

ARKANSAS DEPARTMENT OF TRANSPORTATION



SUBSURFACE INVESTIGATION

STATE JOB NO. BR0406

FEDERAL AID PROJECT NO. STPB-0004(78)

OSAGE CREEK STR. & APPRS. NO. 2 (S)

COUNTY ROAD NO. CR1785

IN BENTON COUNTY

The information contained herein was obtained by the Department for design and estimating purposes only. It is being furnished with the express understanding that said information does not constitute a part of the Proposal or Contract and represents only the best knowledge of the Department as to the location, character and depth of the materials encountered. The information is only included and made available so that bidders may have access to subsurface information obtained by the Department and is not intended to be a substitute for personal investigation, interpretation and judgment of the bidder. The bidder should be cognizant of the possibility that conditions affecting the cost and/or quantities of work to be performed may differ from those indicated herein.



ARKANSAS DEPARTMENT OF TRANSPORTATION

AR DOT.gov | I Drive Arkansas.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

March 9, 2020

TO: Mr. Rick Ellis, Bridge Engineer
SUBJECT: Job No. BR0406
Osage Creek Str. & Apprs. No. 2 (S)
Benton County
County Road 1785

Transmitted herewith are a brief summary of the geology and site conditions, rock core unconfined compression test summary, RMR, D50 scour analysis, and the logs of the borings conducted for the structures and approaches of the above referenced project.

This project consists of replacing the Benton County Road 1785 (Old Highway 68) Bridge crossing Osage Creek, east of Siloam Springs. The new bridge will be constructed on the same alignment as the existing.

Based on the depth at which bedrock was encountered and correspondence with Bridge Design, it is anticipated that both end bents will be founded on piling bearing on rock and all intermediate bents will be founded on spread footings.

TABLE 1 – Bearing Capacity Recommendations for Spread Footings

Table with 3 columns: Nominal Bearing Resistance (KSF), Factored Bearing Resistance (KSF), Bearing Resistance at Service Limit State (KSF). Values: 78, 35, 20.

It is acceptable to utilize 2H:1V end slopes for the proposed embankments. This embankment geometry provides a satisfactory Factor of Safety for static conditions.

Signature of Michael C. Benson, Materials Engineer

MCB:rpt:mlg
cc: State Construction Engineer - Master File Copy
District 9 Engineer
G.C. File

GEOLOGY AND SITE CONDITIONS
Job BR0406
Osage Creek STR. & APPRS. No. 2 (S)
Benton County
County Road 1785

Site Conditions

The existing County Road 1785 (Old Hwy. 68) Bridge is an approximately 300 feet long, 9 span, east to west oriented bridge that crosses Osage Creek. The superstructure consists of cast-in-place concrete decking, resting on steel beams, supported by pier walls on spread footings. The guardrails are composed of steel supported by steel posts leading up to the bridge and concrete posts on the bridge. The endwalls are composed of concrete with riprap placed on the abutments to help prevent erosion.

From the bridge, Osage Creek flows to the southwest for approximately one-third of a mile before reaching its confluence with the Illinois River. The channel is lined with trees and pastureland beyond. The river passes through a conservation easement to the north of the bridge. A buried telecommunication line parallels the south side of the roadway. It is buried up-and down-station from the bridge and runs overhead over the channel.

Site Geology

The project alignment is located in the Chattanooga Formation (mapped as MDcp). The Chattanooga is typically composed of black, fissile clay shale that weathers into thin flakes. The beds are usually cut by prominent joints creating polygonal blocks upon weathering. The upper part of the formation may be slightly sandy and usually contains abundant pyrite. The Chattanooga Shale is all Devonian in Arkansas. A lower sandstone member (Sylamore Sandstone) may dominate or fill the Chattanooga Shale interval in some areas. The Sylamore is a white to dark-gray phosphatic quartz sandstone. Its texture is fine-grained to sandy conglomerate. The thickness of the Chattanooga Shale (including the Sylamore Sandstone) ranges from 0 to about 85 feet, but normally averages about 30 feet. Shale was encountered in borings at depths ranging from 6.1 to 12.7 feet below ground level.

Scour Potential

In October 2019, flooding occurred in many streams in northwest Arkansas, including Osage Creek. This high-flow event caused a great deal of scour in the stream banks and in the bridge abutments. The flow was high enough to deposit gravel in the fields outside of the streambed. Due to the tremendous scour created by the flood, it is impossible to discern how much scour is caused by normal flow conditions. The scour sample graded out to be gravelly lean clay with sand, which would not be expected to have a high scour potential under typical flow conditions.

Subsurface Conditions

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

- 0 to 6.1 Feet: Varies from moist to wet, very loose to medium dense, brown **silty sand with some gravel** to **sand with gravel** to very soft, brown **sandy clay**.
- 6.1 to 12.7 Feet: Varies from wet, very loose to medium dense, brown **silty sand with some gravel** to **sand with gravel** to very soft, brown **sandy clay** to unweathered, medium hard, dark gray **shale** with occasional to frequent fractures.
- 12.7 to 34.7 Feet: Consists of unweathered, medium hard, dark gray **shale** with occasional to frequent fractures.

Rock Core Unconfined Compression Test Summary

Project Number: BR0406
 Project Name: Osage Creek Str. & Apprs. No. 2 (S)
 Date Tested: 2/18/2020

Station	Location	Sample No.	Depth (ft.)	Diameter (in)	Height (in)	Total Load (lbs.)	Correction Factor	Stress (psi)	Remarks
106+80	24' Lt	1	9.7	1.75	3.87	25,540	1.00	10,641	Pyrite/Calcite/SH
106+80	24' Lt	2	14.3	1.75	3.26	4,640	1.00	1,933	SH
106+80	24' Lt	3	21.6	1.75	2.10	12,960	0.918	4,957	SH
107+80	18' Lt	4	10.3	1.75	3.50	22,420	1.00	9,341	Pyrite/Calcite/SH
107+80	18' Lt	5	15.6	1.75	3.75	5,130	1.00	2,137	SH
107+80	18' Lt	6	20.6	1.75	1.80	9,950	0.875	3,627	SH
109+50	22' Lt	7	11.0	1.75	2.33	8,050	0.940	3,152	SH
109+50	22' Lt	8	16.3	1.75	2.05	7,980	0.911	3,029	SH
109+50	22' Lt	9	22.7	1.75	3.55	4,250	1.00	1,770	SH
109+80	18' Lt	10	11.9	1.75	3.83	2,980	1.00	1,241	SH
109+80	18' Lt	11	15.8	1.75	3.96	11,070	1.00	4,612	SH
109+80	18' Lt	12	22.7	1.75	3.54	3,580	1.00	1,491	SH

Terminology

SH = Shale

* Please note any broken samples, fractures or other characteristics of sample in Remarks.

ROCK MASS RATING SUMMARY

JOB # **BR0406**

SAMPLE #1

Station/Location	106+80/24' LT
Depth (ft)	9.7
Relative Rating	
Uniaxial Compressive Strength	7
RQD	17
Spacing of Joints	30
Condition of Joints	25
Groundwater Conditions	7
Sum	86
Class Number	I
Description	VERY GOOD ROCK

SAMPLE #2

Station/Location	106+80/24' LT
Depth (ft)	14.3
Relative Rating	
Uniaxial Compressive Strength	2
RQD	20
Spacing of Joints	30
Condition of Joints	25
Groundwater Conditions	7
Sum	84
Class Number	I
Description	VERY GOOD ROCK

SAMPLE #3

Station/Location	106+80/24' LT
Depth (ft)	21.6
Relative Rating	
Uniaxial Compressive Strength	4
RQD	17
Spacing of Joints	25
Condition of Joints	20
Groundwater Conditions	7
Sum	73
Class Number	II
Description	GOOD ROCK

SAMPLE #4

Station/Location	107+80/18' LT
Depth (ft)	10.3
Relative Rating	
Uniaxial Compressive Strength	7
RQD	13
Spacing of Joints	20
Condition of Joints	20
Groundwater Conditions	7
Sum	67
Class Number	II
Description	GOOD ROCK

SAMPLE #5

Station/Location	107+80/18' LT
Depth (ft)	15.6
Relative Rating	
Uniaxial Compressive Strength	2
RQD	13
Spacing of Joints	10
Condition of Joints	20
Groundwater Conditions	7
Sum	52
Class Number	III
Description	FAIR ROCK

SAMPLE #6

Station/Location	107+80/18' LT
Depth (ft)	20.6
Relative Rating	
Uniaxial Compressive Strength	4
RQD	13
Spacing of Joints	25
Condition of Joints	20
Groundwater Conditions	7
Sum	69
Class Number	II
Description	GOOD ROCK

SAMPLE #7

Station/Location	109+50/22' LT
Depth (ft)	11.0
Relative Rating	
Uniaxial Compressive Strength	2
RQD	13
Spacing of Joints	25
Condition of Joints	25
Groundwater Conditions	7
Sum	72
Class Number	II
Description	GOOD ROCK

SAMPLE #8

Station/Location	109+50/22' LT
Depth (ft)	16.3
Relative Rating	
Uniaxial Compressive Strength	2
RQD	17
Spacing of Joints	25
Condition of Joints	25
Groundwater Conditions	7
Sum	76
Class Number	II
Description	GOOD ROCK

ROCK MASS RATING SUMMARY

JOB # **BR0406**

SAMPLE #9

Station/Location	109+50/22' LT
Depth (ft)	22.7
Relative Rating	
Uniaxial Compressive Strength	2
RQD	20
Spacing of Joints	30
Condition of Joints	25
Groundwater Conditions	7
Sum	84
Class Number	I
Description	VERY GOOD ROCK

SAMPLE #10

Station/Location	106+80/24' LT
Depth (ft)	11.9
Relative Rating	
Uniaxial Compressive Strength	1
RQD	8
Spacing of Joints	20
Condition of Joints	20
Groundwater Conditions	7
Sum	56
Class Number	III
Description	FAIR ROCK

SAMPLE #11

Station/Location	106+80/24' LT
Depth (ft)	15.8
Relative Rating	
Uniaxial Compressive Strength	4
RQD	13
Spacing of Joints	10
Condition of Joints	20
Groundwater Conditions	7
Sum	54
Class Number	III
Description	FAIR ROCK

SAMPLE #12

Station/Location	109+80/18' LT
Depth (ft)	22.7
Relative Rating	
Uniaxial Compressive Strength	1
RQD	17
Spacing of Joints	20
Condition of Joints	20
Groundwater Conditions	7
Sum	65
Class Number	II
Description	GOOD ROCK

SAMPLE #13

Station/Location	
Depth (ft)	
Relative Rating	
Uniaxial Compressive Strength	
RQD	
Spacing of Joints	
Condition of Joints	
Groundwater Conditions	
Sum	
Class Number	
Description	

SAMPLE #14

Station/Location	
Depth (ft)	
Relative Rating	
Uniaxial Compressive Strength	
RQD	
Spacing of Joints	
Condition of Joints	
Groundwater Conditions	
Sum	
Class Number	
Description	

SAMPLE #15

Station/Location	
Depth (ft)	
Relative Rating	
Uniaxial Compressive Strength	
RQD	
Spacing of Joints	
Condition of Joints	
Groundwater Conditions	
Sum	
Class Number	
Description	

SAMPLE #16

Station/Location	
Depth (ft)	
Relative Rating	
Uniaxial Compressive Strength	
RQD	
Spacing of Joints	
Condition of Joints	
Groundwater Conditions	
Sum	
Class Number	
Description	

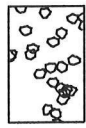
**D₅₀ AGGREGATE ANALYSIS
FOR SCOUR CALCULATIONS**

Job No. BR0406						
Creek Name	Station	Sample Type	Location	Depth (FT)	Soil Description	Aggregate Size (D50) (IN)
Osage Creek	110+25	Creek Bank	80' Left of Const. C.L.	N/A	CL Gravelly Lean Clay with Sand	Less than 0.0029

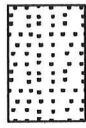
LEGEND

SOIL TYPES

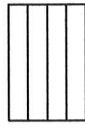
(SHOWN IN SYMBOL COLUMN)
(PREDOMINANT TYPE SHOWN HEAVY)



GRAVEL



SAND



SILT



CLAY



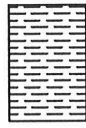
ORGANIC
MATTER

ROCK TYPES

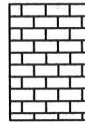
(SHOWN IN SYMBOL COLUMN)



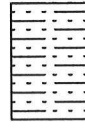
SANDSTONE



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

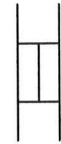


SAMPLE
RECOVERY



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, and 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: $\frac{6}{8-9} \Rightarrow 8+9 = 17 \text{ blows/ft}$. 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
PAGE 1 OF 1

JOB NO. BR0406 Benton County
JOB NAME: Osage Creek Str. & Apprs. No.2 (S)
Co. Rd. 1785
STATION: 105+80
LOCATION: 50' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: January 7, 2020
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: Acker 2094
HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 30

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.	% T C R	% R Q D
			SURFACE ELEVATION: 982.8									
5			Clayey Sand with Some Gravel									
			Wet, Very Dense, Brown Clayey Sand with Some Gravel							9		
			SHALE							39-60 (11")		
10			SHALE - Slightly Weathered, Medium Hard, Occasional Pyrite Seams, Dark Gray								100	0
15			SHALE - Slightly Weathered, Medium Hard, Occasional Fractures, Occasional Calcite and Pyrite Seams, Dark Gray								100	53
20			SHALE - Unweathered, Medium Hard, Occasional Fractures, Occasional Pyrite Seams, Dark Gray								100	56
25			SHALE - Unweathered, Medium Hard, Occasional Pyrite Seams, Dark Gray								96	96
30			SHALE - Unweathered, Medium Hard, Occasional Calcite Layers, Dark Gray								100	98
			Boring Terminated									
35												

REMARKS:

**ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. 2
PAGE 1 OF 1

JOB NO. BR0406 Benton County
JOB NAME: Osage Creek Str. & Apprs. No.2 (S)
Co. Rd. 1785
STATION: 106+80
LOCATION: 24' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: January 8, 2020
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: Acker 2094
HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 29.3

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.	% T C R	% R Q D
			SURFACE ELEVATION: 980.0									
5			Clayey Sand*									
			Wet, Medium Dense, Brown Sand with Gravel							6 7-5		
10			SHALE							10 (0")		
			SHALE - Unweathered, Medium Hard, Occasional Calcite and Pyrite Layers, Dark Gray								90	76
15			SHALE - Unweathered, Medium Hard, Dark Gray								100	100
20											97	94
25			SHALE - Unweathered, Medium Hard, Occasional Calcite and Pyrite Layers, Dark Gray								97	72
30			Boring Terminated									
35												

REMARKS: * Water was encountered at 2.6' bgl.

**ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. 3
PAGE 1 OF 1

JOB NO. BR0406 Benton County
JOB NAME: Osage Creek Str. & Apprs. No.2 (S)
Co. Rd. 1785
STATION: 107+80
LOCATION: 18' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: January 14, 2020
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: Acker 2094
HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 30

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.	% T C R	% R Q D
			SURFACE ELEVATION: 979.7									
5			Sand with Clay									
			Wet, Medium Dense, Brown Silty Sand with Gravel*							9 9-9		
10			SHALE							10 (0")		
15			SHALE - Unweathered, Medium Hard, Occasional Calcite and Pyrite Layers, Dark Gray								82	52
20			SHALE WITH OCCASION- Unweathered, Medium Hard, Frequent Fractures, Occasional Pyrite Layers, Dark Gray								96	61
25			SHALE - Unweathered, Medium Hard, Occasional Pyrite Seams, Dark Gray								96	72
30			SHALE - Unweathered, Medium Hard, Occasional Calcite and Pyrite Layers, Dark Gray								97	76
			Boring Terminated									
35												

REMARKS: * Water was encountered at 5.7 ft below ground level.

**ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. 4
PAGE 1 OF 1

JOB NO. BR0406 Benton County
JOB NAME: Osage Creek Str. & Apprs. No.2 (S)
Co. Rd. 1785
STATION: 109+50
LOCATION: 22' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: January 14, 2020
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: Acker 2094
HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 33.6

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.	% T C R	% R Q D
			SURFACE ELEVATION: 980.9									
5			Sand with Gravel									
			Wet, Medium Dense, Brown Sand with Gravel*							9 11-8		
10			SHALE									
			SHALE (No Sample)							13 (2")		
			SHALE - Unweathered, Medium Hard, Occasional Calcite and Pyrite Layers, Dark Gray								95	66
15			SHALE - Unweathered, Medium Hard, Occasional Calcite Layers, Dark Gray								96	82
20			SHALE - Unweathered, Medium Hard, Occasional Fractures, Occasional Pyrite Seams, Dark Gray								100	90
25			SHALE - Unweathered, Medium Hard, Occasional Pyrite Layers, Dark Gray								100	98
30			SHALE - Unweathered, Medium Hard, Occasional Fractures, Occasional Calcite Layers, Dark Gray								90	50
35			Boring Terminated									

REMARKS: * Water was encountered at 5.2 ft below ground level.

**ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. 5
PAGE 1 OF 1

JOB NO. BR0406 Benton County
JOB NAME: Osage Creek Str. & Apprs. No.2 (S)
Co. Rd. 1785
STATION: 109+80
LOCATION: 18' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: January 27, 2020
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: Acker 2094
HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 30.3

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.	% T C R	% R Q D
			SURFACE ELEVATION: 980.3									
5			Silty Sand									
			Wet, Very Loose, Brown Silty Sand with Some Gravel							0 0-0		
10			SHALE									
			SHALE - (No Sample)							10 (1")		
15			SHALE - Unweathered, Medium Hard, Frequent Fractures, Dark Gray								100	33
20			SHALE - Unweathered, Medium Hard, Frequent Fractures, Occasional Pyrite Seams, Dark Gray								100	56
25			SHALE - Unweathered, Medium Hard, Occasional Fractures, Occasional Pyrite Nodules, Dark Gray								94	80
30			SHALE - Unweathered, Medium Hard, Occasional Fractures, Occasional Pyrite Nodules, Dark Gray								100	80
			Boring Terminated									
35												

REMARKS:


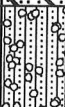
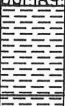
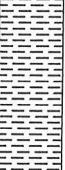



**ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. 6
PAGE 1 OF 2

JOB NO. BR0406 Benton County
JOB NAME: Osage Creek Str. & Apprs. No.2 (S)
Co. Rd. 1785
STATION: 110+80
LOCATION: 55' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: January 28, 2020
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: Acker 2094
HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 34.7

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.	% T C R	% R O D
			SURFACE ELEVATION: 984.3									
5		X	Moist, Very Soft, Brown Sandy Clay							0 0-1		
10		X	Wet, Medium Dense, Brown Sand with Silt and Gravel							4 5-6		
15			SHALE							10 (0")		
20			SHALE - Unweathered, Medium Hard, Frequent Fractures, Dark Gray								100	26
25			SHALE - Unweathered, Medium Hard, Frequent Fractures, Occasional Calcite Layers, Dark Gray								100	26
30			SHALE - Unweathered, Medium Hard, Frequent Fractures, Occasional Pyrite Nodules, Dark Gray								100	57
35			SHALE - Unweathered, Medium Hard, Occasional Fractures, Occasional Pyrite Nodules, Dark Gray								100	88

REMARKS:

**ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.**

BORING NO. 6
PAGE 2 OF 2

JOB NO. BR0406 Benton County
JOB NAME: Osage Creek Str. & Apprs. No.2 (S)
Co. Rd. 1785
STATION: 110+80
LOCATION: 55' Left of Construction Centerline
LOGGED BY: Stanley Bates

DATE: January 28, 2020
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: Acker 2094
HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 34.7

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.	% T C R	% R Q D
			SURFACE ELEVATION: 984.3									
			Boring Terminated									
40												
45												
50												
55												
60												
65												
70												

REMARKS:



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

October 17, 2018

TO: Mr. Claude Klinck, Engineer of State Aid

SUBJECT: Job No. BR0406
Osage Creek Strs. & Apprs. No. 2 (S)
Co. Rd. 1785
Benton 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 bridge crossing Osage Creek on County Road 1785 in Benton County. Samples were taken in the existing travel lanes, shoulders and ditch line.

Based on laboratory results of samples obtained, the subgrade soils consist primarily of low plasticity cherty clay. The subgrade soils are expected to provide a stable working platform with conventional processing if the weather is favorable during construction.

Based on currently available cross sections the maximum embankment height is approximately 19 feet. Prior to embankment construction all soft unstable organic material should be undercut, anticipated to be no more than two feet. The embankment may be constructed with locally available unspecified material utilizing the 3:1 slope configuration shown.

The proposed cut slopes are acceptable as shown in the currently available cross sections.

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 in the vicinity of Gravette.

2. Asphalt Concrete Hot Mix

Table with 3 columns: Type, Asphalt Cement %, Mineral Aggregate %. Rows include Surface Course and Binder Course.

Handwritten signature of Michael C. Benson, Materials Engineer

MCB:pt:bjj
Attachment

cc: State Constr. Eng. - Master File Copy
District 9 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 - 10/02/2018
JOB NUMBER - BR0406

SEQUENCE NO. - 1
MATERIAL CODE - SSRV
SPEC. YEAR - 2014
SUPPLIER ID. - 1
COUNTY/STATE - 04
DISTRICT NO. - 09

JOB NAME - OSAGE CREEK STR. & APPRS. NO. 2 (S)

* STATION LIMITS R-VALUE AT 240 psi *

BEGIN JOB - END JOB 11

RESILIENT MODULUS
STA. 102+00 5254

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.	BR0406	Material Code	SSRVPS
Date Sampled:	8/7/18	Station No.:	102+00
Date Tested:	August 29, 2018	Location:	18'RT
Name of Project:	OSAGE CREEK STR. & APPRS. NO. 2 (S)		
County:	Code: 4	Name:	BENTON
Sampled By:	FRAZIER/BATES	Depth:	0-5
Lab No.:	20181816	AASHTO Class:	A-4 (0)
Sample ID:	RV463	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	3.95
Middle	3.95
Bottom	3.95
Average	3.95
Membrane Thickness (in):	0.01
Height of Specimen, Cap and Base (in):	8.02
Height of Cap and Base (in):	0.00
Initial Length, Lo (in):	8.02
Initial Area, Ao (sq. in):	12.18
Initial Volume, AoLo (cu. in):	97.68

3. Soil Specimen Weight:

Weight of Wet Soil Used (g):	3051.60
------------------------------	---------

4. Soil Properties:

Optimum Moisture Content (%):	16.2
Maximum Dry Density (pcf):	104.9
95% of MDD (pcf):	99.7
In-Situ Moisture Content (%):	N/A

5. Specimen Properties:

Wet Weight (g):	3051.60
Compaction Moisture content (%):	16.0
Compaction Wet Density (pcf):	119.03
Compaction Dry Density (pcf):	102.61
Moisture Content After Mr Test (%):	16.1

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

#VALUE!

7. Resilient Modulus, Mr:

4739(Sc)^{-0.10794}(S3)^{0.44873}

8. Comments

9. Tested By:

GW

Date: August 29, 2018

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
MATERIALS DIVISION**

**AAASHTO T 307-99 - RESILIENT MODULUS OF SUBGRADE SOILS
RECOMPACTED SAMPLES**

Job No. BR0406 **Material Code** SSRVPS
Date Sampled: 8/7/18 **Station No.:** 102+00
Date Tested: August 29, 2018 **Location:** 18RT
Name of Project: OSAGE CREEK STR. & APPRS. NO. 2 (S)
County: Code: 4 **Name:** BENTON
Sampled By: FRAZIER/BATES **Depth:** 0-5
Lab No.: 20181816 **AAASHTO Class:** A-4 (0)
Sample ID: RV463 **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
	S ₃ psi	S _{cyclic} psi	P _{max} lbs	P _{cyclic} lbs	P _{contact} lbs	S _{max} psi	S _{cyclic} psi	S _{contact} psi	H _{avg} in	ε _r in/in	M _r psi
Sequence 1	6.0	2.0	25.1	22.4	2.7	2.1	1.8	0.2	0.00149	0.00019	9,877
Sequence 2	6.0	4.0	47.5	44.8	2.7	3.9	3.7	0.2	0.00312	0.00039	9,463
Sequence 3	6.0	6.0	70.2	66.7	3.5	5.8	5.5	0.3	0.00484	0.00060	9,062
Sequence 4	6.0	8.0	94.3	88.4	5.9	7.7	7.3	0.5	0.00669	0.00083	8,699
Sequence 5	6.0	10.0	118.6	110.3	8.2	9.7	9.1	0.7	0.00865	0.00108	8,398
Sequence 6	4.0	2.0	25.0	22.6	2.4	2.1	1.9	0.2	0.00177	0.00022	8,415
Sequence 7	4.0	4.0	46.4	43.9	2.5	3.8	3.6	0.2	0.00397	0.00049	7,294
Sequence 8	4.0	6.0	67.7	65.2	2.5	5.6	5.4	0.2	0.00620	0.00077	6,930
Sequence 9	4.0	8.0	91.8	87.0	4.8	7.5	7.1	0.4	0.00828	0.00103	6,919
Sequence 10	4.0	10.0	116.1	109.0	7.1	9.5	8.9	0.6	0.01021	0.00127	7,024
Sequence 11	2.0	2.0	24.3	21.9	2.3	2.0	1.8	0.2	0.00230	0.00029	6,289
Sequence 12	2.0	4.0	44.6	42.1	2.5	3.7	3.5	0.2	0.00501	0.00063	5,530
Sequence 13	2.0	6.0	65.0	62.4	2.6	5.3	5.1	0.2	0.00782	0.00098	5,254
Sequence 14	2.0	8.0	87.9	83.8	4.2	7.2	6.9	0.3	0.01042	0.00130	5,295
Sequence 15	2.0	10.0	112.2	105.6	6.6	9.2	8.7	0.5	0.01285	0.00160	5,411

TESTED BY _____ DATE August 29, 2018
 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.	BR0406	Material Code	SSRVPS
Date Sampled:	8/7/18	Station No.:	102+00
Date Tested:	August 29, 2018	Location:	18'RT
Name of Project:	OSAGE CREEK STR. & APPRS. NO. 2 (S)		
County:	Code: 4	Name:	BENTON
Sampled By:	FRAZIER/BATES		Depth: 0-5
Lab No.:	20181816	AASHTO Class:	A-4 (0)
Sample ID:	RV463	Material Type (1 or 2):	2
LATITUDE:		LONGITUDE:	

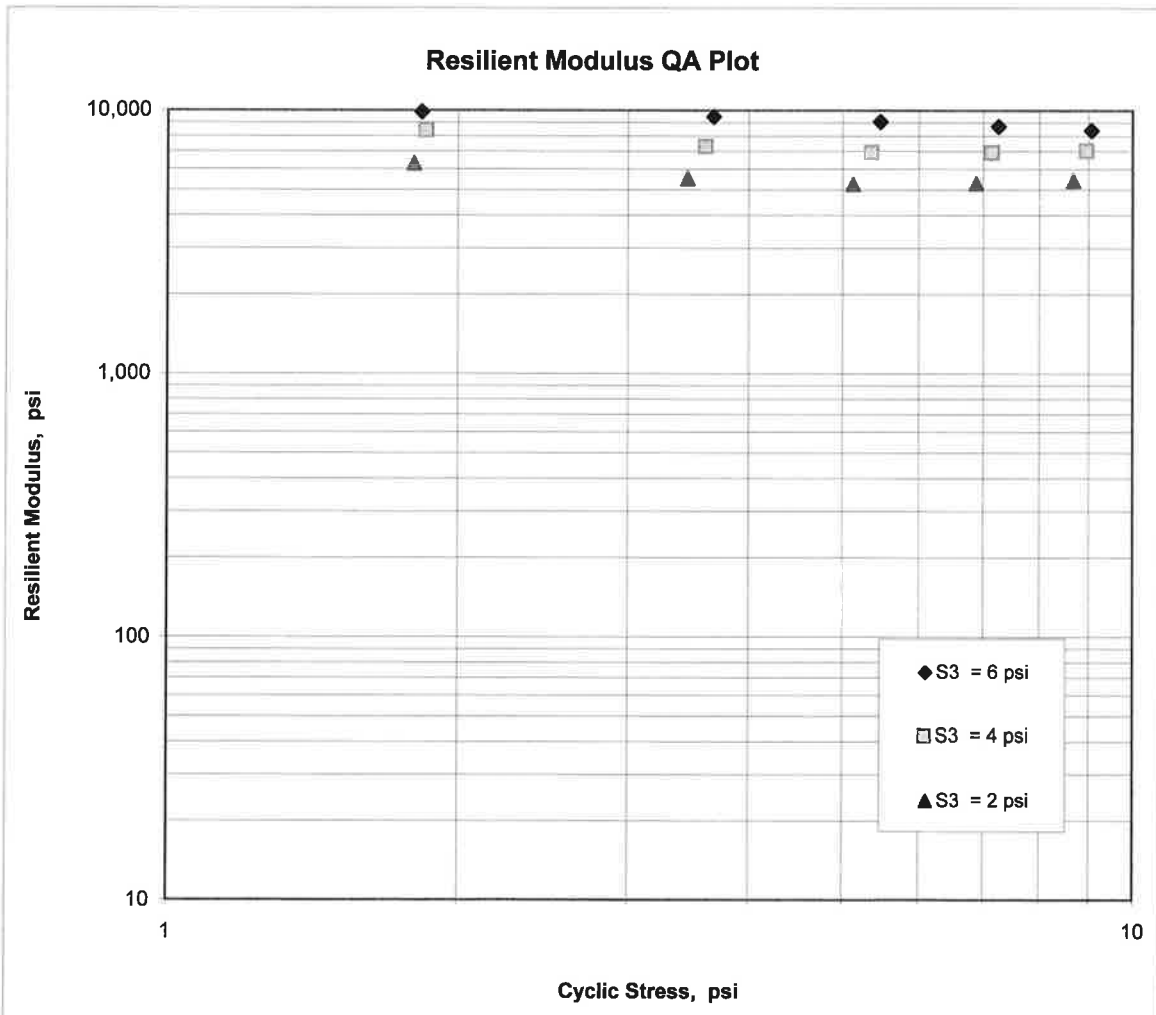
$$M_R = K_1 (S_c)^{K_2} (S_3)^{K_5}$$

$$K_1 = 4,739$$

$$K_2 = -0.10794$$

$$K_5 = 0.44873$$

$$R^2 = 0.98$$



JOB: BR0406

Arkansas State Highway Transportation Department

JOB NAME: OSAGE CREEK STR. & APPRS. NO. 2 (S)

Materials Division

COUNTY NO. 4 DATE TESTED 9/28/2018

Michael Benson, Materials Engineer

STA.#	LOC.	DEPTH	COLOR						L.L.	P.I.	SOIL CLASS	LAB #:	%MOISTURE
				#4	#10	#40	#80	#200					
				S	I	E	V	E	S				
102+00	18 RT	0-5	BROWN	75	59	50	46	43	ND	NP	A-4 (0)	RV463	
102+00	06 RT	0-5	RD/BR	76	67	60	57	56	23	6	A-4 (1)	S457	17.8
102+00	14 RT	0-5	RD/BR	79	72	65	64	63	23	5	A-4 (1)	S458	21.3
102+00	18 RT	0-5	BROWN	58	50	44	42	40	24	5	A-4 (0)	S459	17.7
115+00	06 LT	0-5	RD/BR	92	79	61	60	58	30	14	A-6 (5)	S460	16.4
115+00	14 LT	0-5	RD/BR	91	79	68	65	62	27	11	A-6 (4)	S461	14.7
115+00	18 LT	0-5	BROWN	67	48	45	33	17	ND	NP	A-1-B (0)	S462	10.1

JOB: BR0406

JOB NAME: OSAGE CREEK STR. & APPRS. NO. 2 (S)

Arkansas State Highway Transportation Department

Materials Division

Michael Benson, Materials Engineer

DATE TESTED

9/28/2018

COUNTY NO. 4

STA.# LOC.

PAVEMENT SOUNDINGS

102+00	06 RT	ACHMSC 3.5W	ACHMBC 2.5	ACHMSC 3.0
102+00	14 RT	ACHMSC 2.5W	ACHMBC 5.0	ACHMSC
102+00	18 RT	ACHMSC	ACHMBC	ACHMSC
115+00	06 LT	ACHMSC 5.0WX	ACHMBC 1.5	AGG. BASE CRS. CL-7
115+00	14 LT	ACHMSC 2.0	ACHMBC 1.0	AGG. BASE CRS. CL-7
115+00	18 LT	ACHMSC	ACHMBC	AGG. BASE CRS. CL-7

Comments: W=MULTIPLE LAYERS, X=STRIPPED

Wednesday, October 10, 2018

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT - LITTLE ROCK, ARKANSAS
MATERIALS DIVISION

MICHAEL BENSON, MATERIALS ENGINEER

*** SOIL SURVEY / PAVEMENT SOUNDING TEST REPORT ***

DATE	- 09/28/18	SEQUENCE NO.	- 1
JOB NUMBER	- BR0406	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	- 04
SUPPLIER NAME	- STATE	DISTRICT NO.	- 09
NAME OF PROJECT	- OSAGE CREEK STR. & APPRS. NO. 2 (S)		
PROJECT ENGINEER	- NOT APPLICABLE		
PIT/QUARRY	- ARKANSAS		
LOCATION	- BENTON COUNTY	DATE SAMPLED	- 08/07/18
SAMPLED BY	- FRAZIER/BATES	DATE RECEIVED	- 08/10/18
SAMPLE FROM	- TEST HOLE	DATE TESTED	- 09/28/18
MATERIAL DESC.	- SOIL SURVEY - RESISTANCE R-VALUE ACTUAL RESULTS		

LAB NUMBER	- 20181816	-	-
SAMPLE ID	- RV463	-	-
TEST STATUS	- INFORMATION ONLY	-	-
STATION	- 102+00	-	-
LOCATION	- 18 RT	-	-
DEPTH IN FEET	- 0-5	-	-
MAT'L COLOR	- BROWN	-	-
MAT'L TYPE	-	-	-
LATITUDE DEG-MIN-SEC	- 36 10 49.80	-	-
LONGITUDE DEG-MIN-SEC	- 94 24 11.60	-	-
% PASSING	2 IN.	-	-
	1 1/2 IN.	-	-
	3/4 IN.	100	-
	3/8 IN.	90	-
	NO. 4	75	-
	NO. 10	59	-
	NO. 40	50	-
	NO. 80	46	-
	NO. 200	43	-
LIQUID LIMIT	- ND	-	-
PLASTICITY INDEX	- NP	-	-
AASHTO SOIL	- A-4 (0)	-	-
UNIFIED SOIL	-	-	-
% MOISTURE CONTENT	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-

REMARKS - W=MULTIPLE LAYERS, X=STRIPPED

-
-
-
-

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT - LITTLE ROCK, ARKANSAS
MATERIALS DIVISION

MICHAEL BENSON, MATERIALS ENGINEER

*** SOIL SURVEY / PAVEMENT SOUNDING TEST REPORT ***

DATE - 09/28/18 SEQUENCE NO. - 1
JOB NUMBER - BR0406 MATERIAL CODE - SSRVPS
FEDERAL AID NO. - TO BE ASSIGNED SPEC. YEAR - 2014
PURPOSE - SOIL SURVEY SAMPLE SUPPLIER ID. - 1
SPEC. REMARKS - NO SPECIFICATION CHECK COUNTY/STATE - 04
SUPPLIER NAME - STATE DISTRICT NO. - 09
NAME OF PROJECT - OSAGE CREEK STR. & APPRS. NO. 2 (S)
PROJECT ENGINEER - NOT APPLICABLE
PIT/QUARRY - ARKANSAS
LOCATION - BENTON COUNTY DATE SAMPLED - 08/07/18
SAMPLED BY - FRAZIER/BATES DATE RECEIVED - 08/10/18
SAMPLE FROM - TEST HOLE DATE TESTED - 09/28/18
MATERIAL DESC. - SOIL SURVEY - R VALUE- PAVEMENT SOUNDINGS

LAB NUMBER	- 20181810	- 20181811	- 20181812
SAMPLE ID	- S457	- S458	- S459
TEST STATUS	- INFORMATION ONLY	- INFORMATION ONLY	- INFORMATION ONLY
STATION	- 102+00	- 102+00	- 102+00
LOCATION	- 06 RT	- 14 RT	- 18 RT
DEPTH IN FEET	- 0-5	- 0-5	- 0-5
MAT'L COLOR	- RD/BR	- RD/BR	- BROWN
MAT'L TYPE	-	-	-
LATITUDE DEG-MIN-SEC	- 36 10 49.90	- 36 10 49.90	- 36 10 49.80
LONGITUDE DEG-MIN-SEC	- 94 24 11.50	- 94 24 11.60	- 94 24 11.60
% PASSING			
2 IN.	-	-	-
1 1/2 IN.	-	-	-
3/4 IN.	- 100	- 100	- 100
3/8 IN.	- 92	- 88	- 73
NO. 4	- 76	- 79	- 58
NO. 10	- 67	- 72	- 50
NO. 40	- 60	- 65	- 44
NO. 80	- 57	- 64	- 42
NO. 200	- 56	- 63	- 40
LIQUID LIMIT	- 23	- 23	- 24
PLASTICITY INDEX	- 6	- 5	- 5
AASHTO SOIL	- A-4 (1)	- A-4 (1)	- A-4 (0)
UNIFIED SOIL	-	-	-
% MOISTURE CONTENT	- 17.8	- 21.3	- 17.7
ACHMSC	(IN) - 3.5W	- 2.5W	- ---
ACHMBC	(IN) - 2.5	- 5.0	- ---
ACHMSC	(IN) - 3.0	- ---	- ---
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-
	-	-	-

REMARKS - W=MULTIPLE LAYERS, X=STRIPPED

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT - LITTLE ROCK, ARKANSAS
MATERIALS DIVISION

MICHAEL BENSON, MATERIALS ENGINEER

*** SOIL SURVEY / PAVEMENT SOUNDING TEST REPORT ***

DATE - 09/28/18 SEQUENCE NO. - 2
JOB NUMBER - BR0406 MATERIAL CODE - SSRVPS
FEDERAL AID NO. - TO BE ASSIGNED SPEC. YEAR - 2014
PURPOSE - SOIL SURVEY SAMPLE SUPPLIER ID. - 1
SPEC. REMARKS - NO SPECIFICATION CHECK COUNTY/STATE - 04
SUPPLIER NAME - STATE DISTRICT NO. - 09
NAME OF PROJECT - OSAGE CREEK STR. & APPRS. NO. 2 (S)
PROJECT ENGINEER - NOT APPLICABLE
PIT/QUARRY - ARKANSAS
LOCATION - BENTON COUNTY DATE SAMPLED - 08/07/18
SAMPLED BY - FRAZIER/BATES DATE RECEIVED - 08/10/18
SAMPLE FROM - TEST HOLE DATE TESTED - 09/28/18
MATERIAL DESC. - SOIL SURVEY - R VALUE- PAVEMENT SOUNDINGS

LAB NUMBER	-	20181813	-	20181814	-	20181815
SAMPLE ID	-	S460	-	S461	-	S462
TEST STATUS	-	INFORMATION ONLY	-	INFORMATION ONLY	-	INFORMATION ONLY
STATION	-	115+00	-	115+00	-	115+00
LOCATION	-	06 LT	-	14 LT	-	18 LT
DEPTH IN FEET	-	0-5	-	0-5	-	0-5
MAT'L COLOR	-	RD/BR	-	RD/BR	-	BROWN
MAT'L TYPE	-	-	-	-	-	-
LATITUDE DEG-MIN-SEC	-	36 10 47.50	-	36 10 47.60	-	36 10 47.60
LONGITUDE DEG-MIN-SEC	-	94 23 56.10	-	94 23 56.00	-	94 23 56.00
% PASSING						
	2	IN.	-	-	-	-
	1 1/2	IN.	-	-	-	-
	3/4	IN.	-	100	-	100
	3/8	IN.	-	98	-	91
	NO. 4		-	91	-	67
	NO. 10		-	79	-	48
	NO. 40		-	68	-	45
	NO. 80		-	65	-	33
	NO. 200		-	62	-	17
LIQUID LIMIT	-	30	-	27	-	ND
PLASTICITY INDEX	-	14	-	11	-	NP
AASHTO SOIL	-	A-6 (5)	-	A-6 (4)	-	A-1-B (0)
UNIFIED SOIL	-	-	-	-	-	-
% MOISTURE CONTENT	-	16.4	-	14.7	-	10.1
ACHMSC	(IN)	5.0WX	-	2.0	-	---
ACHMBC	(IN)	1.5	-	1.0	-	---
AGG. BASE CRS. CL-7	(IN)	---	-	3.0	-	---
			-		-	
			-		-	
			-		-	
			-		-	
			-		-	
			-		-	
			-		-	
			-		-	

REMARKS - W=MULTIPLE LAYERS, X=STRIPPED