Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: 12/1/2023 **Proposed SN:** 057-0258 **Route:** FAP 317
Revised Date: 01/09/2024 **Existing SN:** 057-0070 **Section:** 28BR-1
Geotechnical Engineer: Doris D. Gonzalez **County:** McLean
Structural Engineer: BBS **Contract:** 70571

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The proposed structure is a simple span bridge with PPC IL beams and integral abutments supported by piles. This structure will replace an existing three-span reinforced concrete slab bridge supported by precast concrete piles. The Project Planning Unit estimated a factored load of 883 kips at each abutment. A location map is included in the Attachments.

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): Two borings designated boring 1 WB and 2 EB were each advanced approximately 65 ft from the location of the proposed abutments. The soil profile consists of interbedded layers of clays and sands over stiff clay till. The boring logs, as well as a TSL with their location is included in the Attachments.

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: Per the provided Plan and Profile, the grade will be maintained, and no new fills are expected. Settlement is neglegible and no further testing or analyses are necessary.

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: Per the provided Plan and Profile, the grade will be maintained, and no new fills or significant cuts are expected. The static slope stability analyses reflected a Factor of Safety greater than 1.5 for both end slopes.

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: The Design Scour Elevation Table is shown below. The design and check scour elevations for integral abutments should be taken as the corresponding bottom of abutment cap elevations.

Event/Limit State	Design Scour Elevations (ft.)		Item 113
	W. Abut.	E. Abut.	
Q100	707.82	707.54	8
Q200	707.82	707.54	
Design	707.82	707.54	
Check	707.82	707.54	

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 project is located in Seismic Performance Zone 1, has a global Site Class equal to class C, and the corresponding spectral accelerations are as follows:
Site Adjusted PGA (A_s) = 0.059g
SDS = 0.138g
SD1 = 0.080g

Since the proposed structure is located in SPZ 1, the risk of liquefaction is minimal; therefore, a liquefaction analysis is not necessary.

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 and pile design tables have been included in the Attachments section. FGU recommends utilizing Metal Shell piles with pile shoes to support the proposed abutments. One test pile per abutment is recommended.

The piles will be analyzed for lateral loads during final design.

Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: The provided estimated water surface elevation (EWSE) is equal to 698.3 ft. Since the EWSE is located below the bottom of both abutments, there is no need for cofferdams.

Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: Traffic will be maintained utilizing stage construction. Temporary Sheet Piling is feasible at both abutments.

Attachments

Figure 1: Location Map

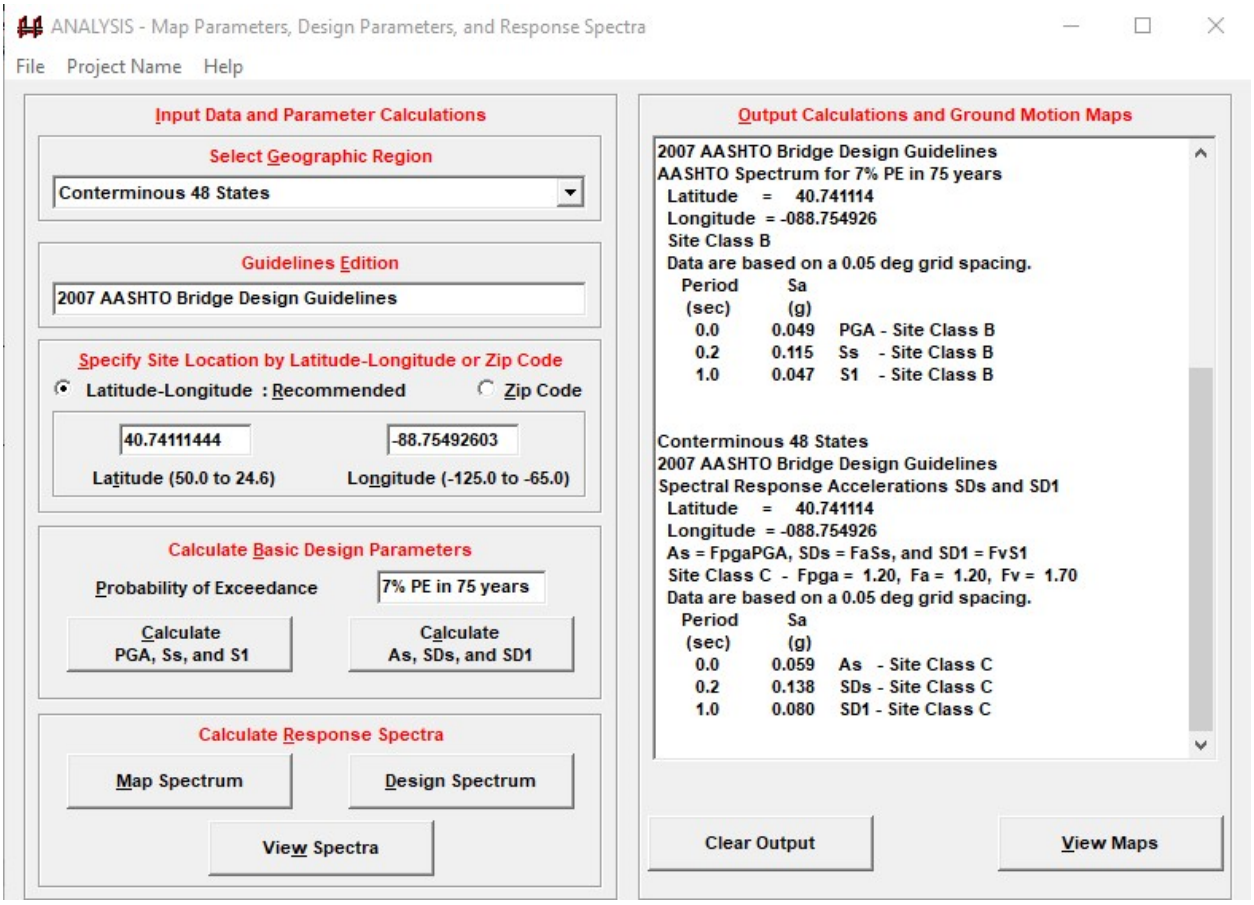

Figure 2: Seismic Data

Pile Design Table for 057-0258 utilizing Boring #1 WB

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls			
	97	53	22
	127	70	23
	131	72	25
	136	75	27
	140	77	29
	392	216	31
Metal Shell 14"Φ w/.25" walls			
	115	63	22
	155	85	23
	160	88	25
	165	91	27
	170	94	29
	459	252	31
Metal Shell 14"Φ w/.312" walls			
	115	63	22
	155	85	23
	160	88	25
	165	91	27
	170	94	29
	570	314	31
Metal Shell 16"Φ w/.312" walls			
	121	66	19
	135	74	22
	184	101	23
	190	105	25
	196	108	27
	202	111	29
	654	360	31
Metal Shell 16"Φ w/.375" walls			
	121	66	19
	135	74	22
	184	101	23
	190	105	25
	196	108	27
	202	111	29
	782	430	31

Pile Design Table for 057-0258 utilizing Boring #2 EB

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls			
	119	65	22
	142	78	25
	178	98	30
	202	111	33
	342	188	35
	392	216	39
Metal Shell 14"Φ w/.25" walls			
	143	79	22
	170	94	25
	213	117	30
	241	132	33
	428	235	35
	459	252	39
Metal Shell 14"Φ w/.312" walls			
	143	79	22
	189	104	28
	428	235	35
	449	247	38
	491	270	40
	532	293	44
Metal Shell 16"Φ w/.312" walls			
	168	93	22
	199	110	25
	221	122	28
	250	137	30
	522	287	35
	597	328	40
	645	355	44
Metal Shell 16"Φ w/.375" walls			
	168	93	22
	221	122	28
	250	137	30
	522	287	35
	546	301	38
	597	328	40
	645	355	44

Illinois Department of Transportation
Division of Highways
IL DEPARTMENT OF TRANSPORTATION

SOIL BORING LOG

Date 4/14/22

ROUTE FAP 317 (US 24) **DESCRIPTION** US 24 OVER INTERMITTANT STREAM **LOGGED BY** DDB

SECTION 28BR-1 **LOCATION** 0.9 mi W of I-55, **SEC.** 3, **TWP.** T26N, **RNG.** R4E, 3rd **PM.**, **GPS:**

COUNTY MCLEAN **DRILLING METHOD** HSA **HAMMER TYPE** AUTOMATIC

STRUCT. NO. 057-0070
Station 1494+00

BORING NO. 1 WB
Station 1495+00
Offset 6.00ft LT
Ground Surface Elev. 715.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 694.0 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	SPT N (/12")	UCS Qu (tsf)	MOIST (%)	Description
				ASPHALT 714.67
				CONCRETE 713.84
				AGGREGATE 713.59
				STIFF BLACK CLAYEY EMBANKMENT WITH TRACE AGGREGATE 711.50
	11			STIFF BLACK CLAYEY EMBANKMENT
	6	2.5	16.7	
-5	8	P		
	3			
	2	1.5	28.6	
	5	P		
	4			
	4	1.7	32.4	
-10	4	B		
				704.50
				TAN VARVED SILTY CLAY
	2			
	2	1.7	24.0	
	3	B		
	1			701.00
	2	1.0	23.8	TAN MOIST COARSE CLAYEY SAND
-15	4	P		
				699.50
				MOIST GRAY SILTY CLAY
	2			
	3	0.5	19.0	698.00
	3	B		GRAY SILTY CLAY
	2			
	2	1.7	24.8	
-20	7	B		

DEPTH (ft)	SPT N (/12")	UCS Qu (tsf)	MOIST (%)	Description
				GRAY SILTY CLAY *(continued)* 694.00 ▼
	3			MOIST GRAY SANDY CLAY
	7	0.5	20.2	
	11	P		692.50
				GRAY COARSE SAND 691.50
	7			NO SAMPLE (WASHED BORING)
	8	--	--	
-25	8			690.00
				MOIST GRAY COARSE SANDY CLAY 689.00
	8			GRAY STIFF SANDY CLAY
	11	1.5	16.2	
	10	P		
	3			
	7	1.5	15.2	
-30	7	P		685.00
				GRAY COARSE SAND (WASHED BORING)
	3			
	3	--	--	
-35	4			
				677.00
	8			VERY STIFF GRAY CLAY TILL
	33	--	6.8	
-40	69			

SOIL BORING 057-0070 - 1 MI W OF CHENOA.GPJ IL_DOT.GDT 4/26/22

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IL DEPARTMENT OF TRANSPORTATION

SOIL BORING LOG

Date 4/14/22

ROUTE FAP 317 (US 24) **DESCRIPTION** US 24 OVER INTERMITTANT STREAM **LOGGED BY** DDB

SECTION 28BR-1 **LOCATION** 0.9 mi W of I-55, **SEC.** 3, **TWP.** T26N, **RNG.** R4E, 3rd **PM.**, **GPS:**

COUNTY MCLEAN **DRILLING METHOD** HSA **HAMMER TYPE** AUTOMATIC

STRUCT. NO. 057-0070
Station 1494+00

BORING NO. 1 WB
Station 1495+00
Offset 6.00ft LT
Ground Surface Elev. 715.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 694.0 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	SPT N (/12")	UCS Qu (tsf)	MOIST (%)
VERY STIFF GRAY CLAY TILL *(continued)*			
	32		
	50	--	6.7
-45	50-4"		
	22		
	52	10.0	7.7
665.00 -50	63	S	
End of Boring			
-55			
-60			

SOIL BORING 057-0070 - 1 MI W OF CHENOA.GPJ IL_DOT.GDT 4/26/22

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IL DEPARTMENT OF TRANSPORTATION

SOIL BORING LOG

Date 4/21/22

ROUTE FAP 317 (US 24) **DESCRIPTION** US 24 OVER INTERMITTANT STREAM **LOGGED BY** DDB

SECTION 28BR-1 **LOCATION** 0.9 mi W of I-55, **SEC.** 3, **TWP.** T26N, **RNG.** R4E, 3rd **PM.**, **GPS:**

COUNTY MCLEAN **DRILLING METHOD** HSA **HAMMER TYPE** AUTOMATIC

STRUCT. NO. 057-0070
Station 1494+00

BORING NO. 2 EB
Station 1493+00
Offset 6.00ft RT
Ground Surface Elev. 715.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 694.0 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	SPT N (/12")	UCS Qu (tsf)	MOIST (%)	Description
				ASPHALT 714.67
				CONCRETE 713.84
				AGGREGATE 713.59
				STIFF VARVED CLAY
				711.00
				BURIED PCC PAVEMENT - SPLIT SPOON PENETRATION NOT POSSIBLE 710.00
-5	--	4.0 P	21.2	
				SOFT BLACK TOPSOIL
	2			
	3	0.7	20.9	
	3	B		
	4			
	5	4.1	23.4	
-10	4	S		
				704.50
				SOFT VARVED CLAY
	3			
	2	1.0	30.4	
	2	B		
				702.00
				STIFF GRAY SILTY CLAY
	2			
	4	2.5	22.7	
-15	4	P		
				700.00
				SOFT VARVED CLAY
				699.00
				STIFF GRAY SILTY CLAY
	3			
	4	1.5	21.2	
	4	P		
	3			
				696.00
				MOIST SOFT GRAY SILTY CLAY
	6	1.5	18.3	
-20	7	S		
				MOIST SOFT GRAY SILTY CLAY *(continued)*
				▼
				692.00
				GRAY COARSE SAND (WASHED BORING)
	6			
	6	--	--	
-25	7			
				686.50
	7			
				MOIST GRAY STIFF SANDY CLAY
	10	2.5	8.8	
-30	11	P		
				684.00
				MOIST GRAY COARSE SAND
				683.00
				GRAY CLAY TILL
	7			
	8	2.5	12.1	
-35	8	P		
				679.50
				STIFF VARVED CLAY
				678.50
				STIFF GRAY CLAY TILL
	4			
	4	3.2	10.2	
-40	8	B		

SOIL BORING 057-0070 - 1 MI W OF CHENOA.GPJ IL_DOT.GDT 4/26/22

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, from 137 (Rev. 8-99)

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SOIL BORING LOG

Date 4/21/22

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SECTION 28BR-1 **LOCATION** 0.9 mi W of I-55, **SEC.** 3, **TWP.** T26N, **RNG.** R4E, 3rd **PM.**, **GPS:**

COUNTY MCLEAN **DRILLING METHOD** HSA **HAMMER TYPE** AUTOMATIC

STRUCT. NO. 057-0070
Station 1494+00

BORING NO. 2 EB
Station 1493+00
Offset 6.00ft RT
Ground Surface Elev. 715.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 694.0 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	SPT N (/12")	UCS Qu (tsf)	MOIST (%)
STIFF GRAY CLAY TILL *(continued)*			
	9		
	17	8.5	10.1
-45	23	S	
	9		
	17	3.4	10.4
-50	27	B	
	13		
	17	7.5	8.6
662.50	28	B	
AUGER REFUSAL End of Boring			
-55			
-60			

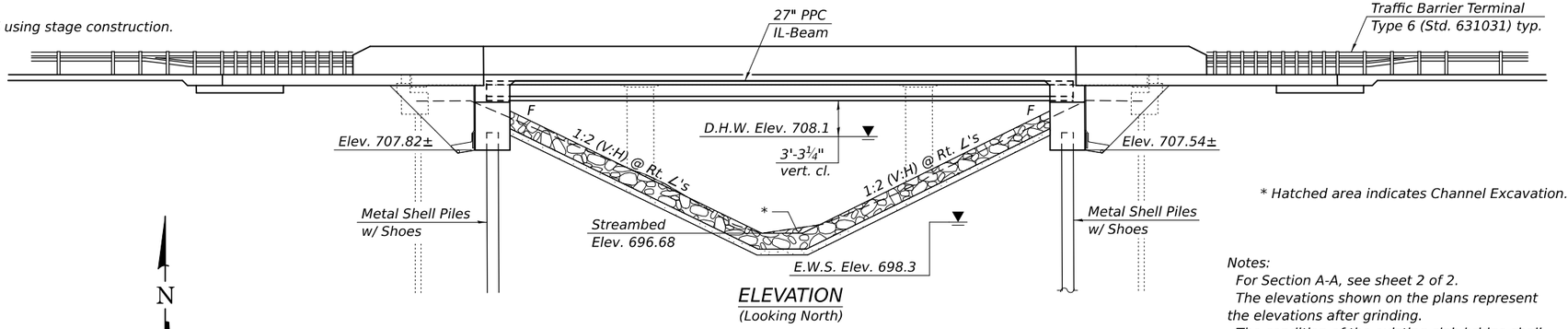
SOIL BORING 057-0070 - 1 MI W OF CHENOA.GPJ IL_DOT.GDT 4/26/22

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

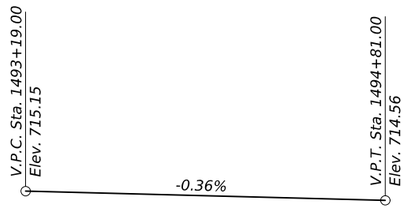
Benchmark: Northeast wingwall of SN 057-0070 at Sta. 1494+46.57 - 18.45' Lt., Elevation 715.13.

Existing Structure: SN 057-0070 was originally built in 1959 under Section 28-BR at Station 1494+00. The structure is a 3-span RC slab bridge measureing 86'-10" between back of abutments carrying F.A.P. 317 (US 24) over an unnamed tributary of Rooks Creek 0.9 miles West of F.A.I. 55 by Chenoa. The structure was repaired in 1996 under Section ((28,29,30)R)RS-1&28BR with deck patching, integral abutment conversion, new approach slabs, scarification with microsilica overlay and steel bridge rails. Deck patching was performed in 2021.

Traffic to be maintained using stage construction.



ELEVATION
(Looking North)

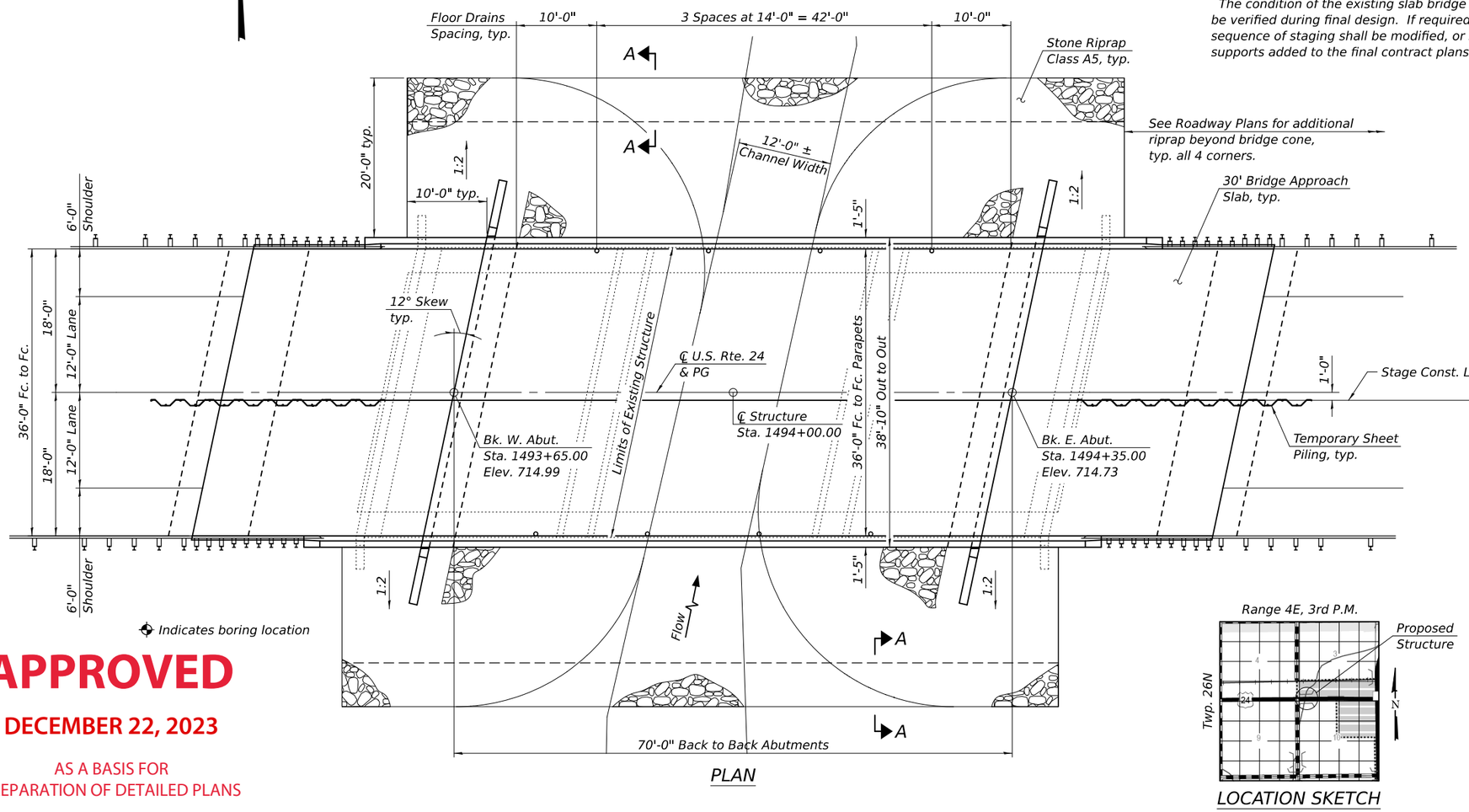


PROFILE GRADE
(Along ℄ U.S. 24)

The profile grade shows the final elevations after grinding.

* Hatched area indicates Channel Excavation.

Notes:
For Section A-A, see sheet 2 of 2.
The elevations shown on the plans represent the elevations after grinding.
The condition of the existing slab bridge shall be verified during final design. If required, the sequence of staging shall be modified, or slab supports added to the final contract plans.



PLAN

DESIGN SPECIFICATIONS
2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

LOADING HL-93
Allow 50#/sq. ft. for future wearing surface.

DESIGN STRESSES
FIELD UNITS
f 'c = 3,500 psi
f 'c = 4,000 psi (Superstructure)
fy = 60,000 psi (Reinforcement)

PRECAST PRESTRESSED UNITS
f 'c = 8,500 psi
f 'c = 6,500 psi
fpu = 270,000 psi (0.6" Dia. low lax. Strands)
fpbt = 202,300 psi (0.6" Dia. low lax. Strands)

SEISMIC DATA
Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.080g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.138g
Soil Site Class = C

HIGHWAY CLASSIFICATION
F.A.P. Rte. 317 - U.S. 24
Functional Class: Other Principal Arterial
ADT: 3300 (2021); 3650 (2041)
ADTT: 726 (2021); 803 (2041)
DHV: 260
Design Speed: 60 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 55/45

LOCATION SKETCH

GENERAL PLAN & ELEVATION
U.S. RTE. 24 OVER UN-NAMED TRIBUTARY TO ROOKS CREEK
F.A.P. RTE. 317 – SEC. 28BR-1
MCLEAN COUNTY
STATION 1494+00.00
STRUCTURE NO. 057-0258

APPROVED
DECEMBER 22, 2023
AS A BASIS FOR
PREPARATION OF DETAILED PLANS

DESIGNED	-	JUSTIN T. BELUE
CHECKED	-	RICHARD J. CHAPUT
DRAWN	-	DENNIS A. POP
CHECKED	-	J.T.B. / R.J.C.

12/22/2023 1:51:28 PM

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
317	28BR-1	McLean	2	1
		CONTRACT NO. 70571		
	ILLINOIS	FED. AID PROJECT		

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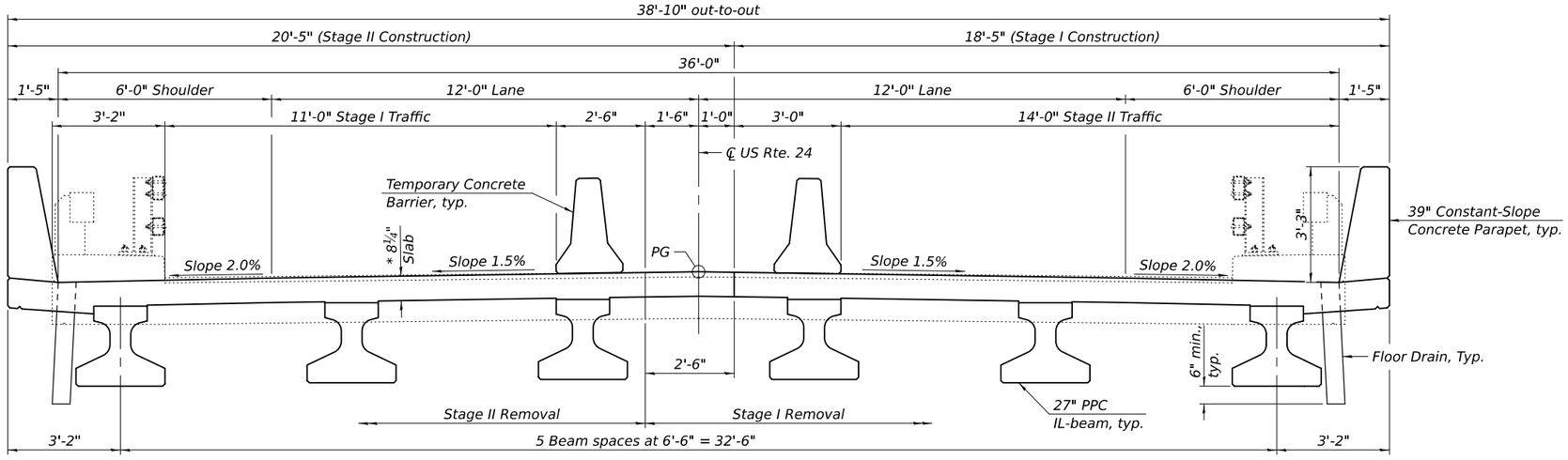
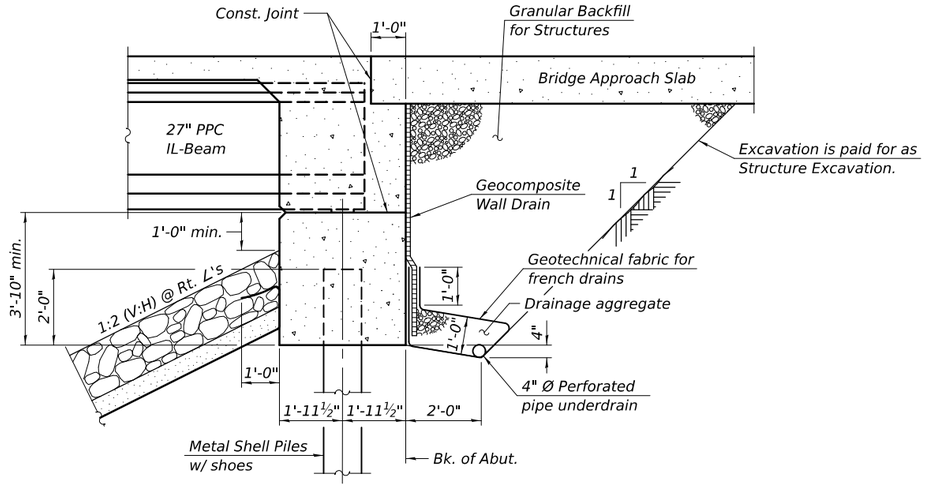
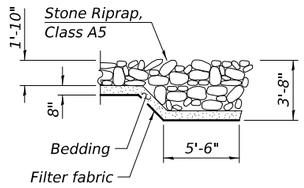


* Prior to grinding. Up to ¼" may be ground off the bridge deck and the bridge approach slabs.

CROSS SECTION
(Looking East)



SECTION THRU INTEGRAL ABUTMENT
(Horiz. dim. at Rt. ∠'s)



SECTION A-A

WATERWAY INFORMATION

Drainage Area = 8.18 mi.²

Existing Low Grade Elev. 714.40 @ Sta. 1496+00
Proposed Low Grade Elev. 714.40 @ Sta. 1496+00

Flood	Freq. Yr.	Q C.F.S.	Opening Ft² Exist.	Opening Ft² Prop.	Nat. H.W.E.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
	10	1150	237	247	706.6	0.3	0.2	706.9	706.8
Design	50	1850	305	321	708.1	0.7	0.6	708.8	708.7
Base	100	2160	325	342	708.5	1.0	0.8	709.5	709.3
Scour Design Check	200	2487	340	358	708.8	1.2	1.0	710.0	709.8
Max. Calc.	500	2920	361	381	709.2	1.5	1.3	710.7	710.5

10 Year velocity through existing bridge = 4.82 ft/s
10 Year velocity through proposed bridge = 4.54 ft/s

DESIGN SCOUR ELEVATION TABLE

Event / Limit State	Design Scour Elevations (ft.) W. Abut.	Design Scour Elevations (ft.) E. Abut.	Item 113
Q100	707.82	707.54	8
Q200	707.82	707.54	
Design	707.82	707.54	
Check	707.82	707.54	

APPROVED

DECEMBER 22, 2023

AS A BASIS FOR
PREPARATION OF DETAILED PLANS

DETAILS
U.S. RTE. 24 OVER UN-NAMED TRIBUTARY TO ROOKS CREEK
F.A.P. RTE. 317 – SEC. 28BR-1
MCLEAN COUNTY
STATION 1494+00.00
STRUCTURE NO. 057-0258

DESIGNED	-	JUSTIN T. BELUE
CHECKED	-	RICHARD J. CHAPUT
DRAWN	-	DENNIS A. POP
CHECKED	-	J.T.B. / R.J.C.

12/22/2023 7:48:42 AM

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

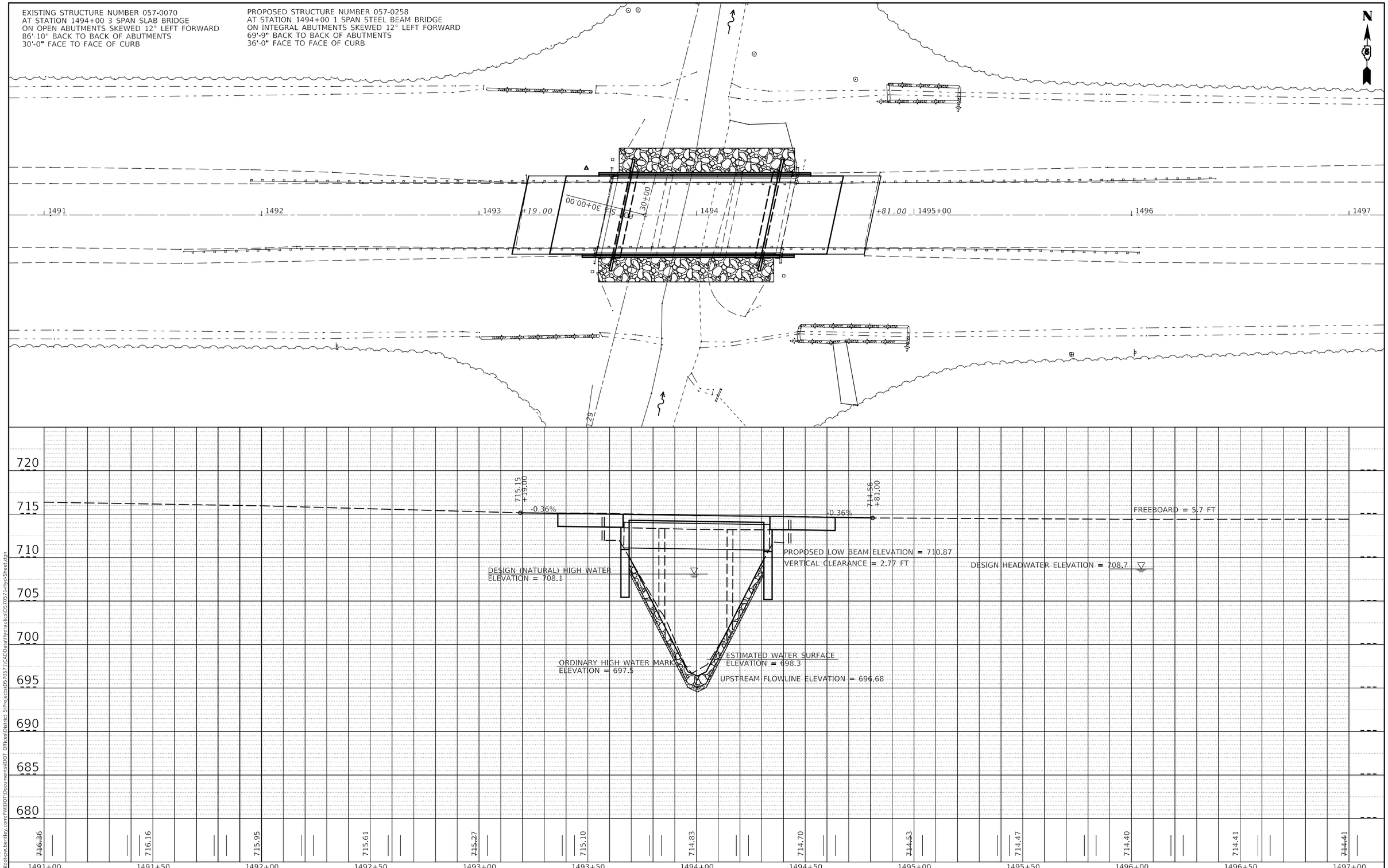
SHEET 2 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
317	28BR-1	McLean	2	2
		CONTRACT NO. 70571		
	ILLINOIS FED. AID PROJECT			

MODEL: 057025B-70571-TSL-002.dgn
FILE NAME: p:\dot-pw.bentley.com:PWIDOT\Documents\IDOT O ces\Bureau of Bridges and Structures\OBM Projects\057025B\CADData\Bridge\057025B-70571.dgn

EXISTING STRUCTURE NUMBER 057-0070
AT STATION 1494+00 3 SPAN SLAB BRIDGE
ON OPEN ABUTMENTS SKEWED 12° LEFT FORWARD
86'-10" BACK TO BACK OF ABUTMENTS
30'-0" FACE TO FACE OF CURB

PROPOSED STRUCTURE NUMBER 057-0258
AT STATION 1494+00 1 SPAN STEEL BEAM BRIDGE
ON INTEGRAL ABUTMENTS SKEWED 12° LEFT FORWARD
69'-9" BACK TO BACK OF ABUTMENTS
36'-0" FACE TO FACE OF CURB



PLAN
SURVEYED
PLOTTED
ALIGNMENT CHECKED
RT. OF WAY CHECKED
CADD FILE NAME
NOTE BOOK
NO.
BY
DATE

PROFILE
SURVEYED
PLOTTED
PROFILES CHECKED
B.M. NOTED
STRUCTURE NOTATNS CHKD
NOTE BOOK
NO.
BY
DATE

MODEL: $MODELNAME$
FILE NAME: pw:\\dot-pw.bentley.com:PWIDOT\Documents\IDOT Offices\District 5\Projects\D57057.1\CADData\Hydraulics\D357057-Hyd-Sheet.dgn

USER NAME = Eurnie.Garver	DESIGNED - _____	REVISED - _____	
	DRAWN - _____	REVISED - _____	
PLOT SCALE = 40.0000 ' / in.	CHECKED - _____	REVISED - _____	
PLOT DATE = 12/15/2022	DATE - _____	REVISED - _____	

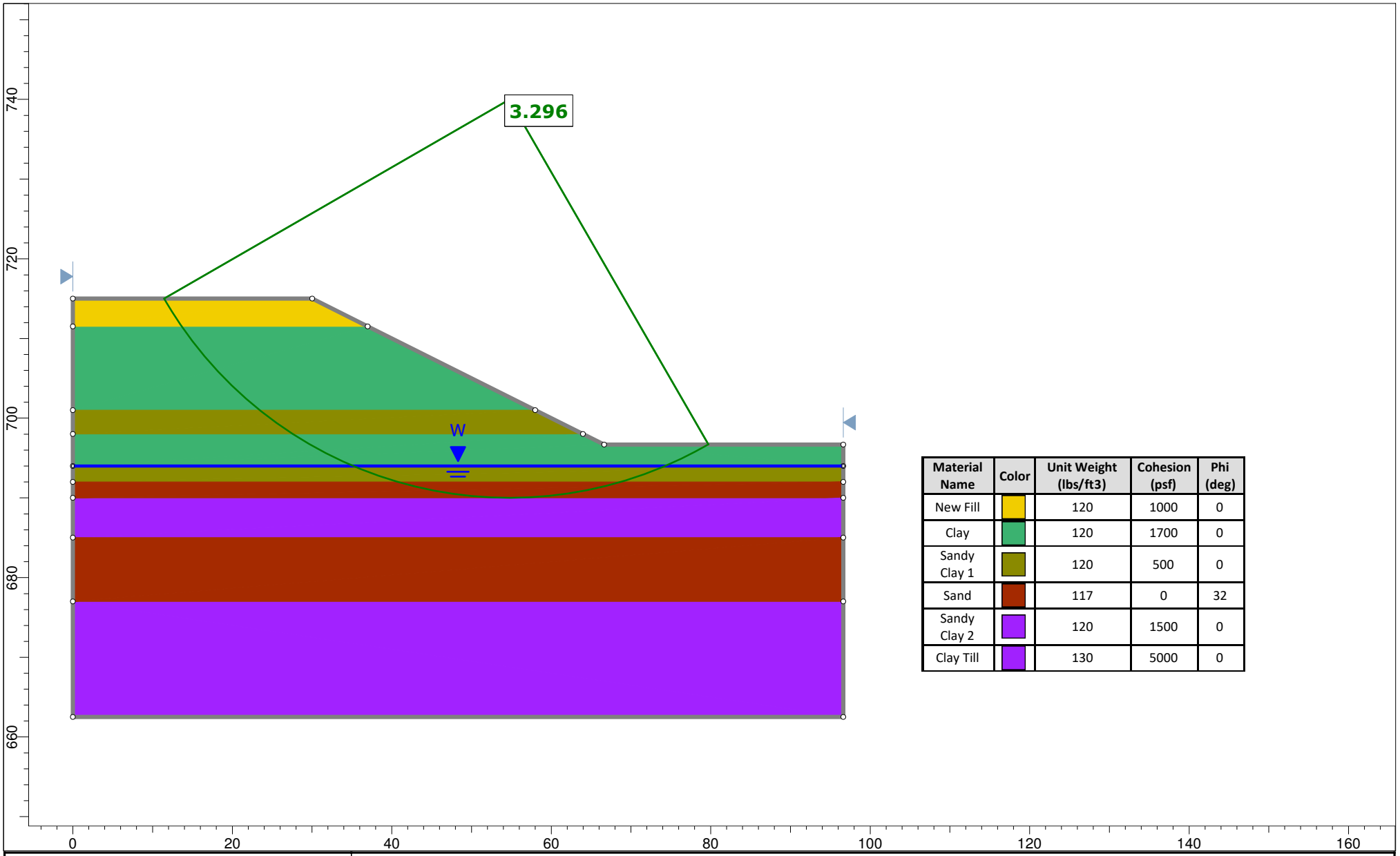
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SCALE: _____ SHEET __ OF __ SHEETS STA. _____ TO STA. _____

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
___	_____	_____	___	___

CONTRACT NO. ____

ILLINOIS | FED. AID PROJECT



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
New Fill		120	1000	0
Clay		120	1700	0
Sandy Clay 1		120	500	0
Sand		117	0	32
Sandy Clay 2		120	1500	0
Clay Till		130	5000	0

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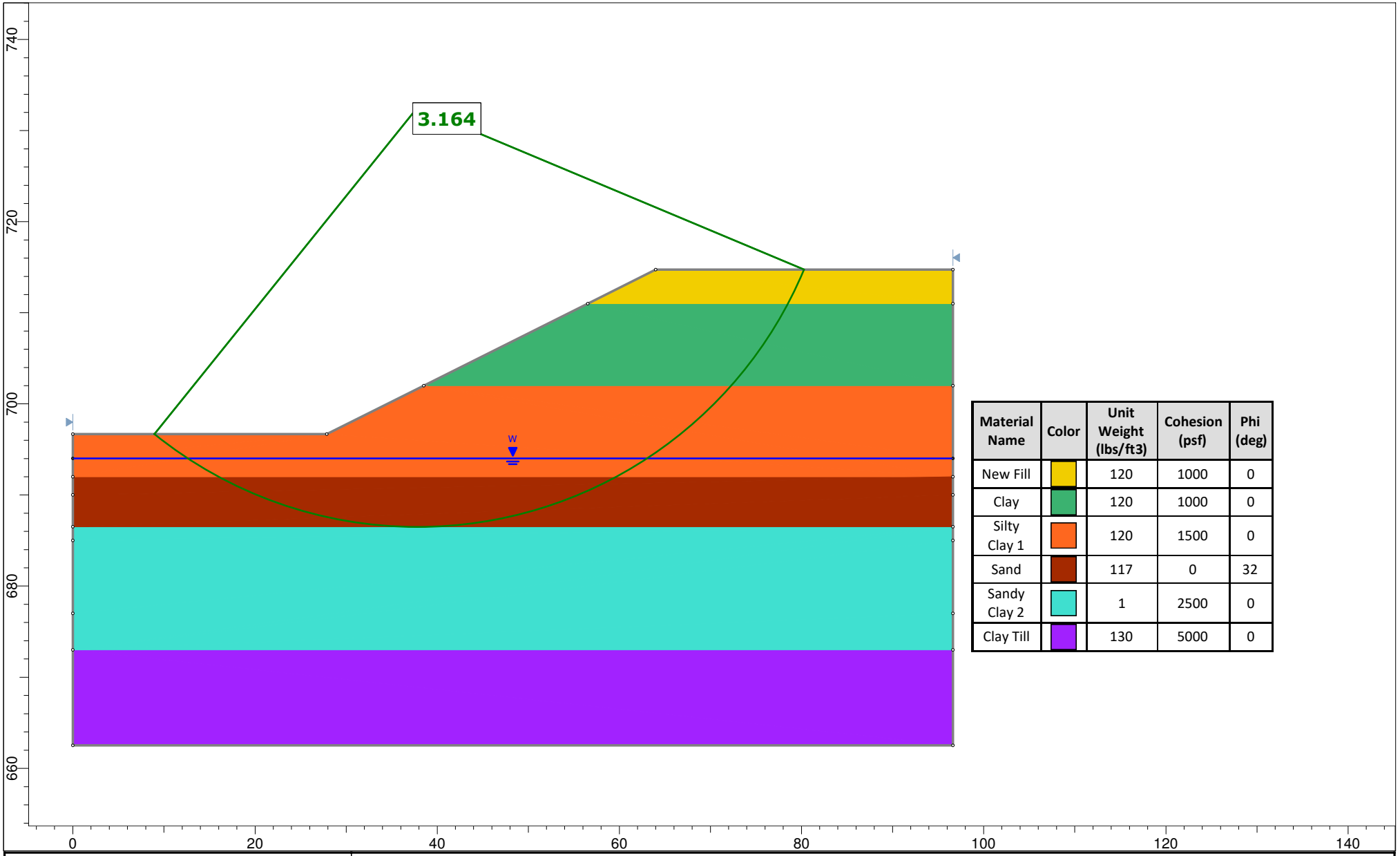
SLIDEINTERPRET 9.024

Project	Slide2 - An Interactive Slope Stability Program		
Group	Group 1	Scenario	Master Scenario
Drawn By		Company	
Date	11/3/2023, 9:47:58 AM	File Name	West Embankment.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
New Fill		120	1000	0
Clay		120	1000	0
Silty Clay 1		120	1500	0
Sand		117	0	32
Sandy Clay 2		1	2500	0
Clay Till		130	5000	0

rocscience

SLIDEINTERPRET 9.024

Project	Slide2 - An Interactive Slope Stability Program		
Group	Group 1	*Scenario*	Master Scenario
Drawn By		*Company*	
Date	11/3/2023, 9:47:58 AM	*File Name*	East Embankment.slmd