

ROUTE 10 WATER MAIN EXTENSION

PHASE II – HARDY ELEMENTARY SCHOOL TO BERRY HILL ROAD

Technical Specifications

Engineer:

Timmons Group

2901 S Lynnhaven Rd, # 200

Virginia Beach, VA 23452



TIMMONS GROUP

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August 2022

Project Number 48527

PROJECT DIRECTORY

WATER MAIN OWNERS: Isle of Wight County
13048 Poor House Road
P.O. Box 80
Isle of Wight, Virginia 23397
Director of Utility Services: Donald Jennings, P.E.
Phone: (757) 365-6319

Town of Smithfield
Department of Public Works & Utilities
310 Institute Street
Smithfield, Virginia 23430
Director of Public Works and Utilities: Jack Reed
Phone: (757) 365-3338

SCHOOL OWNER: Isle of Wight County Public Schools
820 West Main Street
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Director of Support Services: Chris Coleman
Phone: (757) 357-4393

CIVIL ENGINEER: Timmons Group, Inc.
2901 S. Lynnhaven Road
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Virginia Beach, Virginia 23452
Project Manager: Kenneth Turner, P.E.
Phone: (757) 213-6671

NOTE: The word “Architect” used in these specifications may mean Architect or Engineer depending on the specific context.

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These technical specifications are supplemental to the Isle of Wight County Department of Utility Service Standards, Town of Smithfield Standards, and Hampton Road Planning District Commission (HRPDC) Regional Technical Standards, and Specifications included in Appendix A. Where requirements overlap or conflict, the more stringent requirements shall apply.

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(Provided by GET Solutions, Inc. August 19, 2021)

APPENDIX B: Statement of Special Inspections

APPENDIX C: Commonwealth of Virginia Marine Resources Commission (VMRC) Permit
(Provided by VMRC)

APPENDIX D: Test Hole Reports
(Provided by T2 Utility Engineers. September 23, 2021)

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SECTION 01000 - SUMMARY OF WORK

GENERAL

1.01 DESCRIPTION

A. This Section includes requirements of a general nature applicable to the Contract.

B. The Work includes but is not limited to the following:

Install new 8" PVC C900 water main and appurtenances

Provide and install new 8" HDPE pipe for the two (2) horizontal directional drills

Install new 12" Ductile Iron water main and appurtenances

1.02 REFERENCE DOCUMENTS

A. Applicable Codes, Specifications, and Standards:

All references to codes, specifications, and standards referred to in the Contract Documents shall be the latest edition, amendment and/or revision of such reference standard in effect as of the date of Bid Opening for this Contract.

B. Documents on the Site

The Contractor shall maintain, on the site, copies of all appropriate documents including codes, specifications, permits, and reference standards referred to for this project.

C. Specs and Standards

The Contractor shall follow the Town of Smithfield Design Standards for Water Distribution and Sanitary Sewer Systems for the water main within the town limits.

The Contractor shall follow the Isle of Wight County Construction Specifications and Standards for Waterworks and Sanitary Sewerage Facilities for the water main outside the town limit.

The Contractor shall follow the Hampton Roads Planning District Commission (HRPDC) *Regional Construction Standards Details* for the entire water main throughout the project.

D. Geotechnical Report

A Geotech report including the *Hampton Roads Area Statement of Special Inspections* is provided by GET Solutions, Inc., attached in Appendix A.

E. Commonwealth of Virginia Marine Resources Commission (VMRC) Permit

The VMRC permit is attached in Appendix B

F. Test Hole Report

Five (5) test holes along Old Stage Highway (Route 10) are recorded in the Test hole report provided by T2 Utility Engineers, attached in Appendix C.

1.03 ABBREVIATIONS AND SYMBOLS

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BOCA	Building Officials Code Administration, Inc.
HRPDC	Hampton Road Planning District Commissions
NACE	National Association of Corrosion Engineers
NEC	National Electrical Code
OSHA	Occupational Safety and Health Administration
USACE	US Army Corps of Engineer
VDOT	Virginia Department of Transportation
VMRC	Commonwealth of Virginia Marine Resources Commission
VSWCC	Virginia Soil and Water Conservation Board

1.04 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall, at his own expense, obtain any and all permits and surety required and be responsible for all submittals necessary to obtain said permits required in the Contract Documents. Permits include but shall not necessarily be limited to.

VDOT Land Use Permit

VPDES VAR-10 (General Permit for Land Disturbance > 1 acre)

Locality's Land Disturbing (E & S) Permit

- B. Use of Premises and Off-Site Work

Lands by Contractor - Any land and access thereto not furnished by the County that the Contractor deems necessary for the work, temporary construction facilities, access and egress, or for storage of materials shall be provided by the Contractor at no cost to the Owner. The Contractor shall confine his apparatus and storage to such additional areas as he may provide at his expense. The Contractor shall obtain

permits and written approvals from the appropriate jurisdictional agency and or property owner for use of the premises not furnished as described above, and all off-site areas which include but are not limited to off-site borrow pits and waste areas. Such permits and approvals must specify treatment of said areas during and at the completion of construction. Copies of all permits and approvals shall be furnished to the Engineer before utilization of the areas.

Private and Public Property - The Contractor shall not enter upon private property for any purpose without obtaining written permission from the property owner. Letters of permission from property owners shall be filed with the Engineer prior to entering private property.

- C. The Contractor shall not load nor permit any part of any structure to be loaded with weights that could endanger the structure, nor shall he subject any part of the work to stresses or pressures that could endanger it.

- D. Public Convenience

The Contractor shall, at all times, so conduct his work as to insure the least possible obstruction to traffic and inconvenience to the Owner, the general public, and the businesses and residences in the vicinity of the work, and to insure the protection of persons and property. Fire hydrants on and adjacent to the work shall be kept accessible to fire fighting equipment at all times. Temporary provisions shall be made by the Contractor to insure the use of sidewalks and the proper functioning of all gutters, stormwater systems, drainage ditches, and culverts, etc. such that they shall not be obstructed.

- E. Measurements

All dimensions shown on existing work and all dimensions required for work that is to connect to existing work shall be verified by the Contractor by actual measurement of the existing work. Any discrepancies between the Contract Documents and the existing conditions shall be referred to the Engineer before any work affected thereby has been completed.

- F. Coordination

Phases of the construction of the project which involve the temporary interruption of essential services (water, electricity, etc.) shall be scheduled in consultation with the Engineer, and shall be not of longer duration than essential to accomplish the purpose for such interruptions. Liaison with the Engineer in this matter shall be a salient feature of this Contract.

The Contractor shall notify the Engineer and the Owner not less than 48 hours in advance of commencing work. The Owner shall be given no less than 48 hours notice in advance of the time and date of making any connections and will advise the Contractor as to a suitable time and date.

- G. The Contractor, at his own expense, shall retain the services of a registered land surveyor to establish the necessary horizontal and vertical control in order to construct the proposed work in the proper location. Cut sheets performed by a registered Land Surveyor shall be delivered to the Engineer 48 hours prior to installation of any work.

Contractor Checklist for Major Items to be Performed and/or Submitted

This checklist is intended to be a guide to assist the contractor in determining what items need to be submitted to the Owner/Engineer or what services need to be performed by the contractor. The checklist is not intended to be an all-inclusive list of services to be performed by the contractor and does not relieve the contractor of the responsibilities stipulated within these specifications.

Required as Part of This Contract	Description of Submittal Item or Service to be Performed	Check Once Item is Completed
No	Diagram of location of fuel storage areas on plans	
No	Diagram of location of temporary sanitary Facilities on plans	
Yes	Statement of payment of taxes	
Yes	Affidavit of payment of debts and claims	
Yes	Affidavit of release of liens	
Yes	Construction schedule of work prior to the commencement of any work	
Yes	Updates of the construction schedule if work does not follow the original schedule	
Yes	Schedule of values (shows the value of each kind of work) prior to first application for payment	
Yes	Schedule of shop drawing submittals	
No	Schedule of estimated monthly payments (within 30 days after contract date)	
Yes	Material and products schedule (include in construction schedule)	
Yes	List of product substitutions (for a period of 30 days after contract date)	
Yes	All required permits (e.g., construction general permit, land disturbance permit, etc.)	
No	Field office located at project site with the following equipment: 1) Telephone 2) Message recording unit 3) Water and sanitary facilities	

		Temporary field office for use by the Engineer that is approximately 150 square feet and includes: 1) One stick file 2) One drawing table 3) One stool 4) One non-folding desk chair 5) One desk 6) One four-drawer lockable filing cabinet	
Yes		Shop drawings and product data	
	No	Samples	
Yes		Layout data/schedule for pipe joining and special connections	
	No	Copies of survey cut sheets	
	No	Diary or log book recording significant construction activities, meetings, weather conditions, etc.	
Yes		Progress reports submitted with each application for payment	
	No	Test results (e.g., concrete cylinder tests, compaction tests, etc.)	
Yes		One signed original and 3 copies of inspections or approvals of work required to be inspected by local code or law	
	No	Project photographs (a minimum of 10 photos per month during contract) that include two glossy color prints (8 in. x 10 in.) and each negative	
Yes		Product guarantees, certificates, and warranties	
Yes		Contractor’s one-year standard warranty for all work	
Yes		Operation and maintenance data manuals	
	No	Spare parts and maintenance materials	
Yes		One complete set of contract drawings and one project manual recording all changes to the work to indicate actual installation	
Yes		Application and certificate for payment in appropriate format	
Yes		Monthly progress meetings	
	No	Preliminary inspection and testing (a demonstration that individual	

		components of equipment/work have been completed) scheduled a minimum of 20 days before the pre-final inspection is scheduled.	
	No	Pre-final inspection (a demonstration that all individual project components function and are coordinated with other systems) scheduled a minimum of 20 days before the final inspection.	
Yes		Final inspection (a demonstration that all elements of the project are ready to be placed in operation and all work has been substantially completed) scheduled a minimum of 20 days before completion date.	
	No	Calibration test results performed by competent experienced test engineers	
Yes		Nameplates on all devices	
	No	Brass tags on each field mounted device	
Yes		List of manufacturers, suppliers, and subcontractors who participated in the construction of the project	

END OF SECTION 01000

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SECTION 01200 – PROJECT MEETINGS

1. GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor participation in preconstruction conferences.
- B. Contractor participation of progress meetings and pre-installation conferences.

1.02 PRECONSTRUCTION CONFERENCES

- A. Engineer will administer preconstruction conference for execution of Owner-Contractor Agreement and exchange of preliminary submittals.
- B. Attendance: Owner, Engineer, Contractor, major Subcontractors, representatives of Quality Control firm(s).

1.03 PROGRESS MEETINGS

- A. Engineer shall schedule and administer project meetings throughout progress of the work at maximum monthly intervals, as well as administer called meetings, and pre-installation conferences.
- B. Engineer shall make physical arrangements for meetings, prepare agenda with copies for participants, preside at meetings, records minutes, and distribute copies within seven (7) days to Contractor, participants, and those affected by decisions made at meetings.
- C. Attendance: Contractor's Superintendent, Contractor's Project Manager, major Subcontractors and Suppliers; Owner and Engineer as appropriate to agenda topics for each meeting.
- D. Suggested Agenda: Review of Work progress, status of progress schedule and adjustments thereto, delivery schedules, submittals, maintenance of quality standards, pending changes and substitutions, and other items affecting progress of Work.

1.04 PRE-INSTALLATION CONFERENCES

- A. When required in individual specification Section, Contractor shall convene a pre-installation conference prior to commencing work of that Section.
- B. Require attendance of entities directly affecting, or affected by, work of the Section.
- C. Review conditions of installation, preparation and installation procedures, and coordination with related work.

END OF SECTION 01200

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SECTION 01500
TEMPORARY FACILITIES AND ENVIRONMENTAL PROTECTION

1. GENERAL

1.01 TEMPORARY FACILITIES

A. General:

1. Temporary facilities and protective devices include, but are not limited to, the following items: temporary barricades, fences, bridges, guards, temporary utilities, steel plates over trenches, maintenance of traffic and project identification signs.
2. All materials used in construction of the above mentioned items of work shall be of such size, shape and strength as to be suitable for the use intended.
3. The Contractor shall conduct construction operations in such a manner as to cause as little inconvenience as possible to the general public, and the Owner. Wherever required, the Contractor shall erect and maintain signs, fences, barricades, and pedestrian bridges and provide guards and flagmen for the protection of the public.
4. The Contractor shall take positive measures to prevent at all times, entry to the site of the work and storage areas by children, animals, and unauthorized adults.

B. Furnish and construct temporary fencing as needed to fence off excavation, storage, and operating areas. All temporary fences erected by the Contractor shall be substantially constructed, and neat in appearance.

1. Barricade or close all openings in roadways, floors, walls, or other parts of structures or walkways while the openings are not in regular use. Barricades shall be substantial and neat in appearance.

C. Unless otherwise specified, the Contractor will furnish water required during the entire construction period for the project at no cost to the Owner. The Contractor shall assure the availability of drinking water for his work force, and provide temporary pumps, tanks, pre-assembled flushing mechanisms and compressors as necessary to produce the required pressures.

D. The Contractor shall make the necessary arrangements and provide all temporary electrical service and lighting required during the entire construction period. The cost of electricity used shall be borne by the Contractor. The electrical service shall be sufficient capacity and characteristics to supply the proper current for the various types of construction tools, motors, welding machines, lights, heating plant, pumps, and other work required. All necessary temporary wiring, panel boards, outlets, switches, lamps, fuses, controls, and accessories shall be provided.

E. The Contractor shall provide and maintain an adequate number of temporary toilets with proper enclosures as necessary for use of workmen during construction. The Contractor shall keep toilets clean and comply with local and state health requirements and sanitary regulations. Toilet facilities shall be the prefabricated chemical type unless otherwise permitted.

F. The Contractor shall be responsible for provisions of temporary heating, including all costs of equipment and installation, fuel and attendance, whenever and for such periods as such heating may be required, either because of general weather conditions to prevent freezing, to provide suitable working conditions, or to assure progress of the operation within the established scheduled time for curing of concrete.

1.02 MAINTENANCE OF TRAFFIC

- A. The Contractor shall be responsible for maintaining a normal through traffic flow in accordance with County and VDOT requirements.
- B. The Contractor shall provide temporary facilities as required for pedestrian and vehicular access to properties adjacent to or contiguous to the project. Should it be necessary to temporarily interrupt access, the Contractor shall so notify the Engineer, and after securing the Engineer's approval, the Contractor shall notify all affected parties of the time, extent, and duration of the interruption.
- C. Contractor shall not obstruct any driveway longer than two (2) hours without providing an alternate temporary access to the property.

1.03 ENVIRONMENTAL PROTECTION

- A. The contractor shall be responsible for furnishing all necessary items for fulfilling the work described herein for Environmental Protection including prevention and control of erosion and sedimentation that results directly or indirectly from the project. The Contractor shall also be responsible for compliance with the Pollution Prevention Plan shown on the approved contract drawings in accordance with the VSMP General Permit.
- B. Prevention of Water Pollution:
 - 1. The Contractor shall take all such precautions in the conduct of his operations as may be necessary to avoid contaminating the water in adjacent watercourses or water storage areas.
 - 2. All earthwork, moving of equipment, and other operations likely to create silting, shall be conducted so as to minimize pollution of water courses and water storage areas.
 - 3. Water used during the work which has become contaminated with oil, bitumens, harmful or objectionable chemicals, sewage or other pollutants, shall be disposed of so as to avoid affecting all nearby waters and lands. Under no circumstances shall the Contractor discharge pollutants into any watercourse or water storage area. The Contractor shall not allow water used in aggregate processing, concrete curing, foundation, and concrete lift cleanup, or any other waste, to enter a stream. When water from adjacent natural sources is used in the work, intake methods shall be such to avoid contaminating the source of supply or becoming a source of erosion.
- C. Noise and Air Pollution Control
 - 1. The Contractor shall conduct his operations so as not to violate any applicable ordinances, regulations, rules, and laws in effect in the area pertaining to noise and air pollution.
- D. Preservation of Natural Resources
 - 1. All construction operations, cleanup, and the condition of the adjacent terrain upon completion of the work shall fully comply with all applicable regulations and laws concerning the preservation of natural resources.
- E. Dust Control
 - 1. Throughout the entire construction period, maintain dust control by use of water sprinklers or chemical dust control binder as may be approved by the Engineer and VDOT.

1.04 CONFINED SPACE REQUIREMENTS

- A. The Contractor shall be responsible for all practices and procedures, either singularly or in combination, required for entry into a confined space area as defined by the Virginia Occupational Safety and Health Codes Board. Such practices include, but are not limited to:
 - 1. Preparation
 - 2. Atmospheric Testing
 - 3. Attendants and Rescue Teams
 - 4. Permit Systems
 - 5. Training
 - 6. Special Equipment and Tools
 - 7. Tripods, Safety Harnesses, Retrieval Lines, and Respiratory Protection
 - B. The contractor shall be required to conform to requirements stipulated in the Occupational Safety and Health Administration regulations.
- #### 1.05 CLEANING DURING CONSTRUCTION
- A. Control accumulation of waste materials and rubbish; periodically dispose of off-site.
 - B. Clean areas prior to start of finish work; maintain areas free of dust and other contaminants during finishing operations.

END OF SECTION

SECTION 01730
OPERATING AND MAINTENANCE DATA

1. GENERAL

1.01 Requirements

- A. Operation and Maintenance manuals are required for all materials and equipment provided and installed in the project.
- B. Two preliminary copies of each manual shall be submitted to Engineer prior to the date of shipment of the equipment. After review and approval by Engineer, four final copies of each operation and maintenance manual shall be prepared and delivered to Engineer not later than 30 days prior to placing the equipment in operation. Copies supplied to Engineer are in addition to those required by the Contractor. Preliminary and final manuals, and all other parts lists and information, shall be bound in a loose-leaf type manual properly indexed and bound in hard back, three-ring binder(s) with covers and spines bearing suitable identification. A table of contents and index tabs shall be furnished for all volumes containing data for three or more items of equipment. All material shall be marked with Project identification.
- C. Operation and Maintenance shall contain complete operation and maintenance instructions including but not limited to the following:
 - 1. Equipment warranties;
 - 2. Operating and maintenance data;
 - 3. Troubleshooting information and procedures;
 - 4. Lubrication information and schedules;
 - 5. Nameplate data, model numbers and serial numbers for all equipment and motors;
 - 6. Wiring diagrams;
 - 7. Assembly drawings with part numbers;
 - 8. Approved shop drawings, plan elevation and section drawings showing all details as equipment has been installed.
 - 9. All appurtenances provided with equipment including pipe, valves, fittings, supports and brackets;
 - 10. All electrical components, control panels, switches, floats, electronic components, relays, sensors, starters, contactors and enclosures;
 - 11. Names, telephone numbers, and addresses of applicable subcontractors, equipment and service suppliers and manufacturers;
 - 12. Adequate information to satisfy State regulatory agency requirements; and,
 - 13. Any other information concerning operation or maintenance of equipment readily available to Contractor and as required to repair and order parts.
- D. At a minimum, operating and maintenance data shall be supplied for the following equipment:
 - 1. Control Systems (including dialer, etc.);
 - 2. Process equipment and devices
 - 3. Pumps;

4. Electrical Devices
5. Generator Set (including transfer switch);
6. Control Valves (check, pressure reducing/sustaining, etc.);
7. Pipe valves and fittings;
8. Instrumentation
9. SCADA systems if applicable
10. Flow measuring devices;
11. Pressure measuring devices;
12. Sensors
13. Unit Heaters;
14. Lighting
15. Air Handling Equipment
16. Electrical switch gear

2. PRODUCTS NOT USED

3. EXECUTION

- A. Information included in the O & M Manual shall be specific to the equipment or item installed. Data sheets that include information not pertinent to the specific equipment or product should be omitted. Where data sheets have multiple information all non pertinent information shall be edited out and pertinent information shall be highlighted to make it clear which information applies.
- B. Drawings shall be provided which clearly indicate the item and the installation. These should include plan views, elevation views and section views as required. Drawings should be scaled and dimensioned. Drawings from the approved submittals should be included and corrected if required to indicate the “as-built” condition.
- C. Information shall include name plate data, serial numbers, order numbers, dates, contact information and other pertinent information that are required to trace a piece of equipment back to the manufacturer.

END OF SECTION

APPENDIX A

Geotechnical Report



REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING SERVICES

**Isle of Wight County
Water Main Extension
Smithfield, Virginia**

G E T Project No: VB21-164G

August 19, 2021

PREPARED FOR:





August 19, 2021

TO: **MSA, P.C.**
5032 Rouse Drive, Suite 100
Virginia Beach, Virginia 23462

Attn: Mr. Gregory B. Hayes, PE, LEED AP BD+C

RE: Report for Subsurface Exploration and Geotechnical Engineering Services
Isle of Wight County Water Main Extension
Smithfield, Virginia
G E T Project No: VB21-164G

Dear Mr. Hayes:

In compliance with your instructions, we have completed our Subsurface Exploration and Geotechnical Engineering Services for the referenced project. The results of this study, together with our recommendations, are presented in this report.

Often, because of design and construction details that occur on a project, questions arise concerning subsurface conditions. **G E T Solutions, Inc.** would be pleased to continue its role as Geotechnical Engineer during the project implementation.

Thank you for the opportunity to work with you on this project. We trust that the information contained herein meets your immediate need, and should you have any questions or if we could be of further assistance, please do not hesitate to contact us.

Respectfully Submitted,
G E T Solutions, Inc.

Grey Weber, EIT
Project Engineer

Chris M. Caton, PE, PG, PMP
Senior Geotechnical Engineer
VA Lic. No. 046947



Copies: (1) Client

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1.0 PROJECT INFORMATION

1.1 Project Authorization

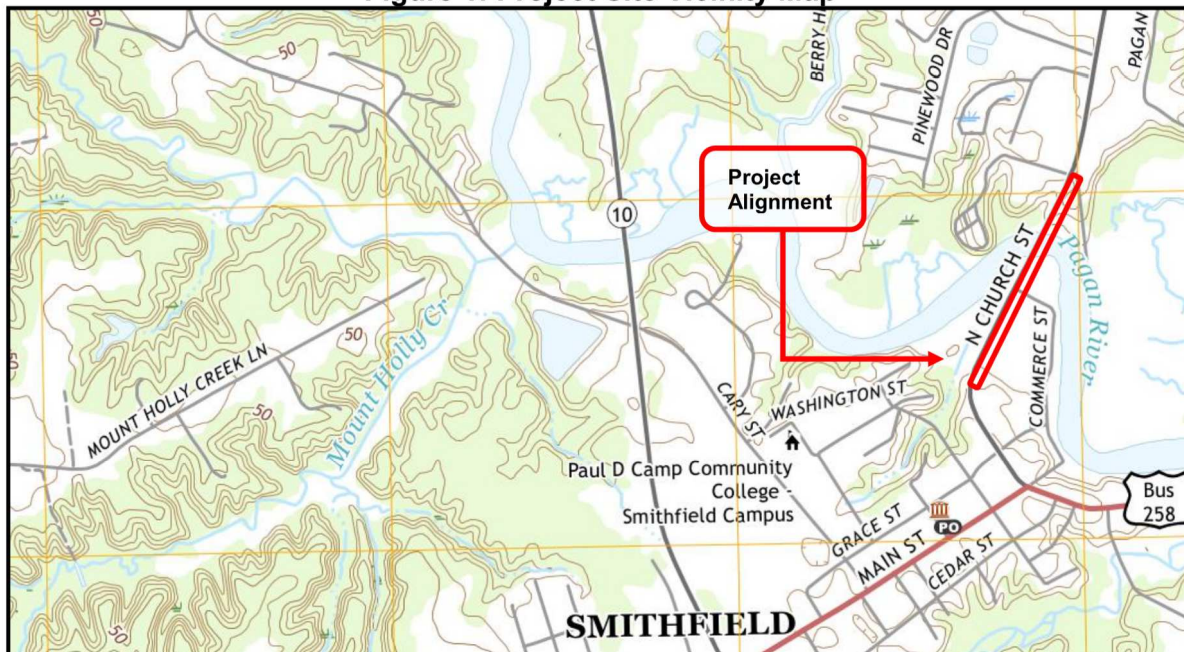
G E T Solutions, Inc. has completed our subsurface exploration and geotechnical engineering services for the proposed Isle of Wight County Water Main Extension project located in Smithfield, Virginia. The geotechnical engineering services were conducted in general accordance with the scope presented in **G E T** Proposal No. PVB21-224G dated March 19, 2021. Authorization to proceed with our services was received from the Client via a signed Work Authorization Form dated April 23, 2021.

1.2 Project Site Location and Construction Description

The project site is located adjacent to a section of North Church Street in the Town of Smithfield in Isle of Wight County, Virginia. The proposed alignment is along the east side of North Church Street laying outside the roadway boundaries. The alignment begins on the south side of the Pagan River Bridge, traverses the Pagan River, and terminates on the north side of the bridge. The proposed construction will consist of extending the existing 12-inch polyvinyl chloride (PVC) water main with approximately 2,000 linear feet of high-density polyethylene (HDPE) pipe using horizontal directional drilling (HDD) techniques. The HDD is expected to start in a vacant parking lot northeast of the Smithfield Center at a depth of approximately 4 feet and terminate at the intersection of North Church Street and Clontz Way. HDD depths below the Pagan River mudline range from 10 feet to 15 feet.

Based on information provided by the Client, the existing ground elevations within the water main extension alignment range from 2 feet (mainly within areas on the south of the Pagan River) to 30 feet (mostly within areas on the north side of the Pagan River). The elevation datum was unknown at the time of this reporting. A site vicinity map is provided in Figure 1.

Figure 1: Project Site Vicinity Map



United States Geological Survey Smithfield Quadrangle, Virginia 7.5-Minute Series 2019

If any of the noted information is incorrect or has changed, please inform G E T Solutions, Inc. so that we may amend the recommendations presented in this report, if appropriate.

1.3 Purpose and Scope of Services

The purpose of this study was to obtain information on the general subsurface conditions at the proposed project site. The subsurface conditions encountered were then evaluated with respect to the available project characteristics. In this regard, the following engineering assessments were formulated:

1. General assessment of the soils revealed by the borings performed at the site.
2. General location and description of potentially deleterious material encountered in the borings that may interfere with construction progress or structure performance, including existing fills or surficial/subsurface organics.
3. Determination of pertinent information regarding the groundwater conditions at the site.
4. Soil subgrade preparation, including stripping, grading, and compaction. Engineering criteria for placement and compaction of approved structural fill material.
5. Evaluation of the on-site soils for re-use as structural fill.
6. Soil design parameters and construction considerations related to the trenchless pipeline.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands; hazardous or toxic material in the soil, bedrock, surface water, groundwater, or air; on, below, or around this site.

2.0 FIELD AND LABORATORY PROCEDURES

2.1 Field Exploration

In order to explore the general subsurface soil types and to aid in developing associated design parameters and recommendations, one (1) 55-foot deep Standard Penetration Test (SPT) boring, one (1) 60-foot deep SPT boring, and one (1) 50-foot deep SPT boring (designated as B-1, B-2, and B-5, respectively), were drilled on land within the vicinity of the proposed water main extension alignment. One (1) 50-foot deep SPT boring and one (1) 55-foot deep SPT boring (designated as B-3 and B-4, respectively), were drilled in the water below the mudline of the Pagan River within the vicinity of the proposed water main extension alignment.

Standard Penetration Tests were performed in the field in general accordance with ASTM D1586. The tests were performed continuously from the existing ground surface to a depth of 12 feet, and at 5-foot intervals thereafter starting at a depth of 13-feet. The soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., 30-inch-long split-spoon sampler. The sampler was driven with blows of a 140 lb. hammer falling 30 inches, using a safety hammer. The number of blows required to drive the sampler each 6-inch increment of penetration was recorded and is shown on the boring logs. The sum of the second and third penetration increments is termed the SPT N-value (uncorrected for automatic hammer and overburden pressure). A representative portion of each disturbed split-spoon sample was collected with each SPT, placed in a sealed glass jar, and returned to our laboratory for review.

The boring locations were established by **GET Solutions, Inc.** in coordination with the design team. The boring locations were staked in the field by a representative of **GET Solutions, Inc.** with the use of a hand-held Global Positioning System (GPS) device and by corroborating with easily identifiable landmarks. All boreholes on land were backfilled upon completion with surplus soils and patched, where applicable, with cold mix asphalt for safety considerations. Approximate soil boring locations are shown on the Boring Location Plan provided in Appendix I, which was developed by **GET Solutions, Inc.** based on information provided by the Client.

2.2 Laboratory Testing

Soil testing provided by **GET Solutions, Inc.** was performed in accordance with American Society for Testing and Materials (ASTM) standards. All soils and materials tests were performed in our AASHTO re:source (formerly AMRL) and US Army Corps of Engineers certified Virginia Beach laboratory.

Representative portions of all soil samples collected during drilling operations were labeled, preserved, and transferred to our laboratory in accordance with ASTM D4220 for classification and analysis. Soil descriptions on the boring logs are provided using visual-manual methods in general accordance with ASTM D2488 using the Unified Soil Classification System (USCS). Soil samples that were selected for index testing were classified in general accordance with ASTM D2487. It should be noted that some variation can be expected between samples classified using the visual-manual procedure (ASTM D2488) and the USCS (ASTM D2487). A summary of the soil classification system is provided in Appendix II.

Classification Tests:

Representative split-spoon samples were selected and subjected to natural moisture, No. 200 sieve wash, and Atterberg Limits testing to corroborate the visual classification. These test results are presented in Appendix III and on the soil test boring logs provided in Appendix IV. A generalized soil profile is provided in Appendix V.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Geology

The project site lies within a major physiographic province called the Atlantic Coastal Plain. Numerous transgressions and regressions of the Atlantic Ocean have deposited marine, lagoonal, and fluvial (stream lain) sediments. The regional geology is very complex and generally consists of interbedded layers of varying mixtures of sands, silts, and clays. Based on our review of existing geologic and soil boring data, the geologic stratigraphy encountered in our subsurface explorations generally consisted of marine deposited sands, silts, and clays.

3.2 Subsurface Soil Conditions

Summaries of the subsurface soil conditions encountered at the SPT boring locations are presented in Table I, Table II, and Table III.

Table I – Subsurface Soil Conditions – South Side of Pagan River (Borings B-1 & B-2)

Depth Range ⁽¹⁾ (ft)	Stratum	Description	SPT ⁽²⁾ N-Value Range
0 to 0.42 – 0.67	Pavement	5 inches of Asphalt (B-1) 2 inches of Asphalt and 6 inches of Aggregate Base (B-2)	–
0.67 to 2	FILL	SAND (SM) with varying amounts of silt and asphalt fragments - Encountered at boring B-2.	18
0.42 – 2 to 10	I	SAND (SM, SC) with varying amounts of silt, clay, gravel, and fibrous organic material - Deposit of medium stiff CLAY (CL) encountered at boring B-1 from 6 feet to 8 feet below existing grade.	3 – 28
10 to 46.5	II	CLAY (CL, CH, OL/OH) with varying amounts of sand, silt, and fibrous organic material	0 – 2
46.5 to 56.5	III	SAND (SM, SC) with varying amounts of silt, clay, gravel, and marine shell fragments - Deposit of very soft CLAY (CL) encountered at boring B-2 from 51.5 feet to 56.5 feet below grade. - Boring B-1 terminated at 55 feet below existing grade.	3 – 8
56.5 to 60	IV Yorktown	SAND (SC) with varying amounts of silt, clay, and marine shell fragments - Boring B-2 terminated at 60 feet below existing grade.	11

Notes: (1) Depths below existing site grades.

(2) SPT = Standard Penetration Test, N-values in blows per foot (uncorrected).

Table II – Subsurface Soil Conditions – Below Pagan River Mudline (Borings B-3 & B-4)

Depth Range ⁽¹⁾ (ft)	Stratum	Description	SPT ⁽²⁾ N-Value Range
0 to 19.5 – 20.5	Water	19.5 feet (B-3) 20.5 feet (B-4)	–
19.5 – 20.5 to 42 – 46	II	CLAY (CH, OL/OH) with varying amounts of sand, silt, fibrous organic material, and marine shell fragments - Deposit of very soft ELASTIC SILT (MH) encountered at boring B-3 from 21.5 feet to 23.5 feet below the water surface.	0
42 – 46 to 66 – 67	III	SAND (SM, SC) with varying amounts of silt, clay, and fibrous organic material	2 – 11
66 – 67 to 75.5	IV Yorktown	SAND (SC) with varying amounts of silt, clay, and marine shell fragments - Boring B-3 terminated at 69.5 feet below the water surface. - Boring B-4 terminated at 75.5 feet below the water surface.	5 – 6

Notes: (1) Depths below water surface on June 14, 2021.
 (2) SPT = Standard Penetration Test, N-values in blows per foot (uncorrected).

Table III – Subsurface Soil Conditions – North Side of Pagan River (Boring B-5)

Depth Range ⁽¹⁾ (ft)	Stratum	Description	SPT ⁽²⁾ N-Value Range
0 to 0.5	Surficial	6 inches of Topsoil (B-5)	–
0.5 to 26.5	I	SAND (SP-SM, SC) with varying amounts of silt, clay, and gravel - Deposit of medium stiff CLAY (CL) from 12.5 feet to 16.5 feet below grade.	5 – 32
26.5 to 36.5	II	CLAY (OL/OH) with varying amounts of sand, silt, and fibrous organic material	5 – 8
36.5 to 41.5	III	SAND (SC) with varying amounts of silt, clay, and cemented fines	6
41.5 to 50	IV Yorktown	CLAY (CL) with varying amounts of sand, silt, and marine shell fragments - Boring B-5 terminated at 50 feet below existing grade.	5 – 9

Notes: (1) Depth below existing site grade.
 (2) SPT = Standard Penetration Test, N-values in blows per foot (uncorrected).

The subsurface descriptions are of a generalized nature provided to highlight the major soil strata encountered. The records of the subsurface exploration are included in Appendix IV (Boring Logs) and in Appendix V (Generalized Soil Profile), which should be reviewed for specific information as to the individual borings. The stratifications shown on the records of the subsurface exploration represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the transition may be gradual. It is noted that the "Topsoil" designation references the presence of surficial organic laden soil and does not represent any particular quality specification. This material is to be tested for approval prior to use as topsoil.

3.3 Groundwater Information

The initial groundwater level was recorded at the boring locations and as observed through the relative wetness of the recovered soil samples during the drilling operations. The initial groundwater level in the borings on the south side of the Pagan River was measured to occur at a depth range of 2 feet to 4 feet below existing grade at the time of drilling, corresponding to elevations of approximately 0 feet to 2 feet (datum unknown). The initial groundwater level in the boring on the north side of the Pagan River was measured to occur at a depth of 20 feet below existing grade at the time of drilling, corresponding to an elevation of approximately 8 feet (datum unknown).

As subsurface soils begin to dry, moisture moves upwards through the soil profile by means of capillary action. Based on the subsurface soil composition (soils containing more than 30% of fines by weight), the initial groundwater readings (based on the relative wetness of the soils) could be in part attributed to the capillary action of the soils. As such, if the static groundwater elevation is critical to the design, it is recommended to install a temporary groundwater monitoring well to substantiate these initial readings and to determine groundwater impact on the construction procedures.

Groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences, such as existing swales, drainage ponds, underdrains, and areas of covered soil (paved parking lots, sidewalks, etc.). In the project's area, seasonal groundwater fluctuations of ± 2 feet or more are common; however, greater fluctuations have been documented.

4.0 EVALUATIONS AND RECOMMENDATIONS

Our recommendations are based on the previously discussed project information, our interpretation of the soil test borings and laboratory data, and our observations during our site reconnaissance. If the proposed construction should vary from what was described, we request the opportunity to review our recommendations and make any necessary changes.

It is understood that the installation of the water main extension will be conducted utilizing trenchless technologies. The recommendations herein address only the geotechnical aspects of design and installation of the proposed water main extension. The interpretation and recommendations provided are intended to provide the designers/Contractors with information to assess and specify the construction methodology and equipment. This report does not assess other design aspects of the HDD installation (e.g., identifying casing type, jacking force, etc.).

4.1 Pipeline Installation – HDD

HDD is a method of installing underground pipes and conduits along a chosen bore path from the surface, typically crossing areas such as waterways, roadways, congested areas, or other areas where conventional methods are not advisable, feasible, or are otherwise cost-prohibitive.

A pilot hole is first drilled along the alignment using a cutting head or drill bit. Directional boring machines typically use drilling fluid (mud) in soil. The drilling fluid, primarily a mixture of bentonite clay and water, is utilized to improve performance and ease-of-installation by lubricating the borehole in stronger soils, helping prevent the borehole from collapsing in weaker soils, and to cool the cutting head. The drilling fluid also suspends the auger cuttings, minimizing clogging of the borehole and providing a pathway for removal of the auger cuttings from the borehole. In cases where the ground is unstable or weak, a casing may also be pushed down the borehole to prevent the collapse of the sidewalls.

Once the pilot hole is drilled, a larger cutting tool, typically known as a back reamer, is attached to the directional boring machine and is passed through the pilot hole to create a sufficiently sized borehole to allow for placement of the production line. The production line is then installed by means of the drill stem behind the reamer to properly center the line within the borehole.

HDD installation methods carry inherent risks of damage to nearby existing utilities, pavement, and structures. The major risks associated with HDD include, but are not limited to, collapse or subsidence of the surface or adjacent utilities, heaving of the surface and damage to structures or roadways, hydraulic fracture and inadvertent fluid returns, and striking existing utilities or underground obstructions. Settlement is the primary source of damage to adjacent roadways, utilities and structures during trenchless construction. Surface settlement due to trenchless pipeline installation is mainly the result of loss of ground during tunneling/augering and dewatering operations. Selection of appropriate trenchless construction equipment and methods will limit ground loss, although some minor ground loss and surface settlement are unavoidable. Cave-in and/or “running” sand conditions should be anticipated. The Contractor should take appropriate precautions to avoid piping of material into the tunnel excavation. Casing should be advanced ahead of the excavation to reduce the risk of ground loss and settlement and open face tunnel conditions should be avoided.

Quality control observations and measurements should be implemented during the installation of the proposed pipeline for the purpose of minimizing the risks posed by HDD installation. Some of these practices include, but not limited to the following:

- Monitor, on a full-time basis, the drilling and fluid records by a qualified engineer.
- Perform continuous surface heave or subsidence monitoring during HDD drilling operations.
- Measure HDD equipment system and line losses in the field for the specific project configuration.
- Measure and maintain HDD drilling fluid pressures within appropriate limits (to be determined by Contractor).
- Evaluate influence of nearby utilities and structures to determine allowable drill pressures.

- A survey monitoring program should be developed prior to drilling. The elevations of the ground surface should be measured along the pipe alignment prior to and following construction to determine if the surface has been impacted by the trenchless installation.

It is imperative that a qualified and experienced Contractor performs this type of work with demonstrated knowledge and QA/QC plan to adequately perform these tasks.

4.2 Below-Grade Soil Parameters

To aid the Contractor in the design of the water main extension installation, the estimated soil parameters in which the 12-inch HDPE pipe will bear are presented in Table IV.

Table IV – Estimated Below-Grade Soil Parameters

Stratum	I	II		III	IV Yorktown Formation		
Depth ⁽¹⁾ (ft)	See Tables I, II, & III						
Soil Type ⁽²⁾	SAND (SP-SM, SM, SC)	CLAY/SILT (CL, CH, MH)	CLAY (OL/OH)		SAND (SM, SC)	CLAY (CL)	SAND (SC)
Average SPT ⁽³⁾ N-Value	14	1	1	7 ⁽⁴⁾	6	7	7
Estimated Moist Unit Weight (pcf)	115	90	80		115	110	120
Estimated Saturated Unit Weight (pcf)	125	100	90		125	120	130
Estimated Buoyant Unit Weight (pcf)	63	38	28		63	58	68
Friction Angle, ϕ (deg)	30	5	5		30	10	34
Cohesion, c (psf)	0	100	100		0	500	0
Active Coefficient of Lateral Earth Pressure, K_a	0.33	0.84	0.84		0.33	0.70	0.28
At-rest Coefficient of Lateral Earth Pressure, K_o	0.50	0.91	0.91		0.50	0.83	0.44
Passive Coefficient of Lateral Earth Pressure, K_p	3.0	1.19	1.19		3.0	1.42	3.54

- Notes: (1) See referenced tables for associated depth ranges below existing grades/water surface.
 (2) Parameters are not provided for man-made FILL as these soils may contain varying amounts of deleterious debris that cannot be qualified.
 (3) SPT = Standard Penetration Test, N-values in blows per foot (uncorrected).
 (4) Average N-value for CLAY (OL/OH) encountered at boring B-5.

5.0 CONSTRUCTION CONSIDERATIONS

In Federal Register, Volume 54, No. 209 (October, 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better ensure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations, or footing excavations, be constructed in accordance with the new (OSHA) guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the Contractor could be liable for substantial penalties.

The Contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The Contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the Contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our Client. **G E T Solutions, Inc.** is not assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

6.0 REPORT LIMITATIONS

The recommendations submitted are based on the available soil information obtained by **G E T Solutions, Inc.** and the information supplied by the Client and their designated agents for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, **G E T Solutions, Inc.** should be notified immediately to determine if changes in the recommendations are required. If **G E T Solutions, Inc.** is not retained to perform these functions, **G E T Solutions, Inc.** cannot be responsible for the impact of those conditions on the geotechnical recommendations for the project.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the Geotechnical Engineer should be provided the opportunity to review the final design plans and specifications to make sure our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations.

This report has been prepared for the exclusive use of the Client and their designated agents for the specific application to the proposed Isle of Wight County Main Extension project in Smithfield, Virginia.

APPENDICES

APPENDIX I	BORING LOCATION PLAN
APPENDIX II	CLASSIFICATION SYSTEM FOR SOIL EXPLORATION
APPENDIX III	SUMMARY OF LABORATORY CLASSIFICATION RESULTS
APPENDIX IV	BORING LOGS
APPENDIX V	GENERALIZED SOIL PROFILE

APPENDIX I

BORING LOCATION PLAN



Boring Location Plan

PROJECT: Isle of Wight Counter Water Main Extension

PROJECT LOCATION: Smithfield, Virginia

PROJECT NO: VB21-164G

CLIENT: MSA, P.C.



APPENDIX II

CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

Standard Penetration Test (SPT), N-value

Standard Penetration Tests (SPT) were performed in the field in general accordance with ASTM D 1586. The soil samples were obtained with a standard 1.4" I.D., 2" O.D., 30" long split-spoon sampler. The sampler was driven with blows of a 140 lb. hammer falling 30 inches. The number of blows required to drive the sampler each 6-inch increment (4 increments for each soil sample) of penetration was recorded and is shown on the boring logs. The sum of the second and third penetration increments is termed the SPT N-value.

NON COHESIVE SOILS

(SILT, SAND, GRAVEL and Combinations)

Relative Density

Very Loose	4 blows/ft. or less
Loose	5 to 10 blows/ft.
Medium Dense	11 to 30 blows/ft.
Dense	31 to 50 blows/ft.
Very Dense	51 blows/ft. or more

Particle Size Identification

Boulders	8 inch diameter or more
Cobbles	3 to 8 inch diameter
Gravel	Coarse 1 to 3 inch diameter
	Medium 1/2 to 1 inch diameter
	Fine 1/4 to 1/2 inch diameter
Sand	Coarse 2.00 mm to 1/4 inch (diameter of pencil lead)
	Medium 0.42 to 2.00 mm (diameter of broom straw)
	Fine 0.074 to 0.42 mm (diameter of human hair)
Silt	0.002 to 0.074 mm (cannot see particles)

CLASSIFICATION SYMBOLS (ASTM D 2487 and D 2488)

Coarse Grained Soils

More than 50% retained on No. 200 sieve

- GW** - Well-graded Gravel
- GP** - Poorly graded Gravel
- GW-GM** - Well-graded Gravel w/Silt
- GW-GC** - Well-graded Gravel w/Clay
- GP-GM** - Poorly graded Gravel w/Silt
- GP-GC** - Poorly graded Gravel w/Clay
- GM** - Silty Gravel
- GC** - Clayey Gravel
- GC-GM** - Silty, Clayey Gravel
- SW** - Well-graded Sand
- SP** - Poorly graded Sand
- SW-SM** - Well-graded Sand w/Silt
- SW-SC** - Well-graded Sand w/Clay
- SP-SM** - Poorly graded Sand w/Silt
- SP-SC** - Poorly graded Sand w/Clay
- SM** - Silty Sand
- SC** - Clayey Sand
- SC-SM** - Silty, Clayey Sand

Fine-Grained Soils

50% or more passes the No. 200 sieve

- CL** - Lean Clay
- CL-ML** - Silty Clay
- ML** - Silt
- OL** - Organic Clay/Silt
Liquid Limit 50% or greater
- CH** - Fat Clay
- MH** - Elastic Silt
- OH** - Organic Clay/Silt

Highly Organic Soils

- PT** - Peat

COHESIVE SOILS

(CLAY, SILT and Combinations)

Consistency

Very Soft	2 blows/ft. or less
Soft	3 to 4 blows/ft.
Medium Stiff	5 to 8 blows/ft.
Stiff	9 to 15 blows/ft.
Very Stiff	16 to 30 blows/ft.
Hard	31 blows/ft. or more

Relative Proportions

<u>Descriptive Term</u>	<u>Percent</u>
Trace	0-5
Few	5-10
Little	15-25
Some	30-45
Mostly	50-100

Strata Changes

In the column "Description" on the boring log, the horizontal lines represent approximate strata changes.

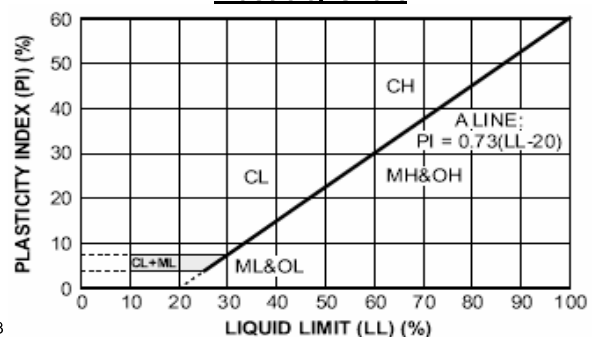
Groundwater Readings

Groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as tidal influences and man-made influences, such as existing swales, drainage ponds, underdrains and areas of covered soil (paved parking lots, side walks, etc.).

Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent	GW, GP, SW, SP
More than 12 percent	GM, GC, SM, SC
5 to 12 percent	Borderline cases requiring dual symbols

Plasticity Chart



APPENDIX III

SUMMARY OF LABORATORY CLASSIFICATION RESULTS



GET Solutions, Inc.
 5465 Greenwich Road
 Virginia Beach, Virginia 23462
 757-518-1703

SUMMARY OF LABORATORY RESULTS

CLIENT MSA, P.C.

PROJECT NAME Isle of Wight County Water Main Extension

PROJECT NUMBER VB21-164G

PROJECT LOCATION Smithfield, Virginia

(1) GET - LABORATORY TEST SUMMARY - GET_STANDARD_DATA_TEMPLATE(03-17-14).GDT - 8/12/21 12:19 - N:\GETLEGACY\GET_VABIGINT\PROJECTS\VB21\VB21-164G ISLE OF WIGHT COUNTY WATER MAIN EXTENSION.GPJ

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Classification	Water Content (%)	Dry Density (pcf)	Saturation (%)	Void Ratio
B-1	7.0	49	22	27	0.075	62	CL	26.7			
B-1	11.0	195	66	129	0.075	54	OH	76.0			
B-1	34.0	152	39	113	0.075	96	OH	106.4			
B-2	44.0	166	52	114	0.075	98	OH	98.5			
B-3	22.5	156	60	96	0.075	100	MH	137.5			
B-4	21.5	96	34	62	0.075	51	CH	97.2			

APPENDIX IV

BORING LOGS



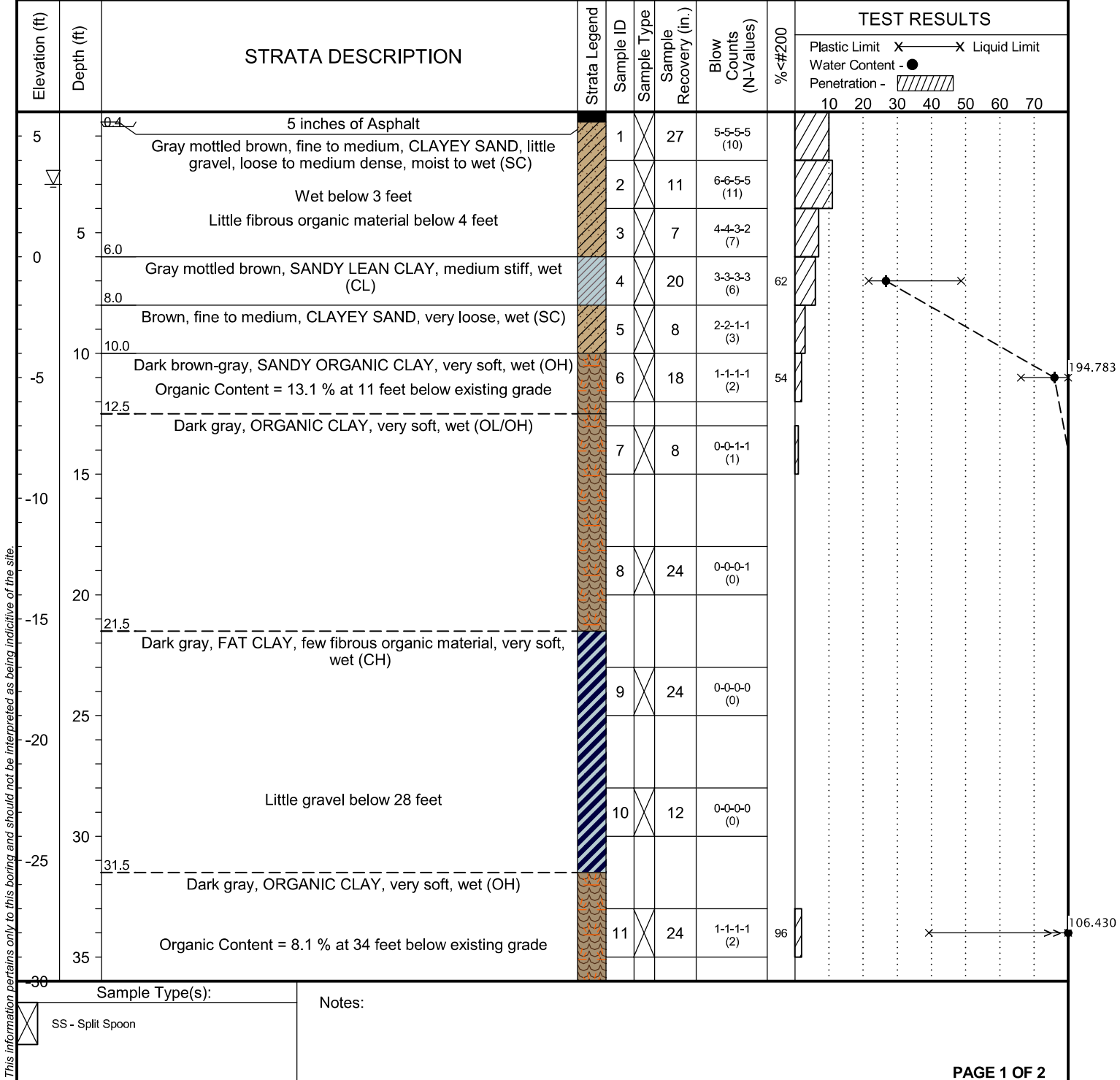
RECORD OF SUBSURFACE EXPLORATION

Virginia Beach 5465 Greenwich Road 757-518-1703
 Williamsburg 1592-E Penniman Road 757-564-6452
 Elizabeth City 106 Capital Trace Unit E 252-335-9765
 Jacksonville 415-A Western Blvd Jacksonville, NC 28546 910-478-9915

BORING ID B-1

PROJECT NAME: **Isle of Wight County Water Main Extension**
 CLIENT: **MSA, P.C.**
 PROJECT LOCATION: **Smithfield, Virginia**
 BORING LOCATION: **See attached Boring Location Plan**
 DRILLING METHOD(S): **Rotary wash "mud"**
 GROUNDWATER*: INITIAL (ft) ∇ : **3** AFTER _____ HOURS (ft) ∇ : _____ CAVE-IN (ft) \odot : _____
The initial groundwater readings are not intended to indicate the static groundwater level.

PROJECT NUMBER: **VB21-164G**
 SURFACE ELEVATION (ft): **6**
 LOGGED BY: **G. Weber, EIT**
 DATE STARTED: **6/15/2021**
 DATE COMPLETED: **6/15/2021**
 DRILLER: **GET Solutions, Inc.**



This information pertains only to this boring and should not be interpreted as being indicative of the site.

Sample Type(s):
 SS - Split Spoon

Notes:



RECORD OF SUBSURFACE EXPLORATION

Virginia Beach: 5465 Greenwich Road, Virginia Beach, VA 23642, 757-518-1703
 Williamsburg: 1592-E Penniman Road, Williamsburg, VA 23185, 757-564-6452
 Elizabeth City: 106 Capital Trace Unit E, Elizabeth City, NC 27909, 252-335-9765
 Jacksonville: 415-A Western Blvd, Jacksonville, NC 28546, 910-478-9915

BORING ID B-1

PROJECT NAME: Isle of Wight County Water Main Extension
 CLIENT: MSA, P.C.
 PROJECT LOCATION: Smithfield, Virginia
 BORING LOCATION: See attached Boring Location Plan
 DRILLING METHOD(S): Rotary wash "mud"
 GROUNDWATER*: INITIAL (ft) ∇ : 3 AFTER HOURS (ft) ∇ : CAVE-IN (ft) \odot :

PROJECT NUMBER: VB21-164G
 SURFACE ELEVATION (ft): 6
 LOGGED BY: G. Weber, EIT
 DATE STARTED: 6/15/2021
 DATE COMPLETED: 6/15/2021
 DRILLER: GET Solutions, Inc.

The initial groundwater readings are not intended to indicate the static groundwater level.

Elevation (ft)	Depth (ft)	STRATA DESCRIPTION	Strata Legend	Sample ID	Sample Type	Sample Recovery (in.)	Blow Counts (N-Values)	% < #200	TEST RESULTS				
									Plastic Limit	Water Content	Penetration	Liquid Limit	
36.5		Dark brown-gray, FAT CLAY, few fibrous organic material, very soft, wet (CH)		12	SS	24	1-1-1 (2)						
	40												
	45	Dark gray, some gravel below 43 feet		13	SS	24	0-0-1 (1)						
46.5		Gray, fine to medium, SILTY SAND, few gravel, contains marine shell fragments, loose, wet (SM)		14	SS	24	2-3-5-4 (8)						
	50												
	55	Dark gray below 53 feet		15	SS	12	3-3-5-3 (8)						
	55.0	Boring terminated at 55 feet below existing grade.											

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Sample Type(s):
 SS - Split Spoon

Notes:



RECORD OF SUBSURFACE EXPLORATION

Virginia Beach 5465 Greenwich Road 757-518-1703
 Williamsburg 1592-E Penniman Road 757-564-6452
 Elizabeth City 106 Capital Trace Unit E 252-335-9765
 Jacksonville 415-A Western Blvd Jacksonville, NC 28546 910-478-9915

BORING ID B-2

PROJECT NAME: Isle of Wight County Water Main Extension
 CLIENT: MSA, P.C.
 PROJECT LOCATION: Smithfield, Virginia
 BORING LOCATION: See attached Boring Location Plan
 DRILLING METHOD(S): Rotary wash "mud"
 GROUNDWATER*: INITIAL (ft) ∇ : 2 AFTER HOURS (ft) ∇ : CAVE-IN (ft) \odot :

PROJECT NUMBER: VB21-164G
 SURFACE ELEVATION (ft): 2
 LOGGED BY: G. Weber, EIT
 DATE STARTED: 6/15/2021
 DATE COMPLETED: 6/15/2021
 DRILLER: GET Solutions, Inc.

The initial groundwater readings are not intended to indicate the static groundwater level.

Elevation (ft)	Depth (ft)	STRATA DESCRIPTION	Strata Legend	Sample ID	Sample Type	Sample Recovery (in.)	Blow Counts (N-Values)	% < #200	TEST RESULTS	
									Plastic Limit X	Liquid Limit X
	0.2	2 inches of Asphalt		1		8	4-8-10-8 (18)			
	0.7	6 inches of Aggregate Base		2		20	9-11-10-7 (21)			
	2.0	Fill, Brown-gray, fine to medium, SILTY SAND, contains asphalt fragments, medium dense, moist (SM)		3		9	6-5-6-8 (11)			
	4.0	Gray mottled brown, fine to medium, SILTY SAND, little gravel, medium dense, wet (SM)		4		24	8-14-14-12 (28)			
	5.0	Gray mottled brown, fine to medium, CLAYEY SAND, trace gravel, medium dense, wet (SC)		5		10	8-11-11-12 (22)			
	6.0	Gray-brown, fine to medium, SILTY SAND, few gravel, medium dense, wet (SM)		6		8	2-1-1-1 (2)			
	10.0	Little fibrous organic material below 8 feet		7		24	0-0-0-0 (0)			
		Gray, FAT CLAY, trace fibrous organic material, very soft, wet (CH)		8		23	0-0-0-0 (0)			
				9		18	0-0-0-0 (0)			
				10		18	0-0-0-0 (0)			
				11		6	0-0-1-1 (1)			

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Sample Type(s):
 SS - Split Spoon

Notes:



RECORD OF SUBSURFACE EXPLORATION

Virginia Beach: 5465 Greenwich Road, Virginia Beach, VA 23642, 757-518-1703
 Williamsburg: 1592-E Penniman Road, Williamsburg, VA 23185, 757-564-6452
 Elizabeth City: 106 Capital Trace Unit E, Elizabeth City, NC 27909, 252-335-9765
 Jacksonville: 415-A Western Blvd, Jacksonville, NC 28546, 910-478-9915

BORING ID B-2

PROJECT NAME: Isle of Wight County Water Main Extension
 CLIENT: MSA, P.C.
 PROJECT LOCATION: Smithfield, Virginia
 BORING LOCATION: See attached Boring Location Plan
 DRILLING METHOD(S): Rotary wash "mud"
 GROUNDWATER*: INITIAL (ft) ∇ : 2 AFTER HOURS (ft) ∇ : CAVE-IN (ft) \odot :

PROJECT NUMBER: VB21-164G
 SURFACE ELEVATION (ft): 2
 LOGGED BY: G. Weber, EIT
 DATE STARTED: 6/15/2021
 DATE COMPLETED: 6/15/2021
 DRILLER: GET Solutions, Inc.

The initial groundwater readings are not intended to indicate the static groundwater level.

Elevation (ft)	Depth (ft)	STRATA DESCRIPTION	Strata Legend	Sample ID	Sample Type	Sample Recovery (in.)	Blow Counts (N-Values)	% < #200	TEST RESULTS					
									Plastic Limit	Water Content	Penetration	Liquid Limit		
-35		Gray, FAT CLAY, trace fibrous organic material, very soft, wet (CH) (layer continued from previous page)		12	SS	4	0-0-0-0 (0)							
-40	41.5	Dark gray, ORGANIC CLAY, very soft, wet (OH) Organic Content = 6.7 % at 44 feet below existing grade		13	SS	24	1-1-1-1 (2)	98						98.4560
-45	46.5	Gray, fine to medium, CLAYEY SAND, very loose, wet (SC)		14	SS	24	1-1-2-2 (3)							
-50	51.5	Gray, LEAN CLAY, very soft, wet (CL)		15	SS	24	0-0-0-0 (0)							
-55	56.5	Yorktown, Green-gray, fine to medium, CLAYEY SAND, contains marine shell fragments, medium dense, wet (SC)		16	SS	12	6-5-6-6 (11)							
-60	60.0	Boring terminated at 60 feet below existing grade.												

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Sample Type(s):
 SS - Split Spoon

Notes:



RECORD OF SUBSURFACE EXPLORATION

Virginia Beach 5465 Greenwich Road Virginia Beach, VA 23642 757-518-1703
 Williamsburg 1592-E Penniman Road Williamsburg, VA 23185 757-564-6452
 Elizabeth City 106 Capital Trace Unit E Elizabeth City, NC 27909 252-335-9765
 Jacksonville 415-A Western Blvd Jacksonville, NC 28546 910-478-9915

BORING ID B-3

PROJECT NAME: Isle of Wight County Water Main Extension
 CLIENT: MSA, P.C.
 PROJECT LOCATION: Smithfield, Virginia
 BORING LOCATION: See attached Boring Location Plan
 DRILLING METHOD(S): Rotary wash "mud"
 GROUNDWATER*: INITIAL (ft) ∇ : AFTER HOURS (ft) ∇ : CAVE-IN (ft) \odot :

PROJECT NUMBER: VB21-164G
 SURFACE ELEVATION (ft): 0
 LOGGED BY: G. Weber, EIT
 DATE STARTED: 6/14/2021
 DATE COMPLETED: 6/14/2021
 DRILLER: GET Solutions, Inc.

The initial groundwater readings are not intended to indicate the static groundwater level.

Elevation (ft)	Depth (ft)	STRATA DESCRIPTION	Strata Legend	Sample ID	Sample Type	Sample Recovery (in.)	Blow Counts (N-Values)	% <#200	TEST RESULTS					
									Plastic Limit X	Liquid Limit X	Water Content - ●	Penetration - ▨		
		19.5 ft of Water												
-5	5													
-10	10													
-15	15													
-20	20	Dark gray, FAT CLAY, very soft, wet (CH)		1	SS	24	0-0-0-0 (0)	100						
-21.5	21.5	Dark gray, ELASTIC SILT, very soft, wet (MH)		2	SS	24	0-0-0-0 (0)							
-23.5	23.5	Dark gray, FAT CLAY, few to little fibrous organic material, very soft, wet (CH)		3	SS	24	0-0-0-0 (0)							
-25	25			4	SS	24	0-0-0-0 (0)							
-30	30			5	SS	24	0-0-0-0 (0)							
-30	30			6	SS	24	0-0-0-0 (0)							
-35	35			7	SS	13	0-0-0-0 (0)							

X → 137.522

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Sample Type(s):
 SS - Split Spoon

Notes:



RECORD OF SUBSURFACE EXPLORATION

Virginia Beach 5465 Greenwich Road 757-518-1703
 Williamsburg 1592-E Penniman Road 757-564-6452
 Elizabeth City 106 Capital Trace Unit E 252-335-9765
 Jacksonville 415-A Western Blvd Jacksonville, NC 28546 910-478-9915

BORING ID B-3

PROJECT NAME: Isle of Wight County Water Main Extension
 CLIENT: MSA, P.C.
 PROJECT LOCATION: Smithfield, Virginia
 BORING LOCATION: See attached Boring Location Plan
 DRILLING METHOD(S): Rotary wash "mud"
 GROUNDWATER*: INITIAL (ft) ∇ : AFTER HOURS (ft) ∇ : CAVE-IN (ft) \odot :

PROJECT NUMBER: VB21-164G
 SURFACE ELEVATION (ft): 0
 LOGGED BY: G. Weber, EIT
 DATE STARTED: 6/14/2021
 DATE COMPLETED: 6/14/2021
 DRILLER: GET Solutions, Inc.

The initial groundwater readings are not intended to indicate the static groundwater level.

Elevation (ft)	Depth (ft)	STRATA DESCRIPTION	Strata Legend	Sample ID	Sample Type	Sample Recovery (in.)	Blow Counts (N-Values)	% <#200	TEST RESULTS						
									Plastic Limit	Water Content	Penetration	Liquid Limit			
		Dark gray, FAT CLAY, few to little fibrous organic material, very soft, wet (CH) (layer continued from previous page)		8	SS	24	0-0-0 (0)								
	41.0	Dark brown-gray, ORGANIC CLAY, very soft, wet (OL/OH)		9	SS	24	0-0-0-1 (0)								
	46.0	Dark brown, fine, CLAYEY SAND, some fibrous organic material, very loose, wet (SC)		10	SS	22	1-1-1-3 (2)								
	51.0	Gray, fine to medium, SILTY SAND, loose, wet (SM)		11	SS	12	2-4-3-4 (7)								
	55			12	SS	11	2-2-4-4 (6)								
	65			13	SS	8	2-3-5-7 (8)								
	66.0	Yorktown, Green-gray, fine, CLAYEY SAND, contains marine shell fragments, loose, wet (SC)		14	SS	24	2-3-2-4 (5)								
	69.5	Boring terminated at 69.5 feet below water surface.													

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Sample Type(s):
 SS - Split Spoon

Notes:



RECORD OF SUBSURFACE EXPLORATION

Virginia Beach 5465 Greenwich Road 757-518-1703
 Williamsburg 1592-E Penniman Road 757-564-6452
 Elizabeth City 106 Capital Trace Unit E 252-335-9765
 Jacksonville 415-A Western Blvd Jacksonville, NC 28546 910-478-9915

BORING ID B-4

PROJECT NAME: Isle of Wight County Water Main Extension
 CLIENT: MSA, P.C.
 PROJECT LOCATION: Smithfield, Virginia
 BORING LOCATION: See attached Boring Location Plan
 DRILLING METHOD(S): Rotary wash "mud"
 GROUNDWATER*: INITIAL (ft) ∇: AFTER HOURS (ft) ▼: CAVE-IN (ft) ⊕:

PROJECT NUMBER: VB21-164G
 SURFACE ELEVATION (ft): 0
 LOGGED BY: G. Weber, EIT
 DATE STARTED: 6/14/2021
 DATE COMPLETED: 6/14/2021
 DRILLER: GET Solutions, Inc.

The initial groundwater readings are not intended to indicate the static groundwater level.

Elevation (ft)	Depth (ft)	STRATA DESCRIPTION	Strata Legend	Sample ID	Sample Type	Sample Recovery (in.)	Blow Counts (N-Values)	% <#200	TEST RESULTS					
									Plastic Limit X	Liquid Limit X	Water Content - ●	Penetration - ▨		
		20.5 ft of Water												
-5	5													
-10	10													
-15	15													
-20	20	20.5 Dark gray, SANDY FAT CLAY, contains marine shell fragments, very soft, wet (CH)		1	SS	9	0-0-0-1 (0)	51	X	X				97.2424
-22.5	22.5	Dark gray, FAT CLAY, contains marine shell fragments, very soft, wet (CH)		2	SS	10	0-0-0-0 (0)							
-25	25			3	SS	18	0-0-0-0 (0)							
-30	30			4	SS	9	0-0-0-0 (0)							
-35	35			5	SS	24	0-0-0-0 (0)							
				6	SS	24	0-0-0-0 (0)							
				7	SS	24	0-0-0-1 (0)							

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Sample Type(s):
 SS - Split Spoon

Notes:



RECORD OF SUBSURFACE EXPLORATION

Virginia Beach 5465 Greenwich Road
 Williamsburg 1592-E Penniman Road
 Elizabeth City 106 Capital Trace Unit E
 Jacksonville 415-A Western Blvd
 Virginia Beach, VA 23642
 Williamsburg, VA 23185
 Elizabeth City, NC 27909
 Jacksonville, NC 28546
 757-518-1703
 757-564-6452
 252-335-9765
 910-478-9915

BORING ID B-4

PROJECT NAME: Isle of Wight County Water Main Extension
 CLIENT: MSA, P.C.
 PROJECT LOCATION: Smithfield, Virginia
 BORING LOCATION: See attached Boring Location Plan
 DRILLING METHOD(S): Rotary wash "mud"
 GROUNDWATER*: INITIAL (ft) ∇ : ___ AFTER ___ HOURS (ft) ∇ : ___ CAVE-IN (ft) \odot : ___
The initial groundwater readings are not intended to indicate the static groundwater level.

PROJECT NUMBER: VB21-164G
 SURFACE ELEVATION (ft): 0
 LOGGED BY: G. Weber, EIT
 DATE STARTED: 6/14/2021
 DATE COMPLETED: 6/14/2021
 DRILLER: GET Solutions, Inc.

Elevation (ft)	Depth (ft)	STRATA DESCRIPTION	Strata Legend	Sample ID	Sample Type	Sample Recovery (in.)	Blow Counts (N-Values)	% < #200	TEST RESULTS				
									Plastic Limit	Water Content	Penetration	Liquid Limit	
		Dark gray, FAT CLAY, contains marine shell fragments, very soft, wet (CH) (layer continued from previous page)		8	SS	14	0-0-0-1 (0)						
	42.0	Gray, fine to medium, CLAYEY SAND, loose, wet (SC)		9	SS	24	1-2-3-4 (5)						
	47.0	Gray, fine to medium, SILTY SAND, loose, wet (SM)		10	SS	13	3-3-2-3 (5)						
	52.0	Gray, fine to medium, CLAYEY SAND, very loose, wet (SC)		11	SS	12	1-1-1-1 (2)						
	57.0	Brown-gray, fine to medium, SILTY SAND, trace fibrous organic material, loose to medium dense, wet (SM)		12	SS	9	3-3-4-5 (7)						
	67.0	Yorktown, Green-gray, fine, CLAYEY SAND, contains marine shell fragments, loose, wet (SC)		13	SS	9	4-5-6-6 (11)						
	70			14	SS	24	2-2-4-5 (6)						

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Sample Type(s):
 SS - Split Spoon

Notes:



RECORD OF SUBSURFACE EXPLORATION

BORING ID B-4

Virginia Beach 5465 Greenwich Road Virginia Beach, VA 23642 757-518-1703
 Williamsburg 1592-E Penniman Road Williamsburg, VA 23185 757-564-6452
 Elizabeth City 106 Capital Trace Unit E Elizabeth City, NC 27909 252-335-9765
 Jacksonville 415-A Western Blvd Jacksonville, NC 28546 910-478-9915

PROJECT NAME: Isle of Wight County Water Main Extension
 CLIENT: MSA, P.C.
 PROJECT LOCATION: Smithfield, Virginia
 BORING LOCATION: See attached Boring Location Plan
 DRILLING METHOD(S): Rotary wash "mud"
 GROUNDWATER*: INITIAL (ft) ∇ : AFTER HOURS (ft) ∇ : CAVE-IN (ft) \odot :

PROJECT NUMBER: VB21-164G
 SURFACE ELEVATION (ft): 0
 LOGGED BY: G. Weber, EIT
 DATE STARTED: 6/14/2021
 DATE COMPLETED: 6/14/2021
 DRILLER: GET Solutions, Inc.

The initial groundwater readings are not intended to indicate the static groundwater level.

Elevation (ft)	Depth (ft)	STRATA DESCRIPTION	Strata Legend	Sample ID	Sample Type	Sample Recovery (in.)	Blow Counts (N-Values)	% < #200	TEST RESULTS						
									Plastic Limit X	Liquid Limit X	Water Content - ●	Penetration - ▨			
									10	20	30	40	50	60	70
-75	75	Yorktown, Green-gray, fine, CLAYEY SAND, contains marine shell fragments, loose, wet (SC) (layer continued from previous page)		15	X	24	3-2-3-4 (5)								
		Boring terminated at 75.5 feet below water surface.													

Sample Type(s):
 SS - Split Spoon

Notes:

This information pertains only to this boring and should not be interpreted as being indicative of the site.



RECORD OF SUBSURFACE EXPLORATION

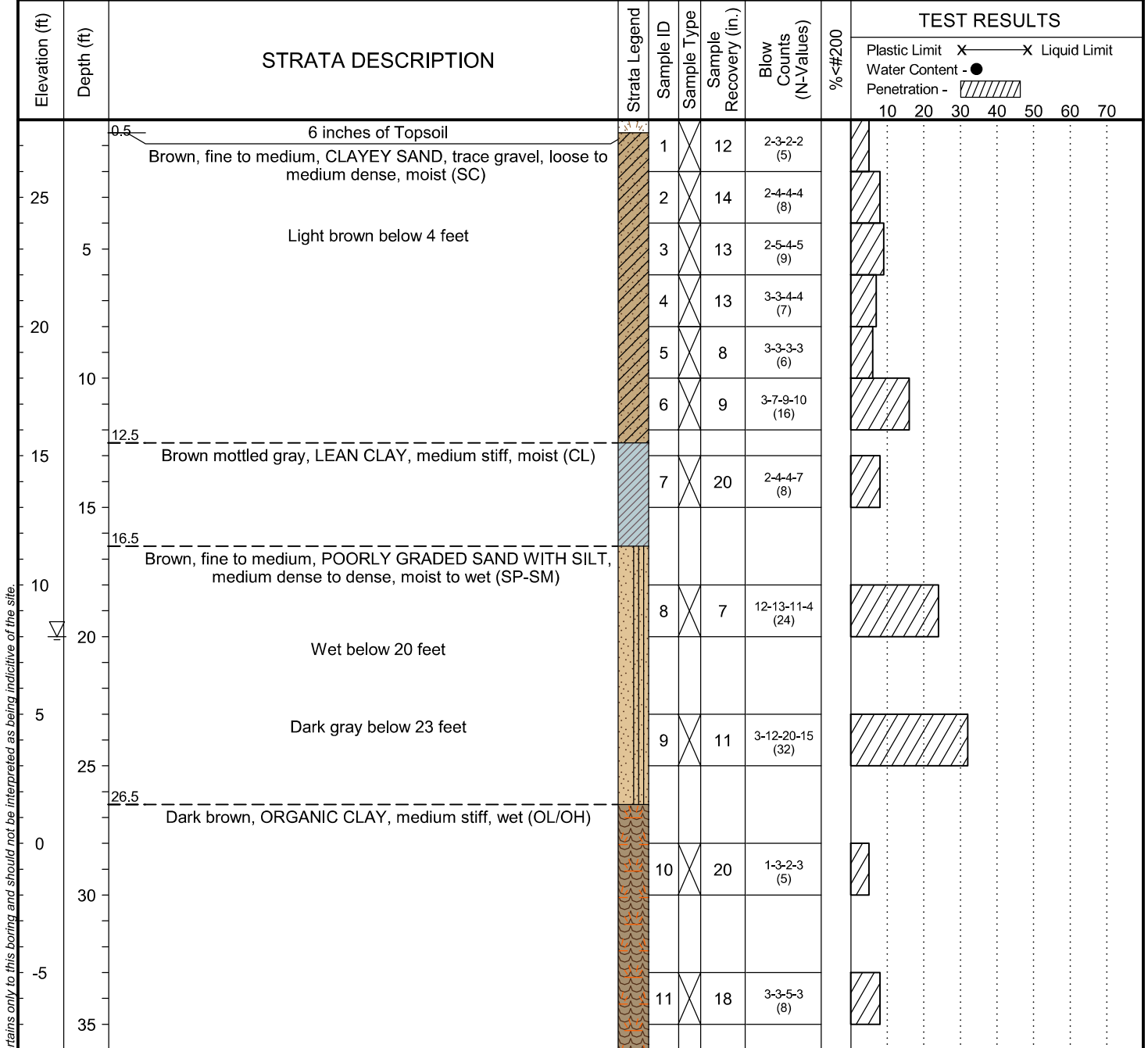
Virginia Beach 5465 Greenwich Road 757-518-1703
 Williamsburg 1592-E Penniman Road 757-564-6452
 Elizabeth City 106 Capital Trace Unit E 252-335-9765
 Jacksonville 415-A Western Blvd Jacksonville, NC 28546 910-478-9915

BORING ID B-5

PROJECT NAME: Isle of Wight County Water Main Extension
 CLIENT: MSA, P.C.
 PROJECT LOCATION: Smithfield, Virginia
 BORING LOCATION: See attached Boring Location Plan
 DRILLING METHOD(S): Rotary wash "mud"
 GROUNDWATER*: INITIAL (ft) ∇ : 20 AFTER HOURS (ft) ∇ : CAVE-IN (ft) \odot :

PROJECT NUMBER: VB21-164G
 SURFACE ELEVATION (ft): 28
 LOGGED BY: G. Weber, EIT
 DATE STARTED: 6/16/2021
 DATE COMPLETED: 6/16/2021
 DRILLER: GET Solutions, Inc.

The initial groundwater readings are not intended to indicate the static groundwater level.



This information pertains only to this boring and should not be interpreted as being indicative of the site.

Sample Type(s):
 SS - Split Spoon

Notes:



RECORD OF SUBSURFACE EXPLORATION

Virginia Beach: 5465 Greenwich Road, Virginia Beach, VA 23642, 757-518-1703
 Williamsburg: 1592-E Penniman Road, Williamsburg, VA 23185, 757-564-6452
 Elizabeth City: 106 Capital Trace Unit E, Elizabeth City, NC 27909, 252-335-9765
 Jacksonville: 415-A Western Blvd, Jacksonville, NC 28546, 910-478-9915

BORING ID B-5

PROJECT NAME: Isle of Wight County Water Main Extension
 CLIENT: MSA, P.C.
 PROJECT LOCATION: Smithfield, Virginia
 BORING LOCATION: See attached Boring Location Plan
 DRILLING METHOD(S): Rotary wash "mud"
 GROUNDWATER*: INITIAL (ft) ∇ : 20 AFTER HOURS (ft) ∇ : CAVE-IN (ft) \odot :

PROJECT NUMBER: VB21-164G
 SURFACE ELEVATION (ft): 28
 LOGGED BY: G. Weber, EIT
 DATE STARTED: 6/16/2021
 DATE COMPLETED: 6/16/2021
 DRILLER: GET Solutions, Inc.

The initial groundwater readings are not intended to indicate the static groundwater level.

Elevation (ft)	Depth (ft)	STRATA DESCRIPTION	Strata Legend	Sample ID	Sample Type	Sample Recovery (in.)	Blow Counts (N-Values)	% <#200	TEST RESULTS											
									Plastic Limit X	Liquid Limit X	Water Content - ●	Penetration -								
	36.5	Dark gray, fine to medium, CLAYEY SAND, contains cemented fines, loose, wet (SC)		12	SS	24	2-3-3-3 (6)													
	41.5	Yorktown, Green-gray, LEAN CLAY, contains marine shell fragments, medium stiff to stiff, wet (CL)		13	SS	24	2-2-3-4 (5)													
	50.0	Boring terminated at 50 feet below existing grade.		14	SS	24	5-4-5-6 (9)													

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Sample Type(s):
 SS - Split Spoon

Notes:

APPENDIX V

GENERALIZED SOIL PROFILE



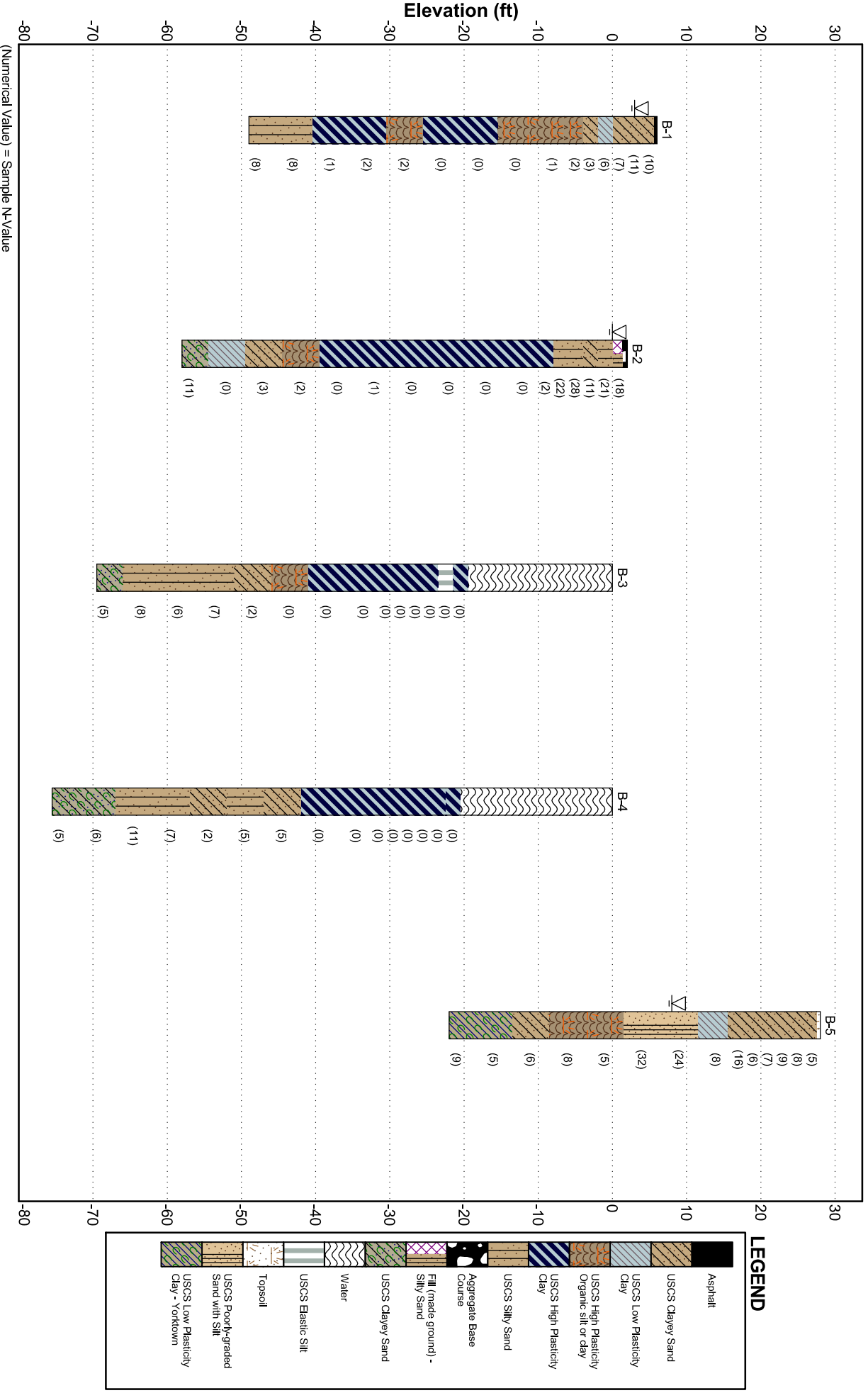
GENERALIZED SOIL PROFILE

PROJECT NAME: **Isle of Wight County Water Main Extension**

PROJECT LOCATION: **Smithfield, Virginia**

PROJECT NUMBER: **VB21-164G**

CLIENT: **MSA, P.C.**



LEGEND

- Asphalt
- USCS Clayey Sand
- USCS Low Plasticity Clay
- USCS High Plasticity Organic silt or clay
- USCS High Plasticity Clay
- USCS Silty Sand
- Aggregate Base Course
- Fill (made ground) - Silty Sand
- USCS Clayey Sand
- Water
- USCS Elastic Silt
- Topsoil
- USCS Poorly-graded Sand with Silt
- USCS Low Plasticity Clay - Yorktown

APPENDIX B

Statement of Special Inspections

Hampton Roads Regional Special Inspection Guidelines and Procedures

Appendix A

HAMPTON ROADS AREA STATEMENT OF SPECIAL INSPECTIONS

PROJECT

PERMIT APPLICANT

Route 10 Water Main Extension and Pump Station
Isle of Wight County

PRIMARY RDP OF RECORD

STRUCTURAL ENGINEER OF RECORD

Timmons Group
2901 S Lynnhaven Road, Suite 200
Virginia Beach, Virginia 23452

This Statement of Special Inspections is submitted as a condition for permit issuance in accordance with the International Building Code (IBC) as stated in the Virginia Uniform Statewide Building Code (USBC). It includes a Schedule of Special Inspections applicable to this project as well as the name of the Special Inspector, and the identity of other testing laboratories or agencies intended to be retained for conducting these inspections or tests.

The Special Inspector shall keep records of all inspections, and shall furnish inspection reports to the Building Official, appropriate Registered Design Professional(s) (RDP(s)), Owner and Contractor. All discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and appropriate RDP(s). Interim reports shall be submitted to the Building Official, Owner, Contractor, and the appropriate RDP(s) according to the *Hampton Roads Regional Special Inspection Guidelines and Procedures*.

Jobsite safety is solely the responsibility of the contractor. Materials and activities to be inspected are not to include the contractor's equipment and methods used to erect or install the materials listed. **All fees/costs related to the performance of Special Inspections shall be the responsibility of the Owner. Additionally, the undersigned (RDP or SER) are only acknowledging that the items enumerated on the Schedule of Special Inspections are consistent with the required design elements, the applicable sections of the Uniform Statewide Building Code, and their area of expertise.**

REVIEW, AUTHORIZATION & ACCEPTANCE

Permit Applicant (General Contractor):

Signature / date: _____

Printed Name: _____

Owner's Authorization:

Signature / date: _____

Printed Name: Isle of Wight County c/o Donald Jennings, P.E.

Signature / date: _____

Printed Name: Town of Smithfield c/o Jack Reed

Virginia RDP Seal of SSI Preparer

Printed Name of the Preparer of the Schedule (on line above)

Primary RDP of Record:(Review and Acceptance of Schedule)

Signature / date: _____

Printed Name: Timmons Group c/o Kenneth Turner, P.E.

Special Inspector:

Signature / date: _____

Printed Name: _____

SER of Record:(Review and Acceptance of Schedule)

Signature / date: _____

Printed Name: _____

SI Company Name: _____

Building Official's Acceptance:Signature / date: _____

Printed Name: _____

SCHEDULE OF SI PREPARED BY:

SCHEDULE OF SPECIAL INSPECTIONS

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT			
		Y/C/P/N	EXTENT/REFERENCE	AGENT	COMPLETED
GENERAL					
Pre-construction conference	Meeting with parties listed in Section 6 of HRRSIGP to discuss Special Inspection procedures	Y	Scheduled by SI with the Contractor prior to commencement of work; VCC 113.4	1, 2, and 4	
EARTHWORK					
Site preparation (structure)	Field testing and inspection	Y/P	Field Review; VCC 1705.6	2	
Fill material (structure)	Review submittals, field testing and inspection	Y/P	Field Review; VCC 1705.6	2	
Fill compaction (structure)	In-place density tests, lift thickness	Y/C	Field Review; VCC 1705.6	2	
Excavation	Field inspection and verification of proper depth	Y/P	Field Review; VCC 1705.6	2	
Foundation sub-grade (structure)	Field inspection of foundation subgrade prior to placement of concrete	Y/P	Field Review; VCC 1705.6	2	
DEEP FOUNDATION ELEMENTS					
Materials	Review product, sizes, and lengths	Y	Submittal and Field Review; VCC 1705.7, 1705.8, 1705.9	1	
Test piles	Monitor driving of test piles	N	Field Review; VCC 1705.8, 1704.9 or 1704.10	2	
Installation	Monitor drilling, placement, plumbness, driving of piles, including recording blows per foot, cut off, and tip elevation	Y/P	Field Review; VCC 1705.2, 1705.3, 1705.7	2	
Load test	Monitor pile load test	N	Field Review; VCC 1705.8, 1704.9 or 1704.10	2	
CONCRETE					
Materials	Review product supplied versus certificates of compliance and mix design	Y	Submittal & Field Review; ACI 318: Ch. 19, 26.4.3, 26.4.4; VCC 1705.3, 1903.2, 1908.2, 1903.4	1	
Installation of reinforcing steel, including welding, as well as prestress tendons, anchor bolts, and fiber-reinforcement	Field inspection of placement	Y/C	Submittal and Field Review; ACI 318: Ch. 20, 25.2, 25.3, 26.5.1-26.5.3; AWS D1.4; VCC 1705.3, 1901.3, 1908.4	1 and 2	
Formwork installation	Field inspection	Y	Field Review; ACI 318; VCC 1705.3	1	
Concreting operations and placement	Field inspection of placement/sampling	Y/C	Field Review; ACI 318: 26.5.2, 26.12.3; ASTM C 172, C 31; VCC 1705.3, 1908.6, 1908.7, 1908.8, 1908.10	2	
Concrete curing	Field inspection of curing process	Y/P	Field Review; ACI 318: 26.5.3, 26.5.4; VCC 1705.3, 1908.9	1 and 2	
Concrete strength	Evaluation of concrete strength	Y/P	Laboratory Testing; ACI 318: 26.12; VCC 1705.3	2	

Hampton Roads Regional Special Inspection Guidelines and Procedures

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT			
		Y/C/P/N	EXTENT/REFERENCE	AGENT	COMPLETED
Application of forces for prestressed concrete	Field inspection	N	Field Review; ACI 318: 26.10.2 (c); VCC 1705.3	1	
Grouting of prestress tendons	Field inspection	N	Field Review; ACI 318: 19.4.1, 20.6.4, 26.13.3.2(b); VCC 1705.3	2	
PRECAST CONCRETE					
Verify fabrication/quality control procedures	In-plant inspection of fabrication/quality control procedures**	N	Submittal or Field Review; VCC 1705.3	1	
Erection and installation	Review submittals and as-built assemblies; Field inspection of in-place precast	N	Submittal and Field Review; ACI 318; VCC Table 1705.3	1	
MASONRY (Level ____; Building Risk Category ____)					
Materials	Review of products supplied versus certificate of compliance and material submitted	N	Submittal & Field Review; ACI 530/ASCE 5; ACI 530.1/ASCE 6; VCC 1705.4, 1709	1	
Strength	Testing/review of strength	N	Submittal & Field Review; ACI 530/ASCE 5; ACI 530.1/ASCE 6; VCC 1705.4, 2105.	2	
Mortar and Grout	Inspection of proportioning and mixing. Placement of mortar only.	N	Submittal & Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	2	
Grout placement, including prestressing grout	Verification to ensure compliance	N	Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	2	
Grout space	Verification to ensure compliance	N	Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6; TMS 602	2	
Mortar, grout, and prism specimens	Observe Preparation	N	Field Review; VCC 1705.4, ACI 530.1; ASCE 6	2	
Reinforcement, prestressing tendons, and connections	Inspect condition, size, location, and spacing	N	Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	1	
Welding of reinforcing bars	Inspection and testing of welds	N	Field Review; VCC 1705.3.1, 1705.4; ACI 530/ASCE 5; ACI 530.1/ ASCE 6	2	
Prestressing force	Verify application and measurement	N	Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	1	
Protection	Inspect procedures for protection during cold and hot weather	N	Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	1 and 2	
Anchorage	Inspection of anchorages	N	Field Review; VCC 1705.4; ACI 530.1/ASCE 6; ACI 530/ASCE 5	1	
Masonry installation	Inspection of placement of masonry and joints	N	Field Review; VCC 1705.4; ACI 530/ASCE 5; ACI 530.1/ASCE 6	1 and 2	
STRUCTURAL STEEL					
Verify fabrication/quality control procedures	In-plant inspection of fabrication/quality control procedures** or submit Certificate of Compliance	N	Submittal or Field Review; VCC 1704.2.5, 1704.2.5.1, 1705.2	1	
Bolts, nuts, and washers – materials	Material identification markings; Review of Certificate of Compliance	N	Submittal & Field Review; VCC 1705.2.1, 1706; ASTM; AISC 360, Section A3.3	1	

Hampton Roads Regional Special Inspection Guidelines and Procedures

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT			
		Y/C/P/N	EXTENT/REFERENCE	AGENT	COMPLETED
Bolts, nuts, washers – installation	Inspection of in-place high-strength bolts, snug-tight joints, pre-tensioned and bearing type, and slip critical connections	N	Submittal & Field Review; VCC 1705.2.1, 2204.2; AISC 360 Section M2.5	1 or 2	
Structural steel – materials	Material identification markings and review of Certificate of Compliance	N	Submittal & Field Review; VCC 1705.2.1, 1706; ASTM A6, A568; AISC 360 Section A3.1	4	
Structural steel details – installation	Inspection of member locations, structural details for bracing, connections, and stiffening	N	Submittal & Field Review; VCC 1705.2.1, 1705.2.2, AISC 360	1 and 2	
Open-web steel joists and joist girders – installation	Inspection of end connections and bridging	N	Submittal & Field Review; VCC 1705.2.3	1 and 2	
Weld filler materials and welder certification	Review of identification markings, certificate of compliance, and welder certifications	N	Submittal & Field Review; ASTM; AISC 360 A3.5	4	
Welds	Inspection and testing of welds	N	Field Review; VCC 1705.2, 2204.1; AWS D1.1, D1.3	4	
Cold-formed metal deck – materials	Review of identification marking manufacturer’s certified test results	N	Submittal & Field Review; VCC 1705.2.2; ASTM	1	
Cold-formed metal deck – installation	Review laps and welds	N	Submittal & Field Review; IBC 1705.2.2, AWS D1.3	1 and 2	
Cold-formed light frame construction – welds	Review welding operation	N	Field Review; VCC 1705.11, 1705.11.2, 1705.11.3	2	
Cold form light frame construction wind resistance – screws	Review screw attachment bolting, anchoring hold downs, bracing, diaphragms, struts	N	Field Review; VCC 1705.11, 1705.11.2, 1705.11.3	1	
Cold-formed steel trusses spanning 60’ or greater	Inspection of temporary and permanent restraints/bracing	N	Submittal & Field Review; VCC 1705.2.4	1	
WOOD					
Verify fabrication/quality control procedures	In-plant inspection of fabrication/quality control procedures** or submit Certificate of Compliance	N	Submittal or Field Review; VCC 1704.2.5, 1704.2.5.1, 1705.5	1	
Metal plate connected wood/metal trusses spanning 60’ or more	Review approved submittal and installation of restraint/bracing	N	Submittal & Field Review; VCC 1704.2.5, 1704.2.5.1, 1705.5, 1705.5.2	1	
Joist Hangers – Materials/Installation	Review manufacturer’s material and test standards,	N	Field Review; ASTM D 1761	1	
High-Load Diaphragms - Installation	Review submittal and as-built assemblies; Inspection of sheathing, framing size, nail and staple diameter and length, number of fastener lines, and fastener spacing.	N	Submittal & Field Review; VCC 1705.5, 1705.5.1	1	
Wood Shear Walls – installation	Review nailing, bolting, anchoring, fastening, diaphragms, struts, braces, and hold downs when fasteners are ≤ 4” on center.	N	Field Review; VCC 1705.11.1	1	

Hampton Roads Regional Special Inspection Guidelines and Procedures

MATERIAL/ACTIVITY	TYPE OF INSPECTION	APPLICABLE TO THIS PROJECT			
		Y/C/P/N	EXTENT/REFERENCE	AGENT	COMPLETED
MAIN WIND FORCE RESISTING SYSTEM					
Wind requirements	Review of the system components and installation for wood construction, cold-formed steel light frame construction, components, and cladding	N	Submittal & Field Review; VCC 1609.1.2, 1704.6.2, 1705.11, 1709	1	
SEISMIC FORCE RESISTING SYSTEMS					
Seismic requirements	Review of the designated seismic systems and seismic force resistance systems	N	Submittal & Field Review; VCC 1613, 1704.6.1, 1705.12, 1705.13; ASCE 7	1	
SMOKE CONTROL					
Special Inspection of smoke control systems	Leakage testing and recording of device location; pressure difference testing, flow measurement and detection, and control verification	N	Field Review; VCC 1705.18, 1705.18.1, 1705.18.2	3	
SPRAYED FIRE RESISTIVE MATERIAL, FIRE RESISTANT PENETRATIONS; JOINTS, MASTIC AND INTERMESCENT FIRE RESISTANT COATING					
Structural member surface conditions	Field review of surface conditions prior to application	N	AWCI 12-B; VCC 1705.14, 1705.14.1, 1705.14.2	2	
Application/thickness/density/bond strength	Field review of application operations, thickness, and density	N	ASTM E605, AWCI 12-B; VCC 1705.14.1, 1705.14.2, 1705.14.3, 1705.14.4, 1705.14.5, 1705.14.6	2	
Mastic & Intumescent Fire Resistant Coating	Field review of application operations and thickness	N	AWCI 12-B; VCC 1705.15	2	
EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS)					
Application	Field Review of application/installation	N	ASTM E2570, VCC 1705.16	2	
SPECIAL CASES					
Retaining Walls	Field review of installation of pre-manufactured structural components	N	Field Review; VCC 113.4, 1705.1.1	1 or 2	
Sprinkler system hangers/supports	Field review of placement and anchorage	N	Field Review; VCC 903.3.1.1, 1705.1.1; NFPA 13: 9.2	1 or 2	
Alternative Materials and Systems	As requested by Building Official, review system and installation	N	VCC 113.4, 1705.1.1	1 or 2 or 3	
INSPECTION AGENTS	FIRM		ADDRESS	TELEPHONE	
1. Special Inspector:					
2. Materials and Testing Laboratory:	GET Solutions, Inc.		5465 Greenwich Rd, Virginia Beach, VA 23462	(757) 518-1703	
3. Special Inspector Smoke Control System:	N/A		N/A	N/A	
4. (Additional Agents)					

Note: * The Qualifications of the Special Inspector and Testing Laboratories are subject to the Approval of the Building Official.
 ** Inspection of quality control procedures required only if fabricator is not regularly inspected by an Approved independent inspection agency.
 ***For construction projects in seismic regions, the Schedule of Special Inspections shall be expanded to include Architectural, Mechanical, and Electric components, as well as Storage Racks and Isolation Systems. Items in VCC Section 1705.12

FINAL REPORT OF SPECIAL INSPECTIONS

PROJECT

PERMIT APPLICANT

PRIMARY RDP OF RECORD

STRUCTURAL ENGINEER OF RECORD

To the best of my information, knowledge, and belief, the Special Inspections required for this project, and itemized in the Statement of Special Inspections submitted for permit, have been completed. Attached to this final report are the Certificates of Compliance for shop fabricated load bearing members and assemblies. (Include this statement only if applicable).

Interim reports submitted prior to this final report, and numbered _____ to _____, form a basis for, and are to be considered an integral part of this final report.

Respectfully submitted,

Signature

Date

Type or Print Name (**Agent 1**)

Seal of SI

Upon completion of all Special Inspections and testing, the SI shall submit a Final Report of Special Inspections to Building Official for review and approval. The Building Official review and approval is required prior to final building inspection approval or issuance of a Certificate of Occupancy.

APPENDIX C

Commonwealth of Virginia Marine Resources
Commission (VMRC) Permit



Permit# 2021-2579

Commonwealth of Virginia Marine Resources Commission Authorization

A Permit has been issued to:

Isle of Wight County
17140 Monument Circle
Isle of Wight, VA 23397

Permittee is hereby authorized to install a 12-inch water main across a 200-foot section of the Pagan River using the horizontal directional drilling method a minimum of 10 feet beneath the substrate adjacent to N. Church Street in Isle of Wight County. All activities authorized herein shall be accomplished in conformance with the plans and drawings dated received December 16, 2021, and revised drawings dated received April 12, 2022, and which are attached and made a part of this permit.

Issuance Date: 05/03/2022

Expiration Date: 05/31/2025


Randy Owen
Chief, Habitat Management Division

This Notice Must be Conspicuously Displayed at Site of Work

**COMMONWEALTH OF VIRGINIA
MARINE RESOURCES COMMISSION
PERMIT**

The Commonwealth of Virginia, Marine Resources Commission, hereinafter referred to as the Commission, on this 26th day of April 2022 hereby grants unto:

**Isle of Wight County
17140 Monument Circle
Isle of Wight, VA 23397**

hereinafter referred to as the Permittee, permission to:

 X Encroach in, on, or over State-owned subaqueous bottoms pursuant to Chapter 12, Subtitle III, of Title 28.2 of the Code of Virginia.

 Use or develop tidal wetlands pursuant to Chapter 13, Subtitle III, of Title 28.2 of the Code of Virginia.

Permittee is hereby authorized to install a 12-inch water main across a 200-foot section of the Pagan River using the horizontal directional drilling method a minimum of 10 feet beneath the substrate adjacent to N. Church Street in Isle of Wight County. All activities authorized herein shall be accomplished in conformance with the plans and drawings dated received December 16, 2021, and revised drawings dated received April 12, 2022, and which are attached and made a part of this permit.

This permit is granted subject to the following conditions:

- (1) The work authorized by this permit is to be completed by **May 31st, 2025**. The Permittee shall notify the Commission when the project is completed. The completion date may be extended by the Commission in its discretion. Any such application for extension of time shall be in writing prior to the above completion date and shall specify the reason for such extension and the expected date of completion of construction. All other conditions remain in effect until revoked by the Commission or the General Assembly.
- (2) This permit grants no authority to the Permittee to encroach upon the property rights, including riparian rights, of others.
- (3) The duly authorized agents of the Commission shall have the right to enter upon the premises at reasonable times, for the purpose of inspecting the work being done pursuant to this permit.
- (4) The Permittee shall comply with the water quality standards as established by the Department of Environmental Quality, Water Division, and all other applicable laws, ordinances, rules and regulations affecting the conduct of the project. The granting of this permit shall not relieve the Permittee of the responsibility of obtaining any and all other permits or authority for the projects.
- (5) This permit shall not be transferred without written consent of the Commissioner.
- (6) This permit shall not affect or interfere with the right vouchsafed to the people of Virginia concerning fishing, fowling and the catching of and taking of oysters and other shellfish in and from the bottom of acres and waters not included within the terms of this permit.
- (7) The Permittee shall, to the greatest extent practicable, minimize the adverse effects of the project upon adjacent properties and wetlands and upon the natural resources of the Commonwealth.
- (8) This permit may be revoked at any time by the Commission upon the failure of the Permittee to comply with any of the terms and conditions hereof or at the will of the General Assembly of Virginia.
- (9) There is expressly excluded from the permit any portion of the waters within the boundaries of the Baylor Survey.
- (10) This permit is subject to any lease of oyster planting ground in effect on the date of this permit. Nothing in this permit shall be construed as allowing the Permittee to encroach on any lease without the consent of the leaseholder. The Permittee shall be liable for any damages to such lease.
- (11) The issuance of this permit does not confer upon the Permittee any interest or title to the beds of the waters.
- (12) All structures authorized by this permit, which are not maintained in good repair, shall be completely removed from State-owned bottom within three (3) months after notification by the Commission.
- (13) The Permittee agrees to comply with all of the terms and conditions as set forth in this permit and that the project will be accomplished within the boundaries as outlined in the plans attached hereto. Any encroachment beyond the limits of this permit shall constitute a Class 1 misdemeanor.
- (14) This permit authorizes no claim to archaeological artifacts that may be encountered during the course of construction. If, however, archaeological remains are encountered, the Permittee agrees to notify the Commission, who will, in turn notify the Department of Historic Resources. The Permittee further agrees to cooperate with agencies of the Commonwealth in the recovery of archaeological remains if deemed necessary.
- (15) The Permittee agrees to indemnify and save harmless the Commonwealth of Virginia from any liability arising from the establishment, operation or maintenance of said project.

The following special conditions are imposed on this permit:

- (16) The placard accompanying this permit document must be conspicuously displayed at the work site.
- (17) Permittee agrees to notify the Commission upon the start of the activities authorized by this permit.
- (18) Erosion and sediment control measures shall be in conformance with the 1992 Third Edition of the Virginia Erosion and Sediment Control Handbook and shall be employed throughout construction.
- (19) The Permittee agrees to abide by the Frac-out Monitoring and Response plan that is attached to and made a part of this permit.

Description of Fees	Amount	Unit of Measure	Rate	Total	Frequency	After-The-Fact
Permit Fee				\$600.00	One-Time	
Total Permit Fees				\$600.00		

This permit consists of 12 Pages

PERMITTEE(S)

BY CHECKING THIS BOX, I certify that I am the Permittee OR the certified agent acting on behalf of all Permittees, that I have read and understood the permit as drafted and accept all of the terms and conditions herein. I agree and understand that checking the box has the same legal authority as a written signature. The provisions of the permit authorization shall be binding on any assignee or successor in interest of the original Permittee(s). In cases where the Permittee is a corporation, agency or political jurisdiction, I certify I have proper authorization to bind the organization to the financial and performance obligations which result from activity authorized by this permit.

PERMITTEE OR CERTIFIED AGENT

DATE TERMS ACCEPTED

Donald N Jennings, PE, Utility Services Director
Print Your Name Here

May 02, 2022

PERMITEE

Isle of Wight County
17140 Monument Circle
Isle of Wight, VA 23397

AGENT

MSA, P.C.
Brian Owen
5033 Rouse Drive
Virginia Beach, VA 23462

COMMISSION

This permit is executed on behalf of the Commonwealth of Virginia, Marine Resources Commission by the undersigned:



Randy Owen
Chief, Habitat Management Division

DATE SIGNED
3rd day of May 2022



Mapped by BRO
 0 500 1,000 2,000 3,000 4,000 Feet
 Smithfield and Bacons Castle, VA USGS Quadrangle Topographic Maps



USGS TOPOGRAPHIC VICINITY MAP

JOINT PERMIT APPLICATION
STATE ROUTE 10 WATER LINE

SMITHFIELD AND ISLE OF WIGHT COUNTY, VIRGINIA

MSA, P.C.
 Environmental Sciences, Surveying,
 Civil & Environmental Engineering
 5032 Rouse Drive, Suite 200
 Virginia Beach, VA. 23462
 757-490-9264 (Ofc) 757-490-0634 (Fax)
 www.msaonline.com

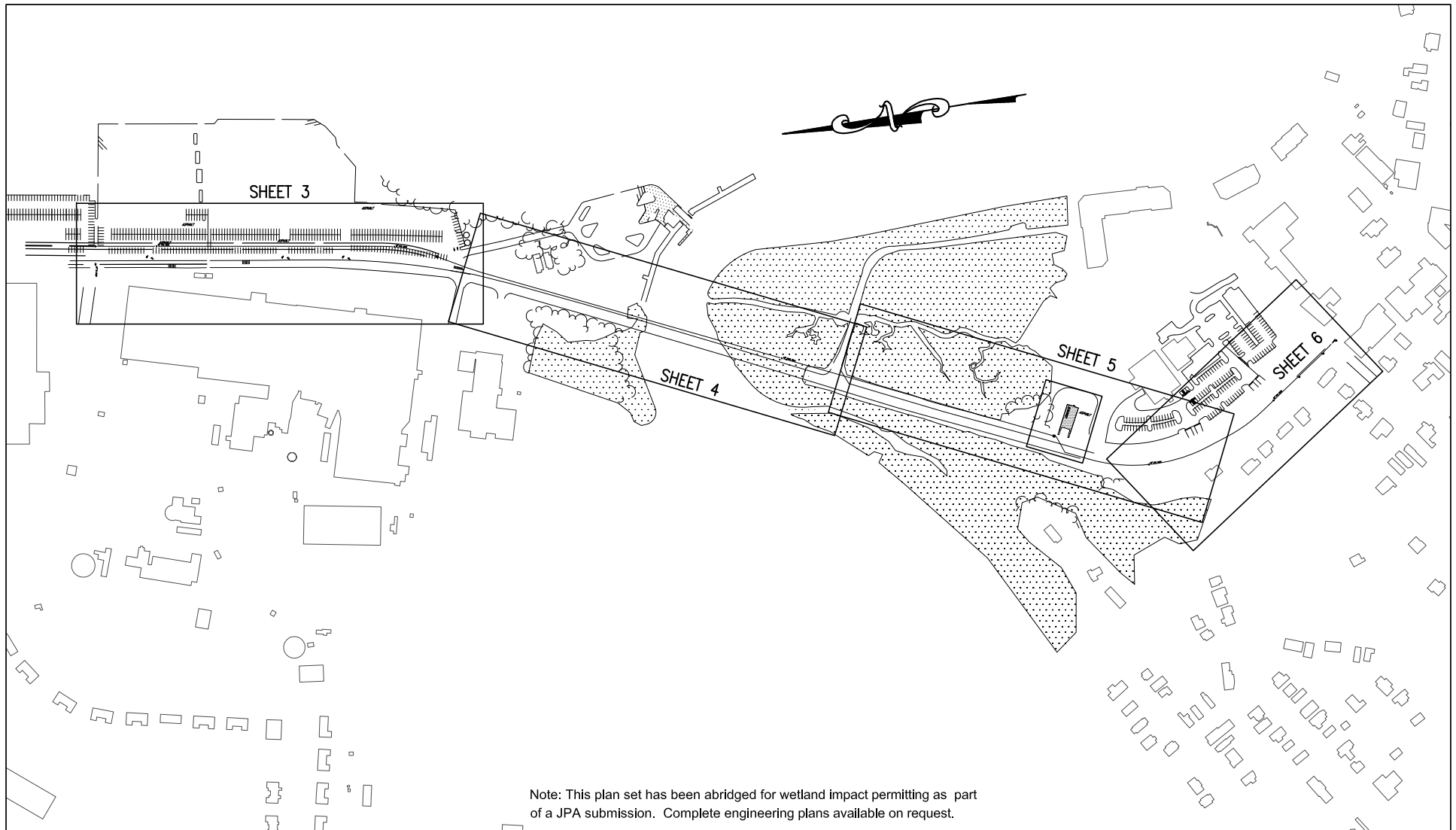


MSA JOB #
19321A

DATE:
AUG 26, 2021

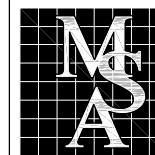
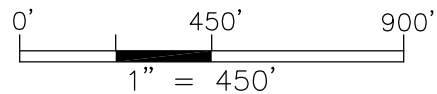
MAPPED BY:
BRO

SCALE
AS SHOWN



OVERALL SITE LAYOUT

DATE: 08/20/2021
 DESIGNED BY: GBH
 JPA EDIT BY: BRO



MSA, P.C.
 Environmental Sciences • Surveying
 Civil & Environmental Engineering

5032 Rouse Drive, Suite 200
 Virginia Beach, VA 23462-3764
 757-490-9264 | www.msaonline.com

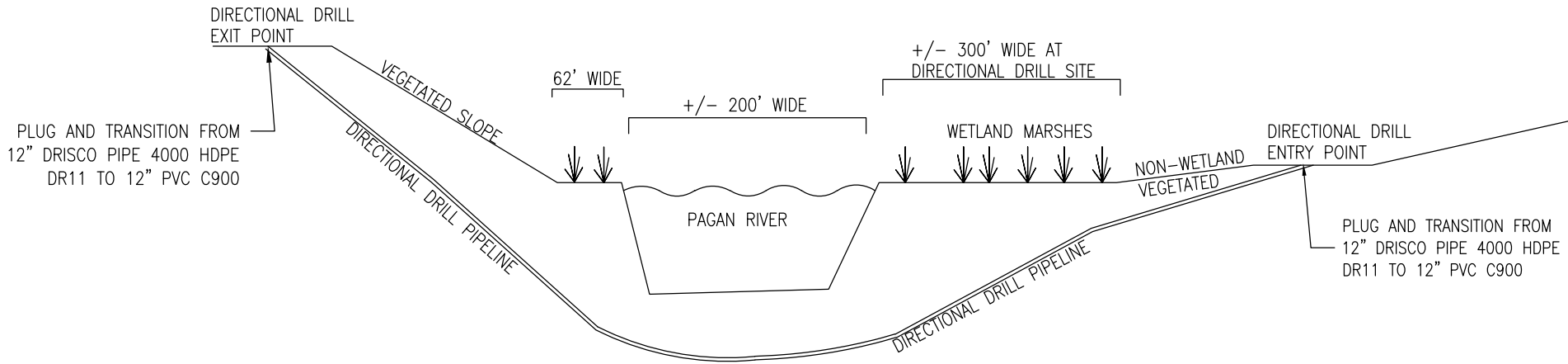
MSA #
19321A

DATE:
08/20/21

SHEET
2 OF 7



TOTAL DIRECTIONAL DRILL DISTANCE +/- 2,000 FEET



NOTE: ACTUAL DIRECTIONAL DRILL DEPTH IS TO BE DETERMINED, BUT SHALL BE DEEP ENOUGH TO AVOID WETLAND IMPACTS

Note: This plan set has been abridged for wetland impact permitting as part of a JPA submission. Complete engineering plans available on request.

CROSS SECTION
DATE: 08/20/2021
DESIGNED BY: GBH
JPA EDIT BY: BRO



	MSA, P.C.	
	Environmental Sciences • Surveying Civil & Environmental Engineering	
5032 Rouse Drive, Suite 200 Virginia Beach, VA 23462-3764 757-490-9264 www.msaonline.com		
MSA # 19321A	DATE: 08/20/21	SHEET 7 OF 7

State Route 10 Water Line Extension

Frac-Out Contingency Plan

1. Introduction

Isle of Wight County is replacing the +/- 60-year-old Hardy Elementary School in Smithfield. Water is currently supplied to the school via a private groundwater well that is inadequate for fire suppression systems. Replacement of the school must include this infrastructure as per building codes. The existing well is incapable of providing adequate water supply for fire suppression. A new 12" water main will be installed starting in the Town of Smithfield and running parallel to State Route 10 northward, and directionally drill under the Pagan River. The line will continue north passing the Smithfield Packing Company (SPC) and terminate at the Hardy Elementary School property. The directional drill will start in a parking area of a vacant lot on the south side of the bridge over the Pagan River, and terminate in the parking lot of the SPC. This will avoid direct impacts to marshes and riverine wetlands and waters associated with the Pagan River.

With directional drilling, a risk is present for escaping of drilling fluids from the boring, and while this risk is minimal it is possible. This can occur at the entrance and exit points, but also if the drilling bit encounters a geologic seam, fissure, fracture or a void along the drill path. A loss of drilling fluid pressure is detected when the fluids disperse into the surrounding soils, resulting in a frac-out scenario.

This plan intends to minimize potential for a frac-out associated with directional drilling, allow for timely detection and response to a frac-out situation, and protect the river and wetland environment. Ultimately it will be the contractor's responsibility to manage a frac-out situation, the general guidance provided herein is not intended to supersede the contractor's standard operating procedures for a frac-out especially should those standards exceed what is provided below. This frac-out plan shall be available onsite at all times during the drilling operation.

The drilling contractor is fully responsible for directional drilling operations and to provide all labor, material and equipment needed to complete the directional drill, and implement frac-out response. All work shall be done in compliance with contract documents and applicable laws, rules, ordinances and permits of regulatory agencies including the Virginia Marine Resources Commission (VMRC), the Virginia Department of Environmental Quality (VDEQ), the Corps of Engineers, and any other agencies that have jurisdiction. The project shall comply with the Hampton Roads Planning District Commission (HRPDC) Section 806 specification for Horizontal Directional Drilling where applicable. All wastes generated from drilling activities, including mud removed from the bore path and any waste drilling fluids, shall be properly managed and disposed of.

2. Preventative Measures:

Drilling fluid pressure, pumping and return rates and volumes will be monitored to detect the potential occurrence of a loss of fluid. In the even that a loss is found, the drilling operator will cease pumping and implement the processes in this contingency plan.

A monitor will be onsite continuously during drilling activities to visually observe the return conditions. In the event of night operations, adequate lighting shall be provided. The drilling contractor will keep the monitor apprised of the drill fluid release pressures and mud volume balance and provide guidance on level of risk of inadvertent return occurring at any given time. Should any significant spike or decrease in annular pressure readings occur, the monitor shall immediately notify the drill operator and an attempt shall be made to stop the flow to the formation before advancing the drill head past the known point of the frac-out. The amount of drilling mud release is contingent on the speed of detecting the frac-out scenario, and with a monitor constantly

observing the drill path, the risk of significant release is reduced. The drilling contractor shall insure that all employees are trained prior to drilling in how to respond to a frac-out.

For this particular project, the directional drill shall be 20 feet below the river bottom, and +/- 45 feet below the marsh wetlands on either side of the river. These depths should minimize risk of a frac-out reaching the river or surface of the marsh.

3. Reporting Requirements:

The contractor is required to submit complete written daily logs and records by noon of the following day to which records correspond. The following will be reported:

- Drilling lengths
- Location of drill head
- Drilling fluid properties, including checks every 2 hours for mud weight, viscosity, sand content, chlorides content if applicable, hardness, and pH

4. Response and Containment:

If a loss of pressure / circulation occurs, immediately stop all drilling operations and initiate the following:

- Notify the drilling superintendent and general contractor.
- Pull back the bore stem to release pressure on the frac-out
- Inspect the surface path of the crossing for inadvertent return of drilling fluid
- If considered safe and if no damage to the existing structures and environment would occur, the drill rig string can be rotated slowly and swabbed, and drilling fluid would be pumped at a reduced rate to try to regain circulation.
- If circulation is not restored in a timely manner, consider further backing the drill string until circulation is regained, then advancing it again monitoring the quality of the returns.
- If circulation is again lost, a loss control material pill – a mixture of polymer additives and swelling agents, should be set.
- If circulation is again lost, further action would be determined after consultation between the general contractor, directional drill operator, engineer, and other stakeholders. Such further actions may include redirection of the bore, however this will only be considered once all efforts to control the frac-out have failed.

If a release reaches the surface ground outside of entry and exit points, the following actions will be considered to control the release:

- Construction of a small pit or sandbag coffer around the release point, installation of physical barriers such as silt fences or hay bales to trap as much sediment as possible, and placement of a pump hose in the pit to pump the drilling fluid back to the bore site.
 - o Response materials to be kept onsite include, but are not limited to sandbags, silt fences, plastic sheeting, shovels, push brooms, squeegees, pumps and hoses, mud storage tanks, and having a vacuum truck on 24-hour call.
- If a large quantity is present, a vacuum truck may be deployed to clean up and return drilling fluids to the bore site, or if fluids cannot be recycled into the operation, removal to appropriate offsite disposal.
- Reduce drilling fluid pressure.
- Thicken drilling fluid mixture or add a loss control material.
- Cease pumping operations.

In the event of an underwater release, the contractor is required to take appropriate reasonable actions to reduce and control the release, depending on the location and release point of the frac-out. Actions include:

- Monitor inadvertent return for 4 hours to determine if the drilling mud congeals from the bentonite
- Consult with the VMRC regarding the next step, which may include one or more of the following:

- If mud congeals, take no additional actions that would release sediments to the water column
- If mud does not congeal, deploy isolation / containment methods including underwater boom and curtain
- If the frac-out becomes excessively large, a spill response team would be called in to contain and clean up drilling mud in the water. Drilling contractor shall keep phone numbers of a spill response team(s) in the area, and shall coordinate with such teams prior to drilling operations to verify that they will be able to respond in the event of a frac-out.
- If vegetated areas are impacted, they shall be seeded or replanted to restore to pre-existing conditions
- Once stabilized and frac-out mud / slurry removed, post-cleanup conditions shall be documented with photographs and an incident report prepared describing the release, containment efforts, and restoration, and provided to the VMRC no later than 30 days after the incident.
- If a dead fish or turtle is observed resulting from project activities, photos shall be taken and sent to VMRC and MSA, P.C. for identification. Otherwise it is to remain undisturbed.

Any waste materials generated during response and cleanup shall be properly containerized, labeled and removed from the site to a proper disposal location by personnel experienced in the removal transport and disposal of drilling fluids.

5. Communication:

- Upon identification of the frac-out, immediately contact the drill operator and general contractor
- Drilling shall stop immediately and response plan implemented
- The project engineer (Greg Hayes of MSA, P.C. 757-490-9264) and VMRC (Claire Gorman 757-247-2885) shall be immediately contacted and advised of the frac-out.
- Follow the steps in this frac-out contingency plan, work with project engineer and VMRC to determine best response based on the nature of the frac-out
- If a professional spill response team is needed, they shall be contacted to initiate activities. The contractor shall previously have coordinated with several such contractors and have them aware of the operation and times, such that they can respond if needed.
- MSA, P.C. shall provide an incident report to VMRC after review by relevant stakeholders
- The incident shall also be documented in the SWPPP if applicable.

APPENDIX D

Test Hole Reports



TEST HOLE DATA FORM

10988 Richardson Road
Ashland, VA 23005
804-285-4811

T2 PROJECT NO.: VA03500201
TEST HOLE NO.: 1
PROJECT NAME: Hardy ES Water Main Ext.
DATE: 9-8-2021
CREW: B.T. & R.J.

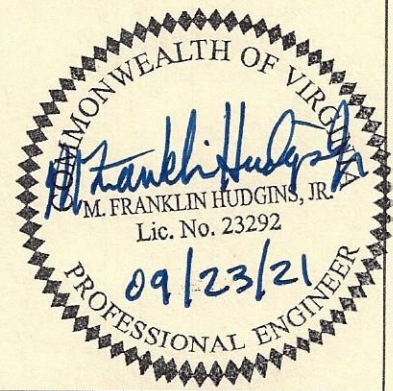
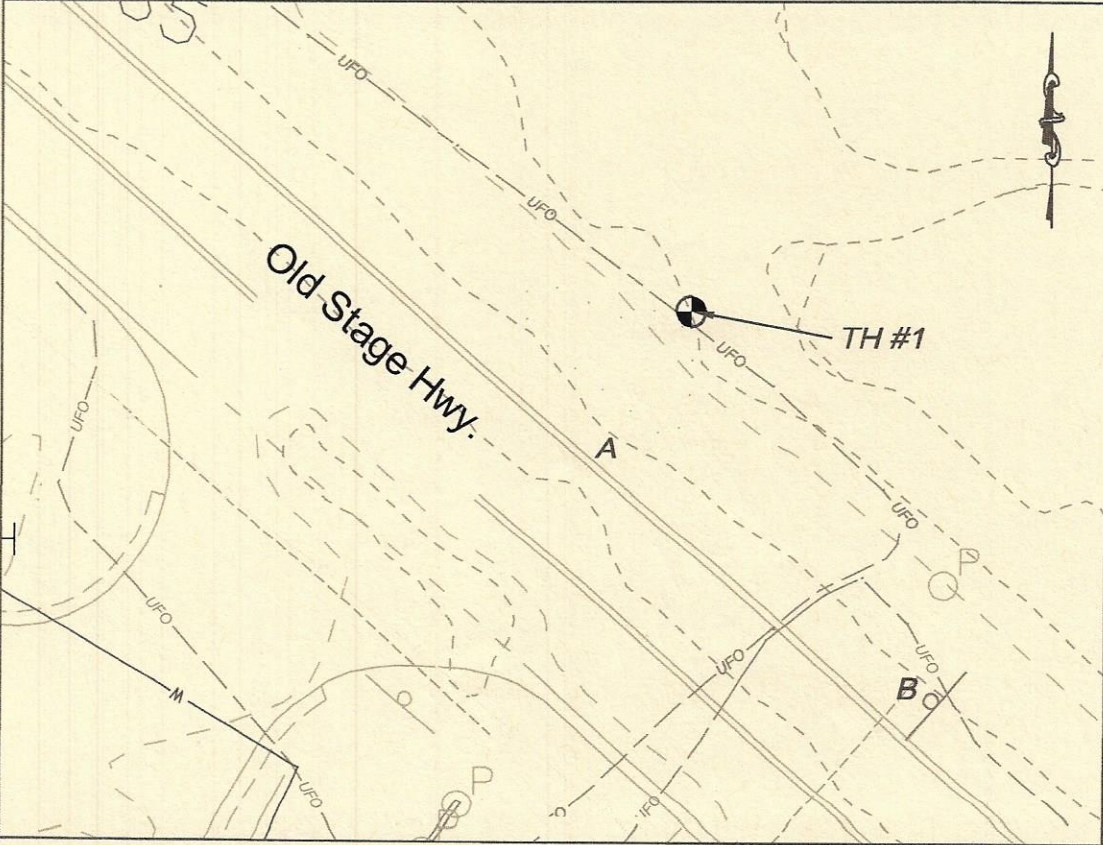
CITY OR COUNTY Surry ROUTE NO. RTE 10
GENERAL LOCATION Old Stage Hwy. (Rt. 10)
SIZE & MATERIAL OF UTILITY 3/4" Direct Buried Fiber
UTILITY OWNER Verizon (OWNERSHIP BASED ON BEST AVAILABLE INFORMATION)

VERTICAL DATUM: Based on survey provided by Client ELEVATION: _____

T2 TEST HOLE REFERENCE POINT INFORMATION
IDENTIFIED BY: _____ PK NAIL: _____ X IN CONCRETE: _____ ROD & CAP: X
TYPE/THICKNESS OF SURFACE : _____ ASPHALT: _____ CONCRETE: _____ SOIL: X
ROD READING: _____ TOP OF UTILITY: 7.95 T2 REF. POINT: 4.83
COORDINATES: NORTHING: 3533280.509 EASTING: 12028491.359

UTILITY DIAMETER BASED ON: FULL <u>X</u> HALF _____ OTHER _____ EXPOSURE OF UTILITY _____	Section view NTS	
		<u>63.24</u> REFERENCE POINT ELEVATION <u>60.12</u> TOP OF UTILITY/STRUCTURE ELEVATION

REMARKS: _____ SWING TIES (NTS)
FROM:(A)Edge Of Pavement = 19.0'
FROM:(B)Sign = 16.0'



TEST HOLE EXCAVATED _____ RT. _____ LT. _____ OF CENTERLINE AT APPROXIMATE STATION: _____

REVISD: _____ PREPARED BY: GMC DATE 9/20/2021
QC BY: M.F.H. DATE 09/22/21



TEST HOLE DATA FORM

10988 Richardson Road
Ashland, VA 23005
804-285-4811

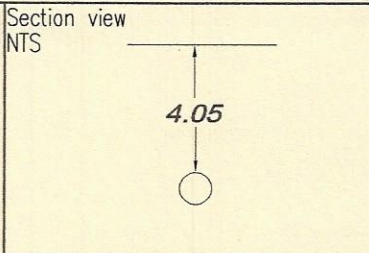
T2 PROJECT NO.: VA03500201
TEST HOLE NO.: 3
PROJECT NAME: Hardy ES Water Main Ext.
DATE: 9-8-2021
CREW: B.T. & R.J.

CITY OR COUNTY Surry ROUTE NO. RTE 10
GENERAL LOCATION Old Stage Hwy. (Rt. 10)
SIZE & MATERIAL OF UTILITY 1" Direct Buried Fiber
UTILITY OWNER Verizon (OWNERSHIP BASED ON BEST AVAILABLE INFORMATION)

VERTICAL DATUM: Based on survey provided by Client ELEVATION: _____

T2 TEST HOLE REFERENCE POINT INFORMATION	IDENTIFIED BY: _____	PK NAIL: _____	X IN CONCRETE: _____	ROD & CAP: <u>X</u>
	TYPE/THICKNESS OF SURFACE : _____	ASPHALT: _____	CONCRETE: _____	SOIL: <u>X</u>
	ROD READING: _____	TOP OF UTILITY: <u>9.24</u>	T2 REF. POINT: <u>5.19</u>	
COORDINATES:		NORTHING: <u>3533241.945</u>	EASTING: <u>12028439.294</u>	

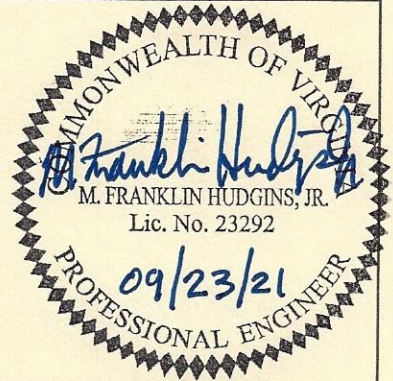
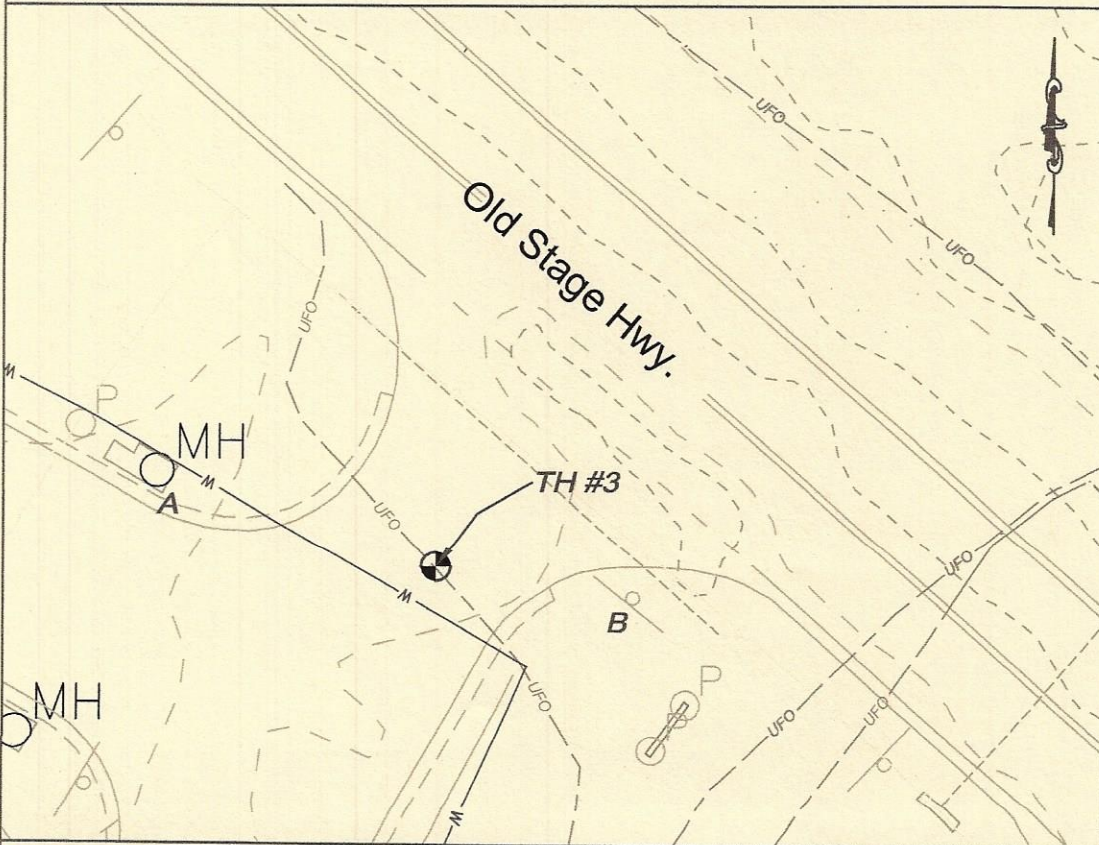
UTILITY DIAMETER BASED ON:
FULL X
HALF _____
OTHER _____
EXPOSURE OF UTILITY _____



65.27 REFERENCE POINT ELEVATION
61.22 TOP OF UTILITY/STRUCTURE ELEVATION

REMARKS:

SWING TIES (NTS)
FROM:(A)Storm Manhole =32.0'
FROM:(B)Sign = 21.6'



TEST HOLE EXCAVATED _____ RT. _____ LT. _____ OF CENTERLINE AT APPROXIMATE STATION: _____

REVISED:

PREPARED BY: GMC DATE 9/20/2021

QC BY: M.F.H. DATE 09/22/21



TEST HOLE DATA FORM

T2 PROJECT NO.: VA03500201
 TEST HOLE NO.: 4
 PROJECT NAME: Hardy ES Water Main Ext.
 DATE: 9-8-2021
 CREW: B.T. & R.J.

10988 Richardson Road
 Ashland, VA 23005
 804-285-4811

CITY OR COUNTY Surry ROUTE NO. RTE 10
 GENERAL LOCATION Old Stage Hwy. (Rt. 10)
 SIZE & MATERIAL OF UTILITY 1/2" Direct Buried Fiber
 UTILITY OWNER Verizon (OWNERSHIP BASED ON BEST AVAILABLE INFORMATION)

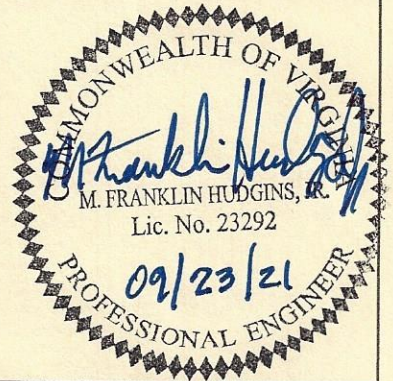
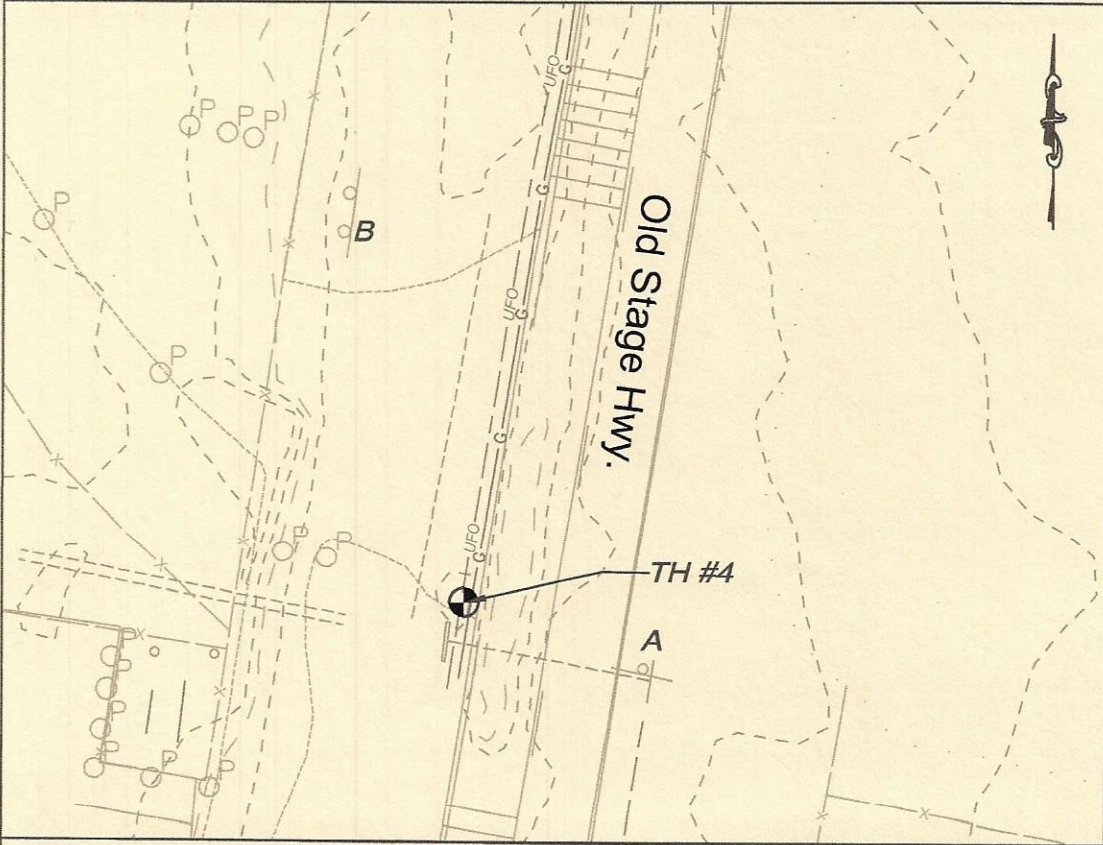
VERTICAL DATUM: Based on survey provided by Client ELEVATION: _____

T2 TEST HOLE REFERENCE POINT INFORMATION	IDENTIFIED BY: _____	PK NAIL: _____	X IN CONCRETE: _____	ROD & CAP: <u>X</u>
	TYPE/THICKNESS OF SURFACE : _____	ASPHALT: _____	CONCRETE: _____	SOIL: <u>X</u>
	ROD READING: _____	TOP OF UTILITY: <u>6.40</u>	T2 REF. POINT: <u>2.99</u>	
COORDINATES:		NORTHING: <u>3527614.299</u>	EASTING: <u>12029516.029</u>	

UTILITY DIAMETER BASED ON: FULL <u>X</u> HALF _____ OTHER _____ EXPOSURE OF UTILITY _____	Section view NTS		<u>41.07</u> REFERENCE POINT ELEVATION
			<u>37.66</u> TOP OF UTILITY/STRUCTURE ELEVATION

REMARKS: _____

SWING TIES (NTS)
 FROM:(A)Sign = 29.8'
 FROM:(B)Sign = 62.0'



TEST HOLE EXCAVATED _____ RT. _____ LT. _____ OF CENTERLINE AT APPROXIMATE STATION: _____

REVISD: _____ PREPARED BY: GMC DATE 9/20/2021
 QC BY: MEH DATE 09/22/21



TEST HOLE DATA FORM

10988 Richardson Road
Ashland, VA 23005
804-285-4811

T2 PROJECT NO.: VA03500201
TEST HOLE NO.: 5
PROJECT NAME: Hardy ES Water Main Ext.
DATE: 9-8-2021
CREW: B.T. & R.J.

CITY OR COUNTY Surry ROUTE NO. RTE 10
GENERAL LOCATION Old Stage Hwy. (Rt. 10)
SIZE & MATERIAL OF UTILITY 6" Metallic Gas
UTILITY OWNER Columbia Gas (OWNERSHIP BASED ON BEST AVAILABLE INFORMATION)

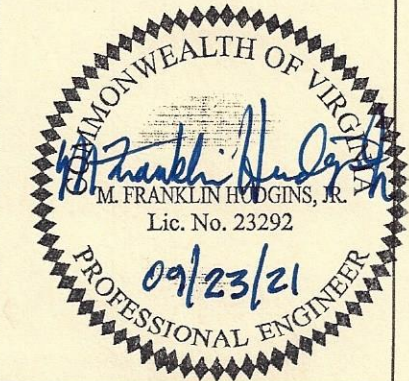
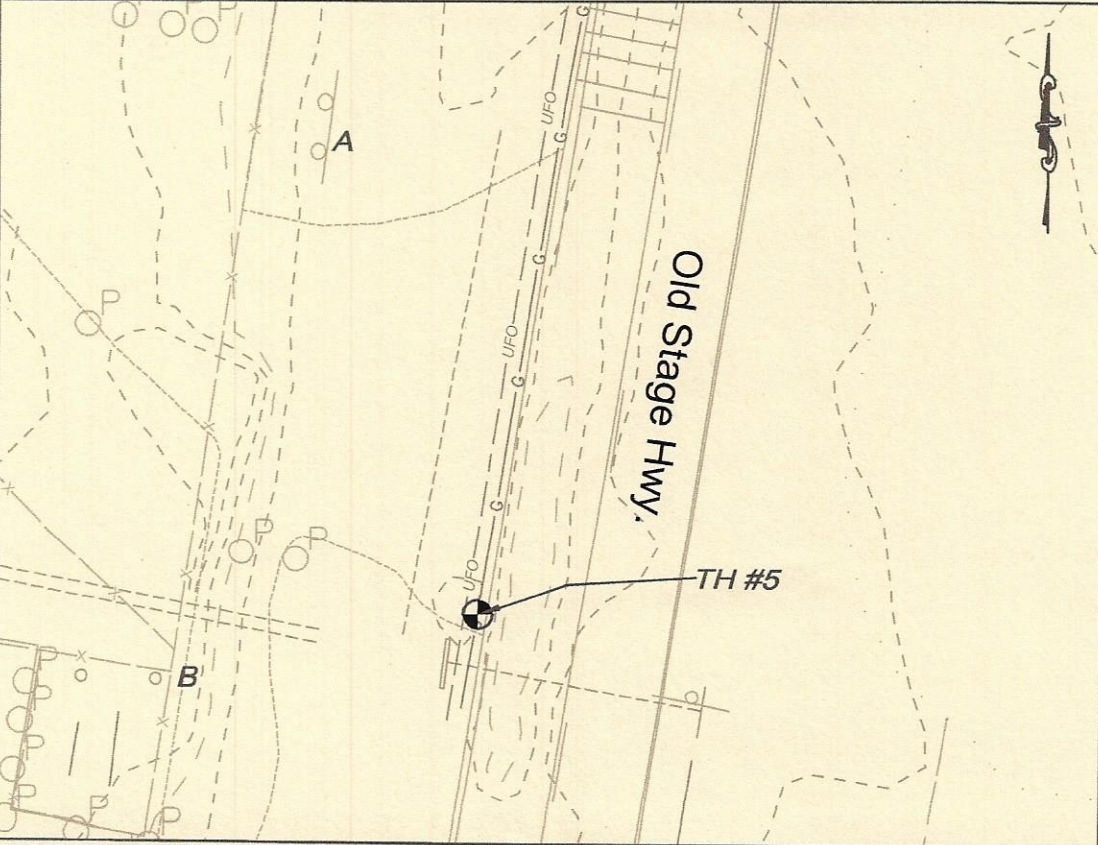
VERTICAL DATUM: Based on survey provided by Client ELEVATION: _____

T2 TEST HOLE REFERENCE POINT INFORMATION
IDENTIFIED BY: _____ PK NAIL: _____ X IN CONCRETE: _____ ROD & CAP: X
TYPE/THICKNESS OF SURFACE : _____ ASPHALT: _____ CONCRETE: _____ SOIL: X
ROD READING: _____ TOP OF UTILITY: 5.31 T2 REF. POINT: 2.89
COORDINATES: NORTHING: 3527614.126 EASTING: 12029517.414

UTILITY DIAMETER BASED ON:
FULL X
HALF _____
OTHER _____
EXPOSURE OF UTILITY _____
Section view NTS

41.21 REFERENCE POINT ELEVATION
38.79 TOP OF UTILITY/STRUCTURE ELEVATION

REMARKS: _____
SWING TIES (NTS)
FROM:(A)Sign = 72.4'
FROM:(B)Fence Corner = 56.5'



TEST HOLE EXCAVATED _____ RT. _____ LT. OF CENTERLINE AT APPROXIMATE STATION: _____

REVISED: _____ PREPARED BY: GMC DATE 9/21/2021
QC BY: M.F.H. DATE 09/22/21



TEST HOLE DATA FORM

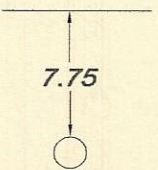
10988 Richardson Road
Ashland, VA 23005
804-285-4811

T2 PROJECT NO.: VA03500201
TEST HOLE NO.: 6
PROJECT NAME: Hardy ES Water Main Ext.
DATE: 9-9-2021
CREW: B.T. & R.J.

CITY OR COUNTY Surry ROUTE NO. RTE 10
GENERAL LOCATION Old Stage Hwy. (Rt.10)
SIZE & MATERIAL OF UTILITY UnKnown Size Fiber
UTILITY OWNER Verizon (OWNERSHIP BASED ON BEST AVAILABLE INFORMATION)

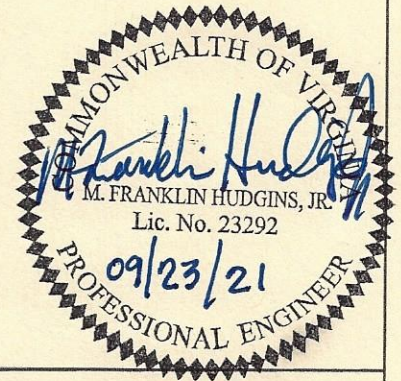
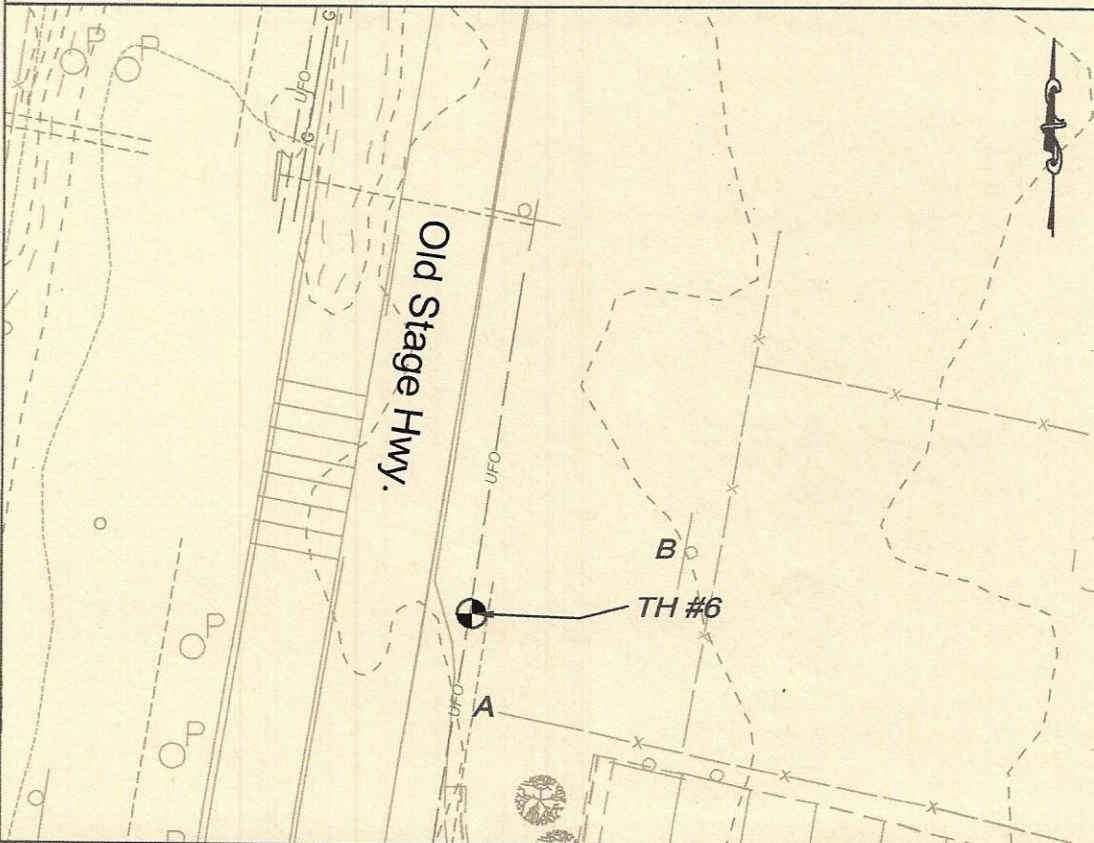
VERTICAL DATUM: Based on survey provided by Client ELEVATION: _____

T2 TEST HOLE REFERENCE POINT INFORMATION	IDENTIFIED BY: _____	PK NAIL: _____	X IN CONCRETE: _____	ROD & CAP: <u>X</u>
	TYPE/THICKNESS OF SURFACE : _____	ASPHALT: _____	CONCRETE: _____	SOIL: <u>X</u>
	ROD READING: _____	TOP OF UTILITY: <u>7.75</u>	T2 REF. POINT: <u>0.00</u>	
COORDINATES:		NORTHING: <u>3527554.010</u>	EASTING: <u>12029537.814</u>	

UTILITY DIAMETER BASED ON:	Section view NTS	<u>41.55</u> REFERENCE POINT ELEVATION
FULL <u>X</u>		<u>33.80</u> TOP OF UTILITY/STRUCTURE ELEVATION
HALF _____		
OTHER _____		
EXPOSURE OF UTILITY		

REMARKS: *Unable to determine size and material due to excessive groundwater and cave-ins.*

SWING TIES (NTS)
FROM:(A)Fence = 13.0'
FROM:(B)Sign = 28.4'



TEST HOLE EXCAVATED _____ RT. _____ LT. OF CENTERLINE AT APPROXIMATE STATION: _____

REVISD: _____ PREPARED BY: GMC DATE 9/21/2021
QC BY: msgh DATE 09/22/21