

ARKANSAS DEPARTMENT OF TRANSPORTATION



SUBSURFACE INVESTIGATION

STATE JOB NO. 050439

FEDERAL AID PROJECT NO. FEDERAL AID PROJECT NHPP-0032(44)

HWY. 25 STR. & APPRS. (INDEPENDENCE CO.) (S)

STATE HIGHWAY 25 SECTION 5

IN INDEPENDENCE 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 | Lorie H. Tudor, 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

July 11, 2023

TO: Mr. Trinity Smith, Engineer of Roadway Design

SUBJECT: Job No.050439
Hwy. 25 Str. & Apprs. (Independence Co.) (S)
Route 25 Section 5
Independence County

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

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

Asphalt Concrete Hot Mix 70-22

Type	Asphalt Cement %	Mineral Aggregate %
Surface Course	5.3	94.7
Binder Course	4.3	95.7
Base Course	4.1	95.9


Paul Tinsley
Materials Engineer

RPT:zy:bjj
Attachment

cc: District 5 Engineer
System Information and Research Div.
G. C. File



July 24, 2025

TO: Mr. Rick Ellis, Bridge Engineer
SUBJECT: Job No. 050439
Hwy. 25 Str. & Apprs. (Independence Co.) (S)
Independence County
Route 25, Section 5

INTRODUCTION

Submitted herein are the results of the subsurface investigation and geotechnical recommendations developed for the proposed replacement bridge planned on Hwy. 25 over Blue Creek in Independence County.

The proposed structure will be 196 feet in total length and consists of a 194.5-foot Integral Prestressed Concrete Girder Unit. The proposed structure has an out-to-out width of 42.5 feet. The proposed alignment is located southwest of the existing bridge.

Based on the geotechnical investigation request from Bridge Division, foundation loads are expected to be supported on spread footings at the intermediate bents and H-Piles at the end bents. 2-Horizontal to 1-Vertical (2H:1V) end slopes and 3H:1V side slopes are planned at the proposed abutments. Abutment slopes will be constructed utilizing fill with heights ranging from 11 to 13 feet.

FIELD INVESTIGATION

A subsurface investigation was requested by Bridge Division on September 24, 2024, to provide geotechnical recommendations for bridge foundations and to evaluate the proposed embankment configuration at the bridge abutments. Six borings were initially requested. However, three borings were located on inaccessible private property.

The approximate boring locations are shown on the Plan of Borings included in Attachment A. Boring logs showing the subsurface conditions and the results of field and laboratory tests are also included in Attachment A. A legend is attached following the boring logs to describe the symbols, terms, and conventions used on the logs. Drilling was performed using a track-mounted Acker Renegade rotary drill rig utilizing hollow-stem auger and rock coring techniques. Standard Penetration Tests (SPT) were conducted in accordance with ASTM D1586 to obtain in-situ soil resistance and to collect soil samples. The hammer energy correction factor is noted on the boring logs. Liners were not used in the split-barrel samplers.

SPT blow counts were recorded in 6-inch increments over an 18-inch drive depth, with the N-value defined as the number of blows required to penetrate the final 12 inches. All N-values shown on the boring logs are uncorrected field values. Groundwater levels observed during drilling are also noted on the logs.

Bedrock core samples were obtained using NQ3-size triple-tube core barrels (1¾-inch diameter core, 3-inch diameter hole). Total Core Recovery (TCR) and Rock Quality Designation (RQD) were assessed in the field and later reviewed by licensed Professional Geologists (PGs). TCR represents the percentage of total intact core recovered, while RQD indicates the percentage

of core pieces that are four inches or longer. The vertical rock bedding can result in rock fragmentation during the coring process. Consequently, these values listed on the boring logs may underestimate the true rock quality. Core pictures are also included in Attachment A for reference.

LAB INVESTIGATION

All soil and rock samples collected during the field investigation were transported to the Materials Division laboratory for further testing and evaluation. Laboratory tests were conducted to characterize the index properties and to confirm the soil classifications.

Soil samples were analyzed for moisture content, Atterberg limits, grain size distribution, resistivity, and pH. Soils were classified by a licensed PG in accordance with the Unified Soil Classification System (USCS) and the AASHTO Soil Classification System. The test results are denoted on the boring logs. Table 1 summarizes the laboratory tests performed, the applicable ASTM and/or AASHTO standards, and how results are indicated on the logs.

Rock cores were first reviewed by a licensed PG to confirm TCR and RQD values recorded in the field and to determine the Geological Strength Index (GSI) and Rock Mass Rating (RMR). Uniaxial compressive strength tests were performed on selected intact rock specimens in accordance with ASTM D7012, Method C. Results of these tests, along with RMR values, are provided in Attachment B.

Table 1: Summary of Laboratory Tests and Methods

Laboratory Test	ASTM	AASHTO	Denotation on Logs
Moisture Content	D2216	T 265	Solid Circle Symbol (●)
Grain Size Distribution	D6913	T 88	Whole Number in the “Percent Passing No. 200 Sieve” Column (e.g., 12)
Atterberg Limits	D4318	T 89	Vertical line (l) on the Right for Liquid Limit
		T 90	Vertical line (l) on the Left for Plastic Limit
Resistivity		T 288	Not Denoted on Logs
pH	ARDOT 357		
Uniaxial Compression of Rock Cores	D7012, Method C		

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

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

Hydraulic Feature	Sample Location	Sample Type	Location	D_{50} , mm
Blue Creek	116+81, 2' LT	Bulk	Creek Bank	18

To determine the corrosive potential of the foundation soils on steel piles, laboratory pH and resistivity tests were performed with bulk soil samples obtained from Borings 1 and 3. The results of pH and resistivity tests are summarized in Table 3.

Table 3: Results of Laboratory pH and Resistivity Test

Laboratory Test	Boring	Depth, ft	Results
pH	1	0-10	7.0
	3		7.4
Resistivity	1		2650 ($\Omega \cdot \text{cm}$)
	3		3500 ($\Omega \cdot \text{cm}$)

SITE CONDITIONS

The project involves replacing the existing bridge on Hwy. 25 over Blue Creek with a new structure southwest of the current alignment. Blue Creek flows northeast-to-southwest through the project area. Overhead power lines are present on the north side paralleling Hwy. 25.

The existing bridge is approximately 106 feet long and 25.7 feet wide (out-to-out), consisting of a 15-foot and 19-foot precast channel beam spans supported by reinforced concrete columns and footings. It is located approximately 43 feet upstream (northeast) of the planned new structure. Representative site pictures are included in Attachment C.

SITE GEOLOGY AND GENERAL SUBSURFACE CONDITIONS

According to the Arkansas Office of the State Geologist, the Moorefield Formation in the Batesville area consists of a lower member composed of black, calcareous shale and siliceous limestone, and an upper member of dark, fissile clay shale. The unit identified as the Ruddell Shale on the state geologic map is typically considered part of the Moorefield Formation and is equivalent to the upper member described in the logs. The lower boundary of the formation is sharp and regarded as unconformable by most researchers. The formation's thickness ranges from a thin edge to approximately 300 feet.

A generalized subsurface profile is provided in Attachment D to illustrate stratigraphy and expected subsurface conditions. Estimated elevations of resistant rock and competent rock at each boring location are summarized in Table 4. Resistant rock is defined as medium hard to harder weathered to unweathered rock that is suitable for supporting foundations. Highly weathered rock is not considered as resistant rock. Competent rock is defined as slightly weathered to unweathered rock. Considering natural variations in stratigraphy and subsurface conditions, deviation from these illustrated in the profile must be anticipated.

Table 4: Estimated Elevation of Resistant Rock and Competent Rock

Boring No.	Ground Surf. Elev. @ Boring Location, ft.	Estimated Elev. Of Resistant Rock, ft.	Estimated Elev. of Competent Rock, ft.
1	296.7	285.7	278.0
2	294.0	288.0	279.6
3	298.7	284.0	274.0

SEISMIC CONDITIONS

Seismic Site Class and Seismic Performance Zone

Based on the average subsurface conditions, a Seismic Site Class B (Soft Rock) was calculated for the proposed bridge over Blue Creek. Utilizing Seismic Site Class B 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}), were determined. These seismic coefficients are summarized in Table 5. For the design long-period spectral acceleration coefficient (S_{D1}) of 0.128g, a Seismic Performance Zone 1 is considered applicable.

Table 5: Design Ground Motion Acceleration Response Coefficients

Acceleration Coefficient	Value (g)
A_S (Site PGA)	0.225
S_{DS} (0.2 sec)	0.463
S_{D1} (1 sec)	0.128

Design Response Spectrum is presented in Attachment E.

APPROACH EMBANKMENTS

Embankment Configuration

The proposed bridge includes embankments with 2H:1V end slopes and 3H:1V side slopes. The onsite soils are suitable for use as embankment fill. At Bent 1, max fill height is anticipated to be approximately 13 feet, while at Bent 4, the max fill height is expected to be approximately 11 feet.

Settlement Potential

The overburden soils consist of gravel with clay/sand, sand with gravel, or clay with gravel. Due to the granular nature of these materials and the shallow depth to competent bedrock, most of the anticipated settlement is expected to be elastic and will occur shortly after the application of embankment loading. Long-term consolidation settlement is expected to be negligible.

Approach Slope Stability

Slope stability analyses were conducted using the Slide2 software (Version 2021) developed by RocScience. The Spencer method was utilized to assess slope stability under three loading conditions: Short-Term/End of Construction, Long-Term, and Seismic/Pseudo-Static.

For the seismic analysis, a horizontal acceleration coefficient (K_h) of 0.1125 (equivalent to 0.5 times the site peak ground acceleration) was used. A uniform live load surcharge of 250 psf was applied in the Long-Term condition.

Stability analyses were performed for the 2H:1V end slopes at Bents 1 and 4. The calculated factors of safety under each loading condition are summarized in Table 6. All results indicate that the proposed slope geometry meets or exceeds the recommended factors of safety,

confirming the suitability of the planned embankment configurations. Graphical outputs of the analyses are provided in Attachment F.

Table 6: Results of Slope Stability Analyses Utilizing Plan Configuration

Design Condition	Calculated Factor of Safety		Recommended Factor of Safety
	Bent 1	Bent 4	
End of Construction (Short Term)	3.55	3.91	1.3
Long Term	1.57	1.61	1.4
Pseudo-Static (Seismic)	2.62	2.95	1.05

Based on results from the slope stability analyses, plan configuration of the embankments is suitable.

FOUNDATION RECOMMENDATIONS

Based on the provided plans and results of the geotechnical investigation, it is recommended that the intermediate bents (Bents 2 and 3) be supported on spread footings, while steel H-piles be used to support the end bents (Bents 1 and 4).

Spread Footings

Spread footings are considered suitable for supporting foundation loads at intermediate bents where resistant rock is located within 15 feet of the ground surface. As noted, resistant rock is defined as medium hard to harder weathered shale to unweathered shale that is suitable for supporting footings. These footings should be embedded a minimum of 2 feet into the resistant rock. The recommended minimum footing bottom elevations are listed in Table 7.

Table 7: Recommended Shallowest Footing Bottom Elevation

Bent No.	Boring No.	Estimated Elev. of Resistant Rock, ft	Recommended Shallowest Footing Bottom Elevation, ft
2	2	288.0	286.0
3			

While the bedrock in Boring 2 from 6 feet (Elev. 288) to 14.4 feet (Elev. 279.6) bgl is weathered, the poor core recovery may result from shale being broken down during the coring process, rather than actual weathering. Shallowest footing elevation may differ during the excavation process.

A maximum nominal bearing capacity of 30 ksf is recommended for spread footings founded in resistant rock. Applying a resistance factor (ϕ_b) of 0.45 yields a maximum factored bearing resistance of 14.4 ksf. For increased bearing resistance, footings may be founded deeper in the competent rock (Elev. 279.6). In this case, a factored bearing resistance of 22.5 ksf is

recommended. Post-construction settlement of footings embedded in resistant to competent rock is expected to be negligible.

Uplift resistance may be provided by the self-weight of the footing and superstructure dead loads. If additional uplift resistance is needed, rock anchors may be used. Design recommendations for rock anchors can be provided upon request.

Lateral resistance should be evaluated using a maximum nominal coefficient of friction ($\tan \delta$) of 0.70 for concrete on rock, along with a resistance factor for sliding (ϕ) of 0.85. Additional lateral resistance may be derived from the passive resistance of intact foundation rock in direct contact with the footing. However, any overburden soil and the upper 2 feet of foundation rock should be excluded from passive resistance calculations. Factored passive resistance values can be provided as needed.

All existing underground utilities within planned footing excavation zones must be removed or relocated and properly backfilled. Sump pumps should be utilized to remove any water seepage into the excavation bottom. The excavation bottom should be free of standing water prior to foundation placement. Where over-excavation occurs, Class S concrete should be used for backfill. Excavation to plan footing depths will likely require rock excavation methods other than ripping.

Steel H Piles

Steel H-piles are recommended to support foundation loads at the end bents (Bents 1 and 4) and should be driven to practical refusal and should penetrate through embankment fill, overburden soils, and highly weathered bedrock to bear in the resistant bedrock. Practical refusal is defined as achieving a penetration of 1 inch or less after 20 hammer blows.

For estimating pile length, a pile penetration of 2 feet into resistant rock is anticipated. Due to moderate to severe driving conditions anticipated at the site, rock points are recommended for all piles.

A minimum pile embedment of 10 feet below the existing ground surface is recommended. Preboring will be required at both end bent locations to achieve minimum pile penetration requirements. Table 8 presents the recommended minimum pile tip elevations. Actual pile lengths may vary depending on field conditions and lateral load requirements determined by the Structural Engineer.

Table 8: Recommended Shallowest Pile Tip Elevation

Bent No.	Boring No.	Estimated Shallowest Pile Tip Elevation, ft	Comments
1	1	283.5	Preboring will be required
4	3	282.0	

The elevations summarized in Table 8 are the recommended shallowest pile tip elevations utilizing boring results and engineering judgement. As-constructed pile tip elevations can vary and



must be field verified. Greater pile length/penetration may be warranted by lateral resistance demand.

Long-term settlement of H-piles driven to refusal is expected to be negligible. The nominal axial resistance of these piles will be governed by their structural capacity and must be evaluated by the Structural Engineer using applicable AASHTO LRFD procedures.

Geotechnical Input Parameters for LPile/Group

Lateral load analysis will be performed by the Structural Engineer using commercial computer programs LPile and/or Group. The geotechnical input parameters are included in Attachment G.

If there are any questions concerning these recommendations, please contact the Materials Division.

A handwritten signature in blue ink, appearing to read 'Paul Tinsley', is written over a light blue horizontal line.

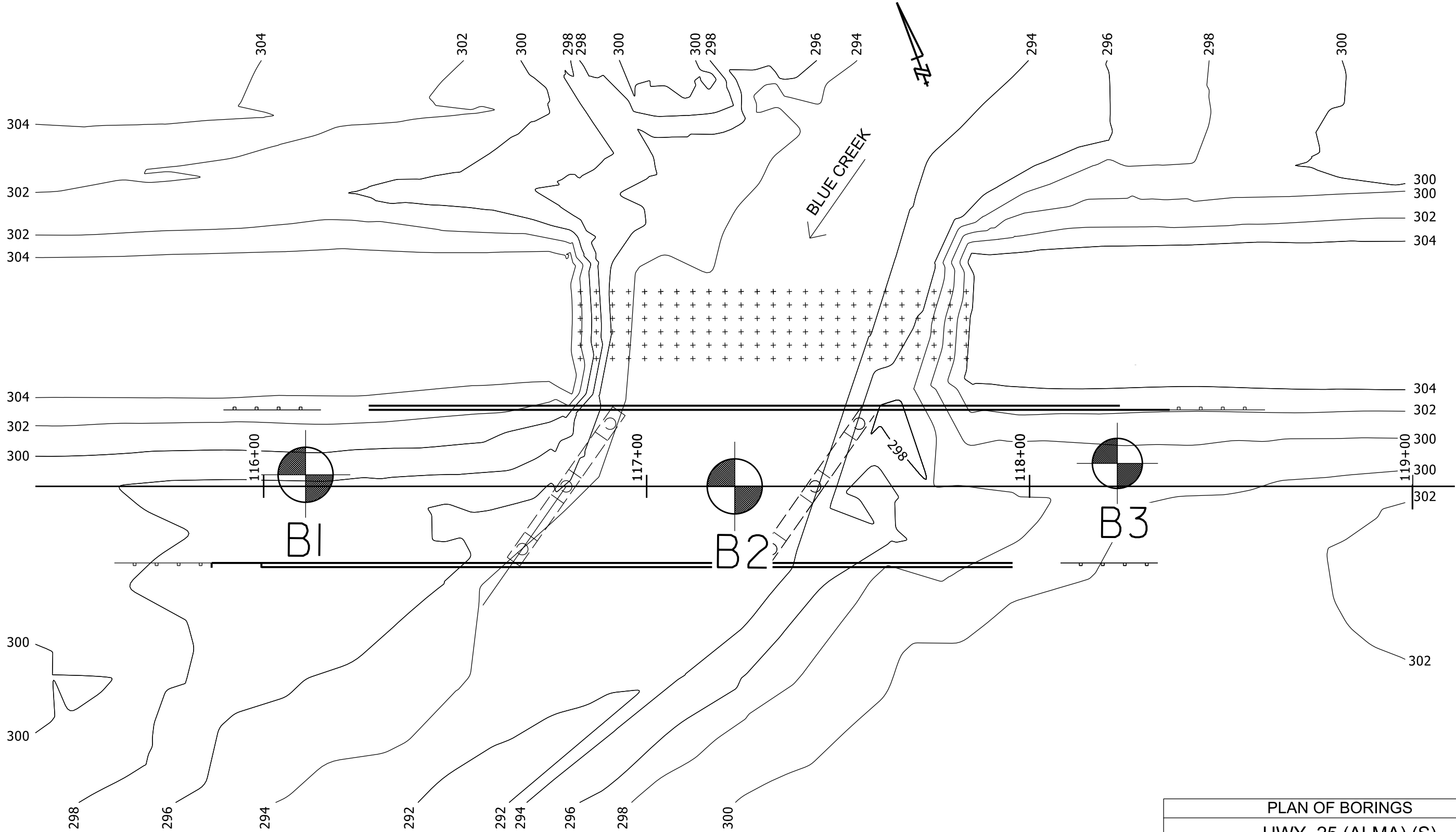
Paul Tinsley
Materials Engineer

PT:yz:mbb:pwc

cc: State Construction Engineer
District 5 Engineer
G. C. File

Attachment A

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
6	AR			
JOB NO.		050439		
PLAN OF BORINGS				



PLAN OF BORINGS	
HWY. 25 (ALMA) (S) ROUTE 25, SECTION 5 INDEPENDENCE COUNTY	
JOB NO. 050439	SHEET 1/1
NOT TO SCALE	

BORING NO. 1
PAGE 1 OF 2

DATE:	May 13, 2025
TYPE OF DRILLING:	Hollow Stem Auger-Diamond Core
EQUIPMENT:	Acker 1
COORD.:	
HAMMER CORRECTION FACTOR:	1.42

[illegible]

REMARKS: *Water level was 2.2 feet below ground level on May 14.
**Poor recovery due core to swelling in barrel.

ARKANSAS DEPARTMENT OF TRANSPORTATION MATERIALS DIVISION - GEOTECHNICAL SECTION						BORING NO. 1 PAGE 2 OF 2									
JOB NO. 050439 Independence County JOB NAME: Hwy. 25 Str. & Apprs. (Independence Co.) (S) Route 25, Section 5 STATION: 116+11 OFFSET: 3' Left of Construction Centerline PARTY CHIEF: Tracy Henderson LOGGED BY/DRILLED BY: Jeremiah Harjo/Guy King						DATE: May 13, 2025 TYPE OF DRILLING: Hollow Stem Auger-Diamond Core EQUIPMENT: Acker 1 COORD.: HAMMER CORRECTION FACTOR: 1.42									
COMPLETION DEPTH: 39.5															
D E P T H	S Y M B O L	S A M P L E S	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.	% T C R	% R Q D
FT.			SURFACE ELEVATION: 296.7												
			ARGILLACEOUS LIMESTONE -												
			Unweathered, Moderately Hard,												
			Dark Gray (Calcareous Shale)												
40			SHALE - Unweathered, Medium												
			Hard, Dark Gray												
			LIMESTONE - Unweathered, Hard,												
			Sandy, Gray												
			Boring Terminated												
45															
50															
55															
60															
65															
70															

REMARKS: *Water level was 2.2 feet below ground level on May 14.
 **Poor recovery due core to swelling in barrel.

**ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SECTION**

BORING NO. 2

PAGE 1 OF 1

JOB NO. 050439 Independence County
 JOB NAME: Hwy. 25 Str. & Apprs. (Independence Co.) (S)
 Route 25, Section 5
 STATION: 117+23 OFFSET: Construction Centerline
 PARTY CHIEF: Tracy Henderson
 LOGGED BY/DRILLED BY: Jeremiah Harjo/Tracy Henderson

DATE: May 21, 2025
 TYPE OF DRILLING:
 Hollow Stem Auger-Diamond Core
 EQUIPMENT: Acker 1
 COORD.:
 HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 24.4

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%) PL 10 20 30 40 50 60 70 LL							PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D
			SURFACE ELEVATION: 294.0												
5			Gravel and Cobbles												
10			SHALE - Weathered, Medium Hard, Dark Gray* (Moorefield Formation)										14 60 (5")	94	21
15			SHALE - Slightly Weathered, Medium Hard, Dark Gray SHALE - Unweathered, Hard, Siliceous, Dark Gray											42	0
20			SHALE - Unweathered, Medium Hard to Hard, Dark Gray											96	62
25			Boring Terminated											97	95
30															
35															

REMARKS: *Auger refusal at 5.9 feet below ground level

**ARKANSAS DEPARTMENT OF TRANSPORTATION
MATERIALS DIVISION - GEOTECHNICAL SECTION**

BORING NO. 3

PAGE 1 OF 2

JOB NO. 050439 Independence County
 JOB NAME: Hwy. 25 Str. & Apprs. (Independence Co.) (S)
 Route 25, Section 5
 STATION: 118+23 OFFSET: 6' Left of Construction Centerline
 PARTY CHIEF: Tracy Henderson
 LOGGED BY/DRILLED BY: Jeremiah Harjo/Guy King

DATE: May 14, 2025
 TYPE OF DRILLING:
 Hollow Stem Auger-Diamond Core
 EQUIPMENT: Acker 1
 COORD.:
 HAMMER CORRECTION FACTOR: 1.42

COMPLETION DEPTH: 34.7

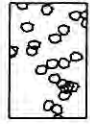
DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SOIL GROUP	MOISTURE CONTENT (%)						PERCENT PASSING NO. 200 SIEVE	NO. OF BLOWS PER 6-IN.	% T C R	% R Q D
			SURFACE ELEVATION: 298.7		PL					LL				
					10	20	30	40	50	60	70			
5			Moist, Medium Dense, Brown Silty Sand with Gravel	- SM		•						32	2 5-8	
			Wet, Medium Dense, Brown Clayey Gravel with Sand*	- GC		•	—					28	1 6-7	
10			SHALE - Highly Weathered, Medium Hard, Dark Gray (Moorefield Formation)									8 26-40		
			SHALE - Highly Weathered with Weathered Layers, Medium Hard, Dark Gray									60 (6")	64	0
15														
20			SHALE - Weathered, Medium Hard, Dark Gray**	-									77	0
25													12	0
30			SHALE - Unweathered, Medium Hard to Hard, Dark Gray										97	82
35													68	58

REMARKS: *Water level was 7.3 feet below ground level on May 20. **Poor core recovery from 19.7 to 24.7 feet below ground level due to barrel malfunction.

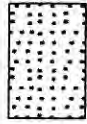
LEGEND

SOIL TYPES

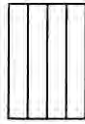
(SHOWN IN SYMBOL COLUMN)
(PREDOMINANT TYPE SHOWN HEAVY)



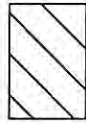
GRAVEL



SAND



SILT



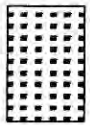
CLAY



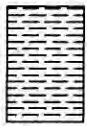
ORGANIC
MATTER

ROCK TYPES

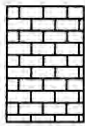
(SHOWN IN SYMBOL COLUMN)



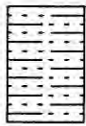
SANDSTONE



SHALE
or
SILTSTONE



LIMESTONE
or
DOLOMITE



ALTERNATING
LAYERS of
SHALE and
SANDSTONE



OTHER

SAMPLER TYPES

(SHOWN IN SAMPLE COLUMN)

SHELBY TUBE



UNDISTURBED
SAMPLE
RECOVERY

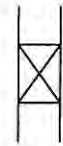


DISTURBED
SAMPLE
RECOVERY

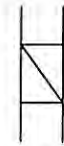


NO
RECOVERY

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: $\frac{6}{8-9} \Rightarrow 8+9 = 17 \text{ blows/ft}$. 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.

ROCK CORE PHOTO

Job No.: 050439



**Station 116+11, 3 Feet Left of Construction Centerline (Boring 1)
Depth, ft: 10.6 - 24.5**



ROCK CORE PHOTO

Job No.: 050439



**Station 116+11, 3 Feet Left of Construction Centerline (Boring 1)
Depth, ft: 24.5 – 34.5**



ROCK CORE PHOTO

Job No.: 050439



Station 116+11, 3 Feet Left of Construction Centerline (Boring 1)
Depth, ft: 34.5 - 39.5

ROCK CORE PHOTO

Job No.: 050439

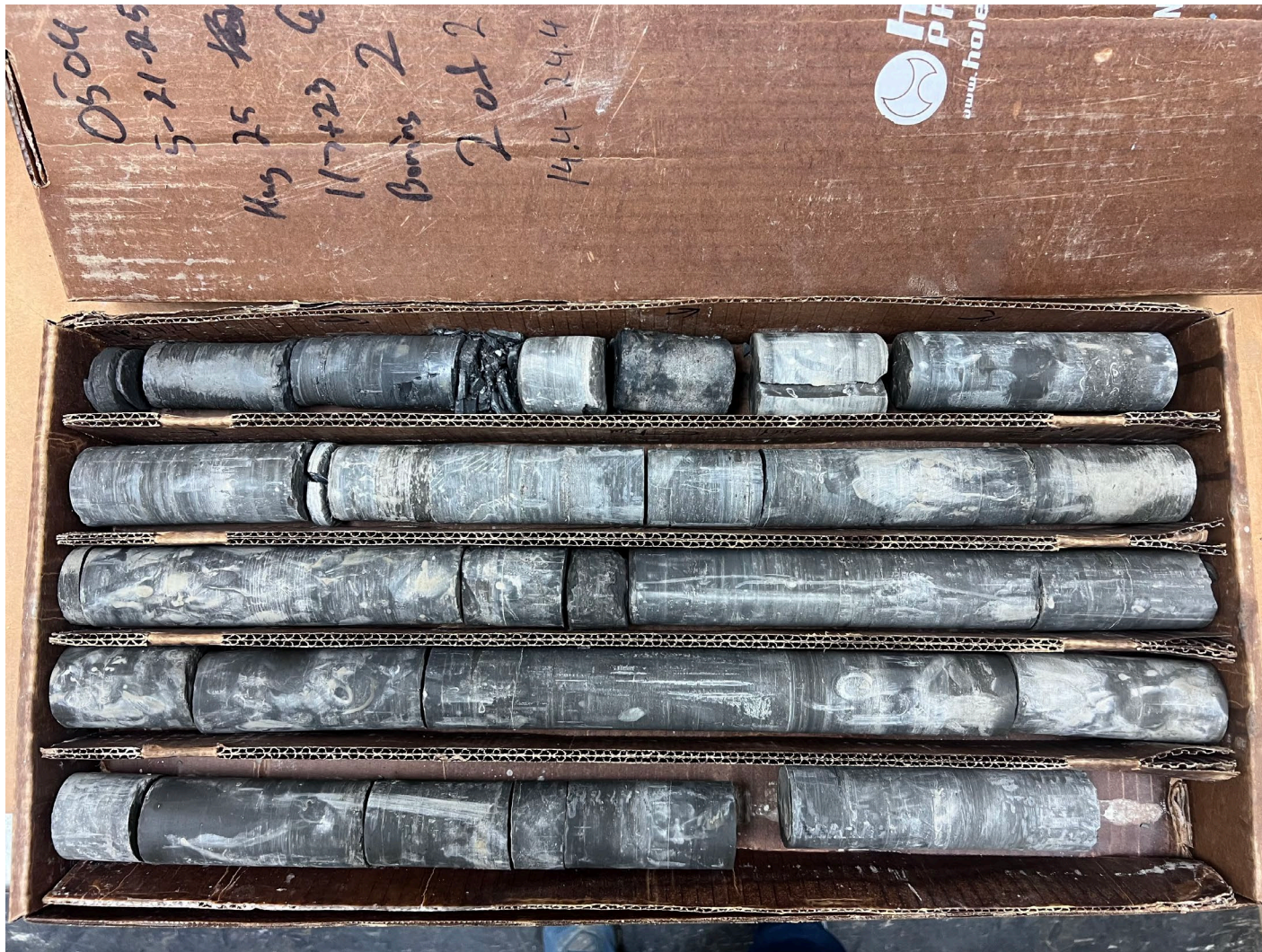


Station 117+23, Construction Centerline (Boring 2)
Depth, ft: 5.9 – 14.4



ROCK CORE PHOTO

Job No.: 050439



Station 117+23, Construction Centerline (Boring 2)
Depth, ft: 14.4 – 24.4



ROCK CORE PHOTO

Job No.: 050439



Station 118+23, 6 Feet Left of Construction Centerline (Boring 3)
Depth, ft: 10.5 - 24.7

ROCK CORE PHOTO

Job No.: 050439



**Station 118+23, 6 Feet Left of Construction Centerline (Boring 3)
Depth, ft: 24.7 – 34.7**

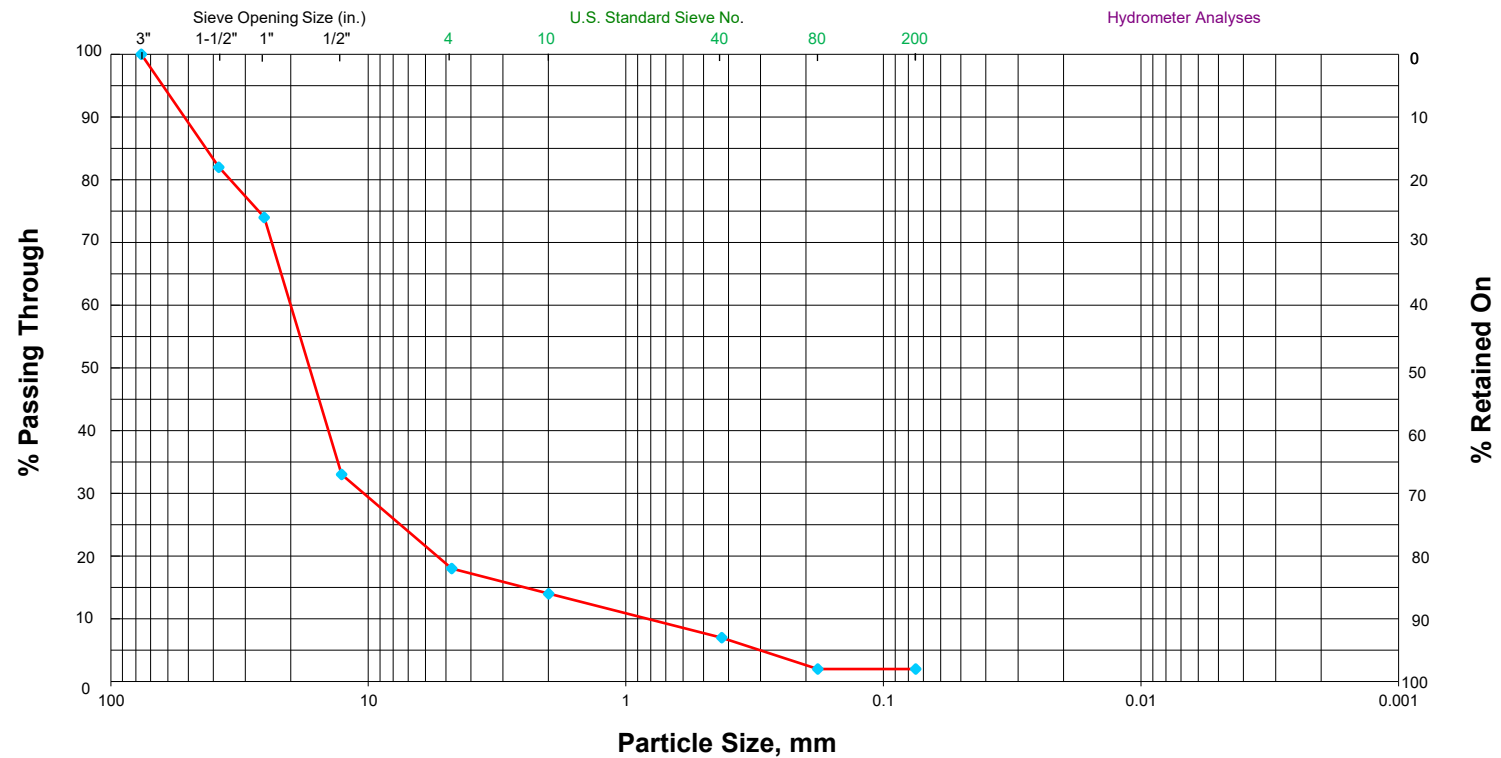
Attachment B

Summary of Rock Core Uniaxial Compression Test Results, Geological Strength Index (GSI) and Rock Mass Rating (RMR)

Project Number:	050439
Project Name:	Hwy. 25 Str. & Apprs. (Independence Co.) (S)
Date Tested:	

GSI:	80
------	----

[illegible]



Particle Size Distribution Curve for D₅₀ Sample
Station 116+81, 2' Left of CL



Attachment C



SITE PICTURES

Job No.: 050439
Site No.: 1

Made by: JCS
Checked by: MB



Looking west at the east end of the existing bridge (November 2024)



SITE PICTURES

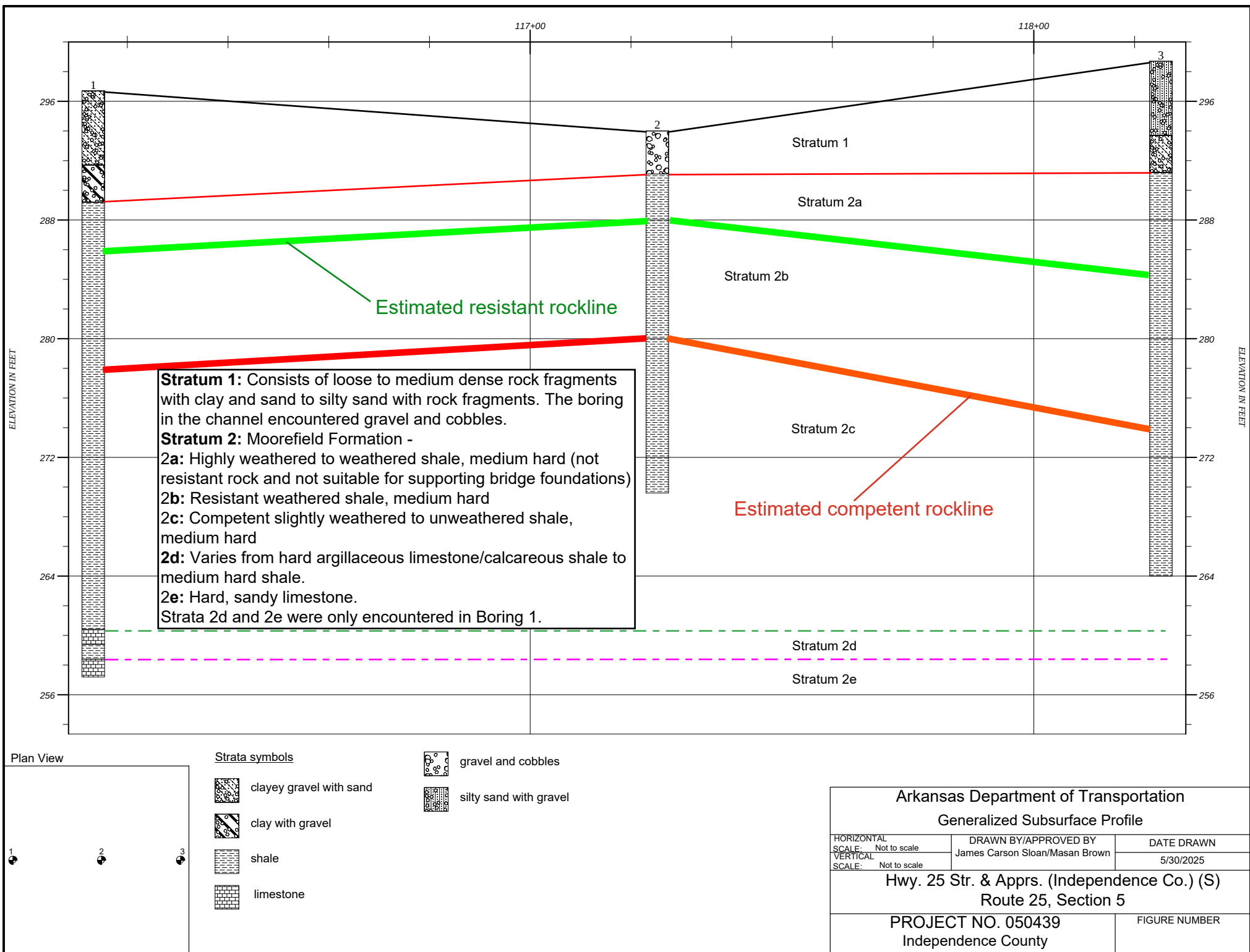
Job No.: 050439
Site No.: 1

Made by: JCS
Checked by: MB



South side of existing bridge, looking east (May 2025)

Attachment D



Attachment E

Title:050439

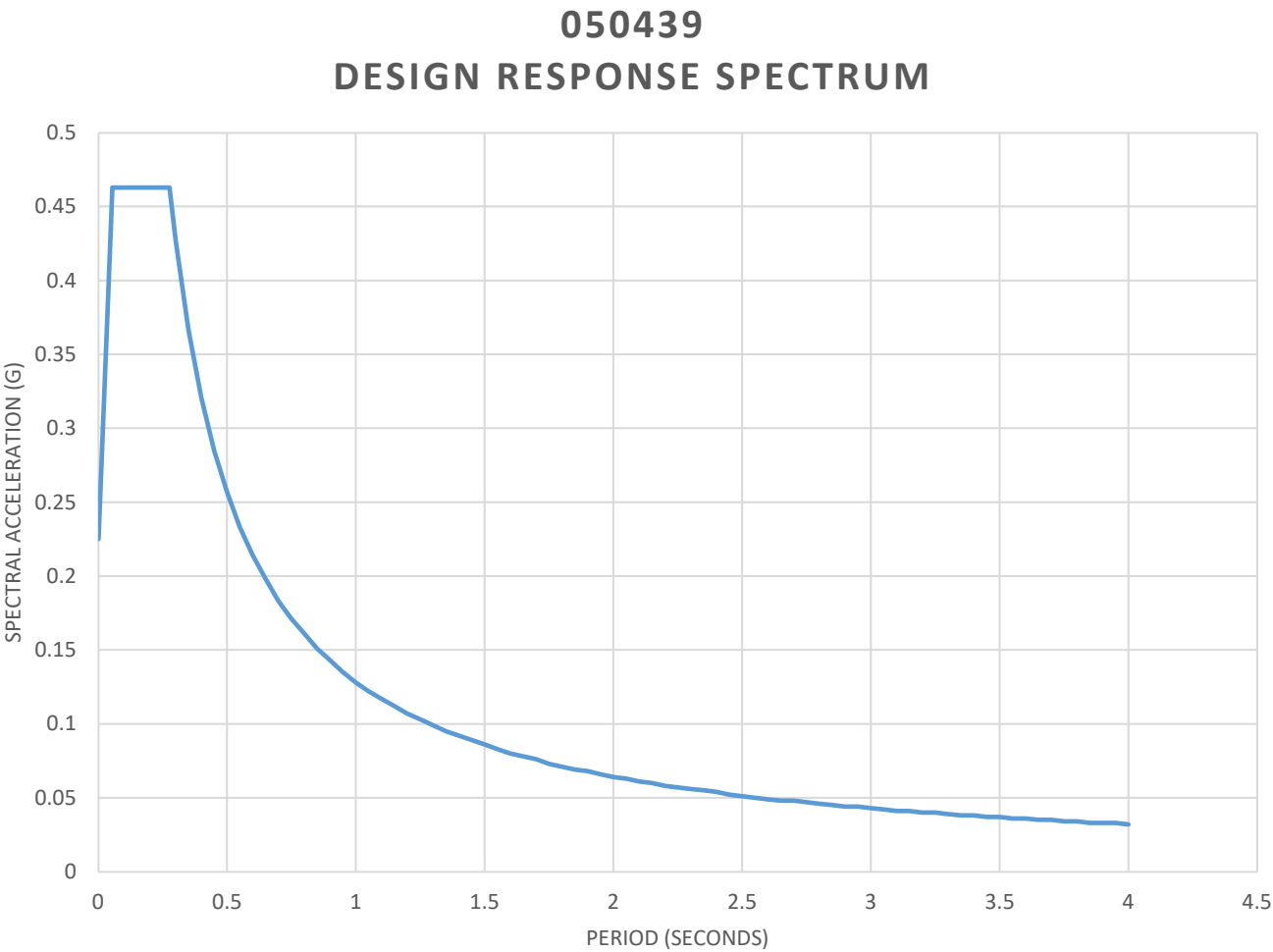
Latitude:35.787452

Longitude:-91.586241

Site ClassB

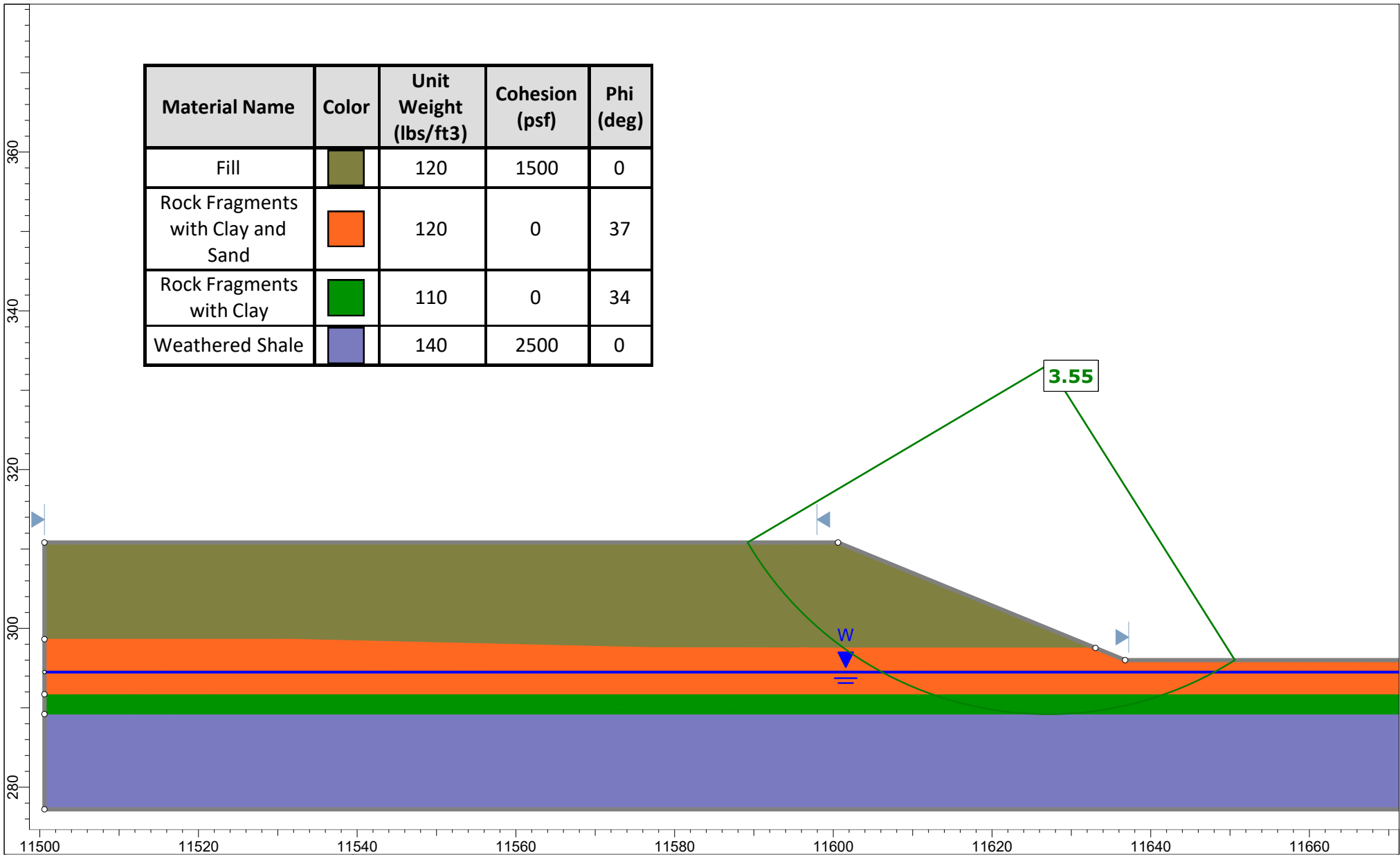
Get USGS Data

PGA:	0.225
F _{PGA} :	1
A _S :	0.225
S _S :	0.463
F _A :	1
S _{DS} :	0.463
S ₁ :	0.128
F _V :	1
S _{D1} :	0.128
S _{DC} :	A
T _S :	0.277
T ₀ :	0.055



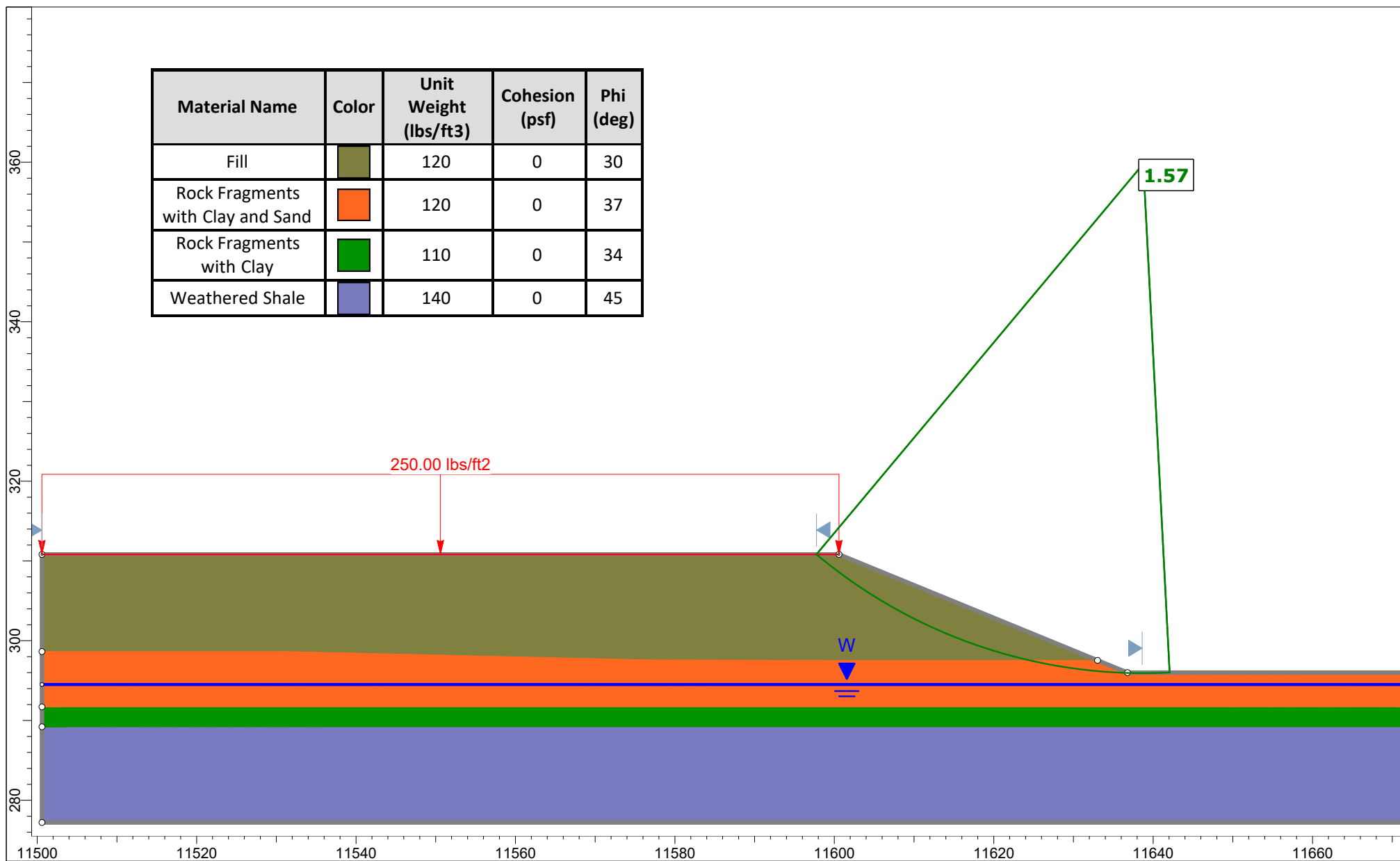
Attachment F

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Fill		120	1500	0
Rock Fragments with Clay and Sand		120	0	37
Rock Fragments with Clay		110	0	34
Weathered Shale		140	2500	0



Project	050439- Hwy. 25 (Blue Creek)		
Site	Site 1/1	Analysis Type	Short Term
Analyzed By	MB	Configuration	Bent 1- 2H:1V End Slopes
Date	6/2/2025		

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Fill		120	0	30
Rock Fragments with Clay and Sand		120	0	37
Rock Fragments with Clay		110	0	34
Weathered Shale		140	0	45



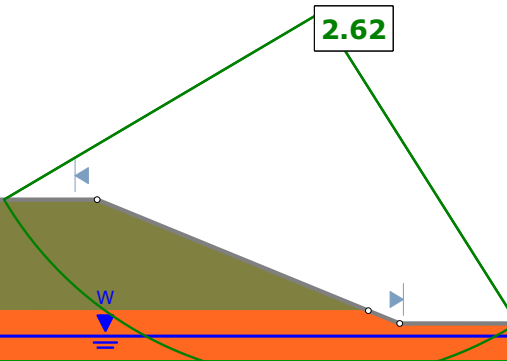
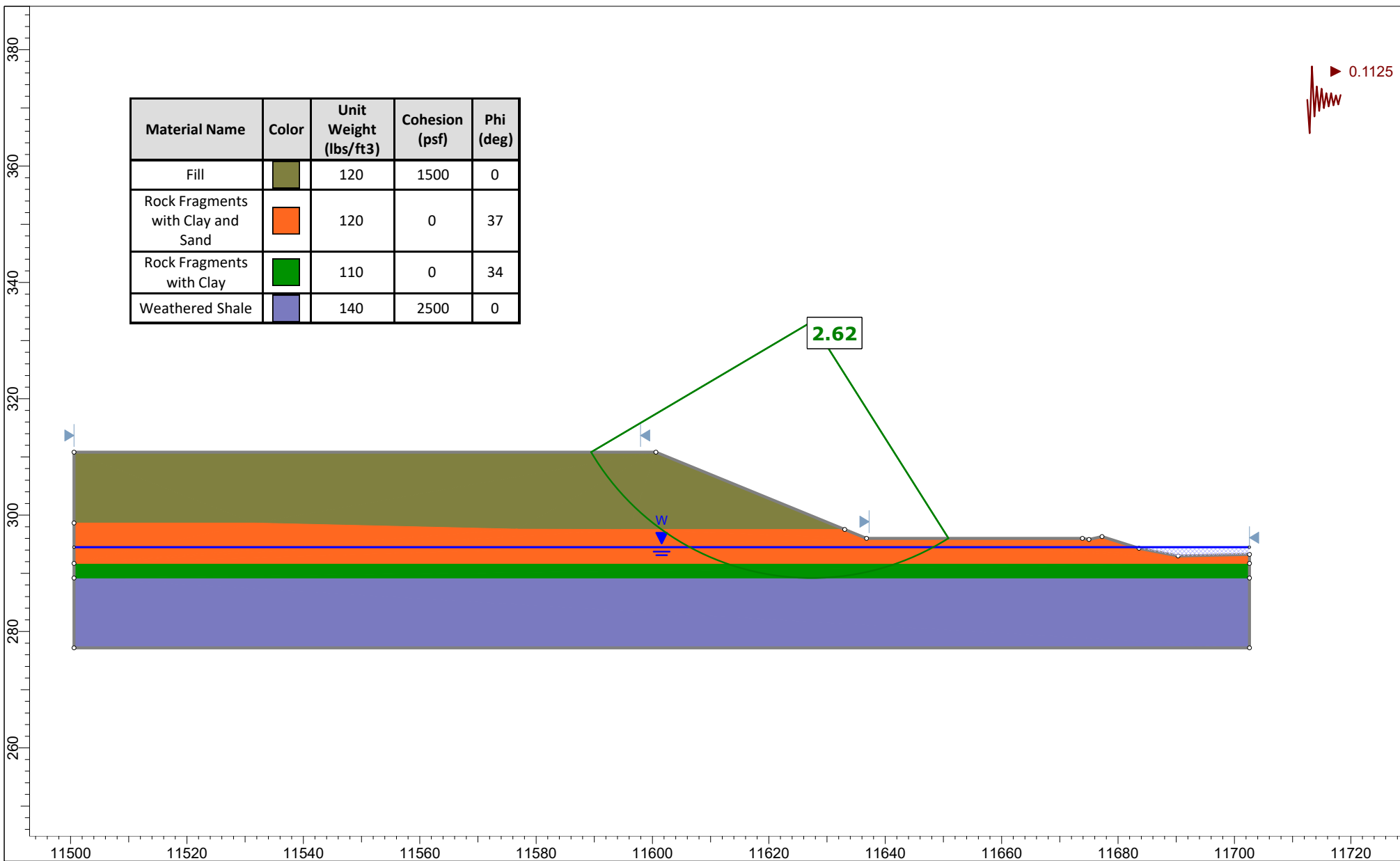
Project	050439- Hwy. 25 (Blue Creek)		
Site	Site 1/1	Analysis Type	Long Term
Analyzed By	MB	Configuration	Bent 1- 2H:1V End Slopes
Date	6/2/2025		

Material Name	Color	Unit Weight (lbs/ft ³)	Cohesion (psf)	Phi (deg)
Fill		120	1500	0
Rock Fragments with Clay and Sand		120	0	37
Rock Fragments with Clay		110	0	34
Weathered Shale		140	2500	0

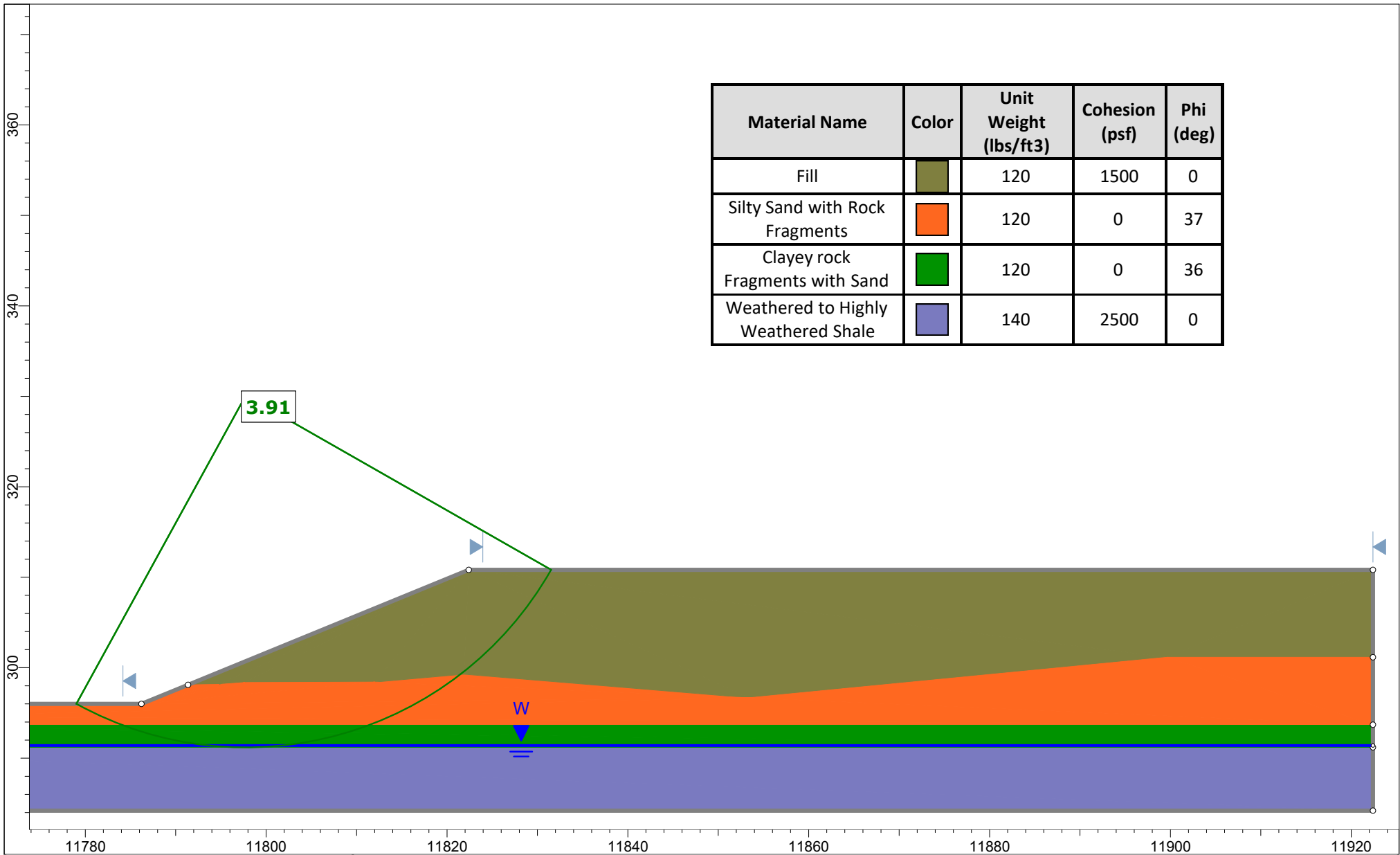
0.1125



2.62

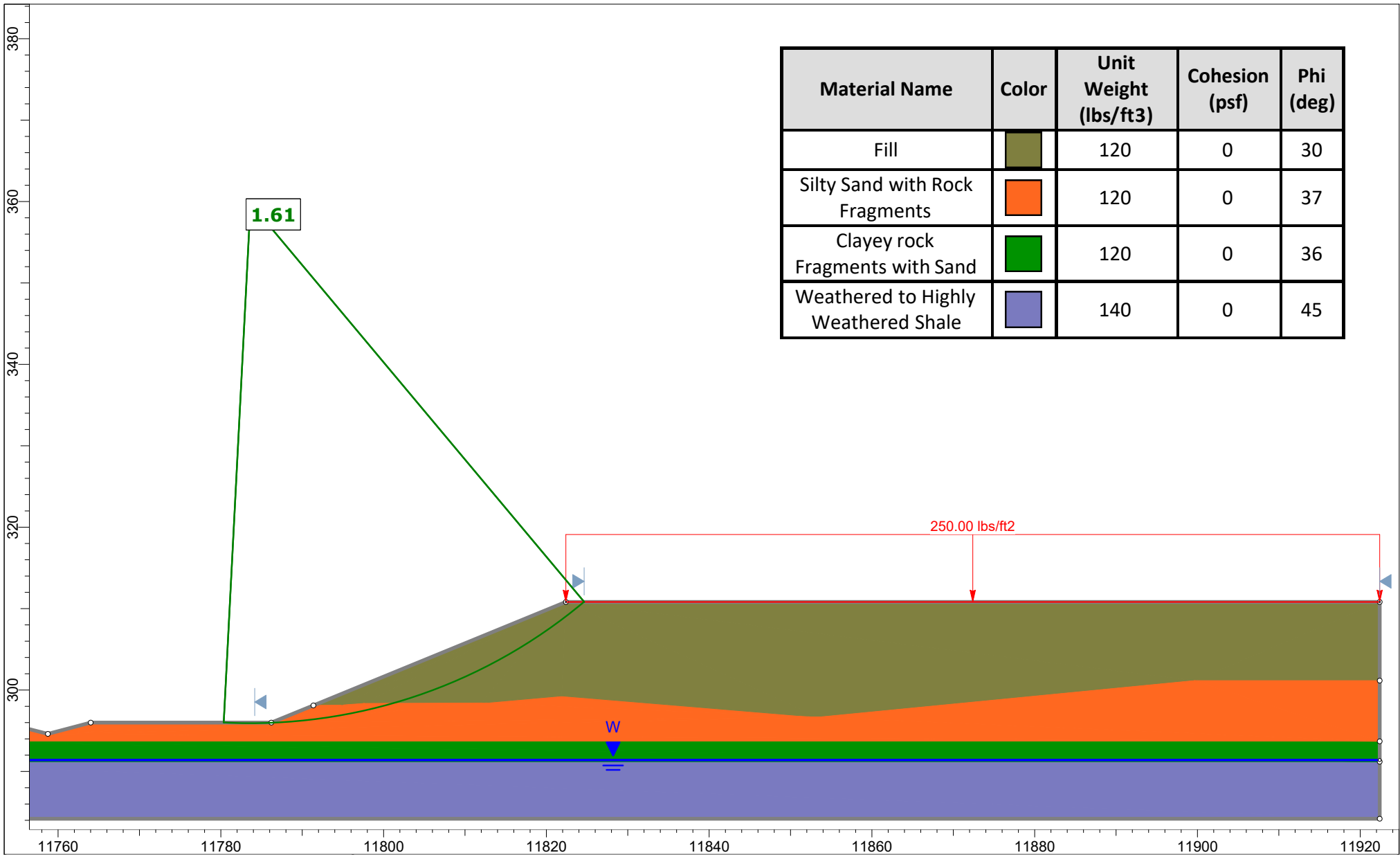
Project	050439- Hwy. 25 (Blue Creek)		
Site	Site 1/1	Analysis Type	Seismic
Analyzed By	MB	Configuration	Bent 1- 2H:1V End Slopes
Date	7/10/2025		



Material Name	Color	Unit Weight (lbs/ft ³)	Cohesion (psf)	Phi (deg)
Fill		120	1500	0
Silty Sand with Rock Fragments		120	0	37
Clayey rock Fragments with Sand		120	0	36
Weathered to Highly Weathered Shale		140	2500	0

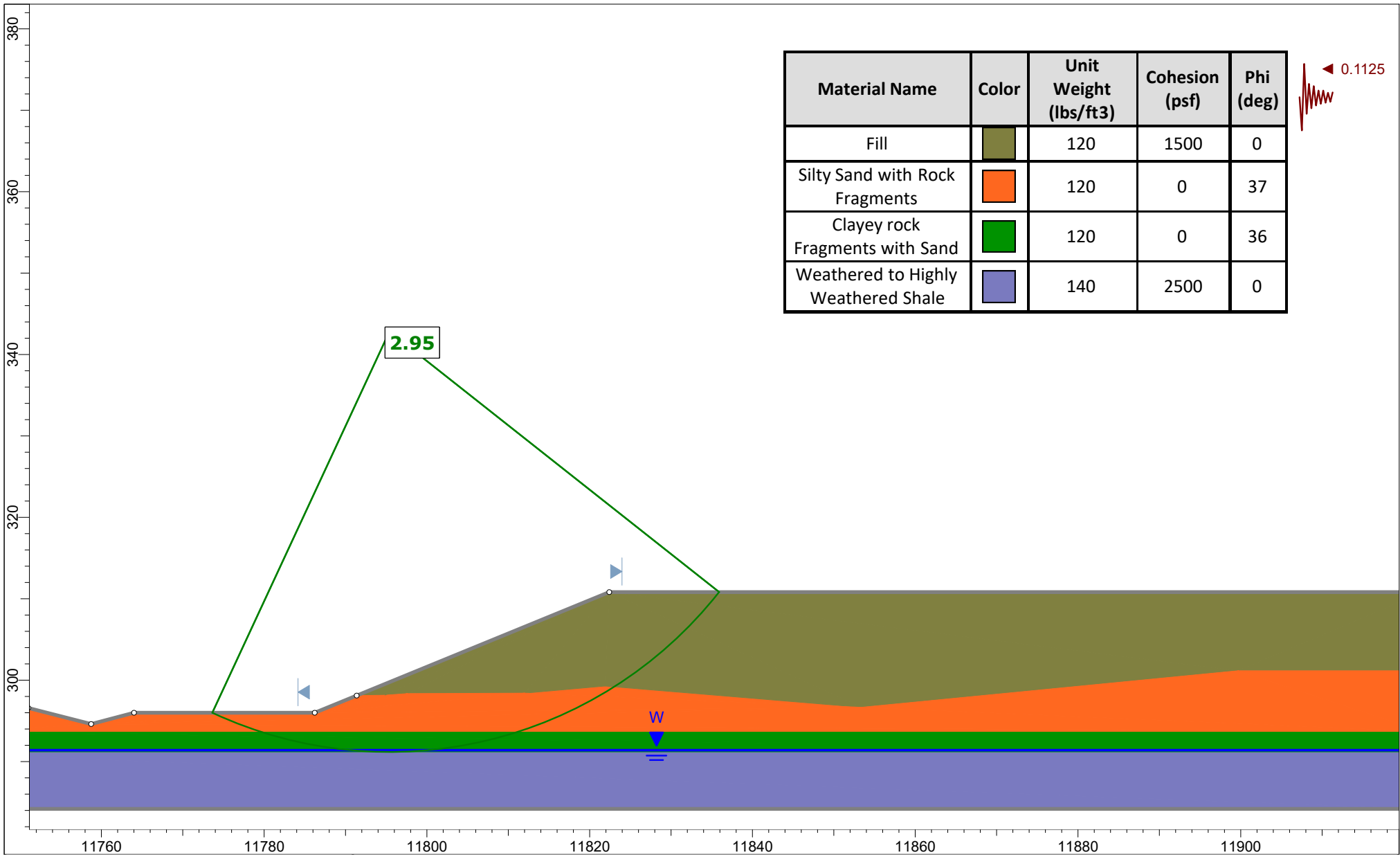


Project	050439- Hwy. 25 (Blue Creek)		
Site	Site 1/1	Analysis Type	Short Term
Analyzed By	MB	Configuration	Bent 4- 2H:1V End Slopes
Date	6/2/2025		



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Fill		120	0	30
Silty Sand with Rock Fragments		120	0	37
Clayey rock Fragments with Sand		120	0	36
Weathered to Highly Weathered Shale		140	0	45

	Project 050439- Hwy. 25 (Blue Creek)		
	Site	Site 1/1	Analysis Type Long Term
	Analyzed By	MB	Configuration Bent 4- 2H:1V End Slopes
	Date	6/2/2025	



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Fill		120	1500	0
Silty Sand with Rock Fragments		120	0	37
Clayey rock Fragments with Sand		120	0	36
Weathered to Highly Weathered Shale		140	2500	0

	Project		050439- Hwy. 25 (Blue Creek)	
	Site	Site 1/1	Analysis Type	Seismic
	Analyzed By	MB	Configuration	Bent 4- 2H:1V End Slopes
	Date	7/10/2025		

Attachment G



Job No.:	050439
Site No.:	1

Input by:	MBB	5/30/2025
Checked by:	MLG	7/14/2026
Back-checked by:		

Bent 1 - Boring 1

Elevation, ft		Material	Lpile/GROUP Model	Effective Unit Weight, γ' , pcf	Undrained Shear Strength of Soil, C_u , psf	Strain Factor (ϵ_{50} for Soil) / k_m for Rock)	Friction Angle, ϕ , °	Soil Modulus, k, pci	Uniaxial Compressive Strength, q_u , psi	Rock Mass Modulus, E_{rm} , 10^6 psi	Rock Quality Designation, RQD, %
Top	Bottom										
Above Ground Surface		Fill	Soft Clay (Matlock)	120	750	0.010	NA	NA	NA	NA	NA
Ground (297)	292	Gravel with Clay and Sand	Sand (Reese)	65	NA	NA	37	104	NA	NA	NA
292	289	Gravel with Clay	Sand (Reese)	60	NA	NA	35	78	NA	NA	NA
below 289		Weathered Shale	Weak Rock	85	NA	0.0005	NA	NA	1250	5.5	35

Bent 4- Boring 3

Elevation, ft		Material	Model	Effective Unit Weight, γ' ,pcf	Undrained Shear Strength of Soil (C_u) (psf)	Strain Factor (ϵ_{50} for Soil) / k_m for Rock)	Friction Angle, ϕ , °	Soil Modulus, k, pci	Uniaxial Compressive Strength, q_u , psi	Rock Mass Modulus, E_{rm} , 10^6 psi	RQD, %
Top	Bottom										
Above Ground Surface		Fill	Soft Clay (Matlock)	120	750	0.010	NA	NA	NA	NA	NA
Ground (299)	291	Silty Sand and Clayey Gravel	Sand (Reese)	115	NA	NA	36	146	NA	NA	NA
below 291		Weathered Shale	Weak Rock	85	NA	0.0005	NA	NA	1250	5.5	35