall not be used for temporary or permanent sediment detention.

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

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

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

b. Stormwater management. A description of measures that will be installed during the construction process to control pollutants in stormwater discharges that will occur after construction operations have been completed. Structural measures should be placed on upland soils to the degree attainable. The installation of these devices may be subject to Section 404 of the CWA. This permit only addresses the installation of stormwater management measures, and not the ultimate operation and maintenance of such structures

after the construction activities have been completed and the site has undergone final stabilization. Operators are only responsible for the installation and maintenance of stormwater management measures prior to final stabilization of the site and are not responsible for maintenance after stormwater discharges associated with construction activity have been eliminated from the site.

(1). Such practices may include: stormwater detention structures (including wet ponds); stormwater retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff on-site; and sequential systems (which combine several practices). The Plan shall include an explanation of the technical basis used to select the practices to control pollution where flows exceed pre-development levels.

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

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

c. Other controls.

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

(2). For building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other

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

(3). Off-site vehicle tracking of dirt, soils, and sediments and the generation of dust shall be minimized or eliminated to the maximum extent practical. The Plan shall include the best management practice to be implemented at the site or construction activity.

(4). Nothing in this permit relieves a permittee from any obligations to comply with all applicable State and/or local regulations of waste disposal, sanitary sewer, septic and petroleum storage systems.

(5). The Plan shall include best management practices for the remediation of all petroleum spills and leaks as appropriate.

(6). The Plan shall include best management practices for concrete washdown of tools, concrete mixer chutes, hoppers and the rear of vehicles. Washout of the drum at the construction site is prohibited. Additional information about best management practices for concrete washout is available at the USEPA website.

(7). All permittees are required to minimize the discharge of pollutants from dewatering trenches and excavations. Discharges are prohibited unless managed by appropriate controls.

4. Inspections.

a. Permittee requirements.

(1). Each day when any type of construction activity has taken place at a Primary Permittee's site, certified personnel provided by the Primary Permittee shall inspect: (a) all areas at the Primary Permittee's site where petroleum products are stored, used, or handled for spills and leaks from vehicles and equipment and (b) all locations at the Primary Permittee's site where vehicles enter or exit the site for evidence of off-site sediment tracking. These inspections must be conducted until a Notice of Termination is submitted.

(2). Measure and record rainfall within disturbed areas of the site that have not met final stabilization once every 24 hours except any non-working Saturday, non-working Sunday and non-working Federal holiday. The data collected for the purpose of compliance with this permit shall be representative of the monitored

activity. Measurement of rainfall may be suspended if all areas of the site have undergone final stabilization or established a crop of annual vegetation and a seeding of target perennials appropriate for the region.

(3). Certified personnel (provided by the Primary Permittee) shall inspect the following at least once every fourteen (14) calendar days: (a) disturbed areas of the Primary Permittee's construction site; (b) areas used by the Primary Permittee for storage of materials that are exposed to precipitation; and (c) structural control measures. Erosion and sediment control measures identified in the Plan applicable to the Primary Permittee's site shall be observed to ensure that they are operating correctly. Certified personnel shall also conduct inspections within 24 hours of the end of a storm that is 0.5 inches rainfall or greater (unless such storm ends after 5:00 PM on any Friday or on any non-working Saturday, non-working Sunday or any non-working Federal holiday in which case the inspection shall be completed by the end of the next business day and/or working day, whichever occurs first). Post-rain inspections will reset the 14-day inspection frequency requirement. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving water(s). For areas of a site that have undergone final stabilization or established a crop of annual vegetation and a seeding of target perennials appropriate for the region, the permittee must comply with Part IV.D.4.a.(4). These inspections must be conducted until a Notice of Termination is submitted.

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

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

(6). A report of each inspection that includes the name(s) of certified personnel making each inspection, the date(s) of each inspection, construction phase (i.e., initial, intermediate or final), major observations relating to the implementation of

the Erosion, Sedimentation and Pollution Control Plan, and actions taken in accordance with Part IV.D.4.a.(5). of the permit shall be made and retained at the site or be readily available at a designated alternate location until the entire site or that portion of a construction site that has been phased has undergone final stabilization and a Notice of Termination is submitted to EPD. Such reports shall be readily available by end of the second business day and/or working day and shall identify all incidents of best management practices that have not been properly installed and/or maintained as described in the Plan. Where the report does not identify any incidents, the inspection report shall contain a statement that the best management practices are in compliance with the Erosion, Sedimentation and Pollution Control Plan. The report shall be signed in accordance with Part V.G.2. of this permit.

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

6. Sampling Requirements. This permit requires the monitoring of nephelometric turbidity in receiving water(s) or outfalls in accordance with this permit. The following procedures constitute EPD's guidelines for sampling turbidity.

a. *Sampling Requirements* shall include the following:

(1). A USGS topographic map, a topographic map or a drawing (referred to as a topographic map) that is a scale equal to or more detailed than a 1:24000 map showing the location of the infrastructure construction; (a) the location of all perennial and intermittent streams and other water bodies as shown on a USGS topographic map, and all other perennial and intermittent streams and other water bodies located during mandatory field verification, into which the stormwater is discharged and (b) the receiving water and/or outfall sampling locations for each representative stormwater outfall. When the permittee has chosen to use a USGS topographic map and the receiving water(s) is not shown on the USGS topographic map, the location of the receiving water(s) must be hand-drawn on the USGS topographic map from where the stormwater(s) enters the receiving water(s) to the point where the receiving water(s) combines with the first blue line stream shown on the USGS topographic map;

(2). A written narrative of site specific analytical methods used to collect and analyze the samples including quality control/quality assurance procedures. This narrative must include precise sampling methodology for each sampling location;

(3). When the permittee has determined that some or all outfalls will be sampled, a rationale must be included on the Plan for the NTU limit(s) selected from Appendix B. This rationale must include the size of the construction site, the calculation of

the size of the surface water drainage area, and the type of receiving water(s) (i.e., trout stream or supporting warm water fisheries); and

(4). Any additional information EPD determines necessary to be part of the Plan. EPD will provide written notice to the permittee of the information necessary and the timeline for submittal.

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

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

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

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

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

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

c. *Sampling Points*.

(1). For construction activities the Primary Permittee must sample all perennial and intermittent streams and other water bodies shown on the USGS topographic map and all other field verified perennial and intermittent streams and other water bodies, or all outfalls into such streams and other water bodies, or a combination thereof. However, provided for in and in accordance with Part IV.D.6.c.(2). of this permit, Primary Permittees on an infrastructure construction project may sample the representative perennial and intermittent streams, other water bodies or outfalls, or a combination thereof. Sampling points shall be located on applicable pages of the Initial, Intermediate, and Final phase of the Erosion, Sedimentation and

Pollution Control Plans. Samples taken for the purpose of compliance with this permit shall be representative of the monitored activity and representative of the water quality of the receiving water(s) and/or the stormwater outfalls using the following minimum guidelines:

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

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

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

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

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

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

(g). Permittees do not have to sample sheet flow that flows onto undisturbed natural areas or areas stabilized by the project. For purposes of this section, stabilized shall mean, for unpaved areas and areas not covered by permanent structures, 100% of the soil surface is uniformly covered in permanent vegetation with a density of 70% or greater, or landscaped according to the Plan (uniformly covered with landscaping materials in planned landscaped areas), or equivalent permanent stabilization measures as defined in the Manual (excluding a crop of annual vegetation and a seeding of target crop perennials appropriate for the region). For infrastructure construction projects on land used for agricultural or silvicultural purposes, final

stabilization may be accomplished by stabilizing the disturbed land for its agricultural or silvicultural use.

(h). All sampling pursuant to this permit must be done in such a way (including generally accepted sampling methods, locations, timing, and frequency) as to accurately reflect whether stormwater runoff from the construction site is in compliance with the standard set forth in Parts III.D.4. or III.D.5, whichever is applicable.

(2). For infrastructure construction projects, the permittee is not required to sample a perennial or intermittent stream or other water bodies (or the associated outfall, if applicable) if the design professional preparing the Plan certifies that an increase in the turbidity of a specific identified receiving water to be sampled will be representative of the increase in the turbidity of a specific identified un-sampled receiving water. A written justification and detailed analysis shall be prepared by the design professional justifying such proposed sampling. A summary chart of the justification and analysis for the representative sampling must be included on the Plan. The justification and analysis shall include the location and description of the specified sampled and un-sampled receiving water and shall contain a detailed comparison and discussion of each such receiving water in the following areas:

(a). site land disturbances and characteristics;

(b). receiving water watershed sizes and characteristics; and

(c). site and watershed runoff characteristics utilizing the methods in Appendix A-1 (United States Department of Agriculture Soil Conservation Service's TR-55, Urban Hydrology for Small Watersheds) of the most recent version of the "Manual for Erosion and Sedimentation Control in Georgia" for the various precipitation events and any other such considerations necessary to show that the increase in the turbidity of a specific identified sampled receiving water will be representative of the increases in the turbidity of a specific identified un-sampled receiving waters.

(3). For infrastructure construction projects, when the permittee determines that some receiving water(s) will not be sampled due to representative sampling, the design professional making this determination and preparing the Plan must include and sign the following certification in the Plan:

"I certify that the permittee's Erosion, Sedimentation and Pollution Control Plan provides for the monitoring of: (a) all perennial and intermittent streams and other water bodies shown on the USGS topographic map and all other field verified perennial and intermittent steams and other water

bodies, or (b) where any such specific identified perennial or intermittent stream and other water body is not proposed to be sampled, I have determined in my professional judgment, utilizing the factors required in the General NPDES Permit No. GAR100002, that the increase in the turbidity of each specific identified sampled receiving water will be representative of the increase in the turbidity of a specific identified un-sampled receiving water."

(4). For infrastructure construction projects, if at any time during the life of the project a selected receiving water no longer represents another receiving water, then the permittee shall sample the latter receiving water until selection of an alternative representative receiving water.

(5). For infrastructure construction projects, if at any time during the life of the project a receiving water is determined not to be represented as certified in the Plan, the permittee shall sample that receiving water until a Notice of Termination is submitted or until the applicable phase is stabilized in accordance with this permit.

(6). For infrastructure construction projects, monitoring obligations shall cease for any phase of the project that has been stabilized in accordance with Part IV.D.6.c.(1)(g).

d. *Sampling Frequency*.

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

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

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

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

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

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

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

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

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

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

E. Reporting.

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

2. All sampling reports shall include the following information:

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

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

F. Retention of Records

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

a. A copy of all Notices of Intent submitted to EPD;
b. A copy of the Erosion, Sedimentation and Pollution Control Plan required by this permit;
c. The design professional's report of the results of the inspection conducted in accordance with Part IV.A.5. of this permit;
d. A copy of all sampling information, results, and reports required by this permit;

e. A copy of all inspection reports generated in accordance with Part IV.D.4.a. of this permit;
f. A copy of all violation summaries and violation summary reports generated in accordance with Part III.D.2. of this permit; and
g. Daily rainfall information collected in accordance with Part IV.D.4.a.(2). of this permit.

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

Part V. STANDARD PERMIT CONDITIONS

A. Duty to Comply.

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

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

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

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

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

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

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

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

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

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

    a. For a corporation: by a responsible corporate officer. For the purpose of this permit, a responsible corporate officer means: (1) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation; or (2) the manager of one or more manufacturing, production or operating facilities provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

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

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

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

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

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

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

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

"I certify under penalty of law that this report and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that certified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

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

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

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

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

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

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

M. Inspection and Entry. The permittee shall allow the Director or an authorized representative of EPA or EPD or, in the case of a construction site which discharges through a municipal separate storm sewer system with an NPDES permit, an authorized representative of the municipal operator of the separate storm sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit; and

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment).

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

Part VI. TERMINATION OF COVERAGE

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

1. For infrastructure construction projects, by the permittee where the entire project has undergone final stabilization, all stormwater discharges associated with construction activity that are authorized by this permit have ceased, the site is in compliance with this permit and all temporary BMPs have been removed. The permittee may also submit a Notice of Termination for each phase of the infrastructure project, not to exceed four (4) phases, that have undergone final stabilization and all stormwater discharges associated with construction activity for that phase authorized by this permit have ceased. Except for the final phase, the disturbed acreage for each phase must be equal to or greater than 25% of the total estimated disturbed acreage for the infrastructure project. For the final phase, the disturbed acreage for the final phase must be equal to or greater than 10% of the total estimated disturbed acreage for the infrastructure project. The Notice of Termination for each phase of the infrastructure project must include the GPS locations (decimal degrees) of the beginning and end of each phase and if applicable, a map identifying significant landmarks.

2. By the Owner or Operator or both when the Owner or Operator or both of the site changes. Where stormwater discharges will continue after the identity of the Owner or Operator or both changes, the permittee must, prior to filing the Notice of Termination, notify any subsequent Owner or Operator or both of the permitted site as to the requirements of this permit.

B. Notice of Termination Contents:

1. The NPDES permit number for the stormwater discharge associated with construction activity identified by the Notice of Termination (i.e., GAR100002 – Infrastructure);

2. The project construction site name, site location, GPS locations (decimal degrees) of the beginning and end of the infrastructure construction project or if applicable, of each phase in accordance with Part VI.A.1., construction site location and if applicable, a map identifying significant landmarks, city (if applicable) and county of the site for which the notification is submitted. This information must correspond to the similar information as provided on the NOI. The construction site location information must be sufficient to accurately locate the construction site;

3. The owner's legal name, address, telephone number and email address and the operator's legal name, address, telephone and email address;

4. The name of the receiving water(s), and when the discharge is through a municipal separate storm sewer system (MS4), the name of the local government operating the municipal separate storm sewer system and the name of the receiving water(s) which receives the discharge from the MS4;

5. If sampling was not conducted for the permitted site, then provide a written justification for why sampling was not conducted within electronic NOT submittal;

6. Any other information specified on the NOT in effect at the time of submittal; and

7. The following certification signed in accordance with Part V.G.1. (signatory requirements):

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

C. Notice of Termination Submittal. All Notices of Termination (NOT) by this permit shall be submitted to EPD using the electronic submittal service provided by EPD no more than 14 days after the site has completed construction related activities, achieved final stabilization and temporary BMPs have been removed as referenced in Part VI.A.1. A copy of the NOT shall also be submitted to the Local Issuing Authority in jurisdictions authorized to issue a Land Disturbance Activity permit for the permittee's construction site pursuant to O.C.G.A. 12-7-1, et seq.

APPENDIX A

EPD DISTRICT OFFICES

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

Information shall be submitted to: Wcd.epd.reporting@dnr.ga.gov
West Central District Office
Georgia Environmental Protection Division
2640 Shurling Drive
Macon, GA 31211-3576
(478) 751-6612

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

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

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

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

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

Information shall be submitted to: MDOAtlanta.SW@dnr.ga.gov
Mountain District - Atlanta Satellite
Georgia Environmental Protection Division
4244 International Parkway, Suite 114
Atlanta, GA 30354-3906

(404) 362-2671

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

Information shall be submitted to: MDOCartersville.SW@dnr.ga.gov
Mountain District - Cartersville Office
Georgia Environmental Protection Division
16 Center Road
Cartersville, GA 30120
(770) 387-4900

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

Information shall be submitted to: coast.epdreporting@dnr.ga.gov
Coastal District - Brunswick Office
Georgia Environmental Protection Division
1050 Canal Road 400 Commerce Center Drive
Brunswick, GA 31523-6856
(912) 264-7284

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

Information shall be submitted to: southwest.districtreporting@dnr.ga.gov
Southwest District Office
Georgia Environmental Protection Division
2024 Newton Road
Albany, GA 31701-3576
(229) 430-4144

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

Information shall be submitted to: Watershed Protection Branch
Environmental Protection Division
2 Martin Luther King Jr. Drive
Suite 1462 East

Atlanta, Georgia 30334
(404) 463-1511

APPENDIX B

Nephelometric Turbidity Unit (NTU) TABLES

Trout Streams

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

Waters Supporting Warm Water Fisheries

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

To use these tables, select the size (acres) of the construction site. Then, select the surface water drainage area (square miles). The NTU matrix value arrived at from the above tables is the one to use in Part III.D.5.

Example 1: For a site size of 12.5 acres and a "trout stream" drainage area of 37.5 square miles, the NTU value to use in Part III.D.5. is 75 NTU.

Example 2: For a site size of 51.7 acres and "waters supporting warm water fisheries" drainage area of 72 square miles, the NTU value to use in Part III.D.5. is 100 NTU.

INDEX TO

SECTION 31 37 00 – RIP–RAP

SECTION 31 37 00

RIP–RAP

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Material placed as bank protection and erosion control.

1.2 RELATED SECTIONS

A. Section 31 00 00 – Earthwork

B. Section 33 10 00 – Water Distribution System

C. 33 16 13 – Composite Elevated Water Storage Tank

1.3 ALLOWABLE TOLERANCES

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

1.4 OMITTED

1.5 REFERENCES (LATEST REVISION)

A. ASTM C 150 – Portland Cement.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Stone Rip–Rap: Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight or weather. Stone shall be solid and non–friable and range in weight from a minimum of 25 pounds to a maximum of 165 pounds. At least 50 percent of the stone pieces shall weigh more than 60 pounds. The stone pieces shall have a minimum dimension of 12 inches. Documents indicating stone analysis, source and other pertinent data (i.e. – filter fabric) shall be submitted for review by the Engineer prior to delivery. Rip-rap shall comply with GDOT Type 3 gradation. Shall comply with AASHTO T 96, ASTM C 295, and AASHTO T 104.

B. Sand–Cement Bag Rip–Rap:

1. Bags: Shall be of cotton, burlap, or fiber–reinforced paper capable of containing the sand–cement mixture without leakage during handling and placing. Bags previously used for any purpose shall not be used.

Capacity shall be not less than 0.75 cubic foot nor more than two cubic feet.

2. Cement: Portland cement shall be Type I meeting requirements of ASTM C 150. Cement which has been damaged, or which is partially set, lumpy, or caked shall not be used.
3. Fine Aggregate: Shall be composed of hard, durable particles, free from injurious amounts of organic impurities and shall contain, in the material passing the No. 10 sieve, not more than 7 percent clay, and not more than 20 percent passing the No. 200 sieve.

C. Filter Fabric: Shall be a woven fabric of monofilament and multifilament yarn equivalent to Mirafi FW700. Fabric shall be finished so the filaments will retain their relative position with respect to each other. Fabric shall contain stabilizers and/or inhibitors added to make filaments resistant to deterioration due to ultraviolet and/or heat exposure. Fabric shall be free of flaws, rips, holes or defects.

2.2 PRODUCT REVIEW

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

PART 3 – EXECUTION

3.1 PREPARATION

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

3.2 PLACEMENT

A. Filter fabric shall be placed with the long dimension running up slope. The strips shall be placed to provide a minimum width of one foot of overlap for each joint. Fabric shall be anchored in place with securing pins of the type recommended by fabric manufacturer. Pins shall be placed on or within 3 inches of the over–lap. Place fabric so upstream strip will overlap the downstream strip. Fabric shall be placed loosely to give and avoid stretching and tearing during placement of the stones.

B. Minimum depth or thickness of stone blanket shall be 12 inches with no under tolerance. Stones shall be dropped no more than three feet during construction. Placing shall begin at bottom of slope. Provide a toe trench if required as detailed on the construction drawings. Entire mass of stone shall be placed to conform with lines, grades, and thickness shown on the plans. Rip–rap shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the underlying material. Placing of rip–rap in layers, or by dumping into chutes, or by similar methods likely to cause segregation, will not be permitted.

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

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

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

END OF SECTION

INDEX TO

SECTION 31 62 13 – CONCRETE PILES

SECTION 31 62 13

CONCRETE PILES

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes solid, precast, prestressed concrete piles.

1.2 OMITTED

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For concrete piles. Prepared by or under the supervision of a qualified professional engineer detailing fabrication and lifting devices necessary for handling and driving piles.

1. Indicate pile dimensions, cross sections, locations, and sizes. Show details of pile splices and shoes.
2. Indicate types of reinforcement, including prestressing strand, and detail fabricating, bending, and placing.
3. Indicate layout and dimensions, and identify each pile. Indicate welded connections by AWS standard symbols. Detail cast-in hardware.
4. Indicate transportation, storage, and lifting points.
5. Include arrangement of static pile reaction frame, test and anchor piles, equipment, and instrumentation. Submit structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Delegated Design Submittal: For concrete piles.

1. Indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer manufacturer professional engineer and testing agency.

B. Welding certificates.

C. Design Mixes: For each concrete mix.

D. Material Certificates: For steel reinforcements prestressing strand and concrete admixtures.

E. Material Test Reports: For concrete materials.

F. Pile-Driving Equipment Data: Include type, make, and rated energy range; weight of striking part of hammer; weight of drive cap; and, type, size, and properties of hammer cushion.

G. Static Pile Test Reports: Submit within three days of completing each test.

H. Pile-Driving Records: Submit within three days of driving each pile.

I. Certified Piles Survey: Submit within seven days of pile driving completion.

J. Field quality-control reports.

K. Preconstruction Photographs: Photographs or video of existing conditions of adjacent construction. Submit before the Work begins.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Engineering Responsibility: Assumes engineering responsibility to comply with requirements in "Performance Requirements" Article by engaging a qualified professional engineer to prepare design calculations, Shop Drawings, and other structural data for piles.
2. PCI Plant Certification Program: Participates in PCI's Plant Certification Program and is designated a PCI-Certified Plant for C2 product group and category, or better.

B. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. Installer's responsibility includes engaging a qualified professional engineer to prepare pile-driving records.

C. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.

D. Design Practices: Comply with ACI 318 (ACI 318M) and the recommendations in PCI Committee Report: "Recommended Practice for Design, Manufacture and Installation of Prestressed Concrete Piling."

E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for piles, comply with applicable requirements in PCI MNL-116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."

F. Comply with requirements in ACI 301, "Specifications for Structural Concrete."

G. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

1.7 PRECONSTRUCTION TESTING

A. General: Static pile tests are used to verify driving criteria and pile lengths and to confirm allowable load of piles.

1. Furnish test piles 60 inches (1524 mm) longer than production piles.
2. Determination of actual length of piles is based on results of static pile tests.

B. Pile Tests: Arrange and perform the following pile tests:

1. Axial Compressive Static Load Test: ASTM D1143/D1143M. Procedure A, Quick Test and the following Procedures:

a. Procedure B, Maintained Test.
b. Procedure C, Loading in Excess of Maintained Test.
c. Procedure G, Cyclic Loading Test.

2. Axial Tension Static Load Test: ASTM D3689.
3. Lateral Load Test: ASTM D3966.

C. Equip each test pile with two telltale rods, according to ASTM D1143/D1143M, for measuring deformation during load test.

D. Provide pile reaction frame, anchor piles, equipment, and instrumentation with enough reaction capacity to perform tests. Notify Architect at least 48 hours in advance of performing tests. On completion of testing, remove testing structure, anchor piles, equipment, and instrumentation.

1. Allow a minimum of seven days to elapse after driving test piles before starting pile testing.
2. Number of Test Piles: As indicated.

E. Drive test piles at locations indicated to the minimum penetration or driving resistance indicated. Use test piles identical to those required for Project, and drive with appropriate pile-driving equipment operating at rated driving energy to be used in driving permanent piles.

1. Pile Design Load: As indicated.

F. Approval Criteria: Allowable load is to be the load acting on the test pile when the lesser of the following criteria are met, divided by a factor of safety of 2:

1. Net settlement, after deducting rebound, of not more than 0.01 inch/ton (0.25 mm/907 kg) of test load.
2. Total settlement exceeds the pile elastic compression by 0.15 inch (4 mm), plus 1.0 percent of the tip diagonal dimension.

3. A plunging failure or sharp break in the load settlement curve.

G. Test Pile-Driving Records: Prepare driving records for each test pile, compiled and attested to by a qualified professional engineer. Include same data as required for driving records of permanent piles.

H. Test piles that comply with requirements, including location tolerances, may be used on Project.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver piles to Project site in such quantities and at such times to ensure continuity of installation. Handle and store piles at Project site to prevent cracking, distorting, warping, or other physical damage, and so markings are visible.

B. Lift and support piles only at designated lifting or supporting points as shown on Shop Drawings.

1.9 FIELD CONDITIONS

A. Protect structures, underground utilities, and other construction from damage caused by pile driving.

B. Site Information: A geotechnical report has been prepared for this Project and can be viewed upon request. Contractor is responsible for verifying all ground conditions.

C. Preconstruction Photographs: Inventory and record the condition of adjacent structures, underground utilities, and other construction. Document conditions that might be misconstrued as damage caused by pile driving.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 45 00 "Quality Control," to design piles, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Piles withstand transportation, erection, and driving stresses and design loads within limits indicated and under conditions existing at Project site.

2.2 MOLD MATERIALS

A. Molds: Provide molds of metal, plastic, wood, or another material that is nonreactive with concrete and that produces required finish surfaces.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420); deformed.
B. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M.

C. Galvanized Reinforcing Bars: ASTM A767/A767M, Class II zinc coated, hot-dip galvanized after fabrication and bending, as follows:

1. Steel Reinforcement: ASTM A615/A615M, Grade 60 (Grade 420) ASTM A706/A706M, deformed.

D. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M, as follows:

1. Steel Reinforcement: ASTM A615/A615M, Grade 60 (Grade 420) ASTM A706/A706M, deformed.

E. Plain and Deformed Steel Wire: ASTM A1064/A1064M, as drawn.

F. Epoxy-Coated-Steel Wire: ASTM A884/A884M, Class A coated, plain.

2.4 PRESTRESSING TENDONS

A. Prestressing Strand: ASTM A416/A416M, Grade 250 or 270 (Grade 1725 or 1860); uncoated, seven-wire, low-relaxation strand.

2.5 CONCRETE MATERIALS

A. General: Limit water-soluble chloride ions in concrete to the maximum percentage by mass of cementitious material permitted by ACI 318 (ACI 318M), but not more than 0.06 percent.

B. Portland Cement: ASTM C150/C150M, Type I or Type III, of same type, brand, and source.

1. Fly Ash: ASTM C618, Class C or F.
2. Silica Fume: ASTM C1240, amorphous silica.

C. Normal-Weight Aggregates: Except as modified by PCI MNL-116, ASTM C33/C33M, with coarse aggregates complying with Class 4M. Provide aggregates from single source.

1. Nominal Maximum Size of Aggregate: 3/4 inch (19 mm).

D. Water: Potable, free of deleterious material that may affect color stability, setting, or strength of concrete, and complying with chemical limits of PCI MNL-116.

E. Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures.

1. Air-Entraining Admixture: ASTM C260/C260M.
2. Water-Reducing Admixture: ASTM C494/C494M, Type A.
3. Retarding Admixture: ASTM C494/C494M, Type B.
4. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.

5. Water-Reducing and Accelerating Admixture: ASTM C494/C494M, Type E.
6. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
7. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
8. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

2.6 PILE ACCESSORIES

A. Pile Shoes: 1-inch- (25-mm-) thick minimum, carbon-steel plate fabricated to match shape of pile tip.

B. Pile Splices: Manufactured from carbon-steel plates or castings and capable of developing strength of continuous pile at splice location.

2.7 CONCRETE MIXES

A. Prepare design mixes for each type of concrete required.

1. Limit use of fly ash and silica fume to not exceed, in total, 25 percent of portland cement by weight.

B. Design mixes may be prepared by a qualified independent testing agency or by qualified personnel at precast manufacturing plant at precast manufacturer's option.

C. Proportion mixes by either laboratory trial batch or field-test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 6000 psi (41.4 MPa).
2. Maximum Water-Cementitious Material Ratio: 0.40.

D. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content of 2.5 to 4.5 percent.

2.8 FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete placement and temperature changes and for pretensioning and detensioning operations. Maintain molds to provide completed piles of shapes, lines, and dimensions indicated, within fabrication tolerances specified in PCI MNL-116 and PCI MNL-135.

1. Unless molds are stripped before detensioning, design molds so stresses are not induced in piles due to deformation of concrete under prestress or movement during detensioning.
2. Chamfer edges and corners of square piles.

B. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.

1. Accurately position, support, and secure reinforcement against displacement by molds, construction, or concrete placement. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
2. Place reinforcement to obtain at least the minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

B. Prestress tendons for piles by either pretensioning or post-tensioning methods. Comply with PCI MNL-116.

C. Pile Shoes: Accurately position and secure pile shoes at pile tips so as to not affect pile alignment during driving. Weld pile shoes to longitudinal reinforcements.

E. Pile Splices: Accurately position and secure pile-splice segments requiring embedding in tips of piles.

E. Mix concrete according to PCI MNL-116 and requirements in this Section. After initial concrete batching, no additional water may be added.

F. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in piles. Comply with requirements in PCI MNL-116 for measuring, mixing, transporting, and placing concrete.

    1. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL-116.
    2. Comply with ACI 306.1 procedures for cold-weather concrete placement.
    3. Comply with ACI 305R recommendations for hot-weather concrete placement.

G. Identify pickup points of piles with permanent markings that correspond with markings indicated on Shop Drawings. Imprint casting date on each pile.

H. Cure concrete, according to requirements in PCI MNL-116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.

I. Delay detensioning piles until concrete has attained at least 70 percent of its compressive strength as established by test cylinders cured under the same conditions as concrete.

    1. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
    2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.

K. Where ends of strands are not enclosed or covered, cut flush and cover with a high-strength mortar bonded to unit with an epoxy-resin bonding agent.

L. Fabricate precast, prestressed concrete piles straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL-116 and PCI MNL-135 product tolerances.

M. Finish: Fabricate concrete piles with normal plant-run finish produced in forms that impart a smooth finish to concrete. Small surface holes caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls are tolerated. Major or unsightly imperfections, honeycombs, or structural defects are not permitted.

1. Finish unformed surfaces by trowel unless otherwise indicated. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.

N. Pile-Length Markings: Mark each pile with horizontal lines at 12-inch (305-mm) intervals; label the distance from pile tip at 60-inch (1524-mm) intervals. Maintain markings on piles until driven.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified, independent testing agency to evaluate pile manufacturer's quality-control and testing methods.

1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency, and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.

B. Testing: Test and inspect piles according to PCI MNL-116.

1. Strength of piles will be considered deficient if units fail to comply with requirements.

C. If there is evidence that strength of piles may be deficient or may not comply with PCI MNL-116 requirements, Contractor will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C42/C42M.

1. A minimum of three representative cores are to be taken from piles of suspect strength, from locations directed by Architect.
2. Cores are to be tested, following immersion in water, in a wet condition in accordance with ACI 301 if piles are wet under service conditions.
3. Cores are to be tested in an air-dry condition in accordance with ACI 301 if piles are dry under service conditions.
4. Strength of concrete for each series of three cores is considered satisfactory if average compressive strength is at least 85 percent of the 28-day design compressive strength and no core compressive strength is less than 75 percent of the 28-day design compressive strength.
5. Test results are to be reported in writing on same day that tests are performed, with copies to Architect, Contractor, and pile manufacturer. Test reports are to include the following:
   a. Project identification name and number.

b. Date when tests were performed.
c. Name of precast concrete manufacturer.
d. Name of concrete testing agency.
e. Identification letter, name, and type of pile represented by core tests; design compressive strength; type of break; compressive strength at break, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

D. Patching: If core test results are satisfactory and piles comply with requirements, solidly fill core holes with patching mortar and finish to match adjacent pile surfaces.

E. Piles will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Site Conditions: Do not start pile-driving operations until earthwork fills have been completed or excavations have reached an elevation of 6 to 12 inches (152 to 305 mm) above bottom of footing or pile cap.

3.2 DRIVING EQUIPMENT

A. Pile Hammer: Air-, steam-, hydraulic-, or diesel-powered type capable of consistently delivering adequate peak-force duration and magnitude to develop the ultimate capacity required for type and size of pile driven and character of subsurface material anticipated.

1. Use pile hammer capable of adjustment to deliver reduced impact to maintain tensile stress within 70 percent of yield strength of pile reinforcement.

B. Hammer Cushions and Driving Caps: Between hammer and top of pile, provide hammer cushion and steel driving cap as recommended by hammer manufacturer and as required to drive pile without damage.

C. Leads: Use fixed, semifixed, or hanging-type pile-driver leads that hold the full length of pile firmly in position and in axial alignment with hammer.

3.3 DRIVING PILES

A. General: Continuously drive piles to elevations or penetration resistance indicated or established by static load testing of piles. Establish and maintain axial alignment of leads and piles before and during driving.
B. Predrilling: Provide pre-excavated holes where indicated, to depths indicated. Drill holes with a diameter less than the largest cross-section dimension of pile.

1. Firmly seat pile in predrilled hole by driving with reduced energy before starting final driving.

C. Heaved Piles: Redrive heaved piles to tip elevation at least as deep as original tip elevation with a driving resistance at least as great as original driving resistance.

D. Pile Splices: Splice piles during installation, and align pile segments concentrically.

E. Driving Tolerances: Drive piles without exceeding the following tolerances, measured at pile heads:

1. Location: 4 inches (102 mm) from location indicated after initial driving, and 6 inches (152 mm) after pile driving is completed.
2. Plumb: Maintain 1 inch (25 mm) in 48 inches (1219 mm) from vertical, or a maximum of 4 inches (102 mm), measured when pile is aboveground in leads.
3. Batter Angle: Maximum 1 inch (25 mm) in 48 inches (1219 mm) from required angle, measured when pile is aboveground in leads.

F. Withdraw damaged or defective piles and piles that exceed driving tolerances, and install new piles within driving tolerances.

1. Fill holes left by withdrawn piles using cohesionless soil material such as gravel, broken stone, and gravel-sand mixtures. Place and compact in lifts not exceeding 72 inches (1830 mm).
2. Fill holes left by withdrawn piles as directed by Architect.

G. Abandon and cut off rejected piles as directed by Architect. Leave rejected piles in place, and install new piles in locations as directed by Architect.

H. Cut off tops of driven piles square with pile axis and at elevations indicated.

I. Buildups: Construct buildups to elevations indicated of cast-in-place reinforced concrete with compressive strength not less than 6000psi at 28 days.

J. Pile-Driving Records: Maintain accurate driving records for each pile, compiled and attested to by a qualified professional engineer. Include the following data:

1. Project name and number.
2. Name of Contractor.
3. Type of pile and date of casting.
4. Pile location in pile group and designation of pile group.
5. Sequence of driving in pile group.
6. Pile dimensions.
7. Ground elevation.
8. Elevation of tips after driving.
9. Final tip and cutoff elevations of piles after driving pile group.
10. Records of redriving.
11. Elevation of splices.
12. Type, make, model, and rated energy of hammer.
13. Weight and stroke of hammer.
14. Type of pile-driving cap used.

15. Cushion material and thickness.
16. Actual stroke and blow rate of hammer.
17. Pile-driving start and finish times, and total driving time.
18. Time, pile-tip elevation, and reason for interruptions.
19. Number of blows for every 12 inches (305 mm) of penetration, and number of blows per 1 inch (25 mm) for the last 6 inches (152 mm) of driving.
20. Pile deviations from location and plumb.
21. Preboring, jetting, or special procedures used.
22. Unusual occurrences during pile driving.

K. Certified Piles Survey: Engage a land surveyor to prepare a piles survey showing final location of piles in relation to the property survey and existing benchmarks.

1. Notify Architect when deviations from locations exceed allowable tolerances.

3.4 FIELD QUALITY CONTROL

A. All Special inspections shall be the responsibility of the Contractor, shall be in accordance with Chapter 17 (Special Inspections and Tests) of the 2018 International Building Code, as adapted by the State of Georgia. and will be paid for through the Allowance – "Special Inspections". Contractor will engage a qualified special inspector to perform the following special inspections:

1. Pile foundations.

B. Testing Agency: Contractor will engage a qualified testing agency to perform tests.

C. Tests and Inspections:

1. Dynamic Pile Testing: High-strain dynamic monitoring is to be performed and reported according to ASTM D4945 during initial driving and during restriking on 3 percent of piles.
2. Low-strain integrity measurement is to be performed and reported for each pile.

D. Piles will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 DISPOSAL

A. Remove withdrawn piles and cutoff sections of piles from site and legally dispose of them off Owner's property.

END OF SECTION

INDEX TO

SECTION 31 63 16 – AUGER CAST GROUT PILES

SECTION 31 63 16

AUGER CAST GROUT PILES

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 auger cast grout piles which will be required for the Elevated Ground Storage Tank.

1.3 OMITTED

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each grout mixture. Submit alternative design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Shop Drawings: For auger cast grout piles, prepared by or under the supervision of a qualified professional engineer.

1. Identify each pile and indicate pile dimensions, cross sections, locations, and sizes.
2. Indicate types and configurations of reinforcement and detail fabricating.
3. Detail connections to pile caps.
4. Include method of centralizing reinforcement, type and size of centralizing devices, and locations on reinforcing bars.
5. Include site plan of where test piles will be performed
6. Static Pile Tests: Include arrangement of static test pile reaction frame, test and anchor piles, equipment, and instrumentation. Submit structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

1.9 PRECONSTRUCTION TESTING

A. Test Piles: Construct of diameter, depth, and at locations indicated on Drawings or, if not indicated, of same diameter and depth as largest production piles and at locations selected by Engineer, to confirm allowable load of piles and demonstrate Installer's construction methods, equipment, standards of workmanship, and tolerances.

1. If Engineer, or Owner, determines that test pile does not comply with requirements, excavate for and cast another until it is accepted.
2. Tests: Arrange and perform the following pile tests:

    a. Axial Compressive Static Load Test: ASTM D1143/D1143M, Procedure A, Quick Test.
    b. Axial Tension Static Load Test: ASTM D3689.
    c. Lateral Load Test: ASTM D3966.

3. Equip each test pile with two telltale rods, according to ASTM D1143/D1143M, for measuring deformation during load test.
4. Provide pile reaction frame, anchor piles, equipment, and instrumentation with enough reaction capacity to perform tests. Notify Engineer and Owner at least 48 hours in advance of performing tests. On completion of testing, remove testing structure, anchor piles, equipment, and instrumentation.

    a. Allow a minimum of seven days to elapse after installing test piles before starting pile testing.
    b. Number of Test Piles: As indicated.

5. Approval Criteria: Allowable load shall be the load acting on the test pile when the lesser of the following criteria are met, divided by a factor of safety of 2:

    a. Net settlement of not more than 0.01 inch/ton (0.25 mm/907 kg) of test load.
    b. Total settlement of 1 inch (25 mm) provided the load settlement curve shows no sign of failure.
    c. A plunging failure or sharp break in the load settlement curve.

6. Test Pile Records: Prepare records for each test pile, compiled and attested to by a qualified professional engineer. Include same data as required for permanent piles.
7. Test piles that comply with requirements, including location tolerances, may be used on Project.

1.10 FIELD CONDITIONS

A. Protect structures, underground utilities, and other construction from damage caused by pile excavation.

B. Site Information: A geotechnical report has been prepared for this Project and is included elsewhere in the Project Manual for information only.

C. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for auger cast grout piles. Before excavating, lay out each pile to lines and levels required. Record actual measurements of each pile's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.

1. Record and maintain information pertinent to each pile and indicate on record Drawings. Provide Contractor's testing and inspecting agency data for required reports to the Engineer and Owner.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Contractor is responsible for design of foundations in accordance with Geotechnical Report recommendations.

B. Delegated Design: Engage and retain a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design piles, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Design Loads: As indicated on Drawings.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed.

B. Single Bar Reinforcing: ASTM A722/A722M, high strength, threaded.

1. Mechanical Couplings: Screw-on type, capable of supporting the minimum ultimate tensile strength of the coupled bars.

C. Centralizers: Devices to center steel reinforcement in excavation; spaced not less than 20 feet (6 m) o.c. for vertical piles.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I/II.

1. Fly Ash: ASTM C618, Class F.

B. Fine Aggregate: ASTM C33/C33M with 100 percent passing a No. 8 (2.36-mm) sieve, free of materials with deleterious reactivity to alkali in cement. Provide aggregate from single source.

C. Water: ASTM C94/C94M and potable.

D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
3. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
4. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

E. Fluidifier: ASTM C937, with expansion of less than 4 percent.

2.4 RELATED MATERIALS

A. Pile-Top Forms: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes. Provide units with enough wall thickness to resist plastic concrete loads without detrimental deformation. Diameter same as pile diameter.

2.5 GROUT MIXTURES

A. Prepare design mixtures for each type and strength of grout, proportioned on the basis of laboratory trial mixture, field test data, or both.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Proportion grout mixture as follows:

1. Minimum Compressive Strength: 5000 psi (34.5 MPa) at 28 days; ASTM C109/C109M with cube specimens restrained from expansion according to ASTM C942.
2. Maximum Water-Cementitious Materials Ratio: 0.43.
3. Grout Flow: 10 to 25 seconds; ASTM C939 and ASTM C109/C109M using a flow cone with 0.75-inch (19-mm) opening.

2.6 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.7 GROUT MIXING

A. Ready-Mixed Grout: Measure, batch, mix, and deliver according to ASTM C94/C94M, and furnish batch ticket information.

1. Temperature Limits: Comply with ACI 305.1 for hot weather and ACI 306.1 for cold weather.

PART 3 – EXECUTION

3.1 PREPARATION

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

B. Rough grade ground elevation at pile locations to a minimum of 12 inches (305 mm) above required cutoff elevation.

3.2 DRILLING AND PUMPING EQUIPMENT

A. Drilling Rig: Capable of advancing hollow-stem, continuous-flight augers of design diameters to depths 20 percent greater than design depths; with stabilizing arm at bottom of leads to prevent rotation, and middle guide for augers greater than 40 feet (12 m) in length.

1. Mark leads at maximum 60-inch (1500-mm) intervals to facilitate measurement of penetration.

B. Hollow-Stem Auger: Continuous auger flighting without gaps or breaks, of diameter no more than 3 percent less than pile diameter; with grout pumping hole at bottom of auger head below cutting teeth. Seal grout-pumping hole with temporary tip plug to be fully opened by grout pressure or reinforcing bar during grout installation.

1. Hollow Shaft Diameter: Minimum 1-1/4-inch (32-mm) clear ID.

C. Grout Pump: Positive-displacement pump with a known volume per stroke. Minimum displacement pressure at pump of 350 lbf/sq. in. (2.4 MPa).

D. Automated Monitoring Equipment: Capable of measuring auger depth, penetration rate, and grout volume pumped per unit depth increment and of printing results.

3.3 EXCAVATION

A Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.

C. Advance auger at a continuous rate during insertion that prevents removal of excess soil.

D. Excavate piles to elevations indicated. Establish and maintain axial alignment of leads and shaft before and during driving.

1. Auger Refusal: Rate of less than 1 fpm (0.3 m/s).

E. Drilling Tolerances:

1. Location: Pile centers maximum 3 inches (75 mm) from locations indicated.
2. Plumb: Within 2 percent from vertical.
3. Batter Angle: Within 4 percent from required angle.

3.4 INSTALLATION

A. Maintain positive (clockwise) rotation of auger during withdrawal. Promptly remove excavated spoils to prevent accumulation.

B. Grout Placement: Place grout in continuous operation.

1. Lift auger 6 to 12 inches (152 to 305 mm) at start of grout pumping to facilitate tip plug removal, then return to previously established tip elevation.
2. Develop an initial grout head of 60 inches (1500 mm) before start of auger withdrawal and maintain during extraction.
3. Monitor pumped grout volumes using automated monitoring equipment.
4. Volume of placed grout is at least 115 percent of theoretical volume. If less than required volume is placed for any given 60-inch (1500-mm) segment, lower auger a minimum of 60 inches (1500 mm), or to bottom of pile if less than 60 inches (1500 mm) available, and restart withdrawal.
5. If grout pumping is interrupted during placement, lower auger a minimum of 60 inches (1500 mm), or to bottom of pile if less than 60 inches (1500 mm) available, and restart withdrawal.

C. Steel Reinforcement Installation, General: Comply with recommendations in CRSI's "Manual of Standard Practice."

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with grout.
2. Screen pile top to remove spoils immediately after auger withdrawal and before placing reinforcement.

D. Single Bar Reinforcing: Install through center of hollow-stem auger before grout placement.

E. Reinforcing Cages: Install immediately after grout placement and support at ground surface until initial set. Allow cages to fall into shaft freely under their own weight; do not force by vibrating or pushing with mechanical equipment.

F. Adjacent Piles: Do not install piles within 10 feet of piles grouted within the previous 12 hours.

G. Pile Completion:

1. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation with pile-top form.
2. Where cutoff elevation is below the ground elevation, cut off top of piles at elevations indicated by removing fresh grout from the top of pile or cutting off hardened pile top after initial set.

H. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit corrective construction proposals to Engineer and Owner for review before proceeding.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: All Special inspections shall be the responsibility of the Contractor, shall be in accordance with Chapter 17 (Special Inspections and Tests) of the 2018 International Building Code, as adapted by the State of Georgia. and will be paid for through the Allowance – "Special Inspections". Contractor will engage a qualified special inspector to perform the following special inspections:

1. Pile excavation, placement, and testing.
2. Steel reinforcement welding.

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

C. Grout Tests: Testing of samples of fresh grout obtained according to ASTM C172/C172M shall be performed according to the following requirements:

1. Flow Rate: ASTM C939 and ASTM C109/C109M using a flow cone with 0.75-inch (19-mm) opening.
2. Compressive Strength: ASTM C109/C109M with cube specimens restrained from expansion according to ASTM C942.

    a. Testing Frequency: Obtain six 2-inch (101-mm) cubes for each 50 cu. yd. (38 cu. m) or fraction thereof of grout placed, but not less than one set for each day's pour. Obtain an additional set of cubes from each truck during test pile placement.
    b. Test two cubes at 7 days, two cubes at 28 days, and hold two cubes in reserve.
    c. Strength of each grout mixture is satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
    d. Report test results in writing to Engineer, Owner, grout manufacturer, and Contractor within 48 hours of testing. List Project identification name and number, date of placement, name of testing and inspecting agency, location of grout batch in Work, design compressive strength at 28 days, grout mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests in reports of compressive-strength tests.
    e. Additional Tests: Testing and inspecting agency to make additional tests of grout if test results indicate that compressive strengths or other requirements have not been met, as directed by Engineer.
    f. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.
    g. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Low-Strain Integrity Testing: Performed and reported according to ASTM D5882 on 10 percent piles and reported for each pile.

E. Pile Inspection Reports: Prepare inspection reports for each auger cast grout pile as follows:

1. Pile location.
2. Pile diameter.
3. Actual top and bottom elevations.
4. Final top centerline location and deviations from requirements.
5. Variation from plumb.
6. Date and time of starting and completing.
7. Position and condition of reinforcing steel and splices or mechanical couplings.
8. Automatic monitoring equipment record including grout volume actually pumped.
9. Grout testing results.
10. Remarks, unusual conditions encountered, and deviations from requirements.

F. Certified Piles Survey: Prepared by a qualified land surveyor or professional engineer showing final location of piles in relation to the property survey and existing benchmarks.

1. Notify Engineer and Owner when deviations from locations exceed allowable tolerances.

G. Auger cast grout piles will be considered defective if they do not pass tests and inspections.

H. Prepare test and inspection reports.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property at no additional cost to Owner.

END OF SECTION

INDEX TO

SECTION 32 00 00 – SURFACE RESTORATION

SECTION 32 00 00

SURFACE RESTORATION

PART 1 – GENERAL

1.1 WORK INCLUDED

A. This section covers the work necessary to restore new access routes, drainage facilities, turfs and grasses, and other features damaged either directly or indirectly by operations incidental to new construction. The work consists of restoring existing surface areas due to planned improvements.

B. Standard specifications noted in this section are the 2021 Edition of Georgia Department of Transportation Standard Specifications for Construction of Transportation System.

C. All disturbed areas shall be left equal to or better than preconstruction conditions.

1.2 RELATED SECTIONS

A. Section 03 00 00 – Site Concrete

B. Section 31 00 00 – Earthwork

C. Section 31 25 00GA – Erosion, Sedimentation, and Pollution Control – GA

D. Section 32 11 23 – Aggregate Base Course

E. Section 32 90 00 – Landscaping

1.3 OMITTED

1.4 GENERAL PROVISIONS

A. Maintenance of Traffic

Whenever work interferes with flow of traffic along a roadway, Contractor shall provide for traffic control, signing, and public safety in accordance with provisions of the State Department of Transportation and Manual on Uniform Traffic Control Devices. Neither road closures nor detours shall be permitted unless specified in the Special Provisions and applicable permits/approvals are authorized by Engineer and DOT. Where road closures or detours are permitted by Engineer and DOT, Contractor must notify the appropriate agencies or departments prior to taking action. Proper advance notice shall be provided to the Owner, Engineer, and DOT.

Compliance with this requirement shall not be construed to relieve Contractor from the responsibility of notifying agencies or institutions whose services may be predicated upon a roadway being opened to traffic or whose services would be hindered if a roadway is closed to traffic or delays traffic. Such agencies or institutions shall include, but not be limited to, police department, fire

department, municipal bus service, school bus service, and ambulance service. Contractor shall keep the required agencies informed of changing traffic patterns and detour situations.

B. Surface Restoration

Contractor shall perform all work and furnish all materials to restore the work area. This includes any gravel, asphalt, concrete, lawn, fences, mailboxes, signs or any other surfaces or related objects damaged or disturbed by the construction operation. Surface restoration shall follow as closely as possible the backfill and compaction of excavations.

Cleanup shall be a continuing process from the start of work to final acceptance of project. Contractor shall, at all times, keep the area on which work is in progress free from accumulations of waste material or rubbish.

Spillage from the Contractor's hauling vehicles on public and private roads shall be promptly cleaned up. Upon completion of work, Contractor shall remove all temporary structures, rubbish, waste material, equipment, and supplies, resulting from the Contractor's operations. Contractor shall leave such lands in a neat and orderly condition, which is at least as good as found, prior to the new work. Contractor shall submit photos and similar records of preconstruction conditions to the Engineer prior to commencing work.

In roadways and traffic areas, Contractor shall be responsible for maintaining a road surface suitable for travel by the public and emergency vehicles from time of excavation until road surface has been restored. Such work includes dust control, temporary patching, signing, grading, temporary surfaces, and filling of potholes on temporary street surfaces, etc. Contractor shall be responsible for all claims and damages resulting from failure to maintain a suitable surface.

1.5 REFERENCES

A. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.

B. ACI 301 – Specifications for Structural Concrete.

C. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.

D. ACI 318 – Building–Code Requirements for Structural Concrete and Commentary.

E. ACI 330R – Guide for the Design and Construction of Concrete Parking Lots.

F. ASTM A 185 – Steel Welded Wire Reinforcement, Plain, for Concrete.

G. ASTM A 497 – Steel Welded Wire Reinforcement, Deformed, for Concrete.

H. ASTM A 615 – Deformed and Plain Carbon–Steel Bars for Concrete Reinforcement.

I. ASTM C 31 – Making and Curing Concrete Test Specimens in the Field.

J. ASTM C 33 – Concrete Aggregates.

K. ASTM C 39 – Compressive Strength of Cylindrical Concrete Specimens.

L. ASTM C 94 – Ready–Mixed Concrete.

M. ASTM C 150 – Portland Cement.

N. ASTM C 172 – Sampling Freshly Mixed Concrete.

O. ASTM C 260 – Air–Entraining Admixtures for Concrete.

P. ASTM C 309 – Liquid Membrane–Forming Compounds for Curing Concrete.

Q. ASTM C 494 – Chemical Admixtures for Concrete.

R. ASTM C 920 – Elastomeric Joint Sealants.

S. ASTM E 1155 – Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.

T. ASTM C 1116 – Fiber–Reinforced Concrete.

U. ASTM D 1751 – Preformed Expansion Joint Filler for Concrete Paving and Structural Construction. (Nonextruding and Resilient Bituminous Type).

V. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

W. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.

PART 2 – PRODUCTS

2.1 BASE COURSE

A. See Section 32 11 23 for Aggregate Base Course products and specifications.

2.2 ASPHALT CONCRETE

A. Engineer reserves the right to vary classes of backfill and type of resurfacing as best serves the interest of Owner. Trench backfill shall be as specified in the details and related specifications.

2.3 CONCRETE

See Section 03 00 00 for Site Concrete products and specifications.

2.4 CONCRETE PIPE FOR CULVERT REPLACEMENT

Concrete Pipe shall conform to ASTM C 76, Class III O-ring unless there is less than 1.5 feet of cover over the pipe, then Class IV O-ring will be required.

PART 3 – EXECUTION

3.1 CONSTRUCTION PROCEDURE

A. Engineer reserves the right to vary classes of backfill and type of resurfacing as best serves the interest of Owner. Trench backfill shall be as specified in the details and related specifications.

B. Replace all pavement damaged under this contract with similar materials and design. Bomanite shall be replaced to match existing conditions.

3.2 REMOVAL OF PAVEMENT, SIDEWALK, CURBS AND GUTTERS

Removal and disposal of all pavement, sidewalks, curbs, and gutters shall conform to the standard specifications. Saw cut sections to be removed to create a neat edge.

3.3 STREET MAINTENANCE

Maintain all streets as specified in the applicable Encroachment Permit(s) and allow traffic to follow normal or rerouted traffic patterns.

3.4 ASPHALT CONCRETE PAVEMENT REPLACEMENT

Procedures shall be followed as specified below and as detailed on the plans.

A. Subgrade:

1. Bring trench to a smooth, even grade at correct distance below top of existing pavement surface, providing adequate space for the base course and pavement. Trim existing pavement to a straight line. Remove any pavement which has been damaged, broken, or is unsound. Provide a smooth, sound edge for joining the new pavement.
2. Compact the subgrade to ninety-seven percent (97%) of its modified proctor. (ASTM D-1557)

B. Base Course:

1. Place sufficient base course on the subgrade to obtain a minimum thickness of twelve inches (12") after compaction. Place for
2. full width of the trench and compact as required to provide a smooth surface without segregation.

3. Compact the base course with mechanical vibratory or impact tampers. Determine the amount and method of compaction necessary to prevent subsequent settlement. Any subsequent settlement of finished surfacing during the warranty period shall be promptly repaired at Contractor's expense.

C. Prime Coat: After base course has been compacted, apply an asphalt prime coat, specified above, at 0.15- to 0.30- gallon per square yard to the surface of base course and edges of existing pavement as required.

D. Asphalt Concrete:

1. Place asphalt concrete on prepared subgrade over the trench to a depth of not less than two and one-half inches (2 1/2") or depth of adjacent pavement, whichever is greater, but not for more than 6 inches. Place asphalt concrete after the prime coat has set. Spread and level asphalt concrete with hand tools or by use of a mechanical spreader, depending upon the area to be paved. Bring asphalt concrete to the proper grade and compact by rolling or use hand tampers where rolling is impossible or impractical.
2. Roll with power rollers capable of providing compression of 200 to 300 pounds per linear inch. Begin rolling from outside edge of the replacement progressing toward existing surfacing, lapping existing surface at least one-half the width of the roller. If existing surfacing bounds both edges of the replacement, begin rolling at edges of the replacement, lapping existing surface at least one-half the width of the roller, and progress toward center of the replacement area. Overlap each preceding track by at least one-half the width of the roller and make sufficient passes over entire area to remove all roller marks and to produce desired result, as determined by Engineer.
3. Finished surface of new compacted paving shall be flush with existing surface and shall conform to the grade and crown of adjacent pavement.
4. Immediately after new paving is compacted, all joints between new and original asphalt pavement shall be painted with hot asphalt or asphalt emulsion and be covered with dry paving sand before the asphalt solidifies.

E. Surface Smoothness: When a straightedge is laid across patched area between edges of old surfacing and surface of new pavement, new pavement shall not deviate from the straightedge more than one-quarter inch.

3.5 WEATHER CONDITIONS

Asphalt shall not be applied to wet material. Asphalt shall not be applied during rainfall, sand or dust storms, or any imminent storms. The Engineer will determine when surfaces and material are dry enough to proceed with construction. Asphalt concrete shall not be placed (1) when atmospheric temperature is lower than 45 degrees F (unless asphalt thickness is 1 inch, then temperature shall be above 55 degrees F), (2) during heavy rainfall, or (3) when the surface upon which it is to be placed is frozen or wet. Asphalt mixture shall be delivered to spreader at a temperature between 275 degrees F and 325 degrees F and shall not have dropped more than 50 degrees F from temperature the mix left asphalt plant. Asphalt for prime coat shall not be applied when the surface temperature is less than 50 degrees F. Exceptions will be permitted only in special cases and only with prior written acceptance of the Engineer.

3.6 PROTECTION OF STRUCTURES

A. Provide whatever protective coverings may be necessary to protect the exposed portions of bridges, culverts, curbs, gutters, posts, guard fences, road signs, and any other structures from splashing oil and asphalt from paving operations. Remove any oil, asphalt, dirt, or other undesirable matter from structures caused by the paving operations.

B. Where water valve boxes, manholes, catch basins, or other underground utility appurtenances are within area to be surfaced, resurfacing shall be level with the top of existing finished elevation of these facilities. If it is evident these facilities are not in accordance with the proposed finished surface, notify Engineer to have proper authority contacted. Have the facility altered before proceeding with resurfacing around the obstruction. Consider any delays experienced from such obstructions as incidental to the paving operation. Protect all covers during asphalt paving.

C. All surface structures and features located outside permissible excavation limits for underground installations, together with those within the construction areas which are indicated in the Plans as being saved, shall be properly protected against damage and shall not be disturbed or removed without direction from the Engineer. Within construction limits, as required, the removal of improvements such as paving, curbing, walks, turf, etc., shall be subject to acceptable replacement after completion of underground work. All expense of removal and replacement shall be borne by the Contractor to the extent that separate compensation is not specifically provided for in the Contract.

Obstructions such as street signs, guard posts, small culverts, mailboxes, and other items of prefabricated construction may be temporarily removed during construction provided that essential service is maintained in a relocated setting as accepted by the Engineer. Nonessential items shall be properly stored for the duration of construction. Upon completion of the underground work, all such items shall be replaced in their proper setting at the sole expense of Contractor.

Contractor shall be responsible for protection of existing overhead utilities and poles. This shall include arranging with and paying the utility for holding poles close to the edge of any trench. Holding of poles and repair of any damage to these facilities shall be considered incidental to the project with no additional compensation allowed. If relocation or removal of these facilities is required, Contractor will contact the concerned utility and pay for relocation or removal at no additional expense to Owner.

3.7 EXCESS MATERIALS

Dispose of all excess materials at the Contractor's expense. Make arrangements for the disposal and bear all costs or retain any profit incidental to such disposal.

3.8 CONTRACTOR'S RESPONSIBILITY

Settlement of replaced pavement over trenches within the warranty period shall be considered result of improper or inadequate compaction of sub base or base materials. Contractor shall promptly repair all pavement deficiencies during the warranty period at Contractor's sole expense.

3.9 ROCK SURFACING

Where existing, place crushed rock surfacing material, as specified herein, for the full width of all streets, driveways, parking areas, street shoulders, and other areas disturbed by hand labor where necessary. Level and grade the rock to conform to existing grades and surfaces.

3.10 SIDEWALKS

A. Replace concrete sidewalks to the same section width, depth, line, and grade as removed or damaged.

B. Replace concrete sidewalks between scored joints and make replacement in a manner that will avoid a patched appearance. Provide a minimum two-inch (2") thick compacted leveling course of clean 3/4-inch minimum crushed rock or gravel of quality hereinbefore specified. Finish concrete surface similar to the adjacent sidewalks. Score joints and finish edges with a steel edging tool.

C. Saw cut edges neatly.

D. Tunneling under curbs and sidewalks is optional. However, should any subsequent cracking, subsidence, or any other indication of failure occur within the warranty period, damaged section shall promptly be replaced at Contractor's sole expense.

3.11 OMITTED

3.12 CULVERTS

A. All culverts removed because of interference with new construction shall be removed with the least possible damage to pipe or basin. Dispose of culvert pipe in too poor condition for replacement because of age, physical condition, or other reasons.

B. Culverts anticipated to be removed must have elevations taken to ensure proper replacement. Replace all pipes to preexisting lines and grades. Pipe fifteen inches (15") and smaller shall be laid on a minimum four-inch (4") thick crushed stone aggregate. Use a minimum six-inch (6") thick stone aggregate base under pipe eighteen inches (18") and larger.

C. Replace culvert headwalls of all types to a condition at least equivalent to their original shape or form.

3.13 RESTORATION OF SURFACE IMPROVEMENTS

Wherever any surface improvements such as pavement, pavement marking, curbing, pedestrian walks, fencing, or turf have been removed, damaged or otherwise disturbed by Contractor's operations, they shall be repaired or replaced to the Engineer and

Owner's satisfaction. Each item of restoration work shall be completed as soon as practicable after installation and backfilling operations on each section of pipeline.

The in place pavement structure (including base aggregates) shall be restored in kind and depth as previously existed or to the detail shown on drawings, whichever is more stringent.

Existing concrete and bituminous surfaces at the trench wall shall be sawed or cut with a cutting wheel to form a neat edge in a straight line before surfaces are to be restored. Sawing or cutting may be accomplished as a part of removal or prior to restoration at the option of Contractor. However, all surface edges will be checked prior to restoration.

Upon replacement of any and all asphalt and concrete, Contractor shall restore all pavement markings that were on site previously. New markings shall be made with standard, wet weather, and audible profiled thermoplastic reflectorized pavement marking compound.

The compound shall adhere to GDOT Specification 653. Contractor shall furnish a submittal of proposed material that contains a certification that the material meets said specifications.

Coloring shall conform to what was previously onsite and adhere to GDOT Section 653.2.A.3.

Application shall adhere to 653.3.15. Notify Engineer and Owner of application 72 hours in advance. Contractor shall perform an Initial Retroreflectivity evaluation, and 6 Month Retroreflectivity evaluation. Contractor shall certify that the new markings comply with Standard ASTM E 1710, Wet Weather ASTM E 1710, Wet Recovery ASTM E 2177, and Audible Profile Thermoplastic ASTM E 1710 testing. As Contractor is to Warranty work for 1 year, they will be obligated to perform this 6-month evaluation even if final payment has been made at the 6-month mark. If material fails to meet GDOT Specification 653, Contractor shall correct at no additional cost. No additional payment will be made for removal and replacement. Any retest due to failures will be performed at no additional cost to the Owner.

3.14 TURF RESTORATION

Turf restoration shall be accomplished by sod placement except where seeding is specifically allowed or required.

Topsoil shall be placed to a minimum depth of four inches under all sod and in all areas seeded. The topsoil material used shall be light friable loam containing a liberal amount of humus and shall be free of heavy clay, coarse sand, stones, plants, roots, sticks and other foreign matter. Topsoil meeting these requirements shall be selected from excavated materials to the extent available and needed. If additional topsoil is required, Contractor shall provide it at no additional cost to the Owner.

3.15 RESTORATION OF MISCELLANEOUS ITEMS

Wherever any curbing, curb and gutter sections, pedestrian walks, fencing, driveway surfacing, or other improvements are removed or in any way damaged or undermined,

they shall be restored to original condition by repair or replacement as the Engineer and Owner consider necessary. Replacement of old materials will be acceptable only to the extent existing quality can be fully achieved, such as in the case of fencing. Otherwise new materials shall be provided and placed as the Engineer and Owner direct. Workmanship and finished quality shall be equal to new construction.

A proper foundation shall be prepared before reconstructing concrete or bituminous improvements. Unless otherwise directed, granular material shall be placed to a depth of at least four inches under all concrete and bituminous items. No direct compensation will be made for furnishing and placing this material even though such course was not part of the original construction.

3.16 MAINTENANCE AND FINAL CLEANUP

All subgrade surfaces shall be maintained acceptably until the start of surfacing construction or restoration work, and until work has been finally accepted. Additional materials shall be provided and placed as needed to compensate for trench settlement and to serve as temporary construction pending completion of the final surface improvements.

Final disposal of debris, waste materials, and other remains or consequences of construction, shall be accomplished intermittently as new construction items are completed and shall not be left to await final completion of all work. Cleanup operations shall be considered as being a part of the work covered under Contract Items involved and only work which cannot be accomplished at any early time shall be considered as final cleanup work not attributable to a specific Contract Item.

If disposal operations and other cleanup work are not conducted properly as construction progresses, Engineer may withhold partial payments until such work is satisfactorily pursued or deduct the estimated cost of its performance from partial estimate value.

Maintenance of sodded and seeded areas shall include adequate watering for plant growth and replacement of any dead or damaged sod as may be required for acceptance of the work.

END OF SECTION

INDEX TO

SECTION 32 11 23 – AGGREGATE BASE COURSE

SECTION 32 11 23

AGGREGATE BASE COURSE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Aggregate base course.

1.2 RELATED SECTIONS

A. Section 01 45 00 – Quality Control

B. Section 01 45 23 – Testing and Inspecting Services

C. Section 03 00 00 – Site Concrete

D. Section 31 00 00 – Earthwork

E. Section 31 37 00 – Rip–Rap

F. Section 32 00 00 – Surface Restoration

G. Section 33 10 00 – Water Distribution System

1.3 OMITTED

1.4 REFERENCES (LATEST REVISION)

A. ASTM C 131 – Resistance to Degradation of Small–Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.

B. ASTM D 1557 – Laboratory Compaction Characteristics of Soil Using Modified Effort.

C. ASTM D 3740 – Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.

D. ASTM D 6938 – In–Place Density and Water Content of Soil and Soil–Aggregate by Nuclear Methods (Shallow Depth).

E. ASTM E 329 – AGENCIES Engaged in Construction Inspection, Testing, or Special Inspection.

1.5 QUALITY ASSURANCE

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

1.6 TESTING

A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).

B. In place density tests in accordance with ASTM D 6938.

C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.

D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any tests.

E. Testing shall be Contractor's responsibility and performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph C above.

F. Test results shall be furnished to the Engineer and Owner prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 MATERIALS

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

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

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

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify subbase has been tested, is dry, and slopes and elevations are correct.

B. ON SITE OBSERVATIONS OF WORK: The Owner's Representative or Engineer will have the right to require any portion of the work be completed in their presence

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

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

3.2 PREPARATION

A. Subbase shall be graded and shaped conforming to the lines, grades, and cross sections required and cleaned of all foreign substances prior to constructing base course. Do not place base on soft, muddy or frozen surfaces. Correct irregularities in subbase slope and elevation by scarifying, reshaping, and recompacting.

B. At the time of base course construction, subbase shall contain no frozen material.

C. Surface of subbase shall be checked by the Engineer or Project Representative for adequate compaction and surface tolerances. Ruts or soft yielding spots appearing in areas of subbase course having inadequate compaction, and areas not smooth or which vary in elevation more than 3/8 inch above or below required grade established on the plans, shall be corrected to the satisfaction of the Engineer or Project Representative. Base material shall not be placed until subbase has been properly prepared and test results have so indicated.

3.3 AGGREGATE PLACEMENT

A. Aggregate shall be placed with an acceptable spreader in accordance with Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition Section 310 and in accordance with all terms included in these specifications. (Spreader shall contain a hopper, adjustable screed and designed so there will be a uniform, steady flow of material from the hopper. Spreader shall be capable of laying material without segregation across full width of the lane to a uniform thickness and to a uniform loose density.) Spreaders are not required on curb and gutter road sections.

B. Level and contour surfaces to elevations and slopes indicated.

C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

F. While at optimum moisture (± 1–1/2%), compact base course with rollers capable of obtaining required density. Vibratory, flatwheel, and other rollers accepted by the Engineer may be used to obtain required compaction. Rolling shall continue until base is compacted to 98% of the maximum laboratory dry density as determined by ASTM D 1557. In–place density of the compacted base will be determined in accordance with ASTM D 6938.

3.4 PRIME COAT

A. Bituminous material for the prime coat shall be applied uniformly and accurately in quantities of not less than 0.15 gallons per square yard nor more than 0.30 gallons per square yard of base course. All irregularities in the base course surface shall be corrected prior to application of prime coat. Clean the base course of all mud, dirt, dust, and caked and loose material

B. Do not apply prime to a wet surface nor when temperature is below 40°F in the shade. Do not apply prime when rain threatens nor when weather conditions prevent proper construction and curing of prime coat.

C. The primed base should be adequately cured before the binder or surface course is laid. In general, a minimum of 48 hours should be allowed for complete curing. Ordinarily, proper surface condition of the prime is indicated by a slight change in the shiny black appearance to a slightly brown color.

3.5 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with an acceptable 10–foot straight edge.

B. Scheduled Compacted Thickness: Within 3/8 inch.

C. Variation from Design Elevation: Within 3/8 inch.

D. Depth measurements for compacted thickness shall be made by test holes through the base course. Where base course is deficient, correct such areas by scarifying, adding base material and recompacting as directed by the Engineer.

3.6 FIELD QUALITY CONTROL

A. See Section 01 45 00 – Quality Control

B. Density and moisture testing will be performed in accordance with ASTM D 1557 and ASTM D 6938.

C. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest at no additional cost to the Owner

D. Frequency of Tests:

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

END OF SECTION

INDEX TO

SECTION 32 12 16GA – ASPHALT PAVING

SECTION 32 12 16GA

ASPHALT PAVING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Surface Course

B. Binder Course

1.2 RELATED SECTIONS

A. Section 01 22 00 – Unit Prices

B. Section 01 45 00 – Quality Control

C. Section 31 00 00 – Earthwork

D. Section 32 11 23 – Aggregate Base Course

1.3 OMITTED

1.4 REFERENCES (LATEST REVISION)

A. ASTM D 946 – Penetration–Graded Asphalt–Cement for Use in Pavement Construction.

B. ASTM D 1188 – Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.

C. ASTM D 1754 – Effect of Heat and Air on Asphalt Materials (Thin–film Oven Test).

D. ASTM D 2726 – Bulk Specific Gravity and Density of Non–Absorptive Compacted Bituminous Mixtures.

E. ASTM D 2950 – Density of Bituminous Concrete in Place by Nuclear Methods.

F. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.

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

1.5 QUALITY ASSURANCE

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

B. Mixing Plant: Conform to Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.

1.6 ENVIRONMENTAL REQUIREMENTS

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

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

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

1.7 GUARANTEE

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

1.8 TESTING

A. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer and Owner.

B. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any tests.

C. Testing shall be Contractor's responsibility and performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph A above.

D. Test results shall be furnished to the Engineer and Owner prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 TACK COAT

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

2.2 ASPHALT CEMENT AND ADDITIVES

A. Asphalt Cement: Shall conform to the requirements of Section 820 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition. The material shall be PG67–22.

B. Anti–Stripping: Shall be hydrated lime and conform to requirements of Section 831 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.

2.3 AGGREGATES

A. General: Mineral aggregate shall be composed of fine aggregate or a combination of fine and coarse aggregate. Coarse aggregate shall be the portion of material retained on a No. 8 sieve.

B. Fine aggregate shall be considered the portion passing a No. 8 sieve. Fine aggregate, coarse aggregate, and any additives in combination with the specified percentage of asphalt cement shall meet the requirements of tests specified, before acceptance may be given for their individual use.

C. Fine Aggregate: Shall conform to the requirements of Section 802 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.

D. Coarse Aggregate: Shall be granite stone and conform to the requirements of Section 802.02 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition.

E. Surface Course: Shall consist of fine and coarse aggregate and mineral filler uniformly mixed with hot asphalt cement in an acceptable mixing plant. Job mix formula and design limits shall conform to 9.5 mm Superpave requirements.

F. Intermediate or Binder Course: Shall consist of fine and coarse aggregate and mineral filler uniform mixing with hot asphalt cement in an acceptable mixing plant. Job mix formula and design limits shall conform to 19 mm Superpave requirements.

2.4 SOURCE QUALITY CONTROL AND TESTS

A. Section 01 45 00 – Quality Control and Section 01 45 23 – Testing and Inspecting Services.

B. Submit proposed mix design for review prior to beginning of work.

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

PART 3 – EXECUTION

3.1 EXAMINATION

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

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

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

3.2 PREPARATION

A. Apply tack coat in accordance with Section 413 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition. Rate of application shall be 0.04 to 0.06 gallons per square yard of surface.

B. Work shall be planned so no more tack coat than is necessary for the day's operation is placed on the surface. All traffic not essential to the work shall be kept off the tack coat.

C. Apply tack coat to contact surfaces of curbs and gutters. Apply in manner so exposed curb or gutter surfaces are not stained.

D. Coat surfaces of manhole frames and inlet frames with oil to prevent bond with asphalt pavement. Do <u>not</u> tack coat these surfaces.

3.3 PLACEMENT

A. Construction shall be in accordance with Section 400 of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition

B. Asphaltic concrete shall not be placed on a wet or frozen surface.

C. Compaction shall commence as soon as possible after the mixture has been spread to the desired thickness. Compaction shall be continuous and uniform over the entire surface. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks. Compaction rolling shall be complete before material temperature drops below 185° F.

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

3.4 TOLERANCES

A. General: All paving shall be subject to visual and straightedge evaluation during construction operations and thereafter prior to final acceptance. A 10 foot straightedge shall be maintained in the vicinity of the paving operation at all times for the purpose of measuring surface irregularities on all paving courses. The straightedge and labor for its use shall be provided by the Contractor. The surface of all courses shall be checked with the straightedge as necessary to detect surface irregularities. Irregularities such as rippling, tearing or pulling, which in the judgment of the Engineer indicate a continuing problem in equipment, mixture or operating technique, will not be permitted to recur. The paving operation shall be stopped until appropriate steps are taken by the Contractor to correct the problem.

B. Flatness: All irregularities in excess of 1/8 inch in 10 feet for surface courses and 3/16 inch in 10 feet for intermediate and base courses shall be corrected.

1. General Paving: Less than 1/4 inch.
2. Accessible Routes: Shall not exceed 1/4 inch. However, accessible routes shall not exceed maximum ADA allowable slopes. Contractor shall remove and replace any and all portions of the accessible route that exceed maximum ADA allowable slopes.
3. Variation from Design Elevation: Less than 1/4 inch.
4. Scheduled Compacted Thickness: Less than 1/4 inch under tolerance.
5. Pavement Deficient in Thickness: When measurement of any core indicates the pavement is deficient in thickness, additional cores will be drilled 10 feet either side of the deficient core along the centerline of the lane until the cores indicate the thickness conforms to the above specified requirements. A core indicating thickness deficiencies is considered a failed test. Pavement deficient in thickness shall be removed and replaced with the appropriate thickness of materials. If the Contractor believes the cores and measurements taken are not sufficient to indicate fairly the actual thickness of the pavement, additional cores and measurements will be taken, provided the Contractor will bear the extra cost of drilling the cores and filling the holes in the roadway as directed.

3.5 FIELD QUALITY CONTROL

A. Acceptance of the in–place density of the surface course shall be in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, 2021 Edition and these specifications.

B. Density Testing: Performed in accordance with ASTM D–2726 and ASTM D–2950. Core samples for each day's operation shall be taken, tested and results reported to the Engineer the following day. The areas sampled shall be properly restored by the Contractor at no additional cost to the Owner. Nuclear gauge tests shall be taken during the asphaltic concrete placement.

C. Density of each pavement course shall conform to one of the following:

1. Average 96% of laboratory density with no test less than 94%.
2. Average 92% of maximum theoretical density with no test less than 90%.
3. Average 99% of control strip density.

D. Temperature:

1. Asphaltic concrete shall not exceed 325 degrees F at any time.
2. Asphaltic concrete shall not be placed once the temperature of the mix falls below 250 degrees F or the delivered temperature is more than 15 degrees F below the batch plant's delivery ticket.
3. Temperature at time of loading shall be recorded on the truck delivery ticket.

E. Frequency of Tests:

1. Asphaltic Concrete – One test for each 250 tons placed.

   a. Asphalt extraction and gradation test.
   b. Core Sample

2. Field determination of density by nuclear method every 5,000 square feet during construction of the asphaltic concrete binder/surface course.

END OF SECTION

INDEX TO

SECTION 32 31 13 – CHAIN LINK FENCES AND GATES

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Fence framework, fabric, and accessories.

B. Excavation for post bases; concrete foundation for posts, and center drop for gates.

C. Manual gates and related hardware.

1.2 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 78 23 – Operation & Maintenance Information

C. Section 01 78 33 – Bonds

D. Section 01 78 36 – Warranties

E. Section 03 00 00 – Site Concrete

F. Section 33 16 13 – Composite Elevated Water Storage Tank

1.3 OMITTED

1.4 REFERENCES (Latest Revision)

A. ASTM A 90/A 90M – Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc–Alloy Coatings.

B. ASTM A 116 – Metallic–Coated, Steel–Woven Wire Fence Fabric.

C. ASTM A 121 – Metallic–Coated Carbon Steel Barbed Wire.

D. ASTM A 123/A 123M – Zinc (Hot–Dip Galvanized) Coatings on Iron and Steel Products.

E. ASTM A 153/A 153M – Zinc Coating (Hot–Dip) on Iron and Steel Hardware.

F. ASTM A 392 – Zinc–Coated Steel Chain–Link Fence Fabric.

G. ASTM A 428/A 428M – Weight (Mass) of Coating on Aluminum–Coated Iron or Steel Articles.

H. ASTM A 491 – Aluminum–Coated Steel Chain–Link Fence Fabric.

I. ASTM A 653/A 653M – Steel Sheet, Zinc–Coated (Galvanized) or Zinc–Iron Alloy–Coated (Galvannealed) by the Hot–Dip Process.

J. ASTM A 1011 – Steel, Sheet and Strip, Hot–Rolled, Carbon, Structural, High Strength Low–Alloy, High–Strength Low–Alloy with Improved Formability, and Ultra–High Strength.

K. ASTM C 94/C 94M – Ready–Mixed Concrete.

L. ASTM F 567 – Installation of Chain–Link Fence.

M. ASTM F 668 – Polyvinyl Chloride (PVC), Polyolefin, and Other Polymer–Coated Steel Chain–Link Fence Fabric.

N. ASTM F 1043 – Strength and Protective Coatings on Steel Industrial Fence Framework.

O. ASTM F 1083 – Pipe, Steel, Hot–Dipped Zinc–Coated (Galvanized) Welded, for Fence Structures.

P. Chain Link Fence Manufacturers Institute (CLFMI) – Product Manual.

1.5 SYSTEM DESCRIPTION

A. Fence Height: 6 feet nominal, with 1 foot (3 strands) of barbed wire as indicated on Drawings.

B. Line Post Spacing: At intervals not exceeding 10 feet.

C. Fence Post and Rail Strength: Conform to ASTM F1043 quality.

1.6 SUBMITTALS FOR REVIEW

A. Product Data: Provide data on privacy slats, posts, accessories, fittings and hardware.

B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.

1.7 SUBMITTALS FOR INFORMATION

A. Manufacturer's Installation Instructions: Indicate installation requirements.

1.8 SUBMITTALS FOR CLOSEOUT

A. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.

1.9 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM F567 and manufacturer's instructions.

1.10 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 – PRODUCTS

2.1 OMITTED

2.2 MATERIALS

A. Framing (Steel): ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, minimum yield strength of 25 ksi; coating conforming to ASTM F1043 Type A on pipe exterior and interior.

B. Fabric Wire (Steel): ASTM A116 galvanized wire.

C. Barbed Wire: ASTM A121 galvanized steel.

D. Concrete: ASTM C94 Type 1 Portland Cement, 3,000 psi strength at 28 days, 4 days, 4 inch slump, fine and coarse aggregate.

2.3 COMPONENTS

A. Line Posts: 2.38 inch diameter.

B. Corner and Terminal Posts: 3.5.

C. Gate Posts: 4 inch diameter.

D. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.

E. Gate Frame: 1.66 inch diameter for welded fittings and truss rod fabrication.

F. Fabric: 2 inch diamond mesh interwoven wire, 9 gage thick, top selvage twisted tight.

G. Tension Wire: 6 gage thick steel, single strand.

H. Tension Band: 3/8 inch thick steel.

I. Tension Strap: 1/2 inch thick steel.

J. Tie Wire: Aluminum alloy steel wire.

2.4 ACCESSORIES

A. Caps: Cast steel galvanized sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

C. Extension Arms: Cast steel galvanized, to accommodate 3 strands of barbed wire, single arm, sloped to 45 degrees.

D. Gate Hardware: Fork latch with gravity drop; two duckbill backstop 180 degree gate hinges per leaf and hardware for padlock.

E. Padlocks: 2" size – Equivalent to No. 175DLH by Master Lock Co. with 2 feet of S.S. chain. All padlocks keyed alike.

F. Privacy Slats: Vinyl strips, sized to fit fabric weave, black in color.

2.5 FINISHES

A. Components and Fabric: Galvanized to ASTM A123; 2.0 oz/sq ft coating.

B. Black vinyl wire coating.

C. All components and fittings of fence and gate to be black vinyl coated.

2.6 GATES

A. General:

1. Gate Operation: Opened and closed easily by one person.

2. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F1043 and ASTM F1083 for materials and protective coatings.

3. Frames and Bracing: Fabricate members from round galvanized steel tubing with outside dimension and weight according to ASTM F900.

4. Gate leaves more than 8-feet wide shall have intermediate tubular members and diagonal truss rods to provide rigid construction, free from sag or twist.

5. Gate Fabric Height: Same as for adjacent fence height.

6. Welded Steel Joints: Paint with zinc-based paint.

B. Cantilever Horizontal Sliding Gates:

1. Comply with ASTM F1184 for single slide gate Type I, Class 2 with internal roller assemblies.

2. Overhead Track Assemble: Manufacturer's standard track, with overhead framing supports, bracing, and accessories, designed to support size, weight, width, operation, and design of gate and roller assemblies.

3. Roller Guards: As required per ASTM F1184 for Type II, Class 2 gate.

4. Hangers, roller assemblies, and stops fabricated from galvanized malleable iron.

5. Shall be provided with a counterbalance a minimum of 1/2 the length of the opening, gate designer shall provide specifics.

6. O.D. posts shall be a minimum of 4".

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with manufacturer's instructions.

B. Place fabric on outside of posts and rails.

C. Set intermediate, terminal, gate, and posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finish Grade: 3 feet.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: 3 feet.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

G. Provide top rail through line post tops and splice with 6 inch long rail sleeves.

H. Install center brace rail on corner gate leaves.

I. Do not stretch fabric until concrete foundation has cured 28 days.

J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 4 inches above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut between terminal posts.
O. Install support arms sloped outward and attach barbed wire; tension and secure.

P. Do not attach the hinged side of gate from building wall; provide gate posts.

Q. Install gate with slats [and barbed wire overhang] to match fence. Install three hinges per leaf, latch, catches, drop bolt torsion spring retainer.

R. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

3.2 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/4 inch.

B. Maximum Offset from True Position: 1 inch.

C. Components shall not infringe on adjacent property lines.

3.3 SCHEDULES

A. Elevated Tank Perimeter: 6 feet high, with 12" of galvanized barbed wire, black vinyl coated.

END OF SECTION

INDEX TO

SECTION 32 90 00 - LANDSCAPING

SECTION 32 90 00

LANDSCAPING

PART 1 – GENERAL

1.1 DESCRIPTION

A. The work covered in this section consists of soil preparation, fine grading, lawns, trees, shrubs and ground cover planting and protection and maintenance of planted areas until acceptance.

1.2 RELATED WORK

A. Section 31 00 00 – Earthwork

B. Section 31 25 00GA – Erosion, Sedimentation, and Pollution Control – GA

1.3 QUALITY ASSURANCE

A. Qualifications of Workmen: Contractor shall provide at least one person present at all times during execution of work who is thoroughly familiar with the type of materials being installed and proper equipment and methods for their installation and who shall direct all work performed under this section.

B. Standards: All seed, sod, trees, shrubs, and ground covers shall meet or exceed the specifications of Federal, State, and County laws requiring inspection for disease and insect control.

1. Plants and planting methods shall conform to the latest edition of American Standard for Nursery Stock, ANSI Z60.1, 2014.
2. Plants shall be true and representative of their genus, species, cultivar, or variety. One of each bundle or lot shall be tagged with name and size of the plant in accordance with American Association of Nurserymen. In all cases, botanical names shall take precedence over common names. Landscape Architect should be consulted in the event questions arise about nomenclature of plants to be used and their availability.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging and location of packaging. Damaged packages are not acceptable.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Deliver sod on pallets.

D. Handling of plants shall be by lifting the root mass or container and not by lifting plant by trunk or branches. Handling of plants in an improper fashion shall be cause for rejection of plant materials. Care must be taken during all phases of the location and planting procedures not to damage root system, trunk or branches. All plant

materials shall be planted as soon after arrival at the site as possible. Contractor is responsible for keeping plants safe from injury by the construction activity and watered to prevent drying out before planting. Balled and burlapped plants shall be "Heeled-in" and protected with burlap or other accepted material if they cannot be planted upon delivery. Plants with broken major branches, badly bruised or damaged bark are not acceptable and will be rejected.

E. Store fertilizer and grass seed in cool, dry location away from contaminated.

F. All materials shall be approved by Engineer in submittal review prior to use.

1.5 PLANTING DATES

A. This specification provides for establishment of a permanent grass cover between the dates of March 1 and September 30. If finished earth grades are not completed in time to permit planting and establishment of permanent grass during the favorable season between dates specified above unless otherwise accepted, Contractor will be required to plant a temporary cover to protect new graded areas from erosion and to keep windborne dust to a minimum. The temporary cover shall be planted between October 1 and February 28 unless otherwise permitted.

B. Contractor is responsible for planting permanent grass the following Spring.

1.6 OMITTED

PART 2 – PRODUCTS

2.1 MATERIALS

A. Contractor shall submit source and species certification documents to Engineer and Owner's Representative for review prior to installation. Supply complete information on all analysis/test methodologies and results; laboratory certifications, manufacturer's specifications, and agency approvals to the Project Engineer prior to placement of soil mixtures. Contractor shall make necessary adjustments to meet requirements specified here in and to ensure proper growing medium for plant material.

2.2 TOPSOIL

A. Topsoil shall be fertile, friable natural loam capable of sustaining vigorous plant growth. It shall be free of any admixture of subsoil, stones over 1" diameter, clods of hard earth, plants, roots, sticks or other extraneous material. It shall not be excessively acid or alkaline.

2.3 SEED

A. Hulled common Bermuda grass, pure line seed to be 82% by weight, with a maximum weed seed of 0.50%. To be applied at rate of 50lbs/acre.

B. Temporary grassing shall consist of annual rye grass seed at a rate of 75 pounds per acre.

C. All seed shall conform to State Laws and requirements and regulations of the State Department of agriculture.

D. Engineer reserves the right to test, reject, or accept all seed before application.

2.4 SOD

A. Sod shall be premium grade, densely rooted, good quality gras of the species and certified variety as shown on the plans, trees from noxious weeds with no surface soil being visible. The sod shall be obtained from areas where the soil is reasonably fertile. Sod specified species shall be grown from seed or sprig with not less than 98 percent germination 85 percent pure seed or spring wit h 0.5 percent weed seed. The sod shall be machine cut to a uniform soil thickness that shall contain practically all of the dense root system and not be less than 1–inch thick.

B. Before cutting sod shall be moved to a height of not less than 1-1/2 inches or more than 2–inches. Sod shall be cut in minimum uniform widths of 12–inches and lengths of 24–inches.

C. Sod shall be delivered to site in a fresh, moist condition with healthy green foliage. It shall be unloaded from delivery trucks on pallets and placed in final position within 24 hours of delivery. Sod shall be protected from wind and sun and shall not be allowed to dry out before planting.

2.5 PLANT MATERIALS

A. Plants shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs or larvae, and shall have healthy, well developed root systems. Plants shall have been grown under climate conditions similar to those in the locality of project. Trees for planting in rows shall be uniform in size and shape.

B. Plants shall possess a normal balance between height and width. Plants shall be measured when branches are in their normal position. Height and spread dimensions specified refer to the main body of plant and not from branch tip to tip. Plants larger in size than specified may be used with no change in contract price.

C. Plants shall be dug with firm natural balls of earth, of diameter not less than recommended by American Standard for Nursery Stock and of sufficient depth to include fibrous and feeding roots. Plants will not be accepted if ball is cracked or broken before or during planting operations.

D. Trees specified for Street Tree Grade shall conform to standards of the A.A.N.:

1. Suitable for planting as street trees.
2. Free of branches to approximately 50% of height from ground.
3. Crown of tree shall be in good balance with the trunk.

2.6 FERTILIZER

A. Commercial fertilizer shall be 5-10-10 or 6-12-12, uniform in composition, free flowing, and suitable for application with appropriate equipment. Deliver to site unopened

in manufacturer's standard containers showing weight, analysis and name of manufacturer.

B. To be conforming to State fertilizer laws at the rate as recommended by soils tests.

2.7 PEAT MOSS

A. Peat moss shall be finely shredded, 90% organic moss peat, brown in color and suitable for horticultural purposes. Peat shall be measured in air dry condition, containing not more than 35% moisture by weight. Ash content shall not exceed 10%.

2.8 MULCH

A. Hydromulch
   a. May be any one or combination of: Wood, paper, straw, hay, cotton, coconut, jute, or hemp and may contain poly fibers.
   b. Any hay, cotton, or straw must be treated to kill seeds.
   c. Shall be HydroStraw HE or approved equivalent.

B. Mulch for Trees, Shrubs and Ground Covers
   a. Mulch shall be pine, oat, or wheat straw, reasonably free from weeds, foreign matter detrimental to plant life, and in dry conditions.

2.9 STAKING EQUIPMENT

A. Shall consist of treated wood stakes, 18 gauge galvanized guy wire, 1/4" x 4" galvanized turnbuckle and 1/2 inch rubber hose.

2.10 LIME

A. Agricultural grade, ground limestone at the rate as recommended by soils tests.

2.11 SPRIGGING

A. Healthy living stems, stoles, or rhizomes and attached roots of locally adapted grass without adhering soil including two to three nodes and from 4 to 6 inches long. Obtain from heavy dense certified sod. Provide sprigs which have been grown under climatic conditions similar to those in the locality of project. Coordinate harvesting and platting operations to prevent exposure of sprigs to the sun from more than 30 minutes before covering and moistening. Sprigs showing signs of wilt, mold, containing weeds or other detrimental materials or are heat damaged will be rejected.

B. Varieties of sprig, as specified in section 2.6 shall be individually packaged or bagged, and tagged to show name of sprig, net weight, origin, and other information required by the State Department of Agriculture.

C. Springs shall be pure to variety specified and shall be free of other grass species, weeds, or foreign matter.

D. Sprigs shall be harvested by digging (not collected above soil level) shredding sod, rototilling sod and raking, overcuring or with a sprig harvester. Sprigs shall consist of mostly rhizomes and crowns with only a few green leaves.

PART 3 – EXECUTION

3.1 FINE GRADING

A. All areas within limits of construction shall be fine graded to the desired grades. All areas within limits of construction are to be fine graded, free of roots, debris and/or other objectionable material, before planting or grassing commence. Any additional fill material needed to fill low or uneven areas shall be provided by the Contractor. Positive drainage shall be provided in all plant beds so standing water does not occur.

B. Planting and grassing areas, if not loose, shall be loosened to a minimum depth of 3-inches before fertilizer, seed or sod is applied.

3.2 FERTILIZER

A. Apply fertilizer after fine grading and mix thoroughly into upper 2 inches of soil.

B. Fertilizer shall be applied at a rate of 12 pounds per 1,000 square feet of area to be grassed.

3.3 SODDING

A. Do not begin grasswork until irrigation system is completely installed, tested and operational. Grassed areas lost due to an inoperable irrigation system shall be regrassed at no additional cost to Owner.

B. All areas to be sodded shall be brought to the proper line grade or cross section as was existing prior to construction. Sod shall be placed so edges of the sodded areas will be smooth and will conform to previous existing conditions. Sod shall be laid smooth, edge to edge, with staggered joints. Sod shall be immediately pressed firmly into contact with the sod bed by tamping or rolling, to eliminate any air pockets. A true and even surface shall be provided, to insure knitting without displacement of sod or deformation of the sodded surface area. Following compaction, screened soil of good quality shall be used to fill all cracks, and excess soil shall be worked into the grass with rakes or other suitable equipment. On slopes steeper than 3 to 1, the sod shall be fastened in place with suitable wood or metal pins to hold the sod in place. Any damage by erosion or other causes occurring after completion of grading operations shall be repaired before commencing with the sod placement.

C. Immediately before sodding, moisten topsoil with a fine spray to a minimum 1 inch depth.

D. Within 2 hours after sod has been placed, thoroughly water to a minimum depth of 4 inches. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove depressions and irregularities. Roll sodded areas with a roller not exceeding 150 lbs. per foot of roller width.

3.4 SEEDING

A. Seeding and sprigging shall be performed during periods and at rates specified in their respective schedules. Seeding and sprigging work may, at discretion of Contractor be performed throughout the year using schedule prescribed for given period. Seeding and sprigging work shall not be conducted when the ground is frozen or excessively wet. Contractor will be required to product a satisfactory strand of grass regardless of the period of year work is performed.

B. Apply seed evenly at a rate of 40 pounds per acre using acceptable mechanical seed drills.

C. Seeds shall be covered and lightly compacted by means of a cultipacker or light roller if the drill does not perform this operation.

D. Apply water with fine spray immediately after each area has been sown.

E. Do not sow immediately following rain, when ground is too dry, or during windy periods.

3.5 SEED PROTECTION

A. All areas seeded with permanent grasses shall be uniformly mulched in a continuous blanket immediately following seeding and compacting operations, using at least 1-1/2 tons of straw per acre.

3.6 LAYOUT OF TREES, SHRUBS, AND GROUND COVERS

A. All plants shall be placed in the proper location as shown on construction plans, allowing Landscape Architect to review all plant locations prior to actual planting. Landscape Architect may make minor adjustments which shall not be cause for changes to the contract price.

3.7 OBSTRUCTIONS BELOW GROUND

A. Prior to excavating planting holes, Contractor shall determine the exact location of electrical, phone, or television cables or conduits, water, drainage or sewer lines, and any other subsurface structures and take precautions to protect them. Any damage to underground utilities shall be repaired immediately at the Contractor's expense.

B. In the event rock, underground construction work, or other obstructions are encountered in any plant hole excavation under this contract, alternate locations may be selected.

3.8 PLANTING HOLES

A. For trees, shall be 12" deeper and 24" wider than the size of root ball. Planting holes for shrubs and containerized ground covers shall be 6" deeper and 12" wider than the root mass.

3.9 PLANTING HEIGHTS

A. Shall be same as grown in the nursery and/or container soil level. Adjust bottom soil mix to insure proper planting level with the proposed surrounding grades. Check plants to insure proper vertical alignment.

3.10 BALLED AND BURLAPPED PLANTS

A. Shall have all bindings removed and the top half of burlap removed from around root ball. The burlap can be laid back from root mass or can be cut away. All weeds growing on the root mass shall be removed prior to planting.

3.11 CONTAINER GROWN PLANTS

A. Shall have the container removed prior to planting. Care shall be taken to protect root mass from injury and the root mass intact. If root mass shows evidence of being bound or matted, three vertical 1/2" deep cuts shall be made on alternate sides of the root mass and roots pulled away slightly. This is to untangle roots which have begun to "circle" the root mass and to encourage new root growth. All weeds growing in the root mass shall be removed prior to planting.

3.12 SOIL MIX

A. Shall consist of 25% peat moss and 75% native soil. The soil mix shall be added to planting holes and compacted to the proper level prior to setting plants. Level of soil mix shall be adjusted to achieve the proper planting height. The soil mix shall be added to all sides equally and tamped until planting hole is 1/4 full. Water in well and then complete addition of soil mix and tamping soil until the level is at grade. Water in well once again.

3.13 EARTH SAUCERS

A. Shall be constructed around the perimeter of planting holes of all trees and all single planted shrubs. Earth saucers shall be minimum 3" high and compacted to retain water. Earth saucers shall not be installed around mass shrub or groundcover plantings.

3.14 STAKING OF TALL PLANTS

A. Shall take place immediately after planting of the trees. Three 2" x 2" x 2' - 6" stakes shall be driven into ground equidistant around the plant a distance from plant equal to one third of its height. Stakes shall be driven into ground at an acute angle away from the plant. Insert twisted guy wires through the rubber hose and loop around trunk of tree above first set of branches or at a point on trunk of plant equal to one third of height, whichever is higher. Twist guy wire tightly around itself to form a loose loop around the trunk. Make sure the hose makes contact with trunk rather than wire. Attach each section of guy wire to turnbuckles and then to the wood stakes and tighten turnbuckles and guy wire so plant is vertical and immobile to wind action. Attach flagging to all guy wires at eye level for proper visibility.

3.15 MULCHING

A. All plants shall be mulched with an evenly thick 3" layer of clean pine straw immediately after planting. Mass plant beds shall be completely mulched to outer limits of all plants 12" past the existing dripline. Limit of mulching for individual trees

and shrubs shall be slightly beyond the saucer berm. The areas mulched shall be tidy and clean in appearance.

B. Apply hydromulch with hydraulic spray equipment that mixes fiber, tackifier, fertilizer, and other erosion control materials specified. If applying hydroseed, add seed to hydromulch. Seed may be dry applied to small areas not accessible by hydroseeding equipment if authorized. Add water to hydromulch and hydroseed materials as recommended by the manufacturer and mix sufficiently to ensure an even application. A dispersing agent may be added to the mixture if authorized. Equipment must have a built-in continuous agitation and discharge system capable of producing a homogeneous mixture and a uniform application rate. The tank must have a minimum capacity of 1,000 gallons. You may use a smaller tank if authorized.

a. Apply materials in locations, rates, and number of applications shown and as follows:
   i. Start application within 60 minutes after adding seed to the tank.
   ii. Apply in successive passes as necessary to achieve the specified application rate.
   iii. Apply all hydromulch or hydroseed materials shown for a single area within 72 hours.

b. If hydromulch or hydroseed materials are applied to areas covered by RECP, apply hydromulch and hydroseed materials to the rolled product as follows:
   i. Verify the RECP is in uniform contact with the slope surface.
   ii. Spray materials into the RECP perpendicular to the slope and integrate well.
   iii. Do not displace or damage the RECP.

c. After the final application, do not allow pedestrians or equipment on the treated areas.

3.16 WEEDING

A. All planted areas shall be kept free from weeds and undesirable grasses until final acceptance by the Owner.

3.17 INSECT AND DISEASE CONTROL

A. All plant materials shall be disease or insect free upon arrival to the site, however, should any plants show signs of insect or disease infestations, Contractor shall identify nature of infestation and submit to Architect a proposed method of control. Contractor shall treat all infested plants at its expense. Should the infestation be wide spread and uncontrollable, plants affected shall be removed from site, fresh plants brought in and all other plants treated to prevent infestation of remaining plants at Contractor's expense.

3.18 CLEAN UP

A. Contractor is responsible for removing all trash, debris, rubbish and all other materials associated with the construction from site on a daily basis. All tags, flags, and labels will be removed from plants and trees. The site shall be left broom clean and tidy. Clean up of the site is a prerequisite to final acceptance by the Owner.

3.19 SPRIGGING

A. Sprigs shall be placed at the date and rates as shown above. The sprigging method shall be by broadcast sprigging, hydroplaning or now plater. Sprigging procedure shall ensure even coverage.

B. Sprigs applied by broadcast over the site with a distributor or Hydroseeder shall be planted at the rates listed in section 2.6 Cover broadcast sprigs with straw mulch immediately after broadcast and water in immediately (within 2 hours).

C. Sprigs installed by row planter creating a narrow furrow that cover 50 to 80% of the sprig with soil material. Rate shall be a recommended by sprig supplier to provide a solid stand of turf within the time required in Section 2.6. Water in immediately (within hour).

PART 4 – MAINTENANCE AND WARRANTY

4.1 MAINTENANCE

A. All landscaping (grass, plants and trees) shall be protected and maintained by the Contractor immediately after installation.

B. Maintenance shall include but is not limited to watering, weeding, cultivating, removal of dead material, resetting plants to proper grades or upright position, lawn mowing, fertilizing, and other necessary operations.

C. The Contractor shall repair immediately any areas damaged as a result of construction operations or erosion.

D. The Owner will be responsible for maintenance from time of acceptance. It is then the responsibility of the Owner to supply the plant with sufficient water and fertilizer (as needed) during their growing season (May to October) to keep them healthy. The Owner shall supply a certification that regular maintenance and plant care was provided and no herbicides were used on such plants.

4.2 WARRANTY

A. All lawns, shrubs, ground cover, and trees shall be guaranteed by the Contractor to be alive and healthy for a one year period after substantial completion. Provided, that the Owner can provide the certification of care required in 4.1.D.

B. Any lawn, plant, or tree which is dead or not showing satisfactory growth shall be replaced at Contractor's expense at the end of warranty period. All replacements shall be of original quality and of a size equal to adjacent plants or trees of the same kind.

4.3 ACCEPTANCE

A. Before acceptance of seeding performed for the establishment of permanent vegetation. Contractor will be required to produce a satisfactory stand of perennial grass whose root system shall be developed sufficiently to survive dry period and winter weather and be capable of reestablishment in spring.

B. A minimum coverage of 80% density over 100% of the disturbed area is required for seeded areas before project acceptance. Sprig and sod areas shall have 95% coverage over 100% of the disturbed areas prior project acceptance.

END OF SECTION

INDEX TO

SECTION 33 10 00 – WATER DISTRIBUTION SYSTEM

SECTION 33 10 00

WATER DISTRIBUTION SYSTEM

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Piping

B. Valves

C. Fittings

D. Connect to Existing System

E. All necessary appurtenances to convey potable water from existing well and all locations shown on plans.

1.2 RELATED SECTIONS

A. Section 01 45 23 – Testing and Inspecting Services

B. Section 01 33 00 – Submittal Procedures

C. Section 31 10 00 – Site Clearing

D. Section 31 00 00 – Earthwork

E. Section 33 16 13 – Composite Elevated Water Storage Tank

F. Section 35 01 40.92 – Water Management Services

1.3 OPTIONS

A. The bid form and specifications describe several pipe materials. Where manufacturers of material or equipment are named in the specifications, Contractor shall provide materials as manufactured by those listed in Appendix 2A – "Water Distribution System Acceptable Manufacturers." If contradictions found in these specifications, Appendix 2A shall supersede that of these specifications. If materials are no longer manufactured by those listed, or manufacturer is no longer in operation, Contractor shall provide all evidence in writing that the proposed material/manufacturer is equivalent in all manners. Owner will have final say in approved materials/manufacturers.

1.4 REFERENCES (LATEST REVISION)

A. ASTM A 53 – Pipe, Steel, Black and Hot–Dipped, Zinc–Coated, Welded and Seamless.

B. ASTM A 139 – Electric–Fusion (Arc) – Welded Steel Pipe (NPS 4 and Over).

C. ASTM C 443 – Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

D. ASTM C 478 – Circular Precast Reinforced Concrete Manhole Sections.

E. ASTM D 1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.

F. ASTM D 1784 – Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

G. ASTM D 2241 – Poly (Vinyl Chloride) (PVC) Pressure–Rated Pipe (SDR – Series).

H. ASTM D 2737 – Polyethylene (PE) Plastic Tubing.

I. ASTM D 2774 – Underground Installation of Thermoplastic Pressure Piping.

J. ASTM D 3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

K. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

L. ASTM D 6938 – In–Place Density and Water Content of Soil and Soil – Aggregate by Nuclear Methods (Shallow Depth).

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

N. AWWA C 104– Cement–Mortar Lining for Ductile Iron Pipe and Fittings for Water.

O. AWWA C 110 – Ductile–Iron and Gray–Iron Fittings.

P. AWWA C 111– Rubber Gasket Joints for Ductile–Iron Pressure Pipe and Fittings.

Q. AWWA C 115 – Flanged Ductile–Iron Pipe with Ductile–Iron or Gray–Iron Threaded Flanges.

R. AWWA C 150 – Thickness Design of Ductile Iron Pipe.

S. AWWA C 151 – Ductile Iron Pipe, Centrifugally Cast, for Water.

T. AWWA C 153 – Ductile–Iron Compact Fittings.

U. AWWA C 200 – Steel Water Pipe 6 Inch (150 mm) and Larger.

V. AWWA C 500 – Metal–Seated Gate Valves for Water Supply Service.

W. AWWA C 502 – Dry–Barrel Fire Hydrants.

X. AWWA C 504 – Rubber–Seated Butterfly Valves, 3 inch through 72 inch.

Y. AWWA C 509 – Resilient–Seated Gate Valves for Water Supply Service.

Z. AWWA C 512 – Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.

AA. AWWA C 515 – Reduced–Wall, Resilient–Seated Gate Valves for Water Supply Service.

BB. AWWA C 600 – Installation of Ductile Iron Water Mains and Their Appurtenances.

CC. AWWA C 605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.

DD. AWWA C 651 – Disinfecting Water Mains.

EE. AWWA C 800 – Underground Service Line Valves and Fittings.

FF. AWWA C 900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inch through 60 inch (100mm Through 300 mm), Water Distribution.

GG. AWWA C 901 – Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch through 3 inch, for Water Service.

HH. ASME B18.2.1 – Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (inch series).

II. ASME B18.2.2 – Nuts for General Application: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (inch series).

JJ. NSF/ANSI 61 – Drinking Water System Components – Health Effects.

KK. ASSE 1003 – Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems.

1.5 QUALITY ASSURANCE

A. Materials – Contractor will furnish the Engineer and Owner a description of all material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.

B. Manufacturer – Material and equipment shall be standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on quality and performance of the products.

C. Subcontractor – A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with its competence.

D. Design – If Contractor wishes to furnish devices, equipment, structures, and systems not designed by Engineer, these items shall be designed by either a Professional Engineer registered in the state of this project, or by someone Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance. This shall be done at no additional cost to the Owner.

E. Testing Agencies – Soil testing shall be conducted by a testing laboratory that operates in accordance with ASTM D 3740 and E 329 latest revision and be acceptable to the Engineer prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with name of entity making the test.

F. Hydrostatic tests on pipe shall be made by Contractor with equipment qualified by the Engineer. Engineer and Owner or Project Representative reserves the right to accept or reject testing equipment. Hydrostatic testing shall be conducted in the presence of Engineer or Project Representative and a representative of water supplier.

G. All pipe, fittings, packing, jointing materials, valves, and fire hydrants shall conform to Section C of the American Water Works Association (AWWA) Standards.

H. All materials and products that contact potable water must be third party certified as meeting the specifications of ANSI/NSF Standard 61.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

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

B. Water lines in high hazard categories shall be protected by an acceptable Reduced Pressure Zone (RPZ) Backflow Preventer.

C. Any pipe, solder, or flux which is used in the installation or repair of any public water system or in any plumbing in a residential or nonresidential facility which provides water, through connection to a public water system, for human consumption shall be lead free. Lead free is defined as (a) not containing more than 0.2 percent lead when used with respect to solder; and (b) not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing, fittings, and fixtures.

D. No water pipe shall pass through or come in contact with any part of a sewer manhole. Water lines may come in contact with storm sewers or catch basins if there is no practical alternative, provided ductile iron is used, no joints of water line are within the storm sewer or catch basin, and joints are located as far as possible from storm sewer or catch basin.

E. Air relief valves shall be provided in accordance with sound engineering practices at high points in water mains as required. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur.

F. The open end of an air relief pipe from automatic valves or from a manually operated valve shall be extended to the top of pit and provided with a downward facing elbow containing a 24/24 S.S. screen.

G. Chambers, pits, or manholes containing valves, blow–off, meters, air release valves, or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer.

H. There shall be no connection between distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminated materials may be discharged or drawn into the system.

I. Asbestos cement pipe shall not be used in potable water system.

J. Thermoplastic pipe shall not be used above grade.

K. Steel pipe shall not be allowed in water systems unless specified as in AWWA C200 or ASTM A53.

L. Water mains shall be installed out of contaminated areas, such as sanitary landfills or dumping areas, no exceptions.

M. Cross Connection Control (Backflow Prevention Devices):

1. There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminated materials may be discharged or drawn into the system.

2. No–by–passes shall be allowed, unless the bypass is also equipped with an acceptable backflow prevention device.

3. Reduced pressure principal backflow prevention assemblies shall not be installed in any area location subject to possible flooding. This includes pits or vaults not provided with a gravity drain to the ground's surface capable of exceeding discharge rate of relief valve. Generally, if installed in a pit, drain line shall be 2 times the size of line entering backflow prevention device. The drain cannot empty into any type of ditch, storm drain, or sewer, which could flood water back into pit.

4. All piping up to inlet of the backflow prevention device must be suitable for potable water. The pipe must be AWWA or NSF approved. Black steel pipe cannot be used on inlet side of the device.

1.7 PRODUCT DELIVERY, STORAGE & HANDLING

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

1.8 SEQUENCING AND SCHEDULING

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

1.9 ALTERNATIVES

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

B. BGJWSC has an "Acceptable Manufacturers List," as included in these specifications. For materials listed on the "Acceptable Manufacturers List," the Contractor must use one of the listed manufacturers.

1.10 GUARANTEE

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

1.11 EXISTING UTILITIES

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

B. The Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at 1–800–282–7411 (GA) or 811.

1.12 CONNECT NEW MAIN TO EXISTING SYSTEM

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

1.13 DAMAGE TO EXISTING WATER SYSTEM

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

1.14 OMITTED

1.15 TESTING

A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).

B. In place density tests in accordance with ASTM D 6938.

C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.

D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any tests.

E. Testing shall be Contractor's responsibility and shall be performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph C above.

F. Test results shall be furnished to the Engineer and Owner prior to continuing with associated or subsequent work.

G. Hydrostatic and sterilization testing shall be in accordance with section 3.4.

PART 2 – PRODUCTS

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

2.1 PIPE

A. Ductile Iron Pipe – Shall conform to ANSI A21.50 (AWWA C–150) latest revision and ANSI A21.51 (AWWA C–151) latest revision. All piping shall be pressure class 250 unless otherwise noted. Each length shall be clearly marked with the name of the manufacturer, the pressure rating, thickness, pressure class, and nominal pipe diameter. It shall be externally coated with bituminous coating per ANSI A21.51. In the presence of corrosive soils defined by AWWA C105, all bolts, nuts, studs, and other uncoated parts shall be coated with asphalt or coal tar prior to backfilling. All pipe to be cement lined with a seal coat in accordance with ANSI A21.4. Provide PE encasement in areas of severely aggressive soils in accordance with AWWA C105.

1. To be manufactured by American Cast Iron Pipe Company, US Pipe and Foundry, Clow, or McWane.

B. PVC – virgin polyvinyl chloride (PVC) pipe for potable water and shall have a bell type coupling with a thickened wall section integral with the pipe barrel in accordance with ASTM D3139. Provisions must be made for expansion and contraction at each joint with flexible ring gaskets made of rubber or other suitable material. Elastomeric seals shall meet ASTM F477. P.V.C. Pipe is to be manufactured to ductile iron pipe equivalent outside diameters. Pipe for water

mains shall be blue in color with each length marked with name of the manufacturer, pressure rating, nominal pipe diameter and the seal of the National Sanitation Foundation (NSF).

1. PVC water pipe four (4) inches through twelve (12) inches in diameter shall conform to AWWA C900 Pressure Class (PC) 235 DR–18 and shall have the following minimum wall thickness:

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

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

3. Glued or Solvent weld joints will not be accepted.

All PVC pipe shall be stored out of sunlight or appropriately covered with a UV resistant cover. All PVC pipe shall be properly supported so sagging of the pipe does not occur during storage. Any PVC pipe showing UV degradation or sagging shall be removed and replaced at the Contractor's expense. PVC to be manufactured by one of the approved manufacturers included in Appendix 2A.

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

Polyethylene Tubing: CTS PE 3408 conforming to all requirements of AWWA C–901 and ASTM D–2737 (SDR9). The tubing shall be copper tubing size SDR–9, rated for a minimum working pressure of 200 p.s.i. and blue in color. Tubing shall be approved for use with potable water by the National Sanitation Foundation and shall be continuously marked at intervals of not more than four (4) feet. Marking on the tubing shall include nominal size, pressure rating, NSF seal, manufacturer's name, standard dimension ratio and ASTM specification. PE tubing to be manufactured by one of the approved manufacturers included in Appendix 2A.

D. Couplings shall be bronze with compression fittings on both ends suitable for connection to PE tubing with inserts.

2.2 JOINTS

A. Flanged Joints – Shall conform to AWWA C–115 and C–110. Flanges shall be in accordance with ANSI B16.1, Class 125. Bolts and nuts shall conform to Grade B conforming to ASTM A307. The number and size of bolts shall be in accordance with the same ANSI Standard as the flanges.
Gaskets shall be rubber ring type with cloth inserts and shall be 1/8 inch thick. Gaskets shall conform to the dimensions recommended by AWWA C–115 latest revision.

B. Mechanical Joints – In ductile iron pipe shall conform to AWWA C–111. All glands shall be epoxy coated ductile iron.

C. Push–On–Joints – In ductile iron pipes shall conform to AWWA C–111. In PVC pipes shall conform to ANSI A–21.11

D. Plastic Pipe – Joints in plastic pipe 4 inches through 60 inches shall meet all requirements of AWWA C–900. Joints in plastic pipe with a diameter less than 4 inches shall conform to ASTM D–3139.

E. Restrained Joints – On ductile iron fittings, mechanical joint restraints shall be incorporated into the design of the follower gland. Restraint devices shall consist of multiple gripping wedges incorporated into the follower gland and meeting the requirements of ANSI A21.10 (AWWA C110). Gland body, wedges and wedge actuating components shall be ductile iron in accordance with ASTM A536. Dimensions of the gland shall be such that it can be used with the standard mechanical joint bell and tee head bolts. Twist off nuts (same size as the tee head bolts) shall be used to ensure proper actuation of the restraining device. The mechanical joint restraint shall be designed to accommodate the full working pressure of the pipe with a minimum safety factor of 2.0. Where called for on the plans, joints on ductile iron piping may be restrained by utilizing a joint restrained gasket which includes a stainless steel locking segment vulcanized into the rubber gasket. The gasket shall be rated for operating pressures up to 250 PSI in accordance with ANSI A21.11 (AWWA C111).

Where it is necessary to restrain PVC pipe bells adjacent to valves and fittings, a harness restraint device shall be used in lieu of thrust blocking. The restraint shall be manufactured of ductile iron in accordance with ASTM A536. A split ring shall be used behind the pipe bell with a serrated ring to grip the pipe. A sufficient number of steel tie rods/bolts shall be used to connect the bell ring and the gripping ring. The harness restraint device shall accommodate the full working pressure of the pipe with a minimum safety factor of 2.0.

The use of concrete thrust blocks as a method of joint restraint shall be limited to situations such as ties to or work associated with existing systems where exposing several joints of pipe is not feasible due to existing ground conditions. In such cases other restraining devices may be required at the direction of the Engineer or Owner. Concrete thrust blocks may be used in combination with tie rods in accordance with the Owner standard construction details. Where used, concrete shall be 2,500 PSI minimum. Where tie rods are used as a method of restraint at mechanical joint fittings and valves, offset eyebolts shall be used to connect tie rods to the fitting. Tie rods shall be steel, threaded as required and installed with a washer and nut (same material as the rod) on either side of the joint. The size and number of tie rods shall be in accordance with the Figure WD–2.

FIGURE WD–2
TIE ROD SIZE AND NUMBER TABLE

PIPE SIZE	NO. OF RODS	ROD SIZE
4"	2	¾"
6"	2	¾"
8	2	¾"
10	4	¾"
12	4	¾"
14	6	¾"
16	6	¾"
>16"	PER ENGINEER REC.	PER ENGINEER REC.

Restrained joints for pipe, valves and fittings shall be mechanical joints with ductile iron retainer glands,"Megalug"

The manufacturer of the joints shall furnish certification, witnessed by an independent laboratory, that the joints furnished have been tested without signs of leakage or failure. Restrained joints shall be capable of being deflected after assembly.

F. Natural rubber or other material which will support microbiological growth may not be used for any gaskets, o–rings, and other products used for jointing pipes, setting meters, and valves or other appurtenances which will expose such material to water.

2.3 FITTINGS

A. Fittings for Ductile Iron Pipe – Shall conform to ANSI A21.10 (AWWA C–110) latest revision. They shall be cement lined in accordance with ANSI A21.4 (AWWA C–104) latest revision. Fittings shall be designed to accommodate the type of pipe used. Compact fittings shall normally be used but this does not preclude the use of standard or long body fittings where shown on the plans or at the direction of the Engineer or Owner. All ductile iron fittings shall be externally coated and internally lined as specified in this section (under Ductile Iron Pipe).

1. Fittings shall have cast on them the pressure rating, nominal diameter, manufacturer's name, foundry location and type of fitting in degrees. Cast letters and figures shall be on the outside body of the fitting. Fittings shall have a minimum working pressure of 250 PSI.

2. To be manufactured by American Cast Iron Pipe Company, US Pipe and Foundry, Clow, or McWane.

B. Fittings for PVC – PVC 1120, SDR–21 fittings shall be injection molded, push–on bell type with elastomeric rubber seals in accordance with ASTM D3139. Seals shall conform to ASTM F477.

1. To be manufactured by J.M. Eagle Blue Brue, Diamond Plastics Corporation, North American Pipe Corporation, National Pipe and Plastics, or Vulcan.

2.4 GATE VALVES

A. Gate Valves –

1. 4" and larger:

a. Shall be designed for a minimum working pressure of not less than 250 psi.

b. Valves shall be iron body, bronze mounted, resilient seated, with non–rising stems, conforming to AWWA C 509 or C515.

c. All exterior mounted bolts and nuts of 316 stainless steel.

d. Valves shall be equipped with 2–inch square operating nuts and mechanical joint ends when installed below grade. And may be hand wheel operated with flanged ends above grade.

e. No hand wheels shall be used in vaults.

f. Shall open counter–clockwise and shall be protected by a bonded epoxy coating inside and out conforming to the requirements of AWWA C–550 and listed on the EPA approved coating list.

g. Manufacturer's information on valve and coating will be submitted to Engineer prior to ordering.

2. 2"–3":

a. shall be non–rising stem, resilient seat wedge type with epoxy coated iron body and two (2) inch square operating nut.

b. Valve shall conform to the applicable requirements of AWWA C509 and ASTM A126 Class B with threaded ends and designed for 200 PSI working pressure.

3. Smaller than 2 Inches – Shall be all brass, ball valve type. The pressure rating shall be 175 p.s.i.

B. Valve Boxes – Valve boxes shall be cast–iron, heavy–duty roadway rated, screw type adjustable to six (6) inches up and down from the nominal required cover over the pipe.

1. Six (6) inch PVC C900 Pipe shall be used to extend valve boxes to grade.

2. Cast iron castings shall be manufactured of clean, even grain, gray cast iron conforming to ASTM A48, Class 20B.

3. Valve boxes shall have cast iron drop covers with the word "WATER" stamped on it.

4. Frame and cover to be centered over valves.

2.5 BUTTERFLY VALVES

A. All butterfly valves shall be of the tight–closing, rubber seated type, with rubber seat positively locking in place sealing against flow from either direction. No metal–to–metal seating surfaces will be permitted. Valves shall be bubble–tight at rated pressures with flow in either direction. Butterfly valves shall conform to ANSI/AWWA C504, Class 150B.

1. Valve body end connections for buried valves shall be installed using restrained joints.

2. Valve shafts shall be stainless steel and may consist of a one–piece unit or may be the "Stub Shaft" type. A stub shaft comprises two separate shafts inserted into the valve disc hubs. Each stub shaft shall be inserted into the valve disc hubs for a distance of at least 1–1/2 shaft diameters.

3. Valve discs shall be solid ductile iron with an epoxy coating making it corrosion resistant. The thickness of the discs shall not exceed 2–1/4 times the shaft diameter.

4. Valve seats shall be natural or synthetic rubber providing 360 degrees uninterrupted seating. The resilient seat shall be adjustable or replaceable in the field without burning or grinding. The seat shall be molded over a stainless steel ring for support and secured to the disc by corrosion resistant, self locking stainless steel screws.

5. All internal ferrous metal surfaces in the waterway shall be factory coated with a non–toxic, to–component, holiday–free, thermosetting epoxy to a nominal thickness of 4 mils.

6. All butterfly valves shall be manually operated. Operators shall be of the traveling nut, self–locking type and shall be designed to hold the valve in any intermediate position without creeping or fluttering. Operators shall be furnished with externally adjustable mechanical stop limiting devices. Valves shall have a 2 inch square operating nut and shall be installed with extension stem to extend the operating nut in accordance with the project details. The operator shall be integrally mounted on the valve mounting flange and shall have a gearing totally enclosed for buried service. Maximum force for operating nut shall be 40 pounds.

7. To be manufactured by Clow, Mueller, or Matco.

B. Valve Boxes – Underground valves shall be installed in approved valve boxes. The valve boxes shall have a suitable base that does not damage the pipe, and shaft extension sections to cover and protect the valve and permit easy access and operation. The cover, box, and any extensions needed shall be cast iron, and heavy duty rated pounds per linear foot. Valve boxes shall conform to the detail shown. To be manufactured by one of the approved manufacturers included in Appendix 2A.

2.6 WEIGHTED FLAP VALVES

A. The flap valve shall have a cast iron body and cover.

B. The seat and disc ring shall be bronze, and the hinge pin and cotter pins shall be stainless steel.

C. The valve shall be constructed with a 10-degree offset from vertical to ensure positive closure.

D. The weighted flap valve shall have a weight attached to the lid and allow for minor sensitivity adjustment.

E. The valve lid shall have a mechanical stop to ensure the lid cannot over rotate.

F. The flange shall be drilled using an ANSI 125# template.

G. All iron parts shall be coated in TNEMEC 2-part epoxy with 3-4 mils dry film thickness to prevent rusting or corrosion.

H. The valve shall be machined, assembled, and tested in the USA for quality assurance.

I. The manufacturer shall show proof of ISO 9001 certification.

J. Valve and accessories shall be manufactured by Troy Valve, Model A2540 or approved equal.

2.7 FIRE HYDRANTS

K. Fire hydrants:

1. Shall be of the compression type

2. Shall close with line pressure

3. Shall conform to AWWA C502

4. Fire hydrants shall have a minimum valve opening of five and one–fourth (5 ¼) inches with two and one–half (2 ½) inch hose nozzles and one four and one–half (4 ½) inch pumper nozzle.

5. Hydrants shall open left or counterclockwise.

6. The nozzle caps shall be securely chained to the hydrant barrel and be constructed of heavy–duty corrosion resistant material. Fire hydrants shall be fully bronze mounted. All nuts and bolts shall be 304 stainless steel.

7. All working parts, including the valve seat ring, shall be removable through the top of the hydrant without disturbing the barrel.

8. The operating threads shall be totally enclosed in an operating chamber separated from the hydrant barrel by a rubber o–ring stem seal and lubricated by a grease or oil reservoir.

9. The hydrant operating nut shall be pentagon shaped (5–sided) measuring one and one–half (1 ½) inches from point to flat. The inlet connection shall be six (6) inch mechanical joint type.

10. Fire hydrants shall be traffic type such that the barrel will break away from the standpipe at a point above grade to prevent damage to the barrel and stem.

11. Fire hydrants shall be of a non–freezing type design and shall be provided with a simple and positive automatic drain which will be fully closed whenever the main valve is opened.

12. All inside and outside portions of hydrant shall be coated in accordance with AWWA C–502. The exterior portion of hydrant above grade shall be factory primed and then painted with Alkyd Enamel approved by Owner. Color shall be red. The base shoe shall be painted with a minimum 4 mils thick epoxy and the lower barrel shall be asphaltic or epoxy coated.

13. To be manufactured by one of the approved manufacturers included in Appendix 2A.

2.8 SERVICE CONNECTIONS

A. Taps in pipe larger than 3 inches shall be made with a tapping machine. A corporation stop shall be installed at the connection to the main. The corporation stop shall be brass manufactured in conformance with AWWA C–800 and shall accommodate the full working pressure of the system. The inlet connection shall be AWWA standard iron pipe (IPT) thread. The outlet connection shall be compression type for polyethylene tubing.

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

1. Taps for services in PVC pipe 3 inches and smaller shall be equivalent to Romac Industries Style 306 Saddle or made with a PVC Tee. The connection shall be capable of withstanding internal water pressure continuously at 150 p.s.i. House service lines will be 1 inch polyethylene tubing with a curb stop at the property line. The end of the service lateral at the property line shall be marked with a 2 x 4 stake, 36 inches long with the top 6 inches above the ground and painted blue. The depth of the pipe shall be marked on the back of the stake. Location of service line must appear on the "as–built" information and record drawings.

2. The key and body seating surfaces shall be accurately machined and fit to a taper of 1–3/4–inches per foot. The stem and retaining nut shall be so designed that failure from overtightening of the retaining nut results in thread stripping rather than stem fracture

3. Where connections to larger service pipes are required, multiple taps shall be made and connected by branch. Taps for house services in PVC pipe

2–inches and smaller shall be equivalent to a Dresser Style 294 "Qwik Tap" or made with a PVC Tee. The connection shall be capable of withstanding internal water pressure continuously at 150 p.s.i. House service lines will be 1–inch polyethylene tubing with a curb stop at the property line. The end of the service lateral at the property line shall be marked with a 2 x 4 stake, 36–inches long with the top 6–inches above the ground and painted blue. The depth of the pipe shall be marked on the back of the stake. Location of service line must appear on the "as–built" information and record drawings.

4. Corporation stops are to be manufactured by one of the approved manufacturers included in Appendix 2A.

2.9 TAPPING SLEEVES

A. Tapping sleeves shall be used for live tap applications or where directed by the Engineer and approved by the Owner. Tapping sleeves shall be stainless steel wrap around type conforming to ASTM A126 and shall accommodate the full working pressure of the system.

B. Tapping valves shall meet the requirements of gate valves included in this section. Tapping valves shall be flanged on one end for connection to the tapping saddle and mechanical joint on the other end. MJ tapping saddles and valves shall be used where the main to be tapped is not level so that the valve operator may be installed in a vertical position.

C. Tapping sleeves to be manufactured by JCM, or Smith–Blair.

2.10 CURB STOPS

A. Curb stops shall be ball valve type conforming to AWWA C800. Curb stops shall be made of brass conforming to AWWA C800, ASTM B62 and/or ASTM B584 and shall accommodate the full working pressure of the system. Service line connections shall be compression type for polyethylene tubing. Curb stops to be manufactured by Mueller, or Ford.

2.11 BACKFLOW PREVENTER ASSEMBLY

A. Reduced Pressure – The RPZ shall consist of an internal pressure differential relief valve located in a zone between two positive seating check modules with captured springs and silicone seat discs. Seats and seat discs shall be replaceable in both check modules and the relief valve. There shall be no threads or screws in the waterway exposed to line fluids. Service of all internal components shall be through a single access cover secured with stainless steel bolts. The assembly shall also include two resilient seated isolation valves, four resilient seated test cocks and an air gap drain fitting. The assembly shall meet the requirements of USC Manual 8th Edition, ASSE Std. 1013, AWWA C511, IAPMO File No. 1563 and CSA B64.4.

B. Double Check – The backflow preventer shall feature modular check assemblies with center stem guiding. Each check module shall have a captured spring and be accessible through a bolted cover plate. Seats shall be replaceable without

special tools. The device shall be completely factory assembled and include, in addition to the check modules, tight closing resilient seated shut off valves, test cocks and strainer. The assembly shall meet the requirements of USC Manual 8th Edition, ASSE No. 1015, AWWA C510, CSA B64.5, IAPMO PA31 and UL Classified File No. EX3185.

C. Backflow prevention devices to be manufactured by Watts, Hersey, or Febco.

2.12 METAL DETECTOR TAPE

A. Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. The tape shall be safety blue in color, shall be at least two and half (2–1/2) inches wide and will bear the printed identification "CAUTION: BURIED WATER LINE BELOW".

B. To be manufactured by one of the approved manufacturers included in Appendix 2A.

2.13 TRACER WIRE

A. Tracer wire shall be #10 AWG High–Strength Copper Clad Steel (HS–CCS) Conductor, insulated with 30 mil High Density Polyethylene (HDPE) Insulation, and rated for direct burial, temperature range –20° C to 60° C, 600 Volts RMS. Insulation color shall meet APWA color code standards for identification of buried utilities. Tracer wire to be manufactured by Copperhead, on Apex.

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

2.14 AIR RELEASE, AIR/VACUUM, AND COMBINATION AIR VALVES

A. Combination air release valves shall be two (2) inch inlet, stainless steel internal trim, including float, lever arm, leakage, etc., stainless steel assembly bolts, backwash accessories, quick disconnects, and ball valves. Body shall be 316 S.S., iron, or steel with fusion bonded epoxy (12 mil minimum) or ceramic coating.

B. The valve shall be manufactured by A.R.I, APCO, or approved equivalent.

C. The valve shall be designed for a maximum pressure of 200 psi with venting capacity of 20 CFM.

2.15 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement shall be used on all ductile iron pipe and shall be in tube conforming to the requirements or ANSI/AWWA C105/A21.5 latest revision. The polyethylene film shall have the following characteristics:

Tensile Strength:	3,600 psi minimum
Elongation:	700 percent minimum
Dielectric Strength:	800V/mil thickness minimum
Thickness:	Nominal thickness of 0.009 inch (8mil)

To be manufactured by one of the approved manufacturers included in Appendix 2A.

2.16 PRESSURE TRANSMITTER

A. Pressure transmitter shall be Rosemount Model 3051T (in line) unit or Engineer and Owner approved equivalent. Shall come with NSF drinking water certification.

2.17 PRESSURE GAUGE

A. Gauge shall be furnished and installed complete with 1/2" stainless steel nipples, impulse dampener, needle valve and other components required for a successful operation.

B. Compound gauge to have stainless steel movement with bushings and sector gear, stainless steel Bourdontube, 4Ø" diameter dial with white background and black lines and figures, heavy flat glass, and a non–corrosive cast aluminum case. Range shall be –30 to 200 psi. Accuracy shall be within 1%. The unit shall be glycerin filled.

2.18 CHECK VALVE

A. All check valves shall be silent check valves. They shall be globe type. Silent check valve shall be designed with semi–steel bodies, bronze seat, bronze plug and stainless steel spring, for a 125 lb. ANSI flange rating. Check valve shall be of non–slam or silent type, of such design that the closing action is controlled by a conical (or helical) spring which telescopes within itself and so designed to return disc to seat at aero velocity or before reversal of flow takes place on the pipeline. Silent check valves shall be equivalent to valve manufactured by Empire or Valmatic.

1. Globe Valves 2 inches and smaller shall be bronze with rising stems and screwed bonnets. Valves shall be designed to permit prepacking under pressure when fully opened.

B. Other check valves shall be swing check valves. They shall have iron bodies and be bronze mounted designed for a water working pressure of 200 psi for sizes 2"-12" and 150 psi for valves larger than 12". They shall be operated by outside level and weight.

2.19 WALL CASTINGS

A. The Engineer and Owner shall approve all fittings having non–standard dimensions and cast specifically for a particular project. Such fittings shall meet the requirements of the same standards listed in paragraph 2.3 and shall have the same diameter and thickness as standard fittings. Laying lengths and types of ends shall be determined by the particular application and the piping to which they connect.

B. Wall castings shall be as indicated on the drawings. Flanges shall be faced and drilled to 125–pound ANSI Standards. Flanges shall be tapped for studs. Wall Castings for lines conveying liquids shall be coated in the interior with only coal–

tar pitch varnish in the same manner as specified herein for the pipe. Wall castings and wall sleeves shall be provided with wall collars.

C. Wall collars shall be used in locations where the pipes enter the walls above ground and where indicated on the drawings.

D. All castings and wall sleeves shall be manufactured by Clow, American Cast Iron Pipe Company, McWane or approved equal.

2.20 FLEXIBLE COUPLINGS

A. Shall be installed as indicated in the plans. They shall consist of a cylindrical steel ring, two (2) steel follower rings, two (2) resilient gaskets, and at least six (6) high strength steel track head bolts. Expansion joints shall be hypalon, neoprene or chlorobutyl construction, pressure and vacuum type.

2.21 FLEXIBLE EXPANSION JOINTS

A. Shall be rated for a 350 p.s.i. working pressure and constructed of ductile–iron conforming to the material properties of ANSI/AWWA C153/A21.53. All flexible expansion joints shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum of 150 deflection per ball and a 4" minimum expansion.

2.22 HANGERS AND SUPPORTS

A. All piping shall be supported in such a manner to eliminate all undue stresses or strains to pumps or other equipment or piping to which it is connected.

B. Pipe hangers shall be manufactured by Crawford, Grinnell, Blaw–Know or approved equal. Hangers for pipe sizes 2–inches and smaller shall be adjustable swivel solid ring or split ring type and for sizes 2–inches and larger shall be adjustable wrought clevis type. Hanger spacing and rod dimensions shall be in conformance with the following

Pipe Size	Maximum Spacing	Minimum Rod Diameter
Up to 1"	6'	3/8"
1–1/4"	6'	3/8"
1–1/2", 2"	6'	3/8"
2–1/2"	7'	1/2"
3"	8'	1/2"
4" & 5"	8'	5/8"
6"	9'	3/4"
8" & 12"	9'	7/8"

Pipe Size	Maximum Spacing	Minimum Rod Diameter
Over 12"	9'	1"

C. Support spacing for PVC pipe shall be in strict accordance with the pipe manufacturers recommendations. Hangers or copper tubing shall be copper plated. Each length of cast iron pipe shall have at least one hanger or support.

D. All necessary supports, anchors, guides, and miscellaneous steel such as angles, channels, rods, etc., hangers, wall brackets, riser clamps, beam clamps, concrete inserts, rollers, saddles, and other incidental devices are to be provided.

E. Exposed piping shall be braced horizontally by angle irons anchored to the wall, where span exceeds 18 feet below elbows or tees.

F. Concrete piers shall support base elbows and piping near floors, using a minimum of one pier per pipe length, as approved by the Engineer.

2.24 MANHOLES

A. Precast Concrete – Shall be reinforced concrete constructed in accordance with C478 at minimum and be provided with "O" ring gasket type joints, conforming to ASTM Designation C443–77, or flexible joint sealant roping of butyl rubber conforming to Federal Specification SS–S–210A, AASHTO M–198, Type B–Butyl Rubber with a minimum cross section of 1 ¼ inches the details shown on the plans and shall be:

1. Constructed where valve operating nuts are centered on manhole opening

2. constructed using a top section cast monolithically and shaped as an eccentric cone, or for manhole depths five (5) feet or less be a concentric cone, joint systems must match associated riser or base sections; the clear opening for the manhole frame & cover shall not be less than thirty two (32) inches in diameter.

3. constructed using riser sections cast monolithically having a minimum lay length of sixteen (16) inches and of joint systems matching associated base and cone sections;

4. steps, on the vertical or straight wall of four (4) foot and five(5) foot diameter manholes shall be aligned vertically on sixteen (16) inch centers, secured to the wall with a compression fit in tapered holes or cast in place, coated with a copolymer polypropylene plastic coating, reinforced with one–half (½) inch diameter grade 60 bar with serrated treads and tall end lugs; step pullout strength shall be 2000 lbs. minimum when tested according to ASTM C497; steps shall begin no less than eighteen (18) inches from the manhole rim and end no closer than sixteen (16) inches above the manhole bench;

a. steps shall not be used on manholes greater than five (5) foot in diameter or where a concentric cone or flat–slab top is the final section;

5. lifting devices for handling precast manhole section components shall comply with OSHA Standard 1926.704

6. manhole entrance couplings with the entry pipes greater than eighteen (18) inch in diameter shall be fitted with pipe entrance connectors conforming to ASTM C923, and for eighteen (18) inch pipes and smaller to ASTM C–425 using neoprene boot inserts tightened to the pipe using a stainless steel adjustable band, ("A–Loc" or approved equal), rigid cement or synthetic type grout collars are not acceptable as a seal between the manhole and entry pipe in new construction.

B. Frames and Covers – Shall be cast iron equivalent to the following:

Neenah Foundry Co. R–1668 Type "C" Lid

2.25 SAMPLING SPIGOT

A. Shall be stainless steel, plain outlet, with 3/4–inch female thread and stainless steel ball valve. To be NSF 61.

2.29 CASING

A. Casing pipe shall be steel conforming to ASTM A 139, yield point of 35,000 psi, of the diameter shown on the contract drawings for each crossing. Wall thicknesses shall meet the requirements of the American Railway Engineering Association Manual of Recommended Practice or the Georgia (GDOT) Standard Specifications. Pipe lengths shorter than eight (8) feet long may not be used.

2.30 CASING SPACERS

A. Casing spacers shall be a two–piece shell per carrier pipe and made from T–304 stainless steel of a minimum 14 gauge thickness. Each shell section shall be lined with a 0.090" thick, ribbed PVC extrusion with a retaining section that overlaps the edges of the shell and prevents slippage. Bearing surfaces (runners) shall be ultra high molecular weight polyethylene to provide abrasion resistance and a low coefficient of friction. The runners shall be attached to support structures (risers) at appropriate positions to properly support the carrier pipe within the casing pipe. The runners shall be mechanically bolted to the riser. Risers shall be made of T–304 stainless steel of a minimum 10 gauge. All risers shall be MIG welded to the shell. Bottom risers six (6) inches and over in height shall be reinforced. All reinforcing plates shall be 10 gauge T–304 stainless steel and shall be MIG welded to mating parts. All nuts, bolts and washers shall be 304 stainless steel. To be manufactured by one of the approved manufacturers included in Appendix 2A.

2.32 ALTITUDE VALVE

A. Altitude valve shall be one–way with solenoid override.

B. Altitude control is a spring loaded, 3–way diaphragm actuated control that senses pressure in the reservoir. When reservoir pressure (liquid level) is lower than the set point of control, ports "1" and "D" are interconnected. Altitude control adjustment: Turn the spring adjusting nut clockwise to increase the liquid level shutoff point; counterclockwise to decrease the liquid level shutoff point. Shall be CLA–VAL or equivalent per description below.

a. 12" CLA–VAL 210–hf single acting altitude and solenoid shut–off valve
b. 100–01 main valve
c. epoxy coating
d. Inlet/outlet pressure gauges
e. CSM11–A2–2 solenoid control
f. Body and Cover: Ductile Iron ASTM A536
g. Main Valve Trim: Stainless Steel
h. Seat: Stainless Steel
i. Stem, Nut, and Spring: Stainless Steel
j. Seal Disc: Bruna–N ® Rubber
k. Diaphragm: Nylon Reinforced Buna–N® Rubber
l. Internal Trim Parts: Stainless Steel

C. Contractor shall provide a repair kit inclusive of (at a minimum):

a. Diaphragm
b. Disc Assembly
c. O-Rings
d. Gaskets

2.33 PRODUCT REVIEW

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

PART 3 – EXECUTION

3.1 ON–SITE OBSERVATION

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

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

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

3.2 INSTALLATION

A. Ductile iron pipe shall be laid in accordance with AWWA C–600; Plastic pipe shall be laid in accordance with AWWA C 605, ASTM D 2774, UNI–Bell UNI–B 3, and the pipe manufacturer's recommendations. The standards are supplemented as follows:

1. Depth of Pipe – Contractor shall perform excavation of whatever substances are encountered to be depth providing a minimum 36–inches cover over top of pipe from the existing or proposed finished grade, unless pipe material is steel, concrete, ductile iron, or other accepted material, and if exposed should be insulated to prevent freezing.

2. Alignment and Grade – Water mains shall be laid and maintained to lines and grades established by the plans and specifications, with fittings, valves, and hydrants at required locations unless otherwise accepted by Owner. Valve–operating stems shall be oriented in a manner to allow proper operation. Hydrants shall be installed plumb.

   a. Prior Investigation – Prior to excavation, investigation shall be made to the extent necessary to determine location of existing underground structures, utilities, and conflicts. Care shall be exercised by the Contractor during excavation to avoid damage to existing structures and utilities. Pipe manufacturer's recommendations shall be used when the watermain being installed is adjacent to a facility cathodically protected.

   b. Unforeseen Obstructions – When obstructions not shown on plans are encountered during progress of work and interfere so a change of the plans is required, Engineer will revise plans, or order a deviation in line and grade, or arrange for removal, relocation, or reconstruction of obstructions.

   c. Clearance – When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the acceptance of Engineer, to provide clearance as required by federal, state, and local regulations or as deemed necessary by Engineer to prevent future damage or contamination.

3. Trench Construction – The trench shall be excavated to alignment, depth, and width specified or shown on plans and shall be in conformance with all federal, state, and local regulations for protection of workers.

4. Joint Restraint – All bends, plugs, valves, caps and tees on 2–inches pipe and larger, shall be provided with stainless steel tie rods or joint restraints

equivalent to Megalugs by EBAA. Additional restraint shall be as indicated on the drawings.

5. Anchorage for Hydrants – A concrete block 1 foot x 1 foot x 2 feet shall be poured between back of hydrant and undisturbed earth of the trench side without covering weep holes and bolts. Joint restraints equivalent to Megalugs manufactured by EBAA Iron may be used in lieu of concrete blocking.

6. Hydrostatic and Leakage Tests – Ductile iron pipe shall be tested in accordance with AWWA Standard C 600, Section 5.2 – Hydrostatic Testing. Allowable leakage shall not exceed the formula $L = SDP^{1/2}/148{,}000$, in which L is allowable leakage in gallons per hour; S is length of pipe in feet tested; D is nominal diameter of the pipe in inches; and P is average test pressure during leakage test in pounds per square inch gauge. Test shall be conducted for at least 2 hours and a pressure of 150 p.s.i. shall be maintained during the test. Fire lines shall be tested at 225 p.s.i. for the same duration.
   P.V.C. pipe shall be tested in accordance with AWWA Standard C 605, Section 7.3 – Hydrostatic Testing. Allowable leakage shall not exceed the formula $Q = LDP^{1/2}/148{,}000$, in which Q is allowable leakage in gallons per hour; L is length of pipe in feet tested; D is nominal diameter of the pipe in inches; and P is average test pressure during leakage test in pounds per square inch gauge. Test shall be conducted for at least 2–hours and a pressure of 150 p.s.i. shall be maintained during the test. Fire lines shall be tested at 225 p.s.i. for the same duration.
   Should any test of pipe laid disclose leakage greater than the above specified, Contractor shall at its own expense, locate and repair defective joints until leakage is within specified allowance. Contractor is responsible for notifying the Engineer 48 hours (minimum) prior to applying pressure for testing. Pressure test will be witnessed by the Engineer or Project Representative. All visible leaks shall be repaired regardless of the leakage amount.

7. Bedding, Backfilling and Compaction – Continuous and uniform bedding shall be provided for all buried pipe. All trenches and excavation shall be backfilled immediately after pipes are laid therein, unless other protection of the pipe line is directed. The backfilling material shall be selected and deposited with special reference to future safety of pipes. The material shall be completely void of rocks, stones, bricks, roots, sticks, or any other debris causing damage to pipe and tubing or preventing proper compaction of backfill. Except where special methods of bedding and tamping are provided for, clean earth or sand shall be solidly tamped about pipe up to a level at least 2 feet above top of pipes, and shall be carefully deposited to uniform layers, each layer solidly tamped or rammed with proper tools to not injure or disturb the pipeline. The remainder of trench backfilling shall be carried on simultaneously on both sides of pipe in such manner preventing injurious side pressure. Material used shall be selected from excavations anywhere on site if any of the soil is suitable.
   Under traffic areas, the top 24 inches of backfill material shall be compacted to a density of not less than 98% of maximum laboratory

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

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

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

8. New Service Connections – Contractor shall coordinate with the JWSC, and the JWSC shall tap the main and install a service connection to each lot or as directed by Engineer in accordance with details shown on plans for Water Service Connections. Plastic tubing for service lines shall be installed in a manner preventing abrupt changes or bends in any direction. Contractor shall exercise extreme caution to prevent crimping of the tubing during handling, storage, and installation. Tubing shall have an absolute positive connection to the water main to prevent leakage. Taps shall be made perpendicular to the main. A water service connection shall be marked on the curb with a "W." The mark shall be made with a branding iron on vertical face of curb and shall be a minimum of 1/4 inch in depth.

9. Detection Tape – Detection tape will be used over all pipe and tubing. The tape shall be laid 18 inches below finished grade.

10. Tracer Wire – Tracer wire will be installed on all water mains and water service laterals directly on top of the pipe. The wire shall be secured to the pipe with tape or other acceptable methods at spacings of no more than 36 inches apart. Where water service laterals connect to water mains, the wire connection shall be made with a direct bury moisture resistant connector. Installation of connector shall be per manufacturer's instructions. The insulated wire must maintain electrical continuity. The tracer wire shall also be stubbed up into each valve box and at each fire hydrant. Stub up connections shall be installed as previously described for water service laterals. This tracer wire system shall be checked and tested by Contractor, in the presence of Engineer or water department, prior to acceptance of water main installation. All equipment, meters, detectors, etc., needed for testing shall be furnished by the Contractor.

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

12. Polyethylene Encasement – Polyethylene encasement shall be used on all ductile iron piping, fittings, valves and appurtenances and installed according to the requirements of ANSI/AWWA C105/A21.5, Sec. 5.4, Method A.

3.3 IDENTIFICATION

B. Contractor is to label all pipes, valves, and fittings for identification purposes. Equipment shall be supplied with pipe labels, color coding, banding, flow arrows, equipment numbers, valve tags.

3.4 HYDRANTS

A. Valves shall be installed at all high points in the water main and in locations as shown on the contract drawings. The Contractor shall verify high points in the water line and notify Engineer of differing conditions from the drawings. If the location of proposed hydrants as indicated on the water main extension plans are found to not be at a high point in the system, Contractor shall notify Engineer/Owner and Engineer may direct the Contractor to not install the hydrant at such location.

B. Hydrants shall be opened during initial filling of the water main. Valves shall be closed during hydrostatic testing.

3.5 CONNECTIONS OF WATER MAINS

A. Any physical connection of untested water mains with existing water mains is prohibited except when acceptable backflow prevention devices have been installed and checked by Engineer or Engineer's Representative.

1. Any new water main to be tested must be capped and restrained with retaining glands or thrust blocks to prevent blow out or leakage during the pressure testing.

2. Water for filling or flushing a new water main will be obtained through a Temporary Jumper Connection to the existing main. Appropriate taps of sufficient size must be made at the end of new system to allow air to escape during filling sequence.

3. This physical tie–in with the existing system must be physically disconnected after sufficient water for hydrostatic testing and disinfection has been obtained.

4. Once the new water system has demonstrated adequate hydrostatic testing and has been flushed and chlorinated in accordance with paragraph 3.5, the new system or main will then be subjected to bacteriological testing.

5. Permanent connection to the new system must be made with clean materials. The connection may be made with either solid or split ductile

iron sleeves. Any connection with stainless steel or similar metal full circle clamps is prohibited. Once connection has been made, the new system must be flushed using water from existing system to insure adequate flow and velocity into new water system.

3.6 DISINFECTION

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

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

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

3.7 PARTIAL ACCEPTANCE OF THE WORK

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

3.8 SEPARATION BETWEEN WATER AND SANITARY SEWER

A. Parallel Installation:

1. Water mains shall be laid at least 10 feet horizontally from any existing or proposed sanitary sewer, force main, septic tank, subsoil treatment, storm sewer, or sewer manhole. The distance shall be measured edge–to–edge.

2. When conditions prevent a horizontal separation of 10 feet, the water main may be laid closer to a sewer (on a case–by–case basis) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation where the bottom of the water main is at least 18 inches above the top of the sewer. The sewer shall be constructed of materials and with joints equivalent to

water main standards of construction and be pressure tested to assure water–tightness prior to backfilling.

B. Crossing:

1. Water mains crossing house sewers, storm sewers, or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. At the crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.

2. When conditions prevent a vertical separation of 18 inches, the sewer passing over or under water mains shall be constructed of materials and with joints equivalent to water main standards of construction and shall be pressure tested to assure water–tightness prior to backfilling.

3. When water mains cross under sewers, additional measures shall be taken by providing:

   a. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main;

   b. Adequate structural support for the sewers to prevent excessive deflection of joints settling on and breaking the water mains;

   c. The length of water pipe be centered at the point of crossing so the joints will be equidistant and as far as possible from the sewer; and

   d. Both the sewer and water main shall be constructed of water main materials extending on each side of the crossing until at least 10 feet separates the two pipes and subjected to hydrostatic tests, as prescribed in this document. Other options that may be considered are as follows:

      i. Encasement of the water pipe or sewer in a carrier pipe constructed of water main materials, extending on each side of the crossing until at least 10 feet separates the two pipes.

      ii. The sewer has a structural lining that meets ASTM F1216 extending on each side of the crossing until at least 10 feet separates the two pipes.

4. Maximum obtainable separation of reclaimed water lines and potable water lines shall be practiced. A minimum horizontal separation of three (3) feet (outside of pipe to outside of pipe) shall be maintained between reclaimed water lines and either potable water mains or sewage collection lines. A minimum of 18 inches shall be provided between the bottom of any potable water supply line and the top of the reuse line.

3.9 REMOVE AND REPLACE PAVEMENT

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

See section 32 00 00 for replacement of pavement.

3.10 FIELD QUALITY CONTROL

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

The minimum number of tests required shall be:

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

Backfill over pipe
in non–traffic areas. . . . .1 per 500 linear feet or less for each 4 feet of depth or portion thereof.

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

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

In non–traffic Areas. . . . . 90% or 95% of maximum laboratory density, unless otherwise accepted by the Engineer.

END OF SECTION

STANDARDS
FOR
WATER AND SEWER
DESIGN AND CONSTRUCTION

February 2012

Revised November 2023

Planning and Construction Division
700 Gloucester Street, Suite 300, Brunswick, Georgia 31520

APPENDIX 2A

WATER DISTRIBUTION SYSTEM
ACCEPTABLE PRODUCTS & MANUFACTURERS

PARAGRAPH	PRODUCT	MANUFACTURERS
	Potable Water Pipe	
	Ductile Iron Pipe	American Cast Iron Pipe Company U.S, Pipe and Foundry Clow McWane Ductile Griffin Pipe
	Polyvinyl Chloride (PVC) Pipe	J.M. Eagle Blue Brute Diamond Plastics Corporation North American Pipe Corporation National Pipe and Plastics Vulcan U.S. Plastic Corp.
	Polyethylene Tubing	Charter ADS
	High Density Polyethylene (HDPE) Pipe	Performance J.M. Eagle Lamson WL Plastics Integrity Fusion
	Steel Casing Pipe	Pittsburg Pipe Arntzen Pipe United-Steel
	Fittings	
	Ductile Iron	American Cast Iron Pipe Company U.S, Pipe and Foundry Clow McWane Star Pipe Sigma Corporation
	PVC	J.M. Eagle Blue Brute Diamond Plastics Corporation North American Pipe Corporation National Pipe and Plastics Vulcan
	Joints	
	Mechanical Joint Restraints	American Cast Iron Pipe Company U.S, Pipe and Foundry Clow McWane Star Pipe Sigma Corporation EBAA Iron Sales
	Harness (Bell) Restraints	American Cast Iron Pipe Company U.S, Pipe and Foundry Clow McWane Star Pipe Sigma Corporation EBAA Iron Sales

	Valves and Appurtenances	
	Gate Valves (4" and Larger)	Clow/Mueller/Kennedy
	Gate Valves (2")	Matco Mueller
	Fire Hydrants	Clow Medallion Mueller Super Centurion
	Valve Boxes	Star Sigma
	Tapping Sleeves	JCM Smith-Blair
	Water Services and Appurtenances	
	Corporation Stops	Mueller Ford
	Curb Stops	Mueller Ford
	Double Strapped Tapping Saddles	JCM Ford Smith-Blair
	Meter Boxes (Residential)	Pentair
	Meter Boxes (1-1/2" and 2" Meters)	Pentair
	Backflow Prevention Devices	
	Double Check Valve (DCV) Assemblies	Watts Hersey Febco Wilkins
	Reduced Pressure Zone (RPZ) Assemblies	Watts Hersey Febco Wilkins
	Miscellaneous Items	
	Detection Tape	Omega Pro-Line Signaltape
	Tracer Wire	Copperhead Apex
	Polyethylene Wrap	Trumbull
	Casing Spacers	BWM Cascade
	End Seals	BWM Cascade

Note:

Where no manufacturer is listed for a particular item of material or equipment, the contractor may select the manufacturer provided that all requirements of these standards for that particular item of material or equipment are met. Submittals of such items are required.

WASTEWATER COLLECTION- GRAVITY SEWER
ACCEPTABLE MANUFACTURERS

PARAGRAPH	PRODUCT	MANUFACTURERS
	Material Specifications	
	PVC 1120, Class 160, SDR 26 *PVC 1120, Pressure Class (PC) 235*	Vulcan Plastics JM Eagle
	SDR 26 Gasketed Fittings	Multi-Fittings GPK Products Plastic Trends
	PVC 1120, Class 118, SDR 35	Vulcan Plastics JM Eagle
	SDR 35 Gasketed Fittings	Multi-Fittings GPK Products Plastic Trends
	No Hub Fittings	Fernco LDR
	PVC 1120, Class 150, DR 18	Vulcan Plastics JM Eagle
	DR 18 Sewer Safe Mechanical Joint Fittings	Star Pipe Sigma Corp.
	Ductile Iron Pipe	Griffin Pipe US Pipe
	Ductile Iron Pipe Sewer Safe Mechanical Joint Fittings	Star Pipe Sigma Corp.
	High Density Polyethylene (HDPE) Pipe	Performance Pipe JM Eagle Lamson & Sessions
	Fusible Polyvinyl Chloride (PVC) Pipe	Underground Solutions Inc. (ONLY MANUFACTURE)
	Sewer Safe Coupling	HyMax Star Pipe Sigma Corp.
	Manhole Structures	
	Precast Concrete Manholes	Hanson Pipe and Precast MegaCast MST Concrete Products
	Fiberglass Manholes	L.F. Manufacturing, Inc.
	Manhole Frame and Covers	U.S. Foundry and Manufacturing
	Sewer Manholes	
	Grade Rings	Sealing Systems, Inc. Custom Concrete LadTech System
	Concrete Corrosion Protection	
	Moderate Risk Corrosion Protection	Raven Epoxy 405 EpoxyTec CPP
	High Risk Corrosion Protection	IMERYS SewperCoat Madewell Mainstay GML Green Monster Structural

	Significant Risk Corrosion Protection	IMERYS SewperCoat Vortex AluminaLiner GML Green Monster Extreme

Note:

Where no manufacturer is listed for a particular item of material or equipment, the contractor may select the manufacturer provided that all requirements of these standards for that particular item of material or equipment are met. Submittals of such items are required.

WASTEWATER COLLECTION – PUMP STATION AND FORCE MAIN
ACCEPTABLE MANUFACTURERS

PARAGRAPH	PRODUCT	MANUFACTURERS
	Site Requirements	
	Bypass Pumping Connection Cam Lock	Dixon OPW
	Bypass Piping *PVC 1120, Class 150, DR 18*	Vulcan Plastics JM Eagle
	DR 18 Sewer Safe Mechanical Joint Fittings	Star Pipe Sigma Corp.
	Bypass Piping *Ductile Iron Pipe*	Griffin Pipe US Pipe
	Ductile Iron Pipe Sewer Safe Mechanical Joint Fittings	Star Pipe Sigma Corp.
	Wet Well & Vault Access	
	Access Hatches	U.S. Foundry
	Wetwell & Vault Structures	
	Precast Concrete Structures *Fiberglass Structures* *High Density Polyethylene (HDPE)*	MST Inc. Hanson Pipe and Precast Mega Cast Old Castle Xerxes L.F.M. manufacturing Thompson Pipe Group Flowtite ISCO Manufacturing Consolidated Pipe Supply- Custom
	Wet Well and Discharge Header Piping	
	Interior Piping High density Polyethylene (HDPE) Pipe	Performance Pipe JM Eagle Lamson & Sessions
	Interior Piping Class 53 Flange by Flange Ductile Iron Pipe	Star Pipe Sigma Corp.
	Exterior Piping Class 53 Flange by Flange Ductile Iron Pipe	Griffin Pipe US Pipe
	Exterior Pipe Fittings Flange by Flange	Star Pipe Sigma Corp.
	Valves and Appurtenances	
	Isolation (Plug) Valves	Mueller Dezurik
	Check Valves	Clow
	Air Release Valve	A.R.I.
	Discharge Gauge Fittings	
	Pumping Station	
	Submersible Pumps	Flygt KSB Ebarra Wilo
	Grinder Pumps	Flygt KSB Ebarra Wilo
	Suction Lift	Gorman-Rupp

	Electrical Equipment and Controls	
	Enclosure	Saginaw Hoffman Hammond APX Flygt Bison
	Motor Starters *Variable Frequency Drives*	Danfoss (preferred) ABB Square D Yasakawa ITT Toshiba
	Circuit Breakers	Square D GE Cutler Hammer Westinghouse
	Audible Alarm	Federal Signal
	Alarm Light	Federal Signal
	GFI Receptacles	ISO GE Morris Levite
	Generator Receptacles	Crouse Hinds
	Manual Transfer Switch	ABB TruOne (preferred) Square D GE Westinghouse
	Hand Off Auto Switches	Cutler Hammer Square D
	Power Monitor	Diversified Electronics
	Relays	NTE Allen Bradley AA Electric Idec
	Lighting Arrestors	Square D ASCO Ditek Delta
	Elapsed Time Meter	ENG Yokogawa
	Level Controls	Roto Float Blue Ribbon Keller ITT
	Transformers	Hammond GE Square D Warrick ACME
PARAGRAPH	**PRODUCT**	**MANUFACTURERS**
	Remote Terminal Unit	
	RTU (SCADA)	Electric Machine Control, Inc.

	Low Flow Station (Only) RTU System	
	RTU (SCADA)	Electric Machine Control, Inc.
	On-Site Standby Generators & Automatic Transfer Controls	
	Standby Generators	Cummins Onan Caterpillar
	Engine-Generator Controls	Cummins Onan Caterpillar
	Auto Transfer Switches	ABB TruOne GE ASCO Onan Caterpillar
	Force Main Materials	
	SDR 21 Class 200 PVC Pipe *AWWA C-900/C-905 DR-18*	J.M. Eagle Blue Brute Diamond Plastics Corporation North American Pipe Corporation National Pipe and Plastics Vulcan U.S. Plastic Corp.
	DR 11 (HDPE) Pipe High Density Polyethylene	Performance Pipe J.M. Eagle Lamson
	Interior Coated CL52 Ductile Iron Pipe	American Cast Iron Pipe Company U.S, Pipe and Foundry Clow McWane Ductile Griffin Pipe
	Sewer Safe Mechanical Joint Fittings	American Cast Iron Pipe Company U.S, Pipe and Foundry Clow McWane Star Pipe Sigma Corporation EBAA Iron Sales
	Sewer Safe Coupling	Mueller Hymax USA Star Pipe Sigma Corporation
	Isolation (Plug) Valves *Air Release Valves*	Clow Mueller A.R.I.
	Miscellaneous Items	
	Detection Tape	Omega Pro-Line Signaltape
	Tracer Wire	Copperhead Apex

Note:

Where no manufacturer is listed for a particular item of material or equipment, the contractor may select the manufacturer provided that all requirements of these standards for that particular item of material or equipment are met. Submittals of such items are required.

GREASE INTERCEPTORS, OIL AND SAND INTERCEPTORS
ACCEPTABLE MANUFACTURERS

PARAGRAPH	PRODUCT	MANUFACTURERS
	Precast Concrete	
	Precast Concrete Tanks	- Oldcastle - AAA Precast
	Pre-engineered Interceptors	
	Pre-engineered grease interceptors (poly)	- Ashland - Endura - Schier
	Pre-engineered grit and sand separators - *Art room sink* - *Dental/Medical plaster casting* - *Sink to which any soil, grit, debris, etc. will be discharged.* - *Mud room drain* - *Washdown facility*	- Gleco Trap GT-19, GT-64, GT-32-C, GT-43-C, GT-128-C - Zurn Z-1180 Z-1181 Solids Interceptor (sized by the number and size of the sinks being served). - Zurn Z-1187 Sand & Sediment Interceptor - Zurn Z-1187-SI Sand Interceptor - Jay R Smith 8811 Sand Interceptor - Jay R Smith 8817 Sand & Sediment Interceptor
	Pre-engineered hair and lint traps - *Shampoo bowl in hair salon* - *Pet grooming sink* - *Residential grade washing machine used in commercial building.* - *Commercial grade washing machine.*	- Marble Products No. 1701 “Catch-all” Hair Trap - Petlift Plastic Pet Hair Trap (PL5000) - Petlift Zurn Hair Trap Model 650 - Petlift Plastic Hair Trap Model 600 - Filtrol 160 Lint Trap - Zurn Z-1185 Lint Interceptor - Jay R Smith 8910 Lint Interceptor

***** Applicant to provide data to verify correct sizing and application per manufacture’s recommendations**.** No carbon steel (only stainless steel) or fiberglass tank/interceptors allowed.

INDEX TO

SECTION 33 16 13 – COMPOSITE ELEVATED WATER STORAGE TANK

PART 1 – GENERAL

SECTION 33 16 13

COMPOSITE ELEVATED WATER STORAGE TANK

PART 1 – GENERAL

1.1 DESCRIPTION

1. SCOPE OF WORK:

   The work to be performed under these specifications includes furnishing all labor, materials, tools, and equipment necessary to design, fabricate, construct, inspect and test a welded steel elevated water storage tank supported on a concrete support structure, including the foundation and accessories as shown on the drawings and specified herein.

   The work shall also include all labor, materials, and equipment necessary to clean, paint and disinfect the water storage tank as specified herein.

2. RELATED WORK:

   The work shall also include all labor, materials and equipment necessary to construct the site improvements and site piping as shown on the drawings and specified herein.

3. DESCRIPTION:

   The tank and support structure shall be the composite elevated tank style as designed and constructed by the Contractor/Tank Manufacturer. The tank shall be of all welded steel design and have a dome roof, straight sides and a cone bottom. The support structure shall be of concrete design. The concrete support structure shall be configured so that a concrete tank floor with a steel liner plate supports the water inside the steel reservoir. Suspended steel tank floor configurations will not be allowed. Geo-piers will not be an acceptable foundation design.

1.2 PRE–QUALIFICATION OF CONTRACTOR

Bids will only be accepted from experienced contractors who have successfully completed at least ten composite elevated tanks of equal or greater capacity in the last five years. Each bidder shall provide a list of at least ten such projects stating location, completion date, contact names and telephone numbers.

The composite elevated tank design, concrete support structure construction and welded steel tank fabrication and construction shall be performed by the Contractor and shall not be subcontracted. The foundation shall be installed by the Contractor or his onsite foundation subcontractor.

1.3 STANDARDS, CODES AND GUIDES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only, and the latest revision of each shall apply.

ACI 117	Standard Tolerances for Concrete Construction Materials
ACI 301	Standard Specifications for Structural Concrete
ACI 305	Hot Weather Concreting
ACI 306	Cold Weather Concreting
ACI 318	Building Code Requirements for Structural Concrete
ACI 347	Guide to Formwork for Concrete
AISC S335	Specification for Structural Steel Buildings
ASCE 7	Minimum Design Loads for Buildings and Other Structures
ASCE 20	Standard Guidelines for the Design and Installation of Pile Foundations
ASME B16.3	Malleable Iron Threaded Fittings
ASME B40.1	Gauges – Pressure Indicating Dial Type – Elastic Element
ASTM A 48	Gray Iron Castings
ASTM A 53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 197	Cupola Malleable Iron
AWWA A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA A21.10	Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in.
AWWA A21.11	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA A21.15	Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
AWWA A21.50	Thickness Design of Ductile-Iron Pipe
AWWA A21.51	Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
AWWA C500	Metal-Sealed Gate Valves for Water Supply Service
AWWA C504	Rubber-Seated Butterfly Valves
AWWA C508	Swing-Check Valves for Waterworks Service, 2 in. Through 24 in.

AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C652	Standard for Disinfection of Water Storage Facilities
AWWA D100	Standard for Welded Steel Tanks for Water Storage
AWWA D102	Standard for Painting Steel Water Storage Tanks
WWA D107	Standard for Composite Elevated Tanks for Water Storage
FAA 70/7460-1H	Obstruction Marking and Lighting
MSS SP-80	Bronze Gate, Globe, Angle and Check Valves
NSF 61	Drinking Water System Components – Health Effects (Sections 1-9)
NFPA 70	National Electrical Code
NFPA 780	Standard for the Installation of Lightning Protection Systems
NSF 61	Drinking Water System Components
OSHA	Occupational Safety and Health Standards
SSPC–PA1	Paint Application Specification

1.4 OWNER OR ENGINEER SUPPLIED INFORMATION

The Owner or Engineer shall provide the following information with the bid documents:

A. Technical data that is specific to the site and prepared by a qualified geotechnical engineer. The technical data shall include a determination of the site classification. The determination of the site classification shall be in accordance with AWWA D107.

1.5 SUBMITTALS

1. Each Contractor shall submit with their bid a sketch of the composite elevated tank showing major dimensions and plate thicknesses. A sketch of the foundation showing preliminary dimensions and approximate quantities of concrete and reinforcing steel shall also be provided with the proposal.

2. Prior to construction, the Contractor shall furnish construction drawings of the tank, concrete support structure and foundation sealed by a Professional Engineer licensed in the State of Georgia. Foundation designer shall be a Structural Engineer, per Georgia's PELS Board. The elevated water storage tank is a "Designated Structure" as it is a Risk Category IV structure as determined by IBC Table 1604.5.

3. Welder's certifications shall be submitted in accordance with AWWA D107 upon request.

4. A summary of the design for the foundation, support structure and the tank including concrete mix design, bearing capacities of soil and lightning protection shall be provided prior to construction. Include the design basis, loading and

results showing conformance with the specifications and the referenced codes and standards. The design shall be sealed by a Professional Engineer licensed in the State of Georgia. Foundation designer shall be a Structural Engineer, per Georgia's PELS Board. The elevated water storage tank is a "Designated Structure" as it is a Risk Category IV structure as determined by IBC Table 1604.5.

5. Provide an operating and maintenance manual containing operating instructions, maintenance instructions, as–built construction drawings, cleaning and painting instructions, a gage table and catalog cuts of equipment supplied.

1.6 OMITTED

1.7 TESTING & INSPECTIONS

A. All Special inspections shall be the responsibility of the Contractor, shall be in accordance with Chapter 17 (Special Inspections and Tests) of the 2018 International Building Code, as adapted by the State of Georgia, and will be paid for through the Allowance – "Special Inspections". Contractor shall employ the services of qualified and certified commercial testing laboratories and inspectors, in accordance with the standard of care.

B. Testing of the tank structure, including but not limited to, materials, framing, bolted connections, welds, coating system, and anchorage shall be performed in accordance with AWWA D107.

C. Contractor shall retain the services of a qualified and reputable geotechnical engineering and testing firm to perform tests and confirm geotechnical assumptions used as the basis of design for the foundation system. Testing associated with foundation system may include soil compaction and density tests (ASTM D1557 & D6938), pile load tests (ASTM D4945), and other tests as required for ground improvement systems. Testing lab shall operate in accordance with ASTM D3740 and ASTM E329.

D. In addition to the tank and soil, the Contractor shall engage certified special inspectors to inspect, at a minimum, the following additional elements:

1. Structural steel, including reinforcing bars and anchors
2. Formwork for concrete structures
3. Concrete mix
4. Concrete placement, per ACI 301, 305 and 306
5. Deep foundation elements
6. Ground improvement elements / components
7. Conformance with Construction Documents

Chapter 17 of The International Building Code shall be used as the basis for inclusions, frequency, qualifications and procedures for these inspections.

E. Contractor shall correct deficiencies in Work and deviations from Construction Documents that are identified during inspections and testing.

F. Owner and Engineer shall be notified of deficiencies, discrepancies and deviations immediately following the identification of such, whether or not they have been addressed.

G. Testing and inspection reports shall be submitted to the Owner and Engineer within three (3) days of performing the field work if no deficiencies or discrepancies are identified and within one (1) day of performing the field work if deficiencies or discrepancies are identified.

H. At the conclusion of the Work, the Contractor shall submit one combined document with all testing and inspections reports and a final statement of compliance from the testing agency or firm. Multiple compliance reports may be required depending upon the services offered by one firm.

PART 2 – PRODUCTS

2.1 GENERAL

The elevated tank shall have a minimum storage capacity of 500,000 gallons. The high–water level of tank shall be at an elevation of 157' with the top of column foundations at a minimum of 6 inches above the finished grade. The range between high and low water levels shall be approximately 30 feet. The existing grade at the tank site is approximately elevation 13'. Proposed finish grade at the tank site is 14'. The top of straight side sheets, where a cone–shaped roof is furnished, shall not be less than 6 inches above the top of the overflow weir. The tank diameter shall be not less than 50 feet.

2.2 MATERIALS

1. Materials and material tests used for reinforced concrete shall conform to ACI 318 except as modified herein.

2. The same brand and type of cement, and aggregate from a consistent source shall be used throughout the construction of the concrete support structure to maintain uniformity of color.

3. The minimum specified compressive strength of concrete shall be 4000 psi. The specified compressive strength of concrete used for the design of the wall and dome shall not exceed 6000 psi and 5000 psi, respectively.

4. Deformed bar reinforcing steel shall conform to ASTM A615 Grade 60 or ASTM A706 Grade 60. Plain welded wire reinforcement shall conform to ASTM A185.

5. Materials and material tests for the steel tank and all tank components shall comply with the latest edition of AWWA D107 except as modified herein.

2.3 DESIGN CRITERIA

A. GENERAL

1. Design and Construction Standards

Tank and Tower shall be designed, fabricated, and erected in accordance with AWWA D107-16 and project specifications.

<u>WIND LOADS (PER IBC 2018/ ASCE 7–16):</u>

- BASIC WIND SPEED: 147 MPH
- RISK CATEGORY: IV

SEISMIC LOADS (PER IBC 2018/ ASCE 7–16):

- S_s: 0.152 g
- S_1: 0.071 g
- F_a: 1.600 g
- F_v: 2.400 g
- S_{ds}: 0.163 g
- S_{d1}: 0.114 g
- PGA_M: 0.122 g
- RISK CATEGORY: IV
- SITE CLASS: D

TANK CENTER LOCATION

- Latitude: 31° 07' 36.02" N
- Longitude: 81° 35' 3.36" W

The wind and seismic data provided herein are to aid in the bidding process. **The Contractor/Tank Manufacturer is SOLEY responsible for foundation and structural design and shall verify all design criteria and requirements independently.** Contractor shall provide six (6) sets of tank structural drawings signed and sealed by a Professional Engineer licensed in the state of Georgia during the submittal phase of construction. Contractor shall also furnish three (3) sets of tank structure record drawings on mylar with the as–built data and conditions of the structure. The structural record drawings shall be in addition to the site as–built drawings.

The tank foundation and design shall be provided by a qualified structural engineer licensed in Georgia as a structural engineer (SE), hired by the Contractor. The elevated water storage tank is considered by the state of Georgia to be a "Designated Structure" and shall be evaluated with load and design considerations consistent with Risk Category IV, as defined by the International Building Code (IBC).

A Geotechnical Report was obtained by the Owner prior to bidding and was used as the basis of design for the bid documents. This Report is not permitted to be used as the basis of design for the tank elements. Contractor may utilize the report to better understand the general site conditions and will be provided with a copy, upon request. Contractor shall obtain a qualified Geotechnical engineer, licensed in Georgia, to perform a geotechnical investigation and provide foundation recommendations to be used as the basis of the foundation design. The report shall also include recommendations for testing during construction that will enable the Geotechnical Engineer to verify the foundation recommendations have satisfied the load capacity demand of the structure.

The foundation design shown on the Construction Drawings shall be used as the Contractor's base bid. If Contractor wishes to propose an alternate foundation system in addition to the base bid, he must submit the alternate system clearly designated as such with the cost differential identified. If alternate is proposed, the Contractor's Geotechnical Engineering report must provide a recommendation for use of the alternate system.

Consult Special Conditions for more information to aid in the bidding of the project.

B. CONCRETE SUPPORT STRUCTURE

1. The design of the concrete support structure shall conform to AWWA D107 and ACI 318 except as modified herein.

2. The minimum wall thickness shall not be less than 8 inches exclusive of rustications or other architectural relief.

3. The concrete support structure walls shall have a minimum reinforcement ratio in accordance with AWWA D107-16. Where the seismic design category determined in accordance with ASCE 7 is D, E or F, the minimum reinforcement ratio shall be 0.25% in the vertical and horizontal directions.

4. The concrete support structure walls shall have reinforcement placed in two layers in each direction with 50% of the minimum required steel in each layer.

5. The vertical load capacity for walls shall be determined using the procedures in AWWA D107 Section 6.3.

6. Horizontal reinforcement shall be provided to resist the ovalling of the wall due to wind pressure, using the procedures in AWWA D107 Section 6.3.

7. The concrete support structure walls shall be designed to resist in plane shear using the procedures in AWWA D107 Section 6.3. The effect of openings shall be considered in the shear design.

8. Openings in the concrete support structure walls that are less than or equal to 24 inches and are isolated do not require a beam and column analysis. Isolated openings shall have a clear distance between openings equal to 0.75 times the cumulative width of adjacent openings. Additional reinforcement having an area of not less than 1.2 times the area of interrupted reinforcement shall be distributed equally to either side of openings. Openings shall have a minimum of one No. 5 reinforcing bar placed diagonally in each corner. All reinforcing shall be fully developed beyond the opening.

9. Openings larger than 24 inches or combinations of openings that are not isolated shall be designed using an effective beam and column analysis as per AWWA D107 Section 6.3. Vertical and horizontal reinforcement shall be provided around the opening in accordance with the requirements of this section.

   9.1 The corners of the openings shall be reinforced with diagonal bars. The area of bars provided shall be equal to the minimum horizontal reinforcement ratio times the column area. A minimum of two No. 5 reinforcing bars shall be placed diagonally in each corner.

   9.2 Reinforcement provided around openings shall be fully developed. Column reinforcement shall extend the greater of half the opening height or the development length above and below the opening or be developed into the foundation. Horizontal reinforcement shall extend the greater of the development length

past the midpoint of the column or a minimum of half a development length beyond the column.

10. Local effects at openings shall be considered when the opening is located less than half the opening width above the foundation. The foundation shall be designed to adequately develop the opening reinforcement and redistribute loads across the unsupported width.

C. CONCRETE TO TANK INTERFACE

1. The concrete to tank interface region includes those portions of the concrete support structure and welded steel tank that are affected by the transfer of forces between the concrete tank floor, ringbeam, tank cone bottom and support structure wall. The design of the interface region shall be based on an analysis using finite element or similar analysis which can accurately model the interaction of the intersecting elements. The analysis shall provide results including the shear, moment and compression or tension caused by the intersecting elements in the interface region.

2. The analysis shall consider the transfer of forces from the intersecting elements under all anticipated load conditions. These conditions shall include the eccentricity of loads, restraint effects caused by shrinkage and temperature differentials, long term effects caused by concrete creep, and the effect of anchorage of the welded steel tank to the concrete.

3. The geometry of the interface region shall provide positive drainage at the top of the wall and ringbeam. Condensation or precipitation shall not be allowed to accumulate in this area.

4. The geometry of the tank shall be established such that the ringbeam provided at the top of the wall is a compression member with gravity loads acting alone (D + F). In this loading condition the compressive stress in the ringbeam shall be not less than 50 psi to minimize cracking in the interface region. No direct tension in the ringbeam under this loading condition will be allowed. The maximum compression in the ringbeam shall be no greater than $0.18f'_C$.

5. The ringbeam shall be reinforced as a compression member with a minimum longitudinal reinforcement ratio of 0.40%. Tie reinforcement shall be provided in accordance with ACI 318 for compression members as a minimum. Additional tie reinforcement shall be provided if required by the analysis of the interface region.

6. When a concrete dome supports the tank contents, it shall not be less than 9 inches thick, or less than the mean spherical radius of the dome divided by 50. The minimum reinforcement ratio shall be 0.36% in orthogonal directions. The reinforcement shall be placed in two layers with 50% of the minimum required steel in each layer.

D. WELDED STEEL TANK

1. The design for all sections of the steel tank shall be per the unit tension/compression stresses allowed for material classes listed in the latest edition of AWWA D107.

2. The tank shall have a domed steel roof or an approved individual tank roof design to minimize snow accumulating and water ponding on the roof plates. The dome roof allows visual confirmation of roof accessories for tank security and structural integrity by allowing observation of the roof appurtenances. Tank manufactures are responsible for guaranteeing function, reliable, and safe tank design that conforms to AWWA standards. The roof radius shall be between 0.8 and 1.2 times the tank diameter. Roof plates and supporting structure shall be designed to support the full snow load or 15 psf as a minimum.

3. For areas of the steel tank where the water is supported by a steel cone, the cone plate thickness may be determined using a nonlinear buckling analysis. A nonlinear buckling analysis may only be performed for liquid filled cones with a thickness–to–radius ratio greater than 0.0010 and less than 0.0030. The angle of the cone measured from the axis of revolution to the plate surface shall not exceed 60 degrees. If a nonlinear buckling analysis is not performed, the cone plate thickness shall be determined in accordance with the shell stability formulas provided in AWWA D107.

   3.1 The nonlinear buckling analysis shall include the effects of material and geometric non–linearities, residual stresses and imperfections.

   3.2 The imperfection considered in the analysis shall have a magnitude of not less than $0.04(Rt)^{1/2}$, where R is the radius normal to the plate measured to the axis of revolution, and t is the corroded plate thickness. The length of the imperfection shall be equal to or less than $4(Rt)^{1/2}$ and be appropriate for the type of construction used for the cone. The location and shape of the imperfection shall produce the lowest critical buckling stress.

   3.3 The minimum specified yield strength of the cone plate material shall be equal to or greater than 36 ksi. The yield strength used for the analysis shall be no greater than 40 ksi when the material of construction has a minimum specified yield strength greater than 40 ksi.

   3.4 Plate thickness used for the cone plates shall be no less than 80% of that required by the shell stability formulas provided in AWWA D107 when the thickness to radius ratio is greater than or equal to 0.00143. Cone plate thickness shall be no less than 70% of that required by AWWA D107 when the thickness to radius ratio is less than 0.00143.

   3.5 The nonlinear buckling analysis shall demonstrate that the provided cone plate thickness has a factor of safety of at least 2.0 against buckling in the corroded condition.

4. The concrete tank floor shall be covered with a welded steel liner to provide a water tight boundary. The minimum thickness of the liner plate

shall be 1/4–inch. Liner plates may be placed directly on the concrete when the liner plates are formed to match the shape of the tank floor. Liner plates that are not formed to match the shape of the tank floor shall have the space between the liner plates and the tank floor completely filled with a flowable grout.

5. Unless otherwise noted, at junctions in plates where meridional forces are discontinuous such as cone to cylinder junctions, a tension or compression ring may be required to resist the radial forces generated. In these regions, the allowable stresses shall not exceed those referred to in AWWA D107.

   5.1 Tension ring stresses shall not exceed the lesser of 15,000 psi or one half of the minimum specified yield of the plate material.

   5.2 Compression ring stresses shall not exceed 15,000 psi.

   5.3 To determine the stresses in the ring due to discontinuity forces, the tank plates immediately adjacent to the discontinuity may be assumed to participate for a distance of $0.78(Rt)^{1/2}$.

6. Minimum plate thickness of all tank parts shall be in accordance with AWWA D107.

7. No corrosion allowance is required.

2.4 APPURTENANCES

A. EXTERIOR DOORS

1. Provide one 36–inch x 84–inch commercial steel door, 1¾" thick, 4¾" 16–gauge jamb, industrial duty type door closer and automatic door bottom. Door to be AMWELD series 1500 seamless door, with series 400 frame, or approved equal. Door shall be minimum 16–gauge and insulated with pre–formed polystyrene insulation. Door shall be thoroughly cleaned, phosphated and finished with one coat of baked–on rust inhibiting primer in accordance with ASTM B117 and ASTM D1735. Provide three (3) full mortise, 5 knuckle hinges, 4½" x 4½" minimum. Door shall include window. Hinges shall be steel, phosphated and primed coated for finish painting. Provide a complete and functional door lockset and tumbler–type lock, keyed to the owner's existing system. Door painting shall conform to the tank exterior paint system.

2. Provide one manually chain operated 12' wide x 10' high overhead steel rolling door located in the base of the support structure. Add insulation to door with top and side rubber seals. Door slats shall be formed of 22–gauge steel with end locks and designed for a minimum 20–psf wind load. Steel curtain construction with high–grade zinc coating per ASTM A153 hot process, and phosphate coating for paint adhesion. Provide air baffle for entire upper barrel, curtain bottom bar with brush sealing, weather end lock on alternate slats and sealing strips for weather tightness. The door shall be equipped with slide bolt locks on both sides of interior bottom. Overhead door location shall be as shown on the drawings.

The door is to be finish painted by the manufacturer. The door provider shall submit manufacturer's finish color samples to the owner for selection of the finish color.

Provide two (2) 8-inch diameter steel safety posts on the exterior of the overhead door opening to protect the door from vehicle impact. Safety posts painted yellow shall be filled with concrete.

B. PIPING & PRESSURE RELIEF

1. A 12–inch diameter inlet/outlet pipe shall be provided from near the low point of the tank floor to a flanged connection at the base of the support structure. The inlet & outlet pipe shall be ASTM A240–304L material. Piping shall conform to ASTM A778 and welded fittings shall conform to ASTM A774. All pipe–to–pipe joints shall be welded. The pipe shall have a minimum thickness of schedule 10S. Provide a stainless-steel expansion joint near grade to accommodate differential movements between the inlet/outlet pipe and concrete support structure. The inlet/outlet pipe shall be attached to the support structure with galvanized steel brackets spaced no more than 20 feet apart.

2. An 8–inch diameter overflow pipe equipped with an anti–vortex entrance shall be provided. The overflow pipe within the support structure shall be ASTM A240–304L material. Stainless steel piping shall conform to ASTM A778 and welded fittings shall conform to ASTM A774. The pipe shall have a minimum thickness of schedule 10S. Inside the tank, the overflow pipe shall conform to ASTM A53 Grade B and have a minimum thickness of 1/4–inch. All pipe–to–pipe joints shall be welded. The overflow shall be attached to the access tube and support structure, and discharge at a point 12"-24" feet above grade level onto a splash pad. The attachment to the support structure shall be with galvanized steel brackets spaced no more than 20 feet apart. The end of the overflow shall be covered with a No. 4 galvanized mesh screen.

3. The floor shall be sloped to a proposed 18" x 18" x 42' sump pit equipped with 606 I-T6 aluminum grating, and a flygt BS-2004 submersible sump pump or approved equivalent, equipped with float switch. 1-1/2" PVC discharge piping shall be routed to proposed pre-cast catchment box with elevations to be verified by contractor for positive drainage.

4. A minimum of one aluminum pressure–vacuum vent near the center of the roof shall be provided. The vent(s) shall be sized to handle pressure differential caused by water entering or leaving the tank at a maximum rate. The maximum inlet rate is 1,500 gpm, the maximum withdrawal rate is 1,500 gpm. The open area of the overflow shall not be considered as a venting area. The vent(s) shall have insect screens and shall be designed to relieve any pressure or vacuum in the event the screen frosts over or is otherwise clogged and shall be easily dismantled for cleaning. The vent(s) shall be self–correcting. The pressure–vacuum vent may be mounted on the exhaust hatch.

C. ACCESS, LADDERS & PLATFORMS

1. Provide a galvanized steel ladder system attached to the support structure which extends from finished grade to the walkway and painters

access manhole. This ladder system shall consist of a continuous straight run ladder with rest platforms provided at no more than 50 feet intervals. Contractor to ensure that all OSHA requirements are met. This ladder shall be equipped with a ladder safety cable or aluminum safety rail system.

2. Provide a painted steel ladder on the interior of the access tube from the walkway to the tank roof. This ladder shall be equipped with a ladder safety cable or aluminum safety rail system.

3. Provide a galvanized steel ladder from the walkway to the tank bottom manhole. This ladder shall be equipped with ladder safety cable or aluminum safety rail system.

4. The ladder shall be equipped with a ladder safety cable or aluminum safety rail system and shall be provided by the Contractor at no additional cost to BGJWSC. The ladder safety cable and aluminum safety rail system shall be as followed:

   4.1 The ladder safety cable shall be an OSHA approved galvanized system as manufactured by BILCO, or equal. Provide a removable extension for each ladder that does not extend 48 inches beyond the walkway level. The owner shall be supplied with 2 harnesses, 2 lanyards and 2 sleeves.

   4.2 The aluminum safety rail system shall be an OSHA approved system. Provide ladder rung clamps and associated rail system hardware per Manufacture's and OSHA recommendation. Provide one rail climbing trolly for each fall protection kit.

5. Provide a galvanized steel walkway immediately below the tank extending from the support structure to the access tube. The walkway shall be a minimum of 48 inches wide with 42–inch high handrails.

6. Provide an access tube located on the vertical centerline of the tank. The access tube shall have a minimum diameter of 60 inches. The access tube shall extend below the tank floor to the walkway level to provide continuous ladder access from the walkway to the tank roof.

D. MANHOLES, HATCHES & VENTS

1. One 24–inch x 36–inch painter's access manhole/ventilation louver opening shall be provided giving access to the exterior painters rail located at the top of the concrete support structure. This opening shall have a removable aluminum rainproof louver with 24 SS mesh bird screen to provide ventilation for the concrete support structure. The louver shall be accessible from the walkway.

2. One 36–inch diameter tank bottom manhole shall be provided in the tank floor with access by ladder from the walkway.

3. Two 36–inch diameter steel hatches shall be supplied. One shall be at the top of the access tube with spring assist, chain and inside handle. The other shall be adjacent to the access tube for entry into the tank and shall have a handle and hasp. The hatch openings shall have a curb four inches high and the cover shall have a downward overlap of two inches.

4. One 24–inch diameter flanged exhaust hatch shall be supplied, located adjacent to the access tube and so constructed that an exhaust fan may be connected for ventilation during painting.

5. One 36–inch diameter painters access manhole shall be provided adjacent to each interior painters rail giving access from the roof. The 24–inch diameter exhaust hatch may be positioned to serve as one of these access manholes.

6. NOTE: All exterior vents and access points that are exposed to open air shall be equipped with 24 SS mesh bird and insect screens.

E. PAINTERS RAILS

Provide painters rails and an interior inspection rail as shown on the drawings and specified herein:

1. Interior Painters Rails. The rails shall be attached to the underside of the roof. Provide one rail near the center of the tank and one rail approximately 18 inches from the tank shell. If the slope distance between these two rails exceeds 32 feet, provide a third rail near midspan.

2. Exterior Painters Rail. The rail shall be located near the top of the support structure and be accessible from the walkway via the painter's access manhole/ventilation louver.

3. Interior Inspection Rail. The rail shall be located near the top of the support structure and be accessible from the walkway. The rail and support brackets shall be galvanized.

F. LIGHTNING PROTECTION

Provide a lightning protection system for the elevated tank structure and any roof mounted equipment that may be damaged by lightning.

Minimum requirements include two 28 strand by 14 gauge copper conductors bonded to the steel tank 180 degrees apart. The conductors shall be fastened to the interior support wall at 3 foot minimum spacing, and shall terminate with buried 5/8 inch diameter by 8 foot long copper clad ground rods.

Lightning protection for obstruction lights shall consist of an air terminal mounted on the support and formed to fit around the fixture. The 1/2 inch diameter copper air terminal shall extend a minimum of 10 inches above the light fixture and shall connect to a copper conductor that terminates in a bonding plate secured to the tank roof.

G. CATHODIC PROTECTION

1. Submittals provided for review by Engineer shall be inclusive of shop drawings showing design/configuration, a description of all components, NSF 61 certification, all design calculations for required voltage, amperage and life expectancy.

2. As-built drawings and an Owner's Operation and Maintenance Manual shall be provided to Owner, both a digital copy, and (2) hard copies.

3. All materials in contact with the water or exposed to the interior of the tank shall be classified in accordance with ANSI/NSF 61 "Drinking Water System Components". Contractor shall submit copy of ANSI/NSF 61 certification with submittal/ shop drawings.

4. At no additional cost to the Owner, Contractor shall employ a Corrosion Specialist who is accredited by the National Association of Corrosion Engineers International as a Senior Corrosion Technologist, Corrosion Specialist or Cathodic Protection Specialist. The system shall be designed by a Corrosion Specialist with experience in cathodic protection for water storage tanks. The Corrosion Specialist shall design the system to provide effective corrosion control in accordance with criteria for protection. The criteria for protection shall be based on a tank-to-water potential, IR drop free, within a range of -0.850 volts to -1.050 volts relative to a stationary copper-copper sulfate reference electrode. This potential shall be measured free of the effect of voltage gradients (IR drops). Specialist shall have a minimum of five (5) years experience designing cathodic protection of this scale. The installer shall also have a minimum of five (5) years experience installing such systems. The system shall be installed by personnel specifically trained by the constructor to provide all workmanship required for corrosion control performance.

5. The Corrosion Specialist shall also base system capacity and performance on:

    a. Total submerged surface area of the tank. (includes area up to high water line within tank bowl and wet risers in elevated tanks)

    b. Type of coating and condition of coating.

    c. Total bare surface area to be protected will be a minimum of 25% of total surface area.

    d. Minimum current density of 0.5 MA/ft.2 bare surface area.

    e. Chemical analysis of water including resistivity expressed in ohm-cm.

    f. Minimum anode design life of twenty (20) years.

    g. Selection, dimensions, and layout of system components for tanks provided. Coordinate with tanks, including all alternates.

6. System Components shall include:

    a. Rectifier:

    i. Shall be in accordance with ANSI/AWWA D104
    ii. Shall be inclusive of the following:
        1. Transformer
        2. Silicon rectifying elements
        3. Circuit breaker(s),

4. Lighting, surge, and overload protection,
5. Provision for air-cooling operation,
6. Digital voltmeter(s), ammeter(s) and potential meter(s)
7. Weatherproof cabinet in accordance with NEMA I for composite tanks (and spherical tanks– pertinent to Section 33 16 13.13) (NEMA 4 requirements for multi legged tank – pertinent to Section 33 16 13.13)
8. Provision to vary current output from 0% to 100% of rated capacity
9. Provisions for mounting, grounding, and locking
10. Provide 'fail' contact in rectifier for remote monitoring.
11. Provision for 110-120 volt, 60 Hz, single phase A.C. power.
12. D.C. output capacity in volts and amperes in accordance with Design
13. Number of circuits as required
14. Automatic controller shall adjust current output to compensate for changes in water level, temperature of water, water chemistry, and cathodic polarization, and shall include the following provisions:
    a. Utilize long-life reference electrode(s) installed within the tank
    b. Monitor the tank-to-water potential, free of IR drop
    c. Automatically adjust the tank-to-water potential, free of IR drop, to a preset value
    d. Operate within 25MV of preset value
    e. Limit current to a preset value
    f. Utilize digital potential meter(s) to display tank-to-water potential, free of IR drop.

b. Long Life Reference Electrode(s): The permanent reference electrode shall consist of a copper-copper sulfate electrode which is manufactured to remain stable (plus or minus 10MV) for minimum of twenty (20) years. The reference electrode to lead wire connection shall be encapsulated to prevent water migration. The stationary reference electrode shall be positioned within the tank to provide the most representative measurements for the submerged surface area(s).

c. Anode Suspension System: The anode suspension system shall be in accordance with ANSI/AWWA Standard D104, Section 4.2.4.2.2 Type C, Vertical System or Section 4.2.4.1.1 Type A, Horizontal System. The anode lead wire for vertical suspension shall be attached to a porcelain insulator bracket bolted to the interior of the tank roof. Handhole assemblies used for the installation of vertical anode suspension systems from the roof of the tank shall consist of a 6" diameter acrylic plastic cover, rubber gasket, and an acrylic plastic bar with a stainless-steel bolt assembly for each 5" diameter access opening.

d. Anode Materials: consist of one of the following as determined by specialist:

    i. Minimum .062" diameter titanium with a mixed metal oxide coating.
    ii. Minimum .062" diameter platinized niobium with 25 micro-inches of platinum.

All anode-to-header cable connections shall be sealed to prevent water migration.

e. Pressure Entrance Fitting: shall accommodate anode and reference electrode lead wires at the base of the tank or at the base of wet risers for elevated tanks. The fitting shall be manufactured to prevent leakage through the fitting and to prevent water migration through the wire insulation. The entrance fitting shall be sized for a 1.0 inch NPT, 3000 p.s.i. steel coupling.

f. Wiring: All wiring within the tank shall be insulated to prevent copper conductor to water contact. All wiring on the exterior of the tank shall be insulated and run in rigid conduit.

g. Hardware: All hardware used in conjunction with the system shall be protected against corrosion.

7. Performance:

a. Welding of steel coupling and anchors for horizontal anode suspension and rectifier mounting bracket shall be performed by the prime contractor prior to coating the tank. The cutting of 5" diameter access openings for vertical anode suspension shall be performed by the prime contractor prior to coating. The cathodic protection constructor shall furnish drawings and materials to the prime contractor prior to coating.

b. Work to be done in accordance with AWWA D100, D102, D105

c. Verification of electrical continuity of all sections of bolted or riveted tanks shall be the responsibility of the Primary Contractor.

d. Materials and equipment shall be inspected prior to installation. Any defective component shall be replaced.

e. Electrical work shall be in accordance with the National Electrical Code.

f. Lead wires shall be installed to prevent damage from abrasion.

g. Electrical connections within the tank shall be sealed to prevent water migration.

h. The rectifier shall be mounted at a convenient height (eye level) above grade for monitoring and service purposes.

i. A.C. power to the rectifier shall be provided by the Primary Contractor.

j. Disinfection of the tank shall be the responsibility of the Primary Contractor.

k. Work provided by the constructor shall be completed in a clean and safe manner.

l. After the system is installed and the tank is filled, the cathodic protection specialist shall provide start-up service which includes energizing, testing, and adjusting the system for optimum performance of the cathodic

protection system. This start-up service shall be performed in accordance with ANSI/AWWA D104 Section 5.2 Testing. This start-up service shall be coordinated with the Primary Contractor, Engineer and Owner.

m. All tank-to-water potential measurements shall be conducted with a calibrated portable copper-copper sulfate reference electrode and a portable high impedance voltmeter. A minimum of five (5) locations shall be measured. All test data shall be reviewed and evaluated by the Corrosion Specialist. The final test and adjustment of the system shall be conducted approximately twelve (12) months after the start-up service.

n. The cathodic protection constructor shall furnish self-addressed report cards to be completed by the Owner. Report cards received by the cathodic protection constructor during the guarantee and service period(s) shall be evaluated for system performance. All workmanship, equipment, and materials furnished by the cathodic protection constructor shall be guaranteed for one (1) year.

o. At the conclusion of the warranty period, the cathodic protection constructor shall furnish a service agreement to the owner for the type of system installed. The Owner may elect to enter this agreement with the contractor at the rate proposed by the constructor but is not required to. The Engineer will not be responsible for managing said agreement. The agreement shall include the annual service rate and a complete description of the scope of work proposed. The agreement for annual inspection and potential testing shall be in accordance with AWWA D104, Appendix C and include as a minimum:

i. One (1) annual job site visit.
ii. Tank-to-water potential measurements conducted at representative locations within the tank. A minimum of five (5) locations shall be measured.
iii. Measurements shall be conducted with a portable high impedance voltmeter and a calibrated copper-copper sulfate reference electrode.
iv. Adjustments for optimum corrosion control shall be in accordance with criteria for protection.
v. Data recorded shall provide sufficient information to evaluate the performance of the system relating to criteria for protection.
vi. In the event additional work is required, the constructor shall submit a report with recommendations for optimizing corrosion control.

H. TANK MIXING SYSTEM

1. Furnish and erect a passive tank mixing system.

2. The storage tank mixing system shall accomplish thorough mixing of the tank contents. The mixing system shall function without the use of mechanical pumps or blowers or other equipment with motor drives or other continuously moving parts. The energy needed to mix the storage tank shall be provided solely by the flow of water through the tank inlet pipe. The mixing system shall distribute the fresh, newly-disinfected incoming water throughout the tank, reducing microbial growth and related tastes and odors.

PART 3 – EXECUTION

3.1 GENERAL

1. All concrete formwork, placement and consolidation shall comply with ACI 318 and ACI 301 except as modified herein. Concrete tolerances shall comply with ACI 117 except as modified herein.

2. Concrete placed in cold weather conditions shall be protected to prevent damage in accordance with ACI 306. The cold weather protection shall continue until the concrete has attained 35% of the specified compression strength and the allowable temperature differential can be maintained.

3. Concrete placed in hot weather conditions shall be protected to prevent damage in accordance with ACI 305.

4. Concrete shall be cured in conformance with ACI 318. Curing methods shall be continued until the concrete has reached a compressive strength that will allow for safe jumping of forms without causing damage to previously placed concrete.

5. Concrete strength tests shall be taken in accordance with ACI 318 except as modified herein. Strength test samples shall be taken as the concrete is delivered from the truck. At least one strength test sample shall be taken for every day that concrete is placed. Additional strength test samples shall be taken for every 50 yd^3 of concrete placed when the total daily pour is less than or equal to 150 yd^3 and for every 150 yd^3 of concrete placed when the total daily pour is greater than 150 yd^3.

6. Each strength test sample shall provide at least four 6" x 12" molded cylinders. Two cylinders will be used to establish the 28 day strength in accordance with ACI 318. One cylinder should be tested at 7 days to supplement the 28 day test. The fourth cylinder shall be a spare for the other cylinders.

7. Inspection and testing of the welded steel tank shall comply with AWWA D107 Section 9.

3.2 CONCRETE FOUNDATION

1. Both an inlet and an outlet pipe extending 15 feet outside the foundation wall shall be included as part of the foundation.

2. All exposed formed surfaces shall receive a smooth as–cast form finish and all unexposed formed surfaces shall receive a rough form finish. All exposed unformed surfaces shall receive a trowel finish and all unexposed unformed surfaces shall receive a float finish.

3. Provide a 6–inch concrete slab at grade in the base of the support structure. The slab shall be placed over compacted structural backfill and shall be reinforced with #4 reinforcing steel at 12–inch centers each way. Provide 1/2–inch expansion material at the slab to foundation intersection and at floor penetrations. Provide saw–cut control joints at 18 foot maximum spacing. The slab shall be sloped towards the floor drain. The slab shall be constructed in accordance with the latest edition of ACI 301.

3.3 CONCRETE SUPPORT STRUCTURE

1. The concrete support structure wall shall be constructed using a jump form process. The form system shall use curved, prefabricated form segments of the largest practical size to minimize panel joints. Form panels shall extend the full height of the concrete pour using only vertical panel joints. Formwork shall be secured using bolts through the wall prior to concrete placement. Working platforms that allow safe access for inspection and concrete placement shall be provided. Form facing material shall be metal, or plywood faced with plastic or fiberglass.

2. The form system shall incorporate a uniform pattern of vertical and horizontal rustications to provide architectural relief to the exterior wall surface. Construction joints and formwork panel joints shall be located in rustications. Formwork panel joints shall be sealed using closures which combine with the form pattern to prevent grout leakage and panel joint lines. The top of each concrete placement shall be finished with a grade strip. The vertical and horizontal rustications shall be proportioned and combined to impart a symmetrical architectural pattern to the completed structure.

3. Support wall forming system shall incorporate segmented concrete placement. Temporary vertical bulkheads shall divide the wall pour into segments that are less than a single batch of concrete. The bulkheads shall be located at rustications, braced rigid and tight to maintain vertical alignment under concrete load. Each segment shall be continuously placed with concrete to the full form height. Temporary bulkheads shall not be removed until adjacent concrete is placed.

4. Formwork shall remain in place until the concrete has attained sufficient strength to support the form removal and subsequent loads without damage to the structure. The Contractor shall base formwork removal procedures and times on early–age test results. However, form movements and concrete placement shall be limited to a maximum of once per day.

5. Dimensional tolerances for the concrete support structure shall be checked by the contractor prior to each pour and maintained as the structure is built. The tolerances for construction of the concrete support structure shall comply with ACI 117 and the following:

5.1	Support wall variation:	
	Thickness ……..	–3%, +5%
	Diameter ……	0.4% ≤ 3 inch
	Vertical alignment:	
	in any 10 feet of height …..	½ inch
	in any 50 feet of height …..	1 inch
	over total height ……..	1 ½ inch
5.2	Tank floor variation:	
	Slab floor thickness ……	–3%, +5%
	Dome floor thickness ……..	–6%, +10%
	Dome floor radius ……	1%
	Local deviation from true ……	3/4 inch
	(Using a 5 foot sweep board)	
5.3	Level alignment variation:	
	From specified elevation …….	1 inch
	From a horizontal plane ……..	1/2 inch
5.4	Offset between formwork:	

Exterior exposed surfaces ….. 1/8 inch
Interior exposed surfaces …... 1/4 inch

6. All exterior exposed surfaces shall receive a smooth as–cast form finish. All interior exposed surfaces shall receive a rough as–cast form finish. All exposed surfaces shall be cleaned to remove surface contamination. Remove fins, repair surface defects greater than ⅜-inch depth. Tie holes shall be filled with a color matching non-shrink grout. All exposed surfaces shall be cleaned to remove any concrete paste leakage from higher placed concrete shaft rings. No additional finish of the exterior exposed surface is required unless excessive form oil remains on the concrete surface.

7. The top of the concrete tank floor shall receive a float finish.

3.4 WELDED STEEL TANK

1. All welding shall comply with AWWA D107.

2. All welding procedures, welders and welding operators shall be qualified in accordance with ASME Section IX for the processes and positions utilized.

3. To minimize corrosion and rust staining on the underside of the roof, the underside roof plate laps and rafter–to–roof plate seams shall be seal welded. The minimum thickness for seal welded roof plates shall be 1/4 inch.

4. The edges or surfaces of the pieces to be joined by welding shall be prepared by flame cutting, plasma arc cutting, arc gouging, machining, shearing, grinding or chipping and shall be cleaned of detrimental oil, grease, scale and rust. The edges of the pieces may have a protective coating applied to them which need not be removed before they are welded unless specifically prohibited by the welding procedures.

5. Field and shop welding may be done by the shielded metal arc welding process, the gas metal arc welding process, the flux core arc welding process and the submerged arc welding process.

6. Plates and component members of the tank shall be assembled and welded following erection methods which result in a minimum of distortion from weld shrinkage. Surfaces to be welded shall be free from loose scale, slag, heavy rust, grease, paint and other foreign material.

7. The Contractor shall remove weld of slag, spatter, burrs and other sharp or rough projections. The surface of the weld shall be suitable for subsequent cleaning and painting operations.

8. Full penetration butt–welded joints shall be inspected using the radiographic examination method. The number and location of the radiographs and the acceptance criteria shall be as required by AWWA D107. Inspection by sectional segments is not allowed.

9. All liner plate welds shall be tested using the vacuum box testing method before the tank is painted.

10. When the cone plate thickness has been determined using a nonlinear buckling analysis, the contractor shall measure the actual imperfections of the cone plates

after welding. The measurements shall be taken in the meridional direction. Measurements shall be taken at each meridional weld seam and midway between each meridional weld seam. Where the actual imperfections exceed the tolerances assumed in the analysis, further evaluation will be required and corrective action such as reworking the shell or adding stiffeners may be required.

11. In order to assist in the maximization of the paint's lifecycle, all welds on the tank exterior shall be ground smooth and blended to a NACE–D profile. All welds on the tank interior shall be ground smooth and blended to a NACE–D profile. Welds on the interior dry support column can remain in an as–welded condition but must have a profile adequate for the specified paint system. Engineer/Owner reserves the right to provide third–party inspection to ensure compliance to this requirement.

3.5 BEACON

Beacon shall be provided and installed as shown, and shall conform to Section 26 00 00 Electrical.

1. Communication Equipment Carrousel

A carrousel shall be installed to support communication equipment on the top of the tank. The carrousel shall be 15 feet in diameter with 30 vertical posts at approximately equal spacing. Carrousel shall be welded directly to the tank with support brackets as detailed. Coax cable routing supports shall be installed through the interior riser of the tank.

a. Contractor Qualifications

i. All licensee installations require the use of certified electronics technicians, steeplejacks, electricians or licensed contractors that have received Owner approval prior to commencing any installation work. All installation work shall be in accordance with an Owner previously approved installation plan. Owner, at its sole discretion, shall have the right to supervise the installation of any and all equipment. Certificates of insurance will be required by Owner of any installer.

ii. All approved installers shall have demonstrated capability of conforming to established manufacturer's installation standards, as well as any special standards imposed by Owner. All work shall be performed in a neat and workmanlike manner.

iii. All installers will have a certified welder per AWS D1.1 performing any welding.

iv. All installers will have a demonstrated familiarity with AWWA D100 code requirements as it relates to the installation of appurtenances and attachments.

b. General Workmanship

i. Epoxy attachments shall not be used. Epoxy compounds can lose strength at temperatures exceeding 140 degrees Fahrenheit. Additionally, epoxy compounds can subjected to extreme stresses

from thermal expansion/contraction of the metal structure due to changes in the ambient temperature and subsequently exhibit shear failure.

ii. Stud welding shall not be used. A properly installed stud weld will scorch the internal coating system in the same manner as ordinary stick welding. In addition, the plate attachment to the studs is open water seepage and corrosion from trapped water and moisture. Proper coating procedures cannot be used on tank surfaces that have plates or other attachments bolted to them.

iii. Antenna cables should be arranged and located to allow protective wrapping during abrasive blasting and recoating. Neatly arranged cables shall be offset from the tank to allow maintenance contractors to perform this work without removing the cable runs. Chaining or strapping to tower legs or handrails is not allowed. Cable runs should be routed under balconies or walkways to minimize access interference.

iv. Interference with interior tank components should be considered and avoided to minimize cable rerouting.

v. Penetrations shall be designed in accordance with AWWA Section 3.13.

vi. Penetrations through walkways and platforms shall be toe board compliant in accordance with OSHA regulations.

vii. All installers shall comply with applicable local, state, and federal requirements. In the absence of any applicable government standards, applicable BOCA and NEC Codes, as well as EIA, TIA, and AWWA, Standards will apply.

viii. All materials and workmanship are to be in compliance with the latest AWWA codes and regulations.

ix. Cables shall not be attached to any ladder structures, in accordance with OSHA standards.

x. Manholes and other access ports shall not be obstructed in any way by cable routing or attachments, in accordance with OSHA standards.

xi. Balconies and platforms shall not be obstructed in any way by cable routing or attachments, in accordance with OSHA standards.

c. Welding

i. All welding shall be in accordance with AWWA D100 Section 8, Welding and Section 11, Inspection and Testing. This requires all welders to be certified in accordance with AWS D1.1.

ii. All welds to the tank surface shall be made with E7018 low hydrogen rod and shall be smooth and free of burs and undercuts. Unacceptable welds shall be repaired as 6.1 required to meet AWWA D100 requirements.

iii. No welding shall be done when the ambient temperature is below 32 degrees Fahrenheit unless the cold weather welding requirements of AWWA D100, Section 10.2.1 are followed.

iv. Penetrations shall not intersect tank weld seams. Penetrations should clear existing seams by 6 inches. If this clearance is not possible, a review by a professional engineer shall be made of adjacent weld seams that may be affected by local welding.

v. Galvanized components shall not be welded directly to the tank surface. Galvanized surfaces mating to the tank structure must be ground free of galvanizing prior to welding.

vi. Tubular columns on multi–leg supported tanks are hermetically sealed and must not be breached or punctured under any circumstances since moisture will accumulate inside the leg and eventually cause serious structural damage.

vii. All welds on the tank interior and exterior shall be ground smooth and blended to a NACE-D profile.

3.6 PAINTING AND COATING OF TANK

The painting and coating of both interior and exterior tank surfaces shall be performed in accordance with Section 09 96 00. Owner shall select color scheme, lettering and logo(s) prior to application of coating system. Contractor shall submit manufacturer's color samples showing full range of standard colors.

3.7 DISINFECTION

The elevated tank and connecting lines thereto shall be disinfected with chlorine before being placed in operation.

1. Tank

1.1 The elevated tank shall be disinfected by the Contractor in accordance with AWWA C652. After the chlorination procedure is completed and before the storage facility is placed in service, the Contractor will collect samples of water in properly sterilized containers for bacteriological testing from the full facility in accordance with Section 7 of AWWA C652. The tank will not be accepted until satisfactory bacteriological results have been obtained.

1.2 Cleaning

All scaffolding, planks, tools, rags, and other materials not part of the structural or operating facilities of the tank shall be removed. Then the surfaces of the walls, floor, and operating facilities of the storage facility shall be cleaned thoroughly using a high–pressure water jet, sweeping, scrubbing, or equally effective means. All water, dirt, and foreign material

accumulated in this cleaning operation shall be discharged from the storage facility or otherwise removed.

Following the cleaning operation, the vent screen, overflow screen, and any other screened openings shall be checked and put in satisfactory condition to prevent birds, insects, and other possible contaminants from entering the facility. Any material required to be in the operating storage facility after the cleaning procedure has been completed shall be clean and sanitary when placed in the facility. In such instances, care shall be taken to minimize the introduction of dirt or other foreign material. (For example, placing a layer of limestone granules on the unpainted bottom of the storage facility to prevent corrosion.)

1.3 Forms of Chlorine for Disinfection

The forms of chlorine that may be used in the disinfecting operations are liquid chlorine, sodium hypochlorite solution, and calcium hypochlorite granules or tablets.

a. Liquid Chlorine – Liquid chlorine conforming to ANSI/AWWA B301 contains 100 percent available chlorine and is packaged in steel containers usually of 100–lb, 150–lb, or 1–ton net chlorine weight. Liquid chlorine shall be used only (1) in combination with appropriate gas–flow chlorinators and ejectors to provide a controlled high–concentration solution feed to the water to be chlorinated; (2) under the direct supervision of a person who is familiar with chlorine's physiological, chemical, and physical properties, and who is trained and equipped to handle any emergency that may arise; and (3) when appropriate safety practices are observed to protect working personnel and the public.

b. Sodium Hypochlorite – Sodium hypochlorite conforming to ANSI/AWWA B300 is available in liquid form in glass, rubber–lined, or plastic containers typically ranging in size from 1 qt to 5 gal. Containers of 30 gal or larger may be available in some areas. Sodium hypochlorite contains approximately 5 percent to 15 percent available chlorine by volume, and care must be taken to control storage conditions and length of storage to minimize its deterioration.

c. Calcium Hypochlorite – Calcium hypochlorite conforming to ANSI/AWWA B300 is available in granular form or in small tablets, and contains approximately 65 percent available chlorine by weight. The material should be stored in a cool, dry, dark environment to minimize its deterioration.

1.4 Chlorination Method

The method of disinfection for the proposed facility shall be by chlorination of full storage facility with water having a free chlorine residual of 2 mg/l after 24 h. Contractor shall utilize AWWA Chlorination Method 3.

a. Chlorination Method 3 – Water and chlorine shall be added to the storage facility in amounts such that the solution will initially contain 50 mg/l available chlorine and will fill approximately 5 percent of the total storage volume. This solution shall be held in the storage facility for a period of not less than 6 hours. The storage facility shall then be filled to the overflow level by flowing potable water into the highly chlorinated water. It shall be held full for a period of not less than 24 hours. All highly chlorinated water shall then be purged from the drain piping. Following this procedure, and subject to satisfactory bacteriological testing and acceptable aesthetic quality, the remaining water may be delivered to the distribution system.

1.5 Disposal

After the applicable retention period, the heavily chlorinated water must not be disposed of in a manner that will harm the environment as specified in the Georgia EPD publication Minimum Standards for Public Water Systems, Revised March 2021. Neutralizing chemicals, such as Sulfur Dioxide, Sodium Bisulfate, Sodium Sulfite or Sodium Thiosulfate can be used to neutralize the chlorine residual remaining in the water to be wasted.

1.6 Bacteriological Sampling and Testing

After the chlorination procedure is completed, and before the storage facility is placed in service, water from the full facility shall be sampled and tested for coliform organisms in accordance with the latest edition of *Standard Methods for the Examination of Water and Wastewater.* The testing method used shall be either the multiple–tube fermentation technique or the membrane–filter technique.

a. *Test for Odor.* The water in the full facility should also be tested to assure that no offensive odor exists due to chlorine reactions or excess chlorine residual.

b. *Results of Testing.* A minimum of two samples from each sampling site shall be collected for total coliform analysis. Each set of samples shall be taken at least 24 hours apart after disinfection and tested by a State approved lab and shall indicate bacteriological satisfactory water. If the test for coliform organisms is negative, then the storage facility may be placed in service upon written letter approval from local and state issuing authority. If the test shows the presence of coliform bacteria, then the situation shall be evaluated by a qualified engineer. In any event, repeat samples shall be taken until two consecutive samples are negative, or the storage facility shall again be subjected to disinfection.

3.8 TESTING AND STERILIZATION

1. Sufficient cure, per the manufacturer's recommendations, of the final coat on the interior wet surface shall be allowed before the elevated tank is sterilized and filled with water.

2. The tank shall be sterilized per the requirements of AWWA C652 Chlorination Method No. 3.

3. The Contractor shall furnish and dispose of sufficient water for testing and sterilization. The water shall be at proper pressure to fill the tank to the maximum working level. Any leaks in the tank that are disclosed by this test shall be repaired by gouging out defective areas and re–welding. No repair work shall be done on any joint unless the water in the tank is at least 2 feet below the joint being repaired. Any paint damaged by repairs shall be properly restored.

4. Upon completion of the sterilization procedure, the CONTRACTOR or his representative shall arrange and bear the cost of any bacteriological testing of water samples from the tank that may be required. The tank shall not be placed in service until safe test results are obtained.

3.9 FILLING OF TANK

1. The Contractor shall be responsible for completely filling the tank once the tank construction has been accepted by the Engineer and Owner. The tank may be filled using chlorinated water of acceptable quality as approved by Engineer and Owner from the aquifer well located on the adjacent property. During this time the contractor shall measure and record any settlement of the tank using measuring devices approved by the Engineer and Owner. The contractor shall notify the engineer at least 48 hours prior to filling the tank.

3.10 GUARANTEE

1. The Contractor shall guarantee its work for a period of one year from the date of substantial completion. Substantial completion is defined as the date when the tank is placed, or available to be placed, into service. The Contractor will repair any defects of which they are notified during that period which may appear because of faulty design, workmanship or materials furnished under the specifications. Defects caused by damaging service conditions such as electrolytic, chemical, abrasive or other damaging service conditions are not covered by this guarantee.

2. All guarantees obtained by the Contractor from the manufacturer or installer of paint, equipment or accessories not manufactured by the Contractor shall be obtained for the benefit of the Owner.

END OF SECTION

INDEX TO

SECTION 33 40 00 – STORM DRAINAGE

SECTION 33 40 00

STORM DRAINAGE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Construction of pipes, drainage inlets, manholes, headwalls, and various drainage structures.

1.2 RELATED SECTIONS

A. Section 03 00 00 – Site Concrete
B. Section 33 10 00 – Water Distribution System – Appendix "2A" – Standards for Water and Sewer Design and Construction "Water Distribution System Acceptable Products & Manufacturers" by Brunswick-Glynn Join Water & Sewer Commission. Consult for "Wastewater Collection – Gravity Sewer Acceptable Manufacturers".

1.3 REFERENCES (Latest Revision)

A. ASTM B 745/B 745M – Corrugated Aluminum Pipe for Sewers and Drains.

B. ASTM C 55 – Concrete Building Brick.

C. ASTM C 62 – Building Brick (Solid Masonry Units Made From Clay or Shale).

D. ASTM C 76 – Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

E. ASTM C 144 – Aggregate for Masonry Mortar.

F. ASTM C 150 – Portland Cement.

G. ASTM C 207 – Hydrated Lime for Masonry Purposes.

H. ASTM C 443 – Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.

I. ASTM C 478 – Precast Reinforced Concrete Manhole Sections.

J. ASTM C 913 – Precast Concrete Water and Wastewater Structures.

K. ASTM C 1433 – Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers.

L. ASTM D 1056 – Flexible Cellular Materials – Sponge or Expanded Rubber.

M. ASTM D 1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

N. ASTM D 1751 – Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non–extruding and Resilient Bituminous Types).

O. ASTM D 1752 – Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

P. ASTM D 2321 – Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

Q. ASTM D 3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

R. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

S. ASTM D 6938 – In Place Density and Water Content of Soil and Soil–Aggregate by Nuclear Methods (Shallow Depth).

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

U. ASTM F 405 – Corrugated Polyethylene (PE) Pipe and Fittings.

V. ASTM F 477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

W. ASTM F667 – 3 through 24 in. Corrugated Polyethylene Pipe and Fittings.

X. ASTM F 2306/F 2306M – 12 to 60–Inch (300 to 1,500 mm) Annular Corrugated Profile–Wall Polyethylene (PE) Pipe and Fittings for Gravity–Flow Storm Sewer and Subsurface Drainage Applications.

Y. AASHTO M 294 – Corrugated Polyethylene Pipe, 300 to 1500–mm (12 – to 60–in.) Diameter.

1.4 QUALITY ASSURANCE

A. Material Review – Contractor will furnish the Engineer and Owner a description of all material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.

B. Manufacturer – Material and equipment shall be standard products of a manufacturer who has manufactured them for a minimum of 2 years and provides published data on their quality and performance.

C. Subcontractor – A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with their competence.

D. Design – Devices, equipment, structures, and systems not designed by Engineer and Contractor wishes to furnish, shall be designed either by a Registered Professional Engineer or by someone the Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before ordering.

E. Testing Agencies – Soil tests shall be taken by a testing laboratory operating in accordance to ASTM D–3740 and E–329 and be acceptable to the Engineer and Owner prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests, spot checked by an outside laboratory and furnishes satisfactory certificates.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1.6 SEQUENCING AND SCHEDULING

A. Contractor shall arrange work so sections of pipes between structures are backfilled, checked, pavement replaced, and the section placed in service as soon as reasonable after installation.

1.7 ALTERNATIVES

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

B. Consult "Wastewater Collection – Gravity Sewer Acceptable Manufacturers". In part of Section 33 10 00, Appendix 2A. These manufacturers shall take precedence to any suggested alternatives.

1.8 GUARANTEE

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

1.9 EXISTING UTILITIES

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

B. The Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at 1–800–282–8411 (GA)or 811.

1.10 OMITTED

1.11 TESTING

A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).

B. In place density tests in accordance with ASTM D 1556 or ASTM D 6938.

C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.

D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48–hours' notice prior to taking any tests.

E. Testing shall be the Contractor's responsibility and shall be performed at Contractor's expense by a commercial testing laboratory operating in accordance with subparagraph C above.

F. Test results shall be furnished to the Engineer and Owner prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 PIPE

A. Concrete Pipe – Shall be reinforced Class III, Class IV, or Class V and shall conform to ASTM Specification C–76. Pipe shall be manufactured without lifting holes. Gasketed single offset joints may be used in lieu of 'O' ring joints if acceptable to the Engineer.

Joint design shall be bell and spigot or tongue and groove. Joints shall be water tight using a confined gasket joint consisting of an O–ring rubber gasket conforming to requirements of ASTM C 443. Joint assemblies shall be accurately formed so when each pipe section is forced together, the assembled pipe shall form a continuous watertight conduit with smooth and uniform interior surface. Gaskets shall be the sole element of providing joint water tightness. Ends of pipe shall be in planes at right angles to the longitudinal centerline of pipe. Ends shall be finished to regular smooth surfaces.

B. Corrugated Aluminum Alloy Pipe – Shall conform to ASTM B745. Pipe may be annular or helical.

1. Joints – Coupling bands shall be one piece lap–type, having a width conforming to the pipe manufacturer's recommendations. They shall be of the angle lug, rod and lug, or U–bolt type. The type, size, and gauge of bands and size of angles, bolts, and rods shall be as specified in

applicable standards or specifications for pipe. Exterior rivet heads in the longitudinal seam under coupling band shall be countersunk or rivets shall be omitted and the seam welded.

2. Gaskets – Gaskets shall be made of 3/8 inch thick by 6–1/2 inch minimum width closed cell expanded synthetic rubber, fabricated in the form of a cylinder with a diameter approximately 10% less than nominal pipe size. The gasket material shall conform to requirements of ASTM D1056, Grade Number SBE–43.
3. Bends – Where specified, shall be shop fabricated to angles and dimensions shown on the construction drawings.

C. Polyethylene – Shall be high density polyethylene corrugated pipe having an integrally formed smooth interior, equivalent to Advanced Drainage Systems N–12WT, N–12STIB or Hancor Blue Seal or Sure–Lok ST. Pipe shall conform to ASTM F667 and F2306.

1. Joints – Pipe shall be joined using an integral bell and spigot joint meeting ASTM F2306 specifications. The joint shall be soil and water tight and gaskets, when applicable, shall meet requirements of ASTM F477. A joint lubricant supplied by manufacturer shall be used on the gasket and bell during assembly.

D. Subgrade Drain – Shall be heavy duty corrugated polyethylene perforated pipe manufactured by Advanced Drainage Systems (ADS) or equivalent and shall conform to ASTM F–405.

E. Roof Drain – Shall be SDR 26 PVC Pipe. Pipe shall be green or white in color.

2.2 DRAINAGE STRUCTURES

A. Details – See plans.

B. Concrete – Reinforced and non–reinforced.

1. Minimum compressive strength = 3,000 p.s.i. at 28 days.
2. Reinforcing shall be covered by a minimum 1–inch of concrete for top slabs and 1–1/2 inches for walls and bases and 3 inches where concrete is deposited directly against the ground.
3. Expansion joint filler materials shall conform to ASTM D 1751 or D 1752.

C. Mortar – Connection of pipe and drainage structures shall be composed of one part by volume of Portland cement and two parts of sand. The Portland cement shall conform to ASTM C–150, Type I or II. The sand shall conform to ASTM C–144 and shall be of an accepted gradation. Hydrated lime may be added to the mixture of sand and cement in an amount equal to 25% of cement volume used. Hydrated lime shall conform to ASTM C–207, Type S. Quantity of water in the mixture shall be sufficient to produce a workable mortar, but shall in no case exceed 7 gallons of water per sack of cement. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes from time ingredients are mixed with water. After mortaring, flexible pipe connections, including HDPE, PP and corrugated aluminum shall include a 12"

filter fabric extending a minimum 12" up the pipe and structure adhered with a bituminous coating.

D. Precast – Shall be constructed in accordance with ASTM C–478, C–913, or C–1433 and conform to details on the project drawings.

1. Joints – Shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O–Ring or Type A or B "Tylox" conforming to ASTM C443 and mastic shall be "Ram–nek" or equivalent with primer. Primer shall be applied to all contact surfaces of manhole joints at the factory in accordance with manufacturer's instructions.
2. Steps – no steps shall be supplied. Owner will supply their own ladder to perform future maintenance as required.
3. Leaks – No leaks in the manhole will be acceptable. All repairs made from inside the manhole shall be made with mortar composed of one part portland cement and two parts clean sand; mixing liquid shall be straight bonding agent equivalent to "Acryl 60."

F. Frame, cover & grating shall conform to details shown on the project drawings. Grates in pavement and in other flush–mounted type surfaces shall be of a "bicycle–safe" configuration consisting of 45–degree diagonal bars or slotted grates with a maximum clear opening of 1 inch and a maximum length of 9–inches. In any case, the long dimension of openings should be located transverse to direction of traffic when possible.

2.3 FILTER FABRIC

A. Shall be a non–woven heat–bonded fiber of polypropylene and nylon filaments equivalent to Mirafi 140 N. The fabric shall be finished so filaments will retain their relative position with respect to each other. Fabric shall contain stabilizers and/or inhibitors added to the base plastic to make filaments resistant to deterioration due to ultraviolet and/or heat exposure. The product shall be free of flaws, rips, holes, or defects.

2.4 SOILS AND STONE AGGREGATES

A. Stone aggregate shall be clean crushed granite or concrete meeting the gradation requirements of grade No. 57.

B. Soils used for bedding, haunching, and initial backfill shall be as shown in the following table and shall meet requirements and classifications of ASTM D2321 and ASTM D2487.

Class	***Type***	***Soil Group Symbol D 2487***	***Description***	***Percentage Passing Sieve Sizes***		
				1–1/2 inch (40 mm)	***No. 4 (4.75 mm)***	***No. 200 (0.075 mm)***
IB	*Manufactured, Processed*	*None*	*Angular, crushed stone (or other Class 1A materials) and*	*100%*	*≤50%*	*<5%*

Class	Type	Soil Group Symbol D 2487	Description	Percentage Passing Sieve Sizes		
				1–1/2 inch (40 mm)	No. 4 (4.75 mm)	No. 200 (0.075 mm)
	Aggregates; dense–graded, clean.		*stone/sand mixtures with gradations selected to minimize migration of adjacent soils; contain little or no fines.*			
II	*Coarse – Grained Soils, clean*	*GW*	*Well–graded gravels and gravel–sand mixtures; little or no fines.*	*100%*	*<50% of "Coarse Fraction "*	*<5%*
		GP	*Poorly–graded gravels and gravel–sand mixtures; little or no fines.*			
		SW	*Well–graded sands and gravelly sands; little or no fines.*		*>50% of "Coarse Fraction "*	
		SP	*Poorly–graded sands and gravelly sands; little or no fines.*			
	Coarse–Grained Soils; borderline clean to w/fines.	*Eg. GW–GC, SP–SM.*	*Sands and gravels that are borderline between clean and with fines.*	*100%*	*Varies*	*5% to 12%*
III	*Coarse–Grained Soils with Fines*	*GM*	*Silty gravels, gravel–sand–silt mixtures.*	*100%*	*<50% of "Coarse Fraction "*	*5%*
		GC	*Clayey gravels, gravel–sand–clay mixtures.*			
		SM	*Silty sands, sand–silt mixtures.*		*>50% of "Coarse Fraction "*	
		SC	*Clayey sands, sand–clay mixtures.*			
IVA	*Fine–grained soils (inorganic)*	*ML*	*Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, silts with slight plasticity.*	*100%*	*100%*	*>50%*
		CL	*Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays.*			

2.5 PRODUCT REVIEW

A. Contractor shall provide the Engineer and Owner with a complete description of all products before ordering. Engineer and Owner will review all products by the submittal of shop drawings before they are ordered.

PART 3 – EXECUTION

3.1 ON SITE OBSERVATIONS OF WORK

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

Contractor shall give the Project Engineer or Project Representative a minimum of 48–hours' notice for all required observations or tests. Storm sewers shall be dry for observation by the Engineer. Lines under water shall be pumped out by Contractor prior to observation, at no additional cost to the Owner.

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

3.2 EXCAVATION FOR PIPE AND STRUCTURES

A. Excavated material shall be piled a sufficient distance from the trench banks to avoid overloading to prevent slides or cave–ins.

B. Remove from site all material not required or suitable for backfill.

C. Grade as necessary to prevent water from flowing into excavations.

D. Remove all water accumulating in the excavation, from surface flow, seepage, or otherwise, by pumping or other acceptable method.

E. Sheeting, bracing or shoring shall be used as necessary for protection of the work and safety of personnel.

3.3 TRENCHING FOR PIPE

A. Trenching for Pipe – The width of trenches at any point below top of pipe shall be not greater than outside diameter of pipe plus 4 feet to permit satisfactory jointing and thorough bedding, haunching, backfilling and compacting under and around pipes. Sheeting and bracing where required shall be placed within the trench width as specified. Care shall be taken not to over–excavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures shall be necessary. Cost of this re–design and increased cost of pipe or installation shall be borne by Contractor without additional cost to the Owner. When installing pipe in a positive projecting

embankment installation, the embankment shall be installed to an elevation of at least 1 foot above top of pipe for a width of five pipe diameters on each side of pipe before installation of pipe.

B. Removal of Unsuitable Material – Where wet or otherwise unstable soil, incapable of supporting the pipe is encountered in bottom of trench, such material shall be removed to depth required and replaced to proper grade with stone or sand foundation as determined by Engineer. This foundation shall be compacted to 95% modified proctor.

3.4 PROTECTION OF UTILITY LINES

A. Existing utility lines shown on drawings or locations of which are made known to the Contractor prior to excavation, and are to be retained, as well as utility lines constructed during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired at Contractor's expense. If the Contractor damages any existing utility lines not shown on drawings or locations of which are not known to Contractor, report thereof shall be made immediately. If Engineer determines repairs shall be made by Contractor, such repairs will be ordered under the clause in GENERAL CONDITIONS of contract entitled "CHANGES." When utility lines to be removed are encountered within the area of operations, Contractor shall notify Engineer and Owner in ample time for necessary measures taken to prevent interruption of service.

3.5 FOUNDATION AND BEDDING

A. Stone Foundation – Where the subgrade of pipe is unsuitable material, Contractor shall remove unsuitable material to a depth determined by Engineer or Geotechnical Consultant and furnish and place stone foundation in trench to stabilize subgrade.

B. Sand Foundation – Where the character of soil is unsuitable, even though dewatered, additional excavation to a depth determined by Engineer or Geotechnical Consultant shall be made and replaced with clean sand furnished by Contractor.

C. Bedding for pipe shall provide a firm surface of uniform density throughout the entire length of pipe. Before laying pipe, trench bottom shall be de–watered by the use of well points. Where well points will not remove the water, Contractor shall construct sumps and use pumps to remove all water from bedding surface. Pipe shall be carefully bedded in stone accurately shaped and rounded to conform to lowest 1/3 outside portion of circular pipe, or lower curved portion of arch pipe for the entire length of pipe. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type joint.

D. Concrete Pipe:

1. Materials for bedding concrete pipe shall be either Class II, Class III, or Class IB if processed, to minimize migration of adjacent material.
2. Depth of bedding shall be equal to 1/24 the outer diameter of pipe or 3 inches, whichever is greater.

3. Bedding area under the center of pipe, for a width 1/3 outer diameter of pipe, known as middle bedding, shall be loosely placed. Remainder of bedding for full width of the trench shall be compacted to a minimum density of 85% for Class II bedding and 90% for Class III bedding as determined by ASTM D1557.

E. Polyethylene and Corrugated Aluminum Alloy Pipe

1. Materials for bedding polyethylene and corrugated aluminum alloy pipe shall be either Class II, Class III, or Class IB if processed to minimize migration of adjacent materials.
2. Depth of bedding shall be equal to 1/10 the outer diameter of pipe or a minimum of 6 inches, whichever is greater.
3. Bedding area under the center of pipe, for a width 1/3 outer diameter of pipe, known as middle bedding, shall be loosely placed. Remainder of bedding for full width of the trench shall be compacted to a minimum density of 90% for Class II bedding and 95% for Class III bedding.

3.6 HAUNCHING, INITIAL BACKFILL, AND FINAL BACKFILL

A. Haunching – After the bedding has been prepared and pipe is installed, Class II or Class III soil shall be placed along both sides of pipe, in layers not exceeding 6 inches in compacted depth. Care shall be taken to insure thorough compaction and fill under haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers and rammers. Haunching shall extend up to the spring line of pipe and be compacted to following densities:

1. RCP: Minimum density shall be 90% as determined by ASTM D1557.
2. HDPE and Corrugated Aluminum Alloy Pipe: Minimum density shall be 95% as determined by ASTM D1557.

B. Initial Backfill – HDPE and corrugated aluminum alloy pipe require initial backfill material of either Class II or Class III soils to be placed from the spring line to a minimum of 6 inches above top of pipe in 6–inch lifts. This initial backfill shall be compacted to a minimum density of 95% as determined by ASTM D1557. Reinforced concrete pipe does not specifically require initial backfill. Initial backfill for reinforced concrete pipe can be the same as final backfill.

C. Final Backfill – For all pipes, it should extend to the surface and shall be select materials compacted to a minimum of 98% as determined by ASTM D1557 if pipe is under pavement. If pipe is in grassed areas final backfill may be native materials compacted to a minimum density of 90% as determined by ASTM D1557.

3.7 PLACING PIPE

A. Each pipe shall be carefully examined before being laid and defective or damaged pipe shall not be used. Pipe lines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be

provided as necessary. All pipe in place shall have been checked before backfilling. When storm drain pipe terminates in a new ditch, headwall or end section, together with ditch pavement, if specified, shall be constructed immediately as called for on the plans. Ditch slopes and disturbed earth areas shall be grassed and mulched as required. Contractor will be responsible for maintaining these newly constructed ditches and take immediate action subject to acceptance, keeping erosion of the ditch bottom and slopes to a minimum during life of contract. No additional compensation will be given to Contractor for the required diversion of drainage and/or dewatering of trenches. Grassing the trench backfill shall conform to requirements of Section 32 90 00 – "Landscaping."

B. Concrete Pipe: Laying shall proceed upgrade with spigot ends of bell and spigot pipe and tongue ends of tongue and groove pipe pointing in the direction of flow. Place pipe in trench with the invert conforming to required elevations, slopes, and alignment. Provide bell holes in pipe bedding in order to insure uniform pipe support. Fill all voids under the pipe by working in backfill material.

C. Corrugated Aluminum Pipe: Shall be laid with separate sections joined firmly together, with outside laps of circumferential joints pointing upstream and with longitudinal laps on the side. Lifting lugs, where used, shall be placed to facilitate moving the pipe without damage to exterior or interior coatings. Place pipe in trench with the invert conforming to required elevations, slopes, and alignment. Fill all voids under the pipe by working in backfill material.

D. Polyethylene Pipe – Laying shall proceed upgrade with spigot ends of bell and spigot pipe pointing in the direction of flow. Place pipe in trench with the invert conforming to required elevations, slopes, and alignment. Provide bell holes in pipe bedding in order to ensure uniform pipe support. Fill all voids under the pipe by working in bedding material. Pipe shall be installed in accordance with ASTM D–2321.

E. Subgrade Drain Tubing – Shall be laid as detailed on construction drawings with the invert conforming to required elevations and alignment.

3.8 JOINTS IN PIPES

A. Concrete Pipe – Maintain pipe alignment and prevent infiltration of fill material at joints during installation. Manufacturer's recommendations and requirements shall be followed.

All joints shall receive one layer of filter fabric completely around exterior of the joint. Filter fabric shall be a minimum of 2 feet wide, centered on the joint, and overlapped a minimum of 1 foot.

B. Corrugated Aluminum Pipe – Maintain pipe alignment and prevent infiltration of fill material at joints during installation.

1. Installation of Gaskets – Shall be in accordance with recommendations of the manufacturer in regard to use of lubricants and cements and other special installation requirements. Gasket shall be placed over one end of a section of pipe for half the width of a gasket. The other half shall be

doubled over end of same pipe. When adjoining section of pipe is in place, the double–over half of gasket shall then be rolled over the adjoining section. Any unevenness in overlap shall be corrected so gasket covers ends of pipe sections equally. Connecting bands shall then be centered over the adjoining sections of pipe, and rods or bolts placed in position and nuts tightened. The band shall be tightened evenly. Tension shall be kept on rods or bolts and gasket shall be closely observed to see it is seating properly in the corrugations.

2. Installation of Filter Fabric at Joint – After the connecting band has been tightened; Contractor shall place one layer of filter fabric completely around exterior of joint, a minimum of 2 feet wide, centered on joint, and overlapped a minimum of 1 foot.

C. Polyethylene and PVC Pipe – Maintain pipe alignment and prevent infiltration of fill material at joints during installation.

1. Joints shall be gasketed soil–tight and water–tight bell and spigot meeting ASTM F2306. Gaskets shall meet the requirements of ASTM F477. A joint lubricant supplied by manufacturer shall be used on the gasket and bell during assembly. Spigot end of pipe shall be inserted into bell using methods recommended by the manufacturer. Pipe shall be kept true to line and grade during assembly.
2. Installation of Filter Fabric at Joint – All polyethylene pipe joints shall receive one layer of filter fabric completely around exterior of the joint. Filter fabric shall be a minimum of 2 feet wide, centered on the joint, and overlapped a minimum of 1 foot.

D. Subgrade Drain Tubing – Joints shall be joined using snap couplings. When installing sock wrapped pipe, overlap sock ends over coupling and secure with polyethylene tape.

3.9 FIELD QUALITY CONTROL

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

The minimum number of tests required shall be:

Haunching and Initial Backfill in all areas….	1 per 100–linear feet of pipe, minimum of one per run of pipe for both the haunching and initial backfill zones.
Final Backfill over pipe in traffic areas……..	1 per 100–linear feet or less for each 4–feet of depth or portion thereof.
Final Backfill over pipe in non–traffic areas…..	1 per 500–linear feet or less for each 6–feet of depth or portion thereof.

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

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

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

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

C. 100% of pipes under roadways shall be televised and video recorded. The video observation shall include a complete pan view of each joint. If the video observation indicates problems, further televising may be required. Additional televising and video recording will be at no additional cost to the Owner.

3.10 DRAINAGE STRUCTURES

A. Drainage structures shall be constructed of materials specified for each type and in accordance with details shown on the drawings.

3.11 REMOVE AND REPLACE PAVEMENT

A. Pavement shall only be removed after prior written authorization by the Engineer and Owner. Pavement removed and replaced shall be constructed in accordance with latest specifications of the State Department of Transportation.

Traffic shall be maintained and controlled per State Department of Transportation regulations.

3.12 CONNECT PIPE TO EXISTING STRUCTURES

A. Contractor shall connect pipe to the existing structure where indicated. For brick or precast structures, a hole not more than 4 inches larger than outside diameter of new pipe shall be cut or cored neatly in the structure, new pipe laid so it is flush with inside face of structure, and annular space around pipe filled with a damp, expanding mortar or grout to make a watertight seal.

END OF SECTION

INDEX TO

SECTION 35 01 40.92 – WATER MANAGEMENT SERVICES

SECTION 35 01 40.92

WATER MANAGEMENT SERVICES

PART 1 – GENERAL

1.1 DESCRIPTION

A. The Contractor shall provide all supervision, labor, material and equipment required to provide continuous, uninterrupted storm drainage for the duration of the construction. The temporary storm drainage system (ditch, pipe, pump, flap gates, and any other necessary stormwater management devices) shall have a minimum conveyance equal to or greater than the existing storm drainage system.

1.2 RESPONSIBILITY

A. The Contractor shall install, furnish, and maintain all necessary temporary storm drainage systems to provide the same existing level of flood protection 24 hours per day, 7 days per week. The Contractor shall maintain the drainage system to allow continuous, uninterrupted drainage throughout the construction period. In addition, the Contractor will provide a supervisory level individual to be on call at all times to maintain, modify, and respond to weather dictated demands. Upon construction completion, the Contractor shall promptly remove any temporary storm drainage system and restore the area to its original or better condition.

B. The Contractor is responsible for all cost and liability for any water damages resulting from improper execution of the water management's services.

C. Contractor is responsible for floodproofing the construction area. Contractor is responsible for all cost, liability, time, material, equipment, etc. for flood damages occurring to the construction project.

D. The Contractor shall be responsible for the control of groundwater within work areas at all times during construction.

PART 2 – PRODUCTS

2.1 MATERIALS

A. All material and equipment used in the stormwater management operations shall be new or in acceptable condition when first installed and shall remain in an acceptable condition throughout the construction period.

END OF SECTION

SECTION 46 01 00

SCADA AND LOCAL CONTROL SYSTEMS

PART 1 – GENERAL

1.01 SCOPE

A. The CONTRACTOR shall furnish, program, and install a Remote Terminal Unit in accordance with JWSC Supervisory Control and Data Acquisition (SCADA) System specifications for monitoring and / or controlling listed 1/O requirements. Provide SCADA panel at the new elevated tank

B. Furnish and install all equipment and appurtenances necessary to provide complete systems as shown on the drawings or specified herein. The SCADA system shall be provided by Electric Machine Control, Inc. as part of this contract. Include all costs in bid.

C. Furnish and install all electrical controls, switches, conduits, relays, starters, etc., and wiring required for operation of the equipment. All products shall be of the highest quality with regard to materials and workmanship and shall be furnished and installed in accordance with the Electrical Section of these specifications.

D. Wiring shall be installed in accordance with applicable codes and in accordance with the recommendations as set forth by the supplier of the equipment under this section.

E. Provide points and controls for the elevated tank as shown on the drawings and as specified in this section.

1.02 RELATED SECTIONS

A. Section 260000 – Electrical

1.03 REFERENCES

A. The following references apply:

1. National Electrical Code (NEC)
2. National Electrical Manufacturers Association (NEMA)

1.04 SUBMITTALS

A. Submittals shall be as specified in Section 01300 – Submittals

B. CONTRACTOR shall provide shop drawings for control systems which show all components and a complete schematic diagram showing all interconnections, including wiring numbers and terminal numbers for all equipment. Coordinate

final drawings with equipment actually provided. Contractor shall provide record drawings (reproducible and three copies) indicating all field changes.

1.05 DELIVERY, STORAGE, AND HANDLING

A. The CONTRACTOR shall be responsible for the delivery, storage, and handling of products in accordance with the manufacturer's recommendations.

1.06 WARRANTY REQUIREMENTS

A. All equipment, unless otherwise stated, shall be warranted by the manufacturer for 12 months from date of start–up not to exceed 18 months from date of shipment.

1.07 MEASUREMENT AND PAYMENT

A. SCADA and Control – The cost of all required work and all costs incidental thereto shall be included in the amount bid in the Proposal for the item which includes the controls. This includes control wiring.

PART 2 – PRODUCTS

2.01 REMOTE TERMINAL UNIT

A. The work required under this specification consists of furnishing, installing, testing, FCC licensing and commissioning the Remote Terminal Unit and local automatic backup control in accordance with JWSC Supervisory Control and Data Acquisition (SCADA) System specifications for monitoring and/or controlling listed I/O requirements.

B. The contractor is advised that JWSC has an existing radio based SCADA system and all equipment supplied under this specification shall be totally compatible and integrate successfully with the existing system. Operating protocols, hardware including logic controllers and radio transceivers and spare parts compatibility shall conform to the existing system. Additionally, as part of this specification the supplier shall provide all modifications, additions, deletions and/or software development requirements to successfully integrate the additional RTU to the existing Human–Machine Interface (HMI) software system and workstation hardware.

C. Monitor and Control Points

The RTU and its integrated PLC shall be equipped and programmed to accommodate the Monitor and Control Points as shown on SCADA Diagram (SC1.1) in the plans and as listed below:

1. Programmed SCADA PROCESS DISPLAY AND ALARM:
   Display and historically collect all the above defined Input and output points.

Display and historically collect daily runtime for each High service pump and raw well
Display and historically collect daily–accumulated flow for system flow and well flow.
SCADA communication failure alarm

2. Local (W.T.P.) Display (RTU Panel PC) shall include the following. The local display screen(s) shall be consistent with other W.T.P. locations.
   Elevated Tank Points
   i. Tank level
   ii. System Pressure
   iii. Residual Chlorine
   iv. Altitude Valve Position
   v. Altitude Valve Control Status
   vi. Cathodic Protection Alarm

2.02 LOCAL CONTROLLER

A. The SCADA panel at the elevated tank is to be in a NEMA I enclosure where located inside.

2.03 ELEVATED TANK SYSTEM

A. For elevated tank, provide a monitoring system to monitor and control the following points:

1. Analog Input
   Tank level/pressure
   System level/pressure
   Residual Chlorine
2. Discrete Input
   Altitude valve positions (2)
   Cathodic Protection Alarm
3. Discrete Output
   Altitude valve control

B. Provide RTU with exterior antenna for elevated tank site.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install complete and operational control system as specified and as shown on the drawings. Coordinate with all equipment being provided under this and other sections of the specifications.

B. Test all components and system before final inspection.

C. Provide identification for all wiring, terminal strips, and devices. Provide record drawings as specified.

3.02 START–UP SERVICES AND TESTING

A. The SCADA system vendor shall provide start–up and testing to demonstrate operation and monitoring of system as specified.

B. After start–up and testing the representatives shall provide two - 4 hours of instruction in 2 sessions. in the proper operation and maintenance of the systems.

C. Testing shall include all systems and operating conditions. The contractor shall provide a testing schedule with shop drawings for review by owner and engineer. Schedule all tests with owner and engineer. Provide testing report at time of final inspection. All failed tests must be repeated until corrected as no additional cost to the owner.

END OF SECTION

THOMAS & HUTTON

EXHIBIT A

PHASE I ENVIRONMENTAL SITE ASSESSMENT

J – 30998.0000

Phase I Environmental Site Assessment

SPLOST Exit 29 Water Production Facility and Elevated Storage Tank – JWSC Project No. 2102
501 South Port Parkway
Brunswick, Glynn County, Georgia

May 17, 2024, Revised June 14, 2024
Terracon Project No. ES237265

Prepared for:

Thomas & Hutton Engineering Co.
Savannah, Georgia 31405

Terracon

Nationwide
Terracon.com

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- Environmental
- Geotechnical
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May 17, 2024, Revised June 14, 2024

Thomas & Hutton Engineering Co.
50 Park of Commerce Way
Savannah, Georgia 31405

Attn: Chris Stovall, P.E., LEED AP
E: Stovall.c@tandh.com

Re: **Phase I Environmental Site Assessment**
SPLOST Exit 29 Water Production Facility and Elevated Storage Tank –
JWSC Project No. 2102
501 South Port Parkway
Brunswick, Glynn County, Georgia
Terracon Project No. ES237265

Dear Mr. Stovall:

Terracon Consultants, Inc. (Terracon) is pleased to submit the enclosed Phase I Environmental Site Assessment (ESA) report for the above-referenced site. This assessment was performed in accordance with Terracon's Proposal No. PES237265 and Subcontract for Services effective as of February 20, 2024.

We appreciate the opportunity to be of service to you on this project. In addition to Phase I services, our professionals provide **geotechnical, environmental, construction materials, and facilities services** on a wide variety of projects locally, regionally, and nationally. For more detailed information on all of Terracon's services please visit our website at www.terracon.com.

If there are any questions regarding this report or if we may be of further assistance, please do not hesitate to contact us.

Sincerely,
Terracon Consultants, Inc.

Kerri E. Doyle
Senior Geologist

Norman E. Partin, Jr, CHMM
Department Manager

TABLE OF CONTENTS

Section **Page No.**

APPENDICES

EXECUTIVE SUMMARY

This Phase I Environmental Site Assessment (ESA) was performed in general accordance with Terracon's Proposal No. PES237265 and Subcontract for Services effective as of February 20, 2024; and was conducted consistent with the procedures included in ASTM International (ASTM) E1527-21, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process*. The ESA was conducted under the supervision or responsible charge of Kerri E. Doyle, Environmental Professional. Tyler Tomberlin performed the site reconnaissance on March 8, 2024, for SPLOST Exit 29 Water Production Facility and Elevated Storage Tank – JWSC Project No. 2102. This report is for the Elevated Tank.

Findings and Opinions

A summary of findings is provided below, followed by our conclusions and recommendations. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein.

Site Description and Use

The subject site is located at 501 South Port Parkway in Brunswick, Glynn County, Georgia and consists of a 0.36-acre portion of Glynn County PIN 03-16474. The subject site is undeveloped wooded land.

Historical Information

The subject site and surrounding properties have been undeveloped wooded land from as early as 1918. The subject site and the surrounding parent parcel have remained undeveloped. Construction of Interstate 95 began to the east and south of the subject site around 1974, and development of the existing residential community to the west and north began in the early 2000s. Based on review of historical information no recognized environmental conditions (RECs) were identified on the subject site and surrounding properties.

Records Review

Selected federal and state environmental regulatory databases, as well as responses from state and local regulatory agencies were reviewed. The subject site was not listed on any regulatory databases. The Exit 29 Water Pollution Control Plant/ Brunswick Glynn County JWSC Exit 29 WPCP was identified on the FINDS, ECHO, PFAS ECHO, LUST, UST Finder, and UST Finder Release databases and the facility is located approximately 520 feet northwest and cross-gradient of the subject site. Based on apparent topographic gradient and distance from the subject site, the Exit 29 Water Pollution Control Plant/ Brunswick Glynn County JWSC Exit 29 WPCP facility does not constitute a REC, controlled REC (CREC), or historical REC (HREC) in connection with the subject site at this time.

Site Reconnaissance

The subject site consisted of undeveloped wooded land. No RECs were identified on the subject site based on field observations.

Adjoining Properties

The subject site was surrounded by undeveloped wooded land, followed by Interstate 95 to the east and south and a residential community to the north and west. Visual observations showed no obvious signs of a release of petroleum products or hazardous substances on any adjoining properties. Terracon did not identify RECs on adjoining properties based on field observations.

Significant Data Gaps

No Significant Data Gaps (SDGs) were identified.

Conclusions

Terracon has performed a Phase I ESA in accordance with ASTM Practice E1527-21 for JWSC Exit 29 Elevated Tank, 501 South Port Parkway in Brunswick, Glynn County, Georgia. Any exceptions to, or deletions from, this practice are described in Section 1.4 of this report. Results of the Phase I ESA did not identify RECs, CRECs, HRECs, or SDGs in connection with the subject site.

Recommendations

Based on the scope of services, limitations, and conclusions of this Phase I ESA, no additional assessment is warranted at this time.

1.0 INTRODUCTION

1.1 Site Description

Site Name	SPLOST Exit 29 Water Production Facility and Elevated Storage Tank –JWSC Project No. 2102
Site Location / Address	501 South Port Parkway Brunswick, Glynn County, Georgia 31525 PIN: 03-16474
Land Area	Approximately 0.36 acres
Site Improvements	Undeveloped, wooded land.
Anticipated Future Site Use	Potable water production.
Reason for the ESA	Installation of new elevated water storage tank and associated piping.

The subject site location is depicted on Figure 1 of Appendix A as reproduced from portions of the 2020 Brunswick and Dover Bluff, Georgia, United States Geological Survey (USGS) 7.5-minute series topographic quadrangle maps. A Site Diagram depicting the subject site and adjoining properties is provided as Figure 2 of Appendix A. Acronyms and terms used in this report are described in Appendix F.

1.2 Scope of Services

This Phase I Environmental Site Assessment (ESA) was performed in general accordance with the Terracon Proposal No. PES237265 and Subcontract for Services effective as of February 20, 2024; and was conducted consistent with the procedures included in ASTM E1527-21, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* and Client Scope of Work.

The purpose of this ESA was to assist the client in developing information to identify recognized environmental conditions (RECs) in connection with the site as reflected by the scope of this report. RECs are defined by ASTM E1527-21 as "(1) the presence of hazardous substances or petroleum products in, on, or at the subject property due to a release to the environment; (2) the likely presence of hazardous substances or petroleum products in, on, or at the subject property due to a release or likely release to the environment; or (3) the presence of hazardous substances or petroleum products in, on, or at the subject property under conditions that pose a material threat of a future release to the environment." A de minimis condition is not a REC.

This purpose was undertaken through user-provided information, a regulatory database review, historical and physical records review, interviews (including local government inquiries, as applicable), and a visual noninvasive reconnaissance of the site and adjoining properties. Limitations, ASTM deviations, and significant data gaps (if identified) are noted in the applicable sections of the report.

1.3 Standard of Care

This ESA was performed in accordance with generally accepted practices of this profession, undertaken in similar studies at the same time and in the same geographical area. We have endeavored to meet this standard of care, but may be limited by conditions encountered during performance, a client-driven scope of work, or inability to review information not received by the report date. Where appropriate, these limitations are discussed in the text of the report, and an evaluation of their significance with respect to our findings has been conducted.

Phase I ESAs, such as the one performed at this subject site, are of limited scope, are noninvasive, and cannot eliminate the potential that hazardous, toxic, or petroleum substances are present or have been released at the subject site beyond what is identified by the limited scope of this ESA. In conducting the limited scope of services described herein, certain sources of information and public records were not reviewed. It should be recognized that environmental concerns may be documented in public records that were not reviewed.

No ESA can wholly eliminate uncertainty regarding the potential for RECs in connection with a property. Performance of this practice is intended to reduce, but not eliminate, uncertainty regarding the potential for RECs. No warranties, express or implied, are intended or made. The limitations herein must be considered when the user of this report formulates opinions as to risks associated with the subject site or otherwise uses the report for any other purpose. These risks may be further evaluated - but not eliminated - through additional research or assessment. We will, upon request, advise you of additional research or assessment options that may be available and associated costs.

1.4 Additional Scope Limitations, ASTM Deviations and Data Gaps

Based upon the agreed-on scope of services, this ESA did not include subsurface or other invasive assessments, vapor intrusion assessments or indoor air quality assessments (i.e., evaluation of the presence of vapors within a building structure), business environmental risk evaluations, or other services not particularly identified and discussed herein. Credentials of the company (Statement of Qualifications) have not been included in this report but are available upon request. Pertinent documents are referred to in the text of this report, and a separate reference section has not been included.

Reasonable attempts were made to obtain information within the scope and time constraints set forth by the client; however, in some instances, information requested is not, or was not, received by the issuance date of the report. Information obtained for this ESA was received from several sources that we believe to be reliable; nonetheless, the authenticity or reliability of these sources cannot and is not warranted hereunder.

An evaluation of the significance of limitations and missing information with respect to our findings has been conducted, and where appropriate, significant data gaps are identified and discussed in the text of the report. However, it should be recognized that an evaluation of significant data gaps is based on the information available at the time of report issuance, and an evaluation of information received after the report issuance date may result in an alteration of our conclusions, recommendations, or opinions. We have no obligation to provide information obtained or discovered

recommendations, or opinions. We have no obligation to provide information obtained or discovered by us after the issuance date of the report, or to perform any additional services, regardless of whether the information would affect any conclusions, recommendations, or opinions in the report. This disclaimer specifically applies to any information that has not been provided by the client.

This report represents our service to you as of the report date and constitutes our final document; its text may not be altered after final issuance. Findings in this report are based upon the subject site's current utilization, information derived from the most recent reconnaissance and from other activities described herein; such information is subject to change. Certain indicators of the presence of hazardous substances or petroleum products may have been latent, inaccessible, unobservable, or not present during the most recent reconnaissance and may subsequently become observable (such as after site renovation or development). Further, these services are not to be construed as legal interpretation or advice.

1.5 Reliance

This ESA report is prepared for the exclusive use and reliance of Thomas & Hutton Engineering Co. (the Client) and Brunswick Glynn County Joint Water Sewer Commission (JWSC). Use or reliance by any other party is prohibited without the written authorization of the client and Terracon.

Reliance on the assessment by the client and all authorized parties will be subject to the terms, conditions and limitations stated in the Subcontract for Services, assessment report, and Terracon's Agreement. The limitation of liability defined in the Agreement is the aggregate limit of Terracon's liability to the client and all relying parties.

Continued viability of this report is subject to ASTM E1527-21 Sections 4.6 and 4.8. If the assessment will be used by a different user (third party) than the user for whom the assessment was originally prepared, the third party must also satisfy the user's responsibilities in Section 6 of ASTM E1527-21.

1.6 Client Provided Information

Mr. Samuel Dodd, client representative, was asked to provide the following user questionnaire information as described in ASTM E1527-21 Section 6. Mr. Dodd provided the following responses:

Client Questionnaire Responses

Client Questionnaire Item	Client Did Not Respond	Client's Response	
		Yes	No
Specialized Knowledge or Experience that is material to a REC in connection with the subject site.			X
Actual Knowledge of Environmental Liens or Activity Use Limitations (AULs) that may encumber the subject site.			X
Actual Knowledge of a Lower Purchase Price because contamination is known or believed to be present at the subject site.			X
Commonly Known or Reasonably Ascertainable Information that is material to a REC in connection with the subject site.			X
Obvious Indicators of Contamination at the subject site.			X

Terracon's consideration of the client provided information did not identify RECs associated with the subject site. A copy of the ASTM User Questionnaire is provided in Appendix C.

2.0 PHYSICAL SETTING

Physical Setting

Physical Setting Information		Source
Topography (Refer to Appendix A, Figure 1 for an excerpt of the USGS Topographic Map)		
Site Elevation	Approximately 15 feet above mean sea level (amsl)	Site Observations and 2020 Brunswick and Dover Bluff, U.S. Geologic Survey Topographic Map
Topographic Gradient	Topography slopes toward the southeast.	
Closest Surface Water	A tributary approximately 1,500 feet to the southeast.	
Soil Characteristics		**Source**
Soil Types	CaB: Cainhoy fine sand BO: Bohicket-Capers association	USDA-NRCS Web Soil Survey, Bryan and Chatham Counties, Georgia, Accessed March 2024
Descriptions	CaB: A fine sand resulting in an excessively drained soil. BO: A mixture of stratified silty clay loam and silty clay resulting in a very poorly drained soil.	
Geology / Hydrogeology		**Source**
Formation	Qpmi: Pamlico Shoreline Complex	Lawton, D.E., and others, 1976, Geologic Map of Georgia: Georgia Geological Survey
Description	Coastal Plain sedimentary rocks consisting of unconsolidated barrier island facies.	
Estimated Depth to First Occurrence of Groundwater	Approximately 3 to 4.5 feet below ground surface (bgs)	On-site Terracon Geotechnical Investigation 2024
*Hydrogeologic Gradient	Not known – may be inferred to be parallel to topographic gradient (southeast).	

***NOTE:** The groundwater flow direction and the depth to shallow, unconfined groundwater, if present, would likely vary depending upon seasonal variations in rainfall and other hydrogeological features. Without the benefit of on-site groundwater monitoring wells surveyed to a datum, groundwater depth and flow direction beneath the subject site cannot be directly ascertained

3.0 HISTORICAL USE INFORMATION

Terracon reviewed the following historical sources to develop a history of the previous uses of the subject site and surrounding area to help identify past uses for indications of RECs. Copies of selected historical documents are included in Appendix C.

3.1 Historical Topographic Maps, Aerial Photographs, Sanborn Fire Insurance Maps

Readily available historical topographic maps and selected historical aerial photographs (at approximately 10 to 15-year intervals) were reviewed to evaluate land development and obtain information concerning the history of development on and near the subject site. Historical information was provided by Environmental Data Resources, Inc. (EDR). Historical fire insurance maps produced by the Sanborn Map Company were requested from EDR to evaluate past uses and relevant characteristics of the subject site and surrounding properties. Based upon inquiries to the above-listed Sanborn provider, Sanborn maps were not available for the subject site. Reviewed historical topographic maps and aerial photographs are summarized next.

- Topographic Map: Bladen, Georgia published in **1918**, **1939** (1:62,500); Published in **1983** (1:50,000)
- Topographic Map: Dover Bluff, Georgia photorevised in 1961 from **1957** aerial photos; photorevised in 1979 from **1974** aerial photos; photorevised in 1988 from **1983** aerial photos; photorevised in 1995 from **1993** aerial photos; published in **2014, 2017,** and **2020** (1:24,000)
- Topographic Map: Brunswick West, Georgia photorevised in 1957 from **1951** aerial photos; photorevised in 1979 from **1974** aerial photos; photorevised in 1988 from **1983** aerial photos; photorevised in 1995 from **1993** aerial photos; published in **2014, 2017,** and **2020** (1:24,000)
- Aerial Photographs: **1953, 1957, 1968, 1974, 1983, 1988, 1993, 1999, 2007, 2010, 2015,** and **2019** (1:500);
- Google Earth**: 1999-2022** (variable)

Historical Topographic Maps, and Aerial Photographs

Direction	Description
Subject Site	Undeveloped wooded land (1918-2007); The northeast corner of the subject site appears cleared (2010); Wooded land (2015-2022).
North	Undeveloped wooded land (1918-1999); Wooded land followed by residential development (2003-2022).
East	Undeveloped, wooded land (1918-1968); Wooded land followed by Interstate 95 (1974-2022).

Direction	Description
South	Undeveloped, wooded land (1918-1968); Wooded land followed by I-95 development (1974-1979); Wooded and cleared land followed by Interstate 95 (1974-2022).
West	Undeveloped wooded land (1918-1999); Wooded land followed by residential development (2003-2022).

3.2 Historical City Directories

Cole Information, Polk's, and EDR Digital Archive city directories reviewed in this study were made available through EDR (selected years reviewed: 2000-2020) and were reviewed at approximate five-year intervals, if readily available. Summarized in the following table are all on-site and nearby non-residential listings identified in the city directory search. Pertinent excerpts of the EDR-provided city directory report are included in Appendix C.

Historical City Directories

Direction	Description
Subject Site	**501 South Port Parkway:** Not listed (2000-2020).
North	**501 South Port Parkway:** Not listed (2000-2020).
East	**501 South Port Parkway (Parent Parcel):** Not listed (2000-2020). **503 South Port Parkway:** Not listed (2000-2020).
South	**501 South Port Parkway (Parent Parcel):** Not listed (2000-2020). **503 South Port Parkway:** Not listed (2000-2020).
West	**296-304 Cinder Hill Drive:** Not listed (2000-2020). **501 South Port Parkway:** Not listed (2000-2020).

3.3 Site Ownership

Based on a review of information obtained from the Glynn County Board of Tax Assessors website, the current owner of the subject site is Brunswick-Glynn County Joint Water Sewer Commission. The subject site consists of an approximate 0.36-acre portion of the land parcel identified as PIN 03-16474. A copy of the 2024 Property Record Card for the subject site is included in Appendix C.

3.4 Title Search

At the direction of the client, a title search was not included as part of the scope of services. Unless notified otherwise, we assume the client is evaluating this information outside the scope of this report.

3.5 Environmental Liens and Activity and Use Limitations

The EDR regulatory database report included a review of both Federal and State Engineering Control (EC) and Institutional Control (IC) databases. Based on a review of the database report, the subject site was not listed on the EC or IC databases. Please note that in addition to these federal and state listings, AULs can be recorded at the county and municipal level that may not be listed in the regulatory database report. Environmental lien and activity and use limitation records recorded against the subject site were not provided by the client. At the direction of the client, performance of a review of these records was not included as part of the scope of services and unless notified otherwise, we assume the client is evaluating this information outside the scope of this report.

3.6 Interviews Regarding Current and Historical Site Uses

The following individuals were interviewed regarding the current and historical use of the subject site.

Interviews

Interviewer	Name / Phone No./Email	Title	Date / Time
Tyler Tomberlin	Jason Vo / (912)-324-9905	Project Manager	March 8, 2024
Tyler Tomberlin	Angela Walker / awalker@bgjwsc.org	Plant Manager	March 8, 2024

According to Mr. Vo:

- He has been associated with the property since 2019 and the subject site has been undeveloped, wooded land since that time.
- He is unaware of any past use of the subject site.
- He is aware the planned future use of the subject site is an elevated water storage tank.
- He is unaware of any pending, threatened, or past environmental litigation or proceedings regarding the subject site.
- He is unaware of any notices of possible violations of environmental laws/liability or potential environmental concerns in connection with the subject site.
- He is unaware of any current or previous storage of petroleum or hazardous waste on the subject site.
- He is unaware of any spills or releases of petroleum or hazardous materials on the subject site.
- He is unaware of any petroleum pipelines currently or previously located on the subject site.
- He is unaware of any septic systems or sumps currently or previously located on the subject site.

- He is unaware of any current or historical landfills located on the subject site.

According to Ms. Walker:

- She has been associated with the property since 2016 and the subject site has been undeveloped, wooded land since that time.
- She is unaware of any past use on the subject site.
- She is aware the planned future use of the subject site is an elevated water storage tank.
- She is unaware of any pending, threatened, or past environmental litigation or proceedings regarding the subject site.
- She is unaware of any notices of possible violation of environmental laws/liability or potential environmental concerns in connection with the subject site.
- She is not aware of any current or previous storage of petroleum products or hazardous substances on the subject site.
- She is unaware of any spills or releases of petroleum or hazardous materials on the subject site.
- She is unaware of any current underground or aboveground storage of petroleum or hazardous materials on the subject site.
- She is unaware of any petroleum pipelines currently or formerly located on the subject site.
- She is unaware of any septic systems or sumps currently or previously located on the subject site.
- She is unaware of any current or historic landfills located on the subject site.

3.7 Prior Report Review

Terracon requested the client provide any previous environmental reports they are aware of for the subject site. No reports were provided to Terracon for review.

4.0 RECORDS REVIEW

Regulatory database information was provided by EDR, a contract information services company in a report dated February 28, 2024. The purpose of the records review was to identify RECs, Controlled RECs (CRECs), and Historical RECs (HRECs) in connection with the subject site. Information in this section is subject to the accuracy of the data provided by the information services company and the date at which the information is updated. Please note the scope herein did not include confirmation of facilities listed as "unmappable" by regulatory databases.

In some of the following subsections, the words up-gradient, cross-gradient, and down-gradient refer to the topographic gradient in relation to the subject site. As stated previously, the groundwater flow direction and the depth to shallow groundwater, if present, would likely vary depending upon seasonal variations in rainfall and the depth to the soil/bedrock interface. Without the benefit of on-site groundwater monitoring wells surveyed to a datum, groundwater depth and flow direction beneath the subject site cannot be directly ascertained.

4.1 Federal and State/Tribal Databases

Listed below are the facility listings identified on federal and state/tribal databases within the ASTM-required search distances from the approximate subject site boundaries. Database definition, descriptions, and the database search report are included in Appendix D.

Federal Databases

Database	Description	Distance (miles)	Listings
BF	Brownfields Management System	0.5	0
CERCLIS	Comprehensive Environmental Response Compensation & Liability Information System	0.5	0
CORRACTS	Corrective Action Cleanup	1	0
EC/IC	Federal Engineering and Institutional Control Sites	Site	0
LUCIS	Land Use Control Information System	0.5	0
NLRRCRAG	No Longer Regulated RCRA Generator Facilities	0.125	0
NLRRCRAT	No Longer Regulated RCRA Non-CORRACTS TSD Facilities	0.5	0
NPL	National Priorities List	1	0
RCRA Generators	RCRA Very Small, Small, and Large Quantity Generators	0.25	0
SEMS	Superfund Enterprise Management System	0.5	0

State/Tribal Databases

Database	Description	Distance (miles)	Listings
GABF	Brownfield Properties	0.5	0
GAAST	Aboveground Storage Tanks	0.25	0
GAAUL	Activity and Use Limitations	0.5	0
GA INST CONTROL	Institutional Control	0.5	0
GANONHSI	Non-Hazardous Site Inventory	1	0
GASHWS	State Hazardous Waste Sites	1	0
GAHSI	Hazardous Site Inventory	1	0
GALUST	Leaking Underground Storage Tanks	0.5	1
GANPDES	National Pollutant Discharge Elimination System Permits	Site	0
GASPILLS	Spills Listing	Site	0
GASWF/LF	Solid Waste Facilities	0.5	0
GATIERII	Tier II Chemical Reporting Program Facilities	Site	0
GAUEC	Uniform Environmental Covenant Properties	Site	0
GAUST	Underground Storage Tanks	0.25	0
GAVCP	Voluntary Cleanup Program Sites	0.5	0

Other Ascertainable Information

Database	Description	Distance (miles)	Listings
RCRA NonGen/NLR	RCRA Non-Generator / No Longer Regulated	0.25	0
EDR Historical Auto	An EDR proprietary historical auto database.	0.125	0
EDR Historical Cleaner	An EDR proprietary historical cleaner database.	0.125	0
PFAS ECHO	PFAS Enforcement and Compliant History Online	0.25	1
UST FINDER RELEASE	Underground Storage Tank Finder Release Database	0.50	1

In addition to the above ASTM-required listings, Terracon reviewed other federal, state, local, and proprietary databases provided by the database firm. A list of the additional reviewed databases is included in the regulatory database report included in Appendix D.

The following table summarizes the site-specific information provided by the database and/or gathered by this office for identified facilities. Facilities are listed in order of proximity to the subject site. Additional discussion for selected facilities follows the summary table.

Listed Facilities

Facility Name and Location	Estimated Distance / Direction / Gradient	Database Listings	Is a Rec, CREC, or HREC to the Subject Site
Brunswick Glynn County JWSC Exit 29 WPCP / Exit 29 Water Pollution Control Plant 314 and 391 South Port Parkway	520 ft / NE / Cross-gradient	PFAS ECHO, FINDS, ECHO, LUST, UST FINDER, UST FINDER RELEASE	No, based on distance and topographic gradient.

Unmapped facilities are those that do not contain sufficient address or location information to evaluate the facility listing locations relative to the site. The report listed two facilities in the unmapped section. Determining the location of unmapped facilities is beyond the scope of this assessment; however, none of these facilities were identified as the site or adjacent properties. These facilities are listed in the database report in Appendix D.

4.2 Local Agency Inquiries

The following local agencies and/or private companies were contacted regarding information relevant to the subject site. Communication logs documenting the conversations with the various parties are provided in Appendix D.

Agency Contacted / Contact Method	Response
Glynn County Open Records https://glynncounty-ga.nextrequest.com/	Terracon's Tyler Tomberlin submitted an open records request on February 28, 2024 requesting any documents pertaining to Aboveground Storage Tanks, Underground Storage Tanks, chemical spills/releases, development records including building permits/as-built diagrams, code violations, land use, zoning, soil reports, or any other environmental records. Tyler Tomberlin followed up for response on March 7, 2024; however, at the issuance of this report no response has been received.

Agency Contacted / Contact Method	Response
Glynn County Fire Department twhite@cityofbrunswick-ga.gov	Terracon's Tyler Tomberlin submitted an open records request on February 28, 2024 for information pertaining to emergency response, fires, and chemical spills/releases Tyler Tomberlin followed up for response on March 7, 2024; however, at the issuance of this report no response has been received.

5.0 SITE RECONNAISSANCE

5.1 General Site Information

Information contained in this section is based on a visual reconnaissance conducted while walking through the subject site and the accessible interior areas of structures, if any, located on the subject site. Photo documentation of the subject site at the time of the visual reconnaissance is provided in Appendix B. Credentials of the individual who conducted the site visit are included in Appendix E.

General Site Information

Site Reconnaissance				
Field Personnel	Tyler Tomberlin			
Reconnaissance Date	March 8, 2024			
Weather Conditions	Sunny, approximately 77°F			
Site Contact / Title	Jason Vo / Site Owner Representative			
Building Description				
Building Identification	**Building Use**	**Approx. Construction Date**	**Number of Stories**	**Approx. Size (ft^2)**
NA	NA	NA	NA	NA
Site Utilities				
Drinking Water	None			
Wastewater	None			
Electric	None			
Natural Gas	None			

5.2 Overview of Current Site Occupants

The subject site was unoccupied.

5.3 Overview of Current Site Operations

The subject site consisted of undeveloped wooded land. No RECs were identified on the subject site based on field observations.

5.4 Site Observations

The following table summarizes site observations and interviews. Affirmative responses (designated by an "X") are discussed in more detail following the table.

Site Characteristics

Category	Item or Feature	Observed
Site Operations, Processes, and Equipment	Emergency generators	
	Elevators	
	Air compressors	
	Hydraulic lifts	
	Dry cleaning	
	Photo processing	
	Ventilation hoods and/or incinerators	
	Waste treatment systems and/or water treatment systems	
	Heating and/or cooling systems	
	Paint booths	
	Sub-grade mechanic pits	
	Wash-down areas or carwashes	
	Vehicle repair or maintenance	
	Pesticide/herbicide production or storage	
	Printing operations	
	Electroplating, chrome plating or galvanizing	
	Salvage operations	
	Oil, gas, or mineral production	
	Other processes or equipment	
Aboveground Chemical or Waste Storage	Aboveground storage tanks	
	Drums, barrels and/or containers ≥ 5 gallons	

	MSDS	
Underground Chemical or Waste Storage, Drainage or Collection Systems	Underground storage tanks or ancillary UST equipment	
	Sumps, cisterns, catch basins and/or dry wells	
	Grease traps	
	Septic tanks and/or leach fields	
	Oil/water separators, clarifiers, sand traps, triple traps, interceptors	
	Pipeline markers	
	Interior floor drains	
Electrical Transformers / PCBs	Transformers and/or capacitors	
	Other equipment	
Releases or Potential Releases	Stressed vegetation	
	Stained soil	
	Stained pavement or similar surface	
	Leachate and/or waste seeps	
	Trash, debris and/or other waste materials	
	Dumping or disposal areas	
	Construction/demolition debris and/or dumped fill dirt	
	Surface water discoloration, odor, sheen, and/or free-floating product	
	Strong, pungent, or noxious odors	
	Exterior pipe discharges and/or other effluent discharges	
Other Notable Site Features	Surface water bodies	
	Quarries or pits	
	Wastewater lagoons	
	Wells	

None of the site characteristics listed in the table above were observed on the subject site.

6.0 ADJOINING PROPERTY RECONNAISSANCE

Visual observations of adjoining properties (from subject site boundaries) are summarized in the table below.

Adjoining Properties

Direction	Description
North	Wooded land followed by residential development
East	Wooded land followed by Interstate 95
South	Wooded land followed by Interstate 95
West	Wooded land followed by residential development

Visual observations showed no obvious signs of a release of petroleum products or hazardous substances on any adjoining properties. Terracon did not identify RECs on adjoining properties based on field observations.

7.0 ADDITIONAL SERVICES

Per the agreed scope of services specified in the proposal, additional services (e.g. asbestos sampling, lead-based paint sampling, wetlands evaluation, lead in drinking water testing, radon testing, vapor encroachment screening, etc.) were not conducted.

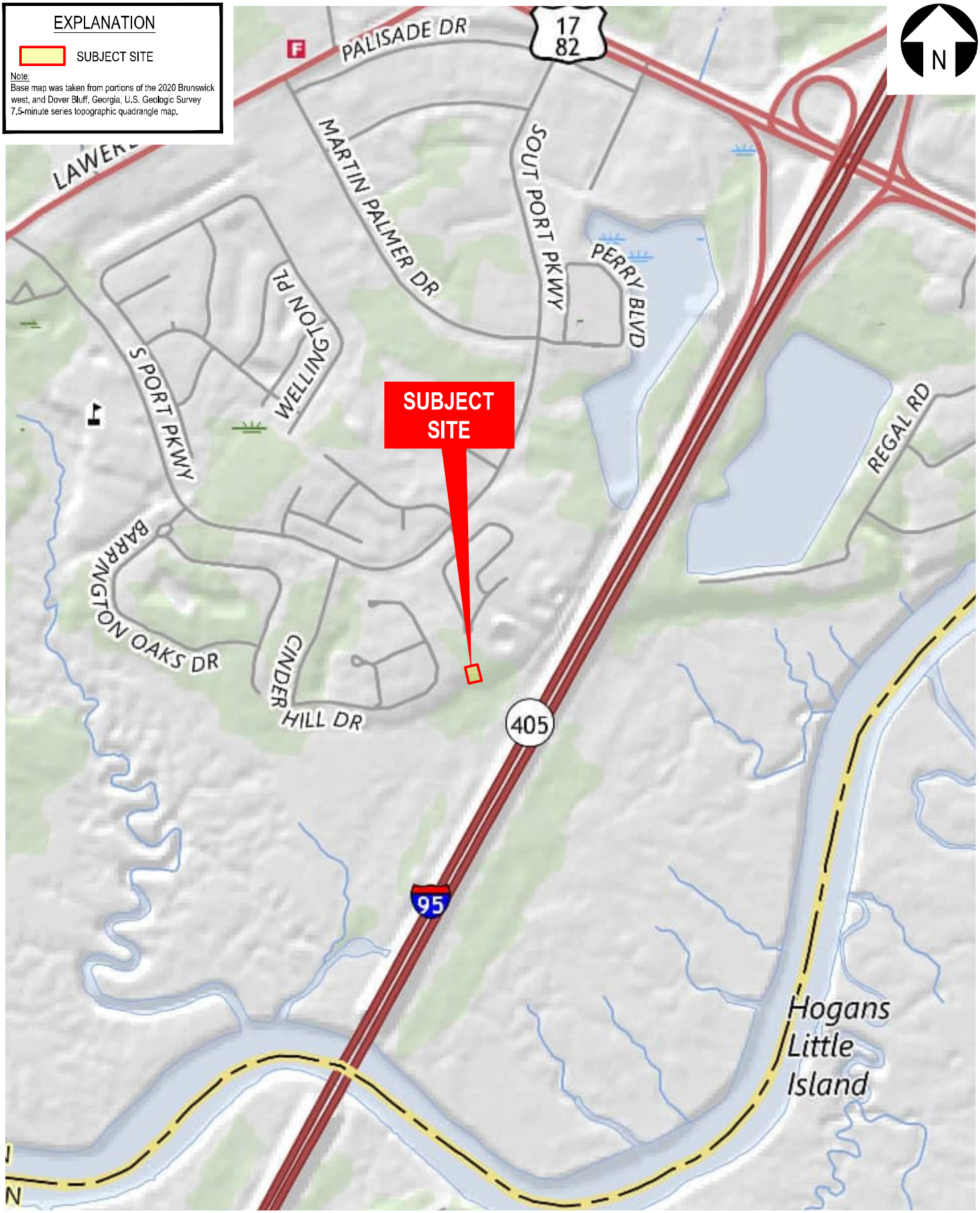
8.0 DECLARATION

I, Kerri E. Doyle, Environmental Professional, declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in Section 312.10 of 40 CFR 312; and I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject site. I have developed and performed the All-Appropriate Inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

Kerri E. Doyle
Senior Geologist

APPENDIX A

Figures



0 500' 1,000'
1" = 1,000'
SCALE IN FEET

Project Mngr:	STT
Drawn By:	NJL
Checked By:	KED
Approved By:	NEP

Project No.	ES237265
Scale:	AS SHOWN
File Name:	ES237265.dwg
Date:	March 04, 2024

Terracon
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax. (912) 629 4001

TOPOGRAPHIC MAP

JWSC EXIT 29 ELEVATED TANK
501 South Port Parkway
Brunswick, Glynn County, Georgia

Figure
1

EXPLANATION

- SUBJECT SITE BOUNDARY
- ADJACENT PARCEL BOUNDARY
- UNPAVED ACCESS ROAD

Note:
Map elements were graphically estimated from Bing Maps aerial imagery, Glynn County tax maps, Thomas and Hutton Staking Plan and on-site observations. Parcel boundaries are approximate. Not intended for construction purposes.

0 40' 80'

1" = 80'
SCALE IN FEET

N

UNPAVED ACCESS ROAD

DOGWOOD CT.

CINDER HILL DR

BRUNSWICK GLYNN COUNTY JOINT WATER & SEWER COMISSION (PARENT PARCEL)
Address: 501 South Port Parkway
PIN: 03-16474
±5.75 acres

BUDD BILLBOARDS LLC
Address: N/A
PIN: 03-21081
±0.21 acres

RESIDENTIAL
Address: 304 Cinder Hill Dr.
PIN: 03-17153
±0.45 acres

SUBJECT SITE
Address: 501 South Port Parkway
PIN: 03-16474
±0.36 acres

RESIDENTIAL
Address: 296 Cinder Hill Dr.
PIN: 03-17152
±0.77 acres

RESIDENTIAL
Address: 288 Cinder Hill Dr.
PIN: 03-17151
±0.50 acres

CAUSEWAY PROPERTIES LLC
Address: 503 South Port Parkway #31002
PIN: 03-16494
±443.93 acres

INTERSTATE 95

40

95

Project Mngr:	STT
Drawn By:	NJL
Checked By:	KED
Approved By:	NEP

Project No.	ES237265
Scale:	AS SHOWN
File Name:	ES237265.dwg
Date:	April 02, 2024

Terracon
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax. (912) 629 4001

SITE DIAGRAM

JWSC EXIT 29 ELEVATED TANK
501 South Port Parkway
Brunswick, Glynn County, Georgia

Figure
2A

APPENDIX B

Site Photographs

PHOTO # 1: General view of the subject site. View is to the east.

PHOTO # 2: View of western adjoining property. View is to the west.

PHOTO # 3: View of southern adjoining property. View is to the south.

PHOTO # 4: View of eastern adjoining property. View is to the east.

PHOTO # 5 View of northern adjoining property. View is to the north.

PHOTO # 6 View from center of subject site. View is to the east.

PHOTO # 7 View from center of subject site. View is to the north.

PHOTO # 8 View from center of subject site. View is to the south.

PHOTO # 9 View from center of subject site. View is to the east.

PHOTO # 10 View from center of subject site. View is to the west.

APPENDIX C

Historical Documentation and User Questionnaire

ASTM E1527-21 USER QUESTIONNAIRE

Date Completed	2/29/2024
Person Completing Questionnaire	Name: Samuel Dodd Phone: 912-721-4347 Company: Thomas & Hutton Email: dodd.s@tandh.com
Site Name	Exit 29 Water Production Facility & Elevated Storage Tank
Site Address	501 South Port Pkwy #3, Brunswick, GA 31523
Point of Contact for Access	Name: Jason Vo Phone: 912-261-7140 Company: BGJWSC Email: jvo@bgjwsc.org
Access Restrictions or Special Site Requirements?	___No _X_Yes (If yes, please explain) Contact BGJWSC for gate access
Confidentiality Requirements?	___No ___Yes (If yes, please explain)
Current Site Owner	Name: BGJWSC Phone: 912-261-7140 Company: Email: jvo@bgjwsc.org
Current Site Operator	Name: BGJWSC Phone: 912-261-7140 Company: Email: jvo@bgjwsc.org
Reasons for ESA (e.g., financing, acquisition, lease, etc.)	Installation of a new elevated water storage tank and associated piping
Anticipated Future Site Use	Potable water production
Relevant Documents?	Please provide Terracon copies of prior Phase I or II ESAs, Asbestos Surveys, Environmental Permits or Audit documents, Underground Storage Tank documents, Geotechnical Investigations, Site Surveys, Diagrams or Maps, or other relevant reports or documents.

ASTM User Questionnaire

To qualify for one of the *Landowner Liability Protections (LLPs)* offered by the Small Business Liability Relief and Brownfields Revitalization Act of 2001 (the "*Brownfields Amendments*"), the user must respond to the following inquiries required by 40 C.F.R. §§ 312.25, 312.28, 312.29, 312.30, and 312.31. These inquiries must also be conducted by EPA Brownfield Assessment and Characterization grantees. The *user* should provide the following information to the *environmental professional*. Failure to conduct these inquiries could result in a determination that "*all appropriate* inquiries" is not complete.

1) Did a search of land title records (or judicial records where appropriate) identify any environmental liens filed or recorded against the site under federal, tribal, state, or local law (40 CFR 312.25)?

_X_No ___Yes (If yes, explain below and send Terracon a copy of the title records or judicial records reviewed.)

2) Did a search of land title records (or judicial records where appropriate) identify any activity and use limitations (AULs), such as engineering controls, land use restrictions, or institutional controls that are in place at the site and/or have been filed or recorded against the site under federal, tribal, state, or local law (40 CFR 312.26)?

_X_No ___Yes (If yes, explain below and send Terracon a copy of the title records or judicial records reviewed.)

3) Do you have any specialized knowledge or experience related to the site or nearby properties? For example, are you involved in the same line of business as the current or former occupants of the site or an adjoining property so that you would have specialized knowledge of the chemicals and processes used by this type of business (40 CFR 312-28)?

_X_No ___Yes (If yes, explain below)

Do you have actual knowledge of a lower purchase price because contamination is known or believed to be present at the site (40 CFR 312.29)?

_X_No ___Yes ___Not applicable (If yes or Not applicable, explain below)

5) Are you aware of commonly known or reasonably ascertainable information about the site that would help the environmental professional to identify conditions indicative of releases or threatened releases (40 CFR 312.30)? For example, (a.) Do you know the past uses of the site? (b.) Do you know of specific chemicals that are present or once were present at the site? (c.) Do you know of spills or other chemical releases that have taken place at the site? (d.) Do you know of any environmental cleanups that have taken place at the site?

_X_No ___Yes (If yes, explain below)

6) Based on your knowledge and experience related to the site, are there any obvious indicators that point to the presence or likely presence of releases at the site (40 CFR 312.31)?

_X_No ___Yes (If yes, explain below)

Comments or explanations:

JWSC Exit 29 Elevated Tank

501 S PORT PKWY

BRUNSWICK, GA 31523

Inquiry Number: 7581738.4

February 28, 2024

EDR Historical Topo Map Report

with QuadMatch™

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Historical Topo Map Report

02/28/24

Site Name:	Client Name:
JWSC Water Plant and Tank	Terracon
501 S PORT PKWY	2201 Rowland Avenue
BRUNSWICK, GA 31523	Savannah, GA 31404
EDR Inquiry # 7581738.4	Contact: Tyler Tomberlin

EDR Topographic Map Library has been searched by EDR and maps covering the target property location as provided by Terracon were identified for the years listed below. EDR's Historical Topo Map Report is designed to assist professionals in evaluating potential liability on a target property resulting from past activities. EDRs Historical Topo Map Report includes a search of a collection of public and private color historical topographic maps, dating back to the late 1800s.

Search Results:		*Coordinates:*	
P.O.#	NA	**Latitude:**	31.126628 31° 7' 36" North
Project:	JWSC Exit 29 Water Plant B	**Longitude:**	-81.584314 -81° 35' 4" West
		UTM Zone:	Zone 17 North
		UTM X Meters:	444291.24
		UTM Y Meters:	3443782.48
		Elevation:	9.00' above sea level

Maps Provided:

2020	1939
2017	1918
2014	
1995	
1988	
1983	
1979	
1956, 1961	

Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

2020 Source Sheets

Brunswick West
2020
7.5-minute, 24000

Dover Bluff
2020
7.5-minute, 24000

2017 Source Sheets

Brunswick West
2017
7.5-minute, 24000

Dover Bluff
2017
7.5-minute, 24000

2014 Source Sheets

Brunswick West
2014
7.5-minute, 24000

Dover Bluff
2014
7.5-minute, 24000

1995 Source Sheets

Dover Bluff
1995
7.5-minute, 24000
Aerial Photo Revised 1993

Brunswick West
1995
7.5-minute, 24000
Aerial Photo Revised 1993

Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

1988 Source Sheets

Dover Bluff
1988
7.5-minute, 24000
Aerial Photo Revised 1983

Brunswick West
1988
7.5-minute, 24000
Aerial Photo Revised 1983

1983 Source Sheets

BLADEN
1983
15-minute, 50000

1979 Source Sheets

Dover Bluff
1979
7.5-minute, 24000
Aerial Photo Revised 1974

Brunswick West
1979
7.5-minute, 24000
Aerial Photo Revised 1974

1956, 1961 Source Sheets

Brunswick West
1956
7.5-minute, 24000
Aerial Photo Revised 1951

Dover Bluff
1961
7.5-minute, 24000
Aerial Photo Revised 1957

Topo Sheet Key

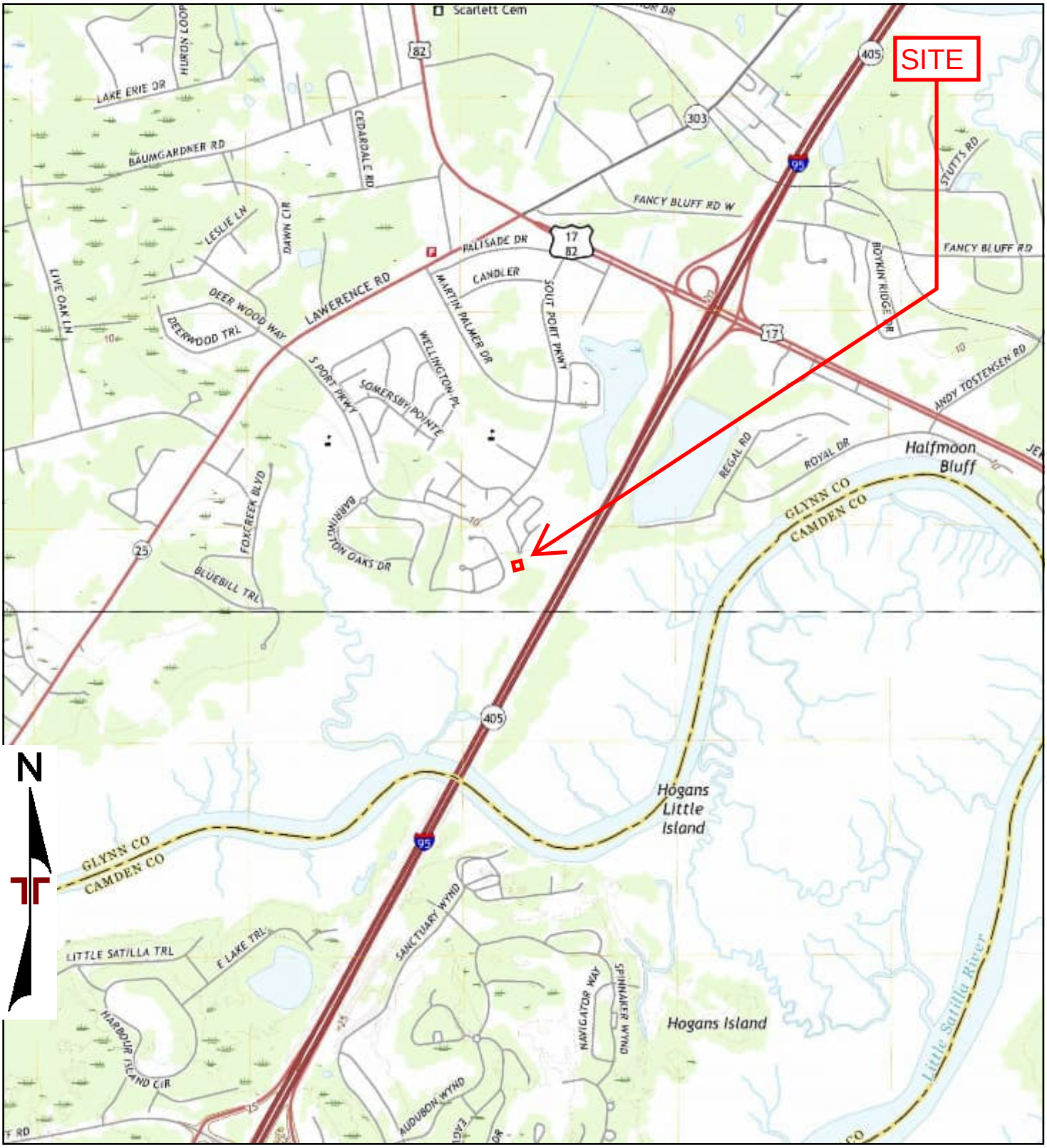
This EDR Topo Map Report is based upon the following USGS topographic map sheets.

1939 Source Sheets

Bladen
1939
15-minute, 62500

1918 Source Sheets

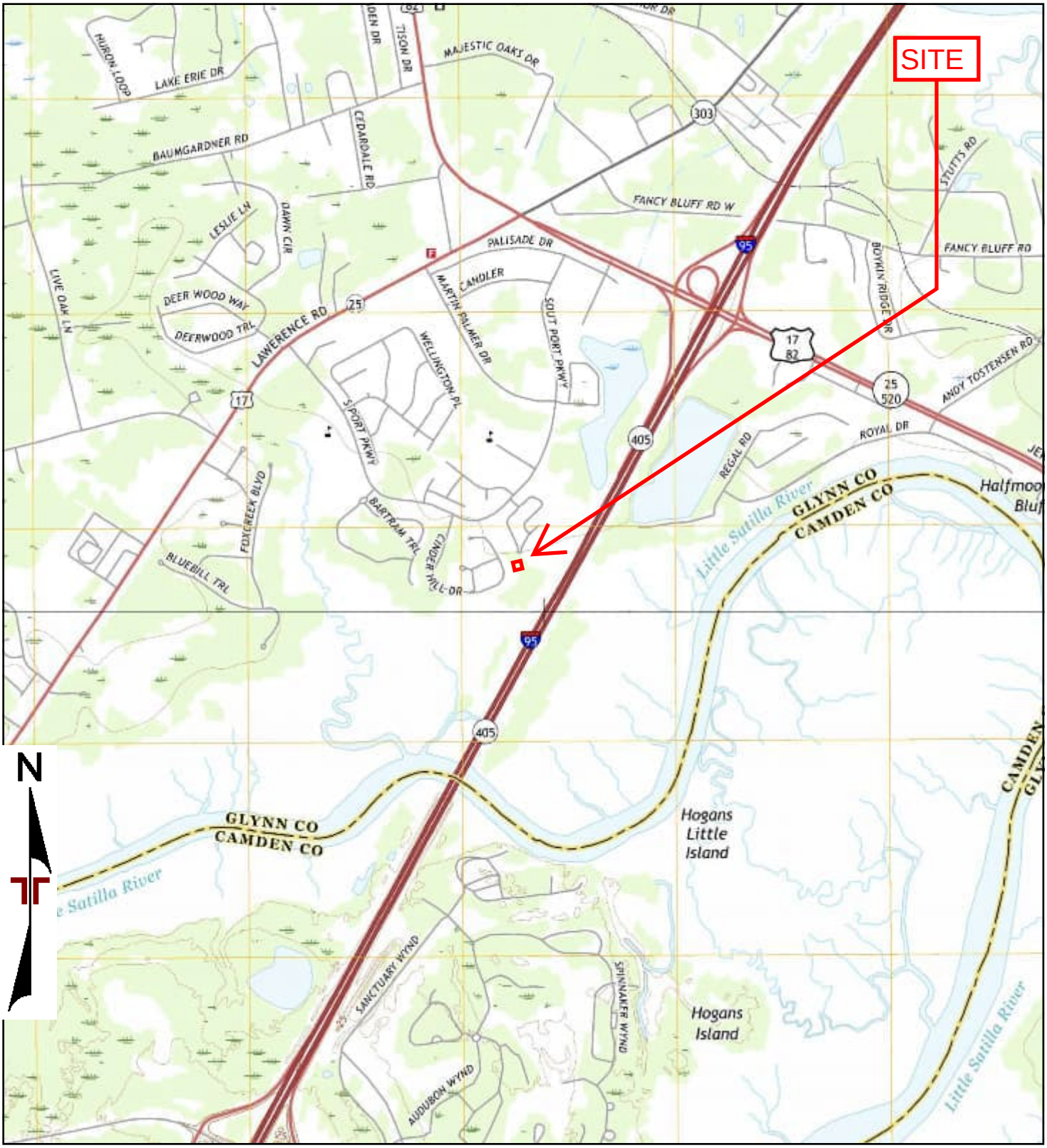
Bladen
1918
15-minute, 62500



TP, Brunswick West, 2020, 7.5-minute
S, Dover Bluff, 2020, 7.5-minute

0 Miles 0.25 0.5 1 1.5

Project Manager: KED	Project No. JSWC Exit 29 W	Terracon 2201 Rowland Avenue Savannah, GA 31404	2020 TOPOGRAPHIC MAP JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523
Drawn by:	Scale: As Shown		Appendix C
Checked by: STT	File Name:		
Approved by: NEP	Date: 2020		



TP, Brunswick West, 2017, 7.5-minute
S, Dover Bluff, 2017, 7.5-minute

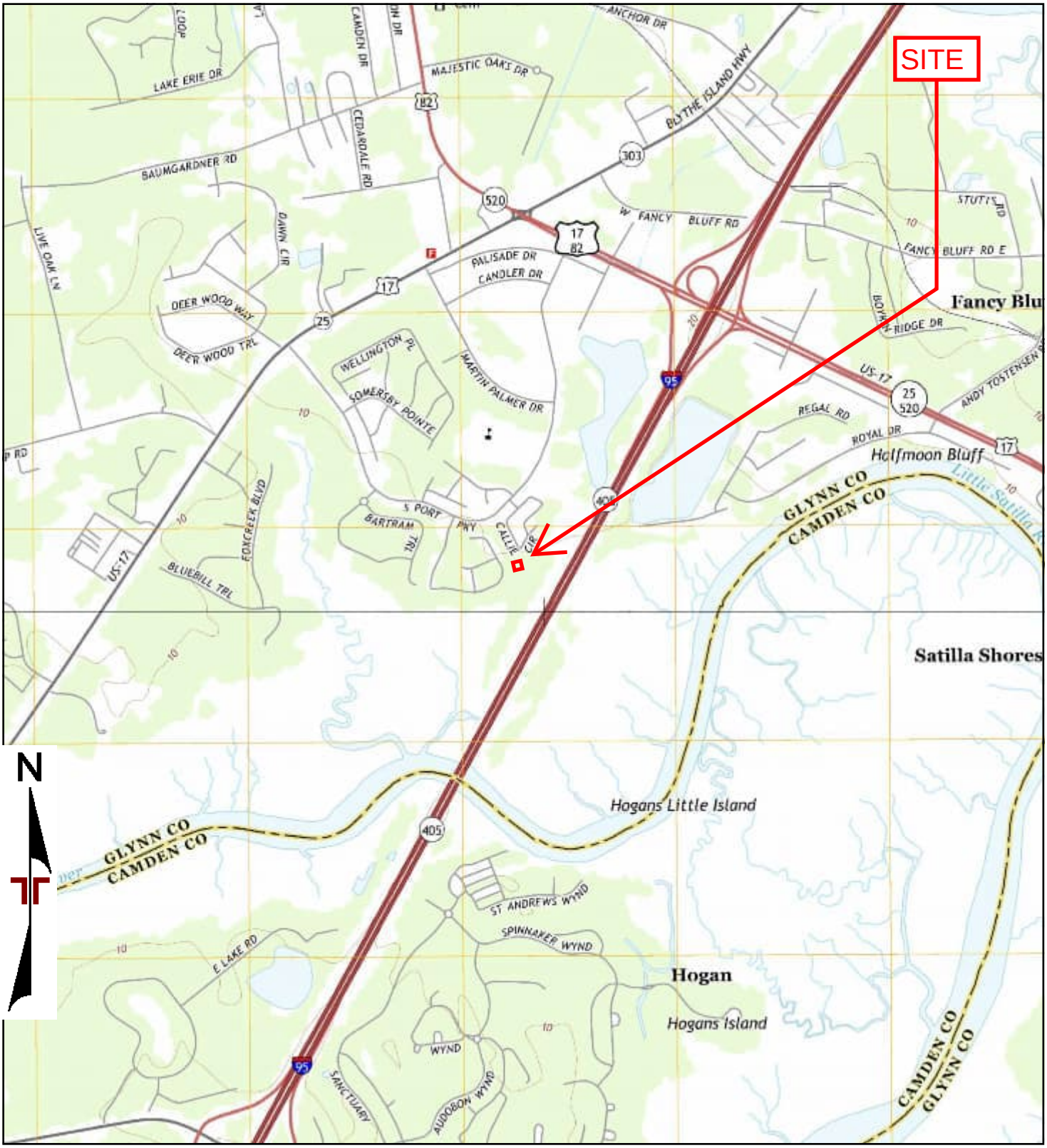
0 Miles 0.25 0.5 1 1.5

Project Manager: KED	Project No. JSWC Exit 29 W
Drawn by:	Scale: As Shown
Checked by: STT	File Name:
Approved by: NEP	Date: 2017

Terracon
2201 Rowland Avenue
Savannah, GA 31404

2017 TOPOGRAPHIC MAP
JWSC Exit 29 Elevated Tank
501 S PORT PKWY
BRUNSWICK, GA 31523

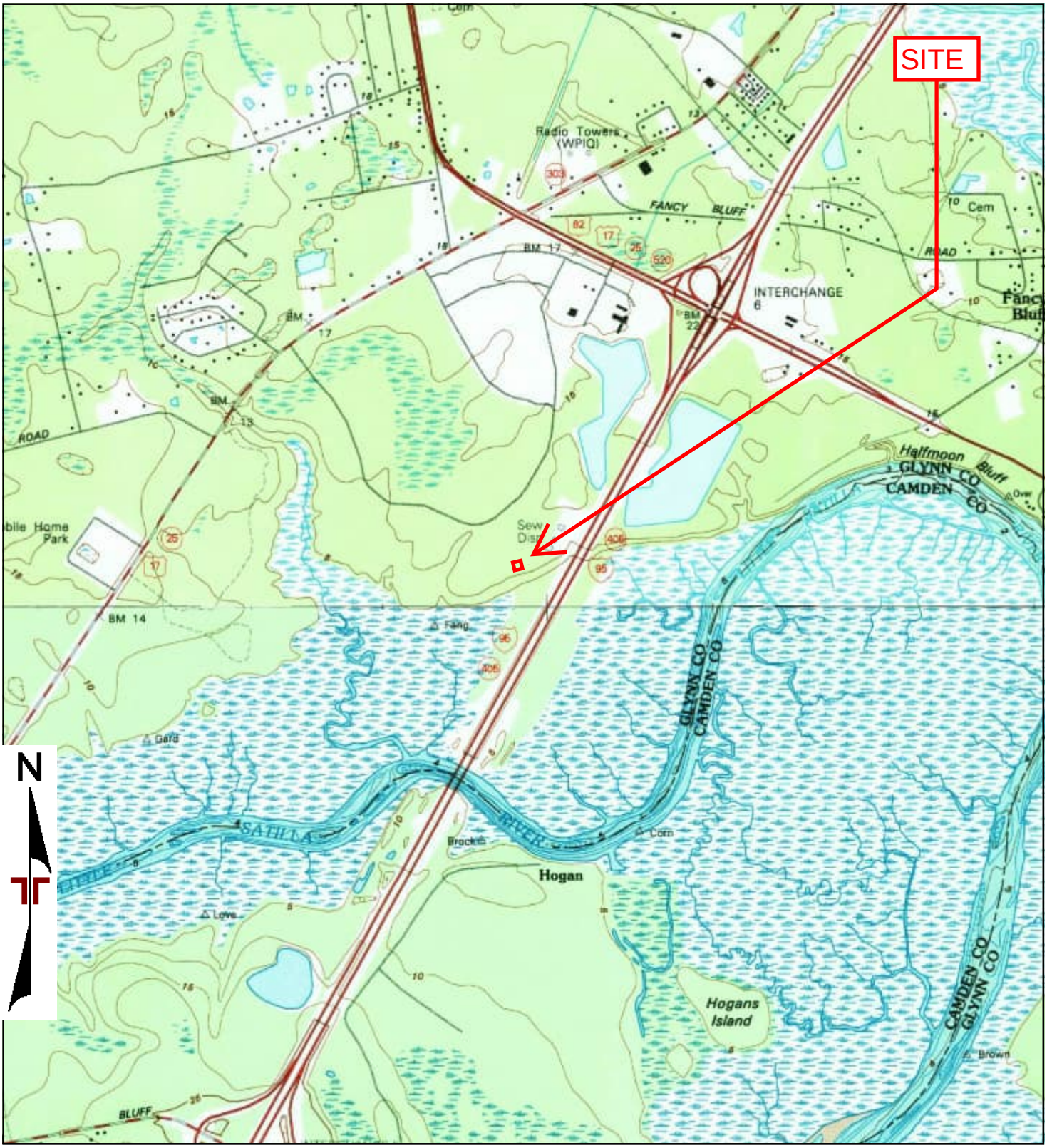
Appendix
C



TP, Brunswick West, 2014, 7.5-minute
S, Dover Bluff, 2014, 7.5-minute

0 Miles 0.25 0.5 1 1.5

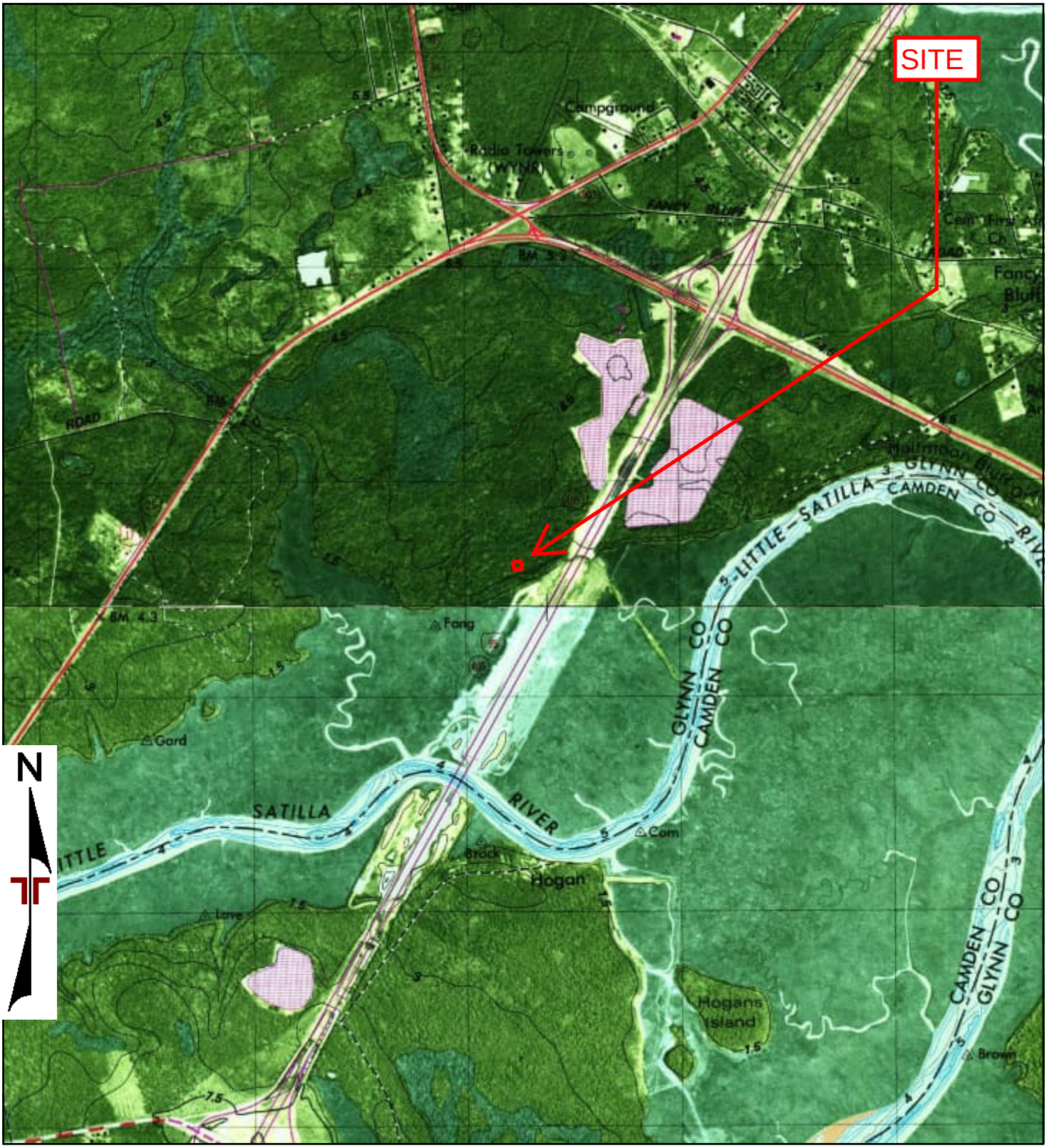
Project Manager: KED	Project No. JSWC Exit 29 W	Terracon 2201 Rowland Avenue Savannah, GA 31404	2014 TOPOGRAPHIC MAP JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn by:	Scale: As Shown			
Checked by: STT	File Name:			
Approved by: NEP	Date: 2014			



TP, Brunswick West, 1995, 7.5-minute
S, Dover Bluff, 1995, 7.5-minute

0 Miles 0.25 0.5 1 1.5

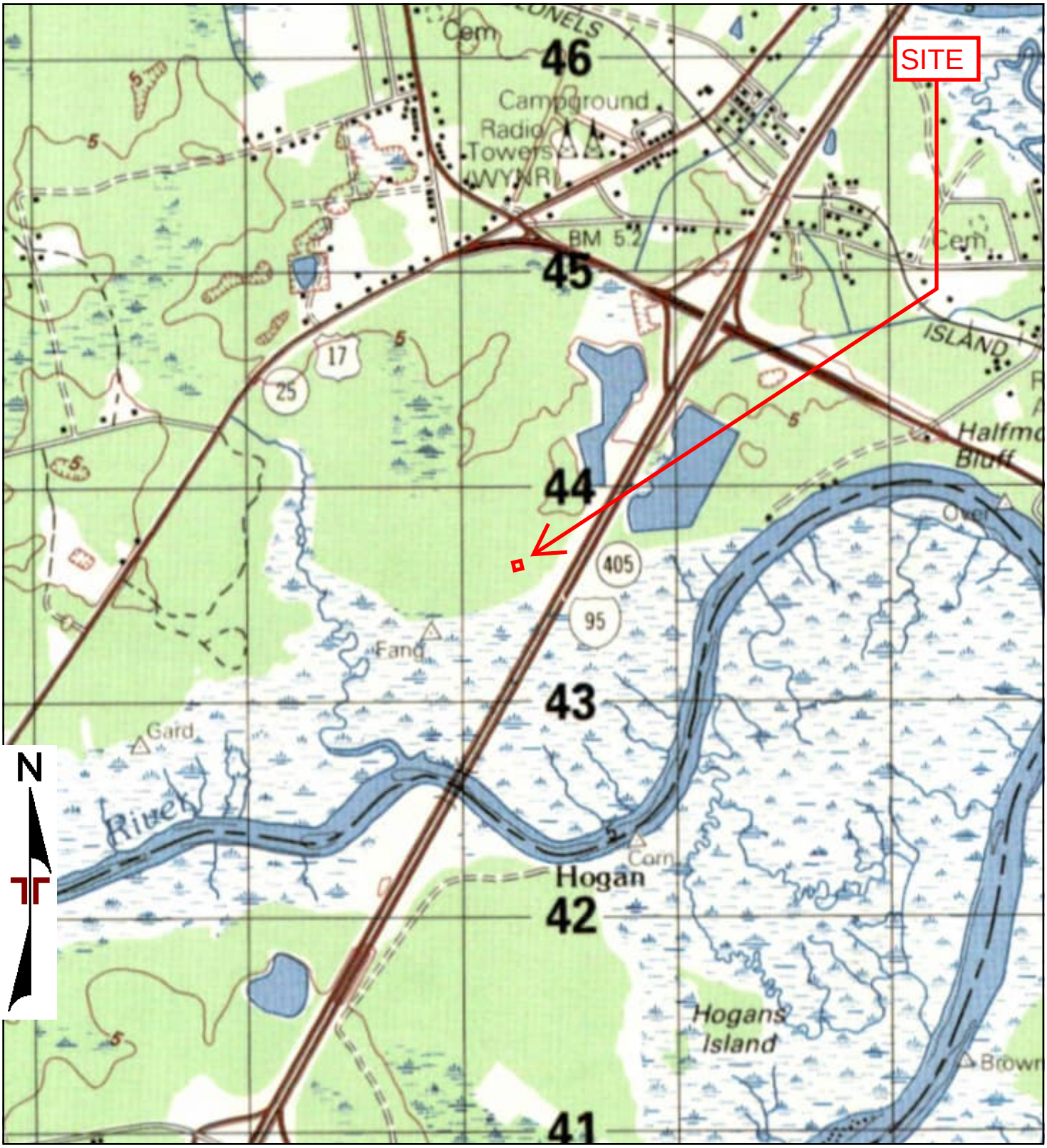
Project Manager: KED	Project No. JSWC Exit 29 W	Terracon 2201 Rowland Avenue Savannah, GA 31404	1995 TOPOGRAPHIC MAP JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn by:	Scale: As Shown			
Checked by: STT	File Name:			
Approved by: NEP	Date: 1995			



TP, Brunswick West, 1988, 7.5-minute
S, Dover Bluff, 1988, 7.5-minute

0 Miles 0.25 0.5 1 1.5

Project Manager: KED	Project No. JSWC Exit 29 W	Terracon 2201 Rowland Avenue Savannah, GA 31404	1988 TOPOGRAPHIC MAP JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn by:	Scale: As Shown			
Checked by: STT	File Name:			
Approved by: NEP	Date: 1988			



TP, BLADEN, 1983, 15-minute

0 Miles 0.25 0.5 1 1.5

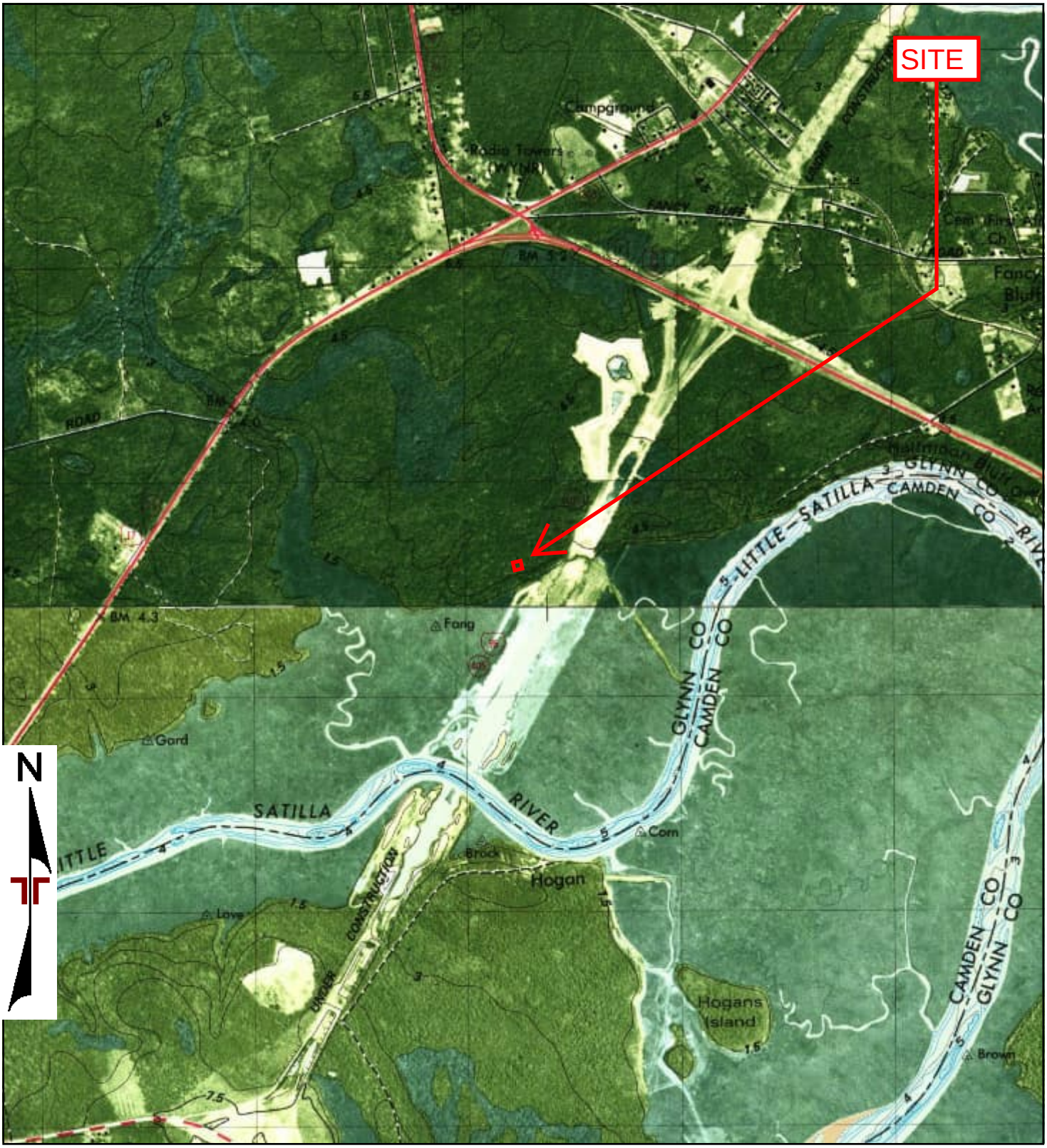
Project Manager: KED	Project No. JSWC Exit 29 W
Drawn by:	Scale: As Shown
Checked by: STT	File Name:
Approved by: NEP	Date: 1983

Terracon
2201 Rowland Avenue
Savannah, GA 31404

1983 TOPOGRAPHIC MAP

JWSC Exit 29 Elevated Tank
501 S PORT PKWY
BRUNSWICK, GA 31523

Appendix C



TP, Brunswick West, 1979, 7.5-minute
S, Dover Bluff, 1979, 7.5-minute

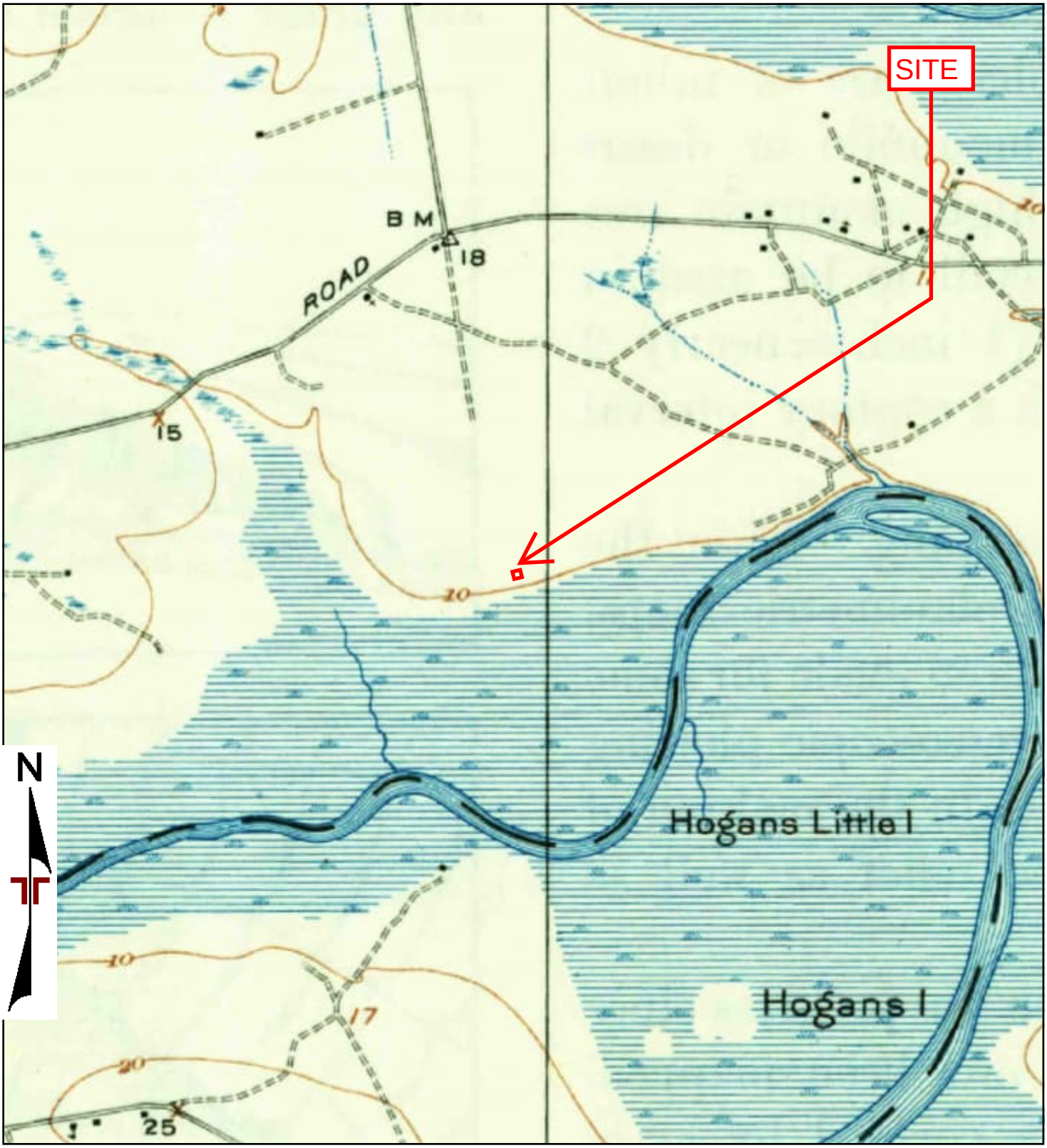
0 Miles 0.25 0.5 1 1.5

Project Manager: KED	Project No. JSWC Exit 29 W	Terracon 2201 Rowland Avenue Savannah, GA 31404	1979 TOPOGRAPHIC MAP JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn by:	Scale: As Shown			
Checked by: STT	File Name:			
Approved by: NEP	Date: 1979			

TP, Brunswick West, 1956, 7.5-minute
S, Dover Bluff, 1961, 7.5-minute

0 Miles 0.25 0.5 1 1.5

Project Manager: KED	Project No. JSWC Exit 29 W	Terracon 2201 Rowland Avenue Savannah, GA 31404	1956, 1961 TOPOGRAPHIC MAP JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix
Drawn by:	Scale: As Shown			C
Checked by: STT	File Name:			
Approved by: NEP	Date: 1956, 1961			



TP, Bladen, 1939, 15-minute

0 Miles 0.25 0.5 1 1.5

Project Manager: KED	Project No. JSWC Exit 29 W	Terracon 2201 Rowland Avenue Savannah, GA 31404	1939 TOPOGRAPHIC MAP JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn by:	Scale: As Shown			
Checked by: STT	File Name:			
Approved by: NEP	Date: 1939			

TP, Bladen, 1918, 15-minute

0 Miles 0.25 0.5 1 1.5

Project Manager: KED	Project No. JSWC Exit 29 W
Drawn by:	Scale: As Shown
Checked by: STT	File Name:
Approved by: NEP	Date: 1918

Terracon
2201 Rowland Avenue
Savannah, GA 31404

1918 TOPOGRAPHIC MAP

JWSC Exit 29 Elevated Tank
501 S PORT PKWY
BRUNSWICK, GA 31523

Appendix C

JWSC Exit 29 Elevated Tank

501 S PORT PKWY BRUNSWICK,

GA 31523

Inquiry Number: 7581738.8

March 04, 2024

The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

03/04/24

Site Name:	Client Name:
JWSC Water Plant and Tank	Terracon
501 S PORT PKWY	2201 Rowland Avenue
BRUNSWICK, GA 31523	Savannah, GA 31404
EDR Inquiry # 7581738.8	Contact: Tyler Tomberlin

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

Search Results:

Year	Scale	Details	Source
2019	1"=500'	Flight Year: 2019	USDA/NAIP
2015	1"=500'	Flight Year: 2015	USDA/NAIP
2010	1"=500'	Flight Year: 2010	USDA/NAIP
2007	1"=500'	Flight Year: 2007	USDA/NAIP
1999	1"=500'	Acquisition Date: January 01, 1999	USGS/DOQQ
1993	1"=500'	Acquisition Date: January 31, 1993	USGS/DOQQ
1988	1"=500'	Acquisition Date: January 01, 1988	USGS/DOQQ
1983	1"=500'	Flight Date: March 09, 1983	USDA
1974	1"=500'	Flight Date: January 01, 1974	USGS
1968	1"=500'	Flight Date: January 01, 1968	USGS
1957	1"=500'	Flight Date: January 01, 1957	USGS
1953	1"=500'	Flight Date: January 29, 1953	USDA

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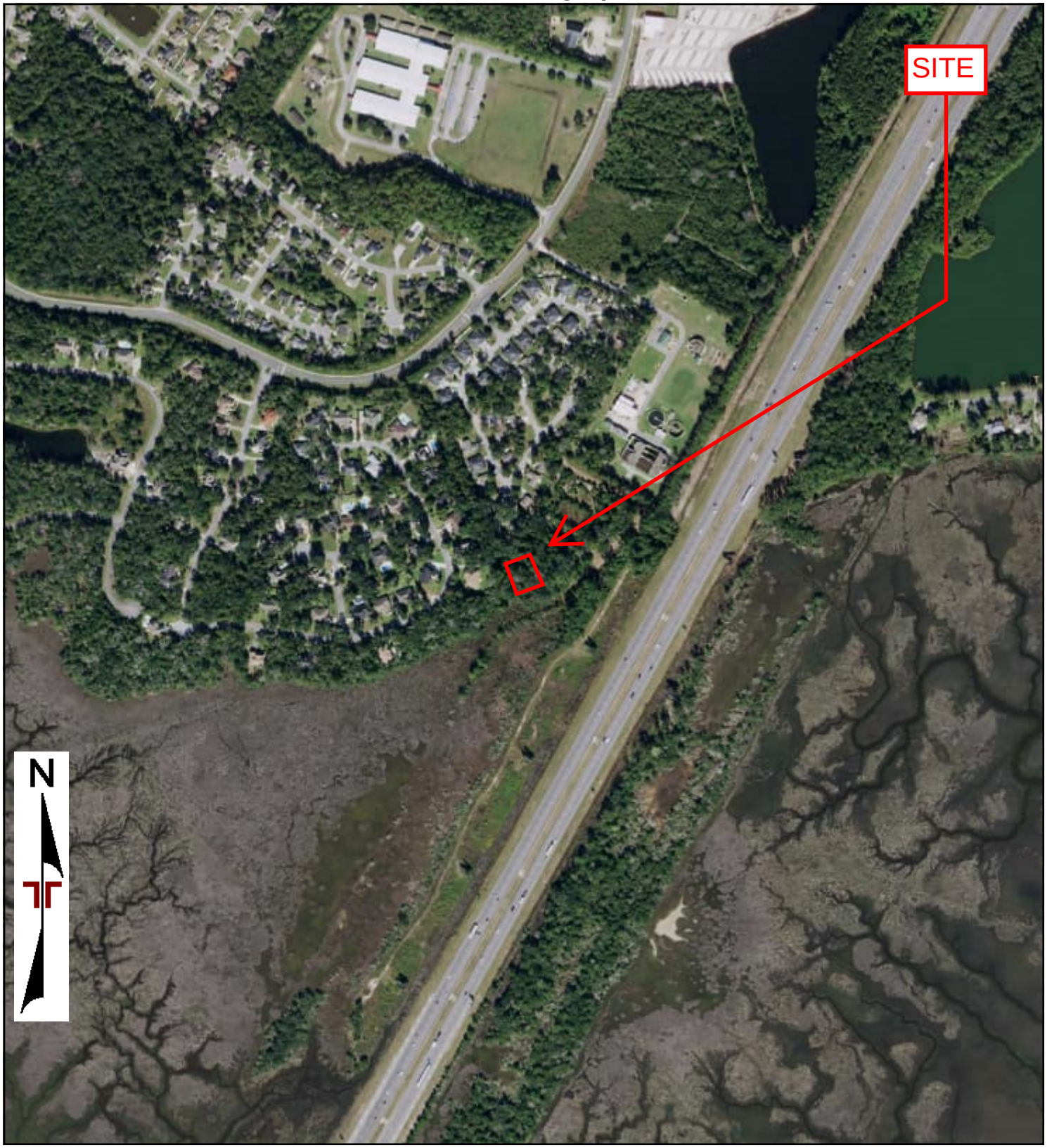
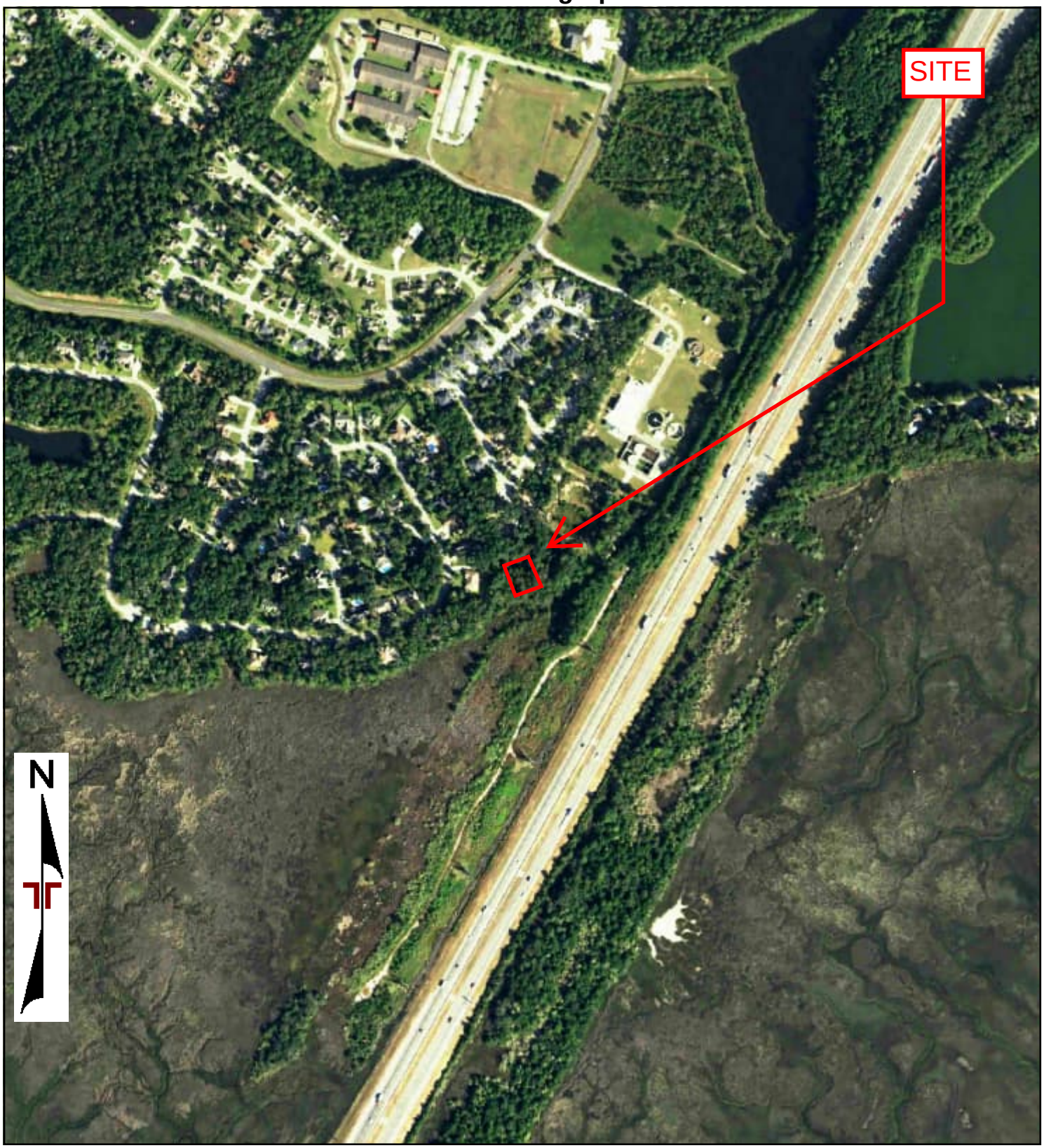


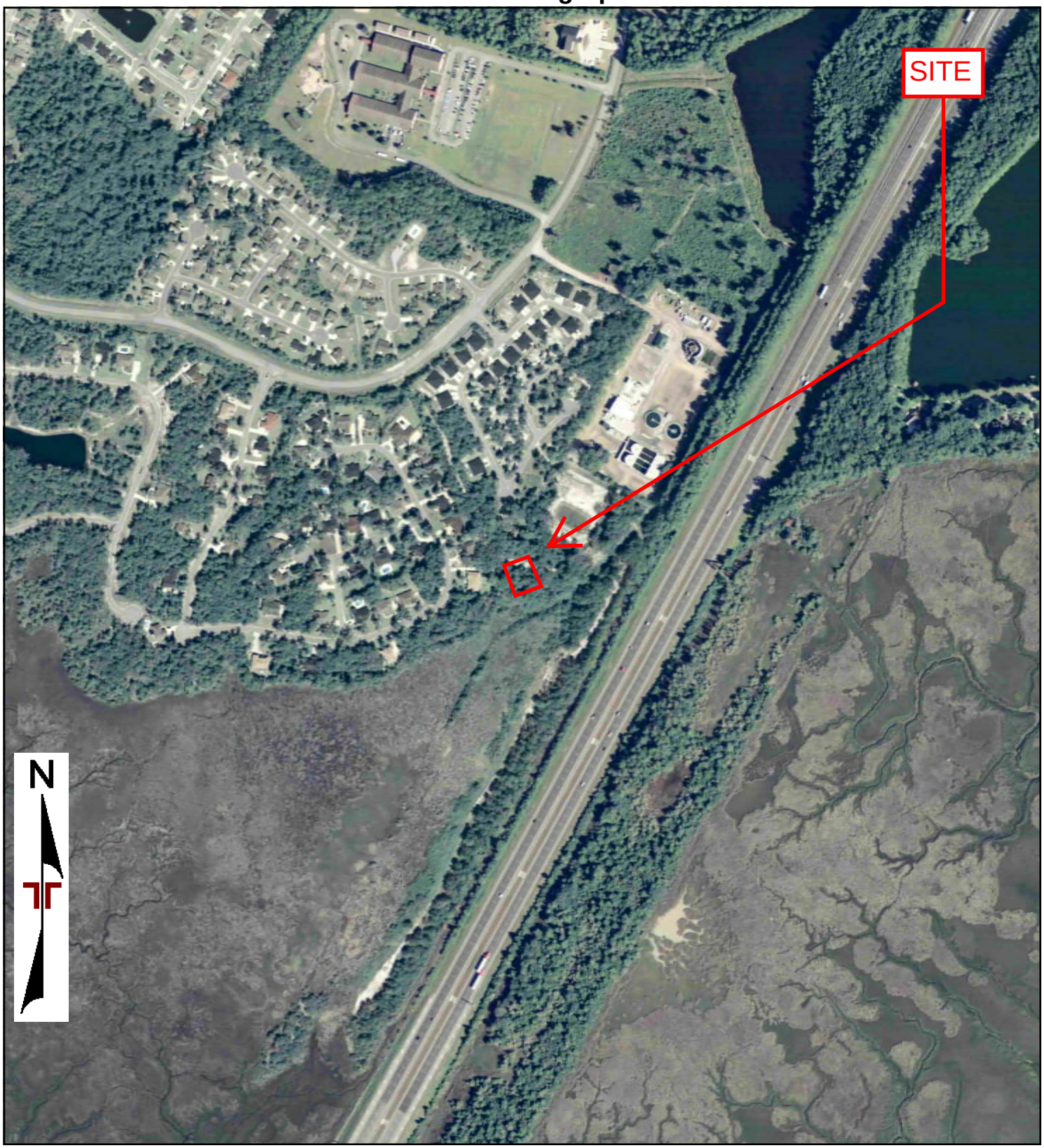
0 Feet 500 1000 2000

Project Manager: KED	Project No: JSWC Exit 29 Wa	Terracon 2201 Rowland Avenue Savannah, GA 31404	2019 AERIAL PHOTOGRAPH JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn By:	Scale: As Shown			
Checked By: STT	File Name:			
Approved By: NEP	Date: 2019			



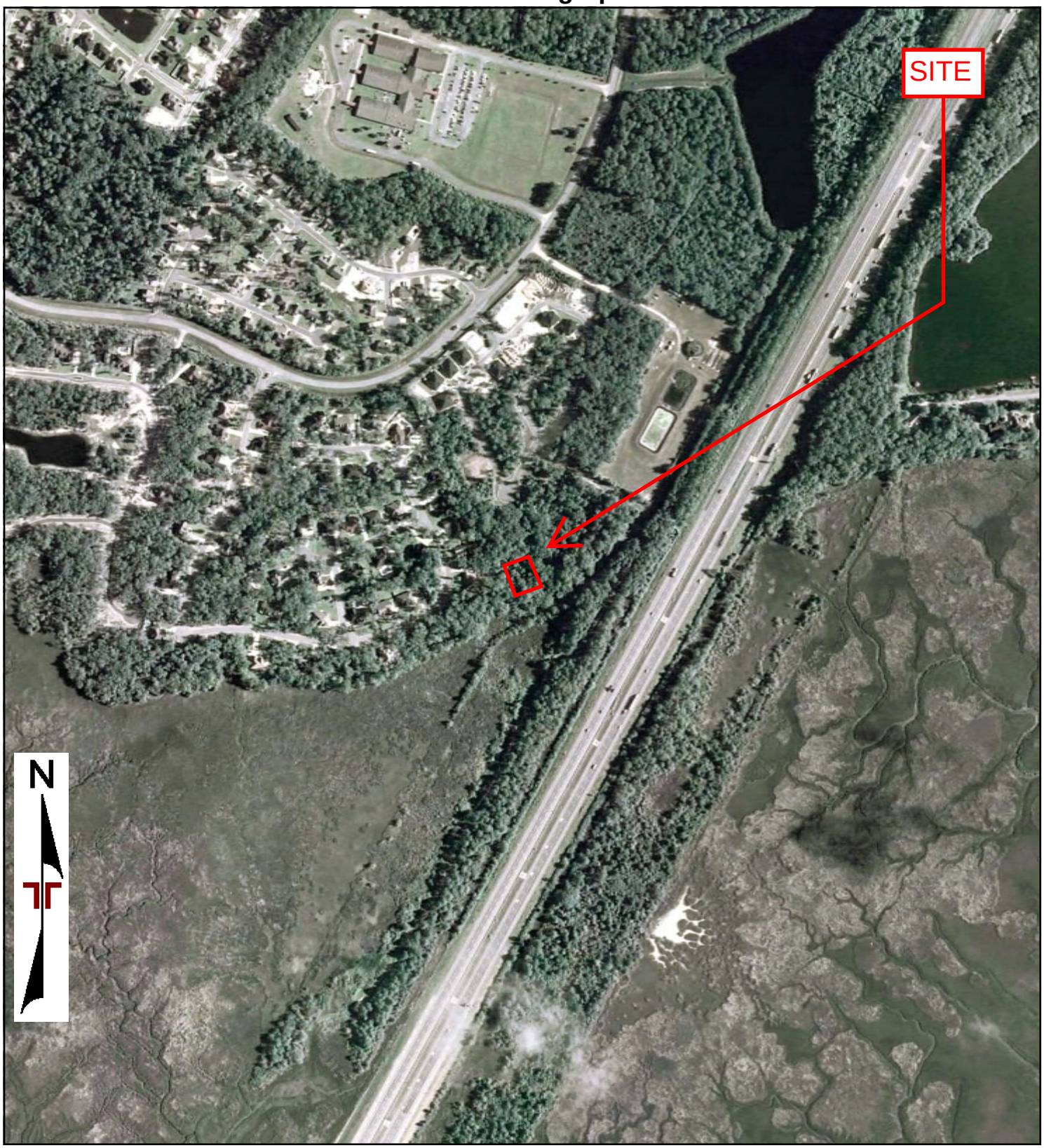
0 Feet 500 1000 2000

Project Manager: KED	Project No: JSWC Exit 29 Wa	Terracon 2201 Rowland Avenue Savannah, GA 31404	2015 AERIAL PHOTOGRAPH JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn By:	Scale: As Shown			
Checked By: STT	File Name:			
Approved By: NEP	Date: 2015			



0 Feet 500 1000 2000

Project Manager: KED	Project No: JSWC Exit 29 Wa	Terracon 2201 Rowland Avenue Savannah, GA 31404	2010 AERIAL PHOTOGRAPH JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn By:	Scale: As Shown			
Checked By: STT	File Name:			
Approved By: NEP	Date: 2010			

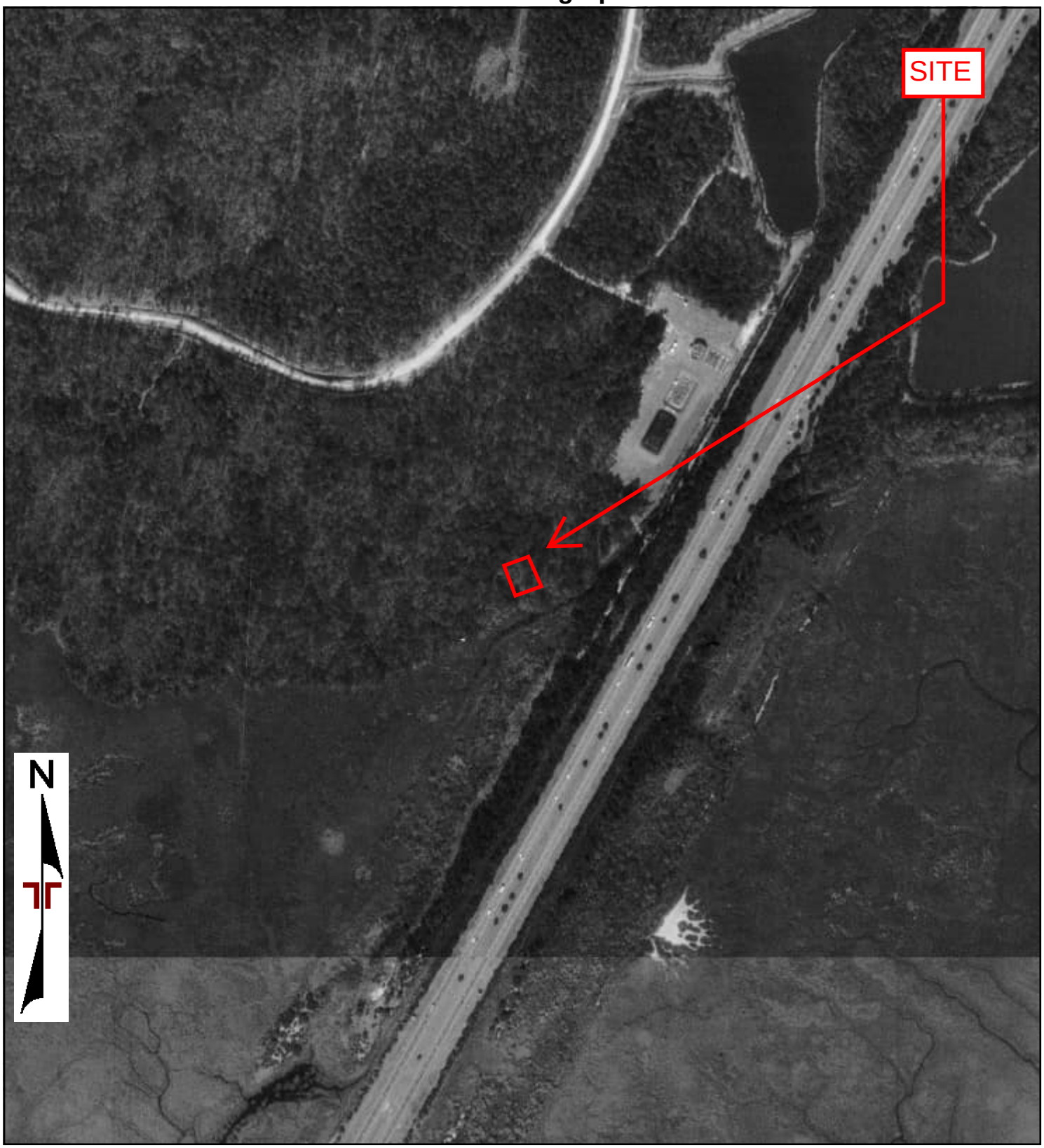


0 Feet 500 1000 2000

Project Manager: KED	Project No: JSWC Exit 29 Wa	Terracon 2201 Rowland Avenue Savannah, GA 31404	2007 AERIAL PHOTOGRAPH JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn By:	Scale: As Shown			
Checked By: STT	File Name:			
Approved By: NEP	Date: 2007			

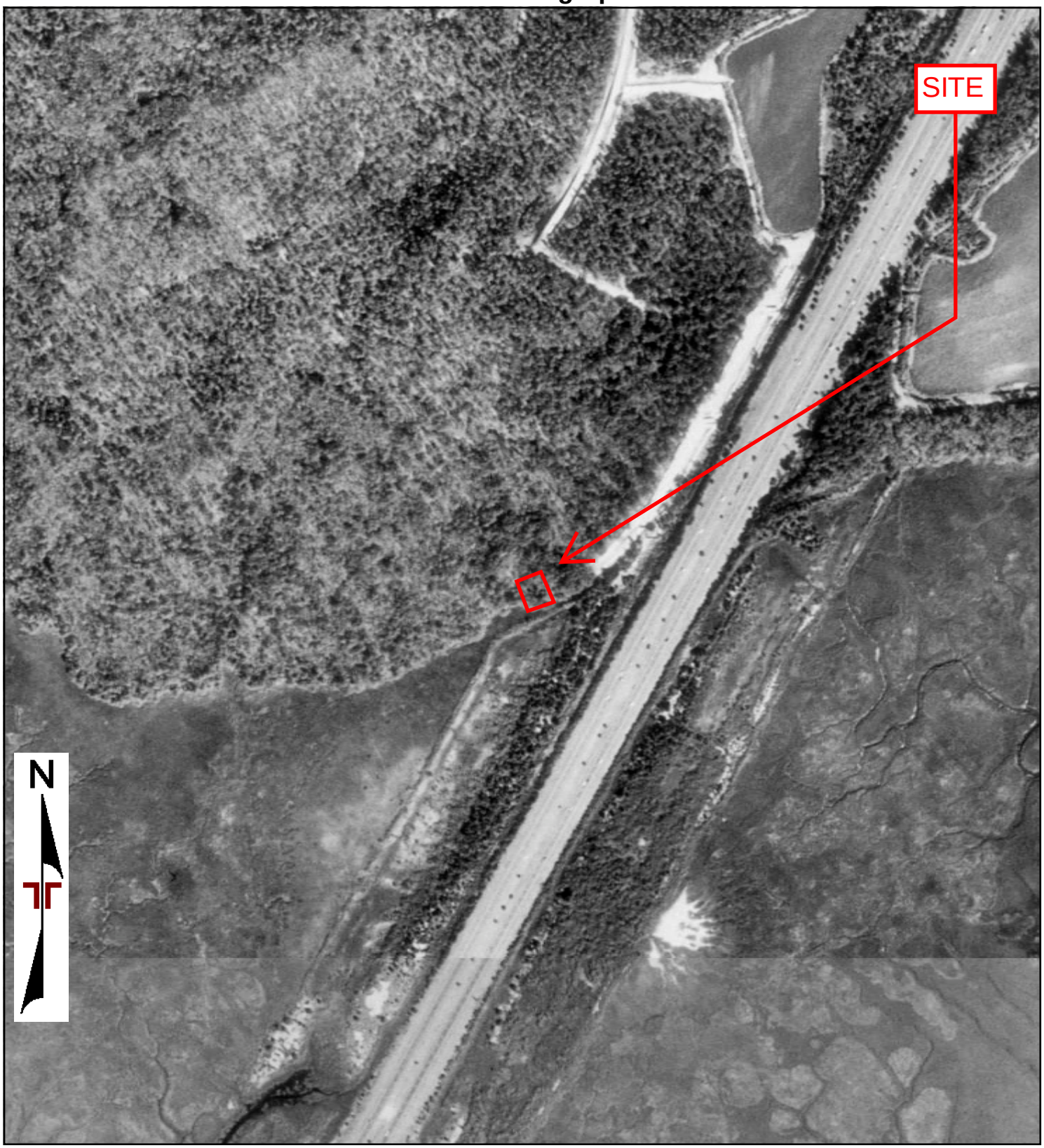
0 Feet 500 1000 2000

Project Manager: KED	Project No: JSWC Exit 29 Wa	Terracon 2201 Rowland Avenue Savannah, GA 31404	1999 AERIAL PHOTOGRAPH JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn By:	Scale: As Shown			
Checked By: STT	File Name:			
Approved By: NEP	Date: 1999			

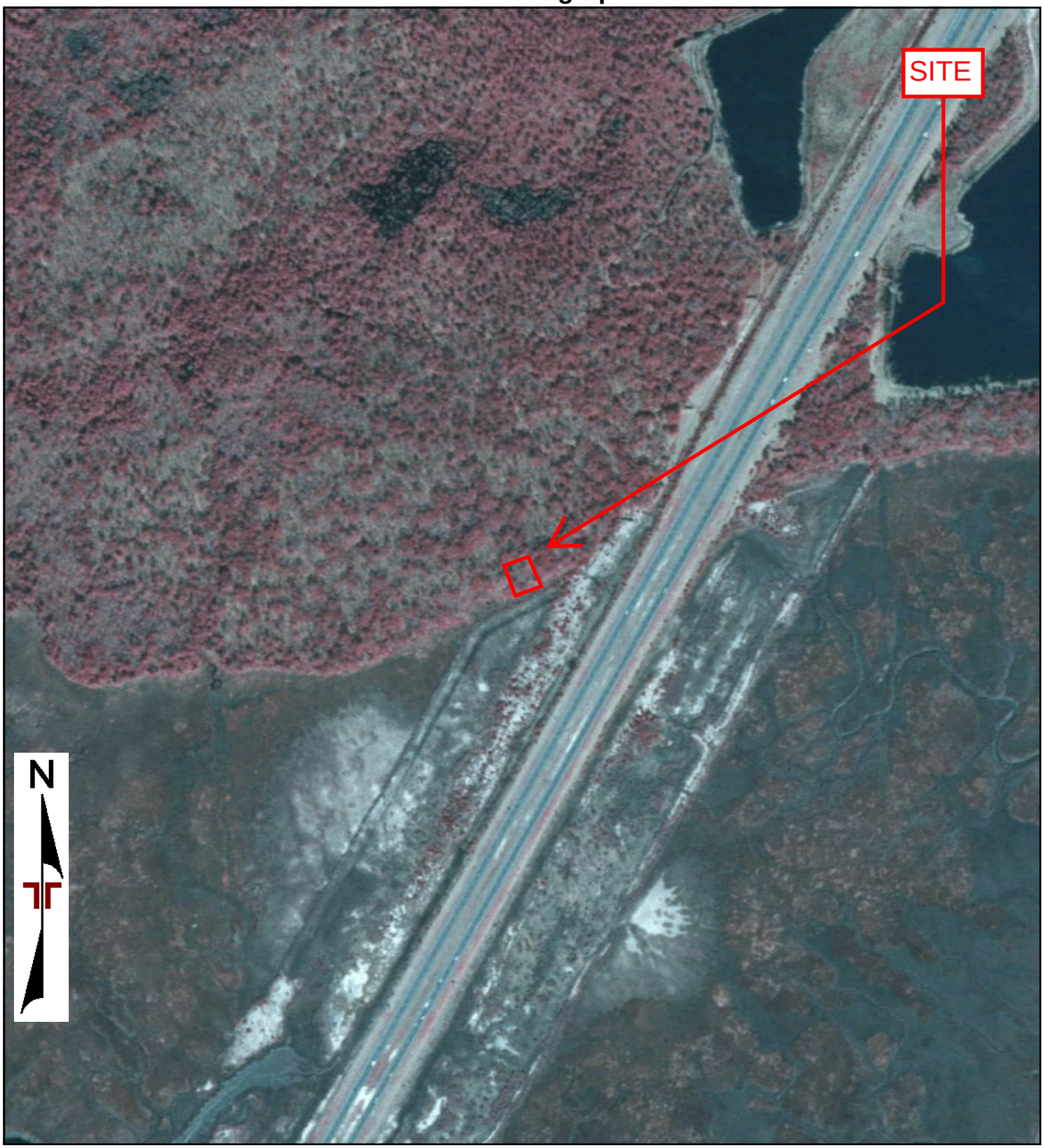


0 Feet 500 1000 2000

Project Manager: KED	Project No: JSWC Exit 29 Wa	Terracon 2201 Rowland Avenue Savannah, GA 31404	1993 AERIAL PHOTOGRAPH JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn By:	Scale: As Shown			
Checked By: STT	File Name:			
Approved By: NEP	Date: 1993			

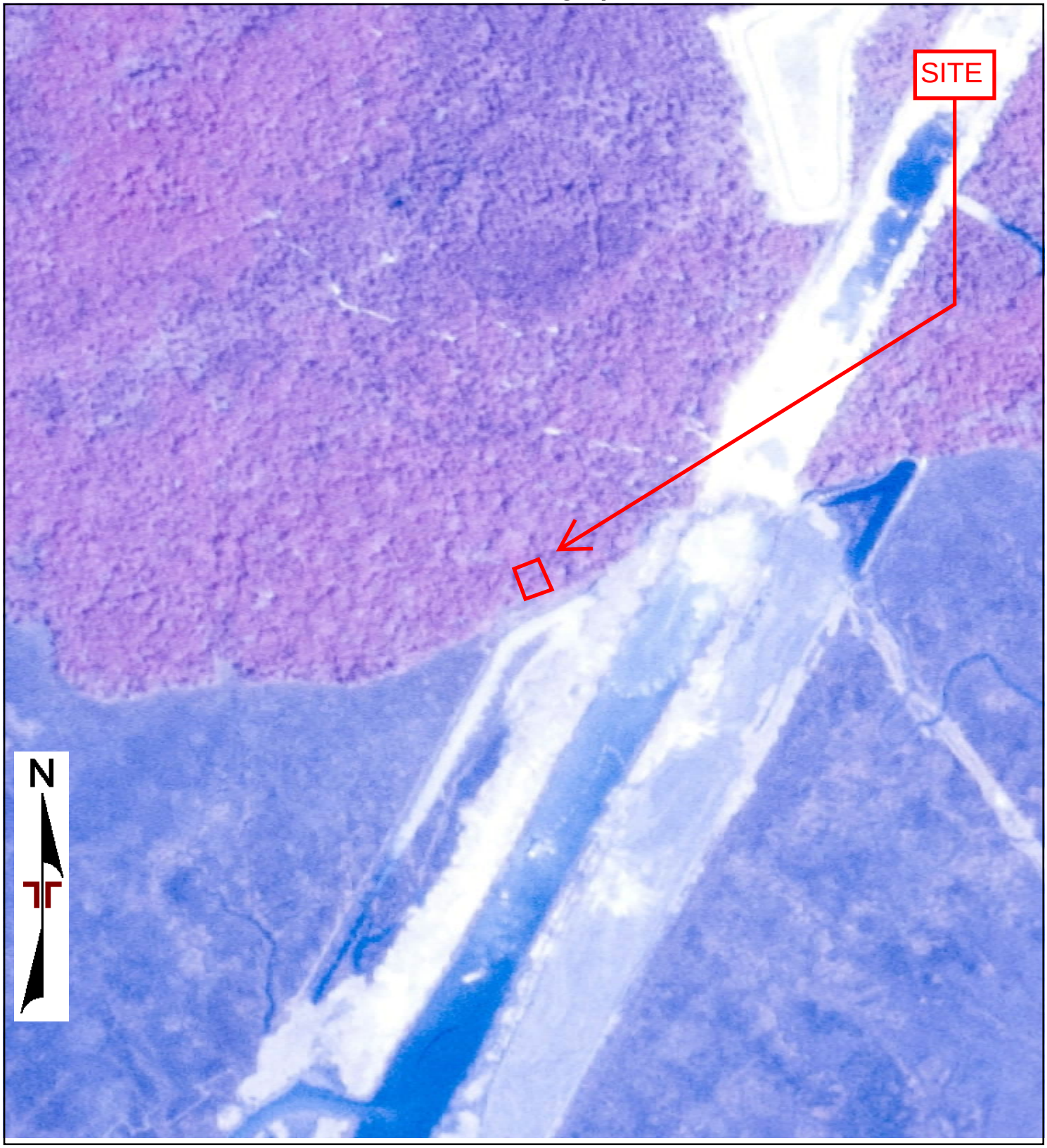


Project Manager: KED	Project No: JSWC Exit 29 Wa	Terracon 2201 Rowland Avenue Savannah, GA 31404	1988 AERIAL PHOTOGRAPH JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn By:	Scale: As Shown			
Checked By: STT	File Name:			
Approved By: NEP	Date: 1988			



0 Feet 500 1000 2000

Project Manager: KED	Project No: JSWC Exit 29 Wa	Terracon 2201 Rowland Avenue Savannah, GA 31404	1983 AERIAL PHOTOGRAPH JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn By:	Scale: As Shown			
Checked By: STT	File Name:			
Approved By: NEP	Date: 1983			

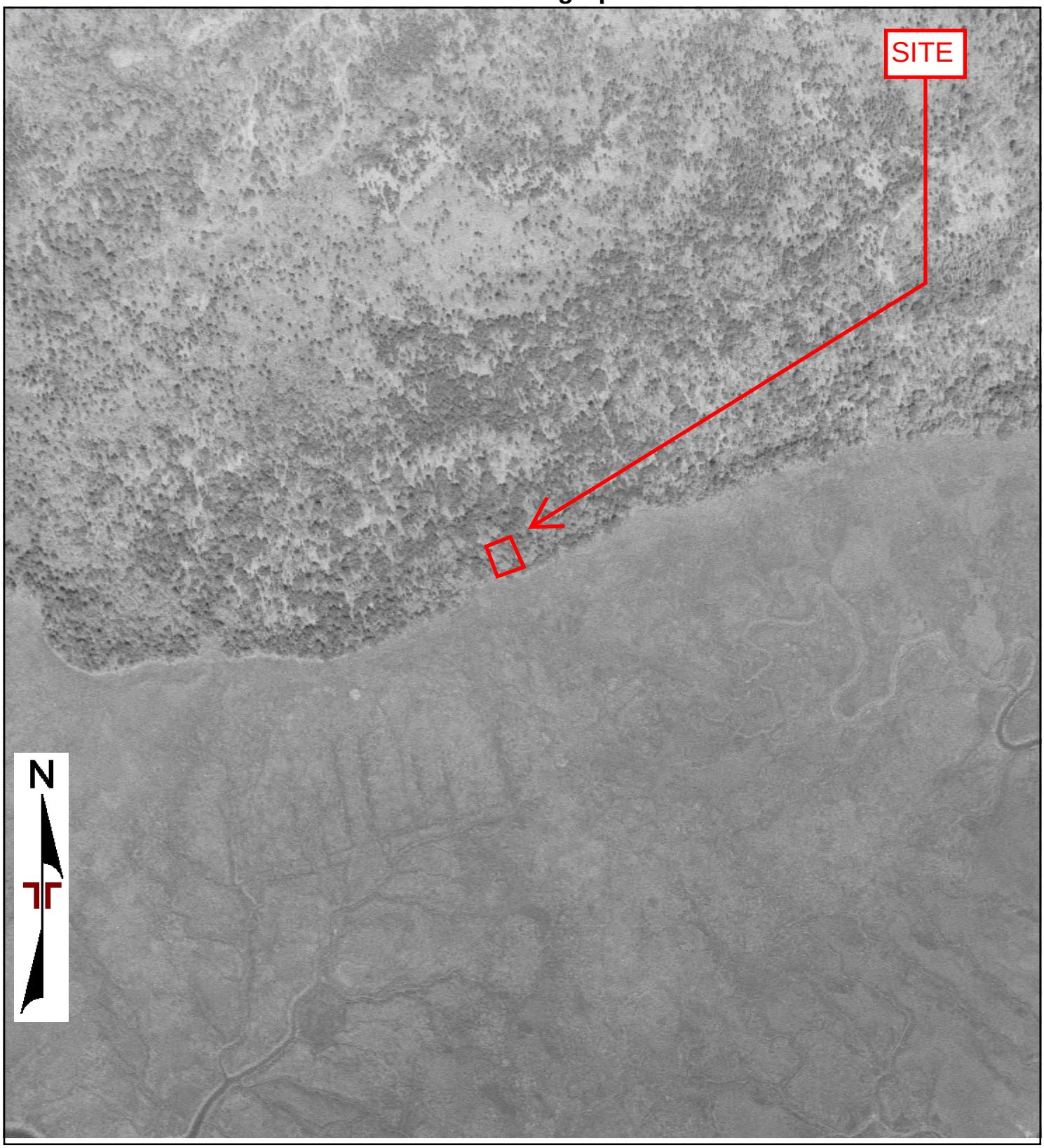


0 Feet 500 1000 2000

Project Manager: KED	Project No: JSWC Exit 29 Wa	Terracon 2201 Rowland Avenue Savannah, GA 31404	1974 AERIAL PHOTOGRAPH JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn By:	Scale: As Shown			
Checked By: STT	File Name:			
Approved By: NEP	Date: 1974			

0 Feet 500 1000 2000

Project Manager: KED	Project No: JSWC Exit 29 Wa	Terracon 2201 Rowland Avenue Savannah, GA 31404	1968 AERIAL PHOTOGRAPH JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn By:	Scale: As Shown			
Checked By: STT	File Name:			
Approved By: NEP	Date: 1968			



0 Feet 500 1000 2000

Project Manager: KED	Project No: JSWC Exit 29 Wa	Terracon 2201 Rowland Avenue Savannah, GA 31404	1957 AERIAL PHOTOGRAPH JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn By:	Scale: As Shown			
Checked By: STT	File Name:			
Approved By: NEP	Date: 1957			

0 Feet 500 1000 2000

Project Manager: KED	Project No: JSWC Exit 29 Wa	Terracon 2201 Rowland Avenue Savannah, GA 31404	1953 AERIAL PHOTOGRAPH JWSC Exit 29 Elevated Tank 501 S PORT PKWY BRUNSWICK, GA 31523	Appendix C
Drawn By:	Scale: As Shown			
Checked By: STT	File Name:			
Approved By: NEP	Date: 1953			

JWSC Water Plant and Tank
501 S PORT PKWY
BRUNSWICK, GA 31523

Inquiry Number: 7581738.3
February 28, 2024

Certified Sanborn® Map Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

Certified Sanborn® Map Report

02/28/24

Site Name:	Client Name:
JWSC Water Plant and Tank 501 S PORT PKWY BRUNSWICK, GA 31523 EDR Inquiry # 7581738.3	Terracon 2201 Rowland Avenue Savannah, GA 31404 Contact: Tyler Tomberlin

The Sanborn Library has been searched by EDR and maps covering the target property location as provided by Terracon were identified for the years listed below. The Sanborn Library is the largest, most complete collection of fire insurance maps. The collection includes maps from Sanborn, Bromley, Perris & Browne, Hopkins, Barlow, and others. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by the Sanborn Library LLC, the copyright holder for the collection. Results can be authenticated by visiting www.edrnet.com/sanborn.

The Sanborn Library is continually enhanced with newly identified map archives. This report accesses all maps in the collection as of the day this report was generated.

Certified Sanborn Results:

Certification # 01CA-45EF-827E

PO # NA

Project JWSC Exit 29 Water Plant B

UNMAPPED PROPERTY

This report certifies that the complete holdings of the Sanborn Library, LLC collection have been searched based on client supplied target property information, and fire insurance maps covering the target property were not found.

Sanborn® Library search results

Certification #: 01CA-45EF-827E

The Sanborn Library includes more than 1.2 million fire insurance maps from Sanborn, Bromley, Perris & Browne, Hopkins, Barlow and others which track historical property usage in approximately 12,000 American cities and towns. Collections searched:

- ☑ Library of Congress
- ☑ University Publications of America
- ☑ EDR Private Collection

The Sanborn Library LLC Since 1866™

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JWSC Exit 29 Elevated Tank
501 S PORT PKWY
BRUNSWICK, GA 31523

Inquiry Number: 7581738.5 March 01, 2024

The EDR-City Directory Image Report

Environmental Data Resources Inc

6 Armstrong Road
Shelton, CT 06484
800.352.0050
www.edrnet.com

TABLE OF CONTENTS

SECTION

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

DESCRIPTION

Environmental Data Resources, Inc.'s (EDR) City Directory Report is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's City Directory Report includes a search of available business directory data at approximately five year intervals.

RECORD SOURCES

The EDR City Directory Report accesses a variety of business directory sources, including Haines, InfoUSA, Polk, Cole, Bresser, and Stewart. Listings marked as EDR Digital Archive access Cole and InfoUSA records. The various directory sources enhance and complement each other to provide a more thorough and accurate report.

EDR is licensed to reproduce certain City Directory works by the copyright holders of those works. The purchaser of this EDR City Directory Report may include it in report(s) delivered to a customer.

RESEARCH SUMMARY

The following research sources were consulted in the preparation of this report. A check mark indicates where information was identified in the source and provided in this report.

Year	*Target Street*	*Cross Street*	*Source*
2020	☑	☐	EDR Digital Archive
2017	☑	☐	Cole Information
2014	☑	☐	Cole Information
2010	☑	☐	Cole Information
2005	☑	☐	Cole Information
2000	☑	☐	Cole Information
1995	☐	☐	Cole Information
1992	☐	☐	Cole Information
1987	☐	☐	Polk's City Directory
1982	☐	☐	Polk's City Directory
1977	☐	☐	Polk's City Directory
1972	☐	☐	Polk's City Directory
1967	☐	☐	Polk's City Directory
1964	☐	☐	Polk's City Directory
1930	☐	☐	Polk's City Directory

FINDINGS

TARGET PROPERTY STREET

501 S PORT PKWY
BRUNSWICK, GA 31523

Year	*CD Image*	*Source*	
S PORT PKWY			
2017	pg A2	Cole Information	
2014	pg A3	Cole Information	
2010	pg A4	Cole Information	
2005	pg A5	Cole Information	
2000	pg A6	Cole Information	
1995	-	Cole Information	Target and Adjoining not listed in Source
1992	-	Cole Information	Target and Adjoining not listed in Source
1987	-	Polk's City Directory	Street not listed in Source
1982	-	Polk's City Directory	Street not listed in Source
1977	-	Polk's City Directory	Street not listed in Source
1972	-	Polk's City Directory	Street not listed in Source
1967	-	Polk's City Directory	Street not listed in Source
1964	-	Polk's City Directory	Street not listed in Source
1930	-	Polk's City Directory	Street not listed in Source
S PORT PKY			
2020	pg A1	EDR Digital Archive	

FINDINGS

CROSS STREETS

No Cross Streets Identified

City Directory Images

Target Street	Cross Street	Source
✔	-	EDR Digital Archive

S PORT PKY 2020

260	EXIT 29 SELF STGE-MOBILE STGE
287	COASTAL GA RV RESORT
314	SOUTHPORT ACADEMY
360	SATILLA MARSH ELEMENTARY SCH
391	BRUNSWICK WATER ALARM LINE
707	RISLEY MIDDLE SCHOOL

Target Street	Cross Street	Source
✔	-	Cole Information

S PORT PKWY 2017

260	EXIT 29 SELF STORAGE & MOBILE STORAG
	STUFF IT MOBILE STORAGE
	UHAUL
287	COASTAL GA RV RESORT
314	SOUTHPORT ACADAMEY
391	BRUNSWICK WATER ALARM LINE

Target Street	Cross Street	Source
✔	-	Cole Information

S PORT PKWY 2014

260	EXIT 29 SELF STORAGE
	UHAUL
287	COASTAL GA RV RESORT
314	SOUTHPORT ACADAMEY
360	GLYNN COUNTY SCHOOLS
391	BRUNSWICK WATER ALARM LINE
639	BARRINGTON OAKS HOA

Target Street	Cross Street	Source
✔	-	Cole Information

S PORT PKWY 2010

287	COASTAL GA RV RESORT
314	SOUTHPORT ACADEMY
360	SATILLA MARSH ELEMENTARY SCHL

Target Street	Cross Street	Source
✔	-	Cole Information

S PORT PKWY 2005

117	EXIT 29 MINI STORAGE
129	GLYNN COUNTY SCHOOLS FOOD SERVICE
	TELEMARSH ELEMENTARY
360	SATILLA ELEMENTARY SCHOOL

Target Street	Cross Street	Source
✔	-	Cole Information

S PORT PKWY 2000

117 EXIT 6 MINI STORAGE
129 EXPLORE INCORPORATED
GLYNN COUNTY SCHOOLS PRESCHOOL PROGRAMS

Glynn County, GA

Summary

Parcel Number	03-16474
Tax District	CENTRAL GLYNN (District 03)
Alias	
Location Address	501 SOUTH PORT PKWY BRUNSWICK, GA 31523
Millage Rate	25.079
Legal Description	5.874 AC SOUTHPORT
Subdivision	PLANTING HAMMOCK
Documents	PD 32, Pg 137; PD C-2, Pg 301; PD 28, Pg 115 A; PD 20, Pg 109; PD 19-A, Pg 1292
Class Code	R3 - Residential Lots (Note: This is for tax purposes only. Not to be used for zoning.)
Neighborhood	Planting Hammock (Code: 3005)
Zoning	GC
Map# Block-Lot	0115-00 000-079
Property Class	VL
Homestead Exemption	No
GIS Mapped acres	6.11
Elementary School	Satilla Marsh
Middle School	Risley Middle School
High School	Glynn Academy
Commissioner District	DISTRICT 1 - SAMMY TOSTENSEN, Phone (912) 269-0470 stostensen@glynncounty-ga.gov

View Map

Owner

BRUNSWICK-GLYNN COUNTY
JOINT WATER SEWER COMMISSION
1703 GLOUCESTER ST
BRUNSWICK, GA 31520

Value Information

Assessed Year		**2023**
Land Value	+	$99,700.00
Improvement Value	+	$0.00
Total Value	=	**$99,700.00**
Assessed Land Value	+	$39,880.00
Assessed Improvement Value	+	$0.00
Assessed Total Value	+	**$0.00**

Sale/Transfer Information

Date	Deed Book and Page	Price	Deed Type	Grantor
1/27/2004	1348-222	$105,000.00		GRACE INVESTMENTS INC
8/1/2000	707-55	$300,000.00		
8/1/2000	707-55	$300,000.00		

View/Pay Tax Bills

View/Pay Tax Bills

Photos

To print an image, click to view then right-click and open in new tab.

Recent Sales In Area

Sale date range:

From: 02/28/2014 **To:** 02/28/2024

Sales by Neighborhood

Sales by Subdivision

1500 Feet Sales by Distance

No data available for the following modules: Summary (MH), Improvement Information, Mobile Homes-IasW, Prebill Mobile Homes, Accessory Information, Additions, 2023 Notice of Assessment, Sketches, Planned Development.

Map Scale: 1:438 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 20 40 80 120

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Camden and Glynn Counties, Georgia
Survey Area Data: Version 17, Aug 30, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 9, 2022—Apr 22, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BO	Bohicket-Capers association	0.0	0.2%
CaB	Cainhoy fine sand, 0 to 5 percent slopes	0.5	99.8%
Totals for Area of Interest		**0.5**	**100.0%**

APPENDIX D

Environmental Database Information

JWSC Exit 29 Elevated Tank

501 S PORT PKWY

BRUNSWICK, GA 31523

Inquiry Number: 7581738.2s

February 28, 2024

The EDR Radius Map™ Report with GeoCheck®

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

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with any questions or comments.

MAPPED SITES SUMMARY

Target Property Address:
501 S PORT PKWY
BRUNSWICK, GA 31523

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION
1	BRUNSWICK-GLYNN COUN	391 SOUTH PORT PKY	FINDS, ECHO, PFAS ECHO	Higher	913, 0.173, NE
A2	EXIT 29 WATER POLLUT	314 S PORT PKWY	LUST	Higher	2203, 0.417, North
A3	EXIT 29 WATER POLLUT	314 S PORT PKWY	UST FINDER, UST FINDER RELEASE	Higher	2203, 0.417, North

OVERVIEW MAP - 7581738.2S

0 1/4 1/2 1 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- County Boundary
- Power transmission lines
- Special Flood Hazard Area (1%)
- 0.2% Annual Chance Flood Hazard
- National Wetland Inventory
- State Wetlands

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: 501 S PORT PKWY	CLIENT: Terracon
ADDRESS: 501 S PORT PKWY BRUNSWICK GA 31523	CONTACT: Tyler Tomberlin
LAT/LONG: 31.126628 / 81.584314	INQUIRY #: 7581738.2s DATE: February 28, 2024 5:44 pm

DETAIL MAP - 7581738.2S

Target Property

Sites at elevations higher than or equal to the target property

Sites at elevations lower than the target property

Manufactured Gas Plants

Sensitive Receptors

National Priority List Sites

Dept. Defense Sites

0 1/16 1/8 1/4 Miles

Indian Reservations BIA

Special Flood Hazard Area (1%)

0.2% Annual Chance Flood Hazard

National Wetland Inventory

State Wetlands

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	501 S PORT PKWY	CLIENT:	Terracon
ADDRESS:	501 S PORT PKWY BRUNSWICK GA 31523	CONTACT:	Tyler Tomberlin
		INQUIRY #:	7581738.2s
LAT/LONG:	31.126628 / 81.584314	DATE:	February 28, 2024 5:45 pm

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Lists of Federal NPL (Superfund) sites								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	1.000		0	0	0	0	NR	0
Lists of Federal Delisted NPL sites								
Delisted NPL	1.000		0	0	0	0	NR	0
Lists of Federal sites subject to CERCLA removals and CERCLA orders								
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
SEMS	0.500		0	0	0	NR	NR	0
Lists of Federal CERCLA sites with NFRAP								
SEMS-ARCHIVE	0.500		0	0	0	NR	NR	0
Lists of Federal RCRA facilities undergoing Corrective Action								
CORRACTS	1.000		0	0	0	0	NR	0
Lists of Federal RCRA TSD facilities								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Lists of Federal RCRA generators								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-VSQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
LUCIS	0.500		0	0	0	NR	NR	0
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROLS	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
Lists of state- and tribal hazardous waste facilities								
SHWS	1.000		0	0	0	0	NR	0
GA NON-HSI	1.000		0	0	0	0	NR	0
Lists of state and tribal landfills and solid waste disposal facilities								
SWF/LF	0.500		0	0	0	NR	NR	0
Lists of state and tribal leaking storage tanks								
LUST	0.500		0	0	1	NR	NR	1

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
INDIAN LUST	0.500		0	0	0	NR	NR	0
Lists of state and tribal registered storage tanks								
FEMA UST	0.250		0	0	NR	NR	NR	0
UST	0.250		0	0	NR	NR	NR	0
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
INST CONTROL	0.500		0	0	0	NR	NR	0
AUL	0.500		0	0	0	NR	NR	0
Lists of state and tribal voluntary cleanup sites								
INDIAN VCP	0.500		0	0	0	NR	NR	0
VCP	0.500		0	0	0	NR	NR	0
Lists of state and tribal brownfield sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
SWRCY	0.500		0	0	0	NR	NR	0
HIST LF	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
IHS OPEN DUMPS	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US HIST CDL	TP		NR	NR	NR	NR	NR	0
CDL	TP		NR	NR	NR	NR	NR	0
DEL SHWS	1.000		0	0	0	0	NR	0
US CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
SPILLS	TP		NR	NR	NR	NR	NR	0
SPILLS 90	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
FUDS	1.000		0	0	0	0	NR	0
DOD	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ROD	1.000		0	0	0	0	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
RAATS	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
DOT OPS	TP		NR	NR	NR	NR	NR	0
CONSENT	1.000		0	0	0	0	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
FUSRAP	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
ABANDONED MINES	0.250		0	0	NR	NR	NR	0
MINES MRDS	0.250		0	0	NR	NR	NR	0
FINDS	TP		NR	NR	NR	NR	NR	0
DOCKET HWC	TP		NR	NR	NR	NR	NR	0
ECHO	TP		NR	NR	NR	NR	NR	0
UXO	1.000		0	0	0	0	NR	0
FUELS PROGRAM	0.250		0	0	NR	NR	NR	0
PFAS NPL	0.250		0	0	NR	NR	NR	0
PFAS FEDERAL SITES	0.250		0	0	NR	NR	NR	0
PFAS TSCA	0.250		0	0	NR	NR	NR	0
PFAS TRIS	0.250		0	0	NR	NR	NR	0
PFAS RCRA MANIFEST	0.250		0	0	NR	NR	NR	0
PFAS ATSDR	0.250		0	0	NR	NR	NR	0
PFAS WQP	0.250		0	0	NR	NR	NR	0
PFAS NPDES	0.250		0	0	NR	NR	NR	0
PFAS ECHO	0.250		0	1	NR	NR	NR	1
PFAS ECHO FIRE TRAINING	0.250		0	0	NR	NR	NR	0
PFAS PART 139 AIRPORT	0.250		0	0	NR	NR	NR	0
AQUEOUS FOAM NRC	0.250		0	0	NR	NR	NR	0
BIOSOLIDS	TP		NR	NR	NR	NR	NR	0
AIRS	TP		NR	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
COAL ASH	0.500		0	0	0	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
TIER 2	TP		NR	NR	NR	NR	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
UST FINDER RELEASE	0.500		0	0	1	NR	NR	1
HSRA NOTIF	TP		NR	NR	NR	NR	NR	0
UST FINDER	0.250		0	0	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR Hist Auto	0.125		0	NR	NR	NR	NR	0
EDR Hist Cleaner	0.125		0	NR	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA HWS	TP		NR	NR	NR	NR	NR	0
RGA LF	TP		NR	NR	NR	NR	NR	0
RGA LUST	TP		NR	NR	NR	NR	NR	0
- Totals --		0	0	1	2	0	0	3

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

1
NE
1/8-1/4
0.173 mi.
913 ft.

BRUNSWICK-GLYNN COUNTY JWSC - EXIT 29 WPCP
391 SOUTH PORT PKY
BRUNSWICK, GA 31523

FINDS **1024079961**
ECHO **N/A**
PFAS ECHO

Relative:
Higher

Actual:
13 ft.

FINDS:
Registry ID: 110035854135

Click Here for FRS Facility Detail Report:

Environmental Interest/Information System:
The National Pollutant Discharge Elimination System (NPDES) module of the Integrated Compliance Information System (ICIS). Under NPDES, all facilities that discharge pollutants from any point source into waters of the United States are required to obtain a permit. The permit will likely contain limits on what can be discharged, impose monitoring and reporting requirements, and include other provisions to ensure that the discharge does not adversely affect water quality.

Click this hyperlink while viewing on your computer to access additional FINDS: detail in the EDR Site Report.

ECHO:

Envid:	1024079961
Registry ID:	110035854135
DFR URL:	http://echo.epa.gov/detailed-facility-report?fid=110035854135
Name:	BRUNSWICK-GLYNN COUNTY JOINT WATER & SEWER COMMISSION (EXIT 29 WPCP)
Address:	391 SOUTH PORT PKY
City,State,Zip:	BRUNSWICK, GA 31523

PFAS ECHO:

Name:	BRUNSWICK-GLYNN COUNTY JOINT WATER & SEWER COMMISSION (EXIT 29 WPCP)
City,State,Zip:	BRUNSWICK, GA
Latitude:	31.128542
Longitude:	-81.582128
Count:	1
County:	GLYNN
Status:	Active
Region:	04
Industry:	Waste Management
ECHO Facility Report:	https://echo.epa.gov/detailed-facility-report?fid=110035854135
Facility Percent Minority:	19.308
Facility Derived Tribes:	-
Facility Population:	201.42
EPA Programs:	CWA
Federal Facility:	No
Federal Agency:	-
Facility FIPS Code:	13127
Facility Indian Country Flag:	N
Facility Collection Method:	-
Facility Derived HUC:	03070203
Facility Derived WBD:	030702030302
Facility Derived CD113:	01
Facility Derived CB2010:	131270010002133
Facility Major Flag:	Y
Facility Active Flag:	Y
Facility Inspection Count:	4
Facility Date Last Inspection:	5/11/2023
Facility Days Last Inspection:	135

BRUNSWICK-GLYNN COUNTY JWSC - EXIT 29 WPCP (Continued) **1024079961**

Facility Informal Count:	4
Facility Date Last Informal Action:	3/21/2022
Facility Formal Action Count:	0
Facility Date Last Formal Action:	11/21/2014
Facility Total Penalties:	0
Facility Penalty Count:	-
Facility Date Last Penalty:	11/21/2014
Facility Last Penalty AMT:	10,000
Facility QTRS With NC:	3
Facility Programs With SNC:	0
Facility Compliance Status:	No Violation Identified
Facility SNC Flag:	N
AIR Flag:	N
NPDES Flag:	Y
SDWIS Flag:	N
RCRA Flag:	N
TRI Flag:	N
GHG Flag:	N
AIR IDS:	-
CAA Permit Types:	-
CAA NAICS:	-
CAA SICS:	-
NPDES IDS:	GA0038938 GAIS12233
CWA Permit Types:	Major, Minor
CWA NAICS:	221320
CWA SICS:	4952
RCRA IDS:	-
RCRA Permit Types:	-
RCRA NAICS:	-
SDWA IDS:	-
SDWA System Types:	-
SDWA Compliance Status:	-
SDWA SNC Flag:	N
TRI IDS:	-
TRI Releases Transfers:	-
TRI On Site Releases:	-
TRI Off Site Transfers:	-
TRI Reporter:	-
Facility IMP Water Flag:	-
EJSCREEN Flag US:	N
EJSCREEN Report:	https://ejscreen.epa.gov/mapper/mobile/EJSCREEN_mobile.aspx?geometry=%7B%22x%22:-81.582128,%22y%22:31.128542,%22spatialReference%22:%7B%22wkid%22:4326%7D%7D&unit=9035&areatype=&areaid=&basemap=streets&distance=1

A2 **EXIT 29 WATER POLLUTION CONTROL PLANT** **LUST** **S110591066**
North **314 S PORT PKWY** **N/A**
1/4-1/2 **BRUNSWICK, GA 31525**
0.417 mi.
2203 ft. **Site 1 of 2 in cluster A**

Relative: LUST:
Higher

Name:	EXIT 29 WATER POLLUTION CONTROL PLANT
Address:	314 S PORT PKWY
City,State,Zip:	BRUNSWICK, GA 31525
Facility ID:	10001856
Leak ID:	1
Description:	Confirmed Release

Actual:
14 ft.

EXIT 29 WATER POLLUTION CONTROL PLANT (Continued) **S110591066**

Cleanup Status:	NFA - No Further Action
Date Received:	03/25/2011
Project Officer:	Ron Wallace
Project Name:	UST - 1 - EXIT 29 WATER POLLUTION CONTROL PLANT
Site Code Description:	Owner/Operator funded site
No Further Action Date:	04/21/2011

A3 **EXIT 29 WATER POLLUTION CONTROL PLANT** **UST FINDER** **1028258904**
North **314 S PORT PKWY** **UST FINDER RELEASE** **N/A**
1/4-1/2 **BRUNSWICK, GA 31525**
0.417 mi.
2203 ft. **Site 2 of 2 in cluster A**

Relative:
Higher

Actual:
14 ft.

UST FINDER:

Object ID:	84851
Facility ID:	GA10001856
Name:	EXIT 29 WATER POLLUTION CONTROL PLANT
Address:	314 S PORT PKWY
City,State,Zip:	BRUNSWICK, GA 31525
Address Match Type:	PointAddress
Open USTs:	0
Closed USTs:	1
TOS USTs:	0
Population 1500ft:	136
Private Wells 1500ft:	42
Within 100yr Floodplain:	No
Land Use:	Non-Developed
Within SPA:	No
Within WHPA:	No
Facility Status:	Closed UST(s)
EPA Region:	4
Coordinate Source:	Geocode
X Coord:	-81.58300077
Y Coord:	31.1327772400001
Latitude:	31.13277724
Longitude:	-81.58300077

UST FINDER:

Object ID:	321092
Facility ID:	GA10001856
Tank ID:	GA10001856_1
Tank Status:	Closed
Installation Date:	2010/04/20 15:59:59+00
Tank Capacity:	1200
Substances:	Diesel

UST FINDER RELEASE:

Object ID:	144042
Facility ID:	GA10001856
Lust ID:	GA12715
Name:	EXIT 29 WATER POLLUTION CONTROL PLANT
Address:	314 S PORT PKWY
City,State,Zip:	BRUNSWICK, GA 31525
Address Match Type:	PointAddress
Reported Date:	2011/03/25 15:59:59+00
Status:	No Further Action
Population within 1500ft:	136

EXIT 29 WATER POLLUTION CONTROL PLANT (Continued) **1028258904**

Domestic Wells within 1500ft:	42
Land Use:	Non-Developed
Within SPA:	No
Within WHPA:	No
Within 100yr Floodplain:	No
EPA Region:	4
Coordinate Source:	Geocode
X Coord:	-81.583
Y Coord:	31.13278
Latitude:	31.13278
Longitude:	-81.5829999999999

Count: 2 records. ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
BRUNSWICK	S129189696	NATIONAL TRUCK STOP BRUNSWICK	I-95 @ EXIT 29 / 110 DUNGENESS	31523	LUST
BRUNSWICK	U001491609	FRIENDLY EXPRESS #23	2501 PERRY LANE RD		LUST, UST, Financial Assurance

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
GA	AIRS	Permitted Facility & Emissions Listing	Department of Natural Resources	10/31/2023	11/03/2023	11/16/2023
GA	AST	Above Ground Storage Tanks	Office of Insurance & Safety Fire Commissione	05/25/2023	05/25/2023	08/18/2023
GA	AUL	Uniform Environmental Covenants	Department of Natural Resources	10/31/2023	11/01/2023	01/23/2024
GA	BROWNFIELDS	Brownfields Public Record List	Department of Natural Resources	10/31/2023	11/01/2023	01/23/2024
GA	CDL	Clandestine Drug Labs	Georgia Bureau of Investigation	06/02/2016	06/13/2016	08/15/2016
GA	COAL ASH	Coal Ash Disposal Site Listing	Department of Natural Resources	08/01/2014	08/05/2014	09/02/2014
GA	DEL SHWS	Delisted Hazardous Site Inventory Listing	Department of Natural Resources	07/01/2023	07/12/2023	10/03/2023
GA	DRYCLEANERS	Drycleaner Database	Department of Natural Resources	10/26/2023	10/27/2023	01/16/2024
GA	Financial Assurance 1	Financial Assurance Information Listing	Department of Natural Resources	09/05/2023	09/07/2023	11/27/2023
GA	Financial Assurance 2	Financial Assurance Information Listing	Department of Natural Resources	07/08/2019	07/09/2019	08/26/2019
GA	HIST LF	Historical Landfills	Department of Natural Resources	01/15/2003	01/20/2004	02/06/2004
GA	HSRA NOTIF	Hazardous Site Response Notifications Listing	Department of Natural Resources	12/13/2023	12/22/2023	01/05/2024
GA	INST CONTROL	Public Record List	Department of Natural Resources	10/31/2023	11/01/2023	01/23/2024
GA	LUST	List of Leaking Underground Storage Tanks	Environmental Protection Division	07/31/2023	09/06/2023	12/05/2023
GA	NON HSI	Non-Hazardous Site Inventory	Rindt-McDuff Associates, Inc.	08/23/2023	08/29/2023	11/07/2023
GA	NPDES	NPDES Wastewater Permit List	Department of Natural Resoruces	10/17/2023	10/24/2023	01/16/2024
GA	RGA HWS	Recovered Government Archive State Hazardous Waste Facilitie	Department of Environmental Protection		07/01/2013	12/24/2013
GA	RGA LF	Recovered Government Archive Solid Waste Facilities List	Department of Natural Resources		07/01/2013	01/13/2014
GA	RGA LUST	Recovered Government Archive Leaking Underground Storage Tan	Environmental Protection Division		07/01/2013	12/24/2013
GA	SHWS	Hazardous Site Inventory	Department of Environmental Protection	07/01/2023	07/12/2023	10/03/2023
GA	SPILLS	Spills Information	Department of Natural Resources	12/20/2023	12/20/2023	01/11/2024
GA	SPILLS 90	SPILLS90 data from FirstSearch	FirstSearch	10/04/2012	01/03/2013	02/11/2013
GA	SWF/LF	Solid Waste Disposal Facilities	Department of Natural Resources	07/06/2023	10/25/2023	10/26/2023
GA	SWRCY	Recycling Center Listing	Department of Community Affairs	09/19/2023	09/20/2023	12/11/2023
GA	TIER 2	Tier 2 Data Listing	Department of Natural Resources	12/31/2021	08/17/2022	11/07/2022
GA	UIC	Underground Injection Control	Department of Natural Resources	11/28/2023	11/30/2023	02/23/2024
GA	UST	Underground Storage Tank Database	Environmental Protection Division	07/31/2023	09/06/2023	11/27/2023
GA	VCP	Voluntary Cleanup Program site	DNR	11/17/2023	11/20/2023	02/15/2024
US	2020 COR ACTION	2020 Corrective Action Program List	Environmental Protection Agency	09/30/2017	05/08/2018	07/20/2018
US	ABANDONED MINES	Abandoned Mines	Department of Interior	11/28/2023	11/29/2023	12/11/2023
US	AQUEOUS FOAM NRC	Aqueous Foam Related Incidents Listing	Environmental Protection Agency	09/23/2023	10/03/2023	12/21/2023
US	BIOSOLIDS	ICIS-NPDES Biosolids Facility Data	Environmental Protection Agency	12/31/2023	01/03/2024	01/16/2024
US	BRS	Biennial Reporting System	EPA/NTIS	12/31/2021	03/09/2023	03/20/2023
US	COAL ASH DOE	Steam-Electric Plant Operation Data	Department of Energy	12/31/2022	11/27/2023	02/22/2024
US	COAL ASH EPA	Coal Combustion Residues Surface Impoundments List	Environmental Protection Agency	01/12/2017	03/05/2019	11/11/2019
US	CONSENT	Superfund (CERCLA) Consent Decrees	Department of Justice, Consent Decree Library	12/31/2023	01/11/2024	01/16/2024
US	CORRACTS	Corrective Action Report	EPA	12/04/2023	12/06/2023	12/12/2023
US	DEBRIS REGION 9	Torres Martinez Reservation Illegal Dump Site Locations	EPA, Region 9	01/12/2009	05/07/2009	09/21/2009
US	DOCKET HWC	Hazardous Waste Compliance Docket Listing	Environmental Protection Agency	05/06/2021	05/21/2021	08/11/2021
US	DOD	Department of Defense Sites	USGS	06/07/2021	07/13/2021	03/09/2022
US	DOT OPS	Incident and Accident Data	Department of Transporation, Office of Pipeli	01/02/2020	01/28/2020	04/17/2020
US	Delisted NPL	National Priority List Deletions	EPA	12/26/2023	01/02/2024	01/24/2024
US	ECHO	Enforcement & Compliance History Information	Environmental Protection Agency	09/23/2023	10/03/2023	01/04/2024
US	EDR Hist Auto	EDR Exclusive Historical Auto Stations	EDR, Inc.			
US	EDR Hist Cleaner	EDR Exclusive Historical Cleaners	EDR, Inc.			
US	EDR MGP	EDR Proprietary Manufactured Gas Plants	EDR, Inc.			
US	EPA WATCH LIST	EPA WATCH LIST	Environmental Protection Agency	08/30/2013	03/21/2014	06/17/2014

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
US	ERNS	Emergency Response Notification System	National Response Center, United States Coast	09/18/2023	09/20/2023	12/11/2023
US	FEDERAL FACILITY	Federal Facility Site Information listing	Environmental Protection Agency	12/20/2023	12/20/2023	01/24/2024
US	FEDLAND	Federal and Indian Lands	U.S. Geological Survey	04/02/2018	04/11/2018	11/06/2019
US	FEMA UST	Underground Storage Tank Listing	FEMA	11/16/2023	11/16/2023	02/13/2024
US	FINDS	Facility Index System/Facility Registry System	EPA	11/03/2023	11/08/2023	11/20/2023
US	FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fu	EPA/Office of Prevention, Pesticides and Toxi	04/09/2009	04/16/2009	05/11/2009
US	FTTS INSP	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fu	EPA	04/09/2009	04/16/2009	05/11/2009
US	FUDS	Formerly Used Defense Sites	U.S. Army Corps of Engineers	09/28/2023	11/10/2023	02/07/2024
US	FUELS PROGRAM	EPA Fuels Program Registered Listing	EPA	11/10/2023	11/10/2023	02/07/2024
US	FUSRAP	Formerly Utilized Sites Remedial Action Program	Department of Energy	03/03/2023	03/03/2023	06/09/2023
US	HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing	Environmental Protection Agency	10/19/2006	03/01/2007	04/10/2007
US	HIST FTTS INSP	FIFRA/TSCA Tracking System Inspection & Enforcement Case Lis	Environmental Protection Agency	10/19/2006	03/01/2007	04/10/2007
US	HMIRS	Hazardous Materials Information Reporting System	U.S. Department of Transportation	09/18/2023	09/20/2023	11/14/2023
US	ICIS	Integrated Compliance Information System	Environmental Protection Agency	11/18/2016	11/23/2016	02/10/2017
US	IHS OPEN DUMPS	Open Dumps on Indian Land	Department of Health & Human Serivces, Indian	04/01/2014	08/06/2014	01/29/2015
US	INDIAN LUST R1	Leaking Underground Storage Tanks on Indian Land	EPA Region 1	04/20/2023	05/09/2023	07/14/2023
US	INDIAN LUST R10	Leaking Underground Storage Tanks on Indian Land	EPA Region 10	04/20/2023	05/09/2023	07/14/2023
US	INDIAN LUST R4	Leaking Underground Storage Tanks on Indian Land	EPA Region 4	04/20/2023	05/09/2023	07/14/2023
US	INDIAN LUST R5	Leaking Underground Storage Tanks on Indian Land	EPA, Region 5	04/14/2023	05/09/2023	07/14/2023
US	INDIAN LUST R6	Leaking Underground Storage Tanks on Indian Land	EPA Region 6	04/26/2023	05/09/2023	07/14/2023
US	INDIAN LUST R7	Leaking Underground Storage Tanks on Indian Land	EPA Region 7	04/25/2023	05/09/2023	07/14/2023
US	INDIAN LUST R8	Leaking Underground Storage Tanks on Indian Land	EPA Region 8	04/19/2023	05/09/2023	07/14/2023
US	INDIAN LUST R9	Leaking Underground Storage Tanks on Indian Land	Environmental Protection Agency	04/19/2023	05/09/2023	07/14/2023
US	INDIAN ODI	Report on the Status of Open Dumps on Indian Lands	Environmental Protection Agency	12/31/1998	12/03/2007	01/24/2008
US	INDIAN RESERV	Indian Reservations	USGS	12/31/2014	07/14/2015	01/10/2017
US	INDIAN UST R1	Underground Storage Tanks on Indian Land	EPA, Region 1	04/20/2023	05/09/2023	07/14/2023
US	INDIAN UST R10	Underground Storage Tanks on Indian Land	EPA Region 10	04/20/2023	05/09/2023	07/14/2023
US	INDIAN UST R4	Underground Storage Tanks on Indian Land	EPA Region 4	04/20/2023	05/09/2023	07/14/2023
US	INDIAN UST R5	Underground Storage Tanks on Indian Land	EPA Region 5	04/14/2023	05/09/2023	07/14/2023
US	INDIAN UST R6	Underground Storage Tanks on Indian Land	EPA Region 6	04/26/2023	05/09/2023	07/14/2023
US	INDIAN UST R7	Underground Storage Tanks on Indian Land	EPA Region 7	04/25/2023	05/09/2023	07/14/2023
US	INDIAN UST R8	Underground Storage Tanks on Indian Land	EPA Region 8	04/20/2023	05/09/2023	07/14/2023
US	INDIAN UST R9	Underground Storage Tanks on Indian Land	EPA Region 9	04/19/2023	05/09/2023	07/14/2023
US	INDIAN VCP R1	Voluntary Cleanup Priority Listing	EPA, Region 1	07/27/2015	09/29/2015	02/18/2016
US	INDIAN VCP R7	Voluntary Cleanup Priority Lisitng	EPA, Region 7	03/20/2008	04/22/2008	05/19/2008
US	LEAD SMELTER 1	Lead Smelter Sites	Environmental Protection Agency	12/26/2024	01/02/2024	01/24/2024
US	LEAD SMELTER 2	Lead Smelter Sites	American Journal of Public Health	04/05/2001	10/27/2010	12/02/2010
US	LIENS 2	CERCLA Lien Information	Environmental Protection Agency	11/14/2023	12/22/2023	01/24/2024
US	LUCIS	Land Use Control Information System	Department of the Navy	08/03/2023	08/07/2023	10/10/2023
US	MINES MRDS	Mineral Resources Data System	USGS	08/23/2022	11/22/2022	02/28/2023
US	MINES VIOLATIONS	MSHA Violation Assessment Data	DOL, Mine Safety & Health Admi	01/02/2024	01/03/2024	01/04/2024
US	MLTS	Material Licensing Tracking System	Nuclear Regulatory Commission	07/20/2023	09/01/2023	09/20/2023
US	NPL	National Priority List	EPA	12/26/2023	01/02/2024	01/24/2024
US	NPL LIENS	Federal Superfund Liens	EPA	10/15/1991	02/02/1994	03/30/1994
US	ODI	Open Dump Inventory	Environmental Protection Agency	06/30/1985	08/09/2004	09/17/2004
US	PADS	PCB Activity Database System	EPA	03/20/2023	04/04/2023	06/09/2023
US	PCB TRANSFORMER	PCB Transformer Registration Database	Environmental Protection Agency	09/13/2019	11/06/2019	02/10/2020

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
US	PCS	Permit Compliance System	EPA, Office of Water	12/16/2016	01/06/2017	03/10/2017
US	PCS ENF	Enforcement data	EPA	12/31/2014	02/05/2015	03/06/2015
US	PFAS ATSDR	PFAS Contamination Site Location Listing	Department of Health & Human Services	06/24/2020	03/17/2021	11/08/2022
US	PFAS ECHO	Facilities in Industries that May Be Handling PFAS Listing	Environmental Protection Agency	09/23/2023	10/03/2023	12/21/2023
US	PFAS ECHO FIRE TRAINING	Facilities in Industries that May Be Handling PFAS Listing	Environmental Protection Agency	09/23/2023	10/03/2023	12/21/2023
US	PFAS FEDERAL SITES	Federal Sites PFAS Information	Environmental Protection Agency	09/23/2023	10/03/2023	12/21/2023
US	PFAS NPDES	Clean Water Act Discharge Monitoring Information	Environmental Protection Agency	09/23/2023	10/03/2023	01/04/2024
US	PFAS NPL	Superfund Sites with PFAS Detections Information	Environmental Protection Agency	09/23/2023	10/03/2023	12/21/2023
US	PFAS PART 139 AIRPORT	All Certified Part 139 Airports PFAS Information Listing	Environmental Protection Agency	09/23/2023	10/03/2023	12/21/2023
US	PFAS RCRA MANIFEST	PFAS Transfers Identified In the RCRA Database Listing	Environmental Protection Agency	12/28/2023	12/28/2023	01/04/2024
US	PFAS TRIS	List of PFAS Added to the TRI	Environmental Protection Agency	12/28/2023	12/28/2023	01/04/2024
US	PFAS TSCA	PFAS Manufacture and Imports Information	Environmental Protection Agency	12/28/2023	12/28/2023	01/04/2024
US	PFAS WQP	Ambient Environmental Sampling for PFAS	Environmental Protection Agency	09/23/2023	10/03/2023	10/10/2023
US	PRP	Potentially Responsible Parties	EPA	09/19/2023	10/03/2023	10/19/2023
US	Proposed NPL	Proposed National Priority List Sites	EPA	12/26/2023	01/02/2024	01/24/2024
US	RAATS	RCRA Administrative Action Tracking System	EPA	04/17/1995	07/03/1995	08/07/1995
US	RADINFO	Radiation Information Database	Environmental Protection Agency	07/01/2019	07/01/2019	09/23/2019
US	RCRA NonGen / NLR	RCRA - Non Generators / No Longer Regulated	Environmental Protection Agency	12/04/2023	12/06/2023	12/12/2023
US	RCRA-LQG	RCRA - Large Quantity Generators	Environmental Protection Agency	12/04/2023	12/06/2023	12/12/2023
US	RCRA-SQG	RCRA - Small Quantity Generators	Environmental Protection Agency	12/04/2023	12/06/2023	12/12/2023
US	RCRA-TSDF	RCRA - Treatment, Storage and Disposal	Environmental Protection Agency	12/04/2023	12/06/2023	12/12/2023
US	RCRA-VSQG	RCRA - Very Small Quantity Generators (Formerly Conditionall	Environmental Protection Agency	12/04/2023	12/06/2023	12/12/2023
US	RMP	Risk Management Plans	Environmental Protection Agency	09/01/2023	09/27/2023	12/21/2023
US	ROD	Records Of Decision	EPA	12/26/2023	01/02/2024	01/24/2024
US	SCRD DRYCLEANERS	State Coalition for Remediation of Drycleaners Listing	Environmental Protection Agency	07/30/2021	02/03/2023	02/10/2023
US	SEMS	Superfund Enterprise Management System	EPA	01/29/2024	02/01/2024	02/22/2024
US	SEMS-ARCHIVE	Superfund Enterprise Management System Archive	EPA	01/29/2024	02/01/2024	02/22/2024
US	SSTS	Section 7 Tracking Systems	EPA	10/19/2023	10/20/2023	01/16/2024
US	TRIS	Toxic Chemical Release Inventory System	EPA	12/31/2022	11/13/2023	02/07/2024
US	TSCA	Toxic Substances Control Act	EPA	12/31/2020	06/14/2022	03/24/2023
US	UMTRA	Uranium Mill Tailings Sites	Department of Energy	08/30/2019	11/15/2019	01/28/2020
US	US AIRS (AFS)	Aerometric Information Retrieval System Facility Subsystem (	EPA	10/12/2016	10/26/2016	02/03/2017
US	US AIRS MINOR	Air Facility System Data	EPA	10/12/2016	10/26/2016	02/03/2017
US	US BROWNFIELDS	A Listing of Brownfields Sites	Environmental Protection Agency	08/15/2023	08/30/2023	12/01/2023
US	US CDL	Clandestine Drug Labs	Drug Enforcement Administration	11/17/2023	11/17/2023	02/07/2024
US	US ENG CONTROLS	Engineering Controls Sites List	Environmental Protection Agency	10/26/2023	11/17/2023	02/13/2024
US	US FIN ASSUR	Financial Assurance Information	Environmental Protection Agency	09/18/2023	09/20/2023	12/12/2023
US	US HIST CDL	National Clandestine Laboratory Register	Drug Enforcement Administration	11/17/2023	11/17/2023	02/07/2024
US	US INST CONTROLS	Institutional Controls Sites List	Environmental Protection Agency	10/26/2023	11/17/2023	02/13/2024
US	US MINES	Mines Master Index File	Department of Labor, Mine Safety and Health A	11/01/2023	11/17/2023	02/13/2024
US	US MINES 2	Ferrous and Nonferrous Metal Mines Database Listing	USGS	01/07/2022	02/24/2023	05/17/2023
US	US MINES 3	Active Mines & Mineral Plants Database Listing	USGS	04/14/2011	06/08/2011	09/13/2011
US	UST FINDER	UST Finder Database	Environmental Protection Agency	06/08/2023	10/04/2023	01/18/2024
US	UST FINDER RELEASE	UST Finder Releases Database	Environmental Protecton Agency	06/08/2023	10/31/2023	01/18/2024
US	UXO	Unexploded Ordnance Sites	Department of Defense	09/06/2023	09/13/2023	12/11/2023

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
CT	CT MANIFEST	Hazardous Waste Manifest Data	Department of Energy & Environmental Protecti	11/06/2023	11/07/2023	01/31/2024
NJ	NJ MANIFEST	Manifest Information	Department of Environmental Protection	12/31/2018	04/10/2019	05/16/2019
NY	NY MANIFEST	Facility and Manifest Data	Department of Environmental Conservation	12/31/2019	11/30/2023	12/01/2023
PA	PA MANIFEST	Manifest Information	Department of Environmental Protection	06/30/2018	07/19/2019	09/10/2019
RI	RI MANIFEST	Manifest information	Department of Environmental Management	12/31/2020	11/30/2021	02/18/2022
WI	WI MANIFEST	Manifest Information	Department of Natural Resources	05/31/2018	06/19/2019	09/03/2019
US	AHA Hospitals	Sensitive Receptor: AHA Hospitals	American Hospital Association, Inc.			
US	Medical Centers	Sensitive Receptor: Medical Centers	Centers for Medicare & Medicaid Services			
US	Nursing Homes	Sensitive Receptor: Nursing Homes	National Institutes of Health			
US	Public Schools	Sensitive Receptor: Public Schools	National Center for Education Statistics			
US	Private Schools	Sensitive Receptor: Private Schools	National Center for Education Statistics			
GA	Daycare Centers	Sensitive Receptor: Child Care Centers	Department of Human Resources			
US	Flood Zones	100-year and 500-year flood zones	Emergency Management Agency (FEMA)			
US	NWI	National Wetlands Inventory	U.S. Fish and Wildlife Service			
GA	State Wetlands	Wetlands Inventory	Georgia GIS Clearinghouse			
US	Topographic Map	Current USGS 7.5 Minute Topographic Map	U.S. Geological Survey			
US	Oil/Gas Pipelines		Endeavor Business Media			
US	Electric Power Transmission Line Data		Endeavor Business Media			

STREET AND ADDRESS INFORMATION

GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

501 S PORT PKWY
501 S PORT PKWY
BRUNSWICK, GA 31523

TARGET PROPERTY COORDINATES

Latitude (North):	31.126628 - 31˚ 7’ 35.86’’
Longitude (West):	81.584314 - 81˚ 35’ 3.53’’
Universal Tranverse Mercator:	Zone 17
UTM X (Meters):	444290.1
UTM Y (Meters):	3443598.0
Elevation:	9 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	15932533 BRUNSWICK WEST, GA
Version Date:	2020
South Map:	15932547 DOVER BLUFF, GA
Version Date:	2020

EDR’s GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principle investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

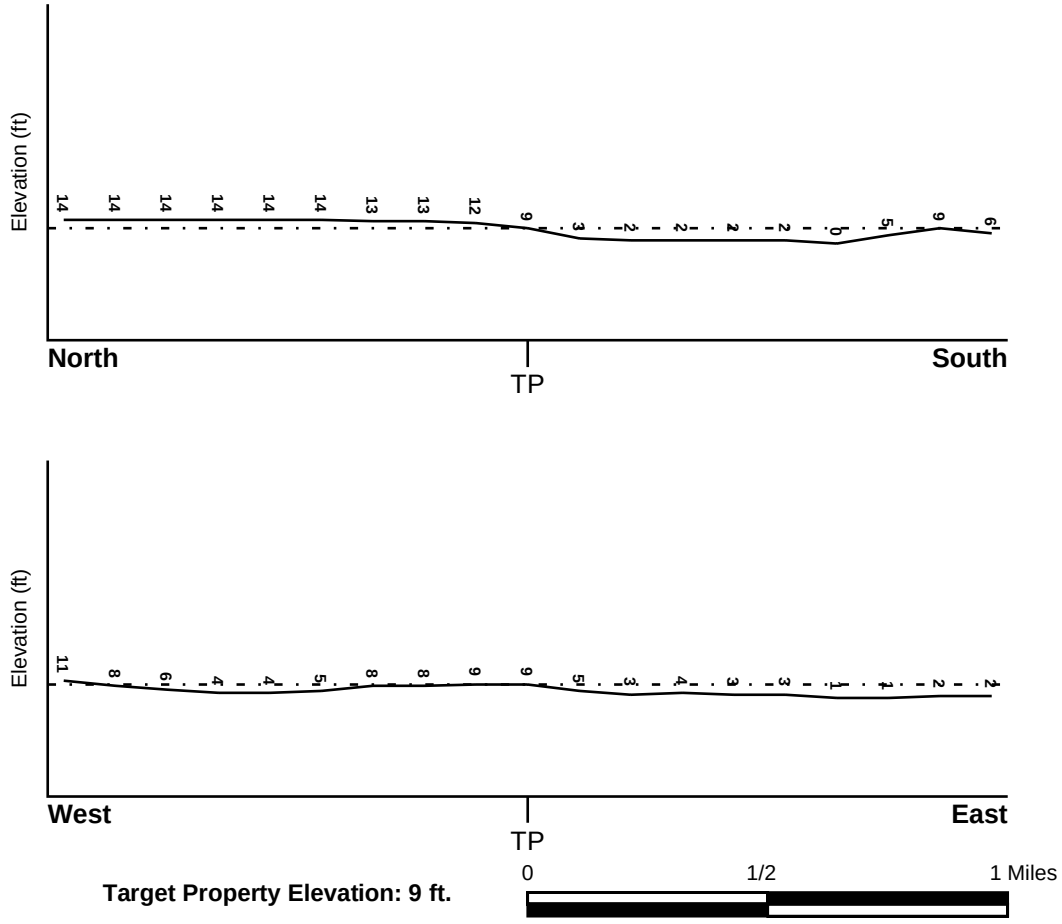
TOPOGRAPHIC INFORMATION

Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General SSE

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES



Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Flood Plain Panel at Target Property	FEMA Source Type
13127C0214F	FEMA FIRM Flood data

Additional Panels in search area:	FEMA Source Type
13127C0213F	FEMA FIRM Flood data
13127C0305F	FEMA FIRM Flood data

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
BRUNSWICK WEST	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

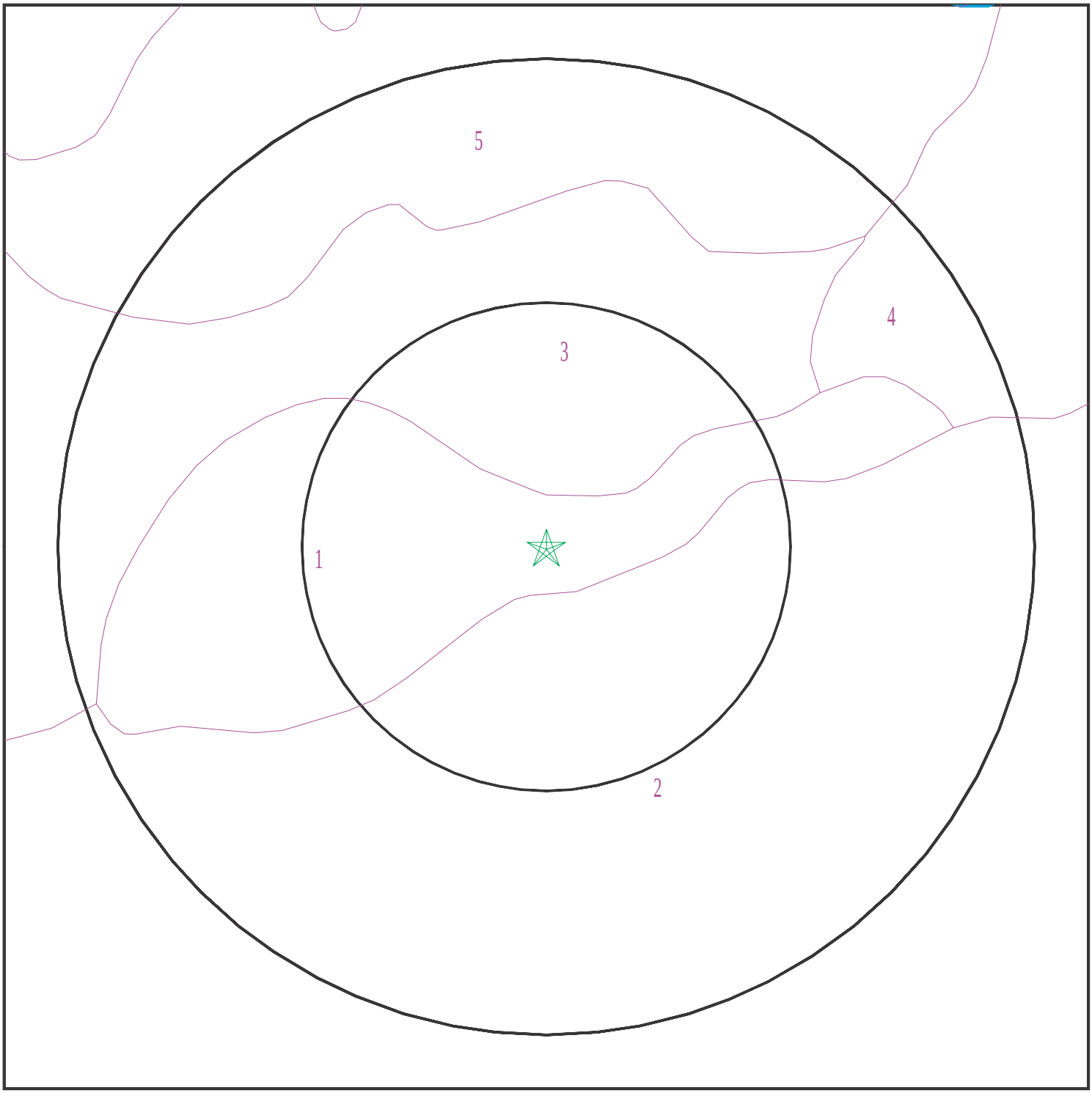
Era:	Cenozoic
System:	Quaternary
Series:	Holocene
Code:	Qh *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Stratifed Sequence

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

SSURGO SOIL MAP - 7581738.2s



Target Property
SSURGO Soil
Water

0 1/16 1/8 1/4 Miles

N

SITE NAME:	501 S PORT PKWY	CLIENT:	Terracon
ADDRESS:	501 S PORT PKWY BRUNSWICK GA 31523	CONTACT:	Tyler Tomberlin
LAT/LONG:	31.126628 / 81.584314	INQUIRY #:	7581738.2s
		DATE:	February 28, 2024 5:46 pm

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. The following information is based on Soil Conservation Service SSURGO data.

Soil Map ID: 1

Soil Component Name: Cainhoy

Soil Surface Texture: fine sand

Hydrologic Group: Class A - High infiltration rates. Soils are deep, well drained to excessively drained sands and gravels.

Soil Drainage Class: Excessively drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	50 inches	fine sand	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Clean Sands, Poorly graded sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 141 Min: 42	Max: 6.5 Min: 4.5
2	50 inches	98 inches	fine sand	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Clean Sands, Poorly graded sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 141 Min: 42	Max: 6.5 Min: 4.5

Soil Map ID: 2

Soil Component Name: Bohicket

Soil Surface Texture: stratified silty clay loam

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Very poorly drained

Hydric Status: All hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	7 inches	stratified silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Elastic silt.	Max: 0.42 Min: 0.01	Max: 8.4 Min: 6.1
2	7 inches	64 inches	silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Elastic silt.	Max: 0.42 Min: 0.01	Max: 8.4 Min: 6.1

Soil Map ID: 3

Soil Component Name: Mandarin

Soil Surface Texture: fine sand

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Somewhat poorly drained

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 77 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	18 inches	fine sand	Granular materials (35 pct. or less passing No. 200), Fine Sand.	Not reported	Max: 14 Min: 4	Max: 7.3 Min: 3.6
2	18 inches	33 inches	fine sand	Granular materials (35 pct. or less passing No. 200), Fine Sand.	Not reported	Max: 14 Min: 4	Max: 7.3 Min: 3.6
3	33 inches	61 inches	fine sand	Granular materials (35 pct. or less passing No. 200), Fine Sand.	Not reported	Max: 14 Min: 4	Max: 7.3 Min: 3.6
4	61 inches	79 inches	fine sand	Granular materials (35 pct. or less passing No. 200), Fine Sand.	Not reported	Max: 14 Min: 4	Max: 7.3 Min: 3.6

Soil Map ID: 4

Soil Component Name: Pelham

Soil Surface Texture: loamy sand

Hydrologic Group: Class B/D - Drained/undrained hydrology class of soils that can be drained and are classified.

Soil Drainage Class: Poorly drained

Hydric Status: All hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 15 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	25 inches	loamy sand	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 14 Min: 1.4	Max: 5.5 Min: 4.5
2	25 inches	40 inches	sandy clay loam	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 14 Min: 1.4	Max: 5.5 Min: 4.5
3	40 inches	75 inches	sandy clay loam	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Sands with fines, Clayey sand.	Max: 14 Min: 1.4	Max: 5.5 Min: 4.5

Soil Map ID: 5

Soil Component Name: Pottsburg

Soil Surface Texture: sand

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Somewhat poorly drained

Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 84 inches

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	9 inches	sand	Granular materials (35 pct. or less passing No. 200), Fine Sand.	COARSE-GRAINED SOILS, Sands, Clean Sands, Poorly graded sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 42 Min: 14	Max: 6 Min: 3.6
2	9 inches	62 inches	sand	Granular materials (35 pct. or less passing No. 200), Fine Sand.	COARSE-GRAINED SOILS, Sands, Clean Sands, Poorly graded sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 42 Min: 14	Max: 6 Min: 3.6
3	62 inches	79 inches	sand	Granular materials (35 pct. or less passing No. 200), Fine Sand.	COARSE-GRAINED SOILS, Sands, Clean Sands, Poorly graded sand. COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 42 Min: 14	Max: 6 Min: 3.6

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
1	USGS40000254376	1/4 - 1/2 Mile NNE
A3	USGS40000254377	1/4 - 1/2 Mile NNW
B4	USGS40000254393	1/4 - 1/2 Mile NNW
C8	USGS40000254398	1/2 - 1 Mile WNW
D9	USGS40000254437	1/2 - 1 Mile NW

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No PWS System Found		

Note: PWS System location is not always the same as well location.

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
A2	0000004784	1/4 - 1/2 Mile NNW
B5	0000004794	1/4 - 1/2 Mile NNW
B6	0000004793	1/4 - 1/2 Mile NNW
C7	0000004795	1/2 - 1 Mile WNW
D10	0000004814	1/2 - 1 Mile NW

PHYSICAL SETTING SOURCE MAP - 7581738.2s

- County Boundary
- Major Roads
- Contour Lines
- Earthquake epicenter, Richter 5 or greater
- Water Wells
- Public Water Supply Wells
- Cluster of Multiple Icons
- Groundwater Flow Direction
- GI Indeterminate Groundwater Flow at Location
- GV Groundwater Flow Varies at Location
- Wildlife Areas

SITE NAME:	501 S PORT PKWY	CLIENT:	Terracon
ADDRESS:	501 S PORT PKWY BRUNSWICK GA 31523	CONTACT:	Tyler Tomberlin
		INQUIRY #:	7581738.2s
LAT/LONG:	31.126628 / 81.584314	DATE:	February 28, 2024 5:46 pm

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance
Elevation | Database | EDR ID Number

1
NNE **FED USGS** **USGS40000254376**
1/4 - 1/2 Mile
Higher

Organization ID:	USGS-GA	Organization Name:	USGS Georgia Water Science Center
Monitor Location:	33H344	Type:	Well
Description:	Not Reported	HUC:	03070203
Drainage Area:	Not Reported	Drainage Area Units:	Not Reported
Contrib Drainage Area:	Not Reported	Contrib Drainage Area Unts:	Not Reported
Aquifer:	Not Reported	Formation Type:	Not Reported
Aquifer Type:	Not Reported	Construction Date:	Not Reported
Well Depth:	Not Reported	Well Depth Units:	Not Reported
Well Hole Depth:	Not Reported	Well Hole Depth Units:	Not Reported

---

A2
NNW **GA WELLS** **0000004784**
1/4 - 1/2 Mile
Higher

County code:	127	Well num:	33H226
Remarks:	GLYNN CO.	Lat:	310747
Lon:	0813513	Latlon datum:	NAD27
Alt:	13	Alt datum:	NGVD29
Depth:	890	Depth to casing:	640
Casing dia:	16	Casing matl:	S
Depth to top:	640	Depth to bot:	890
Opening type:	X	Constr date:	198810
Discharge:	1627	Prim use:	P
Aquifer code:	Not Reported	Edr id:	0000004784

A3
NNW **FED USGS** **USGS40000254377**
1/4 - 1/2 Mile
Higher

Organization ID:	USGS-GA	Organization Name:	USGS Georgia Water Science Center
Monitor Location:	33H226	Type:	Well
Description:	GLYNN CO.	HUC:	03070203
Drainage Area:	Not Reported	Drainage Area Units:	Not Reported
Contrib Drainage Area:	Not Reported	Contrib Drainage Area Unts:	Not Reported
Aquifer:	Not Reported	Formation Type:	Not Reported
Aquifer Type:	Not Reported	Construction Date:	198810
Well Depth:	890	Well Depth Units:	ft
Well Hole Depth:	890	Well Hole Depth Units:	ft

B4
NNW **FED USGS** **USGS40000254393**
1/4 - 1/2 Mile
Higher

Organization ID:	USGS-GA	Organization Name:	USGS Georgia Water Science Center
Monitor Location:	33H225	Type:	Well
Description:	SOUTHPORT OBS (FAULT)WELL	HUC:	03070203
Drainage Area:	Not Reported	Drainage Area Units:	Not Reported

Contrib Drainage Area:	Not Reported	Contrib Drainage Area Unts:	Not Reported
Aquifer:	Floridan aquifer system	Formation Type:	Upper Floridan Aquifer
Aquifer Type:	Not Reported	Construction Date:	19880623
Well Depth:	890	Well Depth Units:	ft
Well Hole Depth:	900	Well Hole Depth Units:	ft

Ground water levels,Number of Measurements:	1	Level reading date:	1988-09-09
Feet below surface:	-4.92	Feet to sea level:	Not Reported
Note:	Not Reported		

B5
NNW
1/4 - 1/2 Mile
Higher

GA WELLS **0000004794**

County code:	127	Well num:	33H225
Remarks:	SOUTHPORT OBS (FAULT)WELL	Lat:	310757
Lon:	0813516	Latlon datum:	NAD27
Alt:	15	Alt datum:	NGVD29
Depth:	890.00	Depth to casing:	640.00
Casing dia:	16	Casing matl:	S
Depth to top:	Not Reported	Depth to bot:	Not Reported
Opening type:	Not Reported	Constr date:	Not Reported
Discharge:	Not Reported	Prim use:	U
Aquifer code:	120FLRDU	Edr id:	0000004794

B6
NNW
1/4 - 1/2 Mile
Higher

GA WELLS **0000004793**

County code:	127	Well num:	33H225
Remarks:	SOUTHPORT OBS (FAULT)WELL	Lat:	310757
Lon:	0813516	Latlon datum:	NAD27
Alt:	15	Alt datum:	NGVD29
Depth:	890.00	Depth to casing:	40.00
Casing dia:	26	Casing matl:	S
Depth to top:	640.00	Depth to bot:	890.00
Opening type:	X	Constr date:	19880623
Discharge:	Not Reported	Prim use:	U
Aquifer code:	120FLRDU	Edr id:	0000004793

C7
WNW
1/2 - 1 Mile
Higher

GA WELLS **0000004795**

County code:	127	Well num:	33H003
Remarks:	MADGE MERRITT GARDEN CLUB	Lat:	310759
Lon:	0813554	Latlon datum:	NAD27
Alt:	9.62	Alt datum:	NGVD29
Depth:	480	Depth to casing:	147.
Casing dia:	3.	Casing matl:	S
Depth to top:	147.	Depth to bot:	480.
Opening type:	X	Constr date:	1959
Discharge:	Not Reported	Prim use:	U
Aquifer code:	Not Reported	Edr id:	0000004795

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance
Elevation | Database | EDR ID Number

C8
WNW
1/2 - 1 Mile
Higher | **FED USGS** | **USGS40000254398**

Organization ID:	USGS-GA	Organization Name:	USGS Georgia Water Science Center
Monitor Location:	33H003	Type:	Well
Description:	MADGE MERRITT GARDEN CLUB	HUC:	03070203
Drainage Area:	Not Reported	Drainage Area Units:	Not Reported
Contrib Drainage Area:	Not Reported	Contrib Drainage Area Unts:	Not Reported
Aquifer:	Not Reported	Formation Type:	Not Reported
Aquifer Type:	Not Reported	Construction Date:	1959
Well Depth:	480	Well Depth Units:	ft
Well Hole Depth:	480	Well Hole Depth Units:	ft

Ground water levels,Number of Measurements:	131	Level reading date:	1994-07-23
Feet below surface:	-15.68	Feet to sea level:	Not Reported
Note:	Not Reported		

Level reading date:	1972-07-19	Feet below surface:	-10.70
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1972-06-21	Feet below surface:	-11.40
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1972-05-18	Feet below surface:	-11.40
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1972-04-19	Feet below surface:	-11.74
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1972-03-15	Feet below surface:	-11.85
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1972-02-17	Feet below surface:	-12.08
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1971-12-15	Feet below surface:	-11.49
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1971-11-17	Feet below surface:	-10.93
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1971-09-17	Feet below surface:	-10.38
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1971-08-18	Feet below surface:	-10.16
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1971-07-16	Feet below surface:	-9.79
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1971-06-16	Feet below surface:	-10.02
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1971-05-19	Feet below surface:	-10.02
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1971-04-16	Feet below surface:	-10.84

Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1971-03-19	Feet below surface:	-11.04
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1971-01-20	Feet below surface:	-8.22
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1970-12-09	Feet below surface:	-5.25
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1970-01-15	Feet below surface:	-15.56
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1969-11-18	Feet below surface:	-13.09
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1969-10-22	Feet below surface:	-13.64
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1969-09-23	Feet below surface:	-15.90
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1969-08-19	Feet below surface:	-15.79
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1969-06-24	Feet below surface:	-13.41
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1969-05-22	Feet below surface:	-14.12
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1969-04-18	Feet below surface:	-14.46
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1969-03-19	Feet below surface:	-14.01
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1969-01-16	Feet below surface:	-14.78
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1968-12-20	Feet below surface:	-14.33
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1968-10-22	Feet below surface:	-13.99
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1968-09-19	Feet below surface:	-13.08
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1968-08-19	Feet below surface:	-12.97
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1968-07-18	Feet below surface:	-12.86
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1968-06-21	Feet below surface:	-12.86
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1968-05-14	Feet below surface:	-13.31
Feet to sea level:	Not Reported	Note:	Not Reported

Level reading date:	1968-03-21	Feet below surface:	-15.35
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1968-01-19	Feet below surface:	-15.57
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1967-12-06	Feet below surface:	-15.12
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1967-10-18	Feet below surface:	-15.57
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1967-09-28	Feet below surface:	-15.57
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1967-07-18	Feet below surface:	-15.12
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1967-06-21	Feet below surface:	-14.90
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1967-05-25	Feet below surface:	-15.57
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1967-04-19	Feet below surface:	-17.73
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1967-03-22	Feet below surface:	-18.07
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1967-02-20	Feet below surface:	-17.28
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1967-01-19	Feet below surface:	-17.17
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1966-11-29	Feet below surface:	-17.17
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1966-10-25	Feet below surface:	-17.17
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1966-09-20	Feet below surface:	-17.41
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1966-08-22	Feet below surface:	-17.98
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1966-07-19	Feet below surface:	-16.73
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1966-05-20	Feet below surface:	-17.19
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1966-04-19	Feet below surface:	-17.98
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1966-03-17	Feet below surface:	-17.98
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1966-02-16	Feet below surface:	-17.87
Feet to sea level:	Not Reported	Note:	Not Reported

Level reading date:	1966-01-19	Feet below surface:	-18.21
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1965-12-03	Feet below surface:	-17.30
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1965-11-19	Feet below surface:	-17.41
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1965-10-19	Feet below surface:	-17.52
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1965-09-17	Feet below surface:	-17.03
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1965-08-26	Feet below surface:	-18.88
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1965-07-16	Feet below surface:	-17.19
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1965-06-22	Feet below surface:	-17.07
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1965-05-18	Feet below surface:	-17.98
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1965-04-20	Feet below surface:	-14.24
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1965-03-23	Feet below surface:	-19.96
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1965-02-16	Feet below surface:	-19.33
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1965-01-19	Feet below surface:	-20.20
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1964-12-08	Feet below surface:	-18.11
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1964-10-21	Feet below surface:	-17.78
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1964-09-22	Feet below surface:	-17.43
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1964-08-18	Feet below surface:	-18.79
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1964-07-23	Feet below surface:	-17.09
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1964-06-23	Feet below surface:	-17.77
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1964-05-19	Feet below surface:	-18.34
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1964-04-20	Feet below surface:	-19.25
Feet to sea level:	Not Reported	Note:	Not Reported

Level reading date:	1964-03-23	Feet below surface:	-16.98
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1964-02-19	Feet below surface:	-16.75
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1964-01-20	Feet below surface:	-16.30
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1963-12-05	Feet below surface:	-15.40
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1963-11-19	Feet below surface:	-15.96
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1963-10-15	Feet below surface:	-15.90
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1963-08-17	Feet below surface:	-15.40
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1963-08-04	Feet below surface:	-15.00
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1963-07-18	Feet below surface:	-15.40
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1963-06-18	Feet below surface:	-15.80
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1963-05-21	Feet below surface:	-16.40
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1963-04-18	Feet below surface:	-16.60
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1963-03-19	Feet below surface:	-17.60
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1963-02-20	Feet below surface:	-18.71
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1963-01-23	Feet below surface:	-19.21
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1962-12-19	Feet below surface:	-18.91
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1962-11-21	Feet below surface:	-21.71
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1962-10-16	Feet below surface:	-21.21
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1962-09-17	Feet below surface:	-21.81
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1962-08-17	Feet below surface:	-21.51
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1962-07-16	Feet below surface:	-21.21
Feet to sea level:	Not Reported	Note:	Not Reported

Level reading date:	1962-06-27	Feet below surface:	-21.81
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1962-05-22	Feet below surface:	-22.81
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1962-04-17	Feet below surface:	-22.91
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1962-03-16	Feet below surface:	-23.61
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1962-02-19	Feet below surface:	-23.81
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1962-01-19	Feet below surface:	-23.51
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-12-19	Feet below surface:	-22.70
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-11-28	Feet below surface:	-22.90
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-10-25	Feet below surface:	-22.50
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-09-20	Feet below surface:	-22.00
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-08-31	Feet below surface:	-21.70
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-08-01	Feet below surface:	-22.10
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-06-20	Feet below surface:	-22.10
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-05-26	Feet below surface:	-22.70
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-04-25	Feet below surface:	-23.10
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-04-12	Feet below surface:	-23.80
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-03-21	Feet below surface:	-23.50
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-02-20	Feet below surface:	-23.40
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1961-01-31	Feet below surface:	-23.60
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1960-12-22	Feet below surface:	-23.20
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1960-11-18	Feet below surface:	-23.90
Feet to sea level:	Not Reported	Note:	Not Reported

Level reading date:	1960-10-26	Feet below surface:	-23.70
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1960-09-15	Feet below surface:	-23.80
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1960-08-22	Feet below surface:	-23.40
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1960-07-19	Feet below surface:	-23.70
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1960-06-20	Feet below surface:	-23.50
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1960-05-19	Feet below surface:	-24.50
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1960-04-21	Feet below surface:	-24.70
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1960-03-24	Feet below surface:	-24.90
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1960-02-24	Feet below surface:	-24.70
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1960-01-26	Feet below surface:	-23.80
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1959-10-05	Feet below surface:	-22.20
Feet to sea level:	Not Reported	Note:	Not Reported
Level reading date:	1959-09-18	Feet below surface:	-23.7
Feet to sea level:	Not Reported	Note:	Not Reported

D9
NW
1/2 - 1 Mile
Higher

FED USGS **USGS40000254437**

Organization ID:	USGS-GA	Organization Name:	USGS Georgia Water Science Center
Monitor Location:	33H186		
Type:	Well: Test hole not completed as a well		
Description:	HUMBLE/BELL 01	HUC:	03070203
Drainage Area:	Not Reported	Drainage Area Units:	Not Reported
Contrib Drainage Area:	Not Reported	Contrib Drainage Area Unts:	Not Reported
Aquifer:	Floridan aquifer system	Formation Type:	Not Reported
Aquifer Type:	Not Reported	Construction Date:	19590903
Well Depth:	Not Reported	Well Depth Units:	Not Reported
Well Hole Depth:	905	Well Hole Depth Units:	ft

D10
NW
1/2 - 1 Mile
Higher

GA WELLS **0000004814**

County code:	127	Well num:	33H186
Remarks:	HUMBLE/BELL 01	Lat:	310817

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Lon:	0813539	Latlon datum:	NAD27
Alt:	19.00	Alt datum:	NGVD29
Depth:	905	Depth to casing:	100.00
Casing dia:	6.00	Casing matl:	Not Reported
Depth to top:	100.00	Depth to bot:	905
Opening type:	X	Constr date:	19590903
Discharge:	Not Reported	Prim use:	U
Aquifer code:	Not Reported	Edr id:	0000004814

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

Federal EPA Radon Zone for GLYNN County: 3

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for GLYNN COUNTY, GA

Number of sites tested: 5

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.260 pCi/L	100%	0%	0%
Living Area - 2nd Floor	0.400 pCi/L	100%	0%	0%
Basement	Not Reported	Not Reported	Not Reported	Not Reported

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Current USGS 7.5 Minute Topographic Map
Source: U.S. Geological Survey

HYDROLOGIC INFORMATION

Flood Zone Data: This data was obtained from the Federal Emergency Management Agency (FEMA). It depicts 100-year and 500-year flood zones as defined by FEMA. It includes the National Flood Hazard Layer (NFHL) which incorporates Flood Insurance Rate Map (FIRM) data and Q3 data from FEMA in areas not covered by NFHL.
Source: FEMA
Telephone: 877-336-2627
Date of Government Version: 2003, 2015

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005, 2010 and 2015 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetlands Inventory
Source: Georgia GIS Clearinghouse
Telephone: 706-542-1581

HYDROGEOLOGIC INFORMATION

AQUIFLOW^{R} Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Service, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

OTHER STATE DATABASE INFORMATION

A listing of Private Water Well locations
Georgia Department of Public Health
Telephone: (404) 657-2700
A listing of Private Water Well locations

Georgia Public Supply Wells
Source: Georgia Department of Community Affairs
Telephone: 404-894-0127

USGS Georgia Water Wells
Source: USGS, Georgia District Office
Telephone: 770-903-9100

DNR Managed Lands
Source: Department of Natural Resources
Telephone: 706-557-3032
This dataset provides 1:24,000-scale data depicting boundaries of land parcels making up the public lands managed by the Georgia Department of Natural Resources (GDNR). It includes polygon representations of State Parks, State Historic Parks, State Conservation Parks, State Historic Sites, Wildlife Management Areas, Public Fishing Areas, Fish Hatcheries, Natural Areas and other specially-designated areas. The data were collected and located by the Georgia Department of Natural Resources. Boundaries were digitized from survey plats or other information.

RADON

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

Earthquake Fault Lines: The fault lines displayed on EDR's Topographic map are digitized quaternary faultlines, prepared in 1975 by the United State Geological Survey

STREET AND ADDRESS INFORMATION

Tomberlin, Tyler

From:	Tomberlin, Tyler
Sent:	Monday, March 11, 2024 11:13 AM
To:	twhite@cityofbrunswick-ga.gov
Subject:	501 and 391 South Port Parkway Records Request

Chief White,

I'm requesting records for the parcels of land located at 501 and 391 South Port Parkway in Brunswick (PINs: 03-12061 and 03-16474) pertaining to emergency response, fires, and chemical spills/releases.

V/R

Tyler Tomberlin
Senior Staff Geologist I Environmental

Terracon

2201 Rowland Avenue I Savannah, Georgia 31404
D (912) 200-9130 | M (478) 765-2033
Tyler.Tomberlin@terracon.com I Terracon.com

Tomberlin, Tyler

From: Glynn County GA Public Records <messages@nextrequest.com>
Sent: Monday, March 11, 2024 3:32 PM
To: Tomberlin, Tyler
Subject: [External Message Added] Glynn County, GA public records request #24-1116

– Attach a non-image file and/or reply ABOVE THIS LINE with a message, and it will be sent to staff on this request. --

Glynn County, GA Public Records

A message was sent to you regarding record request #24-1116:

501 and 391 South Port Parkway in Brunswick (PINs: 03-12061 and 03-16474

Zoning - General Commercial

View Request 24-1116

https://glynncounty-ga.nextrequest.com/requests/24-1116

Questions about your request? Reply to this email or sign in to contact staff at Glynn County, GA .

Technical support: See our help page

APPENDIX E

Credentials

Tyler Tomberlin

Senior Staff Geologist / Due Diligence Coordinator

PROFESSIONAL EXPERIENCE

Tyler Tomberlin is a Senior Staff Geologist and Due Diligence Coordinator in Terracon's Savannah, Georgia office. Mr. Tomberlin has 8 years of experience in the environmental field including: RCRA and CERCLA site management, SPCCP program management, and geotechnical engineering. In addition, Mr. Tomberlin is responsible for coordination and preparation of Phase I ESAs. Proposal development, cost estimation, budget tracking, allocation of resources, and progress tracking are also vital skills Mr. Tomberlin possesses.

Mr. Tomberlin's project experience includes Phase I ESAs, UST Closures, AST Closures, Hazardous Waste/Hazardous Materials compliance, UST and AST compliance, and landfill cell construction and closure.

PROJECT EXPERIENCE

Phase I ESAs – Multiple Sites, US

Performs Phase I ESAs, including industrial, commercial, agricultural, and multi-family residential properties throughout the southeast US using ASTM and client-specific due diligence guidelines.

UST/AST Closures – Fort Gordon, GA

Assisted in the closure of multiple underground and above ground storage tanks throughout the entire Fort Gordon installation. Achieved less than 1 million gallons of storage tanks on installation so that facility no longer required Facility Response Plan.

Landfill Cell Construction/Closure – Multiple Sites, US

Independently lead landfill cell construction and cell closure projects throughout Texas and the southeast US. Performed soil density tests, collected Shelby tube samples, analyzed soil samples, and managed high density polyethylene liner deployment.

EDUCATION

Bachelor of Science, Geology, Georgia Southwestern State University, Americus, GA

PROFESSIONAL TRAINING

OSHA 40-hour Health & Safety

WORK HISTORY

Terracon Consultants Inc
Senior Staff Geologist
2023-present

US Department of Defense – Fort Gordon
Physical Scientist
2017-2023

Atlantic Coast Consulting
Geotechnical Field Technician
2016-2017

Kerri E. Doyle

ENVIRONMENTAL SERVICES SENIOR GEOLOGIST/DUE DILIGENCE COORDINATOR

PROFESSIONAL EXPERIENCE

Kerri Doyle is a Senior Geologist and Due Diligence Coordinator in Terracon's Savannah, Georgia office and has 23 years of experience. Ms. Doyle is responsible for client and resource management and integrating operations, team relationships, and site safety protocol throughout project life cycles. Significant experience includes site investigation, remedial investigation strategies and implementation, and post remediation site closure for federal and private sector facilities. In addition to technical functions, Ms. Doyle is responsible for proposal development, cost estimation, budget tracking, allocation of resources, and progress tracking and reporting.

Ms. Doyle's project experience includes Phase I and Phase II ESAs, Georgia HSRA and Brownfield assessments and remediation, UST compliance, assessment, and remediation; environmental risk assessments, large-scale remedial excavation and site restoration, chlorinated solvent bedrock groundwater remediation, operation and maintenance of groundwater and soil treatment systems, vapor intrusion investigation and mitigation, and emerging contaminants.

EDUCATION

Bachelor of Science, Environmental Earth Science, University of North Carolina Asheville

CERTIFICATIONS

Project Manager Certification, Wood New Jersey

40-hour OSHA Training

8-hour OSHA Supervisory Training

Case Study Training for Licensed Site Remediation Professional

Loss Prevention System (LPS) Training

WORK HISTORY

Terracon Consultants, Inc., Senior Geologist
2022 – Present

Wood E&IS, Associate Geoscientist,
2012 – 2022

SAIC, Project Geologist,
2006-2012

URS Corporation, Staff Geologist, 2001-2005

Engeo, Geotechnical Field Technician, 2000-2001

PROJECT EXPERIENCE

Phase I Environmental Site Assessments
Perform and manage hundreds of Phase I ESAs including industrial, commercial, agricultural, and multi-family residential properties throughout the southeast, northeast, and western USA using ASTM and client-specific due diligence guidelines.

Limited Site Investigations/Phase II Environmental Site Assessments
Provide project management to assess subsurface conditions for petroleum products and other hazardous substances at various industrial, commercial, and agricultural facilities throughout the southeast, northeast, and western USA. Develop sample and analysis plans and provide technical oversight for data collection and review of reports. Develop remedial strategies and communicate detailed technical data in practical ways to assist clients with making critical development decisions.

Georgia HSRA and Brownfield Assessments
Provide technical evaluation of data and reporting for various prospective purchaser assessments to determine appropriate comparison of HSRA Risk Reduction Standards and evaluate appropriate alternatives to achieve compliance and progress development schedules.

UST Assessments
Responsible for directing site characterization, risk assessment, monitoring, and remediation in accordance with UST Management Program requirements for multiple retail fuel facilities throughout the southeast, northeast, and western USA. Facilitate achievement of project goals among clients and regulators. Coordinate staff schedules, project notifications, and provide technical report review for data and reporting to regulatory agencies.

Norman E. (Gene) Partin, Jr., CHMM

DEPARTMENT MANAGER – ENVIRONMENTAL SERVICES

PROFESSIONAL EXPERIENCE

Mr. Partin is the Department Manager for Environmental Services in Terracon's Columbia, South Carolina office and has over 24 years of experience.

Mr. Partin's experience includes consulting for the prospective purchaser on pre-purchase due diligence assessments and consulting for owners on pre-renovation and pre-demolition surveys of structures. Mr. Partin helps clients to maneuver through the regulatory requirements of State and Federal Brownfield Assessments.

DUE DILIGENCE EXPERIENCE

Phase I Assessments

Mr. Partin has performed hundreds of Phase I ESAs for buyer due diligence as part of real property transactions in South Carolina and North Carolina. Sites have included small owner/operator commercial facilities, multi-tenant strip retail centers, high-rise office buildings, convenience stores, gas stations, large and small industrial facilities, as well as wooded and agricultural land ranging in size from less than one acre to 400+ acres.

HUD Environmental Assessments / Environmental Reviews

Mr. Partin has performed several Environmental Assessments / Environmental Reviews for buyers/grantees/local municipalities seeking US Dept of Housing and Urban Development (HUD) funding. Mr. Partin has completed environmental reviews using Form HUD-4128 to document compliance with NEPA and more recently using the HUD Environmental Review Online System (HEROS) and associated worksheets. Projects have included new public and private multifamily apartment construction, refinancing projects for Local Housing Authorities, and hospital expansions under the Hospital Mortgage Insurance Program.

Phase II Assessments

Mr. Partin has performed numerous Phase II Assessments which include development of site conceptual models; creating goal focused investigation scopes; and subcontractor and regulatory coordination. Mr. Partin has developed investigation scopes with input from the client, lender, and/or the regulatory agency. Investigations performed have included presence/absence determinations or nature, source, and extent depending on decision making needs. Mr. Partin has become adept at communicating sometimes detailed technical data in understandable ways so that clients can get the answers they need to make critical development decisions.

Asbestos & Mold Consulting Services

Mr. Partin has performed asbestos and lead paint surveys including materials inspection and bulk sampling for numerous commercial properties, industrial facilities and schools in South Carolina. He has carried projects from initial inspection, through abatement design and oversight, to demolition as a licensed building inspector and project designer.

Mr. Partin has performed indoor air quality and mold surveys on commercial properties affected by gross water intrusion from roof leaks, floods, firefighting efforts, and hurricanes and those affected by high humidity, toilet overflows, and improper HVAC unit balance. Other property types have included multi-family residential and assisted living facilities. Mr. Partin has performed initial inspections, prepared removal guidelines, and performed clearance assessments.

EDUCATION

Master of Public Health,
Environmental Health Sciences,
University of South Carolina, 1998

Bachelor of Arts,
Business Economics,
Wofford College, 1992

Hazmat/Health and Safety Training,
40 hours, Precision Environmental Laboratory, 1998

Princeton Groundwater Pollution and Hydrology Course, 2000

CERTIFICATIONS

Asbestos Project Designer, South Carolina License No. PD-00058, 2006

Asbestos Building Inspector, South Carolina License No. BI-00473, 1998

Certified Hazardous Materials Manager, Certification No. 10680, 2000

AFFILIATIONS

2022 Carolinas Environmental Information Association-Member, Past President (2010)

2022 Environmental Information Association – Member

2022 Member Alliance of Hazardous Materials Professionals

WORK HISTORY

Terracon Consultants, Inc., Department Manager, Site Redevelopment Services, 2004-Present

Earth Management Systems, Inc., Project Environmental Scientist, 2001-2004

QORE Property Sciences, Inc., Project Environmental Scientist, 1998-2001

Lorris Environmental, Inc., Staff Scientist, 1997-1998

APPENDIX F

Description of Terms and Acronyms

Description of Selected General Terms and Acronyms

Term/Acronym	Description
ACM	Asbestos Containing Material. Asbestos is a naturally occurring mineral, three varieties of which (chrysotile, amosite, crocidolite) have been commonly used as fireproofing or binding agents in construction materials. Exposure to asbestos, as well as ACM, has been documented to cause lung diseases including asbestosis (scarring of the lung), lung cancer and mesothelioma (a cancer of the lung lining). Regulatory agencies have generally defined ACM as a material containing greater that one (1) percent asbestos, however some states (e.g., California) define ACM as materials having 0.1% asbestos. In order to define a homogenous material as non-ACM, a minimum number of samples must be collected from the material dependent upon its type and quantity. Homogenous materials defined as non-ACM must either have 1) no asbestos identified in all of its samples or 2) an identified asbestos concentration below the appropriate regulatory threshold. Asbestos concentrations are generally determined using polarized light microscopy or transmission electron microscopy. Point counting is an analytical method to statistically quantify the percentage of asbestos in a sample. The asbestos component of ACM may either be friable or non-friable. Friable materials, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure and have a higher potential for a fiber release than non-friable ACM. Non-friable ACM are materials that are firmly bound in a matrix by plastic, cement, etc. and, if handled carefully, will not become friable. Federal and state regulations require that either all suspect building materials be presumed ACM or that an asbestos survey be performed prior to renovation, dismantling, demolition, or other activities that may disturb potential ACM. Notifications are required prior to demolition and/or renovation activities that may impact the condition of ACM in a building. ACM removal may be required if the ACM is likely to be disturbed or damaged during the demolition or renovation. Abatement of friable or potentially friable ACM must be performed by a licensed abatement contractor in accordance with state rules and NESHAP. Additionally, OSHA regulations for work classification, worker training and worker protection will apply.
AHERA	Asbestos Hazard Emergency Response Act
AST	Aboveground Storage Tanks. ASTs are generally described as storage tanks less than 10% of which are below ground (i.e., buried). Tanks located in a basement, but not buried, are also considered ASTs. Whether, and the extent to which, an AST is regulated, is determined on a case-by-case basis and depends upon tank size, its contents and the jurisdiction of its location.
BGS	Below Ground Surface
Brownfields	State and/or tribal listing of Brownfield properties addressed by Cooperative Agreement Recipients or Targeted Brownfields Assessments.

Description of Selected General Terms and Acronyms

Term/Acronym	Description
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes. BTEX are VOC components found in gasoline and commonly used as analytical indicators of a petroleum hydrocarbon release.
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (a.k.a. Superfund). CERCLA is the federal act that regulates abandoned or uncontrolled hazardous waste sites. Under this Act, joint and several liability may be imposed on potentially responsible parties for cleanup-related costs.
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System. An EPA compilation of sites having suspected or actual releases of hazardous substances to the environment. CERCLIS also contains information on site inspections, preliminary assessments and remediation of hazardous waste sites. These sites are typically reported to EPA by states and municipalities or by third parties pursuant to CERCLA Section 103.
CESQG	Conditionally Exempt Small Quantity Generators
CFR	Code of Federal Regulations
CREC	Controlled Recognized Environmental Condition is defined in ASTM E1527-21 as "a recognized environmental condition resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority) , with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls). A condition considered by the environmental professional to be a controlled recognized environmental condition shall be listed in the findings section of the Phase I Environmental Site Assessment report, and as a recognized environmental condition in the conclusions section of the Phase I Environmental Site Assessment report."
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
ERNS	Emergency Response Notification System. An EPA-maintained federal database which stores information on notifications of oil discharges and hazardous substance releases in quantities greater than the applicable reportable quantity under CERCLA. ERNS is a cooperative data-sharing effort between EPA, DOT, and the National Response Center.
ESA	Environmental Site Assessment
FRP	Fiberglass Reinforced Plastic

Description of Selected General Terms and Acronyms

Term/Acronym	Description
Hazardous Substance	As defined under CERCLA, this is (A) any substance designated pursuant to section 1321(b)(2)(A) of Title 33, (B) any element, compound, mixture, solution, or substance designated pursuant to section 9602 of this title; (C) any hazardous waste having characteristics identified under or listed pursuant to section 3001 of the Solid Waste Disposal Act (with some exclusions); (D) any toxic pollutant listed under section 1317(a) of Title 33; (E) any hazardous air pollutant listed under section 112 of the Clean Air Act; and (F) any imminently hazardous chemical substance or mixture with respect to which the EPA Administrator has taken action under section 2606 of Title 15. This term does not include petroleum, including crude oil or any fraction thereof which is not otherwise listed as a hazardous substance under subparagraphs (A) through (F) above, and the term include natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).
Hazardous Waste	This is defined as having characteristics identified or listed under section 3001 of the Solid Waste Disposal Act (with some exceptions). RCRA, as amended by the Solid Waste Disposal Act of 1980, defines this term as a "solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed."
HREC	Historical Recognized Environmental Condition is defined in ASTM E1527-21 as "a past release of any hazardous substances or petroleum products that has occurred in connection with the property and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted residential use criteria established by a regulatory authority, without subjecting the property to any required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls). Before calling the past release a historical recognized environmental condition, the environmental professional must determine whether the past release is a recognized environmental condition at the time of the Phase I Environmental Site Assessment is conducted (for example, if there has been a change in the regulatory criteria). If the EP considers the past release to be a recognized environmental condition at the time the Phase I ESA is conducted, the condition shall be included in the conclusions section of the report as a recognized environmental condition."
IC/EC	A listing of sites with institutional and/or engineering controls in place. IC include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls. EC include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.
ILP	Innocent Landowner/Operator Program

Description of Selected General Terms and Acronyms

Term/Acronym	Description
LQG	Large Quantity Generators
LUST	Leaking Underground Storage Tank. This is a federal term set forth under RCRA for leaking USTs. Some states also utilize this term.
MCL	Maximum Contaminant Level. This Safe Drinking Water concept (and also used by many states as a ground water cleanup criteria) refers to the limit on drinking water contamination that determines whether a supplier can deliver water from a specific source without treatment.
MSDS	Material Safety Data Sheets. Written/printed forms prepared by chemical manufacturers, importers and employers which identify the physical and chemical traits of hazardous chemicals under OSHA's Hazard Communication Standard.
NESHAP	National Emissions Standard for Hazardous Air Pollutants (Federal Clean Air Act). This part of the Clean Air Act regulates emissions of hazardous air pollutants.
NFRAP	Facilities where there is "No Further Remedial Action Planned," as more particularly described under the Records Review section of this report.
NOV	Notice of Violation. A notice of violation or similar citation issued to an entity, company or individual by a state or federal regulatory body indicating a violation of applicable rule or regulations has been identified.
NPDES	National Pollutant Discharge Elimination System (Clean Water Act). The federal permit system for discharges of polluted water.
NPL	The NPL is the EPA's database of uncontrolled or abandoned hazardous waste facilities that have been listed for priority remedial actions under the Superfund Program.
OSHA	Occupational Safety and Health Administration or Occupational Safety and Health Act
PACM	Presumed Asbestos-Containing Material. A material that is suspected of containing or presumed to contain asbestos but which has not been analyzed to confirm the presence or absence of asbestos.
PCB	Polychlorinated Biphenyl. A halogenated organic compound commonly in the form of a viscous liquid or resin, a flowing yellow oil, or a waxy solid. This compound was historically used as dielectric fluid in electrical equipment (such as electrical transformers and capacitors, electrical ballasts, hydraulic and heat transfer fluids), and for numerous heat and fire sensitive applications. PCB was preferred due to its durability, stability (even at high temperatures), good chemical resistance, low volatility, flammability, and conductivity. PCBs, however, do not break down in the environment and are classified by the EPA as a suspected carcinogen. 1978 regulations, under the Toxic Substances Control Act, prohibit manufacturing of PCB-containing equipment; however, some of this equipment may still be in use today.

Description of Selected General Terms and Acronyms

Term/Acronym	Description
pCi/L	picoCuries per Liter of Air. Unit of measurement for Radon and similar radioactive materials.
PLM	Polarized Light Microscopy (see ACM section of the report, if included in the scope of services)
PST	Petroleum Storage Tank. An AST or UST that contains a petroleum product.
Radon	A radioactive gas resulting from radioactive decay of naturally-occurring radioactive materials in rocks and soils containing uranium, granite, shale, phosphate, and pitchblende. Radon concentrations are measured in picoCuries per Liter of Air. Exposure to elevated levels of radon creates a risk of lung cancer; this risk generally increases as the level of radon and the duration of exposure increases. Outdoors, radon is diluted to such low concentrations that it usually does not present a health concern. However, radon can accumulate in building basements or similar enclosed spaces to levels that can pose a risk to human health. Indoor radon concentrations depend primarily upon the building's construction, design and the concentration of radon in the underlying soil and ground water. The EPA recommended annual average indoor "action level" concentration for residential structures is 4.0 pCi/l.
RCRA	Resource Conservation and Recovery Act. Federal act regulating solid and hazardous wastes from point of generation to time of disposal ('cradle to grave"). 42 U.S.C. 6901 et seq.
RCRA Generators	The RCRA Generators database, maintained by the EPA, lists facilities that generate hazardous waste as part of their normal business practices. Generators are listed as either large (LQG), small (SQG), or conditionally exempt (CESQG). LQG produce at least 1000 kg/month of non-acutely hazardous waste or 1 kg/month of acutely hazardous waste. SQG produce 100-1000 kg/month of non-acutely hazardous waste. CESQG are those that generate less than 100 kg/month of non-acutely hazardous waste.
RCRA CORRACTS/ TSDs	The USEPA maintains a database of RCRA facilities associated with treatment, storage, and disposal (TSD) of hazardous materials which are undergoing "corrective action". A "corrective action" order is issued when there is a release of hazardous waste or constituents into the environment from a RCRA facility.
RCRA Non-CORRACTS/ TSDs	The RCRA Non-CORRACTS/TSD Database is a compilation by the USEPA of facilities which report storage, transportation, treatment, or disposal of hazardous waste. Unlike the RCRA CORRACTS/TSD database, the RCRA Non-CORRACTS/TSD database does not include RCRA facilities where corrective action is required.
RCRA Violators List	RAATS. RCRA Administrative Actions Taken. RAATS information is now contained in the RCRIS database and includes records of administrative enforcement actions against facilities for noncompliance.
RCRIS	Resource Conservation and Recovery Information System, as defined in the Records Review section of this report.

Description of Selected General Terms and Acronyms

Term/Acronym	Description
REC	Recognized Environmental Conditions are defined by ASTM E1527-21 as 1) the presence of hazardous substances or petroleum products in, on, or at the subject property due to a release to the environment; (2) the likely presence of hazardous substances or petroleum products in, on, or at the subject property due to a release or likely release to the environment; or (3) the presence of hazardous substances or petroleum products in, on, or at the subject property under conditions that pose a material threat of a future release to the environment. A de minimis condition is not a recognized environmental condition.
SCL	State "CERCLIS" List (see SPL /State Priority List, below).
SPCC	Spill Prevention, Control and Countermeasures. SPCC plans are required under federal law (Clean Water Act and Oil Pollution Act) for any facility storing petroleum in tanks and/or containers of 55-gallons or more that when taken in aggregate exceed 1,320 gallons. SPCC plans are also required for facilities with underground petroleum storage tanks with capacities of over 42,000 gallons. Many states have similar spill prevention programs, which may have additional requirements.
SPL	State Priority List. State list of confirmed sites having contamination in which the state is actively involved in clean up activities or is actively pursuing potentially responsible parties for clean up. Sometimes referred to as a State "CERCLIS" List.
SQG	Small Quantity Generator
SWF/LF	State and/or Tribal database of Solid Waste/Landfill facilities. The database information may include the facility name, class, operation type, area, estimated operational life, and owner.
TPH	Total Petroleum Hydrocarbons
TRI	Toxic Release Inventory. Routine EPA report on releases of toxic chemicals to the environment based upon information submitted by entities subject to reporting under the Emergency Planning and Community Right to Know Act.
TSCA	Toxic Substances Control Act. A federal law regulating manufacture, import, processing and distribution of chemical substances not specifically regulated by other federal laws (such as asbestos, PCBs, lead-based paint and radon). 15 U.S.C 2601 et seq.
USACE	United States Army Corps of Engineers
USC	United States Code
USGS	United States Geological Survey
USNRCS	United States Department of Agriculture-Natural Resource Conservation Service

Description of Selected General Terms and Acronyms

Term/Acronym	Description
UST	Underground Storage Tank. Most federal and state regulations, as well as ASTM E1527-21, define this as any tank, incl., underground piping connected to the tank, that is or has been used to contain hazardous substances or petroleum products and the volume of which is 10% or more beneath the surface of the ground (i.e., buried).
VCP	State and/or Tribal facilities included as Voluntary Cleanup Program sites.
VOC	Volatile Organic Compound
Wetlands	Areas that are typically saturated with surface or ground water that creates an environment supportive of wetland vegetation (i.e., swamps, marshes, bogs). The Corps of Engineers Wetlands Delineation Manual (Technical Report Y-87-1) defines wetlands as areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. For an area to be considered a jurisdictional wetland, it must meet the following criteria: more than 50 percent of the dominant plant species must be categorized as Obligate, Facultative Wetland, or Facultative on lists of plant species that occur in wetlands; the soil must be hydric; and, wetland hydrology must be present. The federal Clean Water Act which regulates "waters of the US," also regulates wetlands, a program jointly administered by the USACE and the EPA. Waters of the U.S. are defined as: (1) waters used in interstate or foreign commerce, including all waters subject to the ebb and flow of tides; (2) all interstate waters including interstate wetlands; (3) all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, etc., which the use, degradation, or destruction could affect interstate/ foreign commerce; (4) all impoundments of waters otherwise defined as waters of the U. S., (5) tributaries of waters identified in 1 through 4 above; (6) the territorial seas; and (7) wetlands adjacent to waters identified in 1 through 6 above. Only the USACE has the authority to make a final wetlands jurisdictional determination.