ARKANSAS DEPARTMENT OF TRANSPORTATION

SUBSURFACE INVESTIGATION

STATE JOB NO. 040721

FEDERAL AID PROJECT NO. NHPP-0017(42) & RTP-0017(42)

FAYETTEVILLE AVE. – HWY. 162 (ALMA) (S)

STATE HIGHWAY 64 **SECTION** 2C

IN CRAWFORD **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
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 14, 2019

TO: Mr. Trinity Smith, Engineer of Roadway Design

SUBJECT: Job No. 040721
Little Frog Bayou Str. & Apprs. (Alma) (S)
Route 64 Section 2C
Crawford County

Based on soil information from projects in the surrounding area, an estimated R-Value of 14 is appropriate for pavement design.

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

Asphalt Concrete Hot Mix

Type	Asphalt Cement %	Mineral Aggregate %
Surface Course	6.1	93.9
Binder Course	4.2	95.8
Base Course	3.7	96.3

Michael C. Benson
Materials Engineer

MCB:pt:bjj
Attachment
cc: State Constr. Eng. – Master File Copy
District 4 Engineer
System Information and Research Div.
G. C. File

ARKANSAS DEPARTMENT OF TRANSPORTATION
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MATERIALS DIVISION
11301 West Baseline Road | P.O. Box 2261 | Little Rock, AR 72203-2261 | Phone: 501.569.2185 | Fax: 501.569.2368

September 9, 2021

TO: Mr. Rick Ellis, Bridge Engineer

SUBJECT: Job No. 040721
Fayetteville Ave. – Hwy. 162 (Alma) (S)
Crawford County
Route 64, Section 2C

Introduction

Submitted herein are foundation recommendations for the proposed bridge planned on U.S. Highway 64B in Crawford County. This project consists of replacing the existing 101-ft. long, 20.8-ft. wide bridge over Little Frog Bayou with a new 131-ft. long, 45.5-ft. wide (out-to-out width) structure. This new bridge will be a three (3)-span, integral continuous W-beam unit to be constructed in the alignment of the existing bridge. 2-Horizontal to 1-vertical (2H:1V) end slopes are planned at both ends of the new bridge by cutting back the existing embankments. Maximum abutment embankment height varies from 12 ft. to 15 feet. The new embankment configuration (slope and height) appears to be equivalently or less critical than that for the existing bridge.

Field Investigation

A subsurface investigation was requested on April 6, 2021 by Bridge Division to develop recommendations for bridge foundations. A total of eight (8) borings were requested and six (6) borings were completed at accessible locations due to the high water level in the Little Frog Bayou, extremely steep embankment slopes, numerous underground utilities (including a water line, a sanitary sewer line, a gas line and a fiber optic line), overhead power lines, as well as busy traffic in the U.S. Highway 64.

The approximate locations of the borings are presented in the Plan of Borings included in Attachment A. The borings were advanced with truck-mounted CME 75 and CME 45B rotary drill rigs using a combination of hollow-stem auger and diamond core method. The boring logs, showing the subsurface conditions encountered in the borings and the results of field and laboratory tests, are also included in Attachment A, immediately following the Plan of Borings. A Legend is attached after the boring logs to interpret / explain the symbols, terms, and conventions used on logs. Standard Penetration Tests (SPT) were conducted in accordance with ASTM D1586 for field testing and soil sampling. The correction factor for the calibrated hammer (CME 45B) are indicated on the corresponding boring logs. Liners were not used inside the standard split-barrel samplers.

The number of blows required to drive the standard split-barrel sampler for each 6-inch penetration of the total 18-inch drive were counted and shown on the logs. SPT N-values are defined as the number of blows required to advance the split barrel the final 12 inches. The SPT N-values indicated on the logs are raw (uncorrected) blow count measured in field.

Core samples of bedrock were retrieved by using NQ3-size triple-tube core barrels (rock core diameter of 1-3/4 in. and hole diameter of 3 in.). For each core run, Total Core Recovery (TCR) and Rock Quality Designation (RQD) was determined in the field and further evaluated by

licensed Professional Geologist (PG). TCR, expressed in percent, is defined as quotient of the sum of all intact core pieces to the total length of the core run. RQD, also expressed in percent, is defined as the sum of all intact core pieces that are longer than 4 in. divided by the total length of the core run. TCR and RQD values of each core run are indicated on corresponding log. Core pictures are also included in Attachment A, following the boring logs and Legend.

Groundwater was also observed during the drilling and excavating process. Groundwater observations were noted on the logs.

Lab Investigation

All samples were brought to the Materials laboratory for further evaluation and testing. Soil and weathered rock samples were tested to evaluate index properties and to verify soil type and classification. Lab tests were performed on representative soil / weathered rock samples to determine moisture content, Atterberg limits, and / or gradation. Tested soils are classified by experienced professionals in accordance with both USCS and AASHTO soil classification systems.

Rock cores were first examined by licensed Professional Geologist to verify TCR and RQD measured in field and to obtain parameters for determination of Geological Strength Index (GSI) and Rock Mass Rating (RMR). Compressive strength of rock cores was then determined by uniaxial compressive test on intact rock cores in accordance with ASTM D7012, Method C.

The laboratory test results, including results of rock core uniaxial compressive tests, are presented in Attachment B. GSI and RMR of rock cores, as evaluated by licensed Professional Geologists, are also included in Attachment B. The laboratory test and their corresponding ASTM and / or and AASHTO test methods are listed in Table 1.

Table 1: Summary of Laboratory Tests and Methods

Laboratory Test	ASTM	AASHTO
Moisture Content	D2216	T 265
Grain Size Analysis by Sieving	D6913	T 88
Atterberg Limits	D4318	T 89 and T 90
Uniaxial Compression of Rock Cores	D7012, Method C	

Site Conditions

The proposed bridge will replace the existing Hwy. 64 Business (Hwy. 64B) bridge that crosses Little Frog Bayou. The existing bridge is a three (3)-span structure with the middle span consisting of a steel pony truss supported on concrete wall piers. Little Frog Bayou flows northwest to the southeast at the bridge. There is an industrial complex immediately south of the bridge and the channel southeast of the bridge is lined with trees and brush. The area immediately north of the bridge is primarily open field. Mountain Grove Road intersects Hwy 64B immediately northeast of the bridge on the left side of the road.

There are numerous utilities located adjacent to the existing bridge. A sewer line passes under the roadway southwest of the bridge and a buried gas line and water line are located on the southeast side of the roadway. A buried telecommunication line is located on the northwest

side of the roadway. Overhead power lines cross diagonally over the bridge. Selected pictures of the job site are included as Attachment C.

D_{50} for Scour Analysis

The particle size through which 50% of particles by weight passing, D_{50}, is summarized below in Table 2. Detailed particle size distribution curves used for D_{50} determination are included in Attachment C.

Table 2: Summary of D_{50} for Scour Analysis

Creek Name	Station	Sample Type	Location	D_{50}, mm
Little Frog Bayou	209+53, 158 Lt.	Bulk	Creek Bank	0.075

Site Geology

The project alignment is located on deposits mapped as alluvial deposits (map symbol Q_{al}). The alluvial deposits at this site consists primarily of fine sandy silt and silty fine sand with some zones containing gravel. Depth to bedrock ranges from 14.9 to 33.1 feet below ground level (bgl). The elevation of the top of bedrock varies from 399.3 to 402.5 feet above MSL. In general, the elevation of the top of bedrock decreases from southwest to northeast across the jobsite.

There are numerous normal faults in this area; however, there are no mapped faults at the proposed site for the bridge. The rocks located under the unconsolidated deposits at the bridge are either part of the McAlester or the Savanna Formation (map symbols P_{ma} and P_{sa}, respectively). Due to the lithological similarities of these formations, numerous faults in the area, and lack of nearby outcrops for field evaluation, it is unclear which formation actually underlies the bridge.

The McAlester Formation consists of (in ascending order): several hundred feet of shale with thin sandstone beds and coal (the Lower Hartshorne Coal is just above the base), several hundred feet of shale with a few sandstone beds and coal (Upper Hartshorne Coal), and capped by several hundred feet of shale with a few coal beds. The unit ranges from about 500 to 2,300 feet in thickness. The Savanna Formation conformably overlies the McAlester Formation. The Savanna Formation consists mostly of dark-gray shale and silty shale. It contains minor amounts of light-gray siltstone and medium-gray, very fine- to fine-grained sandstone. On rare occasions, the sandstones may contain rounded, coarse-grained, quartz sand. The beds at the base and top of the section are normally the thickest. At least six coal beds are present in the formation. The Savanna Formation is about 1,600 feet in thickness at its type section, but the top several hundred feet of the sequence is usually missing in Arkansas.

Generalized Subsurface Conditions

A Generalized Subsurface Profile is included in Attachment D to aid in visualizing subsurface conditions. In light of the natural variations in stratigraphy and subsurface conditions, slight deviation from those illustrated on the profile should be anticipated.

Competent medium hard gray, slightly weathered to unweathered shale was encountered in the borings at 14.9 to 35.0 feet (Elev. 401.5 to 397.4). The estimated elevation of the competent rock are summarized below in Table 3.

Table 3: Estimated Elevation of Competent Rock

Boring No.	Boring Location	Ground Surf. Elev., ft	Depth to Competent Rock, ft	Estimated Elev. of Competent Rock, ft
1	Sta. 209+45, 6 Rt.	432.5	32.5	400.0
2	Sta. 209+53, 52 Lt.	416.2	18.0	398.2
3	Sta. 210+07, 39 Lt.	416.4	14.9	401.5
4	Sta. 210+85, 75 Lt.	425.6	25.3	400.3
5	Sta. 210+85, 28 Lt.	429.4	31.7	397.7
6	Sta. 211+13, 6 Rt.	432.4	35.0	397.4
Average, ft		**425.4**	**26.2**	**399.2**

Seismic Conditions

In light of the average subsurface conditions as revealed by the borings, a **Seismic Site Class D (Stiff Soil Profile)** is calculated for the project site. Utilizing the Seismic Site Class D and the approximate GPS coordinates of the project site, the following design peak ground acceleration coefficient (A_S), design short-period spectral acceleration coefficient (S_{DS}), as well as design long-period spectral acceleration coefficient (S_{D1}), are determined. These seismic coefficients are summarized in Table 4. Design Response Spectrum is presented in Attachment E.

Table 4: Summary of Design Ground Motion Acceleration Response Coefficients

Design Acceleration Coefficient	Value, g
A_S (Site PGA)	0.089
S_{DS} (0.2 sec)	0.210
S_{D1} (1 sec)	0.128

For the design long-period spectral acceleration coefficient (S_{D1}) of 0.128, a **Seismic Performance Zone 1** is considered applicable to the project site.

Foundation Recommendations

Steel H-Piling – Bents 1 and 4. It is anticipated steel h-piling will be utilized to support the foundation loads at the bridge end bents (Bents 1 and 4). Final pile size has not been provided. Steel h-piles should be driven to practical refusal and should penetrate through embankment fill, the overburden soils and any highly weathered shale immediately below the overburden soils, to bear into the medium hard weathered shale, slightly weathered shale or unweathered (fresh)

shale. Based on the results of the borings, preboring is generally not expected to be required to advance piling into suitable bearing strata as recommended above.

Practical refusal is defined as a maximum penetration of 1.0 inch for 20 blows by a pile hammer. For the purpose of estimating pile length, a pile embedment of up to 12 in. into the medium hard weathered shale / slightly weathered shale / unweathered shale is assumed. This estimated penetration is based on the results of the borings and our experience with similar foundation rock. The results of the borings indicate moderate to severe driving conditions are expected to be experienced. Consequently, rock points are recommended for all the h-piles driven to refusal.

Based on the results of the borings and the assumption of up to 12 in. penetration into the suitable bearing strata as recommended above, estimated shallowest pile tip elevation is summarized below in Table 5.

Table 5: Summary of Estimated Shallowest Pile Tip Elevation

Bent No.	Boring No.	Estimated Shallowest Pile Tip Elevation, ft	Comments
1	1	401.5	Estimation based on assumed 12 in. embedment into medium hard weathered shale
	2	400.2	
4	5	398.4	Estimation based on expectation to penetrate through highly weathered shale and refusal just to occur on weathered shale
	6	397.4	

The estimated shallowest pile tip elevation summarized in the table above is based on our evaluation of the rock cores retrieved from the borings. Actual subsurface conditions may vary from those encountered in the borings. **As-constructed pile tip elevation may vary and must be field verified**.

A minimum pile penetration of 10 feet, measured below natural ground surface, is recommended. Greater pile length / penetration may be warranted by lateral resistance demand. In light of the boring results, all piles are expected to be deeper than 10 ft. below natural ground surface. Therefore the requirements for the minimum 10 ft. penetration are expected to be satisfied.

Nominal axial resistance of steel h piles driven to refusal in competent rock is governed by the structural capacity of the piles. Therefore the nominal resistance should be determined by the Structural Engineer utilizing applicable AASHTO LRFD design procedures. The Geotechnical Section is available to provide geotechnical inputs for structural evaluation of the nominal axial pile resistance. In light of the expected moderate to severe driving conditions, a resistance factor (φ_c) of 0.50 is recommended for calculating factored structural bearing resistance of h-piles. For steel piling driven to refusal in competent rock, long-term, post-construction settlement is expected to be negligible.

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Drilled Shafts – Bents 2 and 3. Borings drilled for the project indicate competent rock that is suitable for rock socket was encountered at 14.9 to 35.0 ft. below ground surface or Elev. 401.5 to Elev. 397.4. Drilled shafts are suitable to be utilized to support the foundation loads of the intermediate bents (Bents 2 and 3). Drilled shafts should be founded a minimum of two (2) shaft diameters into the competent medium hard slightly weathered to fresh (unweathered) shale. It is understood that diameter of the drilled shafts will be 6 feet.

A maximum nominal bearing capacity (q_p) of 120 ksf is recommended for drilled shafts founded as recommended above. A resistance factor (φ_{stat}) of 0.50 is considered suitable for drilled shaft tip resistance. Due to several unpredictable factors, such as: the roughness of the shaft side wall after drilling and the rate of deterioration of the shale mass once exposed to the atmosphere, it is recommended that shaft side resistance be neglected. Applying the resistance factor to the nominal tip resistance results in a maximum factored tip resistance (q_R) of 60 ksf.

Utilizing the results of the borings, we recommend the drilled shafts be designed with a shallowest tip elevation of Elev. 387. This recommended tip elevation utilizes an estimated average competent rockline elevation of approximately Elev. 399 and two (2) shaft diameters (12 ft.) of penetration into the competent medium hard slightly weathered to fresh (unweathered) shale. Deeper rock socket or larger shaft diameter may be required by bearing and / or lateral resistance demand. If rock socket and shaft diameter other than these assumed parameters are to be utilized, shaft tip elevation should be adjusted accordingly based on the competent rockline elevation of Elev. 399. Actual competent rockline elevation at the drilled shaft locations can vary and must be field verified. Depending on specific rock quality, deepening or shortening of shaft length can be warranted. Settlement of properly constructed drilled shafts founded into the competent rock should be negligible.

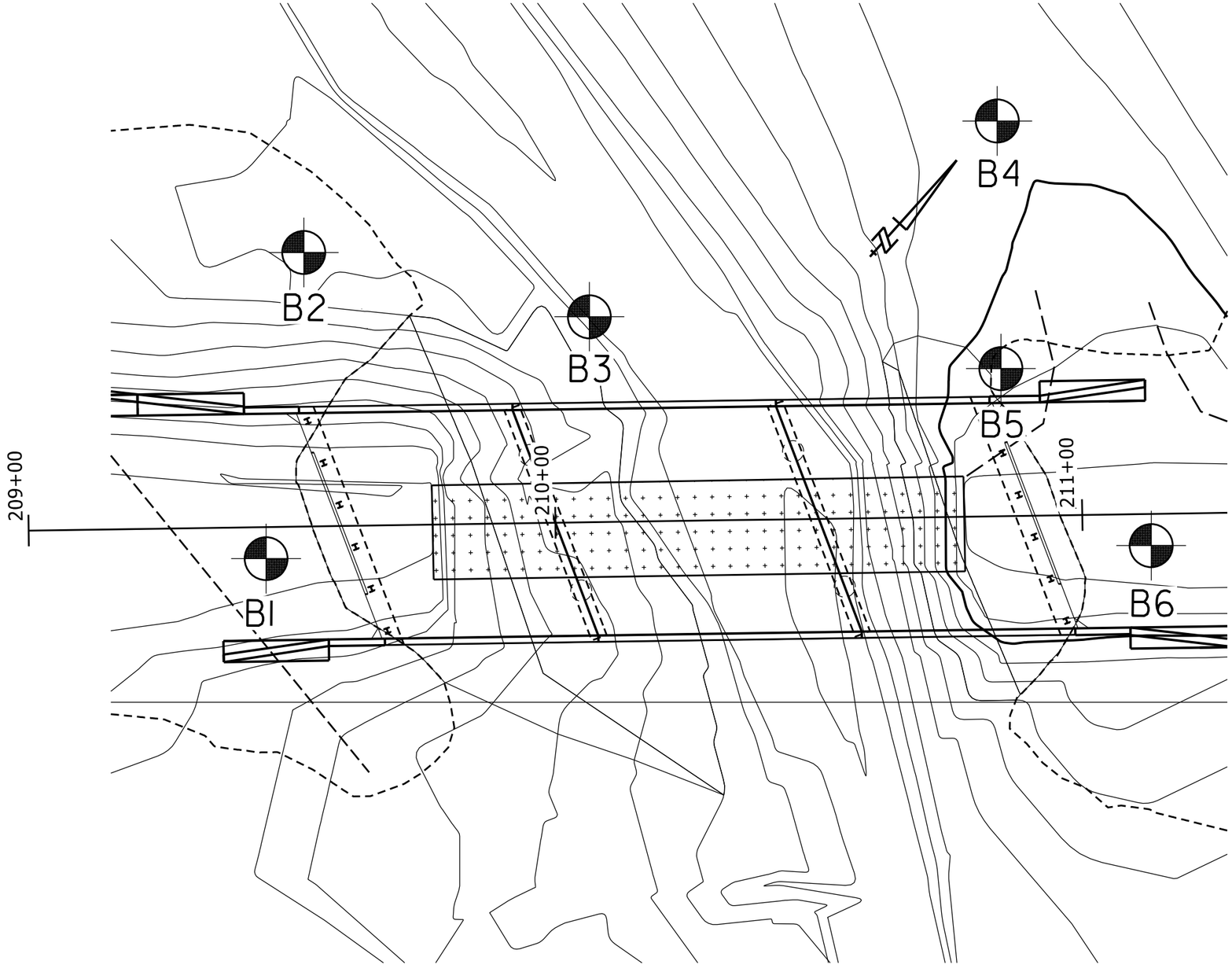
We recommend one test boring be drilled at each shaft location prior to drilled shaft excavation. Test borings should be 1-1/2 inches or larger and should extend to a minimum depth of 1.5 times of the shaft diameter below planned tip elevation.

Jonathan A. Annable
Materials Engineer

JAA:yz:mlg:jcs
cc: State Construction Engineer
District 4 Engineer
G. C. File

Attachment A

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
6	AR			
JOB NO.		040721		
PLAN OF BORINGS				



LITTLE FROG BAYOU			
BORING	STATION	OFFSET	ELEVATION
B1	209+45	6 RT	432.50
B2	209+53	52 LT	416.18
B3	210+07	39 LT	416.40
B4	210+85	75 LT	425.55
B5	210+85	28 LT	429.44
B6	211+13	6 RT	432.44

PLAN OF BORINGS

FAYETTEVILLE AVE. - HWY. 162 (ALMA) (S)
ROUTE 64, SECTION 2C
CRAWFORD COUNTY
FED. AID PROJECT

JOB NO. 040721	SHEET 1/1

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 1
PAGE 1 OF 2

JOB NO. 040721 Crawford County
JOB NAME: Fayetteville Ave. - Hwy. 162 (Alma)(S)
Route 64, Section 2C
STATION: 209+45
LOCATION: 6' Right of Construction Centerline
LOGGED BY: Anthony Nicholson

DATE: August 10, 2021
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: CME 75

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 47.9

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 432.5	SOIL GROUP	MOISTURE CONTENT (%) PL + – – – – – – – – + LL (10 20 30 40 50 60 70)	PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			Asphalt						
			Base						
5			Moist, Very Loose, Brown Fine Sand with Silt				2 2-2		
			Silty Fine Sand with Gravel and Cobbles (Concrete Fragments)						
10			Moist, Loose, Brown Silty Fine Sand with Some Gravel (Concrete Fragments)				2 3-4		
15			Wet, Very Loose, Gray Silty Fine Sand				0 0-0		
20			Wet, Very Loose, Brown Silty Fine Sand				0 0-2		
25			Wet, Very Dense, Brown Silty Sand with Gravel				6 28-23		
30			SHALE - Weathered, Medium Hard, Dark Gray				14 30 (2")	74	0
35									

REMARKS:

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 1
PAGE 2 OF 2

JOB NO. 040721 Crawford County
JOB NAME: Fayetteville Ave. - Hwy. 162 (Alma)(S)
Route 64, Section 2C
STATION: 209+45
LOCATION: 6' Right of Construction Centerline
LOGGED BY: Anthony Nicholson

DATE: August 10, 2021
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: CME 75

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 47.9

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 432.5	SOIL GROUP	MOISTURE CONTENT (%) PL + – – – – – – – – + LL 10 20 30 40 50 60 70	PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SHALE - Slightly Weathered, Medium Hard, Dark Gray					97	68
40								100	76
45			SHALE - Unweathered, Medium Hard, Dark Gray					100	60
50			Boring Terminated						
55									
60									
65									
70									

REMARKS:

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 2
PAGE 1 OF 1

JOB NO. 040721 Crawford County
JOB NAME: Fayetteville Ave. - Hwy. 162 (Alma)(S)
Route 64, Section 2C
STATION: 209+53
LOCATION: 52' Left of Construction Centerline
LOGGED BY: Anthony Nicholson

DATE: August 3, 2021
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: CME 75

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 33

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%) PL + – – – – – – – – + LL (10 20 30 40 50 60 70)	PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 416.2						
			Moist, Medium Dense, Brown Silty Fine Sand with Trace Gravel		●		2 6-10		
			Wet, Very Loose, Brown and Gray Silty Fine Sand		●		3 2-2		
5			Wet, Very Loose, Gray Silty Fine Sand*		●		0 0-0		
10			Wet, Medium Dense, Silty Fine Sand with Gravel		●		9 10-10		
15			Wet, Very Dense, Silty Fine Sand with Gravel		●		30 (5")		
			SHALE - Weathered, Medium Hard, Dark Gray					76	0
20								100	39
25			SHALE - Unweathered, Medium Hard, Occasional Fractures, Dark Gray					96	74
30								99	85
35			Boring Terminated						

REMARKS: * Water encountered at 6.0' below ground level.

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 3
PAGE 1 OF 2

JOB NO. 040721 Crawford County
JOB NAME: Fayetteville Ave. - Hwy. 162 (Alma)(S)
Route 64, Section 2C
STATION: 210+07
LOCATION: 39' Left of Construction Centerline
LOGGED BY: Anthony Nicholson

DATE: July 28, 2021
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: CME 45B

HAMMER CORRECTION FACTOR: 1.47

COMPLETION DEPTH: 40.1

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 416.4	SOIL GROUP	MOISTURE CONTENT (%) PL + – – – – – – – + LL (10 20 30 40 50 60 70)	PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			Moist, Loose, Brown Fine Sand with Silt				2		
			Moist, Very Loose, Brown Silty Fine Sand				2-3 3		
							2-2 2		
5			Wet, Very Loose, Gray Silty Fine Sand				1-2 0		
							1-1 1		
			Wet, Loose, Gray Silty Fine Sand with Trace Organic Matter (Wood)				1-1 1		
10							1-9 15		
			Wet, Medium Dense, Gray Silty Fine Sand with Some Gravel				11-8		
15			Wet, Very Dense, Brown Silty Fine Sand with Gravel				38		
			SHALE - Slightly Weathered, Medium Hard, Dark Gray				20 (1")		
			SHALE - Unweathered, Medium Hard, Occasional Fractures, Dark Gray					100	40
20									
			SHALE - Unweathered, Medium Hard, Occasional Fractures, Occasional Slickensides, Dark Gray*					74	0
25									
			SHALE - Unweathered, Medium Hard, Occasional Fractures, Dark Gray					100	88
30									
								98	88
35									

REMARKS: * Multiple rig malfunctions caused poor recovery of core.

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 3
PAGE 2 OF 2

JOB NO. 040721 Crawford County
JOB NAME: Fayetteville Ave. - Hwy. 162 (Alma)(S)
Route 64, Section 2C
STATION: 210+07
LOCATION: 39' Left of Construction Centerline
LOGGED BY: Anthony Nicholson

DATE: July 28, 2021
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: CME 45B

HAMMER CORRECTION FACTOR: 1.47

COMPLETION DEPTH: 40.1

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%) PL + – – – – – – – – + LL (10 20 30 40 50 60 70)	PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 416.4						
			SHALE - Unweathered, Medium Hard, Dark Gray					100	99
40			Boring Terminated						
45									
50									
55									
60									
65									
70									

REMARKS: * Multiple rig malfunctions caused poor recovery of core.

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 4
PAGE 1 OF 2

JOB NO. 040721 Crawford County
JOB NAME: Fayetteville Ave. - Hwy. 162 (Alma)(S)
Route 64, Section 2C
STATION: 210+85
LOCATION: 75' Left of Construction Centerline
LOGGED BY: Anthony Nicholson

DATE: July 27, 2021
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: CME 45B

HAMMER CORRECTION FACTOR: 1.47

COMPLETION DEPTH: 53.2

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 425.6	SOIL GROUP	MOISTURE CONTENT (%) PL + – – – – – – – – + LL (10 20 30 40 50 60 70)	PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
5			Sandy Gravel						
10			Moist, Loose, Brown Fine Sand with Silt		●		2 2-3		
15			No Sample Recovered				0 0-0		
20			Wet, Very Loose, Gray Silty Fine Sand*		●		0 1-1		
25			Wet, Medium Dense, Gray Silty Fine Sand with Gravel		●		5 10-10		
			No Sample Recovered					0	0
30			SHALE - Unweathered, Medium Hard, Frequent Fractures, Dark Gray Shale with Thin Coal Seams SHALE - Unweathered, Medium Hard, Frequent Fractures, Dark Gray					82	50
35			SHALE - Unweathered, Medium Hard, Occasional Fractures, Dark Gray SHALE - Unweathered, Medium					92	67

REMARKS: * Water encountered at 16.2' below ground layer.

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 4
PAGE 2 OF 2

JOB NO. 040721 Crawford County
JOB NAME: Fayetteville Ave. - Hwy. 162 (Alma)(S)
Route 64, Section 2C
STATION: 210+85
LOCATION: 75' Left of Construction Centerline
LOGGED BY: Anthony Nicholson

DATE: July 27, 2021
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: CME 45B

HAMMER CORRECTION FACTOR: 1.47

COMPLETION DEPTH: 53.2

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%) PL + ● LL (10 20 30 40 50 60 70)	PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 425.6						
			Hard, Occasional Fractures, Frequent Slickensides, Dark Gray SHALE - Unweathered, Medium Hard, Occasional Fractures, Dark Gray					100	92
40									
			SHALE - Unweathered, Medium Hard, Dark Gray					96	88
45									
			SHALE - Unweathered, Medium Hard, Occasional Fractures, Dark Gray					100	82
50									
			SHALE - Unweathered, Medium Hard, Dark Gray					100	98
			Boring Terminated						
55									
60									
65									
70									

REMARKS: * Water encountered at 16.2' below ground layer.

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 5
PAGE 1 OF 2

JOB NO. 040721 Crawford County
JOB NAME: Fayetteville Ave. - Hwy. 162 (Alma)(S)
Route 64, Section 2C
STATION: 210+85
LOCATION: 28' Left of Construction Centerline
LOGGED BY: Anthony Nicholson

DATE: July 21, 2021
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: CME 45B

HAMMER CORRECTION FACTOR: 1.47

COMPLETION DEPTH: 46

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%) PL + – – – – – – – + LL (10 20 30 40 50 60 70)	PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 429.4						
				-					
5		X	Wet, Very Loose, Brown Fine Sandy Silt	ML	●	61	1 1-2		
				-					
10		X		ML	●	62	1 3-2		
			Wet, Loose, Brown Fine Sandy Silt	-					
15		X		SM	●	38	0 1-1		
				-					
20		X	Wet, Very Loose, Brown and Gray Silty Fine Sand	SM	●	35	1 1-2		
				-					
25		X		SM	●	27	3 17-41		
			Wet, Very Dense, Gray Silty Fine Sand with Some Gravel						
30			SHALE - Weathered with Highly Weathered Layers, Medium Hard with Soft Layers, Dark Gray					79	0
			SHALE - Weathered, Medium Hard, Dark Gray						
35			SHALE - Slightly Weathered, Occasional Fractures, Medium					88	46

REMARKS:

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 5
PAGE 2 OF 2

JOB NO. 040721 Crawford County
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DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%) PL + – – – – – – – – + LL (10 20 30 40 50 60 70)	PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SURFACE ELEVATION: 429.4						
			Hard, Dark Gray SHALE - Slightly Weathered, Frequent Slickensides, Medium Hard, Dark Gray	-					
40								92	62
			SHALE - Unweathered, Medium Hard Dark Gray						
45								100	98
			Boring Terminated						
50									
55									
60									
65									
70									

REMARKS:

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 6
PAGE 1 OF 2

JOB NO. 040721 Crawford County
JOB NAME: Fayetteville Ave. - Hwy. 162 (Alma)(S)
Route 64, Section 2C
STATION: 211+13
LOCATION: 6' Right of Construction Centerline
LOGGED BY: Anthony Nicholson

DATE: August 10, 2021
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: CME 75

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 52.3

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 432.4	SOIL GROUP	MOISTURE CONTENT (%) PL + – – – – – – – – + LL (10 20 30 40 50 60 70)	PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			Asphalt Base						
5			Moist, Loose, Brown Fine Sand with Silt		●		2 3-3		
10			Moist, Loose, Brown Silty Fine Sand		●		2 3-4		
15			Wet, Very Loose, Brown Silty Fine Sand*		●		2 1-2		
20					●		2 1-2		
25			Wet, Very Loose, Gray Silty Fine Sand		●		0 1-1		
30			Wet, Very Loose, Gray Silty Fine Sand with Some Gravel		●		2 2-1		
35			SHALE - Highly Weathered, Medium Hard, Dark Gray				40 (5")		

REMARKS: * Water encountered at 17.0' below ground level.

ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SEC.

BORING NO. 6
PAGE 2 OF 2

JOB NO. 040721 Crawford County
JOB NAME: Fayetteville Ave. - Hwy. 162 (Alma)(S)
Route 64, Section 2C
STATION: 211+13
LOCATION: 6' Right of Construction Centerline
LOGGED BY: Anthony Nicholson

DATE: August 10, 2021
TYPE OF DRILLING:
Hollow Stem Auger - Diamond Core
EQUIPMENT: CME 75

HAMMER CORRECTION FACTOR: N/A

COMPLETION DEPTH: 52.3

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 432.4	SOIL GROUP	MOISTURE CONTENT (%) PL + LL (10 20 30 40 50 60 70)	PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% TCR	% RQD
			SHALE - Slightly Weathered, Medium Hard, Dark Gray					100	50
40								98	78
			Coal						
			SHALE - Slightly Weathered, Medium Hard,Frequent Slickensides, Dark Gray						
45								100	88
			SHALE - Unweathered, Medium Hard, Dark Gray						
50								96	92
			Boring Terminated						
55									
60									
65									
70									

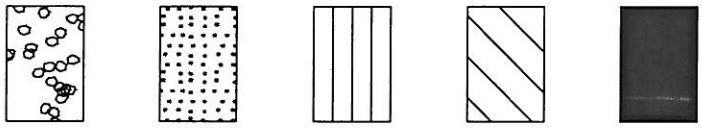
REMARKS: * Water encountered at 17.0' below ground level.

LEGEND

SOIL TYPES

(SHOWN IN SYMBOL COLUMN)

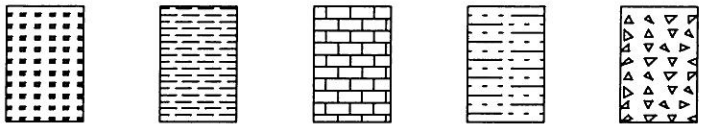
(PREDOMINANT TYPE SHOWN HEAVY)



GRAVEL | SAND | SILT | CLAY | ORGANIC MATTER

ROCK TYPES

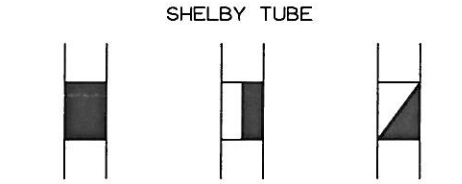
(SHOWN IN SYMBOL COLUMN)



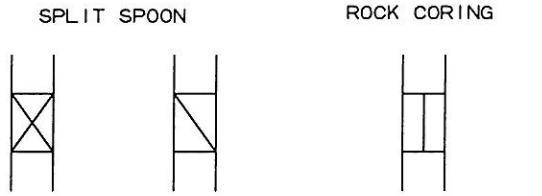
SANDSTONE | SHALE or SILTSTONE | LIMESTONE or DOLOMITE | ALTERNATING LAYERS of SHALE and SANDSTONE | OTHER

SAMPLER TYPES

(SHOWN IN SAMPLE COLUMN)



UNDISTURBED SAMPLE RECOVERY | DISTURBED SAMPLE RECOVERY | NO RECOVERY



SAMPLE RECOVERY | NO RECOVERY | % 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.

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 209+45, 6 Rt.
Depth, ft: 30.2-37.9

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 209+45, 6 Rt.
Depth, ft: 37.9-47.9

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 209+53, 52 Lt.
Depth, ft: 15.0-23.0

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 209+53, 52 Lt.
Depth, ft: 23.0-33.0

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 210+07, 39 Lt.
Depth, ft: 15.1-25.1

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 210+07, 39 Lt.
Depth, ft: 25.1-35.1

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 210+07, 39 Lt.
Depth, ft: 35.1-40.1

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 210+85, 75 Lt.
Depth, ft: 25.2-35.2

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 210+85, 75 Lt.
Depth, ft: 35.2-45.2

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 210+85, 75 Lt.
Depth, ft: 45.2-53.2

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 210+85, 28 Lt.
Depth, ft: 29.1-36.0

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 210+85, 28 Lt.
Depth, ft: 36.0-46.0

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 211+13, 6 Rt.
Depth, ft: 34.9-42.3

ROCK CORE PHOTO

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Station and Offset, ft: Sta. 211+13, 6 Rt.
Depth, ft: 42.3-52.3

Attachment B

Materials Division

Results of Classification Tests
ARDOT Project No.: 040721
Project: Fayetteville Ave. - Hwy. 162 (Alma)(S)
Site: Route 64, Section 2C County: Crawford

Summarized by: JCS
Checked by: PWC

Sample Identification					Moisture Content, %	Atterberg Limits			% Fines	Soil Classification	
Boring	Structure	Station	Offset	Depth, ft		LL	PL	PI		USCS	AASHTO
5	Little Frog Bayou Bridge	210+85	28' Left	5.2-6.7	18	Non-Plastic			61	ML	A-4
5		210+85	28' Left	10.2-11.7	20	Non-Plastic			62	ML	A-4
5		210+85	28' Left	15.2-16.7	24	Non-Plastic			38	SM	A-4
5		210+85	28' Left	20.2-21.7	24	Non-Plastic			35	SM	A-2-4
5		210+85	28' Left	25.2-26.7	23	Non-Plastic			27	SM	A-2-4

Rock Core Unconfined Compression Test Summary

Project Number: 040721
Project Name: Fayetteville Ave. - Hwy. 162 (Alma)(S)
Date Tested: 9/9/2021

Station	Location	Sample No.	Depth (ft.)	Diameter (in)	Height (in)	Total Load (lbs.)	Correction Factor	Stress (psi)	Remarks
209+45	6' Rt.	1	37.0						Broke
209+45	6' Rt.	2	39.9	1.75	3.50	17,930		7,454	
209+45	6' Rt.	3	40.9	1.75	3.49	10,960		4,556	
209+45	6' Rt.	4	42.2	1.75	3.47	10,000		4,157	
209+45	6' Rt.	5	43.9						Broke
209+53	52' Lt.	6	18.4	1.75	2.92	11,870	0.973	5,083	
209+53	52' Lt.	7	20.8	1.75	3.53	9,980		4,149	
209+53	52' Lt.	8	22.0	1.75	3.45	930		386	
209+53	52' Lt.	9	24.0	1.75	3.49	8,040			
209+53	52' Lt.	10	28.5						Broke
210+07	39' Lt.	11	16.0	1.75	3.56	16,460		6,843	
210+07	39' Lt.	12	19.0	1.75	3.52	9,880		4,107	
210+07	39' Lt.	13	26.0	1.75	3.50	11,400		4,739	
210+07	39' Lt.	14	28.5	1.75	3.53	6,660		2,768	
210+07	39' Lt.	15	31.0	1.75	3.37	6,270		2,606	
210+07	39' Lt.	16	34.0	1.75	3.41	8,280		3,442	
210+07	39' Lt.	17	38.0	1.75	3.10	5,430		2,257	
210+85	75' Lt.	18	26.0	1.75	3.45	8,350		3,471	
210+85	75' Lt.	19	32.0	1.75	3.54	3,400		1,413	
210+85	75' Lt.	20	36.0	1.75	3.46	8,470		3,521	
210+85	75' Lt.	21	39.5	1.75	3.46	14,710		6,115	
210+85	75' Lt.	22	44.0	1.75	3.45	6,180		2,569	
210+85	75' Lt.	23	48.0	1.75	3.45	7,540		3,134	
210+85	28' Lt	24	32.0	1.75	3.49	10,686		4,440	
211+13	6' Rt.	25	36.0	1.75	3.10	4,980		2,070	
211+13	6' Rt.	26	38.0						Broke
211+13	6' Rt.	27	40.0						Broke
211+13	6' Rt.	28	44.0						Broke

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

ROCK MASS RATING SUMMARY

JOB # 040721

SAMPLE #1

Station/Location	209+45/6' Rt
Depth (ft)	37
	Relative Rating
Uniaxial Compressive Strength	Broke
RQD	
Spacing of Joints	
Condition of Joints	
Groundwater Conditions	
Sum	*0*
Class Number	**V**
Description	**VERY POOR ROCK**

SAMPLE #2

Station/Location	209+45/6' Rt
Depth (ft)	40
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 #3

Station/Location	209+45/6' Rt
Depth (ft)	41
	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 #4

Station/Location	209+45/6' Rt
Depth (ft)	42
	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 #5

Station/Location	209+45/6' Rt
Depth (ft)	44
	Relative Rating
Uniaxial Compressive Strength	Broke
RQD	
Spacing of Joints	
Condition of Joints	
Groundwater Conditions	
Sum	
Class Number	
Description	

SAMPLE #6

Station/Location	209+53/52' Lt
Depth (ft)	18.5
	Relative Rating
Uniaxial Compressive Strength	4
RQD	8
Spacing of Joints	20
Condition of Joints	20
Groundwater Conditions	7
Sum	*59*
Class Number	**III**
Description	**FAIR ROCK**

SAMPLE #7

Station/Location	209+53/52' Lt
Depth (ft)	21.0
	Relative Rating
Uniaxial Compressive Strength	4
RQD	13
Spacing of Joints	20
Condition of Joints	20
Groundwater Conditions	7
Sum	*64*
Class Number	**II**
Description	**GOOD ROCK**

SAMPLE #8

Station/Location	209+53/52' Lt
Depth (ft)	22
	Relative Rating
Uniaxial Compressive Strength	0
RQD	13
Spacing of Joints	20
Condition of Joints	20
Groundwater Conditions	7
Sum	*60*
Class Number	**III**
Description	**FAIR ROCK**

SAMPLE #9

Station/Location	209+53/52' Lt
Depth (ft)	24
	Relative Rating
Uniaxial Compressive Strength	2
RQD	17
Spacing of Joints	20
Condition of Joints	25
Groundwater Conditions	7
Sum	*71*
Class Number	**II**
Description	**GOOD ROCK**

SAMPLE #10

Station/Location	209+53/52' Lt
Depth (ft)	28.5
	Relative Rating
Uniaxial Compressive Strength	Broke
RQD	
Spacing of Joints	
Condition of Joints	
Groundwater Conditions	
Sum	
Class Number	
Description	

SAMPLE #11

Station/Location	210+07/39' Lt
Depth (ft)	16
	Relative Rating
Uniaxial Compressive Strength	4
RQD	8
Spacing of Joints	20
Condition of Joints	20
Groundwater Conditions	7
Sum	*59*
Class Number	**III**
Description	**FAIR ROCK**

SAMPLE #12

Station/Location	210+07/39' Lt
Depth (ft)	19
	Relative Rating
Uniaxial Compressive Strength	4
RQD	3
Spacing of Joints	20
Condition of Joints	20
Groundwater Conditions	7
Sum	*54*
Class Number	**III**
Description	**FAIR ROCK**

SAMPLE #13

Station/Location	210+07/39' Lt
Depth (ft)	26
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 #14

Station/Location	210+07/39' Lt
Depth (ft)	28.5
Uniaxial Compressive Strength	2
RQD	17
Spacing of Joints	25
Condition of Joints	20
Groundwater Conditions	7
Sum	*71*
Class Number	**II**
Description	**GOOD ROCK**

SAMPLE #15

Station/Location	210+07/39' Lt
Depth (ft)	31
Uniaxial Compressive Strength	2
RQD	17
Spacing of Joints	30
Condition of Joints	20
Groundwater Conditions	7
Sum	*76*
Class Number	**II**
Description	**GOOD ROCK**

SAMPLE #16

Station/Location	210+07/39' Lt
Depth (ft)	34
Uniaxial Compressive Strength	2
RQD	20
Spacing of Joints	30
Condition of Joints	20
Groundwater Conditions	7
Sum	*79*
Class Number	**II**
Description	**GOOD ROCK**

SAMPLE #17

Station/Location	210+07/39' Lt
Depth (ft)	38
	Relative Rating
Uniaxial Compressive Strength	2
RQD	20
Spacing of Joints	25
Condition of Joints	20
Groundwater Conditions	7
Sum	*74*
Class Number	**II**
Description	**GOOD ROCK**

SAMPLE #18

Station/Location	210+85/75' Lt
Depth (ft)	26
	Relative Rating
Uniaxial Compressive Strength	2
RQD	13
Spacing of Joints	20
Condition of Joints	20
Groundwater Conditions	7
Sum	*62*
Class Number	**II**
Description	**GOOD ROCK**

SAMPLE #19

Station/Location	210+85/75' Lt
Depth (ft)	32
	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 #20

Station/Location	210+85/75' Lt
Depth (ft)	36
	Relative Rating
Uniaxial Compressive Strength	2
RQD	20
Spacing of Joints	25
Condition of Joints	20
Groundwater Conditions	7
Sum	*74*
Class Number	**II**
Description	**GOOD ROCK**

SAMPLE #21

Station/Location	210+85/75' Lt
Depth (ft)	39.5
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 #22

Station/Location	210+85/75' Lt
Depth (ft)	44
Uniaxial Compressive Strength	2
RQD	17
Spacing of Joints	25
Condition of Joints	20
Groundwater Conditions	7
Sum	*71*
Class Number	**II**
Description	**GOOD ROCK**

SAMPLE #23

Station/Location	210+85/75' Lt
Depth (ft)	48
Uniaxial Compressive Strength	2
RQD	20
Spacing of Joints	25
Condition of Joints	20
Groundwater Conditions	7
Sum	*74*
Class Number	**II**
Description	**GOOD ROCK**

SAMPLE #24

Station/Location	210+85/28' Lt
Depth (ft)	32
Uniaxial Compressive Strength	4
RQD	8
Spacing of Joints	20
Condition of Joints	20
Groundwater Conditions	7
Sum	*59*
Class Number	**III**
Description	**FAIR ROCK**

SAMPLE #25

Station/Location	211+13/6' Rt
Depth (ft)	36
	Relative Rating
Uniaxial Compressive Strength	2
RQD	13
Spacing of Joints	20
Condition of Joints	6
Groundwater Conditions	7
Sum	*48*
Class Number	**III**
Description	**FAIR ROCK**

SAMPLE #26

Station/Location	211+13/6' Rt
Depth (ft)	38
	Relative Rating
Uniaxial Compressive Strength	Broke
RQD	
Spacing of Joints	
Condition of Joints	
Groundwater Conditions	
Sum	
Class Number	
Description	

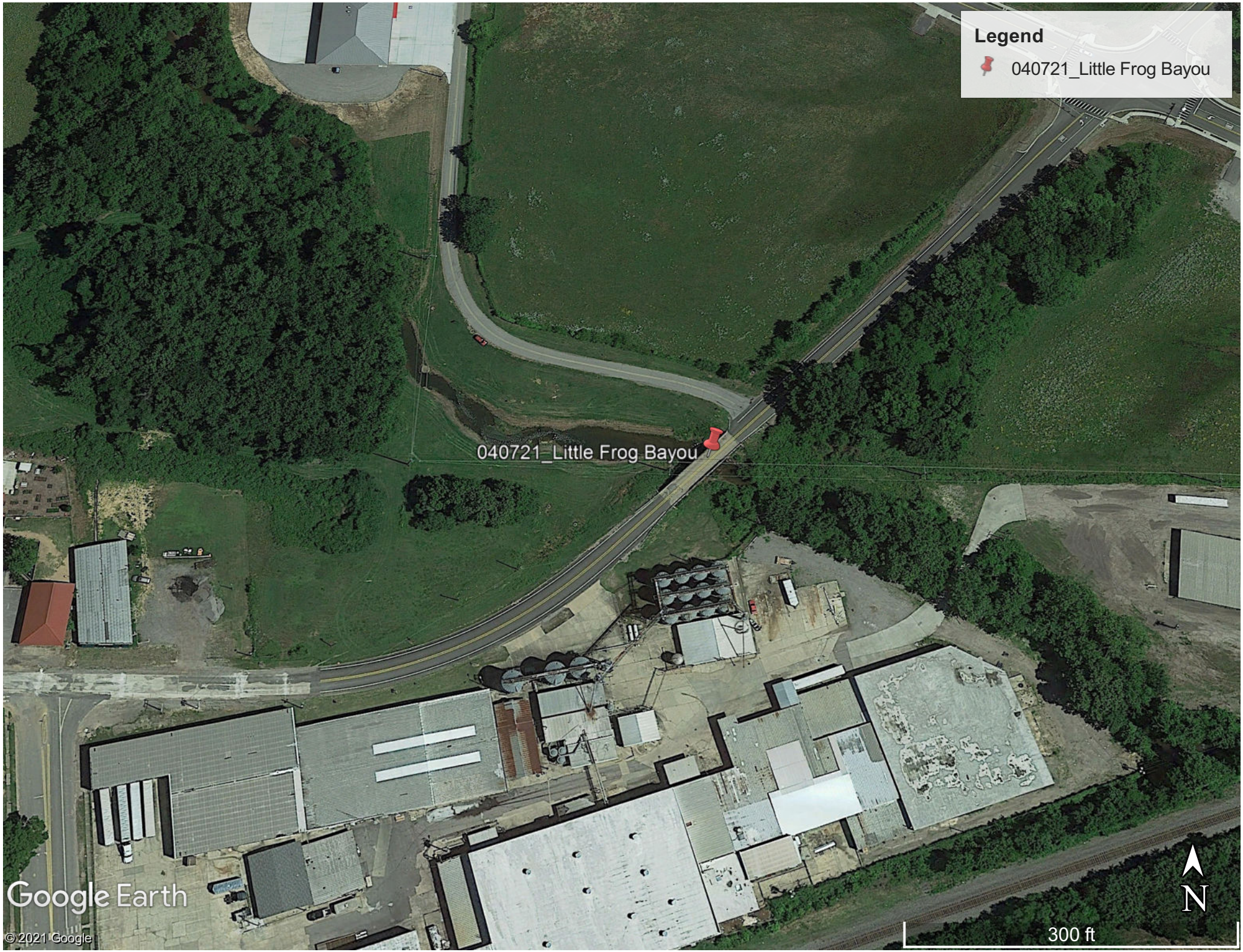
SAMPLE #27

Station/Location	211+13/6' Rt
Depth (ft)	40
	Relative Rating
Uniaxial Compressive Strength	Broke
RQD	
Spacing of Joints	
Condition of Joints	
Groundwater Conditions	
Sum	
Class Number	
Description	

SAMPLE #28

Station/Location	211+13/6' Rt
Depth (ft)	44
	Relative Rating
Uniaxial Compressive Strength	Broke
RQD	
Spacing of Joints	
Condition of Joints	
Groundwater Conditions	
Sum	
Class Number	
Description	

Attachment C


Legend
040721_Little Frog Bayou
040721_Little Frog Bayou
Google Earth
© 2021 Google
N
300 ft

SITE PICTURES

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Looking North from South (July 28, 2021)

SITE PICTURES

Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Looking South from North (July 28, 2021)

SITE PICTURES

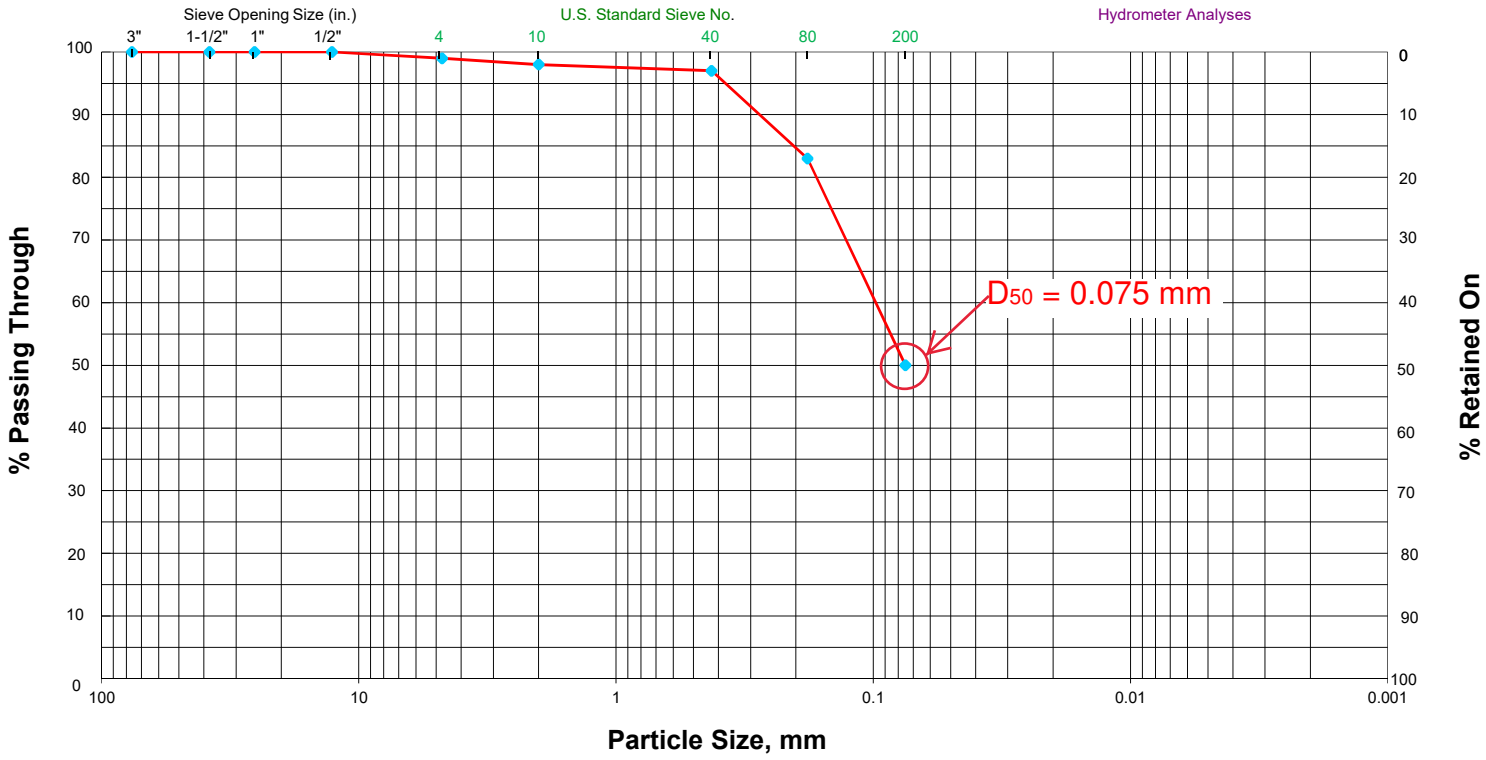
Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Looking East from West (July 28, 2021)

SITE PICTURES

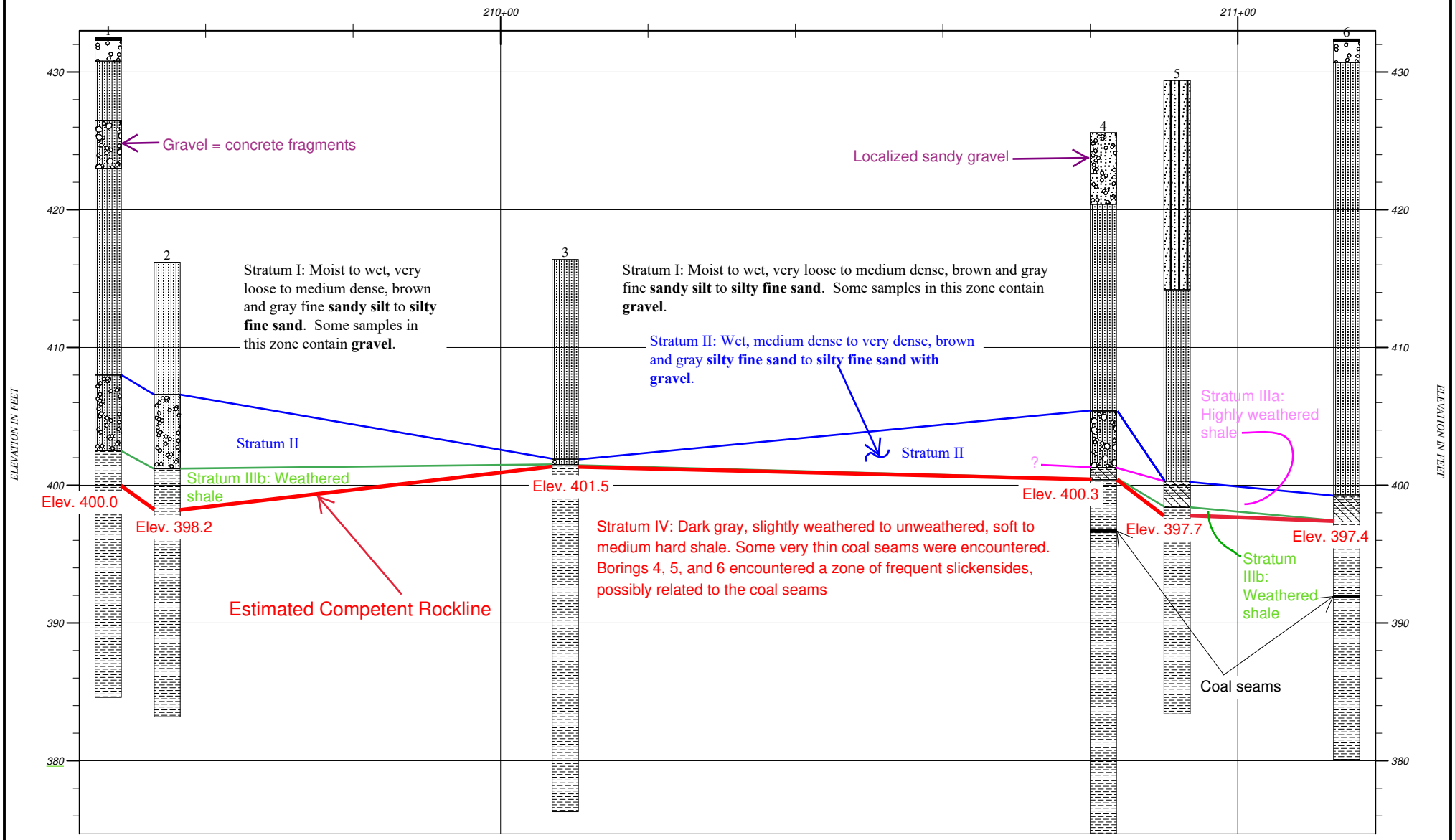
Job No.: 040721
Job Name: Fayetteville Ave. – Hwy. 162 (Alma) (S)

Scour in the Creek Bank - Looking South from North (July 28, 2021)



Particle Size Distribution Curve

Attachment D



Strata symbols

- Coal/Asphalt
- gravel
- silty sand
- silty sand, gravel and cobbles
- silty sand with gravel
- shale/siltstone
- sand and gravel
- shale with clay seams
- sandy silt

GENERALIZED SUBSURFACE PROFILE

HORIZONTAL SCALE: NTS	DRAWN BY/APPROVED BY	DATE DRAWN
VERTICAL SCALE: NTS		8/20/2021

Fayetteville Ave. - Hwy. 162 (Alma)(S)

PROJECT NO. 040721
Crawford County

FIGURE NUMBER

Attachment E

Title:	040721
Latitude:	35.481285
Longitude:	-94.220112
Site Class	D

Get USGS Data

PGA:	0.055
F_{PGA}:	1.6
A_S:	0.089
S_S:	0.131
F_A:	1.6
S_{DS}:	0.21
S_1:	0.053
F_V:	2.4
S_{D1}:	0.128
S_{Dc}:	A
T_S:	0.608
T_0:	0.122