

**THE SHELBY COUNTY COMMISSION
NORTH-SOUTH CONNECTOR
PHASE 2**

ADDENDUM NO. 2

TO: ALL PROSPECTIVE CONTRACTORS AND SUPPLIERS

The changes, modifications, clarifications and/or additions covered by and set forth in this **Addendum No. 2** shall become part and be incorporated in the Specifications, Contract Documents, Bid Documents, and Plans for the above referenced project. The Contractor shall include this Addendum as well as any previous and subsequent addenda that may be issued with his proposal Bid Documents as indicating his receipt and acceptance of its terms, requirements, and clarifications.

The Contractor shall also acknowledge receipt of this addendum on page **BD-16** of the Specifications-Contractual Documents.

GENERAL INFORMATION: The CSX Railroad Water Main Crossing Subsurface Exploration Report is being provided for reference and is not part of the project contract documents.

SPECIFICATIONS:

1. Table of Contents Page 2 of 2

Revisions: Replace Horizontal Directional Drilling (HDD) with Boring and Jacking Page S-52 and update Fencing to begin on S-55.

2. Re: Page BD-11, Items 12 through 14a

Revision: Replace Pipe Line Crossing section with new Gas, Railroad and Road Crossings section. Additional text required changes to the pagination. Revised pages BD-11 - BD14 are included.

3. Re: Page BD-16 Item #12

Revision: Replace Pipe Line Crossing with Gas Crossing #1

4. Re: Page BD-17 Item #13

Revision: Replace Pipe Line Crossing #2 with Gas Crossing #2

5. Re: Page BD-17 Item #14

Revision: Replace Pipe Line Crossing #3 with Railroad Crossing #1

6. Re: Page BD-17, Add New Item #14A

Revision: Add New Item #14A, Road Crossing #1

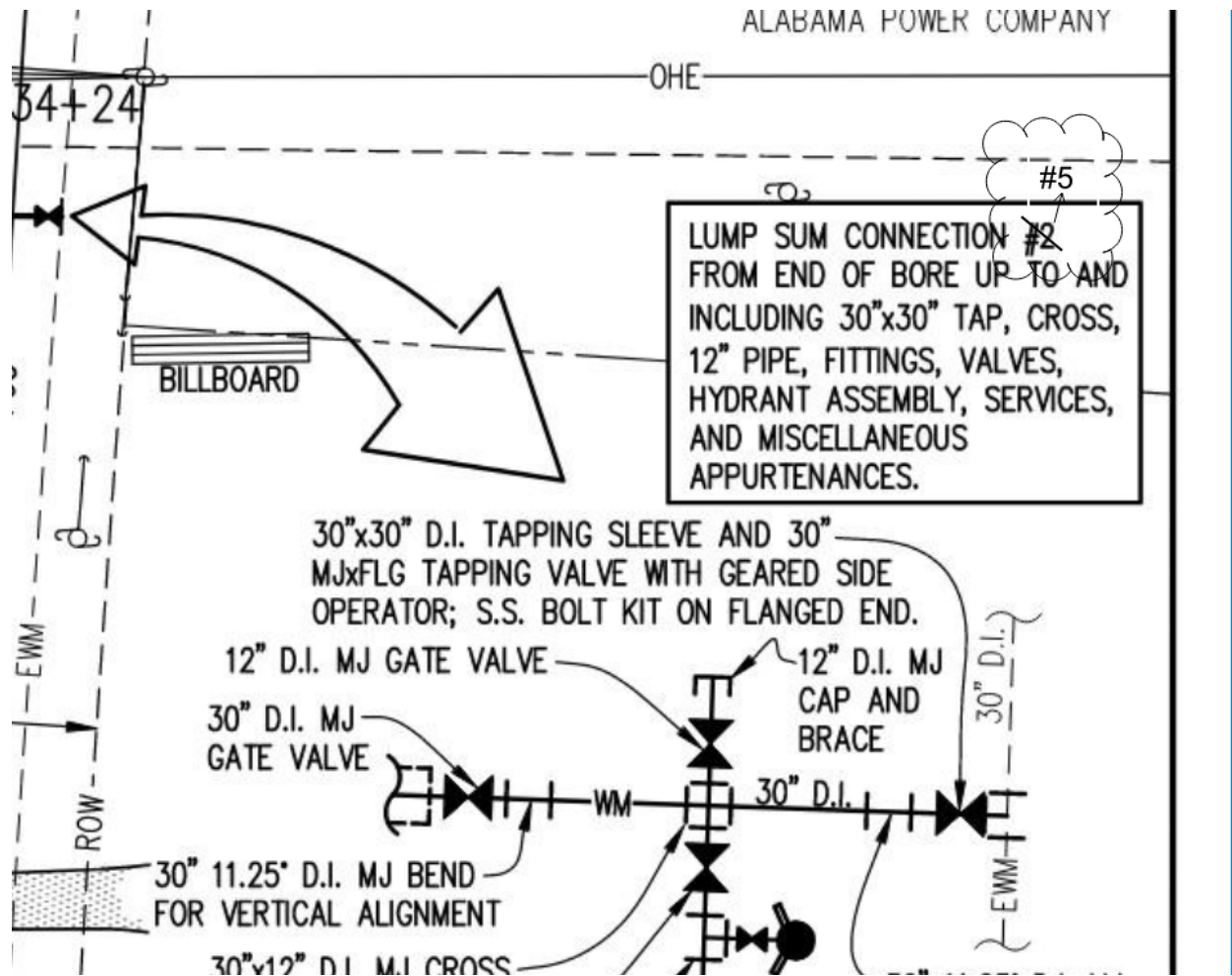
7. Re: Page S-52 Horizontal Directional Drilling

Revision: Replace Section 7 in its entirety with New Section 7 Boring and Jacking (S-52 – S54). Reduced text impacted the pagination for Section 8 Fencing; Section 8 now begins on S-55.

DRAWINGS:

1. Re: Sheet 7 Plan AND Profile

Revision: Lump Sum Connection #2 should read Lump Sum Connection #5 – see snippet below.



SPECIAL PROVISIONS (Continued)

Consent of Surety, Release of Liens, and Payment of Debts and Claims	SP-15
Contractor's Affidavit of Release of Liens, and Payment of Debts and Claims (Form)	SP-16
Consent of Surety to Final Payment (Form)	SP-17
Railroad Crossing Permit & Hwy 280 Crossing Permit	SP-18

GENERAL SPECIFICATIONS

Definition of Terms	G-1
Proposal Requirements and Conditions	G-4
Award and Execution of Contract	G-8
Scope of Work	G-10
Control of Work	G-12
Control of Materials	G-24
Legal Relations and Responsibilities to Public	G-27
Prosecution and Progress	G-38
Project Completion	G-46
Warranty and Guarantees	G-49

STANDARD SPECIFICATIONS

Sitework, Excavation, and Earthwork	S-1
Concrete	S-13
Pipe Materials	S-25
Installation of Pressure Pipe	S-38
Grassing	S-44
Pavement, Gravel, and Concrete Surfaces	S-48
Boring and Jacking	S-52
Fencing	S-55

Exhibit A – CSX Railroad Crossing Permit

Exhibit B – Hwy 280 Crossing Permit

ITEM 10 - 8" PVC DRAIN FOR AIR RELIEF

The Contract Unit Price Bid per linear foot shall be payment in full for the furnishing of all labor and materials to install 8" PVC drain for Type "C" Air Relief on grade and as shown on the drawings. This includes all components including headwall and connection to manhole.

ITEM 11 - POLYETHYLENE ENCASEMENT FOR DUCTILE IRON PIPE, ALL SIZES

The Contract Unit Price Bid per lineal foot shall be payment in full for the furnishing of all labor and materials to encase ductile iron pipe where required by drawings or Engineer in accordance with manufacturer's instructions. Payment shall be based on length of pipe encased unless otherwise paid within a bore or crossing.

ITEMS 12 THROUGH 14A – GAS, RAILROAD, AND ROAD CROSSINGS

The Contract Lump Sum Price Bid per each shall be payment in full for the furnishing of all labor, materials and equipment, pipe fittings, adapters, steel casing pipe or tunnel liner; spacers and ductile iron restrained joint pipe within the limits of the crossing as indicated on the Plans; lights; flagman; traffic control; pedestrian control; and any and all incidentals necessary to complete the crossing satisfactorily and acceptable to the Alabama Department of Transportation (ADOT), the Railroad Company, the Utility Company, County, City, or other agencies having jurisdiction over the crossing, the Engineer, and the Owner. Pipe restraint devices required at the ends of roadway bore casings and any associated rodding requirements shall be included in this item. All crossings under this Contract shall be made by open cut or boring or tunneling, as shown on the Plans. No wet bores will be permitted. The Owner will secure a boring permit for highway bores. Permits required for tunneling and/or open cutting shall be obtained by the Contractor. The Contractor, at his expense, shall furnish all bonds and insurance as required by the agency having jurisdiction over the crossing. A release from the agency having authority over each crossing shall be furnished to the Engineer by the Contractor before acceptance is made. The price shall also include, but not be limited to: anchoring pipe, casing spacers; sealing the ends of the casing; piling, shoring, dewatering, etc. to protect the work, adjacent structures, personnel, etc., when conditions warrant such protection. The Lump Sum price shall be payment in full for the completion of the crossing. No extra payment shall be made for rock encountered as part of the crossing. It is the Contractors responsibility to survey the crossings shown on the Plans to determine the type of construction method required (bore or tunnel) and casing type to complete the crossing at the locations shown on the Plans. No extra payment will be made for altering the method of crossing from boring to tunneling during construction or changing casing sizes or types. Casing sizes indicated on the drawings are to be considered as a minimum. This item shall also include and require the Contractor to obtain permits to cross Colonial and Plantation Pipeline Easements, as well as all requirements of permits, Colonial, and Plantation.

ITEMS 15 THROUGH 19 – CONNECTIONS

The Contract Lump Sum Price Bid shall be payment in full for the furnishing of all labor, machinery, equipment, materials, and all incidentals necessary and required to successfully complete the connections as indicated on the Plans and necessary for a complete installation.

This Lump Sum Bid Price shall include, but not be limited to: For “Hot Tap” connections - tapping sleeve/saddle, tapping valves, concrete bracing, valve boxes, valve pad and nameplates or concrete donut (whichever is required by detail), labor and materials for “Hot” tapping existing line, testing, disinfecting, all piping and appurtenances necessary and required that do not have a unit price established in this Contract; For “cut-in” connections on connections within new pipe - all piping, valves, and appurtenances necessary and required that do not have a unit price established in this Contract; and for all types of connections - thrust collars, temporary piping and valves, temporary plugs, complete coordination with Owner, Engineer, and any Authority with jurisdiction over the work areas. Valves, fire hydrant assemblies and authorized fittings shall be paid for under different pay items if there is a unit price established in this basis of payment for the item. If no unit price is established herein then it shall be included in this item.

ITEM 20 - CRUSHED STONE, EXTRA

The Contract Unit Price per cubic yard shall be payment in full for the furnishing of all labor, materials, equipment, and all incidentals necessary to complete any required crushed stone placement and compaction to 95% standard proctor density which is not outlined, specified, or shown in the Plans, Specifications, and Contract Documents but is identified by Owner or Engineer after the start of construction. Crush stone placement as required on the plans or specifications will be included by the Contractor in other items. Payment is based on stone in place in its final position.

ITEM 21 – RIP RAP, EXTRA

The Contract Unit Price per ton in place shall be payment in full for furnishing of all labor, materials, equipment and all incidentals necessary to complete the installation of Class 2 rip-rap as directed by the Engineer during construction. This item does not include rip rap shown or inferred from the drawings or included as part of the contractor’s BMP installation and maintenance. The cost of which shall be included in other items. Rip-rap placement paid under this item shall include only extra rip-rap placed during construction at the direction of the Engineer. This shall include but not be limited to supplying and placing the rip-rap and all necessary excavation. Tonnage shall be measured from certified invoices from the material supplier.

ITEM 22 - CLASS “B” CONCRETE, EXTRA

The Contract Unit Price per cubic yard shall be payment in full for the furnishing of all labor, materials, equipment, and all incidentals necessary to complete any required Class “B” Concrete placement which is not outlined, specified, or shown in the Plans, Specifications, and Contract Documents but is identified by Owner or Engineer after the start of construction. Class “B” Concrete placement as required on the plans or specifications will be included by the Contractor in other items.

ITEM 23 – ASPHALT PAVEMENT REPLACEMENT FOR OPEN CUT

The Contract Unit Price Bid per square yard shall be payment in full for the furnishing of all labor, machinery, equipment, materials, and all incidentals necessary and required for preparing and replacing pavement removed from roads, driveways, and other paved areas. These items shall include all incidentals necessary and required to complete this work. Measurement for asphalt and concrete pavement replacement shall be per square yard as measured by the Engineer in the field. All paving widths shall be coordinated and approved by the Engineer before saw cutting. Anything beyond the approved widths will be the responsibility of the Contractor with no pay allowed. No extra payment will be made for pavement replacement required for reasons other than open trench pipe installation. Curb, gutter, and sidewalk replacement shall be considered incidental and included under pipe prices. Temporary patches for surfaces are not included in this item.

ITEM 24 – EROSION AND SEDIMENT CONTROL AND BEST MANAGEMENT PRACTICES

The Contract Lump Sum Price Bid shall be payment in full to furnish all labor, equipment, materials, and all incidentals necessary to complete the implementation of all erosion and sediment control and best management practices (BMP's) measures in complete accordance with the Specifications, as shown on the Drawings, Contract Documents, and requirements of NPDES permit. This item shall include procuring an NPDES permit for the site and all BMP's and erosion control measures required, including but not limited to, silt fencing, hay bale check dams, inlet and outlet protection, temporary rip rap check dams and drainage ditches, etc. and other items required for a complete installation required to comply with the NPDES permit for the site. This bid item shall also include preparing the NPDES permit documents, submitting documents, permit fees (if applicable), etc. for applying and receiving an NPDES permit for this work. Payment and measurement shall be 25 percent of lump sum price at the beginning of work, and the remainder paid as a percentage matching that of the percentage of BMP's installed for the project per the Contractor's BMP plan.

ITEM 25 - RIGHT-OF-WAY AND/OR EASEMENT CLEARING AND GRUBBING

The Contract Unit Price per Lump Sum installed shall be payment in full for all labor, materials, equipment, and all incidentals necessary to complete the required clearing and grubbing of the entire right-of-way and/or easement in accordance with the plans and specifications.

ITEM 26 - RIGHT-OF-WAY AND/OR EASEMENT RESTORATION AND GRASSING

The Contract Unit Price per linear foot of pipe installed shall be payment in full for all labor, materials, equipment, and all incidentals necessary to complete the required restoration and maintenance of the right-of-way and easement during and at the completion of the project, and grassing all the disturbed areas of the project in accordance with the plans and specifications. Payment will be made when all restoration and grassing is complete.

ITEM 27 - CONCRETE MARKERS

The Contract Unit Price Bid per each shall be payment in full for the furnishing of all labor, equipment, materials and incidentals to install concrete location markers per the typical detail on the water main where indicated on the drawings, specified or required by the Engineer during construction.

ITEM 28 - ALLOWANCE FOR MOBILIZATION

The Contract Lump Sum Price shall be the cost allowed by the Owner for mobilization of Contractor's forces. The cost includes portions or all the Contractor's cost for bonds, insurance, set up of Contractor's forces and all field offices, acceptance by Engineer and Owner of schedule of payment values, and equipment and personnel movement. The price established by the Owner is an allowance for the Contractor and will be paid upon completion of mobilization.

ITEM 29 – OWNER DIRECTED ALLOWANCE FOR EXTRA WORK

This Contract Allowance is an allowance established by the Owner for Extra Work directed by the Owner during construction. Extra Work shall not include work shown or inferred from the Plans and Specifications, the cost of which shall be included in other pay items. For any element of Extra Work paid under this item, the Contractor shall submit a cost proposal to the Owner for the Extra Work. When approved by the Owner, the Contractor shall perform the work in accordance with the approved cost proposal. Cost proposals for Extra Work included under this item shall only include direct labor, equipment and materials. Overhead, extended overhead, profit, etc. shall not be paid under this item and shall be included as part of the base bid cost for other items.

ITEM 30 - START-UP AND USE OF PROJECT COMPONENTS

The Contract Lump Sum Price shall be paid for furnishing the Owner an operable and completed Project which has successfully passed all tests as specified, been approved by all authorities for use by the Owner as intended, and is put in service. This pay item includes, but is not limited to: equipment/facility testing; final adjustment; coordination with controls, instruments, telemetry, and other equipment; startup; demonstration that the equipment complies with all specifications and other related services as required to demonstrate that the project is ready for operation by the Owner. The price in this item represents an allowance that is established by the Owner and used by all contractors bidding the project. Any costs the Contractor may have above this allowance shall be included in other items. Partial payment is not allowed on this item. The cost of water required for filling of new mains, flushing, and testing shall not be the responsibility of the Contractor. Contractor shall assist Owner as required in determining amount of system water used for construction of this work.

BIDDER acknowledges receipt of the following ADDENDUM:

BIDDER agrees to perform all the work described in the Contract Documents for the following unit prices or lump sum:

Note: The Owner has Sales and Use Tax Exemption status under Alabama law. BIDS shall include only those taxes which are applicable based on this tax exemption status. See Special Provisions for "Application For Tax Certificate of Exemption".

ITEMS OF WORK
BID SCHEDULE

BASE BID

ITEM	QUANT	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
1	3,600	Linear Foot	36" D.I. Slip Joint Pipe; CL 250	\$ _____	\$ _____
2	560	Linear Foot	36" D.I. Restrained Joint Pipe; CL 250	\$ _____	\$ _____
3	120	Linear Foot	30" D.I. Slip Joint Pipe; CL 250	\$ _____	\$ _____
4	60	Linear Foot	30" D.I. Restrained Joint Pipe; CL 250	\$ _____	\$ _____
5	2	Each	30" M.J. Butterfly Valves and Boxes; CL 250	\$ _____	\$ _____
6	3.5	Tons	Ductile Iron Fittings, All Sizes	\$ _____	\$ _____
7	4	Each	36" Field Restraint Assembly, Extra	\$ _____	\$ _____
8	3	Each	Type "B" Air Relief Assembly	\$ _____	\$ _____
9	1	Each	Type "C" Air Relief Assembly	\$ _____	\$ _____
10	100	Linear Foot	8" PVC Drain for Type "C" Air Relief	\$ _____	\$ _____
11	800	Linear Foot	Polyethylene Encasement for D.I. Pipe	\$ _____	\$ _____
12	1	Lump Sum	Gas Crossing #1	\$ _____	\$ _____

ITEM	QUANT	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
13	1	Lump Sum	Gas Crossing #2	\$ _____	\$ _____
14	1	Lump Sum	Railroad Crossing #1	\$ _____	\$ _____
14A	1	Lump Sum	Road Crossing #1	\$ _____	\$ _____
15	1	Lump Sum	Connection #1 - 24" Branch Assembly	\$ _____	\$ _____
16	1	Lump Sum	Connection #2 – Chelsea Park Road Connection	\$ _____	\$ _____
17	1	Lump Sum	Connection #3 - 8" Branch Assembly	\$ _____	\$ _____
18	1	Lump Sum	Connection #4 - 16" Branch Assembly	\$ _____	\$ _____
19	1	Lump Sum	Connection #5 – Hwy 280 Connection	\$ _____	\$ _____
20	100	Cubic Yard	Crushed Stone, Extra	\$ _____	\$ _____
21	50	Ton	Rip-Rap, Extra	\$ _____	\$ _____
22	50	Cubic Yard	Class "B" Concrete, Extra	\$ _____	\$ _____
23	115	Square Yard	Asphalt Replacement for Open Cut	\$ _____	\$ _____
24	1	Lump Sum	Erosion and Sediment Control - Best Management Practices	\$ _____	\$ _____
25	1	Lump Sum	ROW and/or Easement Clearing and Grubbing	\$ _____	\$ _____
26	3,200	Linear Foot	ROW and/or Easement Restoration and Grassing	\$ _____	\$ _____
27	7	Each	Concrete Markers	\$ _____	\$ _____
28	1	Lump Sum	Mobilization	\$ 50,000.00	\$ 50,000.00
29	1	Lump Sum	Owner Directed Allowance	\$ 100,000.00	\$ 100,000.00
30	1	Lump Sum	Startup, Testing, Clean-up, and Use of Project	\$ 50,000.00	\$ 50,000.00

TOTAL OF BASE BID \$ _____

**STANDARD SPECIFICATION
FOR
BORING AND JACKING**

SECTION 7

1.0 GENERAL

This Item shall consist of the crossing of state, federal, and county highways, gas pipelines or under railroads with pipe. Crossings shall be made by boring and installing pipe in welded steel casing. The casing pipe shall be jacked in place during boring. "Jetting" or "Mud Boring" will not be permitted. The Owner will secure the permit to make the crossing and furnish the required bond. Crossing of streets and roads not listed to be bored in the Bid Items shall be included in the Contract Unit Price Bid for pipe. The installation of pipeline casings under the railroad or highway as shown on the Drawings shall be in accordance with all the requirements of the railway company or the Highway Department including, but by no means limited to, bonds, cash deposits, insurance, and safety requirements, etc. The Contractor shall furnish all labor, equipment and materials required to protect the public. The Contractor shall be solely responsible for satisfying all requirements and costs of highway, railroad, or utility crossing permits or agreements regardless of whether such requirements are imposed on the Owner or are imposed directly on the Contractor. This shall include, but by no means be limited to, such requirements as bonds, insurance, indemnification, and flagmen, etc.

2.0 OPEN CUTS

Where open cutting is required, the backfill will be made with concrete or crushed stone, wet and tamped to acceptable density. The cost shall be included in the Contract Unit Price for the crossing.

3.0 RELEASE

The Contractor shall secure a release from the agency controlling the crossing before acceptance.

4.0 CASING FOR CROSSINGS

All casing used for crossing shall be steel, continuous circumferential welded joint, at construction site, and large enough to permit the installation and/or removal of the carrier pipe. No used or mid-weld casing from factory or supplier will be allowable. Casing shall meet A139B and ASTM 252 Grade 2 with the exception of thickness which must meet or exceed the thickness shown herein or the plans whichever is greatest. No thickness tolerance or allowance less than what is specified or shown in the plans will be accepted. Whichever specification noted above is more restrictive, that specification shall apply. The minimum diameter for casing shall be as follows:

<u>PIPE SIZE</u>	<u>O.D. BELL RESTRAINED JOINT</u>	<u>MINIMUM CASING O.D. *</u>	<u>THICKNESS</u>
3"	6.08"	10.50"	.25"
4"	7.88"	12.50"	.25"
6"	9.75"	14"	.25"
8"	11.88"	16"	.25"
10"	14.13"	18"	.25"
12"	16.63"	20"	.375"
14"	19.02"	24"	.375"
16"	21.14"	26"	.375"
18"	23.36"	28"	.375"
20"	25.48"	30"	.375"
24"	30.35"	36"	.500"
30"	36.69"	42"	.500"
36"	43.19"	49.25"	.625"
42"	48.64"	55.25"	.625"

- * Where the drawings or crossing permit call for a larger casing or thicker wall, it shall be provided. All casing's inside diameter will be approximately 4" larger than the outside diameter of the pipe bell used with a 1/2" tolerance allowed (See Chart above). If one pipe manufacturer's bell does not allow this clearance, then an approved substitute pipe manufacturer with an appropriate outside diameter bell will be used. If the minimum size casing as shown on the drawings provides additional space based on the "Bell O.D of Restrained Joint" greater than that shown in the table above, the calculated clearance of the specified casing and bell outside diameter in the table will be maintained.

5.0 SUBSURFACE EXPLORATION

The Contractor will be required to make exploration holes to determine elevation of rock. The cost shall be included in the Bid Price.

6.0 CASING INSTALLATION

If required in the Plans, a two-inch auger pilot hole shall first be attempted to determine if rock will prevent the installation of the casing. If the pilot hole is successfully made, the casing shall be installed and the leading section of conduit shall be equipped with a jacking head securely anchored to prevent any wobble or variation in alignment during the jacking operation. After jacking is completed, the Contractor shall drill holes in the casing at the locations of ground loss and elsewhere where voids are suspected and shall force grout in to fill voids to refusal at pressures determined by the Engineer but not to exceed 50 psi.

Should appreciable loss of ground occur during the jacking operation, the voids shall be backpacked promptly to the extent practicable with soil cement consisting of a slightly moistened mixture of 1 part cement to 5 parts granular material. Where the soil is not suitable for this purpose, the Contractor shall import suitable material at his expense. The soil cement shall be thoroughly mixed and rammed into place as soon as possible after the loss of ground.

Extreme care shall be exercised by the Contractor to maintain line and grade during jacking operations and the Contractor may be required to modify the manner in which he is conducting his jacking operation to correct any deviation when deemed necessary by the Engineer. The Contractor shall be fully responsible for the structural sufficiency of the casing and the placement thereof. The details shown on the Plans are to be considered minimum only.

7.0 PIPE INSTALLATION

The pipe shall be installed in the casing on spacers of sufficient thickness to support and align the pipe to meet the grade specified. Casing spacers shall be installed at the manufacturer's recommended spacing to prevent flotation and shafting. Additional blocking shall be secured to the pipe with stainless steel bands at all pipe joints and intermediate supports as required, but this additional blocking shall not take the place of any spacers.

If the alignment of the casing is such that the pipe grade cannot be met, the grade of the casing shall be adjusted. If realignment is not deemed feasible by the Engineer, another casing meeting the required grade shall be installed. The abandoned casing shall be filled with sand and the ends plugged. Realignment or replacement work shall in no way result in extra cost to the Owner.

All pipe installed in a casing shall be braced by the casing spacers to prevent shifting or flotation during backfilling operations and normal operation. Brick and mortar end seals shall be used to completely seal the ends of the casing after the pipe installation is complete.

8.0 CASING SPACERS

Casing spacers shall be bolt-on style, centered and restrained design (unless indicated otherwise on the Drawings), and include a two piece shell made from T -304 stainless steel of a minimum 14 gauge thickness. Each shell section shall have bolt flanges formed with ribs for added strength. Each connecting flange shall have a minimum of three 5/16 inch T -304 bolts. The shell shall be lined with a ribbed PVC extrusion with a retaining section that overlaps the edge of the shell and prevents slippage. Bearing surfaces (runners) made from UHMW polymer with a static coefficient of friction of .11-.13 shall be attached to support structures (risers) at appropriate positions to properly support the carrier within the casing and to ease installation. The runners shall be attached mechanically by T -304 threaded fasteners that are inserted through the punched riser section and TIG welded for strength. Risers shall be made of T -304 stainless steel of a minimum 14 gauge. All risers over two inches in height shall be reinforced. Risers shall be MIG welded to the shell. All metal surfaces shall be full chemically passivated. Spacers shall be designed and placed to so as to provide restraint for the carrier and to sufficiently support the carrier within two feet of the ends of the casing pipe. Spacer widths shall not be less than 8 inches and spacers shall not exceed 6' -0" unless recommended by the manufacturer and approved by the Engineer. Contractor shall submit the casing spacer design and the proposed spacer layout along the carrier for approval by the Engineer. Casing spacers shall be Model SSI as manufactured by Advance Products and Systems, Inc., Model CCS as manufactured by Cascade Waterworks Manufacturing Company, or equal.

**STANDARD SPECIFICATION
FOR
FENCING**

SECTION 8

1.0 TYPE "A"

Fencing shall be similar and equal to that manufactured by Anchor Post Fence, Division of Anchor Post Products, Inc. or Cyclone Fence Company, Division of U.S. Steel Corporation. The height will be 7 feet, including 3 strands of barbed wire. Wire fabric will be 9 gauge with 6 gauge finish, 2-inch mesh. Line post shall be a maximum 10 foot centers and be 2-1/4 inch beam weighing 4.1 pounds per foot or 2-1/2 inch O.D. pipe weighing 3.65 pounds per foot. Terminal posts shall be 2-1/2 inch square and weigh 5.79 pounds per foot or 3 inch O.D. pipe weighing 5.79 pounds per foot. Top rails shall be 1-5/8 inch weighing 2.28 pounds per foot. Post shall be set in concrete. Drive anchors may be used. Tension wires shall be provided. Entrance gates, unless otherwise indicated, shall be double 6 foot wide. Single entrance gates shall be 4 foot wide. When gates greater than double 6 foot up to double 12 foot wide are specified, terminal posts of 4 inch O.D. pipe weighing 9.11 pounds per foot with braced gates and trusses to be used. Gates shall have latching devices, padlocks (to match existing locks), plunger rod, and recess barrel for rod. Double gates shall have retaining devices to hold gates in fully open position. All gates will have chain and handhole. All materials shall be hot-dipped galvanized after fabrication. Where indicated on the drawings, all fencing and components shall be PVC coated, color to be selected by Owner from manufacturers standard colors. Chain link fabric shall conform to ASTM F-668, Class 2a. Fabric shall have a minimum coating thickness of 0.338 inches. All posts, rails, and fittings shall have a minimum 10 mil coating.

Where indicated on the drawings, fencing (including gates, etc.) shall be furnished with plastic vertical tubing (PVT slats) with colors selected by Owner.

Where indicated on the drawings, fencing shall be furnished with bottom bars (bottom rails) spanning between all posts. The bottom rails shall match the top rail. Install in a manner to provide maximum security.

2.0 TYPE "B"

Fencing will be galvanized hog wire, 47 inches high with three strands of barbed wire one foot above the hog wire. Barbed wire will be double twisted, 4 point, and 12-1/2 gauge. The fencing will be vertical wire of 10 gauge spaced at 6 inches and horizontal wire of 12-1/2 gauge spaced at 3 inches at the bottom and 8 inches at the top. Line post will be buried 30 inches at 10 foot centers and crossed braced at not more than 200 foot intervals. Corner and gate post shall be braced and be buried 36 inches in 12 inch diameter concrete. Double gates shall be welded of 1-3/8 inch O.D. tubular galvanized steel pipe with central support and a diagonal tension rod and turnbuckle. Double gates will be fitted with galvanized hinges and foot latches with lock clasp. Signs not to exceed 200 foot intervals and on each gate shall be aluminum enameled reading "DANGER - NO TRESPASSING" for wastewater lagoons. Materials to be used are specified below and on the Plans.

<u>POST</u>	<u>WOOD</u>	<u>METAL</u>
Line Post	4" diameter SYP treated with creosote oil at 16 pounds	"T" section steel, hot galvanized 1.33 pounds per foot
Braces	same as line post	2" steel, hot galvanized
Corner and Gate	6" diameter SYP treated with creosote oil at 16 pounds	2" angle or 2" i.d. pipe, hot galvanized

3.0 GENERAL

All signs attached to fences and gates will be attached with stainless steel wire or bolts.

All fencing, gates, and appurtenances shall be installed in a manner that fully protects the security of the site.

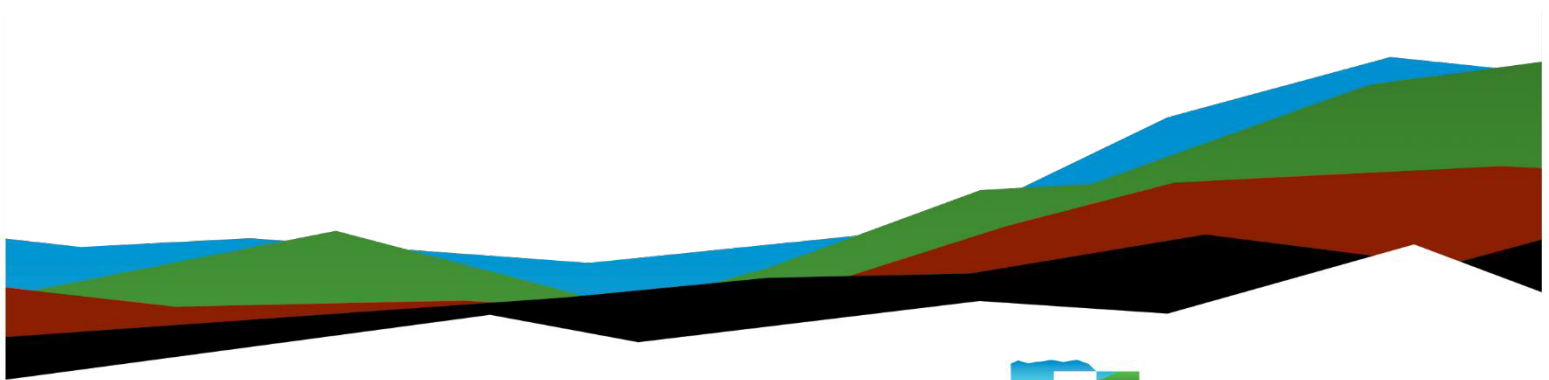
Where fencing work includes modifications or connections to existing fencing, maintain the security provided by the existing fencing at all times throughout construction.

CSX Railroad Water Main Crossing Subsurface Exploration Report

May 28, 2025 | Terracon Project No. E1255027

Prepared for:

Shelby County Water Services
10927 US Hwy 280
Sterrett, AL 35147



Nationwide
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- Facilities
- Environmental
- Geotechnical
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2147 Riverchase Office Road
Birmingham, Alabama 35244
P (205)942-1289
Terracon.com

May 28, 2025

Shelby County Water Services
10927 US Hwy 280
Sterrett, AL 35147

Attn: Mr. Phillip Crunk, P.E.
P: (205) 670-6545
E: pcrunk@shelbyal.com

Re: Subsurface Exploration Report
CSX Railroad Water Main Crossing
Chelsea, Alabama
Terracon Project No. E1255027

Dear Mr. Crunk:

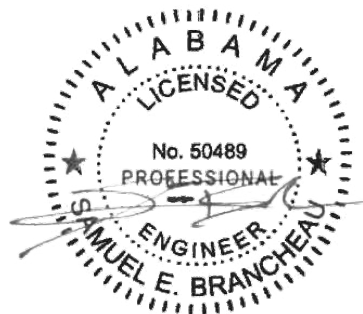
We submit this Subsurface Exploration Report for the above referenced project in general accordance with Terracon Proposal No. PE1255027 dated March 11, 2025. This report presents the findings of the subsurface exploration related to the water main crossing beneath the CSX Railroad right-of-way.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Terracon

A handwritten signature in black ink, appearing to read "Bryan C. Ritenour".

Bryan C. Ritenour, P.E.
Senior Engineer



Samuel E. Brancheau, P.E.
Senior Project Engineer



Table of Contents


Introduction..... 2
Project Description..... 3
Site Conditions 3
Geotechnical Characterization 4
 Groundwater Conditions..... 4
Seismic Site Class..... 5
Geotechnical Overview 5
General Comments 6

Figures

GeoModel

Attachments

- Exploration and Testing Procedures
- Site Location and Exploration Plan And Profile
- Exploration and Laboratory Results
- Supporting Information

Note: This report was also delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the  logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com. Refer to each individual Attachment for a listing of contents.

Introduction

This report presents the results of our subsurface exploration performed for the proposed water main crossing beneath CSX Railroad right-of-way in Chelsea, Alabama. The purpose of these services was to provide the following subsurface information relative to soil and groundwater conditions:

- Subsurface soil and rock conditions
- Subsurface water conditions
- Seismic site classification per AREMA

The geotechnical engineering Scope of Services for this project included the advancement of two soil borings, laboratory testing, and preparation of this report.

Illustrations showing the site and boring locations are shown on the [Site Location](#) and [Exploration Plan And Profile](#), respectively. Results of the laboratory testing performed on samples obtained from the site during our field exploration are included on the boring logs in the [Exploration and Laboratory Results](#).

The following [Site Conditions](#) and [Project Description](#) sections provide our understanding of the site and the project planned at the time of this report. The [Geotechnical Characterization](#) section provides a summary of the soil, rock and groundwater conditions encountered in the borings.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	An e-mail request for proposal was provided by Mr. Phillip Crunk. The request included a plan and profile drawing showing the planned water line alignment and launching and receiving pits.
Project Description	<p>It is understood that the project is planned to include the installation of a new water line that will pass beneath an existing CSX track and right-of-way.</p> <p>The water line will be a 36-inch ductile-iron pipe inside a 48-inch steel casing. The crossing is approximately 110 feet in length, and the crown of the steel casing is planned to be 5'-10" below the bottom of the railroad ties.</p> <p>The launching and receiving pits are planned to be outside of the railroad right-of-way. The bottom of the pits are shown to be about 12 feet below existing grade.</p>

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration.

Item	Description
Site Location	<p>The water main will cross CSX Railroad right-of-way in Chelsea, Alabama.</p> <p>The approximate GPS coordinates at the Track are: 33.3459 N, -86.5672 W (See Site Location)</p>
Existing Improvements	Existing single CSX railroad track at the water main crossing location
Current Ground Cover	Gravel, brush, trees, various vegetation
Existing Topography	Along the planned trenchless alignment, the ground surface is relatively flat to slightly sloping.

Item	Description
Local Geology	Published geologic maps indicate the site is underlain by the Parkwood Formation. The Parkwood Formation consists of interbedded medium to dark-gray shale and light to medium-gray sandstone, and locally contains dusky-red and grayish-green mudstone and argillaceous limestone.

Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based on our review of the subsurface exploration, laboratory data, geologic setting, and our understanding of the project. This characterization, termed GeoModel, forms the basis of our subsurface evaluations. For a profile view of the model layer depths in the borings, refer to the GeoModel. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the [Exploration and Laboratory Results](#) and the GeoModel can be found in the [Figures](#).

As part of our review, we identified the following model layers within the subsurface profile.

Model Layer	Layer Name	General Description
1	Surface Layer	Topsoil 6 to 12 inches thick
2	Native Soils	Lean Clay (CL), yellowish brown, stiff to hard, contains weathered shale relict bedding at depth.
3	Native Shale	Shale, thinly bedded, medium to dark gray, highly weathered

Groundwater Conditions

The borings were advanced using hollow-stem auger drilling techniques to their termination depth of approximately 24 feet below the existing ground surface. The borings were observed for groundwater during and at the completion of the boring. The following table shows the groundwater observations.

Boring No.	Depth To Groundwater During Drilling (ft)	Depth To Groundwater At Completion Of Drilling (ft)
B-1	18	16
B-2	22	21

Groundwater conditions may be different at the time of construction. Groundwater conditions may change because of seasonal variations in rainfall, runoff, and other conditions not apparent at the time of drilling. Long-term groundwater monitoring was outside the scope of services for this project. Additionally, perched groundwater is typically encountered at the interface between soil and weathered to sound bedrock.

Moisture content testing was performed on portions of selected split spoon samples. Certain split spoon samples were also selected for Atterberg limits determination. The results of the laboratory testing for the split spoon samples are shown on the individual logs, and the results of Atterberg Limits determination is shown in the table below.

Sample Location And Depth	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Moist Unit Wt. (pcf)	Moisture (%)
Boring B-1 6.5' – 8'	44	26	18	123.8	27.0
Boring B-2 6.5' – 8'	42	23	19	123.9	20.4

Seismic Site Class

The AREMA Site Class is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with AREMA Part 9, Table 9-1-6. Based on the properties of the materials encountered at the site as described on the logs of the borings and in our results, it is our professional opinion that the Seismic Site Class is C. Subsurface exploration at this site was extended to a maximum depth of 24 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

Geotechnical Overview

Based on the provided plan and profile, and the subsurface conditions encountered in the borings, the trenchless installation is anticipated to encounter mostly stiff to hard native Lean Clay (CL). However, severely weathered shale bedrock was encountered in boring B-1 at a depth of 14 feet below existing grade, which is approximately 2 feet below the planned bottom of the pit at this location. Groundwater was encountered at depths ranging from about 16 feet to 21 feet during our field exploration. Groundwater conditions may change due to weather and the time of year construction occurs.

The findings in this report are based upon the results of field and laboratory testing, engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the limitations of this report.

General Comments

Our analysis and opinions are based on our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance on the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface

Subsurface Exploration Report

CSX Railroad Water Main Crossing | Chelsea, Alabama

May 28, 2025 | Terracon Project No. E1255027



water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

Subsurface Exploration Report

CSX Railroad Water Main Crossing | Chelsea, Alabama

May 28, 2025 | Terracon Project No. E1255027

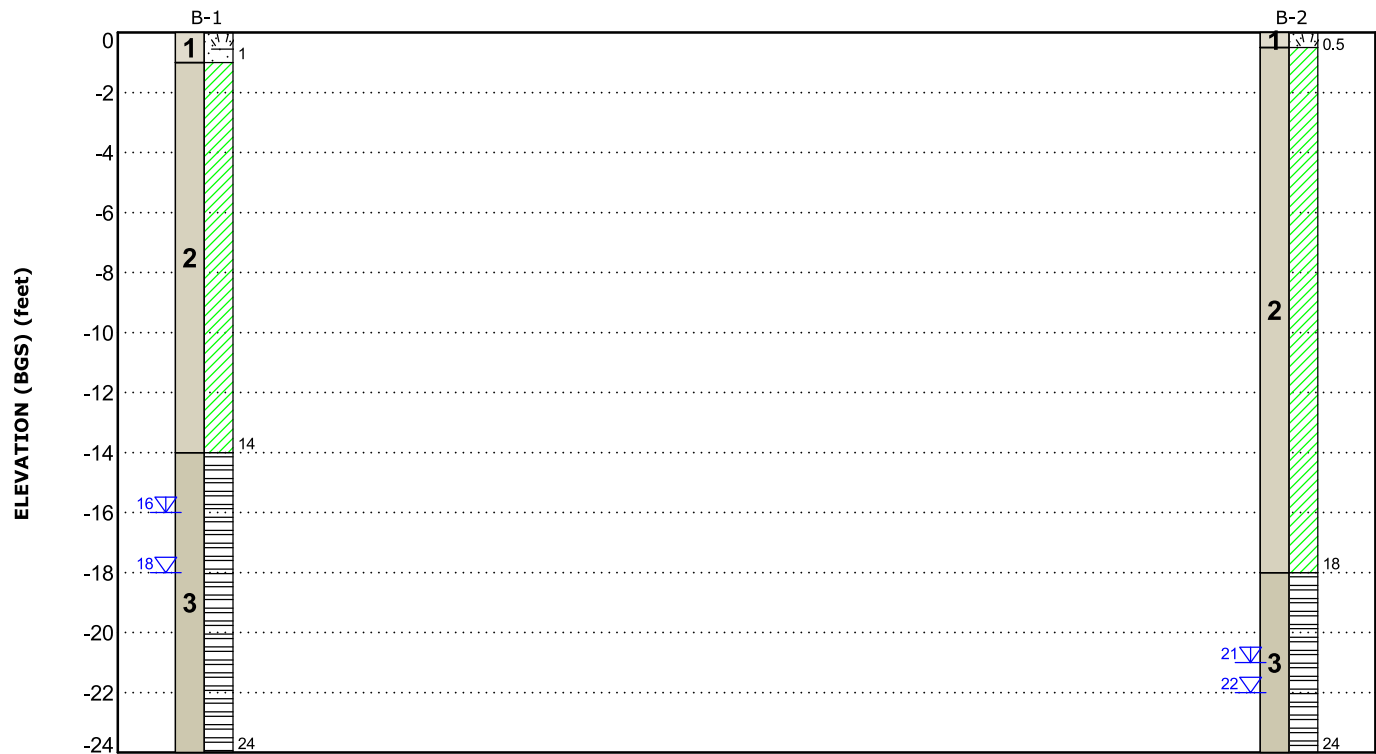


Figures

Contents:

GeoModel

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description	Legend	
1	Surface Layer	Topsoil 6 to 12 inches thick	Topsoil	Lean Clay
2	Naative Soils	Typically Lean Clay yellowish brown, stiff to hard, containing weathered shale relict bedding at depth.	Shale	
3	Native Shale	Shale, thinly bedded, medium to dark gray, highly weathered		

- First Water Observation
- Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

Subsurface Exploration Report

CSX Railroad Water Main Crossing | Chelsea, Alabama

May 28, 2025 | Terracon Project No. E1255027



Attachments

Exploration and Testing Procedures

Field Exploration

Boring ID	Approximate Boring Depth (feet)	Location
B-1	24 feet	North Pit
B-2	24 feet	South Pit

Boring Layout and Elevations: The boring locations were marked in the field by others. Surface elevations were estimated from the provided preliminary boring profile. If a ground surface elevation at each boring location is desired, we recommend the borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with a track-mounted, rotary drill rig using continuous flight augers. Five samples were obtained in the upper 15 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and transported to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. We also observed the boreholes while drilling and at the completion of drilling for the presence of groundwater.

Laboratory Testing

The laboratory testing program included the following types of tests:

- Moisture content
- Unit Weight
- Atterberg limits

Subsurface Exploration Report

CSX Railroad Water Main Crossing | Chelsea, Alabama

May 28, 2025 | Terracon Project No. E1255027



The results of the soil testing are shown on the boring logs at their corresponding depths and as separate graphs in the attached [Exploration and Laboratory Results](#).

The laboratory testing program included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in general accordance with the **General Notes** and the **Unified Soil Classification System** included in the [Supporting Information](#).

Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Subsurface Exploration Report

CSX Railroad Water Main Crossing | Chelsea, Alabama

May 28, 2025 | Terracon Project No. E1255027



Site Location and Exploration Plans

Contents:

Site Location Plan

Exploration Plan And Profile

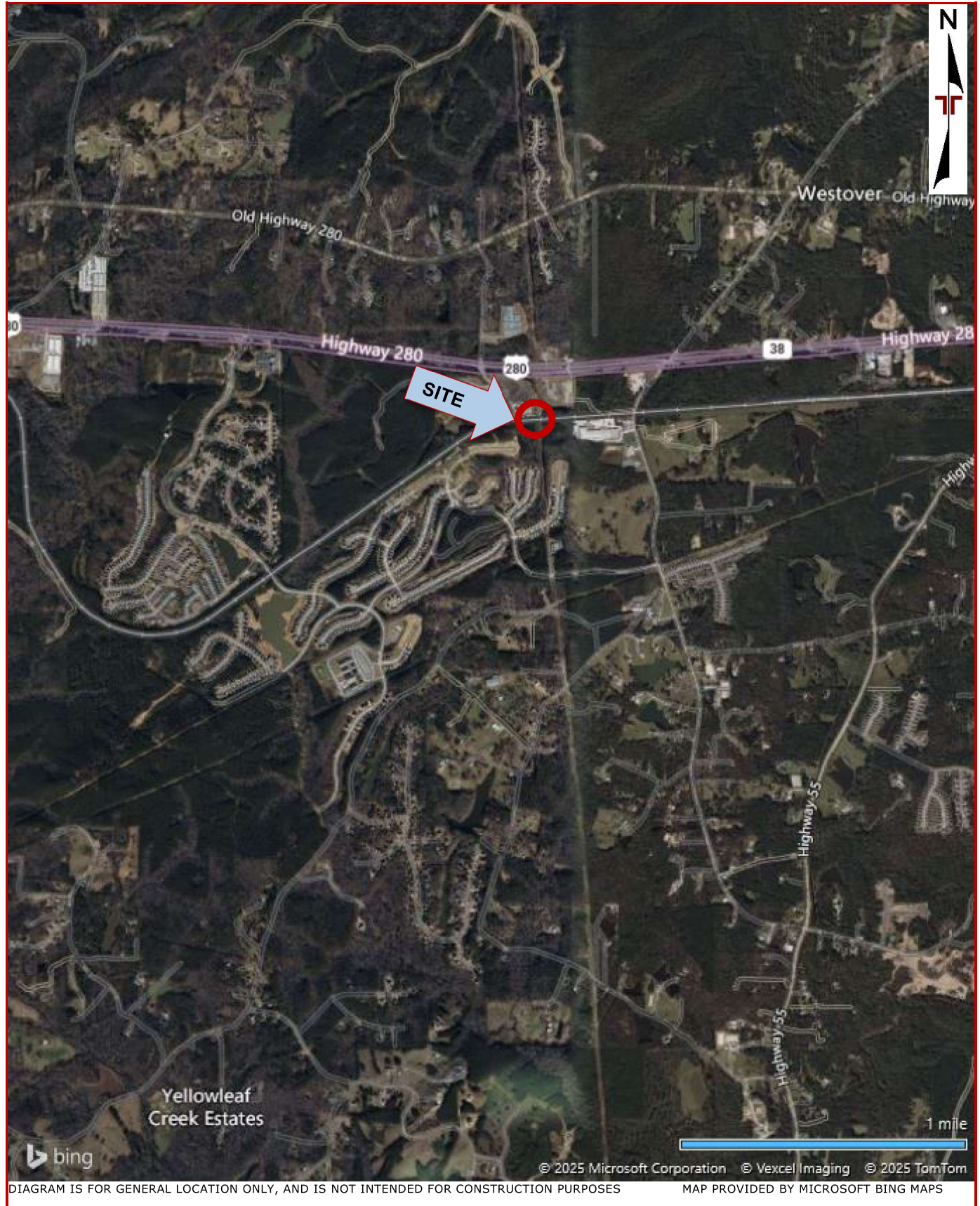
Subsurface Exploration Report

CSX Railroad Water Main Crossing | Chelsea, Alabama

May 28, 2025 | Terracon Project No. E1255027



Site Location



Subsurface Exploration Report

CSX Railroad Water Main Crossing | Chelsea, Alabama

May 28, 2025 | Terracon Project No. E1255027



Exploration Plan And Profile

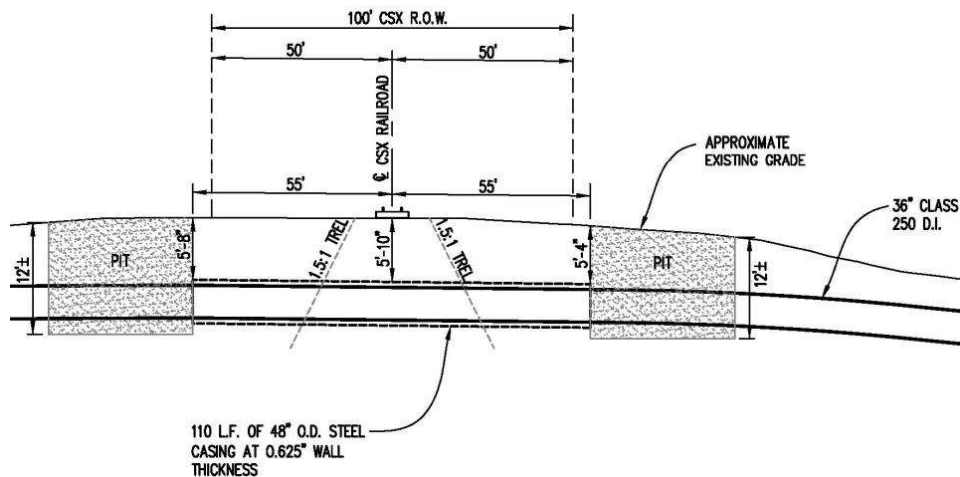


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

PLAN PROVIDED BY SHELBY COUNTY WATER

Exploration and Laboratory Results

Contents:

Boring Logs (B-1 and B-2)

Boring Log No. B-1

Graphic Log	Location: See Exploration Plan Latitude: 33.3462° Longitude: -86.5673° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits
							LL-PL-PI
	TOPSOIL (12") 1.0						
	LEAN CLAY (CL) , yellowish brown, stiff						
	becomes very stiff, with some light gray	5		X	4-5-7 N=12	28.8	
				X	6-8-7 N=15	26.7	
	Moist Unit Weight = 123.8 PCF			X	8-8-10 N=18	27.0	44-26-18
	some relict shale bedding	10		X	4-7-8 N=15	28.7	
				X	4-8-12 N=20	21.3	
	14.0			X	20-50/5" N=50+	13.5	
	HIGHLY WEATHERED SHALE , medium gray, thinly bedded	15					
			▽				
			▽				
				X	21-50/5" N=50+		
		20					
				X	50/5" N=50+		
	24.0						
	Boring Terminated at 24 Feet						

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).
 See [Supporting Information](#) for explanation of symbols and abbreviations.

Water Level Observations

- ▽ Water observed at 18' during drilling
- ▽ Water observed at 16' at completion of drilling

Drill Rig
CME-550

Driller
UES

Notes

Advancement Method
Hollow stem auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
BCR

Boring Started
04-24-2025

Boring Completed
04-24-2025

Boring Log No. B-2


Graphic Log	Location: See Exploration Plan Latitude: 33.3457° Longitude: -86.5673°	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits
							LL-PL-PI
	Depth (Ft.)						
	0.5 TOPSOIL (6")						
	LEAN CLAY (CL) , trace fine sand, yellowish brown with light gray, stiff						
	becomes very stiff	5			4-4-7 N=11	26.9	
	becomes hard Moist Unit Weaght = 123.9 PCF				4-7-9 N=16		
	contains some relict shale bedding				12-18-25 N=43	20.4	42-23-19
		10			18-26-48 N=74	11.8	
					24-26-28 N=54	12.7	
					18-50/5" N=50+	20.0	
		15					
	18.0						
	HIGHLY WEATHERED SHALE , medium to dark gray, thinly bedded				12-44-38 N=82		
		20					
	24.0						
	Boring Terminated at 24 Feet				50/4" N=50+		

See **Exploration and Testing Procedures** for a description of field and laboratory procedures used and additional data (if any).

See **Supporting Information** for explanation of symbols and abbreviations.

Water Level Observations

Water observed at 22' during drilling

 Water observed at 21' at completion of drilling

Drill Rig
CME-550

Driller
UES

Logged by
BCR

Boring Started
04-24-2025

Boring Completed
04-24-2025

Notes

Advancement Method

Hollow stem auger

Abandonment Method

Abandonment Method
Boring backfilled with auger cuttings upon completion.






Supporting Information

Contents:

General Notes

Unified Soil Classification System

General Notes

Sampling	Water Level	Field Tests
 Standard Penetration Test	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time  Cave In Encountered <p>Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.</p>	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		Consistency of Fine-Grained Soils (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Relative Density	Standard Penetration or N-Value (Blows/Ft.)	Consistency	Unconfined Compressive Strength Qu (tsf)	Standard Penetration or N-Value (Blows/Ft.)
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	5 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	9 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	16 - 30
		Hard	> 4.00	> 30

Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification	
				Group Symbol	Group Name ^B
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	Cu≥4 and 1≤Cc≤3 ^E	GW	Well-graded gravel ^F
			Cu<4 and/or [Cc<1 or Cc>3.0] ^E	GP	Poorly graded gravel ^F
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F, G, H}
			Fines classify as CL or CH	GC	Clayey gravel ^{F, G, H}
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	Cu≥6 and 1≤Cc≤3 ^E	SW	Well-graded sand ^I
			Cu<6 and/or [Cc<1 or Cc>3.0] ^E	SP	Poorly graded sand ^I
		Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G, H, I}
			Fines classify as CL or CH	SC	Clayey sand ^{G, H, I}
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	PI > 7 and plots above “A” line ^J	CL	Lean clay ^{K, L, M}
			PI < 4 or plots below “A” line ^J	ML	Silt ^{K, L, M}
		Organic:	$\frac{LL\text{ oven dried}}{LL\text{ not dried}} < 0.75$	OL	Organic clay ^{K, L, M, N}
					Organic silt ^{K, L, M, O}
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above “A” line	CH	Fat clay ^{K, L, M}
			PI plots below “A” line	MH	Elastic silt ^{K, L, M}
		Organic:	$\frac{LL\text{ oven dried}}{LL\text{ not dried}} < 0.75$	OH	Organic clay ^{K, L, M, P}
					Organic silt ^{K, L, M, Q}
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

^A Based on the material passing the 3-inch (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

$$^E Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.

