ARKANSAS DEPARTMENT OF TRANSPORTATION

SUBSURFACE INVESTIGATION

STATE JOB NO. 110617

FEDERAL AID PROJECT NO. NHPP-0068(42)

FIFTEENMILE & CUTOFF BAYOUS STRS. & APPRS. (S)

STATE HIGHWAY 50 & 79 **SECTION** 1 & 17

IN ST. FRANCIS **COUNTY**

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ARKANSAS DEPARTMENT OF TRANSPORTATION
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January 28, 2019

TO: Mr. Rick Ellis, Bridge Engineer

SUBJECT: Job No. 110617
Fifteenmile & Cutoff Bayous Strs. & Apprs. (S)
St. Francis County
Routes 50 & 79 Sections 1 & 17

Transmitted herewith are a brief summary of the geology and site conditions, summary of percent material passing #200 sieve and Atterberg Limits test results (for liquefaction susceptibility analysis), D50 scour analysis, and the logs of the borings conducted for the structure and approaches of the above referenced project. The samples obtained by the Standard Penetration Tests were brought to the laboratory and visually classified by experienced lab personnel to confirm the field identifications.

This project consists of replacing the bridge over Cutoff Bayou on Highway 50, east of Greasy Corner, and the bridge over Fifteenmile Bayou on Highway 79, northeast of Hughes. Both bridges will be constructed on their existing alignment. The Cutoff Bayou Bridge, on Highway 50, will be closed to traffic during construction. A temporary detour structure will be constructed to maintain traffic on Highway 79, during construction of the Fifteenmile Bayou Bridge. Four of the eleven requested borings were inaccessible due to steep slopes and high water levels. The four borings that were not obtained were located at: 111+71 C.L. Construction, 112+39 C.L. Construction, 113+75 C.L. Construction, and 209+97 C.L. Construction. All of the borings had to be offset, due to traffic restrictions and steep slopes. The obtained borings are anticipated to represent uniform site conditions and should be adequate to design the proposed steel shell pile foundations.

Based on plans provided by Bridge Division and the findings from this subsurface investigation, it is anticipated that all bents will be founded on steel shell piles.

Embankment analyses included global stability with seismic design consideration utilizing a horizontal acceleration coefficient of 0.368 for Cutoff Bayou and 0.363 for Fifteenmile Bayou, as provided by Bridge Design. It is assumed that the operational classification for these bridges is "other", as defined in Section 3.10.5 of the AASHTO LRFD Bridge Design Specification, Seventh Edition, 2014. Since this is not a "critical" or "essential" bridge the large expense and additional time associated with removing existing embankments and reconstructing reinforced embankments with significant ground improvement, to satisfy seismic consideration, is not recommended. Embankment displacement is expected to occur in a large seismic event.

Cutoff Bayou

The proposed embankment configuration provides for a satisfactory Factor of Safety for static conditions.

Fifteenmile Bayou

Subsurface conditions are poor in the regions affected by the embankments. In order to satisfy the design requirements for static conditions, embankment reinforcement will be required. The bridge embankments shall be internally reinforced with geogrid. Geogrid placement and specification recommendations are detailed in the attached draft Special Provision: Geosynthetic Internal Reinforced Embankment Construction, along with Figure 1 and Figure 2.

If you have any questions concerning these recommendations, please contact the Geotechnical Section.

Michael C. Benson
Materials Engineer

MCB:rpt:mlg
cc: State Construction Engineer - Master File Copy
District 1 Engineer
G.C. File

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

SPECIAL PROVISION

JOB 110617

GEOSYNTHETIC INTERNAL REINFORCED EMBANKMENT CONSTRUCTION

Description: This item shall consist of furnishing and installing a geosynthetic internal reinforcement for embankment construction in accordance with the plans and specifications. The geosynthetic internal reinforcement shall be placed as described herein, from Station 208+25 to the Southwest Bridge End Slope (Station 209+25) and from the Northeast Bridge End Slope (Station 211+59) to Station 212+59.

Materials: Geogrid shall be manufactured as a single layer regular network of integrally-connected longitudinal and transverse polymer tensile elements with a geometry that permits significant mechanical interlock with the backfill material. The geogrid structure shall remain dimensionally stable under construction stresses and have a high resistance to damage during construction, to ultraviolet degradation and to all forms of chemical and biological degradation encountered in the soil being reinforced.

The geogrid shall also conform in all respects to the following physical requirements:

Provide a geogrid with a minimum tensile strength, T_{allow} specified in the plans and this Special Provision.

Where: $T_{allow} = T_{ult} / RF$

And $RF = FS_{ID} \times FS_{CR} \times FS_{D}$

Determine T_{ult} (Ultimate Tensile Strength) according to ASTM D 6637 Method B (note, that the same test shall be used for definition of the geogrid creep reduction factor) and ASTM D 4759.

Determine FS_{ID}, FS_{CR}, and FS_{D} according to the following:

FS_{ID} Determine the Partial Factor of Safety for Installation Damage from the results of full-scale construction damage tests conducted according to ASTM D 5818. If possible, conduct the tests using project-specific backfill and construction placement techniques. Use a default value of 3.0 if no installation damage testing has been conducted. The minimum value for FS_{ID} is 1.1.

FS_{CR} Determine the Partial Factor of Safety for Creep Deformation according to ASTM D 5262. Collect test data for a minimum duration of 10,000 hours for both standard and elevated temperatures. Extrapolate the test results to

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GEOSYNTHETIC INTERNAL REINFORCED EMBANKMENT CONSTRUCTION

a 75-year design life as provided in Appendix B of FHWA Publication No. FHWA-NHI-10-025, "Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes –Volume II". If testing has not been conducted, default values for FS_{CR} are:

Polymer Type	FS_{CR}
Polyester	3.0
Polypropylene	5.0
Polyethylene	5.0

FS_D The Durability Reduction Factor is dependent on the susceptibility of the geogrid to attack from chemicals, thermal oxidation, hydrolysis, stress cracking, and microorganisms. The minimum reduction factor for the combined effects of chemical and biological degradation is:

Polymer Type	FS_D
Polyester	1.20
Polypropylene	1.25
Polyethylene	1.10

Identify, store and handle geogrids according to ASTM D 4873. Limit geogrid exposure to ultraviolet radiation to less than 10 days.

The Contractor shall furnish to the Engineer a production certification that the geogrid supplied meets the respective criteria set forth in these specifications. The certification shall state the name of the manufacturer, product name, style number, chemical composition of the filaments, ribs, or yarns, and other information to fully describe the geogrid. The Contractor shall supply test data from an independent laboratory to support certified values submitted.

The embankment material placed within the limits of this Special Provision shall consist of a clay material with a minimum plasticity index (PI) of 10 and a maximum plasticity index (PI) of 40. Non-plasticity and/or low plasticity (less than 10) granular material (sand, silt or clayey gravel) will not be acceptable. The Contractor shall perform quality control and acceptance sampling and testing of the compacted embankment material for density and moisture content in accordance with Subsection 210.02 and 210.10, at the frequencies established in Section 210. The Contractor shall perform quality control and acceptance sampling and testing of the compacted embankment material for plasticity

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GEOSYNTHETIC INTERNAL REINFORCED EMBANKMENT CONSTRUCTION

index in accordance with Section 306, except that the size of the standard lots will be 3000 cubic yards. There will be no direct payment made for fulfilling these material requirements but compensation shall be considered included in the price bid for Compacted Embankment (Special).

Construction Methods: The geogrid reinforcement shall be placed to the lines and dimensions shown in the plans or as directed by the Engineer. During clearing and grubbing in the embankment area, all organic and deleterious materials, and soft or loose compressible soils shall be excavated and removed from the fill area. Prior to fill placement, the exposed foundation soils shall be proof-rolled to detect any unstable locations, which shall subsequently be compacted or excavated and replaced with compacted fill.

Correct orientation (roll direction) of the geogrids shall be verified by the Engineer. All geogrids shall be placed/unrolled per manufacturer's recommendations. The contractor shall provide the Engineer detailed installation recommendations from the manufacturer. All geogrid shall be placed to lay flat, pulled tight and pinned or weighted down to hold its position until the subsequent soil layer can be placed.

Geogrid shall be placed in continuous longitudinal strips perpendicular to the face of the embankment slope. The curved transition from side slope to bridge end slope shall be constructed of rectangular pieces of grid. Grid shall be overlapped so that the entire embankment is covered. The reinforcement zone shall contain a minimum of three layers of geogrid placed on one-foot intervals. The top layer shall be placed two feet from finished subgrade. Geogrid in the reinforcement zone shall have a T_{allow} = 6500 Lb./ft.

Overlaps of geogrid between rolls shall be located no less than 30 feet from the finished slope surface. Geogrid shall be overlapped a minimum of 5 feet. The number of overlaps shall be limited to one per strip of geogrid. Mechanical bar connections shall be placed per manufacturer's recommendations if required. Adjacent strips of geogrid do not need to be overlapped. The embankment fill between layers of geogrid reinforcement shall be prepared in accordance with Section 210, Excavation and Embankment of the Standard Specifications for Highway Construction, Edition of 2014. Reinforcement can be placed directly on the prepared embankment. No special surface treatment will be required. If a sheep's-foot roller is utilized, the imprints are acceptable surface for geogrid reinforcement placement.

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Tracked construction equipment shall not be operated directly upon the geogrid. A minimum fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles shall be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid.

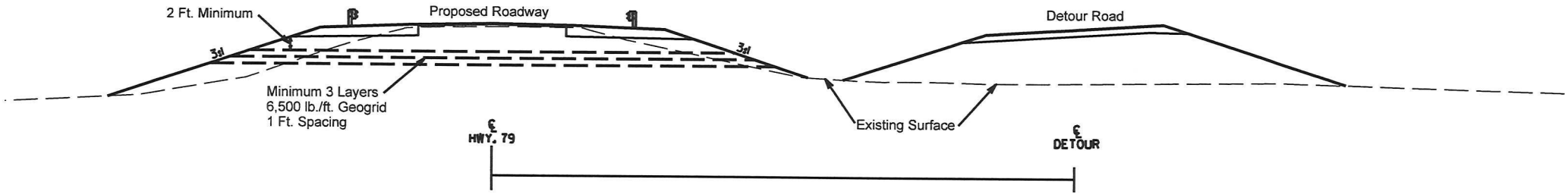
Rubber-tired equipment may pass over geogrid reinforcement at slow speeds of less than 10 mph. Sudden breaking and sharp turning shall be avoided.

Method of Measurement: All embankment material including the geogrid reinforcement will be measured in accordance with Section 210 Excavation and Embankment of the Standard Specifications for Highway Construction, Edition of 2014 for Compacted Embankment.

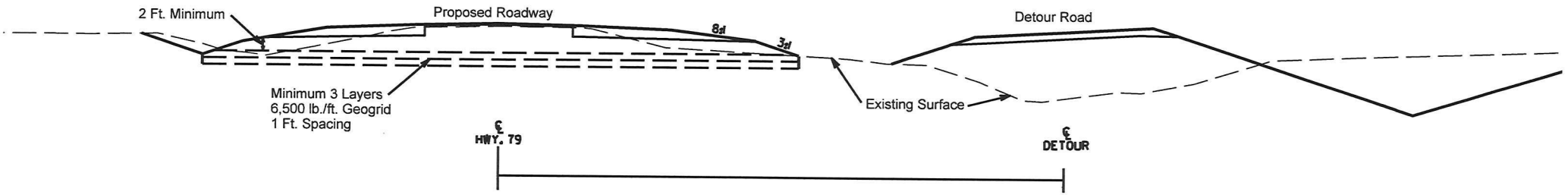
Basis of Payment: Placement and compaction of embankment material and furnishing and installing geogrid reinforcement shall be paid for under the item "Compacted Embankment (Special)", which price shall be full compensation for all costs involved in furnishing all material; for proof rolling ground surfaces or subgrade; for constructing the embankments in accordance with Section 210 and this Special Provision; for quality control and acceptance sampling and testing; and for all labor, tools, equipment, and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Compacted Embankment (Special)	Cubic Yard



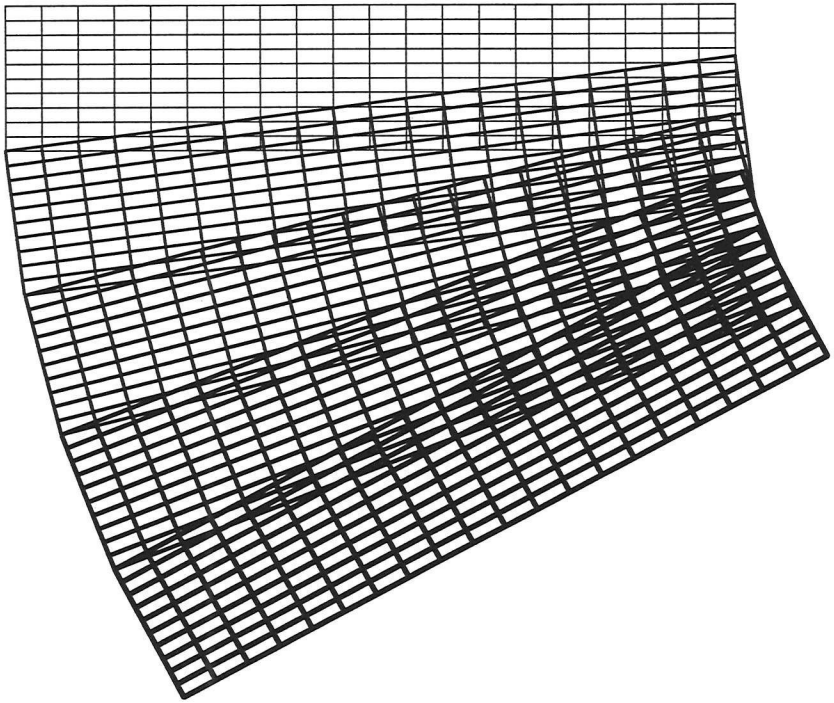
STA. 211+59 (NE BRIDGE END) TO STA. 212+59



STA. 208+25 TO STA. 209+25 (SW BRIDGE END)

Figure 1 - Reinforced Slope Design

Side Slope to End Slope
Geogrid Transition



Geogrid Overlap

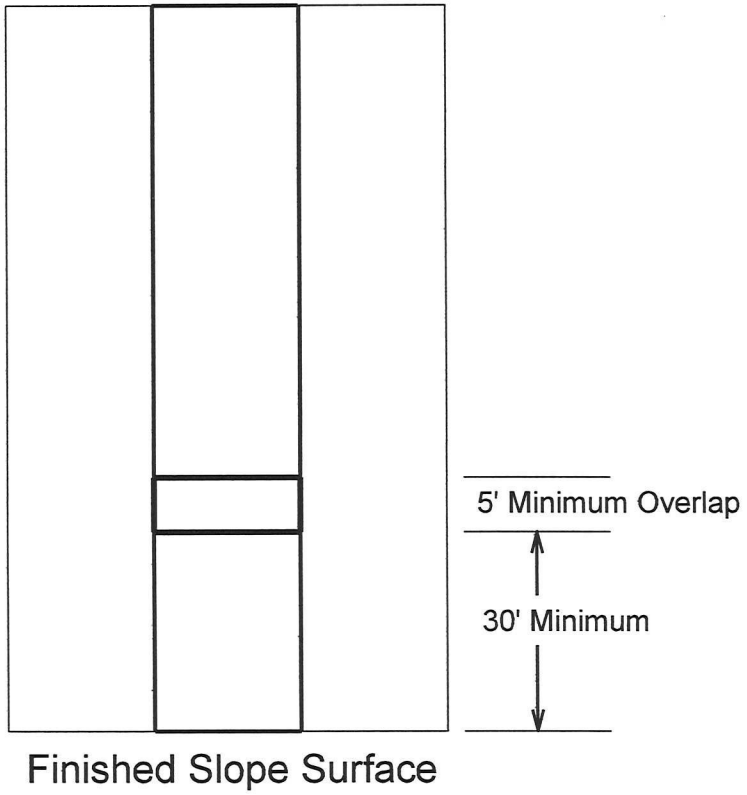


Figure 2 - Geogrid Special Details

GEOLOGY AND SITE CONDITIONS
Job No. 110617

Fifteenmile & Cutoff Bayous
STRS. & APPRS. (S)
St. Francis County
Route 50 Section 1
Route 79 Section 17

Site Conditions

There are two bridges being replaced on this project:

Cutoff Bayou

The existing highway 50 bridge runs east to west and crosses over Cutoff Bayou. This bridge is a 15 span, approximately 357 feet long bridge. The superstructure consists of concrete decking supported by wooden beams. The overall condition of the decking is poor and some of the decking on the west end of the bridge has been patched. The guardrails are composed of steel, supported by concrete curb. Some of the curb on both sides of the bridge is missing. The substructure of the bridge consists of seven steel beams supported by 14 bents with seven timber pilings per bent. The three middle pilings on the upstream side of the bridge have been reinforced with concrete wrapped with sheet metal. The bridge end slopes are supported by timber end walls and piled riprap. Much of the area surrounding the bridge has been plated with riprap and there is a lot of riprap in the channel. There are large amounts of debris including; logs, branches, and accumulated sediment piled up against the bents on the upstream side. This has resulted in the development of islands in the middle of the channel, both up and downstream of the bridge. Cutoff Bayou runs northeast to southwest at this location. The channel around the bridge is shallow and appears to be susceptible to scour and erosion, as evident by large quantities of riprap found on both ends slopes of the bridge and in the channel. The area surrounding the existing bridge is primarily agricultural land. Overhead power lines, a buried water line, and fiber-optic cross the channel on the downstream side of the bridge. There are several beehive boxes located up station and on the south side of the bridge.

Fifteenmile Bayou

The existing highway 79 bridge runs southwest to northeast and crosses over Fifteenmile Bayou. This bridge is a six span, 218 feet long bridge. The superstructure consists of cast in place decking supported by five steel beams. The substructure consists of five bents, each containing five hexagonal piles with concrete pile caps. Some of the concrete on the pile caps is spalling. The guardrails are composed of steel leading up to the bridge and concrete on the bridge. Fifteenmile Bayou flows to the north, at this location, before reaching its confluence with Cutoff Bayou. The channel is heavily vegetated both up and downstream of the bridge. The area surrounding the channel is primarily agricultural fields. There are several grain silos and a church on the southeast side and down station from the bridge. There are several beehive boxes located up station on the southeast side of the bridge. There are buried cables crossing the channel on both sides of the bridge and overhead power lines crossing the channel on the northwest side of the bridge.

Site Geology

The project alignments for both of the proposed bridges are located in abandoned channels. Abandoned channels consist primarily of clayey soils. Clayey soils were encountered in many of the samples in the top 25 feet of the subsurface borings, with the exception of one boring at station 113+05. This is likely due to the fact that this boring was drilled in the middle of the Cutoff Bayou channel and was therefore drilled at a lower elevation than the other borings. These clayey soils encountered are reflected by the low blow counts found in the upper 25 feet of the borings. These abandoned channels overlie valley train deposits, which are gently sloping plains underlain by glacial outwash and confined by valley walls. Valley train deposits are primarily composed of sand with some amount of gravel. The surrounding area is located in Quaternary age point bar deposits of the Mississippi River meander belts, map symbol (Hpm). Point bar deposits typically consist of gravels, sands, silts, clays, and mixtures of any and/or all of these.

Subsurface Conditions

Based on the results of the borings, the subsurface stratigraphy may be generalized as follows:

Cutoff Bayou

Station 110+88

0 to 25 Feet:	Varies from moist to wet, very loose to loose, brown **sand with clay** and **sandy silt** to moist, soft, brown **clay**.
25 to 100.2 Feet:	Wet, medium dense to very dense, brown **sand** to **sand with some gravel**.

Station 113+05

0 to 25 Feet:	Wet, medium dense to dense, gray **sand** to **sand with silt**.
25 to 30 Feet:	Wet, loose, gray **sand with silt**.
30 to 85 Feet:	Wet, medium dense to dense, gray **sand** to **sand with silt** and some **gravel**.
85 to 90 Feet:	Wet, loose, gray **sand with some gravel**.
90 to 111.5 Feet:	Wet, medium dense to very dense, gray **sand with some gravel**.

Station 114+75

0 to 25 Feet:	Wet, loose to very loose, gray **silty** to **clayey sand**.
25 to 101.5 Feet:	Wet, medium dense to dense, gray **sand** to **sand with silt** and **some gravel**.

Stations 115+33 and 115+50

0 to 9.5 Feet:	Moist, medium stiff, brown **clay**.
9.5 to 25 Feet:	Moist to wet, very soft to soft, brown **sandy** to **silty clay**.
25 to 35 Feet:	Varies from wet, very soft, brown **silty clay**, to moist, very loose to medium dense, brown **sand** and **silt** to **silty** and **clayey sands**.
35 to 121.5 Feet:	Wet, medium dense to very dense, gray **sand** to **sand with silt** and **some gravel** and **organic matter**.

Fifteenmile Bayou

Station 209+06

0 to 15 Feet:	Wet, soft to medium stiff, brown **clay** to **clay with sand**.
15 to 35 Feet:	Varies from wet, very loose, brown and gray **silt** to **sandy silt**, to wet, soft to very soft, gray **clay**.
35 to 101.5 Feet:	Wet, medium dense to dense, gray **sand** to **sand with gravel** and **silt**.

Station 210+87

0 to 25 Feet:	Wet, very soft, gray **clay** to **sandy clay**.
25 to 55 Feet:	Wet, loose to medium dense, gray **sand** to **sand with silt** and **trace gravel**.
55 to 65 Feet:	Varies from wet, dense, gray **sand** with **trace gravel** to wet, medium stiff, gray **sandy clay with some gravel**.
65 to 101.5 Feet:	Wet, medium dense to dense, gray **sand with silt** and **trace gravel**.

Station 211+65

0 to 25 Feet:	Varies from moist to wet, very soft to soft, gray **clay** to **sandy clay**, to wet very loose, gray **sand**.
25 to 30 Feet:	Wet, very stiff, gray **clay with sand** and **gravel**.
30 to 70 Feet:	Wet, medium dense to dense, gray **sand with trace gravel**.
70 to 75 Feet:	Wet, loose, gray **sand with clay**.
75 to 105 Feet:	Wet, medium dense to dense, gray **sand with trace gravel**.

Lab Test Summary

Project 110617

Station	Location	Depth (ft)	Plastic Limit	Liquid Limit	Plasticity Index	% Passing No. 200	Unified Soil Classification
113+05	6' Rt.	7.0	NP			9	SP-SM
113+05	6' Rt.	17.0	NP			3	SP
113+05	6' Rt.	25.0	NP			6	SP-SM
113+05	6' Rt.	30.0	NP			2	SP
113+05	6' Rt.	35.0	NP			1	SP
113+05	6' Rt.	40.0	NP			9	SP-SM
113+05	6' Rt.	45.0	NP			1	SP
113+05	6' Rt.	50.0	NP			3	SP
113+05	6' Rt.	55.0	NP			4	SP
113+05	6' Rt.	60.0	NP			6	SP-SM
113+05	6' Rt.	65.0	NP			5	SP-SM
113+05	6' Rt.	70.0	NP			3	SP
113+05	6' Rt.	75.0	NP			2	SP
113+05	6' Rt.	80.0	NP			1	GW
113+05	6' Rt.	85.0	NP			1	SP
113+05	6' Rt.	90.0	NP			6	SP-SM
113+05	6' Rt.	95.0	NP			3	SP
113+05	6' Rt.	100.0	NP			2	SP
113+05	6' Rt.	105.0	NP			3	SP
113+05	6' Rt.	110.0	NP			4	SP
115+33	23' Rt.	4.0	-	-	-	99	NT
115+33	23' Rt.	9.0	23	34	11	87	CL
115+33	23' Rt.	15.0	21	30	9	55	CL
115+33	23' Rt.	20.0	22	35	13	61	CL
115+33	23' Rt.	25.0	NP			96	ML
115+33	23' Rt.	30.0	-	-	-	89	NT
115+33	23' Rt.	35.0	NP			6	SP-SM
115+33	23' Rt.	40.0	NP			3	SP
115+33	23' Rt.	45.0	NP			19	SM
115+33	23' Rt.	50.0	NP			5	SP-SM
115+33	23' Rt.	55.0	NP			4	SP
115+33	23' Rt.	60.0	NP			5	SP-SM
115+33	23' Rt.	65.0	NP			4	SP
115+33	23' Rt.	70.0	NP			3	SW
115+33	23' Rt.	75.0	NP			1	SP
115+33	23' Rt.	80.0	NP			5	SP
115+33	23' Rt.	85.0	NP			4	SP

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115+33	23' Rt.	90.0	NP			4	SP
115+33	23' Rt.	95.0	NP			3	SP
115+33	23' Rt.	100.0	NP			5	SP-SM
115+33	23' Rt.	105.0	NP			2	SP
209+06	27' Rt.	4.0	24	69	45	91	CH
209+06	27' Rt.	9.0	22	31	9	73	CL
209+06	27' Rt.	15.0	NP			88	ML
209+06	27' Rt.	20.0	23	31	8	97	CL
209+06	27' Rt.	25.0	23	28	5	63	ML
209+06	27' Rt.	30.0	19	35	16	91	CL
209+06	27' Rt.	35.0	NP			12	SP-SM
209+06	27' Rt.	40.0	NP			3	SP
209+06	27' Rt.	45.0	NP			3	SP
209+06	27' Rt.	50.0	NP			4	SW
209+06	27' Rt.	55.0	-	-	-	-	NT
209+06	27' Rt.	60.0	NP			5	SP
209+06	27' Rt.	65.0	NP			4	SP
209+06	27' Rt.	70.0	NP			5	SP
209+06	27' Rt.	75.0	NP			5	SP
209+06	27' Rt.	80.0	NP			12	SP-SM
209+06	27' Rt.	85.0	NP			17	SM
209+06	27' Rt.	80.0	NP			11	SP-SM
209+06	27' Rt.	95.0	NP			4	SW
209+06	27' Rt.	100.0	NP			11	SW-SM

D_{50} AGGREGATE ANALYSIS FOR SCOUR CALCULATIONS

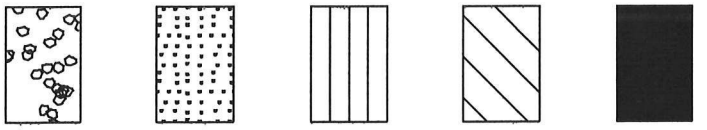
Job No. 110617					
Creek Name	**Station**	**Sample Location**	**Depth (FT)**	**Aggregate Size (D50) (IN)**	**LL/PL/Unified Soil Classification**
Cutoff Bayou	114+43 25' Lt. of C.L. Const.	Creek Bank	NA	Less Than 0.0029	46/19/CL Gravelly Lean Clay
Cutoff Bayou	113+05 6' Rt. of C.L. Const.	Creek Channel	7 - 8.5'	0.0165	Poorly Graded Sand with Silt
Fifteenmile Bayou	210+00 15' Rt. Of C.L. Const.	Creek Bank	NA	Less Than 0.0029	71/26/CH Fat Clay with Sand

LEGEND

SOIL TYPES

(SHOWN IN SYMBOL COLUMN)

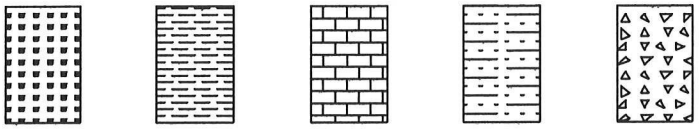
(PREDOMINANT TYPE SHOWN HEAVY)



GRAVEL | SAND | SILT | CLAY | ORGANIC MATTER

ROCK TYPES

(SHOWN IN SYMBOL COLUMN)

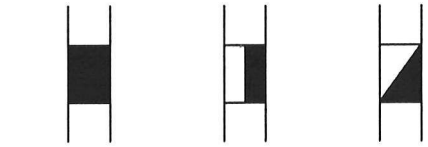


SANDSTONE | SHALE or SILTSTONE | LIMESTONE or DOLOMITE | ALTERNATING LAYERS of SHALE and SANDSTONE | OTHER

SAMPLER TYPES

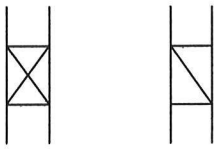
(SHOWN IN SAMPLE COLUMN)

SHELBY TUBE



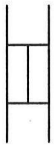
UNDISTURBED SAMPLE RECOVERY | DISTURBED SAMPLE RECOVERY | NO RECOVERY

SPLIT SPOON



SAMPLE RECOVERY | NO RECOVERY

ROCK CORING



% RECOVERY INDICATED ON LOGS

TERMS DESCRIBING CONSISTENCY OR CONDITION

GRANULAR SOIL		CLAY		CLAY-SHALE		SHALE	
"N" Value	Density	"N" Value	Consistency	"N" Value	Consistency	"N" Value	Consistency
0-4	Very Loose	0-1	Very Soft	0-1	Very Soft		
5-10	Loose	2-4	Soft	2-4	Soft	31-60	Soft
11-30	Medium Dense	5-8	Medium Stiff	5-8	Medium Stiff	Over 60	
31-50	Dense	9-15	Stiff	9-15	Stiff	More than 2'	
Over 50	Very Dense	16-30	Very Stiff	16-30	Very Stiff	Penetration	
		31-60	Hard	31-60	Hard	in 60 Blows:	Medium Hard
		Over 60	Very Hard	Over 60	Very Hard	Less than 2'	
						Penetration	
						in 60 Blows:	Hard

1. Ground water elevations indicated on boring logs represent ground water elevations at date or time shown on boring log. Absence of water surface implies that no ground water data is available but does not necessarily mean that ground water will not be encountered at locations or within the vertical reaches of these borings.
2. Borings represent subsurface conditions at their respective locations for their respective depths. Variations in conditions between or adjacent to boring locations may be encountered.
3. Terms used for describing soils according to their texture or grain size distribution are in accordance with the Unified Soil Classification System.

Standard Penetration Test – Driving a 2.0" O.D., 1-3/8" I.D. sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and performing the test are recorded for each 6 inches of penetration on the drill log. The field "N" Value (N_f) can be obtained by adding the bottom two numbers for example: $\frac{6}{8-9} \Rightarrow 8+9=17 blows/ft$. The "N" Value corrected to 60% efficiency (N_{60}) can be obtained by multiplying N_f by the hammer correction factor published on the boring log.

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 1
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 110+88
LOCATION: 19' Left of Construction Centerline
LOGGED BY: Coty Campbell

DATE: September 18, 2018
TYPE OF DRILLING: Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 100.2

SURFACE ELEVATION: 199.0

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
5			Moist, Very Loose, Brown Sand with Clay						1 2-2		
10											
15			Moist, Loose, Brown Sand						2 3-4		
20			Moist, Soft, Brown Clay with Some Silt						1 2-2		
25			Wet, Very Loose, Brown Sandy Silt						1 2-1		
30									4 6-7		
35									4 5-7		

REMARKS: Cutoff Bayou
Coordinates: 35.007045, -90.413942

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 1
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 110+88
LOCATION: 19' Left of Construction Centerline
LOGGED BY: Coty Campbell

DATE: September 18, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 100.2

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 199.0	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
40		X	Wet, Medium Dense, Brown Sand						4 5-7		
		X							4 6-11		
45		X							7 10-13		
50		X							8 11-9		
55		X							7 11-14		
60		X							12 25-15		
65		X	Wet, Dense, Brown Sand						9 11-14		
70											

REMARKS: Cutoff Bayou
Coordinates: 35.007045, -90.413942

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 1
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 110+88
LOCATION: 19' Left of Construction Centerline
LOGGED BY: Coty Campbell

DATE: September 18, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 100.2

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 199.0								
75			Wet, Medium Dense, Brown Sand						10 10-13		
80			Wet, Dense, Brown Sand with Trace Gravel						15 17-14		
85			Wet, Very Dense, Brown Sand with Trace Gravel						17 26-30		
90			Wet, Dense, Brown Sand with Trace Gravel						10 17-20		
95			Wet, Medium Dense, Brown Sand with Some Gravel and Some Organic Matter						6 10-17		
100			Wet, Very Dense, Brown Sand with Trace Gravel						12 22-54		
105			Wet, Very Dense, Brown Sand with Gravel Boring Terminated						60 (2")		

REMARKS: Cutoff Bayou
Coordinates: 35.007045, -90.413942

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 2
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 113+05
LOCATION: 6' Right of Construction Centerline
LOGGED BY: Stanley Bates

DATE: November 6, 13, and 19, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 111.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 174.7								
5			Wet, Medium Dense, Gray Sand with Silt	-							
10			Wet, Medium Dense, Gray Poorly-Graded Sand with Silt	SP-SM	NP				3 5-9		
15				-							
20			Wet, Dense, Gray Poorly-Graded Sand	SP	NP				4 17-32		
25				-							
30			Wet, Loose, Gray Poorly-Graded Sand with Silt	SP-SM	NP				5 3-6		
				-							
35			Wet, Medium Dense, Gray Poorly-Graded Sand	SP	NP				5 6-8		
				-							

REMARKS: Cuttoff Bayou

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 2
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 113+05
LOCATION: 6' Right of Construction Centerline
LOGGED BY: Stanley Bates

DATE: November 6, 13, and 19, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 111.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 174.7	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
40			Wet, Medium Dense, Gray Poorly-Graded Sand	SP -	NP				5 9-8		
45			Wet, Medium Dense, Gray Poorly-Graded Sand with Silt	SP-SM -	NP				3 7-12		
50			Wet, Medium Dense, Gray Poorly-Graded Sand	SP -	NP				7 9-8		
55			Wet, Dense, Gray Poorly-Graded Sand with Some Gravel	SP -	NP				12 18-15		
60			Wet, Medium Dense, Gray Poorly-Graded Sand with Some Gravel	SP -	NP				7 13-17		
65			Wet, Medium Dense, Gray Poorly-Graded Sand with Silt	SP-SM -	NP				11 14-13		
70			Wet, Dense, Gray Poorly-Graded Sand with Silt and Gravel	SP-SM -	NP				13 22-18		

REMARKS: Cuttoff Bayou

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 2
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 113+05
LOCATION: 6' Right of Construction Centerline
LOGGED BY: Stanley Bates

DATE: November 6, 13, and 19, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 111.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 174.7	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
75			Wet, Dense, Gray Poorly-Graded Sand with Gravel	SP -	NP				11 20-16		
80			Wet, Medium Dense, Gray Poorly-Graded Sand with Gravel	SP -	NP				9 12-10		
85			Wet, Medium Dense, Gray Well-Graded Gravel with Sand	GW -	NP				7 10-15		
90			Wet, Loose, Gray Poorly-Graded Sand with Some Gravel	SP -	NP				3 4-6		
95			Wet, Very Dense, Gray Poorly-Graded Sand with Gravel	SP-SM -	NP				9 16-41		
100			Wet, Medium Dense, Gray Poorly-Graded Sand with Some Gravel	SP-SM -	NP				7 10-15		
105			Wet, Medium Dense, Gray Poorly-Graded Sand with Gravel	SP -	NP				13 15-13		

REMARKS: Cuttoff Bayou

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 113+05
LOCATION: 6' Right of Construction Centerline
LOGGED BY: Stanley Bates

DATE: November 6, 13, and 19, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 111.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 174.7	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
110			Wet, Dense, Gray Poorly-Graded Sand with Gravel	SP -	NP				10 13-18		
			Wet, Dense, Gray Poorly-Graded Sand with Some Gravel	SP	NP				9 19-26		
			Boring Terminated								
115											
120											
125											
130											
135											
140											

REMARKS: Cuttoff Bayou

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 114+75
LOCATION: 25' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: October 29, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 101.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 184.6	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
5											
10		X	Wet, Very Loose, Gray Silty Sand						3 1-2		
15		X	Wet, Loose, Gray Sand with Silt						2 2-5		
20											
25		X	Wet, Loose, Gray Clayey Sand						2 2-6		
30		X	Wet, Medium Dense, Gray Sand						3 8-8		
35		X	Wet, Medium Dense, Gray Sand with Silt						3 9-8		

REMARKS: Cutoff Bayou

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BORING NO. 3
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 114+75
LOCATION: 25' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: October 29, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 101.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 184.6	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
40			Wet, Medium Dense, Gray Sand						5 7-7		
45			Wet, Medium Dense, Gray Sand with Silt						4 6-8		
50			Wet, Medium Dense, Gray Sand						7 14-12		
55									4 6-7		
60			Wet, Medium Dense, Gray Sand with Trace Gravel						6 9-10		
65			Wet, Medium Dense, Gray Sand with Some Gravel						6 5-6		
70			Wet, Medium Dense, Gray Sand with Silt and Some Gravel						5 8-9		

REMARKS: Cutoff Bayou

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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 114+75
LOCATION: 25' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: October 29, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 101.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 184.6	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
75			Wet, Medium Dense, Gray Sand with Silt and Trace Gravel						5 7-5		
80			Wet, Dense, Gray Sand with Silt						12 18-19		
85			Wet, Dense, Gray Sand with Trace Gravel						11 28-16		
90			Wet, Dense, Gray Sand with Silt and Trace Gravel						7 13-20		
95			Wet, Dense, Gray Sand with Trace Gravel						10 15-32		
100			Wet, Very Dense, Gray Sand with Silt						13 22-30		
			Wet, Dense, Gray Sand with Silt						13 20-30		
105			Boring Terminated								

REMARKS: Cutoff Bayou

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 115+33
LOCATION: 23' Right of Construction Centerline
LOGGED BY: Coty Campbell

DATE: September 24, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Diamond core
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 106.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 198.7	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
5			Moist, Medium Stiff, Brown Clay with Trace Gravel	-	-				2 3-3		
				NT							
				-							
10			Moist, Soft, Brown Lean Clay	CL	23		34		0 1-1		
				-							
15			Wet, Soft, Brown Sandy Lean Clay	CL	21		30		0 0-3		
				-							
20			Wet, Very Soft, Brown Sandy Lean Clay	CL	22		35		0 0-1		
				-							
25			Wet, Very Loose, Brown Silt	ML	NP				0 0-1		
				-							
30			Wet, Soft, Brown Silty Clay	NT	-				1 2-1		
				-							
35											

REMARKS: Cutoff Bayou
Coordinates: 35.0068933, -90.41246333

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 4
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 115+33
LOCATION: 23' Right of Construction Centerline
LOGGED BY: Coty Campbell

DATE: September 24, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Diamond core
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 106.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 198.7	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
40			Wet, Medium Dense, Brown Poorly-Graded Sand with Silt	SP-SM -	NP				4 6-7		
45			Wet, Medium Dense, Brown Poorly-Graded Sand	SP -	NP				6 11-12		
50			Wet, Medium Dense, Brown Silty Sand	SM -	NP				4 7-7		
55			Wet, Medium Dense, Brown Poorly-Graded Sand with Silt	SP-SM -	NP				6 13-14		
60			Wet, Medium Dense, Brown Poorly-Graded Sand with Trace Organic Matter	SP -	NP				4 10-10		
65			Wet, Dense, Brown Poorly-Graded Sand with Silt	SP-SM -	NP				14 17-18		
70			Wet, Medium Dense, Brown Poorly-Graded Sand	SP -	NP				8 8-10		

REMARKS: Cutoff Bayou
Coordinates: 35.0068933, -90.41246333

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 4
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 115+33
LOCATION: 23' Right of Construction Centerline
LOGGED BY: Coty Campbell

DATE: September 24, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Diamond core
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 106.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 198.7	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
75			Wet, Medium Dense, Brown Well-Graded Sand with Some Gravel	SW -	NP				6 11-10		
80			Wet, Medium Dense, Brown Poorly-Graded Sand with Trace Gravel	SP -	NP				9 13-10		
85			Wet, Loose, Brown Poorly-Graded Sand with Silt Some Gravel and Trace Organic Matter	SP-SM -	NP				1 2-3		
90			Wet, Medium Dense, Brown Poorly-Graded Sand with Trace Gravel	SP -	NP				9 13-17		
95			Wet, Dense, Brown Poorly-Graded Sand	SP -	NP				8 13-36		
100			Wet, Dense, Brown Poorly-Graded Sand with Trace Gravel	SP -	NP				16 15-18		
105			Wet, Medium Dense, Brown Poorly-Graded Sand with Silt and Some Organic Matter	SP-SM -	NP				7 11-14		

REMARKS: Cutoff Bayou
Coordinates: 35.0068933, -90.41246333

ARKANSAS DEPARTMENT OF TRANSPORTATION
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BORING NO. 4
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 115+33
LOCATION: 23' Right of Construction Centerline
LOGGED BY: Coty Campbell

DATE: September 24, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Diamond core
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 106.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 198.7								
			Wet, Medium Dense, Brown Poorly-Granded Sand	SP	NP				7 9-16		
			Boring Terminated								
110											
115											
120											
125											
130											
135											
140											

REMARKS: Cutoff Bayou
Coordinates: 35.0068933, -90.41246333

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 115+50
LOCATION: 23' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: November 20, 26, and 27, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 121.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 198.8								
5		X	Moist, Medium Stiff, Brown Clay with Some Organic Matter						2 3-3		
10		X	Moist, Soft, Brown Silty Clay						2 2-2		
15		X									
20		X	Moist, Loose, Brown Sand						2 2-3		
25		X	Moist, Very Loose, Gray Clayey Sand						0 0-0		
30		X							2 2-2		
35		X							3 5-8		

REMARKS: Cutoff Bayou

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BORING NO. 5
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 115+50
LOCATION: 23' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: November 20, 26, and 27, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 121.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 198.8								
		X							6 6-5		
40		X							4 6-5		
45		X							6 9-10		
50		X	Wet, Medium Dense, Gray Sand						7 7-9		
55		X							4 5-8		
60		X							9 11-15		
65		X							6 9-10		
70											

REMARKS: Cutoff Bayou

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 5
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 115+50
LOCATION: 23' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: November 20, 26, and 27, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 121.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 198.8	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
75			Wet, Medium Dense, Gray Sand with Gravel and Organic Matter						6 10-11		
80			Wet, Medium Dense, Gray Sand						6 4-9 7 11-10		
85											
90			Wet, Dense, Gray Sand with Some Gravel						12 15-25		
95			Wet, Dense, Gray Sand						11 15-21 13 15-22		
100											
105			Wet, Very Dense, Gray Sand						26 26-27		

REMARKS: Cutoff Bayou

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 5
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JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 115+50
LOCATION: 23' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: November 20, 26, and 27, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 121.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 198.8								
110			Wet, Dense, Gray Sand						10 18-20		
115			Wet, Dense, Gray Sand						11 15-20		
120			Wet, Very Dense, Gray Sand						23 30-43		
			Wet, Dense, Gray Sand						20 26-24		
125			Boring Terminated								
130											
135											
140											

REMARKS: Cutoff Bayou

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 6
PAGE 1 OF 3

JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 209+06
LOCATION: 27' Right of Construction Centerline
LOGGED BY: Coty Campbell

DATE: September 26 and October 2, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 101.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 195.6	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			Brown Clay	-							
5			Wet, Medium Stiff, Brown Fat Clay	CH	24		69		1 2-3		
				-							
10			Wet, Soft, Brown Lean Clay with Sand	CL	22		31		0 1-2		
				-							
15											
			Wet, Very Loose, Brown Silt	ML	NP				0 0-0		
20				-							
			Wet, Very Soft, Gray Lean Clay	CL	23		31		0 0-0		
25				-							
			Wet, Very Loose, Gray Sandy Silt	ML	23		28		0 1-1		
30				-							
			Wet, Soft, Gray Lean Clay	CL	19		35		1 2-1		
35				-							

REMARKS: * The sampler was blocked off by gravel-sized clast preventing obtaining enough material for testing.

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 6
PAGE 2 OF 3

JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 209+06
LOCATION: 27' Right of Construction Centerline
LOGGED BY: Coty Campbell

DATE: September 26 and October 2, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 101.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 195.6	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
40		X	Wet, Medium Dense, Gray Poorly-Graded Sand with Silt	SP-SM -	NP				6 10-15		
45		X	Wet, Medium Dense, Gray Poorly-Graded Sand with Trace Gravel	SP -	NP				6 9-9		
50		X	Wet, Medium Dense, Gray Poorly-Graded Sand	SP -	NP				7 11-14		
55		X	Wet, Medium Dense, Gray Well-Graded Sand with Gravel	SW -	NP				9 12-13		
60		X	Wet, Medium Dense, Gray Sand with Trace Gravel*	* -	-				6 4-7		
65		X	Wet, Medium Dense, Gray Poorly-Graded Sand	SP -	NP				8 9-10		
70		X	Wet, Dense, Brown Poorly-Graded Sand	SP -	NP				9 13-20		

REMARKS: * The sampler was blocked off by gravel-sized clast preventing obtaining enough material for testing.

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 6
PAGE 3 OF 3

JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 209+06
LOCATION: 27' Right of Construction Centerline
LOGGED BY: Coty Campbell

DATE: September 26 and October 2, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 101.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 195.6	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
75		X	Wet, Dense, Brown Poorly-Graded Sand	SP -	NP				15 18-23		
80		X	Wet, Dense, Brown Poorly-Graded Sand with Trace Organic Matter (Carbonized Wood)	SP -	NP				12 16-27		
85		X	Wet, Dense, Gray Poorly-Graded Sand with Silt	SP-SM -	NP				15 17-28		
90		X	Wet, Dense, Gray Silty Sand	SM -	NP				14 15-18		
95		X	Wet, Dense, Gray Poorly-Graded Sand with Silt and Some Gravel	SP-SM -	NP				15 19-22		
100		X	Wet, Medium Dense, Gray Well-Graded Sand with Gravel	SW -	NP				15 10-18		
105		X	Wet, Dense, Gray Well-Graded Sand with Gravel	SW-SM	NP				15 18-19		
			Boring Terminated								

REMARKS: * The sampler was blocked off by gravel-sized clast preventing obtaining enough material for testing.

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 7
PAGE 1 OF 3

JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 210+87
LOCATION: 25' Right of Construction Centerline
LOGGED BY: Connor Bunton/Stanley Bates

DATE: October 3, 4, and 9, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 101.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 183.2								
5		X	Wet, Very Soft, Gray Clay						0 0-0		
10		X							0 0-0		
15			Wet, Very Soft, Gray Clay with Sand								
20		X							1 0-1		
25			Wet, Very Soft, Gray Sandy Clay								
30		X							2 4-4		
35		X	Wet, Loose, Gray Sand with Silt and Trace Gravel						3 4-6		

REMARKS: Fifteenmile Bayou

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 7
PAGE 2 OF 3

JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 210+87
LOCATION: 25' Right of Construction Centerline
LOGGED BY: Connor Bunton/Stanley Bates

DATE: October 3, 4, and 9, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 101.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 183.2	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
40		X	Wet, Medium Dense, Gray Sand with Silt and Trace Gravel						10 13-14		
45		X	Wet, Loose, Gray Sand with Trace Gravel						4 5-4		
50		X	Wet, Medium Dense, Gray Sand with Trace Gravel						5 9-8		
55		X							7 11-15		
60		X	Wet, Dense, Gray Sand with Trace Gravel						10 20-25		
65		X	Wet, Medium Stiff, Gray Sandy Clay with Some Gravel						2 3-4		
70		X	Wet, Medium Dense, Gray Sand with Trace Gravel						9 13-16		

REMARKS: Fifteenmile Bayou

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 7
PAGE 3 OF 3

JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 210+87
LOCATION: 25' Right of Construction Centerline
LOGGED BY: Connor Bunton/Stanley Bates

DATE: October 3, 4, and 9, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 101.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 183.2	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
75			Wet, Dense, Gray Sand with Silt						8 14-20		
80			Wet, Dense, Gray Sand with Trace Gravel						10 15-17 9 16-23		
85											
90			Wet, Medium Dense, Gray Sand with Gravel						10 12-13		
95			Wet, Medium Dense, Gray Sand with Trace Gravel						12 14-15		
100			Wet, Medium Dense, Gray Sand with Silt and Trace Gravel						10 14-16		
			Wet, Dense, Gray Sand with Silt and Trace Gravel						11 21-25		
105			Boring Terminated								

REMARKS: Fifteenmile Bayou

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 8
PAGE 1 OF 4

JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 211+65
LOCATION: 42' Right of Construction Centerline
LOGGED BY: Stanley Bates

DATE: October 17, 18, and 22, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 121.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 191.1	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
5		X	Moist, Very Soft, Gray Sandy Clay with Some Organic Matter						0 0-0		
10		X	Wet, Very Soft, Gray Sandy Clay						0 0-0		
15		X	Wet, Very Loose, Gray Sand						0 0-0		
20		X	Wet, Soft, Gray Clay						0 1-2		
25		X	Wet, Very Stiff, Gray Clay with Sand and Trace Gravel						0 7-9		
30			Sand with Gravel								
35		X	Wet, Medium Dense, Gray Sand with Some Organic Matter						5 8-10		

REMARKS: Fifteenmile Bayou
Coordinates: 34.979592, -90.435603

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 8
PAGE 2 OF 4

JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 211+65
LOCATION: 42' Right of Construction Centerline
LOGGED BY: Stanley Bates

DATE: October 17, 18, and 22, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 121.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 191.1								
		X							5 9-9		
40		X							4 8-13		
45		X							9 11-11		
			Wet, Medium Dense, Gray Sand								
50		X							6 7-7		
55		X							4 5-7		
60											
		X							9 18-23		
65		X	Wet, Dense, Gray Sand						12 19-19		
70											

REMARKS: Fifteenmile Bayou
Coordinates: 34.979592, -90.435603

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 8
PAGE 3 OF 4

JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 211+65
LOCATION: 42' Right of Construction Centerline
LOGGED BY: Stanley Bates

DATE: October 17, 18, and 22, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 121.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 191.1	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
75			Wet, Loose, Gray Sand with Clay						3 4-5		
80			Wet, Medium Dense, Gray Sand						5 6-8		
85			Wet, Dense, Gray Sand						10 17-19		
90									13 19-24		
95			Wet, Medium Dense, Gray Sand with Trace Gravel						9 9-10		
100			Wet, Dense, Gray Sand with Trace Gravel						15 15-17		
105									11 20-23		

REMARKS: Fifteenmile Bayou
Coordinates: 34.979592, -90.435603

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 8
PAGE 4 OF 4

JOB NO. 110617 St. Francis County
JOB NAME: Fifteenmile and Cutoff Bayous Str. & Apprs. (S)
Route 50 Section 1 / Route 79 Section 17
STATION: 211+65
LOCATION: 42' Right of Construction Centerline
LOGGED BY: Stanley Bates

DATE: October 17, 18, and 22, 2018
TYPE OF DRILLING:
Hollow Stem Auger - Rotary Wash
EQUIPMENT: Acker 2094

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 121.5

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 191.1	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	DRY WEIGHT LBS PER CU.FT.	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
110		X	Wet, Dense, Gray Sand						14 18-21		
115		X	Wet, Very Dense, Gray Sand with Trace Gravel						15 24-37		
120		X	Wet, Very Dense, Gray Sand						21 30-30		
		X	Wet, Dense, Gray Sand with Trace Gravel						19 21-26		
125			Boring Terminated								
130											
135											
140											

REMARKS: Fifteenmile Bayou
Coordinates: 34.979592, -90.435603

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

April 21, 2017

TO: Mr. Trinity Smith, Engineer of Roadway Design

SUBJECT: Job No. 110617
Fifteenmile & Cutoff Bayous Strs. & Apprs. (S)
Routes 50 & 79 Sections 1 & 7
St. Francis County

Transmitted herewith is the requested Soil Survey, strength data and Resilient Modulus test results for the above referenced job. The project consists of replacing the bridges crossing Fifteenmile and Cutoff Bayous on Highways 50 and Highway 79 respectively. Samples were obtained in the existing travel lanes and ditch line. There were no paved shoulders within the project limits.

Based on laboratory results of samples obtained, the subgrade soils consist primarily of highly plastic clay. Cross-sections are not currently available, but it is assumed that the construction grade line will closely match that of the existing roadway. The subgrade soils are expected to provide a stable working platform with normal drying and compactive efforts, if the weather is favorable during construction.

Additional earthwork recommendations will be made upon request when plans are further developed.

Listed below is the additional information requested for use in developing the plans:

1. The Qualified Products List (QPL) indicates that Aggregate Base Course (Class CL-7) is available from commercial producers located at the river ports in West Memphis.

2. Asphalt Concrete Hot Mix

Type	Asphalt Cement %	Mineral Aggregate %
Surface Course	5.3	94.7
Binder Course	4.3	95.7
Base Course	4.0	96.0

Michael C. Benson
Materials Engineer

MCB:pt:bjj
Attachment
cc: State Constr. Eng. – Master File Copy
District 1 Engineer
System Information and Research Div.
G. C. File

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT - LITTLE ROCK, ARKANSAS
MATERIALS DIVISION
MICHAEL BENSON, MATERIALS ENGINEER
*** SOIL SURVEY STRENGTH TEST REPORT ***

DATE - 04/20/2017
JOB NUMBER - 110617

SEQUENCE NO. - 1
MATERIAL CODE - SSRV
SPEC. YEAR - 2014
SUPPLIER ID. - 1
COUNTY/STATE - 68
DISTRICT NO. - 01

JOB NAME - FIFTEEN MILE & CUTOFF BAYOU STRS & APPRS

STATION LIMITS	R-VALUE AT 240 psi
BEGIN JOB - END JOB	LESS THAN 5
RESILIENT MODULUS	
STA. 107+10	7521
STA. 208+00	7908

REMARKS -
-

AASHTO TESTS : T190

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
MATERIALS DIVISION

AASHTO T 307-99 - RESILIENT MODULUS OF SUBGRADE SOILS
RECOMPACTED SAMPLES

Job No.	110617	**Material Code**	SSRVPS
Date Sampled:	3/1/17	**Station No.:**	107+10
Date Tested:	April 14, 2017	**Location:**	16RT
Name of Project:	FIFTEEN MILE & CUTOFF BAYOUS STRS. & APPRS. (S)		
County:	**Code:** 68 **Name:** ST. FRANCIS		
Sampled By:	DICKERSON	**Depth:**	0-5
Lab No.:	20170758	**AASHTO Class:**	A-6(16)
Sample ID:	RV239	**Material Type (1 or 2):**	2
LATITUDE:		**LONGITUDE:**	

1. Testing Information:

Preconditioning - Permanent Strain > 5% (Y=Yes or N= No)	N
Testing - Permanent Strain > 5% (Y=Yes or N=No)	N
Number of Load Sequences Completed (0-15)	15

2. Specimen Information:

Specimen Diameter (in):	
Top	3.96
Middle	3.95
Bottom	3.95
Average	3.95
Membrane Thickness (in):	0.01
Height of Specimen, Cap and Base (in):	8.04
Height of Cap and Base (in):	0.00
Initial Length, Lo (in):	8.04
Initial Area, Ao (sq. in):	12.20
Initial Volume, AoLo (cu. in):	98.09

3. Soil Specimen Weight:

Weight of Wet Soil Used (g):	2980.80

4. Soil Properties:

Optimum Moisture Content (%):	18.1
Maximum Dry Density (pcf):	102.3
95% of MDD (pcf):	97.2
In-Situ Moisture Content (%):	N/A

5. Specimen Properties:

Wet Weight (g):	2980.80
Compaction Moisture content (%):	18.1
Compaction Wet Density (pcf):	115.79
Compaction Dry Density (pcf):	98.04
Moisture Content After Mr Test (%):	18.4

6. Quick Shear Test (Y=Yes, N=No, N/A=Not Applicable): #VALUE!

7. Resilient Modulus, Mr: 11388(Sc)^-0.24140(S3)^0.18178

8. Comments _____

9. Tested By: GW **Date:** April 14, 2017

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
MATERIALS DIVISION

AASHTO T 307-99 - RESILIENT MODULUS OF SUBGRADE SOILS
RECOMPACTED SAMPLES

Job No.	110617	**Material Code**	SSRVPS
Date Sampled:	3/1/17	**Station No.:**	107+10
Date Tested:	April 14, 2017	**Location:**	16RT
Name of Project:	FIFTEEN MILE & CUTOFF BAYOUS STRS. & APPRS. (S)		
County:	**Code:** 68 **Name:** ST. FRANCIS		
Sampled By:	DICKERSON	**Depth:**	0-5
Lab No.:	20170758	**AASHTO Class:**	A-6(16)
Sample ID:	RV239	**Material Type (1 or 2):**	2
LATITUDE:		**LONGITUDE:**	

PARAMETER	*Chamber Confining Pressure*	*Nominal Maximum Axial Stress*	*Actual Applied Max. Axial Load*	*Actual Applied Cyclic Load*	*Actual Applied Contact Load*	*Actual Applied Max. Axial Stress*	*Actual Applied Cyclic Stress*	*Actual Applied Contact Stress*	*Average Recov Def. LVDT 1 and 2*	*Resilient Strain*	*Resilient Modulus*
DESIGNATION	S_3	S_{cyclic}	P_{max}	P_{cyclic}	$P_{contact}$	S_{max}	S_{cyclic}	$S_{contact}$	H_{avg}	ε_r	M_r
UNIT	psi	psi	lbs	lbs	lbs	psi	psi	psi	in	in/in	psi
Sequence 1	6.0	2.0	25.4	22.6	2.8	2.1	1.9	0.2	0.00114	0.00014	13,106
Sequence 2	6.0	4.0	47.5	44.7	2.8	3.9	3.7	0.2	0.00236	0.00029	12,495
Sequence 3	6.0	6.0	70.1	66.4	3.7	5.7	5.4	0.3	0.00389	0.00048	11,247
Sequence 4	6.0	8.0	92.9	86.8	6.1	7.6	7.1	0.5	0.00589	0.00073	9,718
Sequence 5	6.0	10.0	115.3	106.8	8.5	9.5	8.8	0.7	0.00812	0.00101	8,663
Sequence 6	4.0	2.0	25.2	22.5	2.8	2.1	1.8	0.2	0.00123	0.00015	12,031
Sequence 7	4.0	4.0	47.2	44.5	2.7	3.9	3.6	0.2	0.00264	0.00033	11,120
Sequence 8	4.0	6.0	68.7	65.9	2.7	5.6	5.4	0.2	0.00434	0.00054	10,002
Sequence 9	4.0	8.0	91.6	86.5	5.1	7.5	7.1	0.4	0.00630	0.00078	9,046
Sequence 10	4.0	10.0	114.2	106.7	7.5	9.4	8.7	0.6	0.00850	0.00106	8,271
Sequence 11	2.0	2.0	25.3	22.6	2.7	2.1	1.9	0.2	0.00139	0.00017	10,731
Sequence 12	2.0	4.0	46.8	44.1	2.8	3.8	3.6	0.2	0.00296	0.00037	9,812
Sequence 13	2.0	6.0	68.0	65.3	2.7	5.6	5.4	0.2	0.00484	0.00060	8,885
Sequence 14	2.0	8.0	89.9	85.7	4.2	7.4	7.0	0.3	0.00695	0.00086	8,131
Sequence 15	2.0	10.0	112.2	105.5	6.7	9.2	8.6	0.5	0.00925	0.00115	7,521

TESTED BY GW DATE April 14, 2017

REVIEWED BY _____ DATE _____

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

MATERIALS DIVISION

AASHTO T 307-99 - RESILIENT MODULUS OF SUBGRADE SOILS

RECOMPACTED / THINWALL TUBE SAMPLES

Job No.	110617	**Material Code**	SSRVPS
Date Sampled:	3/1/17	**Station No.:**	107+10
Date Tested:	April 14, 2017	**Location:**	16RT
Name of Project:	FIFTEEN MILE & CUTOFF BAYOUS STRS. & APPRS. (S)		
County:	**Code:** 68 **Name:** ST. FRANCIS		
Sampled By:	DICKERSON	**Depth:**	0-5
Lab No.:	20170758	**AASHTO Class:**	A-6(16)
Sample ID:	RV239	**Material Type (1 or 2):**	2
LATITUDE:		**LONGITUDE:**	

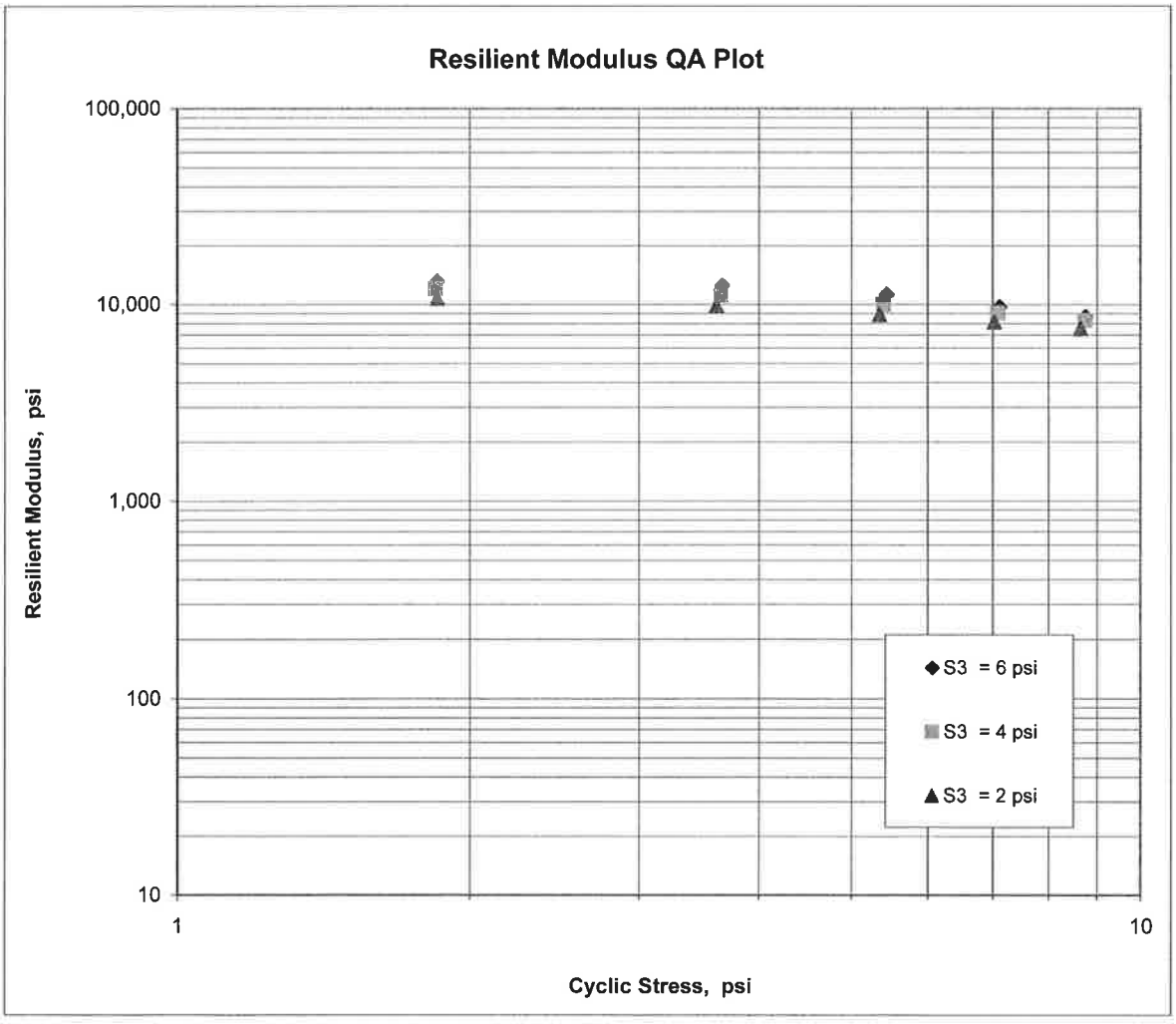
$$M_R = K1\ (S_C)^{K2}\ (S_3)^{K5}$$

K1 = 11,388

K2 = -0.24140

K5 = 0.18178

R^2 = 0.92



ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
MATERIALS DIVISION

AASHTO T 307-99 - RESILIENT MODULUS OF SUBGRADE SOILS
RECOMPACTED SAMPLES

Job No.	110617	**Material Code**	SSRVPS
Date Sampled:	3/1/17	**Station No.:**	208+00
Date Tested:	April 14, 2017	**Location:**	27RT
Name of Project:	FIFTEEN MILE & CUTOFF BAYOUS STRS. & APPRS. (S)		
County:	**Code:** 68 **Name:** ST. FRANCIS		
Sampled By:	DICKERSON	**Depth:**	0-5
Lab No.:	20170759	**AASHTO Class:**	A-7-6(22)
Sample ID:	RV240	**Material Type (1 or 2):**	2
LATITUDE:		**LONGITUDE:**	

1. Testing Information:

Preconditioning - Permanent Strain > 5% (Y=Yes or N= No)	N
Testing - Permanent Strain > 5% (Y=Yes or N=No)	N
Number of Load Sequences Completed (0-15)	15

2. Specimen Information:

Specimen Diameter (in):	
Top	3.94
Middle	3.94
Bottom	3.93
Average	3.94
Membrane Thickness (in):	0.01
Height of Specimen, Cap and Base (in):	8.03
Height of Cap and Base (in):	0.00
Initial Length, Lo (in):	8.03
Initial Area, Ao (sq. in):	12.10
Initial Volume, AoLo (cu. in):	97.14

3. Soil Specimen Weight:

Weight of Wet Soil Used (g):	2947.40

4. Soil Properties:

Optimum Moisture Content (%):	22.0
Maximum Dry Density (pcf):	97.1
95% of MDD (pcf):	92.2
In-Situ Moisture Content (%):	N/A

5. Specimen Properties:

Wet Weight (g):	2947.40
Compaction Moisture content (%):	22.5
Compaction Wet Density (pcf):	115.61
Compaction Dry Density (pcf):	94.37
Moisture Content After Mr Test (%):	22.2

6. Quick Shear Test (Y=Yes, N=No, N/A=Not Applicable): #VALUE!

7. Resilient Modulus, Mr: 11647(Sc)^-0.20292(S3)^0.09801

8. Comments _____

9. Tested By: GW **Date:** April 14, 2017

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
MATERIALS DIVISION

AASHTO T 307-99 - RESILIENT MODULUS OF SUBGRADE SOILS
RECOMPACTED SAMPLES

Job No.	110617	**Material Code**	SSRVPS
Date Sampled:	3/1/17	**Station No.:**	208+00
Date Tested:	April 14, 2017	**Location:**	27RT
Name of Project:	FIFTEEN MILE & CUTOFF BAYOUS STRS. & APPRS. (S)		
County:	**Code:** 68 **Name:** ST. FRANCIS		
Sampled By:	DICKERSON	**Depth:**	0-5
Lab No.:	20170759	**AASHTO Class:**	A-7-6(22)
Sample ID:	RV240	**Material Type (1 or 2):**	2
LATITUDE:		**LONGITUDE:**	

PARAMETER	*Chamber Confining Pressure*	*Nominal Maximum Axial Stress*	*Actual Applied Max. Axial Load*	*Actual Applied Cyclic Load*	*Actual Applied Contact Load*	*Actual Applied Max. Axial Stress*	*Actual Applied Cyclic Stress*	*Actual Applied Contact Stress*	*Average Recov Def. LVDT 1 and 2*	*Resilient Strain*	*Resilient Modulus*
DESIGNATION	S_3	S_{cyclic}	P_{max}	P_{cyclic}	$P_{contact}$	S_{max}	S_{cyclic}	$S_{contact}$	H_{avg}	ε_r	M_r
UNIT	psi	psi	lbs	lbs	lbs	psi	psi	psi	in	in/in	psi
Sequence 1	6.0	2.0	25.1	22.3	2.8	2.1	1.8	0.2	0.00122	0.00015	12,085
Sequence 2	6.0	4.0	47.1	44.3	2.8	3.9	3.7	0.2	0.00255	0.00032	11,543
Sequence 3	6.0	6.0	69.2	65.6	3.6	5.7	5.4	0.3	0.00417	0.00052	10,440
Sequence 4	6.0	8.0	91.8	85.8	6.0	7.6	7.1	0.5	0.00617	0.00077	9,221
Sequence 5	6.0	10.0	113.3	104.9	8.4	9.4	8.7	0.7	0.00850	0.00106	8,186
Sequence 6	4.0	2.0	25.1	22.4	2.7	2.1	1.8	0.2	0.00132	0.00016	11,227
Sequence 7	4.0	4.0	46.8	44.0	2.8	3.9	3.6	0.2	0.00278	0.00035	10,518
Sequence 8	4.0	6.0	68.1	65.3	2.7	5.6	5.4	0.2	0.00441	0.00055	9,826
Sequence 9	4.0	8.0	90.9	85.9	5.0	7.5	7.1	0.4	0.00635	0.00079	8,979
Sequence 10	4.0	10.0	113.0	105.7	7.3	9.3	8.7	0.6	0.00856	0.00107	8,194
Sequence 11	2.0	2.0	25.1	22.5	2.6	2.1	1.9	0.2	0.00143	0.00018	10,465
Sequence 12	2.0	4.0	46.8	44.1	2.7	3.9	3.6	0.2	0.00299	0.00037	9,796
Sequence 13	2.0	6.0	67.9	65.3	2.6	5.6	5.4	0.2	0.00471	0.00059	9,209
Sequence 14	2.0	8.0	89.6	85.5	4.1	7.4	7.1	0.3	0.00666	0.00083	8,523
Sequence 15	2.0	10.0	111.9	105.4	6.5	9.3	8.7	0.5	0.00885	0.00110	7,908

TESTED BY GW DATE April 14, 2017

REVIEWED BY _____ DATE _____

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

MATERIALS DIVISION

AASHTO T 307-99 - RESILIENT MODULUS OF SUBGRADE SOILS

RECOMPACTED / THINWALL TUBE SAMPLES

Job No.	110617	**Material Code**	SSRVPS
Date Sampled:	3/1/17	**Station No.:**	208+00
Date Tested:	April 14, 2017	**Location:**	27RT
Name of Project:	FIFTEEN MILE & CUTOFF BAYOUS STRS. & APPRS. (S)		
County:	**Code:** 68 **Name:** ST. FRANCIS		
Sampled By:	DICKERSON	**Depth:**	0-5
Lab No.:	20170759	**AASHTO Class:**	A-7-6(22)
Sample ID:	RV240	**Material Type (1 or 2):**	2
LATITUDE:		**LONGITUDE:**	

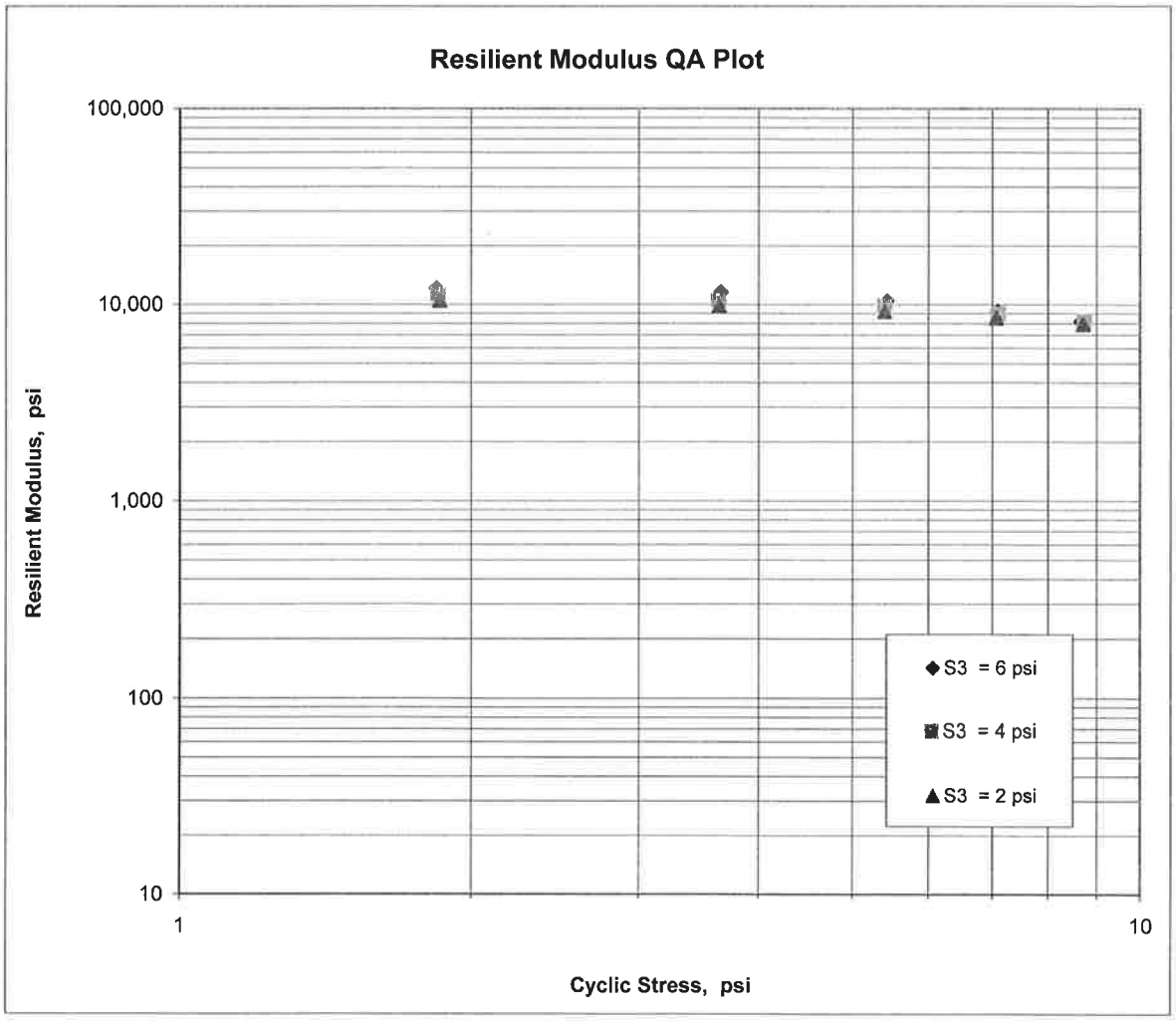
$$M_R = K1\ (S_C)^{K2}\ (S_3)^{K5}$$

K1 = 11,647

K2 = -0.20292

K5 = 0.09801

R^2 = 0.88



JOB: 110617

JOB NAME: FIFTEEN MILE & CUTOFF BAYOU STRS & APPRS

COUNTY NO. 68 **DATE TESTED** 3/28/2017

Arkansas State Highway Transporation Department

Materials Division

Michael Benson, Materials Engineer

STA.#	LOC.	DEPTH	COLOR	#4	#10	#40	#80	#200	L.L.	P.I.	SOIL CLASS	LAB #:	%MOISTURE
				S	I	E	V	E S					
107+10	16 RT	0-5	GRAY	98	97	95	93	90	36	18	A-6(16)	RV239	
208+10	27 RT	0-5	GRAY	95	93	90	80	73	43	33	A-7-6(22)	RV240	
107+00	06 RT	0-5	GRAY	100				90	36	19	A-6(17)	S231	24.4
107+00	16 RT	0-5	GRAY	100				93	34	15	A-6(14)	S232	28.4
120+00	06 LT	0-5	GRAY	98	95	88	84	81	52	33	A-7-6(27)	S233	48.1
120+00	16 LT	0-5	GRAY	98	97	93	91	90	56	35	A-7-6(34)	S234	33
208+00	06 RT	0-5	GRAY	100				91	27	15	A-6(11)	S235	37.8
208+00	27 RT	0-5	GRAY	99	98	95	90	87	49	30	A-7-6(27)	S236	37.9
215+00	06 LT	0-5	GRAY	99	98	96	94	76	34	20	A-6(13)	S237	33.7
215+00	24 LT	0-5	GRAY	99	99	97	95	90	53	38	A-7-6(36)	S238	39.6

comments: W=MULTIPLE LAYERS

Thursday, April 20, 2017

JOB: 110617
JOB NAME: FIFTEEN MILE & CUTOFF BAYOU STRS & APPRS

COUNTY NO. 68

Arkansas State Highway Transporation Department
Materials Division
Michael Benson, Materials Engineer

DATE TESTED
3/28/2017

PAVEMENT SOUNDINGS

STA.#	LOC.				
107+00	16 RT	ACHMSC	ACHMBC	AGG. BASE CRS. CL-7	
		---	---	---	
107+00	06 RT	ACHMSC	ACHMBC	AGG. BASE CRS. CL-7	
		2.25W	**5.0**	**3.0**	
120+00	16 LT	ACHMSC	AGG. BASE CRS. CL-7		
		---	---		
120+00	06 LT	ACHMSC	ACHMBC	AGG. BASE CRS. CL-7	
		4.0W	**4.0**	**5.0**	
208+00	27 RT	ACHMSC	AGG. BASE CRS. CL-7		
		---	---		
208+00	06 RT	ACHMSC	AGG. BASE CRS. CL-7		
		10.0	**5.0**		
215+00	24 LT	ACHMSC	ACHMBC	BASE	AGG. BASE CRS. CL-7
		---	---	---	---
215+00	06 LT	ACHMSC	ACHMBC	BASE	AGG. BASE CRS. CL-7
		7.0W	**3.0**	**1.0**	**5.0**

comments: W=MULTIPLE LAYERS

Thursday, April 20, 2017

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT - LITTLE ROCK, ARKANSAS
MATERIALS DIVISION
MICHAEL BENSON, MATERIALS ENGINEER
*** SOIL SURVEY / PAVEMENT SOUNDING TEST REPORT ***

DATE - 03/28/17
JOB NUMBER - 110617
FEDERAL AID NO.- TO BE ASSIGNED
PURPOSE - SOIL SURVEY SAMPLE
SPEC. REMARKS - NO SPECIFICATION CHECK
SUPPLIER NAME - STATE
SEQUENCE NO. - 1
MATERIAL CODE - SSRVPS
SPEC. YEAR - 2014
SUPPLIER ID. - 1
COUNTY/STATE - 68
DISTRICT NO. - 01
NAME OF PROJECT - FIFTEEN MILE & CUTOFF BAYOU STRS & APPRS
PROJECT ENGINEER - NOT APPLICABLE
PIT/QUARRY - ARKANSAS
LOCATION - ST. FRANCIS COUNTY
SAMPLED BY - D.DICKERSON
SAMPLE FROM - TEST HOLE
DATE SAMPLED - 03/01/17
DATE RECEIVED - 03/09/17
DATE TESTED - 03/28/17
MATERIAL DESC. - SOIL SURVEY - R VALUE- PAVEMENT SOUNDINGS

LAB NUMBER	20170750	20170751	20170752
SAMPLE ID	S231	S232	S233
TEST STATUS	INFORMATION ONLY	INFORMATION ONLY	INFORMATION ONLY
STATION	107+00	107+00	120+00
LOCATION	06 RT	16 RT	06 LT
DEPTH IN FEET	0-5	0-5	0-5
MAT'L COLOR	GRAY	GRAY	GRAY
MAT'L TYPE			
LATITUDE DEG-MIN-SEC	35 24.40	35 00 24.30	35 25.10
LONGITUDE DEG-MIN-SEC	90 24 54.60	90 24 54.60	90 24 41.60
% PASSING 2 IN.			
1 1/2 IN.			
3/4 IN.			
3/8 IN.			100
NO. 4	100	100	98
NO. 10			95
NO. 40			88
NO. 80			84
NO. 200	90	93	81
LIQUID LIMIT	36	34	52
PLASTICITY INDEX	19	15	33
AASHTO SOIL	A-6(17)	A-6(14)	A-7-6(27)
UNIFIED SOIL			
% MOISTURE CONTENT	24.4	28.4	48.1
ACHMSC (IN)	2.25W	---	4.0W
ACHMBC (IN)	5.0	---	4.0
AGG. BASE CRS. CL-7 (IN)	3.0	---	5.0

REMARKS - W=MULTIPLE LAYERS

AASHTO TESTS : T24 T88 T89 T90 T265

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT - LITTLE ROCK, ARKANSAS
MATERIALS DIVISION
MICHAEL BENSON, MATERIALS ENGINEER
*** SOIL SURVEY / PAVEMENT SOUNDING TEST REPORT ***

DATE - 03/28/17
JOB NUMBER - 110617
FEDERAL AID NO.- TO BE ASSIGNED
PURPOSE - SOIL SURVEY SAMPLE
SPEC. REMARKS - NO SPECIFICATION CHECK
SUPPLIER NAME - STATE
SEQUENCE NO. - 2
MATERIAL CODE - SSRVPS
SPEC. YEAR - 2014
SUPPLIER ID. - 1
COUNTY/STATE - 68
DISTRICT NO. - 01
NAME OF PROJECT - FIFTEEN MILE & CUTOFF BAYOU STRS & APPRS
PROJECT ENGINEER - NOT APPLICABLE
PIT/QUARRY - ARKANSAS
LOCATION - ST. FRANCIS COUNTY
SAMPLED BY - D.DICKERSON
SAMPLE FROM - TEST HOLE
DATE SAMPLED - 03/01/17
DATE RECEIVED - 03/09/17
DATE TESTED - 03/28/17
MATERIAL DESC. - SOIL SURVEY - R VALUE- PAVEMENT SOUNDINGS

LAB NUMBER	20170753	20170754	20170755
SAMPLE ID	S234	S235	S236
TEST STATUS	INFORMATION ONLY	INFORMATION ONLY	INFORMATION ONLY
STATION	120+00	208+00	208+00
LOCATION	16 LT	06 RT	27 RT
DEPTH IN FEET	0-5	0-5	0-5
MAT'L COLOR	GRAY	GRAY	GRAY
MAT'L TYPE			
LATITUDE DEG-MIN-SEC	35 25.20	34 58 43.00	34 58 42.80
LONGITUDE DEG-MIN-SEC	90 24 41.60	90 26 13.00	90 26 12.70
% PASSING 2 IN.			
1 1/2 IN.			
3/4 IN.	100		
3/8 IN.	99		100
NO. 4	98	100	99
NO. 10	97		98
NO. 40	93		95
NO. 80	91		90
NO. 200	90	91	87
LIQUID LIMIT	56	27	49
PLASTICITY INDEX	35	15	30
AASHTO SOIL	A-7-6(34)	A-6(11)	A-7-6(27)
UNIFIED SOIL			
% MOISTURE CONTENT	33.0	37.8	37.9
ACHMSC (IN)	---	10.0	---
AGG. BASE CRS. CL-7 (IN)	---	5.0	---

REMARKS - W=MULTIPLE LAYERS

AASHTO TESTS : T24 T88 T89 T90 T265

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT - LITTLE ROCK, ARKANSAS
MATERIALS DIVISION
MICHAEL BENSON, MATERIALS ENGINEER
*** SOIL SURVEY / PAVEMENT SOUNDING TEST REPORT ***

DATE - 04/20/17
JOB NUMBER - 110617
FEDERAL AID NO.- TO BE ASSIGNED
PURPOSE - SOIL SURVEY SAMPLE
SPEC. REMARKS - NO SPECIFICATION CHECK
SUPPLIER NAME - STATE
SEQUENCE NO. - 3
MATERIAL CODE - SSRVPS
SPEC. YEAR - 2014
SUPPLIER ID. - 1
COUNTY/STATE - 68
DISTRICT NO. - 01
NAME OF PROJECT - FIFTEEN MILE & CUTOFF BAYOU STRS & APPRS
PROJECT ENGINEER - NOT APPLICABLE
PIT/QUARRY - ARKANSAS
LOCATION - ST. FRANCIS COUNTY
SAMPLED BY - D.DICKERSON
SAMPLE FROM - TEST HOLE
DATE SAMPLED - 03/01/17
DATE RECEIVED - 03/09/17
DATE TESTED - 03/28/17
MATERIAL DESC. - SOIL SURVEY - R VALUE- PAVEMENT SOUNDINGS

LAB NUMBER	20170756	20170757
SAMPLE ID	S237	S238
TEST STATUS	INFORMATION ONLY	INFORMATION ONLY
STATION	215+00	215+00
LOCATION	06 LT	24 LT
DEPTH IN FEET	0-5	0-5
MAT'L COLOR	GRAY	GRAY
MAT'L TYPE		
LATITUDE DEG-MIN-SEC	34 58 48.90	34 58 48.90
LONGITUDE DEG-MIN-SEC	90 26 5.70	90 26 5.80
% PASSING 2 IN.		
1 1/2 IN.		
3/4 IN.		
3/8 IN.	100	100
NO. 4	99	99
NO. 10	98	99
NO. 40	96	97
NO. 80	94	95
NO. 200	76	90
LIQUID LIMIT	34	53
PLASTICITY INDEX	20	38
AASHTO SOIL	A-6(13)	A-7-6(36)
UNIFIED SOIL		
% MOISTURE CONTENT	33.7	39.6
ACHMSC (IN)	7.0W	---
ACHMBC (IN)	3.0	---
BASE (IN)	1.0	---
AGG. BASE CRS. CL-7 (IN)	5.0	---

REMARKS - W=MULTIPLE LAYERS

AASHTO TESTS : T24 T88 T89 T90 T265

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT - LITTLE ROCK, ARKANSAS
MATERIALS DIVISION
MICHAEL BENSON, MATERIALS ENGINEER
*** SOIL SURVEY / PAVEMENT SOUNDING TEST REPORT ***

DATE	- 04/20/17	SEQUENCE NO.	- 1
JOB NUMBER	- 110617	MATERIAL CODE	- RV
FEDERAL AID NO.	- TO BE ASSIGNED	SPEC. YEAR	- 2014
PURPOSE	- SOIL SURVEY SAMPLE	SUPPLIER ID.	- 1
SPEC. REMARKS	- NO SPECIFICATION CHECK	COUNTY/STATE	- 68
SUPPLIER NAME	- STATE	DISTRICT NO.	- 01

NAME OF PROJECT - FIFTEEN MILE & CUTOFF BAYOU STRS & APPRS
PROJECT ENGINEER - NOT APPLICABLE
PIT/QUARRY - ARKANSAS

LOCATION	- ST. FRANCIS COUNTY	DATE SAMPLED	- 03/01/17
SAMPLED BY	- D.DICKERSON	DATE RECEIVED	- 03/09/17
SAMPLE FROM	- TEST HOLE	DATE TESTED	- 03/28/17

MATERIAL DESC. - SOIL SURVEY - RESISTANCE R-VALUE ACTUAL RESULTS

LAB NUMBER	20170758	20170759
SAMPLE ID	RV239	RV240
TEST STATUS	INFORMATION ONLY	INFORMATION ONLY
STATION	107+10	208+10
LOCATION	16 RT	27 RT
DEPTH IN FEET	0-5	0-5
MAT'L COLOR	GRAY	GRAY
MAT'L TYPE		
LATITUDE DEG-MIN-SEC	35 24.40	34 58 42.90
LONGITUDE DEG-MIN-SEC	90 24 54.50	90 26 12.60
% PASSING 2 IN.		
1 1/2 IN.		
3/4 IN.	100	100
3/8 IN.	99	96
NO. 4	98	95
NO. 10	97	93
NO. 40	95	90
NO. 80	93	80
NO. 200	90	73
LIQUID LIMIT	36	43
PLASTICITY INDEX	18	33
AASHTO SOIL	A-6(16)	A-7-6(22)
UNIFIED SOIL		
% MOISTURE CONTENT		

REMARKS - W=MULTIPLE LAYERS

AASHTO TESTS : T24 T88 T89 T90 T265

ARKANSAS DEPARTMENT OF TRANSPORTATION
ARDOT.gov | IDriveArkansas.com | Scott E. Bennett, P.E., Director
MATERIALS DIVISION
11301 West Baseline Road | P.O. Box 2261 | Little Rock, AR 72203-2261 | Phone: 501.569.2185 | Fax: 501.569.2368

September 19, 2019

TO: Mr. Rick Ellis, Bridge Engineer

SUBJECT: Job No. 110617
Fifteenmile & Cutoff Bayous Strs. & Apprs. (S)
St. Francis County
Routes 50 & 79 Sections 1 & 17

The seismic recommendations included in this memo shall supersede those reported in the IOM dated January 28, 2019. Due to the poor soil conditions at these sites, it is recommended that timber piling be used to densify the soil and provide additional reinforcement against embankment failure due to static and seismic conditions.

Embankment analysis included global stability with seismic design consideration utilizing a horizontal acceleration coefficient of 0.368 for Cutoff Bayou and 0.363 for Fifteenmile Bayou, as provided by Bridge Design. FHWA publication NHI-10-025 Volume II indicates that a value of one-half the horizontal coefficient may be utilized in the design. Therefore, a value of 0.184 for Cutoff Bayou and 0.182 for Fifteenmile Bayou was utilized in this design. The proposed configuration provides for a satisfactory Factor of Safety for seismic and static conditions for the Cutoff Bayou west bridge end embankment only. Utilizing driven timber piles provides a satisfactory Factor of Safety for static conditions. Analyzing the expected displacement resulting from a seismic event utilizing the Newark Block Analysis results in an estimated displacement of 6.9 inches for Cutoff Bayou and 6.3 inches for Fifteenmile Bayou. Since these values are less than ½ the pile diameter or 9 inches, as provided by Bridge Design, the current configurations are therefore adequate for seismic conditions.

Timber piles driven a minimum of 2 feet below finished subgrade on 8 feet center-to-center spacing in both the transverse and longitudinal directions should be placed as described in this report, the attached figures, and the attached Special Provision – Timber Piling for Soil Densification. The end slope toe was used as the reference point for the placement and spacing of all piles in the longitudinal direction and the side slope toe was used as the reference point in the transverse direction. A minimum of one row of piles shall be driven beyond both side slope toes in all embankments. The pile configuration for the east bridge end embankment of Cutoff Bayou is detailed in the attached Figures 1, 2, & 3. Pile configurations for the Fifteenmile bridge end embankments are detailed in the attached Figures 4, 5, 6, 7, 8, & 9.

If you have any questions concerning these recommendations, please contact the Geotechnical Section.

Michael C. Benson
Materials Engineer

MCB:rpt:mlg
cc: State Construction Engineer - Master File Copy
District 1 Engineer
G.C. File

ARKANSAS DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

JOB NO. 110617

TIMBER PILING FOR SOIL DENSIFICATION

DESCRIPTION: This Special Provision covers Timber Piles driven through bridge approach embankments for the purpose of soil densification.

GENERAL: This item shall consist of furnishing and driving untreated or treated piling according to this specification and conforming to the lines, grades, and spacing shown on the plans.

MATERIALS: Materials for timber piling shall conform to the following requirements.

1. Piling may be treated or untreated timber piles. Untreated piles may be of any species that will satisfactorily withstand driving. Treated piles shall be Southern Yellow Pine or Douglas Fir.

2. Piles shall be of sound wood, free from decay or insect damage. Treated piling shall have a minimum amount of red heart. Sound knots shall be no larger than 4" or 1/3 of the diameter of the pile at the point where they occur, whichever is the smaller. The size of a knot shall be its diameter measured at right angles to the length of the pile. Piles may have unsound knots not exceeding 1/2 the permitted size of a sound knot, provided that the unsoundness extends to not more than 1½" depth, and that the adjacent areas of the trunk are not affected. Cluster knots consisting of two or more knots grouped together, the fibers of the wood being deflected around the entire unit, are prohibited. The sum of sizes of all knots in any foot of length of the pile shall not exceed six times the size of the largest permitted single knot.

    a. Holes of 1/2" or less in average diameter will be permitted, provided the sum of the average diameters of all holes in any square foot of pile surface does not exceed 1½".

    b. Twist of spiral grain in any 20' of length shall not exceed 1/2 of the circumference at the midpoint of the length measured.

    c. Splits shall be no longer than the butt diameter. The length of any shake in the outer half of the radius of the butt of the pile, when measured along the curve of the annual ring, shall not exceed 1/3 of the circumference of the butt of the pile. The butts and tips shall be sawed square. The tips may be tapered to a point not less than 4" in diameter.

    d. All piles shall be peeled by removing all of the rough bark and at least 80% of the inner bark. No strip of the inner bark remaining on the pile shall be over 3/4" wide and there shall be at least 1" of clean wood surface between any two such strips. At least 80% of the surface of any circumference shall be clean wood.

ARKANSAS DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

JOB NO. 110617

TIMBER PILING FOR SOIL DENSIFICATION

e. Timber to be used for piling shall be cut above the ground swell and shall taper from butt to tip. A line from the center of the tip to the center of the butt shall not fall outside of the center of the pile at any point more than 1% of the length of the pile. In short bends, the distance from the center of the pile to a line stretched from the center of the pile above the bend to the center of the pile below the bend shall not exceed 4% of the length of the bend or a maximum of 2½". Knots shall be trimmed flush with the body of the pile.

3. Piles shall have a minimum diameter at the tip, measured under the bark, as follows:

Length of Pile	Tip Diameter
Less than 40'	8"
40' to 60'	6"

4. The minimum diameter of piles at sections 3' from the butt, measured under the bark, shall be as follows:

Length of Pile	Southern Yellow Pine, Douglas Fir Diameter	All other Species Diameter
20' to 30'	12"	12"
30' to 40'	12"	13"
Over 40'	13"	14"

The diameter of the pile at the butt shall not exceed 20". The diameter of a pile in cases where the tree is not exactly round shall be determined either by measuring the circumference and dividing the number of inches by 3.14 or by taking the average of the maximum and minimum diameters at the location specified.

STORAGE AND PROTECTION OF MATERIALS: Timber piles shall be stacked on supports at least 12" above the ground surface to avoid absorption of ground moisture. Untreated timber piles shall be open-stacked and stripped to permit free circulation of air between the tiers and courses. When required by the Engineer, untreated material shall be protected from the weather with a suitable cover.

Treated timber piles shall be close-stacked to prevent warping or sagging. The ground underneath and in the vicinity of material stacks shall be kept reasonably clear of vegetation.

PRESERVATION TREATMENT OF TIMBER PILES: Preservation treatment of timber piles shall be accomplished according to the requirements of **Subsection 817.04** of the Standard Specifications.

ARKANSAS DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

JOB NO. 110617

TIMBER PILING FOR SOIL DENSIFICATION

DRIVING: Prior to beginning pile-driving operations the Contractor, shall field verify the location of all underground utilities and obtain approval from the Engineer to begin. The Contractor shall be responsible for all damages and/or claims arising out of the installation of Timber Piling for Soil Densification. Driving equipment that damages the piling shall not be used. Hammers shall be capable of driving to the plan tip elevations without damage to the pile. Driving shall be considered complete once the pile has reached the tip elevation shown on the plans.

1. **Hammers:** All piling shall be driven with an air, steam, or diesel hammer. Gravity hammers will be permitted only when shown on the plans or as elsewhere allowed by the specifications. Hammers shall develop a total energy of not less than 12,500 ft.-lbs.

    a. The plant and equipment furnished for air or steam hammers shall have sufficient capacity to maintain, under working conditions, the pressure at the hammer specified by the manufacturer. Accurate pressure gauges shall be placed at the boiler or tank and at the hammer so that the drop in pressure between the gauges can be determined.

    b. When a single acting diesel hammer is used, it shall be equipped with a stroke indicator or the Contractor must furnish a method approved by the Engineer for determining the actual stroke. When a double acting diesel hammer is used, it shall be equipped with a bounce chamber pressure gauge in good working order mounted near ground level so as to be conveniently read by the Engineer when monitoring energy output of the hammer. The Contractor shall provide charts that equate the chamber pressure to equivalent energy.

2. **Hammer Cushions:** All impact pile driving equipment except gravity hammers shall be equipped with a hammer cushion of suitable thickness to prevent damage to the hammer or pile and to ensure uniform driving behavior. Hammer cushions shall be made of durable, manufactured materials, complying with the hammer manufacturer's guidelines except that all wood, wire rope, and asbestos hammer cushions are specifically prohibited. A striker plate as recommended by the hammer manufacturer shall be placed on the hammer cushion to ensure uniform compression of the cushion material. The hammer cushion shall be inspected in the presence of the Engineer before beginning pile driving at each structure or after each 100 hours of pile driving, whichever is more frequent. When the thickness of a hammer cushion is reduced by more than 25% of its original thickness, the Contractor shall replace it before driving is permitted to continue.

3. **Pile Drive Head:** A pile driven with an impact hammer requires an adequate drive head to distribute the hammer blow to the pile head. The drive head shall be axially aligned with the hammer and the pile. The drive head shall be guided by the leads and shall not be free-swinging. The drive head shall fit around the pile head in a manner that will prevent transfer of torsional forces during driving while maintaining proper alignment of hammer and pile.

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The pile heads shall be cut squarely and a drive head, as recommended by the hammer manufacturer, shall be provided to hold the axis of the pile in line with the axis of the hammer.

4. **Driving Equipment Information:** The Contractor shall submit to the Engineer, for information and record purposes, pile driving equipment information at least 30 days before driving piles. The information shall be submitted on a Pile and Driving Equipment Data Form, which will be supplied by the Engineer. Any change in the driving system will require the Contractor to submit a new Pile and Driving Equipment Data Form.

5. **Additional Equipment:** In case the required penetration is not obtained with a hammer complying with the above minimum requirements, the Contractor shall provide a different hammer and/or sufficient additional equipment at no cost to the Department. Additional equipment not otherwise provided for herein shall be approved by the Engineer prior to its use. Pile tips shall be used where it may be required to reach the minimum tip elevation and shall be at no additional cost to the Department.

6. **Leads:** Pile driver leads shall be constructed in such a manner as to provide freedom for vertical movement of the hammer and shall be held in position in such a manner as to ensure adequate support to the pile during driving. The axis of the leads and hammer shall coincide with the axis of the pile as nearly as practicable.

7. **Accuracy of Driving:** Pile shall be driven with a variation of not more than ¼" per foot from the vertical. Piles spacing shall not differ from those shown on the plans by 1 foot. Piling shall be driven under the observation of the Engineer or his representative so that data may be obtained for determining the penetration.

ORDER LIST FOR PILES: The Contractor shall furnish piles according to an itemized list, which will be furnished by the Engineer, showing the number and length of piles. In determining lengths of piles for ordering and for quantities to be included in the Contract, the lengths given in the order list shall be based on the lengths that are assumed to be driven to minimum penetration and cut off at the elevation shown on the plans.

The Contractor may, at no cost to the Department, increase the lengths given to provide for fresh heading and for such additional length as may be necessary to suit the Contractor's method of operation.

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DEFECTIVE PILES: The Contractor shall not subject piles to excessive abuse that will produce cracking, crushing, splitting, or deformation of the pile. Manipulation of piles to force them into proper position, considered by the Engineer to be excessive, will not be permitted. Any pile damaged because of internal defects or improper driving, or any pile driven out of its proper location or driven below the elevation fixed by the plans or the Engineer, shall be corrected at no cost to the Department by one of the following methods, as approved by the Engineer:

1. The pile may be withdrawn and replaced by a new and, if necessary, longer pile.
2. A second pile may be driven adjacent to the defective or low pile.
3. The pile may be spliced or built up as otherwise provided herein.

Piles pushed up by the driving of adjacent piles or by any other cause shall be re-driven to grade.

Any crushed or damaged portion of piling may be cut off and built up or the pile completely replaced, as approved by the Engineer. Cutoff, buildup, and/or replacement of damaged piles shall be at no cost to the Department. Removing and replacing existing rip-rap or other obstructions shall be considered subsidiary to the item Timber Pile Compaction.

CUTTING OFF TIMBER PILES: Cut-offs shall be a minimum of 2 feet below finished grade at the end bents. In general, the length of the pile above the elevation of the cut-off shall be sufficient to permit the complete removal of any material damaged by driving.

MEASUREMENT AND PAYMENT: Timber Piling will be measured by the actual number of linear feet of accepted pile remaining in the finished work after all cut-offs or build-ups have been made, based upon lengths shown on the plans or established by the Engineer.

Allowance for pile cut-off, where piles have been furnished or built up according to the length shown on the plans or established by the Engineer, will be made at 50% of the cut-off length.

No allowance for cut-off will be made on piling for any length in excess of the lengths shown on the plans or established by the Engineer.

For piles furnished according to the lengths shown on the plans or established by the Engineer that are found to be too short and are spliced according to details shown in the plans, an allowance of 4 linear feet of piling will be made for each timber pile splice in addition to the actual length of accepted pile in place.

No allowance will be made for cut-off or build-up of any portion of a pile that has been damaged, for splices made for the convenience of the Contractor, for extra length ordered for the Contractor's convenience, or for cutback necessary for splicing. Cut-off material shall become the property and responsibility of the Contractor.

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BASIS OF PAYMENT: Work completed and accepted and measured as provided above will be paid for at the contract unit price bid per linear foot for Timber Compaction Pile, which price shall be full compensation for furnishing, transporting, handling and storing material, driving, drilling, and excavation, for cut-off, splicing, and build-up in accordance with the requirements of theses Specifications, and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	**Pay Unit**
Timber Compaction Pile	Linear Foot

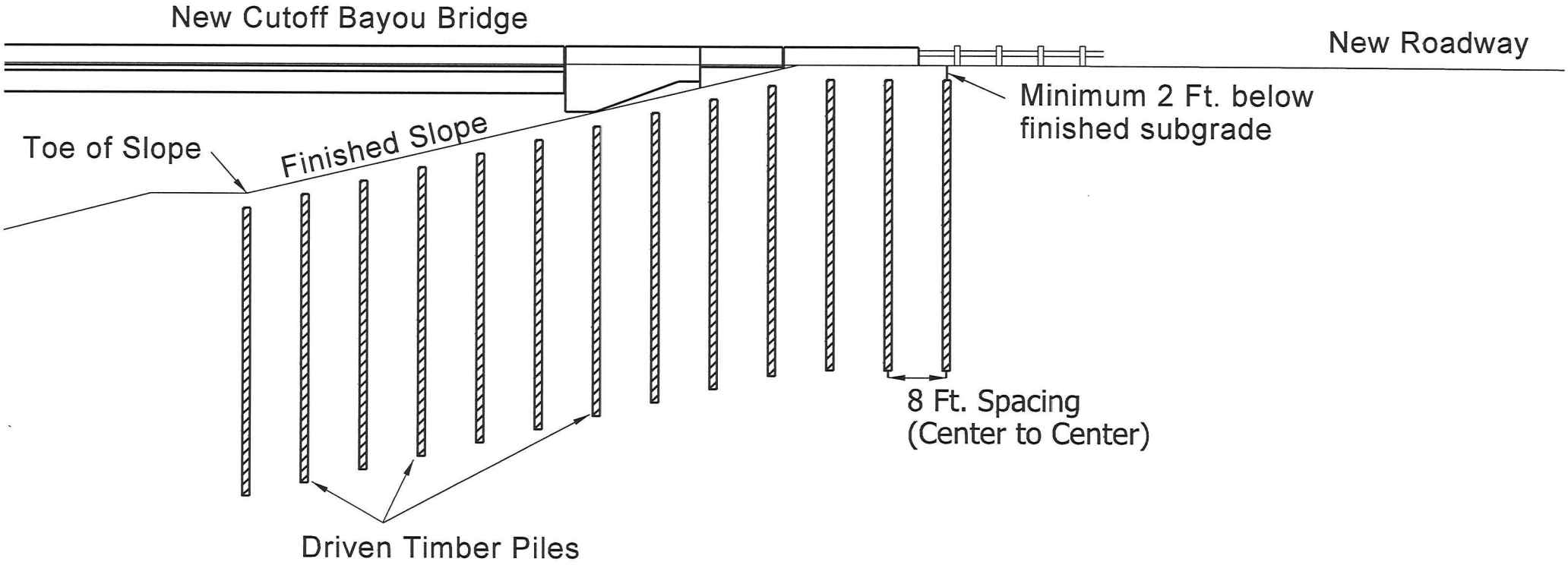

Figure 1 - Cutoff Bayou East
Bridge End Embankment

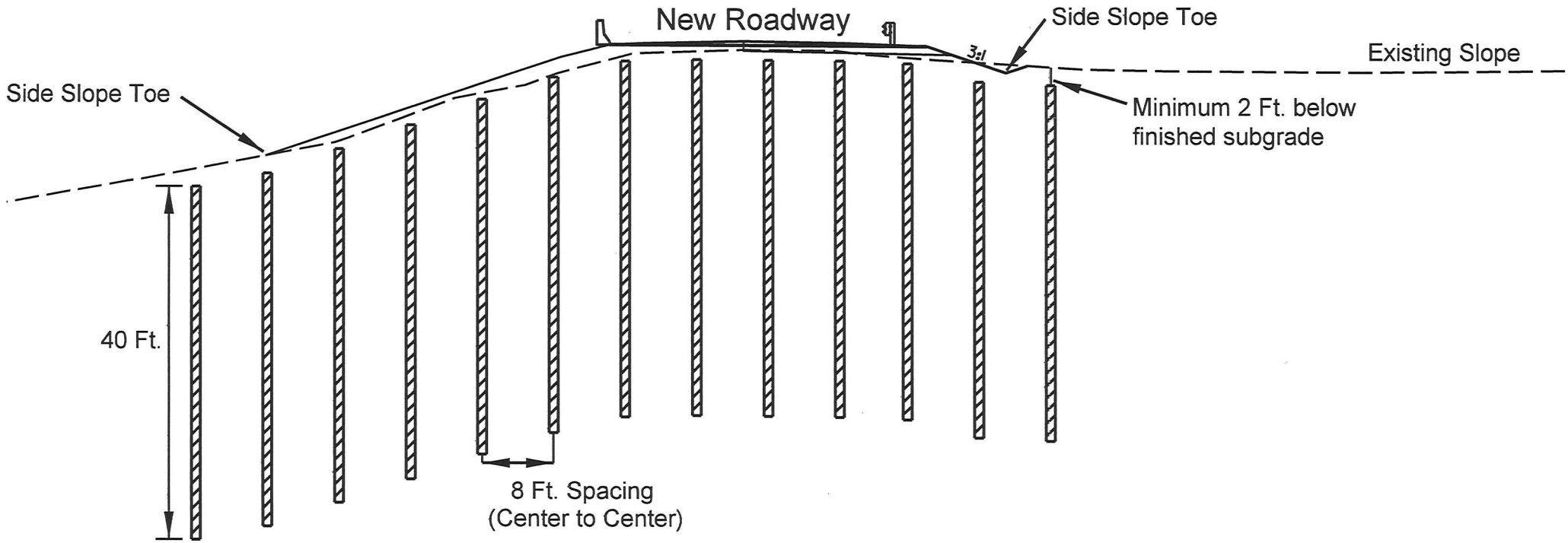

Figure 2 - Cutoff Bayou East Bridge End Embankment

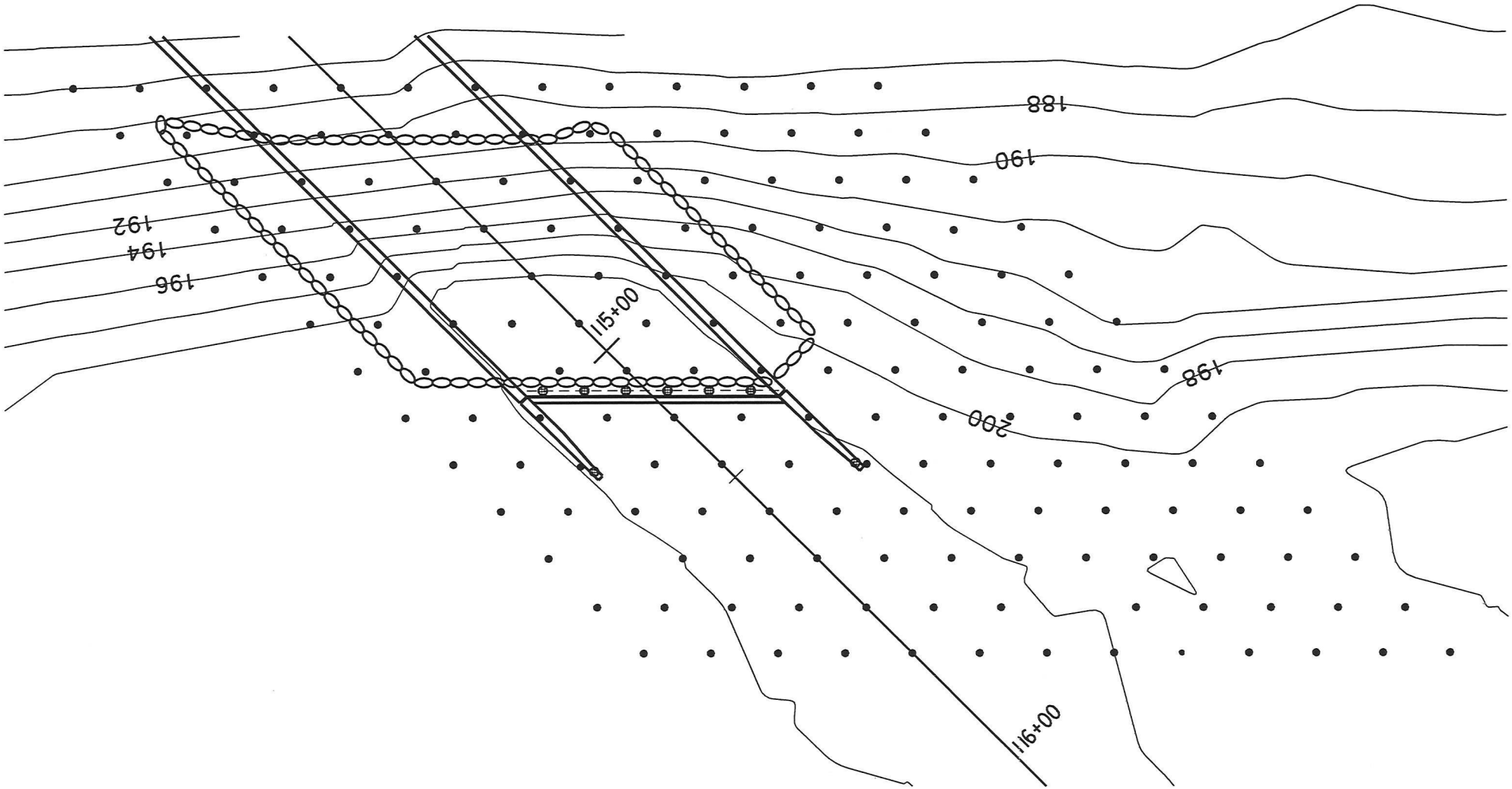

Figure 3 - Cutoff Bayou Timber Pile Plan View

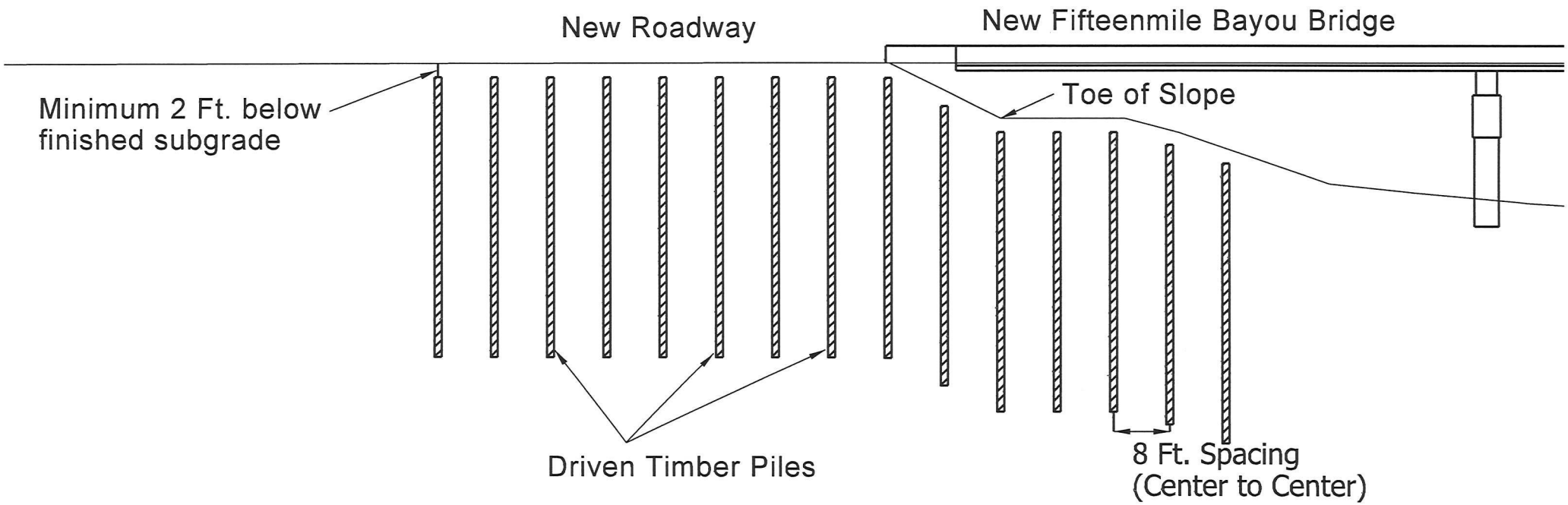

Figure 4 - Fifteenmile Bayou Southwest
Bridge End Embankment

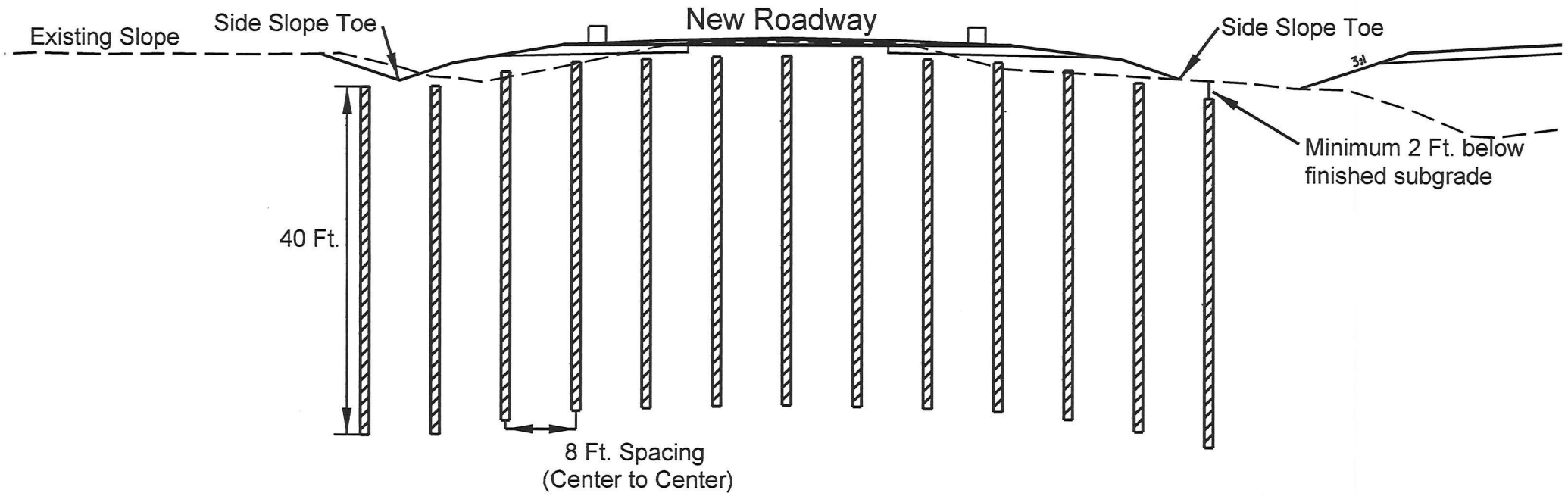

Figure 5 - Fifteenmile Bayou Southwest
Bridge End Embankment

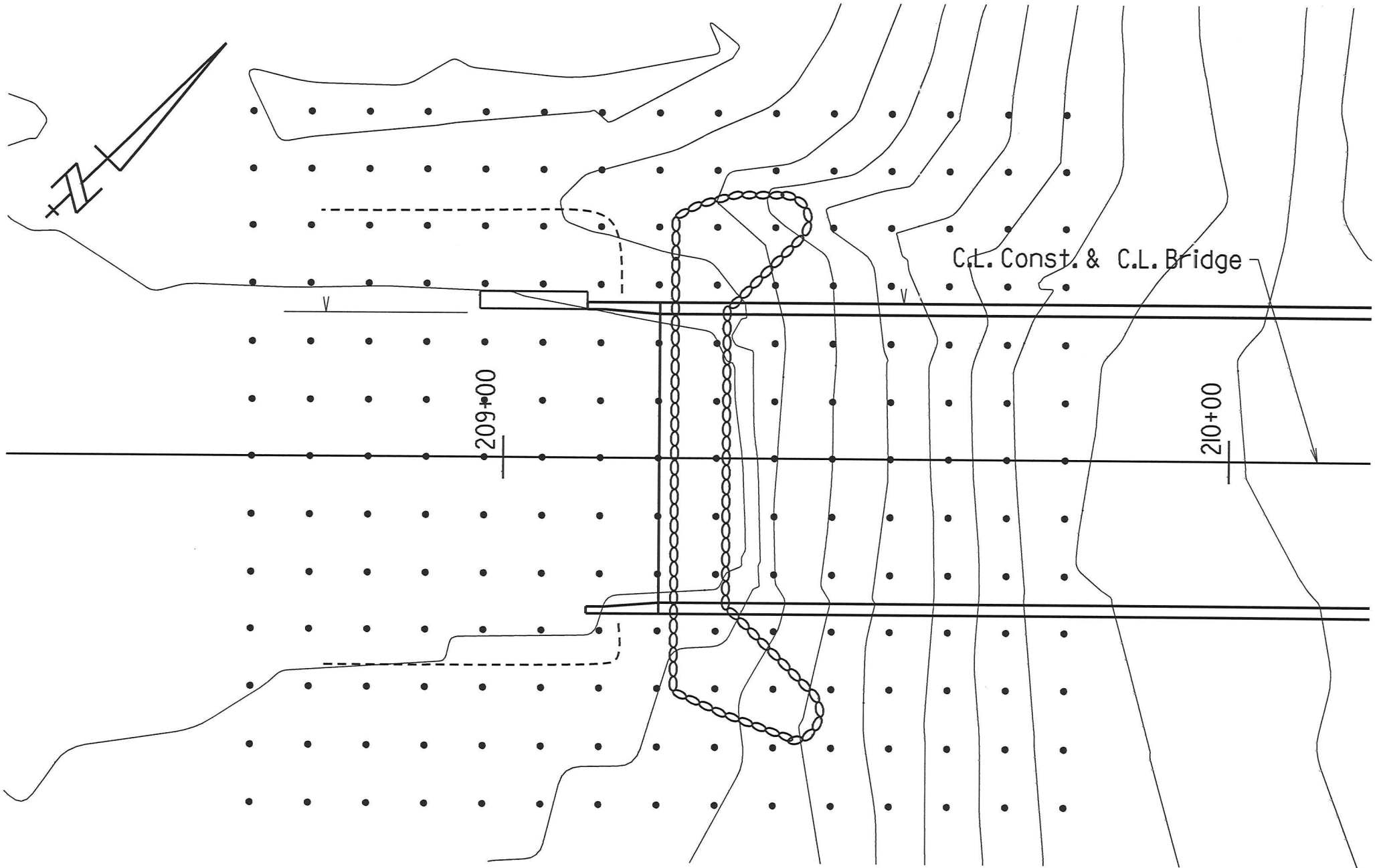

Figure 6 - Fifteenmile Bayou Southwest
Bridge End Timber Pile Plan View

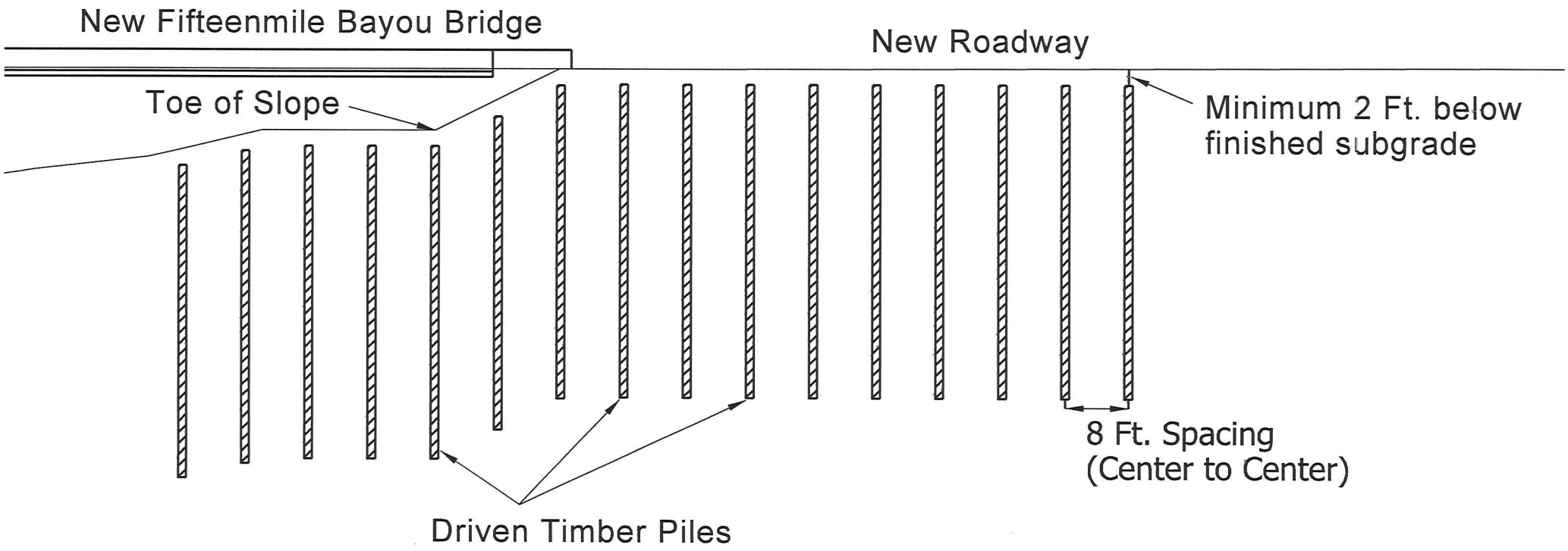

Figure 7 - Fifteenmile Bayou Northeast
Bridge End Embankment

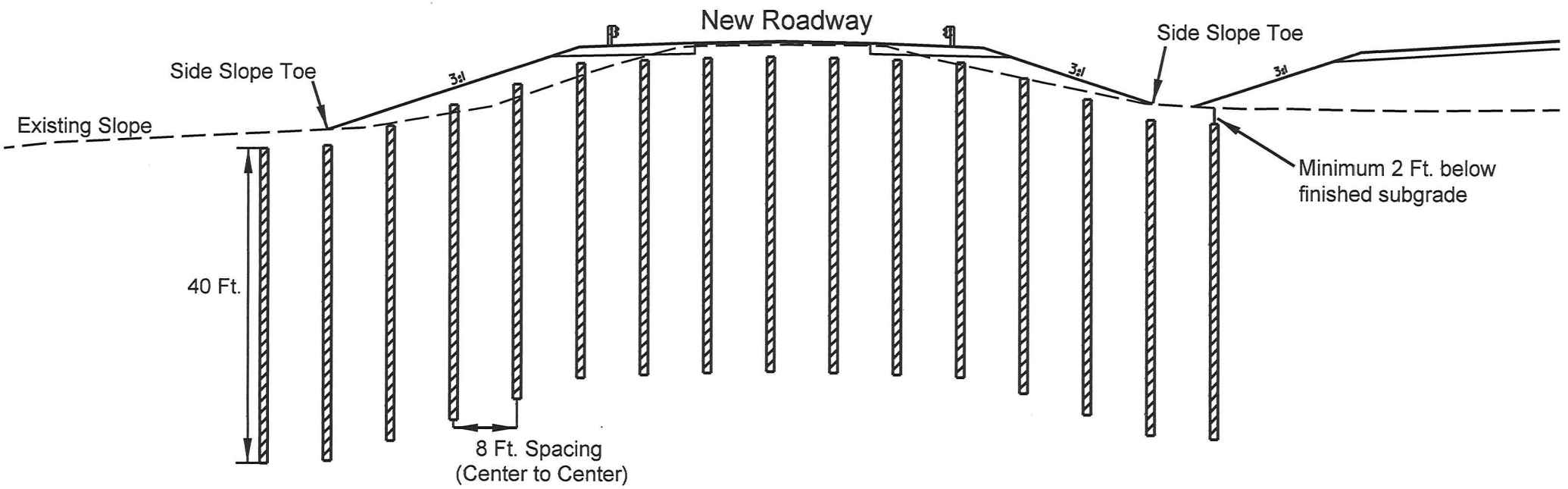

Figure 8 - Fifteenmile Bayou Northeast
Bridge End Embankment

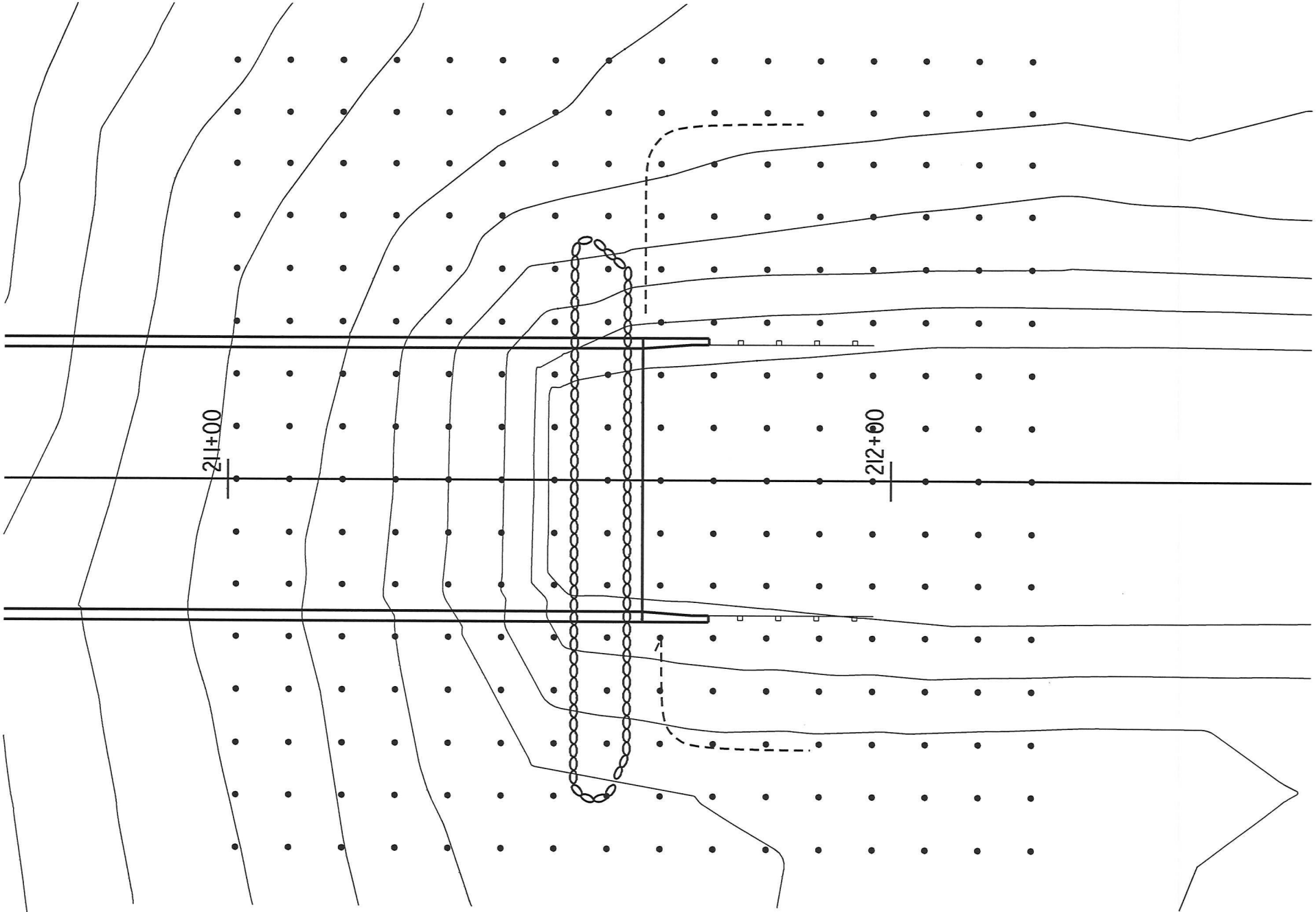

Figure 9 - Fifteenmile Bayou Northeast
Bridge End Timber Pile Plan View