



**GWINNETT COUNTYS
DEPARTMENT OF WATER RESOURCES**

CONTRACT DOCUMENTS

For

**48-INCH PCCP REPLACEMENT
(LOGANVILLE HIGHWAY TO GRAYSON TANK)**

**GCDWR Project No. M-0735-59
Bid No. BL010-19**

**VOLUME II
Technical Specifications**

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GWINNETT COUNTY DEPARTMENT OF WATER RESOURCES

TECHNICAL SPECIFICATIONS FOR THE CONSTRUCTION OF WATER MAINS FOR 48-INCH PCCP REPLACEMENT (LOGANVILLE HIGHWAY TO GRAYSON TANK) PROJECT NUMBER M-0735-59 BL010-19

GWINNETT COUNTY, GEORGIA

DECEMBER 2018

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GENERAL REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

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1.2 REFERENCES

- A. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the documents before it was discontinued shall apply.
- B. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

1.3 DEFINITIONS

- A. Whenever the following abbreviations are used, they shall refer to and designate:
 - “ACI” - American Concrete Institute
 - “AISC” - American Institute of Steel Construction
 - “ANSI” - American National Standards Institute
 - “ASME” - American Society of Mechanical Engineers
 - “ASTM” - American Society for Testing and Materials
 - “AWWA” - American Water Works Association
 - “GCDOT” – Gwinnett County Department of Transportation
 - “GCDWR” – Gwinnett County Department of Water Resources
 - “GDOT” – Georgia Department of Transportation

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements

The Work shall be comprised of and for the construction of GCDWR infrastructure as identified in the Bid Schedule, including but not limited to, safety, installation, connections, sterilizing, testing, and fabrication with any and all appurtenances in accordance with the Contract Documents, complete and fully operational in compliance with federal, state, county, and local codes and regulations, standards, and specifications as applicable at the time of bid unless otherwise directed in writing by GCDWR.

1.5 CONTRACT DRAWINGS

- A. Existing conditions shown on the Contract Drawings were derived from the best available information at the time and preparation of the Contract Documents and do not purport to be completely correct. The Contractor is therefore directed to perform any and all field surveys that are deemed necessary to satisfy the Contractor to the actual surface and sub-surface conditions prior to submitting his/her bid, upon which his/her bid shall be based.
- B. The Work proposed, its connections, routing, and design intent was based on the available information of the existing conditions. The Contractor shall field verify the nature and extent of the Work proposed prior to ordering any materials. No payment shall be authorized for materials not retained as part of GCDWR facilities and its appurtenances.
- C. Additionally, GCDWR reserves the right to require deviations from the Contract during construction where such deviations are deemed necessary to provide for future connections or to provide flexibility in the maintenance and operation of the system and increase the efficiency and reliability of service to its customers. Deviations will be addressed using contract unit prices. If this cannot be accomplished see Article 10 of the General Conditions.
- D. The Contractor shall maintain, on site, one (1) complete set of Contract Documents throughout the course of the Work and make available upon request by GCDWR.

1.6 SCHEDULES

- A. Contractor shall prepare, furnish, distribute, and periodically update the Project Progress Schedule and Schedule of Submittals, as specified herein. Contractor shall also prepare and furnish a Schedule of Values, as specified herein.
- B. Acceptance of the Contractor's Project Progress Schedule, Schedule of Submittals, and Schedule of Values, and revisions thereto, shall in no way relieve Contractor of any duties and obligations under the Agreement. Such approval is limited to the format of the schedule, and does not in any way indicate approval of, or concurrence with, the Contractor's means, methods, and ability to carry out the Work.
- C. Submit a monthly update of the Project Progress Schedule and Schedule of Submittals with each request for payment.
- D. Failure of the Contractor to meet the schedule submission milestones will result in withholding of monthly payments, until deliverables associated with the milestones are received. Payments will be withheld should the Contractor fail to deliver acceptable schedules within thirty (30) days after date of Notice to Proceed.

1.7 OR EQUALS

- A. For the purposes of these Contract Documents, "or equal" item(s) shall be defined as:
 - 1. A product or manufacturer offered as a replacement to a specified product or manufacturer where the term "or equal" is included after the list of acceptable manufacturers in the Specification.
- B. An item which is offered where no specific product, manufacturer, means, methods, technique, sequence, or procedure of construction is specified or shown on the Drawings, shall not be considered a replacement, and shall be at the option of the Contractor, subject to the provisions in the Contract Documents for that item.

- C. For products specified only by a referenced standard, the Contractor may select any product by any manufacturer, which meets the requirements of the Specifications, unless indicated otherwise in the Contract Documents.
- D. If the manufacturer is named on the Drawings, or in the Specifications as an acceptable manufacturer, products of that manufacturer meeting all requirements of the Specifications and Drawings are acceptable.
- E. Whenever the design is based on a specific product of a particular manufacturer, that manufacturer will be shown on the Drawings and/or listed in the list of approved manufacturers in the Specifications. Any Contractor intending to furnish products other than the listed acceptable manufacturer(s) shall:
 - 1. Verify that the item being furnished will fit in the space allowed, perform the same function(s), and have the same capabilities as the item specified,
 - 2. Include in the item price the cost of all accessory items, which may be required by the “or equal” product,
 - 3. Include the cost of any architectural, structural, mechanical, piping, electrical, instrumentation, or other modifications required, and
 - 4. Include the cost of required additional work by the Engineer, if any to accommodate the item.
- F. Approval of the Engineer and Owner of an “or equal” item as an acceptable manufacturer, is dependent on determination that the product offered:
 - 1. Is essentially equal in function, performance, quality of manufacture, ease of maintenance, reliability, service life, availability of local technical support, and other criteria to that on which the design is based, and
 - 2. Will require no major modifications to structures, electrical systems, control systems, or piping systems.
- G. “Or equal” items will be considered only if the term “or equal” is included after the list of acceptable manufacturers in the Specification.
- H. The Contractor shall submit shop drawings on the “or equal” item for the Engineer’s review in accordance with Specification Section 01 33 23 Submittal Procedures.
- I. The cost of Engineer’s and Owner’s factory inspection, reference project tour, or mill inspection, required to evaluate the acceptance of the “or equal” product shall be borne by the Contractor.

1.8 SUBMITTALS

- A. Specified submittals shall be to the Engineer, and submitted by the Contractor only, (i.e. NOT subcontractors, vendors, suppliers, etc.).
- B. Each submittal, with variations from the requirements of the Contract Documents, shall make specific mention of such variations. Those declared variations found acceptable by the

Engineer or GCDWR shall require the Contractor to take suitable action for the proper installation in accordance with the Contract Documents. Variation not declared or suitable action not taken by the Contractor shall not relieve Contractor of error or the responsibility for executing the Work, and cost for remedial actions deemed necessary by the Engineer or GCDWR.

PART 2 – PRODUCTS – (NOT USED)

PART 3 – EXECUTION

3.1 ACCESS

- A. The Contractor shall enable and facilitate access to all parts of the Work to GCDWR and third parties to inspect, certify, or observe when required by law; or to those who require reasonable access to the Work by reason of specific contractual relationship to the Work.

3.2 AID TO THE INJURED

- A. The Contractor shall furnish, maintain, and make ready and available for immediate use, first aid to the injured with standing arrangements for the immediate removal, transport, and hospital treatment of any personnel who may be injured on the Work, as required by federal, state, county and local laws, codes and regulations.

3.3 BUILDINGS AND SHANTIES

- A. No provision shall be allowed for the housing of men/women employed for the Work on land owned or leased by the County, unless in writing a permit is secured from GCDWR. Should permission be asked and granted, the Contractor shall comply with all regulations regarding the construction and maintenance of such buildings.

3.4 CLEANING

- A. With completion of the Work, the Contractor shall return the surface conditions of the work area to pre-work status, unless where otherwise specified in the Contract Documents. The finished surface Work shall leave the grounds in a neat and approved condition, including but not limited to, the removal of material, debris, equipment, structures, and the Contractor's office.
- B. Contractor shall terminate all temporary utilities as applicable or as required by the Contract Documents. Contractor shall also clean out all drains, pipes, inlets, and miscellaneous and appurtenant structures of debris from his/her operations.

3.5 CLEANING AND CROWNING OF STREETS

- A. As Work progresses and before the Work herein specified is accepted, the Contractor shall, upon notice from GCDWR, thoroughly clean all streets, roads, sidewalks, and lawns free from all debris and dirt accumulating from the construction, shall open all gutters so that free drainage may be had, and on unpaved streets and roads, shall completely crown the roadway within the limits of the herein specified Work.

3.6 CLEANING SURFACES

- A. Contact surfaces between existing and new Work shall be free from debris, dirt, grease, or foreign matter to the extent of wire brushing and washing, and such surface preparation as recommended by the manufacturer or directed by GCDWR. The cost for cleaning shall be included in the Prices Bid and stipulated for the various items of the bid.

3.7 CONTRACTOR'S OFFICE

- A. Facilities are not required to be on the project site. The Contractor may provide adequate indoor facilities for conducting project meetings; and at a minimum shall be equipped with power, water, lighting, heating ventilation and air conditioning, and a meeting area with table and chairs. If in the opinion of GCDWR, the location of the facility is not convenient to project personnel, GCDWR may provide suitable facilities for project meetings.

3.8 DIMENSIONS AND ELEVATIONS

- A. In the Contract Documents, figured dimensions shall take precedence over scaled dimensions, detailed drawings shall take precedence over general drawings, and elevations and slopes shall be as indicated on the Drawings, or as directed by the Engineer.

3.9 EMERGENCY RESPONSE

- A. The Contractor shall respond within four (4) hours to any emergency that may arise in connection with the Work on a twenty-four (24) hour per day, seven (7) days per week basis. Should County maintenance forces be called upon by the County to rectify a problem created by the Contractor, the Contractor shall be responsible for all costs incurred by the County, plus twenty-five (25) percent, with a minimum charge of one hundred (100) dollars per occurrence. This charge is subject to change depending upon the severity of the emergency and will be determined by Gwinnett County.

3.10 ENVIRONMENTAL CONTAMINATION

- A. Precautions against property endangerment and/or damages from water, sewage, seepage, storm, stormwater, and flood flows shall be active during the course of Work. Cost for precautions shall be included in the Prices Bid and stipulated for the items of Work.

3.11 EXISTING IRRIGATION AND SPRINKLER SYSTEMS

- A. The Contractor shall be responsible for restoring the soundness to any portion of an existing irrigation or sprinkler system disturbed and/or damaged by the Work. No compensation shall be made for this Work.

3.12 EXISTING UTILITIES

- A. Existing utilities shall be maintained, except when a utility or a utility feature requires moving. In such circumstances, the Contractor shall notify the utility before any such Work is started for approval. In the event that the utility grants approval for such movement that results in damage, it shall be repaired by the authorities having control of the same, and the expense of said repairs shall be paid by the Contractor or deducted from the monies which are due or to become due to said Contractor. No underground or overhead facilities encountered shall be disturbed without proper authority and then only in such manner as said owner may prescribe and approve.

- B. Should it become necessary to change the position, or permanently or temporarily remove part of a utility in order to clear the structure being built or to permit the Contractor to use a particular method of construction, the Contractor shall notify GCDWR of the location and circumstances and shall cease work if necessary, until satisfactory arrangements have been made by the Owners of the said utility to properly care for or relocate the same as necessary to permit the Work to proceed as specified. No claims for damages shall be allowed the Contractor on account of any delay occasioned thereby. The entire cost of the changes or temporary or permanent removal of such utilities shall be borne by the Contractor and the cost thereof shall be included in the Prices Bid and stipulated for the various Items of the Bid.
- C. Nothing contained herein shall relieve the Contractor of doing such Work at his cost and expense as is specifically included in the Contract Documents.
- D. Anything contained herein shall not relieve the Contractor of his obligation to support and protect all pipes, conduits, and other structures which may be encountered during the construction of Work, and to make good all damages done to such pipes, conduits, and other structures, as provided in this specifications. Any such damages must be repaired without delay and the cost of such repairs must be borne by the Contractor.

3.13 INSPECTIONS

- A. GCDWR shall schedule a pre-construction meeting with the Contractor a minimum of 24-hours prior to construction. During construction the GCDWR Inspector shall be the lead person for witnessing construction including, but not limited to, taps, cores, bores, wet cut-ins, flow diversions, shutdowns, testing, chlorination, sampling and work that may be required or determined necessary by the Engineer. Should existing conditions necessitate a change or cost to the Contract Documents, the GCDWR Project Manager shall be notified for approval prior to proceeding.
- B. The GCDWR Inspector shall review and approve quantities of unit items installed and/or materials stored in the Work by the Contractor prior to Contractor's submittal for payment to GCDWR Project Manager. Failure to do so may result in delays in processing payments.
- C. Upon notification by the Contractor, GCDWR shall perform an inspection of the finished surface features and conditions for acceptance of the Work. Should discrepancies exist, the Contractor shall make restorations as directed, until acceptance is granted by GCDWR, upon which final payment shall be made for the Work.
- D. Contractor shall pay for second inspections, if so required by the County.

3.14 INSUFFICIENCY OF SAFETY PRECAUTIONS

- A. If at any time, in the opinion of the County, the Work is not properly instituted or maintained and is not in accordance with federal, state, county and local laws, codes and regulations, the Contractor shall execute immediate measures to bring into compliance unsatisfactory surroundings. In the event that the Contractor is not readily available at the Work to be notified of the insufficiency of safety precautions, then the County may elect to institute or restore such Work to a state deemed safe. Such actions by the County shall in no way release the Contractor from judiciary duty specified. Costs to correct safety precautions shall be at the Contractor's expense.

3.15 INTOXICATING LIQUORS

- A. The Contractor shall neither permit nor suffer the introduction or use of intoxicating substances, such as but not limited to, alcohol or illegal drugs upon or about the Work jobsite.

3.16 LANDSCAPE PROTECTION

- A. Landscaping, such as but not limited to, ornamental trees, shrubbery, hedges, flower beds, decorative berms, decorative rocks, ponds, timbers, and their appurtenances shall not be removed or disturbed without approval from GCDWR. However, should it be required to remove or disturb such items, the Contractor shall seek approval no later than 72 hours in advance of conflict. If and when approval is granted by GCDWR, the Contractor shall take the proper precautions to preserve, protect, and reestablish such items along the line of or contiguous to the Work. All landscaping shall be restored to the same or better general conditions as existed prior to commencement of the Work. If deemed by GCDWR to be damaged, each item damaged shall be replaced with the same type and like size. Cost for removal and relocation shall be considered as having been included in the Prices Bid and stipulated for the various items of Work. Cost for restitution shall be borne by the Contractor.

3.17 LIGHTING

- A. Except for acts of nature, the Work shall be secured by such means to prevent loss to health, limb, and property. Adequate lighting shall be provided and maintained during periods of Overtime Work, from one-half (½) hour before sunset to one-half (½) hour after sunrise. Contractor shall provide adequate lighting for safety and performance of construction operations and provide the necessary safety and other facilities required for work during normal working hours and for work at night.

3.18 MEANS AND METHODS

- A. Unless otherwise expressly provided in the Contract Documents, the means and methods of construction shall be such as the Contractor may choose. However, GCDWR maintains the right to reject or alter the Contractor's proposed means and methods, which shall not produce finished Work in accordance with the terms of the Contract, or to GCDWR right as administrator of the construction to direct the Contractor to more stringent means or methods.
- B. If determined by GCDWR that the Contractor's work methods, features, and/or equipment appears to be unsafe, insufficient, or improper, GCDWR may order the Contractor to improve their safety, sufficiency, and/or character, whereby the Contractor shall conform to such orders; but should GCDWR not demand any increase of such safety precautions, insufficiency, inadequacy or any improvement shall not release the Contractor from his obligation to secure the work methods, safety precautions, work features, and/or equipment for the safe conduct and quality of work specified, and shall not constitute a cause of action for damages.
- C. The Contractor shall have the right to deny access to the Work during construction, except to GCDWR and third parties to inspect, certify, or observe when required by law; or to those who require reasonable access to the Work by reason of specific contractual relationship to the Work.

3.19 MEASURES AND WEIGHTS

- A. Whenever so requested as deemed necessary by GCDWR, the Contractor shall provide accurate scales, adequate equipment, and the necessary assistance for weighing and/or measuring materials for the installed Work as specified. It is understood and agreed that a "ton" shall mean the short ton of two thousand (2,000) pounds.

3.20 MILL AND SHOP TESTS AND INSPECTION

- A. Where the specifications call for mill or shop tests, the Contractor shall furnish triplicate copies of attested certificates signed by a duly authorized representative of the manufacturer, showing details of quality or performance sufficient to demonstrate compliance with the Contract Documents. Inspection of materials shall be made as required by these specifications.

3.21 MONUMENTS AND LANDMARKS

- A. Monuments or landmarks shall not be damaged or removed by the Contractor or any of his/her employees without the written consent of GCDWR. Any monument or landmark so removed shall be replaced by GCDWR at the expense of the Contractor. The cost thereof shall be retained from the monies due or to become due the Contractor under this agreement.

3.22 OBSTRUCTION ENCOUNTERED

- A. The giving of this information upon the Work Assignment Contract Drawings shall not relieve the Contractor of his obligation to support and protect all pipes, conduits, and other structures which may be encountered during the construction of Work, and to make good all damages done to such pipes, conduits, and other structures, as provided in this Specification. The Contractor shall locate obstructions ahead of the Work. Should the Contractor determine that the existing information is not correct and an obstruction shall be encountered, he/she shall immediately contact GCDWR.

3.23 OVERTIME WORK

- A. It is the intent of the contract that the Contractor provide sufficient work force at all times during normal working hours and days of each week to complete the Work without resort to overtime work. The definition of normal working hours and days is an eight (8) hour day, Monday through Friday, Gwinnett County-recognized legal holidays excepted, during a consecutive period as agreed upon in the area of the Work, not counting the lunch period; and the definition of normal work week is the aggregate of the five (5) consecutive eight (8) hour days, Monday through Friday inclusive, maximum, the same holidays excepted.
- B. Night work or work on Saturdays, Sundays, or Gwinnett County-recognized legal holidays, requiring the presence of GCDWR personnel or an inspector, shall not be permitted except in case of emergency, and then only to such extent as is absolutely necessary, and with the written permission of GCDWR.
- C. Should the Contractor, for his convenience, request permission to work overtime or to work on Saturdays, Sundays, or trade recognized legal holidays in the area of the Work, the County shall have the right to deduct sufficient sums from the monies due the Contractor to cover payment of additional salaries for the GCDWR personnel as are normally employed on the Work.
- D. Should it become necessary for Work to be accomplished at the direction of GCDWR for the convenience and/or requirement of the GCDWR outside of normal working hours, then full inspection and engineering shall be provided at no additional cost to the Contractor during those hours.
- E. During periods of overtime work, the Contractor shall provide the necessary facilities required for work during normal working hours and for work at night. The Contractor shall be in readiness in time of emergency even nights, Saturdays, Sundays, and holidays at no cost to the County.

3.24 OWNERSHIP OF MATERIALS

- A. Existing material removed that shall not be relocated or reused in the Work shall be moved off site within 48 hours, becoming the property of the Contractor. The cost for such Work shall be as stipulated by the Prices Bid, for the various items of the Work.
- B. Existing material recovered that shall be relocated or reused in the Work shall be refurbished or renovated as required, unless otherwise directed by GCDWR.
- C. Existing material removed shall be disposed of in a manner approved by GCDWR at the Contractor's expense.
- D. New material not installed in the Work shall be moved offsite and remain the property of the Contractor. Only material that is installed by the Contractor will be paid for. However, the Contractor may submit pay applications for stored material in accordance with Section 14.02 of the General Conditions.
- E. All manhole covers, salvaged fire hydrants and any other material bearing the name of Gwinnett County shall be returned to GCDWR.

3.25 PAINTING AND COATINGS

- A. It is the intention of these specifications that metal permanently installed in the Work shall be protected by a durable coating of paint, or other approved material, and that all such metal surfaces not buried in the earth or masonry shall be left clean and well painted at the completion of the Contract, and in accordance with detailed requirements as may hereinafter be set forth.

3.26 POWER

- A. The Contractor shall make his own arrangements for power. No payment shall be made for cost of obtaining power. The cost for power shall be as stipulated by the Prices Bid, for the various items of the Work.

3.27 PROTECTING EXISTING BUILDINGS AND STRUCTURES

The Contractor shall take the necessary precautions to protect, including but not limited to, buildings, bridges, structures, and substantial walls or fences which may be encountered or endangered in the execution of the Work, not otherwise provided for, shall repair and make good any damages caused by reason of his operations and restore such property to its state before the damages. Existing walls and fences that are removed due to the execution of the Work shall be replaced by the Contractor and, where required or directed by GCDWR, temporary fencing shall be installed by the Contractor. No payment shall be made for said Work or material.

3.28 PROTECTION

- A. The Contractor shall furnish and maintain satisfactory protection to the Work against injury by weather, flooding, or breakage thereby permitting all Work to be left in a perfect condition at the completion of the Work.

3.29 RECORD DRAWINGS

- A. The Contractor shall be furnished one set of Contract Drawings for the purpose of recording information on the as installed Work, as specified in Section 01 78 39 Project Record

Documents. The information shall be correct and presented on the Drawings and returned to GCDWR for acceptance.

- B. The Contractor shall provide Georgia State Plane GPS coordinates for all appurtenances (fire hydrants, manholes, junction boxes, valves (new or existing), etc.) associated with the work.

3.30 ROADWAY RIGHT-OF-WAY, WORKING FACILITIES, AND EASEMENTS

- A. Work within the limits of private property and rights-of-way, shall be done in conformity with all applicable permits and agreements with the County and the owners of such private property, easements, or rights-of-way. Whether or not such a condition be part of the agreement, care shall be taken to avoid injury to the premises entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials, and the restoration of said private property to the same or better general conditions as at the time of entry for Work to be performed under this contract. The Contractor shall not enter any easement without first confirming with GCDWR that such easement is fully executed.
- B. The Contractor shall not (except after consent from the proper parties), enter or occupy with labor, tools, or equipment on any land outside the rights-of-way or property of the County.
- C. The Contractor shall be allowed use of the site designated for construction as necessary for the Work. However, existing access to properties shall be maintained or adequate access provided during the course of the Work. Cost for access shall be included in the Prices Bid and stipulated for the various items of the Work to be done under this contract.
- D. Work that shall be performed on private property or easements that requires granted access beyond the established road right-of-ways shall be done in conformity with all permits and agreements between Gwinnett County and property owners. Should the Contractor desire or require additional space outside the limits of Work, he/she must arrange for such space with property and easement owners at his/her own expense. Legal binding agreements for such additional space must be in writing and a copy filed with GCDWR, prior to accessing such lands. In such agreements, care shall be taken to avoid injury to the premises entered and shall be left in a neat and orderly condition as existed at the time of entry for Work.
- E. When working on easements, the Contractor shall install Tree Save Barriers along all boundaries of the work area, unless otherwise specifically directed by GCDWR, prior to any Work. Work premises shall be left in a neat and orderly condition by the removal of rubbish, debris, and the grading of surplus materials and the restoration of said private property to the same general conditions as existed at the time of entry for Work.

3.31 SAFETY

- A. Unless otherwise specified, all federal, state and county regulations shall be maintained during the course of the Work.

3.32 SALES TAX

- A. The Contractor shall furnish GCDWR with certified copies of paid invoices or their equivalent proof covering sales tax paid on items which GCDWR is eligible for tax refund; none of which shall be refunded or credited to the Contractor.

3.33 SANITARY MEASURES

- A. Sanitary conveniences shall be employed prior to beginning the Work in sufficient number, in such manner and in such places as shall satisfy GCDWR. Such sanitary conveniences shall

be operated and maintained in such a manner as to remove harmful effects to personnel or environment. All persons connected with the Work are obliged to use the conveniences provided and shall in no way violate these provisions. Violations shall result in an immediate dismissal of the employee and removal from the Work. Only upon written consent by GCDWR shall the violator regain access to the Work. Sanitary conveniences shall be maintained during the Work and in compliance with the local Health Department and GCDWR. When possible, sanitary conveniences shall be placed in locations that least impact public view. Upon completion of the Work, the Contractor shall remove sanitary conveniences without deleterious effect.

3.34 SCHEDULES

- A. The Project Progress Schedule shall be plotted on a minimum eleven-inch by seventeen-inch (11" x 17") size sheets with the flow of activities from left to right. Printing shall be in color and suitable for half-size reproduction. No lettering or numbering shall be less than one-eighth-inch (1/8") in height for capital letters and numbers. The critical path shall be clearly marked and readily identifiable.
- B. The Project Progress Schedule shall be a Critical Path Method (CPM) Network Diagram, and include the following:
 1. Furnish an updated diagram with all activities and restraints. This includes providing an "As-Built" Schedule with completion dates for all key monthly completion and delivery dates,
 2. Provide updated Project Progress Schedule graphics in color showing progress-to-date and completion schedule. The critical path shall be clearly identified,
 3. A legend clearly identifying each symbol used,
 4. Be prepared in the form of a time-scaled CPM network,
 5. Group activities by facility and major area of work. The identification number of the individual activities shall be coded such to provide the grouping,
 6. Be prepared in chronological order of the beginning of each item of work,
 7. Have a horizontal time scale based on calendar days and identify the Monday of each week,
 8. Show the order and interdependencies of the activities and the sequence in which the work is to be accomplished as planned by the Contractor. The diagram shall show how the start of a given activity is dependent upon the completion of the preceding activities, and how its completion restricts the start of following activities. Float need not be shown on the network diagram,
 9. Show all activities relating to the construction of the work, and include the following information related to the activities:
 - a. Activity number
 - b. Activity description
 - c. Percent complete
 - d. Estimated duration, in working days, of each activity
 - e. Start date
 - f. Finish date

10. Show all planned facility shutdowns, including temporary relocations, temporary bypasses, and transitions from existing to temporary, temporary to new, and the like.
 - a. For each anticipated shutdown included in the schedule, submit within thirty (30) days prior to the planned shutdown, a description of the shutdown, duration, anticipated start and completion dates, related preparation work, and related temporary facilities to be provided.
11. Show adverse weather days on the critical path.
 - a. The number of adverse weather days per month shown on the critical path of the schedule shall not be less than the mean number of days for that particular month, in which precipitation meets or exceeds 1/10-inch, liquid measure.
 - b. The mean number of days in which the precipitation meets or exceeds 1/10-inch, liquid measure, will be based upon a thirty (30) year average of precipitation recorded and described by the National Oceanic and Atmospheric Administration (NOAA).
 - c. The total number of adverse weather days shall be monitored and agreed to monthly by Contractor, Engineer, and Owner. The Project Progress Schedule shall be updated to reflect the accrual of adverse weather days agreed to and enacted by a Contract Time extension.
12. Show the following for specified submittals of Shop Drawings, product data, samples, and materials:
 - a. Submittal date,
 - b. Review period, based on fourteen (14) calendar day review period,
 - c. Fabrication duration,
 - d. Delivery dates.
13. Show the following events and milestones in addition to construction activities:
 - a. Notice to Proceed,
 - b. Milestones,
 - c. Schedule of Submittals
 - d. Operational Testing (including air testing, chlorination, CCTV, etc.)
 - e. Owner coordination
 - f. Notification Periods
 - g. Coordination with separate contracts/contractors
 - h. Owner activities impacting the Work.
- C. The Project Progress Schedule update shall coincide with the end of the pay period. The update shall be used to create the monthly payment application request. No monthly payment request will be processed unless the Project Progress Schedule is updated and submitted to the Engineer.
- D. The Schedule of Values shall be of the following form:
 1. Type schedule on eight and one-half –inch by eleven-inch (8½” x 11”) white paper,

2. Contractor's standard forms and automated printouts may be used,
3. Identify Schedule of Values information with:
 - a. Title of Project
 - b. Project Location
 - c. Purchase Order Number
 - d. Name of Engineer Firm
 - e. Name and Address of Contractor
 - f. Bid Number (BL)
 - g. Date of Submission
- E. The Schedule of Values shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction. Breakdown shall be by utility, then by CSI Format, for ease of field verification of quantities completed.
- F. For Schedule of Values, follow the Bid Form as the format for listing component items. Identify each item with number and title of the respective major section of the Specifications.
- G. For each major line item, list sub values of major products or operations under the item.
- H. For the various portions of the Work:
 1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
 2. For items on which progress payments will be requested for stored materials, breakdown the value into:
 - a. The delivered and unloaded cost of the materials, with taxes paid. Owner shall require invoices for proof of purchase.
 - b. The total installed value, including Contractor's overhead and profit, less the value of stored material item a. above.

3.35 SHORING, FORMWORK, AND TEMPORARY STRUCTURES

- A. The Contractor shall take full responsibility including the hiring of a practicing licensed professional engineer that may be needed for the adequacy and safety throughout erection, use and removal of all temporary Work such as shoring and supports during all phases of the Work, formwork, and supports for concrete, temporary protection, and structures of all kinds.

3.36 SITE VIDEO

- A. Prior to the Work, the Contractor shall perform and supply GCDWR a thoroughly detailed video of the worksite and its contiguous area. The video shall be of such quality as to view and establish existing conditions in detail and used to render a decision where no other documentation is available. Site videos made from a moving vehicle will not be accepted.

3.37 SOUND ATTENUATION

- A. The Contractor shall, during the course of the Work, comply with Gwinnett County Noise Ordinance unless GCDWR enforces a stricter standard.

- B. Work operations, machinery, equipment, and material handling shall be performed in such a manner as to avoid and eliminate unnecessary noise. Noise deemed unacceptable by the County shall be immediately terminated.

3.38 STORAGE

- A. Materials, equipment, tools, and machinery required for the Work shall be neatly and compactly piled in such a manner as to cause the least inconvenience to property owners and traffic. Storage shall be in areas approved by GCDWR. Fire hydrants, water and gas shut-off boxes, underground power and telephone line manholes shall, at all times, be kept free and unobstructed, and shall be left uncovered by such materials.

3.39 TEMPORARY HEAT

- A. The Contractor shall supply temporary heat for such period of time and at such temperature as needed for the proper protection and execution of the Work. No cost shall be paid for temporary heat.

3.40 USE OF FACILITIES

- A. The County shall have the right or grant permits to connect any conduit, pipe line, or structure with the Work and its appurtenances at any time before the Work is accepted. The Contractor shall not interfere or be granted compensation for such Work.

3.41 USE OF STREETS

- A. Access: During the progress of the Work, the Contractor shall make ample provisions for both vehicular and foot traffic on public roadways except during periods of road closures approved by Gwinnett County, and shall indemnify and save harmless Gwinnett County from any expense whatsoever due to the Work. The Contractor shall provide, but not limited to, free access to all driveways, fire hydrants, water, and gas valves located along the line of Work. Gutters and waterways must be kept open or other provisions made for the removal of stormwater.

Street intersections may not be blocked, except for one-half (½) the roadway at any given time, and the Contractor shall lay and maintain temporary driveways, bridges, and crossings, such as in the opinion of GCDWR are necessary to reasonably accommodate the public.

- B. Traffic Control: Adequate signs, barricades, and lights, in accordance with the standards of GDOT, necessary to protect the public shall be provided.

Flagmen to direct traffic shall be employed continuously during periods when only one-way traffic can be maintained or when equipment is operated back and forth across the pavement areas.

Roadway disturbances shall not be left unfilled overnight, except in emergencies, and in such cases adequate precautions shall be exercised to protect traffic.

- C. Procedural Rules: Work in roads shall be in accordance with the rules and regulations of the controlling agency.

In the event of the Contractor's failure to comply with these provisions, GCDWR may cause the same to be done, and shall deduct the cost of such Work from any monies due or to become due the Contractor under this agreement, but the performance of such Work by GCDWR or at its instance, shall serve in no way to release the Contractor from his general or particular liability for the safety of the public or of the Work.

3.42 UTILITY RELOCATIONS OR MODIFICATIONS

- A. Should, in the course of the Work, a need arise to relocate or modify a portion of GCDWR existing piping system, the Contractor shall immediately notify GCDWR for approval to proceed with such Work in accordance with the Contract Documents, or as directed by GCDWR. Removal of the existing piping system shall include, but not be limited to, the removal of its bulkheads, thrust restraints, piping appurtenances, concrete, and/or masonry that was exposed by excavation in part or whole, except for tie-rods beyond the limits of trenching. Without exception, any part of an existing restraint system relevant to the remaining existing piping system shall remain and be supplemented with additional restraint to maintain an unimpaired piping system. The cost for such Work shall be as stipulated by the Prices Bid, for the various items of the Work.

3.43 WATER SUPPLY

- A. In the vicinity of the Work, GCDWR shall make available water required to execute the Work. The Contractor shall be responsible for the retrieval, transport, and delivery of all water with all means to protect and maintain the integrity of GCDWR water system at his/her cost in accordance with all applicable rules and regulations. When water is required for the Work, the Contractor shall obtain a hydrant water meter from GCDWR Customer Service, at no up-front cost to the Contractor. The Contractor shall notify GCDWR of all project water usage by providing meter reads to the Project Inspector by the first business day of the month for project tracking purposes. If the hydrant meter is kept for 6 months, the Contractor will be contacted via email to bring the meter on a specified date, to GCDWR warehouse for recalibration testing.

3.44 WORK IN INCLEMENT WEATHER

- A. The Contractor shall take into account historical weather conditions and potential difficulties that may be encountered for completing the Work demonstrated in the work schedule. Contractor shall provide adequate protection against unfavorable weather to the satisfaction of GCDWR. Weather shall not be grounds for contract extension of available work days unless, such should be most adverse, and reasonable effort to perform the Work is exercised, and affected construction activities lie on the critical path of the current, approved Project Progress Schedule.
- B. The attachment listed below, following “End of Section 01 00 00” is a part of this Specification.

- 1. Weather Delay Monthly Report

END OF SECTION 01 00 00

WEATHER DELAY MONTHLY REPORT

Month and Year Reported Below	Project Number and Name

Day of Month	Mark "X" if Work delayed by this cause				Specific Description of Delay Condition and Construction Activity Affected
	Precip	Temp	Wind	Dryout	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					

	(a) Total Weather Delay Days this Month
	(b) Standard Baseline Days for Average Climatic Range this Month

	Claimable Days this Month = (a) - (b)

SECTION 01 11 00
SUMMARY OF WORK

PART 1 – GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- A. Water main work to be performed under this Contract is as described in the Notice of Bid Advertisement and shall consist of furnishing all labor, materials, tools, equipment, and incidentals and performing all work required to make, install, test, and place the proposed water main(s) in service in a complete and functioning manner including the following work:
1. Install water mains as indicated on the Drawings. Provided and install all necessary fittings and appurtenances to maintain the proposed alignment, or as directed by the Engineer.
 2. Install thrust restrain systems for piping and fittings, as required or directed by the Engineer.
 3. Make connections to existing water mains using either tapping sleeves and valves or wet cut-ins, as directed.
 4. Install fire hydrant assemblies and isolation valves as shown on the Drawings or as directed by the Engineer.
 5. Install service connections and reconnect existing service meters.
 6. Pressure test and disinfect the new water main until testing and disinfection requirements of the specifications are met.
 7. Backfill, compact, and repave all pipe trench cuts within paved areas; and backfill, compact, and landscape all pipe trench cuts within unpaved areas, in compliance with the Contract Documents.
 8. Provide and install all necessary manholes, vaults, and appurtenances as required or directed by the Engineer.
 9. Remove existing fire hydrants for salvage and deliver to the location directed by GCDWR.
 10. Remove existing valve boxes and refill the holes with compacted material. Cover surface with materials matching the surrounding area.
 11. Abandon existing water mains by plugging pipe ends and closing valves.
 12. Restore all disturbed areas including driveways, parking areas, curbs, curb and gutter, sidewalks, yards, ornamental plantings, etc.
 13. Maintain traffic control throughout the duration of construction.
 14. Clean-up the project work area and return the area to its pre-construction conditions.

- B. Sanitary sewer main work to be performed under this Contract is as described in the Notice of Bid Advertisement and shall consist of furnishing all labor, materials, tools, equipment, and incidentals and performing all work required to make, install, test, and place the proposed sanitary sewer mains in service in a complete and functioning manner including the following work:
1. Install sanitary sewer mains as indicated on the Drawings. Provided and install all necessary fittings and appurtenances to maintain the proposed alignment, or as directed by the Engineer.
 2. Install thrust restrain systems for piping and fittings, as required or directed by the Engineer.
 3. Install service connections and reconnect existing sewer service.
 4. Pressure and leak test the force main and/or gravity sewer and manholes until testing requirements of the specifications are met.
 5. Backfill, compact, and repave all pipe trench cuts within paved areas; and backfill, compact, and landscape all pipe trench cuts within unpaved areas, in compliance with the Contract Documents.
 6. Remove existing vaults and refill the holes with compacted material. Cover surface with materials matching the surrounding area.
 7. Restore all disturbed areas including driveways, parking areas, curbs, curb and gutter, sidewalks, yards, ornamental plantings, etc.
 8. Maintain traffic control throughout the duration of construction.
 9. Clean-up the project work area and return the area to its pre-construction conditions.
 10. Provide and install all necessary manholes, vaults, and appurtenances as required or directed by the Engineer.
 11. Make connections to existing manholes and rehabilitate manhole inverts as required or directed by the Engineer.
 12. Provide the necessary bypass pumping for execution of the Work, while allowing flow to continue through the sewer and around the work area.
 13. Abandon portions of existing sewer and manholes in place in accordance with the Contract Documents.
 14. Clear easements as necessary for installation of the proposed sewer and maintain erosion control measures throughout the duration of the project.

1.2 SCHEDULING AND SEQUENCE OF WORK

- A. The existing water mains must remain in service throughout the duration of construction. Once the Contractor has completed the installation of the proposed water main, successfully tested and disinfected the water main, and received approval from the Engineer and GCDWR, the service connection may be relocated from the existing water mains to the new water main. Upon completion of relocating the service connections, the Contractor shall abandon the existing water mains in place.

- B. All water system shut-offs for making wet cut-ins shall be coordinated with the GCDWR Project Inspector a minimum of one (1) week in advance of planned shut-off. A minimum of twenty four (24) hours' notice shall be provided to the affected residents prior to shutting off water service.
- C. All sanitary sewer flow shall be pumped around segments of existing sanitary sewer under construction, as necessary, for the repair, replacement, or rehabilitation of the existing sanitary sewer, during the installation and testing of the new sanitary sewer, sewer connections/reconnections, and the replacement of manholes.
- D. The Contractor shall prepare and submit a detailed plan for setup, operation, monitoring, and shutdown of the bypass system, as outlined in Section 33 01 30.74 Bypass Pumping.
- E. The Contractor shall schedule any gravity sewer downtime with GCDWR and the Engineer prior to removing any of the existing facilities from service.

1.3 USE OF PREMISES

- A. Confine operations at the site to areas permitted by law, ordinances, permits, and Contract Documents.
- B. Do not unreasonably encumber premises with materials and equipment.
- C. Maintain the premises in clean and safe conditions at all times.
- D. Maintain access for emergency service personnel and school bus traffic at all times during construction.
- E. If construction is going to block driveway access for residents, the Contractor shall notify the residents in advance to allow for removal of vehicles. The Contractor shall also maintain, on site, suitable steel plates for use in allowing vehicle access across open trenches and place plates as required allowing vehicular traffic to pass.
- F. Provide access to GCDWR's authorized persons and the police, fire, or other departments having legal jurisdiction to the site at all times and provide cooperation in their work.

1.4 COMMUNICATION

- A. All formal communications shall be in writing. Use prescribed forms as required by GCDWR.
- B. Designate in writing the individual who will be the Contractor's authorized representative.

END OF SECTION 01 11 00

SECTION 01 22 15.11

MEASUREMENT AND PAYMENT

BID WATER AND SEWER PROJECTS

PART 1 – GENERAL

1.1 SUMMARY

- A. This section defines the bid items of Work listed on the Bid Form and defines how payment shall be determined. Payment shall be made for each bid item based on the description in this section.
- B. Bid Prices included on the Bid Form shall be full compensation for all materials, labor, equipment, tools, construction equipment and machinery, heat, utilities, transportation, taxes, overhead, markup, incidentals and services necessary for the execution and completion of the Work in the Contract Documents to be performed under this Contract. For the Work described, the allowance and unit price, actual used and installed quantities of each bid item shall be measured in the field and certified by the Engineer and/or GCDWR upon completion of construction in the manner set forth for each item in this and other sections of the Specifications. Payment for all items listed on the Bid Form will constitute full compensation for all Work shown and specified to be performed.
- C. The Contractor shall assist and fully cooperate with GCDWR to determine proper measurement and payment for each item providing complete and reasonable backup documentation as requested by GCDWR to substantiate payment due.

1.2 BID ITEMS

The following items 1 through 38 comprise the Base Bid Total as listed on the Bid Form.

- 1. SPECIFICATION SECTION NO. 321216, UNIT PRICE FOR ASPHALT PAVING RESURFACING:
MEASUREMENT: The quantity to be paid under this item shall be the actual number of square yards of roadway or parking area pavement installed as shown on the Drawings or as directed by GCDWR. Pavement required as trench backfill as shown on the Drawings and Specifications for the minimum width trench for utility pipe construction is not included in this section, up to, but not including the final asphalt surface coarse (1½” maximum depth), but shall be included in the applicable bid item for utility pipe construction. This includes trench backfill and compaction, graded aggregate base, and paving to the bottom of the surface coarse of the utility pipe trench as shown on the Drawings. The final asphalt surface coarse is included in Asphalt Pavement Resurfacing. If asphalt pavement resurfacing is not specified or shown on the Drawings, then the final asphalt surface coarse will also be included in the applicable section for utility pipe construction.

PAYMENT: The Unit Prices Bid per square yard (SY) for roadway pavements and parking areas shall include permit fees, maintenance charges and inspection fees required by all road departments and the furnishing of all materials, labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

- a) Partial Depth Repair – Patching: Payment shall be the actual square yards of pavement repair, preparation, and resurfacing utilizing Partial Depth Repair – Patching.
- b) Asphalt Pavement Resurfacing: Payment shall be the actual square yards of pavement resurfacing as specified, shown on the Drawings, or directed by the Engineer. Pavement resurfacing shall include milling, tack coat, asphalt pavement surface, and roadway striping to the depth indicated in the Drawings and Specifications.
- c) Full Depth Pavement: Payment shall be the actual square yards of pavement utilizing Full Depth Pavement as shown on the Drawings, specified, or as directed by the Engineer. Included shall be the costs of graded aggregate base, asphalt base, binder, asphalt surface, roadway striping, tack coat, milling, and all associated costs of work necessary for furnishing Full Depth Pavement. Pavement depth and materials shall be as specified on the Drawings and Specifications.

2. SPECIFICATION SECTION NO. 347100, UNIT PRICE FOR DRIVEWAY CUT RESTORATION:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of square yards of driveway pavement restored within the construction of trench crossing said driveways. The width of pavement measured for payment shall be the allowable payment width of excavation as indicated on the Drawings; except in the instance where entire sections or slabs have been removed under direction of the Engineer or GCDWR. Optional free bores used to cross driveways in lieu of open cutting driveway shall be paid by the square yard, as measured in feet by the width of the driveway at the centerline of the pipe times a length of ten (10) feet.

PAYMENT: The Unit Prices Bid per square yard (SY) of driveway pavement restored shall include the furnishing of all materials, labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

3. SPECIFICATION SECTION NO. 321613, UNIT PRICE FOR CURB/ COMBINATION CURB & GUTTER RESTORATION:

MEASUREMENT: The quantity to be paid under these items shall be the actual number of linear feet of curb and combination curb and gutter restored as specified, indicated on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per linear foot (LF) length for curbs/curbs and gutter shall include the furnishing of all materials, labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

4. SPECIFICATION SECTION NO. 321613, UNIT PRICE FOR SIDEWALK RESTORATION:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of square yards of sidewalk restored in accordance with the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per square yard (SY) of sidewalks shall include the furnishing of all materials, labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

5. SPECIFICATION NO. 330523.16, UNIT PRICE FOR UTILITY PIPE JACKING:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of linear feet placed under the respective items uncased boring, jacked steel casing, or steel casing/open cut, as specified, as indicated on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per linear foot (LF) of uncased boring, jacked steel casing, or steel casing/open cut shall be in full compensation for all excavation, rock excavation, dewatering, sheeting, shoring, jacking/auguring operations, receiving pits, concrete, grout, sand and screenings, brick masonry, steel casing pipe, welding, backfill and all other materials, labor, tools, and equipment necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by GCDWR. The unit price for each shall further include full compensation for furnishing barricades, warning signals, and lights. The carrier pipe shall be paid separately under the item titled for the specific pipe material type.

6. SPECIFICATION NO. 330523.71, UNIT PRICE FOR STEEL TUNNEL LINER:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of linear feet placed as shown on the Drawings or as directed by GCDWR. The length shall be measured along the axis of the tunnel between the existing faces of the masonry bulkheads.

PAYMENT: The Unit Prices Bid per linear foot (LF) of tunnel liner shall include earth excavation, rock excavation, tunneling operations, sheeting and shoring, lumber left in place, concrete, grout or sand fill, brick masonry, liner plates, bolts and other fasteners; furnishing the services of qualified representative of liner plate manufacturer; and the furnishing of all necessary tools, equipment, labor and materials to complete the Work.

7. SPECIFICATION NO. 329200, UNIT PRICE FOR PERMANENT SEEDING:
MEASUREMENT: The quantity to be paid under this item shall be the actual number of square yards of planted seed, complete; to include ground preparation, lime, fertilizer, seed, and mulch as specified, as indicated on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per square yard (SY) shall include all labor, materials, tools, and equipment necessary to complete the Work as specified.

8. SPECIFICATION NO. 329200, UNIT PRICE FOR SODDING:
MEASUREMENT: The quantity to be paid under this item shall be the actual number of square yards installed, complete; to include ground preparation, lime, fertilizer, and sod as specified, as indicated on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per square yard (SY) shall include all labor, materials, tools, and equipment necessary to complete the Work as specified.

9. SPECIFICATION NO. 329343, UNIT PRICE FOR TREE REPLACEMENT:
MEASUREMENT:

a.) Tree Replacement: The quantity to be paid under this item shall be the actual number of trees planted by type as shown on the Drawings or as directed by GCDWR.

b.) Tree Save Barrier Fence: The quantity to be paid under this item shall be the actual number of linear feet of tree save barrier fence installed as required by the Drawings, Specifications, or as directed by GCDWR.

PAYMENT:

a.) Tree Replacement: The Unit Prices Bid for each tree (EA) planted shall include all necessary tools, equipment, labor and materials to complete the Work.

b.) Tree Save Barrier Fence: The Unit Prices Bid per linear feet (LF) of tree save barrier fence installed shall be the actual number of linear feet installed. No payment shall be made for tree save barrier fence required to be reinstalled for any reason.

10. SPECIFICATION NO. 023219, UNIT PRICE FOR EXPLORATORY EXCAVATIONS:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of exploratory excavations as verified by GCDWR. This item is to only be used when directed by GCDWR and is not to be used by the Contractor as a method of payment for locating utilities or valves required for the completion of the Work.

PAYMENT: The Unit Prices Bid for each (EA) exploratory excavation shall include all necessary labor, equipment, and materials required to perform exploratory excavations. The unit price shall further include full compensation for maintaining traffic, furnishing barricades, warning signals, lights, and flagmen. Any and all site restoration and clean-up work shall be included in the unit price. Topsoil removed from the immediate site and reused will not be considered for payment.

11. SPECIFICATION NO. 344116.10, UNIT PRICE FOR TRAFFIC CONTROL:
MEASUREMENT:

- a) Devices: The quantity to be paid under this item shall be lump sum for the construction, maintenance, and removal of temporary traffic control devices required for maintenance of traffic during construction.
- b) Police Officer: The quantity to be paid under this item shall be the actual number of hours (HR) worked by Police Officer(s) to direct traffic outside the immediate construction area.

PAYMENT:

- a) Devices: The Unit Prices Bid lump sum (LS) shall include the furnishing of all materials, tools, equipment, and labor, necessary to complete the Work as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- b) Police Officer: The Unit Prices Bid per hour (HR) shall include the use of Police Officer(s) to direct traffic to be paid at the rate of \$50.00 per hour for the actual number of hours worked by Police Officer(s) (*with a two (2)-hour minimum*), necessary to complete the Work as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR. The \$50.00 per hour cost shall be a fully loaded cost. This cost shall also include all tools and equipment necessary to complete the Work.

12. SPECIFICATION NO. 312500, UNIT PRICE FOR EROSION AND SEDIMENTATION CONTROLS:

MEASUREMENT: The quantity to be paid under this item shall be as indicated for each Best Management Practice (BMP) actually installed as specified, as indicated on the Drawings, as directed by the Engineer, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid shall include all labor, materials, tools, and equipment necessary for furnishing, placing, maintaining, and removing each BMP, as applicable; all costs for inspection, monitoring, and reporting on the erosion and sedimentation controls. There will be no separate payment for installation or maintenance of construction exit(s), interceptor, diversion, or perimeter dikes or ditches.

- a. Anionic Polyacrylamide – PAM (Pm): Payment shall be the actual number of gallons (GAL) of undiluted chemical utilized; or if (PAM) “logs” are utilized, payment shall be the actual number of (PAM) “logs” installed.

- b. Hay Bales (Sd1): Payment shall be for each (EA) hay bale actually installed.
 - c. Temporary Silt Fence Type 'A' (Sd1): Payment shall be the actual number of linear feet (LF) installed. No payment will be made for silt fence required to be reinstalled for any reason.
 - d. Temporary Silt Fence Type 'C' (Sd1): Payment shall be the actual number of linear feet (LF) installed. No payment will be made for silt fence required to be reinstalled for any reason.
 - e. Inlet Sediment Trap (Sd2): Payment shall be for each (EA) number of inlet sediment traps actually installed.
 - f. Slope Stabilization (Ss): Payment shall be for the square yards (SY) of matting or netting actually installed. No payment shall be made for maintenance of matting or netting.
 - g. Stone Check Dam (Cd-S): Payment for shall be for each (EA) stone check dam actually installed.
 - h. Riprap (St): Payment shall be for square yards (SY) actually installed.
 - i. Straw or Hay Mulch (Ds1): Payment shall be per ton (TN) actually installed at the coverage rates specified.
 - j. Temporary Seeding (Ds2): Payment shall be per square yard (SY) of actually planted seed at the coverage rates specified. No payment shall be made for reseeding or maintenance.
13. SPECIFICATION NO. 024211, UNIT PRICE FOR SITE RESTORATION AND REMOVAL OF CONSTRUCTION MATERIAL:
MEASUREMENT: The quantity to be paid under this item shall be lump sum for cleanup and removal of all junk, rubbish, trash, and construction debris.

PAYMENT: The Unit Prices Bid lump sum (LS) shall include all labor, tools, and equipment necessary to complete the Work as specified.
14. SPECIFICATION NO. 017839, UNIT PRICE FOR PROJECT RECORD DRAWINGS:
MEASUREMENT: The quantity to be paid under this item shall be all project record drawings of actual Work installed, complete as specified, submitted, and approved by GCDWR.

PAYMENT: The Unit Prices Bid lump sum (LS) shall include all labor, materials, tools, and equipment necessary to prepare and submit project record drawings of actual Work installed; complete as specified.

15. SPECIFICATION SECTION NO. 331113.05, UNIT PRICE FOR DUCTILE IRON PIPE (WATER):

MEASUREMENT: The quantity to be paid under this item shall be the actual number of linear feet of pipe, by size, furnished and installed or lowered in place.

PAYMENT: The Unit Prices Bid per linear foot (LF) shall include ductile iron pipe and fittings, clearing and grubbing, excavation, borrow, rock excavation, pipe bedding, furnishing and placing of pipe and fittings complete, including all thrust restraints, all concrete work, poly wrap; making all required connections to either active or inactive lines, including wet cut-ins and installation of new service lines where required, service connections; backfilling, testing, and sterilization, including and the furnishing of all labor, materials, tools, and equipment necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

16. SPECIFICATION NO. 331216, UNIT PRICE FOR WATER UTILITY DISTRIBUTION VALVES:

MEASUREMENT: The quantity to be paid under this item shall be the actual number, size, and type of valves installed or relocated as shown on the Drawings or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per each (EA) valve under this item shall be full compensation for the furnishings, testing, installing and painting of all valves, furnishing and installing valve markers, valve boxes with concrete collars, including pilot valves, sleeves, anchors, gauges, gearing, wrenches, lubricant, brackets, valve operating nut extensions, valve keys, the cutting and plugging of existing mains as required, and other accessories and appurtenances, and the furnishing of all detailed drawings, manuals, labor, superintendents, materials, tools and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR. All necessary earth excavation required for the installation of valves shall be included in this Unit Prices Bid item. The valves specifically included under other items of the contract will be included in the payments made under those items. No additional payment will be made for a valve installation on an existing live main requiring a Wet Cut-In.

17. SPECIFICATION SECTION NO. 331216.10, UNIT PRICE FOR AIR RELEASE AND VACUUM VALVES – WATER (NEW INSTALLATION):

MEASUREMENT: The quantity to be paid under this item shall be based on the actual number, size, and type of valves installed as shown on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per each (EA) air and vacuum valve under this item shall include the furnishing of all materials for properly constructing the installation complete; including: manhole base or vault, riser and slab top, frames and covers or hatch, concrete, excavation, bedding, foundation cushion, air and vacuum valve, isolation valve, galvanized steel piping, brass blow-off valve, double strap service saddle, rubber hose with quick disconnect, and the furnishing of all labor, tools, and equipment necessary to complete the Work as specified, as

indicated on the Drawings, or as directed by GCDWR. No additional payment will be made for a valve installation on an existing live main requiring a Wet Cut-In.

18. SPECIFICATION SECTION NO. 331216.10, UNIT PRICE FOR AIR RELEASE AND VACUUM VALVES – WATER (RELOCATED):

MEASUREMENT: The quantity to be paid under this item shall be based on the actual number, size, and type of valves relocated as shown on the Drawings or as directed by GCDWR.

PAYMENT: The Unit Prices Bid for each (EA) air and vacuum valve under this item shall be the furnishing of all materials for the proper relocation of an existing air release and vacuum valve utilizing all reusable components, and the furnishing of all labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR. No additional payment will be made for a valve installation on an existing live main requiring a Wet Cut-In.

19. SPECIFICATION NO. 330516.13, UNIT PRICE FOR PRECAST CONCRETE VAULTS:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of precast concrete vaults installed as shown on the Drawings or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per each (EA) precast concrete vault shall include all necessary tools, equipment, labor and materials to complete the Work.

20. SPECIFICATION SECTION NO. 330516.13, UNIT PRICE FOR ADJUSTING/MODIFYING VAULT TOPS:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of vault tops adjusted, modified, or replaced as specified, as indicated on the Drawings, or as directed by GCDWR. Adjustments utilizing riser sections shall be paid per vertical foot of riser installed. All salvaged manhole frame and covers are to be returned to GCDWR

PAYMENT: The Unit Prices Bid for each (EA) vault top adjustment, modification, or replacement shall include all necessary tools, equipment, labor and materials to complete the Work.

21. SPECIFICATION NO. 331219, UNIT PRICE FOR WATER UTILITY DISTRIBUTION FIRE HYDRANTS:

MEASUREMENT: The quantity to be paid per each fire hydrant shall be the number actually installed as shown on the Drawings or as directed by GCDWR.

PAYMENT: The Unit Prices Bid for each (EA) fire hydrants shall include excavation, furnishing hydrants, placing to correct horizontal alignment and vertical elevation, connecting to existing main, backfill, testing, and shop and field painting of all fire hydrants; complete with all accessories, appurtenances,

restraint, gravel, concrete, and hydrant wrenches; and the furnishing of all labor, superintendents, materials, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR. Connecting pipe and fittings will be paid for under the bid item titled Ductile Iron Pipe: (Water). Gate valves will be paid under bid item titled Water Utility Distribution Valves.

22. SPECIFICATION NO. 331219.81, UNIT PRICE TO RELOCATE OR RECONNECT FIRE HYDRANTS

MEASUREMENT: The quantity to be paid under this item shall be based on the actual number of existing hydrants that have been relocated or reconnected as shown on the Drawings or as directed by GCDWR.

PAYMENT: The Unit Prices Bid for relocating or reconnecting each (EA) fire hydrant shall include excavation, disconnecting from, plugging and blocking, or connecting openings in existing mains, cleaning and reworking hydrants and valves removed from the existing water system, and relocating, setting, connecting all hydrants and gate valves to the new mains, complete with all accessories, appurtenances, restraint, gravel, concrete, and hydrant wrenches, and furnishing all labor, superintendents, equipment, materials, and tools necessary to complete the Work as specified, indicated on the Drawings, or as directed by GCDWR.

Gate valves will be paid under the bid item titled Water Utility Distribution Valves.

Additional ductile iron pipe and fittings will be provided and paid under the item titled Ductile Iron Pipe: (Water).

23. SPECIFICATION NO. 331219.81, UNIT PRICE TO ADJUST EXISTING FIRE HYDRANTS:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of vertical feet of adjusted fire hydrants as specified, as indicated on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per vertical foot (VF) for each fire hydrant shall include excavation, backfill, adjusting gate valve, complete with all accessories, appurtenances, restraint, gravel, concrete, and hydrant wrenches, and furnishing all labor, superintendents, equipment, materials, tools, and equipment necessary to complete the Work specified.

Additional ductile iron pipe and fittings will be provided and paid under the item titled Ductile Iron Pipe: (Water).

24. SPECIFICATION SECTION 331219.81, UNIT PRICE FOR SALVAGE EXISTING FIRE HYDRANT:

MEASUREMENT: The quantities to be paid under this item shall be the actual number of existing fire hydrant(s) removed, transported, and delivered to a location specified by GCDWR.

PAYMENT: The Unit Prices Bid for each (EA) salvaging fire hydrant(s) shall include the furnishing of all materials, labor and equipment for excavation, bedding, disconnecting from, plugging and blocking, or connecting openings in existing mains, backfilling, landscape repairs, transporting and delivery of the complete fire hydrant(s) to a location specified by GCDWR. Removal of hydrant valves shall not be measured for payment under any other Bid Item.

25. SPECIFICATION NO. 331213, UNIT PRICE TO SALVAGE EXISTING METERS:

MEASUREMENT: The quantities to be paid under this item shall be the actual number of existing meters salvaged as indicated on the Drawings or as directed by GCDWR.

PAYMENT: The Unit Prices Bid for each (EA) salvage existing meter(s) under this item shall include the excavation, backfilling, landscape repairs, the furnishing of all labor, materials, tools, and equipment to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR. Payment shall include transporting and delivery of meter(s) to a location specified by GCDWR. Salvaging existing meter(s) shall not be measured for payment under any other Bid Item.

26. SPECIFICATION NO. 312300, UNIT PRICE FOR ADDITIONAL PIPE BEDDING:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of cubic yards of additional bedding material placed as specified, or as directed by GCDWR and not shown on the Drawings,

PAYMENT: The Unit Prices Bid per cubic yard (CY) of additional bedding material include any additional permit fees, maintenance charges and inspection fees required by all road departments and the furnishing of all labor, materials, tools, traffic control and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR. Included shall be the cost of additional excavation beyond trench depth to provide firm foundation and any cost of furnishing necessary work beyond the limits of measurement as defined under these specifications. Payment will not be made when bedding material is used by the Contractor due to over excavation or for the Contractor's convenience.

27. SPECIFICATION SECTION NO. 333100, UNIT PRICE FOR SANITARY UTILITY SEWERAGE PIPING (GRAVITY PVC):

MEASUREMENT:

- a. Service connections shall be measured from the centerline of the main to the end of the house connection. Stubs placed in manholes shall be measured from the center of the manhole to the end of the stub, as indicated on the Drawings. Sewer connecting to existing stubs at manholes shall be measured from the end of the existing stub.
- b. The quantity to be paid for under this item shall be the number of linear feet

of each size of PVC pipe actually furnished and laid in accordance with the specifications, measured along a horizontal line after the pipe has been connected in place. Measurements shall be from center of manhole to center of manhole. No deductions or additions will be made for PVC Tee or Wye fittings, elbow bends or specials. No deductions will be made for manholes.

PAYMENT:

- a. The Unit Prices Bid per linear foot (LF) for service connections under this item shall include excavating, Tee or Wye fitting, plugs, mastic fillers, pipe bedding and other appurtenances for making connections to sewers, backfilling, electronic markers, testing and inspections, and the furnishing of all labor, materials, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.
- b. The Unit Prices Bid per linear foot (LF) for the various sizes of PVC, pipe and specials under this item shall include clearing and grubbing, excavating, rock excavation, [pipe bedding, furnishing and placing of pipe complete with Tee or Wye fittings, elbow bends, jointing materials, mastic fillers, stoppers, concrete work, and other appurtenances; making connections to either active or inactive lines, all service connections, manhole repair for any damaged manholes in the course of the work, backfilling, graded aggregate base backfill when under paved roads, testing and inspections, and the furnishing of all labor, materials, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or directed by GCDWR.

28. SPECIFICATION SECTION NO. 333100, UNIT PRICE FOR SANITARY UTILITY SEWERAGE PIPING (GRAVITY DIP):

MEASUREMENT: The quantity to be paid under this item shall be the actual number of linear feet of pipe, by size, furnished and installed or lowered in place.

PAYMENT: The Unit Prices Bid per linear foot (LF) shall include ductile iron pipe and fittings, clearing and grubbing, as well as, the clearing and preparation of any areas used for storage or for fabrication of materials; television inspection of the existing sewer lines, cleaning of the existing sewer lines, manhole repair for any damaged manholes in the course of the work; excavation, borrow, rock excavation, pipe bedding, furnishing and placing of pipe and fittings complete, including all thrust restraints, or with jointing materials mastic fillers; all concrete work, poly wrap; making all required connections to either active or inactive lines, including service connections; backfilling as shown on the Drawings, testing, including furnishing of all labor, materials, tools, and equipment necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

29. SPECIFICATION SECTION NO. 333100, UNIT PRICE FOR SANITARY UTILITY SEWERAGE PIPING (FORCE MAINS DIP):

MEASUREMENT:

- a. The quantity to be paid under this item shall be the number of linear feet of each size, actually furnished and laid in accordance with these specifications, measured along a horizontal line after the pipe has been connected in place. The number and size of wet cut-ins paid shall be the actual number installed.
- b. The number and size of plug valves shall be the actual number installed.

PAYMENT:

- a. The Unit Prices Bid per linear foot (LF) for the various sizes of pipe and fittings under this item shall include: clearing and grubbing, excavation, borrow, rock excavation, pipe bedding, furnishing and placing of pipe and fittings complete, including all thrust restraints, all concrete work, poly wrap, painting of non-potable pipe lines, installation of Carsonite markers for non-potable pipe lines, and other appurtenances making all required connections, backfilling, graded aggregate base backfill when under paved roads, testing, and inspections and the furnishing of all labor, materials, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.
- b. The Unit Prices Bid for each (EA) wet cut-in shall be full compensation for all necessary tools, equipment, labor, pumping, disposal, material and fittings to complete the Work.
- c. The Unit Prices Bid for each (EA) plug valve shall be full compensation for all necessary tools, equipment, labor, material and fittings, valve boxes and valve markers, and related appurtenances to complete the Work. Installation of plug valves on existing force mains containing sewage shall also include payment for one (1) wet cut-in.

30. SPECIFICATION NO. 331113.07, UNIT PRICE FOR STEEL PIPE:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of linear feet of pipe, by size, furnished and installed.

PAYMENT: The Unit Prices Bid per linear foot (LF) shall include steel pipe, clearing and grubbing, excavation, borrow, rock excavation, pipe bedding, poly wrap, welding; making all required connections to either active or inactive lines; backfilling, testing and sterilization, and the furnishing of all labor, materials, tools, and equipment necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

31. SPECIFICATION SECTION NO. 330516.13, UNIT PRICE FOR PRECAST CONCRETE UTILITY STRUCTURES:

MEASUREMENT:

- a. Standard diameter (48") manholes to be paid under this item shall be the total number of vertical feet of manhole base, riser(s), and cone or slab top placed, as measured between the inside invert of the downstream sewer pipe to the top of the ring and cover. All measurements shall be to the nearest one-tenth (0.1) foot.

- b. Large diameter (60", 72", 84" and 96") manholes to be paid under this item shall be the actual number installed of each size base - including the reducer slab. The vertical feet of 48" manhole riser(s) and cone or slab top placed, as measured between the top of the reducer slab to the top of the ring and cover, shall be paid under Standard diameter (48") manholes.
- c. Frames and covers to be paid under this item for "traffic" and "bolt down" type frames and covers shall be the actual number of manhole frames and covers installed, including all necessary tools, labor and equipment required to complete the Work.
- d. Outside drops to be paid under this item shall be the actual number of outside drops installed. Payment for the manhole shall be paid under the items for manholes described above in items a. or b.
- e. Cores to be paid under this item shall be the actual number of manhole cores made, complete with a flexible manhole boot installed, including all necessary tools, labor and equipment required to complete the Work in accordance with these specifications.
- f. Adjustment of frame and cover to be paid under this item shall be the actual number of frames and covers adjusted.

PAYMENT:

- a. The Unit Prices Bid per vertical foot (VF) of Standard Diameter (48") manhole shall be the total number of vertical feet installed of manhole base, riser(s), and cone or slab top placed, as measured between the inside invert of the downstream sewer pipe to the top of the ring and cover. All measurements shall be to the nearest one-tenth (0.1) foot.
- b. The Unit Prices Bid for each (EA) Large Diameter (60", 72", 84" and 96") manhole shall be the actual number installed of each size base - including the reducer slab. The vertical feet of (48") manhole riser(s) and cone or slab top placed, as measured between the top of the reducer slab to the top of the ring and cover, shall be paid under Standard Diameter (48") manhole item described above in item a.
- c. The Unit Prices Bid for each (EA) frame and cover for "traffic" and "bolt down" type shall be the actual number of manhole frame and cover installed, including all necessary tools, labor and equipment required to complete the Work.
- d. The Unit Prices Bid for each (EA) outside drop shall be the actual number of outside drops installed. Payment for the manhole shall be paid under the items for manholes described above in items a. or b.
- e. The Unit Prices Bid for each (EA) core shall be the actual number of manhole cores made, complete, with a flexible manhole boot installed; including all necessary tools, labor and equipment required to complete the Work in accordance with these specifications.
- f. The Unit Prices Bid for each (EA) adjustment of frame and cover shall be the actual number of frame and cover adjusted.

32. SPECIFICATION SECTION NO. 330130.71, UNIT PRICE FOR MANHOLE INVERT REHABILITATION:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of manhole inverts rebuilt.

PAYMENT: The Unit Prices Bid for each (EA) manhole invert rehabilitation shall include all necessary tools, equipment, labor and materials to complete the Work.

33. SPECIFICATION SECTION NO. 330130.72, UNIT PRICE FOR RELINING SEWERS:

MEASUREMENT: The quantity to be paid under this item shall be the number of linear feet of each size actually furnished, and measured along the horizontal line, after the liner has been sealed in the connecting manholes. Measurement shall be from center of manhole to center of manhole.

PAYMENT: The Unit Prices Bid per linear foot (LF) for each size liner installation shall include the access to the site, clearing of the site of the Work, as well as the clearing and preparation of any areas used for storage or for fabrication of materials; television inspection of the existing sewer lines, cleaning of the existing sewer lines, manhole repair for any damaged manholes in the course of the work, excavation, bedding material, furnishing and installing of pipe lining complete with jointing materials, mastic fillers, and other appurtenances; making connections to manhole and other sewers, reopening of service connections, testing, and inspections; and the furnishing of all labor, materials, tools, and equipment necessary to complete the work. The unit price shall further include full compensation for furnishing barricades, warning signals, and lights.

34. SPECIFICATION SECTION NO. 330130.73, UNIT PRICE FOR PIPE BURSTING:

MEASUREMENT:

- a. The quantity to be paid under this item shall be the number of linear feet of each size actually furnished and installed, as measured along the horizontal line between connecting manholes. Measurement shall be from center of manhole to center of manhole.
- b. The number of service connections to be paid shall be the actual number installed.

PAYMENT:

- a. The Unit Prices Bid per linear foot (LF) for each size of pipe bursting under this item shall include the access to the site, clearing of the site of the Work, as well as the clearing and preparation of any areas used for storage or for fabrication of materials; television inspection of the existing sewer lines, cleaning of the existing sewer lines, manhole repair for any damaged manholes in the course of the work, excavation, furnishing and installing of pipe complete with jointing materials mastic fillers, and other appurtenances, backfilling, testing, and inspections, and the furnishing of all labor, materials, tools, and equipment necessary to complete the Work.

- b. The Unit Prices Bid per linear foot (LF) for connections to manhole and other sewers, locating and reconnecting house service connections, backfilling, testing, and inspections, and the furnishing of all labor, materials, tools, and equipment necessary to complete the Work.
35. SPECIFICATION SECTION NO. 331216.12, UNIT PRICE FOR AIR AND VACUUM VALVES – SEWER (NEW INSTALLATION):
MEASUREMENT: The quantity to be paid under this item shall be the actual number, size, and type of valves installed as shown on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per each air and vacuum valve under this item shall include the furnishing of all materials for properly constructing the installation complete; including: manhole base or vault, riser and slab top, frames and covers or hatch, concrete, excavation, bedding foundation cushion, air and vacuum valve, isolation valve, galvanized steel piping, brass blow-off valve, double strap service saddle, rubber hose with quick disconnect, and the furnishing of all labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.
36. SPECIFICATION SECTION NO. 331216.12, UNIT PRICE FOR AIR AND VACUUM VALVES – SEWER (RELOCATED):
MEASUREMENT: The quantity to be paid under this item shall be the actual number, size, and type of valves relocated as shown on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid for each air and vacuum valve under this item shall be the furnishing of all materials for the proper relocation of an existing air release and vacuum valve utilizing all reusable components, and the furnishing of all labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.
37. SPECIFICATION NO. 330130.74, UNIT PRICE FOR BYPASS PUMPING:
MEASUREMENT: The quantity to be paid under this item shall be the actual number of hours of bypass pump run time during pumping operations.

PAYMENT: The Unit Prices Bid shall include all labor, materials, tools, equipment and monitoring personnel required to complete the Work as specified.
38. SPECIFICATION SECTION NO. 024119.81, UNIT PRICE FOR SEPTIC TANK DEMOLITION:
MEASUREMENT: The quantity to be paid under this item shall be the actual number of septic tanks authorized by GCDWR to be demolished. There will be no additional payment for backfilling, pumping, and disposal of septic tank contents.

PAYMENT: The Unit Prices Bid for each septic tank demolition shall include all necessary tools, equipment, labor and materials to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

END OF SECTION 01 22 15.11

SECTION 01 31 19

PROJECT MEETINGS

PART 1 – GENERAL

1.1 SCOPE:

- A. Work under this Section includes all scheduling and administering of pre-construction and progress meetings as herein specified and necessary for the proper and complete performance of this Work.
- B. Scheduling and Administration by Owner:
 - 1. Prepare Agenda, with assistance from Engineer
 - 2. Make physical arrangements for the meetings.
 - 3. Preside at meetings.
- C. Scheduling and Administration by Engineer:
 - 1. Assist Owner with Agenda
 - 2. Record minutes and include significant proceedings and decisions.
 - 3. Distribute “Draft” meeting minutes for review/revision
 - 4. Incorporate revisions and distribute Final copies of the minutes to participants.

1.2 PRE-CONSTRUCTION MEETING:

- A. The Owner shall schedule the pre-construction conference prior to the issuance of the Notice to Proceed.
- B. Representatives of the following parties are to be in attendance at the meeting:
 - 1. Owner; including project manager, project inspector, Operations stakeholder(s)
 - 2. Engineer
 - 3. Designer (if different than Engineer)
 - 4. Contractor’s project staff including at a minimum: the project manager, site superintendent, quality/safety control coordinator, and subcontractor coordinator
 - 5. Major subcontractors
 - 6. Representative(s) of governmental or regulatory agencies, when appropriate.
 - 7. Materials Testing Firm representative
- C. The agenda for the preconstruction conference shall consist of the following as a minimum:
 - 1. List of attendees, and introduction of each attendee and their respective project role.
 - 2. Project Data to include Bid date, total Bid amount, Notice to Proceed Date, Substantial Completion date, and Final Completion Date.

3. List of project stakeholders and their contact information including email address and cell phone number.
4. Communication procedures and chain of communication for specified project components.
5. Distribute and discuss a list of major subcontractors and a tentative construction schedule, including County Holidays, and adverse weather days.
6. Critical work sequencing.
7. Pay request procedure including format, submittal, pay date, and retainage.
8. Procedures for maintaining record documents.
9. Discuss submittals to include, project schedules, requests for information, shop drawings, product data, samples, and project record drawings.
10. Processing of field decisions and Change Orders.
11. Work Times and Schedule.
12. Inspection of Work, testing, and laboratory work.
13. Safety and first aid procedures.
14. Permits, easements, and their acquisition status.
15. Blasting protocol.
16. Traffic control.
17. Housekeeping notes and procedures.

1.3 PROJECT PROGRESS MEETINGS:

- A. Owner to schedule progress meetings monthly, or more frequently as directed by the Engineer.
- B. Hold called meetings as the progress of the Work dictates.
- C. The meetings shall be held at the location indicated by the Owner.
- D. Representatives of the following parties are to be in attendance at the meetings:
 1. Owner, to include project manager, project inspector, and as conditions dictate, Operations stakeholder(s)
 2. Engineer.
 3. Designer's representative as appropriate
 4. Contractor's project staff including at a minimum the project manager, site superintendent, quality control coordinator, and subcontractor coordinator
 5. Major subcontractors as pertinent to the agenda.
 6. Representatives of governmental or other regulatory agencies, as appropriate.
 7. Materials testing firm representative as pertinent to the agenda
- E. The minimum agenda for progress meetings shall consist of the following:
 1. List of attendees
 2. Review and approve minutes of previous meeting.
 3. Contractor to supply updated Project Progress Schedule.
 4. Review work progress since last meeting.
 5. Review work progress planned for the next period.
 6. Status of Overall Project Schedule, identify problems which impede planned progress.
 7. Review Contractor's corrective measures and procedures to regain plan schedule.

8. Review submittal schedule .
9. Review budget status.
9. Review Request for Information process
10. Review Change Management items and status of individual Change documents.
11. Review Notices, Punch lists, and project coordination issues.
12. Note field observations, problems and decisions.
13. Review testing and quality control measures and associated issues.
14. Complete other current business.

1.4 SHUTDOWN COORDINATION MEETINGS:

- A. One week minimum prior to significant planned shutdowns, Contractor shall arrange with Owner, and Owner shall convene a coordination meeting.
- B. Meeting participants shall include Owner, Engineer, Designer, and Contractor, including involved subcontractors.
- C. Meeting agenda shall include Contractor's review/presentation of detailed work plan and schedule, Owner input regarding facility operations, and all other pertinent coordination topics.

1.5 QUALITY CONTROL AND COORDINATION MEETINGS:

- A. Scheduled by Engineer and coordinated with Owner, on regular basis and as necessary to review test and inspection reports, and other matters relating to quality control of Work and work of other contractors.
- B. Attendees will include:
 1. Owner, including project manager, project inspector, chief inspector, and as it pertains to the Work, Operations stakeholder(s)
 2. Engineer
 3. Designer (if different than Engineer)
 4. Contractor's project staff including at a minimum: the project manager, site superintendent, quality/safety control coordinator, and subcontractor coordinator
 5. Major subcontractors, as it pertains to the Work
 6. Materials Testing Firm representative, as it pertains to the Work.

1.6 PRE-INSTALLATION MEETINGS:

- A. When required in individual Specification Sections, convene at site prior to commencing Work of that section.
- B. Require attendance of entities directly affecting, or affected by, Work of that Section.
- C. Notify Engineer and Owner five (5) days in advance of meeting date.
- D. Provide suggested agenda to Engineer to include reviewing conditions of installation,

preparation and installation or application procedures, and coordination with related Work and work of others.

1.7 FACILITY STARTUP MEETINGS:

- A. Schedule and attend facility startup meetings for each system, facility, or group of facilities, as applicable.
- B. Attendees will include:
 - 1. Contractor's project staff including at a minimum the site superintendent.
 - 2. Subcontractors and equipment manufacturer's representatives whom Contractor deems to be directly involved in facility startup.
 - 3. Engineer's representatives.
 - 4. Owner's inspection personnel.
 - 5. Others as required by Contract Documents.

1.8 OTHER MEETINGS:

- A. In accordance with Contract Documents and as may be required by Owner and Engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 31 19

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 – GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all equipment and labor materials required to provide the Owner with digital construction audio/video recordings of the Project.
- B. Photos, electronic files, and audio/video recordings shall become the property of the Owner, and none of which shall be published without express permission of the Owner.

1.2 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment will be made for work under this section. All costs in connection with this work specified herein, is considered to be incidental to the Work.

1.3 PRE AND POST-CONSTRUCTION AUDIO/VIDEO RECORDINGS:

- A. Prior to the beginning of any work, the Contractor shall make audio/video recordings of the work area to record existing conditions.
- B. Following completion of the work, another recording shall be made showing the same areas and features as in the pre-construction recording.
- C. All conditions which might later be subject to a disagreement shall be shown in sufficient detail to provide a basis for decisions.
- D. The recordings shall include the date and time markings on the video. All videos shall be provided with an audio narration, stating a description of what is shown, structure, area, approximate station of the area shown, and street address and property owner where appropriate.
- E. Audio/video recordings shall be made in standard definition DVD format and stored on a DVD optical disc. The quality and content shall be subject to the approval of the Engineer.
- F. The DVD disc shall bear a typed label containing the following information: Project title, date of recording, and project stations shown on the recording.

1.4 DISPUTES AND POTENTIAL CLAIMS

- A. In the event a problem arises or dispute occurs, which may result in a potential Claim, under General Conditions Article 10.05, and the problem or dispute can be illustrated by photographs and video recordings, the Contractor shall provide such photographs and video files.

1.5 SUBMITTALS:

- A. Formats
 - 1. Photo files shall be provided in jpeg format.
 - 2. Audio/Video Recordings shall be provided in DVD format.
- B. Audio/Video Recordings
 - 1. The pre-construction recording shall be submitted prior to the first progress payment request.
 - 2. The post-construction recording shall be submitted with the final payment request.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 32 33

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Contractor's Responsibilities
1.4	Engineer's Responsibilities
1.5	Request for Information (RFI)
1.6	Letter of Transmittal
2.1	General
2.2	Schedules
2.3	Request for Information
2.4	Shop Drawings
2.5	Operation and Maintenance Manuals
2.6	Record Drawing
3.1	General
3.2	Review Procedures
3.3	Schedules
3.4	Request for Information
3.5	Shop Drawings
3.6	Effect of Review of Contractor's Submittals
3.7	Cost for Review of Submittals

- B. All materials and/or equipment provided to GCDWR shall require submittal to, and approval of, Engineer prior to releasing Contractor for ordering. Any items ordered and/or delivered without approved submittals may be rejected by GCDWR.
- C. This section includes information and requirements for the submittal of documents during the course of work for, including but not limited to, schedules, shop drawings, product data, operation and maintenance manuals, requests for information, and record drawings as specified.
- D. Submittals shall include, but not be limited to, manufacturers' information, catalog data, shop drawings, test procedures, test results, samples, calculations of equipment performance, equipment weight, fabrication, erection, mechanical accessories, materials installed, reinforcing steel, piping, details, and Work-related information. The Contractor shall furnish scaled drawings, or drawings of equivalent dimensions to ascertain information deemed necessary by the Engineer, including descriptive data, certificates, samples, tests, and any other instructions specifically required in the Contract Documents

or recommended by the manufacturer to demonstrate that the materials and equipment to be furnished, and the methods of Work, comply with the provisions and intent of the Contract Documents.

1.2 REFERENCES

- A. Drawings and general provisions of the Agreement, including General and Supplementary Conditions, and Division 1 Specification Sections, apply to this section.

1.3 CONTRACTOR'S RESPONSIBILITIES

- A. Before starting construction, Contractor shall submit to the Engineer for timely review, a Preliminary Progress Schedule, and a Preliminary Schedule of Submittals; and shall submit to GCDWR for timely review, a Schedule of Values for all of the Work, in a format acceptable to GCDWR, per Specification Section 01 00 00 General Requirements.
- B. After starting and during construction, Contractor shall submit to the Engineer for timely review, an updated Progress Schedule, and an updated Schedule of Submittals, per Specification Section 01 00 00 General Requirements.
- C. The Contractor shall be responsible for the accuracy and completeness of information contained in each submittal assuring that the Work shall be done in accordance with the Contract Documents, unless a deviation has been approved. The Contractor shall verify that each feature of every product shall conform to the specified requirements. Submittal documents shall be clearly edited to indicate only those items being submitted in accordance with the Work. All extraneous materials shall be stricken out or removed. The Contractor shall coordinate submittals among his subcontractors and suppliers to meet the specified Work so that the Work shall not be delayed. No extension of time shall be allowed because of failure to properly schedule submittals. The Contractor shall certify on each submittal document that he/she has reviewed the submittal, verified field conditions, and complied with the Contract Documents.
- D. The Contractor may authorize in writing to GCDWR that a material or equipment supplier may deal directly with GCDWR or its authorized representative. These dealings shall be limited to contract interpretations to clarify and expedite the Work.
- E. If the information provided in a submittal indicates any deviation from the Contract requirements, the Contractor shall by written statement accompanying the submittal, advise the Engineer and GCDWR of any deviation and state the reasons for such.
- F. It shall be the Contractor's responsibility to ensure there is no conflict with other submittals and to notify the Engineer and GCDWR in any case where the Contractor's submittal may concern work by another contractor, subcontractor, or GCDWR. The Contractor is solely responsible for the coordination of submittals by his subcontractors and shall verify that his subcontractors' submittals are complete in every way and meet the requirements of the Contract.

1.4 ENGINEER'S RESPONSIBILITIES

- A. Submittal reviews shall be returned to the Contractor and copied to GCDWR, marked with one of the following, “No Exceptions Taken”, “Note Markings”, “Revise and Resubmit”, “Rejected – See Remarks”, or “Engineer’s Review Not Required”. Returned submittals marked with “Revise and Resubmit” or “Rejected – See Remarks” shall be re-submitted until an acceptable mark of “No Exceptions Taken” or “Note Markings” is granted. The contractor shall pay for any submittals requiring Engineer to review beyond the second submittal.
- B. The approval of the Contractor’s submittals shall not relieve the Contractor of responsibility for any error, or any obligation for accuracy of dimensions and details, or for agreement with and conformity to the Contract and Contract Documents, or the responsibility to fulfill the Contract as prescribed. Nor shall approval be considered approval of any deviation or conflict unless Engineer and GCDWR have been expressly advised of the same, or Engineer and GCDWR have expressly approved such deviation or conflict.

1.5 REQUEST FOR INFORMATION (RFI)

- A. The Contractor shall submit in writing, a Request for Information (RFI) to the Engineer concerning all proposed substitutions and deviations to the Contract Documents, with the specified or associated parts. Such written requests shall be clearly marked with a numeric designation and should show a corresponding, concise, and lucid justification substantiating the benefits to GCDWR. RFIs are subject to rejection.

1.6 LETTER OF TRANSMITTAL

- A. Transmittals shall be attached to each submittal with the following minimum requirements:
 - 1. Transmittals written in pencil will be returned along with the submitted documents without review.
 - 2. Transmittals shall be used for each submittal.
 - 3. Transmittals shall be typed or written in ink announcing the project particulars, sender’s and receivers’ information, purpose for the submittal, a listing of items contained in the submittal with a detailed explanation attached to the cover of each submittal package.

PART 2 - SUBMITTALS

2.1 GENERAL

- A. Submittals typically fall into one of five (5) general categories; “Schedules”, “Request For Information (RFI)”, “Shop Drawings”, “Operation and Maintenance Manuals” and “Record Drawings”. Unless otherwise specified, all submittals shall be considered product data.

2.2 SCHEDULES

- A. The Contractor shall submit all requirements sufficiently in advance of construction requirements to allow ample time for the Contractor and Engineer to complete their responsibilities, as specified herein, without claim and or allowance by the Contractor for delays arising from his failure in this respect.
- B. Preliminary and updated Project Progress Schedules shall include construction activities, milestones, and dates for events, including Schedule of Submittals.
- C. The Schedule of Values shall list the installed value of component items of the Work to serve as a basis for computing values for progress payments during construction.

2.3 REQUEST FOR INFORMATION (RFI)

- A. The Contractor shall submit all requirements sufficiently in advance of construction requirements to allow ample time for the Contractor and Engineer to complete their responsibilities, as specified herein, without claim and or allowance by the Contractor for delays arising from his failure in this respect.
- B. Submittals shall include the GCDWR project name and number, and RFI number in numerical order, on the top portion, of the top page of the document(s).

2.4 SHOP DRAWINGS

- A. The Contractor shall submit all requirements sufficiently in advance of construction requirements to allow ample time for the Contractor and Engineer to complete their responsibilities, as specified herein, without claim and or allowance by the Contractor for delays arising from his failure in this respect.
- B. All shop drawings submitted must bear the stamp of approval of and by the Contractor as evidence that the submittal has been thoroughly reviewed and coordinated.
- C. Submittals shall include the GCDWR project name and number, and Shop Drawing Number in numerical order, on the top portion, of the top page of the document(s).

2.5 OPERATION AND MAINTENANCE MANUALS

- A. Operation and Maintenance Manuals submittal documents common to more than one piece of equipment shall be identified with all the appropriate equipment numbers and referenced in the other parts of the manual under that specific equipment or material. Submittals that consist of various items that together constitute a manufacturer's equipment or package, or are so functionally related, must be submitted, reviewed and approved as a whole.

2.6 RECORD DRAWINGS – Refer to Section 01 78 39 “Project Record Documents”

PART 3 - EXECUTION

3.1 GENERAL

- A. As applicable, submittals shall be marked in accordance to following color schemes:

1. **Manufacturer/vendor** comments shall be in '**black**' ink
2. **Contractor** comments shall be in '**green**' ink
3. **Engineer** comments shall be in '**blue**' ink
4. **GCDWR** comments shall be in '**red**' ink

3.2 REVIEW PROCEDURES

- A. Submittals are specified for those features and characteristics of materials, equipment, and methods of operation which can be selected based on the Contractor's judgment of their conformance to the specified requirements. Review shall not extend to means, methods, techniques, sequences or procedures of construction, or to verifying quantities, dimensions, weights or gages, or fabrication processes (except where specifically indicated or required by the specifications) or to safety precautions or programs incident thereto.
- B. When the Contract Documents require a submittal by the Contractor, it shall be to the following minimum requirements:
 1. Shop Drawings: Unless otherwise directed by the Engineer, six (6) copies of submitted information shall be transmitted to Engineer for review and comment. After Engineer's review and comments, Engineer shall return two (2) copies to the Contractor.

3.3 SCHEDULES

- A. Preliminary Project Progress Schedule:
 1. Contractor shall submit to the Engineer, a Preliminary Project Progress Schedule within ten (10) calendar days after the effective date of the Agreement.
 2. The Engineer will review said Preliminary Project Progress Schedule and return reviewed copy to Contractor within fourteen (14) calendar days.
 3. If required, Contractor will resubmit to Engineer, a revised Preliminary Project Progress Schedule incorporating all revisions, within ten (10) calendar days after receipt of a returned review copy.
- B. Preliminary Schedule of Submittals:
 1. Contractor shall submit to the Engineer, a Preliminary Schedule of Submittals within ten (10) calendar days after the effective date of the Agreement.
 2. The Engineer will review said Preliminary Schedule of Submittals and return reviewed copy to Contractor, within fourteen (14) calendar days.
 3. If required, Contractor will resubmit to Engineer, a revised Preliminary Schedule of Submittals incorporating all revisions, within ten (10) calendar days after receipt of a returned review copy.
- C. Schedule of Values:
 1. Contractor shall submit to the Owner, a Schedule of Values allocated to the various portions of the Work, within ten (10) calendar days after the effective date of the Agreement. The value of each activity shall be a complete and total value, including all taxes, overhead, and profit. The sum of all the values of the activities shall equal the total Agreement Price. The first progress payment will

not be made until the next pay cycle following the Owner's approval of the Contractor's Schedule of Values.

2. The Owner will review said Schedule of Values and return reviewed copy to Contractor, within fourteen (14) calendar days. Upon request of the Owner, support the values with data, which will substantiate their correctness.
3. If required, Contractor will resubmit to Owner, a revised Schedule of Values incorporating all revisions, within ten (10) calendar days after receipt of a returned review copy.
4. The Schedule of Values shall be used only as a basis of the Contractor's Application for Payment.

D. Project Progress Schedule:

1. Contractor shall submit to the Engineer, an updated Project Progress Schedule within thirty (30) calendar days after the effective date of the Agreement.
2. The Engineer will review said Project Progress Schedule and return reviewed copy to Contractor within fourteen (14) calendar days.
3. If required, Contractor will resubmit to Engineer, a revised Project Progress Schedule incorporating all revisions, within ten (10) calendar days after receipt of a returned review copy.

E. Schedule of Submittals:

1. Contractor shall submit to the Engineer, an updated Schedule of Submittals within thirty (30) calendar days after the effective date of the Agreement.
2. The Engineer will review said Schedule of Submittals and return reviewed copy to Contractor, within fourteen (14) calendar days.
3. If required, Contractor will resubmit to Engineer, a revised Schedule of Submittals incorporating all revisions, within ten (10) calendar days after receipt of a returned review copy.

3.4 REQUEST FOR INFORMATION (RFI)

- A. If the Contractor proposes to provide material, equipment, or method of Work which deviates from the project manual, he/she shall indicate so on the transmittal letter accompanying that specific submittal. Each RFI must be clearly marked with a numeric designation having a corresponding detailed explanation to indicate the benefit to GCDWR and/or the project. Submittals which do not identify deviations from the contract shall not be acceptable and shall be returned without review.

3.5 SHOP DRAWINGS

- A. The Engineer shall have fourteen (14) calendar days to review and comment on a submittal after its receipt. The returned submittal shall indicate one of the following actions:
1. If the review indicates that the submittal complies with the Contract Documents, it shall be marked "No Exceptions Taken". In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal; no re-submittal is required.

2. If the review indicates limited corrections are required, copies shall be marked “Note Markings”. The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. No re-submittal shall be required except where the submittal information shall be incorporated into the Project Operation and Maintenance Manuals, and then a corrected copy shall be incorporated.
3. If the review reveals that the submittal is insufficient and or contains incorrect data, copies shall be marked “Revise and Resubmit”. Except at his own risk, the Contractor shall not undertake Work covered by this submittal until it has been revised, resubmitted and returned with a mark of “No Exceptions Taken” or “Note Markings.”
4. If the review reveals that the submittal is unacceptable it shall be marked “Rejected – See Remarks”. The Contractor shall not undertake Work covered by this submittal until it has been revised, resubmitted and returned with a mark of “No Exceptions Taken” or “Note Markings.”

3.6 EFFECT OF REVIEW OF CONTRACTOR’S SUBMITTALS

- A. Review of the Contractor’s submittals shall not relieve the Contractor of his responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the County. Also, the Contractor shall have no claim on account of the failure, or partial failure, of the method of Work, material, or equipment so reviewed. A mark of “No Exceptions Taken” or “Note Markings” shall mean that the Owner has no objection to the Contractor, upon his own responsibility, using the plan or method of Work proposed, or providing the materials or equipment proposed, with the exception of incorporating any Notes made by the Engineer.

3.7 COST FOR REVIEW OF SUBMITTALS

- A. GCDWR shall pay for the review of each initial submittal and the first re-submittal required for a project. However, if the Engineer requires that shop drawings or product data be submitted for a third or more review, the Contractor shall then be responsible to pay for the Engineer’s time to review the second or more re-submittal, and for each re-submittal of the same thereafter.

END OF SECTION 01 33 00

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 – GENERAL

1.1 SCOPE:

- A. Permits and Responsibilities: The Contractor shall, without additional expense to the Owner, be responsible for obtaining all necessary licenses and permits, excluding those listed in Supplementary Conditions SC-6.08, and for complying with any applicable federal, state, county and municipal laws, codes, ordinances and regulations, in connection with the prosecution of the Work. The Contractor shall be responsible for coordinating and scheduling all necessary inspections required by applicable federal, state, county and municipal codes and regulations in relation to licenses and permits, including building permits issued for the project.
- B. The Contractor shall take proper safety and health precautions to protect the Work, the workers, the public and the property of others.
- C. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the Work.
- D. The Contractor is hereby notified that a road may be under the jurisdiction of the Georgia Department of Transportation and the Gwinnett County Department of Transportation, necessitating permits and notification of both entities by the Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 41 00

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 – GENERAL

1.1 DESCRIPTION:

- A. Whenever reference is made to conforming to the standards of any technical society, organization, body, code or standard, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the time of advertisement for Bids. This shall include the furnishing of materials, testing of materials, fabrication and installation practices. In those cases where the Contractor's quality standards establish more stringent quality requirements, the more stringent requirement shall prevail. Such standards are made a part hereof to the extent which is indicated or intended.
- B. The inclusion of an organization under one category does not preclude that organization's standards from applying to another category.
- C. In addition, all work shall comply with the applicable requirements of local codes, utilities and other authorities having jurisdiction.
- D. All material and equipment, for which a UL Standard, an AGA or NSF approval or an ASME requirement is established, shall be so approved and labeled or stamped. The label or stamp shall be conspicuous and not covered, painted, or otherwise obscured from visual inspection.
- E. The standards which apply to this Project are not necessarily restricted to those organizations which are listed in Article 1.2.

1.2 STANDARD ORGANIZATIONS:

- A. Piping and Valves:
 - ACPA American Concrete Pipe Association
 - ANSI American National Standards Institute
 - API American Petroleum Institute
 - ASME American Society of Mechanical Engineers
 - AWWA American Water Works Association
 - CISPI Cast Iron Soil Pipe Institute
 - DIPRA Ductile Iron Pipe Research Association
 - FCI Fluid Controls Institute
 - MSS Manufacturers Standardization Society
 - NCPI National Clay Pipe Institute

NSF	National Sanitation Foundation
PPI	Plastic Pipe Institute
Uni-Bell	PVC Pipe Association
- B. Materials:
- | | |
|--------|--|
| AASHTO | American Association of State Highway and Transportation Officials |
| ALS | American Lumber Standards |
| AMA | Acoustical Materials Association |
| ANSI | American National Standards Institute |
| ASTM | American Society for Testing and Materials |
- C. Painting and Surface Preparation:
- | | |
|------|---|
| NACE | National Association of Corrosion Engineers |
| SSPC | Society for Protective Coatings |
- D. Steel, Concrete, and Asphalt:
- | | |
|------|--|
| ACI | American Concrete Institute |
| AI | Asphalt Institute |
| AISC | American Institute of Steel Construction, Inc. |
| AISI | American Iron and Steel Institute |
| CRSI | Concrete Reinforcing Steel Institute |
| NRMA | National Ready-Mix Association |
| PCA | Portland Cement Association |
| PCI | Prestressed Concrete Institute |
- E. Welding:
- | | |
|------|--|
| ASME | American Society of Mechanical Engineers |
| AWS | American Welding Society |
- F. Government and Technical Organizations:
- | | |
|------|--|
| AIA | American Institute of Architects |
| APHA | American Public Health Association |
| APWA | American Public Works Association |
| ASA | American Standards Association |
| ASAE | American Society of Agricultural Engineers |
| ASCE | American Society of Civil Engineers |
| ASQC | American Society of Quality Control |
| ASSE | American Society of Sanitary Engineers |
| CFR | Code of Federal Regulations |
| CSI | Construction Specifications Institute |
| EDA | Economic Development Administration |
| EPA | Environmental Protection Agency |
| EPD | Georgia Environmental Protection Division |
| FCC | Federal Communications Commission |
| FmHA | Farmers Home Administration |
| FS | Federal Specifications |

GCDWR	Gwinnett County Department of Water Resources
IAI	International Association of Identification
ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
ITE	Institute of Traffic Engineers
NBFU	National Board of Fire Underwriters
(NFPA)	National Fluid Power Association
NBS	National Bureau of Standards
NISO	National Information Standards Organization
OSHA	Occupational Safety and Health Administration
SI	Salt Institute
SPI	The Society of the Plastics Industry, Inc.
USDC	United States Department of Commerce
WEF	Water Environment Federation

- G. Roadways:
- | | |
|-------|---|
| AREA | American Railway Engineering Association |
| GDOT | Georgia Department of Transportation |
| GCDOT | Gwinnett County Department of Transportation |
| SSRBC | Standard Specifications for Construction of Transportation Systems,
Georgia Department of Transportation |
- H. Plumbing:
- | | |
|-----|--------------------------------|
| AGA | American Gas Association |
| NSF | National Sanitation Foundation |
| PDI | Plumbing Drainage Institute |
| SPC | SBCC Standard Plumbing Code |

1.3 SYMBOLS:

Symbols and material legends shall be as scheduled on the Drawings.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 42 19

SECTION 01 43 00
QUALITY ASSURANCE

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This section covers Quality Assurance and Quality Control requirements for this contract.
- B. The Contractor is responsible for controlling the quality of work, including work of its subcontractors, and suppliers and for assuring the quality specified in the Technical Specifications is achieved.
- C. Refer to the General Conditions Article 6 - Contractor's Responsibilities, paragraphs 6.01, 6.02, and 6.03.

1.02 SUMMARY:

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and control services required by, including but not limited to, Engineer, Owner, or authorities having jurisdiction, are not limited by provisions of this Section.
- C. Related Requirements:
 - 1. Divisions 01 through 44 Sections for specific test and inspection requirements.

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM):

1. E329: Standard Specification for Agencies Engaged in Construction Inspection and/or Testing

1.04 DEFINITIONS:

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer.
- C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- D. Product Testing: Tests and inspections that are performed by a Nationally Recognized Testing Laboratory (NRTL), an (National Voluntary Laboratory Accreditation Program (NVLAP), or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five (5) previous projects similar in nature, size,

and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.05 CONFLICTING REQUIREMENTS:

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.06 SUBMITTALS:

- A. Shop Drawings: Provide plans, sections, dimensions, and elevations, indicating materials and size of proposed construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- C. Qualification Data: For Contractor's quality-control personnel.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.07 CONTRACTOR'S QUALITY-CONTROL PLAN:

- A. Quality Control Plan, General: Submit quality-control plan within thirty (30) days of Notice to Proceed. Submit in format acceptable to Engineer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and accepted mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of accepted and rejected results. Include work Engineer has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.08 REPORTS AND DOCUMENTS:

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.

3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector, as applicable.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.09 QUALITY ASSURANCE:

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - d. When testing is complete, remove test specimens, assemblies; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - K. Codes and Standards: Refer to General Conditions Article 3 - Contract Documents: Intent, Amending, Reuse, paragraph 3.02 of the General Conditions.
 - L. Copies of applicable referenced standards are not included in the Contract Documents. Where copies of standards are needed by the Contractor for superintendence and quality control of the work, the Contractor shall obtain a copy or copies directly from the publication source and maintain at the jobsite, available to the Contractor's personnel, subcontractors, and Engineer
 - M. Quality of Materials: Unless otherwise specified, all materials and equipment furnished for permanent installation in the Work shall conform to applicable standards and specifications and shall be new, unused, and free from defects and imperfections, when installed or otherwise incorporated in the Work. The Contractor shall not use material and equipment for any purpose other than that intended or specified unless the Engineer authorizes such use.
 - N. Where so specified, products or workmanship shall also conform to the additional performance requirements included within the Contract Documents to establish a higher or more stringent standard or quality than that required by the referenced standard.
- 1.10 OFFSITE INSPECTION:
- A. When the specifications require inspection of materials or equipment during the production, manufacturing, or fabricating process, or before shipment, such services shall be performed by the Owner's independent testing laboratory, or inspection organization acceptable to Engineer in conjunction with or by the Engineer.
 - B. The Contractor shall give appropriate written notice to the Engineer not less than thirty (30) days before offsite inspection services are required, and shall provide for the

producer, manufacturer, or fabricator to furnish safe access and proper facilities and to cooperate with inspecting personnel in the performance of their duties.

1.11 MATERIALS AND EQUIPMENT:

- A. The Contractor shall maintain control over procurement sources to ensure that materials and equipment conform to specified requirements in the Contract Documents.
- B. The Contractor shall comply with manufacturer's printed instructions regarding all facets of materials and/or equipment movement, storage, installation, testing, startup, and operation. Should circumstances occur where the contract documents are more stringent than the manufacturer's printed instructions, the Contractor shall comply with the specifications. In cases where the manufacturer's printed instructions are more stringent than the contract documents, the Contractor shall advise the Engineer of the disparity and conform to the manufacturer's printed instructions. In either case, the Contractor is to apply the more stringent specification or recommendation, unless accepted otherwise by the Engineer.

1.12 QUALITY CONTROL:

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. The Contractor shall furnish a construction schedule and a minimum of 48 hour notice of readiness for testing and inspection of the work. The Engineer shall determine the exact time and location of field sampling and testing, and may require such additional sampling and testing to determine that materials and equipment conform with data previously furnished by Contractor and with the Contract Documents.
 - 3. The Contractor shall schedule the work to permit adequate time for testing and re-testing should test results not conform to the contract documents. Lack of testing or inspection which is attributable to insufficient notice by the Contractor or failure of the Contractor to cooperate, will be cause for rejection of the work.
 - 4. The Contractor shall deliver materials in sufficient quantities to the Owner's testing agency as may be required. Laboratory testing shall be performed within a reasonable time, consistent with the specified standards.
 - 5. The Contractor shall furnish material samples and cooperate in the field sampling and testing activities, interrupting the work when necessary. The Contractor shall furnish personnel, facilities and access to assist in the sampling and testing activities.

6. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
 3. Comply with manufacturers' instructions, including each step in sequence.
 4. When manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
 5. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
 6. Perform Work by persons qualified to produce required and specified quality.
 7. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
 8. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
 9. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 10. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.
 11. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 12. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

13. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Tolerances:
1. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
 2. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
 3. Adjust products to appropriate dimensions; position before securing products in place.
- D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections.
- E. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- F. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- G. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- H. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as

requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

- I. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

- J. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.13 SPECIAL TESTS AND INSPECTIONS:

- A. Special Tests and Inspections: Owner will engage a qualified agency to conduct special tests and inspections required, as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Engineer with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

3.02 PREPARATION:

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.03 QUALITY CONTROL:

- A. Quality control is the responsibility of the Contractor, and the Contractor shall maintain control over construction and installation processes to assure compliance with specified requirements.
- B. Certifications for personnel, procedures, and equipment associated with special processes (e.g., welding, cable splicing, surveying) shall be maintained by the Contractor, available for inspection by the Engineer. Copies shall be made available to the Engineer upon request.
- C. Means and methods of construction and installation processes are the responsibility of the Contractor, and at no time is it the intent of the Engineer to supersede or void that responsibility.

3.04 TEST AND INSPECTION LOG:

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Engineer.
 - 4. Identification of testing agency or special inspector conducting test or inspection.

- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's reference during normal working hours.

3.05 REPAIR AND PROTECTION:

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 29 Cutting and Patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 43 00

SECTION 01 45 29

TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.01 SCOPE:

- A. This Section includes testing which the Owner may require, beyond that testing required of the manufacturer, to determine if materials provided for the Project meet the requirements of these Specifications.
- B. This work also includes all testing required by the Owner to verify work performed by the Contractor is in accordance with the requirements of these Specifications, i.e., concrete strength, slump testing, soil compaction, etc.
- C. This work does not include materials testing required in various sections of these Specifications to be performed by the manufacturer.
- D. The testing laboratory or laboratories will be selected by the Owner. The testing laboratory or laboratories will work for the Owner.

1.02 PAYMENT FOR TESTING SERVICES:

- A. Testing services provided by the Owner will be paid by the Owner through GCDWR annual material testing contract. Testing services provided by the Contractor will be from the County's approved list, but paid by the Contractor.
- B. The cost of material testing described in various sections of these Specifications or as required in referenced standards to be provided by a material manufacturer, shall be included in the price bid for that item and shall not be paid for by the Owner.
- C. The cost of retesting any item that fails to meet the requirements of these Specifications shall be paid for by the Contractor. Retesting shall be performed by the testing laboratory working for the Owner.

1.03 LABORATORY DUTIES:

- A. Cooperate with the Owner, Engineer and Contractor.
- B. Provide qualified personnel promptly on notice.
- C. Perform specified inspections, sampling and testing of materials.

1. Comply with specified standards, ASTM, other recognized authorities, and as specified.
 2. Ascertain compliance with requirements of the Contract Documents.
 - D. Promptly notify the Engineer and Contractor of irregularity or deficiency of work which are observed during performance of services.
 - E. Promptly submit three (3) copies of report of inspections and tests in addition to those additional copies required by the Contractor; one (1) copy to the Owner, one (1) copy to the Engineer, and one (1) copy to the Contractor, with the following information included:
 1. Date issued
 2. Project title and number
 3. Testing laboratory name and address
 4. Name and signature of inspector
 5. Date of inspection or sampling
 6. Record of temperature and weather
 7. Date of test
 8. Identification of product and Specification section
 9. Location of Project
 10. Type of inspection or test
 11. Results of test
 12. Observations regarding compliance with the Contract Documents
 - F. Perform additional services as required.
 - G. The laboratory is not authorized to release, revoke, alter or enlarge on requirements of the Contract Documents, or approve or accept any portion of the Work.
- 1.04 CONTRACTOR RESPONSIBILITIES:
- A. Cooperate with laboratory personnel; provide access to Work and/or manufacturer's requirements.
 - B. Provide to the laboratory, representative samples, in required quantities, of materials to be tested.
 - C. Furnish copies of mill test reports.
 - D. Furnish required labor and facilities to:
 1. Provide access to Work to be tested;
 2. Obtain and handle samples at the site;
 3. Facilitate inspections and tests;
 4. Provide a clear, level and unobstructed location for placement of concrete curing

box(es) adjacent to the work area as agreed upon with the testing laboratory and the Engineer. Provide power and lighting at the curing box location.

- E. Furnish climatically controlled curing box(es) for field storage of cast concrete cylinders or other samples. Multiple boxes shall be furnished when concrete placement activities are being performed at multiple locations across the project site. Curing box shall be manufactured and marketed for the specific purpose described herein and shall meet standards ASTM C31, C192 and C511. Curing box shall be used to maintain temperature and humidity of the concrete cylinder specimens for 48 hours. Cure box shall feature a digital thermometer, heat/cool indicator lights; temperature set buttons and a capacity of 22 standard 6" x 12" cylinders. Use of field constructed curing boxes will not be acceptable.
- F. Notify the laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.
- G. Laboratory Tests: Where such inspection and testing are to be conducted by an independent laboratory agency, the sample(s) shall be selected by such laboratory or agency, or the Engineer, and shipped to the laboratory by the Contractor at Contractor's expense.
- H. Copies of all correspondence between the Contractor and testing agencies shall be provided to the Engineer.

1.05 QUALITY ASSURANCE:

- A. Testing shall be in accordance with all pertinent codes and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM).

1.06 PRODUCT HANDLING:

- A. Promptly process and distribute all required copies of test reports and related instructions to insure all necessary retesting or replacement of materials with the least possible delay in the progress of the Work.

1.07 FURNISHING MATERIALS:

- A. The Contractor shall be responsible for furnishing all materials necessary for testing.

1.08 CODE COMPLIANCE TESTING:

- A. Inspections and tests required by codes or ordinances or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of, and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1.09 CONTRACTOR'S CONVENIENCE TESTING:

- A. Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

1.10 SCHEDULES FOR TESTING:

A. Establishing Schedule

1. The Contractor shall, by advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings, and make all arrangements for the testing laboratory to be on site to provide the required testing.
2. Provide all required time within the construction schedule.

- B. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the testing laboratory as required.

- C. When the testing laboratory is ready to test according to the determined schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra costs for testing attributable to the delay will be back-charged to the Contractor and shall not be borne by the Owner.

1.11 TAKING SPECIMENS:

- A. Unless otherwise provided in the Contract Documents, all specimens and samples for tests will be taken by the testing laboratory or the Engineer.

1.12 TRANSPORTING SAMPLES:

- A. The Contractor shall be responsible for transporting all samples, except those taken by testing laboratory personnel, to the testing laboratory.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 45 29

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 SCOPE:

- A. Temporary facilities required for this work include, but are not necessarily limited to:
 - 1. Temporary utilities such as water and electricity.
 - 2. First aid facilities.
 - 3. Sanitary facilities.
 - 4. Potable water.
 - 5. Temporary enclosures and construction facilities.

1.02 GENERAL:

- A. First aid facilities, sanitary facilities and potable water shall be available on the Project site on the first day that any activities are conducted on site. The other facilities shall be provided as the schedule of the Project warrants.
- B. Maintenance: Use all means necessary to maintain temporary facilities in proper and safe condition throughout progress of the Work. In the event of loss or damage, immediately make all repairs and replacements necessary, at no additional cost to the Owner.
- C. Removal: Remove all such temporary facilities and controls as rapidly as progress of the Work will permit.

1.03 TEMPORARY UTILITIES:

- A. General
 - 1. Provide and pay all costs for all utilities required for the performance of the Work.
 - 2. Pay all costs for temporary utilities until Project completion.
 - 3. Costs for temporary utilities shall include all utilities necessary for the performance of testing as required by the Contract Documents.
- B. Temporary Water: Provide all necessary temporary piping, and upon completion of the Work, remove all such temporary piping.
- C. Temporary Electricity:

1. Provide all necessary wiring for the Contractor's use.
 2. Furnish, locate and install area distribution boxes such that the individual trades may use, their own construction type extension cords to obtain adequate power, and artificial lighting at all points where required for safety.
 3. Provide all temporary electrical services, wire, generators, etc. required for performance of the Work inclusive of maintaining existing facilities in service during required service shutdowns.
 4. Pay all fuel bills for temporary power required for the performance of the Work where required during shutdowns, bypass pumping etc.
- D. Lighting: Provide temporary lighting to meet all applicable safety requirements to allow application or installation of materials and equipment, and observation or inspection of the Work.
- E. Water:
1. Provide temporary facilities and piping required to bring water to point of use, and remove when no longer needed. Install an acceptable metering device for measuring water used.
 2. Provide a means to prevent water used for construction and testing from flowing back into source pipeline. Device(s) shall be as approved by Owner for backflow prevention.

1.04 FIRST AID FACILITIES:

- A. The Contractor shall provide a suitable first aid station, equipped with all facilities and medical supplies necessary to administer emergency first aid treatment. The Contractor shall have standing arrangements for the removal and hospital treatment of any injured person. All first aid facilities and emergency ambulance service shall be made available by the Contractor to the Owner and the Engineer's personnel.

1.05 SANITARY FACILITIES:

- A. Prior to starting the Work, the Contractor shall furnish, for use of Contractor's personnel on the job, subcontractors, and all other on-site personnel, all necessary toilet facilities which shall be secluded from public observation, as much as practical. These facilities shall be chemical toilets. All facilities shall be kept in a clean and sanitary condition and shall comply with the requirements and regulations of the area in which the Work is performed. Adequacy of these facilities will be subject to the Engineer's review and maintenance of same must be satisfactory to the Engineer at all times.
- B. Use of Owner's existing sanitary facilities by construction personnel will not be allowed.

1.06 POTABLE WATER:

- A. The Contractor shall be responsible for furnishing a supply of potable drinking water for employees, subcontractors, inspectors, engineers and the Owner who are associated with the Work.

1.07 ENCLOSURES AND CONSTRUCTION FACILITIES:

- A. Furnish, install and maintain for the duration of construction, all required scaffolds, tarpaulins, canopies, steps, bridges, platforms and other temporary construction necessary for proper completion of the Work in compliance with all pertinent safety and other regulations.

1.08 PARKING FACILITIES:

- A. Parking facilities for the Contractor's and Contractor's subcontractors' personnel shall be the Contractor's responsibility.

PART 2 – PRODUCT (NOT USED)

PART 3 – EXECUTION

3.01 PROTECTION OF WORK AND PROPERTY:

- A. General:
 - 1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
 - 2. No residence or business shall be cut off from vehicular traffic for a period exceeding 4 hours, unless special arrangements have been made.
 - 3. Maintain in continuous service all existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and all other utilities encountered along line of the Work, unless other arrangements satisfactory to owners of said utilities have been made.
 - 4. Where completion of the Work requires temporary or permanent removal and/or relocation of existing utility, coordinate all activities with owner of said utility and perform all work to their satisfaction.
 - 5. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
 - 6. Keep fire hydrants and water control valves free from obstruction and available

for use at all times.

7. In areas where Contractor's operations are adjacent to or near a utility, such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection thereof have been made by Contractor.
8. Utility Interruptions:
 - a. Notify property owners and utility owner offices that may be affected by construction operation at least two (2) days in advance.
 - b. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to Contractor's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
9. Do not impair operation of existing sewer systems. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
10. Maintain original site drainage wherever possible.

B. Trees and Plantings:

1. Protect from damage and preserve trees, shrubs, and other plants outside limits of the Work and within limits of the Work, which are designated on the Drawings to remain undisturbed.
 - a. Where practical, tunnel beneath trees when on or near line of trench.
 - b. Employ hand excavation as necessary to prevent tree injury.
 - c. Do not stockpile materials or permit traffic within drip lines of trees.
 - d. Provide and maintain temporary barricades around trees.
 - e. Water vegetation as necessary to maintain health.
 - f. Cover temporarily exposed roots with wet burlap, and keep burlap moist until soil is replaced around roots.
 - g. No trees, except those specifically shown on Drawings to be removed, shall be removed without written approval of Engineer.
 - h. Dispose of removed trees in a legal manner off the site.
2. In event of damage to bark, trunks, limbs, or roots of plants that are not designated for removal, treat damage by corrective pruning, bark tracing, application of a heavy coating of tree paint, and other accepted horticultural and

tree surgery practices.

3. Replace each plant that dies as a result of construction activities.

- C. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.
- D. Dewatering: Construct, maintain, and operate cofferdams, channels, flume drains, sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Maintain foundations and parts of the Work free from water.

3.02 TEMPORARY CONTROLS:

A. Air Pollution Control:

- 1. Minimize air pollution from construction operations.
- 2. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to site.
- 3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.
- 4. Provide and maintain temporary dust-tight partitions, bulkheads, or other protective devices during construction to permit normal operation of existing facilities. Construct partitions of plywood, insulating board, plastic sheets, or similar material. Construct partitions in such a manner that dust and dirt from demolition and cutting will not enter other parts of existing building or facilities. Remove temporary partitions as soon as need no longer exists.

B. Noise Control:

- 1. Provide acoustical barriers so noise emanating from tools or equipment will not exceed legal noise levels.
- 2. Noise Control Ordinance: Gwinnett County Code of Ordinances, Section 42 - 46 through 42 - 48.

C. Water Pollution Control:

- 1. Divert sanitary sewage and nonstorm waste flow interfering with construction and requiring diversion to sanitary sewers. Do not cause or permit action to occur which would cause an overflow to existing waterway.

2. Prior to commencing excavation and construction, obtain Engineer's agreement with detailed plans showing procedures intended to handle and dispose of sewage, groundwater, and stormwater flow, including dewatering pump discharges.
3. Comply with procedures outlined in U.S. Environmental Protection Agency manuals entitled, "Guidelines for Erosion and Sedimentation Control Planning" and "Implementation, Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity," and "Erosion and Sediment Control-Surface Mining in Eastern United States."
4. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and lawful disposal of waste materials, debris, and rubbish.

D. Erosion, Sediment, and Flood Control:

1. Provide, maintain, and operate temporary facilities to control erosion and sediment releases, and to protect the Work and existing facilities from flooding during construction period.
2. Install erosion and sediment controls as shown on the Drawings, in accordance with applicable local, state, and federal regulations, and as directed by the Engineer.

3.03 STORAGE YARDS AND BUILDINGS:

- A. Temporary Storage Yards: Construct temporary storage yards for storage of products that are not subject to damage by weather conditions.
- B. Temporary Storage Buildings:
 1. Provide environmental control systems that meet recommendations of manufacturers of equipment and materials stored.
 2. Arrange or partition to provide security of contents and ready access for inspection and inventory.
 3. Store combustible materials (paints, solvents, fuels, etc.) in a well-ventilated and remote building meeting safety standards.

3.04 PARKING AREAS:

- A. Control vehicular parking to preclude interference with public traffic or parking, access

by emergency vehicles, Owner's operations, or construction operations.

- B. Provide parking facilities for personnel working on the Project.

END OF SECTION 01 50 00

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.01 SCOPE:

- A. These general product stipulations apply to all equipment and piping. They supplement the detailed product Specifications, but in case of conflict, the detailed product Specifications shall govern.

1.02 COORDINATION:

- A. The Contractor shall assume full responsibility for the coordination of the installation of all equipment, materials and products furnished under these Contract Documents. The Contractor shall be completely responsible for verification that all structures, piping and equipment components furnished by the Contractor and/or subcontractors and suppliers are compatible. The Contractor shall place in service, each pipeline system and shall make all necessary alterations. All such alterations shall be made at the Contractor's expense.

1.03 ADAPTATION AND LOCATION OF EQUIPMENT:

- A. No responsibility for alteration of a planned structure to accommodate other types of equipment will be assumed by the Owner. Equipment which requires alteration of the structures will be considered only if the Contractor assumes all responsibility for making and coordinating all necessary alterations. All such alterations shall be made at the Contractor's expense.
- B. The Contractor shall install the work in such manner that the equipment, piping, vents, conduit, panels, ductwork and appurtenances be as neatly installed with adequate space for maintenance and passage of personnel.

1.04 PATENT ROYALTIES:

- A. All royalties and fees for patents covering materials, articles, apparatus, devices or equipment shall be included in prices bid by the Contractor.

1.05 WARRANTY:

- A. The Contractor shall warrant all work against faulty or inadequate installation, improper assembly or erection, defective materials, breakage or other failure. The warranty period shall be defined in Section 01 78 36 of these Specifications.

1.06 WORKMANSHIP AND MATERIALS:

- A. All products shall be designed, fabricated and assembled in accordance with the most modern engineering and shop practice. Individual parts shall be manufactured to standard sizes and gauges so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Products shall be new and shall not have been in service at any time prior to delivery, except as required by tests.
- B. Materials shall be suitable for service conditions. Iron castings shall be tough, close grained, gray iron free from blowholes, flaws or excessive shrinkage and shall conform to ASTM A48, Class 30 minimum. Plugging of defective castings shall not be permitted. Castings shall be annealed to remove internal stresses prior to machining and shall have the mark number and heat number cast on them.
- C. Except where otherwise specified, structural and miscellaneous fabricated steel used in items of equipment shall conform to the Standards of the American Institute of Steel Construction. All structural members shall be considered as subject to shock or vibratory loads.
- F. All products delivered to the Project site shall include detailed installation instructions and a parts list.

1.07 EQUIPMENT SPECIFICATIONS:

- A. The use of singular or plural terminology in the Specifications is not intended to define the number of units required to fulfill Contract requirements. Bidders must consult the Drawings and Specifications to determine how many units of a particular product are required. This does not relieve the Contractor of the responsibility to provide all equipment specified when multiple units are specifically required in the Specifications.

1.08 GROUTING:

- A. A special epoxy, non-shrink, or sand-cement grout shall be used in grouting applications as shown on the Drawings.

1.09 WELDING AND BRAZING:

- A. All welds shall be sound and free from embedded scale and slag. All butt welds shall be continuous, and where exposed to view, shall be ground smooth. All continuous welds shall be gas and liquid-tight. Welds in piping shall have full penetration and shall be smooth on the inside of the pipe. Intermittent welds shall have an effective length of at least two (2) inches and shall be spaced not more than six (6) inches apart.

- B. All welding of steel and aluminum, including materials, welding techniques, general safety practices, appearance and quality of welds, and methods of correcting defective work, shall conform to the latest requirements of AWS Specifications. Structural steel welding shall conform to the requirements of the AWS Structural Welding Code. The general recommendations and requirements of the AWS Structural Welding Code shall also apply to welded aluminum structures. The welding process and welding operators shall meet qualification tests and welding performance tests in accordance with the latest provisions of ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications. Welding process and qualification procedures for welding of pipe shall conform to the latest requirements of ANSI B31.1, Section 327, Welding, and Section 328, Brazing and Soldering. All welding qualification tests shall be witnessed by the Engineer, except as provided herein. All costs associated with the qualification or testing of welders and welding operators shall be borne by the Contractor.
- C. Reports certifying that the welding procedures, welders and welding operators that the Contractor intends to use meet the requirements specified above. These reports shall be submitted to the Engineer prior to beginning the Work. In the case of welder qualifications for shop welding and for carbon steel field welding, welders presenting certified qualification papers validated within the preceding six (6) month period will not be required to take the qualification tests. In the case of field welding of stainless steel or aluminum, all welders shall be required to take the qualification tests regardless of past experience or availability of certified qualification papers.
- D. Field welding practices shall conform to OSHA construction standards, Part 1926, Subpart J, Welding and Cutting. Shop welding practices shall conform to OSHA General Industry Standards, Part 1910, Subpart Q, Welding, Cutting, and Brazing.
- E. Welding electrodes for structural steel shall conform to the standard recommendations of the AISC. Welding electrodes for stainless steel shall conform to applicable AWS Specifications and shall be as recommended by "Welded Austenitic Chromium-Nickel Stainless Steels, Techniques and Properties", published by the International Nickel Company, New York, New York. Welding electrodes for aluminum shall conform to applicable AWS Specifications.
- F. Each welder and welding operator must identify all welds with welder's assigned symbol.
- G. Welders performing unsatisfactory work shall be removed from the welding process.
- H. The Owner may inspect any weld by radiographic or other means. Welds not in accordance with the requirements specified herein shall be repaired or replaced at the Contractor's expense. Excessive porosity, nonmetallic inclusions, lack of fusion, incomplete penetration and cracking shall constitute grounds for rejection of welds.

1.10 SHOP PRIMING AND PAINTING:

- A. All factory and shop priming and painting, including surface preparation, workmanship and materials, shall be as specified by manufacturer.

1.11 FIELD PRIMING:

- A. All iron and carbon steel surfaces not specified to be galvanized or shop primed and all ferrous or nonferrous surfaces specified to be field primed and painted shall be coated in the field with one or more coats of primer in accordance with the manufacturer's specifications.

1.12 FIELD PAINTING:

- A. Except for interior surfaces of vessels and enclosed equipment not specified to be field painted, all ferrous and nonferrous surfaces of equipment which have received one or more coats of shop or field applied primer shall be field painted after installation in accordance with the manufacturer's specifications.

1.13 GALVANIZING:

- A. All galvanizing shall be done by the hot-dip process after fabrication in conformity with requirements of ASTM A 123, Grade 100; ASTM A 153, ASTM A 384 and ASTM A 385. Articles to be galvanized shall be pickled before galvanizing. Articles to be painted shall not be quenched.
- B. Where galvanized bolts are specified or required by the Drawings, zinc plated bolts will be acceptable provided zinc plating conforms to ASTM B 633, Type II.
- C. Areas of galvanizing damaged at the factory by welding or burning or otherwise damaged shall be thoroughly stripped and cleaned and recoated with zinc to the required thickness by the hot dip process. Areas of galvanizing damaged in the field during transportation, handling or installation shall be stripped, cleaned, and recoated with zinc to the required thickness in accordance with ASTM A 780, Annex A3.
- D. Galvanized articles shall be free from uncoated spots, blisters, flux, black spots, dross, projections and other defects not consistent with acceptable galvanizing practice.
- E. Zinc and cadmium plating shall be subject to visual examination to determine uniformity of coating. The Engineer may require that the coating uniformity be tested in accordance with ASTM A 239 or ASTM E 376.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 60 00

SECTION 01 65 00

PRODUCT DELIVERY REQUIREMENTS

PART 1 – GENERAL

1.1 SCOPE:

- A. The Contractor shall provide transportation of all equipment, materials and products furnished under these Contract Documents to the Work site. In addition, the Contractor shall provide preparation for shipment, loading, unloading, handling and preparation for installation and all other work and incidental items necessary or convenient to the Contractor for the satisfactory prosecution and completion of the Work.
- B. All equipment, materials and products damaged during transportation or handling shall be repaired or replaced by the Contractor at no additional cost to the Owner prior to being incorporated into the Work.

1.2 PREPARATION FOR SHIPMENT:

- A. When practical, factory-assemble products. Match mark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with a strippable protective coating.
- B. Package products to facilitate handling and protect from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of Project, and Contractor, product number, and approximate weight. Include complete packing lists and bills of materials with each shipment.
- C. Deliver materials to project site and place at a location determined by Contractor.
- D. Notify Engineer and Owner's Inspector upon arrival.
- E. Protect equipment from exposure to the elements and keep dry and dust-free as far as practical. Protect painted surfaces against impact, abrasion, discoloration, or other damage.
- F. For major items, request a minimum seven (7) day advance notice of shipment from manufacturers. Upon receipt of manufacturer's advance notice of shipment, promptly notify Engineer of anticipated date of equipment arrival.
- G. Factory Test Results: Reviewed and accepted by Engineer before product shipment as required in individual Specification sections.

1.3 TRANSPORTATION:

- A. All products shall be suitably boxed, crated or otherwise protected during transportation.
- B. Where products will be unloaded using cranes, forklifts, or other hoisting equipment, the Contractor shall ensure that the weights of the assembled sections do not exceed the capacity of the hoisting equipment.
- C. Small items and appurtenances such as gauges and valves, which could be damaged during shipment shall be removed from the equipment prior to shipment, packaged and shipped separately. All openings shall be plugged or sealed to prevent the entrance of water or dirt.

1.4 HANDLING:

- A. Handle products in accordance with the manufacturer's written instructions, and in a manner to prevent damage. Store products, upon delivery, in accordance with manufacturer's instructions, with labels intact and legible, in approved storage yards or sheds. Provide manufacturer's recommended maintenance during storage, installation, and until products are accepted for use by Owner.
- B. Lifting and handling drawings and instructions furnished by the manufacturer or supplier shall be strictly followed. Eyebolts or lifting lugs furnished on the equipment shall be used in handling the equipment. Spreader bars or lifting beams shall be used when the distance between lifting points exceeds that permitted by standard industry practice.
- C. Under no circumstances shall equipment or products such as pipe, structural steel, castings, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground.
- D. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.

1.5 OWNER FURNISHED EQUIPMENT:

- A. Owner furnished equipment shall mean any Owner purchased equipment and such being required by these Specifications to be installed by the Contractor.
- B. The Contractor shall off load and store all Owner furnished equipment per this Section of these Specifications.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 65 00

SECTION 01 66 00

PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 – GENERAL

1.01 SCOPE:

- A. The work under this Section includes, but not limited to, the furnishing of all labor, tools and materials necessary to properly store and protect all materials, equipment, products and the like, as necessary for the proper and complete performance of the Work.
- B. The Contractor shall be responsible for selecting and securing a storage site or sites necessary for the construction of this Project.

1.02 STORAGE AND PROTECTION:

A. Storage:

- 1. Maintain ample way for foot traffic at all times, except as otherwise approved by the Engineer. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration. Keep running account of products in storage to facilitate inspection and to estimate progress payments for products delivered but not installed in the Work.
- 2. All property damaged by reason of storing of material shall be properly replaced at no additional cost to the Owner.
- 3. Packaged materials shall be delivered in original unopened containers and so stored until ready for use.
- 4. All materials shall meet the requirements of these Specifications at the time that they are used in the Work.
- 5. Store products in accordance with manufacturer's instructions.

B. Protection:

- 1. Use all means necessary to protect the materials, equipment and products of every section before, during and after installation and to protect the installed work and materials of all other trades.
- 2. All materials shall be delivered, stored and handled to prevent the inclusion of foreign materials and damage by water, breakage, vandalism or other causes.

- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary for the approval of the Engineer and at no additional cost to the Owner.

- D. All equipment shall be boxed, crated or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept clean and dry, as far as practical. All products shall be stored above ground level and adequately supported on wood blocking or other approved support material. Printed storage instructions of the manufacturers shall be strictly adhered to.
- E. Painted, anodized or otherwise coated surfaces shall be protected against impact, abrasion, discoloration and other damage. All coated surfaces which are damaged prior to acceptance of equipment shall be cleaned and coated to the satisfaction of the Engineer with the same or equivalent coating used in the original application.
- F. Individually packaged, unpainted steel parts shall be protected by a wrapping of vapor phase inhibiting or oil-impregnated paper and polyethylene film prior to shipment.
- G. Parts and equipment not requiring periodic inspection or maintenance shall be stored unopened in their original packaging until used.
- H. Flanged openings on equipment shall be covered with suitable solid wooden or metal blanks securely bolted to the flange using a minimum of four bolts and a suitable rubber gasket. Ends of threaded pipe and fittings shall be sealed watertight with metal or plastic caps. Threaded openings shall be sealed watertight with metal or plastic plugs. Other openings shall be sealed with two layers of 6 mil polyethylene securely taped in place with waterproof tape.
- I. Immediately prior to installation, equipment shall be cleaned of any protective coatings used during storage and any rust, dirt, grit or other foreign material shall be removed.
- J. After storage, rubber parts such as valve seats, diaphragms, expansion joints, gaskets, hoses and shaft couplings shall be checked for hardening or cracking. Deteriorated parts shall be replaced prior to placing in service by the Contractor at Contractor's own expense.
- K. Unless otherwise permitted in writing by the Engineer, building products and materials such as cement, grout, plaster, particleboard, finish lumber, wiring, etc., shall be stored indoors in a dry location. Building products such as rough lumber, plywood, concrete block and structural tile may be stored outdoors.
- L. Tarps and other coverings shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation. Tarps and covers shall be arranged to prevent ponding of water.

1.03 OWNER FURNISHED EQUIPMENT:

- A. The Contractor shall provide storage and protection for all Owner furnished equipment and materials, including extended storage as specified above.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 66 00

SECTION 01 71 23.16

CONSTRUCTION SURVEYING

PART 1 – GENERAL

1.1 SCOPE:

- A. Construction surveying shall include all of the surveying work required to layout the Work and control the location of the finished Project. The Contractor shall have the full responsibility for constructing the Project to the correct horizontal and vertical alignment, as shown on the Drawings, as specified, or as directed by the Engineer. The Contractor shall assume all costs associated with rectifying work constructed in the wrong location.
- B. From the information shown on the Drawings and the information to be provided as indicated under Project Conditions below, the Contractor shall:
 - 1. Be responsible for setting reference points and/or offsets, establishment of baselines, and all other layout, staking, and all other surveying required for the construction of the Project.
 - 2. Safeguard all reference points, stakes, grade marks, horizontal and vertical control points, and shall bear the cost of re-establishing same if disturbed.
 - 3. Stake out the permanent and temporary easements or the limits of construction to ensure that the Work is not deviating from the indicated limits.
 - 4. Be responsible for all damage done to reference points, baselines, center lines and temporary bench marks, and shall be responsible for the cost of re-establishment of reference points, baselines, center lines and temporary bench marks as a result of the operations.
- C. Baselines shall be defined as the line to which the location of the Work is referenced, i.e., edge of pavement, road centerline, property line, right-of-way or survey line.
- D. Record Drawing surveys shall be performed in accordance with Section 01 78 39.

1.2 PROJECT CONDITIONS:

- A. The Drawings provide the location and/or coordinates of principal components of the Project. The alignment of some components of the Project may be indicated in the Specifications. The Engineer may order changes to the location of some of the components of the Project or provide clarification to questions regarding the correct alignment.
- B. The location and elevation of benchmarks are shown on Drawings.

- C. Check and establish exact location of existing facilities prior to construction of new facilities and any connections thereto.

1.3 QUALITY ASSURANCE:

- A. The Contractor shall furnish documentation, prepared by a surveyor currently registered in the State of Georgia, confirming that staking is being done to the horizontal and vertical alignment shown in the Contract Documents. This requires that the Contractor hire, at the Contractor's own expense, a currently registered surveyor, acceptable to the Owner, to provide ongoing construction staking or confirmation of such.
- B. Any deviations from the Drawings shall be confirmed by the Engineer prior to construction of that portion of the Project.
- C. Construction Verification Surveying
 - 1. The Engineer may verify the Contractor's reference points, centerlines and work performed. This verification activity in no way relieves the Contractor of the responsibility of installing reference points, centerlines, temporary benchmarks, verifying that the work has been performed accurately, and all other work covered by this Section.

1.4 SITE WORK:

- A. Staking Precision: The precision of construction staking shall match the precision of a component's location indicated on the Drawings. Staking of utilities shall be done in accordance with generally accepted practice for the type of utility.
- B. Written certification, by a licensed surveyor, that structure base grade and structure locations match the locations shown on the Drawings is required prior to beginning construction of the structure.
- C. Paved Surfaces: The Contractor shall establish a reference point for establishing and verifying the paving subgrade and finished grade elevations. Any variance with plan grades shall be identified by the Contractor and confirmed by the Engineer prior to constructing the road base.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 71 23.16

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 – GENERAL

1.1 SCOPE:

- A. The work under this Section includes, but is not necessarily limited to, cutting and patching work as indicated on the Drawings, herein specified and as necessary for proper and complete performance of the Work.
- B. Requirements for cutting and patching may be described in various sections of these Specifications.
- C. Execute cutting, including excavating and filling, or patching of work required to:
 - 1. Make several parts fit properly.
 - 2. Uncover work to provide for installation of ill-timed work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of the Contract Documents.
 - 5. Remove samples of the installed work as specified for testing.
 - 6. Install specified work in existing construction.
- D. In addition, upon written instruction of the Engineer:
 - 1. Uncover work to provide for the Engineer's observation of covered work.
 - 2. Remove samples of the installed materials for testing.
 - 3. Remove work to provide for alteration of existing work.
- E. Protection of Work:
 - 1. Do not endanger any work by cutting or altering the Work or any part of it.
 - 2. Do not cut or alter the work of another contractor without written consent of the Engineer.

1.2 SUBMITTALS:

- A. Prior to cutting which affects the structural safety of the Project or the work of another contractor, submit a written notice to the Engineer requesting consent to proceed with cutting. The notice shall include:
 - 1. Identification of Project.

2. Description of defective Work.
 3. Necessity for cutting.
 4. Affect on other work or on the structural integrity of the Project.
 5. Description of the proposed work including:
 - a. Scope of cutting and patching
 - b. Subcontractor and trades to execute work
 - c. Products proposed to be used
 - d. Extent of refinishing
 6. Alternatives to cutting and patching.
 7. Designation of party responsible for the cost of cutting and patching.
- B. Cost Estimate: Prior to cutting and patching performed on instruction of the Engineer, submit a cost estimate.
- C. Should conditions of the Work or the schedule necessitate alternative materials or methods, submit a written recommendation to the Engineer that includes:
1. Compelling conditions for alternative materials or methods.
 2. Recommended alternative materials or methods.
 3. Submittals as required for substitutions.
- D. Uncovered Work: Submit written notice to the Engineer designating the time the work will be uncovered for the Engineer's observation.

1.3 PAYMENT FOR COST:

- A. Contractor's Costs: Costs caused by ill-timed or defective work or work not conforming to the Contract Documents, including costs for additional services of the Engineer, shall be paid by the Contractor.
- B. Owner's Costs: Cost of work done as the result of the Engineer's/Owner's instructions, which is not shown on the Drawings or specified, other than defective or non-conforming work, will be paid for by the Owner.

PART 2 – PRODUCTS

2.1 MATERIALS:

- A. All products and materials shall conform to the requirements of the Specifications for the type of work being performed, except where no products are specified in these Specifications for the item being replaced; then the products and materials shall be of an equivalent type, quality, thickness and width of the item removed.

PART 3 – EXECUTION

3.1 INSPECTION:

- A. Inspect existing conditions of the Work including elements subject to movement or damage during cutting and patching, or excavating and backfilling.
- B. After uncovering work, inspect conditions affecting the installation of new products.

3.2 PREPARATION:

- A. Provide shoring, bracing and support as required to maintain structural integrity of the Project.
- B. Provide protection for other portions of the Project and provide protection from the elements.

3.3 PERFORMANCE:

- A. Execute fitting and adjustments of products to provide finished installation that complies with specified tolerances and finishes.
- B. Execute cutting and demolition by means that will prevent damage to other work and will provide proper surfaces to receive installation of repairs and new work.
- C. Execute excavating and backfilling as specified in Section 31 23 00 Excavation and Fill.
- D. Restore work which has been cut or removed and install new products to provide completed work in accordance with the requirements of the Contract Documents.
- E. Refinish entire surfaces as necessary to provide an even finish. Continuous surfaces shall be refinished to the nearest intersection and assemblies shall be entirely refinished.

END OF SECTION 01 73 29

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 SUMMARY:

- A. Section includes administrative and procedural requirements for:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 01 50 00 Temporary Facilities and Controls for environmental-protection measures during construction, and location of waste containers at Project site.
 - 2. Section 31 11 00 Clearing and Grubbing for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.02 DEFINITIONS:

- A. Construction Waste: Structure and site improvement materials and other solid waste resulting from construction, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Structure and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycle, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.03 PERFORMANCE REQUIREMENTS:

- A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:

- a. Asphalt paving.
- b. Concrete.
- c. Concrete reinforcing steel.
- d. Brick.
- e. Concrete masonry units.
- f. Structural and miscellaneous steel.
- g. Piping.
- h. Supports and hangers.
- i. Valves.
- j. Sprinklers.

2. Construction Waste:

- a. Masonry and CMU.
- b. Lumber.
- c. Wood sheet materials.
- d. Wood trim.
- e. Metals.
- f. Piping.
- g. Electrical conduit.
- h. Packaging: Salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

1.04 INFORMATIONAL SUBMITTALS:

- A. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.05 QUALITY ASSURANCE:

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan.
 - 2. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 3. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

1.06 WASTE MANAGEMENT PLAN:

- A. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PLAN IMPLEMENTATION:

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with operation, termination, and removal requirements in Section 01 50 00 Temporary Facilities and Controls.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three (3) days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with Section 01 50 00 Temporary Facilities and Controls for controlling dust and dirt, environmental protection, and noise control.

3.02 SALVAGING DEMOLITION WASTE:

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.

3.03 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL:

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:

1. Recycling Bank of Gwinnett.
 2. Blaze Recycling.
 3. Snellville Recycling Center.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 4. Store components off the ground and protect from the weather.
 5. Remove recyclable waste and transport to recycling receiver or processor.

3.04 RECYCLING DEMOLITION WASTE:

- A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch (38-mm) size.
1. Crush asphaltic concrete paving.
 2. Break up and transport paving to asphalt-recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
1. Pulverize concrete to maximum 1-1/2-inch (38-mm) size.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
1. Pulverize masonry to maximum 1-1/2-inch (38-mm) size.
 2. Clean and stack undamaged, whole masonry units on wood pallets.

3.05 RECYCLING CONSTRUCTION WASTE:

A. Packaging:

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

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Section 32 92 00 Turf and Grasses for use of clean sawdust as organic mulch.

3.06 DISPOSAL OF WASTE:

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from site and legally dispose of them.

END OF SECTION 01 74 19

SECTION 01 74 23

FINAL CLEANING

PART 1 – GENERAL

1.1 SCOPE:

- A. This Section covers the general cleaning which the Contractor shall be required to perform both during construction and before final acceptance of the Project unless otherwise shown on the Drawings or specified elsewhere in these Specifications.

1.2 QUALITY ASSURANCE:

- A. Daily, and more often if necessary, conduct inspections verifying that requirements of cleanliness are being met.
- B. In addition to the standards described in this Section, comply with all pertinent requirements of governmental agencies having jurisdiction.

1.3 HAZARDOUS MATERIAL AND WASTE:

- A. The Contractor shall handle hazardous waste and materials in accordance with applicable local, state, and federal regulations. Waste shall also be disposed of in approved landfills as applicable.
- B. The Contractor shall prevent accumulation of wastes which create hazardous conditions.
- C. Burning or burying rubbish and waste materials on the site shall not be allowed.
- D. Disposal of hazardous wastes or materials into sanitary or storm sewers shall not be allowed.

1.4 DISPOSAL OF WASTE:

- A. The definitions contained in Georgia Environmental Protection Division Rules 391-3-4-.01 shall be applicable to this Project. The term waste shall include excess and surplus materials, and shall include liquid and solid wastes.
- B. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

- C. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on-site.
- D. Remove and transport waste in a manner that will prevent spillage on adjacent surfaces and areas.
- E. Burning: Do not burn waste materials on site.
- F. Waste removed from the Project site shall be disposed of in sites permitted by the Georgia Environmental Protection Division for the acceptance of type of waste being disposed. The acceptable types of permitted disposal facilities are as follows:
 - 1. Inert Waste Landfills
 - 2. Municipal Solid Waste Landfills
 - 3. Municipal Solid Waste Landfills permitted to receive only construction and demolition wastes.
- G. Exceptions to Paragraph F are as follows:
 - 1. Hazardous waste shall be disposed of in accordance with Georgia Environmental Protection Division Rules 391-3-11.
 - 2. Asbestos-containing waste shall also be handled and disposed in accordance with Georgia Environmental Protection Division Rules 391-3-14.
 - 3. Excess earth material and excess excavated rock material may be placed on sites for which the Contractor provides to the Owner a signed affidavit from the property owner that the placement of such material is acceptable to the property owner. The Contractor and property owner shall be responsible for all permitting of such disposal.
- H. No waste shall be placed at a transfer station facility.
- I. The Contractor shall maintain records related to all waste removed from the Project site so as to allow the Owner or the Engineer to readily determine the following:
 - 1. Date waste removed from Project site.
 - 2. Name of hauler (company and driver) transporting such waste.
 - 3. General description of waste transported.
 - 4. "Truck tickets" indicating the waste disposal site and amount of waste disposed therein.
- J. For all wastes hauled to any landfill, the handler of such wastes must be licensed in accordance with Georgia Environmental Protection Division rules.

PART 2 – PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT:

- A. Provide all required personnel, equipment and materials needed to maintain the specified standard of cleanliness.

2.2 COMPATIBILITY:

- A. Use only the methods and equipment which are compatible with the type of waste being removed, as recommended by the manufacturer of the material or as approved by the Engineer.

PART 3 – EXECUTION

3.1 PROGRESS CLEANING:

A. General

1. Do not allow the accumulation of scrap, debris, waste material and other items not required for construction of this Work.
2. At least each week, and more often if necessary, completely remove all scrap, debris and waste material from the job site.
3. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the environment.

B. Site

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.
2. Restack materials stored on site weekly.
3. At all times maintain the site in a neat and orderly condition which meets the approval of the Engineer.

3.2 FINAL CLEANING:

- A. Definitions: Unless otherwise specifically specified, “clean” for the purpose of this Article shall be interpreted as removal of all tools, equipment, surplus materials, scrap, debris, trash, or other waste materials from the site; restoring the site to its pre-construction condition.
- B. General: Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris and waste. Conduct final progress cleaning as described in 3.1 above.
- C. Site: Unless otherwise specifically directed by the Engineer, hose down all paved areas on the site and all public sidewalks directly adjacent to the site; rake clean other surfaces of the grounds. Completely remove all resultant debris.

D. Structures

1. Remove all traces of soil, waste material, splashed material, and other foreign matter to provide a uniform degree of exterior cleanliness. Visually inspect all exterior surfaces and remove all traces of soil, waste material, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure. In the event of stubborn stains not removable with water, the Engineer may require light sandblasting or other cleaning at no additional cost to the Owner.

- E. Post-Construction Cleanup: All evidence of temporary construction facilities, haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other evidence of construction, shall be removed as directed by the Engineer.
- F. Restoration of Landscape Damage: Any landscape feature damaged by the Contractor shall be restored as nearly as possible to its original condition at the Contractor's expense. Restoration shall be performed to the satisfaction of the Engineer.
- G. Timing: Schedule final cleaning as approved by the Engineer to enable the Owner to accept the Project.

END OF SECTION 01 74 23

SECTION 01 78 36

WARRANTIES

PART 1 – GENERAL

1.1 PROJECT MAINTENANCE AND WARRANTY:

- A. Maintain and keep in good repair the Work covered by these Drawings and Specifications until acceptance by the Owner.
- B. Warranty Period: The Contractor shall warrant for a period of one (1) year from the date of Owner's written Final Acceptance of the Project, as defined in the Contract Documents, that the completed Work is free from all defects due to faulty products or workmanship, and the Contractor shall promptly make such corrections as may be necessary by reason of such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect throughout the Warranty Period.
- C. The Contractor shall not be obligated to make replacements which become necessary because of ordinary wear and tear, or as a result of improper operation or maintenance, or as a result of improper work or damage by another Contractor or the Owner, or to perform any work which is normally performed by a maintenance crew during operation.
- D. In the event of multiple failures of major consequences prior to the expiration of the one (1) year warranty described above, the affected work shall be disassembled, inspected and modified or replaced as necessary to prevent further occurrences. All related components which may have been damaged or rendered non-serviceable as a consequence of the failure shall be replaced. A new warranty period equal to the original warranty period shall be provided against defective or deficient design, workmanship, and materials and shall commence on the day that the item is reassembled and placed back into operation. As used herein, multiple failure shall be interpreted to mean two (2) or more successive failures of the same kind in the same item or failures of the same kind in two or more items. Major failures may include, but are not limited to, cracked or broken piping, or vessels, excessive deflections, excessive wear or excessive leakage around seals. Failures which are directly and clearly traceable to operator abuse, such as operations in conflict with published operating procedures or improper maintenance, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over-or under-lubrication and using maintenance procedures not conforming with published maintenance instructions, shall be exempted from the scope of the one (1) year warranty. Should multiple failures occur in a given item, all products of the same size and type shall be inspected, modified or replaced as necessary and rewarranted for the original full Warranty Period.

- E. The Contractor shall, at Contractor's own expense, furnish all labor, materials, tools and equipment required and shall make such repairs and removals and shall perform such work or reconstruction as may be made necessary by any structural or functional defect or failure resulting from neglect, faulty workmanship or faulty materials, in any part of the Work performed by the Contractor. Such repair shall also include refilling of trenches, excavations or embankments which show settlement or erosion after backfilling or placement.
- F. Except as noted on the Drawings or as specified, all structures such as embankments and fences shall be returned to their original condition prior to the completion of the Contract. Any and all damage to any facility not designated for removal, resulting from the Contractor's operations, shall be promptly repaired by the Contractor at no cost to the Owner.
- G. The Contractor shall be responsible for all road and entrance reconstruction and repairs and maintenance of same for a period of one (1) year from the date of final acceptance. In the event the repairs and maintenance are not made immediately and it becomes necessary for the owner of the road to make such repairs, the Contractor shall reimburse the owner of the road for the cost of such repairs.
- H. In the event the Contractor fails to proceed to remedy the defects upon notification within ten (10) days of the date of such notice, the Owner reserves the right to cause the required materials to be procured and the work to be done, as described in the Drawings and Specifications, and to hold the Contractor and the sureties on Contractor's bond liable for the cost and expense thereof.
- I. Notice to Contractor for repairs and reconstruction will be made in the form of a registered letter addressed to the Contractor at Contractor's home office.
- J. Neither the foregoing paragraphs nor any provision in the Contract Documents, nor any special guarantee time limit implies any limitation of the Contractor's liability within the law of the place of construction.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 78 36

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Qualified Personnel
3.1	Maintenance of Documents and Samples
3.2	Record Drawings
3.3	GPS Coordinates for Water Projects
3.4	GPS Coordinates for Sanitary Sewer Projects
3.5	GPS Coordinates for Stormwater Projects

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all material, tools, labor, and equipment necessary to properly compile, prepare, maintain, record, and submit Project Record Documents as specified herein.
- B. Project Record Documents to be prepared and submitted by the Contractor include, but are not limited to Record Drawings, Specifications, Change Orders and other modifications to the Contract, Engineer field orders or written instructions, Requests for Information (RFI) and Clarification Memorandums, reviewed shop drawings, product data and samples, and test records. Final payment will not be made until all Project Record Documents are submitted and approved by the Engineer and GCDWR.
- C. The Contractor shall maintain on the project site an updated set of Record Drawings. These Drawings must be the latest revision, and match those of GCDWR.

1.4 SUBMITTALS

- A. Submit for approval in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, the following items:
1. Record Drawings.
 2. Specifications.
 3. Change Orders and other Contract modifications.
 4. Engineer/Owner Field Orders.

5. Requests for Information (RFI) and Clarification Memorandums.
 6. Approved shop drawings, product data, and samples.
 7. Test records.
 8. Valve cards providing a 3 point measurement on each valve to a fixed permanent reference point.
 9. GPS Coordinates for all fire hydrants, valves, manholes, and other structures and appurtenances installed.
- B. Contractor shall accompany each submittal with transmittal letter containing date, project title and number, Contractor's name and address, title and number of each record document, and signature of Contractor's authorized representative.

PART 2 – PRODUCTS

2.1 QUALIFIED PERSONNEL

- A. Contractor shall furnish qualified and experienced person, whose duty and responsibility shall be to maintain Project Record Documents.

PART 3 - EXECUTION

3.1 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Maintain secure storage for documents and product samples in the Contractor's field office, or an agreed upon location when field offices are not used, apart from documents used for construction. Example acceptable locations may include lockable tool trailer at the lay down area or superintendent's work vehicle. In any case documents shall be kept neat and secure.
- B. File documents and samples in accordance with format of these specifications.
- C. Maintain documents in a neat, clean, dry, legible condition and in good order. Do not use record documents for construction purposes. Maintain at an agreed upon site for GCDWR, one (1) copy of all Project Record Documents.
- D. Make documents and samples available at all times for inspection by the Engineer, or GCDWR.
- E. Failure to maintain up-to-date Project Record Documents, in a satisfactory manner, may be cause for withholding of a certificate for payment.
- F. Purpose of Project Record Documents is to document factual information regarding aspects of Work, both concealed and visible, to enable future modification of Work to proceed without lengthy and expensive site measurement, investigation, and examination.

3.2 RECORD DRAWINGS

- A. The Contractor must maintain an up-to-date Field Record set of drawings by marking changes and other information directly on a clean set of full-size Contract Drawings. The Contractor shall submit for Engineer and GCDWR approval, up-to-date Record Drawings with monthly pay applications. **Approval of monthly pay**

applications will not occur until the updated record drawings are approved.

The Engineer and GCDWR will review the record drawings to confirm that the recorded information is current.

- B. Record information concurrently with construction progress. Do not conceal any Work until required information is recorded. Make entries within twenty-four (24) hours after receipt of information that a change in Work has occurred.
- C. Unless otherwise noted, Record Drawings shall provide dimensions, distances, and coordinates to the nearest one tenth foot (0.1').
- D. Unless otherwise noted, Record Drawings shall provide elevations to the nearest one-hundredth foot (0.01') for all pertinent items constructed by the Contractor.
- E. Record Drawings shall have a title block indicating that the drawings are Record Drawings, the name of the company preparing the Record Drawings, and the date the Record Drawings were prepared.
- F. Record Drawings shall include details not on original Drawings to accurately depict actual constructed items.
- G. Legibly mark drawings using erasable colored pencils to record actual construction, including:
 - 1. Color Coding: RED – When showing information added to drawings
GREEN – When showing information deleted from drawings
BLUE – When showing information notes on drawings
 - 2. Date all entries.
 - 3. Call attention to each entry by drawing a “cloud” around area(s) affected.
 - 4. For water mains, legibly mark to record actual changes made during construction, including but not limited to:
 - a. Depth of valve or meter vaults in relation to finished grade data if not shown, or where depth differs from that indicated on the Drawings. Provide the elevation of piping through the vaults.
 - b. Horizontal and vertical locations of existing and new underground facilities and appurtenances, and other underground structures, equipment, or Work. Reference at least two measurements to permanent surface improvements.
 - c. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
 - d. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
 - e. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, Written Amendment, and Engineer's written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
 - 4. For Sewer, legibly mark to record actual changes made during construction, including but not limited to:
 - a. Invert elevations of all pipes entering manholes, junction boxes, etc.
 - b. Top elevations (ring and cover) of all manholes, vaults, etc.
 - c. Horizontal and vertical locations of existing and new underground facilities

and appurtenances, and other underground structures, equipment, or Work. Reference at least two measurements to permanent surface improvements.

- d. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
 - e. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
 - f. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, Written Amendment, and Engineer's written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
5. For Stormwater mains, legibly mark to record actual changes made during construction, including but not limited to:
- a. Invert elevations of all pipes entering stormwater structures (Catch Basins, Yard Inlets, Junction Boxes, Headwalls, etc.).
 - b. Top elevations (ring and cover, grate, throat, etc.) of all stormwater structures.
 - c. Locate existing facilities, piping, equipment, and items critical to the construction.
 - d. Changes made by Addenda, Field Orders, Work Change Directive, Change Order, Written Amendment, and Engineer's written interpretation and clarification, using consistent symbols for each and showing appropriate document tracking number.

3.3 GPS COORDINATES FOR WATER PROJECTS

- A. At the completion of construction, the Contractor shall provide GPS coordinates for all newly installed and relocated fire hydrants, blow-offs, valves, valve vaults, master meter vaults, and dead ends. Coordinates shall be of survey grade quality (sub foot accuracy minimum) and provided in the Georgia State Plane Coordinates West Zone. Control shall be based on NAD 83 for horizontal and NAVD 88 for vertical. Coordinates shall be submitted in an ESRI shape file format.
- B. As installation of the utility pipeline progresses, the Contractor shall provide offset staking for the centerline of the utility pipe every 100 feet along the pipe. The staking shall identify the distance to the centerline of the pipe and the depth of cover to the top of pipe. At the completion of construction, the Contractor shall provide GPS coordinates for the centerline of the pipe, include depth of bury, based on staked offsets.

3.4 GPS COORDINATES FOR SANITARY SEWER PROJECTS

- A. At the completion of construction, the Contractor shall provide GPS coordinates for all newly installed and relocated manholes, valves, and valve vaults. Coordinates shall be of survey grade quality (sub foot accuracy minimum) and provided in the Georgia State Plane Coordinates West Zone. Control shall be based on NAD 83 for horizontal and NAVD 88 for vertical. Coordinates shall be submitted in an ESRI shape file format.

3.5 GPS COORDINATES FOR STORMWATER PROJECTS

- A. At the completion of construction, the Contractor shall provide GPS coordinates for all newly installed and relocated Stormwater structures, (Catch Basins, Yard Inlets, Junction Boxes, etc.). Coordinates shall be of survey grade quality (sub foot accuracy minimum) and provided in the Georgia State Plane Coordinates West Zone. Control shall be based on NAD 83 for horizontal and NAVD 88 for vertical. Coordinates shall be submitted in an ESRI shape file format.
- B. For force mains, as installation of the pipeline progresses, the Contractor shall provide offset staking for the centerline of the utility pipe every 100 feet along the pipe. The staking shall identify the distance to the centerline of the pipe and the depth of cover to the top of pipe. At the completion of construction, the Contractor shall provide GPS coordinates for the centerline of the pipe, include depth of bury, based on the staked offsets.

END OF SECTION 01 78 39

SECTION 02 32 19

EXPLORATORY EXCAVATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
3.1	Exploratory Excavation

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Erosion and Sedimentation Controls (31 25 00).

1.2 REFERENCES

- ###### A.
- Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- ###### A.
- The Contractor shall, under this item, furnish all material, tools, labor, and equipment necessary to properly conduct excavation at specified locations or as directed by GCDWR.

1.4 SUBMITTALS

- ###### A.
- Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 EXPLORATORY EXCAVATION

- ###### A.
- When directed by GCDWR, the Contractor shall perform field exploratory excavation work to determine the presence of existing underground sanitary sewer, water, and storm drainage, utility piping, and or structures. The information for each said utility

found shall include, but not limited to, type of utility, material dimension, material type, and both vertical and horizontal measurements of its location.

- B. Where necessary, utilize vacuum excavation equipment to minimize the risk of damage to suspected existing utilities.
- C. Follow all federal, state, and local regulations related to excavation work.
- D. For each utility found, provide the following information:
 - 1. Type of utility
 - 2. Material type
 - 3. Material dimension
 - 4. Measurements of the vertical and horizontal location of the utility to permanent reference points
 - 5. Any other information which may help in coordinating work around the utility
- E. Submit documentation of the findings, including a detailed sketch, to the Engineer and GCDWR.

END OF SECTION 02 32 19

SECTION 02 41 13.13

PAVING REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Equipment
3.1	Trench Paving Removal
3.2	Milling Operation

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. Gwinnett County Department of Transportation Standard Specifications.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all materials, tools, labor, and equipment, necessary to remove asphalt and/or concrete paving as required for the installation of proposed water mains or sewer mains and related appurtenances under the Contract and as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. The Contractor shall submit photographs and/or videotape, sufficiently detailed, of existing conditions of project site. These shall be used to evaluate project areas that might be misconstrued as damage caused by debris, or construction material removal.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. MILLING EQUIPMENT:

1. Use power-driven, self-propelled milling equipment that is the size and shape that allows traffic to pass safely through areas adjacent to the work. Also use equipment that is:
 - a. Designed to mill and remove specified depth of existing asphalt and/or concrete paving.
 - b. Equipped with grade slope controls operating from a string line or ski, and based on mechanical or sonic operation.
 - c. Capable of removing pavement to an accuracy of 1/8 in. (3 mm).
 - d. Furnished with lighting system for night work, as necessary.
 - e. Provided with conveyors capable of side, rear, or front loading to transfer the milled material from the roadway to a truck.
- B. DUST CONTROL
 1. Provide power brooms, vacuum sweepers, power blowers, or other means to remove loose debris or dust. Do not allow dust control to restrict visibility of passing traffic or to disrupt adjacent property owners.

PART 3 - EXECUTION

3.1 TRENCH PAVING REMOVAL

- A. Where trench excavation within a paved surface is required, the Contractor shall saw cut in a straight line, vertical joints for the entire depth of pavement. The saw cut joints shall extend for the entire length of trench on both sides of the trench. Ragged edges shall be trimmed so as to provide a substantially straight line juncture between the old and new surfaces.
- B. The saw cut joints shall be a minimum of twelve inches (12") outside of the maximum width of excavated trench.
- C. Pavement shall be removed and hauled off site and disposed of in a proper legal manner. Contractor shall be careful not to disturb or damage any pavement that is to remain.

3.2 MILLING OPERATION

- A. Follow the Plans to mill the designated areas and depths, as required. Ensure the following requirements are met:
 1. Schedule the construction operation. Use milling methods that will produce a uniform finished surface and maintain a constant cross slope between extremities in each lane.
 2. Provide positive drainage to prevent water accumulation on the milled pavement, as shown on the Plans or directed by the Engineer.
 3. Bevel back the longitudinal vertical edges greater than 2 in (50 mm) that are produced by the removal process and left exposed to traffic. Bevel them back at

- least 3 in for each 2 in (75 mm for each 50 mm) of material removed. Use an attached mold board or other approved method.
4. When removing material at ramp areas and ends of milled sections, taper the transverse edges 10 ft (3 m) to avoid creating a traffic hazard and to produce a smooth surface.
 5. Protect with a temporary asphaltic concrete tie-in (paper joint) vertical edges at other areas such as bridge approach slabs, drainage structures, and utility appurtenances greater than ½-inch that are left open to transversing vehicles. Place the temporary tie-in at taper rate of at least 6 to 1 horizontal to vertical distance.
 6. Remove dust, residue, and loose milled material from the milled surface. Do not allow traffic on the milled surface and do not place asphaltic concrete on the milled surface until removal is complete.
- B. The reclaimed asphaltic and/or concrete pavement becomes the Contractor's property unless otherwise specified.

END OF SECTION 02 41 13.13

SECTION 02 41 13.23

UTILITY LINE REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Equipment
3.1	Trench Paving Removal
3.2	Milling Operations
3.3	Pipe Removal/Abandonment
3.4	Valve Abandonment
3.5	Fire Hydrant Removal
3.6	Manhole Removal/Abandonment

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all materials, tools, labor, and equipment, necessary to remove and/or abandon existing utility lines as required for the installation of proposed utility pipelines and related appurtenances under the Contract and as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. The Contractor shall submit photographs and/or videotape, sufficiently detailed, of existing conditions of project site. These shall be used to evaluate project areas that might be misconstrued as damage caused by debris, or construction material removal.
- C. The Contractor shall submit for approval by the Engineer and GCDWR:
1. Details of all caps or plugs to be installed on abandoned piping to remain in the ground.
 2. Details for restraining all existing water mains to remain in services where a portion of the main has been removed or modified.

3. Location of disposal site for all materials removed with documentation from site owner stating acceptance of each type of material to be disposed of.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Milling Equipment

1. Use power-driven, self-propelled milling equipment that is the size and shape that allows traffic to pass safely through areas adjacent to the work. Also use equipment that is:
 - a. Designed to mill and remove specified depth of existing asphalt paving
 - b. Equipped with grade slope controls operating from a stringline or ski and based on mechanical or sonic operation
 - c. Capable of removing pavement to an accuracy of 1/8 in. (3 mm)
 - d. Furnished with lighting system for night work, as necessary
 - e. Provided with conveyors capable of side, rear, or front loading to transfer the milled material from the roadway to a truck.

B. Dust Control Equipment

1. Provide power brooms, vacuum sweepers, power blowers, or other means to remove loose debris or dust. Do not allow dust control to restrict visibility of passing traffic or to disrupt adjacent property owners.

PART 3 - EXECUTION

3.1 TRENCH PAVING REMOVAL

- A. Where trench excavation within a paved surface is required, saw cut vertical joints for the entire depth of pavement. The saw cut joints shall extend for the entire length of trench on both sides of the trench. Ragged edges shall be trimmed so as to provide a substantially straight line juncture between the old and new surfaces.
- B. The saw cut joints shall be a minimum of 12 inches outside of the maximum width of excavated trench.
- C. Pavement shall be removed, hauled off site and disposed of in a proper legal manner. Be careful not to disturb or damage any pavement that is to remain.

3.2 MILLING OPERATION

- A. Follow the Plans to mill the designated areas and depths, as required. Ensure the following requirements are met:
 - 1. Schedule the construction operation. Use milling methods that will produce a uniform finished surface and maintain a constant cross slope between extremities in each lane.
 - 2. Provide positive drainage to prevent water accumulation on the milled pavement, as shown on the Plans or directed by the Engineer.
 - 3. Bevel back the longitudinal vertical edges greater than 2 in (50 mm) that are produced by the removal process and left exposed to traffic. Bevel them back at least 3 inches for each 2 inches (75 mm for each 50 mm) of material removed. Use an attached mold board or other approved method.
 - 4. Remove dust, residue, and loose milled material from the milled surface. Do not allow traffic on the milled surface and do not place asphaltic concrete on the milled surface until removal is complete.
- B. The reclaimed asphaltic pavement becomes the Contractor's property unless otherwise specified.

3.3 PIPE REMOVAL/ABANDONMENT

- A. The Contractor shall be responsible for removal of any existing utility pipeline that is to be abandoned that interferes with the installation of the proposed pipelines. Prior to removing any portion of existing pipelines, the Contractor shall obtain approval from GCDWR.
- B. The Contractor shall isolate the portion of the pipeline to be removed using existing isolation valves. Any service connections on the pipeline to be removed shall be transferred to the new pipeline or an existing pipeline which will remain in service, prior to isolation of the pipeline.
- C. The ends of piping to remain in the ground shall be suitably capped or plugged to prevent water or soil from entering the pipe.
- D. Any existing pipelines that have a portion of pipe removed and are to remain in service shall be properly restrained with thrust blocking to prevent movement of the remaining pipe.
- E. The Contractor shall follow all applicable codes and regulations for removal of hazardous materials, such as asbestos cement pipe, and dispose of in a legal and proper manner.
- F. The Contractor shall load, haul away, and dispose of material in a legally permitted location, any debris, trash, structures, piping, etc. removed from the worksite.

3.4 VALVE ABANDONMENT

- A. Buried valves that are to be abandoned shall be fully closed. The valve box shall be removed and the hole filled with suitable material and compacted. If the valve is within a paved location, the hole shall be capped with matching materials (asphalt, concrete, etc.). If the valve is at the end of a water main that is to remain in service, the valve shall be plugged and restrained to prevent leaks.

3.5 FIRE HYDRANT REMOVAL

- A. Fire hydrants to be removed shall be salvaged in accordance with Section 33 12 19.81 entitled "Relocate and Reconnect Hydrants, Valves, and Meters" of these specifications.

3.6 MANHOLE REMOVAL/ABANDONMENT

- A. The Contractor shall be responsible for removal of any existing manhole that is to be abandoned that interferes with the installation of the proposed sewer or force main. Prior to removing any manholes, the Contractor shall obtain approval from GCDWR.
- B. Where manholes are to be removed, the Contractor shall excavate the manhole; remove the manhole and connecting piping, as required, backfill and compact the void with approved material. If the manhole is located within a road, parking area, driveway or other paved area, the backfill shall be compacted to at least 95% of maximum dry density - Standard Proctor (ASTM D698). If the manhole is located in an unpaved area, the backfill shall be compacted to 85% of maximum dry density - Standard Proctor (ASTM D698), and slightly mounded to allow for settlement.
- C. Where manholes are to be abandoned in place, the Contractor shall grout seal the ends of all pipes entering the manhole, fracture the invert of the manhole to allow for drainage, cut the top of the manhole off to a minimum of three feet (3') below finished grade, fill the manhole with #57 stone, and backfill and compact with suitable fill material. If the manhole is located within a road, parking area, driveway or other paved area, the backfill shall be compacted to at least 95% of maximum dry density - Standard Proctor (ASTM D698). If the manhole is located in an unpaved area, the backfill shall be compacted to 85% of maximum dry density - Standard Proctor (ASTM D698), and slightly mounded to allow for settlement.

END OF SECTION 02 41 13.23

SECTION 02 41 19.81

SEPTIC TANK DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Crushed Stone Backfill
2.2	Select Structural Soil Backfill
3.1	Workmanship

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all materials, tools, labor, and equipment necessary to pump out, abandon, and demolish septic tank(s) under the Contract and as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

PART 2 - PRODUCTS

2.1 CRUSHED STONE BACKFILL

- A. Crushed stone #57 material used for backfilling shall meet the requirements of the Georgia Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, Sections 310 and 815.

2.2 SELECT STRUCTURAL SOIL BACKFILL

- A. Select structural fill soil may be used as backfill provided it has been tested by GCDWR Construction Materials Testing agent/representative and assessed to be of composition and moisture content compatible with achieving the specified degree of compaction. Cost of the testing laboratory, fieldwork, and analysis will not be paid as a separate item. All cost associated with initial compaction testing will be paid by GCDWR. The cost of additional testing due to failure of initial compaction to meet the requirements of the Contract Documents shall be the responsibility of the Contractor.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. The Contractor shall pump out and dispose of the contents of the septic tank. There shall be no separate compensation for this Work.
- B. The Contractor shall crush the septic tank top.
- C. The Contractor shall backfill the tank with crushed stone or select structural fill soil, and compact to 85% of maximum dry density - Standard Proctor (ASTM D698).
- D. The Contractor shall re-grade the surface work area to return the site to its pre-construction conditions.

END OF SECTION 02 41 19.81

SECTION 02 42 11

REMOVAL OF CONSTRUCTION MATERIAL

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
3.1	Workmanship

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all materials, tools, labor, and equipment, necessary to remove all unwanted construction material and debris, as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. The Contractor shall supply identification and license of company hauling/transporting material from the site.
- C. The Contractor shall submit photographs and/or videotape, sufficiently detailed, of existing conditions of project site. These shall be used to evaluate project areas that might be misconstrued as damage, caused by debris, or construction material removal.

PART 2 - PRODUCTS – (NOT USED)

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. The Contractor shall follow all federal, state, and local regulations related to removal, hauling, and disposal of trash and debris.

- B. The Contractor shall comply with Gwinnett County Ordinance SWO 2012-002 for hauling and disposal of all solid waste removed from the site for the duration of the Work.
- C. The Contractor shall load, haul away, and dispose of debris, trash, structures, automobiles, etc., that may be pre-existing on the Worksite, to a legally permitted location.
- D. The Contractor shall load, haul away, and dispose of construction material that is generated in execution of the Work, to a legally permitted location; including, but not limited to any debris, trash, structures, piping, etc.
- E. The Contractor shall remove and dispose of all unused construction materials prior to Final Acceptance of the Work by GCDWR and the Engineer.
- F. No additional payment shall be made for excavation or disposal of excavated material required for placement or removal of backfill placed above the foundation of the pavement; or for preparation of subgrade. The cost thereof shall be considered included in the pavement unit prices bid.

END OF SECTION 02 42 11

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
1.5	Quality Assurance
1.6	Delivery, Storage, and Handling
2.1	General
2.2	Concrete Materials
2.3	Forms
2.4	Reinforcement
2.5	Concrete Mix Design
3.1	Measuring Materials
3.2	Mixing and Transporting
3.3	Concrete Appearance
3.4	Placing and Compacting
3.5	Curing and Protection
3.6	Removal of Forms
3.7	Inspection and Field Testing
3.8	Concrete Finishing
3.9	Failure to Meet Requirements
3.10	Patching and Repairs
3.11	Concrete Schedule

B. RELATED SECTIONS

1. Brick Masonry (04 21 13).
2. Precast Concrete Utility Structures (33 05 16.13).
3. Tunnel Lining (33 05 23.71).
4. Ductile Iron Pipe (33 11 13.05).
5. Steel Pipe (33 11 13.07).
6. Water Utility Distribution Valves (33 12 16).
7. Sanitary Utility Sewerage Piping (33 31 00).
8. Roadway Construction (34 71 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. American Society for Testing and Materials (ASTM)
 - 1. C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field
 - 2. C33 - Standard Specification for Concrete Aggregates
 - 3. C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - 4. C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
 - 5. C94 - Standard Specification for Ready-Mixed Concrete
 - 6. C143 - Standard Test Method for Slump of Hydraulic Cement Concrete
 - 7. C150 - Standard Specification for Portland Cement
 - 8. C171 - Standard Specification for Sheet Materials for Curing Concrete
 - 9. C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
 - 10. C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
 - 11. C260 - Standard Specification for Air-Entraining Admixtures for Concrete
 - 12. C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
 - 13. C494 - Standard Specification for Chemical Admixtures for Concrete
 - 14. C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
 - 15. C1017 - Standard Specification for Chemical Admixtures for use in Producing Flowing Concrete
- C. American Concrete Institute (ACI)
 - 1. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete
 - 2. ACI 305R - Hot Weather Concreting
 - 3. ACI 306.1 - Standard Specification for Cold Weather Concreting
 - 4. ACI 318 - Building Code Requirements for Structural Concrete
 - 5. ACI 350R - Environmental Engineering Concrete Structures
- D. Where reference is made to one of the above Standards, the revision in effect at the time of bid opening shall apply.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all materials, tools, labor, and equipment to place all cast-in-place concrete, including all reinforcing steel and formwork, in the structures shown on the Contract Drawings, and such other concrete as may be found necessary to fully complete the Work indicated under this Contract, or as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

1. Mix Design

- a. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water-cementitious materials ratio, concrete slump, type and manufacturer of cement. Provide either 1) or 2) below for each mix proposed.
 - 1) Standard deviation data for each proposed concrete mix based on statistical records.
 - 2) The curve of water-cementitious materials ratio versus concrete cylinder strength for each formulation of concrete proposed based on laboratory tests. Provide the cylinder strength for the average of the 28 day cylinder strength test results for each mix. Provide results of 7 and 14 day tests.

2. Product Data

- a. Sources of cement, pozzolan and aggregates.
- b. Material Safety Data Sheets (MSDS) for all concrete components and admixtures.
- c. Air-entraining admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM Standards.
- d. Water-reducing admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
- e. High-range water-reducing admixture (plasticizer). Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, retarding effect, slump range and conformity to ASTM standards. Identify proposed locations of use.
- f. Sheet curing material. Product data including catalogue cut, technical data and conformity to ASTM standard.
- g. Liquid curing compound. Product data including catalogue cut, technical data, storage requirements, product life, application rate and conformity to ASTM Standards. Identify proposed locations of use.

3. Samples
 - a. Fine and coarse aggregates if requested by the Engineer.
4. Certificates
 - a. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.
 - b. Certify admixtures are suitable for use in contact with potable water after 30 days of concrete curing.
 - c. Certify curing compound is suitable for use in contact with potable water after 30 days (non-toxic and free of taste or odor).
5. Test and Evaluation Reports
 - a. Fine aggregates – sieve analysis, physical properties, and deleterious substance.
 - b. Coarse aggregates – sieve analysis, physical properties, and deleterious substances.
 - c. Cements – chemical analysis and physical properties for each type.
 - d. Pozzolans – chemical analysis and physical properties.
 - e. Proposed concrete mixes – compressive strength, slump and air content.
 - f. Shrinkage Test Results – In accordance with ASTM C157 as modified hereinafter.
6. Field Quality Control Submittals
 - a. Field test reports.
 - b. Concrete Delivery/Batch Tickets:
 - 1) For each batch of concrete before unloading at Site.
 - 2) In accordance with ASTM C94/C94M, Section 14 including requirements 14.2.1 through 14.2.10.
 - 3) Indicate the amount of mixing water withheld, and maximum amount that may be permitted to be added at Project Site.
7. Special Procedure Submittals
 - a. Detailed plan for cold weather curing and protection of concrete placed and cured in weather below 40 degrees F.
 - b. Detailed plan for hot weather placements including curing and protection for concrete placed in ambient temperatures over 80 degrees F.
 - c. If Contractor chooses to use self-consolidating concrete: Detailed plan of modified procedures for handling, placing, and finishing.

1.5 QUALITY ASSURANCE

- A. Comply with ACI 318, the recommendations of ACI 350R and other stated requirements, codes and standards. The most stringent requirement of the codes, standards and this Section apply when conflicts exist.
- B. Use only one source of cement and aggregates on any one structure. Provide concrete of uniform color and appearance.
- C. A minimum of 14 days in advance of placing concrete, discuss with the Engineer the sources of individual materials and batched concrete proposed for use. Discuss placement methods, waterstops and curing. Propose methods of hot and cold weather concreting as required. Discuss the properties and techniques of batching and placing plasticized concrete prior to the placement of any concrete containing a high-range water-reducing admixture (plasticizer). Include the plasticizer manufacturer in the discussions.
- D. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. Make all changes ordered at the Contractor's expense.
- E. If, during the progress of the work, the materials from the sources originally accepted change in characteristics, provide all materials, labor, and equipment, at the Contractor's expense, necessary to perform new acceptance tests as were originally required using the new materials prior to their incorporation in the work. If the tests are specified to be conducted by others, the costs of these tests shall be borne solely by the Contractor.
- F. Qualifications
 - 1. Batch Plant: NRMCA Program for Certification of Ready-Mixed Concrete Production Facilities or an approved equivalent program.
 - 2. Mix Designer: Person responsible for developing concrete mixture proportions certified as NRMCA Concrete Technologist Level 2 or DOT certified mix designer in the jurisdiction of the Work. Requirements may be waived if the individual is Contractor's Licensed Design Engineer.
 - 3. Installers: Unless otherwise permitted, at least one person on the finishing crew must be certified as an ACI Flatwork Finisher, or equivalent.
- G. Preconstruction Testing
 - 1. Have the following materials tested to verify conformity with this Specification Section and the stated ASTM Standards.
 - a. Fine aggregates for conformity with ASTM C33 – sieve analysis, physical properties, and deleterious substances.
 - b. Coarse aggregates for conformity with ASTM C33 – sieve analysis, physical properties, and deleterious substances.

- c. Cements for conformity with ASTM C150 – chemical analysis and physical properties.
- d. Pozzolans for conformity with ASTM C618 – chemical analysis and physical properties.
- e. Proposed concrete mix designs – compressive strength, slump and air content.

H. Field Samples

- 1. Field testing and inspection services will be provided by GCDWR. GCDWR will pay the cost of such work, except as specifically stated otherwise. GCDWR will test the following items to verify conformity with this Specification Section.
 - a. Concrete placements – compressive strength (cylinders), compressive strength (cores), slump, and air content.
 - b. Other materials or products that may come under question.
- 2. Confirm all materials incorporated in the work to accepted samples.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

- 1. Cement: Store in weathertight buildings, bins or silos to provide protection from dampness and contamination and to minimize warehouse set.
- 2. Aggregate: Arrange and use stockpiles to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Build stockpiles in successive horizontal layers not exceeding 3-ft in thickness. Complete each layer before the next is started. Do not use frozen or partially frozen aggregate.
- 3. Sand: Arrange and use stockpiles to avoid contamination. Allow sand to drain to a uniform moisture content before using. Do not use frozen or partially frozen aggregates.
- 4. Admixtures: Store in closed containers to avoid contamination, evaporation or damage. Provide suitable agitating equipment to assure uniform dispersion of ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.
- 5. Pozzolan: Store in weathertight buildings, bins or silos to provide protection from dampness and contamination.
- 6. Sheet Curing Materials: Store in weathertight buildings or off the ground and under cover.
- 7. Liquid Curing Compounds: Store in closed containers.

PART 2 PRODUCTS

2.1 GENERAL

- A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired. Such reference is not intended to indicate a restrictive preference on the part of GCDWR for that particular manufacturer or product, or to prohibit the use of equivalent products or equally qualified manufacturers.
- B. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance and manufacturer's service.

2.2 CONCRETE MATERIALS

A. Cementitious Materials

1. Portland Cement

- a. In accordance with requirements of ASTM C150.
- b. Brand: Subject to approval of Engineer. Use one brand throughout the Work.
- c. Alkalies: Maximum 0.60 percent.
- d. Nonhydraulic above grade structures: Type I or Type II.
- e. Hydraulic and below grade structures and sewers: Type II

2. Supplementary Cementitious Materials

- a. Fly Ash (Pozzolan): Class F or Class N fly ash in accordance with ASTM C618, except as modified herein:
 - 1) Produced from process that does not use hazardous or potentially hazardous materials.
 - 2) ASTM C618, Table 1, Loss on Ignition: Maximum 3 percent.
 - 3) ASTM C618, Table 2, Water Requirement: Maximum 100 percent of control.
 - 4) ASTM C618, Table 3, Effectiveness in Controlling Alkali-Silica Reaction: Maximum 100 percent expansion of test mixture as a percentage of low-alkali cement control at 14 days.
 - 5) ASTM C618, Table 3, Expansion of Test Mixture: Evaluate results using either Procedure A or Procedure B as follows:
 - a) Procedure A after 6-month sulfate exposure, maximum 0.10 percent.
 - b) Procedure B, expansion of test mixture as a percentage of sulfate resistance cement control, after at least 6-month exposure, maximum 100 percent.
 - 6) Where fly ash is specified to be used with Type I cement, have fly ash meet one of the following requirements:

- a) CaO: Maximum 15 percent.
 - b) Test cementitious materials as follows:
 - (1) In accordance with ASTM C1012.
 - (2) Furnish test data confirming fly ash in combination with cement used meets strength requirements, is compatible with air-entraining agents and other additives, provides increased sulfate resistance equivalent to or better than Type II cement.
 - (3) Conduct tests using proposed fly ash and cement samples together with control samples using Type II cement without fly ash.
 - b. Slag Cement: In accordance with ASTM C989, Grades 100 or 120.
 - 3. Tricalcium Aluminate
 - a. Content of Cementitious Materials: Maximum 8 percent.
- B. Aggregates: Furnish from one source.
- 1. Natural Aggregates
 - a. Free from deleterious coatings and substances and conforming to requirements of ASTM C33, except as modified herein.
 - b. Free from materials and aggregate types causing popouts, discoloration, staining, or other defects on surface of concrete.
 - 2. Nonpotentially Reactive: In accordance with ASTM C33, Appendix XI, Paragraph X1.1.
 - 3. Aggregate Soundness: Test for fine and coarse aggregates in accordance with ASTM C33 and ASTM C88 using sodium sulfate solution.
 - 4. Fine Aggregates
 - a. Clean, sharp, and natural sand.
 - b. ASTM C33.
 - c. Material Passing 200 Sieve: 4 percent maximum.
 - d. Limit deleterious substances in accordance with ASTM C33, Table 1 with material finer than 20 sieve limited to 3 percent, coal and lignite limited to 0.5 percent.
 - 5. Coarse Aggregates
 - a. Natural gravels, combination of gravels and crushed gravels, crushed stone, or combination of these materials containing no more than 15 percent flat or elongated particles (long dimension more than five times the short dimension).
 - b. Materials Passing 200 Sieve: 0.5 percent maximum.
 - c. Limit deleterious substances in accordance with ASTM C33, Table 3 for exposed concrete.

- C. Admixtures: Unless otherwise permitted, furnish from one manufacturer.
 - 1. Characteristics
 - a. Compatible with other constituents in mix.
 - b. Free of chlorides and alkalis (except for those attributable to water).
 - c. Do not use admixtures known to be toxic after concrete has cured for 30 days.
 - d. Furnish type of admixtures as recommended by manufacturer for anticipated temperature ranges.
 - e. Proportion and mix in accordance with manufacturer's recommendations.
 - 2. Air-Entraining Admixture: ASTM C260
 - 3. Water-Reducing Admixture: ASTM C494/C494M, Type A or Type D.
 - 4. Retarding Admixture: ASTM C494/C494M, Type B.
 - 5. High Range Water Reducing Admixture (Superplasticizer): ASTM C494/C494M, Type F or G. Use only when approved by Engineer.
 - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II. Use only when approved by Engineer.
 - a. Use of viscosity modifier if intent is to achieve self-consolidating concrete.
 - 7. Do not use calcium chloride as an admixture.
- D. Water and Ice: Use potable water for mixing water for concrete and water used to make ice, unless alternative sources of water are permitted.
 - 1. Water from alternative sources: Comply with requirements of ASTM C1602/C1602M and contain less than:
 - a. 1,000 ppm of chlorides.
 - b. 3,000 ppm sulfate as SO₄.
 - c. 600 ppm alkalis as (Na₂O + 0.658 K₂O).
 - d. 50,000 ppm total solids by mass.

2.3 FORMS

- A. The Contractor shall furnish all labor and materials for all forms required for the construction of the Work.
- B. Either metal or wood forms may be used.
- C. All forms shall be true to the required shape, clean, of sufficient strength, and well braced so that they shall maintain their proper position during the placing and vibrating of the concrete.

2.4 REINFORCEMENT

- A. All steel reinforcement bars, wire, and dowel bars shall be in accordance with GDOT Standard Specifications for Construction of Road and Bridges, latest edition, Section 853.
- B. Steel reinforcement shall be designed, detailed, fabricated and placed in conformance with all applicable requirements of ACI 318, and the CRSI Manual of Standard Practice.
- C. No concrete shall be placed until all steel reinforcement to be covered has been inspected in place and approved by GCDWR or the Engineer.

2.5 CONCRETE MIX DESIGN

- A. Use an independent testing laboratory acceptable to the Engineer for development of mix designs and testing.
- B. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and to produce concrete having proper workability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.
- C. Base the design mix on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if such data is not available, be developed by a testing laboratory, acceptable to the Engineer, engaged by and at the expense of the Contractor. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 318.
- D. The water content of the concrete mix, determined by laboratory testing, shall be based on a curve showing the relation between water cementitious ratio and 7 and 28 day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test specimens at each age. The curves shall have a range of values sufficient to yield the desired data, including the specified design strengths as modified below, without extrapolation. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the specified design strengths. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content as specified in Table 1.
- E. Compression Tests: Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the specified design strength requirements in conformity with the above paragraphs.
- F. Entrained air, as measured by ASTM C231, as shown in Table 1.
 - 1. If the air-entraining agent proposed for use in the mix requires testing methods other than ASTM C231 to accurately determine air content, make special note of this requirement in the admixture submittal.
- G. Slump of the concrete as measured by ASTM C143, as shown in Table 1. If a high-range water-reducer (plasticizer) is used, measure the slump before plasticizer is added. Plasticized concrete shall have a slump ranging from 7 to 10-in.
- H. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

TABLE 1
CONCRETE MIX REQUIREMENTS

Class	Design Strength (1)	Cement (2)	Fine Aggregate (2)	Coarse Aggregate (3)	Cementitious Content (4)
B	2500	C150 Type II	C33	57	440 min.
A	3000	C150 Type II	C33	57	480 min.
AA	4000	C150 Type II	C33	57	560 min.
AAA	5000	C150 Type II	C33	56	600 min.

Class	W/C Ratio (5)	Fly Ash	AE Range (6)	WR (7)	HRWR (8)	Slump Range Inches
B	0.62 max	--	3.5 to 5	Yes	*	1-4
A	0.54 max	--	3.5 to 5	Yes	*	1-3
AA	0.44 max	25% max	3.5 to 5	Yes	*	3-5
AAA	0.40 max	--	3.5 to 5	Yes	*	3-5

NOTES:

2. Minimum compressive strength in psi at 28 days
3. ASTM designation
4. Size Number in ASTM C33
5. Cementitious content in lbs/cu yd
6. W/C is Water-Cementitious ratio by weight
7. AE is percent air-entrainment
8. WR is water-reducer admixture
9. HRWR is high-range water-reducer admixture
10. *HRWR used at contractor's option

PART 3 EXECUTION

3.1 MEASURING MATERIALS

- A. Compose concrete of portland cement, fine aggregate, coarse aggregate, water and admixtures as specified. Use a batch plant acceptable to the Engineer for concrete production. Batch all constituents, including admixtures, at the plant except a high-range water-reducer may also be added in the field.
- B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified. Have scales certified by the local Sealer of Weights and Measures within 1 year of use.
- C. Measure the amount of free water in fine aggregates within 0.3 percent with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as-batched on printed batching tickets.
- D. Dispense admixtures either manually using calibrated containers or measuring tanks, or by means of an automatic dispenser approved by the manufacturer of the specific admixture.
 - 1. Charge air-entraining and chemical admixtures into the mixer as a solution using an automatic dispenser or similar metering device.
 - 2. Inject multiple admixtures separately during the batching sequence.

3.2 MIXING AND TRANSPORTING

- A. Provide ready-mixed concrete produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions at mixing speeds.
- B. Transport ready-mix concrete to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the name plate.
- C. Keep the water tank valve on each transit truck locked at all times. Any addition of water must be directed by the Engineer. Incorporate added water by additional mixing of at least 35 revolutions. Meter all added water with the amount of water added shown on each delivery ticket.
- D. All central plant and rolling stock equipment and methods shall comply with ACI 318 and ASTM C94.
- E. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Use metal or metal-lined non-aluminum discharge chutes with slopes not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20-ft long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.
- F. Retempering (mixing with or without additional cement, aggregate, or water) of concrete or mortar which has reached initial set will not be permitted.

- G. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.
- H. Furnish a delivery ticket for ready mixed concrete to the Engineer as each truck arrives. Provide a printed record of the weight of cement and each aggregate as batched individually on each ticket. Use the type of indicator that returns for zero punch or returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cement and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of the truck mixer.
- I. Temperature and Mixing Time Control
 - 1. In cold weather, do not allow the as-mixed temperature and concrete temperature at the time of placement in the forms to drop below 40 degrees F.
 - 2. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.
 - 3. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90 degrees F. If necessary, substitute well-crushed ice for all or part of the mixing water.
 - 4. Do not exceed the values shown in Table 2 for the maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms.

TABLE 2
MAXIMUM TIME TO DISCHARGE OF CONCRETE

<u>Air or Concrete Temperature (whichever is greater)</u>	<u>Maximum Time</u>
80 to 90 Degrees F (27 to 30 Degrees C)	45 Minutes
70 to 79 Degrees F (21 to 26 Degrees C)	60 Minutes
40 to 69 Degrees F (5 to 20 degrees C)	90 Minutes

- a. If an approved high-range water-reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes.

3.3 CONCRETE APPEARANCE

- A. Remix concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste. If this does not correct the condition, reject the concrete. If the slump is within the allowable limit, but excessive bleeding, poor workability, or

poor finishability are observed, obtain changes in the concrete mix only by adjusting one or more of the following:

1. The gradation of aggregate.
 2. The proportion of fine and coarse aggregate.
 3. The percentage of entrained air, within the allowable limits.
- B. Provide concrete for the work that results in a homogeneous structure which, when hardened, will have the required strength, durability and appearance. Provide mixtures and workmanship such that concrete surfaces, when exposed, will require no finishing. When concrete surfaces are stripped, the concrete, when viewed in good lighting from 10-ft away, shall be pleasing in appearance, and at 20-ft shall show no visible defects.

3.4 PLACING AND COMPACTING

A. Placing

1. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, excess water, dirt and other foreign materials from forms. Confirm that reinforcement and other embedded items are securely in place. Have a competent workman at the location of the placement who can assure that reinforcing steel and embedded items remain in designated locations while concrete is being placed. Sprinkle semi-porous subgrades or forms to eliminate suction of water from the mix. Seal extremely porous subgrades in an approved manner.
2. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.
3. Pumping of concrete will be permitted. Use a mix design and aggregate sizes suitable for pumping and submit for approval.
4. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only when made of galvanized metal or concrete and if prior approval has been obtained.
5. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs and/or walls) has reached adequate strength.
6. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms with a suitable tool to bring the full surface of the mortar against the form. Prevent the formation of excessive surface voids.

7. Slabs

- a. After suitable bulkheads, screeds and jointing materials have been positioned, place the concrete continuously between construction joints beginning at a bulkhead, edge form, or corner. Place each batch into the edge of the previously placed concrete to avoid stone pockets and segregation.
- b. Avoid delays in casting. If there is a delay in casting, thoroughly spade and consolidate at the edge of that previously placed and the concrete placed after the delay to avoid cold joints. Then bring concrete to correct level and strike off with a straightedge. Use bullfloats or darbies to smooth the surface, leaving it free of humps or hollows.
- c. Where slabs are to be placed integrally with the walls below them, place the walls and compact as specified. Allow 1 hour to pass between placement of the wall and the overlying slab to permit consolidation of the wall concrete. Keep the top surface of the wall moist so as to prevent cold joints.

8. Formed Concrete

- a. Place concrete in forms using tremie tubes and taking care to prevent segregation. Bottom of tremie tubes shall preferably be in contact with the concrete already placed. Do not permit concrete to drop freely more than 4-ft. Place concrete for walls in 12 to 24-inch lifts, keeping the surface horizontal. If plasticized concrete is used, the maximum lift thickness may be increased to 7-ft and the maximum free fall of concrete not exceeding 15-ft.
9. Perform underwater concreting in conformity with the recommendations of ACI 304R. The tremie system shall be used to place underwater concrete. Use tremie pipes in the range of 8 to 12-inch in diameter and space at not more than 16-ft on centers nor more than 8-ft from an end form. Where concrete is being placed around a pipe, provide at least one tremie pipe on each side of each pipe. Where the tremie system is not practical, direct pumped concrete for underwater placement may be used subject to approval of the system including details by the Engineer.

B. Compacting

1. Consolidate concrete by vibration, puddling, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, embedded items and openings and into corners of forms. Continuously perform puddling, spading, etc, along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness.
2. Place and compact all concrete with mechanical vibrators. Obtain approval of the number, type and size of the units from the Engineer in advance of placing operations. Do not order concrete until sufficient approved vibrators (including standby units in working order) are on the job.
3. A minimum frequency of 7000 rpm is required for mechanical vibrators. Insert vibrators and withdraw at points from 18 to 30-in apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from 5 to 15 seconds. Do

not over vibrate so as to segregate. Keep a spare vibrator on the site during concrete placing operations.

4. Concrete Slabs: Consolidate concrete for slabs less than 8-in thick with vibrating screeds; slabs 8 to 12-in thick with internal vibrators and (optionally) with vibrating screeds. Always place vibrators into concrete vertically and do not lay horizontally or over.
5. Walls and Columns: Use internal vibrators (rather than form vibrators) unless otherwise approved by the Engineer. In general, for each vibrator needed to melt down the batch at the point of discharge, one or more additional vibrators must be used to densify, homogenize and perfect the surface. Insert the vibrators vertically at regular intervals, through the fresh concrete and slightly into the previous lift, if any.
6. Amount of Vibration: Vibrators are to be used to consolidate properly placed concrete. Do not use vibrators to move or transport concrete in the forms. Continue vibration until:
 - a. Frequency returns to normal.
 - b. Surface appears liquefied, flattened and glistening.
 - c. Trapped air ceases to rise.
 - d. Coarse aggregate has blended into surface, but has not disappeared.

3.5 CURING AND PROTECTION

- A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.
- B. Curing Methods
 1. Curing Methods for Concrete Surfaces: Cure concrete to retain moisture and maintain specified temperature at the surface for a minimum of 7 days after placement. Use the following curing methods.
 - a. Water Curing: Keep entire concrete surface wet by ponding, continuous sprinkling or covered with saturated burlap. Begin wet cure as soon as concrete attains an initial set and maintain wet cure 24 hours a day.
 - b. Sheet Material Curing: Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.
 - c. Liquid Membrane Curing: Apply over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall NOT be placed on any concrete surface where additional concrete is to be placed, where concrete sealers or surface coatings are to be used, or where the concrete finish requires an integral floor product. Apply curing compound as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can

be absorbed into the concrete. Comply with the manufacturer's application recommendations.

2. Specified applications of curing methods.
 - a. Slabs for Water Containment Structures: Water curing only.
 - b. Slabs on Grade and Footings (not used to contain water): Water curing, sheet material curing or liquid membrane curing.
 - c. Structural Slabs (other than water containment): Water curing or liquid membrane curing.
 - d. Horizontal Surfaces which will Receive Additional Concrete, Coatings, Grout or Other Material that Requires Bond to the substrate: Water curing.
 - e. Formed Surfaces: None if nonabsorbent forms are left in place 7 days. Water cure if absorbent forms are used. Sheet cured or liquid membrane cured if forms are removed prior to 7 days. Water cure exposed horizontal surfaces of formed walls or columns for 7 days or until next placement of concrete is made.
 - f. Concrete Joints: Water cured or sheet material cured.
- C. Protect finished surfaces and slabs from the direct rays of the sun to prevent checking and crazing.
- D. Cold Weather Concreting:
 1. "Cold weather" is defined as a period when for more than 3 successive days, the average daily outdoor temperature drops below 40 degrees F. Calculate the average daily temperature as the average of the highest and the lowest temperature during the period from midnight to midnight.
 2. Conform cold weather concreting to ACI 306.1 and the additional requirements specified herein. Record temperatures at the concrete placement at 12 hour intervals (minimum).
 3. Discuss a cold weather work plan with the Engineer. Discuss the methods and procedures proposed for use during cold weather including the production, transportation, placement, protection, curing and temperature monitoring of the concrete. Also discuss the procedures to be implemented upon abrupt changes in weather conditions or equipment failures. Do not begin cold weather concreting until the work plan is acceptable to the Engineer. Approval of the work Plan by the Engineer shall not relieve the Contractor of their sole responsibility for the quality of the concrete work produced.
 4. During periods of cold weather, protect concrete to provide continuous warm, moist curing (with supplementary heat when required) for a total of at least 350 degree-days of curing.
 - a. Degree-days are defined as the total number of 24 hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (eg: 5 days at an average 70 degrees F = 350 degree-days).

- b. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50 degrees F as 0 degrees F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.
 5. Salt, manure or other chemicals shall not be used for protection.
 6. Do not terminate the protection period for concrete being water cured during cold weather until at least 24 hours after water curing has been terminated.
- E. Hot Weather Concreting
 1. "Hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation estimated in accordance with ACI 305R, approaching or exceeding 0.2 lbs/sqft/hr.
 2. Concrete placed during hot weather, shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305R and the additional requirements specified herein.
 - a. Do not exceed 90 degrees F for the temperature of concrete being placed. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set or cold joints.
 - b. Take all necessary precautions to promptly deliver, to promptly place the concrete upon its arrival at the job and to provide vibration immediately after placement.
 - c. The Engineer may direct the Contractor to immediately cover plastic concrete with sheet material.
 3. Provide the Engineer with a work plan describing the methods and procedures proposed to use for concrete placement and curing during hot weather periods. Do not begin hot weather concreting until the work plan is acceptable to the Engineer. Approval of the work plan by the Engineer shall not relieve the Contractor of their sole responsibility for the quality of the concrete work produced.

3.6 REMOVAL OF FORMS

- A. Except as otherwise specifically authorized by the Engineer, do not remove forms before the concrete has attained a strength of at least 30 percent of its specified design strength, nor before reaching the following number of day-degrees of curing (whichever is the longer):

<u>TABLE 3</u>	
MINIMUM TIME TO FORM REMOVAL	
<u>Forms for</u>	<u>Degree Days</u>
Beams and slabs	500
Walls / Vertical surfaces	100

(See definition of degree-days in Paragraph 3.5.D above).

- B. Do not remove shores until the concrete has attained at least 70 percent of its specified design strength and has achieved sufficient strength to support safely of its own weight and construction live loads.

3.7 INSPECTION AND FIELD TESTING

- A. The batching, mixing, transporting, placing and curing of concrete are subject to the inspection of the Engineer at all times. Advise the Engineer of readiness to proceed at least 24 hours prior to each concrete placement. The Engineer or GCDWR will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing steel and the alignment, cleanliness and tightness of formwork. Do not place concrete without the inspection and acceptance of the Engineer or GCDWR.
- B. Sets of field control cylinder specimens will be taken by the Engineer or GCDWR Materials Testing Representative during the progress of the work, in compliance with ASTM C31. Take a minimum of one set of concrete test cylinders per day, one set for each 150 cubic yards of concrete, or one set for each 5,000 sq ft of surface area for slabs or walls of each class of concrete placed each day.
 - 1. A "set" of test cylinders consists of five cylinders: one to be tested at 7 days and two to be tested and their strengths averaged at 28 days. The other two may be used for special tests at 3 days or to verify strength after 56 days if 28-day test results are low.
 - 2. When the average 28-day compressive strength of the cylinders in any set falls below the specified design strength or below proportional minimum 7-day strengths (where proper relation between seven and 28-day strengths have been established by tests), change proportions, water content, or temperature conditions to achieve the required strengths.
- C. Cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated closed curing box for specimens, affording protection to the specimens against injury or loss through the operations, and furnish material and labor required for the purpose of taking concrete cylinder samples. Provide an appropriate number of curing boxes acceptable to the Engineer.
- D. Slump tests will be made in the field immediately prior to placing the concrete. Make such tests in accordance with ASTM C143. Reject concrete if the slump is greater than the specified range.
- E. Air Content: Test for air content shall be made on a fresh concrete samples. Air content for concrete made of ordinary aggregates having low absorption shall be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173. If lightweight aggregates or aggregates with high absorptions are used, the latter test method shall be used.
- F. The Engineer may have cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of

concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection or determining the continuation of concrete work.

- G. Cooperate in obtaining cores by allowing free access to the work and permitting the use of ladders, scaffolding and such incidental equipment as may be required. Perform coring and collect core samples at the locations indicated by the Engineer and repair all core holes. The testing of the cores will be at the expense of GCDWR. GCDWR will pay for collection and repair of cores if the test results meet the required specifications.

3.8 CONCRETE FINISHING

A. Walls

1. Type W-1 (Ordinary Wall Finish)
 - a. Patch tie holes.
 - b. Surface tolerance Class C as specified in ACI 117.
 - c. Knock off projections larger than ½-inch.
 - d. Patch defective areas.
2. Type W-2 (Smooth Wall Finish)
 - a. Patch tie holes.
 - b. Surface tolerance Class B as specified in ACI 117.
 - c. Grind off projections larger than ¼-inch.
 - d. Patch defective areas and repair rough spots resulting from form release agent failure or other reasons to provide smooth uniform appearance.
3. Type W-3 (Smooth Rubbed Wall Finish)
 - a. Surface tolerance Class A as specified in ACI 117.
 - b. Remove projections larger than 1/8-inch.
 - c. Only water curing will be permitted on walls being rubbed.
 - d. Perform rubbing while green concrete can be physically worked and smoothed without adding other materials, if structurally possible, the day following placement. Finish no later than 3 days after placement has been completed.
 - e. Remove forms at such a rate that finishing, form tie filling, removal of projections, and patching can be completed on same day forms are removed while curing wall.
 - f. After pointings have set sufficiently to permit working on surface, thoroughly saturate entire surface with water for period of 3 hours and rub until uniform surface is obtained.
 - g. Rub either by hand with carborundum stone of medium-coarse grade or abrasive of equal quality, or mechanically operated carborundum stone.

- h. Obtain Engineer approval of mechanically operated carborundum stones before concrete finishing.
- i. Do not use cement grout, other than cement paste drawn from the concrete itself by rubbing process.
- j. Finishing past formed by rubbing by either brushing or floating as follows:
 - 1) Brushing:
 - a) Carefully strike with clean brush.
 - b) Brush in long direction of surface being finished.
 - 2) Floating:
 - a) Spread uniformly over surface and allow to reset.
 - b) Finish by floating with canvas, carpet face, or cork float, or rub down with dry burlap.
- k. Continue water curing of wall during finishing operation in areas not being rubbed.
- l. Move water curing onto rubbed areas as soon as water will not erode rubbed surface.

B. Slabs

1. General

- a. Finish slab concrete per the requirements of ACI 302.1R.
- b. Use manual screeds, vibrating screeds, or roller compacting screeds to place concrete level and smooth.
- c. Do not use “jitterbugs” or other special tools designed for purpose of forcing coarse aggregate away from surface and allowing layer or mortar, which will be weak and cause cracks or delamination, to accumulate.
- d. Do not dust surface with dry materials.
- e. Use evaporation retardant.
- f. Round off edges of slabs with steel edging tool, except where cove finish is shown. Use a steel edging tool with a ¼-inch radius for slabs subject to wheeled traffic.

2. Type S-1 (Steel Troweled Finish)

- a. Finish by screeding and floating with straightedges to bring surfaces to required finish elevation. Use evaporation retardant.
- b. While concrete is still green, but sufficiently hardened to bear a person’s weight without deep imprint, wood float to true, even plane with no coarse aggregate visible.
- c. Use sufficient pressure on wood floats to bring moisture to surface.

- d. After surface moisture has disappeared, hand trowel concrete to produce smooth, impervious surface, free from trowel marks.
- e. Burnish surface with an additional troweling. Final troweling shall produce ringing sound from trowel.
- f. Do not use dry cement or additional water during troweling, nor will excessive troweling be permitted.
- g. Power Finishing:
 - 1) Approved power machine may be used in lieu of hand finishing in accordance with directions of machine manufacturer.
 - 2) Do not use power machine when concrete has not attained necessary set to allow finishing without introducing high and low spots in slab.
 - 3) Do first steel troweling for slab S-1 finish by hand.
- 3. Type S-2 (Wood Float Finish)
 - a. Finish slab to receive fill and mortar setting bed by screeding with straight-edges to bring surface to required finish plane.
 - b. Wood float finish to compact and seal surface.
 - c. Remove laitance and leave surface clean.
 - d. Coordinate with other finish procedures.
- 4. Type S-3 (Underside Elevated Slab Finish)
 - a. When forming is removed, grind off projections on underside of slab and patch defective areas.
- 5. Type S-4 (Broomed Finish)
 - a. Finish as specified for Type S-1 floor finish, except omit final troweling and finish surface by drawing fine-hair broom lightly across surface.
 - b. Broom in same direction and parallel to expansion joints, or, in the case of inclined slabs, perpendicular to slope, except for round roof slab.
- 6. Type S-5 (Sidewalk Finish)
 - a. Slope sidewalk down ¼-inch per foot away from structures, unless otherwise shown.
 - b. Strike off surface by means of strike board and float with wood or cork float to true plane, then flat steel trowel before brooming.
 - c. Broom surface at right angles to direction of traffic or as shown.
 - d. Lay out sidewalk surface in blocks, as shown or as directed by Engineer, with grooving tool.
- C. Beams and Columns
 - 1. General: Inject cracks with crack repair epoxy. Patch and repair defective areas.
 - 2. Type B-1: Match wall Type W-1.

3. Type B-2: Match wall Type W-2.
4. Type B-3:
 - a. Repair rock pockets.
 - b. Fill air voids.
 - c. Match wall Type W-3.
5. Type C-1: Match wall Type W-1.
6. Type C-2: match wall Type W-2.
7. Type C-3:
 - a. Repair rock pockets.
 - b. Fill air voids.
 - c. Match wall Type W-3.

3.9 FAILURE TO MEET REQUIREMENTS

- A. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the values given in Table 1, the Engineer has the right to require changes in proportions outlined to apply to the remainder of the work. Furthermore, the Engineer has the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such additional curing shall be at the Contractor's expense. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Engineer has the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the Contractor. In such cases of failure to meet strength requirements confer with the Engineer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in ASTM C94 is the Contractor in this Section.
- B. When the tests on control specimens of concrete fall below the specified strength, the Engineer will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In the case of cores not indicating adequate strength, the Engineer, in addition to other recourses, may require, at the Contractor's expense, load tests on any of the slabs, beams, piles, caps, and columns in which such concrete was used. Tests need not be made until concrete has aged 60 days.
- C. Should the strength of test cylinders fall below 60 percent of the required minimum 28-day strength, the concrete shall be rejected and shall be removed and replaced.
- D. Any concrete found to be defective from any cause whatsoever, at any time prior to Final Acceptance of the Work, shall be removed and replaced, or repaired at the

expense of the Contractor.

3.10 PATCHING AND REPAIRS

- A. It is the intent of this Section to require quality work, including adequate forming, proper mixture and placement of concrete and curing, so completed surfaces will require no patching.
- B. Repair defective concrete and honeycombed areas using methods complying with industry standards which meet the approval of the Engineer.
- C. As soon as the forms have been stripped and the concrete surfaces exposed, remove fins and other projections; fill recesses left by the removal of form ties; and repair surface defects which do not impair structural strength. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to approval of the Engineer.
- D. Immediately after removal of forms remove plugs and break off metal ties. Promptly fill holes upon stripping as follows: Moisten the hole with water, followed by a 1/16-in brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form of a spiderweb. Trowel smooth with heavy pressure. Avoid burnishing.
- E. When patching exposed surfaces use the same source of cement and sand as used in the parent concrete. Adjust color if necessary by addition of proper amounts of white cement. Rub lightly with a fine Carborundum stone at an age of 1 to 5 days if necessary to bring the surface down with the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

3.11 CONCRETE SCHEDULE

- A. The following (Table 4) are the general applications for the various concrete classes and design strengths:

TABLE 4
CONCRETE SCHEDULE

Class	Design Strength (psi)	Description
A	3,000	Thrust blocking, slabs, curbs, and pavements
AA	4,000	Walls, beam systems, columns, and all other structural concrete
AAA	5,000	Pre-stressed concrete

END OF SECTION 03 33 00

SECTION 04 21 13

BRICK MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Brick
2.2	Mortar
3.1	Brick
3.2	Laying
3.3	Mortar

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Cast-in-Place Concrete (03 30 00).
2. Precast Concrete Utility Structures (33 05 16.13).
3. Utility Pipe Jacking (33 05 23.16).
4. Tunnel Lining (33 05 23.71).

1.2 REFERENCES

- ###### A.
- Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- ###### A.
- The Contractor shall, under this item, furnish all materials, tools, labor, and equipment, necessary to fully complete the Work indicated under this Contract and as directed by GCDWR.

1.4 SUBMITTALS

- ###### A.
- Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- ###### B.
- Submittals shall show in detail the type, size, and location of all brick masonry and accessories to be used in construction. Submittals shall include material properties data and mortar mix design.

PART 2 - PRODUCTS

2.1 BRICK

- A. All brick used shall, unless otherwise shown or specified, be of such quality as to meet ASTM Designation C62.
- B. Subject to compliance with requirements, provide the following or an approved equal:
 - 1. Grade SW hard grade, common, building brick of clay or shale 2- $\frac{1}{4}$ x 3- $\frac{3}{4}$ x 8 inches in size.

2.2 MORTAR

- A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type 'S.'
- C. Aggregate for Mortar: ASTM C144, except for joints less than $\frac{1}{4}$ inch thick, use aggregate graded with 100 percent passing the No.16 sieve.
 - 1. White-Mortar Aggregates: Natural white sand or ground white stone.

PART 3 - EXECUTION

3.1 BRICK

- A. Should brick be brought upon the site of the Work, of which only a portion is of acceptable quality, the Contractor shall at once remove the same and shall not offer that material again for inspection.

3.2 LAYING

- A. The brick shall be laid regularly and truly to line with joints not exceeding one-quarter ($\frac{1}{4}$) inch in thickness on the face and with joints completely filled with mortar as each brick is pushed into place and no subsequent filling of said joints shall be allowed. No bats or imperfect bricks shall be permitted to be used.
- B. The exposed faces of the brick masonry shall have all mortar projecting beyond the surface of the brick scraped off and the brickwork shall be thoroughly cleaned, and the joints pointed immediately after placing.
- C. No broken or cut brick shall be allowed to be used, except where necessary, as closures, and where cutting of bricks is necessary. Then such faces as are exposed in the same must be accurately trimmed to the contour of the face of the Work in which the bricks are laid.
- D. All brickwork shall be bonded as may be directed and adjoining courses shall break joint one-half ($\frac{1}{2}$) a brick as nearly as practicable. The brickwork shall be executed straight and vertical or regularly curved or battered as shown or specified. Whenever brick masonry is left for the night, or is left unfinished for any reason, the masonry shall be racked off or toothed as directed and mortar removed from the exposed surfaces of

the bricks. When new Work is joined to Work previously laid, the old brickwork must first be thoroughly scraped free from adhering mortar or earth, and thoroughly washed with water.

3.3 MORTAR

- A. The brick shall be laid in mortar consisting of one (1) part by volume of Portland Cement and two (2) parts by volume of clean, coarse, screened sand, thoroughly mixed dry, with sufficient water afterwards added slowly to give proper consistency. Twenty (20) pounds of lime per sack of cement may be added.

END OF SECTION 04 21 13

SECTION 31 11 00
CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	Submittals
1.3	Quality Assurance
1.4	Field Conditions
2.1	Equipment
3.1	Clearing and Grubbing
3.2	Timber
3.3	Disposal of Cleared and Grubbed Materials
3.4	Discing

B. SCOPE

1. Work included under this section includes providing all labor, equipment, and materials necessary to clear wooded areas and dispose of cleared materials in a legal manner.
2. Clearing and grubbing includes, but is not limited to removal from the project lands of trees, stumps, roots, brush, structures, abandoned utilities, trash, debris, and all other materials found on or near the surface of the ground in the construction area and understood by generally accepted engineering practice not to be suitable for construction of the type contemplated. Precautionary measures to prevent damage to existing features to remain is part of the work.

1.2 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

1. Field Quality Control Submittals

- a. Photographs and/or videotape sufficiently detailed of existing conditions within the limits of construction and of trees and plantings, construction, and site improvements of the adjoining area that might be misconstrued as damage caused by site clearing.

1.3 QUALITY ASSURANCE

- A. Comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state or federal authorities having jurisdiction over the project. Obtain all required permits for construction operations.
- B. Obtain pre-approval from the local authority having jurisdiction for open burning.

1.4 FIELD CONDITIONS

- A. Existing Conditions
 - 1. The area to be cleared and grubbed is shown schematically on the drawings. Minimize clearing of existing trees to maintain a natural buffer around the proposed work.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Furnish equipment with operators of the type normally used in clearing and grubbing operations including, but not limited to tractors, trucks, loaders, root rakes, and burning equipment.
- B. Furnish discing equipment capable of plowing the soil to a depth of 6 inches twice in a single pass.

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

- A. The sites of all excavation and grading shall be first cleared of all paving, trees, stumps, roots, brush, organic matter, crops, paving, structures, fences, sidewalks, rubbish, debris, etc., which shall be removed or disposed of in a satisfactory manner in a legally permitted location.
- B. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated. When it is necessary to cut tree roots on the surface of the ground, the ends shall be cut off smooth, without splitting or shattering and scars greater than one inch in diameter shall be sealed with an approved asphalt sealant tree paint. The trunks of the trees shall be carefully protected from damage, and if unavoidable damage occurs, the injured portions shall be neatly trimmed and covered with an application of an approved asphalt sealant tree paint. Excavating machinery, cranes, etc., shall be handled with care to prevent damage to trees, particularly to overhanging branches, and branches shall not be cut off except by permission of GCDWR.

2. Grind stumps and remove roots, obstructions, and debris extending to a depth of eighteen (18) inches below exposed sub-grade.
 3. Use only hand methods for grubbing within tree protection zone.
 4. Chip removed tree branches and stockpile in approved areas or dispose of offsite, as directed by GCDWR.
- C. Grub and remove stumps and roots to a depth not less than two feet (2') below grade. Fill depressions caused by clearing and grubbing operations with proper backfill soil material, unless further excavation or earthwork is indicated by the Drawings or directed by GCDWR. Place fill material in horizontal layers or lifts, not exceeding a loose depth of eight (8) inches, and compact each layer to 85% of maximum dry density – Standard Proctor (ASTM D698).
- D. Grub, stockpile, and/or place in embankments surface rocks and boulders from the soil in accordance with the Specifications.
- E. Grub the entire construction area with heavy tractors with root rakes. Generally, conduct raking along the contour rather than up and down slopes so as to inhibit soil erosion.
- F. Grubbing shall consist of completely removing roots, stumps, trash, and other debris from all graded areas so that topsoil is free of roots and debris. Topsoil is to be left sufficiently clean so that further picking and raking will not be required.
- G. Burying of residual materials will not be allowed.
- H. All Contractors should be aware that the Georgia Environmental Protection Division has issued a burning ban for thirteen (13) Metro Atlanta Counties, including Gwinnett. The ban went into effect in 1996 and shall continue each year from May 1 through September 30. This ban should be considered when bidding projects that require clearing and debris removal. It is the Contractor's responsibility to remove all construction debris from the jobsite. Any costs incurred as a result of the burning ban are the sole responsibility of the Contractor.

3.2 TIMBER

- A. Salvage all timber within the cleared area having a marketable value.
- B. The timber within the cleared area shall become the property of the Contractor and the Contractor shall be responsible for selling the timber.

3.3 DISPOSAL OF CLEARED AND GRUBBED MATERIALS

- A. Dispose of the cleared and grubbed materials by burning or chipping. Burning shall be permitted during approved burning seasons only. During non-burning season periods, use chipping for debris disposal. Remove chipped material from the site or disposed of in areas approved by GCDWR.

- B. If burning is allowed, do not allow a fire to be unattended. The Contractor is responsible for damage occasioned by such fires. Do not bury burned and nonflammable materials.
- C. Disposal of materials in streams will not be permitted. Do not pile materials in stream channels or along the banks where it might be washed away by flood.
- D. Remove all fence material within the areas to be cleared from the job site. Fence materials become the property of the Contractor.

3.4 DISCING

- A. After grubbing is complete, discing of the entire area is required. Perform discing in two directions at approximate right angles. Generally perform the second discing along the contour.
- B. The construction area is to be left free-draining with a finished agricultural appearance.

END OF SECTION 31 11 00

SECTION 31 13 11
TEMPORARY FENCING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Tree Save Barrier
3.1	Temporary Fencing

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Clearing and Grubbing (31 11 00).
2. Excavation and Fill (31 23 00).
3. Wetlands Protection (32 73 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor is responsible for installing and maintaining Orange Tree Save Barrier, as indicated on the plans or as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

PART 2 - PRODUCTS

2.1 TREE SAVE BARRIER

- A. Must have the following characteristics:
1. High visibility
 2. Lightweight and easy to handle
 3. UV stabilized fabric

4. 48" height
5. 100' prefabricated rolls or 300' fabric rolls
6. 60" heavy duty oak stakes

PART 3 - EXECUTION

3.1 TEMPORARY FENCING

- A. The Contractor shall install Tree Save Barrier as indicated on the Drawings, or as directed by GCDWR, to exclude the entry of equipment into designated save areas. Tree Save Barrier is to be installed at the beginning of construction before clearing and grubbing activities commence. Contractor shall be responsible for maintaining fence for its intended purpose until directed to remove fence by GCDWR. No work shall be allowed on private property and/or within GCDWR granted easements until Tree Save Barrier has been installed by the Contractor and inspected/confirmed by the Engineer and GCDWR. Where necessary, the Contractor shall obtain the services of a land surveyor, registered in the State of Georgia, to stake easement lines, right-of-way lines, and property lines to designate the limits of construction.

END OF SECTION 31 13 11

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

<u>Paragraph</u>	<u>Title</u>
1.2	Submittals
1.3	Quality Assurance
1.4	Field Conditions
2.1	Bedding
2.2	Backfill
2.3	Top Soil
3.1	Initial Site Preparation
3.2	Protection of Trees and Shrubbery
3.3	Dewatering
3.4	Sheeting, Shoring, and Bracing
3.5	Excavation
3.6	Blasting
3.7	Unauthorized Excavations
3.8	Bedding
3.9	Backfilling
3.10	Fills and Embankments
3.11	Disposal of Waste and Unsuitable Materials
3.12	Final Grading
3.13	Top Soil
3.14	Settlement
3.15	Access by GCDWR's Material Testing Firm

B. Scope

1. The work covered by this section includes furnishing all labor, materials, and equipment required for all earthwork and earthwork related operations including, but not limited to, dewatering; excavating all classes of material encountered on the construction site; pumping, draining, and handling of water encountered in the excavations; handling, storage, transportation, and disposal of all excavated and unsuitable material; handling, storage, and transportation of all off-site borrow excavation; construction of fills and embankments; backfilling around structures and pipe; backfilling all trenches and pits; compacting; sheeting, shoring and bracing; preparation of subgrades; surfacing and grading, and all other appurtenant earthwork operations which may be necessary to complete the work as specified herein and as shown on the drawings.

C. General

1. The term “excavation” as used herein shall mean excavation of materials including earth, hardpan, rock, masonry, concrete – plain and reinforced, pavement, ashes, rubbish, muck, debris, etc.
2. Perform earthwork operations in a safe and proper manner with appropriate precautions being taken against all hazards.
3. Maintain all excavated and filled areas for structures, trenches, fills, topsoil areas, embankments and channels in good condition at all times until final acceptance by the GCDWR. Repair all damage caused by erosion or other construction operations using material of the same type as the damaged material.
4. Perform earthwork within the rights-of-way of the State Department of Transportation, the County Department of Transportation, and the respective cities in accordance with requirements and provisions of the permits issued by those agencies for the construction within their respective rights-of-way. Such requirements and provisions, where applicable, shall take precedence and supersede the provisions of these specifications.
5. Control grading in a manner to prevent water running into excavations. Avoid obstruction of surface drainage and provide means whereby storm water can be uninterrupted in existing gutters, other surface drains, or temporary drains. Provide free access to all fire hydrants, water valves, and meters.
6. No classification of excavated materials will be made. Excavation work includes the removal and subsequent handling of all materials excavated or otherwise removed in performance of the contract work, regardless of the type, character, composition, or condition thereof.
7. It is understood and agreed that the Contractor has made a thorough investigation of the surface and subsurface conditions of the site and any special construction problems which might arise as a result of nearby watercourses and flood plains, particularly in areas where construction activities may encounter water-bearing sands and gravels or limestone solution channels. Provide all services, labor, equipment, and materials necessary or convenient to complete the work within the time specified in these Contract Documents.

1.2 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

1.3 QUALITY ASSURANCE

A. Regulatory Agency Requirements

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

B. Field Testing

1. An independent testing laboratory will conduct tests for compaction and density, in each fill layer at intervals of approximately three hundred feet (300'). Depending on field conditions and results of testing, frequency of testing may be increased or decreased to ensure proper compaction. Make all necessary excavations and supply any samples of materials necessary for conducting compaction and density tests. Costs of compaction tests performed by an independent testing laboratory shall be paid by GCDWR. The cost of all retests made necessary by the failure of materials to conform to the requirements of these Contract Documents shall be paid by the Contractor.

1.4 FIELD CONDITIONS

A. Existing Conditions

1. The elevations shown on the Drawings as existing are intended to give reasonable, accurate information about the relative elevations. They are not precise, and the Contractor should satisfy himself as to the exact quantities of excavation and fill required.

PART 2 PRODUCTS

2.1 BEDDING

- A. Unless otherwise specified, bedding material shall be angular, graded, crushed stone embedment and shall conform to Georgia DOT Specification Section 800 Gradation #57, varying in sizes 1/4" through 3/4".

2.2 BACKFILL

- A. Provide materials for backfill conforming to the following requirements:

Select Earth Backfill	Fine, sound, loose earth containing optimum moisture content for compaction to 95 percent of maximum density (Standard Proctor ASTM D698), free from all wood, vegetable matter, debris, and other objectionable material, and having scattered clods, stones, or broken concrete less than 2 inches in maximum dimension except that the maximum particle size shall be 3/4 inch when used with PVC or other flexible thermoplastic pipe; provided material has been approved for such use by construction material testing firm.

Common Earth Backfill	Sound, loose earth containing optimum moisture content for compaction to 95 percent of maximum density (Standard Proctor ASTM D698), free from all wood, vegetable matter, debris, and other objectionable material, and having scattered clods, stones, or broken concrete and pavement less than 6 inches in maximum dimension.

Sand	Natural or imported sand conforming to ASTM D1073.
Graded Aggregate	Graded aggregate conforming to Sections 310 and 815.01, Class A, Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges.
Class A Concrete	Class A concrete as specified in the section entitled "Cast-in-Place Concrete" of these Specifications.

2.3 TOP SOIL

- A. Top soil is defined as the surface layer of soil and sod that is suitable for use in seeding and planting. No refuse or any material toxic to plant growth is allowed in top soil.

PART 3 EXECUTION

3.1 INITIAL SITE PREPARATION

- A. Preparatory to the beginning of construction operations, remove from the project area all vegetable growth, trees, brush, stumps, roots, debris, and any other objectionable matter, including fences, buildings, and other structures shown on the Drawings in the construction areas which are designated for removal or which, if left in place, would interfere with the proper performance or completion of the contemplated work, would impair its subsequent use, or would form obstructions therein.
- B. Whenever the removal of pavements (other than gravel or surface treated types) is required, the Contractor shall outline the area to be removed by making straight saw cuts, and providing vertical cuts in straight lines in order to permit removal in a straight line. Should pavement breakage occur beyond original saw cut, Contractor will be required to make a new straight saw cut beyond the furthest point of breakage.
- C. Clear and grub the site in accordance with Section 31 11 00 – Clearing and Grubbing of these specifications.
- D. In all areas to be excavated, filled, paved, or graveled, strip the top soil to its full depth and store on site for subsequent reuse. Keep top soil separate from other excavated materials. Screen out and/or remove roots and other undesirable materials from top soil. Stored topsoil shall be used for finish grading in unpaved areas.
- E. Remove and dispose of all excess material resulting from clearing or site preparation operations. Dispose of such materials in a lawful manner and at a location where such materials can be lawfully disposed.

3.2 PROTECTION OF TREES AND SHRUBBERY

- A. Contractor shall be responsible for protection of tops, trunks, and roots of existing trees that are to remain on the project site or in parks, lawns, or other improved areas. Do not disturb and provide protection, if necessary, for all trees in areas where there is no excavation or embankment. Box, fence, or otherwise protect existing trees, which may be subject to construction damage, before any work is started. Remove the boxing when directed or at the completion of the project. Heavy equipment or stockpiles will not be permitted within branch spread. Remove interfering branches without injury to trunks and cover the scars with tree paints.
- B. Do not remove a tree unless absolutely necessary for construction, as approved by the Engineer or GCDWR. In areas beyond construction, right-of-way, or easements do not remove trees or shrubbery without the written consent of the property owner and approval of the GCDWR.
- C. In open or improved lawn areas, excavation is to be done, if possible, utilizing a tractor mounted backhoe. Take extreme care to avoid any damage to adjoining lawn areas. In areas not readily accessible by machinery and where excavation is required near existing trees and shrubberies, which may be damaged by excavation equipment, excavate the trench with hand tools except as provided is in this section. As an alternate method, bores under landscaped areas may be approved by GCDWR to minimize disturbance of existing vegetation. This method of construction will be considered as convenience for the Contractor, and shall be paid the same as an open-cut excavation.

3.3 DEWATERING

- A. Provide and maintain at all times during construction ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavations or other parts of the work. Accomplish dewatering by methods which will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. Methods of dewatering may include sump pumps, well points, deep wells, or other suitable methods which do not damage or weaken structures, foundations, or subgrades. Shallow excavations may be dewatered using open ditches provided such ditches are kept open and free-draining at all times.
- B. Unless specifically authorized by the Engineer, do not place concrete or mortar in water nor allow water to rise over newly-placed concrete or mortar for at least 24 hours after placement. Do not expose concrete structures to unequal hydrostatic forces until the concrete has reached its specified 28-day strength. Ground water encountered within the limits of excavation shall be lowered to an elevation not less than twelve inches (12") below bottom of excavation before pipe laying or concreting is started. Exercise care to prevent damage to pipelines or structures resulting from flotation, undermining, or scour. Commence dewatering operations when ground or surface water is first encountered and continue until such times as water can safely be allowed to rise in accordance with the provisions of this section. Protect excavations from the entrance of surface water to the extent possible by the use of dikes and/or covers.

- C. Provide and maintain standby pumping equipment on the job site. Make available a minimum of one standby unit (a minimum of one for each ten in the event well points are used) for immediate installation should any pumping unit fail. Design and install well points or deep wells suitable for the accomplishment of the work and in compliance with all local codes.
- D. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, excavate and replace the affected areas with crushed rock at no cost to the GCDWR.
- E. Dispose of the water from the work in a suitable manner without damage to adjacent property. Do not allow conveyance of the water to interfere with traffic flow or treatment facilities operation. No water shall be drained into work built or under construction. The Contractor will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.
- F. Provide sedimentation and desilting basins as necessary to prevent the entrance of excessive or injurious amounts of sand and silt from surface runoff or dewatering operations into storm drains or receiving waters. At a minimum, provide a baffled structure having not less than five minutes detention time designed to have a "flow-through" velocity not exceeding 0.2 feet per second at the anticipated peak flow for desanding or desilting the water.
- G. Dispose of water in such a manner as not to be a menace to the public health and in accordance with applicable Environmental Protection Agency, Corps of Engineers, and State Environmental Protection Division standards and permits.
- H. Should sewage or any other odorous liquids be encountered during the Work, GCDWR shall be notified immediately. GCDWR will promptly notify appropriate regulatory agencies, if necessary. In addition, GCDWR will instruct Contractor as to any actions the Contractor can and cannot perform prior to any directives, which may be issued by the regulatory agencies. Any sewage will be pumped and hauled to an in-service manhole, pump station, or water reclamation facility, as directed by GCDWR. Any other liquids will be disposed of properly, as directed by GCDWR and/or any regulatory agencies having jurisdiction. GCDWR will then determine if actions taken by Contractor have caused the source of the odorous liquid to leak, and if so, Contractor shall be responsible for any fines and/or penalties levied by regulatory agencies having jurisdiction.

3.4 SHEETING, SHORING, AND BRACING

- A. Contractor shall sufficiently sheet, shore, and brace the sides of all excavations, as necessary, to prevent slides, cave-ins, settlement or movement of the banks, to maintain the excavation clear of all obstructions, and to provide safe working conditions. Use wood or steel sheeting of approved design and type in wet, saturated or flowing ground. Design all sheeting, shoring, and bracing with sufficient strength and rigidity to withstand the pressure exerted and to maintain shape and position under all circumstances.

- B. It is the Contractor's responsibility for correctly assessing the need for sheeting and analyzing the stresses induced. Since the Engineer does not dictate or determine the Contractor's sequence or limits of excavation, the Engineer assumes no responsibility for sheeting and shoring. The Contractor must employ or otherwise provide for adequate professional structural and geotechnical engineering supervision to assess the need for sheeting and shoring and design same. Submit the results of sheeting and shoring analysis and design to the Engineer on request.
- C. Adequately sheet, shore, or brace excavations adjacent to existing or proposed buildings and structures, or in paved streets or alleys to prevent undermining beneath or subsequent settlement of such structures or pavements. Underpin adjacent structures when necessary to maintain structures in safe condition. Repair any damage to structures or pavements occurring through settlements, water or earth pressures, slides, caves, or other causes; due to failure or lack of sheeting or bracing, or due to improper bracing; or occurring through negligence or fault of the Contractor in any other manner at his own expense.
- D. Do not leave sheeting, shoring, or bracing materials in place unless otherwise specified or shown on the Drawings or ordered by the Engineer in writing. Remove such materials in such manner that no danger or damage will occur to new or existing structures or property, public or private, and so that cave-ins or slides will not take place. Leave trench sheeting in place until backfill has been brought to a level 12 inches above the top of the pipe. Then cut off and remove the upper portion. Leave sheeting for structures in place until backfill has been brought to a level of 12 inches above the top of the bottom footing. Then cut off and remove the upper portion.
- E. Where in the opinion of the Engineer or GCDWR the removal of sheeting would endanger the Work built under this Contract or any adjoining improvements, such sheeting will be ordered to be left in place and the tops cut off as directed. Any timber directed to be left in place will not be paid for as supplemental price. No additional payment will be made for sheeting when directed to be left in place.
- F. In quicksand or soft ground, drive sheeting to such depth below bottom of the trench to prevent upheaval, or as directed.
- G. Fill and thoroughly compact all holes and voids left in the work by the removal of sheeting, shoring, or bracing.
- H. It shall be the sole and exclusive responsibility of the Contractor to meet local and OSHA safety requirements in meeting the need and adequacy of sheeting, shoring, bracing, or other provisions to protect workers and equipment in a trench or other excavation.

3.5 EXCAVATION

- A. General
 - 1. Excavation includes the removal of all material from an area necessary for the construction of a pipeline, structure, basin, flume, or building. Provide adequate

working space and clearances in excavations for the work to be performed therein.

2. Except where otherwise shown on the Drawings or specified herein, replace all material excavated below the bottom of concrete walls, footings, and foundations, at the Contractor's expense, with Class A concrete to the lines and grades shown on the Drawings.
3. Where quicksand, soft clay, spongy, swampy or other materials unsuitable for subgrade or foundation purposes are encountered below the excavation limits, remove and dispose of such to the level of suitable material. Backfill areas so excavated with Class A concrete or with compacted layers of crushed rock, sand, or other approved material conforming to the requirements specified herein for backfill to the lines and grades shown on the Drawings.
4. Place barriers at each end of all excavations and at such places as may be necessary along excavations to warn all pedestrian and vehicular traffic of such excavations. Place lights along excavations from sunset each day to sunrise of the next day until the excavations are backfilled. Barricade all excavations in such a manner as to prevent persons from falling or walking into any excavation.

B. Excavation Methods

1. Use open-cut techniques for all excavation unless otherwise indicated on the Drawings or approved by the Engineer or GCDWR. In general, topsoil may be removed by machine methods. Excavation below topsoil may also be performed by machine, but shall be supplemented by such hand dressing or leveling as may be required to conform to lines and grades as given by the Engineer or GCDWR. Use material so removed in backfill, making embankments, filling low areas, or as otherwise directed.
2. Use hand tool excavation where necessary to protect existing utilities and structures.
3. Carefully cut or grade all slopes to the grades as detailed on the Drawings, and/or required by the Engineer. Tamp or otherwise compact slopes to maintain the material in position.
4. It is the Contractor's sole and exclusive responsibility to have all excavation conform to local and OSHA safety requirements.

C. Rock Excavation

1. All excavation is considered unclassified. Include all cost of rock excavation (excavating, blasting, loading, hauling, crushing, backfilling, and/or disposing) in the lump sum or unit price bid amount for the associated work.
2. Uncover and strip all loose materials and/or rock encountered in the process of excavation for structures over the entire limits of excavation. Uncover rock encountered for removal in a trench section for a distance of not less than 50 feet.

3. Excavate rock and large boulders in trenches over the horizontal limits of excavation and to depths as follows:

Size of Pipe (inches)	Depth of Rock Excavation Below Bottom of Pipe (inches)
3 and smaller	4
4 to 6	6
8 to 18	8
18 to 30	10
32 and larger	12

4. Backfill the space below the bottom of the pipe to the proper grade with compacted layers of crushed rock or sand conforming to the requirements specified herein for backfill. Where pipe sewers are constructed on concrete cradles, excavate rock to the bottom of the cradle as shown on the Drawings.
5. Excavate rock under structures to lines and grades shown on the Drawings. Unless specified otherwise, where rock excavation has been carried below required grade, backfill to grade with bedding material.
6. Where rock foundation is obtained at grade for over 50 percent of the area of any one structure, excavate the portion of the foundation that is not rock below grade to reach a satisfactory foundation of rock. Backfill the portion below grade with bedding material.
7. Where rock foundation is obtained at grade for less than 50 percent of any one structure and satisfactory rock cannot be found over the remaining area by reasonable additional excavation, remove the rock for a depth of 12 inches below grade and backfill the space below grade to the proper grade with compacted layers of crushed rock conforming to the requirements specified herein for backfill.
8. Conduct drilling and blasting operations in accordance with the requirements of paragraph 3.6, below.
9. Complete rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation before construction of any structure is started in the vicinity.

D. Borrow Excavation

1. When sufficient amount of suitable excavated material to complete the Work is not available on the project site; or wherever the backfill of excavated areas or the placement of embankments or other fills requires specified material not available at the site or material in excess of suitable material available from the authorized excavations, obtain such materials from other sources. This may require the opening of borrow pits at points not immediately accessible from the Work. In such cases make suitable arrangements with the property owner and pay all costs incident to the borrowed material including royalties, if any, for the

use of the material. Before a borrow pit is opened, the quality and suitability of the material to be obtained from the borrow pit shall be approved by the GCDWR's materials testing Engineer. No borrow excavation shall be made within the bed limits of any existing or projected public highway.

2. Clear, grub, and finish grade borrow pits in accordance with the requirements specified herein.

E. Structural Excavation

1. Structural excavation consists of the removal of all materials necessary for the construction of structures, including tanks, foundations, footings, wet wells, dry wells, box culverts, flumes, channels, buildings, and other miscellaneous structures.
2. Make the bottom of structural excavations true to the lines and grades shown on the Drawings. Do not undercut faces of excavations for extended footings. Except as provided herein for excavation of unsuitable material or rock, where the excavation is carried below the grade elevation shown on the Drawings, backfill the void thus made to the proper grade with Class A concrete at the Contractor's expense.

F. Trench Excavation

1. Excavate trenches to the lines and grades shown on the Drawings with the centerlines of the trenches located on the centerlines of the pipes.
2. Make the sides of all trenches vertical to a minimum of one foot above the top of the pipe. From the bottom of the trench to twelve inches (12") above the pipe, the maximum width shall be as indicated on the Drawings. This distance will be measured at an elevation in trench which is 12 inches above the top of the pipe when laid to grade. Excavation of pipe trenches with side sloping to the bottom will not be permitted.
3. Wherever the prescribed maximum trench width is exceeded, use the next higher class (load factor) of embedment or encasement for the full trench width as actually cut, at no additional cost to the GCDWR.
4. Excavate the trenches to the required depth allowing for the placement of pipe bedding to the thickness shown on the Drawings.
5. Should the bottom of the trench become an unstable foundation for the pipe through the failure of the Contractor to adequately perform, remove the unstable material and fill the trench to the proper subgrade with crushed rock. No extra compensation will be allowed for this material or work. Should the trench be inadvertently excavated to a greater depth than necessary, provide crushed rock fill to the proper subgrade at no additional cost to the GCDWR.
6. Should the undisturbed material encountered at the grade depth constitute, in the opinion of the Engineer, an unstable foundation for the pipe, remove such unstable material and fill the trench to the proper subgrade with crushed rock.

7. Contractor shall not have more than five hundred feet (500') of trench open at any one time. New trenching will not be permitted to be excavated if there are previously excavated trenches that require backfill or surface area restoration. **Cleanup and grassing shall follow a maximum of 500 feet of pipe installation.**
8. Control drainage in the vicinity of excavation so the ground surface is properly pitched to prevent water from running into the excavation.

3.6 BLASTING

A. Requirements

1. Blasting for removing rock for excavation shall be properly permitted.
2. Contractor shall use all possible precautions against accidents or damages due to use or storage of explosives, and Contractor assumes all responsibility/liability associated with blasting activities.
3. ONLY **LICENSED** EMPLOYEES OR SUBCONTRACTORS WILL BE ALLOWED TO CONDUCT BLASTING ACTIVITIES – PROOF OF SUCH PROPER LICENSING **MUST** BE PROVIDED TO GCDWR **PRIOR TO** ENGAGING IN ANY BLASTING ACTIVITIES.
4. Furnish all labor, equipment and materials required to drill, blast, loosen, excavate, and dispose material to complete the work shown on the Drawings and specified herein.
5. The work includes, but is not be limited to:
 - a. Blast round design.
 - b. Planning and execution of appropriate site-specific safety measures to be employed during all blasting operations, and the safe handling and storage of high explosives and blasting agents.
 - c. Drilling blast holes, loading blast holes with explosives, and wiring and safe detonation of blast rounds.
 - d. Removal from the site of all excess excavated soil, debris, and rock as indicated in the contract Documents, or as directed by the Engineer, and disposal of excess materials at a permitted disposal site.
 - e. Dewatering and maintenance of groundwater and surface water in all excavations.
 - f. Performance of all surveys necessary to establish and verify the lines and grades and to determine the amount of material removed.
 - g. Implementation of monitoring program to monitor condition of existing structures and utilities in vicinity of proposed blasting operations to insure existing features remain undamaged by blasting procedures.
6. Make all excavations in conformance with the lines, grades, and cross sections on the Drawings or established by the Engineer. Where blasting is required, blasting should ensure removal of six inches (6") of rock below proposed grade

line. All over-blast shall be removed and the resulting over-excavation backfilled and compacted with #57 gradation stone coarse aggregate.

7. Conduct all blasting operations, including transporting and storing of explosives in compliance with the Georgia State Fire Commissioner's Rules and Regulations for Explosives and Blasting Agents, latest edition and all applicable local codes.

B. Submittals

1. Submit the following in accordance with the procedures and requirements set forth in Section 01 33 00 Submittal Procedures, at least thirty (30) working days prior to beginning any blasting operations:
 - a. Names, addresses, telephone numbers, and qualifications of the blasting subcontractor(s) and explosives supplier(s) that will be used, including the designated Blaster-In-Charge.
 - b. Copies of Training Certificates for the designated Blaster-In-Charge, blasting foreman and any other key personnel that will be responsible for the work, showing that they have received specialized training in the proper handling of explosives.
 - c. A Blasting Plan, indicating the methods, materials and equipment to be used. The Blasting Plan should indicate the types of explosives to be used, drilling patterns, and a general layout and schedule for executing the work in accordance with state regulations.
 - d. A ground vibration and air blast monitoring plan, indicating structures that will be monitored, monitoring equipment that will be used, and personnel that will perform the monitoring.
2. At least 24 hours before each blast round, submit a detailed blast round design plan to the Engineer's or GCDWR's on-site representative. The blasting plan submitted is for quality control and record keeping purposes. Review by the Engineer does not relieve the Contractor of his responsibilities as provided herein. Include the following in the blast round design submittals:
 - a. Location (state, grid coordinates) and limits of the shot.
 - b. Number, diameter, and depth of blast holes to be detonated in the round, and a plan showing the drill hole pattern, spacing and distance to the free face.
 - c. Depth of overburden.
 - d. Total weight of explosives in the round and the types of explosives to be used.
 - e. Loading diagram showing the location of explosives, primers, and initiators; and location, depth, and type of stemming to be used in each hole.
 - f. Initiation sequence, including delay timer and delay system, total weight of explosive to be detonated on each delay, and a list of the timing of the delays.
 - g. Manufacturer's data sheet for all explosives, primers, and initiators to be used.

- h. Planned seismic monitoring positions, distances from the blast round, and seismograph types to be used to monitor vibrations and air blast overpressures.
- i. Type and amount of blasting mats and/or depth of soil cover to be used over the top surface of the shot.
- j. Any other information required by applicable state and federal regulations.
- 3. Within 24 hours after each blast round, submit a blasting report to the Engineer. Include the following in the blasting report:
 - a. Date and time of shot.
 - b. Foreman's name.
 - c. Number and depth of holes detonated.
 - d. Weather conditions at the time of detonation.
 - e. Type of explosives and detonators used.
 - f. Peak particle velocity of ground motion and primary frequency for all ground vibration monitoring stations.
 - g. Peak air blast overpressure measured.
 - h. Distance from the blast round to each monitoring station for vibrations and air blast.
 - i. Amount of explosive used in each hole, and maximum weight of explosive detonated on any single delay in the blast round.
- C. Pre-Blast Survey
 - 1. Contractor shall have an approved vibration consultant conduct the pre-blast survey on the residences and facilities adjacent to the proposed rock blasting in accordance with the submitted survey and monitoring plan. The survey shall include, but not be limited to the following:
 - a. A site plan or drawing of the structure to be examined showing the structure in relationship to the proposed rock blasting area and a full description of the structure including type of materials and construction.
 - b. Examination of the structure (interior and exterior surfaces) by experienced and qualified personnel, noting any visible structural and aesthetic flaws in or on the structure. Note existing cracks and flaws, with significant cracks measured, and all cracks and flaws photographed.
 - c. Upon completion of the examination, ask the structure's owner to review the report, note any corrections or omissions, and sign a statement that to the best of his knowledge, the examination report reflects the conditions of the structure prior to any rock blasting. If the structure's owner refuses to sign said report, it should be noted in the report by the examiner.
 - d. Nothing contained herein shall relieve the Contractor of responsibility for claims arising from his construction operations. Failure to inspect any structure, whether or not required by these Contract Documents, or inadequacy

of the inspections shall not relieve the Contractor of his responsibility. The Contractor shall indemnify the County from such claim.

- e. In the event that any property owner denies access for the survey of structures and facilities, notify such property owner, by certified mail, stating that this is final notification. Submit to the Engineer, copies of all correspondence between the Contractor and the property owner(s). The Engineer, upon review of the submitted correspondence may waive requirements set forth above. However, the Contractor is fully responsible for claims and damage arising from his construction operations regardless of property location.
- f. Submit two (2) sets of copies of the examination reports to the Engineer for their records.

D. Use of Explosives

- 1. When the use of explosives is necessary for the prosecution of the work, exercise the utmost care not to endanger life or property. Be responsible for any and all damage or injury to persons or property resulting from the use of explosives.
- 2. Store all explosives in a secure manner, in compliance with all laws, and clearly mark all such storage places "DANGEROUS EXPLOSIVES".
- 3. Notify any public utility company having facilities in close proximity to the site of the work of the intention to use explosives. Provide this notice sufficiently in advance to enable the utility companies to take whatever steps they may consider necessary to protect their property from injury. Also give the Engineer, all occupants of adjacent property, and all other Contractors working in or near the Project, notice of the intention to use explosives.
- 4. Only non-electric type initiators maybe used.

E. Blasting Operations

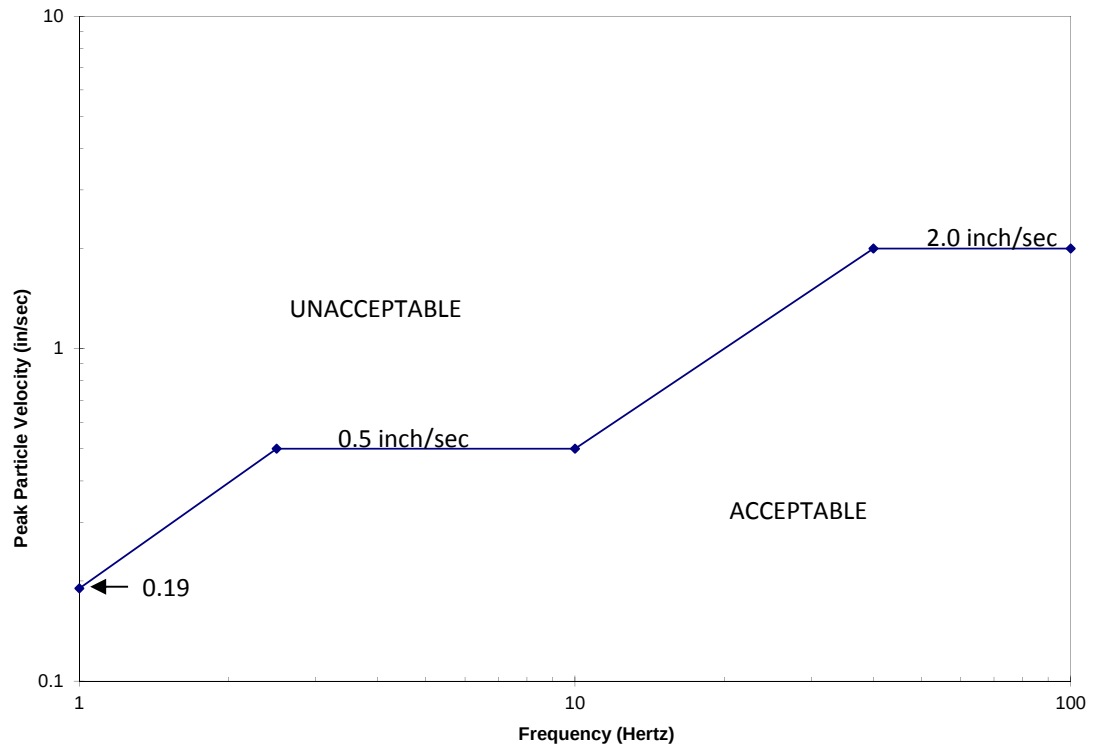
- 1. Provide explosives of such quantity and power and use in such locations as will neither open seams nor otherwise disturb the material outside the prescribed limits of excavation. As the excavation approaches its final limits, reduce the depth of holes for blasting and the amount of explosives used for each hole so that the underlying or adjacent rock will not be disturbed or shattered.
- 2. Do not perform blasting within 100 feet of newly placed concrete that has cured less than 7 days. Do not perform blasting within 50 feet of any existing structure or any new structure in progress.

F. Blast Monitoring

- 1. Exercise the utmost care not to damage property on-site and off-site. Notify each adjoining property owner within 5000 feet of the site of the anticipated ground vibrations and noise which will occur due to the blasting operations. Provide this notice 30 days in advance to enable the adjacent property owners to take whatever precautions they may consider necessary. Limit operations to minimize any disturbance to the adjacent property owners. Notify motorists on

adjacent roadways in accordance with state regulations. Take responsibility for any damage to any structure or utility line, pipes, etc., on-site and off-site as a result of his operations.

2. For each blast round, monitor and record noise and air blast overpressures at the site perimeter nearest the blast location and at the on-site or off-site structure located nearest to the round. Peak air blast overpressure shall not exceed 0.018 psi, measured at the site perimeter.
3. Sufficiently cover the site of every blast round with blasting mats or other devices to prevent any flying debris. The number and type of blasting mats must be satisfactory to the Engineer. The Contractor will be fully responsible for any damage caused by flying debris, both to on-site and off-site properties.
4. Whenever blasting is to be performed within 2500 feet of any structure, measure the peak particle velocities of ground vibration resulting from each blast at the structure. Monitor vibrations utilizing a seismograph capable of providing a record of particle velocity and frequency along three mutually perpendicular axes utilizing internal calibration. Measured peak particle velocity of ground motion at the monitored structure shall not exceed the values shown in the following graph:



G. Notification

1. Give twenty-four (24) hour notice to Engineer and adjacent residences and/or businesses prior to each blast.

H. Complaints

1. Submit notice of blasting complaints to Engineer in writing within twenty-four (24) hours of receipt thereof. Identify the origin of complaint in the notice and provide a brief description of alleged damages or other circumstances upon which the complaint is predicated. Assign a number to each complaint consecutively in the order of receipt. Assign each complaint a separate number and show in each letter complaint all previous complaint numbers registered by the same complainant. In addition, make a summary report each month to Engineer. Indicate date, time and name of person investigating the complaint and amount of damages (or an estimate thereof), if any, in the summary report.
- I. Post Blast Survey
 1. Contractor shall have the same vibration consultant who performed the pre-blast survey conduct the post-blast survey. The consultant shall examine all structures from which a complaint has originated after the blast. The survey shall include, but not be limited to the following:
 - a. A full description of the alleged damage caused by the blast. Where appropriate, provide a sketch to more fully describe the location and type of damage. Measure cracks and compare to any original measurements which may have been taken in the Pre-Blast Survey.
 - b. Take colored photographs of any alleged damage.
 - c. Submit two (2) copies of the Post Blast Survey report to the Engineer. The report shall include the consultant's assessment of the alleged damage and an opinion as to its likely cause.

3.7 UNAUTHORIZED EXCAVATIONS

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

3.8 BEDDING

- A. All pipe bedding requirements, as specified, are to be considered minimum requirements, and as such, do not relieve Contractor of the responsibility to provide additional bedding necessary for proper support of the pipeline and appurtenances, or as directed by the Engineer or GCDWR.
- B. Bell holes shall be provided in all classes of bedding, so as to relieve pipe bells of all loads, but small enough to ensure support is provided throughout length of the pipe.
- C. Trench shall be excavated to allow the placing of bedding material for the full trench width, and spread to form a uniform support (foundation cushion) for the pipe and appurtenances, and then compacted as specified on the Drawings so that the pipe is

true to line and grade. Remaining bedding material shall be carefully placed such that bedding material fills and supports the haunch area and encases the pipe to the limits specified and compacted according to the bedding class specified, as indicated on the Drawings, or directed by the Engineer or GCDWR.

- D. Unless otherwise specified, at a minimum, Class 'D' Bedding shall be used for pressurized mains of ductile iron pipe material (sanitary sewer force main and water main).
- E. Unless otherwise specified, at a minimum, Class 'C' Bedding shall be used for gravity sanitary sewer of ductile iron pipe material.
- F. Unless otherwise specified, at a minimum, Class 'B' Bedding shall be used for gravity sanitary sewer of polyvinylchloride (PVC) pipe material.
- G. All pipe installed within rock excavation, shall be laid upon a minimum of six inches (6") of #57 gradation stone coarse aggregate.
- H. Groundwater Flow Dams will be required under certain conditions. If there is a large volume of groundwater, which will follow the crushed stone bedding downhill due to the elevations involved, and builds adequate pressure to washout the stone bedding, Flow Dams will be required. Flow Dams shall consist of clay bedding three feet (3') long and spaced every one hundred feet (100') along the pipeline route.

3.9 BACKFILLING

A. General

- 1. Unless otherwise specified herein, compact earth backfill to specified maximum dry density as determined by Standard Proctor, ASTM D-698. Compact or consolidate crushed stone to specified maximum dry density as determined by Modified Proctor, ASTM D-1557; or as directed by Engineer or GCDWR Testing Materials Representative.
- 2. Prior to placement, add sufficient water to secure optimum moisture content to material that is too dry for adequate compaction. Do not place material having excessive water content at any time.
- 3. Unless otherwise specified herein, place backfill material required to be compacted in horizontal layers not to exceed six (6) inches in thickness (before compaction) and compacted in place by ramming, tamping, or rolling. Accomplish compaction by power driven tools and machinery wherever possible. Accomplish compaction and consolidation of sand and crushed rock backfill using vibrating equipment.

B. Backfilling around Structures

- 1. Backfilling around structures consists of common earth backfill and shall be placed in 6-inch lifts and compacted to a minimum of 95 percent of the maximum density (determined by Standard Proctor D698) for the full depth of the excavation from the bottom to the finished grade. Do not place backfill against concrete structures until the concrete has reached its specified 28-day

compressive strength. Where practical, accomplish compaction of structural backfill by power-driven compaction equipment.

2. Where crushed rock mats under slabs and foundations are called for on the Drawings, excavate below grade to the depth of the crushed rock mat as shown on the Drawings and install a compacted crushed rock bed. Finish the bed to a true line or plane and even with the subgrade of the concrete foundations, piers, footings, or slabs. Before placing any crushed rock, remove all loose earth or debris. Extend this crushed rock mat 12 inches beyond all slabs and foundations or to edges of sheet piling.
3. Construct crushed rock mats, 12 inches or less in thickness, of compacted layers of crushed rock conforming to Section 815.01 Class A, Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges.
4. Construct the top 12 inches of crushed rock mats of thickness greater than 12 inches of compacted layers of crushed rock as specified above. Construct that portion below the top 12 inches of compacted layers of crushed rock as specified, with a modified gradation of 6 inches to dust as received from the crusher.
5. Compact fill under slab-on-grade to 98% Standard Proctor Density ASTM D698, at moisture content between 2 percent below and 3 percent above the optimum moisture content.
6. Compact granular structural fill under foundation elements, i.e., footings and base slabs for tanks and basins to 100 percent Standard Proctor Density ASTM D698, at moisture content between 2 percent below to 3 percent above the optimum moisture content.
7. Unless otherwise shown on the Drawings, do not use earth backfill to support footings, foundations, and structures.

C. Backfilling Trenches

1. Except as otherwise specified or directed, all forms, bracing, and lumber shall be removed before backfilling.
2. Backfill in paved areas shall include Initial, Final and Sub-base backfill; backfill in unpaved areas shall include Initial and Final backfill and final grading of ground surface; including areas damaged by the Contractor.
3. Trench bottoms of earth must be shaped or molded and compacted to the contour of the outside of the pipe, using bedding materials as specified, as indicated on the Drawings, to give full support of the pipe, such that the pipe is firmly supported in the excavation throughout its entire length, and in such a manner as to prevent any subsequent settlement of the pipe. Rocks larger than two inches (2") diameter will not be permitted in the trench bottom or in the Initial backfill, up to a depth of twelve inches (12") above the top of the pipe. Bottom of excavation which is of loose granular soil, shall be compacted prior to placing bedding or pipe.

4. Initial backfill in trenches where pipe has been laid shall be placed in lifts not exceeding six inches (6") in thickness, and carefully and thoroughly consolidated by compacting simultaneously on both sides of the pipe to a height of twelve inches (12") above the pipe. Initial backfill material shall be free of rocks larger than two inches (2") in diameter, clods, organic matter, rubbish, or other unsuitable material. Initial backfill must be properly placed before any fill is deposited in large quantities from a machine bucket or other vehicle. During Initial backfill, dumping from a bucket must not be allowed to fall upon a pipe from a height of more than one foot (1'), and in all cases the bucket must be lowered so that the shock of the falling earth will not injure the pipe or structure. Only after the Initial backfill has been placed and compacted to a point of twelve inches (12") above the top of the pipe, may Work proceed in placing Final backfill. All precautions must be taken to avoid future settlement in these areas. Compaction shall be performed by approved mechanical compaction devices.
5. Final backfill under paved areas shall be placed in lifts not to exceed eight inches (8"), and shall be compacted to a density of not less than 95% of maximum dry density, as determined by Standard Proctor (ASTM D698). Final backfill in unpaved areas within road right-of-way shall be placed in lifts not to exceed eight inches (8") and shall be compacted to a density of not less than 90% of maximum dry density, as determined by Standard Proctor (ASTM D698). Final backfill in unpaved areas outside of road right-of-way shall be placed in lifts not to exceed eight inches (8") and shall be compacted to a density of not less than 85% of maximum dry density, as determined by Standard Proctor (ASTM D698). Final backfill material shall be free of clods, organic matter, rubbish, or other unsuitable material. Rocks larger than four inches (4") in diameter must be placed to the sides of the trench. Rocks larger than twelve inches (12") are not allowed.
6. Sub-base backfill is comprised of the top twelve inches (12") of Final backfill in paved areas and shall be free of rocks larger than four inches (4") in diameter, clods, organic matter, rubbish, or other unsuitable material. Sub-base backfill shall be placed in lifts not to exceed six inches (6"), and shall be compacted to 98% of maximum dry density, as determined by Standard Proctor (ASTM D698).
7. Backfilling shall not be performed in freezing weather (below 32° F) except by permission of GCDWR, and shall not be done with frozen material or upon frozen material.
8. All Final backfilling in unpaved areas shall be left free of rock on the ground surface, with smooth, even surfaces, properly graded and shall be maintained in this condition until vegetation is established. Where directed by GCDWR, Final backfill shall be mounded slightly above the adjacent ground to account for settlement. In case of settlement after backfill, Contractor shall correct the cause of the settlement and supply sufficient material satisfactory to GCDWR to make up for deficiency. Contractor must provide GCDWR with any independent material testing reports performed on behalf of the Contractor.

9. Fill trenches under concrete slabs and footings of structures with dry sand or crushed stone and tamp in 6 inch layers. Encase piping under concrete slabs and footings in concrete (6 inches minimum).

3.10 FILLS AND EMBANKMENTS

- A. Fills and embankments consist of all earth fills except backfills in trenches or around structures. Unless special material is specified or shown on the Drawings, material for fills and embankments consist of excavated material from structures or of a mixture of such excavated materials and materials borrowed from other sources by the Contractor. Provide all material used for fills and embankments free from wood, vegetable matter, debris, soft or spongy earth or clay, large rock, or other objectionable material. Do not allow rock over 2 inches in diameter to be used in conjunction with backfill material.
- B. Where the crown of a pipe extends above the surface of the ground, or provides less than three feet (3') of cover over the pipe, the pipe shall be covered and protected by an embankment. Unless otherwise specified, indicated on the Drawings, or directed by the Engineer or GCDWR, embankment shall be at least three feet (3') deep over the top of the pipe, at least four feet (4') wide at the top, with side slopes of not less than two horizontal to one vertical (2H:1V) extending to the surface of the ground. Provision shall be made for surface drainage.
- C. Place materials in the fill or embankment in successive layers 6 inches or less in thickness before compaction, each layer being approximately horizontal and extending to the full limit of the required cross section. Compact the fill at optimum water content over the entire surface to not less than 95 percent of the maximum density as determined by Standard Proctor (ASTM D698). Repeat the process for each layer of material until the fill or embankment conforms to the plan lines, grades, and cross sections.
- D. Clear the area over which the fill or embankment is to be constructed of all vegetation, debris, and other objectionable material and, if the ground is in a loose, un-compacted condition, compact it to a minimum 95 percent of maximum density determined as specified herein.
- E. Do not place material beyond the sloping lines of embankment.
- F. Place material for embankments or roadway fills in 6-inch maximum lifts and compact by rolling with power rollers weighing not less than 10 tons, with sheep-foot rollers, with vibrating rollers, or with pneumatic tire rollers, as required to accomplish the work. While and as each layer is deposited, apply water in sufficient amount to ensure optimum moisture to secure the compaction specified.
- G. The use of trucks, carryalls, scrapers, tractors, or other heavy hauling equipment shall not be considered as rolling in lieu of rollers, but the traffic of such hauling equipment shall be distributed over the fill in such a manner as to make the use of the compaction afforded thereby as an addition to compaction by the use of rollers.

- H. Wherever a trench passes through a fill or embankment, place and compact the fill or embankment material to an elevation 12 inches above the top of the pipe before the trench is excavated.

3.11 DISPOSAL OF WASTE AND UNSUITABLE MATERIALS

- A. Use all materials removed by excavation, which are suitable for the purpose, to the extent possible for backfilling pipe trenches, foundations, and footings and for making embankment fills or for such other purposes as may be shown on the Drawings. Consider all materials not used for such purposes as waste materials and dispose thereof in a lawful manner and at a location where such materials can be lawfully disposed.
- B. Spread waste materials in uniform layers and neatly leveled and shaped. Provide spoil banks with sufficient and adequate openings to permit surface drainage of adjacent lands.
- C. Remove unsuitable materials, consisting of wood, shot rock, vegetable matter, debris, soft or spongy clay, peat, and other objectionable material from the work site and dispose of in a lawful manner.
- D. Do not dump unsuitable or waste material on private property unless written permission is furnished by the owner of the property and unless a dumping permit is issued from the local jurisdiction.
- E. Immediately remove and cleanup any material, which may spill or drip from vehicles while being transported on public streets, drives, or other paved surfaces, to the satisfaction of the Engineer, GCDWR, or the proper officials of the municipality in which the hauling or work is being done.
- F. Leave the surface of all graded and spoil areas in a smooth and level or evenly sloped condition, free from stones, rubbish, or other debris.
- G. Leave disturbed areas in a neat and finished appearance and either temporarily stabilized with mulch only or temporary grassing and mulch, or permanently stabilized with grassing and mulch. Meet the requirements in the section titled Erosion and Sedimentation Controls.

3.12 FINAL GRADING

- A. After other earthwork operations have been completed, grade the site of all structures, roads, and embankments within the limits and to the elevations shown on the Drawings. Conduct grading operations so as not to remove or loosen materials beyond the required limits. Leave the finished surfaces in smooth and uniform planes such as are normally obtainable from the use of hand tools. If the Contractor is able to obtain the required degree of evenness by means of mechanical equipment he will not be required to use hand labor methods. Neatly trim and finish slopes and ditches to slopes shown on the Drawings.
- B. Unless otherwise specified or shown on the Drawings, grade and dress all finished ground surfaces to present a surface varying not more than plus or minus 0.10 foot as regards local humps or depressions.

3.13 TOP SOIL

- A. Prepare all areas to be sprigged or planted with grass as shown on the plans by grading to a smooth, even surface to a level 4 inches below the elevation of the finished grade shown on the Drawings. Bring the area to a neat finished grade by the addition of 4 inches of approved top soil.
- B. Top soil removed from the construction area may be stockpiled and reused or top soil may be obtained from approved borrow areas. If obtained from borrow areas, make suitable arrangements with the property owner and pay all costs incident to the borrowed material including royalties.

3.14 SETTLEMENT

- A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within one year after final acceptance of the work by the GCDWR.
- B. Make all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from the Engineer or GCDWR.

3.15 ACCESS BY GCDWR'S MATERIAL TESTING FIRM

- A. Contractor shall allow and accommodate both scheduled and unscheduled sampling of excavation materials and backfill which include, but are not limited to excavating and setting aside directed materials for sampling, providing description, properties, moisture content, dry density, sieve analysis, Atterburg limits, compaction testing, permeability, etc.
- B. All cost associated with initial material testing will be paid by GCDWR. The cost of retesting due to the failure of Contractor to meet specifications of initial required material testing requirements of the Contract Documents shall be the responsibility of the Contractor.
- C. For scheduled testing, the Contractor shall give a minimum of twenty-four (24) hour notice when scheduling testing and/or evaluations.
- D. For unscheduled testing, Contractor shall cooperate fully with providing access to, and/or setting aside as directed, construction materials for obtaining samples for testing and/or evaluation.

END OF SECTION 31 23 00

SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Definitions
1.4	Work Included
1.5	Submittals
1.6	Regulatory Compliance
2.1	Check Dam – Stone (Cd-S)
2.2	Construction Exits (Co)
2.3	Temporary Interceptor, Diversion, and Perimeter Dikes (Di)
2.4	Temporary Interceptor, Diversion, and Perimeter Ditches (Di)
2.5	Sediment Barrier - Temporary Silt Fence (Sd1-NS, Sd1-S)
2.6	Sediment Barrier – Hay Bales (Sd1)
2.7	Inlet Sediment Trap (Sd2)
2.8	Storm Drain Outlet Protection – Riprap (St)
2.9	Surface Roughening (Su)
2.10	Buffer Zone (Bf)
2.11	Disturbed Area Stabilization - Mulching Only (Ds1)
2.12	Disturbed Area Stabilization – Temporary Seeding (Ds2)
2.13	Disturbed Area Stabilization – Permanent Vegetation (Ds3)
2.14	Disturbed Area Stabilization – Sodding (Ds4)
2.15	Dust Control (Du)
2.16	Permanent Slope Stabilization (Ss)
2.17	Anionic Polyacrylamide – PAM (Pm)
3.1	Check Dam – Stone (Cd-S)
3.2	Construction Exits (Co)
3.3	Temporary Interceptor, Diversion, and Perimeter Dikes (Di)
3.4	Temporary Interceptor, Diversion, and Perimeter Ditches (Di)
3.5	Sediment Barrier - Temporary Silt Fence (Sd1-NS, Sd1-S)
3.6	Sediment Barrier – Hay Bales (Sd1)
3.7	Inlet Sediment Trap (Sd2)
3.8	Storm Drain Outlet Protection – Riprap (St)
3.9	Surface Roughening (Su)
3.10	Buffer Zone (Bf)
3.11	Disturbed Area Stabilization - Mulching Only (Ds1)
3.12	Disturbed Area Stabilization – Temporary Seeding (Ds2)
3.13	Disturbed Area Stabilization – Permanent Vegetation (Ds3)

- 3.14 Disturbed Area Stabilization – Sodding (Ds4)
- 3.15 Dust Control (Du)
- 3.16 Permanent Slope Stabilization (Ss)
- 3.17 Anionic Polyacrylamide – PAM (Pm)
- 3.18 Notice of Intent (NOI)
- 3.19 Inspections and Maintenance
- 3.20 Monitoring and Reporting
- 3.21 Notice of Termination (NOT)
- 3.22 Removal of Temporary Sediment Control Structures
- 3.23 Sequence of Construction of Temporary Sediment Control Measures
- 3.24 Specific Requirements
- 3.25 Permitting

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

- 1. Exploratory Excavation (02 32 19).
- 2. Clearing and Grubbing (31 11 00).
- 3. Excavation and Fill (31 23 00).
- 4. Riprap (31 37 00).
- 5. Wetlands Protection (32 73 00).
- 6. Turf and Grasses (32 92 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. Contractor shall be familiar with the following referenced documents and keep them at the construction site at all times. These documents must be complied with as applicable.
 - 1. NPDES General Permit No. GAR100002 State of Georgia Department of Natural Resources Environmental Protection Division Authorization To Discharge Under The National Pollutant Discharge Elimination System Storm Water Discharges Associated With Construction Activity For Infrastructure Construction Projects (the NPDES permit), effective September 24, 2013 to July 31, 2018.
 - 2. 2016 Manual for Erosion and Sediment Control in Georgia (the "Green Book").
 - 3. State of Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, (GDOT specifications), latest edition.
 - 4. National Stone Association, Aggregate Classification (NSA Classification).
 - 5. Gwinnett County, or local issuing authority Soil Erosion and Sediment Control Ordinance, latest edition.
 - 6. Approved and permitted Erosion, Sedimentation, and Pollution Control Plan (ES&PC Plan) utilizing Best Management Practices (BMP), as required by Georgia Erosion and Sedimentation Act and NPDES General Permit.

7. Comprehensive Monitoring Program (the CMP) as required by the NPDES General Permit.

1.3 DEFINITIONS

- A. Designer: For the purpose of this item, the term “Designer” means the person who has designed and stamped the Erosion Sedimentation and Pollution Control Plan, as used in language of permits, laws, rules, regulations, ordinances, and other soil erosion and sediment control references. This person has successfully obtained Georgia professional registration, met certain education requirements, and been certified as Level II Certified Design Professional, as prescribed by the Georgia Soil and Water Conservation Commission in consultation with the Georgia EPD and the Stakeholder Advisory Board.
- B. Contractor: For the purposes of this item, the term “Contractor” is synonymous with Contractor, General Contractor, Discharger, Operator, and Primary Permittee, as used in language of permits, laws, rules, regulations, ordinances, and other soil erosion and sediment control references.
- C. Qualified Person: For the purposes of this item, the term “Qualified Person” means a person, as used in language of permits, laws, rules, regulations, ordinances, and other soil erosion and sediment control references, who has successfully met certain education requirements and been certified as Level 1A, as prescribed by the Georgia Soil and Water Conservation Commission in consultation with the Georgia EPD and the Stakeholder Advisory Board.
- D. Other Definitions: Definitions as listed in the NPDES General Permit GAR 100002, Part I.B. shall apply in this section.

1.4 WORK INCLUDED

- A. The Contractor shall furnish all labor, equipment, and materials necessary for implementing best management practices (BMPs) to prevent and minimize erosion and resultant sedimentation in all disturbed areas (cleared and grubbed) during and after construction. This item covers the Work necessary for the installation of structures and measures for the prevention and control of soil erosion and sedimentation. The Contractor shall furnish all material, labor, and equipment necessary for the proper installation, maintenance, inspection, monitoring, reporting, and removal (where applicable) of erosion and sediment control measures, and to cause compliance with the “NPDES General Permit No. GAR100002 State of Georgia Department of Natural Resources Environmental Protection Division Authorization To Discharge Under The National Pollutant Discharge Elimination System Storm Water Discharges Associated With Construction Activity For Infrastructure Construction Projects, effective September 24, 2013 to July 31, 2018”, under this item.
- B. The Work covered under this item shall include the furnishing, placement, maintenance, and removal of BMPs to include, but not limited to: check dams, construction exits, diversion dikes and ditches, temporary sediment barriers, inlet sediment traps, storm

drain outlet protection, surface roughening, buffer zone, dust control; providing information for, and signing Notice of Intent and Notice of Termination; all monitoring and recording per the Comprehensive Monitoring Program (the CMP); and all temporary and permanent vegetative and non-vegetative ground cover; and all labor, materials, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

- C. The Designer, Engineer, or GCDWR, may at any time during the project, direct the Contractor to provide additional erosion and sediment control measures, as necessary, to adequately control erosion and sedimentation in order to comply with all permits.

1.5 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Contractor shall submit to Engineer the proposed schedule for installation, maintenance, and removal of all temporary, permanent erosion, and sediment control measures. The schedule shall reflect the requirements of the section titled, Sequence of Construction of Temporary Sediment Control Measures, and must show the anticipated starting and completion date for all land disturbance activities including:
 - 1. Installation of temporary and permanent erosion and sediment control structures.
 - 2. Stormwater management facilities, if any.
 - 3. Timber salvage operations, Clearing, Grubbing, Demolition.
 - 4. Utility pipe installation.
 - 5. Rough and finished grading.
 - 6. Paving
 - 7. Landscaping, including all temporary mulching and seeding.
 - 8. Cleanup and restoration
 - 9. Landscaping, including all permanent seeding and sodding.
 - 10. Removal of temporary erosion and sediment control structures.

1.6 REGULATORY COMPLIANCE

- A. Land disturbance activities are not authorized to begin until after all required erosion and sediment control permits are obtained from the United States, the State of Georgia, and/or the local issuing authority, *and* fourteen (14) calendar days have passed since the Notice of Intent (NOI) has been properly filed with Georgia EPD. Contractor is the Primary Permittee and Operator under the provisions of the NPDES General Permit. As such, Contractor shall be required to sign certain certifications as described in the NPDES General Permit. Contractor shall comply with requirements specified in the Contract Documents, or as directed by the Engineer. Contractor shall also comply with all other laws, rules, regulations, ordinances, and requirements concerning soil erosion and sediment control established in the United States, the State of Georgia, and/or the

local issuing authority. The following documents and the documents referenced therein define the regulatory requirements for this item:

1. NPDES GENERAL PERMIT: NPDES General Permit No. GAR100002, State of Georgia Department of Natural Resources Environmental Protection Division Authorization To Discharge Under The National Pollutant Discharge Elimination System Storm Water Discharges Associated With Construction Activity For Infrastructure Construction Projects, effective September 24, 2013 to July 31, 2018. Governs land disturbance construction activities of one (1.0) acre or more. On applicable sites, Contractor is responsible for complying with terms and conditions of this Permit.
2. MANUAL FOR EROSION AND SEDIMENT CONTROL: Contractor shall follow Practices and Standards of the Georgia Soil and Water Conservation Commission 2016 Manual for Erosion and Sediment Control in Georgia, latest edition.
3. SWP3: When a Stormwater Pollution Prevention Plan (SWP3) is provided in the Contract Documents, the Contractor shall follow the practices described in the SWP3.

PART 2 - PRODUCTS

2.1 CHECK DAM – STONE (Cd)

- A. Geotextile plastic filter fabric underliner shall meet the requirements of the Georgia Department of Transportation, Standard Specifications, Construction of Road and Bridges, Section 881, latest edition.

2.2 CONSTRUCTION EXITS (Co)

- A. Geotextile underliner shall conform to AASHTO M288-96, Section 7.3, and shall be used in all instances to separate soil base and graded stone aggregate. Stone aggregate size shall conform to the National Stone Association's (NSA) R-2 Classification (1½" to 3½") stone.

2.3 TEMPORARY INTERCEPTOR, DIVERSION, AND PERIMETER DIKES (Di)

- A. A ridge of compacted soil, constructed above, across, or below a slope.

2.4 TEMPORARY INTERCEPTOR, DIVERSION, AND PERIMETER DITCHES (Di)

- A. A channel depression in soil, above, across, or below a slope.

2.5 SEDIMENT BARRIER - TEMPORARY SILT FENCE (Sd1-NS, Sd1-S)

- A. Non-Sensitive Areas (Type 'A'): Filter fabric shall be thirty-six inch (36") wide, woven fabric slit tape yarns allowed in one direction only, and must meet the requirements set forth in Section 171- Temporary Silt Fence, of the GDOT Standard Specifications,

Construction of Roads and Bridges, latest edition. Contractor shall submit to Engineer copies of delivery invoices, certifications, or other documentation that the filter fabric complies with these specifications. Posts shall be a minimum of four feet (4') long and made of either wood or steel. Wood posts shall be 1½" x 1½" hardwood and made from Ash, Hickory, or Oak. Fabric shall be fastened to wood posts with at least 5 wire staples per post. Staples shall be 17 gauge minimum and shall have a crown at least ¾ inch wide and legs at least ½ inch long. Steel posts shall be "U", "T", or "C" shaped with a minimum weight of 1.3 pounds per foot, and have projections for fastening the filter fabric to the posts.

- B. Sensitive Areas (Type 'C'): Filter fabric shall be thirty-six inch (36") wide, non-calendered woven fabric constructed with monofilament yarns only, and must meet the requirements set forth in Section 171- Temporary Silt Fence, of the GDOT Standard Specifications, Construction of Roads and Bridges. Contractor shall submit to Engineer copies of delivery invoices, certifications, or other documentation that the filter fabric complies with these specifications. Wire fence fabric shall be at least thirty-two inch (32") high and shall have at least six (6) horizontal wires. Vertical wires shall have a maximum spacing of twelve inches (12"). Top and bottom wires shall be at least 10 gauge and all other wires shall be at least 12½ gauge. Posts shall be steel and have a minimum length of five feet (5'). Steel posts shall be "U", "T", or "C" shaped with a minimum weight of 1.3 pounds per foot, and have projections for fastening the woven wire and filter fabric to the posts.

2.6 SEDIMENT BARRIER - HAY BALES (Sd1)

- A. Hay bales may be made of hay or wheat straw and shall be wire or nylon bound and of rectangular shape.

2.7 INLET SEDIMENT TRAP (Sd2)

- A. Filter fabric used on constructing inlet sediment traps shall conform to the requirements listed above in paragraph 2.5.A. SEDIMENT BARRIER - TEMPORARY SILT FENCE (Sd1-A). For gravel drop inlet filters, stone shall conform to NSA's R-3 Specification (3 to 6 inch stone). Baffle Box Inlet Filters shall be constructed of 2 inch x 4 inch posts and 2 inch x 4 inch boards.

2.8 STORM DRAIN OUTLET PROTECTION - RIPRAP (St)

- A. Unless otherwise specified, stone furnished for riprap shall meet the requirements of the Georgia Department of Transportation, Standard Specifications, Construction of Road and Bridges, Sections 603 and 805, latest edition.
- B. Rock from onsite excavation may be used as stone riprap, provided it meets all of the following requirements:
 - 1. The rock meets GDOT specifications as noted above in paragraph 2.8.A.,
 - 2. GCDWR construction material testing representative certifies the rock as suitable for the use intended,

3. GCDWR approves the use of onsite materials.

- B. Plastic filter fabric underliner shall meet the requirements of the Georgia Department of Transportation, Standard Specifications, Construction of Road and Bridges, Section 881, latest edition.

2.9 SURFACE ROUGHENING (Su)

- A. Soil slope steeper than 3:1.

2.10 BUFFER ZONE (Bf)

- A. A strip of undisturbed, original vegetated area bordering streams, ponds, wetlands, and lakes.

2.11 DISTURBED AREA STABILIZATION – MULCHING ONLY (Ds1)

- A. Dry straw shall be applied to a depth of 2 to 4 inches, at a rate of two tons per acre (2T/Ac.).
- B. Dry hay shall be applied to a depth of 2 to 4 inches, at a rate of two and one-half tons per acre (2½ T/Ac.).
- C. Wood waste (chips, sawdust, or bark) shall be applied to a depth of 2 to 3 inches.

2.12 DISTURBED AREA STABILIZATION – TEMPORARY SEEDING (Ds2)

- A. Seed shall be clean, delivered in original, unopened packages and bearing an analysis of contents. Guaranteed 95 percent pure with minimum germination rate of 85 percent. Summer seed mix shall be 40 percent by weight Fawn Fescue, 30 percent by weight Perennial Ryegrass, 15 percent by weight Orchard Grass, and 15 percent by weight Dutch White Clover. Winter seed mix shall be 35 percent by weight Fawn Fescue, 30 percent by weight Perennial Ryegrass, 30 percent by weight Hairy Vetch, and 5 percent by weight Dutch White Clover. Alternative mixes may be approved by the Engineer. Fertilizer shall be used as specified, and/or indicated on the Drawings. Fertilizer shall be commercial, chemical type, uniform in composition, free-flowing, conforming to state and federal laws, and suitable for application with equipment designed for that purpose. Fertilizer shall have a minimum percentage of plant food by weight for the following: Summer mix shall be 10 percent nitrogen, 10 percent phosphoric acid, and 6 percent potash. Straw mulch shall be threshed straw of oats, wheat, or rye free from obnoxious weeds and seeds, or shall be clean hay. Average stalk length shall be 6 inches. Wood waste or erosion control matting, such as jute or excelsior, is appropriate alternatives to hay or straw mulch for temporary stabilization.

2.13 DISTURBED AREA STABILIZATION – PERMANENT VEGETATION (Ds3)

- A. Seed shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act. All seeds shall be furnished in original, unopened, sealed standard containers. The minimum percentage by weight of pure live seed in each lot of seed shall be as follows:

1.	<u>Seed Type</u>	<u>Percent</u>
	K31 Fescue	95
	Material other than grass seed	<u>5</u>
	Total	100

- B. The aggregate percent of material other than grass seed shall include all non-viable seed, chaff, bulbs, live seed of crop plants other than those specified above, harmless inert matter, and weed seed not exceeding 1.0% by weight of pure live seed and other material in the mixture.
- C. Commercial fertilizer shall be composed of a formula of 20-12-10 and shall conform to applicable Georgia fertilizer laws. It shall be uniform in composition, dry, and free flowing and shall be delivered to the site in the original unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer, which becomes caked or otherwise damaged making it unsuitable for use, shall not be accepted.
- D. Agricultural limestone shall be an acceptable grade of ground limestone, ground dolomite, or a mixture of limestone and dolomite meeting the following physical and chemical requirements:

1. Gradation	
Standard	Maximum Percent
<u>Sieve Size</u>	<u>(%) Retained</u>
No. 8, maximum	10
No. 100, maximum	75

- E. The vegetative mulch shall be the cereal straw from stalks of oats, rye, wheat, or barley. The straw shall be free of prohibited weed seeds and shall be relatively free of all other noxious and undesirable seeds. The straw shall be clean and bright, relatively free of foreign material and be dry enough to spread properly.
- F. Topsoil: ASTM D 5268, pH range of 5.5 to 7.4 percent organic material minimum, free of stones 1 inch or larger in any dimension, and other extraneous materials harmful to plant growth.
- Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - The Contractor shall furnish topsoil free from objectionable materials such as hard clods, stiff clay, sods, hardpan, partially disintegrated stone, plant stumps, large roots, litter, or other materials that are not integrally a natural component of

good agricultural soils and which are harmful to or unnecessary for successful plant growth.

2.14 DISTURBED AREA STABILIZATION – SODDING (Ds4)

- A. Turfgrass Sod: Complying with “Specifications for Turfgrass Sod Materials” in TPI’s “Guideline Specifications to Turfgrass Sodding.” Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Bermudagrass, Carpetgrass, Axonopus, Centipedegrass, St. Augustinegrass, and Zoysiagrass.
- C. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Full sun: Kentucky bluegrass, a minimum of three cultivars.
 - 2. Sun and partial shade: Proportioned by weight as follows:
 - a. 50 percent Kentucky bluegrass.
 - b. 30 percent Chewings Red Fescue.
 - c. 10 percent Perennial Ryegrass.
 - d. 10 percent Redtop.
 - 3. Shade: Proportioned by weight as follows:
 - a. 50 percent Chewings Red Fescue.
 - b. 35 percent Rough Bluegrass.
 - c. 15 percent Redtop.
- D. Topsoil: ASTM D 5268, pH range of 5.5 to 7.4 percent organic material minimum, free of stones 1 inch or larger in any dimension, and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - 2. The Contractor shall furnish topsoil free from objectionable materials such as hard clods, stiff clay, sods, hardpan, partially disintegrated stone, plant stumps, large roots, litter, or other materials that are not integrally a natural component of good agricultural soils and which are harmful to or unnecessary for successful plant growth.

2.15 DUST CONTROL (Du)

- A. Dry straw shall be applied to a depth of 2 to 4 inches, at a rate of two tons per acre (2T/Ac.).
- B. Irrigation provided by use of a water truck to wet down the disturbed area.

- C. Asphalt emulsion shall be SS-1, SS-1h, CSS-1 or CSS-1h conforming to the requirements of AASHTO M140-70 or AASHTO M208-72.

2.16 PERMANENT SLOPE STABILIZATION (Ss)

- A. All matting and blanket materials shall be listed on the Georgia Department of Transportation Qualified Products List (QPL #49 for matting, and QPL #62 for blankets).

2.17 ANIONIC POLYACRYLAMIDE (Pm)

- A. Anionic Polyacrylamide shall be non-toxic and can be water-soluble chemical or log form. All Anionic Polyacrylamide products, whether in Powder, Liquid/Emulsion, or log form, shall meet the USEPA Grade 2 classification, "Generally Regarded as Safe (GRAS)". The Contractor shall submit Safety Data Sheets (SDS) to Engineer for approval of Anionic Polyacrylamide. Handling and application of the product shall adhere to the SDS requirements and recommendations.
- B. Liquid/Emulsion form of Anionic Polyacrylamide shall be Applied Polymer Systems, Series 600, or approved equal. Powder form of Anionic Polyacrylamide shall be Applied Polymer Systems, Series 700, or approved equal. Specific polymer type used shall be as per manufacturer's recommendation for Gwinnett County soil classifications.

PART 3 - EXECUTION

3.1 CHECK DAM – STONE (Cd-S)

- A. Install stone check dams as specified, indicated on the Drawings, or as directed by Designer, Engineer, or GCDWR.
- B. Installation: Install check dams in all ditches, channels, or swales draining disturbed areas of up to two (2) acres, and which are not installed with permanent, non-erodible lining or a vegetative cover as specified in paragraphs 2.13 and 2.14 of these specifications.. The specifications for the design criteria, material, installation, and maintenance of check dams are dependent on the upslope drainage area and are described below. A check dam shall not drain a disturbed area greater than two (2) acres.
 - 1. Construct check dam with graded size 5 to 10 inch stone. Hand placement may be required to ensure complete coverage of the entire width of ditch.
 - 2. The center of the check dam must be at least nine inches (9") lower than the edges. Dam height shall be a maximum of two feet (2'), as measured at center of check dam.
 - 3. Side slopes shall be 2:1 or flatter.
 - 4. Two (2) or more check dams placed in series shall be used for drainage areas greater than one (1) acre. Maximum spacing between dams shall be such that the

toe of the upstream dam is at the same elevation as the top of the downstream dam.

5. A geotextile underliner meeting the requirements of paragraph 2.1.A. shall be used as a separator between the graded stone and the soil base.

- C. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all check dams shall be inspected and maintenance performed, if needed, within 24 hours of inspection. Inspection shall occur at least once every seven (7) calendar days and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Dress dams with appropriate sized stone, as necessary, to maintain check dams in accordance with these specifications. At the earlier of: 1): Every fourteen (14) calendar days, or 2): when sediment reaches a depth of one-half (½) the original check dam height; all soil, silt, sediment and other material captured by the dam should be removed and returned upgrade on the construction site.

3.2 CONSTRUCTION EXITS (Co)

- A. Install construction exits as specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR.
- B. Installation: Construction exits shall be installed at all points where traffic shall be leaving the construction site onto a public or private right of way, street, alley, or parking area. All construction exits must be fully installed prior to the commencement of timber salvage, clearing, grubbing, grading, or other land disturbance construction operations.
 1. The stone pad thickness shall be a minimum of six (6) inches.
 2. The stone pad width shall equal the full width of all points of vehicular egress, but not less than twenty (20) feet wide.
 3. If the stone pad does not sufficiently remove the mud from tires prior to entering onto public right-of-way, washing is required. Washing shall be performed on a stabilized area, and the sediment-laden runoff shall be directed into an approved sediment trap.
- C. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all construction exits shall be inspected and maintenance performed, if needed, within 24 hours of inspection, once every seven (7) calendar days and within 24 hours of rainfall an event that has precipitation of ½ inch or greater. At the earlier of: 1) fourteen (14) calendar days since construction exit was installed or last maintained, or 2) geotextile underliner is visible, or 3) if construction exit does not conform to specifications established in this section. Construction exit pad shall be top dressed with NSA's R-2 (1 ½ inch to 3 ½ inch stone) such that underliner is no longer visible and exit pad conforms to specifications.

3.3 TEMPORARY INTERCEPTOR, DIVERSION, AND PERIMETER DIKES (Di)

- A. Install temporary interceptor, diversion, and perimeter dikes as specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR, to intercept and prevent stormwater runoff from entering disturbed areas from any other upgrade

area regardless of whether area is onsite or offsite. Dikes must divert runoff to a drainage ditch, sediment basin, temporary or permanent channel. Dikes shall remain in place until the disturbed area is permanently stabilized. Construct dikes of earth fill free from all perishable matter and refuse, such as scrap forms, wire, brush, rocks larger than six (6) inches or any foreign materials. Ashes, large stones, muck, or other soft materials shall not be used. Compact all dikes using construction equipment. Dikes shall be stabilized immediately after construction with temporary seeding to prevent sediment transport to downstream areas.

3.4 TEMPORARY INTERCEPTOR, DIVERSION, AND PERIMETER DITCHES (Di)

- A. Install temporary interceptor, diversion, and perimeter ditches as specified, indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR. In general, temporary ditches shall be installed parallel and contiguous to, and upgrade of temporary dikes. Construct ditches to the lines and cross section indicated on the Drawings, provided that ditches have a minimum depth of one foot and side slopes have a slope of 2H:1V or flatter. Ditches shall be free of bank projections, trees, brush, stumps, or other objectionable materials or irregularities that shall impede normal flows. Downstream outlets of temporary ditches shall be constructed and stabilized prior to construction of the ditch. The outlet must discharge in such a manner as to not cause an erosion problem.

3.5 TEMPORARY SEDIMENT BARRIERS - SILT FENCE (Sd1-NS, Sd1-S)

- A. Install silt fence as specified, as indicated on the Drawings or as directed by the Designer, Engineer, or GCDWR.
- B. Installation: In general, silt fencing shall be installed on the downgrade side of all areas to be disturbed as well as the perimeter of the project site. All posts used to install silt fence shall comply with the specifications of paragraph 2.5. Posts must be placed at least 18 inches in the ground and spacing cannot be more than four (4) feet center-to-center for Type 'C' fencing, and six (6) feet center-to-center for Type 'A' fencing. Fence fabric must be inserted below ground in a six (6) inch trench, and fence fabric must be fastened to posts according to the specifications of paragraph 2.5. Contractor shall install Type 'A' or Type 'C' silt fence, as specified, as indicated on the Drawings, or when directed by the Designer, Engineer, or GCDWR.
- C. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all silt fencing shall be inspected and maintenance performed, if needed, within 24 hours of inspection and once every seven (7) calendar days, and within 24 hours of a rainfall event that had precipitation of ½ inch or greater. All silt fencing materials, including fabric, post and fasteners must be replaced six (6) months after installation. At the earlier of: 1) every fourteen (14) calendar days, or 2) when sediment reaches a depth of one half the installed fence height; all soil, silt, sediment and other material captured by the silt fence should be removed and returned upgrade on the construction site. The silt fence shall be maintained such that it minimizes sediment transport as designed.

3.6 SEDIMENT BARRIER - HAY BALES (Sd1)

- A. Install hay or straw bales as specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR.
- B. Installation: Place bales in a row with ends tightly abutting the adjacent bales. Corner abutment is not acceptable. Embed bales in the soil a minimum of 4 inches below grade. Build up backfilled soil a minimum of 4 inches above grade on the uphill side of the barrier and conform to grade on the downhill side of the barrier. Anchor each bale in place with 2" by 2" inch wood stakes or No. 3 reinforcing bars. The first stakes shall be driven toward the previously laid bale to force the bales together. Stakes shall be thirty six (36) inches long and shall be driven a minimum of eighteen (18) inches into the ground.
- C. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all hay bales shall be inspected and maintenance performed, if needed, within 24 hours of inspection once every seven (7) calendar days, and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Hay bales must be replaced thirty (30) calendar days after installation. At the earlier of: 1) every fourteen (14) calendar days, or 2) when sediment and other material captured by the hay bales reaches ½ the height of the original bales, such sediment should be removed and returned upgrade on the construction site. The hay bales shall be maintained such that they minimize sediment transport as designed.

3.7 INLET SEDIMENT TRAP (Sd2)

- A. Install inlet sediment traps as specified, as indicated on the Drawings, or as directed by the Designer, Engineer or GCDWR.
- B. Installation: Install in accordance with Chapter Six (6) of the 2016 Manual for Erosion and Sediment Control in Georgia. Excavation may only be used in combination with a filtering device such as stone or silt fence. All sediment traps should provide a minimum of 1.5 feet of sediment storage. Sediment traps must be self-draining.
- C. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all inlet sediment traps shall be inspected and maintenance performed, if needed, within 24 hours of inspection, once every seven (7) calendar days, and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Clean and repair traps such that traps meet the specifications of this section and minimize sediment transport. At the earlier of: 1): Every fourteen (14) calendar days, or 2): when sediment reaches a depth of one-half (½) the original check dam height; all soil, silt, sediment and other material captured by the dam should be removed and returned upgrade on the construction site.

3.8 STORM DRAIN OUTLET PROTECTION – RIPRAP (St)

- A. Install storm drain outlet protection as specified, as indicated on the Drawings, or as directed by the Designer, Engineer or GCDWR.
- B. Installation: Prepare the ground surface where riprap will be placed to conform with lines and grades as specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR. Ground surface shall be smooth and free from obstructions, depressions, or debris. Place woven plastic filter fabric underliner on the prepared ground surface under all riprap. Place riprap to a uniform thickness as

specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR. If no thickness is specified, place riprap to a minimum thickness of eighteen (18) inches.

- C. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all storm drain outlets shall be inspected and maintenance performed, if needed, within 24 hours of inspection, once every seven (7) calendar days, and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Repair storm drain outlet protection such that riprap meets the specifications of this section and minimizes sediment transport.

3.9 SURFACE ROUGHENING (Su)

- A. Perform surface roughening as specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR.
- B. Roughening is best used on cut and fill slopes steeper than 3H:1V, which will not be mowed. In those areas use the method of *grooving*, this consists of using machinery to create a series of ridges and depressions, and shall run perpendicular to the slope.
- C. Using a bulldozer tread for *tracking* as a method of roughening is discouraged, unless no alternatives are available. This causes undue compaction of surface soils and is counter –productive to establishing vegetative growth. When using *tracking* as a technique, use as few passes of the machinery as possible to minimize compaction of the ground surface.
- D. Roughened areas shall be vegetated (mulch, seed, sod, etc.) as specified, indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR, as soon as possible to obtain optimum growth.

3.10 BUFFER ZONE (Bf)

- A. Construction within a buffer zone of a body of water designated as Waters of the United States must meet the requirements listed below in this specification paragraph.
- B. Definition: The buffer zone is officially defined as the distance, in feet, from the edge of the normal high water line (or for wetlands, the distance from the boundary of the wetland). For the purpose of Work in Gwinnett County, the buffer zone for small streams (as determined by the Engineer) shall start at the top of the bank and the buffer zone for larger streams (as determined by the Engineer) and rivers shall start at the edge of the vegetation. Buffer zones are specified in the table below.

C. <u>Type of Waters of the United States</u>	<u>Buffer</u>
Chattahoochee River	100 feet
Tributaries Within 2000 Feet of Chattahoochee River	35 feet
Big Haynes Creek	50 feet
Other Waters of the United States	25 feet

- D. Construction Activity: Construction activity within the buffer zone must be approved by a variance granted by Georgia EPD. Any encroachments must immediately be mulched and/or seeded in accordance with the requirements of paragraph 2.12. titled Disturbed Area Stabilization – Temporary Seeding. All construction within a buffer zone must be complete as soon as possible, and within 24 hours when possible of initial land disturbance within the buffer.

3.11 DISTURBED AREA STABILIZATION – MULCHING ONLY (Ds1)

- A. When mulch only is used without subsequent seeding, mulch shall be applied to provide full coverage of the exposed area. Dry straw or hay, and wood chips shall be applied uniformly by hand or mechanical equipment designed for that specific use.
- B. For areas to receive mulch only, apply at the following rates, to the following depths, and according to the following specifications:
1. Dry Straw or Hay: Spread at a rate of two and one half (2 ½) tons per acre. Apply to a depth of 6 to 10 inches. Apply uniformly and anchor as necessary.
 2. Wood Waste: Spread at a rate of 6 to 9 tons per acre. Apply to a depth of 2 to 3 inches. Apply wood waste only on slopes that are 3:1 or flatter. Anchoring is not necessary.
 3. Jute Matting or Excelsior Netting: Apply in accordance with manufacturer's recommendations.
 4. Asphaltic Emulsion: Apply at a rate of 1200 gallons per acre. Apply uniformly.
- C. If the area will eventually be covered with perennial vegetation, 20-30 pounds per acre of nitrogen, in addition to the normal amount of nitrogen, shall be applied to the area to offset the uptake of nitrogen caused by the decomposition of organic mulches.

3.12 DISTURBED AREA STABILIZATION – TEMPORARY SEEDING (Ds2)

- A. This section covers Work necessary for temporary stabilization of soil to prevent erosion following clearing, grubbing, grading or other construction, except wetlands. Temporary stabilization within a buffer zone of Waters of the United States shall meet the requirements of paragraph 3.10 titled Buffer Zone.
- B. General Criteria: The stabilization measures specified herein shall be initiated on all disturbed areas including dikes and ditches within 24 hours of completion to minimize erosion and soil transport. However, stabilization measures specified herein do not have to be initiated in the event that construction activities shall resume on that portion of the site within fourteen (14) days from the date activities temporarily ceased. For cleared areas which may not receive permanent vegetative or other stabilization measures for six (6) months or less, and a suitable growing season is not available for seeding to establish an erosion retardant cover, mulch may be applied according to the specifications below:
1. Contractor shall submit to Engineer, certificates of inspection of seed by state or federal authorities and copies of delivery invoices or other documentation of quantities of mulch and fertilizer.

2. Contractor shall give at least a three (3) day notice to GCDWR for the time and place of the grass planting.
 3. Contractor shall keep Engineer and GCDWR advised of schedule of operations.
- C. Application: Planting and seeding shall be performed in accordance with the following schedule:
1. Summer Seeding: No earlier than April 1 and no later than October 15.
 2. Winter Seeding: October 16 until weather conditions prohibit further construction operations as determined by the Engineer.
 3. Soil Preparation: Prior to seeding operations, and after surface has been shaped, graded, and compacted, scarify surface to a minimum depth of 1 inch.
 4. Seeding: All seedbeds shall be a minimum depth of 1 inch. Seedbeds shall be reviewed by GCDWR, prior to seeding. After soil has been scarified, apply required seed mix, as specified in this section, uniformly with a cyclone seeder, drill, culti-packer seeder, or hydro-seeder. When hydro-seeding is the selected method of seeding, prepare and apply slurry at the rate and proportion specified below:

Seed Mix 100 lbs/acre
Fertilizer 650 lbs/acre
Water as necessary
 5. The required fertilizer mix shall be uniformly applied at the time of seeding. Fertilizer shall not be applied to a land area within a buffer zone area of a body of water in a Waters of the United States.
 6. Upon completion of the seeding operations, apply straw mulch to a uniform thickness of 1 ½ inches to 2 ½ inches in depth. Mulch shall be loose enough to permit penetration of sunlight and air circulation, but dense enough to shade ground, reduce evaporation rate, and prevent or materially reduce erosion of underlying soil. Retain straw in place by applying asphaltic emulsion at a rate of 100 gallons per acre or mechanically tack the mulch into the soil to approximately 3 inches. Equipment used for tacking shall be specially designed for this use.
- D. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all stabilized areas shall be inspected and maintenance performed, if needed, within 24 hours of inspection, once every seven (7) calendar days and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Apply additional stabilization materials as needed.

3.13 DISTURBED AREA STABILIZATION – PERMANENT VEGETATION (Ds3)

- A. The subgrade for areas to be seeded shall be brought to a uniform grade, free of large stones. Topsoil shall be uniformly graded, trimmed, and raked free from unsuitable material, ridges, bumps, or depressions. Over this area, spread agricultural lime at the rate of 50 pounds per 1000 square feet, and spread fertilizer uniformly on the surface of the ground at the rate of 35 pounds per 1000 square feet. Mix the lime and fertilizer

uniformly into the top four (4) inches of the soil by suitable harrows, rotary tillers, or other approved equipment.

- B. Seeding shall be performed using a properly proportioned mixture of inoculated seed approved for use in The Piedmont Region “Zone One” as detailed in the 2016 Manual for Erosion and Sediment Control in Georgia. Seeding shall only be permitted during the planting season listed for The Piedmont Region. All seeded areas shall be uniformly mulched immediately after seeding.
- C. The Contractor shall be responsible for maintaining all planted areas including, watering, and reseeding defective area until a stand of grass covering ninety percent (90%) of the entire stabilized area is established, and Final Acceptance of the Work by the Engineer is obtained. Areas showing evidence of settlement or loss of topsoil shall be rebuilt and reseeded as required.

3.14 DISTURBED AREA STABILIZATION – SODDING (Ds4)

- A. The subgrade for the areas to be sodded shall be brought to a uniform grade, free of large stones. Topsoil shall be uniformly graded, trimmed, and raked free from unsuitable material, ridges, bumps, or depressions. Over this area, spread agricultural lime at the rate of 50 pounds per 1000 square feet, and spread fertilizer uniformly on the surface of the ground at the rate of 35 pounds per 1000 square feet. Mix the lime and fertilizer uniformly into the top four (4) inches of the soil by suitable harrows, rotary tillers, or other approved equipment.
- B. Sod shall be carefully placed and rolled to insure good soil contact

3.15 DUST CONTROL (Du)

- A. The stabilization measures contained in this section are for controlling surface and air movement of dust on construction sites.
- B. Temporary Methods: Dust may be controlled by use of mulches, tillage, and irrigation. For mulches, refer to paragraphs 2.11 and 3.11 Disturbed Area Stabilization – Mulching Only. For emergency measures to deploy before wind erosion starts, tillage and irrigation may be implemented. The practice of tillage is designed to roughen and bring clods to the surface. Irrigation to be accomplished by sprinkling water on the surface until the surface is wet and no longer produces dust. This must be repeated as necessary to minimize dust production.
- C. Permanent Methods: Applying topsoil (a less erosive soil material), crushed stone, and sodding to disturbed areas may be used to permanently control dust.

3.16 PERMANENT SLOPE STABILIZATION (Ss)

- A. Matting and blankets shall be installed as specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR.

- B. Matting and blankets can be applied in areas of concentrated flows, on slopes steeper than 2½H:1V with a height of ten (10) feet or greater, and cuts and fills within stream buffers.
- C. Installation: After the site has been shaped to the lines and grades as indicated on the Drawings, prepare a friable seedbed relatively free from clods and rocks more than one (1) inch in diameter, and any foreign material that will prevent contact of the mat or blanket to the soil surface. Staple mats or blankets to soil surface following manufacturer's recommendations.
- D. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all erosion control matting and blankets shall be inspected and maintenance performed, if needed, within 24 hours of inspection, once every seven (7) calendar days, and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Any dislocation or failure shall be repaired immediately. If washouts or breakage occurs, reinstall the matting or blanket after repairing damage to the slope or ditch. Continue to monitor these areas until they become permanently stabilized.

3.17 ANIONIC POLYACRYLAMIDE (Pm)

- A. This section covers the use of the chemical anionic Anionic Polyacrylamide to settle out silt and suspend solids from surface water and ground water prior to discharge. Application of Anionic Polyacrylamide shall utilize a method and amount as recommended by the manufacturer and approved by the Engineer. Anionic Polyacrylamide may be applied to disturbed areas in either Powder or Liquid/Emulsion form as described herein.
- B. Application: Liquid/Emulsion form of Anionic Polyacrylamide shall be applied to disturbed areas at a rate of 0.5 gallons of emulsion to 1000 gallons of water. Powder form of Anionic Polyacrylamide shall be applied at a rate of 4 pounds per acre of disturbed area.
- C. Maintenance: Apply additional Anionic Polyacrylamide as authorized or directed by the Engineer.

3.18 NOTICE OF INTENT (NOI)

- A. When land disturbance construction activities are equal to or greater than one (1.0) acre, and an Erosion Sediment & Pollution Control Plan has been approved by the governing jurisdiction, the Contractor, together with GCDWR shall prepare a Notice of Intent. GCDWR shall submit a properly executed NOI to Georgia EPD at least fourteen (14) calendar days prior to start of land disturbance activities.

3.19 INSPECTIONS AND MAINTENANCE

- A. Contractor shall designate a Qualified Person properly certified as such by Georgia Soil and Water Conservation Commission, to perform inspections required by this item. The following areas are to be inspected and maintenance performed, if needed, at least once every seven (7) calendar days and within twenty-four (24) hours of a rainfall event that has a precipitation of ½ inch or greater. Immediate action shall be taken to correct deficiencies to BMPs (Best Management Practices). GCDWR reserves the

right to stop all construction activities not related to maintaining BMP's until such deficiencies to BMPs are repaired. Areas to be inspected under this item are:

1. Disturbed areas of the construction site that have not undergone final stabilization.
 2. Erosion and sediment control structures.
 3. All locations where vehicles enter or exit the site.
 4. Material storage and construction lay down areas that are exposed to precipitation and have not been, or will not be finally stabilized for more than seven (7) calendar days.
- B. In areas that have been finally stabilized, inspections and, if necessary, maintenance by Contractor shall occur at least once per month for the duration of the contract or project, whichever is longer.
- C. During inspections the following shall be observed and appropriate maintenance procedures taken:
1. The conformance to specifications and current condition of all erosion and sediment control structures.
 2. The effectiveness and operational success of all erosion and sediment control measures.
 3. The presence of sediments or other pollutants in stormwater runoff at all runoff discharge points.
 4. The presence of sediments or other pollutants in receiving waters.
 5. Evidence of offsite tracking at all locations where vehicles enter or exit the site.
- D. An inspection checklist is included at the end of this item. This checklist must be completed during each inspection, dated, and signed by the Qualified Person conducting the inspection. Completed inspection checklist shall be kept onsite with the Contract Documents and submitted to GCDWR on a monthly basis. The Contractor shall repair deficiencies within twenty-four (24) hours of inspection.

3.20 MONITORING AND REPORTING

- A. Monitoring: The Contractor shall be responsible for the implementation of the Comprehensive Monitoring Program (CMP) as written by the Designer. The implementation must comply with EPD guidelines as set forth in NPDES Permit No. GAR 100002 – Infrastructure, Part IV.D.6. Sampling Requirements, Part IV.E. Reporting, and Part IV.F. Retention of Records.
- B. Reporting: The Contractor shall prepare and submit a summary of the monitoring results to the Engineer, the Designer and the EPD as required in the NPDES permit (Current Address: Northwest Georgia Regional Office, Georgia Environmental Protection Division, Suite 114, 4244 International Parkway, Atlanta, GA 30354). The County reserves the right to use its own resources to duplicate monitoring and verify the Work required by the Contractor in this section.

- C. Payment Procedures: There shall be no separate payment for Work covered under this section titled Monitoring and Reporting including monitoring, sampling, reporting, all labor, materials, and equipment necessary to complete the Work as specified. There shall be no separate payment for monitoring each location in the project that is to be monitored.

3.21 NOTICE OF TERMINATION (NOT)

- A. When all construction activities have ceased, final stabilization has been certified, and the site is in compliance with the NPDES permit, the Contractor, together with GCDWR shall submit a Notice of Termination.

3.22 REMOVAL OF TEMPORARY EROSION AND SEDIMENT CONTROL STRUCTURES

- A. At such time that temporary erosion and control structures are no longer required under this item, the Contractor shall notify the Designer, and Engineer of Contractor's intent and schedule for the removal of the temporary structures, and obtain Designer's and Engineer's approval in writing prior to removal. Once the Contractor has received such written approval from the Designer and Engineer, the Contractor shall remove, as approved; the temporary structures and all sediments accumulated at the removed structure shall be returned upgrade. In areas where temporary control structures are removed, the site shall be left in a condition that shall restore original drainage. Such areas shall be evenly graded and seeded as specified in paragraph 3.13 Disturbed Area Stabilization – Permanent Vegetation (Ds3).

3.23 SEQUENCE OF CONSTRUCTION OF TEMPORARY SEDIMENT CONTROL MEASURES

- A. Install all erosion and sediment control structures as specified, indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR, as the first item of Work within a given drainage area. Construction and installation of all erosion and sediment control structures shall begin downgrade of the area to be disturbed and proceed upgrade. Contractor shall, at all times, maintain all soil erosion and sediment control structures and practices throughout construction and until permanent vegetative cover is established.
- B. Time: Land disturbance activities are not authorized to begin until after all required erosion and sediment control permits are obtained from the United States, the State of Georgia, and/or the local issuing authority, *and* fourteen (14) calendar days have passed since Notice of Intent (NOI) is properly filed with Georgia EPD.

3.24 SPECIFIC REQUIREMENTS

- C. The requirements as specified, as indicated on the Drawings, are minimum requirements for the preventing or minimizing soil erosion and sediment transport. Contractor shall install and maintain soil erosion and sediment control measures in accordance with the requirements set forth in the 2016 Manual for Erosion and Sediment Control in Georgia, and said manual shall govern in case of conflicting

information, unless an item is clearly identified on the Drawings as a deviation from the Manual.

3.25 PERMITTING

- A. Land disturbance activity shall not commence until the Land Disturbance Permit has been issued by the local issuing authority, *and* fourteen (14) calendar days have passed since Notice of Intent (NOI) was properly filed with Georgia EPD.
- B. A Certified Design Professional properly certified as such by the Georgia Soil and Water Conservation Commission shall be responsible for performing the following duties with respect to the Erosion and Sedimentation Control Permit.
 - 1. Certified Design Professional shall prepare an Erosion, Sedimentation and Pollution Control Plan (ES&PCP), and shall submit same to the local issuing authority for approval, and shall provide Contractor with three (3) approved copies of the ES&PCP.
 - 2. Engineer shall obtain Land disturbance permits from local governments.
 - 3. The same Certified Design Professional who prepared the ES&PCP shall conduct the initial seven (7) day inspection after initial installation of BMPs.
- C. Contractor shall be responsible for performing the following duties with respect to the Erosion and Sedimentation Control Permit.
 - 1. Contractor shall execute the NOI as “Operator” and submit to GCDWR along with required fees, and GCDWR shall execute the NOI as “Owner” and then properly submit fully executed NOI and the required fees to Georgia EPD. No land disturbance activity shall be started until fourteen (14) calendar days have passed after the Notice of Intent (NOI) is properly submitted to Georgia EPD.
 - 2. Contractor shall employ a Qualified Person who shall perform inspections of BMPs as outlined in NPDES General Permit GAR 100002, Part IV, D.4.
 - 3. Contractor shall employ a Qualified Person who shall gather samples of storm water as outlined in NPDES General Permit GAR 100002, Part IV, D.6., and as further defined in the ES&PCP.
- D. Contractor shall employ a Qualified Person who shall prepare, submit and maintain all reporting and report submittal requirements as outlined in NPDES General Permit GAR 100002, Part IV, E. and F.

Gwinnett County Department of Water Resources

Erosion and Sediment Control Checklist

Instructions: Complete this checklist at least once per week and within 24 hours of any rainfall greater than ½ inch. Summarize deficiencies on this page (attach additional pages if necessary). Take action to correct problems within 24 hours. Keep this form in the project file.

Inspection Done by:_____ **Date:**_____

Item No.	Explanation of Deficiency or Deficiencies	Corrective Action Taken	Date Completed

Temporary Interceptor, Diversion and Perimeter Dikes Check List (Di)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
TDK -1	Installation	Are dikes properly placed to divert water to drainage ditches, sediment basins, or temporary or permanent channels?			
TDK -2	Installation	Are dikes constructed of earth fill free of refuse, such as wire, brush, rocks over 6 inches in diameter, ashes, muck, etc?			
TDK -3	Installation	Have dikes been compacted using construction equipment?			
TDK -4	Installation	Do dikes have a top width of at least 2 feet?			
TDK -5	Installation	Are dikes at least 18 inches above surrounding grade?			
TDK -6	Installation	Are side slopes of dikes 2:1?			
TDK -7	Installation	Have dikes been stabilized with vegetative cover (temporary seeding)?			
TDK -8	Maintenance	Are dikes still 2 feet across top and at least 18 inches high even after weathering?			
TDK -9	Maintenance	Do dikes have vegetative cover?			

Inspection done by: _____ **Date:** _____

Temporary Interceptor, Diversion, and Perimeter Ditches (Di)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
TDD –1	Installation	Are ditches properly placed parallel to, contiguous to, and upslope of temporary dikes?			
TDD –2	Installation	Do ditches have a minimum depth of one (1) foot?			
TDD –3	Installation	Are ditch side slopes 2:1 or flatter?			
TDD –4	Installation	Are ditch sides and bottoms free of projections, trees, brush, stumps, etc?			
TDD –5	Installation	Are ditches stabilized with a vegetative cover?			
TDD –6	Maintenance	Ditch side slopes have not eroded to be steeper than 2:1?			
TDD –7	Maintenance	Are ditches free of sediment and debris?			
TDD –8	Maintenance	Do ditches have vegetative cover?			

Inspection done by:_____ **Date:**_____

Temporary Sediment Barrier - Silt Fence (Sd1-S or Sd1-NS)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
SF –1	Installation	Is silt fence installed at proper intervals? <u>Slope (feet)</u> <u>Maximum Interval</u> <2% 100 2% to 5% 75 5% to 10% 50 10% to 20% 25 >20% 15			
SF –2	Installation	Is proper type of silt fence installed? Type A (Sd1-NS) - Project duration is 6 months or greater or slope is greater than 3:1. Post spacing 6 feet max. Type C (Sd1-S) - Where fill slopes exceed a vertical height of 10ft and the slope is greater than 3:1. Post spacing 4 feet maximum. Has woven wire fabric.			
SF –3	Installation	Has silt fence been installed with a trench 6 inches into the ground?			
SF –4	Installation	Has silt fence post been installed at least 18 inches into the ground?			
SF –5	Maintenance	Has silt fence been in place less than 6 months?			
SF –6	Maintenance	Is silt fence controlling offsite migration of sediment?			
SF –7	Maintenance	Has sediment been removed from the up-slope side of the silt fence in the last 14 days?			
SF –8	Maintenance	Is sediment build-up less than one-half (½) the installed silt fence height?			
SF –9	Maintenance	Is silt fence free of damage, including Tears and holes?			
SF –10	Maintenance	Is silt fence horizontally tight?			
SF –11	Maintenance	Are post intact (unbroken and unbent)?			

Inspection done by: _____ **Date:** _____

Temporary Sediment Barrier – Hay Bales (Sd1)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
HB –1	Installation	Have hay bales been installed at the toe of all slopes higher than 3 feet or steeper than 5:1?			
HB –2	Installation	Have hay bales been installed at a maximum of 100ft intervals, if slope persist?			
HB –3	Installation	Are hay bales wire or nylon bound and rectangular shaped?			
HB –4	Installation	Are hay bales placed end to end with ends tightly abutting adjacent hay bale?			
HB –5	Installation	Are hay bales embedded into the soil a minimum of 4 inches below grade?			
HB –6	Installation	Are hay bales anchored with 2 inch x 2 inch wooden stakes or no. 3 reinforced bars, with a minimum length of 36 inches?			
HB –7	Installation	Are stakes driven in at an angle toward the previously placed hay bale, at least 18” into the ground?			
HB –8	Maintenance	Are hay bales intact?			
HB –9	Maintenance	Are stakes unbroken or unbent?			
HB –10	Maintenance	Is sediment build up less than one half (½) the original bale height?			
HB –11	Maintenance	Has sediment been removed from the upslope side of hay bale in last 14 days?			
HB –12	Maintenance	Have hay bales been installed less than thirty (30) calendar days ago?			
HB –13	Maintenance	Are hay bales in firm contact with ground surface with no undermining of soil?			

Inspection done by: _____ **Date:** _____

Construction Exits (Co)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
CE -1	Installation	Have construction exits been constructed prior to any construction operations at all points where traffic leaves the site to a right-of-way, street, alley, or parking area?			
CE -2	Installation	Are construction exits a minimum of 50 feet long and a right angle to the street, alley, etc?			
CE -3	Installation	Are construction exits a minimum of 20 feet wide?			
CE -4	Installation	Are construction exit pads a minimum of 6 inches in depth?			
CE -5	Installation	Have geotextile underliners been placed under the construction exit pads?			
CE -6	Installation	Have the construction exit pads been constructed of 1 ½ to 3 ½ inch diameter stone?			
CE -7	Maintenance	Are construction exit length, width, and depth being maintained?			
CE -8	Maintenance	Have construction exits been maintained within the last 14 days?			
CE -9	Maintenance	Is geotextile underliner still covered by stone (not visible)?			

Inspection done by:_____ **Date:**_____

Check Dams – Stone (Cd-S)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
CD –1	Installation	Were check dams constructed of appropriate materials? < 2 acres draining graded size 5 to 10 inch diameter stone			
CD –2	Installation	Is center of check dam at least 9 inches lower than the outer edges?			
CD –3	Installation	Is check dam height 2 feet maximum at center of check dam?			
CD –4	Installation	Are side slopes of check dam 2:1 maximum?			
CD –5	Installation	Are check dams properly spaced in series (toe of upstream check dam at same elevation as top of downstream check dam)?			
CD –6	Installation	Do check dams cover entire width of ditch or swale?			
CD –7	Installation	Are check dam heights lower than channel banks?			
CD –8	Installation	Are check dam heights lower than upstream property line elevation?			
CD –9	Maintenance	Are check dam dimensions and slopes being maintained?			
CD –10	Maintenance	Is sediment less than one-half (½) the original check dam height?			
CD –11	Maintenance	Are check dams in good contact with ground surface with no undermining of soil?			

Inspection done by:_____ **Date:**_____

Inlet Sediment Trap (Sd2)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
SD -1	Installation	Are inlet sediment traps constructed around all storm drain inlets that receive runoff from disturbed areas?			
SD -2	Installation	Are sediment traps constructed according to design?			
SD -3	Installation	Do sediment traps provide for a minimum of 1½ feet of sediment storage?			
SD -4	Installation	Are sediment traps self-draining?			
SD -5	Installation	If gravel is used for the filtering media, is it 3 to 6 inches in diameter?			
SD -6	Installation	If baffle box inlet filters were used, are they constructed of 2"x 4" or 4"x 4" posts and 2"x 4" boards?			
SD -7	Maintenance	Does sediment trap have adequate storage volume for subsequent rains?			
SD -8	Maintenance	Are sediment traps intact?			
SD -9	Maintenance	Are wooden components unbroken?			
SD -10	Maintenance	Is gravel overtaken with sediment?			
SD -11	Maintenance	Are filter fabrics free of tears or holes?			

Inspection done by: _____ **Date:** _____

Disturbed Area Stabilization (Ds1, Ds2, Ds3, Ds4)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
VS -1	Installation	Have disturbed areas been stabilized with temporary vegetation and mulched within 24 hours of completion?			
VS -2	Installation	Have disturbed areas awaiting permanent stabilization cover, where suitable growing season is not available, been stabilized with temporary vegetation and/or mulch?			
VS -3	Installation	Was surface prepared for seeding (by scarifying soil a minimum of 1 inch deep)?			
VS -4	Installation	Has seeding been performed according to growing seasons and required mixtures of seed and fertilizer?			
VS -5	Installation	Has mulch been loosely applied, after seeding, to a thickness of 1 ½ to 2 ½ inches?			
VS -6	Installation	Has mulch been retained using an asphaltic emulsion or mechanically tacked?			
VS -7	Installation	For areas which have not received temporary vegetation and have received mulch only: Has dry straw or hay mulch been applied to a thickness of 2 to 4 inches? Has wood waste been applied to a thickness of 2 to 3 inches?			
VS -8	Maintenance	Are stabilized areas intact with no signs of eroded areas?			
VS -9	Maintenance	Do disturbed areas that have been stabilized with mulch have the proper thickness of mulch?			
VS -10	Maintenance	Are previously stabilized areas intact and not in need of touch up seeding or mulching?			

Inspection Done by: _____ **Date:** _____

Storm Drain Outlet Protection (St)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
St –1	Installation	Are storm drain outlet protections constructed around all storm drain outlets?			
St –2	Installation	Are storm drain outlet protections constructed according to design?			
St –3	Installation	Are storm drain outlet protection aprons constructed straight – no bends?			
St –4	Installation	Is geotextile filter fabric present between soil and quarried stone?			
St –5	Installation	Is minimum thickness of stone pad at least 18” thick?			
St –6	Installation	Is apron constructed level (0.0%) grade?			
St –7	Maintenance	Has erosion occurred around or below riprap?			
St –8	Maintenance	Have riprap stones been dislodged?			
St –9	Maintenance	Are filter fabrics free of tears or holes?			

Inspection done by: _____ **Date:** _____

Permanent Slope Stabilization (Ss)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
Ss -1	Installation	Are mats installed in concentrated flow areas?			
Ss -2	Installation	Are mats installed on slopes steeper than 2½:1 with a height 10 feet or greater?			
Ss -3	Installation	Are mats installed in cuts and fills within stream buffers?			
Ss -4	Installation	Are mats in direct contact with soil surface (no foreign materials between mats and ground)?			
Ss -5	Installation	Are mats stapled to the ground with U-shaped staples having legs at least 6 inches long?			
Ss -6	Maintenance	Do mats show signs of erosion or undermining?			
Ss -7	Maintenance	Are mats dislocated, broken, or washed out?			

Inspection done by:_____ **Date:**_____

END OF SECTION 31 25 00

SECTION 31 37 00

RIPRAP

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
1.5	Quality Assurance
2.1	Rock Riprap
2.2	Filter Blanket Material
3.1	Equipment
3.2	Preparation of Foundation
3.3	Placement of Filter Blanket
3.4	Construction of Plain Rock Riprap
3.5	Construction of Hand Placed Plain Rock Riprap
3.6	Protection of Structures

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Erosion and Sedimentation Controls (31 25 00).

1.2 REFERENCES

A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

B. Standards

1. ASTM International (ASTM)

- a. C94/C94M – Standard Specifications for Ready-Mix Concrete
- b. C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
- c. C150 – Standard Specification for Portland Cement
- d. C535 – Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

1.3 WORK INCLUDED

- A. The Contractor shall furnish all labor, equipment, and materials necessary for hauling and properly placing stone riprap at the locations and to the limits indicated on the Drawings, or as directed by the Engineer or GCDWR.
- B. Place riprap on slopes of embankments or other surfaces or around structures as protection against the erosive action of water.
- C. Where shown on the Drawings, place a filter blanket course of crushed rock, or sand and gravel, or an approved filter fabric under the riprap.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall include the following:
 - 1. Product Data
 - a. Description and location of sources of Riprap bedding and Riprap.
 - 2. Certificates
 - a. Quarry Certificate of Conformance and supporting documentation showing riprap bedding and/or riprap meet Standard Specification gradation and materials requirements for the Class or Type specified.
 - 3. Test and Evaluation Reports
 - a. Certified test results for riprap gradation, abrasion resistance, and bulk density.
 - 4. Source Quality Control Submittals
 - a. Trip tickets showing source, type, and weight of each load of material delivered to the site.

1.5 QUALITY ASSURANCE

A. Qualifications

1. Suppliers

- a. Riprap Source: Quarry which produces riprap and meets Georgia DOT Qualifications for same.

PART 2 - PRODUCTS

2.1 ROCK RIPRAP

- A. Construct rock riprap using sound, dense, durable stones, or rock fragments, free from cracks, pyrite intrusions and other structural defects. Stones which will be used with

mortar shall be free from dirt, oil, or other material that might prevent good adhesion with the mortar. Avoid using stones with a laminated structure.

- B. When the crushed aggregate is subjected to five alternations of the sodium sulfate soundness test, the weighted percentage of loss shall be not more than 12 percent.
- C. Use stones generally of rectangular or cubic shape. Do not use flat or elongated stones having a small dimension less than 1/3 of the large dimension.
- D. At least thirty-five percent (35%) of the stones or rock fragments for plain rock riprap shall weigh 75 pounds or more. The sizes of the stones shall be well graded from the smaller to the larger, with the largest stones being a maximum of two cubic feet in size. Stone shall be Type I as per section 805.01 of Georgia Department of Transportation Standard Specifications, latest edition.
- E. At least ninety percent (90%) of the stones or rock fragments for hand placed rock riprap shall weigh 50 pounds or more and shall be not less than 12 inches long, 12 inches deep, and 8 inches wide.

2.2 FILTER BLANKET MATERIAL

- A. Provide filter blanket material consisting of fragments of sound, durable stone or crushed rock, free from disintegrated stone, alkali, salt, vegetable matter, or adherent coating. Provide aggregate reasonably free from thin or elongated pieces. The percentage of wear of the aggregate as outlined in AASHTO Test No. T-96 shall not exceed 7 percent.
- B. Aggregate shall have the following gradation:

Sieve Size	Total Percent Passing by Weight
1¼	100
1	95-100
¾"	70-100
3/8"	50-85
No. 4	33-65
No. 10	20-45
No. 40	8-25
No. 200	0-10

- C. The material finer than the No. 10 sieve shall be of such characteristics and gradation that will prevent the mass from setting up or becoming cemented together.

PART 3 - EXECUTION

3.1 EQUIPMENT

- A. Have all equipment necessary for the satisfactory performance of the work on hand before construction will be permitted to begin.
- B. Provide wooden or metal tamps of sufficient weight and number to properly compact the slopes on which the riprap or slope pavement is to be placed.

- C. Provide a mechanical mixer for mixing cement grout or, if the Engineer approves hand mixing for cement grout, a watertight mixing platform or mixing box of adequate size.

3.2 PREPARATION OF FOUNDATION

- A. Immediately prior to the construction of riprap, trim the slopes or ground surface within reasonably close conformity to the lines and grades indicated on the drawings, and thoroughly compact by the use of hand or mechanical tamps.
- B. On slopes, place the bottom of the riprap at least 2 feet below the natural ground surface, unless otherwise shown or directed.
- C. Do not place material on a frozen or otherwise unsuitable slope.

3.3 PLACEMENT OF FILTER BLANKET

- A. Where shown on the drawings, place a filter blanket course under the riprap on the prepared subgrade.
- B. Place filter blanket immediately prior to placement of riprap. Compaction of the filter blanket is not required except where called for by the Engineer.
- C. Where specifically permitted by a Soils Engineer, a synthetic filter fabric may be substituted for the filter blanket course. Filter fabric shall be especially designed for use as slope stabilization under riprap and shall be acceptable to the Soils Engineer. Place filter fabric in strict conformance with the manufacturer's written instructions and recommendations.

3.4 CONSTRUCTION OF PLAIN ROCK RIPRAP

- A. Unless otherwise shown or specified, construct plain rock riprap using a crane and clam-shell. Place the rock as nearly as practicable in final position using powered equipment. If necessary, work larger rocks up to the surface when the material on the surface does not meet the weight specification or when the voids next to the foundation material are too large.
- B. Keep the quantity of small stones as low as possible, sufficient only to fill the voids between the larger stones. Take care that this small material is well distributed throughout the mass and not allowed to segregate or form pockets of small stone. Break down all bridging. Fill large interstices, or open channels, or voids by chinking or otherwise manipulating the stones.
- C. When riprap is to be built on existing riprap, take special care to provide positive anchorage of the new riprap to the existing riprap.
- D. Conform the finished riprap surface to the slope lines shown on the drawings. No objectionable, hazardous, or unsightly projections above the general plane surface will be permitted.
- E. Thoroughly chink and fill the main stones with the smaller stones by throwing them over the surface in any manner that is practicable for the smaller stones to fill the voids. Continue this work with the progress of the construction. Tamping

of the stones will not be required if the stones have been placed in a reasonable and satisfactory manner.

- F. Knapping of the stones will not be required except stone protruding more than 4 inches above what is considered the normal surface of the stones, in which case break down these stones to come within 4 inches of the normal surface.

3.5 CONSTRUCTION OF HAND PLACED, PLAIN ROCK RIPRAP

- A. Construct hand placed plain rock riprap upon the prepared foundation by hand placing so that the stones are as close together as is practicable in order to reduce the voids to a minimum. Begin construction of riprap on sloped surfaces at the bottom and progress upward in approximately horizontal layers.
- B. When rock riprap is constructed in more than one layer, place it so that it will be thoroughly tied together with the larger stones protruding from one layer into the other.
- C. Provide a standard depth of rock riprap of 12 inches unless otherwise indicated or directed. The absolute minimum depth of riprap is 10 inches. Provide an average rock riprap depth of 12 inches for each 25 square feet of surface.
- D. Place each stone so that the depth will be perpendicular to the surface upon which it is set. Place the length so that it will be against the adjoining stones. Place the stones in such a manner as to stagger all joints as far as it is possible and practicable.
- E. Thoroughly chink and fill the main stones with the smaller stones by throwing them over the surface in any manner that is practicable for the smaller stones to fill the voids. Continue this work with the progress of the construction. Tamping of the stones will not be required if the stones have been placed in a reasonable and satisfactory manner.
- F. Knapping of the stones will not be required except stone protruding more than 4 inches above what is considered the normal surface of the stones, in which case break down these stones to come within 4 inches of the normal surface.

3.6 PROTECTION OF STRUCTURES

- A. Carefully protect all structures from damage by equipment or impact of stones or blocks. Correct all damage at own expense.

END OF SECTION 31 37 00

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2	Products
3.1	Preparation
3.2	Construction
3.3	Quality Acceptance

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all Work in accordance with the Contract Documents.

1. Paving Removal (02 41 13.13)
2. Excavation and Fill (31 23 00)
3. Traffic Control (34 41 16.10)
4. Roadway Construction (34 71 00)

- C. This section provides general requirements for asphalt paving work associated with pipeline installation. However, it is the Contractor's responsibility to ensure all asphalt paving work meets the requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

1.3 WORK INCLUDED

The Contractor shall furnish all labor, equipment, and materials necessary to install asphalt paving as indicated on the Drawings, or as directed by the Engineer or GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item. Submittals shall be as required by and in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- B. PRECONSTRUCTION CONDITIONS
Photographs or videotape, sufficiently detailed, of existing conditions of project site that might be misconstrued as damage, caused by debris, or construction material removal.

PART 2 - PRODUCTS

All PRODUCTS shall be in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

PART 3 - EXECUTION

3.1 PREPARATION

Preparation shall be in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

3.2 CONSTRUCTION

- A. Provide the Engineer and GCDWR at least one day's notice prior to beginning construction or prior to resuming production if operations have been temporarily suspended.
- B. All paving operations shall be in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

3.3 QUALITY ACCEPTANCE

Quality Acceptance shall be in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

END OF SECTION 32 12 16

SECTION 32 16 13

SIDEWALKS, CURBS, AND GUTTERS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
1.5	Quality Control
2.1	Materials
3.1	Preparation
3.2	Joints
3.3	Finishes
3.4	Construction
3.5	Curing

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all Work in accordance with the Contract Documents.

1. Paving Removal (02 41 13.13)
2. Cast-In-Place Concrete (03 30 00)
3. Excavation and Fill (31 23 00)
4. Asphalt Paving (32 12 16)
5. Traffic Control (34 41 16.10)
6. Roadway Construction (34 71 00)

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. Gwinnett County Department of Transportation Standard Specifications.
 1. Where section numbers are identified throughout this specification, the reference is to the Georgia Department of Transportation Standard Specifications Construction of Roads and Bridges, latest edition.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all labor, equipment, and materials necessary to install concrete sidewalks, curbs, and gutters as indicated on the Drawings, or as directed by the Engineer or GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

1.5 QUALITY CONTROL

- A. Tolerances: Construct concrete surfaces within 0.05 feet of the indicated elevation on the Drawings, and deviating not more than 3/8-inch from a ten-foot straightedge placed anywhere on the surface.
- B. Strictly conform to requirements for compaction of subgrade, air entrainment of concrete, and curing of concrete.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Concrete: All concrete shall be Class "A" in accordance with GDOT Standard Specifications Section 500.03, and have a 28-day compressive strength of 3,000 psi.
- B. Joint filler: Nonextruding joint material, furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the Engineer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Excavate and compact the subgrade as specified in Section 31 23 00, true to the grade and cross section as indicated on the Drawings.
- B. Place forms or extrusion machine guides to exact elevation and location specified. Visually check forms and machine guides and adjust where necessary to ensure smooth curves and transitions in grade. Provide close spacing on curves to maintain a smooth curve.

3.2 JOINTS

- A. Expansion Joints: Install expansion joints at intervals as indicated on the Drawings, but not exceeding 40 feet for walks and curbs, and wherever new concrete abuts existing construction. Additional joints are to be placed at tangent points of circular curbs and other places where stresses may develop.
- B. Contraction (Control) Joints:
 - 1. Sidewalks: Cut joints with a saw immediately after concrete reaches adequate hardness to allow sawing contraction joints in sidewalks shall be 3/4 inch deep and spaced at a distance equal to the width of the walk.
 - 2. Curb and Gutter: For formed work, use full depth steel forms to achieve contraction joints. For extruded work, cut contraction joints with a saw

immediately after concrete reaches adequate hardness to allow sawing. Contraction joints in curb and gutters shall be 1 ½ inch deep and spaced at 10 feet intervals.

3. Concrete flatwork: Cut joints with a saw immediately after concrete reaches adequate hardness to allow sawing. Contraction joint depth shall be ¼ of the concrete thickness. Spacing and pattern shall be as indicated on the Drawings, or as directed by the Engineer.
- C. Premolded expansion joint filler must be cut to full cross section of the proposed construction and shall extend the full depth, width, and length of the construction. Trim expansion joint material protruding after the concrete has been finished as directed by the Engineer or GCDWR. All longitudinal expansion joints shall be placed as indicated on the Drawings.

3.3 FINISHES

- A. Pedestrian and Wheelchair Ramps: Non-slip finish.
- B. All others: Broom finish.

3.4 CONSTRUCTION

- A. Place forms true to line, grade, and cross section, as indicated on the Drawings.
- B. Brace forms adequately before placing the concrete. Place concrete in forms and thoroughly tamp, vibrate or work it into all corners, removing air pockets. Allow forms to remain in place until the concrete has set sufficiently to hold its shape.
- C. Begin each phase of screed, float, and trowel and finish work as soon as the concrete can be properly worked. Completely finish sidewalks and flat work with forms in place.
- D. Remove forms on the front face of curbs as soon as the concrete will hold its shape and finish the face. For gutters, a strike-off template of the form and shape of the gutter shall be used to shape the top surface of the gutter. Round top edges of curb and edges of gutter using a radius tool matching the radius indicated on the Drawings. Finish the edges where templates have been removed or expansion joint material has been placed with an edging tool with a radius of not over 1/4-inch, and then all lines or marks removed with a wet brush.
- E. Remove all tool marks with a wetted brush or wooden float, and the finished surface shall present a uniform and smooth appearance.

3.5 CURING

- A. Cure concrete as specified in Section 03 30 00 Cast-In-Place Concrete.

END OF SECTION 32 16 13

SECTION 32 73 00
WETLANDS PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Definitions
1.4	Overview
1.5	Work Included
1.6	Submittals
3.1	Conditions Applicable Only to Specific Nationwide Permits
3.2	Construction Activities Near Wetlands
3.3	Enforcement

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Clearing and Grubbing (31 11 00).
2. Temporary Fencing (31 13 11).
3. Excavation and Fill (31 23 00).
4. Erosion and Sedimentation Controls (31 25 00).
5. Riprap (31 37 00).
6. Turf and Grasses (32 92 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 DEFINITIONS

- A. Contractor: For the purposes of this item, the term "Contractor" is synonymous with Contractor, General Contractor, Discharger, Operator, and Primary Permittee, as used in the Individual, or Nationwide Permit language, as it relates to laws, rules, regulations, ordinances and other wetland protection and permitting references.
- B. Designer: For the purpose of this item, the term "Designer" means the person who has designed and stamped the Erosion Sedimentation and Pollution Control Plan, as used in language of permits, laws, rules, regulations, ordinances, and other soil erosion and sediment control references. This person has successfully obtained Georgia professional registration, met certain education requirements, and been certified as Level II Certified Design Professional, as prescribed by the Georgia Soil and Water

Conservation Commission in consultation with the Georgia EPD and the Stakeholder Advisory Board.

- C. Qualified Person: For the purposes of this item, the term “Qualified Person” means a person, as used in language of permits, laws, rules, regulations, ordinances, and other soil erosion and sediment control references, who has successfully met certain education requirements and been certified as Level 1A, as prescribed by the Georgia Soil and Water Conservation Commission in consultation with the Georgia EPD and the Stakeholder Advisory Board.
- D. Other Definitions: Definitions as listed in the NPDES General Permit GAR 100002, Part I.B. shall apply in this section.

1.4 OVERVIEW

- A. Contractor shall meet minimum requirements for complying with Federal Register Code of Federal Regulations (CFR) 33, Part 330.
 - 1. Wetlands: Wetland areas shall be indicated on the Drawings, or identified in the field by the Designer.
 - 2. Compliance: In accordance with General Conditions of the NWP, the Contractor shall comply with the current Section 33 CFR Part 330, as well as all laws, rules, regulations, ordinances, and/or other requirements concerning wetlands protection and permitting designated and established by the United States, the State of Georgia, or Gwinnett County.
 - 3. Time: Land disturbing activities are not authorized to begin until after all required wetland permits and buffer variances are obtained from the U.S. Army Corps of Engineers (USACE), the State of Georgia, and Gwinnett County.
 - 4. For the purposes of this item, the Designer may at any time during the project, provide direction.

1.5 WORK INCLUDED

- A. The Contractor is responsible for using construction techniques and implementing other measures that ensure compliance with all of the general and specific conditions prescribed in Federal Register 33 CFR Part 330, as prescribed in the Final Notice of Issuance, Reissuance, and Modification of Nationwide Permits (NWPs) in the Federal Register (Volume 61, Number 241) on December 13, 1996, or most current version. In addition, the Contractor is also responsible for complying with all project-specific conditions indicated on the Drawings, and in the Contract Documents. This item covers the Work necessary to comply with the above referenced regulations before, during, and after construction in, and adjacent to, wetlands. The Contractor shall furnish all material and labor necessary for compliance with Federal Register 33 CFR Part 330 under this item.

1.6 SUBMITTALS

- A. Contractor shall submit, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods

proposed to be followed in the execution of the Work under this item, the following documents for approval:

Spill Plan: The Contractor shall prepare a Spill Plan that addresses handling of fuels, lubricants, chemicals, and other toxic materials that may be used. The plan must include:

1. Identification of refueling sites.
2. Identification of storage areas for fuels, lubricants, chemicals, and other toxic materials.
3. Procedures for refueling and maintaining pontoon-mounted backhoes, trench dewatering pumps, and other similar equipment used in wetlands or other water bodies.
4. Contingency plan for cleaning up spills and other releases of fuels, lubricants, chemicals, and other toxic materials.

B. Certification of Completed Work: The Contractor shall submit to the Engineer a signed certification regarding the completed Work and any required mitigation. GCDWR shall forward this certification to the USACE with the authorization letter. The certification shall include:

1. A statement that the authorized Work was done in accordance with the USACE authorization, including any general or specific conditions,
2. A statement that any required mitigation was completed in accordance with the permit conditions if completed by the Contractor,
3. The signature of the Contractor certifying the completion of the Work and mitigation if completed by the Contractor.

PART 2 - PRODUCTS – (NOT USED)

PART 3 - EXECUTION

3.1 CONDITIONS APPLICABLE ONLY TO SPECIFIC NATIONWIDE PERMITS

A. The following sections of this item describe conditions specific to certain NWP's. Based on the permits granted by the USACE for a specific project, GCDWR or Designer shall notify the Contractor of the applicability of the following terms and conditions:

1. **NWP 12 - Utility Line Activities**: The Contractor shall meet the following requirements for those areas covered under NWP 12.
 - a. Temporary Sidecast: Material resulting from trench excavation may be temporarily sidecast (for up to three months) into waters of the United States, provided that the material is not placed in such a manner that it is dispersed by currents or other forces. GCDWR cannot extend this time period without approval from the USACE. As such, the Contractor must provide the Engineer with at least 30 days notice if an extension to the temporary side-cast time limit is desired (such a request does not guarantee approval of the extension, and does not release the Contractor from the responsibility to comply with the requirements of this Section).

- b. Disturbed Area: The area of Waters of the United States that is disturbed must be limited to the minimum necessary to construct the utility line.
 - c. Trench Backfill: In wetlands, the top 6" to 12" of the trench must be backfilled with topsoil from the trench, unless otherwise authorized by the USACE, the State of Georgia, and the Designer.
 - d. Excess Material: Excess material must be removed to upland areas within 24 hours of completion of construction.
 - e. Exposed Slopes: Any exposed slopes and stream banks must be stabilized within 24 hours of completion of the utility line.
2. **NWP 13 - Bank Stabilization**: The Contractor shall meet the following requirements for those areas covered under NWP 13:
- a. Material Placement: No material may be placed in excess of the minimum needed for erosion protection.
 - b. Bank Stabilization: The bank stabilization activity must be less than 500 feet in length.
 - c. Activity Limitations: The activity must not exceed an average of one (1) cubic yard per running foot placed along the bank below the plane of the ordinary high water mark or the high tide line.
 - d. Special Aquatic Site: No material may be placed in any special aquatic site, including wetlands.
 - e. Flow Into and Out of Wetlands: No material may be of the type, or placed in any location or in any manner so as to impair surface water flow into or out of any wetland area.
 - f. Erosion by Flows: No material may be placed in a manner that shall be eroded by normal or expected high flows (properly anchored trees and treetops may be used in low energy areas).
3. **NWP 14 – Linear Transportation Projects**: The Contractor shall meet the following requirements for those areas covered under NWP 14.
- a. Width of Fill: The width of the fill must be limited to the minimum necessary for the actual crossing.
 - b. Limitations of Fill: A fill placed in Waters of the United States must be limited to a filled area of no more than 1/3 acre. Furthermore, no more than a total of 200 linear feet of the fill for the roadway can occur in special aquatic sites, including wetlands.
 - c. Crossing Design: The crossing must be culverted, bridged, or otherwise designed to prevent the restriction of, and to withstand, expected high flows, and to prevent the restriction of low flows and the movement of aquatic organisms.
 - d. Single Project: The crossing, including all attendant features, both temporary and permanent, must be part of a single and complete project for crossing of Waters of the U.S.
 - e. Prevention of Sedimentation: The crossing must be constructed in such a manner so as to preclude sedimentation of downstream areas.
4. **NWP 18 - Minor Discharges**: The Contractor shall meet the following requirements for those areas covered under NWP 18.

- a. Quantity of Discharged Material: The quantity of discharged material and the volume of the excavated area cannot exceed 25 cubic yards below the plane of the ordinary high water mark.
 - b. Special Aquatic Site: The discharge cannot cause the loss of more than 1/10 acre of a special aquatic site, including wetlands. This acreage limitation includes the filled area, and excavated area, plus special aquatic sites that are adversely affected by flooding and special aquatic sites that are drained so that they would no longer be Waters of the U.S. as a result of the project.
5. **NWP 33 - Temporary Construction, Access and Dewatering**: The Contractor shall meet the following requirements for those areas covered under NWP 33:
- a. Downstream Flows: Appropriate measures must be taken to maintain normal downstream flows and to minimize flooding.
 - b. Placement of Fill: Fill must be of materials, and placed in a manner, such that it shall not be eroded by expected high flows.
 - c. Dredged Material: The use of dredged material may be allowed only if authorized by the Engineer after consultation with the USACE, the State of Georgia, and the Designer to determine adverse effects on aquatic resources.
 - d. Temporary Fill: Temporary fill must be entirely removed to upland areas, or dredged material returned to its original location, following completion of the construction activity, and the affected areas must be restored to the pre-project conditions.
 - e. Cofferdams: Cofferdams cannot be used to dewater wetlands or other aquatic areas so as to change their use.
 - f. Navigable Waters: Structures located in navigable Waters of the United States must not be left in place after cofferdams are removed, unless authorized by the Engineer after obtaining a Section 10 Permit.
6. **NWP 35 - Maintenance Dredging of Existing Basins**: The Contractor shall meet the following requirements for those areas covered under NWP 35.
- a. Dredged Material: Dredged material must be disposed of at an upland site.
 - b. Siltation Control: Proper siltation control measures must be used.

3.2 CONSTRUCTION ACTIVITIES NEAR WETLANDS

- A. The Contractor shall complete the following:
1. Marking of Locations: Wetland locations affected by the project shall be permanently marked (surveyed, staked, and flagged) so that inadvertently removed markers can be relocated. The marking shall be clearly visible to all site personnel and equipment operators. Markings shall be maintained during the construction period.
 2. Access: All site personnel, including all equipment operators, shall use pre-designated access and egress points to the site and pre-designated access roads within the construction site. No access or egress point shall be located in a wetland or other Waters of the United States. Access roads through wetlands

and other Waters of the United States shall be limited to those approved by the USACE, State of Georgia, and the Designer.

3. Staging Areas: All staging areas, spoil storage areas, and additional work areas shall be placed at least 50 feet from wetlands and other water bodies. No clearing of vegetation between these areas and adjacent wetlands is permitted.
4. Right-of-Way Stabilization: Dirt, rock fill, tree stumps, brush, rip rap, or other material that would not promote a natural system shall not be used to stabilize a right-of-way.
5. Equipment: Low-ground-weight equipment shall be used, or conventional equipment shall be operated from mats or other approved bedding material in wetlands and other water bodies.
6. Trench Breakers: Trench breakers shall be constructed or the bottom of the trench shall be sealed with approved material in areas where the trench could drain adjacent wetlands or other water bodies.
7. Equipment, Fuel, and Hazardous Material Storage: Equipment, fuels, and hazardous materials shall be stored at least 100 feet from wetlands and other water bodies. In addition, land-based equipment shall not be refueled or maintained within 100 feet of a wetland or other water body.
8. Sediment and Erosion Control: Appropriate sediment and erosion control devices shall be installed and maintained to prevent sediment or other materials from reaching adjacent wetlands and water bodies. All exposed soil and other fills, as well as any Work below the ordinary high water mark, must be permanently stabilized at the earliest practicable date. Erosion and sediment control devices shall be installed in advance of the start of construction and shall be maintained in accordance with Specification Section 31 25 00 Erosion and Sedimentation Controls.
9. Crossings: Wetland and water body crossings shall be limited to the minimum size required to safely construct the project. Crossings shall be constructed perpendicular to the water body channel, unless prior approval for other methods is obtained from the Engineer, the USACE, the State of Georgia, and the Designer.
10. Flow in Water Bodies: Flows in all water bodies affected by a project shall be maintained at all times unless prior approval is obtained from the Engineer, the USACE, the State of Georgia, and the Designer.
11. Water Quality Standards: State water quality standards in streams and other water bodies affected by or adjacent to the project area shall be maintained in accordance with Georgia EPD Section 4 of Georgia's Rules and Regulations for Water Quality Control (Chapter 391-3-6-.03). Water quality in adjacent waterways shall be maintained as specified by the Engineer, the USACE, the State of Georgia, and the Designer.
12. Schedule: All wetland and water body crossings shall be completed using a compressed schedule to minimize disturbance in these areas.
13. Temporary Roads and Bridges: Temporary roads and bridges shall be removed as soon as the wetland or water body permanent crossing has been constructed and the project has been completed.

14. Metropolitan River Protection Act: The terms, provisions, and requirements of the Metropolitan River Protection Act shall be abided by at all times.
15. Restoration: Disturbed areas shall be restored through seeding and planting of trees and shrubs as directed by the Engineer, the USACE, the State of Georgia, and the Designer. Liquid and granular fertilizers shall not be spread within 25 feet of the stream bank.
16. Long-Term Maintenance: The site shall be inspected as specified by the Engineer, the USACE, the State of Georgia, and the Designer to assure re-establishment of vegetation.
17. Topsoil: Topsoil shall be segregated from spoil and stored within sediment-filtering enclosures. Topsoil shall be backfilled into the top 6-12 inches of any trench through wetlands.
18. Access Barriers: Barriers shall be installed to prevent access to the site and any adjacent rights-of-way by off-road vehicles.
19. Navigation: No activity may cause more than a minimal adverse effect on navigation.
20. Maintenance: Any structure or fill authorized by the Permit shall be properly maintained, including maintenance to ensure public safety.
21. Aquatic Life Movements: No activity may substantially disrupt the movement of those species of aquatic life indigenous to the water body, including those species which normally migrate through the area, unless the activity's primary purpose is to impound water. The Contractor shall not construct perennial water body crossings from March 1 through May 30 unless otherwise authorized by the USACE, the State of Georgia, and the Designer.
22. Regional and Case-by-Case Conditions: The activity must comply with any regional or case-by-case conditions which may have been added by the USACE.
23. Wild and Scenic Rivers: No activity may occur in a component of the National Wild and Scenic River system, or in a river officially designated by Congress, as a study river for possible inclusion in the system.
24. Tribal Rights: No activity or its operation may impair reserved tribal rights, including but not limited to, reserved water rights and treaty fishing and hunting rights.
25. Endangered Species: No activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species, or a species proposed for such designation as identified under the Federal Endangered Species Act, or which is likely to destroy or adversely modify the critical habitat of such species.
26. Historic Properties: No activity which may affect historic properties listed, or eligible for listing in the National Register of Historic Places, is permitted unless authorized by GCDWR, State Historic Preservation Office (SHPO), the USACE, the State of Georgia, and the Designer (33 CFR part 325, appendix C).
27. Discharge of Dredged or Fill Material: The following conditions apply to activities that involve the discharge of dredged or fill material into waters of the U.S.:

- a. Water Supply Intakes: No discharge of dredged or fill material may occur in proximity to a public water supply intake except where the discharge is for repair of the public water supply intake structures and/or adjacent bank stabilization.
- b. Suitable Material: No discharge of dredged or fill material may consist of unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.) and material discharged must be free from toxic pollutants in toxic amounts (as defined in section 307 of the Clean Water Act).
- c. Spawning Areas: Discharges in spawning areas during spawning seasons must be avoided to the maximum extent practicable. The Contractor shall not construct perennial water body crossings from March 1 through May 30 unless otherwise authorized by GCDWR, USACE, the State of Georgia, and the Designer.
- d. Obstruction of High Flows: Discharges must not permanently restrict or impede the passage of normal or expected high flows or cause the relocation of the water (unless the primary purpose of the fill is to impound waters) unless authorized by GCDWR, the USACE, the State of Georgia, and the Designer.
- e. Adverse Effects from Impoundments: If the discharge creates an impoundment of water, the accelerated passage of water and/or restriction of its flow shall not adversely affect the aquatic system unless authorized by GCDWR, the USACE, the State of Georgia, and the Designer.
- f. Waterfowl Breeding Areas: Discharges into breeding areas for migratory waterfowl must be avoided unless authorized by GCDWR, the USACE, the State of Georgia, and the Designer.
- g. Removal of Temporary Fills: Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.

3.3 ENFORCEMENT

- A. The Contractor is responsible for conducting any restoration and/or paying any fine resulting from a violation of the requirements of these specifications or of an applicable permit or regulatory requirement (including work outside an easement). This responsibility is in effect even if the action is initially directed at GCDWR.

END OF SECTION 32 73 00

SECTION 32 92 00

TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
1.5	Warranty
2.1	Seed
2.2	Sod
2.3	Topsoil
3.1	Preparation of Seeded or Sodded Areas
3.2	Seeding and Sod Replacement
3.3	Sod Removal/Replacement
3.4	Topsoil
3.5	Mulching
3.6	Watering
3.7	Maintenance

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Exploratory Excavations (02 32 19).
2. Removal of Construction Material (02 42 11)
3. Clearing and Grubbing (31 11 00)
4. Excavation and Fill (31 23 00).
5. Erosion and Sedimentation Controls (31 25 00).
6. Trees (32 93 43)

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all labor, equipment, and materials necessary to properly restore all ground surfaces, irrespective of the type, which may be disturbed in the progress of Work required under this contract.

- B. These items shall include in general, but without limitation, the spreading of topsoil, fertilizing, seeding, sod placement/replacement, and mulching required to restore disturbed areas as necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR. It is the intent of these specifications to place seed on all disturbed, non-established areas (i.e. cross-country easements, pasture, etc.); and to place topsoil and sod on all disturbed, established, improved areas (i.e. lawns or other well improved grass areas) that existed as such prior to construction. All disturbed areas are to be restored to same or better general conditions than existed prior to commencement of the Work. Items covered under this section are considered as permanent restoration. Areas disturbed outside the lines and limits of the right-of-way and easements indicated on the Drawings shall be restored at the expense of the Contractor, unless directed otherwise by GCDWR.
- C. Standard Specifications: The requirements of the manual for Erosion and Sediment Control in Georgia, latest edition, shall apply as applicable.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall include, but not be limited to product data for seed, fertilizer, agricultural limestone, vegetative mulch, sod and topsoil.
- C. The Contractor shall submit plans showing in detail, the type, location, fertilizer ratios, and percentage cover of all seeding and sodding to be used in construction.

1.5 WARRANTY

- A. All plantings, seeded or sodded, shall be guaranteed for a period of one (1) year after Final Completion of the project. Any areas showing evidence of settlement or loss of topsoil shall be rebuilt and replanted as required. Any plantings that are dead or dying during the Warranty Period must be replaced, and at Contractor's expense.

PART 2 - PRODUCTS

2.1 SEED

- A. Seed shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act. All seeds shall be furnished in sealed standard containers. The minimum percentage by weight of pure live seed in each lot of seed shall be as follows:

1. Seed Type	Percent
K31 Fescue	95
Material other than grass seed	<u>5</u>
Total	100

- B. The aggregate percent of material other than grass seed shall include all non-viable seed, chaff, bulbs, live seed of crop plants other than those specified above, harmless inert matter, and weed seed not exceeding 1.0% by weight of pure live seed and other material in the mixture.
- C. Commercial fertilizer shall be composed of a formula of 20-12-10 and shall conform to applicable Georgia fertilizer laws. It shall be uniform in composition, dry, and free flowing and shall be delivered to the site in the original unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer, which becomes caked or otherwise damaged making it unsuitable for use, shall not be accepted.
- D. Agricultural limestone shall be an acceptable grade of ground limestone, ground dolomite, or a mixture of limestone and dolomite meeting the following physical and chemical requirements:

1. Gradation

<u>Standard Sieve Size</u>	<u>Maximum Percent (%) Retained</u>
No. 8, maximum	10
No. 100, maximum	75

- E. The vegetative mulch shall be the cereal straw from stalks of oats, rye, wheat, or barley. The straw shall be free of prohibited weed seeds and shall be relatively free of all other noxious and undesirable seeds. The straw shall be clean and bright, relatively free of foreign material and be dry enough to spread properly. If the above straw specifications cannot be met practicably, the foliage of the following plants may, with GCDWR's approval, be substituted: Smooth Brome, Timothy, Orchard Grass, Red Canary Grass, Tall Fescue, Red Top, Millet, Blue Stem, Indian Grass, Red Clover, White Clover, Alfalfa, Crimson Clover, Birds Foot Trefoils, and Vetch. The foliage shall be taken relatively free of noxious and undesirable seeds and foreign material. The asphalt emulsion shall be SS-1, SS-1h, CSS-1 or CSS-1h conforming to the requirements of AASHTO M140-70 or AASHTO M208-72.

2.2 SOD

- A. Turfgrass Sod: Complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Bermudagrass, Carpetgrass, Axonopus, Centipedegrass, St. Augustinegrass, and Zoysiagrass.
- C. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Full sun: Kentucky bluegrass, a minimum of three cultivars.
 - 2. Sun and partial shade: Proportioned by weight as follows:

- a. 50 percent Kentucky bluegrass.
 - b. 30 percent Chewings Red Fescue.
 - c. 10 percent Perennial Ryegrass.
 - d. 10 percent Redtop.
3. Shade: Proportioned by weight as follows:
 - a. 50 percent Chewings Red Fescue.
 - b. 35 percent Rough Bluegrass.
 - c. 15 percent Redtop.

2.3 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7.4 percent organic material minimum, free of stones 1 inch or larger in any dimension, and other extraneous materials harmful to plant growth.
 1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 2. The Contractor shall furnish topsoil free from objectionable materials such as hard clods, stiff clay, sods, hardpan, partially disintegrated stone, plant stumps, large roots, litter, or other materials that are not integrally a natural component of good agricultural soils and which are harmful to or unnecessary for successful plant growth.

PART 3 - EXECUTION

3.1 PREPARATION OF SEEDED OR SODDED AREAS

- A. The sub grade for the areas to be seeded or sodded shall be brought to a uniform grade, free of large stones. Topsoil shall be uniformly graded, trimmed, and raked free from unsuitable material, ridges, bumps, or depressions. Over this area, spread agricultural lime at the rate of 50 pounds per 1000 square feet, and spread fertilizer uniformly on the surface of the ground at the rate of 35 pounds per 1000 square feet. Mix the lime and fertilizer uniformly into the top four (4) inches of the soil by suitable harrows, rotary tillers, or other approved equipment.

3.2 SEEDING AND NEW SOD PLACEMENT

- A. Sod of the same species as existing grass shall be placed on all established lawns and other established, improved grass areas, as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR. If sod species required is out of season at time of placement, seeding may be allowed as a temporary measure, and then only with Contractor obtained written permission from the affected property owner and approval from GCDWR, until such time as the sod species is in season and will be placed at that time. Sod shall be carefully placed and rolled to ensure good soil contact

- B. Seed may be placed on all non-established, disturbed areas, as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- C. Seeding shall be performed using a properly proportioned mixture of inoculated seed approved for use in The Piedmont Region "Zone One" as detailed in the Manual for Erosion and Sediment Control in Georgia. Seeding shall only be permitted during the planting season listed for The Piedmont Region. All seeded areas shall be uniformly mulched immediately after seeding.
- D. The Contractor shall be responsible for maintaining all planted areas including, watering, and reseeding defective area until a stand of grass covering ninety percent (90%) of the entire stabilized area is established, and Final Acceptance of the Work by the Engineer is obtained. Areas showing evidence of settlement or loss of topsoil shall be rebuilt and reseeded as required.
- E. Any deviations from grass species as specified, as indicated on the Drawings, or differs from existing grass; or alternatives proposed due to unavailability of seasonal grasses; or inappropriateness of sod or seeding due to the time of year; must be presented to, and approved by GCDWR, along with written approval by property owner obtained by Contractor.

3.3 EXISTING SOD REMOVAL AND REPLACEMENT

- A. On existing, well-established "sod" type lawns and other improved, well-established grass areas, in lieu of placing new sod, existing sod/grass may be removed and replaced at completion of construction in that area. Existing sod/grass shall be carefully removed, kept watered and alive, and replaced after backfilling has been properly completed. Sod replacement shall be performed using sod of type and grade of that which was disturbed. Sod shall be carefully placed and rolled to ensure good soil contact.

3.4 TOPSOIL

- A. The topsoil shall be of sufficient thickness that when spread and compacted, a minimum of four (4) inches shall be available. The Contractor shall furnish natural topsoil of a good condition and tillable structure. Obtain topsoil as borrow from an outside source and from piles of uniform texture, drainage, and other characteristics so as to constitute a homogenous soil meeting the requirements of the Georgia Department of Transportation. Do not place topsoil containing frost or in muddy conditions. If utilizing existing material obtained from the initial excavation of the worksite for reuse as top soil, the Contractor must first obtain approval from GCDWR construction material testing representative as to suitability of its content, including approval of location and method of storage of topsoil for reuse.

3.5 MULCHING

- A. Uniformly mulch all seeded areas in a continuous blanket immediately after seeding. Apply the mulch so as to permit some sunlight to penetrate and the air to circulate and

at the same time shade the ground, reduce erosion, and conserve soil moisture. Approximately 25 percent of the ground shall be visible through the mulch blanket.

- B. Hold mulch on slopes greater than 3 to 1 ratio in place by the use of an approved mulch binder. Thoroughly mix binder and apply with the mulch. Apply emulsified asphalt or cutback asphalt at the approximate rate of 5 gallons per 1,000 square feet as required to hold the mulch in place.
- C. Cover structures, poles, fence, and appurtenances if the mulch binder is applied in such a way that it would come in contact with or discolor the structures.
- D. Apply mulch and binder by suitable blowing equipment at closely controlled application rates.

3.6 WATERING

- A. Maintain the proper moisture content of the soil to insure adequate plant growth until a satisfactory stand is obtained. If necessary, perform watering to maintain an adequate water content in the soil.
- B. Accomplish watering by hoses, tank truck, or sprinklers in such a way to prevent erosion, excessive runoff, and overwatered spots.

3.7 MAINTENANCE

- A. After the grass has grown to a height of 2 inches and before final acceptance, apply one additional application of nitrogen at the rate of 50 lbs/acre.
- B. Apply nitrogen with mechanical hand spreaders or other approved spreaders capable of uniformly covering the grassed areas. Do not apply nitrogen on windy days or when the foliage is damp. Do not apply nitrogen between October 15 and March 15 except in Zone 4. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- C. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- D. Immediately reseed areas that show bare spots.
- E. Apply fertilizer at approximately 600 lbs/acre each spring after initial plant establishment until Final Acceptance.
- F. The Engineer may require replanting of an area that shows unsatisfactory growth for any reason at any time. Except as otherwise specified or permitted, prepare replanting areas according to the Specifications as if they were the initial planting areas.

END OF SECTION 32 92 00

SECTION 32 93 43

TREES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Trees
2.2	Tree Save Barrier Fence
3.1	Warranty
3.2	Workmanship

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Exploratory Excavations (02 32 19).
2. Removal of Construction Material (02 42 11)
3. Clearing and Grubbing (31 11 00)
4. Excavation and Fill (31 23 00).
5. Erosion and Sedimentation Controls (31 25 00).
6. Turf and Grasses (32 92 00)

1.2 REFERENCES

- ###### A.
- Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- ###### A.
- The Contractor shall, under this item, furnish all materials, tools, labor, and equipment necessary to install select nursery trees or riverbank joint plantings for creek crossings, and install tree save barrier fence to protect designated trees, vegetation, and construction areas, to direct construction work activity away from protected areas, as indicated on the approved Drawings.

1.4 SUBMITTALS

- ###### A.
- Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

- B. The Contractor shall submit detailed plans for tree planting, including location and spacing, hole size, fertilizer rates, and staking requirements.

PART 2 - PRODUCTS

2.1 TREES

- A. All trees shall be nursery grown.
- B. Trees shall be a minimum of 2 inches in diameter as measured 12 inches above the ground. Trees shall be a minimum of 8 feet tall. The exact species of trees and river bank joint plantings must be approved by the Engineer or GCDWR prior to planting.
- C. Refer to Contract Documents for type, size, and quantity.

2.2 TREE SAVE BARRIER FENCE

- A. Materials for tree/vegetation and construction safety protection barriers shall conform to the following requirements:
 - 1. Mesh Safety Barrier Fencing (orange color) as manufactured by Tenax, or approved equal.
 - 2. Posts shall be a minimum length 6 feet, and made of wood or steel. Wood posts shall be 1½" x 1½" hardwood and made from Ash, Hickory, or Oak. Steel posts shall be "U", "T", or "C" shaped with a minimum weight of 1.3 pounds per foot, and have projections for fastening the mesh fabric to the posts.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Tree Save Barrier Fencing: Install temporary tree save barrier fencing as designated on the Drawings, or where directed by the Engineer or GCDWR, to protect remaining vegetation from construction damage. Maintain temporary fencing and remove when construction is complete.
- B. The tree save barrier fencing shall be constructed of orange color safety barrier fencing securely fastened to fence posts spaced a maximum of 5 feet on center. Posts are 6 feet in length with 2 feet set into the ground, and 4 feet extending above ground. The fencing shall be attached to the post with a minimum of four (4) nylon-locking ties, evenly placed at each post.

3.2 WARRANTY

- A. All trees and riverbank plantings shall be guaranteed for a period of one (1) year after substantial completion of the project. Any trees or plantings that are dead or dying during the Warranty Period must be replaced, and at Contractor's expense.

- B. Damaged temporary fencing shall be repaired or reinstalled as directed by the Engineer or GCDWR, and at Contractor's expense.

3.3 WORKMANSHIP

- A. All trees shall be delivered with a burlap root bag, and installed with supporting wires when necessary. Riverbank planting shall be provided by an individual experienced with such plantings and their installation. Riverbank joint plantings shall be installed according to the directions of the supplier. The proposed location of trees must be marked with a stake and approved by the Engineer or GCDWR prior to planting.
- B. All tree save barrier fencing shall be properly maintained during the construction period. Damaged temporary fencing shall be repaired or reinstalled as directed by the Engineer or GCDWR.

END OF SECTION 32 93 43

SECTION 33 01 30.71

REHABILITATION OF SEWER UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Hydraulic Cement
2.2	Brick
2.3	Mortar
3.1	Workmanship

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Brick Masonry (04 21 13).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all materials, tools, labor, and equipment necessary to seal, repair, and rebuild a manhole invert table.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

PART 2 - PRODUCTS

2.1 HYDRAULIC CEMENT

- A. The Contractor shall repair and finish all inverts with a mixture of 50% sand and 50% Portland Cement.

2.2 BRICK

- A. All brick used shall, unless otherwise shown or specified, be of such quality as to meet ASTM Designation C62.
- B. Subject to compliance with requirements, provide the following, or an approved equal:
 - 1. Grade SW hard grade, common, building brick of clay or shale 2- $\frac{1}{4}$ x 3- $\frac{3}{4}$ x 8 inches in size.

2.3 MORTAR

- A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type 'S.'
- C. Aggregate for Mortar: ASTM C144, except for joints less than $\frac{1}{4}$ inch thick, use aggregate graded with 100 percent passing the No.16 sieve.
 - 1. White-Mortar Aggregates: Natural white sand or ground white stone.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. The Contractor shall seal all leaks with hydraulic cement. The Contractor shall rebuild all inverts with bricks and Portland Cement. All invert tables shall be sloped for drainage. All invert channels shall be the same width as the pipe diameter. All invert channels shall be smooth and neatly formed with gradual bends.

END OF SECTION 33 01 30.71

SECTION 33 01 30.72

RELINING SEWERS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	Quality Assurance
1.3	Submittals
1.4	Delivery, Storage, and Handling
1.5	Warranty
1.6	Restoration
2.1	Materials
3.1	Preparatory Work
3.2	Sewage Bypass
3.3	Installation
3.4	Testing
3.5	Inspection

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with Contract Documents.

1. Rehabilitation of Sewer Utilities (33 01 30.71).
2. Sanitary Utility Sewerage Piping (33 31 00)

1.2 QUALITY ASSURANCE

- A. The Contractor shall be certified by the Pipe Lining System Manufacturer, as a fully-trained, licensed installer of Manufacturer's lining system, and shall possess all pertinent certificates to that effect.

1.3 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. The Contractor shall submit the following information in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
1. Shop drawings, catalog data, and manufacturer's technical data showing complete information of material composition, physical properties, dimension of new pipe and fittings, manhole gaskets, hydraulic cement/grout, and manhole rehabilitation/repair materials. Include

manufacturer's recommendation for handling, storage, and repair of damage to pipe and fittings.

2. Method of construction, grouting process and restoration of existing sewer house connections. This shall include detail drawings for information only showing excavation location, dimensions, sheeting and shoring, method of dewatering and other utilities that may be affected; width and length of working area, access pit, and portion of existing sewer to be removed to conduct the work; and sewage flow bypass. Design of sheeting and shoring for excavations and dewatering shall be the Contractor's responsibility.
3. Prior to beginning work, the Contractor shall submit a work plan describing the installation procedures, including equipment staging area requirements, means of sewer access, location and number of access pits, dewatering method, methods of maintaining sewage flow, method used to reactivate service laterals, method used to rehabilitate service connections, and whether access to private property, pits or other excavations is required.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall transport, handle, and store tubing as recommended by manufacturer.
- B. If tubing becomes damaged before or during installation, it shall be repaired or replaced as recommended by the manufacturer, at the Contractor's expense, before proceeding any further.

1.5 WARRANTY

- A. All liner installations shall be warranted to be free from defects in materials and workmanship for a period of two (2) years from the date of installation. Should a defect occur during this two year period that is attributable to the liner installation or materials, the defect shall be repaired by the Contractor at no additional cost to GCDWR.

1.6 RESTORATION

- A. The Contractor shall provide complete restoration, including, but not limited to all backfilling, grassing and sodding, and routine site restoration. Items for relining not covered elsewhere in the Bid Schedule shall be included in the cost for this item.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All materials used in the flexible polyester fiber felt tubing cured-in-place pipe (CIPP) process shall be suitable for use as a sanitary sewer lining material as specified, as depicted on the Drawings, or as directed by the Engineer. The CIPP shall be installed by a licensed contractor of Inliner Technologies, Inc.; Paoli,

Indiana; Insituform of North America, Memphis, Tennessee; Newlife Liner System of Stephen's Technologies, Inc.; Impreline of Texon Industrial Products; or Diamond Lining System; or approved equal.

- B. The thermosetting resin shall meet the requirements of ASTM F1216 and ASTM F1743 and shall produce CIPP that complies with the structural and chemical resistance requirements of this specification.
- C. The tubing materials shall be polyester fiber felt tubing, coated on one side with a waterproof coating such as polyurethane or polyvinylchloride (PVC), and fully impregnated with a liquid, thermosetting resin as specified. The composition, catalyst levels, accelerators, viscosity adjustments, and characteristics of the thermosetting resin/catalyst systems shall be suitable for the cured-in-place pipe installation. The cured material shall conform to the minimum structural standards, as listed below:

<u>Cured Liner Material Test</u>	<u>Standard</u>	<u>Results</u>
Tensile Strength	ASTM C638	3,000 psi
Flexural Strength	ASTM D790	4,500 psi
Flexural Modulus of Elasticity	ASTM D790 (Long-term)	250,000 psi
Felt Tubing	PU Coated, 6 denier	Felt, sewn

- D. The polyester fiber felt tubing shall be fabricated to a size that when installed will neatly fit the internal circumference of the sewer pipe. For complete line segment rehabilitation greater than 20 feet, the length of tubing shall be continuous and sufficient to extend into the inlet and outlet of the respective manholes and shall make a proper seal. For partial or section rehabilitation lining, see the sectional CIPP regarding other information on the length of point repairs.
- E. The polyester fiber felt tubing and resin material shall be in accordance with the requirements of ASTM F 1216. The cured minimum thickness of the tubing shall be 6.0 mm. This thickness is based on (1) the shape factor of the existing pipe not exceeding ovality of 2 percent; (2) flats in circumference not exceeding 20 percent of the diameter; (3) missing segments of the existing pipe not exceeding an angle of 60 degrees on the circumference; (4) the long-term flexural modulus of the new liner being equal to 250,000 psi; and (5) depth of pipe up to 22 feet. If any of the above minimum parameters are not met, the Engineer shall be notified for an evaluation of conditions before placing the liner.

PART 3 - EXECUTION

3.1 PREPARATORY WORK

- A. The sewer main where lining is proposed shall first be cleaned, including the removal of roots, and internally inspected by television camera.
- B. It shall be the responsibility of the Contractor to clear the main of obstructions such as solids, dropped joints, protruding service connections, or collapsed pipe

that will prevent installations. If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment, the Contractor shall advise the Engineer. The Contractor shall excavate and make the required point repair as directed by the Engineer or GCDWR.

- C. Upon completion of the sewer main cleaning and internal inspection, GCDWR reserves the right to direct any sewer service connection be repaired, or the lateral removed and replaced to the edge of the easement, prior to continuing with placement of the liner. Spot Repair of the Main and six inch (6") service lateral shall be as specified herein.
- D. Upon completion of the sewer main cleaning and internal inspection, GCDWR reserves the right to direct any sewer main segments be removed and replaced prior to, or in lieu of, continuing with placement of the liner. Pipe removal and replacement shall be as specified herein. In the event that the main is designated to be replaced, the Contractor shall be paid for sewer main cleaning and internal inspection to the extent that this work has been accomplished in accordance with the Contract.
- E. The Contractor shall notify all service connection occupants prior to temporary discontinuation of sewer service and, based upon discussions with the occupants, make a determination of the need for continuous sewer service. Following a field survey, the Contractor shall meet with GCDWR to review Contractor's proposed procedures for maintaining essential sewer services. The approval by GCDWR shall not relieve the Contractor of full responsibility to maintain essential sewer services. All bypassing and plugging of service lines shall conform to these specifications.

3.2 SEWAGE BYPASS

- A. The Contractor shall bypass sewage flow around the section or sections of sewer main that are to be rehabilitated, cleaned, or televised, to the requirements of Section 33 01 30.74 BYPASS PUMPING.
- B. The pump and bypass mains shall be of adequate capacity and size to handle the flow.
- C. Where pump discharge lines cross streets or alleys, they shall be covered with wooden or metal ramps designed and installed in such manner that they do not unreasonably impair vehicular traffic traveling said streets or alleys. All pumping or bypassing work shall be approved by GCDWR prior to the Work being started.
- D. Whenever the bypassing operation is complete, any stored flow shall be released gradually to avoid a surge in flow that could flood or overload receiving pipes.

3.3 INSTALLATION

- A. The Contractor shall field verify all dimensions and lengths prior to ordering of the lining materials.
- B. All linings for complete line segment lining shall terminate at manholes. Terminations or unfused joints between manholes shall not be accepted.

- C. The Contractor shall make all arrangements with GCDWR for water to be used in the installation operation.
- D. The Contractor shall designate a location where the uncured resin, in the original containers, and the un-impregnated felt tube will be vacuum impregnated prior to installation. The Contractor shall allow the Engineer to inspect the materials and "wet out" procedure. A resin and catalyst system compatible with the requirement of this method shall be used. The quantities of the liquid thermosetting materials shall be sufficient to completely saturate the felt tube, and to provide the minimum wall thickness specified herein.
- E. The wet out felt tube shall be inserted through an existing manhole or other approved access by means of an inversion process, or with the aid of a cable and winch, and the application of a hydrostatic head sufficient to fully extend the felt tube to the next designated manhole. The impregnated tubing materials shall be inserted into the inversion pipe with the impermeable plastic membrane side out. At the lower end of the inversion pipe, the impregnated tube shall be turned inside out and attached to the inversion pipe so that a leak-proof seal is created. The inversion head will be adjusted to be of sufficient height to invert the tube from manhole to manhole, and to hold the tubing against the pipe wall, and to produce dimples at service connections and flared ends at the manhole. The use of a lubricant is allowed and, if used, such lubricant shall not be detrimental to the tube. During the curing process, the elevated curing temperature shall be closely observed, and shall not over-stress the felt fiber or cause damage or failure of the tube prior to cure.
- F. Curing: After inversion is completed, the Contractor shall supply a suitable heat source and water recirculation equipment. The equipment shall be capable of delivering hot water to the far end of the pipe section through a perforated hose, which is to uniformly raise the water temperature sufficiently to affect a cure of the resin.
- G. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing heat exchanger circulating water. Thermocouple shall be placed between the impregnated tube and the invert at the far access point to determine the temperature and time of exotherm. Water temperature in the pipeline during the cure period shall not be less than 150°F or more than 200°F as measured at the exchanger return line.
- H. Initial cure shall be deemed to be complete when the inspection of the exposed portions of the new liner appears to be hard and sound and the thermocouple indicate that an exotherm has occurred. The cure period shall be of a duration recommended by the resin manufacturer, as modified for the cured-in-place process. During the cured period, the recirculation of the water and cycling of the heat exchanger to maintain the temperature shall continue.
- I. Cool Down: The Contractor shall cool the finished cured-in-place pipe installation to a temperature below 100°F before relieving the static head in the inversion stand pipe. Cool-down may be accomplished by the introduction of cool water into the inversion stand pipe to replace water being drained from the downstream

end. Care shall be taken in the release of the static head such that a vacuum will not be developed that could damage the newly installed liner.

- J. Sealing Liner at Manholes: For providing a proper seal of the sewer pipe at the manhole, the Contractor shall apply an approved sealant at manholes by pressure injection, or other approved means to insure a water-tight seal. The sealant shall be of a resin mixture compatible with that used in the inversion process. The operation shall be rechecked after forty-eight (48) hours to ensure the seal is holding.
- K. Reconnecting Sewer Service Lines to Liner: After the pipe has been reconstructed, the Contractor shall reconnect all existing service connections. This generally shall be done without excavation from the interior of the pipeline by means of a television camera and a cutting device that re-establishes service connections to not less than 90 percent capacity. If excavation is necessary to reconnect the service, the Contractor shall make the connection and will be paid at the unit price bid for connecting to existing service line.

3.4 TESTING

- A. After the installation procedures have been performed and curing is complete, but before any service connections are reinstalled, the Contractor shall conduct a hydrostatic test on the sewer line to determine if it is watertight. The test shall be conducted using the existing hydrostatic head provided by the inversion standpipe. The test time shall be five (5) minutes, during which time no makeup water shall be added to the standpipe. If at the end of the test period no water loss is observed in the standpipe, the water tightness of the cured-in-place pipe will be considered satisfactory.

3.5 INSPECTION

- A. The Contractor shall conduct a preliminary CCTV inspection of the existing sewer prior to beginning rehabilitation work. The tape and report shall clearly identify location, size, and condition of the pipe, elevations, material types, and location of all lateral connections. All CCTV work and cleaning performed by the Contractor is incidental to the pipe lining task. The Contractor shall advise the Engineer and GCDWR of any existing pipe conditions which may result in unacceptable pipe conditions post pipe lining. The Engineer will advise the Contractor as to the suitability to proceed with the pipe lining. Prior to beginning CCTV work in a neighborhood, the Contractor, in coordination with GCDWR, shall distribute project outreach door hangers to the affected homes and/or businesses.
- B. All completed liner installations shall be televised and a video recording made in the presence of the Engineer and/or GCDWR. The liner installation shall be continuous over the entire length between two manholes and shall be as free as commercially practical from visual defects that would affect the hydraulic flow characteristics, or cause possible blockage. Any defect during the Warranty Period which will affect the integrity or strength of the pipe, shall be repaired at the Contractor's expense, in a manner mutually agreed to by the Engineer and GCDWR. After the Work of each section is completed, the Contractor shall

provide GCDWR with a videotape showing both the before and after conditions, including the reinstalled sewer service connections.

- C. Defects, including damage, sags, faulty service connections, leaks, etc., which may affect the integrity or strength of the sewer system shall be corrected at the Contractor's expense. Conditions such as sags that were shown to be pre-existing on the preliminary CCTV inspection, and not corrected sufficiently, shall be brought to the attention of the Engineer and GCDWR for review.

END OF SECTION 33 01 30.72

SECTION 33 01 30.73

PIPE BURSTING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	General Description
1.3	Quality Assurance
1.4	Submittals
1.5	Delivery, Storage, and Handling
1.6	Restoration
2.1	Materials
2.2	Material Handling
2.3	Sewer Pipe Bursting Method
2.4	Sewer Service Connection
3.1	Sewage Bypass
3.2	Construction Method
3.3	Pipe Joining
3.4	Manholes
3.5	Television Inspection

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with Contract Documents.

1. Rehabilitation of Sewer Utilities (33 01 30.71).
2. Sanitary Utility Sewerage Piping (33 31 00)

1.2 GENERAL DESCRIPTION

- A. This specification includes requirements to furnish all labor, materials, transportation, and equipment necessary to rehabilitate various sanitary sewer pipelines by pipe bursting methods. This method fragments/splits the existing sewer pipe and immediately installs a new polyethylene pipe. The scope includes the complete installation, reconnection of existing sewer connections and site restoration. Only pneumatically operated equipment with either front or rear expanders providing for the proper connection to the polyethylene pipe will be allowed for use. The pneumatic tool must be used in conjunction with a constant tension hydraulic twin capstan winch of 5, 10, or 20 tons; the size of

the winch depends on the diameter of the pipe to be replaced. In no case is the constant tension on the winch to exceed 20 tons.

1.3 QUALITY ASSURANCE

- A. The Contractor shall be certified by the Pipe Bursting System Manufacturer, as a fully-trained, licensed installer of Manufacturer's bursting system, and shall possess all pertinent certificates to that effect.
- B. Polyethylene pipe joining shall be performed by personnel trained in the use of thermal butt-fusion equipment and recommended methods for new pipe connections. Personnel directly involved with installing the new pipe shall be certified-trained in the proper methods for handling and installing the polyethylene pipe. The Contractor shall provide a certification of training for each member.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. The Contractor shall submit the following information in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. Shop drawings, catalog data, and manufacturer's technical data showing complete information on material composition, physical properties, dimension of new pipe and fittings, manhole gaskets, hydraulic cement/grout, and manhole rehabilitation/repair materials. Include manufacturer's recommendation for handling, storage, and repair of damage to pipe and fittings.
 - 2. Method of construction, grouting process and restoration of existing sewer house connections. This shall include detail drawings for information only showing excavation location, dimensions, sheeting and shoring, method of dewatering and other utilities that may be affected; width and length of working area, access pit, and portion of existing sewer to be removed to conduct the work; and sewage flow bypass. Design of sheeting and shoring for excavations and dewatering shall be the Contractor's responsibility.
 - 3. Certificate test reports for the polyethylene pipe fusion joint test or certificate of compliance.
 - 4. Prior to beginning work, the Contractor shall submit a work plan describing the installation procedures including equipment staging area requirements, means of sewer access, location and number of access pits, dewatering method, methods of maintaining sewage flow, method used to reactivate service laterals, method used to rehabilitate service connections and whether access to private property, pits or other excavations is required.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall transport, handle, and store pipe and fittings as recommended by manufacturer.
- B. If pipe and fittings become damaged before or during installation, it shall be repaired or replaced as recommended by the manufacturer, at the Contractor's expense, before proceeding any further.

1.6 RESTORATION

- A. The Contractor shall provide complete restoration, including, but not limited to all backfilling, grassing and sodding, and routine site restoration. Items for bursting not covered elsewhere in the Bid Schedule shall be included in the cost for this item.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Polyethylene pipe shall be High Density Polyethylene (HDPE) pipe and shall meet the applicable requirements of ASTM F714 Polyethylene Plastic Pipe (SDR-PR) based on outside diameter, ASTM D1248, ASTM D3550. Material designation shall be PE3408 with UV Stabilizer of 2 to 3% carbon black in accordance with ASTM D-1603.
- B. Size of the insertion to be used shall be such to renew the sewer pipe to its original or greater flow capacity.
- C. All pipes shall be made of virgin material. No rework except that obtained from the manufacturer's own production of the same formulation shall be used.
- D. The pipe shall be homogenous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
- E. Dimension Ratios: The minimum wall thickness of the polyethylene pipe shall meet the following:

<u>Depth of Cover (feet)</u>	<u>Minimum SDR of Pipe</u>
0 to 16.0	19
>16.1	17

- F. The interior of the main sewer pipe shall be a light reflective color to facilitate closed circuit television (CCTV) inspection, such as Philips Opticore or approved equal.
- G. Test for compliance with this specification shall be made as specified herein and in accordance with applicable ASTM Specifications. A certificate with this specification shall be furnished by the manufacturer for all material furnished under this specification. Polyethylene plastic pipe and fittings may be rejected if any requirements of this specification are not met.

- H. Backfill material and compaction shall meet the requirements of Section 31 23 00 EXCAVATION AND FILL.
- I. For manhole adapter water seal, use three (3) PIPECONX Manhole Adapter seals, model number PCX MA, or an approved equal.
- J. Connections to the existing sewer service pipe at the property line shall be made using flexible connections. All flexible connections shall conform to ASTM C-425 and shall be manufactured by Fernco #1056 Series Joint Sealer, or an approved equal. For connections made under pavement, a stainless steel Shear ring shall also be installed.

2.2 MATERIAL HANDLING

- A. Pipe shall be stored on level ground, preferably turf or sand, free of sharp objects, which could damage the pipe.
- B. Stacking of the polyethylene pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipe under anticipated temperature conditions.
- C. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with sleeper or between supports.
- D. Ropes, fabric, or rubber-protected slings and straps shall be used when handling pipes. Chains, cables, or hooks inserted into the pipe ends shall NOT be used.
- E. Care shall be exercised when lowering pipe into the trench to prevent damage or twisting of the pipe.
- F. The handling of the joined pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects.
- G. Sections of the pipe with deep cuts and gouges shall be removed and the ends of the pipeline rejoined.

2.3 SEWER PIPE BURSTING METHOD

- A. Pipe Bursting Equipment
 - 1. The pipe bursting tool shall be designed and manufactured to force its way through existing pipe materials by fragmenting/splitting the pipe and compressing the old pipe section into the surrounding soil as it progresses. The bursting unit shall be pneumatic or Engineer approved equivalent and shall generate sufficient force to burst and compact the existing pipeline. Use manufacturer's specifications for the size tool to be used with each size of pipe. Parameter for size tool percentage for upsizing is allowed.
 - 2. The pipe bursting tool shall be pulled through the sewer by a winch located at the destination manhole. The bursting unit shall pull the polyethylene pipe with it as it moves forward. The bursting head shall incorporate an expander to prevent pipe collapse of the hole ahead of the

polyethylene pipe insertion. The pipe bursting unit shall be remotely controlled.

3. The bursting action of the tool shall increase the external dimension sufficiently, causing breakage of the pipe and at the same time expanding the surrounding ground. This action shall not only break the pipe, but also create a void into which the bursting head can be winched, enabling forward progress to be made. At the same time, polyethylene pipe, directly attached to the sleeve on the rear of the bursting head, shall also move forward.
4. A hydraulic winch shall give the bursting head tension, by which it can be moved forward. To form a complete operating system, the bursting head must be matched to a constant tension twin captain engine hydraulic winch system.

B. Winch Unit

1. A winch cable shall be attached to the front of the bursting unit. The winch shall provide a constant tension to the bursting head so that it operates in an efficient manner. The winch shall ensure directional stability in keeping the unit on line.
2. The winch shall be hydraulically operated, providing a constant tension throughout the operation. The winch shall be of the constant tension type, and be fitted with a direct reading load gauge to measure the winching load. The winch must automatically maintain a constant tension at a set tonnage reading.
3. The constant tension winch shall supply sufficient cable in one continuous length so that the pull may be continuous between winching points.
4. The winch, cable, and cable drum must be provided with safety cage and supports so that it may be operated safely without injury to persons or property.
5. The Contractor shall provide a system of guide pulleys and bracing at each manhole to minimize cable contact with the existing sewer between manholes.
6. The supports to trench shoring in the insertion pit shall be completely separate from the winch boom support system, and shall be so designed that neither the pipe nor winch cable shall be in contact with them.

2.4 SEWER SERVICE CONNECTION

- A. All sewer service connections shall be identified and located prior to the pipe insertion to expedite excavation and reconnection. Contractor shall excavate and make the reconnection, replace the service pipe, and tie-in to the existing service pipe at the right-of-way or easement. Excavation may be made by mechanical means, if damage to property is minimal; otherwise hand excavation is required. Excavated material shall be placed on plywood or plastic to

facilitate restoration. Upon commencement, pipe insertion shall be continuous and without interruption from one manhole to another, except as approved by the Engineer. Upon completion of insertion of the new pipe, the contractor shall expedite the reconnection of services to minimize any inconvenience to customers.

- B. Any substitution in the sewer service saddle, due to any reason, must be approved by the Engineer or GCDWR. Sewer service connection shall be connected to the new sewer pipe by one of the following methods:
 - 1. Conventional Schedule 40 PVC saddles with gaskets, held into place by stainless steel bands and adhered to the main pipe with "3M Brand marine Adhesive Sealant 5200 (white), Part no. 05135-06500", or equal.
 - 2. Neoprene flexible saddle, DFW model DFW-6TC, or equal; complete with stainless steel clamps, secured to the main pipe with Devcon Polystrate Plastic welder, or equal; and two (2) stainless steel bands on the main, and one (1) band to secure the lateral PVC piping.
 - 3. When connecting PVC to HDPE, use transition coupling, "Plastic trends" PTI 657, 4" SDR 35, PVC x 4.5 or 6.625 O.D. HDPE pipe coupling.
- C. Service connections replaced via "Open Trench Method" shall be a minimum of six inch (6") diameter or larger, if pre-existing. For service connections replaced via "Trenchless Methods", including pipe bursting, ground piercing, or slip lining a modified Siamese connection, the existing size shall be replaced to maintain or increase flow capacity. Any size deviations shall be reviewed and approved by the Engineer and GCDWR.
- D. If the sewer has instances where multiple sewer services join to a main service line, and are connected to the main sewer line with one connection, the Contractor shall separate the joined service into individual service connections regardless of depth of bury of the main sewer line.

PART 3 - EXECUTION

3.1 SEWAGE BYPASS

- A. The Contractor shall bypass sewage flow around the section or sections of sewer main that are to be rehabilitated, cleaned, or televised, to the requirements of Section 33 01 30.74 BYPASS PUMPING.
- B. The pump and bypass mains shall be of adequate capacity and size to handle the flow.
- C. Where pump discharge lines cross streets or alleys, they shall be covered with wooden or metal ramps designed and installed in such manner that they do not unreasonably impair vehicular traffic traveling said streets or alleys. All pumping or bypassing work shall be approved by GCDWR prior to the Work being started.

- D. Whenever the bypassing operation is complete, any stored flow shall be released gradually to avoid a surge in flow that could flood or overload receiving pipes.

3.2 CONSTRUCTION METHOD

- A. Equipment used to perform the work shall be located so as not to create an unacceptable noise impact. Contractor shall provide a silent engine compartment with the winch and compressor to reduce machine noise as required to meet local noise requirements.
- B. The Contractor shall install all pulleys, rollers, bumpers, alignment control devices, and other equipment required to protect existing manholes, and to protect the pipe from damage during installation. Lubrication may be used as recommended by the manufacturer. Under no circumstances shall the pipe be stressed beyond its elastic limit. Winch line shall be centered in the pipe to be burst with adjustable boom.
- C. The installed pipe shall be allowed the manufacturer's recommended time, for cooling and relaxation due to tensile stressing prior to any reconnection of service lines, sealing of the annulus, or backfilling of the entry/retrieval pits. Sufficient excess length of new pipe, but not less than four inches (4") shall be allowed to protrude into the manhole to provide for relaxation, sealing, and trimming.
- D. Following the relaxation period, the new pipe shall be sealed at the manhole. Provide three (3) flexible water stops centered in the existing manhole wall. Comparable water stops, such as a flexible boot, that offer improved sealing may be substituted for the three (3) flexible water stops, as directed by the Engineer. Grout flexible connector in the manhole, filling all voids the full thickness of the manhole wall, to provide a smooth uniform watertight joint. Alternative methods achieving equal or better results may be considered by the Engineer, and shall not be used unless approved in writing by the Engineer.
- E. Restore manhole bottom and inverts to the original or improved condition per specification Section 33 01 30.71 REHABILITATION OF SEWER UTILITIES.
- F. Line obstructions, dropped joints, protruding service taps, or unacceptable sags in the existing sanitary sewer line which would prevent pipe bursting, shall be corrected by the Contractor, when directed by the Engineer, and will be handled as a Remove and Replace point repair.
- G. The Contractor and work crews shall understand and be responsive to GCDWR safety and project outreach initiatives. Interaction with customers should be handled in a professional and courteous manner. Contractor shall cooperate with GCDWR personnel to maintain a high level of overall customer satisfaction.

3.3 PIPE JOINING

- A. The HDPE pipe shall be assembled and joined at the site using butt-fusion method to provide a leak-proof joint. Threaded or solvent-cement joints and connections are not permitted.
- B. All equipment and procedures shall be used in strict compliance with the manufacturer's recommendations. Fusing shall be accomplished by personnel certified as fusion technicians by the manufacturer of the supplied HDPE pipe and/or fusion equipment.
- C. The butt-fused joint shall be properly aligned and shall have uniform roll-back beads resulting from the use of proper temperature and pressure. The joint shall be allowed to adequately cool before removal of pressure. The fused joint shall be water tight and shall have tensile strength equal to, or greater than, that of the pipe.
- D. All joints shall be subject to acceptance by the Engineer prior to insertion. All defective joints shall be cut out and replaced at no cost to GCDWR. Any section of the pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than ten percent (10%) of the wall thickness, shall not be used and must be removed from the site. However, a defective area of the pipe may be cut out and the joint fused in accordance with the procedures stated above. In addition, any section of the pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness or any other defect of manufacturing or handling shall be discarded and not used.
- E. Pipe that is not butt-fused, that needs to be joined within a pit, as result of a point repair or other circumstances approved by the Engineer, shall be connected with a water main grade, stainless steel, full circle repair clamp or approved equivalent.

3.4 MANHOLES

- A. Manhole frames and covers shall be replaced if damaged during pipe bursting operations, at the Contractors expense. There shall be no separate payment for this item.
- B. Any work required to rehabilitate, modify, or replace manholes and frames and covers shall be in compliance with Sections 33 01 30.71 REHABILITATION OF SEWER UTILITIES and 33 05 16.13 PRECAST CONCRETE UTILITY STRUCTURES.

3.5 TELEVISION INSPECTION

- A. The Contractor shall conduct a preliminary CCTV inspection of the existing sewer prior to beginning rehabilitation work. The videotape and report shall clearly identify location, size, and condition of the pipe, elevations, material types, and location of all lateral connections. All CCTV work and cleaning performed by the Contractor is incidental to the pipe bursting task. The Contractor shall advise the Engineer and GCDWR of any existing pipe conditions which may result in unacceptable pipe conditions post pipe bursting.

The Engineer will advise the Contractor as to the suitability to proceed with the pipe bursting. Prior to beginning CCTV work in a neighborhood, the Contractor in coordination with GCDWR, shall distribute project outreach door hangers to the affected homes and/or businesses.

- B. After the existing sewer is completely replaced, the new line shall be internally inspected using CCTV by the Contractor. The finished video tape shall be continuous over the entire length of sewer between two manholes and prove the new line to be free from visual defects. GCDWR, at its option, may perform a post installation CCTV inspection for project acceptance and follow up inspections during the Warranty Period. The Contractor shall notify the Engineer and GCDWR in writing, forty-eight (48) hours prior to conducting post CCTV inspections.
- C. Defects including damage, sags, faulty service connections, leaks, etc., which may affect the integrity or strength of the sewer system shall be corrected at the Contractor's expense. Conditions such as sags that were shown to be pre-existing on the preliminary CCTV inspection, and not corrected sufficiently via pipe bursting shall be brought to the attention of the Engineer and GCDWR for review.

END OF SECTION 33 01 30.73

SECTION 33 01 30.74

BYPASS PUMPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

<u>Paragraph</u>	<u>Title</u>
1.2	Administrative Requirements
1.3	Submittals
1.4	Quality Assurance
1.5	Field Conditions
2.1	Pumping Equipment
3.1	General
3.2	Attachments

B. Scope

1. The scope of this specification is limited to providing the necessary labor, materials, supervision, and equipment required for bypass pumping of sewer flows around pump stations and/or portions of existing gravity sewers being repaired, replaced, or rehabilitated. All flow shall be pumped around the pump station and sewer segments during the installation and testing of the new or modified pump station, new sewer, sewer connections/reconnections, the replacement of manholes and force main modifications. Contractor shall be responsible for all sewage pumping and any overflows or spills that may occur for any reason including, but not limited to, equipment failure, clogging, hose or pipe breakage, or high flows. Provide 24-hours per day, seven day per week manned operation of the bypass pumping system when in operation. Provide a radio communication or auto-dialer system to contact the contractor, bypass pump system supplier, Engineer, GCDWR personnel, and GCDWR SCADA system for all alarm conditions.
2. In emergency situations, as defined by GCDWR or Engineer, some requirements of these specifications may be waved in order to have the ability to have an operating bypass pumping system installed and operating as soon as possible.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination

1. Schedule any pump station or gravity sewer down-time with the GCDWR Operations personnel and the Engineer a minimum of one (1) week prior to removing any of the existing facilities from service.
2. Prior to the time said pumping and bypassing work is started obtain approval from Engineer and GCDWR for all pumping or bypassing work, the

arrangement or layout of the pumping and bypassing facilities, and the facilities to be utilized in such work, a minimum of two (2) weeks prior to planned start of work.

3. Once all of the required repair, rehabilitation, and/or replacement work is completed, coordinate placing the pump station and/or sewer in service with GCDWR Operations personnel and the Engineer. Schedule placing facilities back in service a minimum of 24 hours in advance of planned start-up.
4. Bypass pumping shall be monitored by the Contractor or bypass system supplier personnel at all times. If pumping operation continues past normal working hours, monitor the pumps 24 hours a day, seven days per week on site as long as the operation is in place. Provide an automatic notification system (similar to a RACO type system) to notify the Contractor and GCDWR of a pump failure or high water level in the suction manhole. Respond to any alarm condition within five (5) minutes of notification. All costs incurred due to alarm conditions will be the responsibility of the Contractor.

B. Pre-installation Meetings

1. Prior to beginning bypass pumping operations, schedule and conduct a pre-startup meeting. Items to be covered include, but are not limited to the following:
 - a. Testing of bypass pumping equipment to verify satisfactory operation, as described below.
 - b. Testing of alarm status notification system.
 - c. Coordination with GCDWR Operations personnel to ensure suitable access is provided to facilities which will remain in operation.
 - d. Verification of noise levels around pumping equipment.
 - e. Identification of lowest overflow location within system and maximum water surface elevation in suction manhole. Engineer will provide data.
2. Utilize Bypass Pump System Start-up Checklist, which will be provided by the Engineer (sample attached at end of section), for starting and shutting down bypass pump system. Obtain Engineer and GCDWR approval on Checklist prior to starting or shutting down the bypass pump system.

1.3 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

1. Product Data

- a. Pump curves for the proposed temporary pumping equipment identifying the duty point (flow and head) for the system.
- b. Engineering calculations showing required suction lift and system head for bypass pumping system.

2. Shop Drawings

- a. Drawings showing arrangement of temporary pumping equipment and location of suction and discharge piping.
- b. Size and type of temporary suction and discharge piping.

3. Special Procedure Submittals

- a. Prepare and submit a detailed written bypass pumping plan for set-up, testing, operation, and shutdown of the bypass pumping system a minimum of two (2) weeks prior to start of by-pass pumping operations. Include the following in the plan:
 - 1) Implementation plan showing coordination between the installation of the new sewer piping or repairs and the starting of the bypass pumping system.
 - 2) Emergency action plan identifying the measures taken in the event of a pump failure.
 - 3) Staffing plan for responding to alarm conditions identifying multiple contacts by name and phone numbers (office, mobile, etc.).
 - 4) A contingency plan to implement in the event the repair, rehabilitation, and/or replacement work has unexpected delays or problems.
 - 5) A schedule of how long the bypass system is to be in operation to allow the repair, rehabilitation, and/or replacement work.
 - 6) Method of noise control for pumps and equipment.
 - 7) A project specific shutdown activities checklist.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Suppliers

- a. Utilize bypass pumping system suppliers who have a minimum of five (5) years of experience providing bypass pumps for similar situations.
- b. Provide field service personnel who can respond to an emergency or alarm condition within one (1) hour of notification.
- c. Provide quality equipment and accessories (hoses, clamps etc.) with no leaks or damage visible.
- d. Demonstrate equipment provided is of good quality and in good working order.
- e. Keep and maintain spare parts for pumps and piping on-site, as required.
- f. Provide quality workmanship in setting up the bypass pumping system.

1.5 FIELD CONDITIONS

A. Existing Conditions

1. It is the Contractor's and pump supplier's responsibility to verify the available working area for the bypass pumping system, the hydraulic conditions for the pumping system, and suitable locations for suction and discharge piping.
2. It is the Contractor's responsibility to protect the environment around the bypass system and ensure no damage occurs.

PART 2 PRODUCTS

2.1 PUMPING EQUIPMENT

- A. Provide pumping equipment with the capacity to convey 100 percent of peak flows around the construction area. Provide pump systems capable of conveying estimated dry and wet weather flows as determined by GCDWR. Intercept flows upstream of the facilities to be bypassed and pump through temporary piping of adequate size. Discharge flow into a bypass connection on the existing force main or a manhole on the downstream side of the construction area, thus bypassing the pump station and/or sewer segment(s) under construction.
- B. Do not use open channels or trenches to convey flow.
- C. Provide pumping systems that are self-priming and capable of operating with automatic controls based on the liquid level in the bypass pumping system wet well. Utilize pumping systems that are diesel or electric powered. For diesel powered systems, provide a minimum fuel storage capacity for 48 hours of continuous operation. Provide all of the required diesel fuel for the system. For electric powered systems, provide the required electrical power to operate the system.
- D. The maximum allowable bypass pumping system wet well level during the bypass pumping operation will be a minimum of 4 feet below the lowest overflow elevation along the incoming sewer. The contractor is responsible for providing a pumping system that can meet any required suction head or provide submersible pump(s) to feed the suction of the primary pumping system.
- E. Provide suitably sized pump discharge piping for the flow to be pumped and discharged into an approved force main bypass connection or downstream manhole or wet well. Suitably brace the discharge piping in the manhole or wet well and direct the discharge so that damage to existing facilities and equipment is prevented. If multiple pumps are required to meet the required pumping capacities, provide the necessary fittings and connections for connecting multiple pump discharges to a single discharge pipe. Provide piping of suitable size and material to handle the flow and pressure of the pumping system, as determined in approved system engineering calculations.
- F. Equip the pumping system with the necessary float switches or level monitoring devices required for starting and stopping the pump. Also provide float switches to sound an alarm if the water level in the bypass pumping system wet well reaches a critical depth.
- G. Provide the necessary control power for the bypass pumping system.

- H. Make available a 100% redundant pumping system on-site and ready to place into service should the primary system fail to function as required.
- I. Provide sound attenuation on the bypass pumps to limit the noise level to a maximum of 70 dBA at 30 feet. Determine the required means of sound attenuation to meet this requirement and submit to Engineer and GCDWR for review. Provide additional measures until noise levels are within acceptable limits.
- J. Provide, on-site, spare suction and discharge piping, fittings, valves, gaskets, etc. ready to be used if there is a failure within the system.
- K. Provide spill and leak containment under the pumping equipment or install a berm around the equipment to prevent leaks, drips, or blow-offs from contaminating the site.

PART 3 EXECUTION

3.1 GENERAL

- A. Complete the Bypass Pump System Start-up Checklist (attached) and obtain the required signatures prior to shutting down any operating pump station. With the assistance of the Engineer, develop a project specific shutdown checklist describing the steps to be taken for the following phases:
 - 1. Prior to shutting down the pump station.
 - 2. During the pump station shutdown.
 - 3. Returning the pump station back to service.
- B. Bypass the wet well, valve vault, or portion of sewer under construction, as necessary, for the repair, replacement, or rehabilitation of the existing facilities.
- C. The requirements for providing temporary bypass pumping include, as a minimum:
 - 1. Sizing and installing the piping, pumps, valves, and control system.
 - 2. Providing and installing temporary suction and discharge piping and fittings.
 - 3. Pressure testing piping.
 - 4. A standby pump of the same capacity on-site, installed, and ready to place in service in the case of lead pump failure.
 - 5. Providing power and/or fuel required to operate the system, including facilities to prevent spills. No power will be available from GCDWR.
 - 6. Personnel to continuously monitor the operations on-site as long as the bypass pumping system is in operation and adjust the flow rate of the pumping system as necessary to match the influent flows. Automatic controls will only be allowed as directed by GCDWR.
 - 7. Removing all temporary pumping facilities when the work is completed.
- D. The Contractor is responsible for acquiring any necessary environmental, Federal, State, Local, Georgia DOT and any other permits necessary for bypass pumping.

Provide GCDWR a detailed schedule and plan regarding any temporary street and/or road closures a minimum of thirty days prior to any construction activities.

- E. Locate bypass pumps in areas that do not disturb nearby home owners or businesses. Locate bypass pumps a minimum of fifty feet from any residential structure. Contact all residential and commercial customers who will be impacted by the bypass pumping and inform them that their sewer service will be temporarily out of service. Advise those customers against water usage until the system is back in service or provisions are made to handle their flows. After completing the necessary work, advise those customers that their service has been restored. Should a condition arise that the Contractor cannot restore service within 12 hours of service interruption, make provisions for pumping all flows within the service interruption area at no cost to GCDWR.
- F. In some instances, it may be necessary to bypass effluent from service connections.
- G. Prior to plugging flow through the existing facilities, demonstrate that the entire bypass pumping system is functioning as required to the Engineer's satisfaction. Demonstrate satisfactory operation of the bypass pumping system by conducting a system test lasting a minimum of six (6) hours, where a portion of the test period is during a peak daily flow period. Start the bypass system test no later than 7:30 AM to ensure an overlap with peak flow period. If the test is not started by this time, it will be postponed until the next day. Bypass system testing may not be conducted on Fridays.
- H. The release of raw wastewater onto the ground or into a receiving stream is prohibited. In the event that such spillage or overflows do occur during the course of or as a result of the Work, immediately eliminate the spillage or overflow and, as necessary, remove the blockage, eliminate the back-up, and restore the pumping ability of the bypass pumping system. On elimination of the spillage or overflow, clean up and disinfect the area. Work to stop or contain such events is to be deemed emergency in nature and sufficient justification for total mobilization of resources, the use of overtime or double time, and any other reasonable measures to assure correction of the problem without delay. The Contractor is responsible for damages arising from blockages, back-ups, spillage, or overflows of sewage during the course of the Work or because of the Work. The Contractor is responsible for paying all costs of clean-up and all fines imposed for overflows or spills during construction.
- I. Perform inspection of the bypass pumping systems, including suction wet well, suction hoses, pumps, discharge hoses, and control system a minimum of every two (2) hours to ensure the system is operating properly.
- J. Insure the temporary bypass pumping system is properly maintained and a responsible operator is on-site at all times during system operation.
- K. Provide the necessary hoisting equipment for each pump on-site throughout bypass pumping system operation.
- L. Upon completion of the by-pass pumping, demonstrate that the new facilities operate properly prior to removing the bypass pumping equipment from the site.

- M. Whenever the bypassing operation is complete, gradually release any stored flow to avoid a surge in flow that could flood or overload receiving pipes.

3.2 ATTACHMENTS

- A. The attachments listed below, following “End of Section 33 01 30.74” are a part of this Specification.
 - 1. Bypass Pump System Start-up Checklist

END OF SECTION 33 01 30.74

Bypass Pump System Start-up Checklist

This form must be completed prior to start-up of any bypass pumping system before Operations shutdown

Reason for Shutdown: _____

Lowest overflow point (provide location and elevation): _____

How long will pump station be off-line? _____

Pre-Start-up of Bypass Pumps

Task	Initials		
	Contractor	GCDWR	Engineer
Contractor to verify pumps have fuel.			
Contractor to verify all control floats properly set.			
Contractor to verify bypass tee isolation valve is open.			
Contractor to verify isolation valves on bypass piping are open.			
Contractor to set up air blower to circulate air into wet well.			
Contractor to check air quality in wet well for man entry.			
Contractor and GCDWR to check for leaks in bypass piping from backpressure on force main.			
Contractor to check safety harness for personnel entering wet well.			

Obtain signatures of designated individuals upon completion of all checks.

Contractor

GCDWR

Engineer

Start-up of Bypass Pumps & Shutdown of Pump Station

Task	Initials		
	Contractor	GCDWR	Engineer
Contractor to start primary bypass pump.			
Contractor to verify all pumps are in automatic control.			
Contractor to verify plug is fully inserted and at required pressure.			
Contractor to verify primary pump primes and is moving water.			

Contractor and GCDWR to check bypass piping for leaks.			
Contractor to close force main isolation valve to stop flow from going back to valve vault.			
GCDWR to lockout wet well pumps to prevent from starting.			

Obtain signatures of designated individuals upon completion of all checks.

Contractor

GCDWR

Engineer

Shutdown of Bypass Pumps & Start-up of Pump Station

Task	Initials		
	Contractor	GCDWR	Engineer
Contractor to verify pumps properly set on base elbows.			
Contractor to open force main isolation valve between bypass tee and valve vault.			
GCDWR to unlock wet well pumps and place in automatic mode.			
Contractor to set up air blower to circulate air into wet well.			
Contractor to check air quality in wet well for man entry.			
Contractor to check safety harness for personnel entering wet well.			
Contractor to deflate plug and remove from wet well.			
Contractor to shut off bypass pumps.			
Contractor to close isolation valve on bypass tee.			
GCDWR to verify wet well pumps start and properly operate.			

Obtain signatures of designated individuals upon completion of all checks.

Contractor

GCDWR

Engineer

SECTION 33 05 16.13

PRECAST CONCRETE UTILITY STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Materials
2.2	Precast Manhole Sections
2.3	Precast Box Sections
2.4	Aluminum Access Hatches
3.1	Construction
3.2	Frames and Covers
3.3	Drop Manholes
3.4	Steps
3.5	Adjusting Manhole Frame and Cover to Grade
3.6	Air Release Manhole Vent Adjustment

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents. Some sections may not be included in the specifications depending on the type of project, water or sewer.

1. Cast-in-Place Concrete (03 30 00).
2. Excavation and Fill (31 23 00).
3. Rehabilitation of Sewer Utilities (33 01 30.71).
4. Bypass Pumping (33 01 30.74).
5. Ductile Iron Pipe (33 11 13.05).
6. Air Release and Vacuum Valves (33 12 16.10 and 33 12 16.12).
7. Sanitary Utility Sewerage Piping (33 31 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all materials, tools, labor, and equipment necessary to install precast concrete utility structures including manholes, concrete boxes, and appurtenances as detailed on the Drawings, including excavation and

foundation cushion, base sections, riser sections, cone and flat top, frame, and cover as required for the proper completion of this Work.

- B. Standard precast concrete manholes shall include all manholes built with standard precast 48-inch interior diameter riser, and eccentric cone section complete with steps and must be fully operational. **The use of T-base type manholes is prohibited.**
- C. Manholes larger than Standard 48-inch base shall include the base and a flat top reducer section to transition to a 48-inch diameter riser section.
- D. Additional vertical feet of 48-inch manhole sections shall include all riser and cone sections complete with steps generally used in conjunction with manhole bases larger than 48 inches in diameter, cast-in-place manholes or subsurface chambers.
- E. Manhole drops shall include all exterior drop pipe additions to manholes complete with drop pipe, pipe encasement, excavation and foundation cushion.
- F. Manhole coring shall include all work to core into an existing manhole or structure and the furnishing and installation of a flexible manhole boot. The manhole coring shall not be backfilled until approved by GCDWR. Manholes must be cored using an industry standard coring machine and shall not be performed using any type of hammer, chisel, jackhammer, or other method.
- G. Construct manhole frame and cover to grade as follows:
 - 1. Manholes in unpaved, unmaintained areas shall be 18-inches above finish grade;
 - 2. Manholes in unpaved, maintained areas shall be “flush” with the ground;
 - 3. Manholes in paved areas shall be to finish grade.
- H. Adjust manhole frame and cover to grade. Manholes needing adjustment to grade greater than one (1) foot must use manhole riser section and final adjust frame and cover with a maximum of three (3) courses of brick.
- I. Following adjustment of concrete structure top, the disturbed area shall be restored to match the existing surrounding area.
- J. Cast manhole frames and covers shall include all frames, covers, and brick work used in conjunction with precast or cast-in-place concrete manholes or subsurface chambers.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show in detail the size, location, dimensions, and accessories of all manholes to be used in construction. Include information for frames, covers, grates, sealants, connectors, waterproofing, steps, grout, and other materials required. The Contractor shall receive approval from the Engineer, before any material may be delivered at the jobsite.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All materials shall be new. All Work shall be performed and finished in a workmanship manor. The precast concrete structures, rings and covers, and aluminum access hatches shall conform to the standards specified in this section. Precast concrete structures shall not be supported on the pipe or valve. Structures shall rest on a #57 crushed stone bedding foundation cushion having a minimum thickness of twelve inches (12"). Structures shall have a proper cut out, shape, and coring to fit valve and pipe.

2.2 PRECAST MANHOLE SECTIONS

- A. Precast manhole riser and cone sections shall be of the dimensions indicated on the Drawings, or required, and shall meet the latest requirements of ASTM Des. C-478, latest revision. Risers shall be a minimum 48-inch interior diameter, machine made with tongue and groove ends. Joints shall be jointed by an approved preformed plastic gasket meeting the requirements of Federal Specifications SS-S-00210, "Sealing Compound, Preformed Plastic for Pipe Joints". Type 1, rope form (Kent Seal or approved equal).
- B. Manhole bases shall have inside diameters based on the size and type of pipe being connected to the manhole as specified, as indicated on the Drawings or as directed by the Engineer or GCDWR. Where sixty inch (60") diameter and larger bases are used, a flat top reducer section shall be used to transition to a forty-eight inch (48") diameter riser section.
- C. Cone tops shall be eccentric type. No concentric cones will be allowed.
- D. Manhole wall thickness shall be in accordance with the following schedule:

<u>Manhole diameter</u>	<u>Wall thickness</u>
48"	5 inches
60"	6 inches
72"	7 inches
84"	8 inches
96"	9 inches

- E. Should precast reinforced concrete manhole sections be brought to the site of the Work which are deemed unacceptable in quality by the Engineer or GCDWR, the Contractor shall at once remove the same and shall not offer that item again for inspection. No refurbished or repaired manhole specified herein shall be permitted for installation.

2.3 PRECAST BOX SECTIONS

- A. Precast concrete box base and riser sections shall be of the dimensions indicated on the Drawings, or required, and shall meet the latest requirements of ASTM Des. C-478 Rev. B. Risers shall be a minimum forty-eight inch (48") interior diameter, machine made with tongue and groove ends. Joints shall be jointed by an approved preformed plastic gasket meeting the requirements of Federal Specifications SS-S-00210, "Sealing

Compound, Preformed Plastic for Pipe Joints". Type 1, rope form (Kent Seal or approved equal).

- B. Precast concrete box bases shall have inside dimensions based on the size and type of pipe being connected to the box as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- C. Precast concrete box wall thickness shall be a minimum of eight inches (8") with a HS20 live load rating and a maximum burial depth rating of thirty-two feet (32').
- D. Precast concrete box base slab thickness shall be a minimum of ten inches (10"). If indicated on the Drawings, or required, for resistance of buoyancy forces, base slab extensions shall be provided.
- E. Monolithic tops shall be provided for precast concrete boxes. Tops shall be rated for a HS20 live load with either a standard cast iron manhole ring and cover cast into the top, or an aluminum access hatch cast into the top as indicated on the Drawings. Aluminum access hatches shall meet the requirements of these specifications, paragraph 2.4.
- F. Should precast, reinforced concrete box sections be brought to the site of the Work which are deemed unacceptable in quality by the Engineer or GCDWR, the Contractor shall at once remove the same and shall not offer that item again for inspection. No refurbished or repaired box sections shall be permitted for installation.

2.4 ALUMINUM ACCESS HATCHES

- A. Aluminum hatches installed on precast concrete vaults outside of the road right-of-way shall be designed for a live load of three hundred pounds per square foot (300 lbs./SF), with a maximum deflection of 1/150th of the span.
- B. Aluminum hatches installed on precast concrete vaults within the road right-of-way shall be designed for a HS20 live load.
- C. Aluminum hatches shall be constructed of ¼" aluminum diamond plate. Channel frame shall be ¼" aluminum with an anchor flange around the perimeter, and have a minimum cross-sectional area of seven and one-half square inches (7½ sq. in.) to allow for adequate water drainage. Door shall be equipped with heavy forged brass hinges with stainless steel pins. Spring operators shall be provided for smooth, easy, and controlled door operation throughout the entire arc of opening and closing. Operation shall not be affected by temperature. The door shall automatically lock in the vertical position by means of a heavy steel hold-open arm with release handle. A type 316 stainless steel snap lock with a gasketed cover plug and removable handle shall be provided. A 1½" drainage coupling shall be located in the front right corner of the channel frame. All hardware shall be type 316 stainless steel. Factory finish shall be mill-finish with bituminous coating applied to all surfaces in contact with concrete.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Base: Manhole bases shall be precast and shall be of the size and minimum thickness, as specified, as indicated on the Drawings, or as directed by the Engineer. Vault or other concrete box bases may be precast, or cast-in-place, if approved by the Engineer. Cast-in-place box bases shall be Class 'A' concrete conforming to the requirements of Section 03 30 00 CAST-IN-PLACE CONCRETE. Bases shall be placed on a twelve inch (12") foundation cushion comprised of #57 crushed stone bedding, and suitable provision shall be made to assure a watertight connection of the pipe to the manhole. Manufactured holes in precast base section shall be provided with an annular clear opening around pipe of a minimum four inches (4"). Openings in base sections shall be precast at the factory at locations and heights as specified, as indicated on the Drawings, or as directed by the Engineer. Knocking out of holes in the field shall not be permitted. Holes in precast bases to receive sewer pipes shall be provided with flexible manhole boots of high quality synthetic rubber, which shall be A-Lok, Z-Lok, Kor-N-Seal Flexible Connectors manufactured by NPC Systems, Inc., or approved equal. The outer end of the boot shall fit around the outside of the pipe and shall be secured to the pipe by means of a stainless steel strap clamp. The synthetic rubber shall be suitable for use in sanitary sewage service.
- B. Risers: Manhole risers and box risers shall be constructed of precast reinforced concrete unless otherwise specified or indicated on the Drawings.
- C. Cones: Manhole cone and slab top reducers shall be constructed of precast concrete. A maximum of four (4) courses of brick shall be used to adjust the elevation of the manhole frame and cover to finished grade. Eccentric manhole cones are required.
- D. Precast Risers Rings (or Grade Rings): are to be used to bring the manhole up to grade.
- E. Vault Boxes: shall have a crushed stone bottom. Vault tops shall be accurately cored to accommodate valve operator, and shall be fitted with a flat slab top.
- F. The top of the wall of all manholes shall be leveled off with mortar so as to form a flat surface upon which the manhole frame is to rest. Manholes shall be carried to such height above sewers as indicated on the Drawings, or as directed by the Engineer.
- G. After joints between precast sections have been made, the inside of the joint opening shall be sealed by troweling in a cement mortar to a minimum one and one half inch (1½") thickness.
- H. Inverts and tables shall be precast, and shall have the same radius as the outflow pipe. Invert walls shall be constructed to a height corresponding to the spring line of the influent and effluent pipes with smooth rounded walls. Inverts shall be appropriately channeled for all stub connections to the manhole.
- I. The flow channel through manholes shall be made to conform in shape and slope to that of the sewers. Minimum drop through manhole shall be two tenths feet (0.2'), or as specified, as indicated on the Drawings, or directed by the Engineer, to prevent solids deposition. Tables are to be gently sloped and troweled smooth from manhole wall to invert wall height and constructed of aggregate-mix cement with smooth, veneer finish.
- J. All aluminum in contact with concrete shall have been painted with a coal tar pitch paint.

3.2 FRAMES AND COVERS

- A. A cast iron/ductile iron frame and cover shall be cast with the following wording "Gwinnett County Water" Or "Gwinnett County Sewer", depending on the application.
- B. Use 'Traffic' frame and cover for structures under pavement, and areas not subject to flooding. Provide heavy duty Vulcan Foundry No. V-1357, or approved equal.
- C. Use 'Bolt Down' frame and cover for structures outside of pavement and in areas subject to flooding. Provide Vulcan Foundry V-2358 watertight, or approved equal.
- D. Traffic frames and covers shall be properly set in place in full bed of mortar and adjusted so as to make the top of the frame conform to the finished surfaces when located in street and public highways. In other locations, they shall be so adjusted as to conform to such elevations as are indicated on the Drawings, or as directed by the Engineer.
- E. Bolt Down frames and covers shall be cast into the precast manhole cones or slab tops at the place of manufacture of the concrete structure, unless Drawings indicate that an adjustment to exact elevation is required. In that case, Bolt Down frames and covers shall be set as described for Traffic frames and covers.
- F. Manholes in wooded or non-maintained areas shall be a minimum of 18 inches above ground level. Manholes on sloped ground in unmaintained areas shall be a minimum of 18 inches above ground on the uphill side of the manhole. The cast iron frame shall be cast into the concrete cone. Manholes in maintained grass areas shall be flush with the finished grade.

3.3 DROP MANHOLES

- A. Manhole outside drops shall be provided for any size sewer line (including 6") entering manhole at an elevation of twenty-four inches (24") or greater above the manhole invert, or at such other locations as indicated on the Drawings, or directed by the Engineer. Drop connections shall be constructed using either ductile iron pipe (DIP) or PVC, whichever material matches incoming pipe material. Ninety degree (90°) elbows shall have a concrete thrust block poured below the elbow. Maximum inside drop allowed is twenty-four inches (24").

3.4 STEPS

- A. Steps shall be M.A. Ind. Inc. # PS-1-PF, or approved equal, and shall be built into the precast concrete risers of the manholes. The uppermost step shall not be over twelve (12") inches below the cast iron manhole frame, and these steps shall be continued in alignment downward along the interior vertical side of the manhole to a point no lower than the crown of the largest pipe. All steps shall be built into the precast concrete risers and shall be spaced not more than twelve (12") inches apart. Steps shall be placed directly above each other and not staggered. Steps shall not descend over any pipe connection into the manhole, unless approved by the Engineer or GCDWR.

3.5 ADJUSTING MANHOLE FRAME AND COVER TO GRADE

- A. Where indicated on the drawings and/or directed by the Engineer, the Contractor shall adjust the elevation of manhole frames and covers to be flush with the proposed finished grade. The Contractor shall use brick and mortar or precast concrete grade rings to raise the frame and cover to the correct elevation and re-grout the frame in place to secure it to the manhole. In no case shall more than four (4) courses of brick or four grade rings be used for adjustment. If adjustment requires more than four (4) courses, a new manhole riser section shall be installed below the top cone section and the frame and cover adjusted thereafter.

3.6 AIR RELEASE MANHOLE VENT ADJUSTMENT

- A. The Contractor shall adjust the elevation of air release manhole vent pipes as required and/or directed by the Engineer. The vent adjustment shall be made by either: removal of the vent pipe from the manhole and replacement with a new vent pipe of the required length, or by cutting and welding new pipe sections into the existing vent pipe. If a complete new vent pipe is installed, the Contractor shall properly grout and support the new vent pipe into the existing manhole structure. Upon completion of the vent pipe installation, the Contractor shall repaint the vent pipe to match the existing vent pipe using one coat of primer and two coats of acrylic epoxy paint as approved by the Engineer.

END OF SECTION 33 05 16.13

SECTION 33 05 23.16

UTILITY PIPE JACKING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Overview
1.4	Work Included
1.5	Qualifications
1.6	Submittals
2.1	Materials
3.1	General
3.2	Maintaining Traffic and Public Safety
3.3	Steel Casing – Jack and Bore
3.4	Steel Casing - Open Cut Installation
3.5	Uncased Boring/Free Bore

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Exploratory Excavations (02 32 19).
2. Cast-in-Place Concrete (03 30 00).
3. Brick Masonry (04 21 13).
4. Excavation and Fill (31 23 00).
5. Erosion and Sedimentation Controls (31 25 00).
6. Turf and Grasses (32 92 00).
7. Traffic Control (34 41 16.10).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 OVERVIEW

- A. The Contractor shall be held fully responsible for protecting against surface subsidence, damage, or disturbance to adjacent property and facilities from Contractor's construction methods. In case loose material is encountered and cave-ins occur or are anticipated, all jacking/auguring shall be discontinued, shoring shall be provided and all voids filled or pressure grouted. Supplemental measures and alternative methods must receive approval of the Engineer before jacking/auguring operation recommences. Any

settlement or upheaval of the existing roadway pavements during the jacking and boring operation, and throughout the warranty period, shall be repaired/restored at the Contractor's expense.

- B. Following completion of the jacking operations, the carrier pipe shall be inserted within the casing; its invert placed upon approved skids or casing insulators (for mains with diameters of 6-inches or greater), previously set on inner-base of the casing. The ends of the casing shall be sealed with brick bulkheads using brick and mortar meeting requirements of Section 04 21 13 BRICK MASONRY, and as indicated on the Drawings.
- C. All jacking/auguring operations must be performed in compliance with the rules and regulations of the Gwinnett County Department of Transportation (GCDOT), State of Georgia Department of Transportation, or other authorities having jurisdiction.
- D. All sheeting placed for the jacking/auguring operation must be completely removed by the Contractor prior to backfill.

1.4 WORK INCLUDED

- A. The Contractor shall under this item, furnish all material, labor, tools, and equipment necessary for the complete installation of an uncased boring, jacked steel casing, free bore, or installation of steel casing by open-cut method, as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- B. The Work shall include, but is not limited to: bore pit excavation, sheeting, shoring, plating, and installing safety barriers for the protection of workers, vehicular and pedestrian traffic, and the general public; steel pipe casing, skids, excavation, rock excavation, backfill, restoration of site, grout, brickwork, earth augers, jacking machine, welder, and other accessories necessary for a complete installation as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- C. When the bore pit excavation and/or the jacking/auguring operation occurs along existing right-of-way, care must be taken to ensure all Work is performed within the right-of-way, or arrangements must be made with the owner of the affected property to permit any encroachment onto the affected property.

1.5 QUALIFICATIONS

- A. Utility pipe jacking operations shall be performed by a qualified contractor who has constructed at least five (5) similar installations, which were constructed within one (1) year of each other, and have been in continuous successful operation for not less than five (5) years.

1.6 SUBMITTALS

- A. Submit to the Engineer, per the requirements of Section 01 33 00 SUBMITTAL PROCEDURES, evidence of Utility Pipe Jacking experience as specified in paragraph 1.5.A. of this specification.
- B. The Contractor shall submit for approval to the Engineer, GCDWR, GCDOT, (and Georgia DOT when work is within a state road right-of-way), all working drawings and

schedules of procedure proposed to be followed in the prosecution of the Work under this item.

- C. Working drawings shall show in detail, the size and location of jacking pits together with all sheeting and shoring to be used in supporting embankments, trench walls, and all other structural details together with large scale plan and profile of the proposed jacked installation and affected structures.
- D. Schedules shall set forth the sequence of the various operations together with the time the Contractor proposes to begin and complete the several phases of the Work.
- E. Contractor shall not proceed with the Work until final approval has been given by the Engineer, GCDWR, GCDOT, and/or GDOT.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel casing pipe shall conform to the requirements of ASTM A139, Grade A.
- B. For steel casing pipe up to twenty inch (20") diameter, wall thickness shall be a minimum of 0.375 (3/8) inch, with the pipe having sufficient strength to withstand superimposed loads and jacking stresses. For steel casing pipe twenty four inch (24") and greater, wall thickness shall be a minimum of 0.500 (1/2) inch.
- C. Subject to compliance with requirements, provide products of smooth wall steel pipe.

PART 3 - EXECUTION

3.1 GENERAL

- A. Unless otherwise specified, the ends of casings shall be sealed with brick bulkheads using brick and mortar.

3.2 MAINTAINING TRAFFIC AND PUBLIC SAFETY

- A. All working operations of the Contractor, their subcontractor(s), and/or their agents or employees, must be subordinated to the free and unobstructed use of the roadway, and structures encountered in the execution of jacking and boring operations.
- B. The Contractor shall proceed with the Work in such a manner as will permit: regular transaction of business by commercial operations adjacent to the project site, without delay or danger to persons or property; free access to and from private residences; and will allow the safe flow of traffic and pedestrians around the work site. The Contractor shall employ the use of traffic control devices as necessary, as specified in Section 34 41 16.10 TRAFFIC CONTROL. The Contractor shall suspend all operations relating to jacking and boring until necessary safety precautions have been met.
- C. Schedules shall set forth the sequence of the various operations, together with the time proposed to begin and complete the phases of the Work.

3.3 STEEL CASING – JACK AND BORE

- A. The Contractor shall jack a steel casing pipe as indicated on the Drawings, using a special earth auger machine. The casing shall be jacked to the line and grade indicated on the Drawings.
- B. Each joint of casing shall be **fully** welded around its entire circumference to the adjacent joint prior to being jacked.
- C. All steel casing buried underground or submerged shall have a standard bituminous outside coating conforming to AWWA Standard Specifications.
- D. Following completion of the jacking operations, the carrier pipe shall be inserted within the casing and its invert supported by pre-fabricated casing spacers. The ends of the casing shall be sealed with brick bulkheads using brick and mortar.

3.4 STEEL CASING - OPEN CUT INSTALLATION

- A. Where indicated on the Drawings, or permitted or directed by the Engineer or GCDWR, the Contractor shall place the steel casing directly in an open ditch for subsequent installation of a carrier pipe after backfill. Except for the method of installation, all requirements of this item shall apply. Ditch preparation, backfill, and compaction shall be as required for direct-bury ductile iron pipe.

3.5 UNCASSED BORING / FREE BORE

- A. When indicated on the Drawings, or permitted or directed by the Engineer or GCDWR, the Contractor shall use a special earth auger machine to bore a controlled hole to the line and grade, as indicated on the Drawings. Said hole shall be of a constant diameter, which shall not exceed four (4) inches larger than the bell diameter of the proposed carrier pipe, and shall be maintained until the pipe is installed through the hole. If the annular space between the earthen hole and the carrier pipe exceeds six (6) inches, then the Contractor shall fill such space by pressure grouting or pumping in a flowable fill to eliminate possible settlement.
- B. At no time will free bores in excess of forty feet (40') be permitted.

END OF SECTION 33 05 23.16

SECTION 33 05 23.71

TUNNEL LINING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Overview
1.4	Work Included
1.5	Qualifications
1.6	Submittals
2.1	Manufacturers
2.2	Materials
3.1	Bulkheads
3.2	Construction Procedure
3.3	Excavation
3.4	Grouting
3.5	Liner Plates
3.6	Bypass Pumping
3.7	Safety Precautions

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Exploratory Excavations (02 32 19).
2. Cast-in-Place Concrete (03 30 00).
3. Brick Masonry (04 21 13).
4. Excavation and Fill (31 23 00).
5. Erosion and Sedimentation Controls (31 25 00).
6. Turf and Grasses (32 92 00).
7. Bypass Pumping (33 01 30.74).
8. Traffic Control (34 41 16.10).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 OVERVIEW

- A. The method of construction for tunnel liner and manner of doing work shall be that selected by the Contractor but subject, at all times, to the prior approval by the Engineer and GCDWR. Unlined tunneling shall not be permitted.

1.4 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all materials, labor, tools, and equipment necessary for the complete installation of a lined tunnel, as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- B. The Work shall include, but is not limited to: excavation, liner plates, sheeting, grouting operation, brickwork, cradles, bases, fills, bolts, and other appurtenances; furnishing the services of qualified representatives of the liner plate manufacturer, and all labor, supervision, materials, tools, and accessories necessary to complete the Work as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.

1.5 QUALIFICATIONS

- A. Tunneling operations shall be performed by a qualified contractor who has constructed at least five (5) similar installations, which were constructed within (1) year of each other and have been in continuous successful operation for not less than five (5) years.

1.6 SUBMITTALS

- A. Submit to the Engineer, per the requirements of Section 01 33 00 SUBMITTAL PROCEDURES, evidence of Tunnel Lining experience as specified in paragraph 1.5.A. of this specification.
- B. The Contractor shall submit to the Engineer, GCDWR, GCDOT, (and GDOT when work is within a state road right-of-way), all working drawings and schedules of procedure the proposed to be followed in the prosecution of the Work under this item.
- C. Working drawings shall show in detail the means and methods of tunneling operations together with all sheeting and shoring, materials of construction and installation, and all other structural details together with large scale plan and profile of the proposed tunneled pipe installation and affected structures.
- D. Schedules shall set forth the sequence of the various operations together with the time the Contractor proposes to begin and complete the several phases of the Work.
- E. The Contractor shall not proceed with the Work until final approval has been given by the Engineer, GCDOT, and/or GDOT.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the requirements, provide products by one (1) of the following: Warren, Contech, Commercial Pantex Sika Inc., or approved equal.

2.2 MATERIALS

A. TUNNEL LINER PLATES

1. Have the panels formed inward and made at least of No.8 gauge (.1644 inches) standard tunnel liner plates for Warren and Commercial liner plates and at least of No.10 gauge (.1345 inches) tunnel liner plates for Contech liner plates and be coated per GCDOT specification.
2. The plates shall be hot rolled, cold formed steel conforming to ASTM: A1011/A1011M with the following mechanical properties before cold forming:

Tensile strength =	49,000 psi
Yield strength =	30,000 psi
Elongation, 2 inches =	25%

PART 3 - EXECUTION

3.1 BULKHEADS

- A. The ends of the tunnel liner shall be sealed with brick bulkheads using brick and mortar meeting requirements of Section 04 21 13 BRICK MASONRY, and as indicated on the Drawings.
- B. All sheeting placed for the tunnel operations must be completely removed by the Contractor.

3.2 CONSTRUCTION PROCEDURE

- A. Unless otherwise specified or approved by the Engineer, follow the construction procedure outlined in paragraphs 3.3. Excavation, 3.4 Grouting, 3.5 Liner Plates, 3.6 Bypass Pumping, and 3.7 Safety Precautions, of this specification.

3.3 EXCAVATION

- A. Excavate and dispose of all materials whatever character encountered, including rock, within the external limits of the tunnel, in such a manner as to assure no settlement in the ground or structures over or near the tunnel. Conform to the outside of the tunnel section as nearly as possible.
- B. Fill voids formed outside of liner plates by the removal of rock by packing with cement mortar as directed by the Engineer or GCDWR.
- C. In the finished excavations, no deviation in excess of four (4) inches from the lines and grades given shall be tolerated. Remedy any excess deviation.
- D. Where tunneling is done with the use of a shield, Contractor shall have the shield designed by an experienced designer, subject to the approval of the Engineer. Make shield structurally sufficient to carry all loads that may be imposed upon it and equip it with steering devices and a sufficient number of jacks to propel the shield accurately to line and grade. Carry jack reactions into the liner plates and sufficient number of rings back of the shield to properly distribute the thrust. Use timber breastworks if necessary

to cause the angle of repose of the excavated material to fall within the limits of the shield.

- E. If poling plates are used in lieu of a shield, make of steel and of an interlocking design adequate for the Work.

3.4 GROUTING

- A. Grout the space between the plates and the excavation. As specified, as indicated on the Drawings, the carrier pipe shall be inserted into the space inside of the liner plates; placed upon approved skids or insulators (for mains with diameters of 6-inches or greater) previously set in the tunnel. The ends of the tunnel shall be sealed with brick bulkheads using brick and mortar meeting requirements of Section 04 21 13 BRICK MASONRY, and as indicated on the Drawings.
- B. Grouting shall be subject to the direction of the Engineer or GCDWR. All voids in the area outside the plates shall be pressure grouted every 10 feet, at the end of the work shift, or more frequently if soil conditions dictate. Before grouting any segment of tunnel liner, that segment shall be sealed sufficiently between the liner plates and the surrounding soil to retain the grouting pressure. These seals shall be located as follows:
 - At the entrance of the tunnel
 - Between grout intrusion nipples
 - Within one (1) foot of the end of the tunnel at the end of the work shift
- C. Perform grouting by a suitable machine, capable of forcing grout into all voids which it is desired to fill. A maximum pressure of 50 pounds per square inch at the grouting nipple may be required.
- D. Make grout of Portland Cement and water as specified, as indicated on the Drawings, or as directed by the Engineer. Where large voids are to be filled, fine sand in a proportion of not more than two (2) parts of sand to one (1) part of cement, may be used as directed by the Engineer.
- E. Take care to avoid causing grout to flow into pipes or conduits. If grout flows into pipe or conduits, remove it.

3.5 LINER PLATES

- A. Line tunnel excavation with rolled or pressed steel liner plates of the quality and type herein specified. Assemble liner plates in a true circle having an outside diameter in place as specified, as indicated on the Drawings.
- B. Provide at least one-sixth ($1/6^{\text{th}}$) of the plates with grout holes; tapped for 1- $1/2$ inch pipe and provide with cast iron screw plugs.
- C. Steel liner plates shall be installed as soon as possible, but no more than five feet (5') of tunnel shall remain unlined while tunneling operations are in progress. Not more than one foot (1') of tunnel shall be left unlined at the end of the day's operation.
- D. Liner plates shall be installed in accordance with the manufacturer's recommendations and shall be self-supporting.

- E. Punch all plates for $\frac{3}{4}$ inch bolts and use all bolt holes in installing. Upon completion of any ring of liner plates, retighten bolts in the two (2) rings previously completed.
- F. The use of steel liner plates shall not relieve the Contractor of full responsibility to properly shore, brace, and protect the tunnel excavation. Provide such temporary supports as may be necessary to properly support the face of headings and the roof and sides of the tunnel until the sewer pipe has been installed and the cradle and sand or grout fill has been placed.
- G. Completely excavate, place the steel lining, and grout each section of tunnel as specified, as indicated on the Drawings, or as directed by the Engineer for the entire distance between shafts or headings before pipe is placed.
- H. Damaged spelter coating shall be repaired in accordance with Georgia Department of Transportation Standard Specifications Section 645. Any plates having damaged spelter or bituminous coatings shall be repaired or replaced at the Contractor's expense.

3.6 BYPASS PUMPING

- A. Furnish and maintain adequate temporary bypass pumping equipment with proper standby units meeting requirements of Section 33 01 30.74 BYPASS PUMPING, to permit the concrete and pipe to be placed in the dry. Continue bypass pumping until all concrete and grout has received its' initial set.

3.7 SAFETY PRECAUTIONS

- A. The tunneling operation is to begin in a pit sheeted and shored as necessary, and begin at and proceed from one end. All of the applicable requirements of Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, Section 615, latest edition shall be observed. The Contractor shall conduct the operations in such a manner that all Work shall be performed below the level of the roadbed. The Contractor shall be responsible for coordinating and scheduling all of the Work with the Georgia Department of Transportation (GDOT), or Gwinnett County Department of Transportation (GCDOT), whoever has jurisdictional authority for the roadway being tunneled.
- B. All tunneling Work, at one particular location, shall be completed before Work is started at another location.
- C. If the tunnel installation Work is being conducted in a manner detrimental to the over passing roadway, or to the safety of the traveling public, all operations of tunneling shall cease until the necessary safety precautions have been made. In the event that distress occurs to the roadway due to the tunneling, the Contractor shall be required to submit to the Engineer, for approval by GDOT or GCDOT, a plan to repair the roadway as well as incur the costs of repair.
- D. A temporary bulkhead against the face of the excavation shall be provided and well braced during each cessation of work while the heading is within twenty feet (20') of railroad tracks or highway pavement.

- E. Furnish and maintain an adequate forced ventilation installation and comply with all the requirements and regulations of the State of Georgia and such other public bodies as have jurisdiction.
- F. Do not consider air from pneumatic tools and equipment as ventilating air. Make suitable provisions for abating dust during construction.
- G. Make first aid equipment appropriate to Work of this nature, available at all times.
- H. Furnish and maintain an adequate lighting system as required by the Work, or as directed by the Engineer.
- I. Provide and maintain all shoring and sheeting necessary for the safety of workers.

END OF SECTION 33 05 23.71

SECTION 33 11 00.10

NON-POTABLE REUSE LINES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Valve Markers
3.1	Special Marking
3.2	Valve Markers

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Submittal Procedures (01 33 00).
2. Project Record Documents (01 78 39).
3. Excavation and Fill (31 23 00).
4. Turf and Grasses (32 92 00).
5. Ductile Iron Pipe (33 11 13.05).
6. Air Release and Vacuum Valves – Sewer (33 12 16.12).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all materials for and shall properly install, adjust, test, and place in continuous operation at the location indicated on the Drawings, or as directed by the Engineer, all push-on ductile iron pipe and ductile iron fittings, all mechanical joint ductile iron pipe and ductile iron fittings, all flanged ductile iron pipe and ductile iron fittings for the construction of Non-Potable Reuse Mains as required for the proper completion of the Work, excepting only such ductile iron pipe and fittings as are specifically included for payment under other items.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Specification Section 01 33 00 SUBMITTAL PROCEDURES, the following:

1. Product data for: piping, fittings, and joint restraining systems.

2. Piping Layout Drawings: depicting pipe sizes, fittings, and valves with corresponding elevations. Include details of underground structures, connections, anchors, joint restraining systems, and reaction blocking. Show other piping in the same trench and clearances from water distribution piping. Indicate interface and spatial relationship between piping and structures.
- B. The manufacturer shall submit a certification that all pipe and fittings meet the applicable AWWA, ANSI, and ASTM standards described in this specification.

PART 2 - PRODUCTS

2.1 VALVE MARKERS

- A. Valve markers shall be white drivable markers #CIB-380 (78" long) manufactured by Carsonite International or equal.

PART 3 - EXECUTION

3.1 SPECIAL MARKING

- A. All ductile iron pipe and fittings used in the construction of Non-Potable Reuse Mains, shall be painted a minimum of one-half (½) of the top of the pipe with Pantone 512C, Tnemec 14SF Safety Purple, or other shade of purple approved by GCDWR.

3.2 VALVE MARKERS

- A. Valve markers shall be furnished and installed with each valve, and air release valve on the project. The markers shall be installed as close to the valve as possible without affecting operation; facing the street. Each marker is to be labeled on both sides. The labels shall be provided by GCDWR.
- B. Valve markers shall be installed along the route of the main directly over the centerline of the pipe every 300 feet or as directed by GCDWR.
- C. All Non-Potable Reuse Mains shall be installed with a minimum of six feet (6') of cover, and two feet (2') below all water lines.
- D. Valves shall be marked on curbs with a saw cut 'V' and paint.

END OF SECTION 33 11 00.10

SECTION 33 11 13.05

DUCTILE IRON PIPE (WATER)

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Submittals
1.4	Quality Assurance
1.5	Delivery, Storage, and Handling
1.6	Warranty
2.1	Manufacturers
2.2	Materials
3.1	Thrust Restraint
3.2	Chlorination of Pipelines and Accessories
3.3	Connections to Existing Lines
3.4	Cutting Pipe
3.5	Inspection
3.6	Marking
3.7	Storing and Materials
3.8	Tapping
3.9	Testing
3.10	Unloading and Laying

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Cast-in-Place Concrete (03 30 00).
2. Excavation and Fill (31 23 00).
3. Erosion and Sedimentation Controls (31 25 00).
4. Turf and Grasses (32 92 00).
5. Precast Concrete Utility Structures (33 05 16.13).
6. Utility Pipe Jacking (33 05 23.16).
7. Water Service Connections (33 12 13).
8. Water Utility Distribution Valves (33 12 16).
9. Air Release and Vacuum Valves – Water (33 12 16.10).
10. Water Utility Distribution Fire Hydrants (33 12 19).
11. Relocate and Reconnect Hydrants, Valves, and Meters (33 12 19.81).
12. Traffic Control (34 41 16.10).
13. Roadway Construction (34 71 00).

1.2 REFERENCES

A. Reference Standards

1. American National Standards Institute (ANSI)/American Water Works Association (AWWA)
 - a. ANSI/AWWA C104/A21.4: Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
 - b. ANSI/ AWWA C105/A21.5: Polyethylene Encasement for Ductile-Iron Pipe Systems
 - c. ANSI/ AWWA C110/A21.10: Ductile-Iron and Gray-Iron Fittings, 3-in through 48-in for Water and Other Liquids
 - d. ANSI/ AWWA C111/A21.11: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 - e. ANSI/ AWWA C115/A21.15: Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
 - f. ANSI/ AWWA C150/A21.50: Thickness Design of Ductile-Iron Pipe
 - g. ANSI/AWWA C151/A21.51: Ductile-Iron Pipe, Centrifugally Cast for Water
 - h. ANSI/ AWWA C153/A21.53: Ductile-Iron Compact Fittings, 3-in through 24-in and 54-in through 64-in for Water Service
 - i. ANSI/ AWWA C600: Installation of Ductile-Iron Water Mains and their Appurtenances
 - j. ANSI/ AWWA C606: Grooved and Shouldered Joints
 - k. ANSI/ AWS D11.2: Guide for Welding Iron
2. Hereafter in this specification the specific referenced ANSI/AWWA standards are referred to either by their full description as in the first column of the above standards list, or only by their abbreviated AWWA "C" designation or abbreviated ANSI designation (e.g. AWWA C151 is meant to refer to ANSI/AWWA C151/A21.51, ANSI A21.51 is meant to refer to ANSI/AWWA C151/A21.51, etc.).

1.3 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, the following:
 1. Product data:
 - a. Complete engineering data including, but not limited to, descriptive data, material specifications, and piping diagrams, as appropriate, to support the design of the piping.
 - b. Copies of the manufacturer's approved installation instructions for types of joints being used.

- c. Complete description of warranty to be provided.
- 2. Shop Drawings
 - a. Drawings showing plan and elevation, as required, of piping and all required fittings and appurtenances
 - b. Dimensional drawings of joints showing the manufacturer's allowable deflections.
- 3. Certificates
 - a. Upon request, furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Manufacturers

- a. All pipes shall be subject to inspection at the place of manufacture, in accordance with the provisions of the referenced standards, as supplemented by the requirements herein.
- b. During the manufacture of the pipe, give the Engineer access to all areas where manufacturing and testing is in process and permit the Engineer to make all inspections necessary to confirm compliance with the Specifications.
- c. Except as modified herein, test all materials used in the manufacture of the pipe in accordance with requirements as applicable.
- d. Perform said material tests at no additional cost to the Owner. The Engineer shall have the right to witness all testing conducted by the Manufacturer, provided that the Manufacturer's and Contractor's schedule is not delayed for the convenience of the Engineer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements

- 1. Inspect all pipe and fittings prior to unloading onto the site. Reject any damaged or defective materials and remove from site immediately.

B. Storage and Handling Requirements

- 1. Store ductile iron pipe and fittings in accordance with the manufacturer's requirements.

1.6 WARRANTY

- A. The Contractor shall warranty for a period of twelve (12) months from Final Completion, all water mains, appurtenances, trenches, roadway and other paved areas, landscaping, and other areas disturbed by the construction of the project, to be free

from defects, and to be installed in compliance with all laws, regulations, codes, specifications, plans, directions, and construction practices which govern said installations.

- B. The Contractor shall be responsible for repairs to any defective or leaking pipe, fittings, etc. Should trenches settle during the Warranty Period, Contractor shall promptly furnish and place fill to the original grade and restore any damaged landscaping. Should any defects, leaks or trench settlement occur under new pavement, the Contractor will be held responsible for the cost of all repairs, including pavement replacement. No bell clamps or wrap around corsets are allowed as a means of repair on new pipelines.
- C. Within the Warranty Period, where no loss of customer service or property damage is involved, the Contractor shall begin work on requested repairs or corrective measures within twenty-four (24) hours following notification by GCDWR. If property damage or loss of customer service is involved, the Contractor shall begin work within four (4) hours of notification by GCDWR.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one (1) of the following manufacturers: American Cast Iron Pipe Company, U.S. Pipe, McWane Ductile, or approved equal.

2.2 MATERIALS

A. DUCTILE IRON PIPE

- 1. All ductile iron pipes shall be asphaltic coated at the point of manufacture in accordance with AWWA C151. Ductile iron pipe shall have cement mortar lining (standard thickness) in accordance with ANSI/AWWA C104/A21.4.
- 2. Ductile iron pipe shall be cast, cleaned, cement lined, coated, tested, and certified at a single manufacturing facility.
- 3. Ductile iron pipe shall be in nominal laying lengths of 18 or 20 feet of nominal diameters specified.
- 4. All ductile iron pipes shall be marked in accordance with AWWA C151 designations at intervals of five feet (5') or less on pipe barrel. As a minimum, pipe marking shall include manufacturer name or trademark, nominal pipe size, specification designation, and date of manufacture.

B. FITTINGS

- 1. All ductile iron fittings shall be asphaltic coated at the point of manufacture in accordance with AWWA C151. Fittings shall have cement mortar lining (double thickness) in accordance with AWWA C104.
- 2. All ductile iron fittings shall be marked in accordance with AWWA C110.

C. PUSH-ON PIPE AND FITTINGS

1. All Push-On ductile iron pipe shall be manufactured in accordance with the latest requirements of AWWA C151/A21.51. Pipe shall be a minimum Pressure Class 350 for four inch (4") through twelve inch (12"), Pressure Class 250 for fourteen inch (14") through twenty inch (20"), and Pressure Class 200 for twenty-four inch (24") through sixty-four inch (64") diameter pipe. For locations where the system hydraulic pressure exceeds the rated pipe working pressure and/or depth of cover exceeds maximum depth of cover in accordance with AWWA C151, a licensed Professional Engineer shall specify the required pipe pressure class to be used.
2. Push-On Ductile Iron Fittings shall be manufactured with body thickness and radius of curvature conforming to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53.
3. At a minimum, fittings four inch (4") through twenty inch (20") diameter shall be rated for 350 psi, and twenty-four inch (24") through sixty-four inch (64") diameter shall be rated for 250 psi.
4. Joint deflection shall be five degrees (5°) for four-inch (4") through twelve-inch (12"); four degrees (4°) for fourteen-inch (14"); three degrees (3°) for sixteen-inch (16") through twenty-four-inch (24"); and two and one-half degrees (2½°) for thirty-inch (30").

D. FLANGED PIPE AND FITTINGS

1. All Flanged Ductile Iron Pipe shall be manufactured in accordance with the latest requirements of AWWA C115.
2. Wall thickness of pipe shall be as required for pressure class in paragraph 2.2.C.1.
3. Flanged Ductile Iron Fittings shall be manufactured in accordance with the latest requirements of AWWA C110, rated for 250 psi. Design of flanged ductile iron fittings shall be as indicated on the Drawings, or as directed by the Engineer. In general, use flanged fittings with long radius elbows, except where space limitations prohibit use of same. Design of special flanged fittings, including wall castings, shall conform to dimensions and details as indicated on the Drawings, or as directed by the Engineer.
4. Flanged Ductile Iron Pipe twelve inches (12") or less in length (spool pieces), shall have flanges cast solidly to the pipe barrel. Flanges on ductile iron pipe longer than twelve inches (12") in length shall be screw on type and attached to a threaded pipe section, and shall be factory fabricated. Pipe threads shall be of such length that, with flanges screwed home, the end of the pipe projects beyond the face of the flange. Flange and pipe to be faced to give a flush finish to the pipe and flange surface normal to the axis of the pipe. The flanges shall be of such design that flange neck completely covers the threaded portion of the pipe to protect same against corrosion. Flanges on ductile iron pipe and fittings are to be coated with coal tar pitch paint after machining.
5. Flanged ductile iron pipe and fittings to be faced and drilled in accordance with the latest requirements of AWWA C115/A21.15, Class 125, unless special

drilling is specified, or required. Where cap bolts or studs are required, flanges shall be drilled and tapped accordingly. Pipe with screw type flanges to be assembled at the point of manufacture unless otherwise specified, or directed by the Engineer.

6. Ductile iron blind and companion flanges shall be in accordance with the latest requirements of AWWA C110/A21.10. Regular or eccentric Ductile Iron Reducing Flanges shall be to the thickness of, and drilled to, the template of the regular companion flange of corresponding outside diameter.
7. Flanged bolt holes on each end of flanged ductile iron pipe and fittings shall accurately straddle the same horizontal and vertical center lines.

E. MECHANICAL JOINT PIPE AND FITTINGS

1. Mechanical Joint Ductile Iron Pipe Barrels shall be manufactured in accordance with the latest requirements of AWWA C151/A21.51.
2. Mechanical Joint Ductile Iron Fittings shall be manufactured with body thickness, laying length, and radii of curvature conforming to the latest requirements of AWWA C110/A21.10 or /AWWA C153/A21.53 and joints in accordance with ANSI/AWWA Standard C111/A21.11.

F. RESTRAINED JOINT PIPE AND FITTINGS

1. Restrained Joint Push-On Ductile Iron Pipe Barrels shall be manufactured in accordance with the latest requirements of AWWA C151/A21.51, as manufactured by American Cast Iron Pipe Lok-Ring or Flex-Ring, U.S. Pipe TR-FLEX, or approved equal.
2. Restrained Joint Ductile Iron Fittings shall be manufactured with body thickness, laying length, and radii of curvature conforming to the latest requirements of AWWA C110/A21.10, and joints in accordance with the latest requirements of AWWA C111/A21.11.

G. GASKETS

1. Push-On and Mechanical Joint:
 - a. Sufficient lubricant shall be furnished with each order of pipe to provide a thin coating on both the gasket and each spigot end of the pipe. Lubricant shall be NSF 61-approved and shall have no deleterious effect on the rubber gasket. Lubricant shall be of such consistency that it can be easily applied to the pipe in either hot or cold weather, and shall adhere to either wet or dry pipe. **Only lubricant furnished with the pipe by the pipe manufacturer shall be used.**
 - b. Gaskets shall meet applicable requirements of AWWA/ANSI C111/A21.11, and shall be styrene butadiene rubber (SBR), and shall be ANSI/NSF Standard 61 certified for contact with potable water.

2. Flanged:

- a. Form flanged joints with through, stud, or cap bolts, as required, of the size and length specified by the manufacturer to thoroughly make up the joint. Use only full face type in all flanged joints; red rubber gaskets one-sixteenth inch (1/16") thick, as manufactured by the U.S. Rubber Company, or equal.
- b. Except as otherwise specified or noted, machine bolts, stud bolts, and cap bolts shall be made from alloy steel, complying with the requirements of ASTM A194-64, Grade 2 or 2H.
- c. For bolts, nuts, and threads, conform to the latest requirements of the following ANSI Standards and ASTM Designations:
 - i. Semi-finished, hexagonal bolt heads and nuts, meeting ANSI B18.2-60, heavy series dimensions.
 - ii. Bolt threads after plating, coarse thread series, Class 2A; and nut threads after plating, coarse thread series, Class 2B: ANSI B1.1-60.
 - iii. Galvanizing (if used): ASTM 153-61.
 - iv. Studs and nuts to be utilized underground or in contact with liquids – alloy steel, Grade B8: ASTM A193-64.

H. EXTERIOR COATING

1. Where corrosive soils, or where the pipe is located within ten feet (10') of a utility line that has cathodic protection that can cause a deleterious effect on the piping system, the exterior of ductile iron pipe shall be base-coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m² (0.6554 oz/ft²) of pipe surface area. A finishing layer of asphaltic topcoat shall be applied to the zinc. The mean, dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. The coating system shall conform in every respect to ISO 8179-1 "*Ductile Iron Pipes – External zinc-based coating – Part 1: Metallic zinc with finishing layer, Second Edition 2004-06-01.*"
2. When soils with electrical or stray currents are encountered, polywrap may be added to the zinc-coated pipe for additional corrosion protection. Polyethylene tube encasement shall be prefabricated, manufactured and supplied in accordance with ANSI/AWWA C105/A21.5, "*Polyethylene Encasement for Ductile Iron Pipe Systems.*" The wrap shall be overlapped one foot in each direction at joints, and secured in place around the pipe, and any wrap at tap locations shall be polyethylene taped tightly to prevent the entrance of foreign matter prior to tapping and inspected for any needed repairs following the tap.
3. Piping system buried underground or submerged, shall have a standard asphaltic outside coating as specified. Exposed pipe and fittings shall have an outside coating of universal primer.

PART 3 - EXECUTION

3.1 THRUST RESTRAINT

A. Location

1. Buried Piping: Where shown and where required to restrain force developed at pipeline tees, plugs, caps, bends, and other locations where unbalanced forces exist because of hydrostatic testing and normal operating pressure.
2. Exposed Piping: At all joints in piping.

B. Where specified, or as directed by the Engineer or GCDWR, plugs, caps, tees, and bends deflecting 22½ degrees or more shall be restrained. Restraint joint pipe and fittings shall be restrained to the minimum restraint lengths specified in the Contract Documents with one (1) of the following methods:

1. Method 'A': Restrained joint pipe and fittings.
2. Method 'B': One (1) of the following dual (2) independent restraints:
 - a. Mechanical joint restraint Mega-Lug, or equal, plus Thrust Blocking
 - b. Mechanical joint restraint Mega-Lug, or equal, plus Rodding.

C. Where indicated on the Drawings, or specified in the Contract Documents, 11¼ degree bends or less may be restrained with only one (1) method of restraint.

D. Thrust Ties

1. Steel Pipe: Attach with lugs fabricated in accordance with details shown on Drawings.
2. Ductile Iron Pipe: Attach with socket clamps anchored against a grooved joint coupling or flange.
3. Flanged Coupling Adapter: For exposed installations, install manufacturer's anchor studs through the coupling or sleeve or use dismantling joints.

E. Mechanical Joint Valve Restraint in Proprietary Restrained Joint Piping

1. Install pipe joint manufacturer's adapter gland follower and pipe end retainer, or mechanical joint anchor gland follower.

F. Thrust Blocking

1. Place between undisturbed ground and fitting to be anchored.
2. Quantity of Concrete: Sufficient to cover bearing area on pipe and provide required soil bearing area as shown.
3. Place blocking so that pipe and fitting joints will be accessible for repairs.
4. Place concrete in accordance with Section 03 30 00 – Cast-in-Place Concrete.

3.2 CHLORINATION OF PIPELINES AND ACCESSORIES

- A. Before being placed in service, all new water main pipelines and accessories shall be disinfected by chlorination. All chlorinating equipment, materials, labor, and supplies shall be furnished by the Contractor.
- B. Prior to chlorination, all mud, dirt, debris and other foreign matter shall be removed from the pipeline by a thorough flushing through fire hydrants or by other approved means. Each valved section of newly laid pipe shall be flushed independently. This shall be performed prior to the pressure test to ensure removal of any trapped air within the pipe.
- C. Unless directed otherwise by GCDWR, cuts made in existing lines for the insertion of valves or fittings, for repairs or for any other purpose, shall be disinfected by thoroughly wetting the interior of the pipes, valves, fittings, etc., by spraying with a one percent (1%) hypochlorite solution.
- D. The preferable point of application of the chlorinating agent shall be at the beginning of the pipe line extension, or any valved section of it. Application shall be through a corporation stop tapped into the newly laid pipe by means of a tapping saddle. Use of fire hydrants for insertion of the chlorinating agent is specifically prohibited.
- E. FIRE HYDRANTS SHALL NOT BE USED AS SAMPLING POINTS. A SAMPLING TAP MUST BE INSTALLED AT ALL TEST POINTS.
- F. Back pressure, causing a reversal of flow or negative pressure in the pipe being treated, shall be prevented.
- G. During the process of chlorinating the newly laid pipe, all valves or other appurtenances shall be operated to ensure the chlorinating agent is equally distributed throughout the pipeline.
- H. Disinfection of water mains shall be performed in strict accordance with the latest requirements of AWWA C651, and the latest requirements of Georgia Environmental Protection Division's *Minimum Standards for Public Water Systems*. Should the initial chlorination treatment prove ineffective, the chlorination procedure shall be repeated until confirmed test results show that water sampled from the newly laid pipe conforms to the requirements as specified above. The highly chlorinated water shall be retained in the pipe, as specified above, to destroy all non-spore-forming bacteria. After the chlorine treated water has been retained for the required time, the water shall be tested for residual chlorine in the extremities.
- I. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremities. This process shall continue until water sampled throughout the entire length of the newly laid main shall test, both chemically and bacteriologically, to be the same water quality as the water being served to the public through the existing pipelines.
- J. When water main is in close proximity to creeks, streams, ponds, or other bodies of water, Contractor may be directed by GCDWR to de-chlorinate any water flushed from the main and discharged to the body of water to prevent damage to aquatic organisms, plants, fish, etc. Method and system of de-chlorination must be pre-approved by GCDWR.

- K. After flushing, GCDWR shall notify the GCDWR Environmental Laboratory that the main is ready for a bacteriological sample to be processed. Bacteriological test sites should be installed as indicated on the Drawings, or as directed by GCDWR. Two (2) consecutive sets of acceptable samples, taken at least twenty-four (24) hours apart, shall be collected from the new main. At least one (1) set of samples shall be collected from every twelve hundred feet (1,200') of new water main; plus one (1) set from the end of the line (dead end or cul-de-sac), and at least one (1) set from each branch. Both sets of samples must receive two (2) acceptable ("passed") test results in order for the line to receive a "Passed" certification and be placed into service.
- L. NOTE: WHEN THE ENVIRONMENTAL LABORATORY REPRESENTATIVE ATTEMPTS TO OBTAIN AN ACCEPTABLE SAMPLE, IF THEY OBSERVE AIR, DISCOLORED WATER, TRASH, DEBRIS, TOO HIGH CHLORINE RESIDUAL, OR NO CHLORINE RESIDUAL, IN THE WATER, NO SAMPLE WILL BE TAKEN UNTIL THE MAIN IS RE-FLUSHED.

3.3 CONNECTIONS TO EXISTING LINES

- A. Connections to existing pipelines shall, in general, be made by the use of tapping sleeves and valves, except as specifically indicated on the Drawings to be otherwise, or directed by the Engineer. In certain instances, it may be specified or directed by the Engineer or GCDWR to tap a dry line. In this circumstance, a tapping sleeve and valve is required and the tap accomplished utilizing a standard tapping machine. UNDER NO CIRCUMSTANCES WILL THE CONTRACTOR BE PERMITTED TO BURN A HOLE IN THE MAIN USING OXYACETYLENE TOOLS.
- B. The closing of any existing mainline valve or valves to isolate a particular pipe for a "wet cut-in" will be accomplished by the Contractor under the specific direction *and* presence of GCDWR. All such shutdowns must be approved in advance by GCDWR. The Contractor shall provide all labor and equipment sufficient to find and uncover valves, and cleanout valve boxes for access to existing valves required to complete or repair any work installed under this Contract. GCDWR will provide all records and information available to assist in the locating of covered valves. This assistance shall not relieve the Contractor of responsibility to locate any necessary valve to accomplish the Work.
- C. The Contractor will be responsible for notifying, with the assistance of GCDWR, all customers who will be affected by the interruption of water service, a minimum of twenty-four (24) hours in advance of the planned shutdown. No service may be interrupted without GCDWR prior approval. No extra payment will be allowed for a connection to a valved "stub-out" line or to a line where no customers will be affected by the tie-on or cut-in.

3.4 CUTTING PIPE

- A. Wherever the pipe requires cutting to fit into the line, or to fabricate joints, the Work shall be performed in such a manner as to leave a smooth end at right angles to the axis of the pipe. Any breakage will be at the Contractor's expense. When a piece of pipe is cut to fit into the line, lead joints on existing piping will be removed. Lead joints are to be disposed of at an approved offsite facility.

- B. Use a cutting saw for all cutting of ductile iron pipe. Remove all burrs from inside and outside edges of all cut pipes.

3.5 INSPECTION

- A. Submit under the requirements of Section 01 33 00 SUBMITTAL PROCEDURES, copies of the Manufacturer's Sworn Certificate of Inspection and Testing of all ductile iron pipe and ductile iron fittings provided for the Work. All ductile iron pipe and fittings will be subject to inspection and approval by GCDWR after delivery of material to the site. Broken, cracked, misshapen, imperfectly coated, unsatisfactory, or otherwise damaged ductile iron pipe or fittings are not permitted to be used in the Work.
- B. Such inspection by GCDWR does not relieve the Contractor of full responsibility for the material installed. FAILURE BY GCDWR TO REJECT UNACCEPTABLE MATERIALS SHALL NOT CONSTITUTE AN ACCEPTANCE OF SAID MATERIALS.

3.6 MARKING

- A. All ductile iron pipes shall be marked in accordance with the latest requirements of AWWA C151/A21.51. Additional pipe markings shall include the manufacturer's initials, pressure or class designation, and size conspicuously on each pipe.
- B. All ductile iron fittings shall be marked in accordance with the latest requirements of AWWA C110/A21.10.
- C. Ductile iron pipes and fittings received shall be furnished by the Contractor with a manufacturer's list, in duplicate, of all pieces of pipe and fittings received on the project, including copies of shipping documents from the manufacturer and/or supplier. Said lists shall, at a minimum, indicate the manufacturer's name, serial or mark number, weight, class or pressure designation, length, size, and description of each typical piece received.

3.7 STORING OF MATERIALS

- A. All tools, materials, machinery, and equipment required in the Work may be stored in compact, neat, stockpiled manner adjacent to the worksite, in a suitable location, and in such a manner as to cause the least inconvenience to the affected property owners, ensure traffic safety, and so as not to endanger the general public in any way. All active, existing fire hydrants, water and gas shut-off boxes, must at all times, be kept unobstructed and accessible at all times. All water and gas valves, underground power, and telephone line manholes must be left uncovered and unobstructed by such storing of materials.

3.8 TAPPING

- A. Where indicated on the Drawings, or directed by the Engineer or GCDWR, piping shall be tapped to receive piping. Taps shall be installed utilizing tapping sleeves or saddles as specified.

1. Direct taps where threads are cut into the pipe barrel shall not be permitted. Holes shall be drilled accurately, and at right angles to the axis of the pipe or fittings. Where plugs are drilled, holes shall be at right angles to the face of the plug.
2. The cutting of tap holes with oxyacetylene is specifically prohibited. On sixteen inch (16") and larger mains, the Contractor will be required to demonstrate to the satisfaction of GCDWR that they are qualified to perform the Work.

3.9 TESTING

- A. Pipes, fittings, and appurtenances shall be laid in such a manner as to leave joints water-tight. After the pipe is laid, each section of water main, as may be determined or defined by GCDWR, shall be properly and adequately flushed, all air removed, and then tested under a hydrostatic pressure of 150 PSI, as measured at the lowest elevation of the test section. Where static pressure of the existing water supply exceeds 100 PSI, the test pressure, as measured at the lowest elevation of the test section, shall be equal to the static pressure plus 50 PSI. If elevation differentials, within a test section, vary by more than forty-five (45) vertical feet, then the test section shall be broken into shorter lengths by the insertion of additional valves.
- B. All stub-outs shall be flushed and included in the pressure test. Each stub-out shall be properly plugged, braced, and tested with the stub-out valve open. Following a successful pressure test, all stub-out valves shall be left in the "closed" position.
- C. ALL TESTING OF WATER MAINS, FITTINGS, AND APPURTENANCES SHALL BE CONDUCTED IN THE PRESENCE OF, AND UNDER THE DIRECTION OF GCDWR. To facilitate the testing, the Contractor shall furnish: 1) a pressure gauge for measuring the pressure on the water main; 2) a corporation cock in the main to attached gauge or pump connection; 3) plugs to seal taps after use in testing; 4) a suitable pump, piping, appliances, labor, fuel, and other appurtenances necessary to conduct the pressure tests; 5) a valve wrench and labor to accompany GCDWR to verify that all valves, including fire hydrant branch valves, are fully open during the pressure test. Each section of pipe shall be filled slowly with water and the specified test pressure, as noted above, shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump shall operate by pumping water from a separate reservoir into the main to be tested, until the specified test pressure is attained. GCDWR will make water available necessary for flushing and testing of water mains. The Contractor shall provide whatever means necessary for transporting or conveying the water from a designated source to the test section of main.
- D. NOTE: THE USE OF FIRE HYDRANTS AS A CONNECTION FOR EITHER HYDROSTATIC TESTING OR INJECTION OF CHLORINE SOLUTIONS FOR DISINFECTION IS EXPRESSLY PROHIBITED.
- E. Before applying the specified test pressure, all air must be expelled from the pipe. To accomplish this, it may be necessary for the Contractor to install additional ¾" service taps at the highest elevation, including any intermediate points of the pipe section to be tested, or at locations directed by GCDWR. Any such taps installed must be removed by the Contractor prior to Final Completion of the main.

- F. The test pressure shall be maintained for a minimum of two (2) hours to allow for thorough examination for leakage, and permit GCDWR to confirm that all the air has been removed, and that all valves within the test section of pipe are fully open. The pipeline shall be made watertight under the test pressure.
- G. A Testing Allowance in compliance with the latest requirements of AWWA C600, Section 5.2 and Table 6 shall be applied. The Testing Allowance shall be defined as the quantity of makeup water that must be supplied to the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. No pipe installation will be accepted if the amount of makeup water is greater than that allowed by AWWA C600.
- H. Any exceeding of the testing allowance or leakage developed during the test shall be corrected at the Contractor's expense by tightening, replacing packing or gaskets, or replacing defective portions of the piping system. Caulking will not be permitted. If defective portion cannot be located, the Contractor, at his expense, shall remove and reconstruct as much of the original work as necessary to obtain a facility meeting the testing requirements specified herein.
- I. No separate payment will be made for testing.
- J. After the section of main has been completely tested, chlorinated, and successfully passed the required bacteriological tests, it shall be placed in service immediately upon direction from GCDWR. The Contractor shall supply all labor and equipment necessary to place the main and all appurtenances in service.

3.10 UNLOADING AND LAYING

- A. Ductile iron pipe shall be loaded, transported, and unloaded in accordance with latest requirements of AWWA C600. Do NOT skid or roll pipe handled on skid ways against pipe already on the ground. Under no circumstances are said materials to be dropped off any delivery vehicle. Should any material be accidentally dropped, it shall be immediately set aside, and thoroughly inspected by GCDWR before any decision is made regarding its acceptability. Do not damage casting and linings. If damage occurs to the lining, make repairs or replacement as directed by GCDWR. If there is any question regarding acceptability of said suspect materials by GCDWR, the Contractor shall remove and replace the questionable materials.
- B. Use proper, suitable tools and appliances for the safe and convenient handling and laying of pipe and fittings. Take care to prevent the pipe coating from being damaged, particularly on the inside of the pipe and fittings.
- C. Pipe may not be "strung" along the project jobsite within highway rights-of-way, unless specifically directed to do so by GCDWR, and then only after receiving permission from the road authority which has jurisdiction.
- D. The Contractor shall carefully examine all pipe and fittings for defects just before laying, and lay no pipe or fitting which is known to be defective. In the event that defective pipe or fittings is discovered after having been laid, the Contractor shall

remove and replace with sound pipe or fittings in a satisfactory manner at Contractor's expense.

- E. Standard depth of cover is four feet (4') below the final grade elevation of the edge of pavement of existing or proposed roadway surface. In the event the road shoulder final grade is below the final grade elevation of the edge of pavement of the roadway surface, then a minimum of four feet (4') of earth cover shall be maintained at all times, measured on the down-slope side of the pipe trench. In the event the road shoulder final grade is above the final grade elevation of the edge of pavement of the roadway surface, then the pipe shall be placed at an elevation of four feet (4') below the final grade elevation of the edge of pavement of the roadway surface and covered with compacted earth. In no case shall depth of cover exceed twelve feet (12') without prior written authorization from GCDWR.
- F. Pressurized flow Ductile Iron Pipe shall be laid using a minimum of Class 'D' bedding. If laying in rock trench, the trench bottom shall be undercut to allow a minimum of six inches (6") of bedding material to be placed and compacted to establish the required elevation indicated on the Drawings.
- G. It is the Contractor's responsibility to maintain a clean worksite and clean materials throughout the project. All pipe and fittings shall be kept free from mud, dirt, and debris while stored on the site, and shall be thoroughly cleaned before being laid. During any breaks in the laying of the pipe, and when ending the construction for the day, the Contractor shall install a mechanical or fitted plug to the open end of the pipe to prevent contamination of the pipeline. Should any accidental contamination occur, the pipe shall be thoroughly cleaned and swabbed out, and inspected by GCDWR, before new or further pipe installation may commence.

END OF SECTION 33 11 13.05

SECTION 33 11 13.07

STEEL PIPE

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
1.5	Verifications
2.1	Manufacturers
2.2	Materials
3.1	Installation
3.2	Joint Assembly
3.3	Installing of Buried Piping
3.4	Installing Above Ground Piping
3.5	Chlorination of Pipelines and Accessories
3.6	Connections to Existing Lines
3.7	Cutting Pipe
3.8	Warranty
3.9	Inspection
3.10	Storing and Materials
3.11	Tapping
3.12	Testing
3.13	Unloading and Laying

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Exploratory Excavation (02 32 19).
2. Cast-in-Place Concrete (03 30 00).
3. Excavation and Fill (31 23 00).
4. Erosion and Sedimentation Controls (31 25 00).
5. Turf and Grasses (32 92 00).
6. Precast Concrete Utility Structures (33 05 16.13).
7. Utility Pipe Jacking (33 05 23.16).
8. Water Service Connections (33 12 13).
9. Water Utility Distribution Valves (33 12 16).
10. Air Release and Vacuum Valves – Water (33 12 16.10).
11. Water Utility Distribution Fire Hydrants (33 12 19).
12. Relocate and Reconnect Hydrants, Valves, and Meters (33 12 19.81).

- 13. Traffic Control (34 41 16.10).
- 14. Roadway Construction (34 71 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, shall furnish all materials, labor and equipment to properly install, relocate, adjust, test, and place in continuous operation at the location(s) indicated on the Drawings, or as directed by the Engineer or GCDWR, steel pipe and fittings for the construction of water mains as required for the proper completion of the Work.
- B. It is the Contractor's responsibility to furnish materials, pipe, and fittings meeting applicable codes.
- C. Water mains shall be constructed in complete sections, each section terminating at a valve. As each section is installed, it shall be tested and sterilized, and upon receipt of a "passed" Inspection Report from GCDWR, the Contractor shall place the section in service immediately. Water shall be carried forward with the construction.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Specifications Section 01 33 00 SUBMITTAL PROCEDURES, the following:
 - 1. Product data: for piping, fittings, and joint restraining systems.
 - 2. Piping layout drawings indicating pipe sizes, fittings, and valves with corresponding elevations. Include details of underground structures, connections, anchors, joint restraining systems, and reaction blocking. Show other piping in the same trench and their clearances from water distribution piping. Indicate interface and spatial relationship between piping and structures.
 - 3. Calculations for pipe design and fittings reinforcement and/or test data.
 - 4. A listing of welder certifications and qualifications.
 - 5. The manufacturer shall submit a certification that pipe and fittings meet the applicable AWWA, ANSI, ASTM, and ASME standards described in this specification.

1.5 VERIFICATIONS

- A. Inspections: All pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of ANSI/AWWA C200 and ANSI/AWWA coating and lining standards as supplemented by the requirements herein.
- B. Tests: Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of ANSI/AWWA C200 and ANSI/AWWA coating and lining standards.

- C. The Contractor shall perform the required testing at no additional cost to GCDWR. The Engineer shall have the right to witness all testing conducted by the Contractor; provided the Contractor's schedule is not delayed for the convenience of the Engineer.
- D. **Welding Requirements:** All welding procedures used to fabricate pipe shall be qualified under the provision of AWS B2.1 or ASME Section IX. Welding procedures shall be required for but not limited to, longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.
- E. **Welder Qualifications:** All welding shall be performed by qualified, skilled welders and welding operators who have had adequate experience and possess required certifications in the methods and materials to be used. Welders shall maintain current qualifications under the provisions of AWS B2.1 or ASME Section IX. Machines and electrodes similar to those in the work shall be used in qualification tests. The Contractor shall furnish all material and bear the expense of qualifying welders.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one (1) of the following manufacturers: American Cast Iron Pipe Company or approved equal.

2.2 MATERIALS

A. PIPE

- 1. Steel Pipe shall conform to ANSI/AWWA C200 with steel of domestic origin conforming to ASTM A139, Grade C, D, or E, with a maximum carbon content of 0.25%.
- 2. Unless otherwise specified, or indicated on the Drawings, the minimum steel cylinder thickness shall be not less than the diameter divided by 240.
- 3. Pipe shall be designed for the following working pressures with an additional 100 psi allowance for surge. Pipe design shall be in accordance with AWWA M11

Diameter	Working Pressure
4" – 12"	350 psi
14" – 20"	250 psi
20" – 64"	200 psi

- 4. Design stress shall be limited to 50% of the minimum specified yield strength at working pressure and 75% at the greater of working pressure plus surge, or test pressure.
- 5. Pipe shall be designed for the cover conditions as indicated on the Drawings. The design shall be in accordance with AWWA M11. Modulus of soil reaction (E') values to be used for design shall be taken from the following table:

Depth of Cover	E'
2 to 10 feet	1,000 psi
10 to 15 feet	1,200 psi
15 to 20 feet	1,300 psi

The allowable design deflection shall be 3% of the pipe inside diameter.

6. Pipe for use with sleeve-type couplings shall have plain ends at right angles to the axis.
7. Pipe is to be furnished principally in 40 to 50 ft. nominal laying lengths with special lengths, field trim pieces and closure pieces as required by plan and profile for location of elbows, tees, reducers and other in-line fittings.
8. Straight pipe shall be coated on the outside with three layers of polyethylene tape, 80 mils total thickness, conforming to ANSI/AWWA C214. Where machine applied tape is not practical such as at fittings and special sections, the pipe shall receive one of the following protective coatings:
 - a. Two coats of polyethylene tape, 70 mils total thickness, conforming to ANSI/AWWA C209.
 - b. One or two coats of liquid epoxy, 16 mils minimum DFT, conforming to ANSI/AWWA C210.
 - c. One coat of polyurethane, 25 mils minimum DFT, conforming to ANSI/AWWA C222.
9. Straight pipe shall be lined with cement mortar applied centrifugally by a machine designed to spin the pipe. Where machine applied mortar is not practical, such as at fittings and special sections, the mortar shall be placed by hand. Cement mortar lining shall conform to ANSI/AWWA C205.

B. FITTINGS

1. Unless otherwise specified, or indicated on the Drawings, all specials and fittings shall meet the minimum dimensional requirements of ANSI/AWWA C208 except that ends of the fittings may be longer. Pipe material used in fittings shall be of the same material and minimum thickness as the pipe. The minimum radius of elbows shall be 2.5 times the pipe diameter and the maximum miter angle on each section of the elbow shall not exceed 11 1/4 degrees. If elbow radius is less than 2.5 x pipe diameter, stresses shall be checked per AWWA M11 and wall thickness or yield strength increased if necessary. Fittings shall be equal in pressure design strength and shall have lining and coating as specified. Fabricate specials and fittings from hydrostatically tested pipe, wherever practical. All welds made after hydrostatic testing of straight pipe shall be magnetic particle examined in accordance with ASTM E 709 or liquid penetrant examined in accordance with ASTM E 165. Acceptance criteria shall be in accordance with ASME Code, Section VIII, Division 1, Appendix 6 for magnetic particle examination and Appendix 8 for liquid penetrant examination.

C. JOINTS

1. The standard joint shall be rubber gasketed, capable of sustaining a working pressure of 250 psi with a design maximum deflection of $\frac{3}{4}$ -inch.
2. The restrained joint shall be a field-welded lap joint, welded on either the inside or out, conforming to the requirements of ANSI/AWWA C200 and ANSI/AWWA C206. The standard bell shall provide for a minimum lap of 1-inch or three times the thickness of the pipe, whichever is greater. The design maximum deflection shall be 1-inch. Joints at elbows, reducers, tees and valves shall be restrained in accordance with AWWA M11 allowing a friction factor of 0.31 in Formula 13-6 for tape-coated pipe.

D. MECHANICAL COUPLINGS

1. Mechanical couplings, where indicated on the Drawings, shall be Smith Blair Style 411, Baker Style 200, Victaulic Depend-O-Loc, or equal. Sleeve type couplings shall conform to ANSI/AWWA C219.
2. Couplings for buried service shall have all metal parts coated except bolts and nuts with epoxy paint conforming to ANSI/AWWA C210 or ANSI/AWWA C213.
3. Where tied joints are required, mechanical couplings shall be harnessed for the maximum pressure (test pressure or transient pressure) in accordance with AWWA M11, or shall be Victaulic Depend-O-Loc F x F, or equal couplings.
4. Pipe ends for mechanical couplings shall conform to ANSI/AWWA C200 and the associated coupling standard. Harness lugs or rings and pipe ends shall be coated with one shop coat of epoxy conforming to ANSI/AWWA C210. The inside lining shall be continuous to the end of the pipe.

E. FLANGES

1. Flanges shall be in accordance with ANSI/AWWA C207 Class D for operating/transient pressures to 175 psi and test pressures to 218 psi on 4 inch through 12 inch diameter, and operating/transient pressures to 150 psi and test pressures to 187 psi on diameters over 12 inches.
2. Flanges shall be ANSI/AWWA C207 Class E for operating/transient pressures over 150 psi to 275 psi and test pressures to 343 psi.
3. Flanges shall be ANSI/AWWA C207 Class F for operating/transient pressures over 275 psi to 300 psi and test pressures to 375 psi (drilling matches ASME B 16.5 Class 250).
4. Shop lining shall be continuous to the end of the pipe. Shop coating shall be continuous to the back of the attached flange. Flange faces shall be shop coated with a soluble rust preventive compound.
5. Gaskets shall be furnished in accordance with ANSI/AWWA C207.

F. BOLTS AND NUTS FOR FLANGES

1. For flanges located indoors and in enclosed vaults and structures, bolts and nuts shall be carbon steel. For Class B & D flanges, bolts shall conform to ASTM

A307, Grade B, and nuts shall be ASTM A563, Grade A heavy hex. For Class E and F flanges, bolts shall conform to ASTM A 193 Grade B7 and nuts shall conform to ASTM A194, Grade 2 H, heavy hex.

2. For flanges that are buried, submerged, located outdoors above ground or in open vaults or structures, bolts and nuts shall be TYPE 316 stainless steel. For Class B and D flanges, bolts shall conform to ASTM A193, Grade B8M, Class 1, and nuts shall conform to ASTM 194, Grade 8M. For Class E and F flanges, bolts shall conform to ASTM A193, Grade B7, and nuts shall conform to ASTM A194, Grade 2H, with bolts and nuts to be zinc plated in accordance with ASTM B633.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The contractor shall provide and install all required piping and accessories in accordance with the Contract Documents and shall handle, store and assemble pipe in accordance with the manufacturer's recommendations. Pipe installation as specified in this section supplements AWWA M11.

3.2 JOINT ASSEMBLY

A. LAP FIELD WELDED JOINTS

1. Wire brush exposed end of joint surfaces. The plain end shall extend into the expanded bell to provide a minimum overlap of one inch, or three times the thickness of the pipe, whichever is greater, at any location around the joint circumference.
2. Welders certified in accordance with AWS B2.1 or ASME Section IX shall provide a single full fillet weld (thickness of the thinnest member plus any gap) on the inside or outside surface of the joint.
3. The exterior surface of the joint shall be protected by priming the joint and applying two wraps of polyethylene tape conforming to ANSI/AWWA C209 or shall be protected by applying one layer of heat-shrink tape in accordance with manufacturer's recommendations and ANSI/AWWA C216. Where the pipe is to be backfilled and welded after taping the joint, the heat-shrink tape method is to be used.
4. The interior joint space shall be mortared using one part cement to two parts sand in accordance with ANSI/AWWA C205.

B. FLANGED JOINTS

1. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe.
2. Assemble flanged joints in accordance with AWWA M11.
3. Execute care when tightening joints to prevent undue strain upon valves, pumps, and other equipment.

4. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or re-tighten the bolts and nuts, and retest the joints. Joints shall be watertight.

3.3 INSTALLING BURIED PIPING

- A. Inspect each pipe and fitting before lowering it into the trench. Inspect the interior and exterior protective coatings. Patch damaged areas in the field with material similar to the original. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
- B. Handle pipe in a manner to avoid any damage to the pipe. Do NOT drop or roll pipe into trenches under any circumstances.
- C. Grade the bottom of the trench and place a four inch (4") minimum layer of select or scarified material under the pipe. Before laying each section of pipe, check the grade and correct any irregularities found. The trench bottom shall form a uniform bearing and support for the pipe.
- D. At the location of each joint, dig bell (joint) holes in the bottom of the trench and at the sides to permit completion and visual inspection of the entire joint.
- E. Maintain the trench in a dewatered condition during pipe laying.
- F. When pipe laying is not in progress, including meal break hours, close the open ends of the pipe. Do NOT permit trench water, animals, or foreign objects to enter the pipe.
- G. The pipe shall be bedded up to seventy percent (70%) of the diameter in a sand or compacted soil envelope. Compaction shall be ninety-five percent (95%) of maximum dry density as determined by ASTM D698 Standard Proctor.

3.4 INSTALLING ABOVE GROUND PIPING

- A. All piping and fittings shall be installed true to alignment and rigidly supported thrust anchors shall be provided where required. Any damage to the linings shall be repaired as directed by the Engineer before the pipe is installed. Each length of pipe shall be cleaned out before installation.
- B. Sleeves shall be installed for all pipes passing through floors or walls as shown on the drawings.
- C. Concrete inserts for hangers and supports shall be furnished and installed in the concrete as it is placed. The inserts shall be in accordance with the requirements of the piping layout and joining method and their location shall be verified from approved piping layout drawings and structural drawings.
- D. Except as otherwise indicated on the Drawings, lap welded, butt welded, split-sleeve type couplings, sleeve type couplings or flange joints may be used. Prior to approval of joining method, layouts for hanger and supports shall be submitted to the Engineer for approval per requirements of Section 01 33 00 SUBMITTAL PROCEDURES.
- E. Flanged joints shall be made with bolts with one nut each, studs with a nut on each end, or studs with one nut each where the flange is tapped.

- F. Exterior surface of the pipe and fittings shall receive a prime coat of paint consistent with any required final coat. The steel surface shall be prepared in accordance with the paint manufacturer's requirements.

3.5 CHLORINATION OF PIPELINES AND ACCESSORIES

- A. Before being placed in service, all new water main pipelines and accessories shall be disinfected by chlorination. All chlorinating equipment, materials, labor, and supplies shall be furnished by the Contractor.
- B. Prior to chlorination, all mud, dirt, debris and other foreign matter shall be removed from the pipeline by a thorough flushing through fire hydrants or by other approved means. Each valved section of newly laid pipe shall be flushed independently. This shall be performed prior to the pressure test to ensure removal of any trapped air within the pipe.
- C. Unless directed otherwise by GCDWR, cuts made in existing lines for the insertion of valves or fittings, for repairs or for any other purpose, shall be disinfected by thoroughly wetting the interior of the pipes, valves, fittings, etc., by spraying with a one percent (1%) hypochlorite solution.
- D. The preferable point of application of the chlorinating agent shall be at the beginning of the pipe line extension, or any valved section of it. Application shall be through a corporation stop tapped into the newly laid pipe by means of a tapping saddle. Use of fire hydrants for insertion of the chlorinating agent is specifically prohibited.
- E. FIRE HYDRANTS SHALL NOT BE USED AS SAMPLING POINTS. A SAMPLING TAP MUST BE INSTALLED AT ALL TEST POINTS.
- F. Back pressure, causing a reversal of flow or negative pressure in the pipe being treated, shall be prevented.
- G. During the process of chlorinating the newly laid pipe, all valves or other appurtenances shall be operated to ensure the chlorinating agent is equally distributed throughout the pipeline.
- H. Disinfection of water mains shall be performed in strict accordance with the latest requirements of AWWA C651, and the latest requirements of Georgia Environmental Protection Division's *Minimum Standards for Public Water Systems*. Should the initial chlorination treatment prove ineffective, the chlorination procedure shall be repeated until confirmed test results show that water sampled from the newly laid pipe conforms to the requirements as specified above. The highly chlorinated water shall be retained in the pipe, as specified above, to destroy all non-spore-forming bacteria. After the chlorine treated water has been retained for the required time, the water shall be tested for residual chlorine in the extremities.
- I. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremities. This process shall continue until water sampled throughout the entire length of the newly laid main shall test, both chemically and bacteriologically, to be the same water quality as the water being served to the public through the existing pipelines.

- J. When water main is in close proximity to creeks, streams, ponds, or other bodies of water, Contractor may be directed by GCDWR to de-chlorinate any water flushed from the main and discharged to the body of water to prevent damage to aquatic organisms, plants, fish, etc. Method and system of de-chlorination must be pre-approved by GCDWR.
- K. After flushing, GCDWR shall notify the GCDWR Environmental Laboratory that the main is ready for a bacteriological sample to be processed. Bacteriological test sites should be installed as indicated on the Drawings, or as directed by GCDWR. Two (2) consecutive sets of acceptable samples, taken at least twenty-four (24) hours apart, shall be collected from the new main. At least one (1) set of samples shall be collected from every twelve hundred feet (1,200') of new water main; plus one (1) set from the end of the line (dead end or cul-de-sac), and at least one (1) set from each branch. Both sets of samples must receive two (2) acceptable ("passed") test results in order for the line to receive a "Passed" certification and be placed into service.
- L. NOTE: WHEN THE ENVIRONMENTAL LABORATORY REPRESENTATIVE ATTEMPTS TO OBTAIN AN ACCEPTABLE SAMPLE, IF THEY OBSERVE AIR, DISCOLORED WATER, TRASH, DEBRIS, TOO HIGH CHLORINE RESIDUAL, OR NO CHLORINE RESIDUAL, IN THE WATER, NO SAMPLE WILL BE TAKEN UNTIL THE MAIN IS RE-FLUSHED.

3.6 CONNECTIONS TO EXISTING LINES

- A. Connections to existing pipelines shall, in general, be made by the use of tapping sleeves and valves, except as specifically indicated on the Drawings to be otherwise, or directed by the Engineer. In certain instances, it may be specified or directed by the Engineer or GCDWR to tap a dry line. In this circumstance, a tapping sleeve and valve is required and the tap accomplished utilizing a standard tapping machine. UNDER NO CIRCUMSTANCES WILL THE CONTRACTOR BE PERMITTED TO BURN A HOLE IN THE MAIN USING OXYACETYLENE TOOLS.
- B. The closing of any existing mainline valve or valves to isolate a particular pipe for a "wet cut-in" will be accomplished by the Contractor under the specific direction *and* presence of GCDWR. All such shutdowns must be approved in advance by GCDWR. The Contractor shall provide all labor and equipment sufficient to find and uncover valves, and cleanout valve boxes for access to existing valves required to complete or repair any work installed under this Contract. GCDWR will provide all records and information available to assist in the locating of covered valves. This assistance shall not relieve the Contractor of responsibility to locate any necessary valve to accomplish the Work.
- C. The Contractor will be responsible for notifying, with the assistance of GCDWR, all customers who will be affected by the interruption of water service, a minimum of twenty-four (24) hours in advance of the planned shutdown. No service may be interrupted without GCDWR prior approval. No extra payment will be allowed for a connection to a valved "stub-out" line or to a line where no customers will be affected by the tie-on or cut-in.

3.7 CUTTING PIPE

- A. Wherever the pipe requires cutting to fit into the line, or to fabricate joints, the Work shall be performed in such a manner as to leave a smooth end at right angles to the axis of the pipe. Any breakage will be at the Contractor's expense. When a piece of pipe is cut to fit into the line, lead joints on existing piping will be removed. Lead joints are to be disposed of at an approved offsite facility.

3.8 WARRANTY

- A. The Contractor shall warranty for a period of twelve (12) months from Final Completion, all water mains, appurtenances, trenches, roadway and other paved areas, landscaping, and other areas disturbed by the construction of the project, to be free from defects, and to be installed in compliance with all laws, regulations, codes, specifications, plans, directions, and construction practices which govern said installations.
- B. The Contractor shall be responsible for repairs to any defective or leaking pipe, fittings, etc. Should trenches settle during the Warranty Period, Contractor shall promptly furnish and place fill to the original grade and restore any damaged landscaping. Should any defects, leaks or trench settlement occur under new pavement, the Contractor will be held responsible for the cost of all repairs, including pavement replacement. No bell clamps or wrap around corsets are allowed as a means of repair on new pipelines.
- C. Within the Warranty Period, where no loss of customer service or property damage is involved, the Contractor shall begin work on requested repairs or corrective measures within twenty-four (24) hours following notification by GCDWR. If property damage or loss of customer service is involved, the Contractor shall begin work within four (4) hours of notification by GCDWR.

3.9 INSPECTION

- A. Submit under the requirements of Section 01 33 00 SUBMITTAL PROCEDURES, copies of the Manufacturer's Sworn Certificate of Inspection and Testing of all steel pipe and steel fittings provided for the Work. All steel pipe and fittings will be subject to inspection and approval by GCDWR after delivery of material to the site. Broken, cracked, misshapen, imperfectly coated, unsatisfactory, or otherwise damaged steel pipe or fittings are not permitted to be used in the Work.
- B. Such inspection by GCDWR does not relieve the Contractor of full responsibility for the material installed. FAILURE BY GCDWR TO REJECT UNACCEPTABLE MATERIALS SHALL NOT CONSTITUTE AN ACCEPTANCE OF SAID MATERIALS

3.10 STORING OF MATERIALS

- A. All tools, materials, machinery, and equipment required in the Work may be stored in compact, neat, stockpiled manner adjacent to the worksite, in a suitable location, and in such a manner as to cause the least inconvenience to the affected property owners, ensure traffic safety, and so as not to endanger the general public in any way. All

active, existing fire hydrants, water and gas shut-off boxes, must at all times, be kept unobstructed and accessible at all times. All water and gas valves, underground power, and telephone line manholes must be left uncovered and unobstructed by such storing of materials.

3.11 TAPPING

- A. Where indicated on the Drawings, or directed by the Engineer or GCDWR, piping shall be tapped to receive piping. Taps shall be installed utilizing tapping sleeves or saddles as specified.
 - 1. Direct taps where threads are cut into the pipe barrel shall not be permitted. Holes shall be drilled accurately, and at right angles to the axis of the pipe or fittings. Where plugs are drilled, holes shall be at right angles to the face of the plug.
 - 2. The cutting of tap holes with oxyacetylene is specifically prohibited. On sixteen inch (16") and larger mains, the Contractor will be required to demonstrate to the satisfaction of GCDWR that they are qualified to perform the Work.

3.12 TESTING

- A. Pipes, fittings, and appurtenances shall be laid in such a manner as to leave joints water-tight. After the pipe is laid, each section of water main, as may be determined or defined by GCDWR, shall be properly and adequately flushed, all air removed, and then tested under a hydrostatic pressure of 150 PSI, as measured at the lowest elevation of the test section. Where static pressure of the existing water supply exceeds 100 PSI, the test pressure, as measured at the lowest elevation of the test section, shall be equal to the static pressure plus 50 PSI. If elevation differentials, within a test section, vary by more than forty-five (45) vertical feet, then the test section shall be broken into shorter lengths by the insertion of additional valves.
- B. All stub-outs shall be flushed and included in the pressure test. Each stub-out shall be properly plugged, braced, and tested with the stub-out valve open. Following a successful pressure test, all stub-out valves shall be left in the "closed" position.
- C. ALL TESTING OF WATER MAINS, FITTINGS, AND APPURTENANCES SHALL BE CONDUCTED IN THE PRESENCE OF, AND UNDER THE DIRECTION OF GCDWR. To facilitate the testing, the Contractor shall furnish: 1) a pressure gauge for measuring the pressure on the water main; 2) a corporation cock in the main to attached gauge or pump connection; 3) plugs to seal taps after use in testing; 4) a suitable pump, piping, appliances, labor, fuel, and other appurtenances necessary to conduct the pressure tests; 5) a valve wrench and labor to accompany GCDWR to verify that all valves, including fire hydrant branch valves, are fully open during the pressure test. Each section of pipe shall be filled slowly with water and the specified test pressure, as noted above, shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump shall operate by pumping water from a separate reservoir into the main to be tested, until the specified test pressure is attained. GCDWR will make water available necessary for flushing and testing of water mains. The Contractor shall provide whatever means necessary for transporting or conveying the water from a designated source to the test section of main.

- D. NOTE: THE USE OF FIRE HYDRANTS AS A CONNECTION FOR EITHER HYDROSTATIC TESTING OR INJECTION OF CHLORINE SOLUTIONS FOR DISINFECTION IS EXPRESSLY PROHIBITED.
- E. Before applying the specified test pressure, all air must be expelled from the pipe. To accomplish this, it may be necessary for the Contractor to install additional ¾" service taps at the highest elevation, including any intermediate points of the pipe section to be tested, or at locations directed by GCDWR. Any such taps installed must be removed by the Contractor prior to Final Completion of the main.
- F. The test pressure shall be maintained for a minimum of two (2) hours to allow for thorough examination for leakage, and permit GCDWR to confirm that all the air has been removed, and that all valves within the test section of pipe are fully open. The pipeline shall be made watertight under the test pressure.
- G. A Testing Allowance in compliance with the latest requirements of AWWA C600, Section 5.2 and Table 6 shall be applied. The Testing Allowance shall be defined as the quantity of makeup water that must be supplied to the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. No pipe installation will be accepted if the amount of makeup water is greater than that allowed by AWWA C600.
- H. Any exceeding of the testing allowance or leakage developed during the test shall be corrected at the Contractor's expense by tightening, replacing packing or gaskets, or replacing defective portions of the piping system. Caulking will not be permitted. If defective portion cannot be located, the Contractor, at his expense, shall remove and reconstruct as much of the original work as necessary to obtain a facility meeting the testing requirements specified herein.
- I. No separate payment will be made for testing.
- J. After the section of main has been completely tested, chlorinated, and successfully passed the required bacteriological tests, it shall be placed in service immediately upon direction from GCDWR. The Contractor shall supply all labor and equipment necessary to place the main and all appurtenances in service.

3.13 UNLOADING AND LAYING

- A. Steel pipe shall be loaded, transported, and unloaded in accordance with latest requirements of AWWA C600. Do NOT skid or roll pipe handled on skid ways against pipe already on the ground. Under no circumstances are said materials to be dropped off any delivery vehicle. Should any material be accidentally dropped, it shall be immediately set aside, and thoroughly inspected by GCDWR before any decision is made regarding its acceptability. Do not damage casting and linings. If damage occurs to the lining, make repairs or replacement as directed by GCDWR. If there is any question regarding acceptability of said suspect materials by GCDWR, the Contractor shall remove and replace the questionable materials.

- B. Use proper, suitable tools and appliances for the safe and convenient handling and laying of pipe and fittings. Take care to prevent the pipe coating from being damaged, particularly on the inside of the pipe and fittings.
- C. Pipe may not be "strung" along the project jobsite within highway rights-of-way, unless specifically directed to do so by GCDWR, and then only after receiving permission from the road authority which has jurisdiction.
- D. The Contractor shall carefully examine all pipe and fittings for defects just before laying, and lay no pipe or fitting which is known to be defective. In the event that defective pipe or fittings is discovered after having been laid, the Contractor shall remove and replace with sound pipe or fittings in a satisfactory manner at Contractor's expense.
- E. It is the Contractor's responsibility to maintain a clean worksite and clean materials throughout the project. All pipe and fittings shall be kept free from mud, dirt, and debris while stored on the site, and shall be thoroughly cleaned before being laid.

END OF SECTION 33 11 13.07

SECTION 33 12 13

WATER SERVICE CONNECTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Definitions
1.4	Work Included
1.5	Submittals
2.1	Materials
3.1	House Service Connections
3.2	Relocate, Replace, or Lower Existing Services
3.3	Abandon Existing Services
3.4	Extra Long Service Line Installation
3.5	New Meter Installation
3.6	Existing Meter Change Out
3.7	Salvage Existing Meter
3.8	Relocate Large Meters/ Check Valves

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Sidewalks, Curbs, and Gutters (32 16 13).
3. Turf and Grasses (32 92 00).
4. Utility Pipe Jacking (33 05 23.16).
5. Ductile Iron Pipe (33 11 13.05).
6. Roadway Construction (34 71 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 DEFINITIONS

- A. House Service Connection is defined as the water line between the water main and the water meter.

1.4 WORK INCLUDED

- A. The Contractor, under this item, shall furnish all materials, labor, tools, and equipment to properly install, relocate, or replace all water house service connections, service lines, meters, and meter boxes, as indicated on the Drawings. If in the process of conducting the Work, Contractor discovers previously unknown services, additional services, or connections affected by construction of the new main, Contractor shall immediately notify GCDWR for direction concerning the services. New service connections to water mains shall be made in accordance with the Drawings, or as directed by GCDWR. New service connection taps shall be made as pipe is installed and shall be directly in line with the meter. The Contractor shall make all reconnections of house water services (presently connected to existing water mains), to water mains constructed under this Contract. Contractor shall remove from service the portion of the house water service connected to the existing water main by closing the corporation stop on the house water service at the existing main. All house service connections shall be installed using copper service lines, compression fittings, and shall meet current GCDWR Meter Installation Standards.
- B. Contractor shall make all pavement, curb, and sidewalk cuts, excavation, sheeting, shoring, boring, backfilling, and landscaping or sodding/seeding repairs required for the house service connections; this includes any disturbed areas associated with long side services on both sides of the roadway. Trenches shall be backfilled and pavement courses installed as specified under Sections 31 23 00 EXCAVATION AND FILL, 32 12 16 ASPHALT PAVING, and 34 71 00 ROADWAY CONSTRUCTION.
- C. Contractor shall make all relocations of existing house services from existing main to new water main as indicated on the Drawings, or as directed by GCDWR, whether or not the existing main is to be abandoned as part of this Contract. When existing main is to remain in service, or when directed by GCDWR, Contractor shall abandon all portions of the existing service by excavating the service connection at the existing main and closing the corporation stop for each service to be abandoned.
- D. All temporary relocations or replacements of house service connections necessary to perform the Work, shall be made at Contractor's expense. Any replacements made necessary due to the negligent or careless operations by the Contractor shall be accomplished immediately, if customer service is affected. The Work shall be of first class workmanship, and shall be completed using only approved materials as specified, as indicated on the Drawings, or as directed by the Engineer.
- E. NOTE: House water service connections shall not be reconnected to new mains until the new mains have been disinfected, tested, and passed for placing into service, as provided in Section 33 11 13.05 DUCTILE IRON PIPE (WATER), paragraph 3.2. Chlorination of Pipelines and Accessories.

1.5 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show, in detail, the size and location of all water service connections and accessories to be used in construction, along with product data sheets for all piping/tubing, valves, meter boxes, and accessories to be used for house service connections.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Service lines shall consist of copper, galvanized steel, or Municplex (or approved equal) pipe with fittings and appurtenances in accordance with the following:
 - 1. Copper Pipe (Tubing): Shall be manufactured and furnished in accordance with ASTM Specifications B88, Type 'K'. Fittings shall be of the compression "pack-joint" coupling type.
 - 2. Galvanized Steel Pipe: shall be standard weight galvanized steel pipe with screw joints conforming to ASTM A53 REV A 1988. Fittings shall be galvanized, except that the nipples and couplings shall be of the same materials as the pipe.
 - 3. Municplex (or approved equal): shall be furnished in SDR 9 copper tube sizes (CTS) in accordance with ASTM F876 and AWWA C800. AWWA C904 compression joint brass valves and fittings (with stainless steel inserts) are for 1-1/2" and 2" services only, and shall be compatible with AWWA C800 tubing.
 - 4. Appurtenances such as corporation stops, curb stops, adaptors for copper and galvanized steel and service lines shall meet the requirements of ASTM B-62 bronze construction, and AWWA C800 for threads. Adaptors shall be furnished as required for connecting copper and galvanized steel pipe. Corporation stops, curbs stops, and adaptors shall be as manufactured by AYMcdonald, Ford, Mueller, or equal. Double strap saddles for tapping the main shall be Dresser Style No. 91, Smith-Blair Style No. 313, or equal; and shall be tapped for mueller threads. Where saddles required, no extra payment shall be allowed.
 - 5. NOTE: The use of soldered joints or flare joints on copper pipe and fittings is expressly prohibited.

PART 3 - EXECUTION

3.1 HOUSE SERVICE CONNECTIONS

- A. When new or replacement water mains are installed, all existing service connections shall be switched to the new water main. The Contractor shall perform all work required for reconnecting the existing meter to the new water

main including, but not limited to, shoring, backfilling, landscape repairs, the furnishing of all labor, materials, tools, appliances, and equipment to complete the water connections as specified above.

- B. Long side service connections shall be installed via boring under the paved road in accordance with Section 33 05 23.16 UTILITY PIPE JACKING.

3.2 RELOCATE, REPLACE, OR LOWER EXISTING SERVICES

- A. As indicated on the Drawings, or as directed by GCDWR, to connect, relocate, or replace an existing water service the following is required:
 - 1. If existing service line is one inch (1") or less, and either galvanized or polybutylene or other pipe material, the entire service line from the main to the meter shall be copper, as specified above in paragraph 2.1.A.1.
 - 2. If existing service line is one and one-half inch (1-1/2") or two inch (2"), and is galvanized pipe which is greater than 10-years-old and shows evidence of significant corrosion internally or externally, or is PVC, then the entire service line from the main to the meter shall be replaced with Galvanized Steel Pipe or Municipex (or approved equal), as specified above in paragraph 2.1.A.2. and 2.1.A.3.
 - 3. Shoring, backfilling, landscape repairs, the furnishing of all labor, materials, tools, appliances, and equipment to complete the water connections as specified. Long side services shall include the related boring necessary to complete the installation. Service line connections, coupled to existing copper service lines to avoid additional service bores, shall be considered short-sided connections. Relocating existing meters and lowering existing service shall include all materials, tools, equipment, and labor to properly relocate services to a depth and location as directed by GCDWR.

3.3 ABANDON EXISTING SERVICES

- A. The Contractor shall abandon existing service connections as indicated on the Drawings, or as directed by the Engineer. Service connections shall be abandoned by removing the existing meter, meter box, curb stop, and service piping. For services connected to ductile iron pipe, the tap in the main shall be sealed with a brass plug. For services connected to PVC pipe, the tap on the main shall be sealed with a repair sleeve. In either case, the plug or sleeve shall be checked for leaks at normal operating pressures prior to backfilling the excavated area.

3.4 EXTRA LONG SERVICE LINE INSTALLATION

- A. When a new service line is to be installed across a road with more than five (5) lanes, it shall be considered an extra long service installation. For these conditions, the Contractor shall install a new copper or galvanized pipe service line, depending on the size of the service, via boring under the road with a minimum of four feet of cover over the new service pipe.

3.5 NEW METER INSTALLATION

- A. Where indicated on the Drawings, or directed by the Engineer or GCDWR, the Contractor shall install new meter connections to existing or new water mains. The Contractor shall perform all work required for installing the new meter including, but not limited to, shoring, backfilling, landscape repairs, the furnishing of all labor, materials, tools, appliances, and equipment to complete the meter installation using copper or galvanized steel pipe, depending on the size of the service, tapping saddles, corporation stops, curb stops, and valve boxes. The meter shall be provided by GCDWR and installed by the Contractor.

3.6 EXISTING METER CHANGE OUT

- A. Where indicated on the Drawings, or as directed by the Engineer or GCDWR, the Contractor shall change out existing water meters. The Contractor shall provide all labor and equipment required for the meter change out. GCDWR shall provide the new meters for installation by the Contractor.

3.7 SALVAGE EXISTING METER

- A. Where indicated on the Drawings, or as directed by the Engineer or GCDWR, the Contractor shall salvage existing water meters. The Contractor shall provide all labor and equipment required for removal of the meter and transporting and delivering such meters for salvage to GCDWR Central Facility, 684 Winder Highway, Lawrenceville, GA 30045. Work shall include placing a plug or cap on the ends of the piping from where the meter was removed.

3.8 RELOCATE LARGE METERS/CHECK VALVES

- A. Where indicated on the Drawings, or directed by the Engineer, the Contractor shall relocate large meters and check valves. The Contractor shall provide all labor and equipment required for removal of the meter/check valve and its associated vault and piping, transporting and delivering such meters and check valves to the new location, and install the new meter/check valve including all excavation, bedding, piping connections, vaults, isolation valves, and related appurtenances for a complete installation. Work shall include placing a plug in or connecting the ends of the piping from where the meter/check valve was removed.

END OF SECTION 33 12 13

SECTION 33 12 16

WATER UTILITY DISTRIBUTION VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Accessory Equipment
2.2	Butterfly Valves
2.3	Gate Valves
2.4	Tapping Sleeves and Valves
2.5	Line Stop Type Valves
2.6	Insertion Type Valves
2.7	Valve Markers
3.1	Painting
3.2	Placing
3.3	Tapping Sleeves and Valves
3.4	Testing
3.5	Wet Cut-Ins

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Turf and Grasses (32 92 00).
3. Ductile Iron Pipe (33 11 13.05).
4. Roadway Construction (34 71 00).

1.2 REFERENCES

- ###### A.
- Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- ###### A.
- The Contractor, under this item, shall furnish all the materials, labor, and equipment to properly set in place, at the locations indicated on the Drawings, or as directed by the Engineer, all gate valves and butterfly valves, tapping sleeves and valves, and other valve-type assemblies of the size and types specified, which are necessary for the proper completion of the Work; including all excavation required for their installation.

1.4 SUBMITTALS

- A. Before any valves or operating devices are manufactured, the Contractor shall submit, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES and receive approval of the Engineer, detailed drawings and product data for each size and type of valve to be provided, including detail of the size and location of all valves and accessories, as specified, as indicated on the Drawings, or as directed by the Engineer.

PART 2 - PRODUCTS

2.1 ACCESSORY EQUIPMENT

- A. All valves, which are to be buried in the ground, shall be provided with a valve box and cover. One (1) adjustable (4'6" to 7'0") gate valve operating key for 2" square operating nuts shall be provided for each 10 valves (or fraction thereof) installed on each project. Key shall be Pollard No. 54801, or equal. Final payment shall be withheld until all accessories are provided to GCDWR. Where the depth of cover is more than five feet (5'), Contractor shall provide suitable, permanently installed valve stem extension and guide at no extra cost to GCDWR. In no case shall depth of cover exceed twelve feet (12') without written authorization from GCDWR.

2.2 BUTTERFLY VALVES

- A. Provide butterfly valves meeting the latest requirements of AWWA C504, and shall be as manufactured by Mueller, Kennedy, Pratt, or approved equal.
- B. Provide butterfly valves that shall be hand-operated, with bodies of cast or ductile iron with integrally cast hubs for shaft bearing housing, and adapted for joints as indicated on the Drawings, or as directed by the Engineer. Except as modified herein, furnish valves of the short body laying length with operators sized on the basis of actual line pressure and velocity. Butterfly valves shall be a minimum Class 150 or as indicated on the Drawings, or directed by the Engineer.
- C. Furnish valves having Type 304 stainless steel valve shaft, keyed for operator connection and connected to the disc with Type 304 stainless steel pins secured in place. Orient shaft as indicated. Furnish two-way thrust bearings, preset at the factory and permanently grease lubricated. Provide resilient valve seat of natural rubber per ASTM D2000, or Buna N type per ASTM D2000 providing uninterrupted 360 degree seating completely adjustable around circumference. Furnish mating seat of Type 304 or 316 Stainless Steel. Apply the resilient seat to the body, recessed in a groove, or to the disc per ANSI/AWWA C504, Sec. 9.5.
- D. Furnish valve discs, seating at 90 degrees to the pipe axis, of ductile iron per ASTM Des. A536, Grade 65-45-12, cast iron per ASTM Des. A48, Class 40, or fabricated steel per ASTM Des. A36.
- E. All butterfly valves shall open by turning the operating nut to the left (counter-clockwise).
- F. Butterfly valves shall only be used on sizes twelve inches (12") and larger.

- G. Where indicated on the Drawings, or as directed by the Engineer, the Contractor shall provide concrete thrust collars, restrained joints, or other restraining mechanisms for valves twenty-four inches (24") and larger, to prohibit movement of the pipe when the valve is closed.

2.3 GATE VALVES

- A. Gate valves shall conform to the latest requirements of AWWA C509 for resilient-seated gate valves, and shall be as manufactured by American Flow Control, U.S. Pipe, M&H, or approved equal.
- B. Gate valves shall be hand operated, non-rising stem, and bronze mounted of the resilient seat type with cast or ductile iron bodies, and adapted for joints as indicated on the Drawings, or as directed by the Engineer.
- C. All gate valves shall open by turning the operating nut to the left (counter-clockwise).
- D. Valve stems shall be manganese bronze with the collar cast solid with the stem. The threads of stems and stem nuts shall be of the square or Acme type. The ultimate tensile strength shall not be less than 65,000 pounds per square inch and an elastic limit of not less than one-half ($\frac{1}{2}$) of the ultimate tensile strength.
- E. Valves shall be provided with 'O' ring seals. Ring seal plate shall be fitted with two (2) 'O' rings: the upper ring serving as a dirt seat, the lower ring as a pressure seal. Design shall permit replacement of 'O' rings while the valve is under pressure in the fully opened position. 'O' rings shall be Precision Rubber Products Corporation, Quality Compound No. 122-70, or approved equal.
- F. Gate valves shall only be used in sizes two inch (2") through twelve inch (12"), of the resilient-seated type.

2.4 TAPPING SLEEVES AND VALVES

- A. Tapping sleeves for size on size taps 16" x 16" and larger shall be ductile iron with mechanical joint ends, such as manufactured by American Valve and Hydrant, Mueller Company, or equal. Split Steel prefabricated tapping sleeves as manufactured by JCM, Smith-Blair, or equal, may be used for size on size taps 12" x 12" and smaller, and for all taps smaller than "size on size". Outlets shall be sized to permit a tap to be made using a full size shell cutter. The existing pipe shall be thoroughly cleaned prior to the installation of the sleeve. The use of strap saddles for taps larger than two inch (2") is not permitted. Shop drawings for split steel sleeves must be approved by the Engineer prior to use.
- B. For asbestos-concrete pipe and Class 200 PVC pipe, the Contractor must use "Ford" stainless steel full circle tapping sleeve or approved equal, which contains a full gasketed surface within the sleeve body to allow for the variances in the manufactured O.D. of the asbestos-concrete pipe.
- C. Tapping valves shall conform to the requirements for gate valves herein before stipulated, except for modifications necessary to permit the use of full size shell cutter.

2.5 LINE STOP TYPE VALVES

- A. Line stop valves shall provide a means to install a temporary blockage of flow in an existing pressurized water main without removing the main from service. The line stop valve shall be installed through a single circular hole cut into the top of the pipe. Line stop valves shall be Insta-Valve System by Hydra-Stop, or approved equal.
- B. The line stop valve shall consist of three sub-assemblies: the valve body, which shall be mounted pressure tight around the main; the valve cartridge, which shall be inserted into the valve body; and the cartridge closure flange, which shall secure and permanently seal the cartridge to the body.
- C. At the completion of the line stoppage, the line stop valve shall be removed, and the valve body shall remain on the main. A blind flange shall be installed on the valve body to seal against leaks.

2.6 INSERTION TYPE VALVES

- A. Insertion type valves shall provide a means to install a permanent block (open-close) valve into an existing pressurized water main without interruption of flow through the pipe and no reduction of line pressure. The insertion valve shall be installed through a single circular hole cut into the top of the pipe. Insertion valves shall be Insta-Valve System by Hydra-Stop, or approved equal.
- B. The insertion-type valve shall consist of three subassemblies; the valve body, which shall be mounted pressure tight around the main, the valve cartridge, which shall be inserted into the valve body, and the cartridge closure flange, which shall secure and permanently seal the cartridge to the body.
- C. The maximum operating pressure of the insertion type valve shall be 150 psi, with a maximum test pressure of 200 psi.

2.7 VALVE MARKERS

- A. Valve markers shall be furnished and installed with each valve installed with exception of fire hydrant valves. The markers shall be of Class 'A' Concrete, as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE, four inch (4") square by five feet (5') long, and shall be of the same construction as that of highway right-of-way markers. The words, "Water Valve" shall be cast vertically into the marker beginning two inches (2") below the top of the marker. There shall be a one and one-quarter inch (1¼") brass plug cast into the marker one inch (1") below the letter 'E' of the word "Valve", which shall be stamped in the field by the Contractor, after installation, with the distance, in feet, from the valve marker to the valve box. The markers shall be installed as close to the right-of-way line opposite the valve as is possible, with the brass plug facing the valve. The marker shall be located so as to avoid damage by traffic. The top of the marker shall generally be set twenty-four inches (24") above finished grade. The markers may be set somewhat lower in areas where it may be considered obtrusive, such as lawns; however, at no time shall the marker be installed at less than eighteen inches (18") above finished grade.

PART 3 - EXECUTION

3.1 PAINTING

- A. All valves where not constructed of brass, bronze, or of finished steel shall be painted at the point of manufacture in accordance with AWWA Specifications for Painting, Ductile, Cast Iron Water Pipes, and Fittings, except machined surfaces, which shall be given a suitable coating of grease or other protective material.

3.2 PLACING

- A. All valves shall be set accurately and carefully to the lines and grades indicated on the Drawings, or as directed by the Engineer, and shall be joined to the pipe utilizing such approved joints as herein specified for ductile iron water mains.
- B. Tapping sleeves and valves, and insert valves, shall be installed in accordance with the manufacturer's recommendation.
- C. Valve boxes shall be centered plumb over the operating nut of the valve with the cover flush with the surface of the finished pavement, finished grade after landscaping, or as directed by GCDWR. The valve box shall not be in direct contact with the bonnet of the valve, and shall be supported in such a manner as not to transmit shock, stress, or load directly to the valve. A formed or pre-cast concrete collar shall be placed around the valve box top as indicated on the Drawings. Valve shall be provided with thrust blocking as indicated on the Drawings, or as directed by the Engineer. VALVE BOXES ARE TO BE OF THE ADJUSTABLE SLIP-TYPE. SCREW ADJUSTING VALVE BOXES ARE NOT PERMITTED.
- D. Where indicated on the Drawings, or as directed by the Engineer, the Contractor shall provide concrete thrust collars, restrained joints, or other restraining mechanisms for valves twenty-four inches (24") and larger, to prohibit movement of the pipe when the valve is closed.
- E. On GCDOT road projects where final grade shall not be obtained until after the waterline construction is completed, the Contractor may install six inch (6") SDR 35 PVC pipe to a grade directed by GCDWR, until final grade is reached. After final grade is completed, the Contractor may install valve boxes, valve markers, and pads as required.

3.3 TAPPING SLEEVES AND VALVES

- A. The Contractor shall furnish and install tapping sleeves and valves suitable for connection to the existing water mains at locations indicated on the Drawings, or as directed by the Engineer. The Contractor shall provide the tapping machine and competent supervision for the making of taps. It is the Contractor's responsibility to verify the type, size, O.D., and class of the existing pipe before ordering the tapping sleeve and valve.
- B. Prior to making the tap, the Contractor, in the presence of GCDWR, shall hydrostatically pressure test the complete tapping sleeve and valve installation at a test pressure of 200 PSI (PNEUMATIC, or AIR-PRESSURE TESTING IS PROHIBITED). The Contractor shall properly support the tapping sleeve and valve using bricks, blocks, wedges, or other substantial supporting materials, which will not permit the tapping

valve or tapping machine to transfer any downward rotational force to the tapping sleeve. This support shall be provided before mounting the tapping machine.

- C. Back taps shall not be permitted unless specifically authorized by GCDWR. Any said authorized backtaps shall be constructed using mechanical joint fittings and mechanical joint retainer glands, Mega-Lug or equal, and single joints of pipe. Threaded rod shall only be permitted from the steel casing to the first fitting. Welding eye bolts directly to the casing for the purpose of installing threaded rod is NOT permitted.
- D. All valves, which are buried in the ground, shall be provided with a valve box and cover. Where the depth of cover is more than five feet (5'), the Contractor shall provide suitable, permanently installed valve stem extensions and guides, which have been approved by GCDWR prior to fabrication and placement.

3.4 TESTING

- A. All valves shall be tested at the point of manufacture in accordance with the specific AWWA Standard for that size and type of valve and made drop-tight when tested under the hydrostatic head specified herein. After the valves have been set in place, and are ready to operate, the Contractor shall hydrostatically field-test each valve as part of the hydrostatic test of the main. Any valve not proved to be "bubble-tight", shall either be repaired to make it so, or be removed from the line and replaced. Valves repaired or replaced shall be re-tested for leakage prior to acceptance by GCDWR.

3.5 WET CUT-INS

- A. The Contractor shall, under this item, provide all labor and equipment necessary to make a cut-in to an existing water main for the purpose of making a connection, installing a valve, fire hydrant assembly, or other fittings and appurtenances. A "wet cut-in" is defined to be the physical cutting into any existing water main, which will result in the interruption of service to an existing customer, or which shall necessitate the removal of water contained within the existing main from the excavation, which is caused by cutting into the pipe. Wet cut-ins shall not be allowed to be performed on Fridays.

END OF SECTION 33 12 16

SECTION 33 12 16.10

AIR RELEASE AND VACUUM VALVES - WATER

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Materials
3.1	Workmanship

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Cast-in-Place Concrete (03 30 00).
2. Excavation and Fill (31 23 00).
3. Precast Concrete Utility Structures (33 05 16.13).
4. Ductile Iron Pipe (33 11 13.05).

1.2 REFERENCES

- ###### A.
- Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- ###### A.
- The Contractor shall, under this item, furnish all material, tools, labor, and equipment necessary to properly install, including excavation, adjust, test, and place in successful service, at the locations indicated on the Drawings, or as directed by the Engineer or GCDWR, all air release and vacuum valves required for the proper completion of the Work.
- ###### B.
- The Work shall include, in general but without limitation, all air release and vacuum valves, all valves, piping, and saddles indicated on the Drawings, pre-cast manhole base or vault, riser, and slab top with cast iron frame and cover or hatch, including excavation together with all accessories and appurtenances required for a complete installation.
- ###### C.
- Wherever the Work disturbs existing structures or landscaping, the Contractor shall replace same to no less than original condition.
- ###### D.
- It is the intent of this contract to require an installation under this item, complete in every detail whether or not indicated on the Drawings, or specified. Consequently, the

Contractor shall be responsible for all details, devices, accessories, and special construction necessary to properly install, adjust, test, and place in successful service a complete installation as specified herein.

1.4 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES and shall show in detail, the size and location of all air release and vacuum valves and accessories to be used in construction. Product data shall be submitted including materials of construction, dimensional drawings, installation requirements, and operation and maintenance manuals for each size and type of valve being provided.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Furnish materials which are new, unused, and as specified.
- B. Air Release and Vacuum Relief Valves shall be automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall open during draining or if a negative pressure occurs. The valve shall also release accumulated air from a piping system while the system is in operation and under pressure. The valve shall perform the functions of both air release and air/vacuum valves and furnished as a single body.
- C. Combination Air Valves shall be GA Industries, Val-Matic, Crispin, or approved equal.
- D. Valves shall be manufactured and tested in accordance with AWWA C512. Valves shall be certified to ANSI/NSF 61.
- E. Valve shall provide a through flow area equal to the nominal size. Floats shall be unconditionally guaranteed against failure including pressure surges. The cover shall be bolted to the body and sealed with a flat gasket. A resilient bumper shall be provided on four inch (4") and larger sizes to cushion the float during sudden opening conditions. The resilient seat shall be replaceable and provide drop tight shut off to the full valve pressure rating.
- F. The air release valve shall have a leverage mechanism with sufficient mechanical advantage so that the valve will open under full operating pressure. Simple lever designs shall consist of a single pivot arm and a resilient orifice button. Compound lever designs shall consist of two levers and an adjustable threaded resilient orifice button.
- G. The valve body and cover shall be constructed of ASTM A126 Class B cast iron for Class 125 and Class 250 valves. Class 300 ductile iron valves shall be constructed of ASTM A536 Grade 65-45-12 ductile iron. The float, guide shafts, and bushings shall be constructed of Type 316 stainless steel. Non-metallic floats, linkage, or bushings are not acceptable. Resilient seat shall be Buna-N.
- H. Operation of the valve shall be as follows:

1. Valves shall not exhibit leaks or weeping of liquid past the large orifice seal at operating pressures of 7.3 psi to twice rated working pressure.
2. Valves shall respond to the presence of air/gas by discharging it through the small orifice at any pressures within a specified design range, 7.3 psi to 250 psi and shall remain leak tight in the absence of air.
3. Valves shall react immediately to pipeline drainage or liquid column separation by the full opening of the large orifice so as to allow unobstructed air intake at the lowest possible negative internal pipeline pressure.
4. Provide a heavy duty vented cast iron manhole frame and cover, East Jordan Iron Works 2603, or equal, or an aluminum hatch, whichever is indicated on the Drawings.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Provide workmanship, which is first class, in every respect. Have installation performed by workers thoroughly experienced in such Work.
- B. The Work shall meet all requirements of pertinent laws, codes and regulations.

END OF SECTION 33 12 16.10

SECTION 33 12 16.12

AIR RELEASE AND VACUUM VALVES - SEWER

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Materials
3.1	Workmanship

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Cast-in-Place Concrete (03 30 00).
2. Excavation and Fill (31 23 00).
3. Precast Concrete Utility Structures (33 05 16.13).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor, under this item, shall furnish all material, tools, labor, and equipment necessary to properly install, including excavation, adjust, test, and place in successful service, at the locations indicated on the Drawings or as directed by GCDWR, all air release and vacuum valves required for the proper completion of the Work included under this Contract.
- B. The Work shall include, in general but without limitation, all air release and vacuum valves, all valves with extended 2" nut operator shaft to top slab, standard valve box in top slab, piping, and saddles indicated on the Drawings, pre-cast manhole base or vault, riser, and slab top with cast iron frame and cover or hatch, including excavation and backfill, together with all accessories and appurtenances required for a complete installation.
- C. Wherever the Work disturbs existing structures or landscaping, the Contractor shall replace same to no less than original condition.
- D. It is the intent of this contract to require an installation under this item, complete in every detail whether or not indicated on the Drawings, or specified. Consequently, the

Contractor shall be responsible for all details, devices, accessories, and special construction necessary to properly install, adjust, test, and place in successful service a complete installation as specified herein.

1.4 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, and shall show in detail the size and location of all air and vacuum valves and accessories to be used in construction. Product data shall be submitted including materials of construction, dimensional drawings, installation requirements, and operation and maintenance manuals for each size and type of valve being provided.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Furnish materials which are new, unused, and as specified.
- B. Air Release and Vacuum Relief Valves shall consist of a compact tubular all stainless steel fabricated body, hollow direct acting float, and solid large orifice float in H.D.P.E.- stainless steel nozzle and woven dirt inhibitor screen, nitrile rubber seals and natural rubber seat.
- C. Sewage Air and Vacuum Release Valves shall be Vent-O-Mat Series RGX, ARI, or approved equal.
- D. The valve shall have an integral anti-surge orifice mechanism, which shall operate automatically to limit surge pressure rise or shock induced by closure to less than 2 times the valve rated working pressure. The intake orifice area shall be equal to the nominal size of the valve (i.e., a 6" valve shall have a 6" intake orifice).
- E. Large orifice sealing shall be effected by the flat face of the control float seating against a nitrile rubber "O" ring housed in a dovetail groove circumferentially surrounding the orifice. Discharge of pressurized air shall be controlled by the seating and unseating of a small orifice nozzle on a natural rubber seal affixed into the control float. The nozzle shall have a flat seating land surrounding the orifice so that damage to the rubber seal is prevented.
- F. The valve construction shall be proportioned with regard to material strength characteristics, so that deformation, leaking or damage of any kind does not occur by submission to twice the designed working pressure. Connection to the valve inlet shall be facilitated by flanged ends conforming ANSI Class 250 or ANSI Class 300 Standards. Flanged ends shall be fastened with ASTM A-193, Grade B8M, 316 stainless steel, heavy hex bolts and ASTM A-194, Grade 8M, 316 stainless steel, heavy hex nuts inserted for alignment to the specified size of, nuts, washers, and gaskets.
- G. Operation of the valve shall be as follows:
 - 1. Prior to the ingress of liquid into the valve chamber, as when the pipeline is being filled, valves shall vent through the large orifice when sewage/effluent approach

velocities are relative to a transient pressure rise, on valve closure, of < 2 -times valve rated pressure.

At higher sewage/effluent velocities, which have a potential to induce transient pressure rises greater than 2-times valve rated pressure on valve closure the valve shall automatically discharge air/gas through the anti-shock orifice and reduce sewage/effluent approach velocity, so that on closure a maximum transient pressure rise of less than 2-times valve rated pressure is realized.

2. Valves shall not exhibit leaks or weeping of liquid past the large orifice seal at operating pressures of 7.3 psi to twice (2) the rated working pressure.
3. Valves shall respond to the presence of air/gas by discharging it through the small orifice at any pressures within a specified design range, 7.3 psi to 250 psi and shall remain leak tight in the absence of air.
4. Valves shall react immediately to pipeline drainage or liquid column separation by the full opening of the large orifice so as to allow unobstructed air intake at the lowest possible negative internal pipeline pressure.
5. Provide a heavy duty vented cast iron manhole frame and cover, East Jordan Iron Works 2603, or equal, or an aluminum hatch, whichever is indicated on the Drawings.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Provide workmanship, which is first class in every respect. Have installation performed by workers thoroughly experienced in such Work.
- B. The Work shall meet all requirements of pertinent laws, codes and regulations.

END OF SECTION 33 12 16.12

SECTION 33 12 19

WATER UTILITY DISTRIBUTION FIRE HYDRANTS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Accessories
2.2	Hydrants
2.3	Automatic Flushing Device
3.1	Painting, Coating, and Lubricating
3.2	Setting Hydrants

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Water Utility Distribution Valves (33 12 16).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish and install at the locations indicated on the Drawings or as directed all fire hydrants necessary or required for the proper completion of the Work under this Contract.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show in detail the size of all fire hydrants and accessories to be used in construction, including product data, materials of construction, and operation and maintenance data.

PART 2 - PRODUCTS

2.1 ACCESSORIES

- A. The Contractor shall furnish one (1) adjustable hydrant wrench for each ten (10) hydrants installed, or fraction thereof. Wrench to be Pollard No. P-665-1, or equal. Final payment shall be withheld until all accessories are provided to GCDWR.

2.2 HYDRANTS

- A. Fire hydrants shall be manufactured in full compliance with the American Water Works Association Standard for Dry - Barrel Fire Hydrants, C502-80, and as herein amended. Hydrants approved for use are American Flow Control B-62-B, M&H 129, Mueller IMP-PRT2, Clow Medallion, U.S. Metropolitan 250 M-94, or EJ 5CD250, or equal.
- B. Type - Three-way, post type, dry top traffic model with compression main valve opening against and closing in the direction of normal water flow.
- C. Size - Internal main valve diameter shall be a minimum of 5- $\frac{1}{4}$ ".
- D. Identification - Each hydrant shall have the name of the manufacturer, the year when made, and the nominal valve size in legible, raised letters cast on the barrel or bonnet.
- E. Dry Top Bonnet - Each hydrant shall be constructed with a moisture-proof lubricant chamber which encloses the operating threads and which provides automatic lubrication of the threads and bearing surfaces each time the hydrant is operated. This assembly shall be comprised of a top "O" ring serving as a dirt and moisture barrier and lower "O" ring which shall serve as a pressure seal.
- F. Operating Nut - The operating nut shall be of regular pentagon shape measuring 1- $\frac{1}{2}$ " point to flat; i.e., National Standard, and shall open by turning counter-clockwise (left). Nozzle caps shall have the same cross-section as the operating nut and shall come with heavy duty, non-kinking chains. Chains shall be securely affixed to the hydrant upper barrel and permit free turning of the caps.
- G. Traffic Design - The hydrant barrel sections shall be connected at the ground line in a manner that shall prevent damage to the hydrant when struck by a vehicle. The main valve rod sections shall be connected at the ground line by a frangible coupling. The standpipe and ground line safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling or removing the top operating components and top section of the hydrant standpipe.
- H. Main Valve - The main valve shall be made of synthetic rubber and formed to fit the valve seat accurately.
- I. Main Valve Seat - The main valve seat shall be of bronze and its assembly into the hydrant shall involve bronze to bronze thread engagement. Two (2) "C" ring seals shall be provided as a positive pressure seal between the bronze seat ring and the shoe. The valve assembly pressure seals shall be obtained without the employment to torque compressed gaskets. The hydrants shall be designed to allow the removal of all operating parts through the hydrant barrel by means of a single, lightweight disassembly wrench without excavating.

- J. Drain - The drain mechanism shall be designed to operate automatically with the operation of the main valve and shall allow a momentary flushing of the drain ports. A minimum of two (2) internal and two (2) external bronze lined drain ports shall be required in the main valve assembly to drain the hydrant barrel.
- K. Inlet Connection - Cast iron inlet elbow shall have a 6 inch mechanical joint connection complete with accessories.
- L. Extensions - Barrel extension sections shall be available in 6 inch increments complete with rod, extension coupling, and the necessary flanges, gaskets, and bolts so that extending the hydrant can be accomplished without excavating.
- M. Nozzles - No lead shall be allowed in nozzle installation.
- N. Testing - All fire hydrants shall be tested in strict accordance with ANSI/AWWA-C502 at the supplier's expense. Certificate of Compliance shall be furnished to GCDWR upon their request.

2.3 AUTOMATIC FLUSHING DEVICE

- A. Automatic flushing device shall have a 1" brass FIP inlet, leading vertically into a 1" automatic solenoid valve. Automatic solenoid valve shall have an internal, self-cleaning debris screen, and have a 220 psi rating. Each unit shall be furnished with a stand-alone valve controller. Valve controller shall not require a second hand-held device for programming. Controller shall have a minimum of 9 possible flushing cycles per day, shall be submersible to 12 feet, operate with 9 volt battery and have resin-sealed electrical components. Solenoid shall have no loose parts when removed from the valve. Each unit shall have a single-valve, all brass, sampling point. Removal of the 1" solenoid valve shall be possible via an o-ring connector located under the valve after removal of the stainless steel access plate. The valve assembly shall be housed in a PVC enclosure and each unit shall be self-draining, non-freezing. All above-ground components shall be contained within a UV-resistant locking cover. Automatic flushing valves shall be as manufactured by Kupferle, or equal.

PART 3 - EXECUTION

3.1 PAINTING, COATING, AND LUBRICATING

- A. All iron parts of the hydrant, inside and outside, shall be thoroughly cleaned and thereafter, unless otherwise stipulated, all surfaces except the exterior portion above the ground line shall be coated or painted with, or dipped in, an asphalt or bituminous base paint or coating. If these parts are painted, they shall be covered with two (2) coats, the first being allowed to dry thoroughly before the second coat is applied.
- B. The outside of the hydrant valve above the finished ground line shall be thoroughly cleaned and thereafter painted in the shop with two (2) coats of Koppers Primer 621 or Owner approved equal. After installation, each hydrant shall be painted with two (2) field coats of Glamortex Enamel as manufactured by the Inertol Company or Owner approved equal; color to be silver.

- C. All bronze, threaded, and contact moving parts shall, during shop assembly, be lubricated and protected by a coating of rust proof compound to prevent damage in shipment and storage.

3.2 SETTING HYDRANTS

- A. Hydrants shall be placed at the locations indicated on the Drawings in a manner to provide complete accessibility and so that the possibility of damage from vehicles or injury to pedestrians shall be minimized. Contractor shall install proper "bury" hydrants or shall use, at no cost to GCDWR, proper length extensions to insure that each fire hydrant is installed in accordance with the manufacturer's recommendation and the requirements of the Specifications. When placed behind curb, the hydrant barrel shall be so set that no portion of the pumper or hose nozzle caps shall be less than six (6) inches, nor more than twelve (12) inches from the gutter face of the curb. Place gravel as shown on the Drawings. All pipes connecting the fire hydrant to the main line shall be ductile iron pipe meeting these specifications or approved connecting pieces.
- B. The use of PVC pipe for hydrant branch piping is specifically prohibited. The connection of the hydrant to the supply main must be through either a Ductile Iron Tee or a tapping sleeve and include an outlet valve at the point of connection. Using a tapping sleeve where the Drawings indicate a Tee shall not result in any additional cost to GCDWR.

END OF SECTION 33 12 19

SECTION 33 12 19.81

RELOCATE AND RECONNECT HYDRANTS, VALVES, AND METERS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
3.1	Existing Materials and Appurtenances
3.2	Work

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Precast Concrete Utility Structures (33 05 16.13).
3. Ductile Iron Pipe (33 11 13.05).
4. Water Utility Distribution Fire Hydrants (33 12 19).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. The Contractor shall perform the Work of this item with due regard to the requirements of Section 33 11 13.05 Ductile Iron Pipe as concerns the overrun of authorized shutdowns, authorized shutdowns, and hours for authorized shutdowns.

1.3 WORK INCLUDED

- A. The Contractor shall, where specified, indicated on the Drawings, or directed by the Engineer, disconnect, relocate and reconnect existing hydrants, check valves and large meters.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show, in detail, the size and location of all hydrants, valves, meters, and accessories to be used in construction.

- C. Per Section 33 05 16.13 Precast Concrete Utility Structures, Contractor shall furnish and install a pre-cast concrete vault with aluminum hatch. Shop drawings for the vault and hatch must be approved by the Engineer prior to installation.

PART 2 - PRODUCTS – (NOT USED)

PART 3 - EXECUTION

3.1 EXISTING MATERIALS AND APPURTENANCES

- A. Existing valves and hydrants, which are suitable for reuse, shall be cleaned and, if required, shall have their internal parts reworked, and shall be properly placed in the Work where indicated or required. Outlets on hydrants shall be re-oriented, if required.
- B. The Contractor shall perform the disconnecting, relocating, and connecting carefully so as to avoid damaging the materials or appurtenances. Materials or appurtenances damaged in the course of the Work shall be replaced or repaired by the Contractor at his own expense and to the approval of GCDWR.

3.2 WORK

- A. Relocate/Reconnect Existing Hydrant - Includes disconnection from existing mains, plugging and blocking openings in the main and reconnecting and/or relocating hydrant to new main in accordance with the manufacturer's recommendations and the requirements of these specifications. The placement of the relocated hydrant shall meet the requirements for fire hydrant installation as shown on the Drawings and/or specified in Section 33 12 19.
- B. Adjust Existing Hydrant – Where indicated on the Drawings or directed by the Engineer, the Contractor shall raise or lower the above ground portion of an existing hydrant to the elevations indicated or directed by the Engineer. All work shall be completed with compatible parts as provided by the fire hydrant manufacturer, or GCDWR approved equal.
- C. Salvage Hydrants and/or Valves – Includes removal of the hydrant, closing and plugging of hydrant valve, and abandonment of hydrant valve in place per these specifications. Hydrants for salvage shall be transported to a location designated by GCDWR.
- D. Relocate Large Meter/Check Valve/Vault - Relocate 3", 4", 6", and 8" water meters or check valves including removal of the existing meter and vault and reinstallation of the existing meters and vaults to the new location. Existing meters and vaults shall be carefully removed, stored (if construction phasing requires), and properly reinstalled in the Work (including all excavation and backfilling) where indicated or as required.
- E. Furnish and Install Concrete Vault - Vault shall be pre-cast concrete with aluminum hatch meeting the requirements of Section 33 05 16.13 of these specifications.

- F. Adjust Valve Box – Where indicated on the Drawings, required by existing or proposed grades, or as directed by the Engineer, the Contractor shall make adjustments to existing valves boxes so they are flush with grade. Adjustments shall be made by adding or removing sections of ductile iron pipe beneath the valve box. In non-paved locations, a concrete ring shall be placed around the top of the valve box. If the existing valve box is not plumb or centered over the operating nut, the Contractor shall re-center and the valve box and return it to a plumb position. Where valves are to be abandoned, the Contractor shall close the valve, remove the valve box, fill the resulting hole with suitable compacted fill material, and restore the surface to match the surrounding area. This work shall include all excavation, backfill, and restoration required to set the valve box as directed and return the site to its preconstruction conditions.
- G. All Work performed under this item shall be performed at the locations and in the manner indicated in the Drawings or as otherwise required by GCDWR.

END OF SECTION 33 12 19.81

SECTION 33 31 00

SANITARY UTILITY SEWERAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Manufacturers
2.2	Flowable Fill
2.3	Joints
2.4	PVC Pipe
2.5	HDPE Pipe
2.6	Ductile Iron Pipe
3.1	Bedding
3.2	Clean-Up
3.3	Connections
3.4	Cutting
3.5	Deflection Testing
3.6	Final Inspection Preceding Acceptance
3.7	Flowable Fill
3.8	General
3.9	Guarantee
3.10	Handling and Distribution
3.11	House Connections
3.12	Infiltration
3.13	Inspection Prior to Installation
3.14	Jointing
3.15	Low Pressure Air Testing
3.16	Safety Precautions
3.17	Storage
3.18	Television Inspection

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with Contract Documents.

1. Cast-in-Place Concrete (03 30 00).
2. Clearing and Grubbing (31 11 00).
3. Excavation and Fill (31 23 00).
4. Erosion and Sedimentation Controls (31 25 00).

5. Turf and Grasses (32 92 00).
6. Utility Pipe Jacking (33 05 23.16).
7. Traffic Control (34 41 16.10).
8. Roadway Construction (34 71 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all the materials, perform all necessary excavation, and properly lay and test, at the locations indicated on the Drawings or directed, all pipe and all pipe specials of the sizes specified or indicated which are necessary for the proper completion of the Work.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Piping submittal shall, at a minimum, show in detail the nominal pipe size, manufacturer name or trademark, and specification designation in accordance with ASTM/ANSI, of all piping and accessories to be used in construction.
- C. The Contractor shall submit for approval, samples, specifications, and manufacturer's recommendations for making joints Contractor proposes to use. No pipe shall be laid until approval has been given by the Engineer and GCDWR.
- D. Transition joints between sewer pipes of different materials shall be accomplished by the use of adapters made especially for that purpose. Shop drawings must be submitted and approved by the Engineer prior to the use of any adapter for this purpose.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following or an approved equal:
 1. Polyvinyl Chloride (PVC) Pipe:
 - a. Certainteed, Inc.
 - b. Diamond Plastics, Inc.
 - c. J-M Eagle
 - d. Lamson Vylon Pipe

2. High Density Polyethylene (HDPE) Pipe:
 - a. ADS
 - b. ISCO Pipe
 - c. J-M Eagle
3. Ductile Iron Pipe (DIP):
 - a. American Cast Iron Pipe Company
 - b. U.S. Pipe
 - c. McWane Ductile
4. Accessories:
 - a. A-LOK Products, Inc.
 - b. Dresser Industries, Inc.
 - c. Harrington Corporation (HARCO)

2.2 FLOWABLE FILL

- A. General: It is the intent of these specifications to produce flowable, cementitious slurry by blending Class "C" fly ash and water. The slurry should be of consistency that is both flowable and self-leveling. It should also be such consistency that it can fill irregular shaped areas through gravity placement.
- B. Materials:
 1. Fly Ash - Fly ash shall meet ASTM Specifications C-618. Section 3.2, when sampled and tested in accordance with Sections 4, 6, and 8, unless otherwise shown in the plans. Fly ash shall be of the Class "C" designation containing a minimum of 25% CaO (hydrated lime). Fly ash shall be obtained from a source approved by the Engineer. Fly ash test certification shall be provided to the Engineer.
- C. Water - The water to be used in the slurry shall be clean, clear, and free of sewage, vegetable matter, oil, acid and alkali. Water known as potable may be used without testing. All other sources shall be tested in accordance with A.A.S.H.T.O. T-26 and approved by the Engineer.

2.3 JOINTS

- A. The pipe shall be joined with an integral bell, bell and spigot type rubber gasketed joint. Each integral bell joint shall consist of a formed bell complete with a single rubber gasket. Joints shall meet the requirements of ASTM D3212.
- B. All fittings shall utilize rubber gasket joints. Gaskets shall conform to ASTM F477.
- C. Joint materials shall minimize infiltration, prevent entry of roots, resist disintegration, cracking, and breaking. Manufacturer's recommendations shall be followed implicitly in preparing pipe and making joints.
- D. PVC sewer mains eight-inch (8") and larger diameter shall NOT be joined by solvent cement with which the pipe surfaces are fused together.

E. Transitions between DIP and PVC:

1. Shall be accomplished by transition collar utilizing C900 x SDR Adapter, HARCO, or equal, meeting ASTM 1784 for material, ASTM D3212 for joints, ASTM F477 for gaskets, and ASTM D3034 and F1336 for fittings; or by utilizing a coated solid sleeve.
2. Transition joints will not be allowed within 36 feet of a manhole, when the end result would be 36 feet or less of PVC adjacent to a manhole.

2.4 POLYVINYL CHLORIDE PIPE (PVC)

- A. PVC pipe for four inch (4") lateral connection and fittings pipe shall be Schedule 40.
- B. PVC pipe may be used for six-inch (6") through twenty-four inch (24") diameter. PVC pipe and specials shall be of the bell and spigot type, meeting the requirements of ASTM D3034 SDR 35. The pipe shall be made of PVC plastic having a cell classification of 12454B as defined in ASTM D1784. Fittings shall be made of PVC plastic meeting ASTM D3034 and F1336.
- C. Pipe of four-inch (4") and six-inch (6") diameter shall not have laying lengths less than ten feet (10'). Pipe of eight-inch (8") and greater diameter shall have laying lengths no less than twelve feet (12'), and no greater than twenty feet (20'). The nominal laying length of wyes and tees shall be per ASTM D3034. Saddles are prohibited.
- D. No old pipe or specials which have been previously used, nor pipe or specials which have been rejected shall be allowed in the Work, and they shall be removed from the project promptly and not again offered for inspection.
- E. Each length of pipe shall be marked at intervals of five feet (5') or less on pipe barrel, in accordance with ASTM/ANSI to include manufacturer name or trademark, date of manufacture, nominal pipe size, and ASTM designation.
- F. Where specified, indicated on the Drawings, or directed by the Engineer, Class 50 Ductile Iron Pipe and specials shall be substituted in lieu of PVC pipe. Ductile Iron Pipe shall meet the requirements of Paragraph 2.6 Ductile Iron Pipe (DIP).

2.5 HIGH DENSITY POLYETHYLENE PIPE (HDPE)

- A. HDPE sewer pipe shall be dual wall, corrugated pipe that has a smooth interior and an annular exterior corrugation; made of high density polyethylene resin that meets or exceeds ASTM D-3350 requirements, manufactured and tested in accordance with ASTM F-2648.
- B. HDPE sewer pipe shall be joined with watertight, bell and spigot joints with gaskets meeting the requirements of ASTM F-477, and joints meeting watertight performance requirements of ASTM D-3212.
- C. HDPE sewer pipe shall have laying lengths of twenty feet (20').

- D. Fittings shall be in accordance with ASTM F-2648 and be watertight meeting the requirements of ASTM D-3213. Manufacturer shall supply joint lubricant for use on the gaskets during assembly.
- E. Where indicated on the Drawings, or directed by GCDWR, Class 50 Ductile Iron Pipe and specials shall be substituted in lieu of HDPE pipe. Ductile Iron Pipe shall meet the requirements of Paragraph 2.6 Ductile Iron Pipe (DIP).

2.6 DUCTILE IRON PIPE (DIP)

- A. Where specified, indicated on the Drawings, or directed by the Engineer, DIP gravity sewerage pipe and fittings shall conform to the requirements of ANSI/ASTM A746, Ductile Iron Gravity Sewer Pipe. DIP shall be cast, clean, cement-lined, asphalt coated, tested, and certified at a single manufacturing facility.
- B. DIP thickness class shall be as indicated on the Drawings.
- C. Nominal laying lengths shall be eighteen feet (18') or twenty feet (20') for pipe diameters specified.
- D. DIP pipe shall be marked in accordance with ASTM/ANSI designations at intervals of five feet (5') or less on pipe barrel. As a minimum, pipe marking shall include manufacturer name or trademark, nominal pipe size, specification designation, and date of manufacture.

E. PUSH-ON JOINT PIPE AND FITTINGS

1. Push-On Ductile Iron Pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51.
2. Push-On Ductile Iron Fittings shall be manufactured with body thickness and radius of curvature conforming to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53.
3. At a *minimum*, fittings four (4) inch through twenty (20) inch shall be rated for 350 psi, and twenty-four (24) inch through sixty-four (64) inch shall be rated for 250 psi.
4. Joint deflection shall be five degrees (5°) for four-inch (4") through twelve-inch (12"); four degrees (4°) for fourteen-inch (14"); three degrees (3°) for sixteen-inch (16") through twenty-four-inch (24"); and two and one-half degrees (2½°) for thirty-inch (30").

F. MECHANICAL JOINT PIPE AND FITTINGS

1. Mechanical Joint Ductile Iron Pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51.
2. Mechanical Joint Ductile Iron Fittings shall be manufactured with body thickness, laying length, and fittings conforming ANSI/AWWA Standard C110/A21.10 or ANSI/AWWA C153/A21.53 and joints in accordance with ANSI/AWWA Standard C111/A21.11.

3. Mechanical joints shall be thoroughly bolted in accordance with the manufacturer's recommendations with Tee Head Bolts of high strength, heat treated, cast iron containing 0.50 percent copper or high strength low-alloy steel having a minimum yield point strength of 40,000 psi and an ultimate tensile strength of 70,000 psi.
4. Gasket, bolts, and nuts shall conform to ANSI A21.11. Gaskets shall be of neoprene or rubber, unless specified otherwise, of such quality that they will not be damaged by the liquid or gases with which they come in contact.
5. Glands shall be of high strength cast iron.

G. GASKETS

1. PUSH-ON & MECHANICAL - Sufficient lubricant shall be furnished with each order of pipe to provide a thin coating on each spigot end. Lubricant shall have no deleterious effect on the rubber gasket. Lubricant shall be of such consistency that it can be easily applied to the pipe in either hot or cold weather and shall adhere to either wet or dry pipe. **Only lubricant furnished with the pipe by the pipe manufacturer shall be used.**
2. Gaskets shall meet applicable requirements of AWWA/ANSI C111/A21.11, and shall be styrene butadiene rubber (SBR).

H. EXTERIOR COATING

1. Where the pipe is located within ten feet (10') of a utility line that has cathodic protection that can cause a deleterious effect on the piping system, the exterior of ductile iron pipe shall be base-coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m² (0.6554 oz/ft²) of pipe surface area. A finishing layer of asphaltic topcoat shall be applied to the zinc. The mean, dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. The coating system shall conform in every respect to ISO 8179-1 "*Ductile Iron Pipes – External zinc-based coating – Part 1: Metallic zinc with finishing layer, Second Edition 2004-06-01.*"
2. Where soils with electrical or stray currents are encountered, polywrap may be added to the zinc-coated pipe for additional corrosion protection. Polyethylene tube encasement shall be prefabricated, manufactured and supplied in accordance with ANSI/AWWA C105/A21.5, "*Polyethylene Encasement for Ductile Iron Pipe Systems.*" The wrap shall be overlapped one foot in each direction at joints, and secured in place around the pipe, and any wrap at tap locations shall be polyethylene taped tightly to prevent the entrance of foreign matter prior to tapping and inspected for any needed repairs following the tap.

I. LININGS

1. PIPE
 - a. Cement mortar lining shall be to Standard thickness in accordance with ANSI/AWWA C104/A21.4

2. FITTINGS

- a. Cement mortar lining shall be to Double thickness in accordance with ANSI/AWWA C104/A21.4

PART 3 - EXECUTION

3.1 BEDDING

- A. For gravity sanitary sewer flow in PVC pipe material, as a minimum, Class 'B' Bedding shall be used. Additional bedding material may be required dependent upon laying conditions, or as directed by the Engineer.
- B. For gravity sanitary sewer flow in DIP pipe material, as a minimum, Class 'C' Bedding shall be used. Additional bedding material may be required dependent upon laying conditions, or as directed by the Engineer.
- C. For pressurized sanitary sewer flow (Force Main), see *Standard Pump Station Specifications, Section 33 11 13.05, Paragraph 3.1.E.*
- D. For laying pipe in rock trench, the trench shall be made to conform to the general dimensions required, and the trench bottom shall be undercut to allow a minimum of six inches (6") of bedding material to be placed and compacted to establish the required sub-grade elevation. Sides and bottom of sewers shall be supported by compacting materials in place, so as to ensure an even bearing surface for the pipe. Particular care shall be taken that pipes are not permitted to rest upon or against solid or projecting portions of rock.
- E. No pipe shall be brought into position until the preceding length has been thoroughly embedded and secured in place. The supporting of pipe on wood blocks, loose brick, etc., shall NOT be permitted. Defects due to settlement shall be corrected by the Contractor at no expense to GCDWR.
- F. Take care to avoid contact between the pipe and mechanical compaction equipment so as not to damage the pipe. Do not use compaction equipment directly over the pipe until sufficient Initial Backfill has been placed to assure that such equipment shall not damage or disturb the pipe.
- G. Additional bedding may be required as determined by bedding class required dependent upon pipe material, laying conditions, or direction of the Engineer.

3.2 CLEAN-UP

- A. A thorough cleanup shall be made before final acceptance and final payment is made. All excess rock shall be removed, private and public property shall be restored to original condition, and all excess pipe and fittings shall be removed.

3.3 CONNECTIONS

- A. When making connection to existing sewers, the Contractor shall remove all bulkheads and shall make proper connections to structures and sewers as

specified, indicated on the Drawings, or directed by the Engineer or GCDWR. Contractor shall make all necessary pipeline and sewer connections where required. No extra payment shall be made for this Work, but the entire cost of same shall be considered as having been included in the Unit Prices Bid.

- B. Where pipe is connected to a concrete or masonry structure which has no existing stub out or cored hole, Contractor shall make such connection *only* with a core into the structure, and provide a flexible manhole boot.

3.4 CUTTING

- A. Whenever a pipe requires cutting, the pipe shall be cut in a satisfactory manner so as to leave a smooth end at right angles to the axis of the pipe. The end shall then be beveled in accordance with manufacturer's recommendations for field beveling.

3.5 DEFLECTION TESTING

- A. Deflection tests shall be required, when in the opinion of GCDWR CCTV Inspection, there is reason to suspect excessive deflections; and said tests shall be performed no sooner than thirty (30) days following completion of backfill unless otherwise approved. Deflection tests shall be performed by GCDWR with the GCDWR Inspector present. Maximum ring deflection of the pipe, under load, shall be limited to five percent (5%) of the inside pipe diameter.
- B. All pipe failing to maintain the minimum deflection diameter shall be considered improperly installed and shall be re-laid or replaced by the Contractor.

3.6 FINAL INSPECTION PRECEDING ACCEPTANCE

- A. Final inspection may include a visual inspection of each section of sewer by looking from manhole to manhole with the aid of reflected sunlight or an electric light. Such light used for inspection shall be plainly visible from manhole to manhole. Light reflected along the pipe walls from manhole to manhole shall not be considered as plainly visible light and shall be reason for rejection of the section of sewer as not being laid true to line and grade. The pipe shall be true to both line and grade; shall show no leaks, shall be free from cracks and protruding joint materials and contain no deposits of sand, dirt, or other materials. All finished Work shall be neat in appearance of first class workmanship.

3.7 FLOWABLE FILL

- A. Equipment:
 - 1. The equipment used by the Contractor shall be capable of properly blending the materials into a homogeneous mixture, suitable for the intended use and complying with all specifications included herein.

2. Equipment shall be capable of continuous mixing. Elapsed time, from the time materials are introduced into the mixing unit, until they are gravity fed from the mixer, shall not exceed (1) minute.
 3. Equipment that requires the use of chemical retarders or other additives is not acceptable without written permission of the Engineer. All equipment shall be approved by the Engineer prior to starting work.
- B. Fly Ash Storage and Delivery:
1. Fly ash shall be stored and handled in closed, waterproof containers until being introduced into the mixing equipment.
 2. If fly ash is furnished in trucks, each truck shall have the weight of fly ash certified on public scales.
 3. Reclaimed fly ash or fly ash that has been exposed to moisture shall be rejected.
- C. Construction Methods: Bulkheads shall be built at both ends of the structure intended for abandonment or casing pipe. Placement of the slurry should start at a point nearest the downstream bulkhead; placement should be through a manhole or inlet. A vent hole should be used to allow for air to escape. Placement shall continue until material is expelled through the vent hole and slurry backs up through the manhole or inlet. Once this happens, the equipment is moved upstream to the nearest manhole or inlet, and the procedure is repeated until the structure is completely filled.
- D. Sampling and Testing:
1. Samples shall be taken at the rate of one (1) per 8-hour shift, unless otherwise directed by the Engineer. Cylinders shall be cast and field cured at the worksite for a minimum of six (6) hours before being taken to the lab. Compressive strength shall be a minimum 100-psi at 28 days.
 2. Prior to starting the Work and no later than 48 hours before placement, the Contractor shall submit to the Engineer in writing both a method statement and mix design.
- E. If required by the Engineer, the flowability shall be checked by the use of the U.S. Army Corps of Engineers "Flow Cone Test Method". Maximum efflux time is 10-16 seconds; this is an optional requirement. The Contractor shall hire a reputable testing lab acceptable to the Engineer to perform the above mentioned tests.
- 3.8 GENERAL
- A. All pipe shall be thoroughly cleaned before being laid, and shall be kept clean until acceptance of the completed Work. Proper and suitable tools and appliances for the safe and convenient handling and laying of pipes shall be used.

- B. All trenches shall be kept free from water when pipe laying is in progress, and no water shall be allowed to rise within twelve inches (12") of the bottom of the pipe until jointing is completed.
- C. Pipe and specials shall be laid accurately to required lines and grades and shall be uniformly supported along their entire length. Bottoms of excavations shall be properly trimmed and bell holes dug to properly support joints. Size of bell holes shall be kept to a minimum, but shall be large enough to permit the proper making of joints.
- D. The open end of uncompleted pipelines shall be provided with a temporary stopper carefully fitted so as to keep dirt and other substances from entering. This stopper shall be maintained in position at all times when laying is not actually in progress.

3.9 WARRANTY

- A. The Contractor shall warranty for a period of twelve (12) months from the date of Final Completion all lines, appurtenances, trenches, and other disturbed surfaces.
- B. The Contractor shall be responsible for repairs to any leaking pipe, fittings, etc. Should trenches settle, he/she shall promptly furnish and place fill to original grade. Should any leaks or trench settlement occur under the new pavement, the Contractor shall be held responsible for the cost of all repairs, including pavement replacement.

3.10 HANDLING AND DISTRIBUTION

- A. Pipe shall be carefully transported, stored, and handled to prevent damage to the pipe or bell. Damaged pipe or bells shall be cause for rejection of the pipe. Pipe shall be stored in such manner as to keep the interior free of dirt or other foreign matter.
- B. Stringing out of pipe more than two (2) days in advance of installation shall not be permitted.

3.11 SERVICE CONNECTIONS

- A. Provision shall be made in sewer mains for Service Connections as specified, indicated on the Drawings, or directed by the Engineer or GCDWR. Service Connections for each building sewer lateral shall be made by installing in the sewer main, at forty-five degrees (45°) above the horizontal axis of the sewer main, a 'Wye' (for PVC pipe), or a 'Tee' (for Ductile Iron Pipe). All Service Connections shall be six-inch (6") diameter.
- B. Service Connections out of manholes, as indicated on the Drawings or as directed by the Engineer or GCDWR, shall extend from the manhole a minimum of ten feet (10'). All stub outs shall be stopped with mechanical plug, joints equal to that specified, and properly installed and braced to prevent leakage

during periods of testing. All pipes laid out of manholes shall connect to the manhole by utilizing a cored hole with a flexible manhole boot.

- C. Service Connections shall be properly stopped with a mechanical plug and marked appropriately on the ground surface.
- D. For sewer mains exceeding twelve feet (12') in depth, Contractor shall use a Deep House Connection. This connection shall utilize a DIP 'Tee' on the main line, DIP service line placed vertically, and topped by a DIP 'Tee' and plug. Connection assembly shall be such that the elevation of the upper 'Tee' shall not be less than five feet (5') below finish grade, and at such elevation as to properly receive the building sewer lateral. Allow a minimum of one percent (1.0%) slope from building sewer lateral elevation to the Service Connection elevation.
- E. When Service Connections are so located that those on opposite sides of the street come to the same point in the sewer, the Contractor must install a separate 'Tee' for each Service Connection.
- F. In general, it is the intent to locate building sewer laterals during construction.
- G. Service Connections shall extend from the main line to five feet (5') outside of road right-of-way, easement line, or as indicated on the Drawings or directed by GCDWR.
- H. Replace or restore lawns and landscaped areas per requirements of Specification Section 32 92 00 Turfs and Grasses.
- I. Where indicated on the Drawings, or as directed by the Engineer, Class 50 ductile iron pipe and specials shall be substituted in lieu of PVC Service Connections. Ductile Iron Pipe and specials shall meet the requirements of this specification section, Paragraph 2.6 Ductile Iron Pipe (DIP).

3.12 INFILTRATION

- A. On newly installed sewers sixteen-inch (16) or less diameter, no infiltration or leaks shall be allowed. Any infiltration flowing at the low point of a project must be eliminated prior to approval.
- B. On large diameter mains (greater than sixteen-inch (16") diameter), the allowable infiltration shall not exceed 75 gallons per day/inch diameter/mile. Visible or known leaks shall not be allowed regardless of total infiltration.

3.13 INSPECTION PRIOR TO INSTALLATION

- A. Pipe shall be inspected and tested at the mill or warehouse by an approved, independent testing laboratory to determine conformity with requirements of ASTM Standards. Signed and dated certificates stating results of inspection and tests shall accompany each shipment and shall be a prerequisite to acceptance of the shipment on the Work by the Engineer.
- B. Prior to lowering pipe and specials into the trench, a field inspection may be made by the Engineer.

3.14 JOINTING

- A. When pipes are ready for jointing, bell interior and spigot surface shall be cleaned of all dirt and foreign matter, coated with manufacturer's approved lubricant, and pipes shoved home. Care shall be exercised after laying to prevent deflection or separation of the joint just made. All joints shall be made in the trench, and only one (1) joint shall be made at a time.
- B. All pipe ten-inch (10") diameter and smaller shall be joined using a pry bar and block. On pipe larger than ten-inch (10") diameter, mechanical assistance may be necessary.
- C. When the joint is completed, the sewer shall have a smooth, unobstructed invert, and the pipe shall be true to grade and alignment. If the invert protrudes above the invert of adjacent pipe it shall be removed and replaced.
- D. After the pipe has been properly embedded and joints made, Initial Backfill materials shall be carefully tamped on each side of the pipe between the walls of the excavation and the pipe before Final Backfill is performed as specified under Specification Section 31 23 00 Excavation and Fill.
- E. Great care shall be used to secure water tightness and to prevent damage to or disturbing of joints during backfilling, or at any other time after the pipes have been laid and the joints have been made. There shall be no walking on or working over the pipe except as may be necessary in tamping, until there is cover no less than one foot (1') in depth over the top of the pipe.
- F. All joints showing leakage shall be uncovered and the joints remade at Contractor's expense.
- G. Laying Pipe in Freezing Weather: No pipe shall be laid upon a foundation in which frost exists, nor when the Engineer deems that there is a danger of the formation of ice or the penetration of frost at the bottom of the excavation.

3.15 LOW PRESSURE AIR TESTING

- A. After completing backfill of a sewer line section, conduct a low pressure air test of all pipe constructed, using methods and devices acceptable to GCDWR. Prior to testing for acceptance, the pipe should be cleaned by passing through the pipe a full gauge squeegee. It shall be the responsibility of the Contractor to have the pipe clean. Perform such test using the following general procedures:
 - 1. Temporarily plug line segment between two (2) manholes using plugs having airtight fittings through which low pressure air can be introduced into the pipe segment being tested.
 - 2. Introduce low pressure air into the test pipe segment until the internal air pressure reaches 4.5 psig above water pressure, if any.
Where high ground water is known to exist, the height in feet of ground water above the invert of the sewer shall be divided by 2.31 to establish the pounds of pressure that shall be added to the internal air pressure used for the test.

3. Wait at least two (2) minutes for air temperature in the test segment to stabilize while internal air pressure remains a minimum of 3.5 psig above ground water pressure.
4. Bleed internal air pressure to exactly 3.5 psig above ground water pressure.
5. Accurately determine the elapsed time for internal pressure to drop to 3.0 psig above ground water pressure.
6. The air test is acceptable if elapsed time is no less than shown by the following table:

<u>PIPE DIAMETER</u>	<u>ELAPSED TIME</u> <u>Minutes/100 feet</u>
6-Inch	.7
8-Inch	1.2
10-Inch	1.5
12-Inch	1.8
15-Inch	2.1
18-Inch	2.4

- B. Air test shall not be required on pipe larger than 18 inches in diameter.
- C. Permanently correct excessive leakage determined by air testing, and repeat operations until Engineer witnesses a successful test on each line segment in accordance with ASTM F1417. If the pipe installation fails to meet these requirements, the Contractor shall determine at his/her own expense, the source or sources of leakage, and he/she shall repair (if the extent and type of repairs proposed by the Contractor is approved by GCDWR) or replace all defective materials or workmanship. Final acceptance of each section or run of sewer tested shall not be issued until leakage has been reduced to rates not exceeding the maximum specified. The Contractor shall furnish all facilities and personnel for conducting tests. All wyes, tees, or end of side sewer stubs shall be plugged with flexible joint caps, or acceptable alternate, securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

3.16 SAFETY PRECAUTIONS

- A. The low pressure air test may be dangerous to personnel if a line is over pressured or plugs are installed improperly. It is extremely important that the plugs be installed so as to prevent their sudden expulsion. Observe the following safety precautions:
 1. No one shall be allowed in the manholes during testing.
 2. Install all plugs securely.
 3. When lines are to be tested, it may be necessary that the plugs be braced as an added safety factor.

- 4. Do not over pressurize the lines.
 - B. Final acceptance of each section or run of sewer tested shall not be issued until leakage has been reduced to rates not exceeding the maximum specified herein as permissible.
 - C. The required measurements for leakage shall be made by the Engineer, but the Contractor shall furnish all labor, materials, and equipment; including hose, weirs, and water supply, as may be necessary in making test. No direct or separate payment shall be made for these tests but the cost thereof shall be included in the Unit Prices Bid for pipe installation.
- 3.17 STORAGE
- A. Store pipe on a flat surface so the barrel is evenly supported. Do not stack higher than 4 feet. For extended storage, PVC pipe must be covered with an opaque material to shield it from the sun's rays. Bells must be stacked in opposing directions on alternate rows so they are not supporting the full load.
- 3.18 TELEVISION INSPECTION
- A. During the progress of construction and upon completion of the same, GCDWR shall inspect, by closed circuit television, all sewers inclusive for leakage, faulty joints, or faulty pipe. The Contractor shall not remove temporary access roads, bridges, and creek crossings until authorized to do so by the Engineer.

END OF SECTION 33 31 00

SECTION 34 41 16.10

TRAFFIC CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Materials
2.2	Worker Safety Apparel
2.3	Traffic Control Devices
3.1	Maintaining Traffic
3.2	Traffic Control

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Submittal Procedures (01 33 00).
2. Exploratory Excavations (02 32 19).
3. Paving Removal (02 41 13.13)
4. Utility Line Removal (02 41 13.23)
5. Removal of Construction Material (02 42 11)
6. Clearing and Grubbing (31 11 00)
7. Excavation and Fill (31 23 00).
8. Erosion and Sedimentation Controls (31 25 00).
9. Asphalt Paving (32 12 16)
10. Sidewalks, Curbs, and Gutters (32 16 13)
11. Roadway Construction (34 71 00)

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all materials, equipment, and labor (including employment of off-duty Gwinnett County Police Officer(s)), necessary to maintain traffic control during construction. This Work shall consist of furnishing, installing, maintaining, and removing necessary traffic signs, pedestrian signs, barricades, lights, signals, cones, pavement markings, and other traffic control devices, as specified by MUTCD,

indicated on the Drawings, or as directed by the Engineer or GCDWR; and shall include flagging and other means for guidance and protection of vehicular, worker, and pedestrian traffic, and shall include both maintaining existing devices and installing additional devices through the Work Zone.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show in detail, the type, number, and location of all traffic control measures to be used in the execution of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Unless otherwise specified, all materials furnished for traffic control shall meet the requirements of the Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, Sections 148 and 150, latest edition; Georgia Department of Transportation, Special Provision, Section 150-Traffic Control, latest edition; and the Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

2.2 WORKER SAFETY APPAREL

- A. All workers within the right-of-way who are exposed to traffic or to work vehicles and construction equipment shall wear high-visibility safety apparel that meets the Performance Class for the risk exposure.

2.3 TRAFFIC CONTROL DEVICES

- A. All traffic control devices used during the execution of the Work shall meet the Standards utilized in the Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

PART 3 - EXECUTION

3.1 MAINTAINING TRAFFIC

- A. All working operations of the Contractor, Subcontractors, and/or their agents or employees must be subordinated to the free and unobstructed use of the highway, and structures encountered in the prosecution of the Work under this item.
- B. The Contractor shall proceed with the Work in such manner as shall permit regular transaction of business by the GCDOT and/or property owner without delay or danger

to life or property, and shall place necessary barricades, warning signs, signals, lights, and if necessary, flaggers or Police Officer(s) for the protection of the traveling public.

- C. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel, and shall give a minimum of twenty-four (24) hour notice to owner(s)/tenant(s) of private drives before interfering with them.
- D. In making open-cut street crossings, Contractor shall not block more than one-half (½) of the street at a time. Whenever possible, Contractor shall widen the shoulder on the opposite side of the street to facilitate traffic flow.

3.2 TRAFFIC CONTROL

- A. Contractor's proposed plan of operation shall supplement the approved traffic control plan as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- B. All traffic control devices shall be in an acceptable condition when first installed on the Project and shall be maintained throughout the construction period. All unacceptable traffic control devices shall be replaced within twenty-four (24) hours.
- C. In the execution of the Work, if it becomes necessary to remove any existing signs, markers, etc., they shall be removed, stored and reinstalled as directed by the Engineer or GCDWR, to line and grade in the same condition as when removed.
- D. All temporary traffic control devices shall be removed within seven (7) calendar days after completion of construction.
- E. When necessary to provide a safe work zone for the Contractor and GCDWR employees, off-duty Police Officer(s) may be utilized to assist in maintaining safe traffic control. Use of Police Officer(s) shall be used when safety necessary, in areas of high traffic volume, installation in roadways, road closures and lane closures, or in areas of low visibility. The Contractor shall contact the Gwinnett County Police Department Uniform Division Office at (770) 513-5820 to schedule an off-duty Police Officer(s). Arrangements for Police Officer(s) must be made a minimum of forty-eight (48) hours prior to the Work to allow time for Police Officer(s) to be scheduled. Depending on the situation, the Police Officer(s) onsite may request additional Police Officer(s), if needed.

END OF SECTION 34 41 16.10

SECTION 34 71 00
ROADWAY CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Materials
3.1	General Conditions
3.2	Materials and Workmanship
3.3	Restoring Driveway and Parking Area Pavements
3.4	Roadway Permits
3.5	Restoring Roadway Pavements

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Submittal Procedures (01 33 00)
2. Removal of Construction Material (02 42 11)
3. Paving Removal (02 41 13.13)
4. Cast-in-Place Concrete (03 30 00).
5. Excavation and Fill (31 23 00).
6. Asphalt Paving (32 12 16).
7. Sidewalks, Curbs, and Gutters (32 16 13)
8. Traffic Control (34 41 16.10)

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. Gwinnett County Department of Transportation Standard Specifications.
 1. Where section numbers are identified throughout this specification, the reference is to the Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, latest edition.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all labor, equipment, and materials necessary to restore all pavements (parking areas, driveways, sidewalks, curbs, gutters, etc.) of whatever

construction and irrespective of the type, which may be damaged, disturbed, or required to be removed in the process of the Work.

- B. These items shall include in general, but without limitation, all necessary concrete, reinforcing steel, stone, gravel, asphalt and other bituminous material necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. The Contractor shall furnish samples, manufacturer's product data, test reports, and material certifications as required above in Paragraph 1.1.B RELATED SECTIONS.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. For asphalt and other bituminous paving, refer to Specification SECTION 32 12 16 ASPHALT PAVING, PART 2 – PRODUCTS.
- B. For concrete paving, sidewalks, curbs, and gutters, refer to Specification SECTION 32 16 13 SIDEWALKS, CURBS, AND GUTTERS, PART 2 – PRODUCTS.

PART 3 - EXECUTION

3.1 GENERAL CONDITIONS

- A. Contractor's attention is directed to the provisions of Specification SECTION 31 23 00 EXCAVATION AND FILL, Paragraph 3.1 BACKFILLING, requiring Final and Sub-base backfill and compaction of backfill under areas to be paved. Any settlement which may occur during the Warranty Period of one (1) year following Substantial Completion certification, shall be corrected at the Contractor's expense, including repaving and/or replacing of streets, curbs, gutters, parking areas, and driveways which settle during the Warranty Period.
- B. The Contractor shall repave all areas over trenches in public streets as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR, promptly after completion of Final and Sub-base backfill to provide full use of the street with a minimum of delay.
- C. No additional payment shall be made for excavation or disposal of excavated material required for placement, or removal of backfill placed above the required elevation of the pavement or for preparation of sub grade, and the cost thereof shall be considered as being included in the Unit Prices Bid for paving and curbing items.

- D. Should settlements, cracks, or other indications of failure appear in adjoining pavements, the adjoining damaged paving shall be removed per provisions of SECTION 02 41 13.13 PAVING REMOVAL, Paragraph 3.1 TRENCH PAVING REMOVAL, to the extent necessary to secure firm, undisturbed bearing, and shall be repaved to Standards as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative.
- E. Where necessary to cut a concrete sidewalk, driveway, or parking area, entire slabs or sections shall be removed and replaced to an edge of paving or joint, unless otherwise directed by GCDWR.
- F. The Contractor shall replace all sidewalks removed or disturbed by the process of the Work in accordance with SECTION 32 16 13 SIDEWALKS, CURBS, AND GUTTERS. Sidewalks shall be constructed to the same dimensions and materials as were originally placed. The sub-base shall be thoroughly rolled or tamped and shall be wet just before, if necessary, concrete is placed, but shall show no pools of water.
- G. The Contractor shall restore all curbs, combination curbs and gutters, which have been removed or disturbed in the process of the Work in accordance with SECTION 32 16 13 SIDEWALKS, CURBS, AND GUTTERS. Curbs and gutters shall be made to conform accurately in size, line, grade, and materials as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR. In restoring curbs and gutters, the subsoil and foundation material shall be compacted as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative, so as to prevent any settlement of concrete curb and/or gutter.
- H. In paved areas, the Contractor shall adjust all utility structures (manhole frame/cover, vault tops, valve boxes, etc.) to final grade per provisions of SECTION 33 05 16.13 PRECAST CONCRETE UTILITY STRUCTURES.

3.2 MATERIALS AND WORKMANSHIP

- A. Materials to be used in the repair and restoration of pavements, driveways, sidewalks, and curbs and gutters shall be as specified above in this section in Paragraph 2.1 MATERIALS. All materials removed during the excavation of the Work shall be disposed of by the Contractor per provisions of SECTION 02 42 11 REMOVAL OF CONSTRUCTION MATERIAL. All workmanship shall be first class.

3.3 RESTORING DRIVEWAY AND PARKING AREA PAVEMENTS

- A. The Contractor shall restore driveway and parking area pavements removed or disturbed during construction. After the pipe has been laid, appurtenant work constructed and backfill completed, the Contractor shall furnish, place and maintain wherever the pavements have been removed or damaged in the process of the Work, asphaltic concrete surfaces, concrete surfaces, or stone surfaces as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR. Driveways and parking areas shall be constructed as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative, but concrete shall not be less than 4 inches thick. Surface finish is to match existing; edges are to be saw cut in straight lines, both horizontally and vertically; expansion joints to

be used as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative. In general, concrete driveways shall be replaced from back of curb to a point ten (10) back from back of curb, or to the closet expansion joint nearest the construction disturbance. The limits of this type of restoration shall be approved by GCDWR prior to construction of that area in order to determine payment quantities.

- B. All Concrete shall conform to Specification SECTION 03 30 00 CAST-IN-PLACE CONCRETE, Paragraph 2.1 CONCRETE.

3.4 ROADWAY PERMITS

- A. The Contractor's attention is called to the requirements that Contractor must obtain all road opening permits from GCDOT, and must assist GCDWR in obtaining all permits required by the Georgia Department of Transportation.
- B. All fees shall be borne by the Contractor.

3.5 RESTORING ROADWAY PAVEMENTS

- A. The Contractor shall restore roadway pavements removed or disturbed during construction. After the pipe has been laid, appurtenant work constructed, and backfill completed, the Contractor shall furnish, place, restore and maintain wherever the pavements or road surfaces have been removed or damaged in the process of the Work, asphaltic concrete surfaces, concrete surfaces, or stone surfaces as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative.
- B. All roadway restoration shall be done, and all highway utilities and traffic controls are to be maintained, in accordance with the laws, ordinances, rules, regulations and Standards, including the use of standard signs, of the jurisdictional authority in which such pavement is located. The Contractor shall provide all such bonds or checks, which may be required by the highway authorities to ensure proper restoration of paved areas, at no cost to GCDWR. All road closures and detours must be submitted and approved by the authorities within whose jurisdiction they are located.
- C. The Contractor shall resurface the entire street from curb to curb, or any other area as directed by the Engineer or GCDWR. Asphaltic concrete paving shall conform to the requirements of SECTION 32 12 16 – ASPHALT PAVING.
- D. If prior to the expiration of the Warranty Period, the asphalt, concrete or stone road surfaces within the lines of excavation, or adjacent thereto, shall have been damaged or injured, due to undermining, or for any other cause which may be attributed to the Work by the Contractor, then the Contractor shall remove such damaged or injured surfaces, foundations of same, and all loose earth. Contractor shall then backfill and compact damaged area as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative, and furnish, place, and maintain an asphalt, concrete or stone road surface until the Warranty Period has expired.

- E. Asphalt, concrete or stone road surfaces, which the Contractor is required to replace, shall at the expiration of the Warranty Period, be in as good or better condition than at the time of Contract award.
- F. All cuts required in restoring pavements shall be made by channeling machine, pneumatic tools, or such other methods as shall furnish a clean, straight cut both horizontally and vertically, in the pavement and pavement base without undue shattering.

END OF SECTION 34 71 00

APPENDIX 'A'

SUPPLEMENTAL SPECIFICATIONS

SECTION A-01 22 15
SUPPLEMENTAL MEASUREMENT AND PAYMENT
BID PROJECTS

PART 1 – GENERAL

1.1 SUMMARY

- A. This section defines the 48-inch PCCP Replacement (Loganville Highway to Grayson Tank) Bid Item(s) of Work listed on the Bid Form Description as Supplemental Measurement and Payment numbers, and the method of determining payment for each said item. Payment shall be made for each Bid Item based on the description in this Specification Section.
- B. Bid Prices included on the Bid Form shall be full compensation for all materials, labor, equipment, tools, construction equipment and machinery, heat, utilities, transportation, taxes, overhead, markup, incidentals and services necessary for the execution and completion of the Work in the Contract Documents to be performed under this Contract. For the Work described, the unit price, actual used and installed quantities of each bid item shall be measured in the field and certified by the Engineer and/or GCDWR upon completion of construction in the manner set forth for each item in this and other sections of the Specifications. Payment for all items listed on the Bid Form will constitute full compensation for all Work as specified, indicated on the Drawings, or as directed by the Engineer or GCDWR.
- C. The Contractor shall assist and fully cooperate with the Engineer and/or GCDWR to determine proper measurement of quantities for each item providing complete and reasonable backup documentation as requested by the Engineer and/or GCDWR to substantiate payment due.

1.2 BID ITEMS

- A. The following item SUP#1 comprise items in the Bid Total as listed on the Bid Form.

SUP#1. SPECIFICATION SECTION NO. 02 41 13.23, UNIT PRICE FOR
ABANDONMENT OF EXISTING COMBINATION AIR/VAC VAULT

MEASUREMENT: The number of abandoned vaults paid for under this item shall be the actual number of vaults shown on the drawings or authorized by GCDWR to be abandoned.

PAYMENT: The Unit Prices Bid for each (EA) existing vault to be abandoned shall include removal and off-site disposal of the existing manhole top and riser section, removal and disposal of the air vent and combination air/vac valve, removal and disposal of any water or solids within the existing manhole, breaking bottom of manhole, placement of geotextile fabric, placement of #57 stone, earth

fill above manhole, repair and/or replacement of any existing site improvement features such as retaining walls, fences, etc. that were disturbed during access to the manhole or during the abandonment work, and all other necessary tools, equipment, labor and materials to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR

END OF SECTION A-01 22 15

APPENDIX 'B'

SUPPLEMENTAL REPORTS

May 1, 2014

Mr. Michael Efeyini
Project Manager
Gwinnett County Department of Water Resources
684 Winder Highway
Lawrenceville, Georgia 30045

Subject: **Report of Geotechnical Exploration
48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)
Gwinnett County, Georgia
GCDWR Project No. M-0735-59
AMEC Project No. 6162-14-0083**

Dear Mr. Efeyini:

AMEC Environment & Infrastructure, Inc. (AMEC) has completed the authorized geotechnical exploration for the 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank) project in Gwinnett County, Georgia. The work was performed in accordance with our proposal dated March 26, 2014. This report discusses our understanding of the project, describes our exploratory procedures and results, and presents our conclusions and recommendations related to the project design and construction.

We appreciate the opportunity of working with you on this project and look forward to our continued association during the construction phase of the project. Please contact us if you have any questions about this report or if we may be of further service.

Sincerely,

AMEC ENVIRONMENT & INFRASTRUCTURE, INC.

A handwritten signature in blue ink, appearing to read "R. Jeffrey Smith".

R. Jeffrey Smith, P.E.
Associate Engineer

A handwritten signature in blue ink, appearing to read "David H. Sikes".

David H. Sikes, P.E.
Associate Engineer

Copies Submitted: Addressee (4)

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APPENDIX

Figure 1 – Boring Location Plan (B-1 through B-8)
 Figure 2 – Boring Location Plan (B-9 through B-18)
 Figure 3 – Boring Location Plan (B-19 through B-27)
 Key to Symbols and Descriptions
 Soil Test Boring Records (27)
 Laboratory Testing Procedures
 Laboratory Testing Results
 ASFE Information About Geotechnical Reports

1.0 PROJECT INFORMATION

Based on plan and profile sheets provided by Cardozo Engineering, we understand that the Gwinnett County Department of Water Resources (GCDWR) plans to replace/realign approximately 10,000 linear feet of existing 48-inch PCCP water main with 48-inch ductile iron pipe (DIP) water main from the intersection of Brannan Boulevard and Herring Road to the intersection of Grayson-New Hope Road and Chandler Road. In addition, about 5,500 linear feet of new 8-inch water line will be installed along Grayson-New Hope Road from Green Gate Place to Chandler Road. Based on the provided plan and profile sheets, the 48-inch water main and 8-inch water line will be installed using cut and cover techniques and will require excavations typically ranging from 10 to 15 feet deep.

2.0 EXPLORATION PROCEDURES

The objective of this exploration was to evaluate subsurface conditions along the water main and water line alignments and to provide recommendations related to the geotechnical aspects of design and construction. To accomplish this objective, soil test borings were drilled along the alignments and laboratory testing was performed on soil samples collected from the borings. The following paragraphs describe these services in more detail.

2.1 SOIL TEST BORINGS

Subsurface conditions along the alignments were explored by drilling 27 soil test borings, designated B-1 through B-27. The borings were drilled on roadway shoulders on 200- to 400-foot centers and were extended to depths ranging from 15 to 20 feet or until reaching auger refusal. Figure 1, Boring Location Plan, in the Appendix presents the approximate locations of the borings. These locations were established in the field by AMEC personnel by taping distances from existing site features shown on the provided plans.

The borings were drilled using an ATV-mounted drill rig to advance continuous flights of hollow-stem augers. At regular intervals, standard penetration tests were conducted through the center of the auger with a standard 1.4-inch I.D., 2-inch O.D., split-barrel sampler. The sampler was first seated six inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "standard penetration resistance". The standard penetration resistance, when properly evaluated, is an index to soil strength and consistency.

Soil samples obtained from the standard penetration tests were visually classified and logged in the field by the driller. Representative portions of the soil samples were returned to the laboratory for stratification by a geotechnical engineer. Soil descriptions were performed in general accordance with the Unified Soil Classification System (USCS) using visual/manual methods.

Detailed descriptions of the materials encountered in each boring, along with graphic representations of standard penetration testing, are presented on the individual Soil Test Boring Records included in the Appendix. These records represent our interpretation of the subsurface conditions based on the field logs and an engineering examination of the samples. The lines designating interfaces between various strata represent approximate boundaries only, as transitions between materials may be gradual. Where topography was available on the provided plans, surface elevations were approximated to the nearest foot and labeled on the boring records.

2.2 LABORATORY TESTING

Laboratory testing was performed on bulk samples of auger cuttings collected from several borings. Laboratory testing procedures and results are presented in the Appendix. The following summarizes the type and number of tests performed.

- Thirteen (13) Standard Proctor compaction tests.
- Thirteen (13) natural moisture content tests.

3.0 GENERAL SITE AND SUBSURFACE CONDITIONS

3.1 AREA AND SITE GEOLOGY

The project site is located in the Piedmont Physiographic Province, an area underlain by metamorphic rocks with localized igneous intrusions. The residual soils encountered in the Piedmont are the product of in-place chemical and physical weathering of the parent rock. Typically, weathering is most advanced at the surface and decreases with depth. This results in a residual soil profile consisting of clayey soils near the surface underlain by sandy silts and silty sands that generally become harder or denser with depth to the top of the parent bedrock. In deeper residual soil strata, the banded structural appearance of the parent rock is typically evident. At some sites, the residual soil profile has been altered by excavation and fill placement associated with previous construction activities.

The boundary between soil and rock in the Piedmont is typically not sharply defined. A transitional zone termed partially weathered rock (PWR) is normally found overlying bedrock. PWR is defined for engineering purposes as residual material with a standard penetration resistance exceeding 100 blows per foot (bpf). Weathering is facilitated by fractures, joints, and by the presence of less resistant rock types. Consequently, the profiles of PWR and hard rock can be quite irregular and erratic, even over short horizontal distances. It is not unusual for lenses and boulders of hard rock and zones of PWR to be present within the soil mantle, well above the general bedrock level.

3.2 GENERAL SITE STRATIGRAPHY

The borings typically encountered grass/leaves/topsoil at the surface. Beneath the surficial materials, the borings encountered fill, residuum, PWR, rock, and groundwater. The following paragraphs provide generalized descriptions of the subsurface conditions encountered.

Fill: Twelve of the borings (B-1, B-2, B-6, B-7, B-9, B-10, B-13, B-15, B-16, B-17, B-23, and B-24) encountered existing fill to depths ranging from about 3 to 12 feet below grade. The fill materials were often described as soft to firm silty clays, clayey silts, and sandy silts and very loose to loose clayey sands and silty sands. At boring B-1, the fill materials also included a thick layer of graded aggregate base. Standard penetration resistance values in the fill typically ranged from 3 to 8 bpf. In some cases, the fill was noted to be moist to wet and/or organic-stained.

Residuum: Beneath the surficial materials or any existing fill, the borings encountered residuum. The residual soils were often described as firm to stiff silty clays, clayey silts and sandy silts and loose to medium dense clayey sands and silty sands. Standard penetration resistances in the residuum typically ranged from 5 to 20 bpf.

PWR: Six of the borings (B-9, B-12, B-14, B-19, B-20, and B-26) encountered PWR. The PWR was encountered at depths ranging from about 1 to 13 feet below grade. The PWR was described as very dense silty sand and exhibited standard penetration resistances ranging from 50 blows for 5 inches to 50 blows for 1 inch.

Rock: Eight of the borings (B-9, B-11, B-12, B-13, B-14, B-19, B-20, and B-26) also encountered rock. Rock was encountered at depths ranging from 3 to 17 feet below grade. In addition, numerous rock outcrops were observed from along the 8-inch water line alignment from about Stations 7+00 to 12+00.

Groundwater: Seven of the borings (B-1, B-7, B-11, B-12, B-23, B-25, and B-27) encountered the groundwater table. Groundwater was encountered at depths ranging from 4 to 15 feet below grade at the time of drilling and from 4 to 12 feet below grade after several hours.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the previously discussed project information, our observations at the site, interpretation of the field data, and our experience with similar subsurface conditions. Subsurface conditions in unexplored locations may vary from those encountered at the specific boring locations. If the proposed construction scheme should vary significantly from that previously described, we request the opportunity to review these recommendations and amend them if necessary.

4.1 DIFFICULT EXCAVATION

Based on the subsurface conditions encountered and the proposed construction, we anticipate that construction excavations will encounter fill, residuum, PWR, and rock. Our past experience is that soils described as very stiff or medium dense can usually be excavated with conventional excavation equipment. The excavation difficulty of PWR is largely dependent on the capability of the equipment used and the conditions under which it is excavated. Hard or dense soils that can readily be loosened by a large single-tooth ripper may require blasting when in a confined excavation. Sound rock will require blasting in all excavations. To help avoid disputes over what materials should be classified as rock, the following performance-type definition of rock is provided for trench excavation.

Blast Rock - Any material that cannot be excavated with a backhoe having a bucket curling force rated at not less than 25,700 pounds (Caterpillar Model 225 or equivalent), and occupying an original volume of at least one-half ($\frac{1}{2}$) cubic yard.

4.2 GROUNDWATER MANAGEMENT

Seven of the borings (B-1, B-7, B-11, B-12, B-23, B-25, and B-27) encountered stabilized groundwater levels at depths ranging from 4 to 12 feet below grade. In these areas, the groundwater table is expected to be near and sometimes higher than proposed inverts. Based on these conditions, we anticipate that groundwater control/dewatering will be necessary during construction in these areas. Gravity flow ditches and pumping from sumps located in and around trench excavations will be necessary to locally drawdown the groundwater table and allow utility installation to proceed under relatively dry conditions. To reduce construction conflicts with the groundwater table, we recommend that proposed inverts be reevaluated to determine if shallower profiles are possible.

We note that groundwater levels are subject to seasonal, climatic, and other variations and may be different at other times than those stated in this report. The rainy season for Atlanta is primarily winter to early spring although monthly rainfall amounts in excess of 3 inches are common throughout the year. Our experience is that annual groundwater fluctuations of 3 to 5 feet are possible, with the higher levels typically occurring in winter and early spring. Given the potential variation of the groundwater table, it may be prudent to reevaluate groundwater levels immediately prior to construction excavations. This reevaluation can best be accomplished by excavating a few test pits around the water main and water line alignments. The use of test pits will not only allow identification of water levels, but will also provide a means of lowering the water using pumps.

4.3 CONSTRUCTION EXCAVATIONS

For safety, construction excavations should be either sloped or braced in accordance with OSHA regulations for Occupational Safety and Health Standards – Excavations (29 CFR Part 1926). We anticipate that most construction excavations can be safely completed using sloping techniques. Temporary slopes in soil should be constructed no steeper than 1 horizontal to 1 vertical (1H:1V) provided there are no surcharge loads from adjacent storage, vehicle traffic, etc. Temporary slopes in rock can be constructed steeper ($\frac{1}{2}$ H:1V) or even vertical in some cases depending on the quality of the rock.

During construction, temporary slopes should be regularly inspected for signs of movement or unsafe condition. Slopes should also be covered for protection from rain and surface run-off should be diverted away from slopes. If sufficient space is not available along the shoulder of the road, trench boxes/shields may be appropriate instead of slopes.

4.4 PIPE SUPPORT

Utility excavations will generally expose residual soils, PWR, and rock. These materials are generally considered suitable to support the proposed water main and water line. However, for excavations near or below the groundwater table, water-softening can sometimes occur in residual soils and PWR depending on the physical characteristics of the material, length of exposure, and rate of water infiltration into the excavation. If water-softening occurs, undercutting of the water-softened materials should be performed and the materials replaced with a granular bedding material such as #57 stone. In the area of boring B-1 where groundwater is shallow, similar techniques appear to have been used in the past based on the presence of a significant amount of graded aggregate base at the boring location. For excavations that expose sound rock, the use of a granular bedding layer should also be considered to provide a cushion for the pipe and to eliminate stress concentrations associated with sharp rock edges.

4.5 BACKFILL PLACEMENT

Trench backfill in structural and landscaped areas should be compacted to at least 95 and 90 percent, respectively, of the maximum dry density as determined by the Standard Proctor compaction test (ASTM D698). Due to the confined nature of utility excavations, portable compaction equipment and the use of thin lifts (4 inches) may be necessary to achieve the specified compaction. During backfill placement, the soil moisture should be maintained within 3 and 5 percent of the optimum moisture content to allow compaction to at least 95 and 90 percent, respectively. The contractor should be prepared to adjust the backfill moisture content as necessary to achieve the specified compaction. We recommend that backfill placement be witnessed by a qualified soil technician and that density and moisture testing be performed to verify that the specified compaction is achieved.

Utility trench backfill should generally be low to moderate plasticity soil (PI less than 30) and free of deleterious materials and large rock fragments. Some fill soils encountered by the borings will not be suitable for reuse due to organic-staining. In general, the remaining soils encountered by the borings will be suitable for reuse as backfill but will require drying. Based on the laboratory Standard Proctor and natural moisture content testing, the majority of the soils exhibit natural moistures in excess of 5 percent over optimum. The following table presents the results of Standard Proctor and natural moisture content testing.

Table 1. Standard Proctor and Natural Moisture Content Test Results

Boring	Proctor Maximum Dry Density (pcf)	Proctor Optimum Moisture (%)	Natural Moisture (%)	% Difference
B-2	112.0	14.8	23.5	+8.7
B-4	113.2	15.1	19.5	+4.4
B-5	109.7	16.7	21.8	+5.1
B-7	113.9	13.6	27.1	+13.5
B-9	117.1	13.0	15.4	+2.4
B-12	109.1	16.6	32.3	+15.7
B-15	115.7	13.3	23.1	+9.8
B-16	113.0	13.6	25.8	+12.2
B-18	113.7	13.8	20.1	+6.3
B-20	119.3	10.0	4.8	-5.2
B-23	117.7	11.9	19.9	+8.0
B-25	112.8	12.5	36.4	+23.9
B-27	118.4	12.6	17.8	+5.2

4.6 THRUST BLOCKS

The most significant factor used to counteract thrust in a pipe at horizontal bends and at tees is the horizontal bearing resistance of the soil. The horizontal bearing resistance is realized as passive pressure and is generated as the pipe attempts to move into the soil. The same resistance is also produced on the back side of a thrust block.

For the residual soils encountered by the borings, we recommend that a horizontal bearing resistance of 1,000 pounds per square foot (psf) be used in design. In areas where fill is present, the horizontal bearing resistance will be significantly reduced due to the weaker condition of the fill and will require fill recompaction or undercutting and replacement to provide adequate support and resistance for thrust blocks.

5.0 QUALIFICATION OF RECOMMENDATIONS

Our evaluation has been based on our understanding of the site and project information and the data obtained during our field exploration. The general subsurface conditions used were based on interpolation of the subsurface data between the boring locations. The nature and extent of variations between the boring locations may not become evident until the course of construction. If such variations then appear evident, it will be necessary to re-evaluate the recommendations of this report after on-site observations of the conditions.

Our professional services have been performed, our findings derived, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied. This company is not responsible for the conclusions, opinions, or recommendations of others based on these data. The assessment of site environmental conditions or the detection of pollutants in the soil or groundwater was beyond the scope of this exploration.

May 1, 2014

Mr. Michael Efeyini
Project Manager
Gwinnett County Department of Water Resources
684 Winder Highway
Lawrenceville, Georgia 30045

Subject: **Report of Geotechnical Exploration
48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)
Gwinnett County, Georgia
GCDWR Project No. M-0735-59
AMEC Project No. 6162-14-0083**

Dear Mr. Efeyini:

AMEC Environment & Infrastructure, Inc. (AMEC) has completed the authorized geotechnical exploration for the 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank) project in Gwinnett County, Georgia. The work was performed in accordance with our proposal dated March 26, 2014. This report discusses our understanding of the project, describes our exploratory procedures and results, and presents our conclusions and recommendations related to the project design and construction.

We appreciate the opportunity of working with you on this project and look forward to our continued association during the construction phase of the project. Please contact us if you have any questions about this report or if we may be of further service.

Sincerely,

AMEC ENVIRONMENT & INFRASTRUCTURE, INC.



R. Jeffrey Smith, P.E.
Associate Engineer



David H. Sikes, P.E.
Associate Engineer

Copies Submitted: Addressee (4)

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1.0 PROJECT INFORMATION

Based on plan and profile sheets provided by Cardozo Engineering, we understand that the Gwinnett County Department of Water Resources (GCDWR) plans to replace/realign approximately 10,000 linear feet of existing 48-inch PCCP water main with 48-inch ductile iron pipe (DIP) water main from the intersection of Brannan Boulevard and Herring Road to the intersection of Grayson-New Hope Road and Chandler Road. In addition, about 5,500 linear feet of new 8-inch water line will be installed along Grayson-New Hope Road from Green Gate Place to Chandler Road. Based on the provided plan and profile sheets, the 48-inch water main and 8-inch water line will be installed using cut and cover techniques and will require excavations typically ranging from 10 to 15 feet deep.

2.0 EXPLORATION PROCEDURES

The objective of this exploration was to evaluate subsurface conditions along the water main and water line alignments and to provide recommendations related to the geotechnical aspects of design and construction. To accomplish this objective, soil test borings were drilled along the alignments and laboratory testing was performed on soil samples collected from the borings. The following paragraphs describe these services in more detail.

2.1 SOIL TEST BORINGS

Subsurface conditions along the alignments were explored by drilling 27 soil test borings, designated B-1 through B-27. The borings were drilled on roadway shoulders on 200- to 400-foot centers and were extended to depths ranging from 15 to 20 feet or until reaching auger refusal. Figure 1, Boring Location Plan, in the Appendix presents the approximate locations of the borings. These locations were established in the field by AMEC personnel by taping distances from existing site features shown on the provided plans.

The borings were drilled using an ATV-mounted drill rig to advance continuous flights of hollow-stem augers. At regular intervals, standard penetration tests were conducted through the center of the auger with a standard 1.4-inch I.D., 2-inch O.D., split-barrel sampler. The sampler was first seated six inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "standard penetration resistance". The standard penetration resistance, when properly evaluated, is an index to soil strength and consistency.

Soil samples obtained from the standard penetration tests were visually classified and logged in the field by the driller. Representative portions of the soil samples were returned to the laboratory for stratification by a geotechnical engineer. Soil descriptions were performed in general accordance with the Unified Soil Classification System (USCS) using visual/manual methods.

Detailed descriptions of the materials encountered in each boring, along with graphic representations of standard penetration testing, are presented on the individual Soil Test Boring Records included in the Appendix. These records represent our interpretation of the subsurface conditions based on the field logs and an engineering examination of the samples. The lines designating interfaces between various strata represent approximate boundaries only, as transitions between materials may be gradual. Where topography was available on the provided plans, surface elevations were approximated to the nearest foot and labeled on the boring records.

2.2 LABORATORY TESTING

Laboratory testing was performed on bulk samples of auger cuttings collected from several borings. Laboratory testing procedures and results are presented in the Appendix. The following summarizes the type and number of tests performed.

- Thirteen (13) Standard Proctor compaction tests.
- Thirteen (13) natural moisture content tests.

3.0 GENERAL SITE AND SUBSURFACE CONDITIONS

3.1 AREA AND SITE GEOLOGY

The project site is located in the Piedmont Physiographic Province, an area underlain by metamorphic rocks with localized igneous intrusions. The residual soils encountered in the Piedmont are the product of in-place chemical and physical weathering of the parent rock. Typically, weathering is most advanced at the surface and decreases with depth. This results in a residual soil profile consisting of clayey soils near the surface underlain by sandy silts and silty sands that generally become harder or denser with depth to the top of the parent bedrock. In deeper residual soil strata, the banded structural appearance of the parent rock is typically evident. At some sites, the residual soil profile has been altered by excavation and fill placement associated with previous construction activities.

The boundary between soil and rock in the Piedmont is typically not sharply defined. A transitional zone termed partially weathered rock (PWR) is normally found overlying bedrock. PWR is defined for engineering purposes as residual material with a standard penetration resistance exceeding 100 blows per foot (bpf). Weathering is facilitated by fractures, joints, and by the presence of less resistant rock types. Consequently, the profiles of PWR and hard rock can be quite irregular and erratic, even over short horizontal distances. It is not unusual for lenses and boulders of hard rock and zones of PWR to be present within the soil mantle, well above the general bedrock level.

3.2 GENERAL SITE STRATIGRAPHY

The borings typically encountered grass/leaves/topsoil at the surface. Beneath the surficial materials, the borings encountered fill, residuum, PWR, rock, and groundwater. The following paragraphs provide generalized descriptions of the subsurface conditions encountered.

Fill: Twelve of the borings (B-1, B-2, B-6, B-7, B-9, B-10, B-13, B-15, B-16, B-17, B-23, and B-24) encountered existing fill to depths ranging from about 3 to 12 feet below grade. The fill materials were often described as soft to firm silty clays, clayey silts, and sandy silts and very loose to loose clayey sands and silty sands. At boring B-1, the fill materials also included a thick layer of graded aggregate base. Standard penetration resistance values in the fill typically ranged from 3 to 8 bpf. In some cases, the fill was noted to be moist to wet and/or organic-stained.

Residuum: Beneath the surficial materials or any existing fill, the borings encountered residuum. The residual soils were often described as firm to stiff silty clays, clayey silts and sandy silts and loose to medium dense clayey sands and silty sands. Standard penetration resistances in the residuum typically ranged from 5 to 20 bpf.

PWR: Six of the borings (B-9, B-12, B-14, B-19, B-20, and B-26) encountered PWR. The PWR was encountered at depths ranging from about 1 to 13 feet below grade. The PWR was described as very dense silty sand and exhibited standard penetration resistances ranging from 50 blows for 5 inches to 50 blows for 1 inch.

Rock: Eight of the borings (B-9, B-11, B-12, B-13, B-14, B-19, B-20, and B-26) also encountered rock. Rock was encountered at depths ranging from 3 to 17 feet below grade. In addition, numerous rock outcrops were observed from along the 8-inch water line alignment from about Stations 7+00 to 12+00.

Groundwater: Seven of the borings (B-1, B-7, B-11, B-12, B-23, B-25, and B-27) encountered the groundwater table. Groundwater was encountered at depths ranging from 4 to 15 feet below grade at the time of drilling and from 4 to 12 feet below grade after several hours.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the previously discussed project information, our observations at the site, interpretation of the field data, and our experience with similar subsurface conditions. Subsurface conditions in unexplored locations may vary from those encountered at the specific boring locations. If the proposed construction scheme should vary significantly from that previously described, we request the opportunity to review these recommendations and amend them if necessary.

4.1 DIFFICULT EXCAVATION

Based on the subsurface conditions encountered and the proposed construction, we anticipate that construction excavations will encounter fill, residuum, PWR, and rock. Our past experience is that soils described as very stiff or medium dense can usually be excavated with conventional excavation equipment. The excavation difficulty of PWR is largely dependent on the capability of the equipment used and the conditions under which it is excavated. Hard or dense soils that can readily be loosened by a large single-tooth ripper may require blasting when in a confined excavation. Sound rock will require blasting in all excavations. To help avoid disputes over what materials should be classified as rock, the following performance-type definition of rock is provided for trench excavation.

Blast Rock - Any material that cannot be excavated with a backhoe having a bucket curling force rated at not less than 25,700 pounds (Caterpillar Model 225 or equivalent), and occupying an original volume of at least one-half ($\frac{1}{2}$) cubic yard.

4.2 GROUNDWATER MANAGEMENT

Seven of the borings (B-1, B-7, B-11, B-12, B-23, B-25, and B-27) encountered stabilized groundwater levels at depths ranging from 4 to 12 feet below grade. In these areas, the groundwater table is expected to be near and sometimes higher than proposed inverts. Based on these conditions, we anticipate that groundwater control/dewatering will be necessary during construction in these areas. Gravity flow ditches and pumping from sumps located in and around trench excavations will be necessary to locally drawdown the groundwater table and allow utility installation to proceed under relatively dry conditions. To reduce construction conflicts with the groundwater table, we recommend that proposed inverts be reevaluated to determine if shallower profiles are possible.

We note that groundwater levels are subject to seasonal, climatic, and other variations and may be different at other times than those stated in this report. The rainy season for Atlanta is primarily winter to early spring although monthly rainfall amounts in excess of 3 inches are common throughout the year. Our experience is that annual groundwater fluctuations of 3 to 5 feet are possible, with the higher levels typically occurring in winter and early spring. Given the potential variation of the groundwater table, it may be prudent to reevaluate groundwater levels immediately prior to construction excavations. This reevaluation can best be accomplished by excavating a few test pits around the water main and water line alignments. The use of test pits will not only allow identification of water levels, but will also provide a means of lowering the water using pumps.

4.3 CONSTRUCTION EXCAVATIONS

For safety, construction excavations should be either sloped or braced in accordance with OSHA regulations for Occupational Safety and Health Standards – Excavations (29 CFR Part 1926). We anticipate that most construction excavations can be safely completed using sloping techniques. Temporary slopes in soil should be constructed no steeper than 1 horizontal to 1 vertical (1H:1V) provided there are no surcharge loads from adjacent storage, vehicle traffic, etc. Temporary slopes in rock can be constructed steeper ($\frac{1}{2}$ H:1V) or even vertical in some cases depending on the quality of the rock.

During construction, temporary slopes should be regularly inspected for signs of movement or unsafe condition. Slopes should also be covered for protection from rain and surface run-off should be diverted away from slopes. If sufficient space is not available along the shoulder of the road, trench boxes/shields may be appropriate instead of slopes.

4.4 PIPE SUPPORT

Utility excavations will generally expose residual soils, PWR, and rock. These materials are generally considered suitable to support the proposed water main and water line. However, for excavations near or below the groundwater table, water-softening can sometimes occur in residual soils and PWR depending on the physical characteristics of the material, length of exposure, and rate of water infiltration into the excavation. If water-softening occurs, undercutting of the water-softened materials should be performed and the materials replaced with a granular bedding material such as #57 stone. In the area of boring B-1 where groundwater is shallow, similar techniques appear to have been used in the past based on the presence of a significant amount of graded aggregate base at the boring location. For excavations that expose sound rock, the use of a granular bedding layer should also be considered to provide a cushion for the pipe and to eliminate stress concentrations associated with sharp rock edges.

4.5 BACKFILL PLACEMENT

Trench backfill in structural and landscaped areas should be compacted to at least 95 and 90 percent, respectively, of the maximum dry density as determined by the Standard Proctor compaction test (ASTM D698). Due to the confined nature of utility excavations, portable compaction equipment and the use of thin lifts (4 inches) may be necessary to achieve the specified compaction. During backfill placement, the soil moisture should be maintained within 3 and 5 percent of the optimum moisture content to allow compaction to at least 95 and 90 percent, respectively. The contractor should be prepared to adjust the backfill moisture content as necessary to achieve the specified compaction. We recommend that backfill placement be witnessed by a qualified soil technician and that density and moisture testing be performed to verify that the specified compaction is achieved.

Utility trench backfill should generally be low to moderate plasticity soil (PI less than 30) and free of deleterious materials and large rock fragments. Some fill soils encountered by the borings will not be suitable for reuse due to organic-staining. In general, the remaining soils encountered by the borings will be suitable for reuse as backfill but will require drying. Based on the laboratory Standard Proctor and natural moisture content testing, the majority of the soils exhibit natural moistures in excess of 5 percent over optimum. The following table presents the results of Standard Proctor and natural moisture content testing.

Table 1. Standard Proctor and Natural Moisture Content Test Results

Boring	Proctor Maximum Dry Density (pcf)	Proctor Optimum Moisture (%)	Natural Moisture (%)	% Difference
B-2	112.0	14.8	23.5	+8.7
B-4	113.2	15.1	19.5	+4.4
B-5	109.7	16.7	21.8	+5.1
B-7	113.9	13.6	27.1	+13.5
B-9	117.1	13.0	15.4	+2.4
B-12	109.1	16.6	32.3	+15.7
B-15	115.7	13.3	23.1	+9.8
B-16	113.0	13.6	25.8	+12.2
B-18	113.7	13.8	20.1	+6.3
B-20	119.3	10.0	4.8	-5.2
B-23	117.7	11.9	19.9	+8.0
B-25	112.8	12.5	36.4	+23.9
B-27	118.4	12.6	17.8	+5.2

4.6 THRUST BLOCKS

The most significant factor used to counteract thrust in a pipe at horizontal bends and at tees is the horizontal bearing resistance of the soil. The horizontal bearing resistance is realized as passive pressure and is generated as the pipe attempts to move into the soil. The same resistance is also produced on the back side of a thrust block.

For the residual soils encountered by the borings, we recommend that a horizontal bearing resistance of 1,000 pounds per square foot (psf) be used in design. In areas where fill is present, the horizontal bearing resistance will be significantly reduced due to the weaker condition of the fill and will require fill recompaction or undercutting and replacement to provide adequate support and resistance for thrust blocks.

5.0 QUALIFICATION OF RECOMMENDATIONS

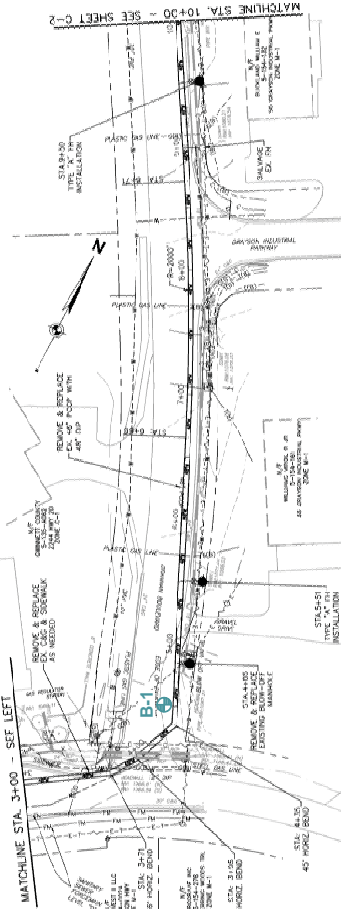
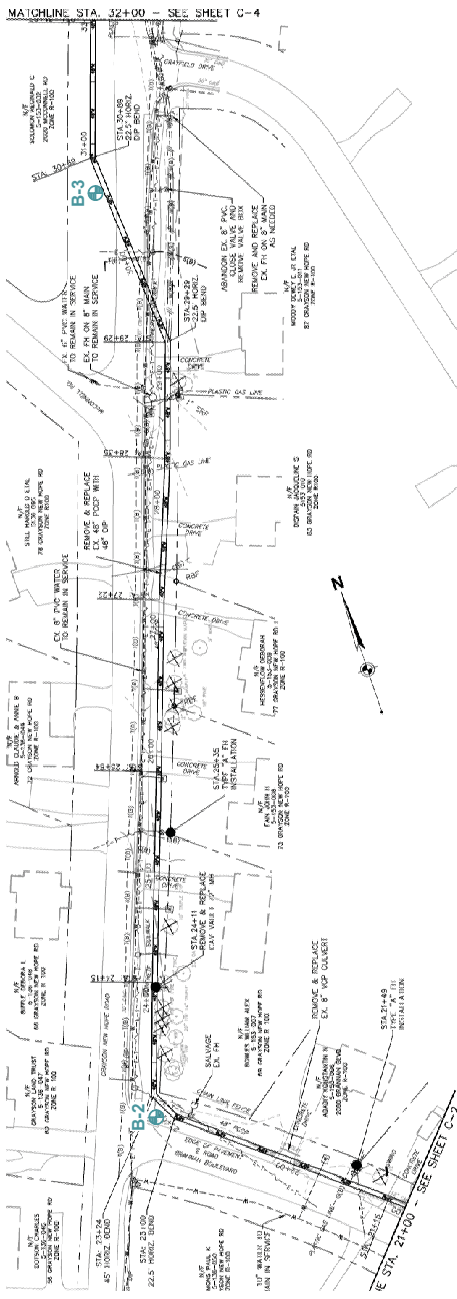
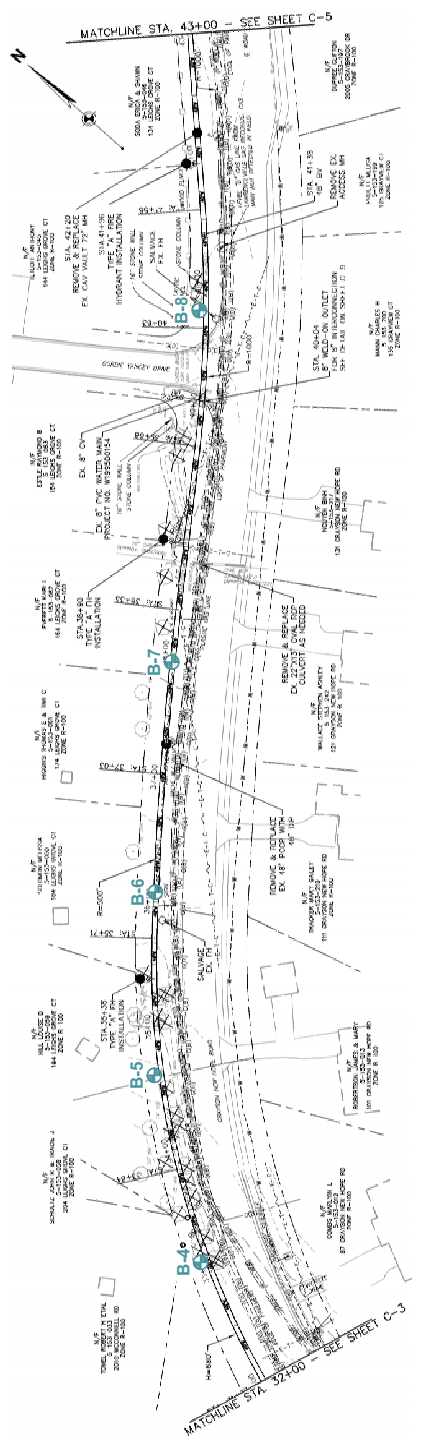
Our evaluation has been based on our understanding of the site and project information and the data obtained during our field exploration. The general subsurface conditions used were based on interpolation of the subsurface data between the boring locations. The nature and extent of variations between the boring locations may not become evident until the course of construction. If such variations then appear evident, it will be necessary to re-evaluate the recommendations of this report after on-site observations of the conditions.

Our professional services have been performed, our findings derived, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied. This company is not responsible for the conclusions, opinions, or recommendations of others based on these data. The assessment of site environmental conditions or the detection of pollutants in the soil or groundwater was beyond the scope of this exploration.

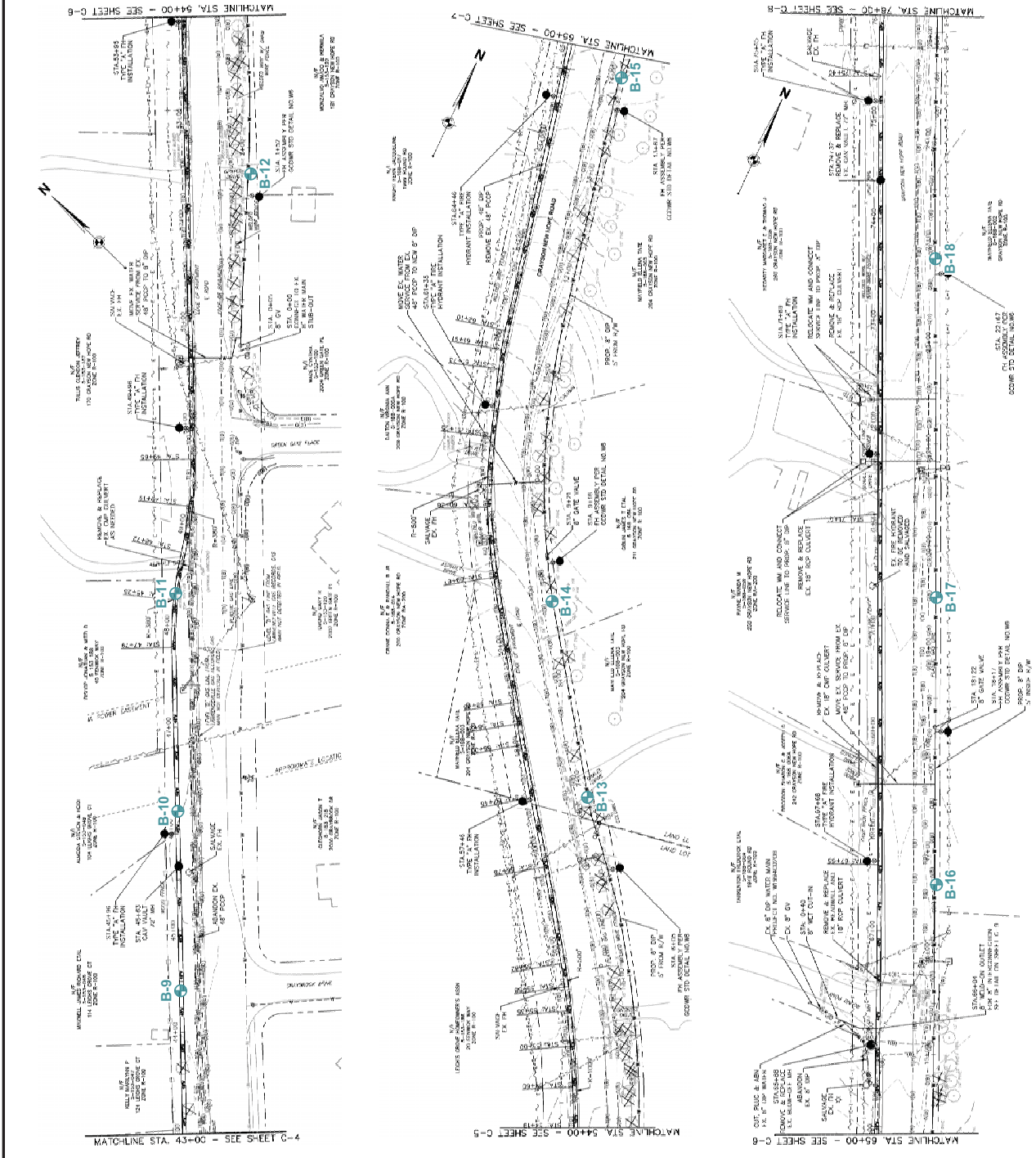


APPENDIX

Figure 1 – Boring Location Plan (B-1 through B-8)
Figure 2 – Boring Location Plan (B-9 through B-18)
Figure 3 – Boring Location Plan (B-19 through B-27)
Key to Symbols and Descriptions
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Source: Water Main Plan and Profile Sheets by Cardozo Engineering, Inc.

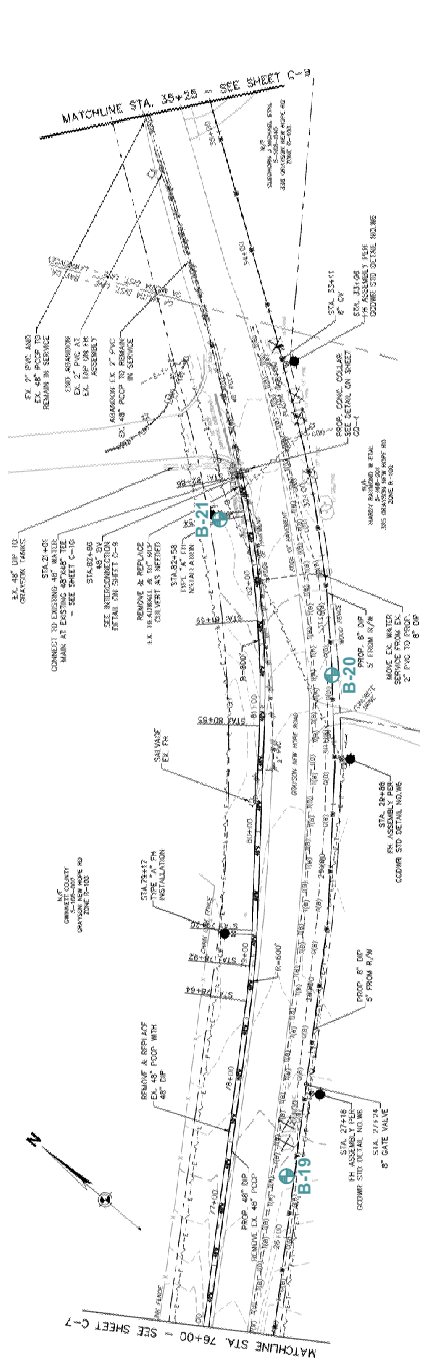
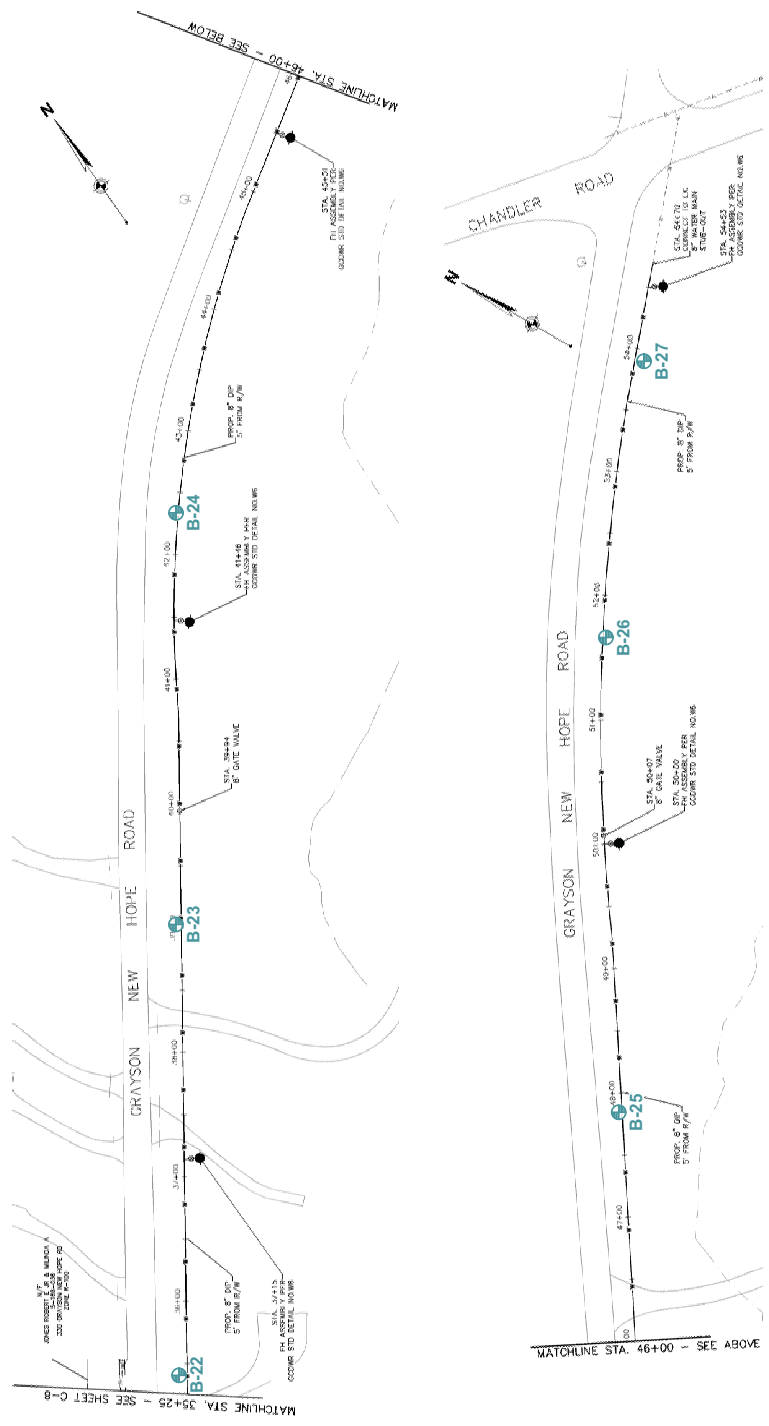


Source: Water Main Plan and Profile Sheets by Cardozo Engineering, Inc.

Figure 2	Prepared By RJS	Reviewed By DHS

48-inch PCP Replacement (Loganville Highway to Grayson Tank) Gwinnett County, Georgia	Project No 6162-14-0083	Date April 2014	Scale 1" = 100'

LEGEND
 Soil Test Boring
 Scale In Feet
 0 50 100



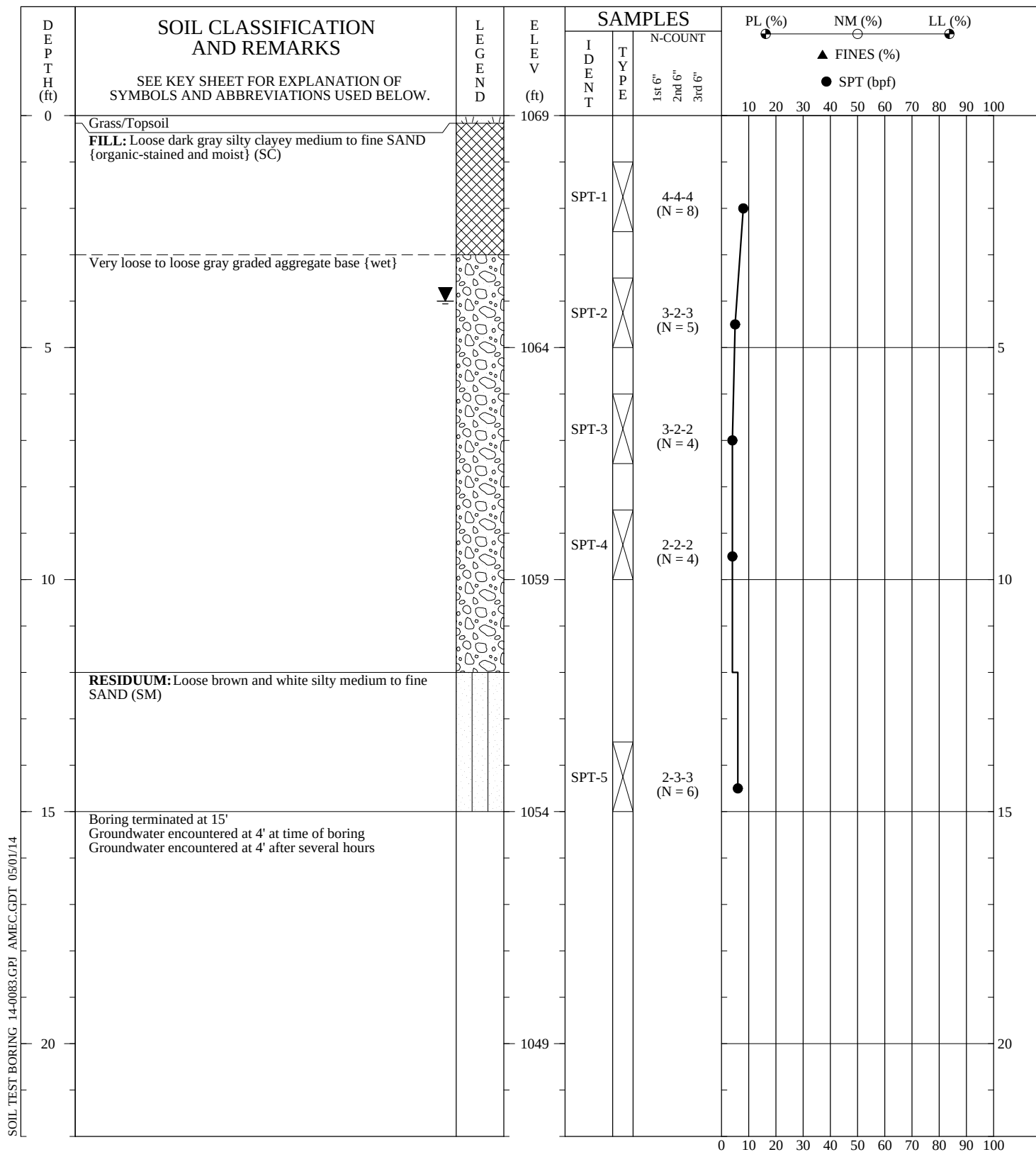
Source: Water Main Plan and Profile Sheets by Cardozo Engineering, Inc.

Figure 3
 Prepared By RJS
 Reviewed By DHS
 Boring Location Plan (B-19 through B-27)

amec
 267 Buford Highway, N.E.
 Atlanta, Georgia 30324

Project No 6162-14-0083
 Date April 2014
 Scale 1" = 100'
 48-inch PCPP Replacement
 (Loganville Highway to Grayson Tank)
 Gwinnett County, Georgia

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	Undisturbed Sample	Auger Cuttings																			
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	 GW	Well graded gravels, gravel - sand mixtures, little or no fines.	 Standard Penetration Test	 Bulk Sample																			
		GRAVELS WITH FINES (Appreciable amount of fines)	 GP	Poorly graded gravels or grave - sand mixtures, little or no fines.	 Rock Core	 Crandall Sampler																			
			 GM	Silty gravels, gravel - sand - silt mixtures.	 Dilatometer	 Pressure Meter																			
			 GC	Clayey gravels, gravel - sand - clay mixtures.	 Packer	 No Recovery																			
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 Sieve Size)	CLEAN SANDS (Little or no fines)	 SW	Well graded sands, gravelly sands, little or no fines.	 Water Table (time of boring)	 Water Table (secondary)																			
		SANDS WITH FINES (Appreciable amount of fines)	 SP	Poorly graded sands or gravelly sands, little or no fines.																					
			 SM	Silty sands, sand - silt mixtures																					
			 SC	Clayey sands, sand - clay mixtures.																					
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)	 ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts and with slight plasticity.	Correlation of Standard Penetration Resistance with Relative Density and Consistency																					
		 CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.																						
		 OL	Organic silts and organic silty clays of low plasticity.	SAND & GRAVEL		SILT & CLAY																			
	SILTS AND CLAYS (Liquid limit GREATER than 50)	 MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	No. of Blows	Relative Density	No. of Blows	Consistency																		
		 CH	Inorganic clays of high plasticity, fat clays	0 - 4	Very Loose	0 - 2	Very Soft																		
				5 - 10	Loose	3 - 4	Soft																		
		 OH	Organic clays of medium to high plasticity, organic silts.	11 - 30	Medium Dense	5 - 8	Firm																		
				31 - 50	Dense	9 - 15	Stiff																		
	 PT	Peat and other highly organic soils.	Over 50	Very Dense	16 - 30	Very Stiff																			
	HIGHLY ORGANIC SOILS					31 - 50	Hard																		
					Over 50	Very Hard																			
BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.					KEY TO SYMBOLS AND DESCRIPTIONS																				
<table><tr><td rowspan="2">SILT OR CLAY</td><td colspan="3">SAND</td><td colspan="2">GRAVEL</td><td rowspan="2">Cobbles</td><td rowspan="2">Boulders</td></tr><tr><td>Fine</td><td>Medium</td><td>Coarse</td><td>Fine</td><td>Coarse</td></tr><tr><td></td><td>No.200</td><td>No.40</td><td>No.10 No.4</td><td>3/4"</td><td>3"</td><td>12"</td><td></td></tr></table> U.S. STANDARD SIEVE SIZE							SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders	Fine	Medium	Coarse	Fine	Coarse		No.200	No.40	No.10 No.4	3/4"	3"
SILT OR CLAY	SAND			GRAVEL		Cobbles		Boulders																	
	Fine	Medium	Coarse	Fine	Coarse																				
	No.200	No.40	No.10 No.4	3/4"	3"	12"																			
Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)																									



DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

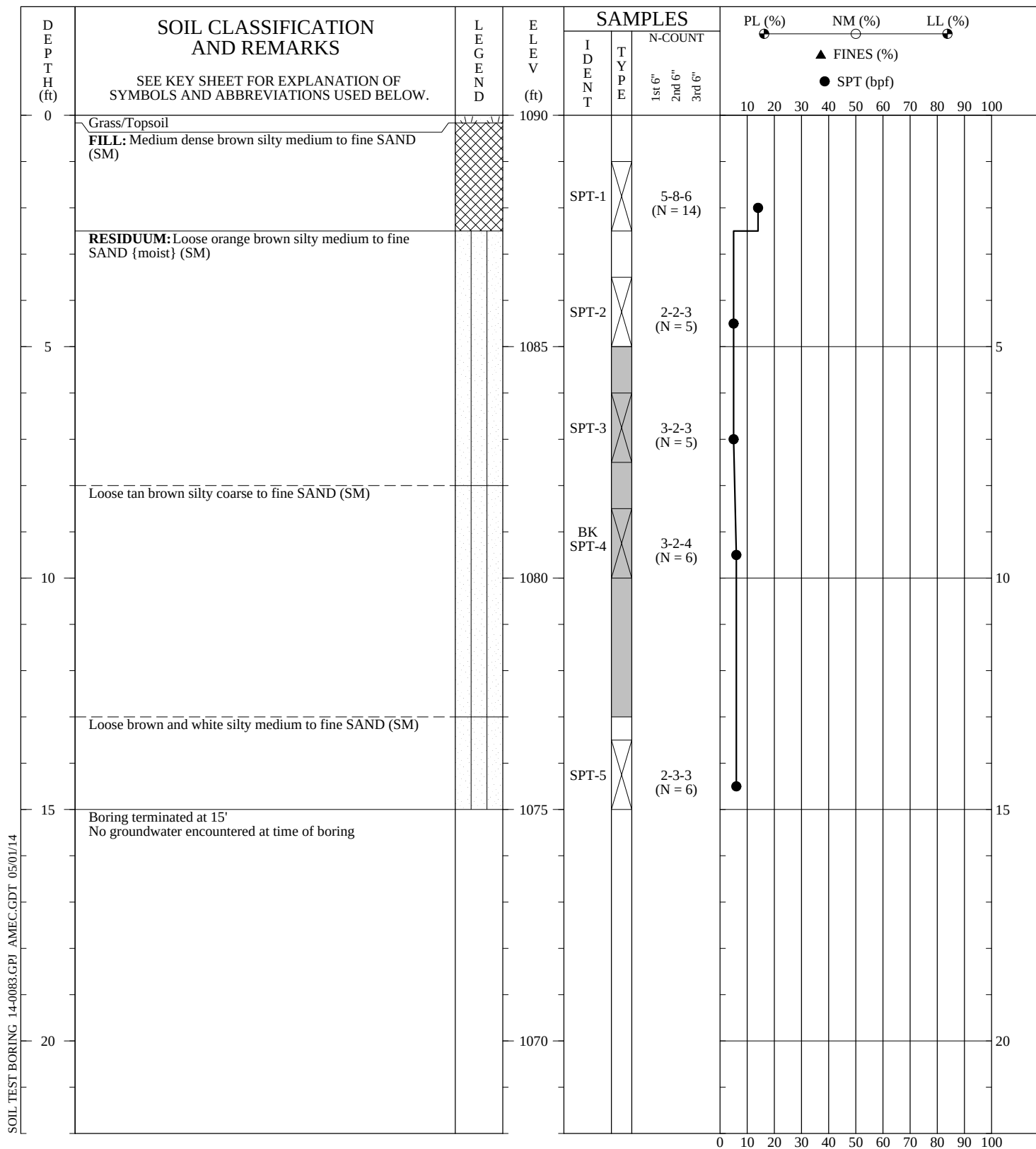
THIS RECORD IS A REASONABLE INTERPRETATION OF
 SUBSURFACE CONDITIONS AT THE EXPLORATION
 LOCATION. SUBSURFACE CONDITIONS AT OTHER
 LOCATIONS AND AT OTHER TIMES MAY DIFFER.
 INTERFACES BETWEEN STRATA ARE APPROXIMATE.
 TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-1
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy
 to Grayson Tank) Gwinnett County, Georgia
DRILLED: April 14, 2014
PROJECT NO.: 6162-14-0083

PAGE 1 OF 1





DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

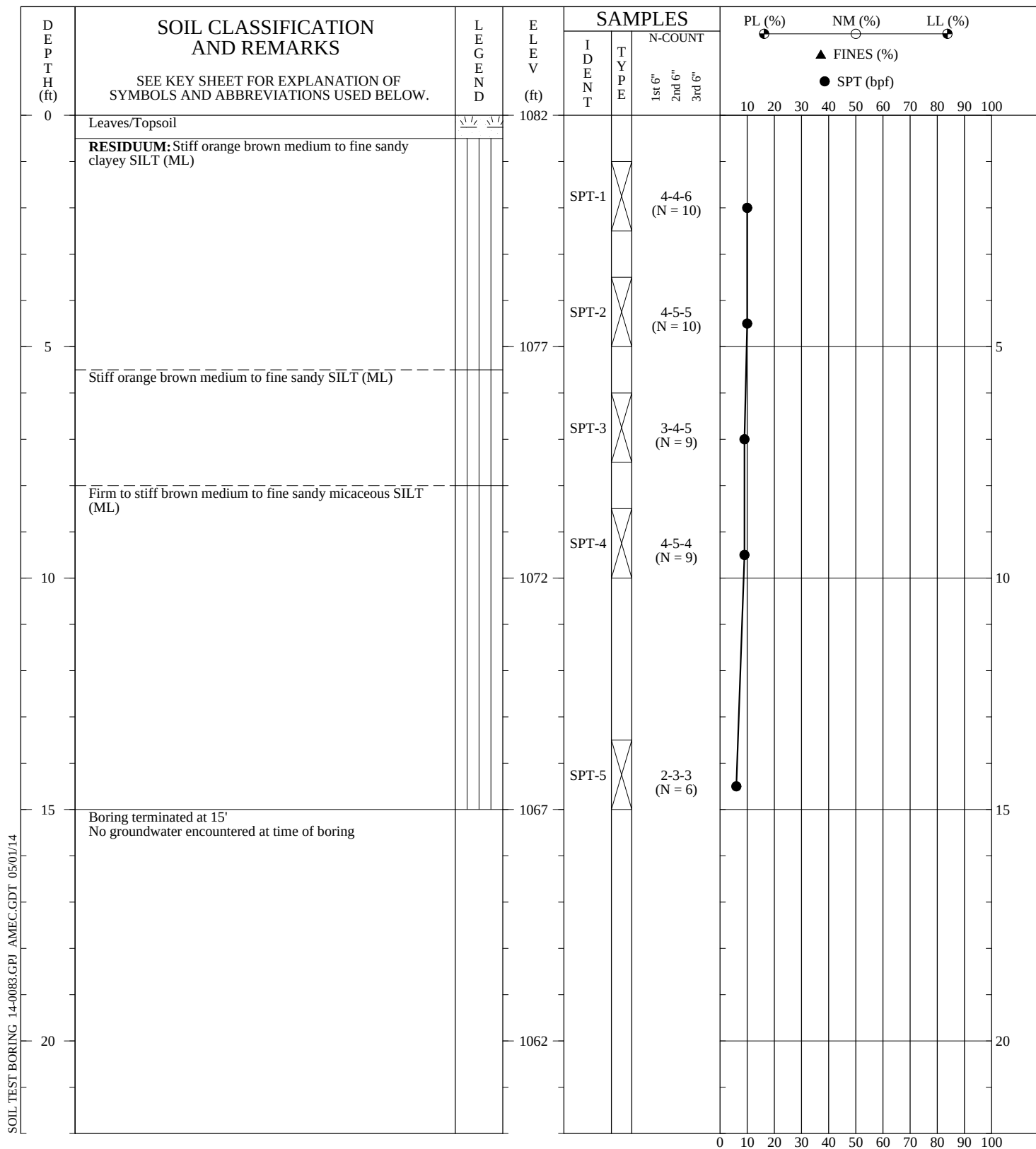
SOIL TEST BORING RECORD

BORING NO.: B-2
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 14, 2014
PROJECT NO.: 6162-14-0083

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THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.





DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

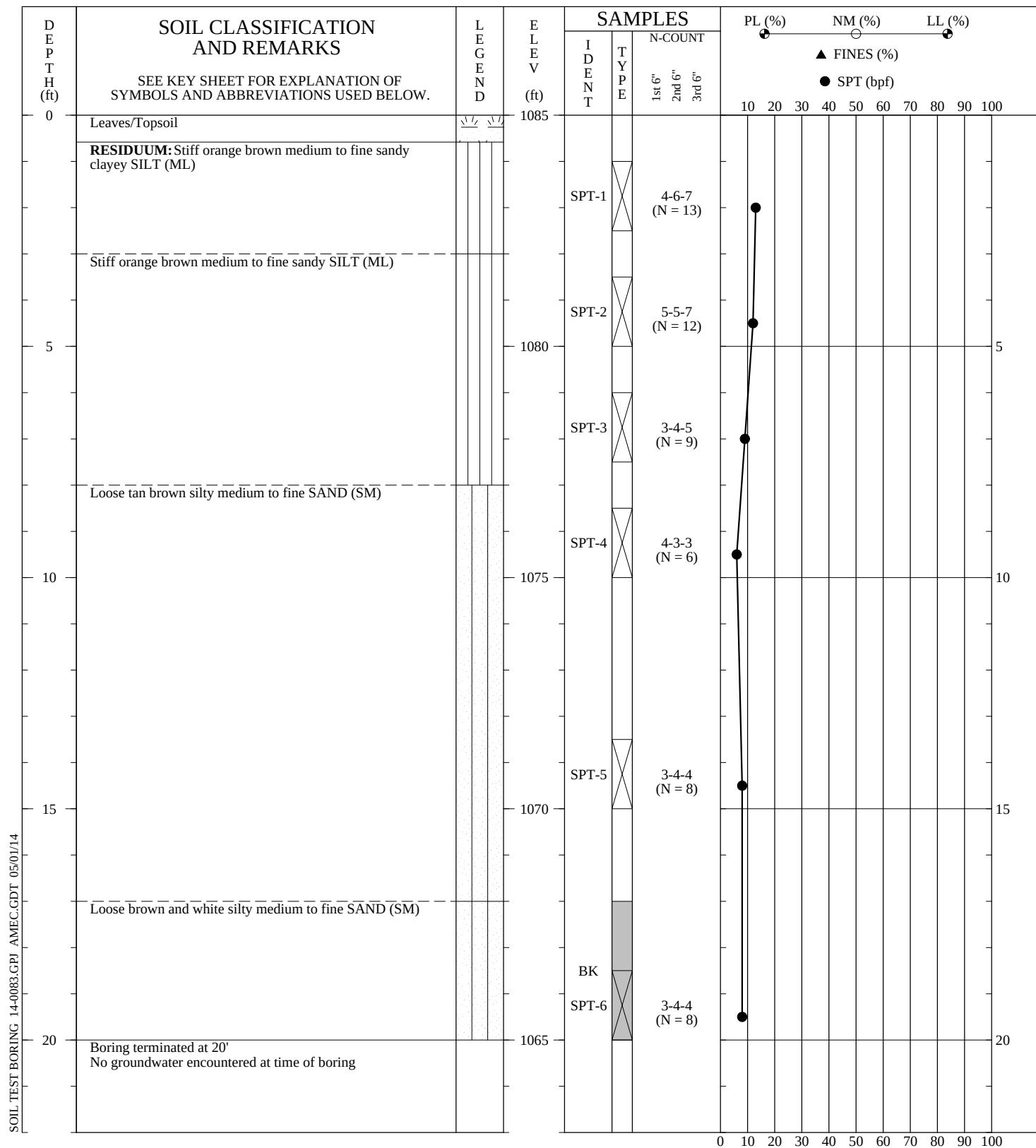
SOIL TEST BORING RECORD

BORING NO.: B-3
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 14, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

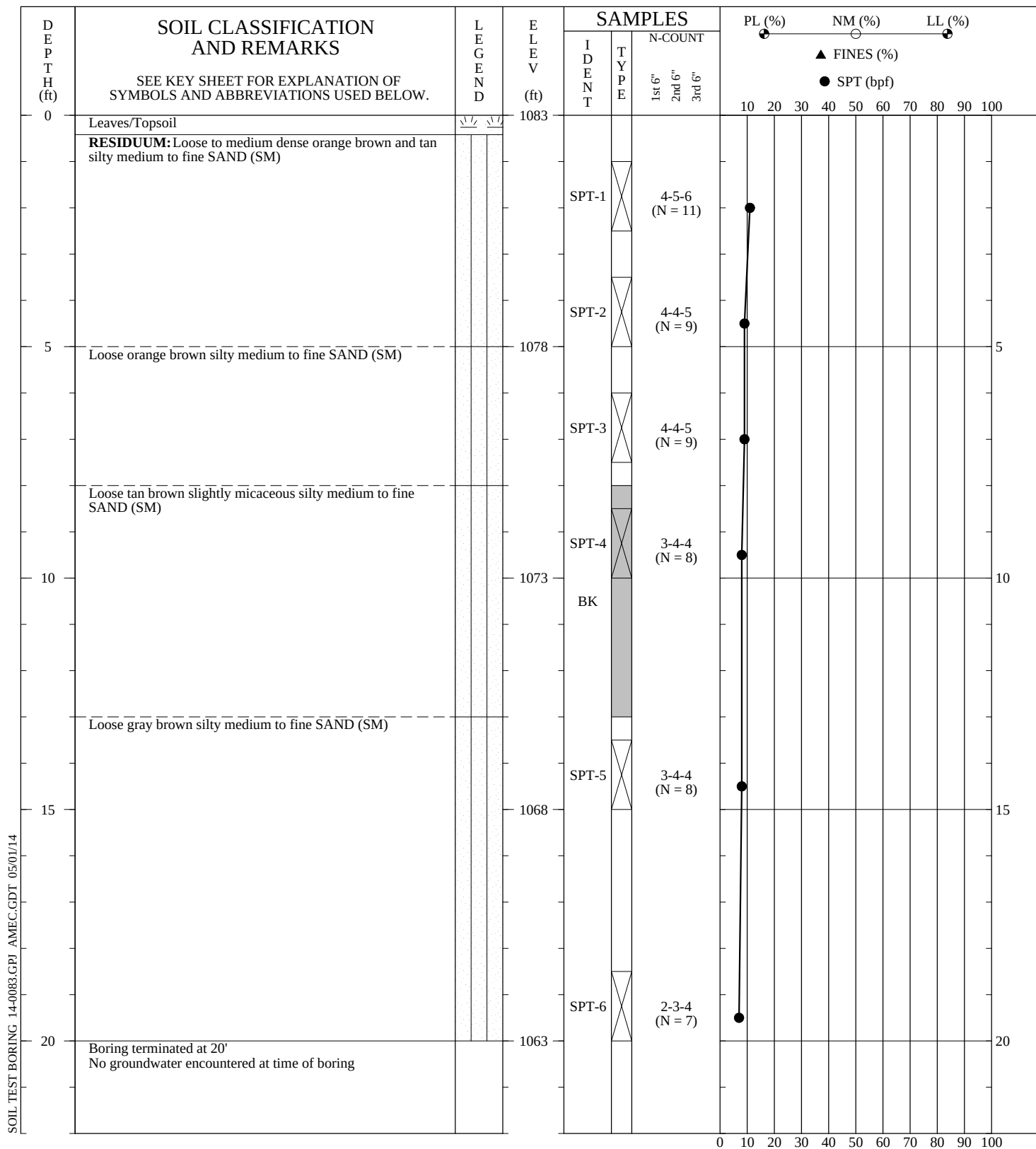
SOIL TEST BORING RECORD

BORING NO.: B-4
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 14, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

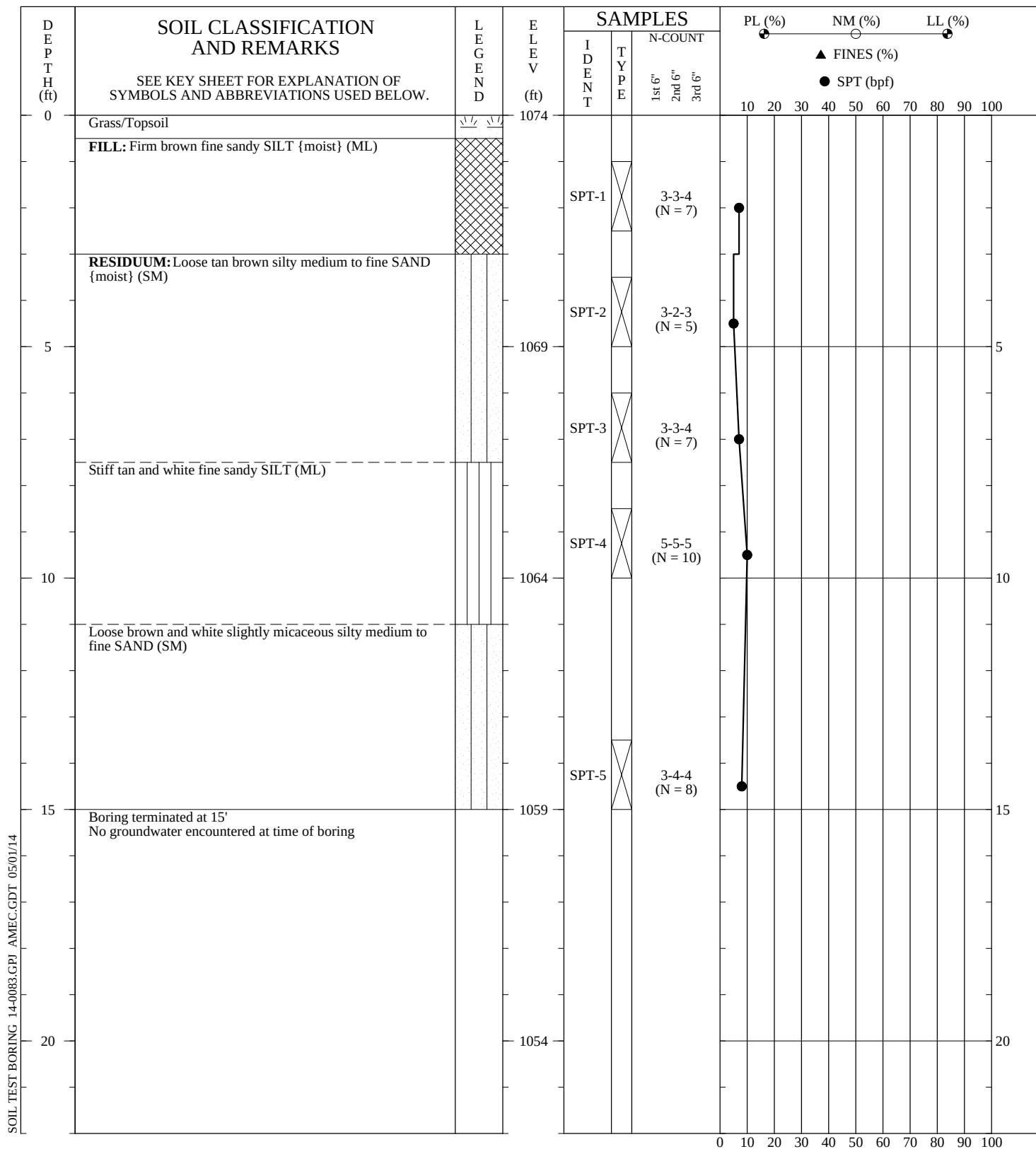
SOIL TEST BORING RECORD

BORING NO.: B-5
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 14, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

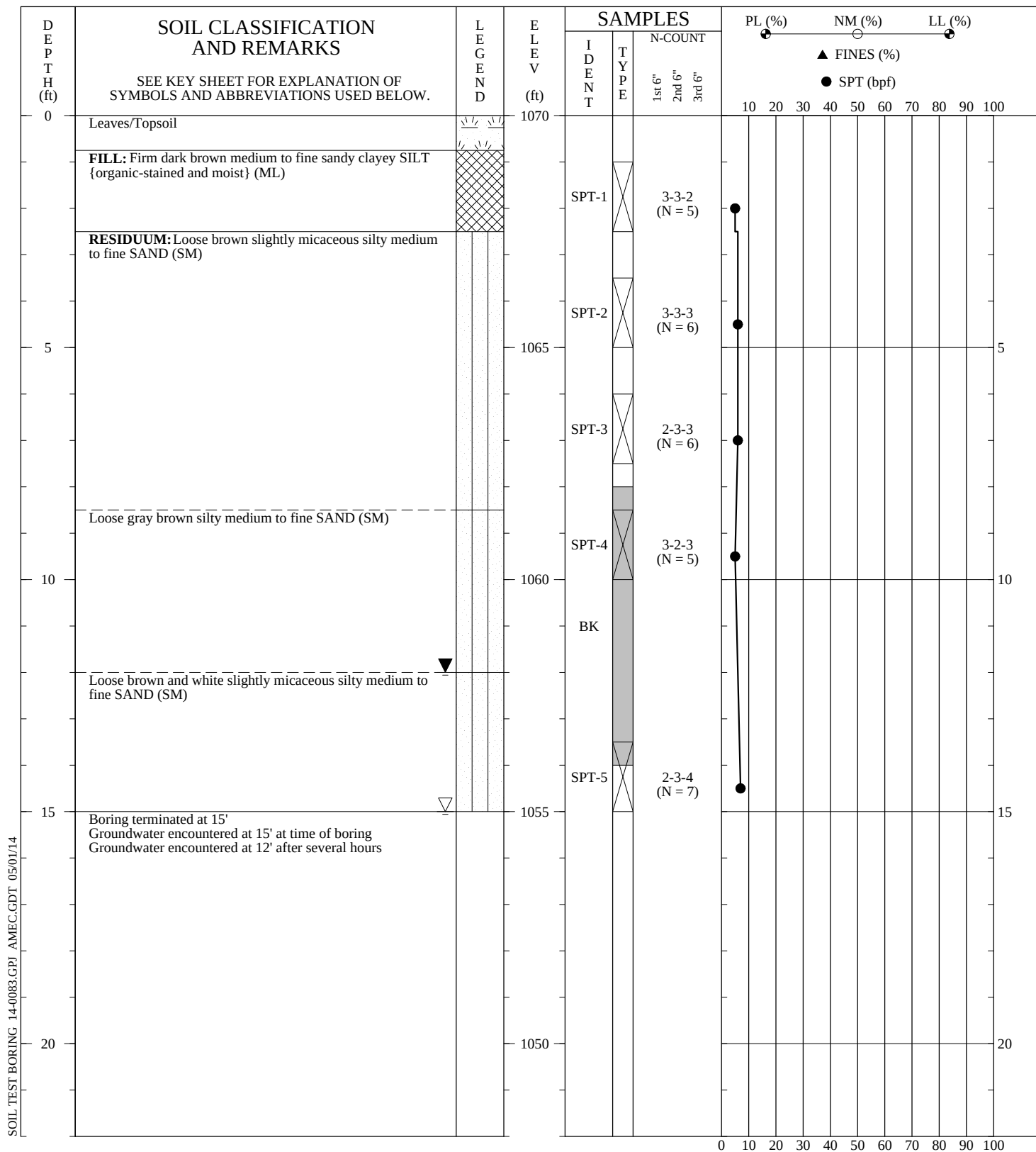
SOIL TEST BORING RECORD

BORING NO.: B-6
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 14, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

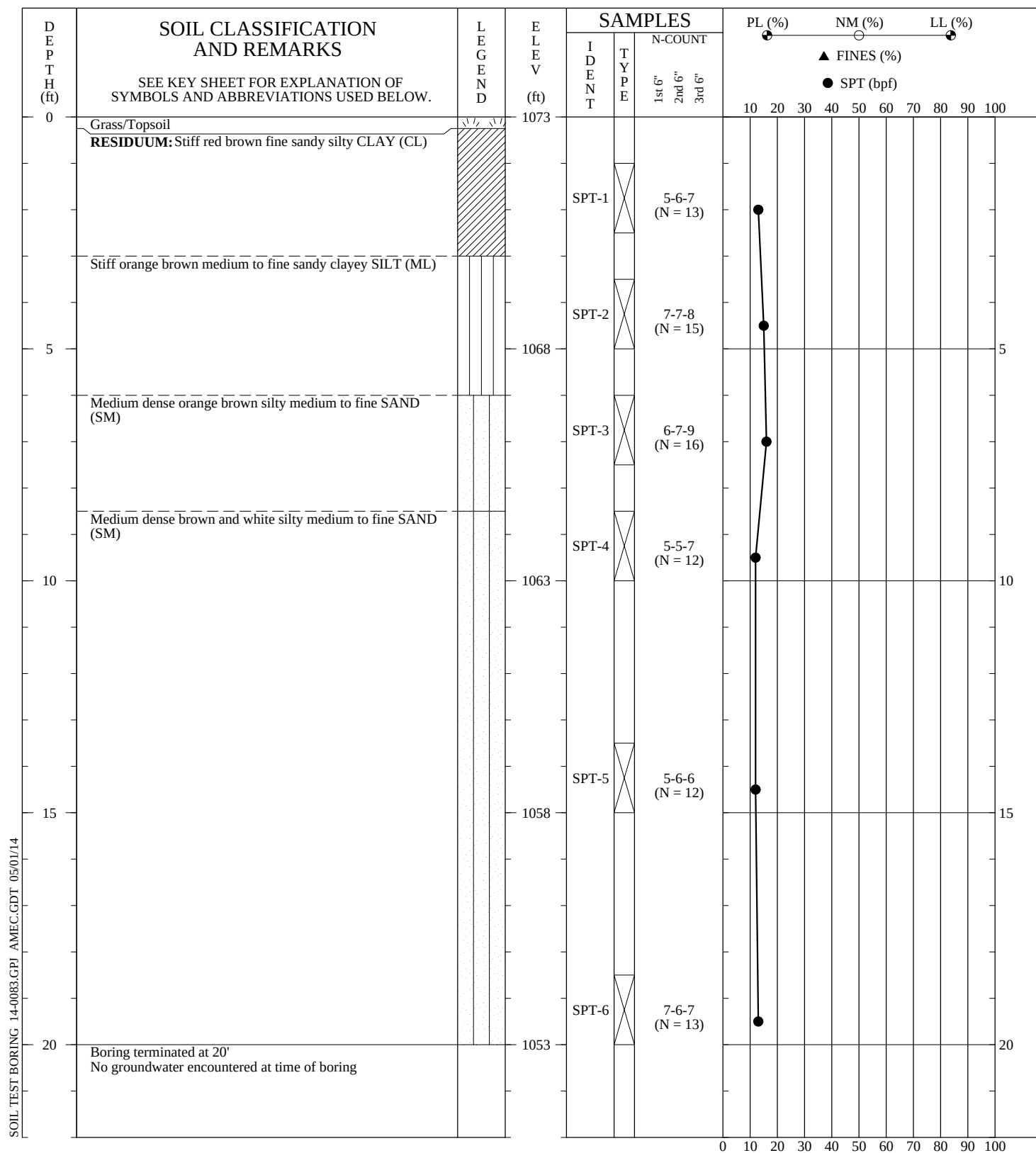
SOIL TEST BORING RECORD

BORING NO.: B-7
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 15, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

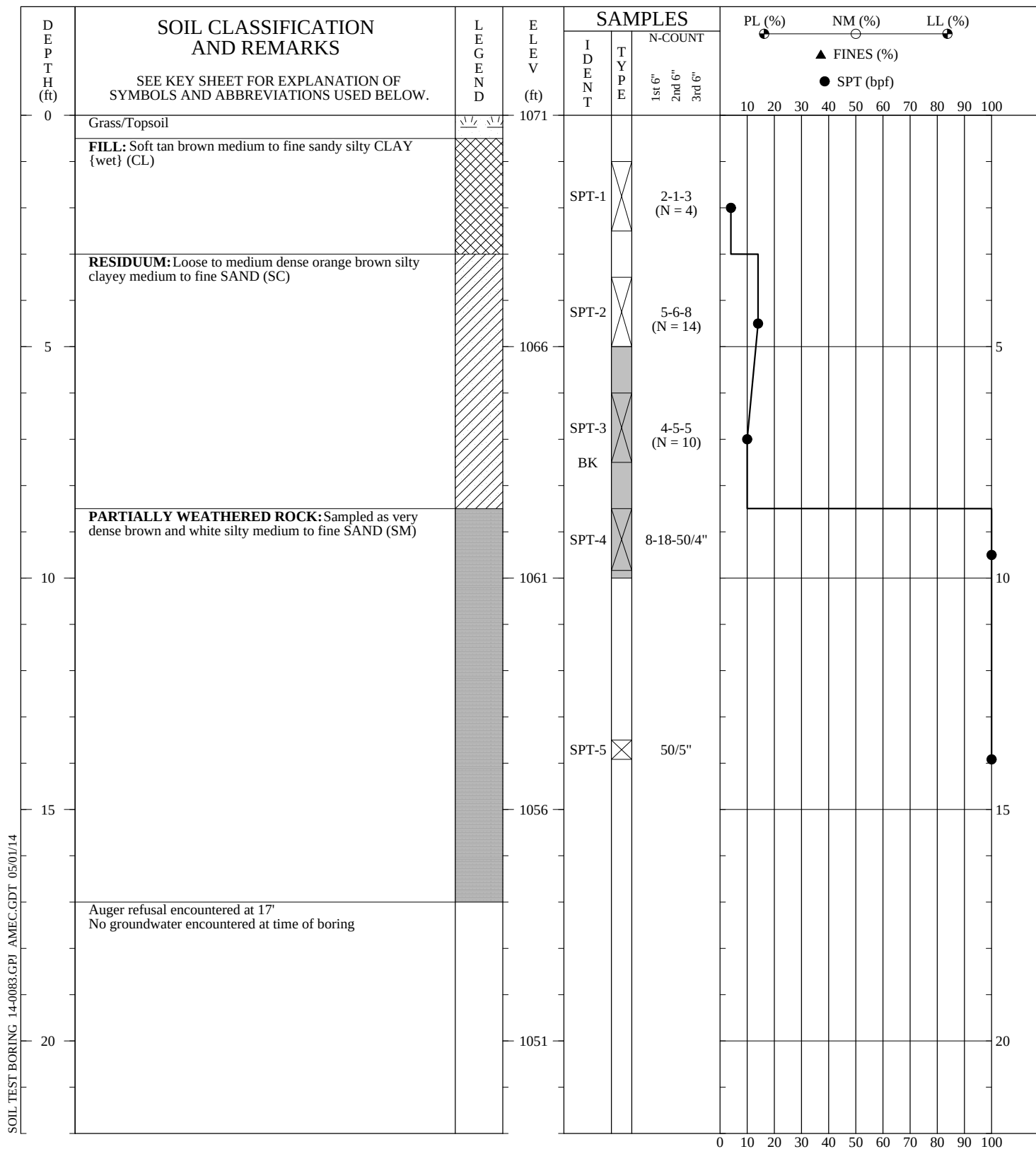
SOIL TEST BORING RECORD

BORING NO.: B-8
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 15, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

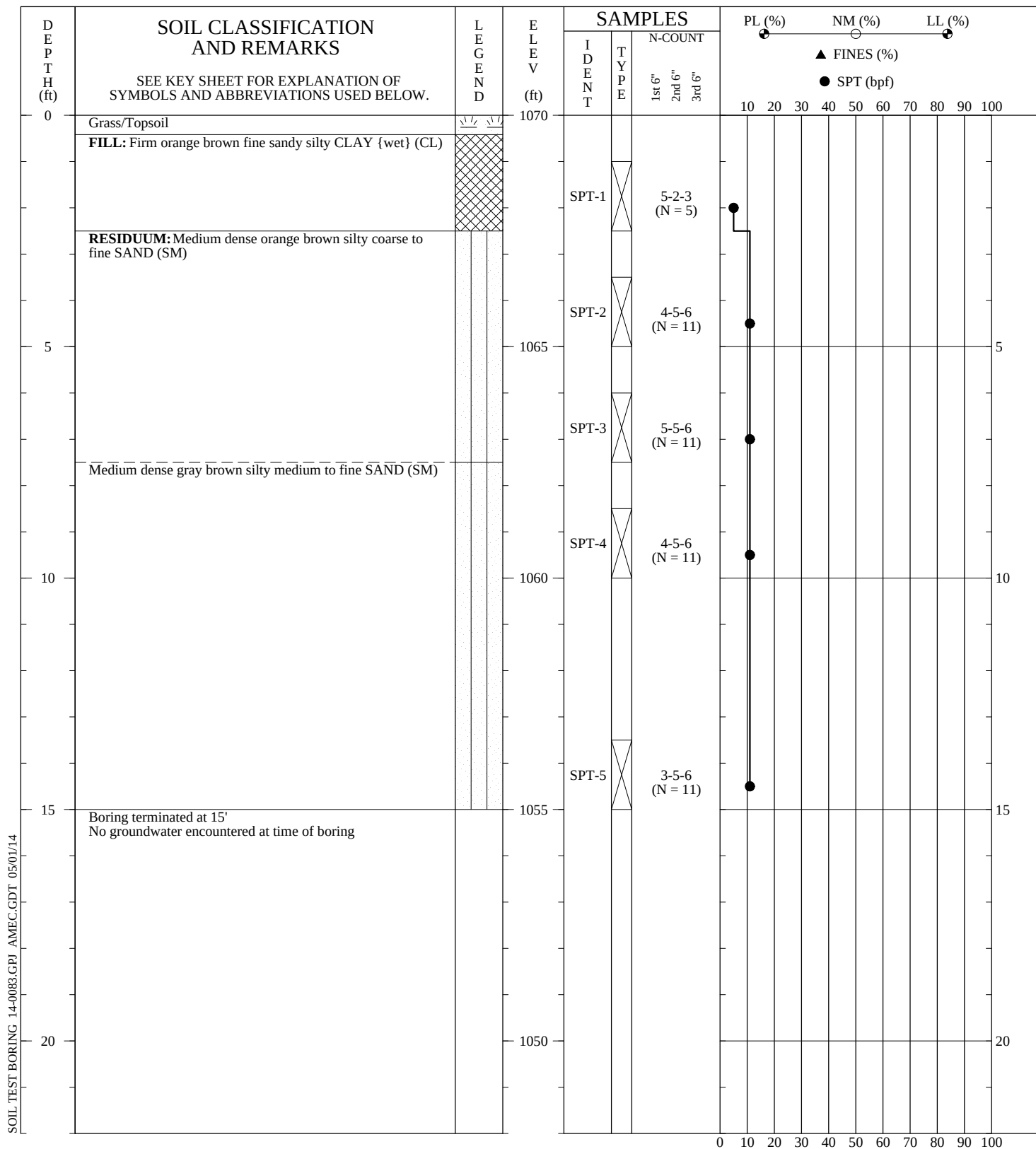
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 TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-9
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy
 to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 15, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

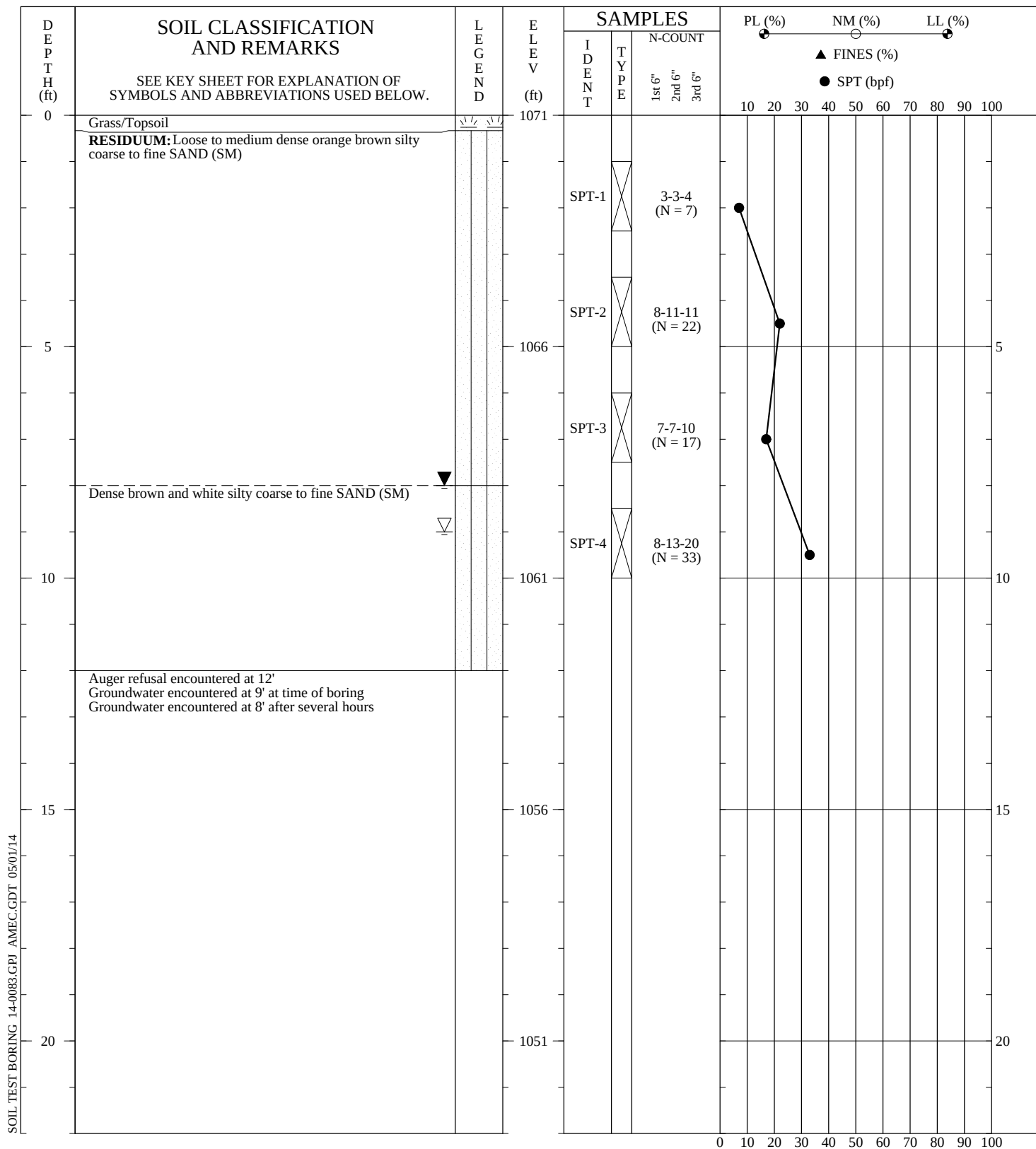
SOIL TEST BORING RECORD

BORING NO.: B-10
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 15, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

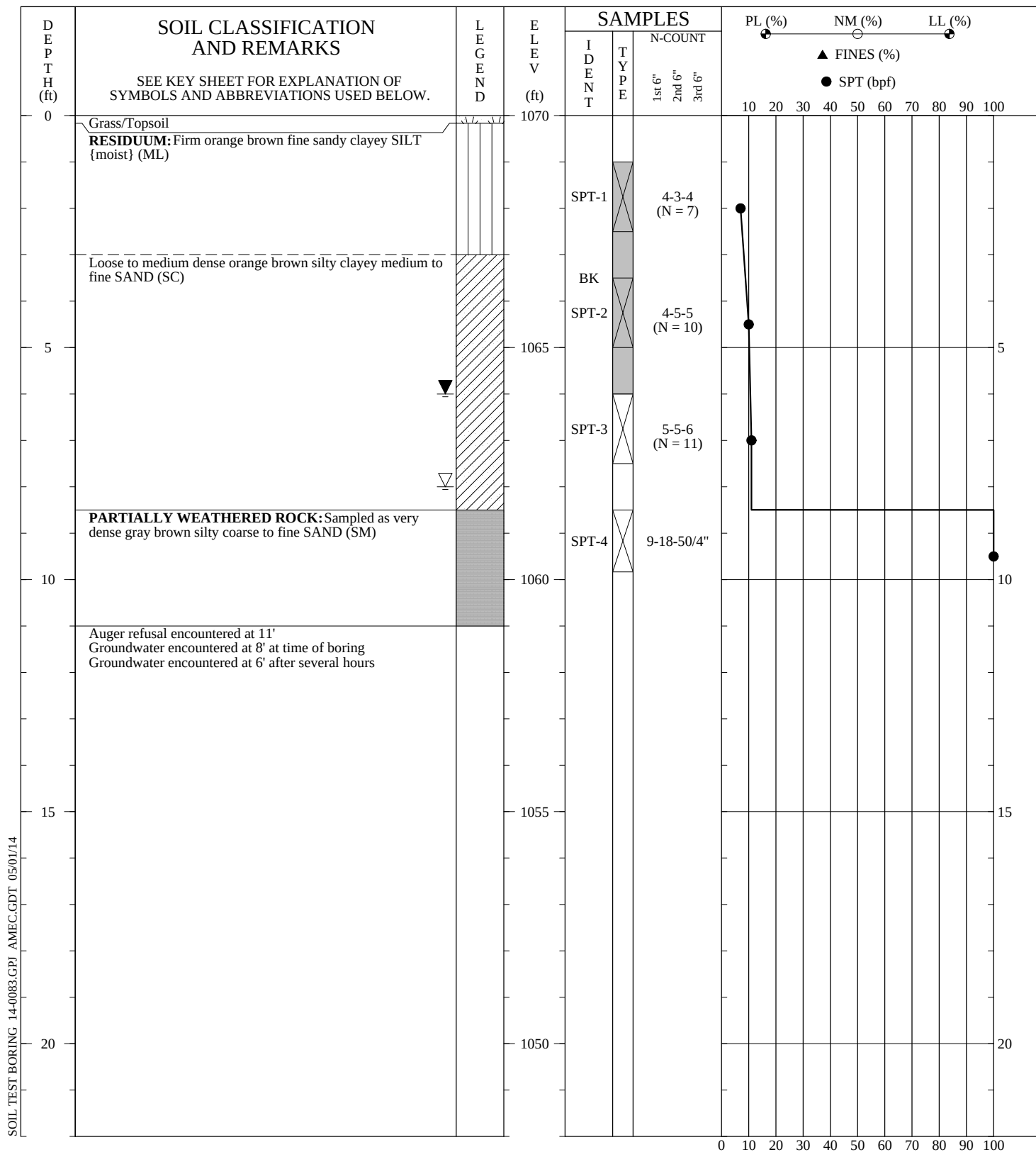
SOIL TEST BORING RECORD

BORING NO.: B-11
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 15, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

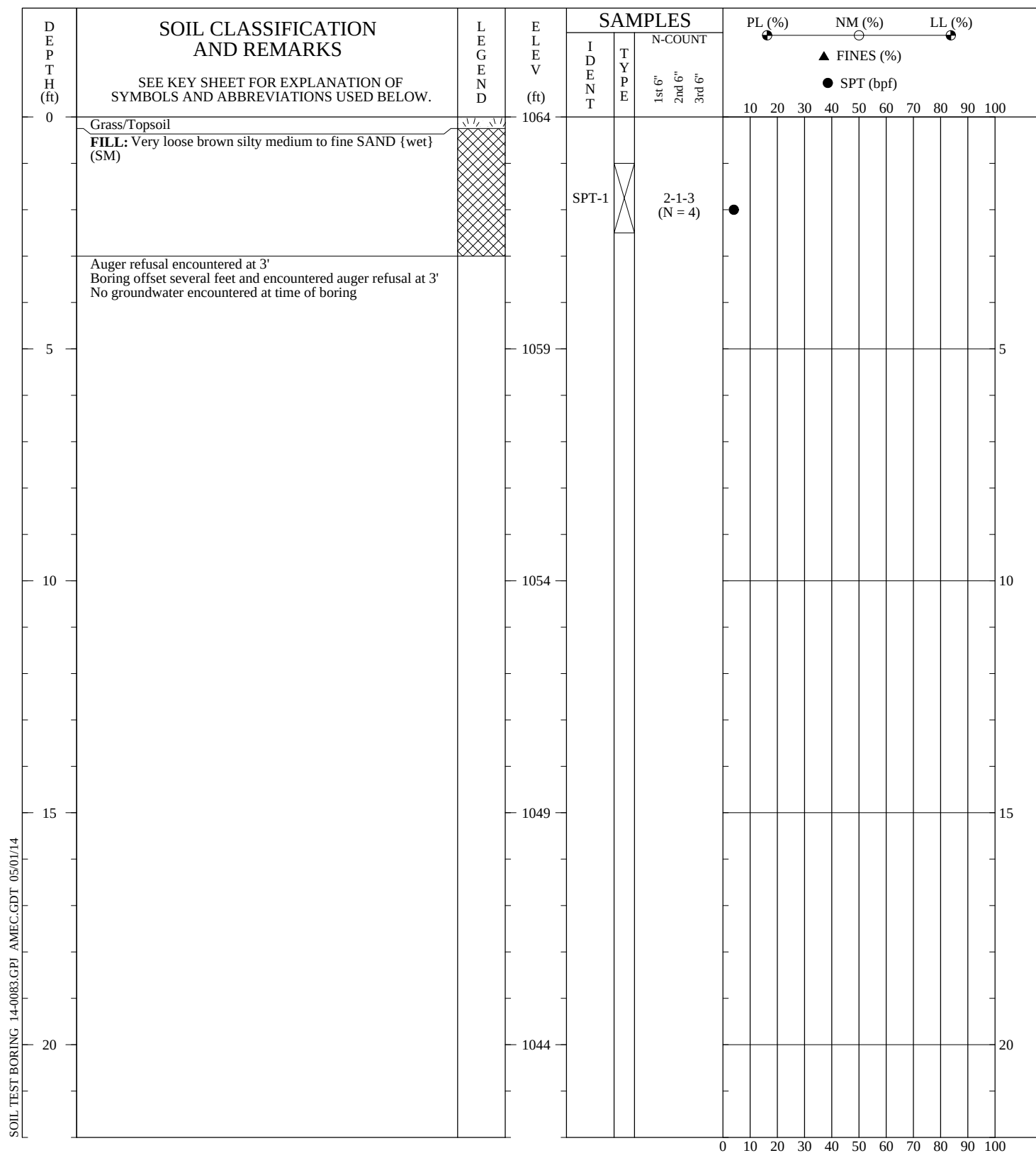
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 TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

BORING NO.: B-12
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy
 to Grayson Tank) Gwinnett County, Georgia
DRILLED: April 15, 2014
PROJECT NO.: 6162-14-0083

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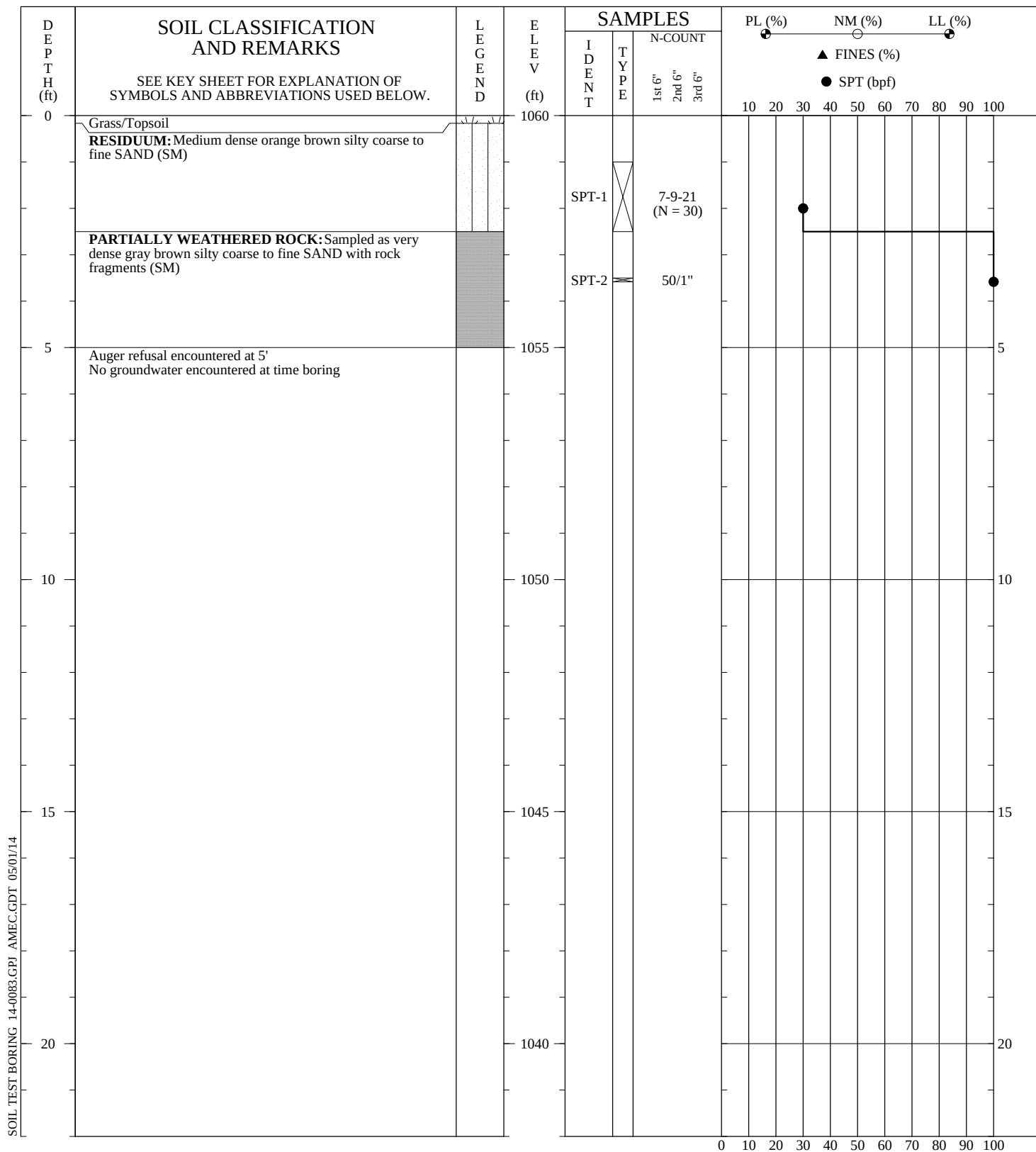




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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

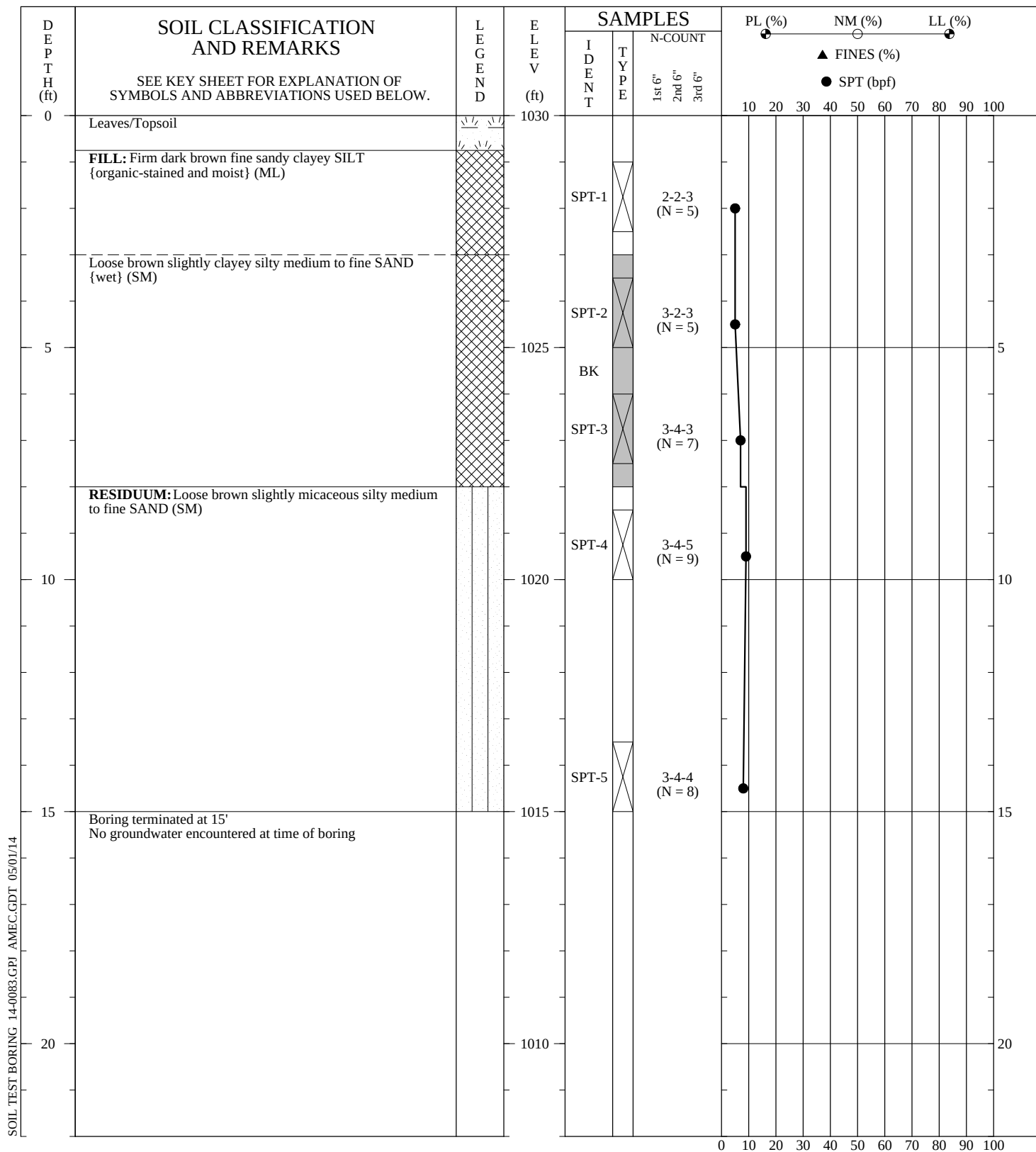
SOIL TEST BORING RECORD

BORING NO.: B-14
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 15, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

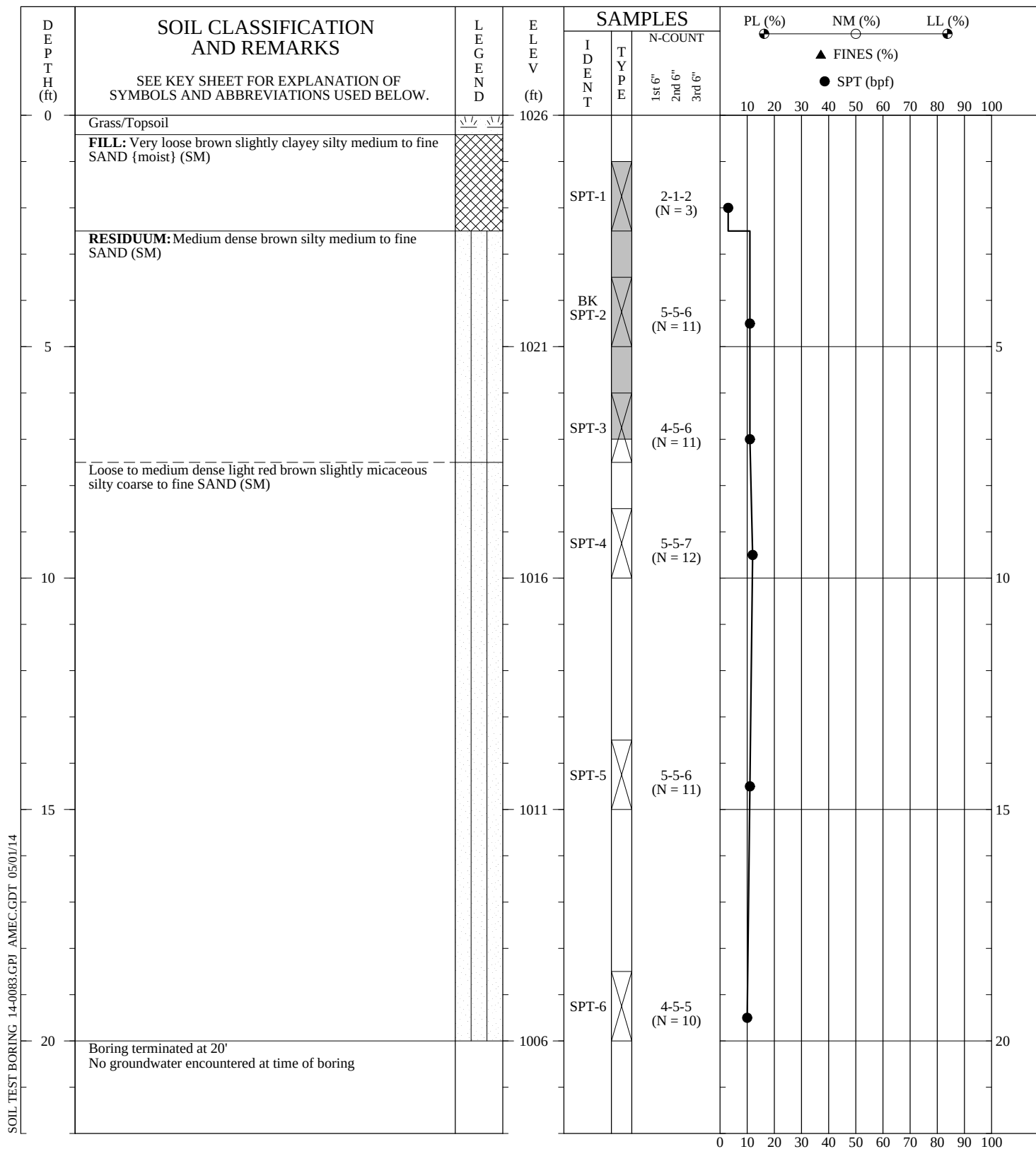
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SOIL TEST BORING RECORD

BORING NO.: B-15
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy
 to Grayson Tank) Gwinnett County, Georgia
DRILLED: April 15, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

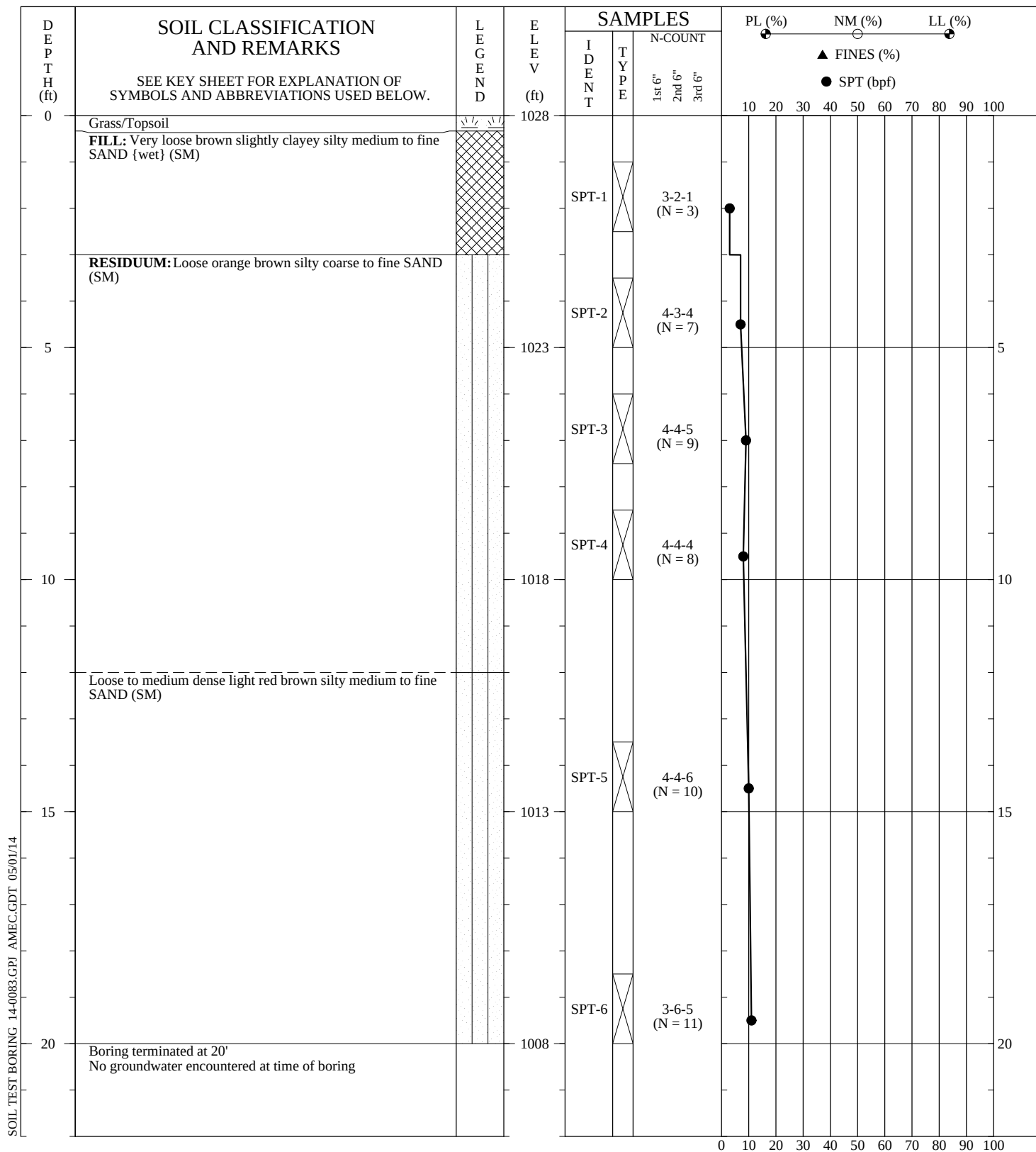
SOIL TEST BORING RECORD

BORING NO.: B-16
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 15, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

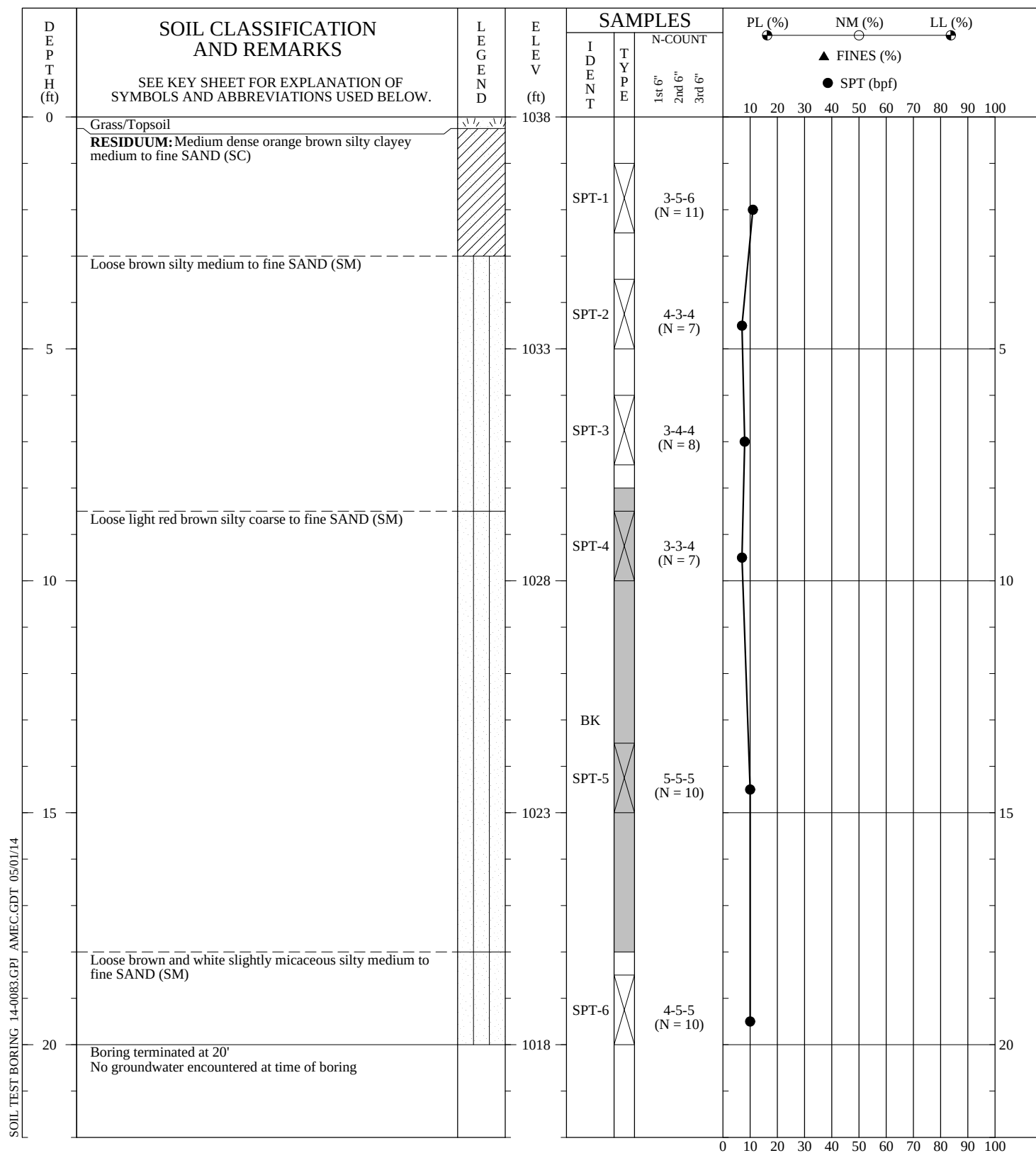
SOIL TEST BORING RECORD

BORING NO.: B-17
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 16, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

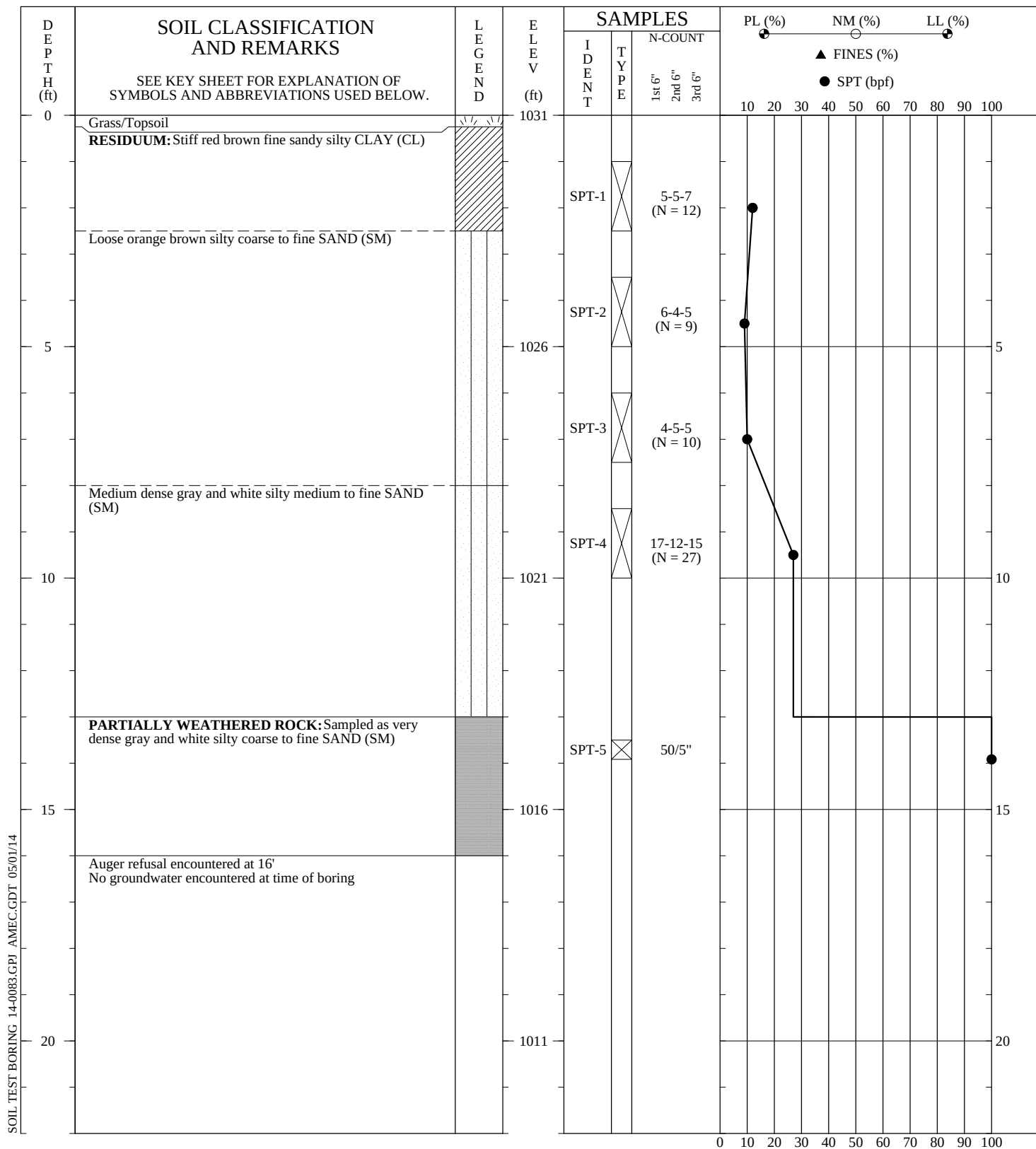
SOIL TEST BORING RECORD

BORING NO.: B-18
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 16, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

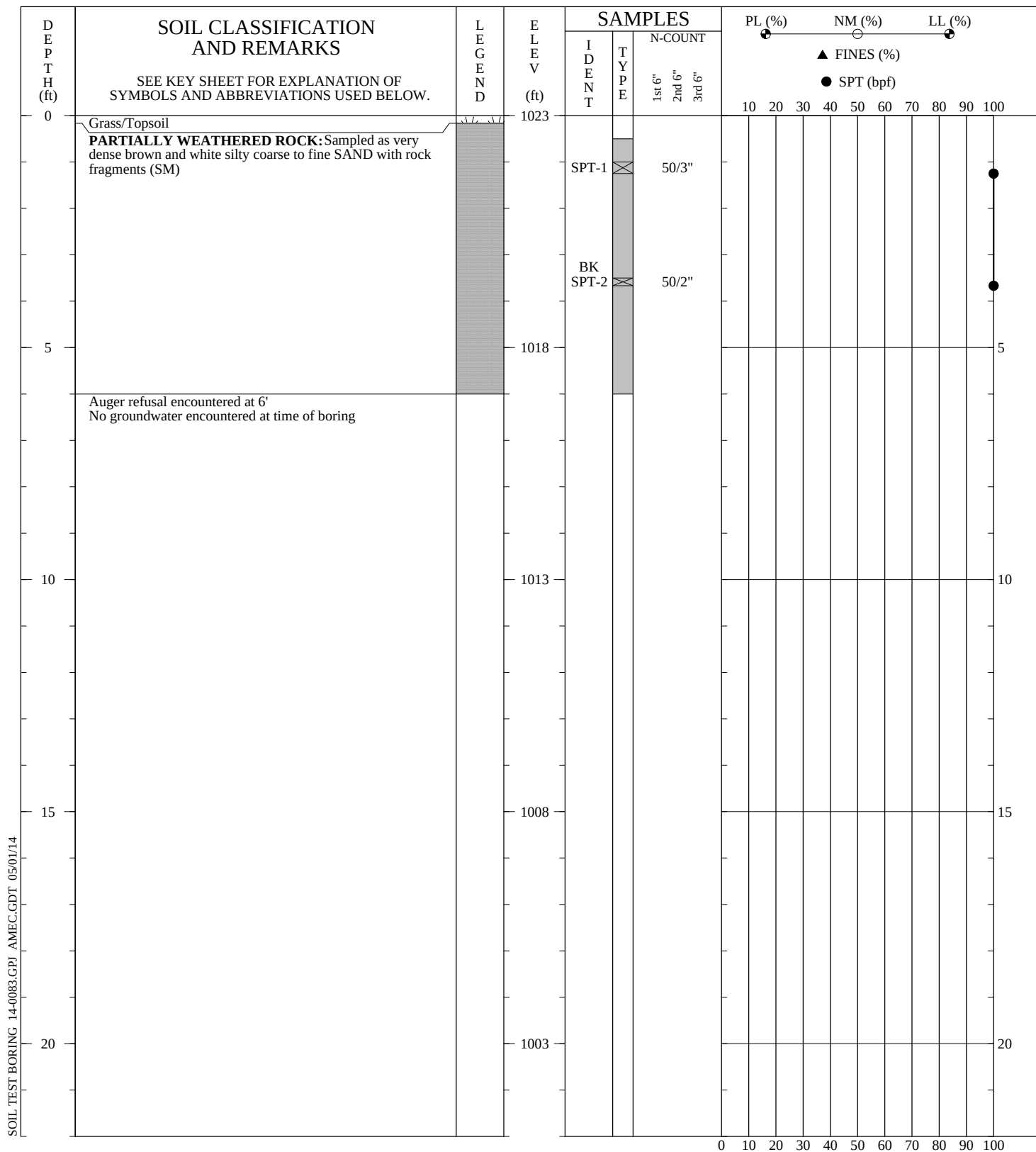
SOIL TEST BORING RECORD

BORING NO.: B-19
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 16, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

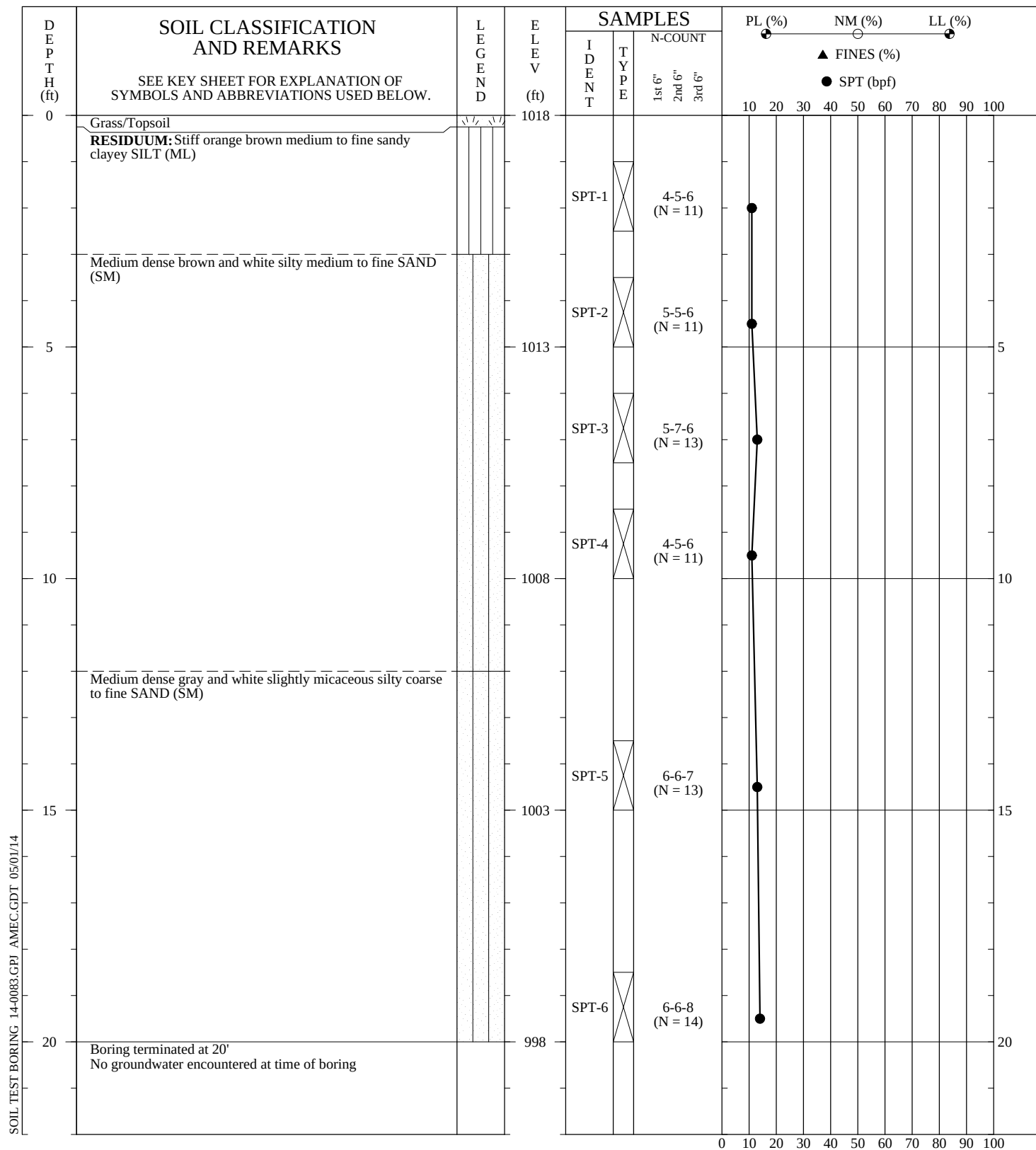
SOIL TEST BORING RECORD

BORING NO.: B-20
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 16, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation shown was approximated to the nearest foot based on water main plan and profile sheets by Cardozo Engineering.

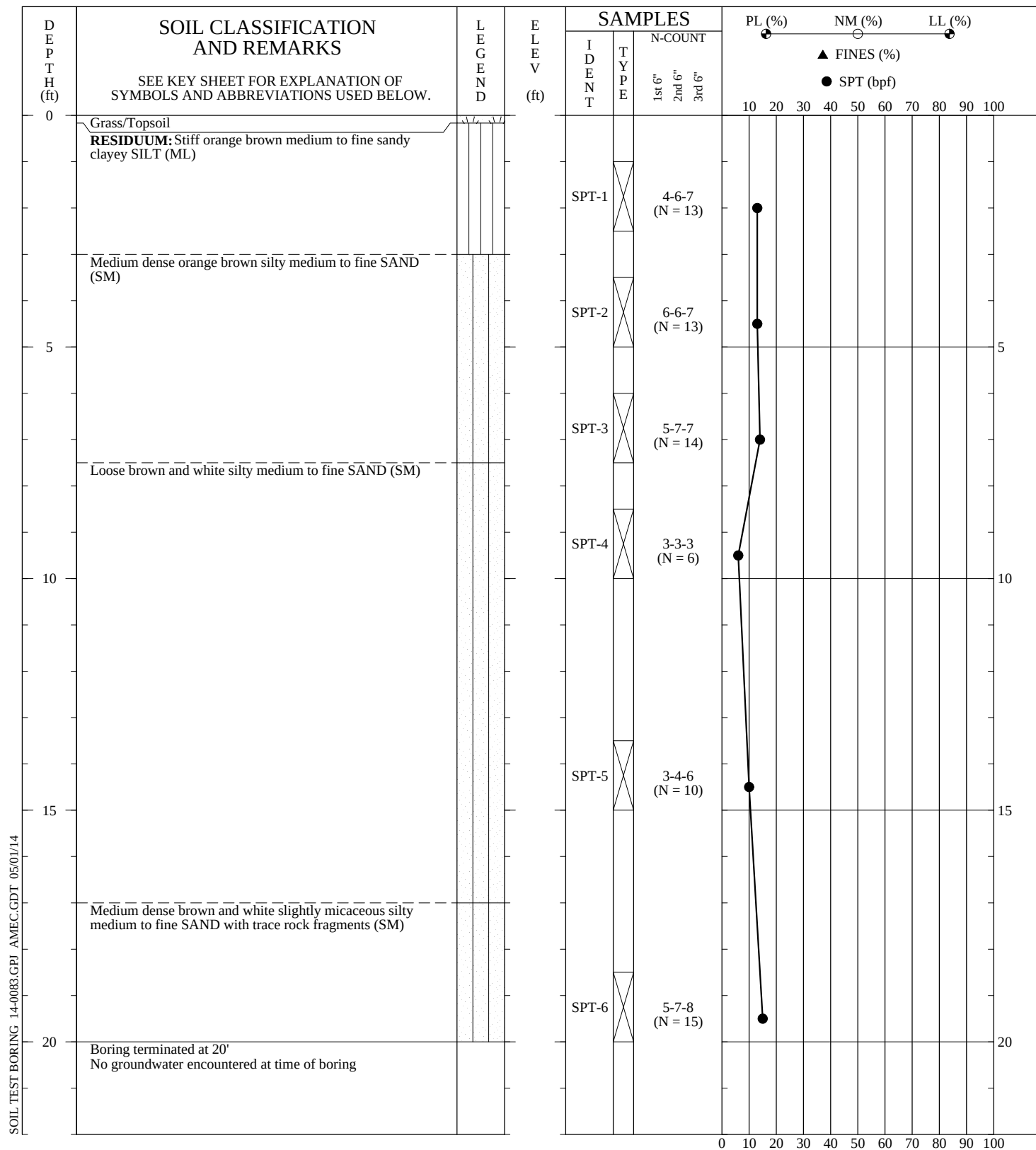
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SOIL TEST BORING RECORD

BORING NO.: B-21
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy
 to Grayson Tank) Gwinnett County, Georgia
DRILLED: April 16, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation was not available for this boring due to incomplete survey work.

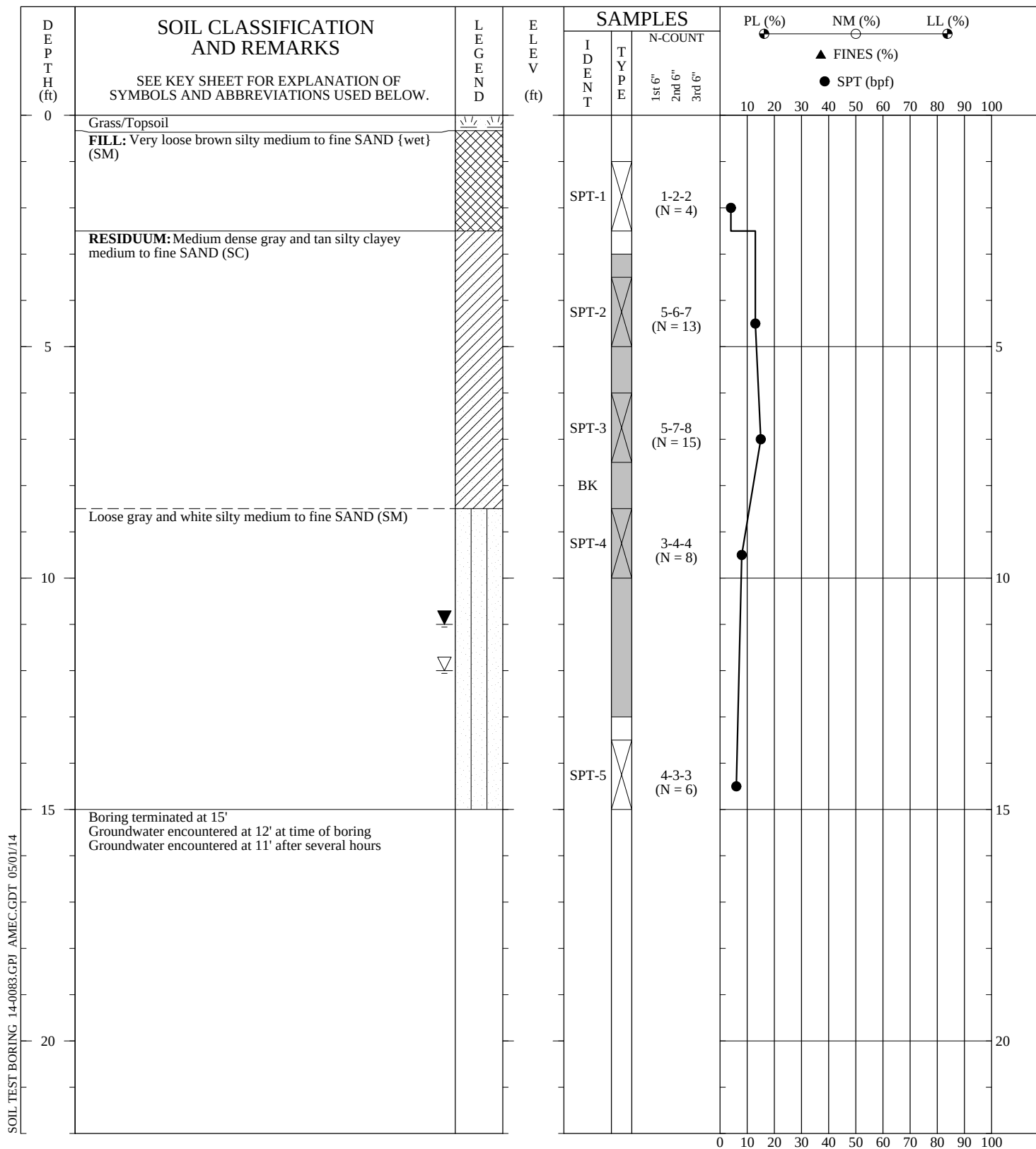
SOIL TEST BORING RECORD

BORING NO.: B-22
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 16, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation was not available for this boring due to incomplete survey work.

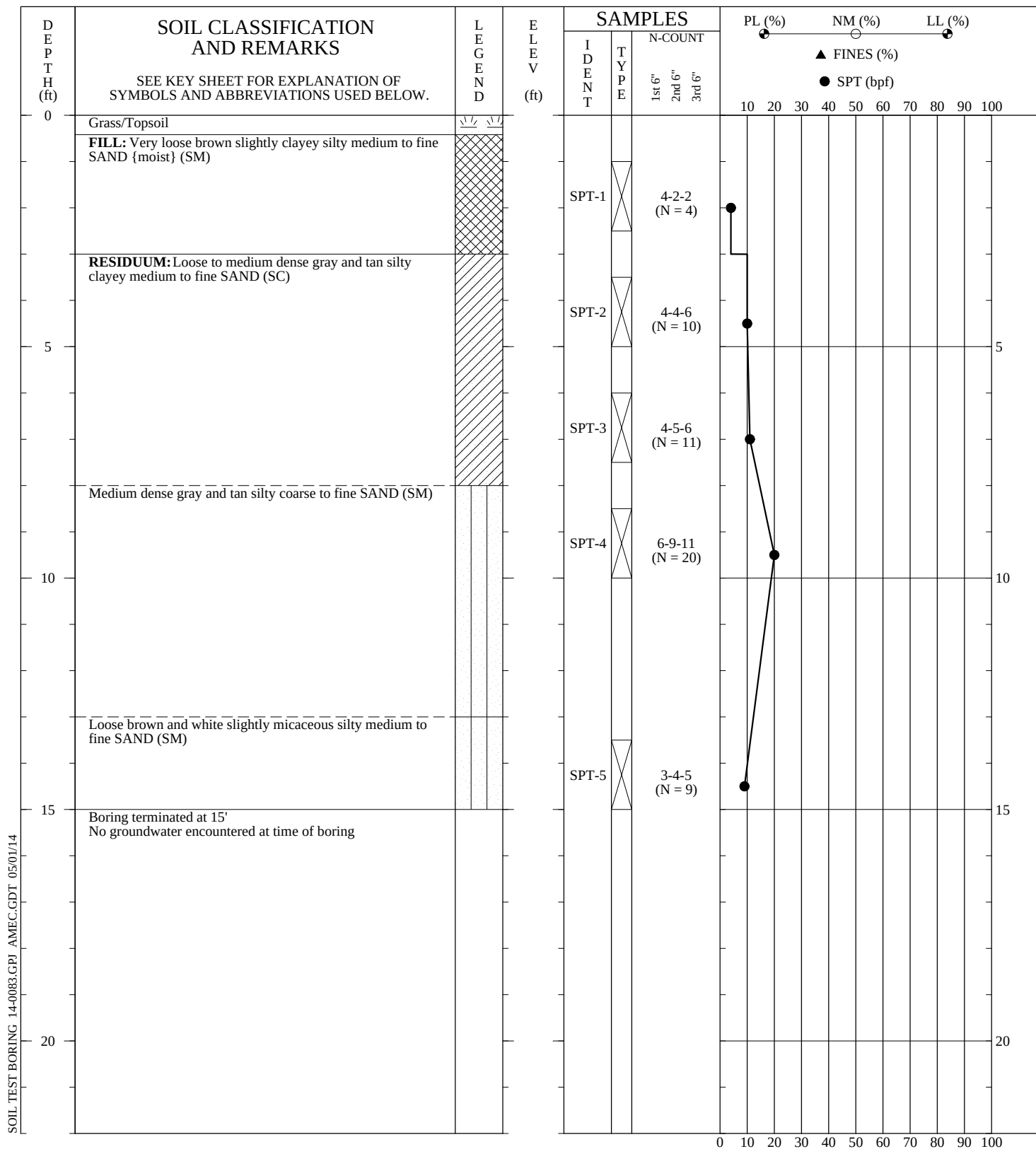
SOIL TEST BORING RECORD

BORING NO.: B-23
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 16, 2014
PROJECT NO.: 6162-14-0083

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 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation was not available for this boring due to incomplete survey work.

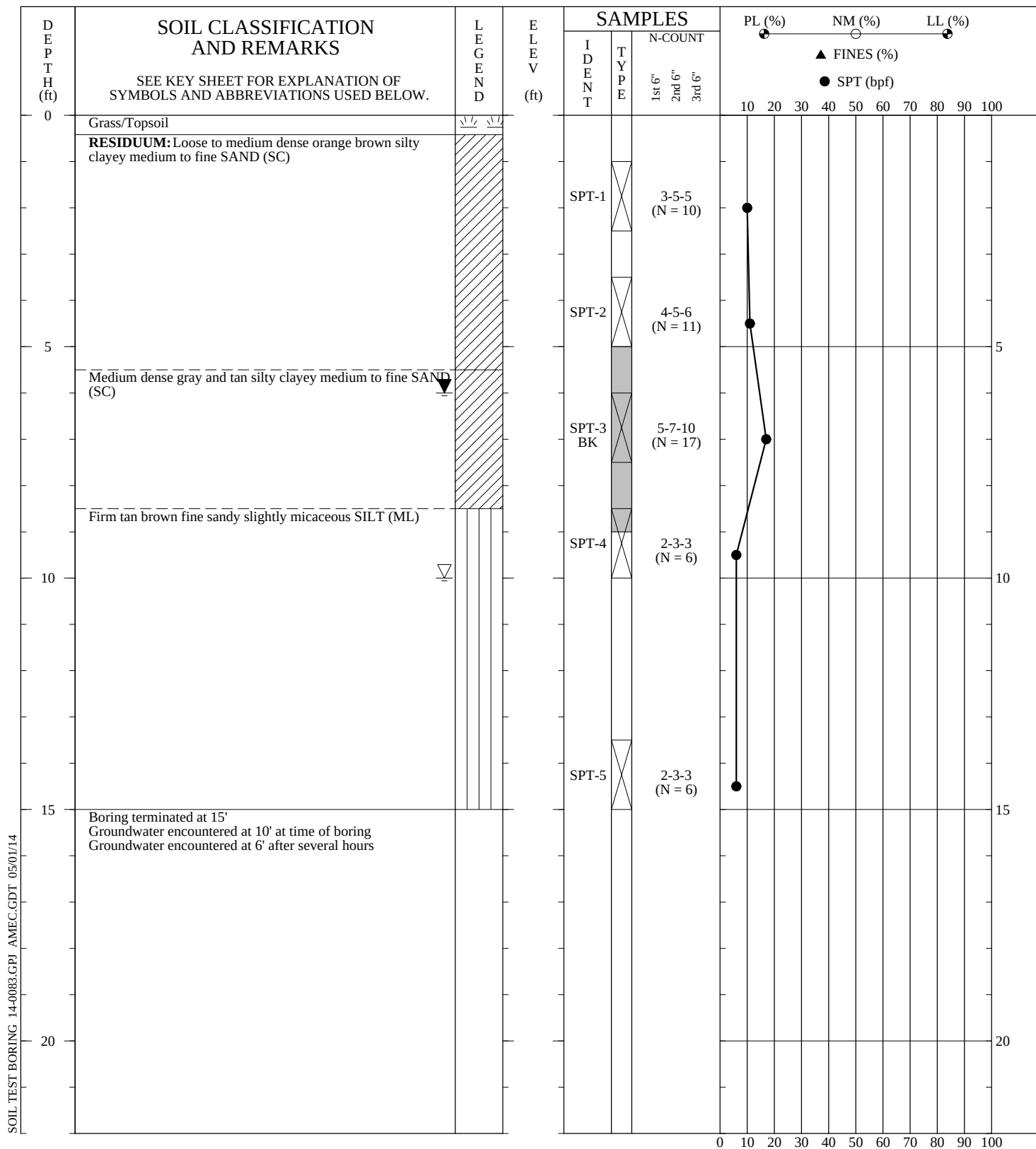
SOIL TEST BORING RECORD

BORING NO.: B-24
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 16, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation was not available for this boring due to incomplete survey work.

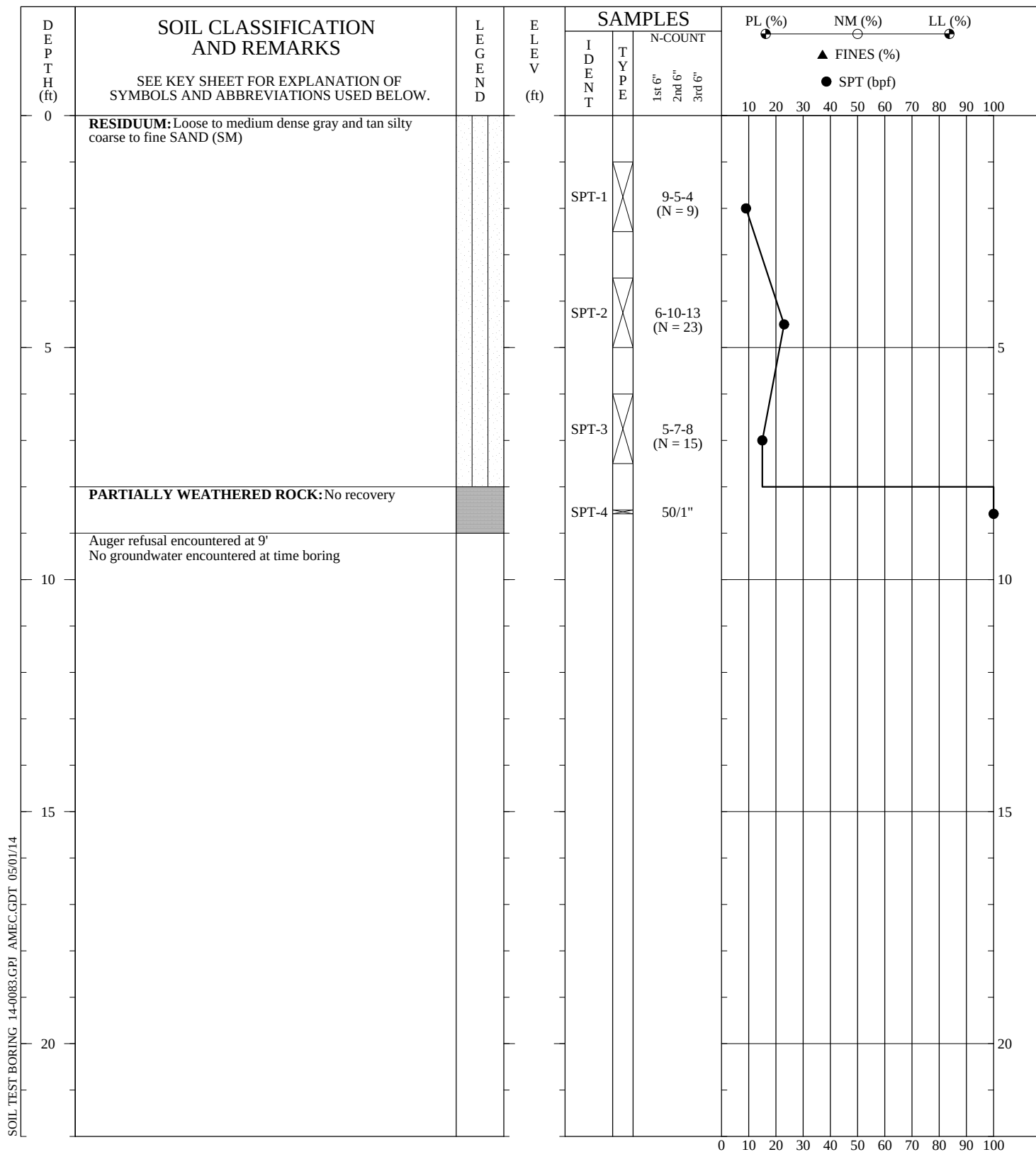
SOIL TEST BORING RECORD

BORING NO.: B-25
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 16, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation was not available for this boring due to incomplete survey work.

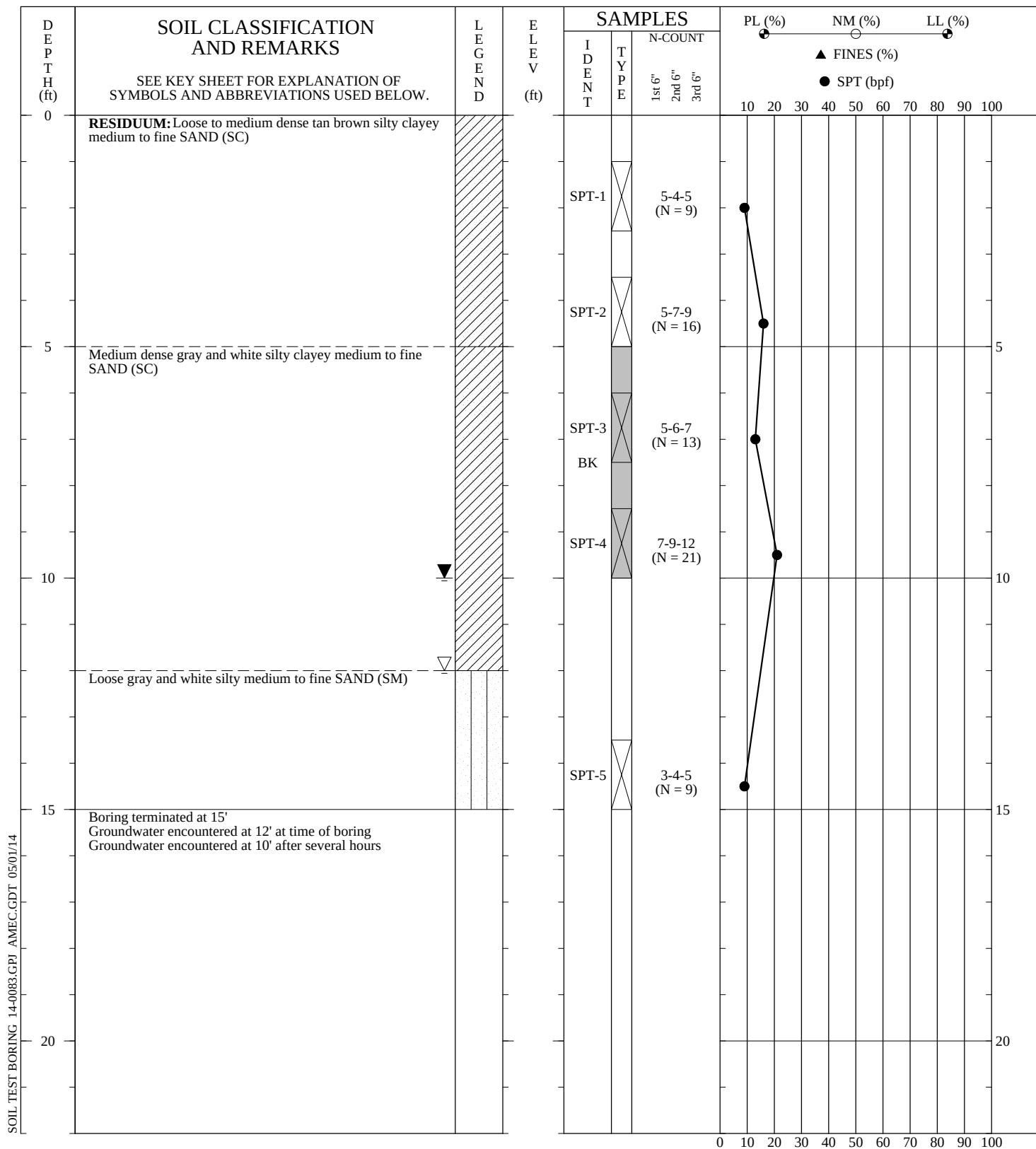
SOIL TEST BORING RECORD

BORING NO.: B-26
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 16, 2014
PROJECT NO.: 6162-14-0083

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DRILLER: Premier Drilling (Scott Towe)
 EQUIPMENT: CME-550 (Auto-Hammer)
 METHOD: 2 1/4" HSA
 HOLE DIA.: 6 inches
 REMARKS: Surface elevation was not available for this boring due to incomplete survey work.

SOIL TEST BORING RECORD

BORING NO.: B-27
PROJECT: 48-Inch PCCP Replacement (Loganville Hwy to Grayson Tank) Gwinnett County, Georgia
LOCATION:
DRILLED: April 16, 2014
PROJECT NO.: 6162-14-0083

PAGE 1 OF 1

THIS RECORD IS A REASONABLE INTERPRETATION OF
 SUBSURFACE CONDITIONS AT THE EXPLORATION
 LOCATION. SUBSURFACE CONDITIONS AT OTHER
 LOCATIONS AND AT OTHER TIMES MAY DIFFER.
 INTERFACES BETWEEN STRATA ARE APPROXIMATE.
 TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.



LABORATORY TESTING PROCEDURES

STANDARD PROCTOR COMPACTION TEST

A representative sample of proposed fill material is obtained in the field. A standard Proctor compaction test (ASTM D698) is performed on the soil to determine compaction characteristics, including the maximum dry density and optimum moisture content. Loose soils are placed in a metal mold and compacted in three layers with 25 blows of a 5.5-pound hammer falling 12 inches. The moisture content and unit weight of each compacted sample is determined. Usually four to five such tests are run at different moisture contents. Test results are presented in the form of a dry unit weight-versus-moisture content curve.

MOISTURE CONTENT

The moisture content of soil is defined as the weight of water in a given soil mass divided by the weight of dry soil solids in the same mass. Moisture contents are determined in accordance with ASTM D2216 and are used to evaluate the natural soil moisture in comparison with the optimum moisture for compaction.

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/18/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-2 **Depth:** 5 to 13'

Sample Number: B-2

Remarks: Lab No.: 12568

MATERIAL DESCRIPTION

Description: Tan brown silty coarse to fine SAND

Classifications -

USCS: SM

AASHTO:

Nat. Moist. = 23.5 %

Sp.G. =

Liquid Limit =

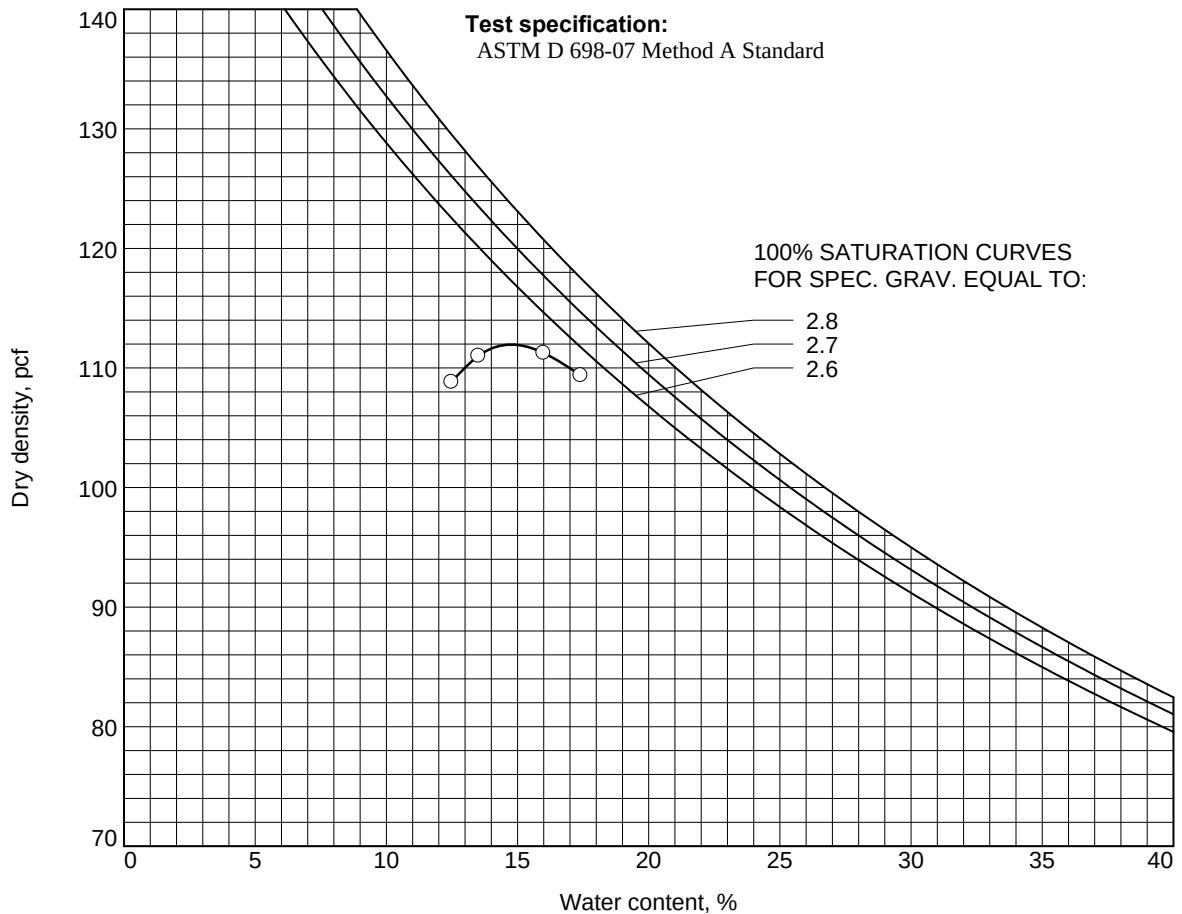
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 112.0 pcf

Optimum moisture = 14.8 %



AMEC

Figure

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-2

Depth: 5 to 13'

Sample Number: B-2

Description: Tan brown silty coarse to fine SAND

Natural Moisture: 23.5

Date: 04/18/14

USCS Classification: SM

Testing Remarks: Lab No.: 12568

Tested by: EH

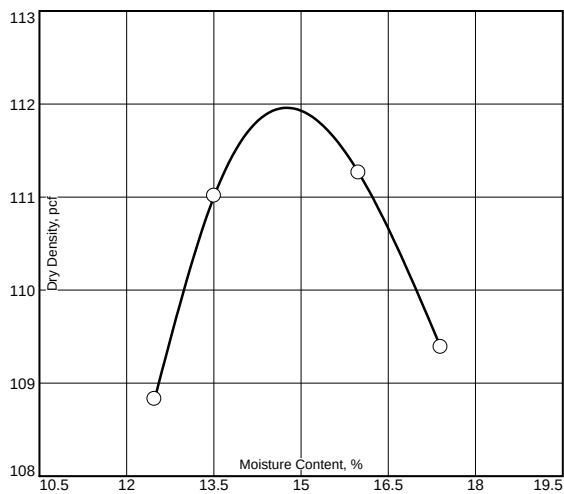
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	3993.0	3983.5	3947.1	3892.9
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	318.3	315.9	283.2	306.1
Wt. D+T	275.0	269.7	250.0	272.6
Tare	4.2	4.2	4.2	4.2
Moist.	16.0	17.4	13.5	12.5
Dry Den.	111.3	109.4	111.0	108.8

Test Results:

Max. Dry Den.= 112.0 pcf Opt. Moist.= 14.8%

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/17/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-4 **Depth:** 17 to 20'

Sample Number: B-4

Remarks: Lab no.: 12569

MATERIAL DESCRIPTION

Description: Brown and white silty medium to fine SAND

Classifications -

USCS: SM

AASHTO:

Nat. Moist. = 19.5 %

Sp.G. =

Liquid Limit =

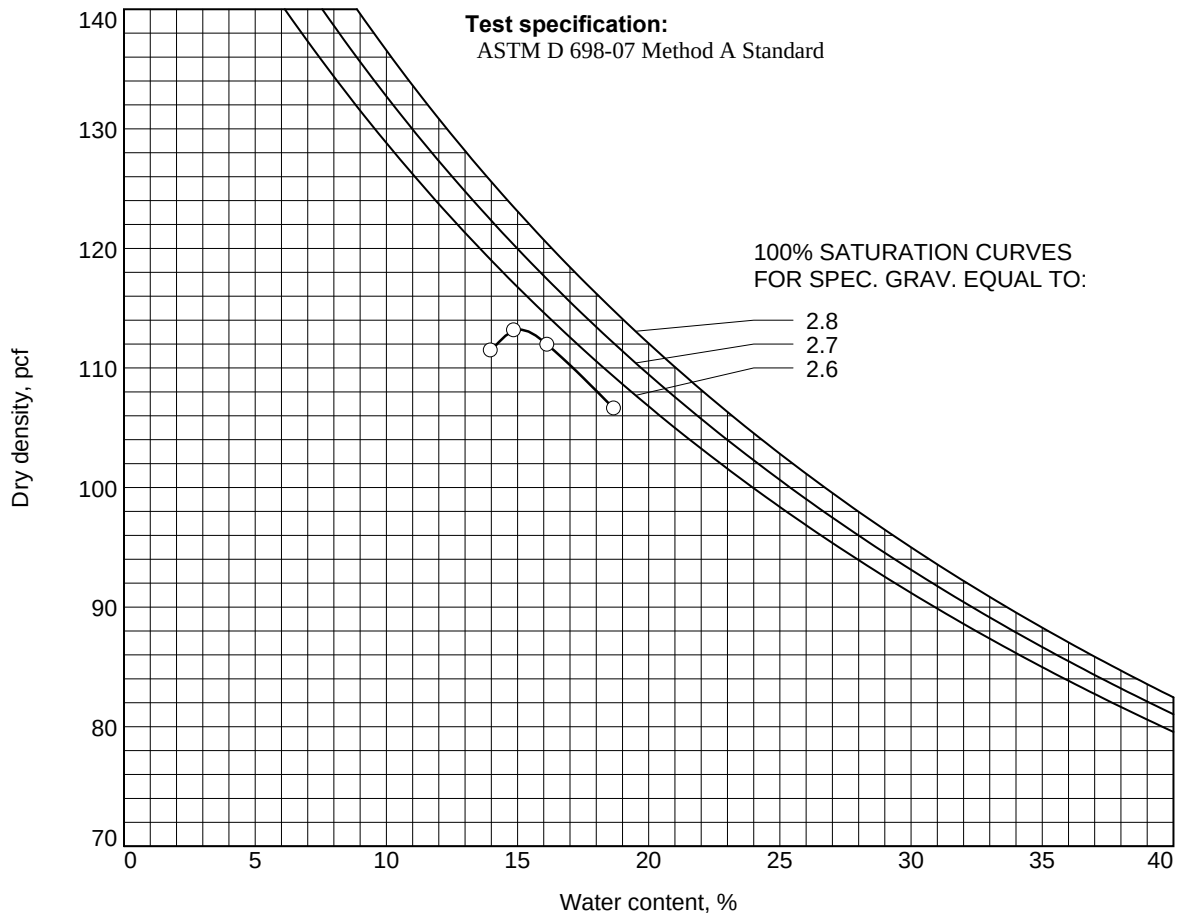
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 113.2 pcf

Optimum moisture = 15.1 %



AMEC

Figure

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-4

Depth: 17 to 20'

Sample Number: B-4

Description: Brown and white silty medium to fine SAND

Natural Moisture: 19.5

Date: 04/17/14

USCS Classification: SM

Testing Remarks: Lab no.: 12569

Tested by: EH

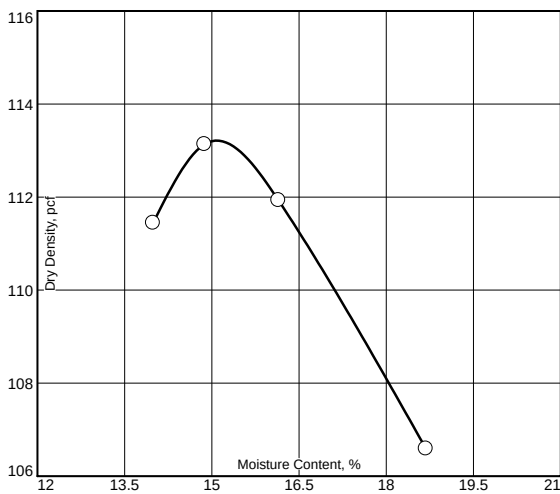
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	3962.6	4007.3	3954.6	4006.7
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	284.4	304.9	330.0	320.1
Wt. D+T	250.0	263.1	278.7	279.2
Tare	4.1	4.2	4.1	4.2
Moist.	14.0	16.1	18.7	14.9
Dry Den.	111.4	111.9	106.6	113.1

Test Results:

Max. Dry Den.= 113.2 pcf Opt. Moist.= 15.1%

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/17/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-5 **Depth:** 8 to 13'

Sample Number: B-5

Remarks: Lab No.: 12570

MATERIAL DESCRIPTION

Description: Tan brown slightly micaceous silty medium to fine SAND

Classifications -

USCS: SM

AASHTO:

Nat. Moist. = 21.8 %

Sp.G. =

Liquid Limit =

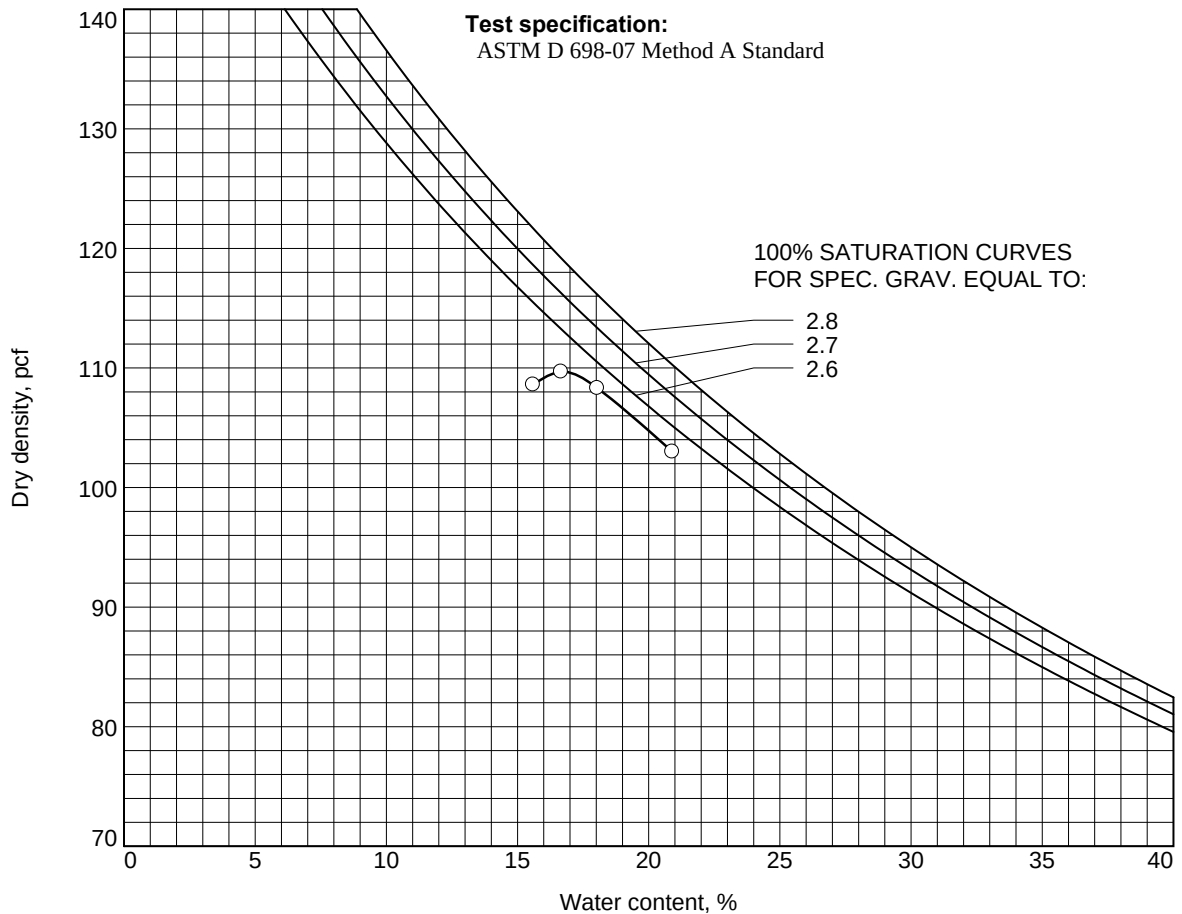
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 109.7 pcf

Optimum moisture = 16.7 %



AMEC

Figure

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-5

Depth: 8 to 13'

Sample Number: B-5

Description: Tan brown slightly micaceous silty medium to fine SAND

Natural Moisture: 21.8

Date: 04/17/14

USCS Classification: SM

Testing Remarks: Lab No.: 12570

Tested by: EH

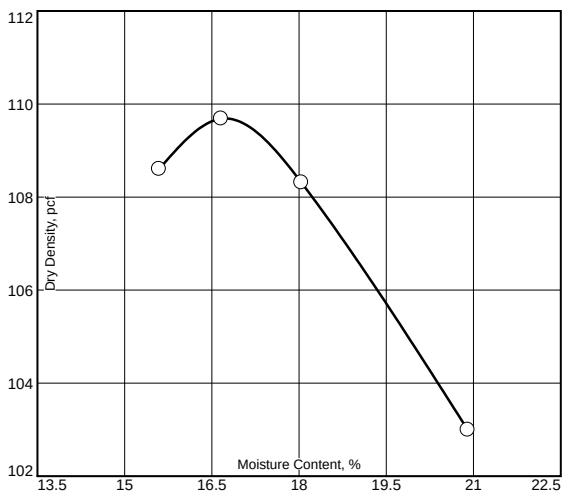
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	3940.0	3974.9	3924.7	3976.5
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	264.4	299.4	288.8	289.9
Wt. D+T	229.3	254.3	239.6	249.1
Tare	4.2	4.3	4.2	4.2
Moist.	15.6	18.0	20.9	16.7
Dry Den.	108.6	108.3	103.0	109.7

Test Results:

Max. Dry Den.= 109.7 pcf **Opt. Moist.=** 16.7%

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/21/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-7 **Depth:** 8 to 14'

Sample Number: B-7

Remarks: Lab No.: 12571

MATERIAL DESCRIPTION

Description: Gray brown silty medium to fine SAND

Classifications -

USCS: SM

AASHTO:

Nat. Moist. = 27.1 %

Sp.G. =

Liquid Limit =

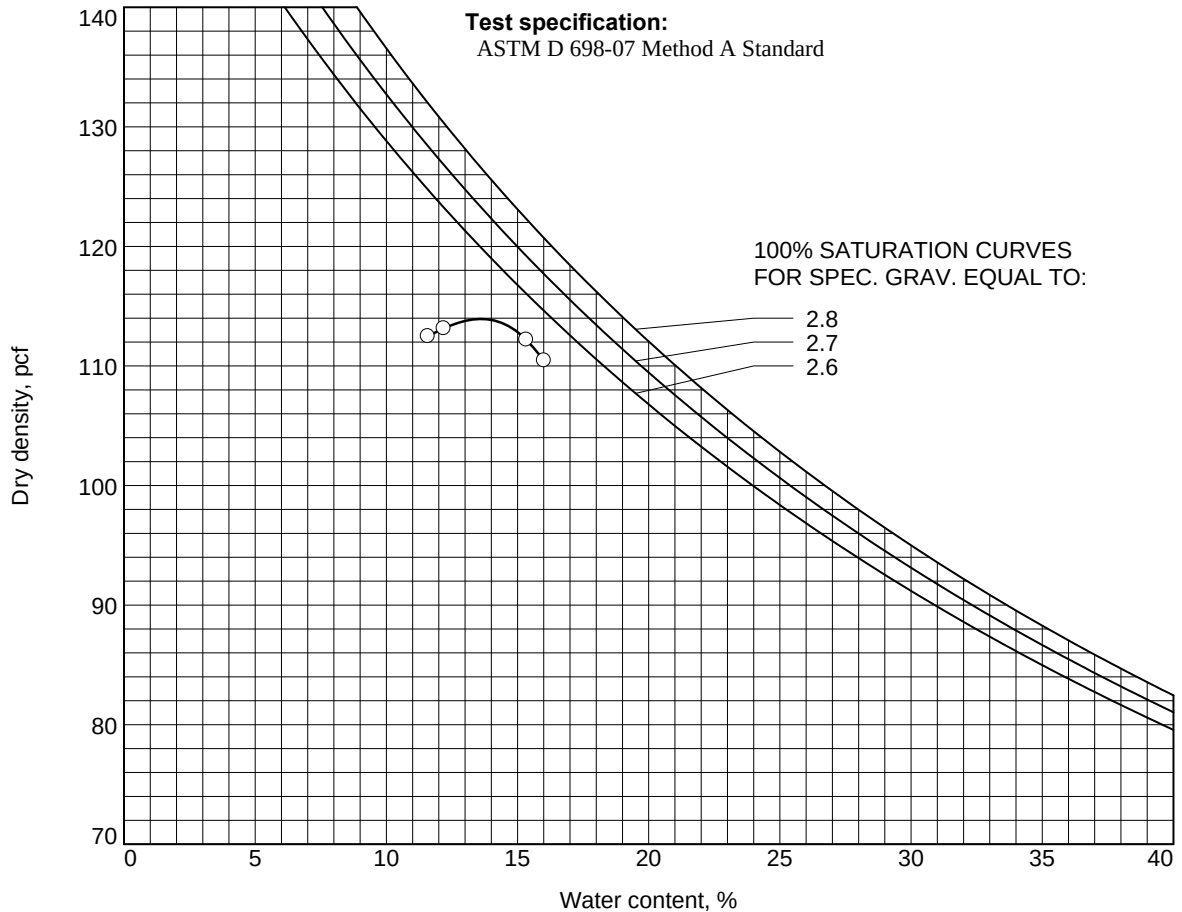
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 113.9 pcf

Optimum moisture = 13.6 %



AMEC

Figure

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-7

Depth: 8 to 14'

Sample Number: B-7

Description: Gray brown silty medium to fine SAND

Natural Moisture: 27.1

Date: 04/21/14

USCS Classification: SM

Testing Remarks: Lab No.: 12571

Tested by: EH

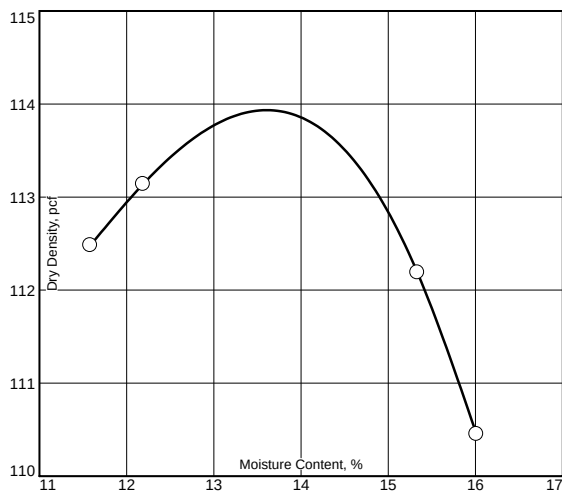
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	3961.0	3998.1	3979.2	3939.6
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	301.6	405.0	337.5	316.4
Wt. D+T	269.3	351.7	291.5	284.0
Tare	4.3	4.1	4.2	4.3
Moist.	12.2	15.3	16.0	11.6
Dry Den.	113.1	112.2	110.5	112.5

Test Results:

Max. Dry Den.= 113.9 pcf Opt. Moist.= 13.6%

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/18/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-9 **Depth:** 5 to 10'

Sample Number: B-9

Remarks: Lab No.: 12572

MATERIAL DESCRIPTION

Description: Orange brown silty clayey medium to fine SAND

Classifications -

USCS: SC

AASHTO:

Nat. Moist. = 15.4 %

Sp.G. =

Liquid Limit =

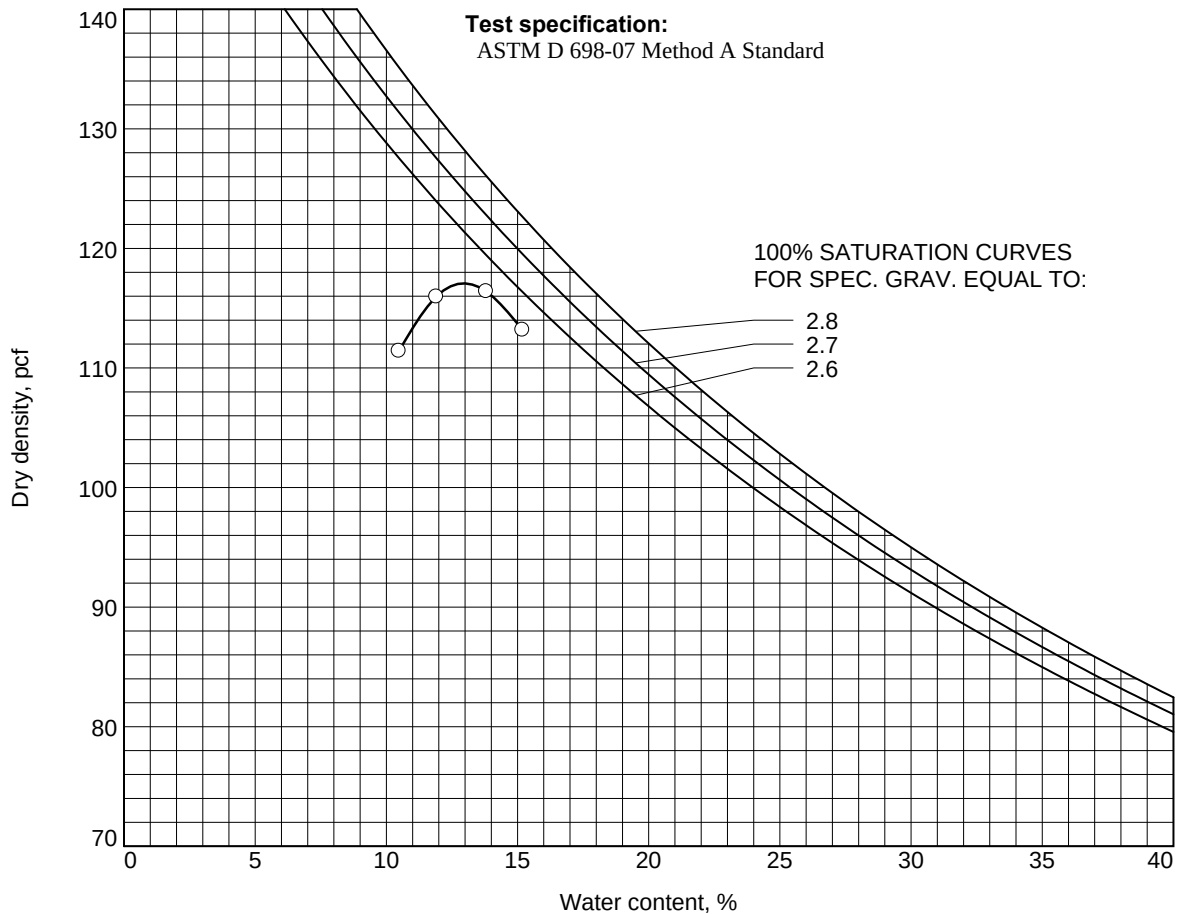
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 117.1 pcf

Optimum moisture = 13.0 %



AMEC

Figure

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-9

Depth: 5 to 10'

Sample Number: B-9

Description: Orange brown silty clayey medium to fine SAND

Natural Moisture: 15.4

Date: 04/18/14

USCS Classification: SC

Testing Remarks: Lab No.: 12572

Tested by: EH

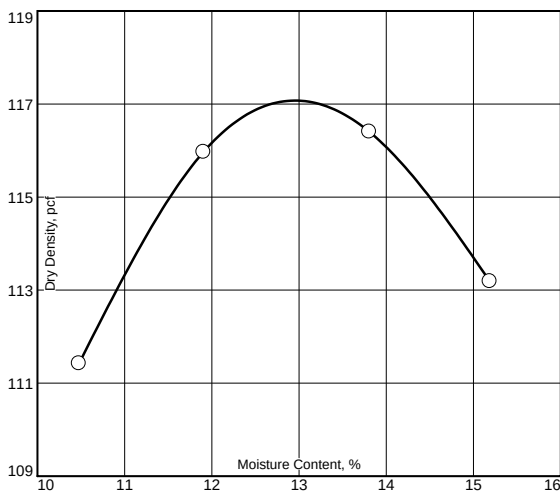
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	4044.6	4013.0	4003.9	3903.2
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	348.8	340.2	325.8	340.6
Wt. D+T	307.0	295.9	291.6	308.7
Tare	4.2	4.2	4.3	4.2
Moist.	13.8	15.2	11.9	10.5
Dry Den.	116.4	113.2	116.0	111.4

Test Results:

Max. Dry Den.= 117.1 pcf Opt. Moist.= 13.0%

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/22/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-12 **Depth:** 1 to 6'

Sample Number: B-12

Remarks: Lab No.: 12573

MATERIAL DESCRIPTION

Description: Orange brown silty clayey fine SAND

Classifications -

USCS: SC

AASHTO:

Nat. Moist. = 32.3 %

Sp.G. =

Liquid Limit =

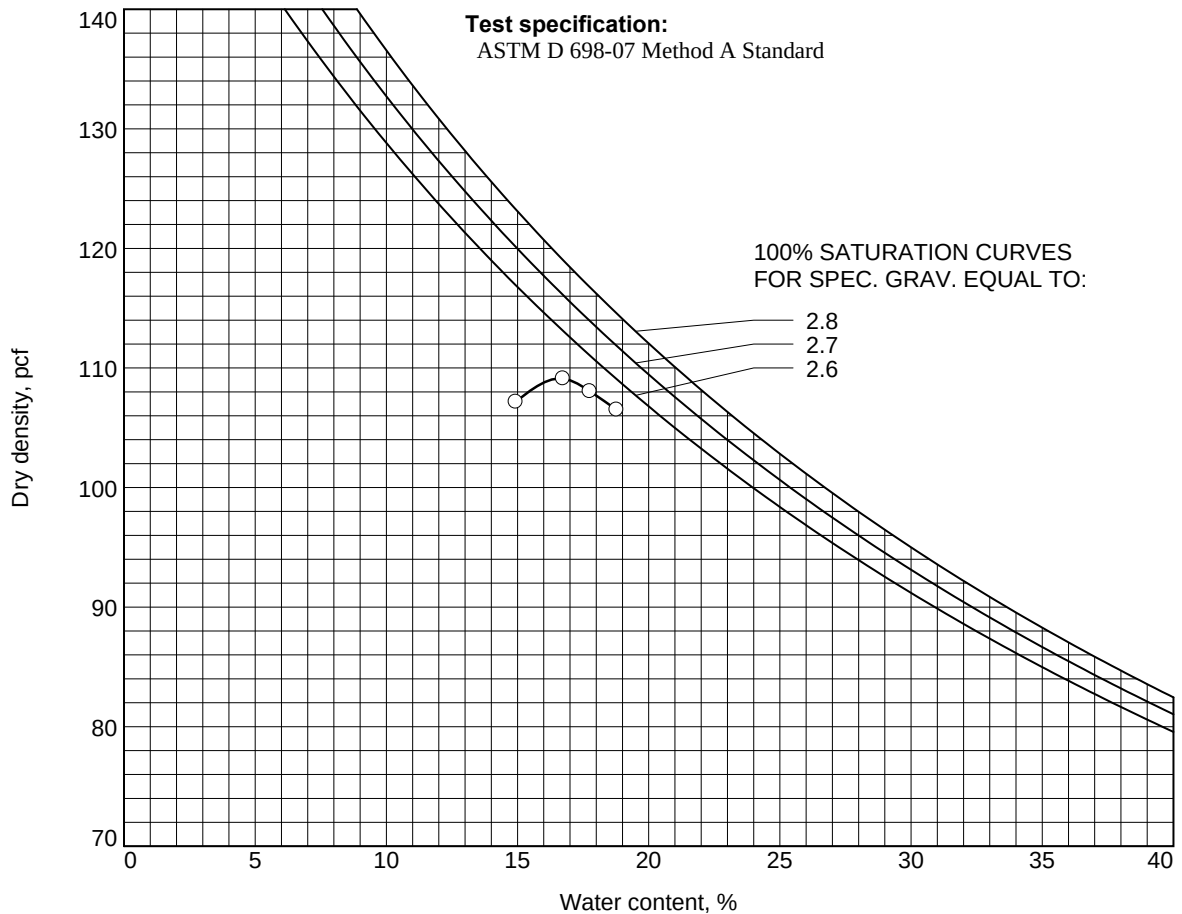
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 109.1 pcf

Optimum moisture = 16.6 %



AMEC

Figure

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-12

Depth: 1 to 6'

Sample Number: B-12

Description: Orange brown silty clayey fine SAND

Natural Moisture: 32.3

Date: 04/22/14

USCS Classification: SC

Testing Remarks: Lab No.: 12573

Tested by: EH

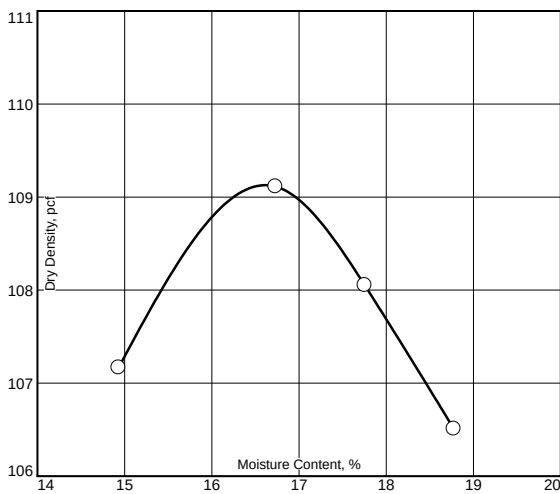
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	3967.6	3965.6	3904.3	3954.6
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	313.4	345.8	304.5	316.2
Wt. D+T	269.1	294.3	265.5	266.9
Tare	4.3	4.2	4.3	4.3
Moist.	16.7	17.8	14.9	18.8
Dry Den.	109.1	108.1	107.2	106.5

Test Results:

Max. Dry Den.= 109.1 pcf **Opt. Moist.=** 16.6%

AMEC

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/23/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-15 **Depth:** 3 to 8'

Sample Number: B-15

Remarks: Lab No.: 12574

MATERIAL DESCRIPTION

Description: Brown slightly clayey silty medium to fine SAND

Classifications -

USCS: SM

AASHTO:

Nat. Moist. = 23.1 %

Sp.G. =

Liquid Limit =

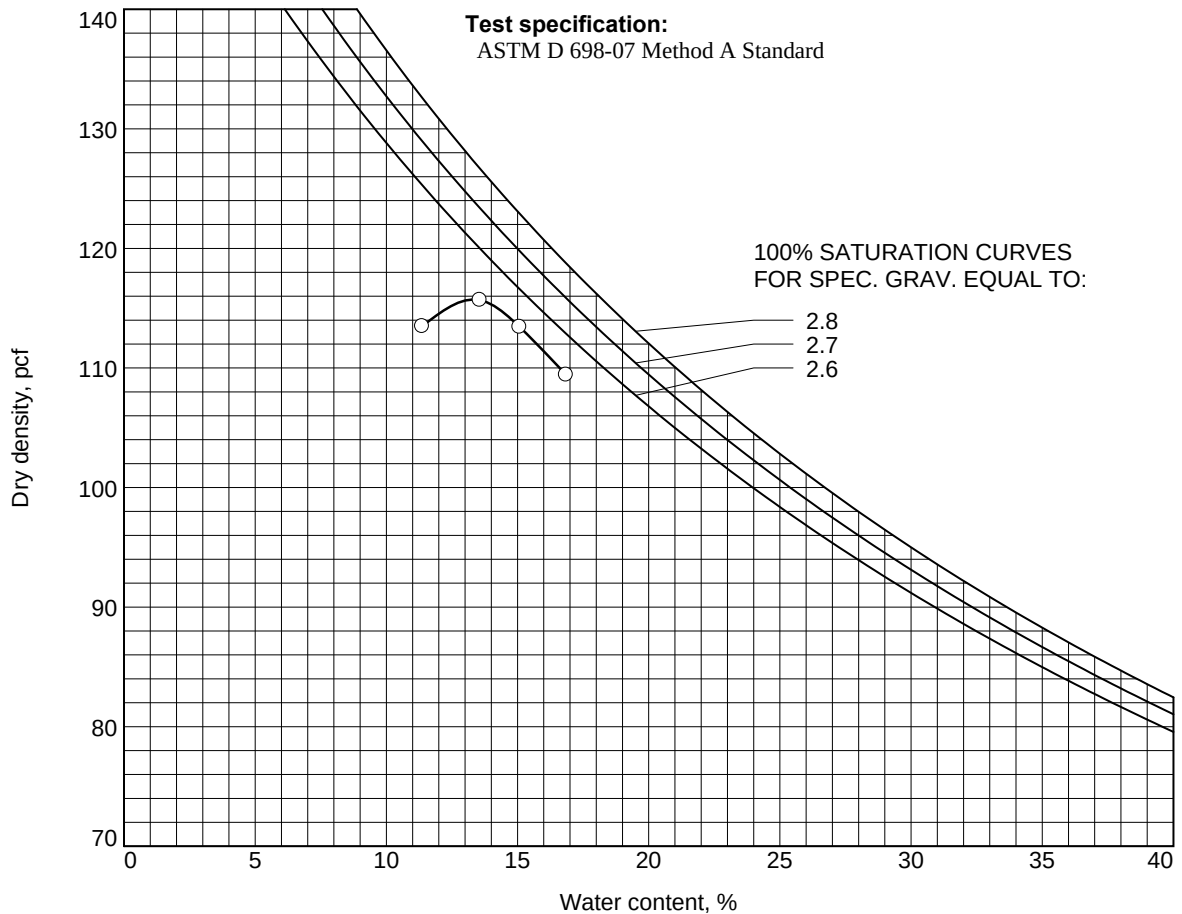
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 115.7 pcf

Optimum moisture = 13.3 %



Figure

AMEC

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-15

Depth: 3 to 8'

Sample Number: B-15

Description: Brown slightly clayey silty medium to fine SAND

Natural Moisture: 23.1

Date: 04/23/14

USCS Classification: SM

Testing Remarks: Lab No.: 12574

Tested by: EH

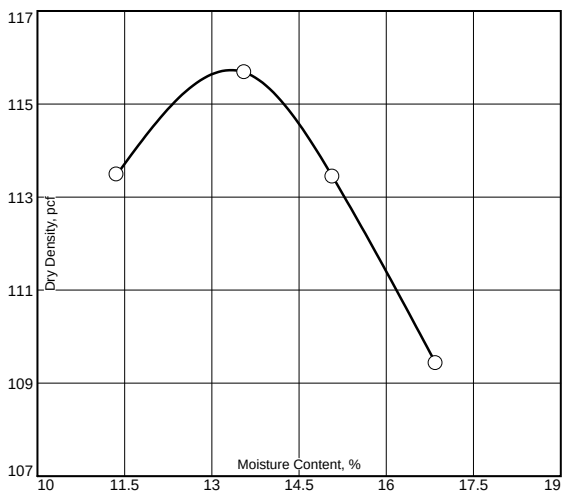
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	4015.4	3975.1	4027.9	3952.7
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	337.1	332.3	351.0	321.7
Wt. D+T	293.5	285.0	309.6	289.3
Tare	4.3	4.3	4.3	4.2
Moist.	15.1	16.9	13.6	11.4
Dry Den.	113.4	109.4	115.7	113.5

Test Results:

Max. Dry Den.= 115.7 pcf Opt. Moist.= 13.3%

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/24/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-16 **Depth:** 1 to 7'

Sample Number: B-16

Remarks: Lab No.: 12575

MATERIAL DESCRIPTION

Description: Brown slightly clayey silty medium to fine SAND

Classifications -

USCS: SM

AASHTO:

Nat. Moist. = 25.8 %

Sp.G. =

Liquid Limit =

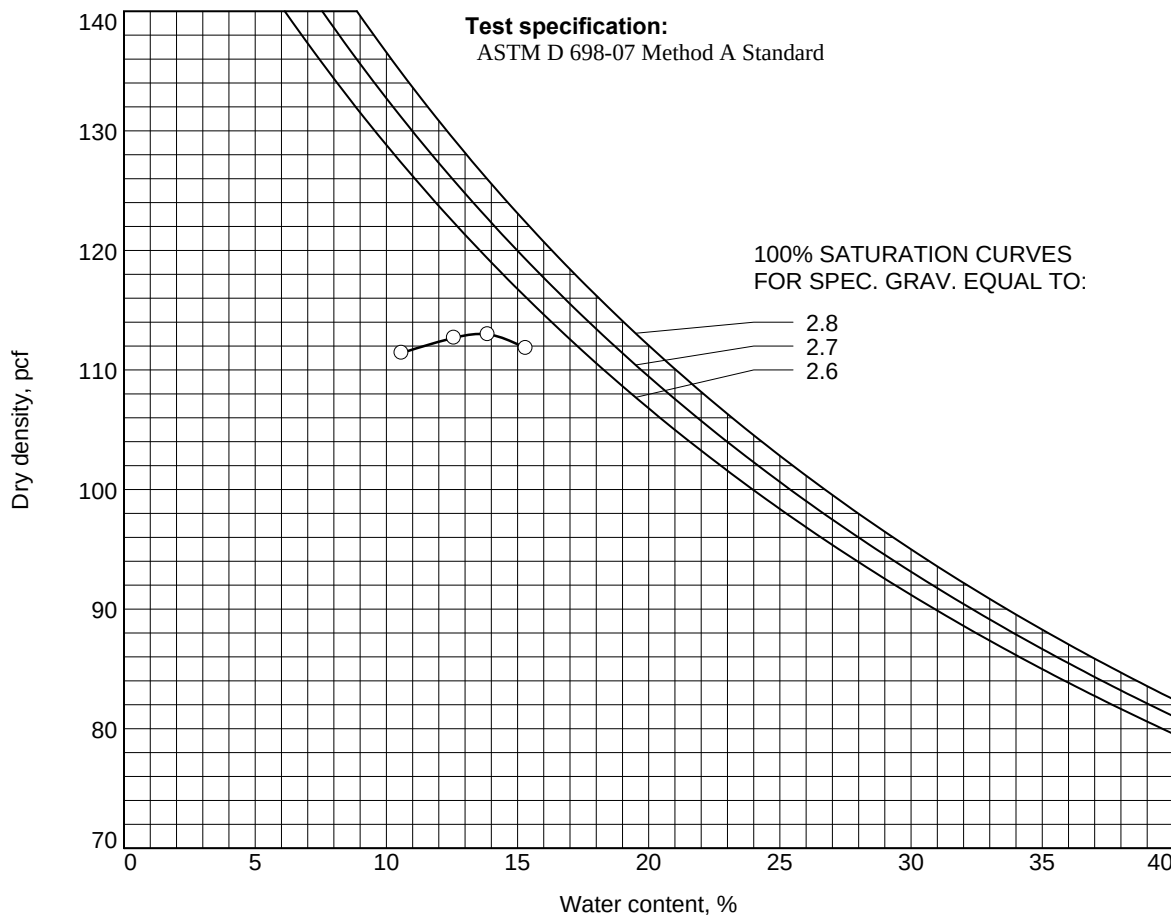
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 113.0 pcf

Optimum moisture = 13.6 %



AMEC

Figure

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-16

Depth: 1 to 7'

Sample Number: B-16

Description: Brown slightly clayey silty medium to fine SAND

Natural Moisture: 25.8

Date: 04/24/14

USCS Classification: SM

Testing Remarks: Lab No.: 12575

Tested by: EH

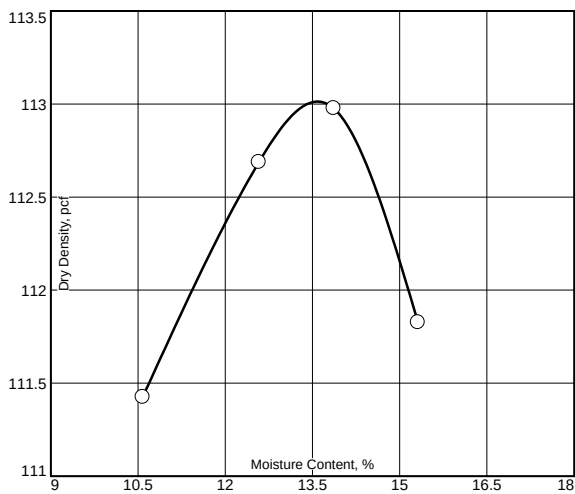
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	3986.8	3991.5	3960.0	3905.0
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	305.6	372.4	323.8	305.3
Wt. D+T	268.9	323.5	288.1	276.5
Tare	4.2	4.2	4.3	4.3
Moist.	13.9	15.3	12.6	10.6
Dry Den.	113.0	111.8	112.7	111.4

Test Results:

Max. Dry Den.= 113.0 pcf **Opt. Moist.=** 13.6%

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/24/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-18 **Depth:** 8 to 18'

Sample Number: B-18

Remarks: Lab No.: 12576

MATERIAL DESCRIPTION

Description: Light red brown silty coarse to fine SAND

Classifications -

USCS: SM

AASHTO:

Nat. Moist. = 20.1 %

Sp.G. =

Liquid Limit =

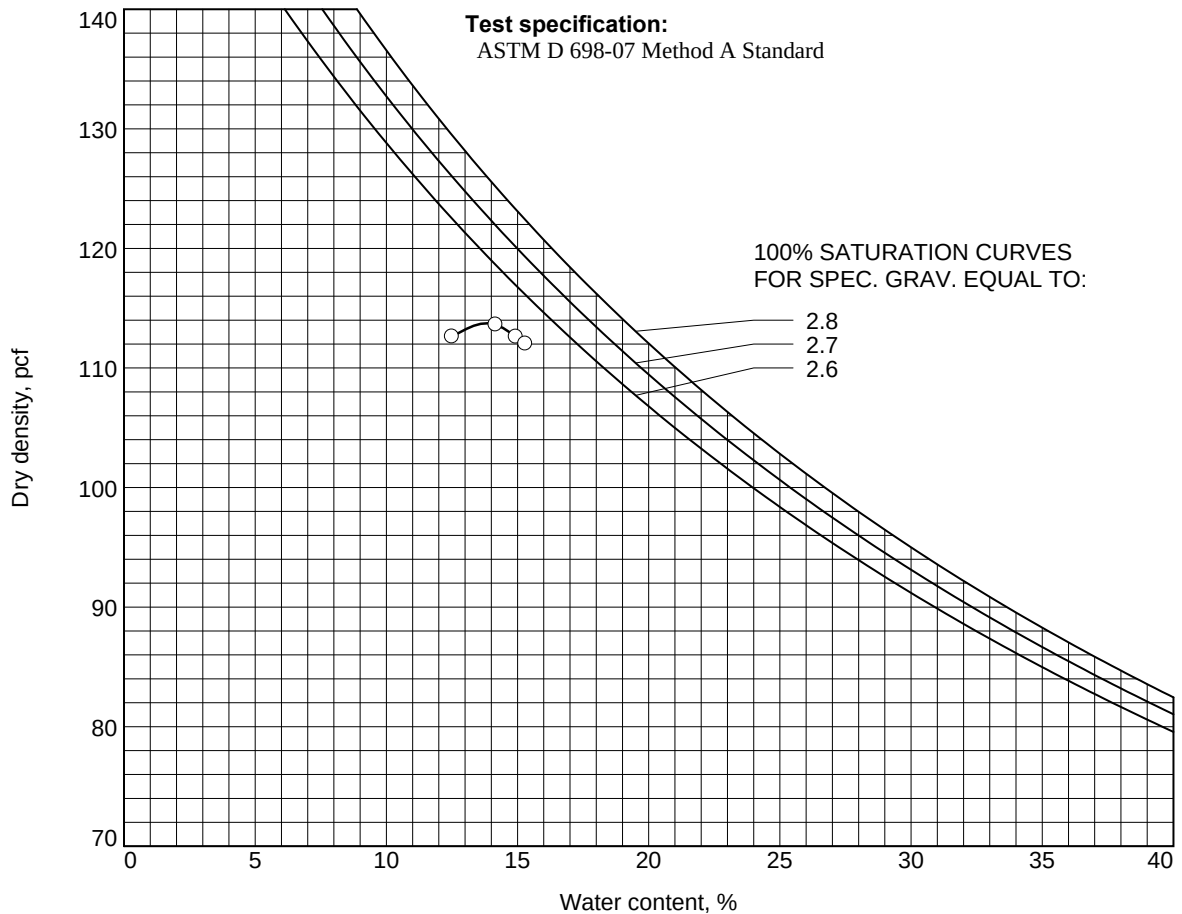
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 113.7 pcf

Optimum moisture = 13.8 %



Figure

AMEC

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-18

Depth: 8 to 18'

Sample Number: B-18

Description: Light red brown silty coarse to fine SAND

Natural Moisture: 20.1

Date: 04/24/14

USCS Classification: SM

Testing Remarks: Lab No.: 12576

Tested by: EH

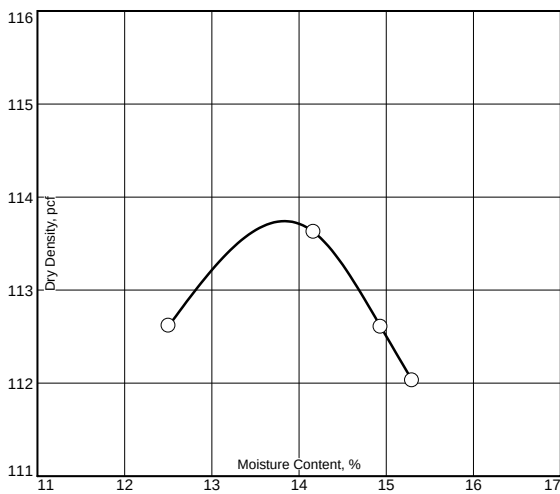
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	4003.1	3998.6	3957.5	3994.7
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	348.2	304.2	308.3	329.8
Wt. D+T	305.5	265.2	274.5	286.6
Tare	4.1	4.1	4.2	4.2
Moist.	14.2	14.9	12.5	15.3
Dry Den.	113.6	112.6	112.6	112.0

Test Results:

Max. Dry Den.= 113.7 pcf **Opt. Moist.=** 13.8%

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/23/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-20 **Depth:** 0.5 to 6'

Sample Number: B-20

Remarks: Lab No.: 12577

MATERIAL DESCRIPTION

Description: Brown and white silty coarse to fine SAND with rock fragments

Classifications -

USCS: SM

AASHTO:

Nat. Moist. = 4.8 %

Sp.G. =

Liquid Limit =

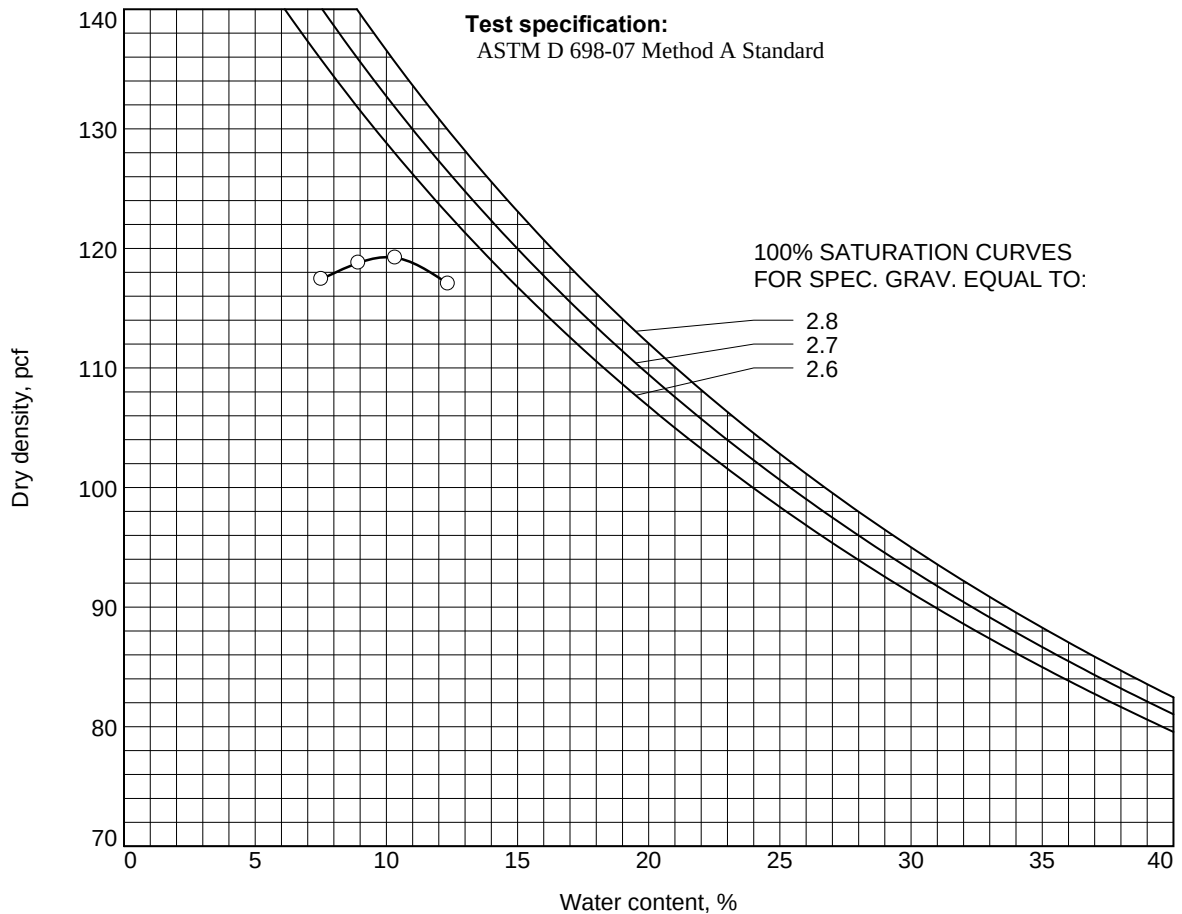
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 119.3 pcf

Optimum moisture = 10.0 %



Figure

AMEC

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-20

Depth: 0.5 to 6'

Sample Number: B-20

Description: Brown and white silty coarse to fine SAND with rock fragments

Natural Moisture: 4.8

Date: 04/23/14

USCS Classification: SM

Testing Remarks: Lab No.: 12577

Tested by: EH

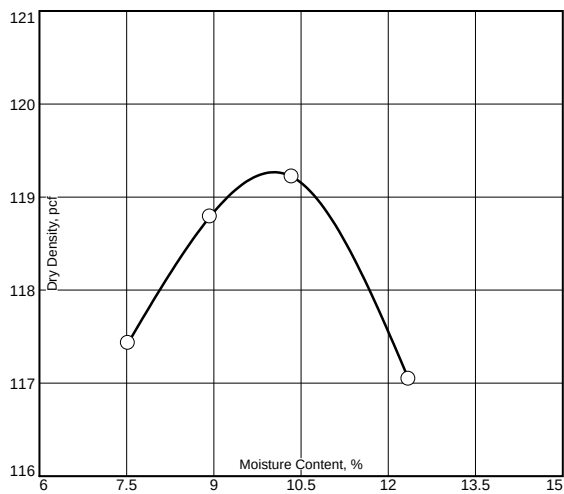
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	4030.6	4029.9	3998.3	3951.0
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	338.3	312.6	322.5	294.3
Wt. D+T	307.0	278.7	296.4	274.0
Tare	4.3	4.2	4.3	4.2
Moist.	10.3	12.3	8.9	7.5
Dry Den.	119.2	117.0	118.8	117.4

Test Results:

Max. Dry Den.= 119.3 pcf **Opt. Moist.=** 10.0%

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/23/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-23 **Depth:** 3 to 13'

Sample Number: B-23

Remarks: Lab No.: 12578

MATERIAL DESCRIPTION

Description: Gray and tan slightly clayey silty medium to fine SAND

Classifications -

USCS: SM

AASHTO:

Nat. Moist. = 19.9 %

Sp.G. =

Liquid Limit =

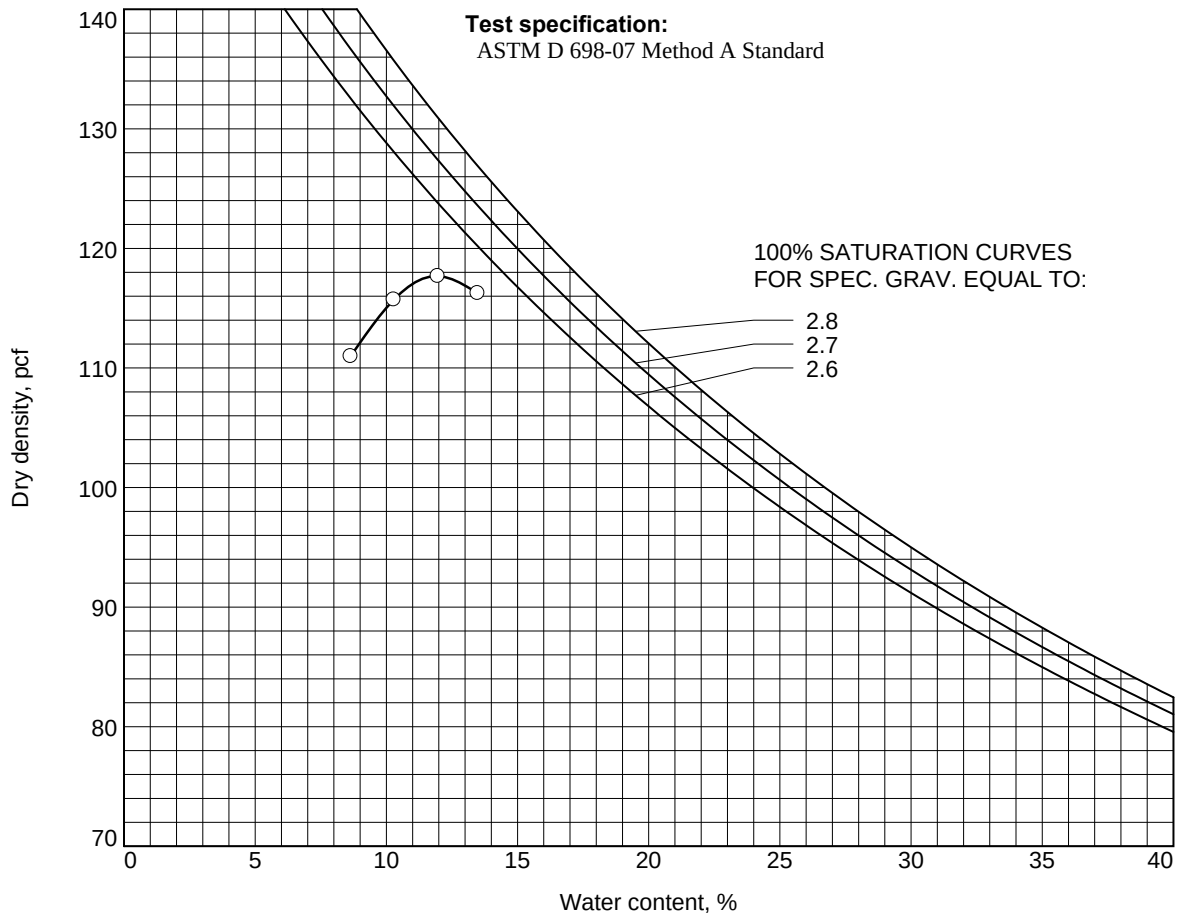
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 117.7 pcf

Optimum moisture = 11.9 %



AMEC

Figure

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-23

Depth: 3 to 13'

Sample Number: B-23

Description: Gray and tan slightly clayey silty medium to fine SAND

Natural Moisture: 19.9

Date: 04/23/14

USCS Classification: SM

Testing Remarks: Lab No.: 12578

Tested by: EH

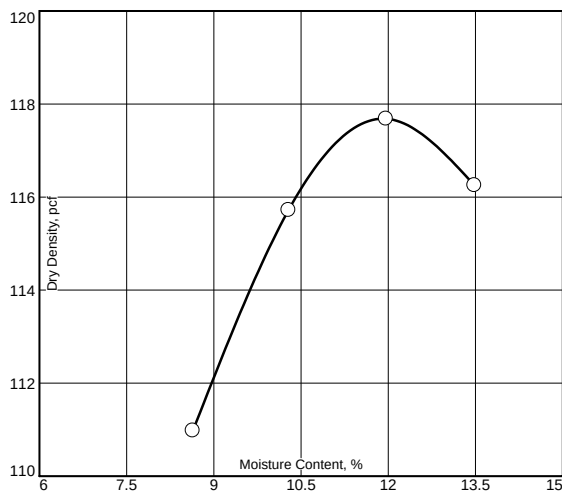
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	3971.4	4033.8	4036.3	3865.1
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	322.7	333.7	319.0	334.9
Wt. D+T	293.0	298.5	281.6	308.6
Tare	4.2	4.2	4.2	4.2
Moist.	10.3	12.0	13.5	8.6
Dry Den.	115.7	117.7	116.3	111.0

Test Results:

Max. Dry Den.= 117.7 pcf Opt. Moist.= 11.9%

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/24/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-25 **Depth:** 5 to 9'

Sample Number: B-25

Remarks: Lab No.: 12579

MATERIAL DESCRIPTION

Description: Gray and tan silty clayey medium to fine SAND

Classifications -

USCS: SC

AASHTO:

Nat. Moist. = 36.4 %

Sp.G. =

Liquid Limit =

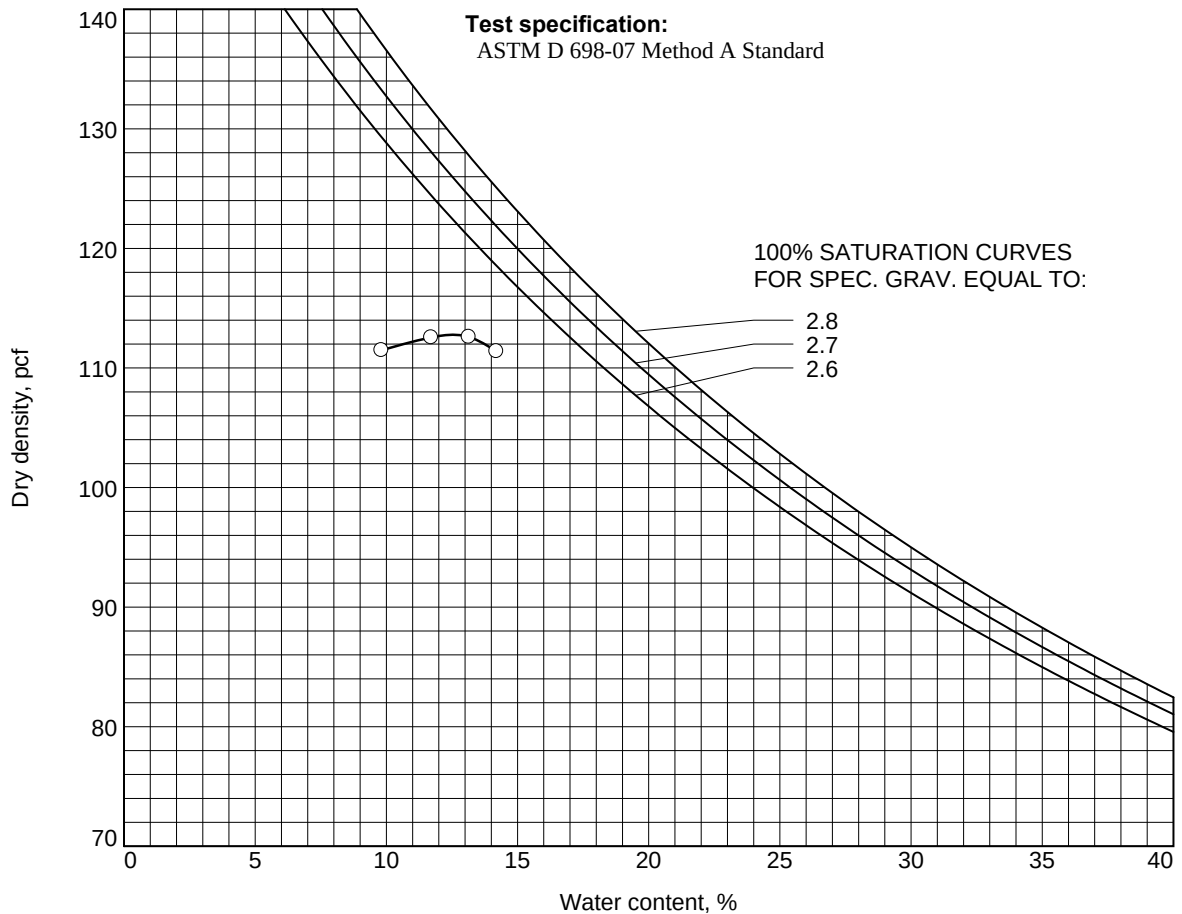
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 112.8 pcf

Optimum moisture = 12.5 %



AMEC

Figure

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-25

Depth: 5 to 9'

Sample Number: B-25

Description: Gray and tan silty clayey medium to fine SAND

Natural Moisture: 36.4

Date: 04/24/14

USCS Classification: SC

Testing Remarks: Lab No.: 12579

Tested by: EH

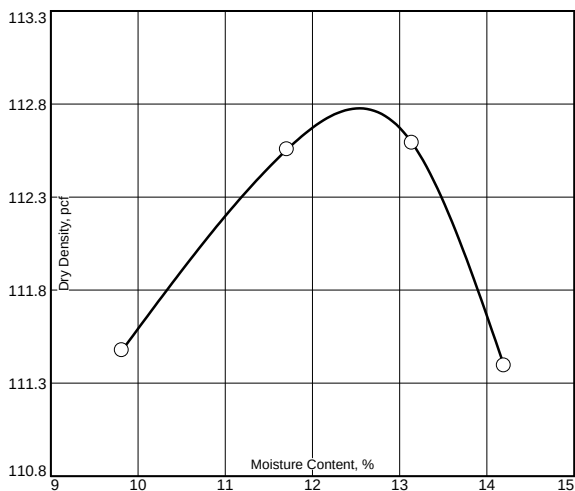
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	3943.0	3967.9	3893.0	3965.2
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	323.8	330.5	315.3	314.0
Wt. D+T	290.3	292.6	287.5	275.5
Tare	4.2	4.2	4.3	4.3
Moist.	11.7	13.1	9.8	14.2
Dry Den.	112.6	112.6	111.5	111.4

Test Results:

Max. Dry Den.= 112.8 pcf Opt. Moist.= 12.5%

COMPACTION TEST REPORT

Project No.: 6162140083

Date: 04/23/14

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Client: Gwinnett County Department of Water Resources

Source of Sample: B-27 **Depth:** 5 to 10'

Sample Number: B-27

Remarks: Lab No.: 12580

MATERIAL DESCRIPTION

Description: Gray and white silty clayey medium to fine SAND

Classifications -

USCS: SC

AASHTO:

Nat. Moist. = 17.8 %

Sp.G. =

Liquid Limit =

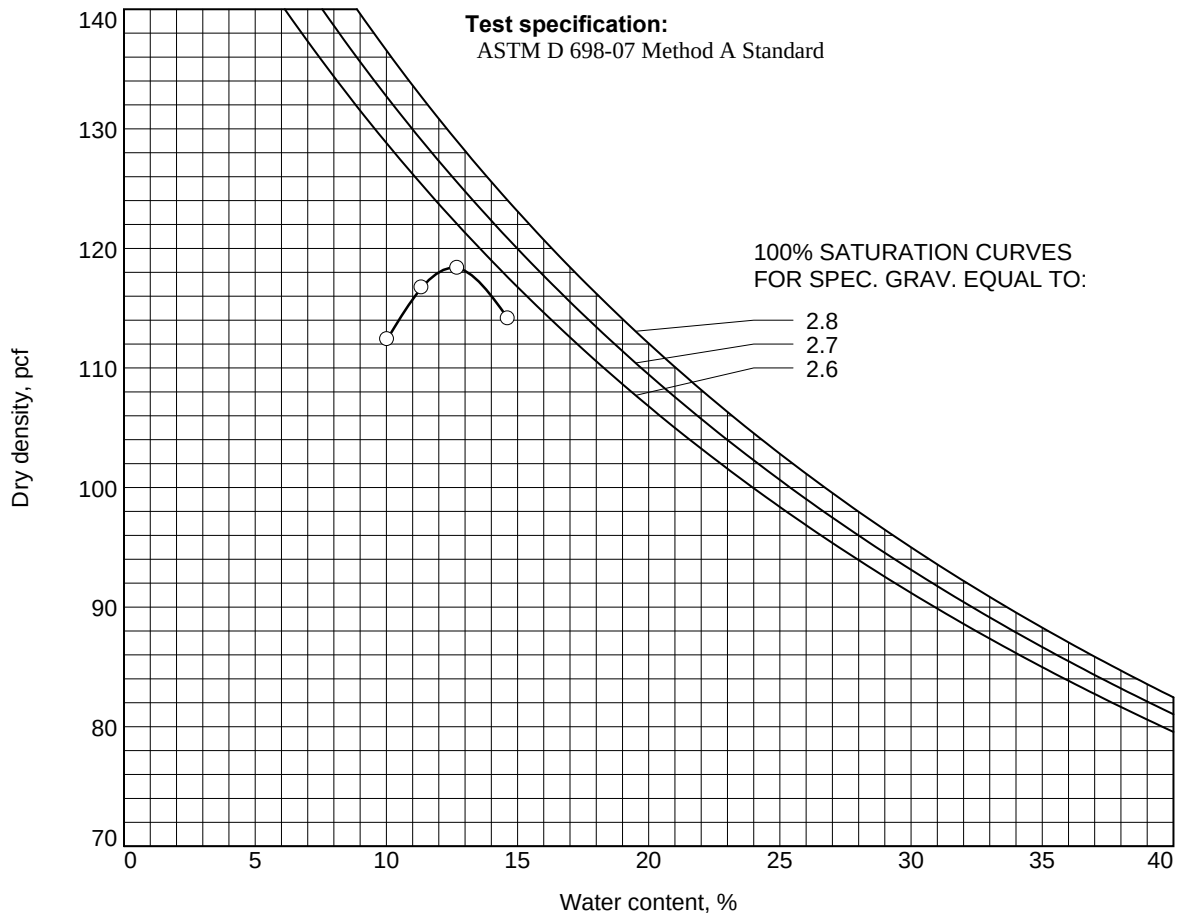
Plasticity Index =

% < No.200 =

TEST RESULTS

Maximum dry density = 118.4 pcf

Optimum moisture = 12.6 %



AMEC

Figure

Tested By: EH

Checked By: JW

MOISTURE DENSITY TEST DATA

Client: Gwinnett County Department of Water Resources

Project: 48-Inch PCCP Replacement (Loganville Highway to Grayson Tank)

Project Number: 6162140083

Location: B-27

Depth: 5 to 10'

Sample Number: B-27

Description: Gray and white silty clayey medium to fine SAND

Natural Moisture: 17.8

Date: 04/23/14

USCS Classification: SC

Testing Remarks: Lab No.: 12580

Tested by: EH

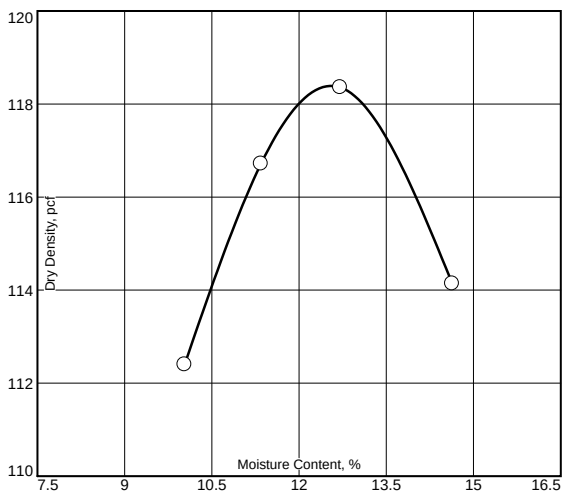
Checked by: JW

Test Data and Results

Test Specification:

Type of Test: ASTM D 698-07 Method A Standard

Mold Dia: 4.00 **Hammer Wt.:** 5.5 lb. **Drop:** 12 in. **Layers:** three **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	4020.0	4058.5	4006.7	3911.9
Wt. M	2047.6	2047.6	2047.6	2047.6
Wt. W+T	319.2	332.4	309.4	328.9
Wt. D+T	279.0	295.4	278.3	299.3
Tare	4.3	4.2	4.2	4.2
Moist.	14.6	12.7	11.3	10.0
Dry Den.	114.1	118.4	116.7	112.4

Test Results:

Max. Dry Den.= 118.4 pcf **Opt. Moist.=** 12.6%

Important Information About Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply the report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,

- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led

to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the express purpose of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechnical Engineer For Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.



8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

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APPENDIX 'C'

RECORDED EASEMENT DOCUMENTS

FILED AND RECORDED
CLERK SUPERIOR COURT
GWINNETT COUNTY, GA
2016 JUL -5 PM 1:54
RICHARD ALEXANDER, CLERK

TEMPORARY CONSTRUCTION EASEMENT

304888

GEORGIA, GWINNETT COUNTY

THIS INDENTURE, made this 27 day of June, 2016, between **Dewey E. Moody, Jr. and Brenda B. Moody**, hereinafter referred to as parties of the first part, and **Gwinnett County Water and Sewerage Authority**, a political subdivision of the State of Georgia, hereinafter referred to as the party of the second part.

WITNESSETH: that the said party of the first part, for and in consideration of the sum of One (\$1.00) Dollar and other valuable considerations in hand paid, at and before the sealing and delivery of these presents, the receipt and sufficiency whereof is hereby acknowledged, has granted, bargained, sold and conveyed and by these presents does grant, bargain, sell and convey unto the said party of the second part, its successors and assigns, a non-exclusive temporary construction easement for the purpose of locating, constructing, installing and maintaining within same sewer and/or water lines and their appurtenances. Said easement being described as to size in Exhibit "A". Said Exhibit shall be considered the legally controlling description of this conveyance. The party of the second part shall have access to said easement for the purposes previously stated.

The said easement being more particularly defined as a portion of that property in Land Lot 153 of the 5th Land District, being described by the tax parcel no. 5153 011 of Gwinnett County, Georgia, for sanitary sewer and/or water lines as shown on the attached plat labeled as Exhibit "A", prepared by **McKim & Creed** and dated October 23, 2013.

The party of the first part grants and conveys to party of the second part, a non-exclusive temporary construction easement being described as to dimensions in Exhibit "A" and provided further that all rights in and to said temporary construction easement shall begin upon commencement of construction activity and shall terminate twenty four months later. The permanent easement area will be cleared of all trees and other vegetation by the party of the second part. The temporary construction easement will be cleared of such trees and other vegetation by the party of the second part as the contractor deems necessary for the construction of the line.

The party of the first part does hereby covenant with party of the second part that he is the owner of record and is lawfully seized and possessed of the property above described, and he has a good and lawful right to convey said property, or any part thereof, subject to existing encumbrances, and that he will forever warrant and defend title thereto against the lawful claims of all persons whomsoever.

0058955

The party of the first part further covenants that no buildings or permanent structures will be constructed upon, over or across the easement described herein during the above stated period of time.

The party of the first part also covenants that no changes will be made to the surface within the easement area during this time without the prior permission of the party of the second part.

TO HAVE AND TO HOLD, the said easement unto the party of the second part, its successors and assigns.

IN WITNESS WHEREOF, the party of the first part has hereunto set his hand and affixed his seal, the day and year first above written.

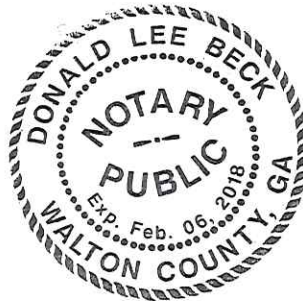
Signed, sealed and delivered on this
1 day of July, 2016
in the presence of:

Dewey E. Moody
Dewey E. Moody, Jr.

Deceased
Brenda B. Moody

[Signature]
Unofficial Witness

[Signature]
Notary Public

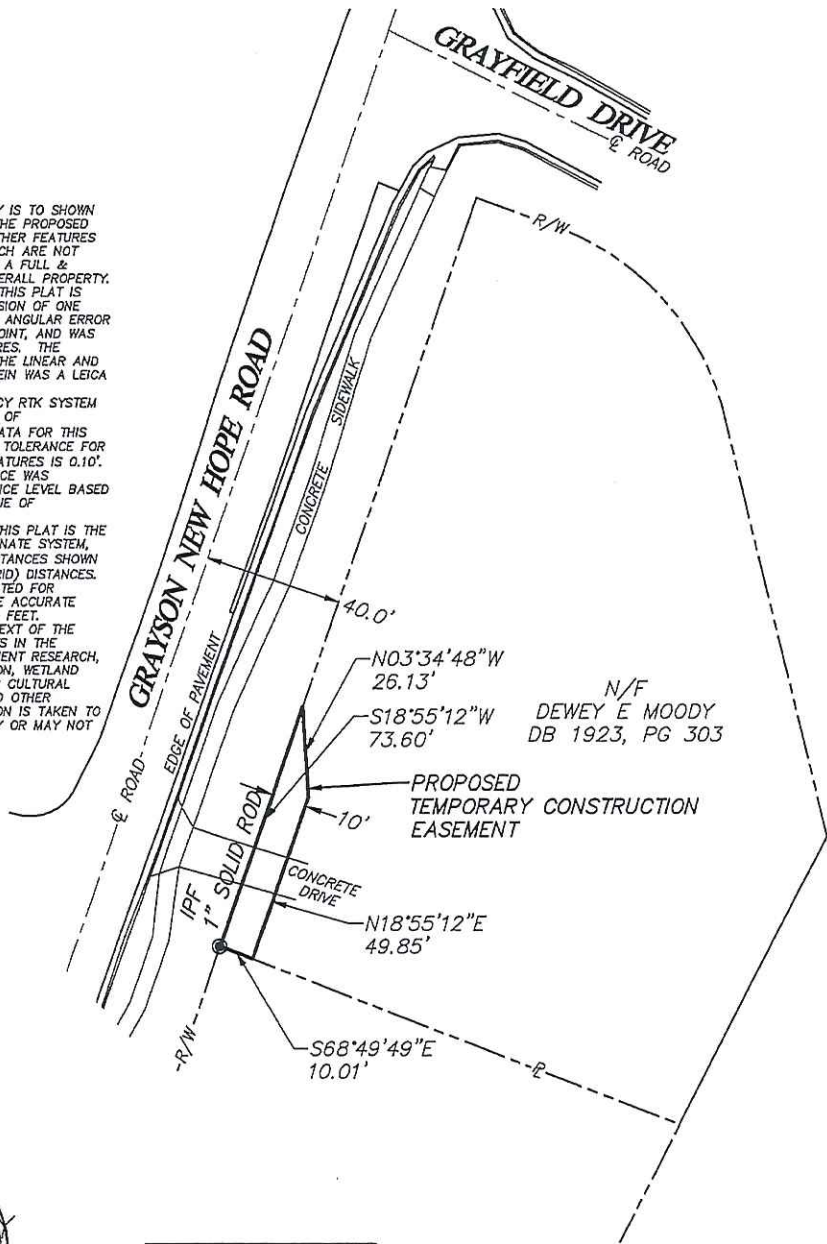


- LEGEND
- C - CENTERLINE
 - DB - DEED BOOK
 - LL - LAND LOT
 - N/F - NOW OR FORMERLY
 - P - PROPERTY LINE
 - PG - PAGE
 - R/W - RIGHT OF WAY
 - IPF - IRON PIN FOUND

GRID NORTH
GEORGIA WEST ZONE

GENERAL NOTES

1. THE PURPOSE OF THIS SURVEY IS TO SHOWN INFORMATION PERTAINING TO THE PROPOSED UTILITY EASEMENT SHOWN. OTHER FEATURES AND IMPROVEMENTS EXIST WHICH ARE NOT SHOWN HEREON. THIS IS NOT A FULL & COMPLETE SURVEY OF THE OVERALL PROPERTY.
2. THE FIELD DATA UPON WHICH THIS PLAT IS BASED HAS A CLOSURE PRECISION OF ONE FOOT IN 29,773 FEET AND AN ANGULAR ERROR OF 01 SECONDS PER ANGLE POINT, AND WAS ADJUSTED USING LEAST SQUARES. THE EQUIPMENT USED TO OBTAIN THE LINEAR AND ANGULAR MEASUREMENTS HEREIN WAS A LEICA TS06 TOTAL STATION.
3. A TRIMBLE R8 DUAL FREQUENCY RTK SYSTEM WAS USED IN THE COLLECTION OF TOPOGRAPHIC/PLANIMETRIC DATA FOR THIS SURVEY. RELATIVE POSITIONAL TOLERANCE FOR TOPOGRAPHIC/PLANIMETRIC FEATURES IS 0.10'. RELATIVE POSITIONAL TOLERANCE WAS CALCULATED AT 95% CONFIDENCE LEVEL BASED ON 2-SIGMA STATISTICAL VALUE OF OBSERVATION RESIDUALS.
4. THE BASIS OF BEARING FOR THIS PLAT IS THE GEORGIA STATE PLANE COORDINATE SYSTEM, WEST ZONE (NAD 83). ALL DISTANCES SHOWN HEREON ARE GROUND (NOT GRID) DISTANCES.
5. THIS PLAT HAS BEEN CALCULATED FOR CLOSURE AND IS FOUND TO BE ACCURATE WITHIN ONE FOOT IN 999,999+ FEET.
6. SURVEYORS, WITHIN THE CONTEXT OF THE PROFESSION, ARE NOT EXPERTS IN THE MATTERS OF TITLE AND EASEMENT RESEARCH, UNDERGROUND UTILITY LOCATION, WETLAND IDENTIFICATION, HISTORICAL OR CULTURAL RESOURCE IDENTIFICATION, AND OTHER SPECIALIZED TRADES. EXCEPTION IS TAKEN TO ANY SUCH MATTER WHICH MAY OR MAY NOT AFFECT THIS PROPERTY.



EASEMENT AREA
617 SQ.FT.

THIS SURVEY HAS BEEN PREPARED IN CONFORMITY WITH THE TECHNICAL STANDARDS FOR PROPERTY SURVEYS IN GEORGIA AS SET FORTH IN CHAPTER 180-7 OF THE RULES OF THE GEORGIA BOARD OF REGISTRATION FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS AND AS SET FORTH IN THE GEORGIA PLAT ACT O.C.G.A. 15-6-67.

40' 0 40'
GRAPHIC SCALE: 1" = 40'

MCKIM & CREED
1505 LAKES PARKWAY, SUITE 170
LAWRENCEVILLE, GA. 30043
(770) 962-4125
WWW.MCKIMCREED.COM
LSF #000689

EASEMENT EXHIBIT FOR
R.P. WESTON
PROPERTY OF
DEWEY E. MOODY
PARCEL NO. 5-153-011-7

FIELD DATE:	10/23/2013
PLAT DATE:	
CC:	
DRAWN:	KD
CHECKED:	JT
JOB NO.:	06423-002
FILE NO.:	06423002_V1_REV1 - ESM.dwg

GEORGIA DEATH CERTIFICATE

A. BIRTH CERTIFICATE NUMBER

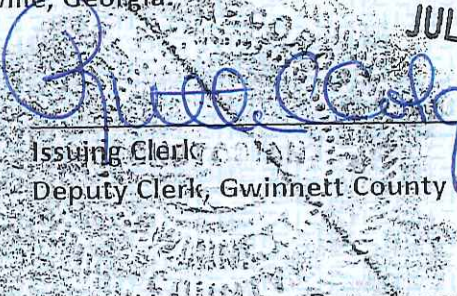
B. STATE FILE NUMBER

DECEDENT'S INFORMATION	1. DECEDENT'S LEGAL FULL NAME (FIRST, MIDDLE, LAST) Brenda Gail Moody		1a. LAST NAME AT BIRTH (IF FEMALE) Brownlee		2. SEX Female	2a. DATE OF DEATH (MO/DAY/YR) June 5, 2013						
	3. SOCIAL SECURITY NUMBER 260-74-0532		4a. AGE (YEARS) 64		4b. UNDER 1 YEAR MONTHS DAYS		4c. UNDER 1 DAY HOURS MINUTES		5. DATE OF BIRTH (MO/DAY/YR) December 22, 1948			
	6. BIRTHPLACE (CITY AND STATE OR FOREIGN COUNTRY) Duluth, GA		7a. STREET AND NUMBER OF RESIDENCE 87 Grayson New Hope Road		7b. ZIP CODE 30017	7c. CITY OR TOWN OF RESIDENCE Grayson						
	7d. COUNTY OF RESIDENCE Gwinnett		7e. STATE OF RESIDENCE Georgia		7f. COUNTRY United States		7g. INSIDE CITY LIMITS ☒ Yes ☐ No ☐ Unknown		8. ARMED FORCES ☐ Yes ☒ No ☐ Unknown			
	8a. OCCUPATION Teacher		8b. NATURE OF BUSINESS Education		8c. EMPLOYER Gwinnett County School Systems							
	9. MARITAL STATUS ☒ Married ☐ Married, but separated ☐ Widowed ☐ Divorced ☐ Never Married ☐ Unknown		10. SPOUSE'S NAME (IF WIFE, GIVE NAME PRIOR TO FIRST MARRIAGE) Dewey E. Moody		11. FATHER'S NAME (FIRST, MIDDLE, LAST) Milton Dewitt Brownlee, Jr.							
	12. MOTHER'S NAME PRIOR TO FIRST MARRIAGE (FIRST, MIDDLE, LAST) Wilma Imogene Kemp		13. DECEDENT'S EDUCATION (HIGHEST LEVEL) ☐ 8th grade or less ☐ 9th - 12th grade; no diploma ☐ High school graduate or GED completed ☐ Some college credit, but no degree ☐ Associate degree (e.g., AA, AS) ☐ Bachelor's degree (e.g., BA, AB, BS) ☒ Master's degree (e.g., MA, MS, MEng, Med, MSW) ☐ Doctorate (e.g., PhD, EdD) or Professional degree (e.g., MD, DDS, DVM, LLB, JD) ☐ Unknown		14a. INFORMANT'S NAME (FIRST, MIDDLE, LAST) Dewey E. Moody							
	14b. RELATIONSHIP TO DECEDENT Husband		14c. MAILING ADDRESS (STREET AND NUMBER, CITY, COUNTY, STATE, ZIP CODE) P.O. Box 54, Grayson, Gwinnett, GA 30017 87 Grayson New Hope Road									
	15b. HISPANIC ORIGIN ☒ No, not Spanish/Hispanic/Latino ☐ Yes, Puerto Rican ☐ Yes, Mexican, Mexican American, Chicano ☐ Yes, Cuban ☐ Yes, other Spanish/Hispanic/Latino (Specify) ☐ Unknown		16. DECEDENT'S RACE ☒ White ☐ Japanese ☐ Asian Indian ☐ Chinese ☐ Filipino ☐ Black/African American ☐ Korean ☐ Vietnamese ☐ Native Hawaiian ☐ Guamanian/Chamorro ☐ Samoan ☐ American Indian/Alaska Native ☐ Other Asian ☐ Other Pacific Islander ☐ Other ☐ Unknown									
	17a. IF DEATH OCCURRED IN HOSPITAL ☐ Inpatient ☐ Emergency Room/Outpatient ☒ Dead on Arrival		17b. IF DEATH OCCURRED OTHER THAN HOSPITAL ☐ Hospice Facility ☐ Nursing Home/Long Term Care Facility ☐ Decedent's Home ☐ Other ☐ Unknown									
18. FACILITY NAME Eastside Medical Center		19. FACILITY ADDRESS (STREET AND NUMBER, CITY, STATE, ZIP CODE) 1700 Medical Way Snellville, GA 30078		20. COUNTY OF DEATH Gwinnett								
DISPOSITION	21. METHOD OF DISPOSITION ☒ Burial ☐ Donation ☐ Removal from State ☐ Cremation ☐ Entombment ☐ Other		22. PLACE OF DISPOSITION (NAME AND COMPLETE ADDRESS) Gwinnett Memorial Park 925 Hwy 29 S. Lawrenceville, GA 30046		23. DATE OF DISPOSITION (MO/DAY/YR) June 7, 2013							
	24a. EMBALMER'S NAME & CERTIFIED INITIALS William L. Meeks W L M		25a. FUNERAL HOME ADDRESS (STREET AND NUMBER, CITY, COUNTY, STATE, ZIP CODE) 330 Simonon Rd P. O. Box 674, Lawrenceville, Gwinnett, GA 30046		24b. LICENSE NUMBER 2693							
	25. FUNERAL HOME NAME Tim Stewart Funeral Home, Inc.		26a. SIGNATURE OF FUNERAL DIRECTOR <i>Timothy L. Stewart</i>		26b. LICENSE NUMBER 2701							
	26. FUNERAL DIRECTOR'S NAME (PRINT) Timothy L. Stewart											
PRONOUNCER	27. DATE PRONOUNCED DEAD (MO/DAY/YR) June 5, 2013		28. TIME PRONOUNCED DEATH 1:53 AM		29a. PRONOUNCER'S NAME AND TITLE (PRINT) Dr. John Nathan Limehouse, M.D.							
	29b. PRONOUNCER'S LICENSE NUMBER 062388		30. ACTUAL OR PRESUMED TIME OF DEATH 1:53 AM									
CAUSE OF DEATH	31. Part I. Enter the chain of events - diseases, injuries, or complications that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. IMMEDIATE CAUSE (Final disease or condition resulting in death) Sudden Cardiac death		Due to, or as a consequence of		Approximate interval between onset and death 15 mins							
	Sequentially list conditions, if any, leading to the cause listed on line a. Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST. Coronary artery disease		Due to, or as a consequence of		Unknown							
	hypercholesterolemia		Due to, or as a consequence of		20 yrs.							
	hypertension		Due to, or as a consequence of		10 yrs.							
	Part II. Enter other significant conditions contributing to death, but not resulting in the underlying cause given in Part I. Hypertension Diabetes mellitus		32. WAS AUTOPSY PERFORMED ☐ Yes ☒ No ☐ Unknown									
	33. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? ☐ Yes ☒ No ☐ Unknown		33a. WAS AN INJURY OF ANY KIND INDICATED IN THE CAUSE OF DEATH FOR PART I OR PART II WITH THE DECEDENT ☐ Yes ☒ No ☐ Unknown		34. WAS CASE REFERRED TO MEDICAL EXAMINER OR CORONER ☐ Yes ☒ No ☐ Unknown							
35. TOBACCO USE CONTRIBUTE TO DEATH ☐ Yes ☒ No ☐ Unknown ☐ Probably		36. IF FEMALE ☐ Not Applicable ☐ Not pregnant within past year ☐ Not pregnant, but pregnant within 42 days of death ☐ Not pregnant, but pregnant 43 days to 1 year before death ☐ Pregnant at the time of death ☐ Unknown if pregnant within the past year		37. MANNER OF DEATH ☐ Accident ☒ Natural ☐ Could not be determined ☐ Pending Investigation ☐ Homicide ☐ Suicide								
38. DATE OF INJURY (MO/DAY/YR)		39. TIME OF INJURY		40. PLACE OF INJURY (e.g., Decedent's home, construction site, restaurant, wooded area)				41. INJURY AT WORK ☐ Yes ☐ No ☐ Unknown				
42. LOCATION OF INJURY		STREET AND NUMBER		CITY		STATE		COUNTY		ZIP CODE		
43. DESCRIBE HOW INJURY OCCURRED		44. IF TRANSPORTATION INJURY ☐ Driver/Operator ☐ Passenger ☐ Pedestrian ☐ Other										
CERTIFICATION	45. To the best of my knowledge, death occurred at the time, date, place, and due to the cause(s) stated. Medical Certifier (Name, Title, License No.) Dr. Laurence Martin Lesser, M.D. 14194		46. On the basis of examination and/or investigation, in my opinion death occurred at the time, date, place, and due to the cause(s) stated. Medical Examiner/Coroner (Name, Title, License No.) DR. LESSER 14194									
	45a. DATE SIGNED (MO/DAY/YR) 6/20/13		45b. HOUR OF DEATH 1:53 AM		46a. DATE SIGNED (MO/DAY/YR)		46b. HOUR OF DEATH 1:53 AM					
	47. PERSON COMPLETING CAUSE OF DEATH (NAME, ADDRESS, COUNTY, ZIP CODE) Dr. Laurence Martin Lesser, M.D., 1700 Tree Lane, Ste 170, Snellville, Gwinnett, GA 30078											
48. REGISTRAR SIGNATURE (PRINT AND SIGN) <i>LORRAINE STAFFORD</i>		49. DATE FILED (REGISTRAR) (MO/DAY/YR) JUL - 1 2013										

BK54410 PG0702

This is to certify that this is a true and correct copy of the Death Certificate Filed with Gwinnett County Probate Court, Vital Records Division, Lawrenceville, Georgia.


Christopher A. Ballar
County Custodian
Vital Records


JUL - 1 2013

Issuing Clerk Date
Deputy Clerk, Gwinnett County Probate Court

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VOID IF ALTERED OR COPIED

2016 JUN 20 PM 2:25

RICHARD ALEXANDER, CLERK

304482

TEMPORARY CONSTRUCTION EASEMENT

GEORGIA, GWINNETT COUNTY

THIS INDENTURE, made this 16 day of June, 2016, between **Kathy Dispain Long**, hereinafter referred to as party of the first part, and **Gwinnett County Water and Sewerage Authority**, a political subdivision of the State of Georgia, hereinafter referred to as the party of the second part.

WITNESSETH: that the said party of the first part, for and in consideration of the sum of One (\$1.00) Dollar and other valuable considerations in hand paid, at and before the sealing and delivery of these presents, the receipt and sufficiency whereof is hereby acknowledged, has granted, bargained, sold and conveyed and by these presents does grant, bargain, sell and convey unto the said party of the second part, its successors and assigns, a non-exclusive temporary construction easement for the purpose of locating, constructing, installing and maintaining within same sewer and/or water lines and their appurtenances. Said easement being described as to size in Exhibit "A". Said Exhibit shall be considered the legally controlling description of this conveyance. The party of the second part shall have access to said easement for the purposes previously stated.

The said easement being more particularly defined as a portion of that property in Land Lot 153 of the 5th Land District, being described by the tax parcel no. 5153 010 of Gwinnett County, Georgia, for sanitary sewer and/or water lines as shown on the attached plat labeled as Exhibit "A", prepared by **McKim & Creed** and dated October 23, 2013.

The party of the first part grants and conveys to party of the second part, a non-exclusive temporary construction easement being described as to dimensions in Exhibit "A" and provided further that all rights in and to said temporary construction easement shall begin upon commencement of construction activity and shall terminate twenty four months later. The permanent easement area will be cleared of all trees and other vegetation by the party of the second part. The temporary construction easement will be cleared of such trees and other vegetation by the party of the second part as the contractor deems necessary for the construction of the line.

The party of the first part does hereby covenant with party of the second part that he is the owner of record and is lawfully seized and possessed of the property above described, and he has a good and lawful right to convey said property, or any part thereof, subject to existing encumbrances, and that he will forever warrant and defend title thereto against the lawful claims of all persons whomsoever.

The party of the first part further covenants that no buildings or permanent structures will be constructed upon, over or across the easement described herein during the above stated period of time.

The party of the first part also covenants that no changes will be made to the surface within the easement area during this time without the prior permission of the party of the second part.

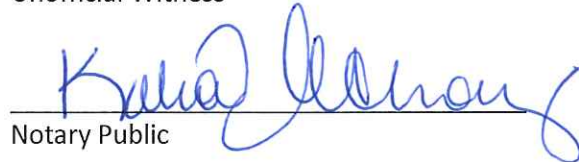
TO HAVE AND TO HOLD, the said easement unto the party of the second part, its successors and assigns.

IN WITNESS WHEREOF, the party of the first part has hereunto set his hand and affixed his seal, the day and year first above written.

Signed, sealed and delivered on this
16th day of June, 2016
in the presence of:



Unofficial Witness



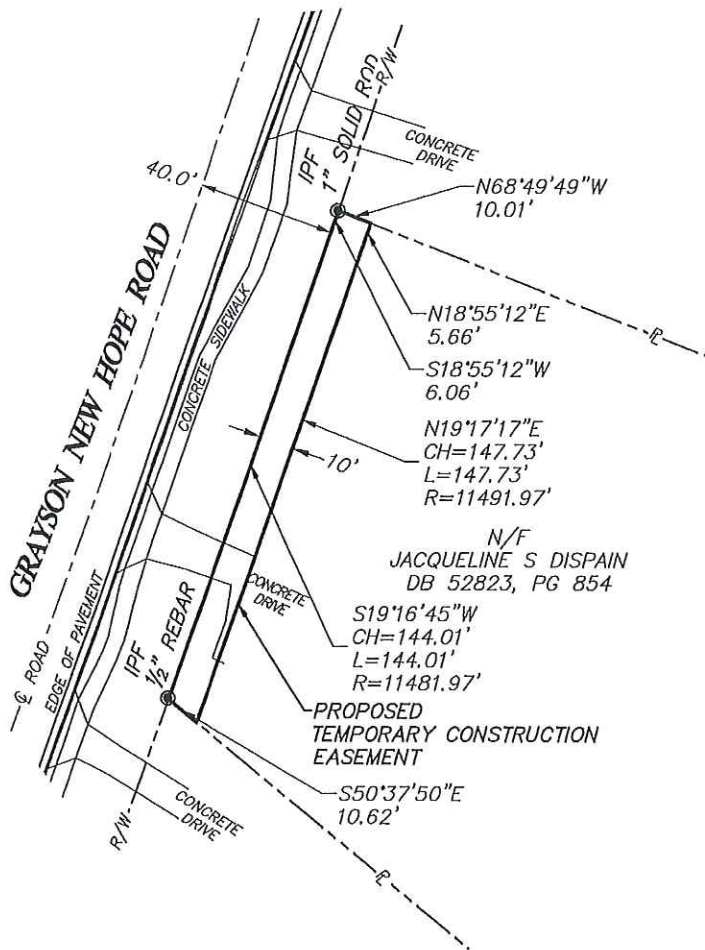
Notary Public


Kathy Dispain Long

Katia McKay
NOTARY PUBLIC
Gwinnett County, GEORGIA
My Comm. Expires
5/19/2020

LEGEND
 CL - CENTERLINE
 DB - DEED BOOK
 LL - LAND LOT
 N/F - NOW OR FORMERLY
 PL - PROPERTY LINE
 PG - PAGE
 R/W - RIGHT OF WAY
 IPF - IRON PIN FOUND

GRID NORTH
 GEORGIA WEST ZONE



GENERAL NOTES

1. THE PURPOSE OF THIS SURVEY IS TO SHOWN INFORMATION PERTAINING TO THE PROPOSED UTILITY EASEMENT SHOWN. OTHER FEATURES AND IMPROVEMENTS EXIST WHICH ARE NOT SHOWN HEREON. THIS IS NOT A FULL & COMPLETE SURVEY OF THE OVERALL PROPERTY.
2. THE FIELD DATA UPON WHICH THIS PLAT IS BASED HAS A CLOSURE PRECISION OF ONE FOOT IN 29,773 FEET AND AN ANGULAR ERROR OF 01 SECONDS PER ANGLE POINT, AND WAS ADJUSTED USING LEAST SQUARES. THE EQUIPMENT USED TO OBTAIN THE LINEAR AND ANGULAR MEASUREMENTS HEREIN WAS A LEICA TS06 TOTAL STATION.
3. A TRIMBLE R8 DUAL FREQUENCY RTK SYSTEM WAS USED IN THE COLLECTION OF TOPOGRAPHIC/PLANIMETRIC DATA FOR THIS SURVEY. RELATIVE POSITIONAL TOLERANCE FOR TOPOGRAPHIC/PLANIMETRIC FEATURES IS 0.10'. RELATIVE POSITIONAL TOLERANCE WAS CALCULATED AT 95% CONFIDENCE LEVEL BASED ON 2-SIGMA STATISTICAL VALUE OF OBSERVATION RESIDUALS.
4. THE BASIS OF BEARING FOR THIS PLAT IS THE GEORGIA STATE PLANE COORDINATE SYSTEM, WEST ZONE (NAD 83). ALL DISTANCES SHOWN HEREON ARE GROUND (NOT GRID) DISTANCES.
5. THIS PLAT HAS BEEN CALCULATED FOR CLOSURE AND IS FOUND TO BE ACCURATE WITHIN ONE FOOT IN 467,858 FEET.
6. SURVEYORS, WITHIN THE CONTEXT OF THE PROFESSION, ARE NOT EXPERTS IN THE MATTERS OF TITLE AND EASEMENT RESEARCH, UNDERGROUND UTILITY LOCATION, WETLAND IDENTIFICATION, HISTORICAL OR CULTURAL RESOURCE IDENTIFICATION, AND OTHER SPECIALIZED TRADES. EXCEPTION IS TAKEN TO ANY SUCH MATTER WHICH MAY OR MAY NOT AFFECT THIS PROPERTY.



EASEMENT AREA
 1,517 SQ.FT.

THIS SURVEY HAS BEEN PREPARED IN CONFORMITY WITH THE TECHNICAL STANDARDS FOR PROPERTY SURVEYS IN GEORGIA AS SET FORTH IN CHAPTER 180-7 OF THE RULES OF THE GEORGIA BOARD OF REGISTRATION FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS AND AS SET FORTH IN THE GEORGIA PLAT ACT O.C.G.A. 15-6-67.

40' 0 40'
 GRAPHIC SCALE: 1" = 40'

MCKIM & CREED
 1505 LAKES PARKWAY, SUITE 170
 LAWRENCEVILLE, GA. 30043
 (770) 962-4125
 WWW.MCKIMCREED.COM
 LSF #000689

EASEMENT EXHIBIT FOR
R.P. WESTON
 PROPERTY OF
JACQUELINE S. DISPAIN
 PARCEL NO. 5-153-010-6

FIELD DATE: 10/23/2013
PLAT DATE:
CC:
DRAWN: KD
CHECKED: JT
JOB NO.: 06423-002
FILE NO.: 0612002 W/REV - ESM/ldg

Return To:
DOSS - Real Estate and Records
Attn. Alan Hayes

BK54600 PG0370

FILED & RECORDED
CLERK SUPERIOR COURT
GWINNETT COUNTY, GA.

2016 SEP 21 PM 1:32

RICHARD ALEXANDER, CLERK

307499-500

TEMPORARY CONSTRUCTION EASEMENT

GEORGIA, GWINNETT COUNTY

THIS INDENTURE, made this 12 day of September, 2016, between **Margaret T. Fain**, hereinafter referred to as parties of the first part, and **Gwinnett County Water and Sewerage Authority**, a political subdivision of the State of Georgia, hereinafter referred to as the party of the second part.

WITNESSETH: that the said party of the first part, for and in consideration of the sum of One (\$1.00) Dollar and other valuable considerations in hand paid, at and before the sealing and delivery of these presents, the receipt and sufficiency whereof is hereby acknowledged, has granted, bargained, sold and conveyed and by these presents does grant, bargain, sell and convey unto the said party of the second part, its successors and assigns, a non-exclusive temporary construction easement for the purpose of locating, constructing, installing and maintaining within same sewer and/or water lines and their appurtenances. Said easement being described as in Exhibit "A". Said Exhibit shall be considered the legally controlling description of this conveyance. The party of the second part shall have access to said easement for the purposes previously stated.

The said easement being more particularly defined as a portion of that property in Land Lot 153 of the 5th Land District, being described by the tax parcel no. 5153 008 of Gwinnett County, Georgia, for sanitary sewer and/or water lines as shown on the attached plat labeled as Exhibit "A", prepared by McKim & Creed and dated October 23, 2013

The party of the first part grants and conveys to party of the second part, a non-exclusive temporary construction easement being described as to dimensions in Exhibit "A", and provided further that all rights in and to said temporary construction easement shall begin upon commencement of construction activity and shall terminate twenty four months later. The temporary construction easement will be cleared of such trees and other vegetation by the party of the second part as the contractor deems necessary for the construction of the line.

The party of the first part does hereby covenant with party of the second part that he is the owner of record and is lawfully seized and possessed of the property above described, and he has a good and lawful right to convey said property, or any part thereof, subject to existing encumbrances, and that he

0087734

BK54600 PG0371

will forever warrant and defend title thereto against the lawful claims of all persons whomsoever

The party of the first part further covenants that no buildings or permanent structures will be constructed upon, over or across the easement described herein during the above stated period of time

The party of the first part also covenants that no changes will be made to the surface within the easement area during this time without the prior permission of the party of the second part.

TO HAVE AND TO HOLD, the said easement unto the party of the second part, its successors and assigns.

IN WITNESS WHEREOF, the party of the first part has hereunto set his hand and affixed his seal, the day and year first above written.

Signed, sealed and delivered on this
12 day of September, 2016
in the presence of:

Margaret T. Fain

Margaret T. Fain

Caelyn Johnson
Unofficial Witness

[Signature]
Notary Public (SEAL)
My commission expires: January 9, 2018



APPENDIX 'D'

REQUIRED CONTRACTOR FORMS

Department of Planning and Development

446 West Crogan Street • Lawrenceville, GA 30046-2440
(tel) 678.518.6000
www.gwinnettcountry.com



Erosion & Sediment Control & Solid Waste Management Affidavit

☐ Residential ☐ Licensed Builder ☐ Developer

***This affidavit must be submitted at time of Permit application.
Please type or print using black ink.***

Permit Number: _____

Permit Type: ☐ Building ☐ Clearing ☐ Clearing & Grubbing ☐ Grading ☐ Development

Subdivision or Project Name: _____

Phase/Unit: _____ Lot: _____ Block: _____

Job Site Address: _____

Company Name: _____

Company Address: _____

City: _____ State: _____ Zip: _____

Company Phone: _____ Other Phone: _____

Erosion Control

My signature hereon signifies that I am the person responsible for compliance with the Soil Erosion & Sediment Control Ordinance. I acknowledge that county Inspection staff may: refuse to make inspections, issue Stop Work Orders, and issue summonses to appear in Recorders Court for violations of erosion control requirements; and that I must use Best Management Practices (BMP's) to control soil erosion on my job site which includes, at a minimum, all of the following:

- Installation and daily maintenance of silt barriers (i.e. silt fences, hay bales, etc.) in those areas where water exits the job site;
- Installation and daily maintenance of a stone driveway entrance/exit pad to minimize the tracking of mud into the street; use geotextile underliner for entire pad;
- Removal of mud from the street or adjacent property immediately following any such occurrence without washing the mud into the storm drainage system;
- Maintenance and removal of mud from detention ponds and sediment basins;
- Conduct no land disturbing activities within 50 feet of the banks of streams, lakes, wetlands, etc. (i.e. "state waters");
- Within 14 days of ceasing land disturbance, whichever is earlier, temporary vegetation and/or mulch on all disturbed areas shall be provided and maintained daily;
- Institute erosion and sediment control measures and practices as indicated on the approved Soil Erosion & Sediment Control Plan.

Solid Waste Management

1. Construction and Demolition (C&D) Waste Disposal Information:

(Please complete **both** paragraphs "a" **and** "b" below)

NOTE: On-site burial/disposal of Construction & Demolition (C&D) Waste is prohibited by Georgia law and the Gwinnett County Solid Waste Disposal Services Ordinance. Construction & Demolition (C&D) Waste means building materials which include but are not limited to asbestos-containing waste, wood, bricks, metal, concrete, wallboard, paper, and cardboard.

- a. State how often C&D Waste will be collected and hauled. (NOTE: Hauler shall be an approved C&D Waste Service Provider in unincorporated Gwinnett County and have a Permit by Rule from Georgia EPD):
-

- b. State the type of container or enclosure to be used to temporarily store waste before hauling (e.g. dumpsters provided at every other lot, etc.):
-

2. Inert Waste Disposal Information: (Please complete **either** paragraph "a" **or** "b" below).

NOTE: On-site disposal of Inert Waste is authorized by Georgia law and Gwinnett County ordinances **ONLY** if the Georgia EPD Permit by Rule regulations are followed. Inert Waste is limited to earth, earth-like products, concrete, cured asphalt, rock, bricks, yard trimmings, stumps, limbs and leaves.

a. Off-Site Disposal (including residue from burning):

- (1) State if inert waste is to be burned (approval from Gwinnett's Fire Marshal's Office is required):

☐ Yes ☐ No; **and**,

- (2) State how often inert waste and/or burning residue will be collected and hauled. (NOTE: Hauler shall be an approved C&D Waste Service Provider in unincorporated Gwinnett County and have a Permit by Rule from Georgia EPD):
-

b. On-Site Disposal (including residue from burning):

- (1) Please attach a copy of completed Georgia EPD Notification of Permit by Rule Operations (NOPBRO) Form; **and**,

- (2) Please attach a copy of "sketch plan" indicating the proposed location and boundaries of the disposal site; **and**,

- (3) Please state if inert waste is to be burned (approval from Gwinnett's Fire Marshal's Office is required) and applied as a soil amendment: ☐ Yes ☐ No.

My signature hereon signifies acknowledgement of all of the following:

- On-site disposal of Construction and Demolition (C&D) Waste is prohibited;
- County inspection staff may refuse to make inspections, issue Stop Work Orders, issue summonses to Records Court for violations of Stop Work Orders, and refuse to approve Final Plats and Certificates of Occupancy or Completion for failure to comply with solid waste disposal laws;
- If on-site disposal of Inert Waste is proposed, proof shall be provided that property/deed records have been revised or recorded indicating the boundaries of the disposal site prior to approval of a Final Plat, Certificate of Occupancy or Completion.

Signature: _____ Date Signed: _____

Printed Name: _____ Title: _____