STRUCTURE GEOTECHNICAL REPORT

TR 23 (Stiritz Road) over I-57

Existing S.N. 100-0053
Proposed S.N. 100-0110

TR 23
SECTION X1-4(HB-3)
WILLIAMSON COUNTY, ILLINOIS
PTB 196 Item 062 WO #7
KEG NO. 20-1109.04

11/29/2023
Exp. 11/30/2025

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Kaskaskia
Engineering Group, LLC

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EXHIBITS

1.0 PROJECT DESCRIPTION AND SCOPE

1.1 Introduction

The geotechnical study summarized in this report was performed by Kaskaskia Engineering Group, LLC (KEG) for a proposed bridge carrying TR 23 (Stiritz Road) over I-57 in Williamson County, Illinois. The purpose of this report is to document subsurface geotechnical conditions, provide analyses of anticipated site conditions as they pertain to the project described herein, and to present design and construction recommendations for the proposed structure.

1.2 Project Description

The project consists of replacing a four-span bridge (existing SN 100-0053) over F.A.I. 57 (I-57) in Williamson County, Illinois. The general location of the proposed structure is shown on a Location Map, Exhibit A. The existing structure was built in 1961. The bridge is 233 ft. long and 31 ft. – 8 in. wide. The project is located approximately 1.5 miles north of Broadway Street and 0.6 miles west of IL 37 near Johnston City, Illinois. The site lies within the limits of the Third Principal Meridian (T. 8S R. 2E) within the Shawnee Hills Section of the Interior Low Plateaus Province.

1.3 Proposed Structure Information

The proposed structure (proposed SN 100-0110) will consist of a two-span steel plate girder superstructure, which will be built on a 5°02’32”-degree skew and will provide two 11 ft.-wide driving lanes and two 4 ft.-wide shoulders with a total width of 32 ft.-10 in. out-to-out. The proposed bridge centerline station will be at 81+75.96 on I-57. The bridge will measure 240 ft.-6 in. back-to-back abutments. A Type, Size, and Location Plan (TS&L) is included in Exhibit B.

Further substructure details will be based on the findings of this SGR.

2.0 FIELD EXPLORATION

2.1 Subsurface Exploration and Testing

The site exploration plan was developed by IDOT. Three borings designated 1-S, 2-S, and 3-S were drilled from October 12th-14th, 2021. The boring locations are shown on Exhibit B – TS&L. Detailed information regarding the nature and thickness of the soils encountered and the results of the field sampling and laboratory testing are shown on the Boring Logs, Exhibit C. The soil profile for the boring can be found in Subsurface Profile, Exhibit D.

2.2 Subsurface Conditions

Table 2.2.1 shows the depth below the ground surface elevation (GSE) where each boring was terminated and the estimated GSE.

Table 2.2.1 – Borings Depths and GSE

Boring	Depth (ft)	Ground Surface Elevation (ft)
1-S	89.0	433.3
2-S	74.0	412.0
3-S	94.3	432.9

In general, the borings included a mix of the following soil types: clays, silts, sands, loams, shale, and coal. A Summary of the general condition of the subsurface is described in Table 2.2.2.

Table 2.2.2 – Subsurface Profile Summary

Soil Type	N-Values (bpf)	Q_u (tsf)	WC (%)	Boring
Clay	4 to 25	0.6 to 4.5	16 to 28	1-S, 2-S, 3-S
Silty Clay/Silty Loam	4 to 26	0.5 to 4.8	15 to 22	1-S, 2-S, 3-S
Silt	4 to 25	0.4 to 2.9	20 to 27	1-S, 2-S, 3-S
Silty Clay Loam/Loam	6 to 15	2.1 to 4.0	18 to 26	1-S, 2-S, 3-S
Sand	11 to 20	1.6 to 2.7	16	1-S, 2-S, 3-S
Clayey Shale	20 to 100/3”	1.0 to 10.8	9 to 27	1-S, 2-S
Coal	-	-	-	1-S, 2-S
Shale (Rock Core)	-	-	-	1-S, 2-S, 3-S

Groundwater was encountered in Boring 1-S at 36.5 ft. below GSE at an elevation of 396.8 ft., Boring 2-S at 16.0 ft. below GSE at an elevation of 396.0 ft., and Boring 3-S at 34.0 ft. below GSE at an elevation of 398.9 ft. It should be noted that the groundwater level is subject to seasonal and climatic variations. In addition, without extended periods of observation, measurement of true groundwater levels may not be possible. Bedrock was encountered in all three borings.

3.0 GEOTECHNICAL EVALUATIONS

3.1 Settlement

Since no significant grading or changes to the existing embankments are expected at the proposed structure, it is estimated that the existing embankments will experience no settlement. Therefore, no settlement calculations were performed for the proposed structure.

3.2 Slope Stability

A stability analysis using SLOPE/W was performed using the proposed roadway and bridge geometry on the TS&L and soil characteristics from Boring 1-S and 3-S. Two conditions were modeled for each scenario: end-of-construction and long-term stability. A critical factor of safety (FOS) was calculated for each condition. According to the current standard of practice, the target FOS is 1.5 for end-of-construction and long-term slope stability. The slope stability analyses indicated that the required minimum FOS for all conditions were met.

In order to model the end-of-construction condition, full cohesion, and a friction angle of 0 degrees were assumed. Nominal values for cohesion were used with full friction angle to model the long-

term condition to analyze the theoretical condition where pore water pressure has dissipated. Nominal values were between 100 and 150 psf for the cohesive soils, with friction angles between 26 and 28 degrees.

The Bishop Circular Method, which generates circular-shaped failure surfaces, was used to calculate the critical failure surfaces and FOS for the proposed conditions. The FOS obtained in the analysis is shown in Table 3.2.1. SLOPE/W program output from this analysis can be found in SLOPE/W Slope Stability Analysis, Exhibit E.

Table 3.2.1 – Slope Stability Critical FOS

Structure	Critical FOS	
	End-of Construction	Long Term
East Abutment (1V:2H)	4.0	1.6
West Abutment (1V:2H)	5.9	1.5

3.3 Seismic Considerations

The determination of Seismic Site Class was based on the method described by IDOT AGMU Memo 09.1 - Seismic Site Class Definition and the IDOT provided spreadsheet titled: '*Seismic Site Class Determination*.' Using these resources, the controlling global site class for this project is Soil Site Class C.

Additional seismic parameters were calculated for use in design of the structure and evaluation of liquefaction potential. Published information and mapping from the USGS, including software directly applicable to the AASHTO Guide Specifications for LRFD Seismic Bridge Design, was used to develop the parameters for the bridge location. The values, based on Soil Site Class C, are summarized in Table 3.3.1 below.

Table 3.3.1 - Summary of Seismic Parameters

Parameter	Value
Seismic Performance Zone	2
Spectral Response Acceleration, 1.0 Sec, S_{D1}	0.256g (Site Class C)
Spectral Response Acceleration, 0.2 Sec, S_{DS}	0.707g (Site Class C)
Soil Site Class	C

As indicated in the table above, the Seismic Performance Zone is 2, based on S_{D1} and Table 3.15.2 in the IDOT Bridge Manual, the Soil Site Class C, and Figure 2.3.10-2 in the IDOT Bridge Manual.

3.4 Liquefaction

A liquefaction analysis was performed using the liquefaction analysis worksheet provided by IDOT BBS Central Geotechnical Unit and procedures outlined in AGMU 10.1 - Liquefaction Analysis.

The PGA and Mw to be used were obtained from the deaggregation data of the seismic hazard for the site, by accessing the USGS website: https://earthquake.usgs.gov/hazards/interactive/ for both NMSZ (far source-site) and CEUS (near source-site) models. The deaggregation data indicated a near source-site contributing at least 5.54% to the hazard for this site; hence, PGA maximums from the NMSZ Model and the CEUS Model were necessary. The Peak Horizontal Ground Surface Acceleration value was set to the PGA calculated in the IDOT Liquefaction Analysis Spreadsheet.

The results from the analysis for the soil profile encountered in Boring 3-S showed no potential for liquefaction from any source contributing at least 5% to the hazard for the site. Therefore, no reduction for liquefaction was considered for the pile design capacity or other foundation considerations. A summary of the liquefaction analysis including each specific run is included in Exhibit F, Liquefaction Analysis.

4.0 FOUNDATION EVALUATIONS AND DESIGN RECOMMENDATIONS

4.1 Bearing Resistance

A shallow foundation is considered a feasible alternative to driven piles for the pier. The soil encountered in the borings at the anticipated bearing elevation of the pier consists of a clay material. The assumed bearing elevation at the bottom of the pier is El. 407.75. The soil from Boring 2-S at the assumed bearing elevation has an N-value of 6 bpf and a UCS of 2.3 tsf. The calculated allowable bearing resistance, using a Resistance Factor of 0.5, at the approximate bottom elevation of the pier (El. 407.75), is estimated to be 6,795 psf. Sliding resistance is calculated as the lessor of the cohesion or one half of the vertical stress. See Exhibit G for calculations performed.

Table 4.1.1 – Factored Bearing and Sliding Resistances

Substructure Unit	Allow. Bearing Resistance (psf)	Sliding Resistance (psf)
Pier	6,795	240

If after final design the bearing elevation changes, KEG should be informed to review that the above recommendations still apply.

4.2 Driven Piles

The foundations supporting the proposed bridge must provide sufficient support to resist dead and live loads. The IDOT Static Method uses the LRFD Pile Design Guide Procedure to estimate the pile lengths (Pile Length/Pile Type, Exhibit H).

The factored reactions and the preliminary design loads, as provided by ESCA Consultants, are provided in Table 4.2.1.

Table 4.2.1 - Preliminary Design Loads

Substructure Unit	Factored Reactions (kips)
East Abutment	1100
Pier	2500
West Abutment	1100

The estimated pile lengths for applicable H-pile and Metal Shell pile types are shown in Tables 4.2.2 through 4.2.12 below. The Nominal Required Bearing (R_N) represents the resistance the pile will experience during driving and will assist the contractor in selecting a proper hammer size. The Factored Resistance Available (R_F) documents the net long-term axial factored pile capacity available at the top of the pile to support factored substructure loadings.

Table 4.2.2 - Estimated Pile Lengths for for Metal Shell 12" ϕ w/.25" walls

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment	299	164	52	428.33
	310	171	55	428.33
	325	178	59	428.33
	332	182	64	428.33
Pier	187	103	37	409.75
	207	114	40	409.75
	241	133	45	409.75
	282	155	51	409.75
West Abutment	342	188	54	428.25
	351	193	56	428.25
	365	201	59	428.25
	385	212	62	428.25

Table 4.2.3 - Estimated Pile Lengths for for Metal Shell 14" ϕ w/.25" walls

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment	351	193	52	428.33
	364	200	55	428.33
	380	209	59	428.33
	387	213	64	428.33
Pier	221	121	37	409.75
	246	135	40	409.75
	286	157	45	409.75
	333	183	51	409.75
West Abutment	403	222	54	428.25
	412	227	56	428.25
	429	236	59	428.25
	452	249	62	428.25

Table 4.2.4 - Estimated Pile Lengths for for Metal Shell 14" ϕ w/.312" walls

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment	351	193	52	428.33
	364	200	55	428.33
	380	209	59	428.33
	387	213	64	428.33
Pier	221	121	37	409.75
	246	135	40	409.75
	286	157	45	409.75
	333	183	51	409.75

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
West Abutment	412	227	56	428.25
	429	236	59	428.25
	452	249	62	428.25
	490	270	68	428.25

Table 4.2.5 - Estimated Pile Lengths for for Metal Shell 16" ϕ w/.312" walls

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment	403	222	52	428.33
	418	230	55	428.33
	437	240	59	428.33
	442	243	64	428.33
Pier	255	140	37	409.75
	285	157	40	409.75
	331	182	45	409.75
	384	211	51	409.75
West Abutment	474	261	56	428.25
	493	271	59	428.25
	521	286	62	428.25
	564	310	68	428.25

Table 4.2.6 - Estimated Pile Lengths for for Metal Shell 16” ϕ w/.375” walls

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment	403	222	52	428.33
	418	230	55	428.33
	437	240	59	428.33
	442	243	64	428.33
Pier	255	140	37	409.75
	285	157	40	409.75
	331	182	45	409.75
	384	211	51	409.75
West Abutment	474	261	56	428.25
	493	271	59	428.25
	521	286	62	428.25
	564	310	68	428.25

Table 4.2.7 - Estimated Pile Lengths for HP 10x42 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment	335	184	67	428.33
Pier	335	184	58	409.75
West Abutment	335	184	74	428.25

Table 4.2.8 - Estimated Pile Lengths for HP 12x53 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment	418	230	67	428.33
Pier	418	230	58	409.75
West Abutment	418	230	74	428.25

Table 4.2.9 - Estimated Pile Lengths for HP 12x63 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment	497	273	69	428.33
Pier	497	273	59	409.75
West Abutment	497	273	75	428.25

Table 4.2.10 - Estimated Pile Lengths for HP 14x73 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment	578	318	68	428.33
Pier	578	318	59	409.75
West Abutment	578	318	74	428.25

Table 4.2.11 – Estimated Pile Lengths for HP 14x89 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment	705	388	70	428.33
Pier	705	388	61	409.75
West Abutment	705	388	76	428.25

Table 4.2.12 - Estimated Pile Lengths for HP 14x117 Steel H-Piles

Substructure Unit	R_n Nominal Required Bearing (kips)	R_F Factored Resistance Available (LRFD) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
East Abutment	929	511	73	428.33
Pier	929	511	64	409.75
West Abutment	929	511	80	428.25

As shown in the Tables above and in Pile Length/Pile Type, Exhibit H, liquefaction has not been included at the substructure locations.

KEG recommends one test pile be performed, at a minimum. A test pile is performed prior to production driving so that actual, on-site field data can be gathered to determine pile driving requirements for the project. This is also the manner in which the contractor's proposed equipment and methodologies identified in their Pile Installation Plan can be assessed.

The piles are expected to be driven into penetrable shale and pre-coring should not be required to reach estimated embedment depths. Therefore, KEG recommends using pile shoes or conical tips to facilitate driving and protect the piles from damage.

4.3 Lateral Pile Response

Generally, the geotechnical engineer provides soil parameters to the structural engineer so that an L-Pile program, or other approved software, can be used for the lateral or displacement analysis of the foundations. Table 4.3.1 and Table 4.3.2 are included for the structural engineer's use in determining lateral pile response.

Table 4.3.1 - Soil Parameters for Lateral Pile Load Analysis

Boring	Elev. at Bottom of Layer	γ (pcf)	Short Term		Long Term		N	Assumed % fines < #200	K (pci)	ε50
			Φ (deg.)	c (psf)	Φ (deg.)	c (psf)				
1-S	430.3	120	0	2000	26	100	6	85	500	0.007
	426.6	120	0	4400	26	100	7	65	2000	0.004
	425.3	110	0	400	26	100	4	60	30	0.02
	417.8	120	28	2100	28	100	7	65	1000	0.005
	408.3	120	0	2475	26	100	13	65	1000	0.005
	407.1	120	0	1300	26	100	9	85	500	0.007
	405.3	120	26	1300	26	100	9	65	25	-
	397.2	120	0	1600	26	100	6	85	500	0.007
	396.6	115	34	-	34	-	19	3	60	-
	391.3	120	0	3150	26	100	15	85	1000	0.005
	380.3	110	0	1800	26	150	21	60	500	0.007
	376.3	120	26	4000	26	100	15	25	60	-
	369.3	120	0	1100	26	100	9	65	500	0.007
	359.3	130	0	2750	12	150	76	25	1000	0.005
2-S	404.4	120	0	2230	26	100	7	85	1000	0.005
	402.8	120	0	600	30	100	4	45	100	0.01
	400.5	120	0	600	26	100	4	85	100	0.01
	398	120	26	500	26	100	5	65	25	-
	385.9	120	0	2120	26	100	8	85	1000	0.005
	384	110	0	1600	26	100	14	60	500	0.007
	382.4	115	34	-	34	-	11	3	90	-
	365	120	0	1720	26	100	11	85	500	0.007
	353	130	0	5200	31	150	42	25	2000	0.004
3-S	419.9	120	0	2440	26	100	7	85	1000	0.005
	414.9	120	0	1950	26	100	7	65	500	0.007
	412.4	120	0	2600	26	100	6	85	1000	0.005
	409.3	120	0	2300	26	100	4	65	1000	0.005
	409	120	0	2300	26	100	7	65	1000	0.005
	406.8	120	0	2300	26	100	7	85	1000	0.005
	402.4	120	0	3250	26	100	18	65	1000	0.005
	390.9	120	26	1400	29	100	6	65	25	-
	383.6	120	0	2500	26	100	16	85	1000	0.005
	381.9	115	34	2700	33	-	20	3	90	-
	376.9	110	0	2900	26	150	22	60	1000	0.005
	365.9	120	0	1975	26	100	8	85	500	0.007
	354.5	130	0	4500	38	150	100	25	2000	0.004

Table 4.3.2 - Rock Parameters for Lateral Pile Load Analysis

Rock Type	Weak Rock			Strong Rock	
	y (psf)	RQD	Qu (tsf)	y (psf)	Qu (tsf)
Shale	135	21	21.2	145	68.7

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Construction Activities

Construction activities should be performed in accordance with the current IDOT Standard Specifications for Road and Bridge Construction and any pertinent Special Provisions or Policies.

Should any design considerations assumed by KEG change, KEG should be contacted to determine if the recommendations stated in this report still apply.

5.2 Temporary Sheeting and Soil Retention

Temporary shoring is not anticipated as traffic will be maintained with the Stiritz Road closure and traffic detour.

5.3 Site and Soil Conditions

Provisions of the Standard Specifications should adequately address site and soil conditions.

6.0 COMPUTATIONS

Computations and analyses for special circumstances, if any, are included as exhibits. Please refer to each section of the report for reference to the exhibit containing any such calculations or analysis used.

7.0 GEOTECHNICAL DATA

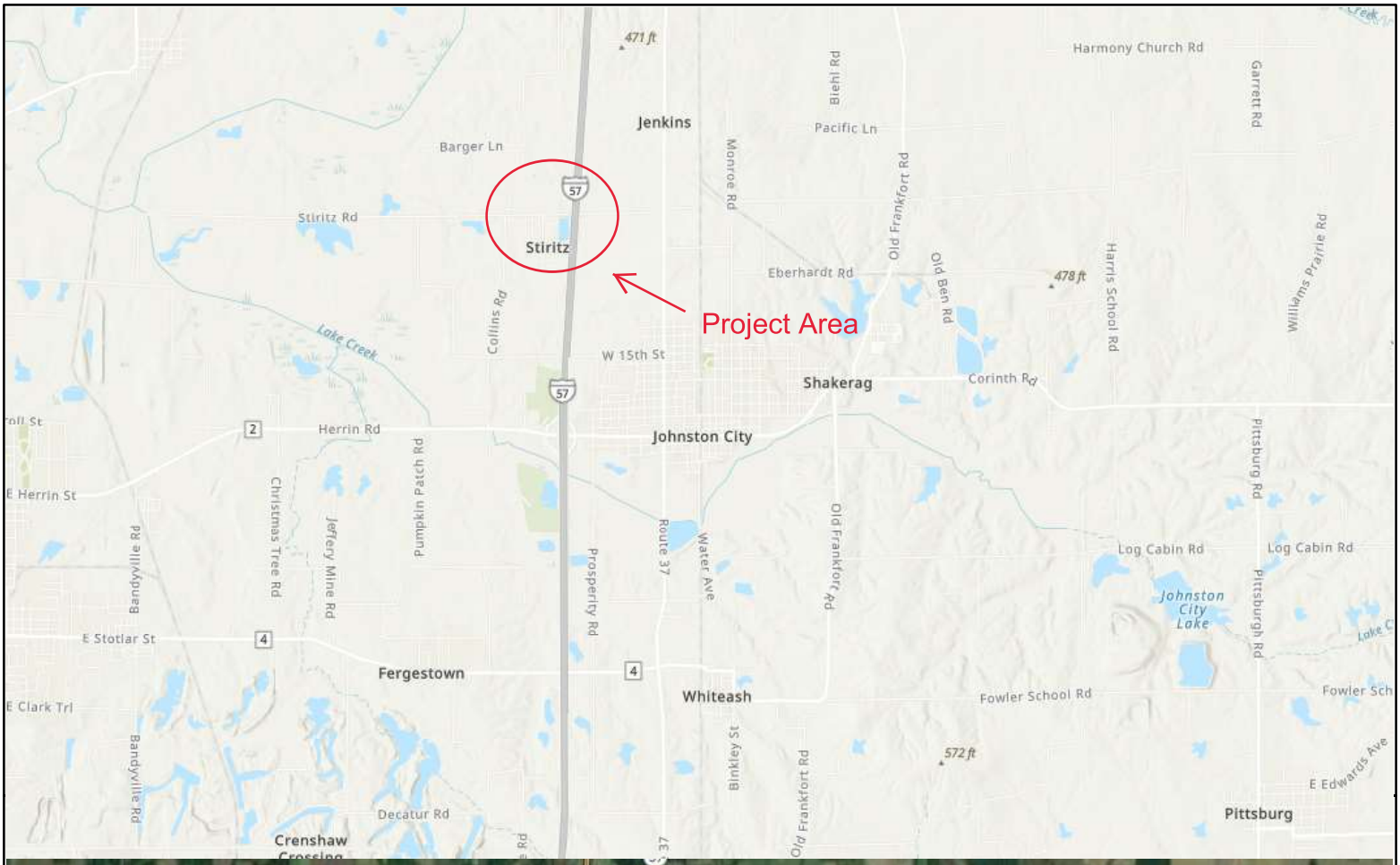
Soil boring logs can be found in Exhibit C. The Subsurface Profile can be found in Exhibit D.

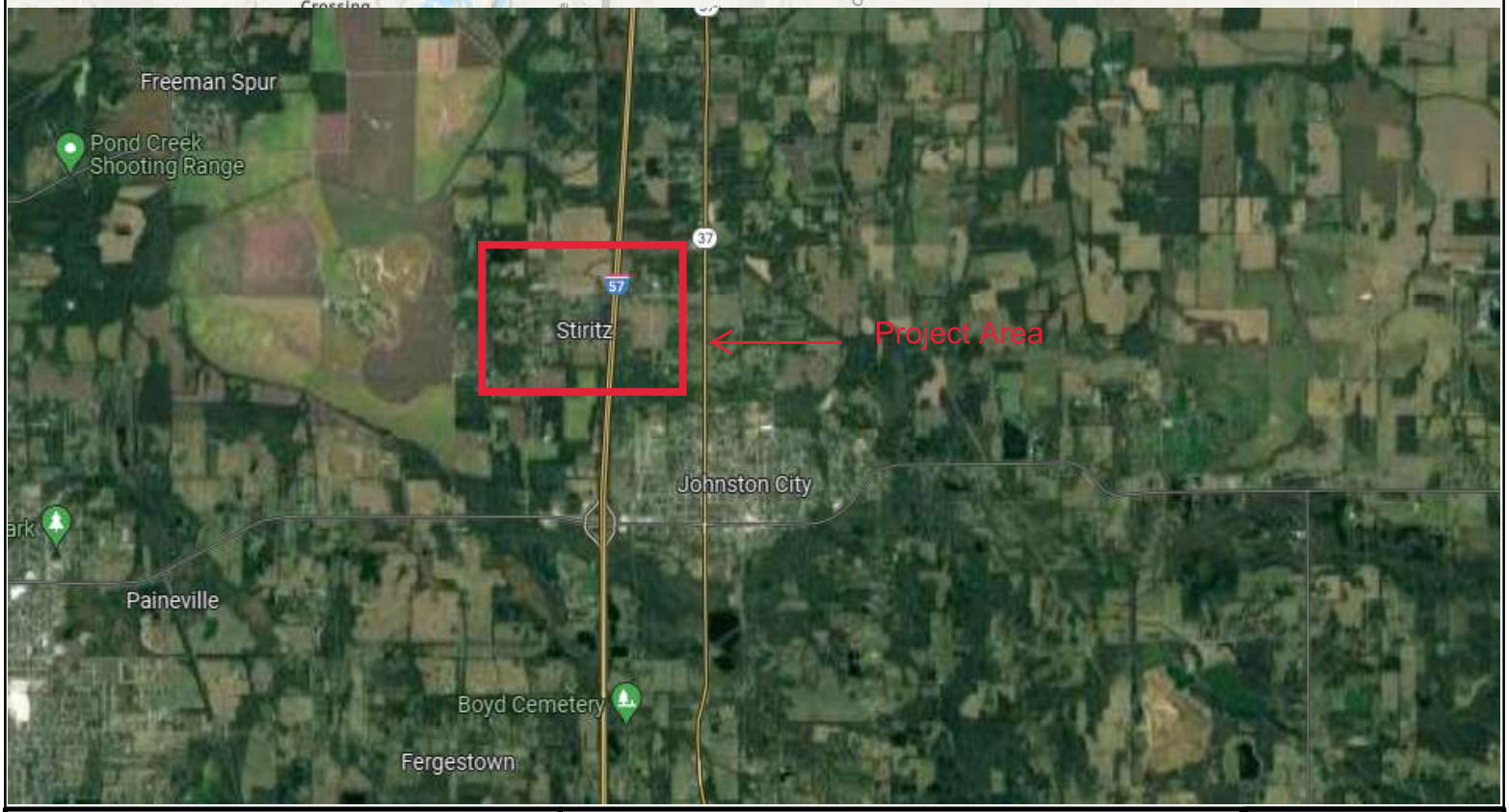
8.0 LIMITATIONS

The recommendations provided herein are for the exclusive use of ESCA Consultants, Inc., and the Illinois Department of Transportation (IDOT) District 9. They are specific only to the project described and are based on the subsurface information obtained by IDOT at three boring locations within the structure area. KEG's understanding of the project as described herein, and geotechnical engineering practice consistent with the standard of care. No other warranty is expressed or implied. KEG should be contacted if conditions encountered during construction are not consistent with those described.

EXHIBIT A

LOCATION MAP





Kaskaskia Engineering Group, LLC

LOCATION MAP

Stiritz Road over I-57
Williamson County, Illinois

Exhibit No.

A

KEG JOB #20-1109.04

EXHIBIT B

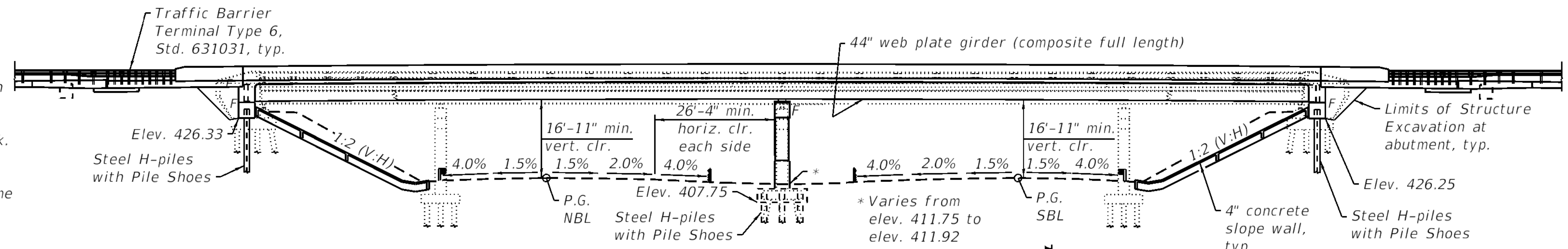
TYPE, SIZE, AND LOCATION PLAN (TS&L)

BENCHMARK: BM10053: Square cut on north side of east abutment of SN 100-0053 at Sta. 8+83, 14.5' rt. elev. 434.120 (NGVD 29)

EXISTING STRUCTURE:
SN 100-0053 was originally constructed in 1961 as FAI Route 57 Section X1-4HB-1. The structure consists of 4 spans of reinforced concrete deck on five lines of rolled steel beams on concrete piers and open abutments. Two pin and link plates are located at each line of the beams. The abutments are supported by concrete piles. The piers are supported by creosoted timber piles. The bridge length is 233'-0" back-to-back of the abutments along the centerline of the roadway, and the width is 31'-8" out-to-out of deck. The existing bridge is skewed 5°-00'-30" left forward.

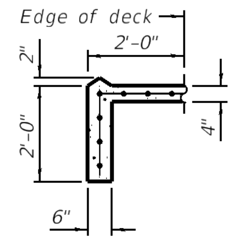
Stiritz Road will be closed during construction. Interstate 57 will be closed for short time periods for removing or setting bridge beams, and traffic will be detoured to Illinois 37.

No salvage.

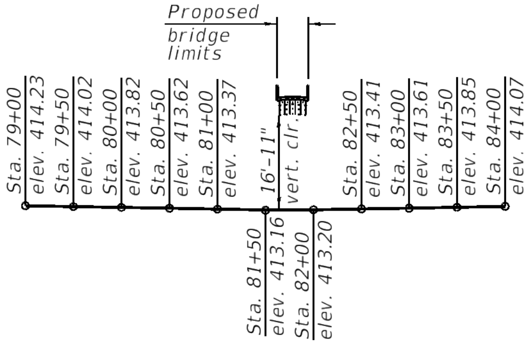


ELEVATION

(Horizontal dimensions and slopes at right angles to substructure)

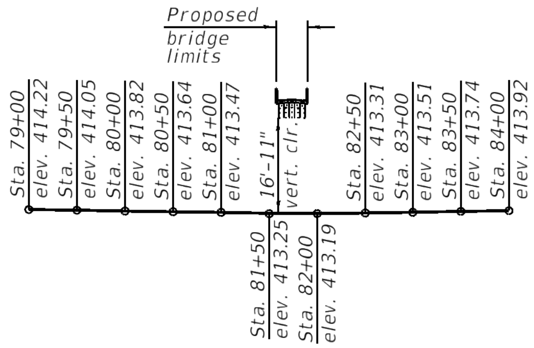


SECTION A-A



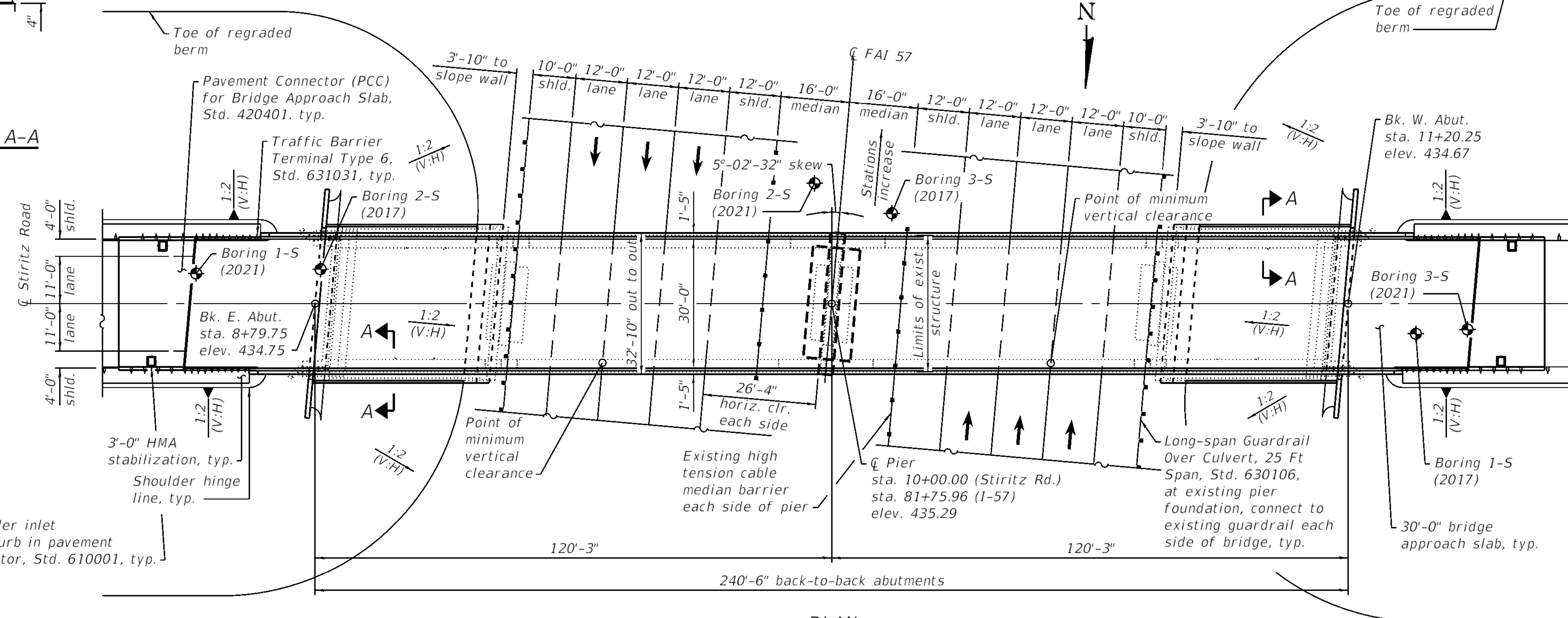
EXISTING I-57 NBL PROFILE GRADE

(Along east edge of center lane)

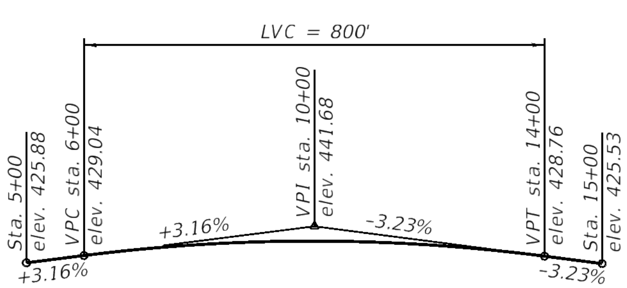


EXISTING I-57 SBL PROFILE GRADE

(Along west edge of center lane)



PLAN



STIRITZ ROAD PROFILE GRADE

(Along ℄ Stiritz Road)

HIGHWAY CLASSIFICATION

TR 23 (Stiritz Road)	FAI 57 (I-57)
Functional Class: Local	Functional Class: Interstate
ADT: 1050 (2024) / 1280 (2044)	ADT: 42660 (2024) / 57460 (2044)
ADTT: 35 (2024) / 45 (2044)	ADTT: 14900 (2024) / 20070 (2044)
DHV: 115 (2044)	DHV: 5170 (2044)
Design Speed: 50 mph	Design Speed: 70 mph
Posted Speed: 45 mph	Posted Speed: 70 mph
Two-Way Traffic	Two-Way Traffic
Directional Distribution: 50:50	Directional Distribution: 50:50

SEISMIC DATA

Seismic Performance Zone (SPZ) = 2
Design Spectral Acceleration at 1.0 sec. (S_{D1}) = 0.256 g
Design Spectral Acceleration at 0.2 sec. (S_{DS}) = 0.707 g
Soil Site Class = C

LOADING HL-93

Allow 50 psf for future wearing surface

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

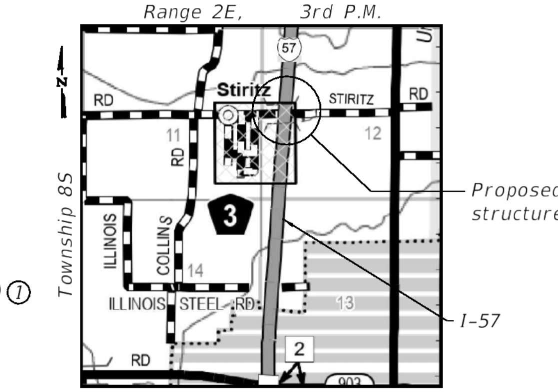
DESIGN STRESSES

FIELD UNITS

f'c = 3,500 psi (substructure)
f'c = 4,000 psi (superstructure)
fy = 50,000 psi (AASHTO M270, Grade 50) (1)
fy = 60,000 psi (reinforcement)

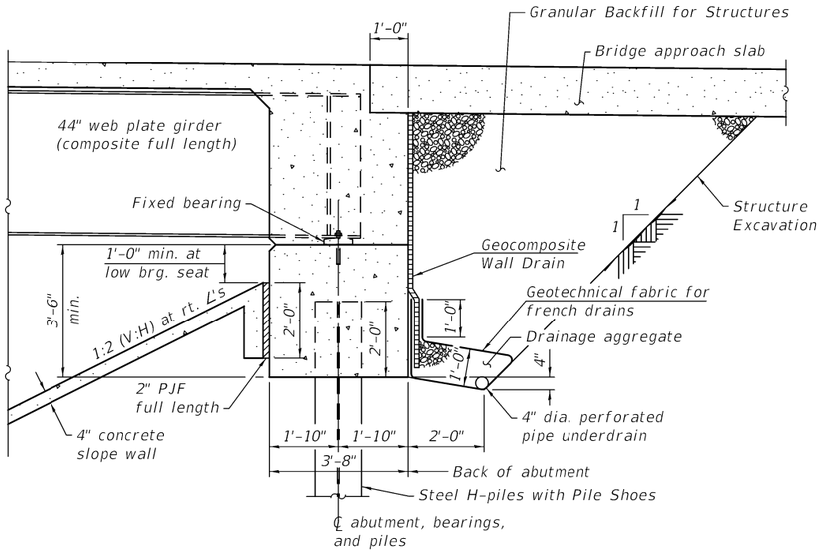
(1) All structural steel shall be metallized.

Range 2E, 3rd P.M.



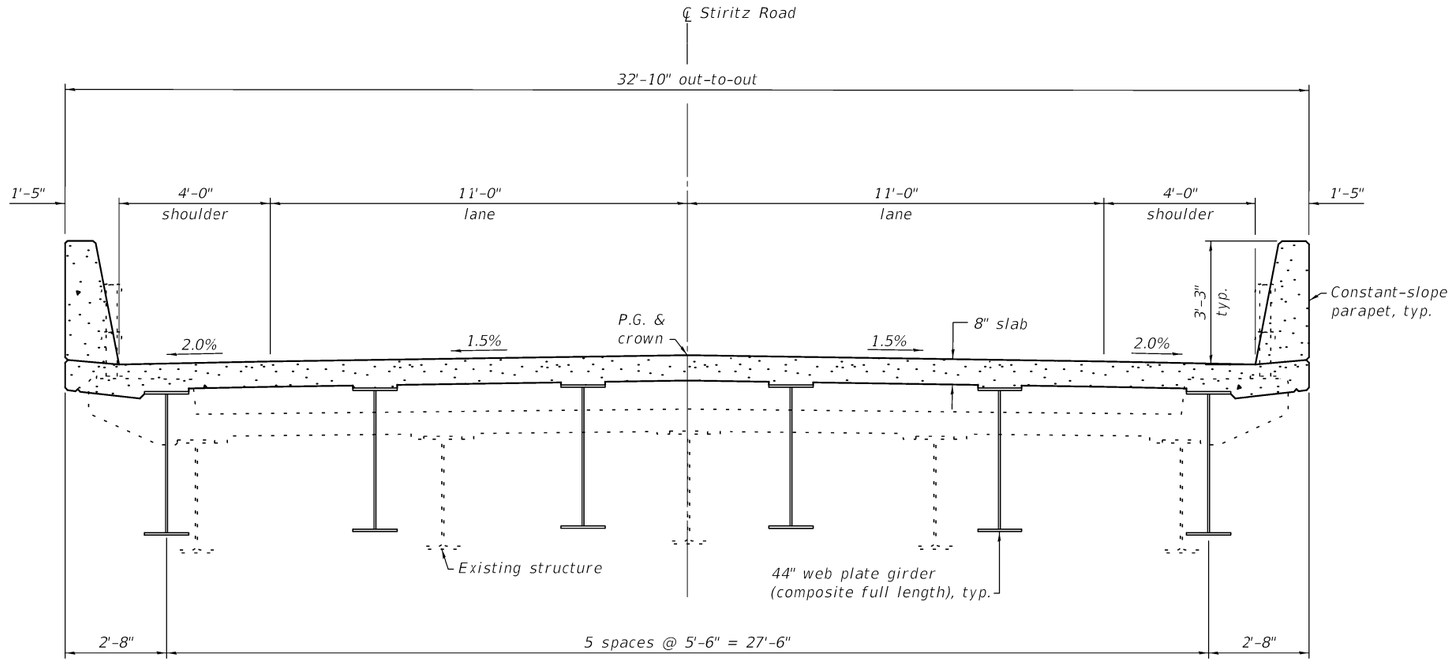
LOCATION SKETCH

GENERAL PLAN & ELEVATION
STIRITZ ROAD OVER I-57
FAI ROUTE 57 - SECTION X1-4(HB-3)
WILLIAMSON COUNTY
STATION 10+00.00
STRUCTURE NO. 100-0110



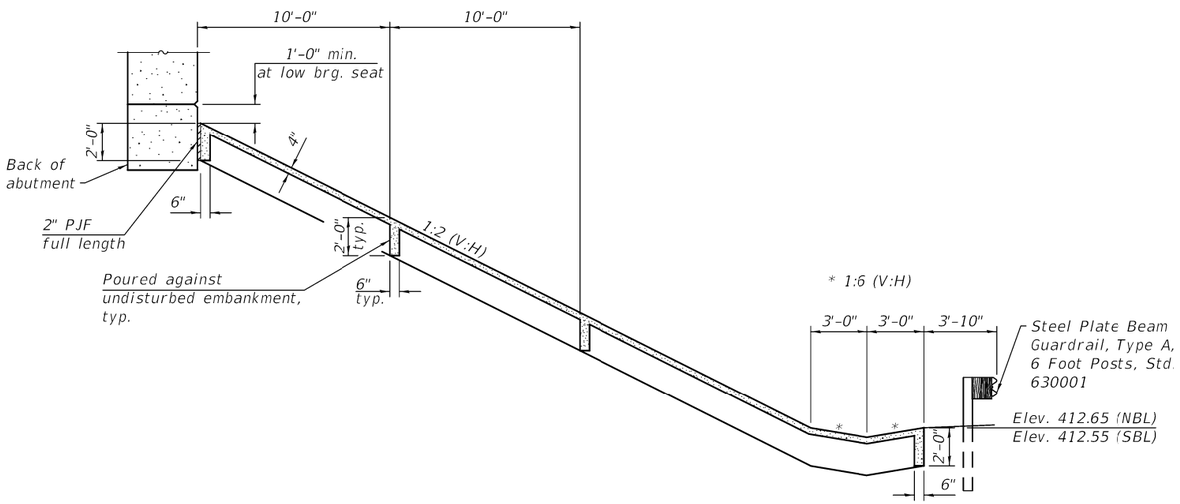
SECTION THRU INTEGRAL ABUTMENT

(Horizontal dimensions at right angles to abutment)



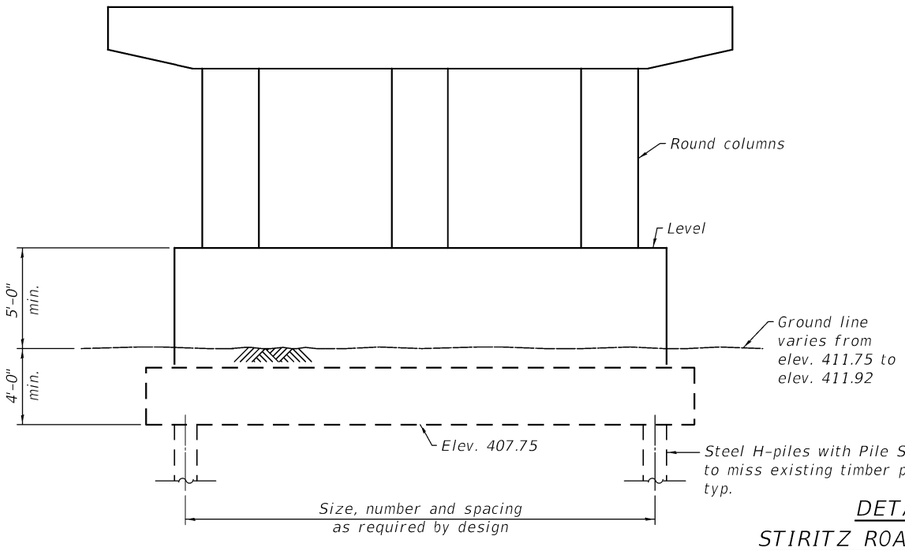
CROSS SECTION

(Looking west)



SECTION THRU CONCRETE SLOPE WALL

(Horizontal dimensions and slopes at right angles to abutment)



PIER SKETCH

(Looking west)

DETAILS
STIRITZ ROAD OVER I-57
FAI ROUTE 57 - SECTION X1-4(HB-3)
WILLIAMSON COUNTY
STATION 10+00.00
STRUCTURE NO. 100-0110

MODEL: $MODELNAME$
FILE NAME: $FILE1$

$DATE$ $TIME$

ESCA CONSULTANTS, INC.

USER NAME = $USER$	DESIGNED - SHL 05/23	REVISED -	
ESCA PROJECT NO. 1359.07	CHECKED - ELH 05/23	REVISED -	
PLOT SCALE = $SCALE$	DRAWN - ZTC 10/23	REVISED -	
PLOT DATE = $DATE$	CHECKED - SHL/ELH 10/23	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
57	X1-4(HB-3)	WILLIAMSON		
		CONTRACT NO. 78831		
		ILLINOIS	FED. AID PROJECT	

EXHBIT C

BORING LOGS

Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 10/13/21

ROUTE TR 23 (Stiritz Road) **DESCRIPTION** TR 23 (Stiritz Road) over I-57 **LOGGED BY** Gonzalez

SECTION X1-4HB-1 (Ex.) **LOCATION** 1.5 mi N. of Broadway St., 0.6 mi W of IL 37

COUNTY Williamson **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. 100-0110
Station 10+10.00

BORING NO. 1-S
Station 8+52
Offset 7.0 ft LT
Ground Surface Elev. 433.30 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 396.8 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				ASPHALT - 8" 432.6
				CRUSHED ROCK - 4" 432.3
	2			CLAY (CH) - Brown and Gray, Medium Dense, Moist
	3 3	2.0 S	20	
				430.3
	4			SILTY CLAY (CL) - Dark Gray, Stiff, Moist
	3 4	4.4 S	18	428.8
-5				SILTY CLAY (CL) - Gray and Brown, Soft, Moist
	2			426.6
	2 2	0.4 S	27	SILT (ML) - Dark Gray, Soft, Moist
				425.3
	2			SILTY CLAY LOAM (CL-ML) - Gray, Stiff, Moist, w/ Trace Coal, A-7-6(27)
	3 3	2.5 S	26	
-10				
	3			
	4 6	2.1 S	23	
	2			LL=48% PL=23%
	3 3	1.8 S	26	
-15				
				417.8
	2			SILTY CLAY (CL) - Brown, Stiff, Moist, w/ Trace Coal
	4 6	2.4 S	19	
	3			
	3 7	2.6 S	18	
-20				
				SILTY CLAY (CL) - Brown, Stiff, Moist, w/ Trace Coal *(continued)*
	3			
	3 6	2.4 S	20	
	4			
	4 19	2.5 S	20	408.7
-25				COAL 408.3
	2			CLAY (CH) - Brown, Loose, Moist
	4 5	1.3 S	18	407.1 SILTY LOAM (CL-ML) - Gray, Stiff, Dry, w/ Iron Nodules, A-4(2) LL=24% PL=20%
				405.3
	2			CLAY (CH) - Gray to Brown, Stiff, Moist
	2 4	2.2 S	26	
-30				
	2			
	4 4	1.4 S	23	
	2			
	2 4	1.2 S	19	
-35				
				397.2
	13			SAND (SP) - Brown, Medium Dense, Fine Grained, Moist 396.6 ▼
	8 11	4.5 P	17	CLAY (CH) - Brown to Gray, Stiff, Dry
	2			
	4 7	1.8 S	17	
-40				

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

SOIL BORING LOG

Date 10/13/21

ROUTE TR 23 (Stiritz Road) **DESCRIPTION** TR 23 (Stiritz Road) over I-57 **LOGGED BY** Gonzalez

SECTION X1-4HB-1 (Ex.) **LOCATION** 1.5 mi N. of Broadway St., 0.6 mi W of IL 37

COUNTY Williamson **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. 100-0110
Station 10+10.00

BORING NO. 1-S
Station 8+52
Offset 7.0 ft LT
Ground Surface Elev. 433.30 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 396.8 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				CLAY (CH) - Brown to Gray, Stiff, Dry *(continued)*
391.3				
				SILT (ML) - Gray, Stiff, Dry, w/ Fine Sand Layers
	4			
	7 11	1.8 S	20	
-45				
	5			
	14 11	N/A	22	
-50				
380.3				
	4			LOAM (CL-ML)- Gray, Very Stiff, Dry
	7 8	4.0 S	18	
-55				
376.3				
	3			SILTY CLAY (CL) - Gray and Brown, Stiff, Moist
	4 5	1.1 S	22	
-60				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				SILTY CLAY (CL) - Gray and Brown, Stiff, Moist *(continued)*
369.3	26			
	37 62	1.0 S	12	CLAYEY SHALE (CL) - Reddish Brown to Brown, Soft, Dry, Weathered
-65				
	11			
	21 33	4.5 P	16	
-70				
359.3	85/6"			
				Borehole continued with rock coring.
-75				
-80				

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

ROCK CORE LOG

Date 10/13/21

ROUTE TR 23 (Stiritz Road) **DESCRIPTION** TR 23 (Stiritz Road) over I-57 **LOGGED BY** Gonzalez

SECTION X1-4HB-1 (Ex.) **LOCATION** 1.5 mi N. of Broadway St., 0.6 mi W of IL 37

COUNTY Williamson **CORING METHOD** Water

STRUCT. NO. 100-0110
Station 10+10.00

BORING NO. 1-S
Station 8+52
Offset 7.0 ft LT
Ground Surface Elev. 433.30 ft

CORING BARREL TYPE & SIZE NQ
Core Diameter 2 in
Top of Rock Elev. 359.30 ft
Begin Core Elev. 359.30 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
SHALE (CLAYEY SHALE) - Gray to Dark Gray, Soft, Highly Weathered, w/ Coal Layers	359.30	-75	1	90	0	1.58	10.9
		-80	2	75	18	1.67	39.9
SHALE (CLAYEY SHALE) - Light Gray, Soft, Highly Weathered	348.80	-85	3	52	33	2	6.6
End of Boring	344.30	-90					

Color pictures of the cores _____
Cores will be stored for examination until _____
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 10/14/21

ROUTE TR 23 (Stiritz Road) **DESCRIPTION** TR 23 (Stiritz Road) over I-57 **LOGGED BY** Gonzalez

SECTION X1-4HB-1 (Ex.) **LOCATION** 1.5 mi N. of Broadway St., 0.6 mi W of IL 37

COUNTY Williamson **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. 100-0110
Station 10+10.00

BORING NO. 2-S
Station 9+96
Offset 28.0 ft LT
Ground Surface Elev. 412.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 396.0 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY (CH) - Brown and Gray, Stiff, Moist, w/ Iron Nodules		2		
		3 5	2.9 S	16
		3		
		3 3	2.3 S	18
	-5			
405.6		4		
COAL or CINDERS		5 2	1.5 P	7
404.4				
SANDY CLAY (SC) - Dark Gray, Medium Stiff, Moist				
403.0		1		
COAL 402.8		2 2	0.6 S	24
CLAY (CH) - Light Gray, Medium Stiff, Moist	-10			
400.5		2		
SILTY LOAM (CL-ML) - Light Gray, Soft, Moist, A-7-6(34) LL=64% PL=15%		2 3	0.5 P	20
398.0		3		
CLAY (CH) - Light Gray, Stiff, Moist		3 4	2.6 S	21
	-15			
▼		2		
		2 3	1.1 S	19
		3		
		3 5	3.1 S	16
Trace Wood	-20			
CLAY (CH) - Light Gray, Stiff, Moist *(continued)*		2		
		5 6	1.9 S	17
388.3		2		
CLAY (CH) - Gray, Stiff, Moist, w/ Fine to Coarse Sands		4 8	1.9 S	17
	-25			
385.9		7		
SILT (ML) - Gray, Stiff, A-4(0) LL=15% PL=15%		12 12	1.6 S	21
384.0				
SAND (SW) - Gray, Loose, Fine to Coarse Grained, Moist		3		
382.4		7 4	3.5 P	-
CLAY (CH) - Gray, Stiff, Moist	-30			
		2		
		4 10	1.4 S	18
		1		
		3 3	1.4 S	21
	-35			
		2		
375.3		3 2	1.8 S	22
CLAY (CH) - Gray, Medium Stiff, Moist				
373.0		2		
CLAY (CH) - Gray and Brown, Stiff, Moist		3 5	1.7 S	22
	-40			

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

SOIL BORING LOG

Date 10/14/21

ROUTE TR 23 (Stiritz Road) **DESCRIPTION** TR 23 (Stiritz Road) over I-57 **LOGGED BY** Gonzalez

SECTION X1-4HB-1 (Ex.) **LOCATION** 1.5 mi N. of Broadway St., 0.6 mi W of IL 37

COUNTY Williamson **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. 100-0110
Station 10+10.00

BORING NO. 2-S
Station 9+96
Offset 28.0 ft LT
Ground Surface Elev. 412.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 396.0 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CLAY (CH) - Gray and Brown, Stiff, Moist *(continued)*				
370.0				
CLAY (CH) - Brown and Blue, Very Stiff, Dry		5		
		10 15	2.3 S	26
	-45			
365.0				
SHALE (CLAYEY SHALE) - Dark Gray w/ Tan Layers, Very Stiff		3		
		7 13	2.6 S	26
	-50			
		5		
		18 40	2.2 S	16
Some Wood	-55			
353.8				
SHALE (CLAYEY SHALE) - Light Gray, Soft, Highly Weathered 353.0		50/3"	10.8 S	9
Borehole continued with rock coring.	-60			

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

ROCK CORE LOG

Date 10/14/21

ROUTE TR 23 (Stiritz Road) **DESCRIPTION** TR 23 (Stiritz Road) over I-57 **LOGGED BY** Gonzalez

SECTION X1-4HB-1 (Ex.) **LOCATION** 1.5 mi N. of Broadway St., 0.6 mi W of IL 37

COUNTY Williamson **CORING METHOD** Water

STRUCT. NO. 100-0110
Station 10+10.00

BORING NO. 2-S
Station 9+96
Offset 28.0 ft LT
Ground Surface Elev. 412.00 ft

CORING BARREL TYPE & SIZE NQ
Core Diameter 2 in
Top of Rock Elev. 353.00 ft
Begin Core Elev. 353.00 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
SHALE (CLAYEY SHALE) - Light Gray, Soft, Moderately Weathered	353.00		1	80	46	1	20.3
		-60					
			2	97	83	0.75	68.2
		-65					
			3	100	47	1.08	54.4
		-70					
	338.00						
End of Boring		-75					

Color pictures of the cores _____
Cores will be stored for examination until _____
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 10/12/21

ROUTE TR 23 (Stiritz Road) **DESCRIPTION** TR 23 (Stiritz Road) over I-57 **LOGGED BY** Gonzalez

SECTION X1-4HB-1 (Ex.) **LOCATION** 1.5 mi N. of Broadway St., 0.6 mi W of IL 37

COUNTY Williamson **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. 100-0110
Station 10+10.00

BORING NO. 3-S
Station 11+48
Offset 6.0 ft RT
Ground Surface Elev. 432.90 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 398.9 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
0				432.2 ASPHALT - 8.5"
				431.5 CRUSHED ROCK - 5"
	3			
	4	2.2	18	CLAY (CH) - Brown and Gray, Stiff, Moist
	3	S		
	3			
	3	2.3	25	
-5	4	S		
				427.4
	3			CLAY (CH) - Brown, Medium Stiff, Moist
	2	1.4	22	
	4	S		
	2			
	3	2.6	19	
-10	4	S		
				422.4
	2			CLAY (CH) - Gray, Stiff, Moist, w/ Iron Staining
	3	3.7	25	
	5	S		
				419.9
	2			CLAY LOAM (CH) - Light Gray, Stiff, Moist
	4	2.5	20	
-15	4	S		
	2			
	3	1.4	21	
	4	S		
				414.9
	1			CLAY (CH) - Greenish Gray, Medium Stiff, Moist, w/ Iron Staining
	3	2.6	27	
-20	3	S		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				412.4
	2			CLAY LOAM (CH) - Light Gray, Stiff, Moist
	4	2.3	20	
	4	S		
				409.3
	2			409.0 SILTY CLAY (CL) - Brown, Soft, Moist
	3	2.3	28	
-25	4	S		CLAY (CH) - Gray, Stiff, Moist
				406.8
	10			SILTY CLAY (CL) - Dark Brown, Very Stiff, Dry, w/ Coal
	12	4.8	15	
	13	S		
				404.4
	3			SILTY CLAY (CL) - Light Gray, Stiff, Moist to Dry
	6	1.7	20	
-30	6	S		
				402.4
	1			SILTY LOAM (CL-ML) - Light Gray, Medium Stiff to Stiff, Moist, A-6(5)
	2	1.5	20	
	3	S		
	1			▼
	1	0.5	22	LL=27% PL=16%
-35	3	S		
	1			
	4	1.6	21	
	5	S		
	2			
	3	2.0	19	
-40	3	S		

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

SOIL BORING LOG

Date 10/12/21

ROUTE TR 23 (Stiritz Road) **DESCRIPTION** TR 23 (Stiritz Road) over I-57 **LOGGED BY** Gonzalez

SECTION X1-4HB-1 (Ex.) **LOCATION** 1.5 mi N. of Broadway St., 0.6 mi W of IL 37

COUNTY Williamson **DRILLING METHOD** HSA **HAMMER TYPE** AUTO

STRUCT. NO. 100-0110
Station 10+10.00

BORING NO. 3-S
Station 11+48
Offset 6.0 ft RT
Ground Surface Elev. 432.90 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 398.9 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SILTY LOAM (CL-ML) - Light Gray, Medium Stiff to Stiff, Moist, A-6(5) *(continued)*
390.9				
				CLAY (CH) - Gray with Brown, Stiff, Moist
	3			
	6 7	2.5 S	16	
-45				
	5			
383.6				
	9 11	2.7 S	16	SAND (SW) - Gray, Loose, Fine Grained, Moist
-50				
381.9				
				SILT (ML)- Gray, Very Stiff, Dry to Moist, A-4(4)
	6			
	8 14	2.9 S	23	LL=30% PL=26%
-55				
376.9				
				CLAY (CH) - Gray, Stiff, Moist
	2			
	4 6	2.3 S	16	
-60				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CLAY (CH) - Gray, Stiff, Moist *(continued)*
	2			
	2 4	1.5 S	19	Trace Wood
-65				
365.9				
				CLAY (CH) - Gray, Stiff, Moist
	1			
	3 5	2.1 S	22	
-70				
	WH			
	5 6	2.0 S	23	Trace Wood, Trace Coal
-75				
354.5				
	73			SHALE (CLAYEY SHALE) - Greenish to Gray, Soft, Moist, Highly to Moderately Weathered
	100/3"	4.5 P	27	
-80				

Borehole continued with rock coring

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

ROCK CORE LOG

Date 10/12/21

ROUTE TR 23 (Stiritz Road) **DESCRIPTION** TR 23 (Stiritz Road) over I-57 **LOGGED BY** Gonzalez

SECTION X1-4HB-1 (Ex.) **LOCATION** 1.5 mi N. of Broadway St., 0.6 mi W of IL 37

COUNTY Williamson **CORING METHOD** Water

STRUCT. NO. 100-0110
Station 10+10.00

BORING NO. 3-S
Station 11+48
Offset 6.0 ft RT
Ground Surface Elev. 432.90 ft

CORING BARREL TYPE & SIZE NQ
Core Diameter 2 in
Top of Rock Elev. 352.90 ft
Begin Core Elev. 352.90 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
SHALE (CLAYEY SHALE) - Greenish to Gray, Soft, Moist, Highly to Moderately Weathered *(continued)*		1	100	9	1.33	28.4
	-85	2	100	53	1.25	64.9
	-90	3	95	50	1.42	87.4
	338.60					
End of Boring	-95					
	-100					

Color pictures of the cores _____
Cores will be stored for examination until _____
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

EXHIBIT D

SUBSURFACE PROFILE

Elevation (ft)

440
430
420
410
400
390
380
370
360
350
340
330

1-S

N	Qu	MC	
6	2.0 S	20	ASPHALT - 8" CRUSHED ROCK - 4" CLAY (CH) - Brown and Gray, Medium Dense, Moist
7	4.4 S	18	SILTY CLAY (CL) - Dark Gray, Stiff, Moist
4	0.4 S	27	SILTY CLAY (CL) - Gray and Brown, Soft, Moist
6	2.5 S	26	SILT (ML) - Dark Gray, Soft, Moist
10	2.1 S	23	SILTY CLAY LOAM (CL-ML) - Gray, Stiff, Moist, w/ Trace Coal, A-7-6(27)
6	1.8 S	26	
10	2.4 S	19	
10	2.6 S	18	SILTY CLAY (CL) - Brown, Stiff, Moist, w/ Trace Coal
9	2.4 S	20	
23	2.5 S	20	COAL
9	1.3 S	18	CLAY (CH) - Brown, Loose, Moist SILTY LOAM (CL-ML) - Gray, Stiff, Dry, w/ Iron Nodules, A-4(2) LL=24% PL=20%
6	2.2 S	26	
8	1.4 S	23	CLAY (CH) - Gray to Brown, Stiff, Moist
6	1.2 S	19	
19	4.5 P	17	SAND (SP) - Brown, Medium Dense, Fine Grained, Moist
11	1.8 S	17	CLAY (CH) - Brown to Gray, Stiff, Dry
18	1.8 S	20	
25	N/A	22	SILT (ML) - Gray, Stiff, Dry, w/ Fine Sand Layers
15	4.0 S	18	LOAM (CL-ML)- Gray, Very Stiff, Dry
9	1.1 S	22	SILTY CLAY (CL) - Gray and Brown, Stiff, Moist
99	1.0 S	12	
54	4.5 P	16	CLAYEY SHALE (CL) - Reddish Brown to Brown, Soft, Dry, Weathered
3.7 S		12	SHALE (CLAYEY SHALE) - Gray to Dark Gray, Soft, Highly Weathered, w/ Coal Layers
			SHALE (CLAYEY SHALE) - Light Gray, Soft, Highly Weathered

8+52
7.0 ft LT

2-S

N	Qu	MC	
8	2.9 S	16	CLAY (CH) - Brown and Gray, Stiff, Moist, w/ Iron Nodules
6	2.3 S	18	
7	1.5 P	7	COAL or CINDERS
4	0.6 S	24	SANDY CLAY (SC) - Dark Gray, Medium Stiff, Moist COAL CLAY (CH) - Light Gray, Medium Stiff, Moist
5	0.5 P	20	SILTY LOAM (CL-ML) - Light Gray, Soft, Moist, A-7-6(34)
7	2.6 S	21	LL=64% PL=15%
5	1.1 S	19	
8	3.1 S	16	CLAY (CH) - Light Gray, Stiff, Moist
11	1.9 S	17	
12	1.9 S	17	CLAY (CH) - Gray, Stiff, Moist, w/ Fine to Coarse Sands
24	1.6 S	21	SILT (ML) - Gray, Stiff, A-4(0) LL=15% PL=15%
11	3.5 P	-	SAND (SW) - Gray, Loose, Fine to Coarse Grained, Moist
14	1.4 S	18	CLAY (CH) - Gray, Stiff, Moist
6	1.4 S	21	
5	1.4 S	22	CLAY (CH) - Gray, Medium Stiff, Moist
8	1.8 S	22	CLAY (CH) - Gray and Brown, Stiff, Moist
25	1.7 S	26	CLAY (CH) - Brown and Blue, Very Stiff, Dry
20	2.3 S	26	
58	2.6 S	16	SHALE (CLAYEY SHALE) - Dark Gray w/ Tan Layers, Very Stiff
10.8	2.2 S	9	SHALE (CLAYEY SHALE) - Light Gray, Soft, Highly Weathered
			SHALE (CLAYEY SHALE) - Light Gray, Soft, Moderately Weathered

9+96
28.0 ft LT

3-S

7	2.2 S	18	ASPHALT - 8.5" CRUSHED ROCK - 5" CLAY (CH) - Brown and Gray, Stiff, Moist
7	2.3 S	25	
6	1.4 S	22	CLAY (CH) - Brown, Medium Stiff, Moist
7	2.6 S	19	
8	3.7 S	25	CLAY (CH) - Gray, Stiff, Moist, w/ Iron Staining
8	2.5 S	20	CLAY LOAM (CH) - Light Gray, Stiff, Moist
7	1.4 S	21	
6	2.6 S	27	CLAY (CH) - Greenish Gray, Medium Stiff, Moist, w/ Iron Staining
8	2.3 S	20	CLAY LOAM (CH) - Light Gray, Stiff, Moist
7	2.3 S	28	SILTY CLAY (CL) - Brown, Soft, Moist CLAY (CH) - Gray, Stiff, Moist
25	4.8 S	15	SILTY CLAY (CL) - Dark Brown, Very Stiff, Dry, w/ Coal
12	1.7 S	20	SILTY CLAY (CL) - Light Gray, Stiff, Moist to Dry
5	1.5 S	20	
4	0.5 S	22	SILTY LOAM (CL-ML) - Light Gray, Medium Stiff to Stiff, Moist, A-6(5)
9	1.6 S	21	
6	2.0 S	19	
13	2.5 S	16	CLAY (CH) - Gray with Brown, Stiff, Moist
20	2.7 S	16	SAND (SW) - Gray, Loose, Fine Grained, Moist
22	2.9 S	23	SILT (ML)- Gray, Very Stiff, Dry to Moist, A-4(4)
10	2.3 S	16	CLAY (CH) - Gray, Stiff, Moist
6	1.5 S	19	
8	2.1 S	22	CLAY (CH) - Gray, Stiff, Moist
11	2.0 S	23	
4.5		27	SHALE (CLAYEY SHALE) - Greenish to Gray, Soft, Moist, Highly to Moderately Weathered

11+48
6.0 ft RT

PRINTERMOD 11X17 20-1109.04 TR 23 OVER I-57.GPJ IL_DOT.GDT 5/16/22

Illinois Department of Transportation
Division of Highways

Not to Horizontal Scale

SUBSURFACE PROFILE

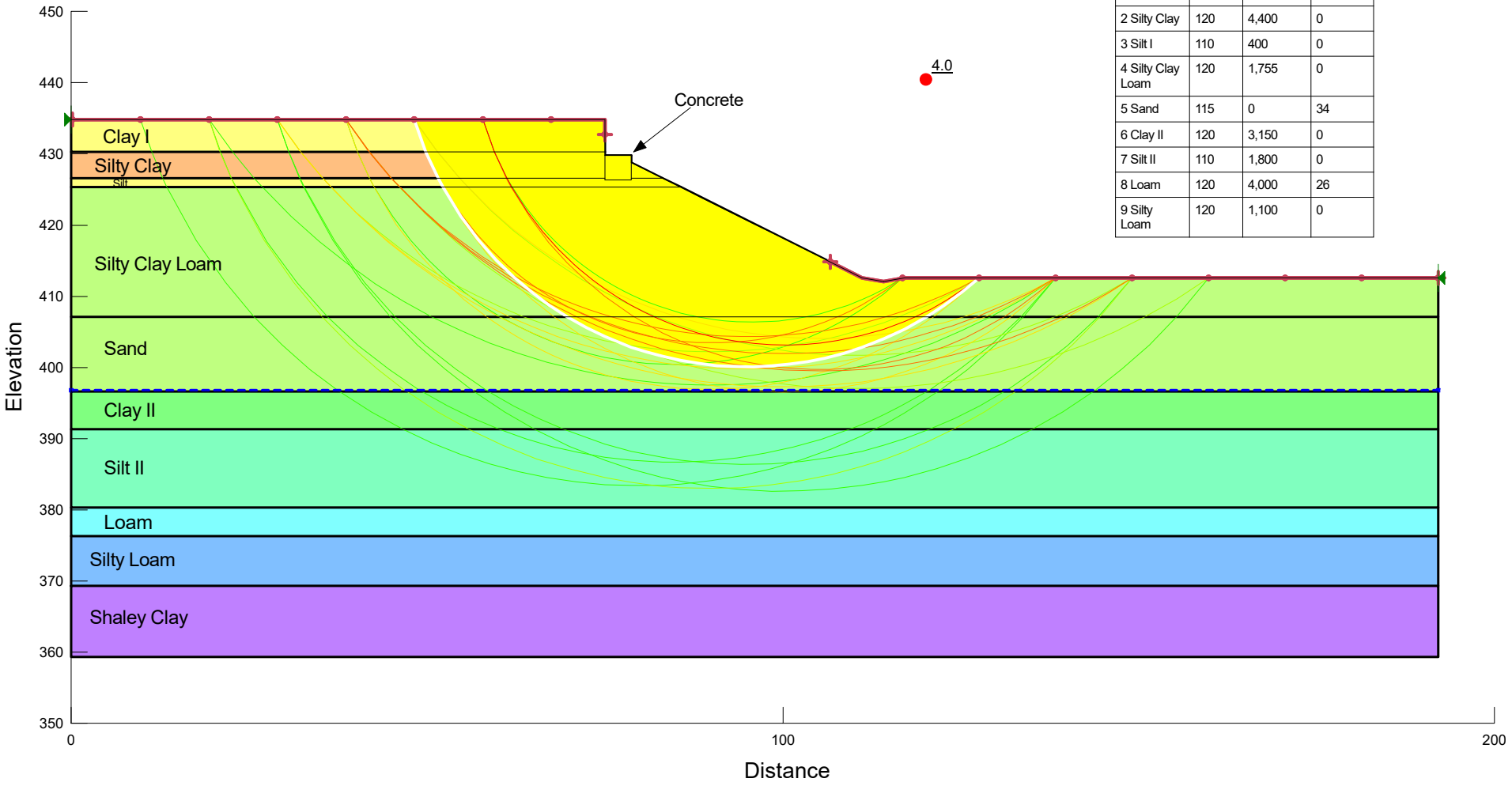
Route: TR 23 (Stiritz Road)
Section: X1-4HB-1 (Ex.)
County: Williamson

EXHIBIT E

SLOPE/W SLOPE STABILITY ANALYSIS

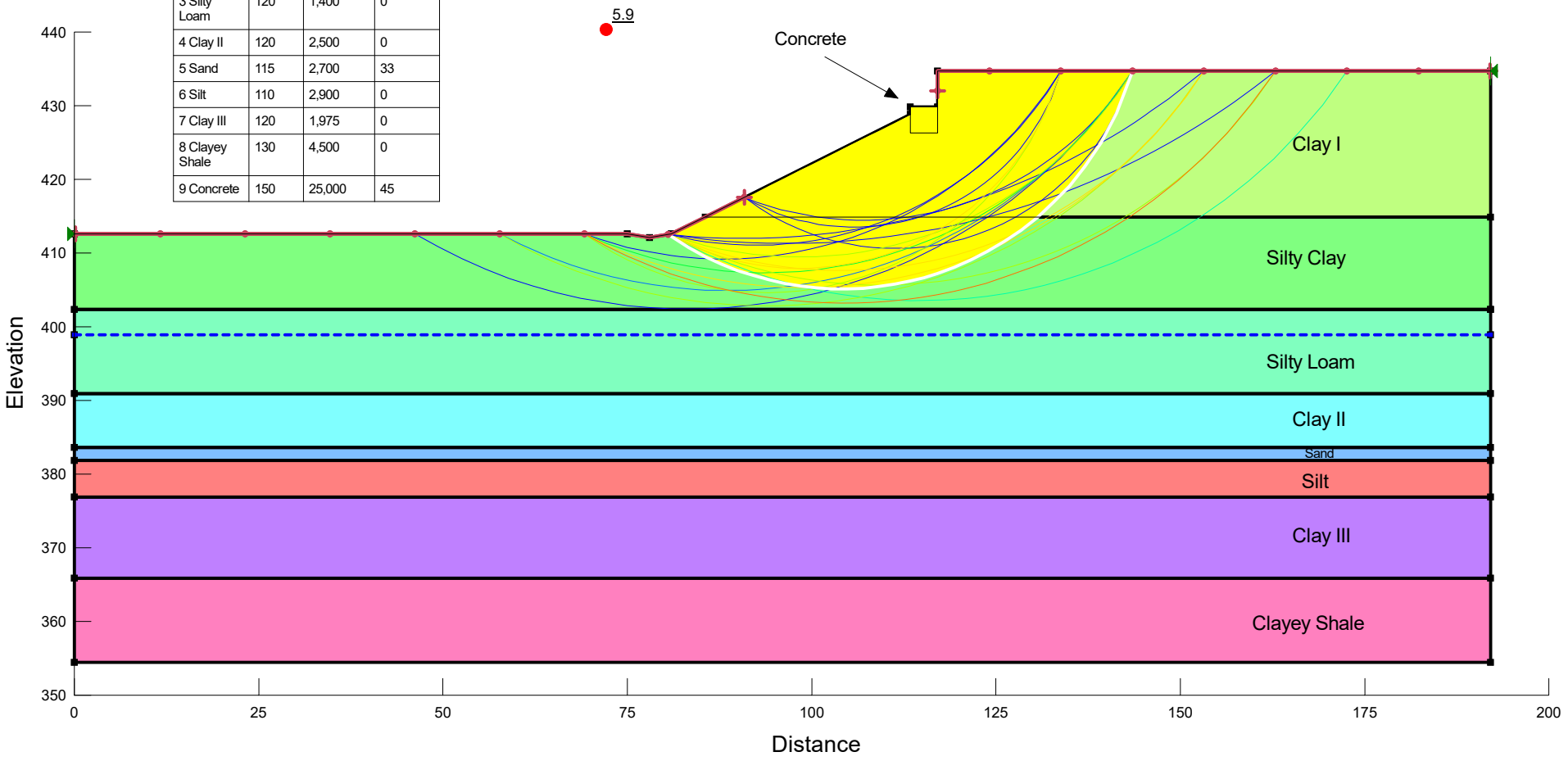
Stiritz Rd over I-57
East Abutment - Boring 1-S (2021)
End-of-Construction (Undrained Analysis)

Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
1 Clay I	120	2,000	0
10 Shaley Clay	130	2,750	0
11 Concrete	150	25,000	45
2 Silty Clay	120	4,400	0
3 Silt I	110	400	0
4 Silty Clay Loam	120	1,755	0
5 Sand	115	0	34
6 Clay II	120	3,150	0
7 Silt II	110	1,800	0
8 Loam	120	4,000	26
9 Silty Loam	120	1,100	0



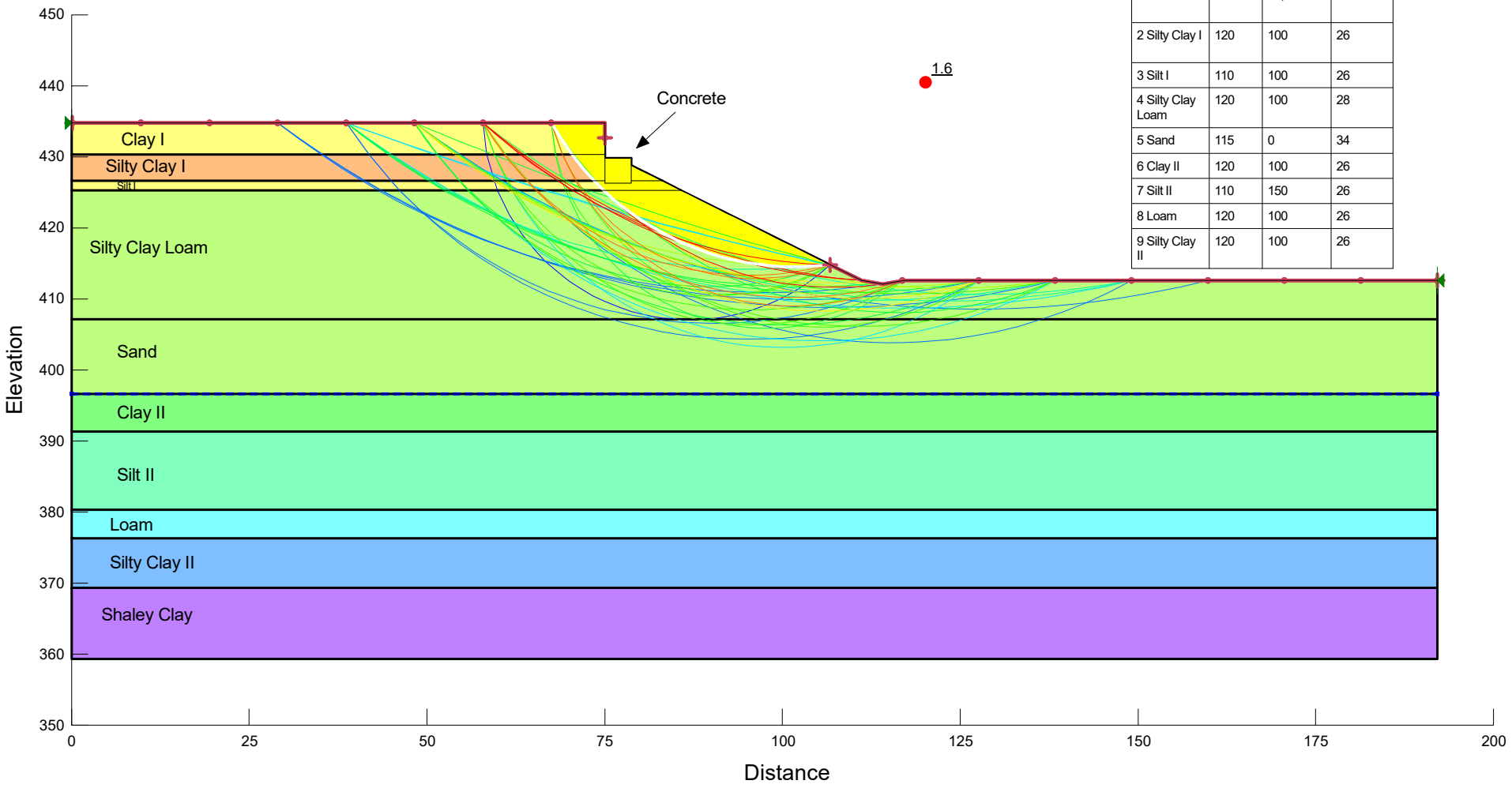
Stiritz Rd over I-57
West Abutment - Boring 3-S (2021)
End-of-Construction (Undrained Analysis)

Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
1 Clay I	120	2,195	0
2 Silty Clay	120	2,550	0
3 Silty Loam	120	1,400	0
4 Clay II	120	2,500	0
5 Sand	115	2,700	33
6 Silt	110	2,900	0
7 Clay III	120	1,975	0
8 Clayey Shale	130	4,500	0
9 Concrete	150	25,000	45



Stiritz Rd over I-57
East Abutment - Boring 1-S (2021)
Long Term (Drained Analysis)

Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
1 Clay I	120	100	26
10 Shaley Clay	130	150	12
11 Concrete	150	25,000	45
2 Silty Clay I	120	100	26
3 Silt I	110	100	26
4 Silty Clay Loam	120	100	28
5 Sand	115	0	34
6 Clay II	120	100	26
7 Silt II	110	150	26
8 Loam	120	100	26
9 Silty Clay II	120	100	26



Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
1 Clay I	120	100	26
2 Silty Clay	120	100	26
3 Silty Loam	120	100	29
4 Clay II	120	100	26
5 Sand	115	0	33
6 Silt	110	150	26
7 Clay III	120	100	26
8 Clayey Shale	130	150	38
9 Concrete	150	25,000	45

Stiritz Rd over I-57
West Abutment - Boring 3-S (2021)
Long Term (Drained Analysis)

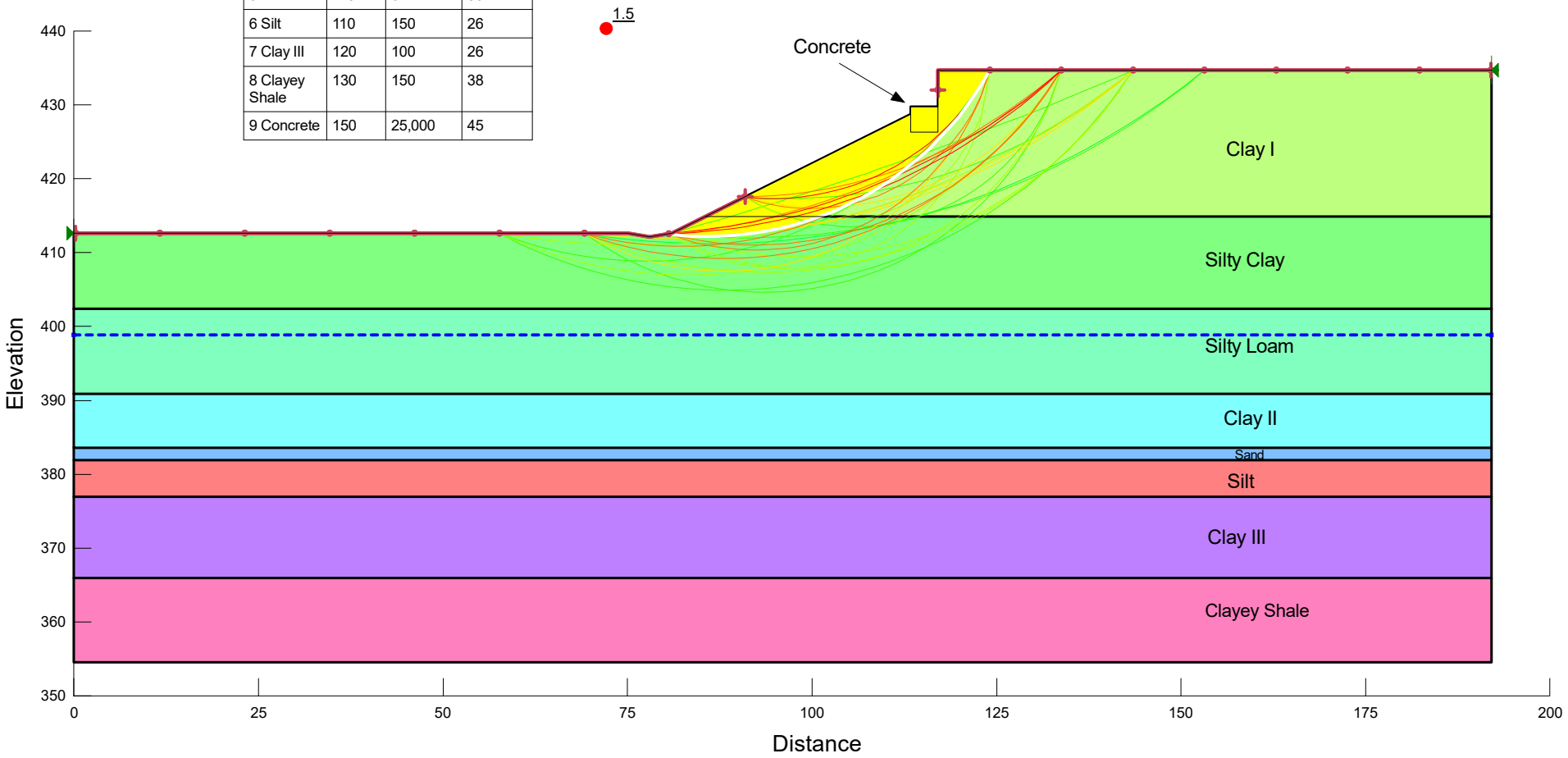


EXHIBIT F

LIQUEFACTION ANALYSIS

Illinois Department of Transportation

LIQUEFACTION ANALYSIS

REFERENCE BORING NUMBER ========== 3-S
ELEVATION OF BORING GROUND SURFACE ========== 432.90 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 34.00 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 27.35 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.345
EARTHQUAKE MOMENT MAGNITUDE ========== 7.5
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 73 %
BOREHOLE DIAMETER========== 2.5 to 4.5 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **1.002**

AVG. SHEAR WAVE VELOCITY (top 40')
$\bar{V}_{s,40'}$ = **469** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 7.51
Source-To-Site Distance, R (km) = 107.25
Ground Motion Prediction Equations = NMSZ
PGA = **0.139**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
430.4	2.5	7	2.2				18	0.131	0.328	11.554	11.554	0.127	0.131	0.328	0.328	1.500	**0.191**	0.982	**0.220**	**N.L. (1)**
427.9	5	7	2.3				25	0.132	0.658	10.254	10.254	0.115	0.132	0.658	0.658	1.314	**0.152**	0.961	**0.216**	**N.L. (1)**
425.4	7.5	6	1.4				22	0.125	0.970	8.045	8.045	0.096	0.125	0.970	0.970	1.187	**0.115**	0.937	**0.210**	**N.L. (1)**
422.9	10	7	2.6				19	0.133	1.303	9.258	9.258	0.107	0.133	1.303	1.303	1.117	**0.119**	0.908	**0.204**	**N.L. (1)**
420.4	12.5	8	3.7				25	0.138	1.648	10.245	10.245	0.115	0.138	1.648	1.648	1.061	**0.123**	0.876	**0.196**	**N.L. (1)**
417.9	15	8	2.5				20	0.133	1.980	9.858	9.858	0.112	0.133	1.980	1.980	1.016	**0.114**	0.840	**0.188**	**N.L. (1)**
415.4	17.5	7	1.4				21	0.125	2.293	8.286	8.286	0.098	0.125	2.293	2.293	0.983	**0.097**	0.803	**0.180**	**N.L. (1)**
412.9	20	6	2.6				27	0.133	2.625	6.772	6.772	0.086	0.133	2.625	2.625	0.956	**0.082**	0.765	**0.171**	**N.L. (1)**
410.4	22.5	8	2.3				20	0.132	2.955	8.600	8.600	0.101	0.132	2.955	2.955	0.929	**0.094**	0.726	**0.163**	**N.L. (1)**
407.9	25	7	2.3				28	0.132	3.285	7.166	7.166	0.089	0.132	3.285	3.285	0.911	**0.081**	0.690	**0.155**	**N.L. (1)**
405.4	27.5	25	4.8				15	0.141	3.638	26.256	26.256	0.319	0.079	3.483	3.492	0.848	**0.271**	0.656	**0.147**	**N.L. (3)**
402.9	30	12	1.7		11	27	20	0.128	3.958	11.147	11.147	0.123	0.066	3.648	3.813	0.879	**0.109**	0.625	**0.146**	**N.L. (2)**
400.4	32.5	5	1.5		11	27	20	0.126	4.273	4.448	4.448	0.068	0.064	3.808	4.129	0.889	**0.061**	0.598	**0.145**	**N.L. (2)**
397.9	35	4	0.5		11	27	22	0.051	4.400	3.506	3.506	0.062	0.051	3.935	4.412	0.884	**0.055**	0.574	**0.144**	**N.L. (2)**
395.4	37.5	9	1.6		11	27	21	0.065	4.563	7.733	7.733	0.094	0.065	4.098	4.731	0.867	**0.081**	0.555	**0.144**	**N.L. (2)**
392.9	40	6	2		11	27	19	0.067	4.730	5.052	5.052	0.072	0.067	4.265	5.054	0.869	**0.063**	0.539	**0.143**	**N.L. (2)**
387.9	45	13	2.5		20	50	16	0.070	5.080	10.502	10.502	0.118	0.070	4.615	5.716	0.833	**0.098**	0.515	**0.143**	**N.L. (2)**
384.4	48.5	20			11	27	16	0.067	5.315	15.996	15.996	0.170	0.067	4.850	6.169	0.800	**0.137**	0.504	**0.144**	**N.L. (2)**
379.4	53.5	22	2.9		20	50	23	0.072	5.675	16.983	16.983	0.181	0.072	5.210	6.841	0.781	**0.141**	0.493	**0.145**	**N.L. (2)**
374.4	58.5	10	2.3		20	50	16	0.069	6.020	7.262	7.262	0.090	0.069	5.555	7.498	0.813	**0.073**	0.486	**0.147**	**N.L. (2)**
369.4	63.5	6	1.5		20	50	19	0.064	6.340	4.204	4.204	0.066	0.064	5.875	8.130	0.816	**0.054**	0.482	**0.150**	**N.L. (2)**
364.4	68.5	8	2.1		20	50	22	0.068	6.680	5.400	5.400	0.075	0.068	6.215	8.782	0.804	**0.060**	0.471	**0.149**	**N.L. (2)**
359.4	73.5	11	2		20	50	23	0.067	7.015	7.167	7.167	0.089	0.067	6.550	9.429	0.786	**0.070**	0.464	**0.150**	**N.L. (2)**
354.4	78.5	100	4.5				27	0.078	7.405	74.088	74.088	0.519	0.078	6.940	10.131	0.622	**0.324**	0.457	**0.150**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS

N.L. (1) = NOT LIQUEFIABLE, ABOVE EQ GROUND WATER ELEVATION
N.L. (2) = NOT LIQUEFIABLE, PI $\geq$ 12 OR w_c/LL $\leq$ 0.85
N.L. (3) = NOT LIQUEFIABLE, $(N_1)_{60} > 25$
(C) = CONTRACTIVE SOIL TYPES
(D) = DILATIVE SOIL TYPES

Illinois Department of Transportation

LIQUEFACTION ANALYSIS

REFERENCE BORING NUMBER ========== 3-S
ELEVATION OF BORING GROUND SURFACE ========== 432.90 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 34.00 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 27.35 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.345
EARTHQUAKE MOMENT MAGNITUDE ========== 5.2
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 73 %
BOREHOLE DIAMETER========== 2.5 to 4.5 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.253**

AVG. SHEAR WAVE VELOCITY (top 40')
$\bar{V}_{s,40'}$ = **469** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.21
Source-To-Site Distance, R (km) = 8.86
Ground Motion Prediction Equations = CEUS
PGA = **#N/A**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
430.4	2.5	7	2.2				18	0.131	0.328	11.554	11.554	0.127	0.131	0.328	0.328	1.500	**0.429**	0.978	**0.219**	**N.L. (1)**
427.9	5	7	2.3				25	0.132	0.658	10.254	10.254	0.115	0.132	0.658	0.658	1.314	**0.341**	0.951	**0.213**	**N.L. (1)**
425.4	7.5	6	1.4				22	0.125	0.970	8.045	8.045	0.096	0.125	0.970	0.970	1.187	**0.258**	0.919	**0.206**	**N.L. (1)**
422.9	10	7	2.6				19	0.133	1.303	9.258	9.258	0.107	0.133	1.303	1.303	1.117	**0.268**	0.882	**0.198**	**N.L. (1)**
420.4	12.5	8	3.7				25	0.138	1.648	10.245	10.245	0.115	0.138	1.648	1.648	1.061	**0.275**	0.841	**0.189**	**N.L. (1)**
417.9	15	8	2.5				20	0.133	1.980	9.858	9.858	0.112	0.133	1.980	1.980	1.016	**0.256**	0.796	**0.179**	**N.L. (1)**
415.4	17.5	7	1.4				21	0.125	2.293	8.286	8.286	0.098	0.125	2.293	2.293	0.983	**0.218**	0.748	**0.168**	**N.L. (1)**
412.9	20	6	2.6				27	0.133	2.625	6.772	6.772	0.086	0.133	2.625	2.625	0.956	**0.185**	0.699	**0.157**	**N.L. (1)**
410.4	22.5	8	2.3				20	0.132	2.955	8.600	8.600	0.101	0.132	2.955	2.955	0.929	**0.211**	0.651	**0.146**	**N.L. (1)**
407.9	25	7	2.3				28	0.132	3.285	7.166	7.166	0.089	0.132	3.285	3.285	0.911	**0.183**	0.604	**0.135**	**N.L. (1)**
405.4	27.5	25	4.8				15	0.141	3.638	26.256	26.256	0.319	0.079	3.483	3.492	0.848	**0.609**	0.560	**0.126**	**N.L. (3)**
402.9	30	12	1.7		11	27	20	0.128	3.958	11.147	11.147	0.123	0.066	3.648	3.813	0.879	**0.244**	0.521	**0.122**	**N.L. (2)**
400.4	32.5	5	1.5		11	27	20	0.126	4.273	4.448	4.448	0.068	0.064	3.808	4.129	0.889	**0.136**	0.486	**0.118**	**N.L. (2)**
397.9	35	4	0.5		11	27	22	0.051	4.400	3.506	3.506	0.062	0.051	3.935	4.412	0.884	**0.123**	0.457	**0.115**	**N.L. (2)**
395.4	37.5	9	1.6		11	27	21	0.065	4.563	7.733	7.733	0.094	0.065	4.098	4.731	0.867	**0.183**	0.432	**0.112**	**N.L. (2)**
392.9	40	6	2		11	27	19	0.067	4.730	5.052	5.052	0.072	0.067	4.265	5.054	0.869	**0.142**	0.411	**0.109**	**N.L. (2)**
387.9	45	13	2.5		20	50	16	0.070	5.080	10.502	10.502	0.118	0.070	4.615	5.716	0.833	**0.221**	0.381	**0.106**	**N.L. (2)**
384.4	48.5	20			11	27	16	0.067	5.315	15.996	15.996	0.170	0.067	4.850	6.169	0.800	**0.307**	0.366	**0.104**	**N.L. (2)**
379.4	53.5	22	2.9		20	50	23	0.072	5.675	16.983	16.983	0.181	0.072	5.210	6.841	0.781	**0.318**	0.352	**0.104**	**N.L. (2)**
374.4	58.5	10	2.3		20	50	16	0.069	6.020	7.262	7.262	0.090	0.069	5.555	7.498	0.813	**0.165**	0.344	**0.104**	**N.L. (2)**
369.4	63.5	6	1.5		20	50	19	0.064	6.340	4.204	4.204	0.066	0.064	5.875	8.130	0.816	**0.122**	0.338	**0.105**	**N.L. (2)**
364.4	68.5	8	2.1		20	50	22	0.068	6.680	5.400	5.400	0.075	0.068	6.215	8.782	0.804	**0.136**	0.326	**0.103**	**N.L. (2)**
359.4	73.5	11	2		20	50	23	0.067	7.015	7.167	7.167	0.089	0.067	6.550	9.429	0.786	**0.158**	0.319	**0.103**	**N.L. (2)**
354.4	78.5	100	4.5				27	0.078	7.405	74.088	74.088	0.519	0.078	6.940	10.131	0.622	**0.728**	0.312	**0.102**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS

N.L. (1) = NOT LIQUEFIABLE, ABOVE EQ GROUND WATER ELEVATION
N.L. (2) = NOT LIQUEFIABLE, PI $\geq$ 12 OR w_c/LL $\leq$ 0.85
N.L. (3) = NOT LIQUEFIABLE, $(N_1)_{60} > 25$
(C) = CONTRACTIVE SOIL TYPES
(D) = DILATIVE SOIL TYPES

EXHIBIT G

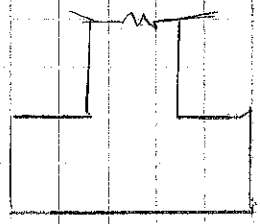
BEARING RESISTANCE

Kaskaskia
Engineering Group, LLC
208 E. Main Street
Suite 100
Belleville, Illinois 62220
618.233.5877 *phone*
618.233.5977 *fax*
www.kaskaskiaeng.com

Project Title: Stritz Rd. over I-57 Sheet: 1 of 1
Project Number: 20-1109.04
Calculated By: TG Date: 5/3/23
Checked By: _____ Date: _____
Comments: Bearing Capacity

Bearing Capacity

Boring 2-S



Bearing on Clay layer

$\gamma = 120$ pcf
$c' = 4300$ psf
$\phi = 0$ → $N_c = 5.7$, $N_q = 1.0$, $N_\gamma = 0.0$

Bearing Capacity for continuous Foundations (Terzaghi)

$q_{ult} = c' N_c + \sigma'_{zD} N_q = 0.5 \gamma' B N_\gamma$

$= 2300(5.7) + (120)(4)(1)$

$= 13590$ psf

$q_{allow} = \frac{q_{ult}}{F.O.S.} = \frac{13590}{2} = 6795$ psf

$q_{allow} = 6795$ psf

Sliding Bearing Resistance

Use $\gamma/2\ \sigma'_V$ or cohesion

$\gamma/2\,\sigma'_V = \frac{1}{2}(120)(4) = 240$ psf < 2300 psf

Sliding Bearing Resistance = 240 psf

EXHIBIT H

PILE LENGTH/PILE TYPE

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== E. Abutment
REFERENCE BORING ========== 1-S
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 428.33 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 426.33 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1100 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 268.05 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 100.52 KIPS

PILE TYPE AND SIZE ========== Steel HP 10 X 42
Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area========= 0.086 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**335** KIPS	**184** KIPS	**67** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
425.30	1.03	0.40			1.1		24.9	1.6		***4.6***	5	0	0	3	3
422.80	2.50	2.50			11.1	23.8	32.2	16.4	3.0	***20.5***	20	0	0	11	6
420.30	2.50	2.10			9.9	20.0	39.3	14.6	2.5	***34.7***	35	0	0	19	8
417.80	2.50	1.80			9.0	17.2	54.0	13.2	2.2	***48.6***	49	0	0	27	11
415.30	2.50	2.40			10.8	22.9	66.7	15.9	2.9	***64.8***	65	0	0	36	13
412.80	2.50	2.60			11.4	24.8	***76.2***	16.8	3.1	81.4	76	0	0	42	16
410.30	2.50	2.40			10.8	22.9	***87.9***	15.9	2.9	97.4	88	0	0	48	18
407.80	2.50	2.50			11.1	23.8	***87.6***	16.4	3.0	112.3	88	0	0	48	21
405.30	2.50	1.30			7.2	12.4	***103.4***	10.6	1.6	123.9	103	0	0	57	23
402.80	2.50	2.20			10.2	21.0	***105.9***	15.0	2.7	138.0	106	0	0	58	26
400.30	2.50	1.40			7.6	13.3	***111.6***	11.1	1.7	148.9	112	0	0	61	28
397.20	3.10	1.20			8.4	11.4	***140.7***	12.3	1.4	163.9	141	0	0	77	31
396.60	0.60		19	Medium Sand	0.7	32.2	***126.4***	1.0	4.1	163.0	126	0	0	70	32
394.30	2.30	1.80			8.3	17.2	***134.6***	12.2	2.2	175.1	135	0	0	74	34
391.30	3.00	1.80			10.8	17.2	***145.4***	15.9	2.2	191.0	145	0	0	80	37
388.80	2.50	1.80			9.0	17.2	***154.4***	13.2	2.2	204.2	154	0	0	85	40
386.30	2.50	1.80			9.0	17.2	***163.4***	13.2	2.2	217.4	163	0	0	90	42
383.80	2.50	1.80			9.0	17.2	***172.3***	13.2	2.2	230.6	172	0	0	95	45
380.30	3.50	1.80			12.6	17.2	***205.9***	18.5	2.2	251.8	206	0	0	113	48
376.30	4.00	4.00	15		25.0	38.1	***203.2***	36.8	4.8	285.1	203	0	0	112	52
373.30	3.00	1.10			7.6	10.5	***210.8***	11.2	1.3	296.3	211	0	0	116	55
369.30	4.00	1.10			10.1	10.5	***220.0***	14.9	1.3	311.0	220	0	0	121	59
364.80	4.50	1.00			10.6	9.5	***221.0***	15.5	1.2	325.4	221	0	0	122	64
363.80	1.00				0.0	0.0	***221.0***	0.0	0.0	325.4	221	0	0	122	65
362.80	1.00				0.0	0.0	***305.8***	0.0	0.0	336.1	306	0	0	168	66
361.80	1.00			Shale	41.1	84.8	***346.9***	60.5	10.7	396.6	~~347~~	~~0~~	~~0~~	~~191~~	~~66.5~~
360.80	1.00			Shale	41.1	84.8	***388.0***	60.5	10.7	457.1	~~388~~	~~0~~	~~0~~	~~213~~	~~67.5~~
359.80	1.00			Shale	41.1	84.8	***429.1***	60.5	10.7	517.7	~~429~~	~~0~~	~~0~~	~~236~~	~~68.5~~
358.80	1.00			Shale	41.1	84.8	***470.2***	60.5	10.7	578.2	~~470~~	~~0~~	~~0~~	~~259~~	~~69.5~~
357.80	1.00			Shale	41.1	84.8	***511.3***	60.5	10.7	638.7	~~511~~	~~0~~	~~0~~	~~281~~	~~70.5~~
356.80	1.00			Shale	41.1	84.8	***552.4***	60.5	10.7	699.2	~~552~~	~~0~~	~~0~~	~~304~~	~~71.5~~
355.80	1.00			Shale	41.1	84.8	***593.5***	60.5	10.7	759.7	~~594~~	~~0~~	~~0~~	~~326~~	~~72.5~~
354.80	1.00			Shale	41.1	84.8	***634.6***	60.5	10.7	820.3	~~635~~	~~0~~	~~0~~	~~349~~	~~73.5~~
353.80	1.00			Shale	41.1	84.8	***675.7***	60.5	10.7	880.8	~~676~~	~~0~~	~~0~~	~~372~~	~~74.5~~
352.80	1.00			Shale	41.1	84.8	***716.8***	60.5	10.7	941.3	~~717~~	~~0~~	~~0~~	~~394~~	~~75.5~~
351.80	1.00			Shale	41.1	84.8	***758.0***	60.5	10.7	1001.8	~~758~~	~~0~~	~~0~~	~~417~~	~~76.5~~
350.80	1.00			Shale	41.1	84.8	***799.1***	60.5	10.7	1062.3	~~799~~	~~0~~	~~0~~	~~439~~	~~77.5~~
349.80	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier
REFERENCE BORING ========== 2-S
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 409.75 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 407.75 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 2500 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 609.20 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 228.45 KIPS

PILE TYPE AND SIZE ========== Steel HP 10 X 42
Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area========= 0.086 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**319** KIPS	**176** KIPS	**57** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
405.60	2.15	2.30			9.0		23.3	13.3		***15.1***	15	0	0	8	4
403.00	2.60	1.50			8.3	14.3	***23.0***	12.1	1.8	26.2	23	0	0	13	7
400.50	2.50	0.60			3.8	5.7	***25.8***	5.6	0.7	31.6	26	0	0	14	9
398.00	2.50	0.50			3.2	4.8	49.1	4.7	0.6	***38.9***	39	0	0	21	12
396.00	2.00	2.60			9.1	24.8	***43.9***	13.4	3.1	50.5	44	0	0	24	14
393.50	2.50	1.10			6.3	10.5	69.3	9.3	1.3	***62.3***	62	0	0	34	16
391.00	2.50	3.10	8		12.9	29.6	***70.8***	19.0	3.7	79.8	71	0	0	39	19
388.30	2.70	1.90			10.0	18.1	***80.8***	14.8	2.3	94.6	81	0	0	44	21
385.90	2.40	1.90			8.9	18.1	***86.9***	13.1	2.3	107.4	87	0	0	48	24
384.00	1.90	1.60			6.3	15.3	***96.6***	9.3	1.9	117.1	97	0	0	53	26
382.40	1.60		11	Medium Sand	1.1	18.6	***112.4***	1.6	2.4	120.5	112	0	0	62	27
380.90	1.50	3.50	11		8.5	33.4	***100.8***	12.5	4.2	130.5	101	0	0	55	29
378.40	2.50	1.40			7.6	13.3	***108.4***	11.1	1.7	141.6	108	0	0	60	31
375.90	2.50	1.40			7.6	13.3	***119.8***	11.1	1.7	153.2	120	0	0	66	34
375.30	0.60	1.80			2.2	17.2	***121.9***	3.2	2.2	156.4	122	0	0	67	34
373.00	2.30	1.80			8.3	17.2	***129.2***	12.2	2.2	168.4	129	0	0	71	37
370.00	3.00	1.70			10.4	16.2	***145.3***	15.3	2.1	184.4	145	0	0	80	40
365.00	5.00	2.30			21.0	21.9	***169.2***	30.9	2.8	215.7	169	0	0	93	45
358.50	6.50	2.60			29.7	24.8	***195.1***	43.7	3.1	258.9	195	0	0	107	51
353.80	4.70	2.20			19.2	21.0	***278.0***	28.2	2.7	295.3	278	0	0	153	56
352.80	1.00			Shale	41.1	84.8	***319.1***	60.5	10.7	355.8	319	0	0	176	57
351.80	1.00			Shale	41.1	84.8	***360.2***	60.5	10.7	416.3	~~360~~	~~0~~	~~0~~	~~198~~	~~58~~
350.80	1.00			Shale	41.1	84.8	***401.3***	60.5	10.7	476.8	~~401~~	~~0~~	~~0~~	~~221~~	~~59~~
349.80	1.00			Shale	41.1	84.8	***442.5***	60.5	10.7	537.3	~~442~~	~~0~~	~~0~~	~~243~~	~~60~~
348.80	1.00			Shale	41.1	84.8	***483.6***	60.5	10.7	597.9	~~484~~	~~0~~	~~0~~	~~266~~	~~61~~
347.80	1.00			Shale	41.1	84.8	***524.7***	60.5	10.7	658.4	~~525~~	~~0~~	~~0~~	~~289~~	~~62~~
346.80	1.00			Shale	41.1	84.8	***565.8***	60.5	10.7	718.9	~~566~~	~~0~~	~~0~~	~~311~~	~~63~~
345.80	1.00			Shale	41.1	84.8	***606.9***	60.5	10.7	779.4	~~607~~	~~0~~	~~0~~	~~334~~	~~64~~
344.80	1.00			Shale	41.1	84.8	***648.0***	60.5	10.7	839.9	~~648~~	~~0~~	~~0~~	~~356~~	~~65~~
343.80	1.00			Shale	41.1	84.8	***689.1***	60.5	10.7	900.5	~~689~~	~~0~~	~~0~~	~~379~~	~~66~~
342.80	1.00			Shale	41.1	84.8	***730.2***	60.5	10.7	961.0	~~730~~	~~0~~	~~0~~	~~402~~	~~67~~
341.80	1.00			Shale	41.1	84.8	***771.3***	60.5	10.7	1021.5	~~771~~	~~0~~	~~0~~	~~424~~	~~68~~
340.80	1.00			Shale	41.1	84.8	***812.4***	60.5	10.7	1082.0	~~812~~	~~0~~	~~0~~	~~447~~	~~69~~
339.80	1.00			Shale	41.1	84.8	***853.5***	60.5	10.7	1142.5	~~854~~	~~0~~	~~0~~	~~469~~	~~70~~
338.80	1.00			Shale	41.1	84.8	***894.6***	60.5	10.7	1203.1	~~895~~	~~0~~	~~0~~	~~492~~	~~71~~
337.80	1.00			Shale	41.1	84.8	***935.8***	60.5	10.7	1263.6	~~936~~	~~0~~	~~0~~	~~515~~	~~72~~
336.80	1.00			Shale	41.1	84.8	***976.9***	60.5	10.7	1324.1	~~977~~	~~0~~	~~0~~	~~537~~	~~73~~
335.80	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== W Abutment
REFERENCE BORING ========== 3-S
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 428.25 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 426.25 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1100 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 268.05 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 100.52 KIPS

PILE TYPE AND SIZE ========== Steel HP 10 X 42
Plugged Pile Perimeter========== 3.300 FT. Unplugged Pile Perimeter========== 4.858 FT.
Plugged Pile End Bearing Area========== 0.680 SQFT. Unplugged Pile End Bearing Area========= 0.086 SQFT.

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	**335** KIPS	**184** KIPS	**74** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
424.90	1.35	1.40			4.1		28.9	6.0		***9.2***	9	0	0	5	3
422.40	2.50	2.60			11.4	24.8	50.8	16.8	3.1	***27.3***	27	0	0	15	6
419.90	2.50	3.70	8		14.7	35.3	54.1	21.7	4.5	***47.5***	48	0	0	26	8
417.40	2.50	2.50			11.1	23.8	***54.7***	16.4	3.0	62.6	55	0	0	30	11
414.90	2.50	1.40			7.6	13.3	***73.7***	11.1	1.7	75.1	74	0	0	41	13
412.40	2.50	2.60			11.4	24.8	***82.3***	16.8	3.1	91.6	82	0	0	45	16
409.40	3.00	2.30			12.6	21.9	***94.9***	18.6	2.8	110.2	95	0	0	52	19
406.90	2.50	2.30			10.5	21.9	129.2	15.5	2.8	***128.6***	129	0	0	71	21
404.50	2.40	4.80	25		16.5	45.8	***116.1***	24.2	5.8	149.1	116	0	0	64	24
402.50	2.00	1.70			6.9	16.2	***121.1***	10.2	2.1	159.1	121	0	0	67	26
400.00	2.50	1.50			7.9	14.3	***119.5***	11.7	1.8	169.6	120	0	0	66	28
397.50	2.50	0.50			3.2	4.8	***133.2***	4.7	0.6	175.6	133	0	0	73	31
395.00	2.50	1.60			8.3	15.3	***145.3***	12.2	1.9	188.3	145	0	0	80	33
390.90	4.10	2.00			15.7	19.1	***165.9***	23.2	2.4	212.1	166	0	0	91	37
385.90	5.00	2.50			22.2	23.8	***190.0***	32.7	3.0	245.1	190	0	0	104	42
383.60	2.30	2.70			10.8	25.7	***208.9***	15.9	3.3	262.0	209	0	0	115	45
381.90	1.70		20	Fine Sand	1.9	33.9	***204.6***	2.8	4.3	264.0	205	0	0	113	46
379.40	2.50	2.90			12.3	27.7	***216.9***	18.1	3.5	282.1	217	0	0	119	49
376.90	2.50	2.90			12.3	27.7	***223.5***	18.1	3.5	299.5	224	0	0	123	51
374.40	2.50	2.30			10.5	21.9	***234.0***	15.5	2.8	315.0	234	0	0	129	54
371.90	2.50	2.30			10.5	21.9	***236.9***	15.5	2.8	329.5	237	0	0	130	56
368.90	3.00	1.50			9.5	14.3	***246.4***	14.0	1.8	343.5	246	0	0	136	59
365.90	3.00	1.50			9.5	14.3	***261.7***	14.0	1.8	358.3	262	0	0	144	62
360.20	5.70	2.10			22.6	20.0	***283.3***	33.2	2.5	391.4	283	0	0	156	68
354.50	5.70	2.00			21.9	19.1	***370.9***	32.2	2.4	432.0	~~371~~	~~0~~	~~0~~	~~204~~	~~74~~
353.50	1.00			Shale	41.1	84.8	***412.0***	60.5	10.7	492.5	~~412~~	~~0~~	~~0~~	~~227~~	~~74.8~~
352.50	1.00			Shale	41.1	84.8	***453.1***	60.5	10.7	553.0	~~453~~	~~0~~	~~0~~	~~249~~	~~75.8~~
351.50	1.00			Shale	41.1	84.8	***494.2***	60.5	10.7	613.5	~~494~~	~~0~~	~~0~~	~~272~~	~~76.8~~
350.50	1.00			Shale	41.1	84.8	***535.3***	60.5	10.7	674.0	~~535~~	~~0~~	~~0~~	~~294~~	~~77.8~~
349.50	1.00			Shale	41.1	84.8	***576.4***	60.5	10.7	734.6	~~576~~	~~0~~	~~0~~	~~317~~	~~78.8~~
348.50	1.00			Shale	41.1	84.8	***617.5***	60.5	10.7	795.1	~~618~~	~~0~~	~~0~~	~~340~~	~~79.8~~
347.50	1.00			Shale	41.1	84.8	***658.6***	60.5	10.7	855.6	~~659~~	~~0~~	~~0~~	~~362~~	~~80.8~~
346.50	1.00			Shale	41.1	84.8	***699.7***	60.5	10.7	916.1	~~700~~	~~0~~	~~0~~	~~385~~	~~81.8~~
345.50	1.00			Shale	41.1	84.8	***740.8***	60.5	10.7	976.6	~~741~~	~~0~~	~~0~~	~~407~~	~~82.8~~
344.50	1.00			Shale	41.1	84.8	***782.0***	60.5	10.7	1037.2	~~782~~	~~0~~	~~0~~	~~430~~	~~83.8~~
343.50	1.00			Shale	41.1	84.8	***823.1***	60.5	10.7	1097.7	~~823~~	~~0~~	~~0~~	~~453~~	~~84.8~~
342.50	1.00			Shale	41.1	84.8	***864.2***	60.5	10.7	1158.2	~~864~~	~~0~~	~~0~~	~~475~~	~~85.8~~
341.50	1.00			Shale		84.8			10.7						