



## Abbreviated Structure Geotechnical Report

**Original Report Date:** 11/21/23      **Proposed SN:** 058-0141      **Route:** FAP 323A  
**Revised Date:** \_\_\_\_\_      **Existing SN:** 058-0021      **Section:** (139BR)B  
**Geotechnical Engineer:** Doris D. Gonzalez (BBS)      **County:** Macon  
**Structural Engineer:** BBS      **Contract:** 74A10

**Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing):** The proposed structure is a simple span bridge with integral abutments supported by Metal Shell piles. It has an out to out width of 42 ft and 10 inches, a back to back of abutments length of 77 ft and 4 inches and no skew.

**Discuss the existing boring data, existing plans foundation information, new subsurface exploration and need for any additional exploration to be provided with SGR Technical Memo (attach all data and subsurface profile plot):** The existing structure is a PPC deck beam bridge with closed abutments supported by timber piles. It has an out-to-out width of 38 ft, a back-to-back of abutments length of 31 ft and 10 3/4 inches and no skew. As part of the geotechnical exploration, two borings designated Borings 1 and 2 were advanced on November 2022. These borings were advanced to depths of 66 ft and 71 ft, respectively. The soil profile consists of silty clays and loams, sandy loams, and tills. A sand layer of a thickness varying from 5 ft to 10 ft was identified in both borings and a 7 ft thick peat layer was identified in Boring 2. Both borings ended in till. The unconfined compressive strengths of the soils range from 0.6 tsf to 7.6 tsf, increasing with depth with some exceptions.

The estimated factored loads at the substructures provided by the Project Planning Units are 1192.6 k at each abutment.

**Provide the location and maximum height of any new soil fill or magnitude of footing bearing pressure. Estimate the amount and time of the expected settlement. Indicate if further testing, analysis, and/or ground improvement/treatment is necessary:** The grade is being maintained and since the proposed abutments will be located behind the existing ones, no significant fill will be placed; therefore, no significant settlement is expected.

**Identify any new cuts or fill slope angles and heights. Estimate the factor of safety against slope failure. Indicate if further testing, analysis, or ground improvement/treatment is necessary:** No significant new fill is expected, since the grade is being maintained. The factor of safety against slope failure was estimated to be greater than 1.5 for the static case and greater than 1.0 for the seismic case, at both ends of the bridge. A horizontal acceleration coefficient equal to the site-adjusted Peak Ground Acceleration (As) was utilized in the seismic case. Diagrams are included in the attachments section.

**Indicate at each substructure, the 100-year and 200-year total scour depths in the Hydraulics report, the non-granular scour depth reduction, the proposed ground surface, and the recommended foundation design scour elevations:** Since integral abutments will be utilized to support the proposed bridge, the design and check scour elevations coincide with the bottom of caps.

Event / Limit State	Design Scour Elevations (ft.)		Item 113
	W. Abut.	E. Abut.	
Q100	653.82	653.62	8
Q200	653.82	653.62	
Design	653.82	653.62	
Check	653.82	653.62	

**Determining the seismic soil site class, the seismic performance zone, the 0.2 and 1.0 second design spectral accelerations and indicate if that the soils are liquefiable:** The global seismic site class for this project is C, it is located in seismic performance zone (SPZ) 1 and the 0.2 and 1.0 second spectral accelerations are 0.215g (SDS) and 0.110 (SD1), respectively. The site adjusted peak ground acceleration (As) is equal to 0.093g.

Since this project is located in SZP 1, the liquefaction potential is minimal, and a liquefaction analysis is not required.

**Confirm feasibility of the proposed foundation or wall type and provide design parameters. Attach a pile design table indicating feasible pile types, various nominal required bearings, factored resistances available and corresponding estimated lengths at locations where piles will be used. Provide factored bearing resistance and unit sliding resistance at various elevations and confirm no ground improvement/treatment is necessary where spread footings are proposed. Estimated top of rock elevations as well as preliminary factored unit side and tip resistance values shall be indicated when drilled shafts are proposed:** The proposed integral abutments are feasible. Since bedrock was not encountered during the geotechnical investigation, FGU recommends utilizing Metal Shell (MS) piles; however, per our analyses it appears that the MS piles are obtaining the majority of their capacity from end bearing at the stiff clay loam till layer. To avoid damage to the piles during driving, conical tips will be required and FGU recommends limiting the pile selection to MS with wall thicknesses equal or greater than 0.312 inches. Pile design tables are included in the attachment section. Due to the short length of the bridge and the soil profile being consistent from one boring to the other, one test pile at one of the abutments is recommended.

**Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat:** The Estimated Water Surface Elevation (EWSE) provided by the Project Planning Unit corresponds to 647.45, so cofferdams will not be necessary.

**Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns:** Due to the expected retained heights and soft soils near the excavation line, the use of the Temporary Sheet Piling Design Charts is not permitted; therefore, the pay item Temporary Soil Retention System needs to be utilized.

# **Attachments**



Figure 1: Location Map

### Input Data and Parameter Calculations

Select Geographic Region

Conterminous 48 States

Guidelines Edition

2007 AASHTO Bridge Design Guidelines

Specify Site Location by Latitude-Longitude or Zip Code

Latitude-Longitude : Recommended   
  Zip Code

Latitude (50.0 to 24.6)

Longitude (-125.0 to -65.0)

Calculate Basic Design Parameters

Probability of Exceedance 7% PE in 75 years

Calculate  
PGA, Ss, and S1

Calculate  
As, SDs, and SD1

Calculate Response Spectra

Map Spectrum

Design Spectrum

View Spectra

### Output Calculations and Ground Motion Maps

2007 AASHTO Bridge Design Guidelines

AASHTO Spectrum for 7% PE in 75 years

Latitude = 39.814330

Longitude = -088.850307

Site Class B

Data are based on a 0.05 deg grid spacing.

Period (sec)	Sa (g)	
0.0	0.077	PGA - Site Class B
0.2	0.179	Ss - Site Class B
1.0	0.065	S1 - Site Class B

Conterminous 48 States

2007 AASHTO Bridge Design Guidelines

Spectral Response Accelerations SDs and SD1

Latitude = 39.814330

Longitude = -088.850307

As = FpgaPGA, SDs = FaSs, and SD1 = FvS1

Site Class C - Fpga = 1.20, Fa = 1.20, Fv = 1.70

Data are based on a 0.05 deg grid spacing.

Period (sec)	Sa (g)	
0.0	0.093	As - Site Class C
0.2	0.215	SDs - Site Class C
1.0	0.110	SD1 - Site Class C

Clear Output

View Maps

Figure 2: Seismic Data

**Pile Design Table for 058-0141 West Abutment utilizing Boring B1**

Nominal Required Bearing (Kips)	Required Resistance Available (Kips)	Estimated Pile Length (Ft.)
<b>Metal Shell 14"Φ w/.312" walls</b>		
133	73	21
167	92	23
179	98	25
216	119	27
246	135	30
266	147	32
292	161	35
299	164	39
308	169	41
365	201	44
395	217	46
570	314	47
<b>Metal Shell 16"Φ w/.312" walls</b>		
151	83	18
197	108	23
210	116	25
256	141	27
290	159	30
312	171	32
341	188	35
343	189	39
353	194	41
427	235	44
461	254	46
654	360	47
<b>Metal Shell 16"Φ w/.375" walls</b>		
151	83	18
197	108	23
210	116	25
256	141	27
290	159	30
312	171	32
341	188	35
343	189	39
353	194	41
427	235	44
461	254	46
782	430	47

**Pile Design Table for 058-0141 East Abutment utilizing Boring B2**

Nominal Required Bearing (Kips)	Required Resistance Available (Kips)	Estimated Pile Length (Ft.)
<b>Metal Shell 14"Φ w/.312" walls</b>		
148	81	32
155	85	35
161	89	37
171	94	39
173	95	40
215	118	42
241	132	45
570	314	46
<b>Metal Shell 16"Φ w/.312" walls</b>		
144	79	25
158	87	27
160	88	29
165	91	30
170	94	32
178	98	35
185	102	37
197	109	39
200	110	40
253	139	42
282	155	45
654	360	46
<b>Metal Shell 16"Φ w/.375" walls</b>		
144	79	25
158	87	27
160	88	29
165	91	30
170	94	32
178	98	35
185	102	37
197	109	39
200	110	40
253	139	42
282	155	45
782	430	46



# SOIL BORING LOG

ROUTE FAP 323A (US 36) DESCRIPTION US 36 over Long Creek Tributary LOGGED BY E. Sandschafer

SECTION (139BR)B LOCATION SE 1/4 of NW 1/4, SEC. 27, TWP. 16N, RNG. 3E, 3<sup>rd</sup> PM,

Latitude N 39.814371, Longitude W 88.850343

COUNTY Macon DRILLING METHOD Hollow stem auger & split spoon HAMMER Auto ETR = 91.8% @ 57.4 bpm

STRUCT. NO. 058-0021 (Existing)  
058-0141 (Proposed)  
 Station 187+43.55

BORING NO. 1 West Abutment  
 Station 187+04  
 Offset 10.0 ft LT  
 Ground Surface Elev. 661.96 ft

DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)	Surface Water Elev. (ft)	Stream Bed Elev. (ft)	Groundwater Elev.:	DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)
				<u>645.22</u>	<u>644.74</u>					
						First Encounter <u>622.0</u> ft				
						Upon Completion <u>644.0</u> ft				
						After <u>24</u> Hrs. <u>647.0</u> ft				

DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)	Soil Description	DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)
659.96				Asphalt				
				Very stiff, moist, brown, CLAY LOAM Till	4	2.9	12	
					12	BS		
				Brown, CLAY	3			
				Hard	6	4.5	11	
					12	B		
				No recovery. Rock stuck in sampler				
	1							
		NT	NT	Very stiff	25	2		
		NT				5	3.1	12
						9	B	
654.96				Medium, moist, grey, SILTY CLAY				
	1					3		
		0.9	23	Stiff, grey		5	1.7	13
		B				7	B	
652.46				Medium, moist, grey, SILTY LOAM				
	1					3		
		0.6	24	Very stiff		3	3.3	12
		B				6	B	
649.96				Medium, moist, dark grey and black, CLAY LOAM				
	WH							
	1	0.6	21					
		B						
				Stiff, grey				
	1	1.7	15	Hard		4		
		B				10	4.5	10
						14	B	
644.96				Medium, moist, brown, CLAY				
	WH							
	1	0.6	17					
		B						
641.96								
	1					4		

SOIL BORING 058-0021 SOIL 2022.GPJ IL\_DOT.GDT 12/5/22

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)  
 The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206), WH-Weight of Hammer, NT-Not Tested.





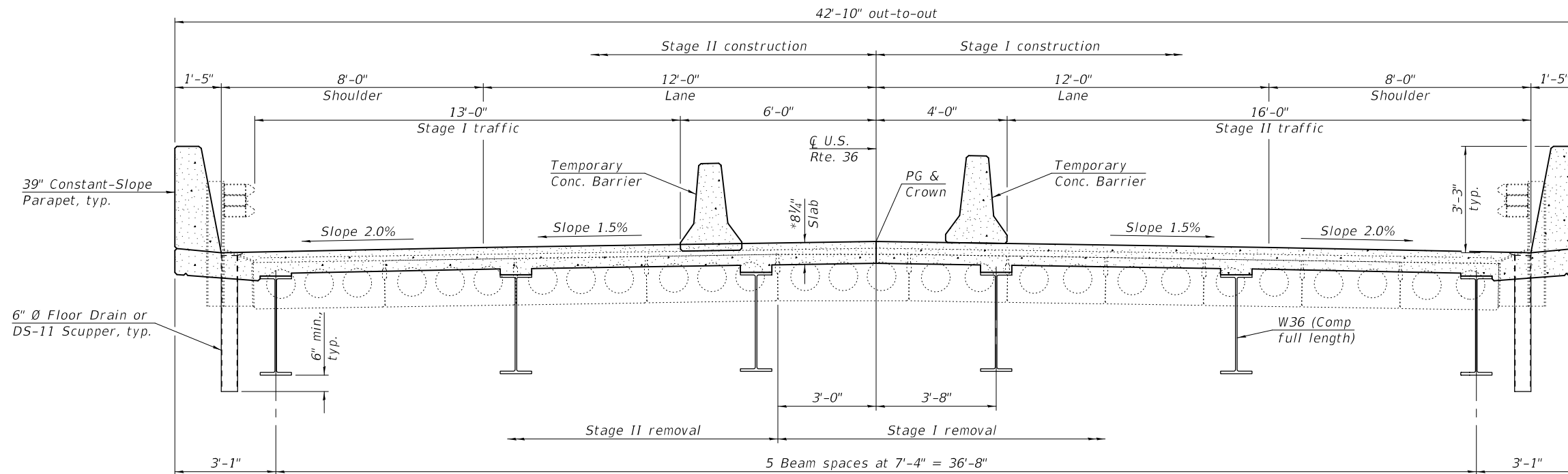




**APPROVED**

**NOVEMBER 21, 2023**

AS A BASIS FOR  
PREPARATION OF DETAILED PLANS



**CROSS SECTION**  
(Looking East)

\* Prior to diamond grinding

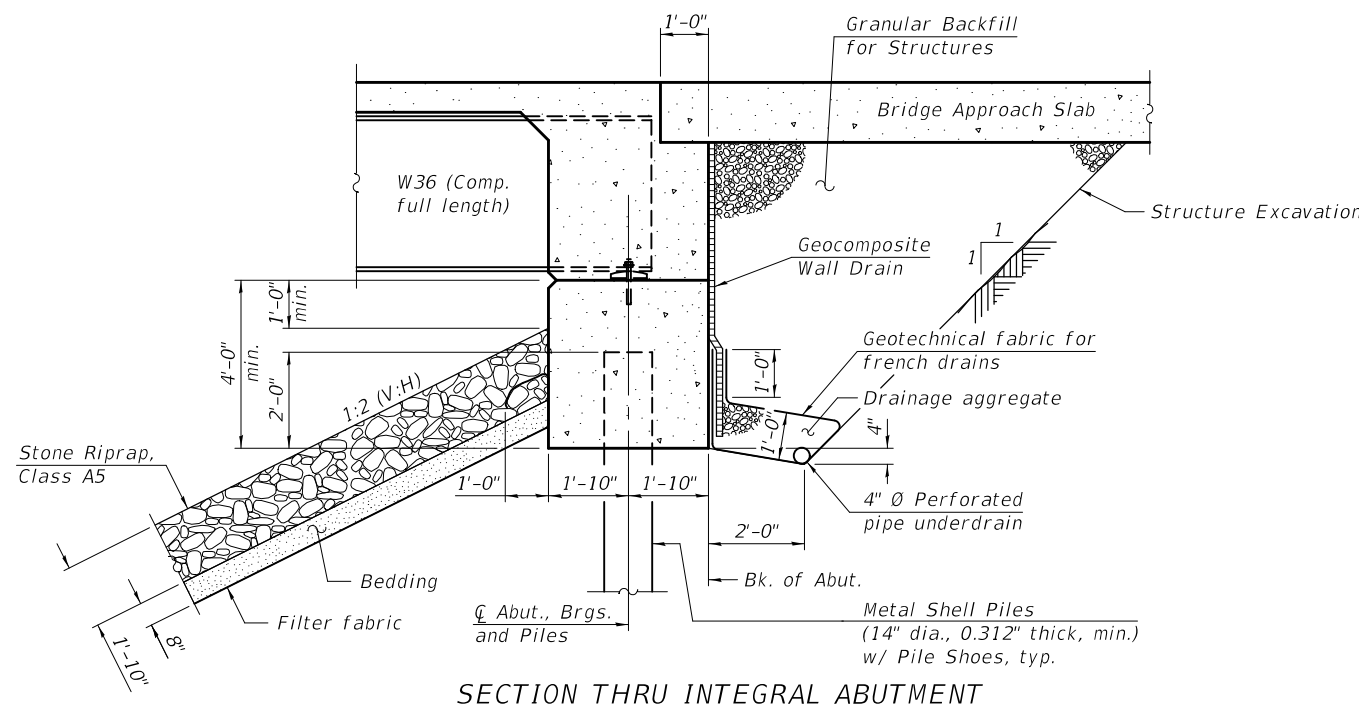
**DESIGN SCOUR ELEVATION TABLE**

Event / Limit State	Design Scour Elevations (ft.)		Item 113
	W. Abut.	E. Abut.	
Q100	653.82	653.62	8
Q200	653.82	653.62	
Design	653.82	653.62	
Check	653.82	653.62	

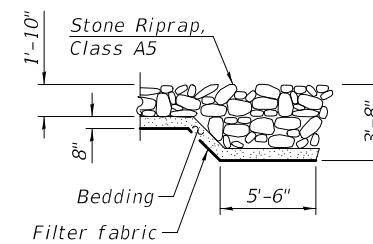
**WATERWAY INFORMATION**

Flood	Freq. Yr.	Q C.F.S.	Opening Ft <sup>2</sup>		Nat. H.W.E.	Head - Ft.		Headwater El.	
			Exist.	Prop.		Exist.	Prop.	Exist.	Prop.
Drainage Area = 3.1 sq. mi.      Existing Overtopping Elev. = 661.71 at Sta. 188+80 Proposed Overtopping Elev. = 661.71 at Sta. 188+80									
	10	438	146	200	650.62	0	0.00	650.62	650.52
Design	50	699	174	244	651.55	0	0.00	651.54	651.39
Base	100	814	185	262	651.92	0	0.01	651.90	651.93
Scour Design Check	200	932	197	283	652.31	0	0.02	652.31	652.33
Overtop Existing	N/A	-	-	-	-	-	-	-	-
Overtop Proposed	N/A	-	-	-	-	-	-	-	-
Max. Calc.	500	1090	211	307	652.77	0.08	0.00	652.85	652.77

10 Year velocity through existing structure = 3.0 ft./sec.  
10 Year velocity through proposed structure = 2.2 ft./sec.



**SECTION THRU INTEGRAL ABUTMENT**



**SECTION A-A**

**DETAILS**  
**U.S. ROUTE 36 OVER**  
**LONG CREEK TRIBUTARY**  
**F.A.P. 323A - SEC. (139BR)B**  
**MACON COUNTY**  
**STA. 187+49.00**  
**STRUCTURE NO. 058-0141**

MODEL: 0580141-74A10-TSL-002  
FILE NAME: p:\v\dot-pw-bentley.com\FWIDOT\Documents\DOT Offices\Bureau of Bridges and Structures\Projects\0580141\CADD Plans\0580141-74A10.dgn

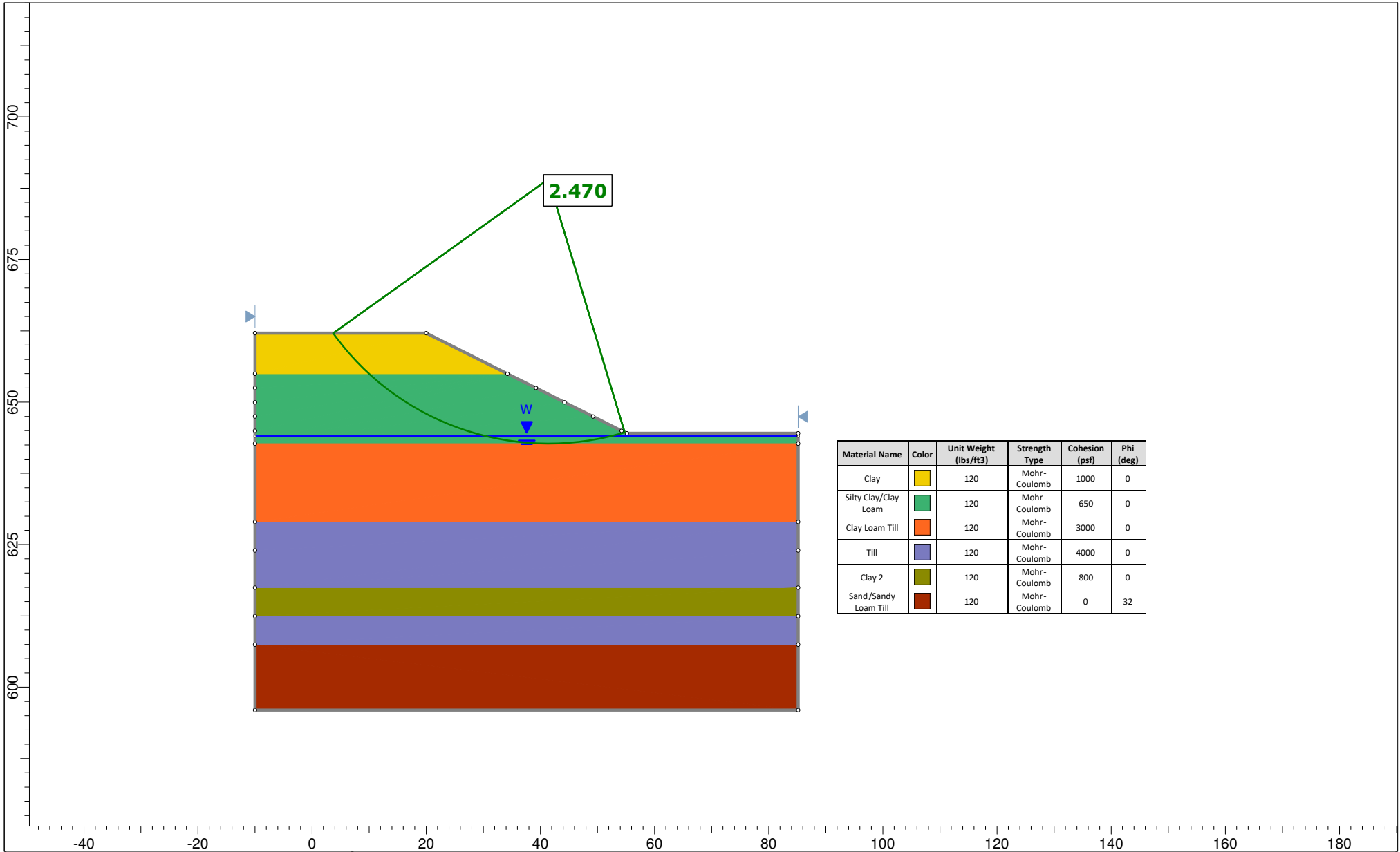
DESIGNED -	MICHAEL A. PAULIONIS
CHECKED -	NEPHTALI RIVERA-MARTINEZ
DRAWN -	ANTHONY J. NOVELLO
CHECKED -	M.A.P. / N.R.M. / J.O.V.

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**STATE OF ILLINOIS**  
**DEPARTMENT OF TRANSPORTATION**

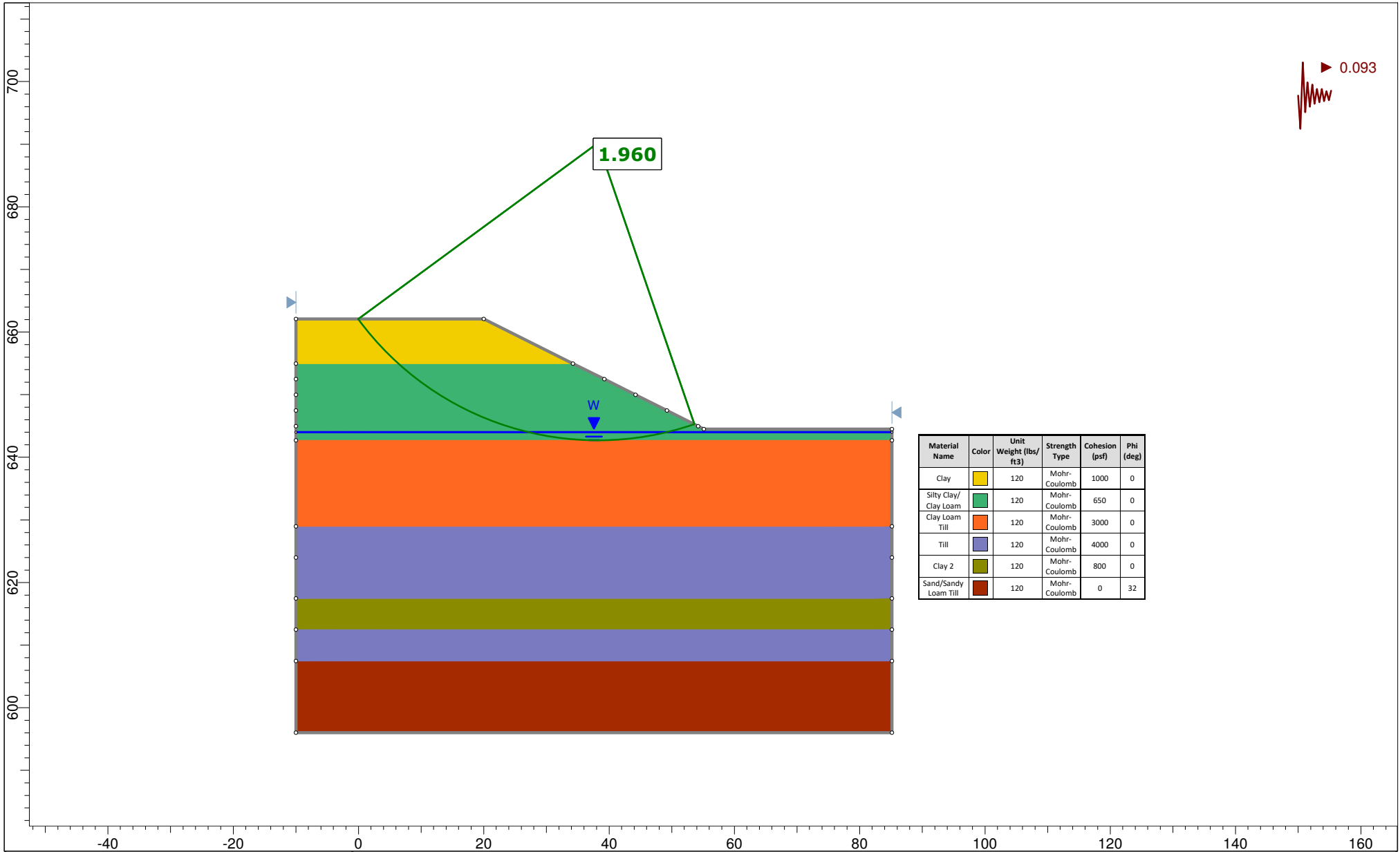
SHEET 2 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
323A	(139BR)B	MACON	—	—
CONTRACT NO. 74A10				
ILLINOIS FED. AID PROJECT				

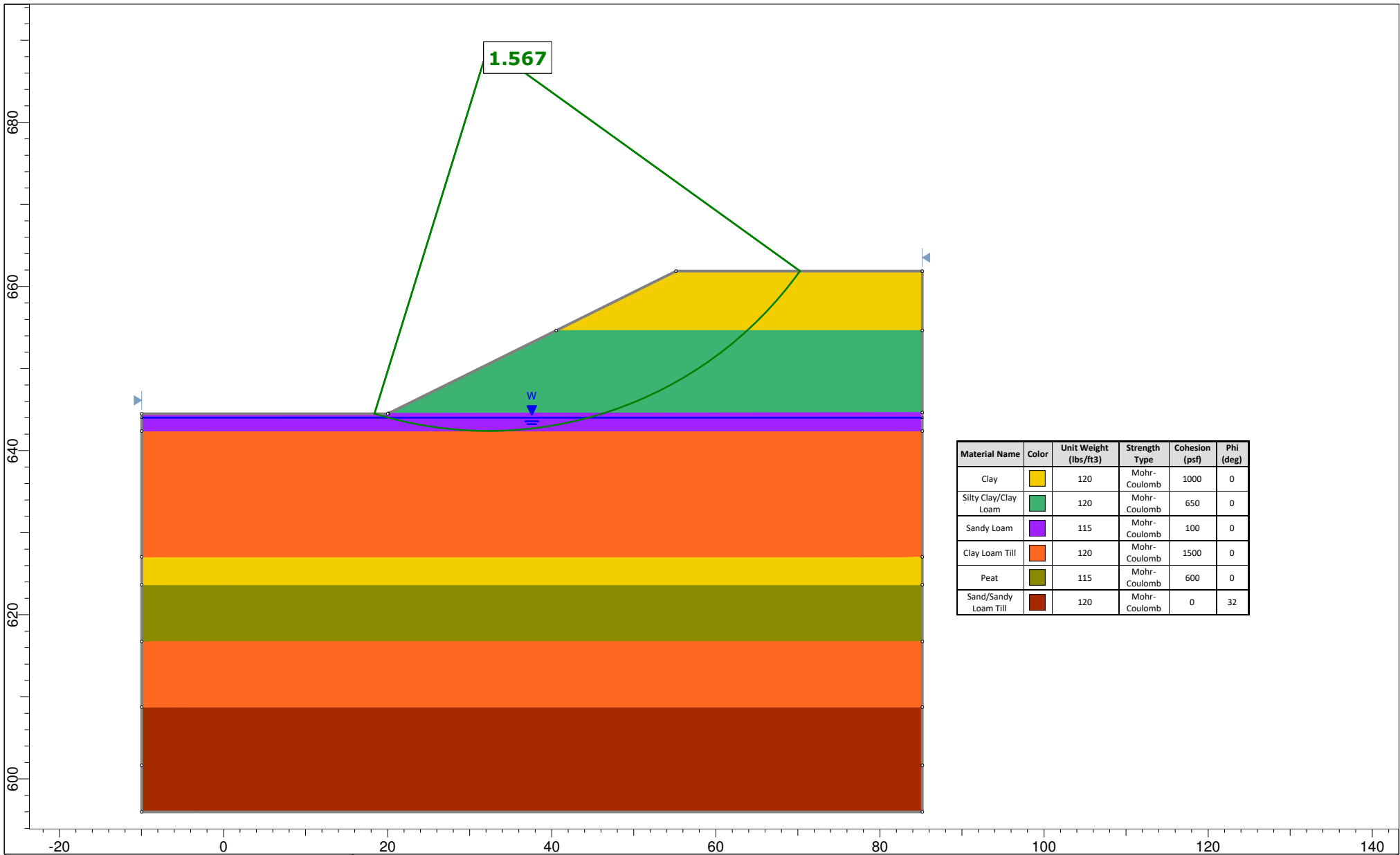


Material Name	Color	Unit Weight (lbs/ft <sup>3</sup> )	Strength Type	Cohesion (psf)	Phi (deg)
Clay	Yellow	120	Mohr-Coulomb	1000	0
Silty Clay/Clay Loam	Green	120	Mohr-Coulomb	650	0
Clay Loam Till	Orange	120	Mohr-Coulomb	3000	0
Till	Purple	120	Mohr-Coulomb	4000	0
Clay 2	Olive	120	Mohr-Coulomb	800	0
Sand/Sandy Loam Till	Brown	120	Mohr-Coulomb	0	32


	<i>Project</i> Slide2 - An Interactive Slope Stability Program	
	<i>Group</i> Group 1	<i>Scenario</i> Master Scenario
	<i>Drawn By</i>	<i>Company</i>
	<i>Date</i> 10/3/2023, 11:22:51 AM	<i>File Name</i> West Abutment.slm

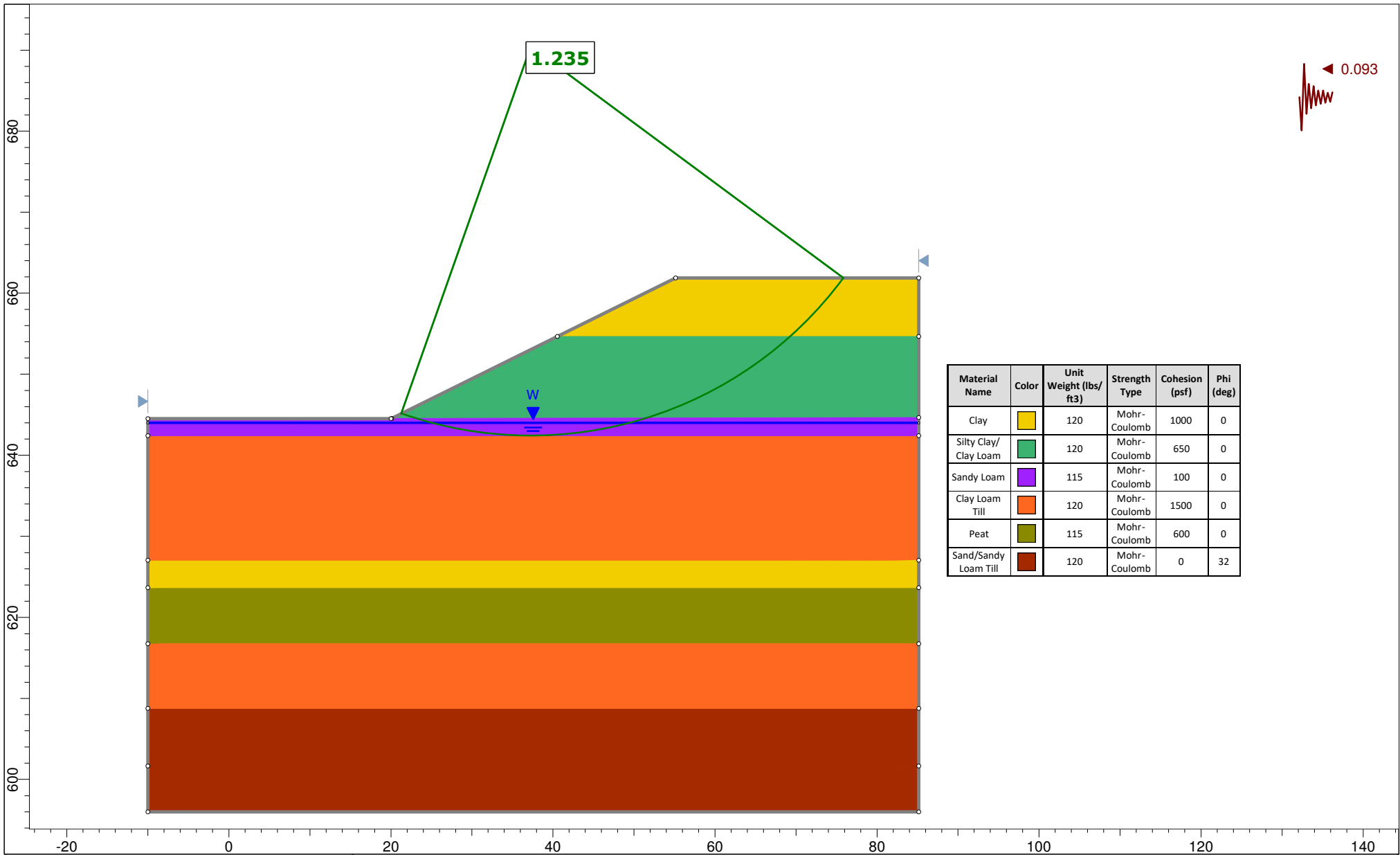


	<i>Project</i> Slide2 - An Interactive Slope Stability Program	
	<i>Group</i> Group 1	<i>Scenario</i> Master Scenario
	<i>Drawn By</i>	<i>Company</i>
	<i>Date</i> 10/3/2023, 11:22:51 AM	<i>File Name</i> West Abutment Seismic.slmd
	SLIDEINTERPRET 9.024	




Material Name	Color	Unit Weight (lbs/ft <sup>3</sup> )	Strength Type	Cohesion (psf)	Phi (deg)
Clay	Yellow	120	Mohr-Coulomb	1000	0
Silty Clay/Clay Loam	Green	120	Mohr-Coulomb	650	0
Sandy Loam	Purple	115	Mohr-Coulomb	100	0
Clay Loam Till	Orange	120	Mohr-Coulomb	1500	0
Peat	Olive	115	Mohr-Coulomb	600	0
Sand/Sandy Loam Till	Brown	120	Mohr-Coulomb	0	32

	<i>Project</i> Slide2 - An Interactive Slope Stability Program	
	<i>Group</i> Group 1	<i>Scenario</i> Master Scenario
	<i>Drawn By</i>	<i>Company</i>
	<i>Date</i> 10/3/2023, 11:22:51 AM	<i>File Name</i> East Abutment Static.slmd
	SLIDEINTERPRET 9.024	



Material Name	Color	Unit Weight (lbs/ft <sup>3</sup> )	Strength Type	Cohesion (psf)	Phi (deg)
Clay	Yellow	120	Mohr-Coulomb	1000	0
Silty Clay/Clay Loam	Green	120	Mohr-Coulomb	650	0
Sandy Loam	Purple	115	Mohr-Coulomb	100	0
Clay Loam Till	Orange	120	Mohr-Coulomb	1500	0
Peat	Olive Green	115	Mohr-Coulomb	600	0
Sand/Sandy Loam Till	Brown	120	Mohr-Coulomb	0	32

	<i>Project</i> Slide2 - An Interactive Slope Stability Program	
	<i>Group</i> Group 1	<i>Scenario</i> Master Scenario
	<i>Drawn By</i>	<i>Company</i>
	<i>Date</i> 10/3/2023, 11:22:51 AM	<i>File Name</i> East Abutment Seismic.slmd
	SLIDEINTERPRET 9.024	

**GENERAL DATA**

STRUCTURE NUMBER=====SN 058-0141  
 STRUCTURE TYPE =====SIMPLE-SPAN  
 STRUCTURE SKEW=====0 DEGREES  
 SUPER. DATA IN REFERENCE TO SUB. DATA ===== ABUT 1  
 TOTAL STRUCTURE LENGTH===== 77.33 FT

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (END OR MAIN SPAN)	
BEAM TYPE =====	WIDE FLANGE
WIDE FLANGE =====	W36X150
BEAM SPACING PERP. TO CL =====	7.33 FT
SLAB THICKNESS =====	8.00 IN
SLAB F'C =====	4.00 KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)	
BEAM SPACING PERP. TO CL =====	FT

ABUTMENT #1 DATA	
ABUTMENT NAME =====	West
ABUTMENT REFERENCE BORING =====	B-1
BOTTOM OF ABUTMENT ELEVATION =====	653.82 FT
ESTIMATED NUMBER OF PILES AT ABUT. =====	6
PILE SPACING PERP. TO CL =====	7.33 FT

ABUTMENT #2 DATA	
ABUTMENT NAME =====	East
ABUTMENT REFERENCE BORING=====	B-2
BOTTOM OF ABUTMENT ELEVATION=====	653.62 FT
ESTIMATED NUMBER OF PILES AT ABUT.=====	6
PILE SPACING PERP. TO CL =====	7.33 FT

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1				
BOT. OF LAYER ELEV. (FT)	LAYER THICKNESS (FT)	UNCONFINED COMPRESSIVE STRENGTH (TSF)	N S.P.T. VALUE (BLOWS/12 IN.)	Qu EQUIV. FOR N VALUE (TSF)
652.57	1.25	0.9		
650.07	2.50	0.6		
647.57	2.50	0.6		
645.07	2.50	1.7		
643.82	1.25	0.6		

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2				
BOT. OF LAYER ELEV. (FT)	LAYER THICKNESS (FT)	UNCONFINED COMPRESSIVE STRENGTH (TSF)	N S.P.T. VALUE (BLOWS/12 IN.)	Qu EQUIV. FOR N VALUE (TSF)
652.37	1.25	0.6		
649.87	2.50	0.6		
647.37	2.50	0.7		
644.87	2.50	0.90		
643.62	1.25	0.10		

10.00 FT = TOTAL DEPTH ENTERED

10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1=====: 0.91 TSF

WEIGHTED AVERAGE Qu FOR ABUTMENT #2=====: 0.64 TSF

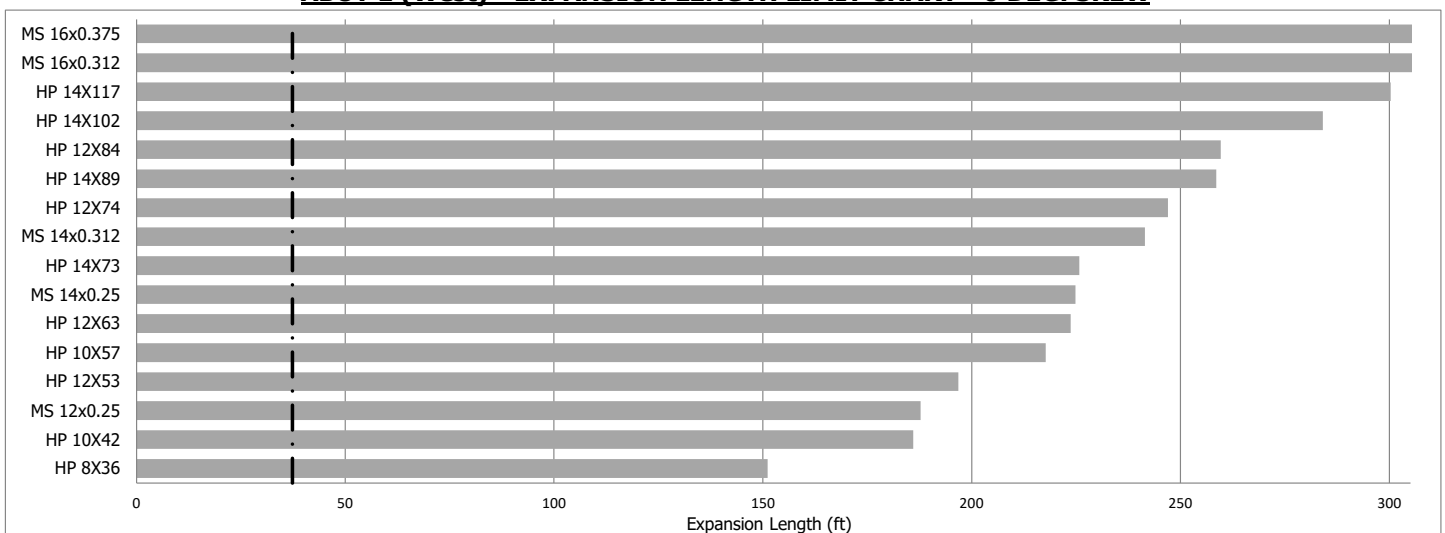
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3\*0.91])===== 0.85

PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3\*0.64])===== 0.79

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [0.85\*6\*0+0.79\*6\*77.33333333333333]/[0.85\*6+0.79\*6]===== 37.36 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [0.79\*6\*0+0.85\*6\*77.33333333333333]/[0.79\*6+0.85\*6]===== 39.98 FT

**ABUT 1 (West) - EXPANSION LENGTH LIMIT CHART - 0 DEG. SKEW**



----- = Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration. (Note: The same size pile should be used at both abutments.)



Route: F.A.P. 323A (US 36) Sheet \_\_\_\_\_ of \_\_\_\_\_  
 Section: (139BR)B Computed by: NRM Date: 08/25/23  
 County: Macon Checked by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Structure Number: 058-0141

**Planning Computations: Estimated Loads for FGU**

**Superstructure Loads: (using MDX)**

**Service I Reactions:**

Unfactored Loads, (kips)				
	*DC1	*DC2	*DW	**LL
W. Abut.	35.88	6.45	13.51	82.25
E. Abut.	35.88	6.45	13.51	82.25

\* per girder

\*\* per Lane

**Table 3.6.1.1.2-1—Multiple Presence Factors, *m***

# Beams	# Lanes	<i>m</i>
6	3	0.85

(very conservative)

Number of Loaded Lanes	Multiple Presence Factors, <i>m</i>
1	1.20
2	1.00
3	0.85
>3	0.65

	Amount, (each)	$\gamma_c$ , (kcf)	Thick, (ft.)	Width, (ft.)	Length, (ft.)	Weight, (kips)
Concrete Diaphragm	1	0.15	3	3.67	42.83	70.68
					$\Sigma =$	70.68

$$W. Abut. = [(1.00)*(35.88k) + (1.00)*(6.45k) + (1.00)*(13.51k)]*(6 \text{ beams}) + [(1.00)*(82.25k)]*(3 \text{ lanes})*(0.85) + (1.00)(70.68)k$$

$$= 615.5 \text{ k}$$

$$E. Abut. = [(1.00)*(35.88k) + (1.00)*(6.45k) + (1.00)*(13.51k)]*(6 \text{ beams}) + [(1.00)*(82.25k)]*(3 \text{ lanes})*(0.85) + (1.00)(70.68)k$$

$$= 615.5 \text{ k}$$

**Strength I Reactions:**

$$W. Abut. = [(1.25)*(35.88k) + (1.25)*(6.45k) + (1.50)*(13.51k)]*(6 \text{ beams}) + [(1.75)*(82.25k)]*(3 \text{ lanes})*(0.85) + (1.25)(70.68)k$$

$$= 894.4 \text{ k}$$

$$E. Abut. = [(1.25)*(35.88k) + (1.25)*(6.45k) + (1.50)*(13.51k)]*(6 \text{ beams}) + [(1.75)*(82.25k)]*(3 \text{ lanes})*(0.85) + (1.25)(70.68)k$$

$$= 894.4 \text{ k}$$



Route: F.A.P. 323A (US 36) Sheet          of           
 Section: (139BR)B Computed by: NRM Date: 08/25/23  
 County: Macon Checked by:          Date:           
 Structure Number: 058-0141

**Planning Computations: Estimated Loads for FGU**

**Substructure Loads:**

**Service I Reactions:**

Abutments						**
Amount, (each)	$\gamma_c$ , (kcf)	Width, (ft.)	Length, (ft.)	Thick, (ft.)	Weight, (kips)	
Abutment Cap	1	0.150	3.67	42.83	4.00	94.23
Amount, (each)	(k/ft. width)	Width, (ft.)				
Approach Slab	1	3.000	42.83	-	-	128.5
$\Sigma =$						222.7

Abutments					**
Amount, (each)	Concrete Weight, (k/ft. <sup>2</sup> )	Cross-Area (ft. <sup>2</sup> )	Length, (ft.)	Weight, (kips)	
39" Constant-Slope Parapet	2	0.150	3.5	15	15.75
$\Sigma =$					15.75

\*\*For simplicity, wingwalls were ignored.

$$\begin{aligned} \text{Service I (Abutments)} &= (1.00) * [222.73k + 15.75k] \\ &= 238.5 \text{ k} \end{aligned}$$

**Strength I Reactions:**

$$\begin{aligned} \text{Strength I (Abutments)} &= (1.25) * [k + k] \\ &= 298.1 \text{ k} \end{aligned}$$

**Summary:** (Estimated Total Loads at Bottom of Encasements)

	Service I			Strength I		
	Super	Sub	Total	Super	Sub	Total
West Abutment	615.5	238.5	853.9	894.4	298.1	1192.6
East Abutment	615.5	238.5	853.9	894.4	298.1	1192.6

Note:

The Estimated Total Loads shown above reflect the loads before distribution to the proposed foundation type due to unknown foundation type at this time.