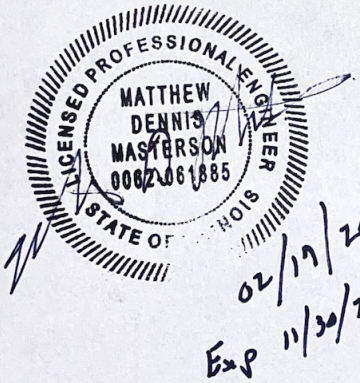
STRUCTURE GEOTECHNICAL REPORT

FAI 74 (I-74) CH R23 and Abandoned Railroad

Proposed S.N. 072-0258/0259
Existing S.N. 072-0074/0075

FAI 74
SECTION 72-(3RS-3;4RS-2)
PEORIA COUNTY,ILLINOIS
JOB NO. P-94-004-21
PTB 198 Item 018
KEG NO. 21-1008.01



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Kaskaskia
Engineering Group, LLC

TABLE OF CONTENTS

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 proposed bridge replacments carrying I-74 (FAI 74) over CH R23 and an abandoned railroad in Peoria 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 reconstructing two bridges from five-span structures (existing WB SN 072-0074 and existing EB SN 072-0075) to two three-span structures (SN 072-0258 WB and 072-0259 EB) carrying I-74 (FAI 74) over CH R23 and an abandoned railroad in Peoria County, Illinois.

The general location of the proposed structures are shown on a Location Map, Exhibit A. The project is located approximately 1.2 miles west of the I-474/74 interchange at Brimfield, Illinois. The site lies within the limits of the Third Principal Meridian (T. 10N R. 5W) within the Galesburg Plain of the Till Plains Section of the Central Lowland Province.

1.3 Proposed Structure Information

The proposed structures (SN 072-0258 WB and SN 072-0259 EB) will consist of two three-span bridges, which will be built on an 83°52'-degree skew over CH-23R. Each bridge will provide two 12 ft.-wide driving lanes, one 6 ft.-wide shoulder, and one 10 ft.-wide shoulder. The total width of each bridge will be 42 ft.-10 inches out-to-out. The bridges will consist of two 43 ft. spans, and one 60 ft. span and will measure 149 ft.-8.25 inches back-to-back of abutments. A Type, Size, and Location Plan (TS&L) is included in Exhibit C.

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 in coordination with Veenstra and Kimm, Inc. and IDOT and completed by KEG. Six borings, designated SB-01, SB-02, SB-03, SB-04, SB-05, and SB-06 were drilled from October 25, 2021 through October 28, 2021. Boring Locations are shown on Exhibit B – Boring Plan. 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 D. The soil profile for the above-mentioned borings can be found in Subsurface Profile, Exhibit E.

2.2 Subsurface Conditions

The profiles at the six (6) boring locations exhibited layers of silts, clays, shales, coal, and limestone. Boring SB-1 was drilled to a depth of 30.0 ft. below a Ground Surface Elevation (GSE) of 697.07 ft. Boring SB-02 was drilled to a depth of 45.0 ft. below a GSE of 695.99 ft. and included rock coring from 30.0 to 45.0 ft. Boring SB-03 was drilled to a depth of 70.0 ft. below a GSE of 724.89 ft. Boring SB-04 was drilled to a depth of 35.0 ft. below a GSE of 698.17 ft. Boring SB-05

was drilled to a depth of 40.0 ft. below a GSE of 699.21 ft. Boring SB-06 was drilled to a depth of 70.0 ft. below a GSE of 723.94 ft.

Topsoil-Encountered in four (4) of the borings (SB-01, SB-02, SB-04, and SB-05) ranged from 0.75 to 1.0 ft. below GSE.

Asphalt-Encountered in two (2) of the borings. SB-03 encountered 14 inches (1.16 ft.) and SB-06 encountered 12 inches (1.0 ft.) of asphalt.

Silty Clay/Silty Clay Loam-Encountered in all six (6) borings. SB-01 encountered it from 0.75 to 4.0, 13.5 to 16.0, and 18.5 to 23.5 ft. below GSE. SB-02 encountered it from 1.0 to 3.5 and 16.0 to 26.0 ft. below GSE. SB-03 encountered it from 1.16 to 3.5, 13.5-33.5, and 49.0 to 53.5 ft. below GSE. Boring SB-04 encountered it from 1.0 to 3.5 and 17.5 to 24.0 ft. below GSE. Boring SB-05 encountered it from 1.0 to 3.5 and 16.5 to 26.0 ft. below GSE. Finally, SB-06 encountered this layer from 11.0 to 33.5 and 48.5 to 53.5 ft. below GSE. The N-values ranged from 7 to 61 blows per foot (bpf) and the unconfined compressive strength (UCS) ranged from 0.22 to 3.93 tons per square foot (tsf). The moisture contents ranged from 11 to 32 percent.

Silty Clay Fill-Encountered in two (2) of the borings. Boring SB-03 encountered it from 3.5 to 13.5 ft. below GSE and Boring SB-06 encountered it from 1.0 to 11.0 ft. below GSE. The N-values ranged from 7 to 13 bpf and the UCS ranged from 1.25 to 3.71 tsf. The moisture contents ranged from 16 to 24 percent.

Clay/Clay Loam-Encountered in all six (6) borings. SB-01 encountered it from 4.0 to 13.5 and 16.0 to 18.5 ft. below GSE. SB-02 encountered it from 3.5 to 16.0 ft. below GSE. SB-03 encountered it from 33.5 to 49.0 ft. below GSE. Boring SB-04 encountered it from 3.5 to 17.5 ft. below GSE. Boring SB-05 encountered it from 3.5 to 16.5 ft. below GSE. Boring SB-06 encountered it from 33.5 to 48.5 ft. below GSE. The N-values ranged from 4 to 19 bpf and the UCS ranged from 0.31 to 1.92 tsf. The moisture contents ranged from 18 to 34 percent.

Clayey Shale/Shaley Clay-Exhibited in four (4) of the borings. Boring SB-01 encountered it from 23.5 to 26.0 ft. below GSE. Boring SB-03 encountered it from 53.5 to 58.5 ft. below GSE. Boring SB-04 encountered it from 24.0 to 26.5 ft. below GSE. SB-06 encountered it from 53.5 to 58.5 ft. below GSE. The N-values ranged from 38 bpf to 50 blows per 5 inches of penetration and the UCS ranged from 1.92 to 4.58 tsf. The moisture contents ranged from 15 to 18 percent.

Shale-Exhibited in all six (6) borings. Boring SB-01 encountered it from 26.0 to 30.0 ft. below GSE. Boring SB-02 encountered it from 26.0 to 31.0 and 40.9 to 45.0 ft. below GSE. Boring SB-03 encountered it from 58.5 to 64.5 ft. below GSE. Boring SB-04 encountered it from 26.5 to 35.0 ft. below GSE. Boring SB-05 encountered it from 26.0 to 33.5 ft. below GSE. Finally, Boring SB-06 encountered it from 58.5 to 68.5 ft. below GSE. The N-Values ranged from 61 bpf to 50 blows per 2” of penetration and the UCS ranged from 1.03 to 4.8 tsf. The moisture contents ranged from 15 to 22 percent.

Coal-Exhibited in four (4) of the borings. Boring SB-02 encountered it from 32.0 to 40.9 ft. below GSE. Boring SB-03 encountered it from 64.5 to 70.0 ft. below GSE. Boring SB-05 encountered it from 35.0 to 40.0 ft. below GSE. Boring SB-06 encountered it from 68.5 to 70.0 ft. below GSE.

Limestone-Exhibited in three (3) of the borings. Boring SB-02 encountered it from 31.0 to 32.0 ft. below GSE and Boring SB-03 encountered it from 63.5 to 64.5 ft. below GSE. Boring SB-05 encountered it from 33.5 to 35.0 ft. below GSE.

3.0 Geotechnical Evaluations

3.1 Settlement

Due to the fill required to reduce the bridge from 5 spans to 3, settlement is expected between the existing west abutments and the proposed west abutments. Therefore, settlement calculations were performed for the west approach of the proposed structures. Boring SB-05 was used for the settlement analysis. A consolidation test was performed on samples from Boring SB-05 at depths between 6 to 8 feet below the ground surface. A settlement of 6.92 in. was calculated for the proposed embankment. This settlement included five layers, of which the first two are overconsolidated, and the last three are considered normally consolidated, relative to the overburden pressure plus the load from the new fill. The time for 50 percent consolidation (t50) was calculated as 261 days, and the time for 90 percent consolidation (t90) was 1081 days. Times were also calculated utilizing wick drains on a 5-ft. triangular spacing, assuming that the drains will be extended to the shale below the base of the new embankment. With the wick drains, t50 was calculated as 18 days and t90, 75 days. While the wick drains will help reduce the time for consolidation, they will not reduce the magnitude of settlement.

Ground improvement will be required due to the high estimated settlement for the new embankment and the structures supported by it. If the construction schedule allows, the ground improvement could include surcharging the fill area before the new embankment is constructed. If the site's layout is such that the surcharge fill cannot be placed or if the construction schedule will not allow for an estimated 261-day surcharge without wick drains or a 75-day surcharge with wick drains, other methods will need to be considered, such as aggregate column ground improvement (ACGI). We recommend that settlement platforms be utilized during embankment and/or surcharge construction to monitor the settlement. Calculations are attached as Exhibit F - Settlement Calculations.

3.2 Slope Stability

Stability analysis using SLOPE/W was performed using the proposed roadway and bridge geometry on the TS&L and soil characteristics from Borings SB-01, SB-03, SB-04 and SB-06. 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 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 30 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. SLOPE/W program output from this analysis can be found in SLOPE/W Slope Stability Analysis, Exhibit G.

Table 3.2 – Slope Stability Critical FOS

Eastbound I-74

Location (1V:2.5H Slope)	Critical FOS	
	End-of Construction	Long Term
East Abutment (SB-06)	4.7	1.7
West Abutment (SB-04)	2.4	1.7

Westbound I-74

Location (1V:2.5H Slope)	Critical FOS	
	End-of Construction	
East Abutment (SB-03)	2.6	1.8
West Abutment (SB-01)	2.3	1.8

3.3 Scour

The proposed structure will not cross a river or other tributary; therefore, scour is not an issue.

3.4 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 D.

Additional seismic parameters were calculated for use in design of the structure. 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 D, are summarized below.

Table 3.4 - Summary of Seismic Parameters

Parameter	Value
Soil Site Class	D
Spectral Response Acceleration, 0.2 Sec, S_{DS}	0.164g (Site Class D)
Spectral Response Acceleration, 1.0 Sec, S_{D1}	0.107g (Site Class D)
Seismic Performance Zone	1

As indicated in the table above, the Seismic Performance Zone is 1, based on S_{D1} and Table 3.15.2 in the IDOT Bridge Manual, the Soil Site Class D, and Figure 2.3.10-2 in the IDOT Bridge Manual.

4.0 Foundation Evaluations and Design Recommendations
4.1 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 Veenstra & Kimm, Inc. are provided in Table 4.1.1 The Nominal Required Bearing (RN) represents the resistance the pile will experience during driving, as well as assisting the contractor in selecting a proper hammer size. The Factored Resistance Available (RF) documents the net long term axial factored pile capacity available at the top of the pile to support factored substructure loadings.

Table 4.1.1 - Preliminary Design Loads

Substructure Unit	Factored Reactions (kips)
Abutments	1200
Piers	2010

The estimated pile lengths for applicable H-pile types are shown in Tables 4.1.1 through 4.1.6 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 4.1.2 - 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.)
WB	West Abutment w/ DD SB-01	335	35	51	719.52
	West Abutment No - DD SB-01	335	184	52	719.52
	Piers SB-02	335	184	34	699.00
	East Abutment SB-03	335	184	51	719.23
EB	West Abutment w/ DD SB-04	335	27	5	719.52
	West Abutment No – DD SB-04	335	184	52	719.52
	Piers SB-05	335	184	31	699.00
	East Abutment SB-06	335	184	56	719.23

Table 4.1.3 - 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.)
WB	West Abutment w/ DD SB-01	418	54	51	719.52
	West Abutment No - DD SB-01	418	230	52	719.52
	Piers SB-02	418	230	34	699.00
	East Abutment SB-03	418	230	51	719.23
EB	West Abutment w/ DD SB-04	418	44	51	719.52
	West Abutment No – DD SB-04	418	230	52	719.52
	Piers SB-05	418	230	31	699.00
	East Abutment SB-06	418	230	56	719.23

Table 4.1.4 - 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.)
WB	West Abutment w/ DD SB-01	497	82	52	719.52
	West Abutment No – DD SB-01	497	273	53	719.52
	Piers SB-02	497	273	34	699.00
	East Abutment SB-03	497	273	52	719.23
EB	West Abutment w/ DD SB-04	497	72	52	719.52
	West Abutment No - DD SB-04	497	273	53	719.52
	Piers SB-05	497	273	32	699.00
	East Abutment SB-06	497	273	57	719.23

Table 4.1.5 - 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.)
WB	West Abutment w/ DD SB-01	578	110	52	719.52
	West Abutment No – DD SB-01	578	318	53	719.52
	Piers SB-02	578	318	34	699.00
	East Abutment SB-03	578	318	51	719.23
EB	West Abutment w/ DD SB-04	578	99	52	719.52
	West Abutment No – DD SB-04	578	318	53	719.52
	Piers SB-05	578	318	32	699.00
	East Abutment SB-06	578	318	57	719.23

Table 4.1.6 - 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.)
WB	West Abutment w/ DD SB-01	705	178	54	719.52
	West Abutment No – DD SB-01	705	388	55	719.52
	Piers SB-02	705	388	36	699.00
	East Abutment SB-03	705	388	53	719.23
EB	West Abutment w/ DD SB-04	705	166	54	719.52
	West Abutment No – DD SB-04	705	388	55	719.52
	Piers SB-05	705	388	33	699.00
	East Abutment SB-06	705	388	59	719.23

Table 4.1.7 - 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.)
WB	West Abutment w/ DD SB-01	929	283	57	719.52
	West Abutment No – DD SB-01	929	511	58	719.52
	Piers SB-02	929	511	39	699.00
	East Abutment SB-03	929	511	57	719.23
EB	West Abutment w/ DD SB-04	929	271	57	719.52
	West Abutment No – DD SB-04	929	511	58	719.52
	Piers SB-05	929	511	36	699.00
	East Abutment SB-06	929	511	62	719.23

As shown in the Tables above and in Pile Length/Pile Type, Exhibit H, downdrag has been included for the West Abutments of each structure due to anticipated settlement. Liquefaction has not been included at the substructure locations.

KEG recommends one test pile be performed at a west abutment location, 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.

4.2 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 4.2 is included for the structural engineer's use in determining lateral pile response.

Table 4.2.1 - Soil Parameters for Lateral Pile Load Analysis

Boring	Depth at Bottom of Layer (Feet)	γ (pcf)	Short Term		Long Term		N Value (Est. Range)	Assumed % Fines < #200	K (pci)	ε50
			Φ (deg)	c (psf)	Φ (deg)	c (psf)				
SB-01	696.30	125	0	1500	26	100	10	65	500	0.007
	693.10	120	0	200	26	100	7	65	30	0.004
	683.6	120	0	475	26	100	5-7	65	30	0.02
	673.60	120	0	1500	26	100	6-38	65	500	0.007
SB-02	695.99	125	0	1500	26	100	10	65	500	0.007
	692.50	120	0	2100	26	100	10	65	1000	0.005
	680	120	0	780	26	100	4-9	65	100	0.01
	670	120	0	1550	26	150	9-37	65	500	0.007
SB-03	711.4	125	0	1500	26	150	10	65	500	0.007
	691.4	120	0	2000	26	150	7-24	65	500	0.007
	675.9	120	0	900	26	100	7	65	100	0.01
	671.4	120	0	3000	26	150	61	65	1000	0.005
SB-04	694.7	125	0	1500	26	100	10	65	500	0.007
	681.7	120	0	600	26	100	6-11	65	100	0.01
	671.7	120	0	1100	26	100	8-38	65	500	0.007
SB-05	695.7	120	0	1800	26	100	9	65	500	0.007
	682.7	120	0	825	26	100	3-7	85	100	0.01
	673.2	120	0	2150	26	150	12-62	65	1000	0.005
SB-06	712.9	125	0	2200	26	100	7-19	65	1000	0.005

Boring	Depth at Bottom of Layer (Feet)	γ (pcf)	Short Term		Long Term		N Value (Est. Range)	Assumed % Fines < #200	K (pci)	ε50
			Φ (deg)	c (psf)	Φ (deg)	c (psf)				
	690.4	120	0	2500	26	100	10-60/14”	65	1000	0.005
	670.4	110	0	2300	26	100	8-79	65	1000	0.005

Table 4.2.2 - Rock Parameters for Lateral Pile Load Analysis

Rock Type	Weak Rock			Strong Rock	
	y (psf)	RQD	Qu (tsf)	y (psf)	Qu (tsf)
Shale	135	52-84	2.4	--	--

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 the bridges will be reconstructed utilizing cross over traffic lanes.

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 specific 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

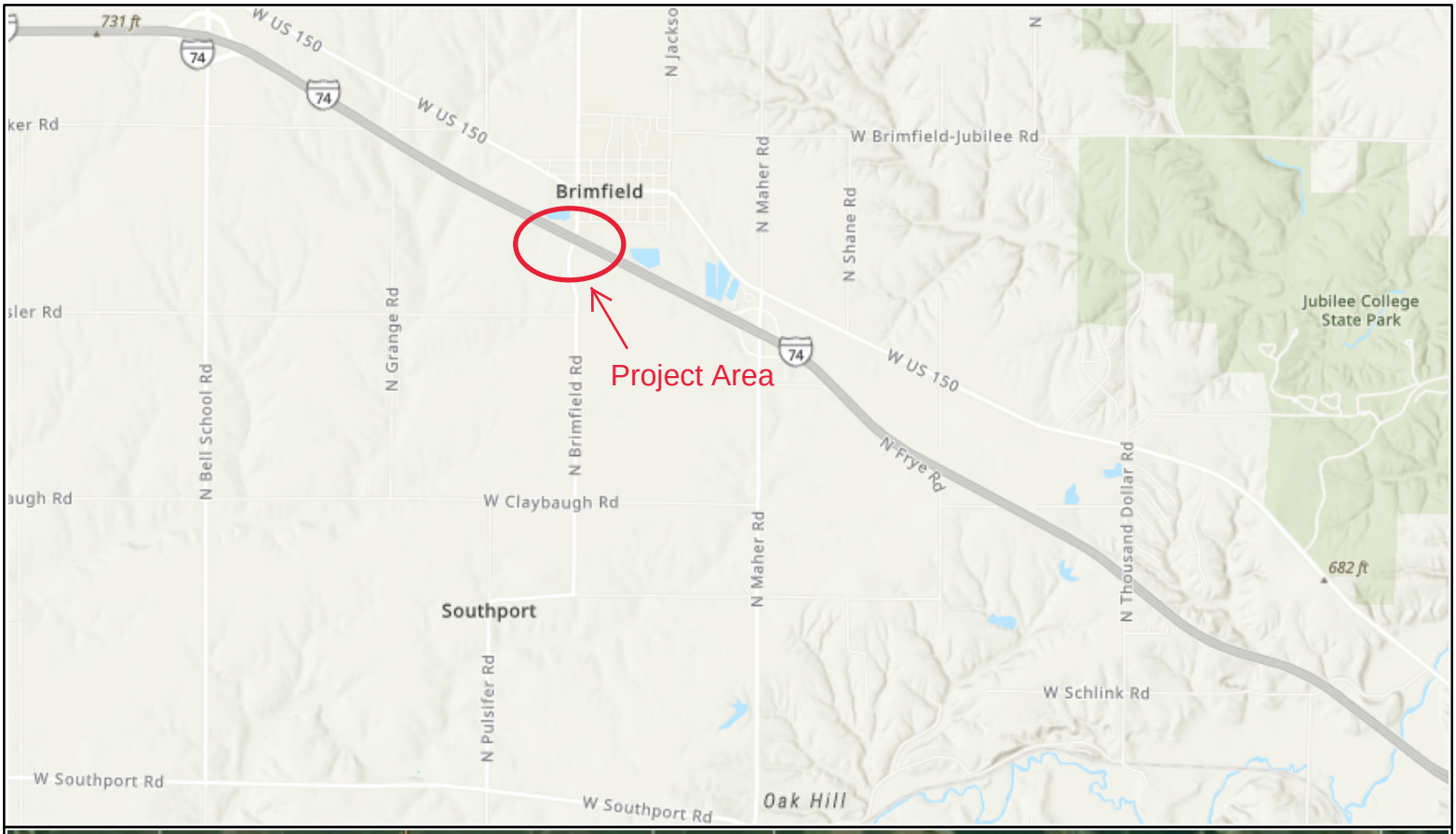
Soil boring logs can be found in Exhibit D. The Subsurface Profile can be found in Exhibit E.

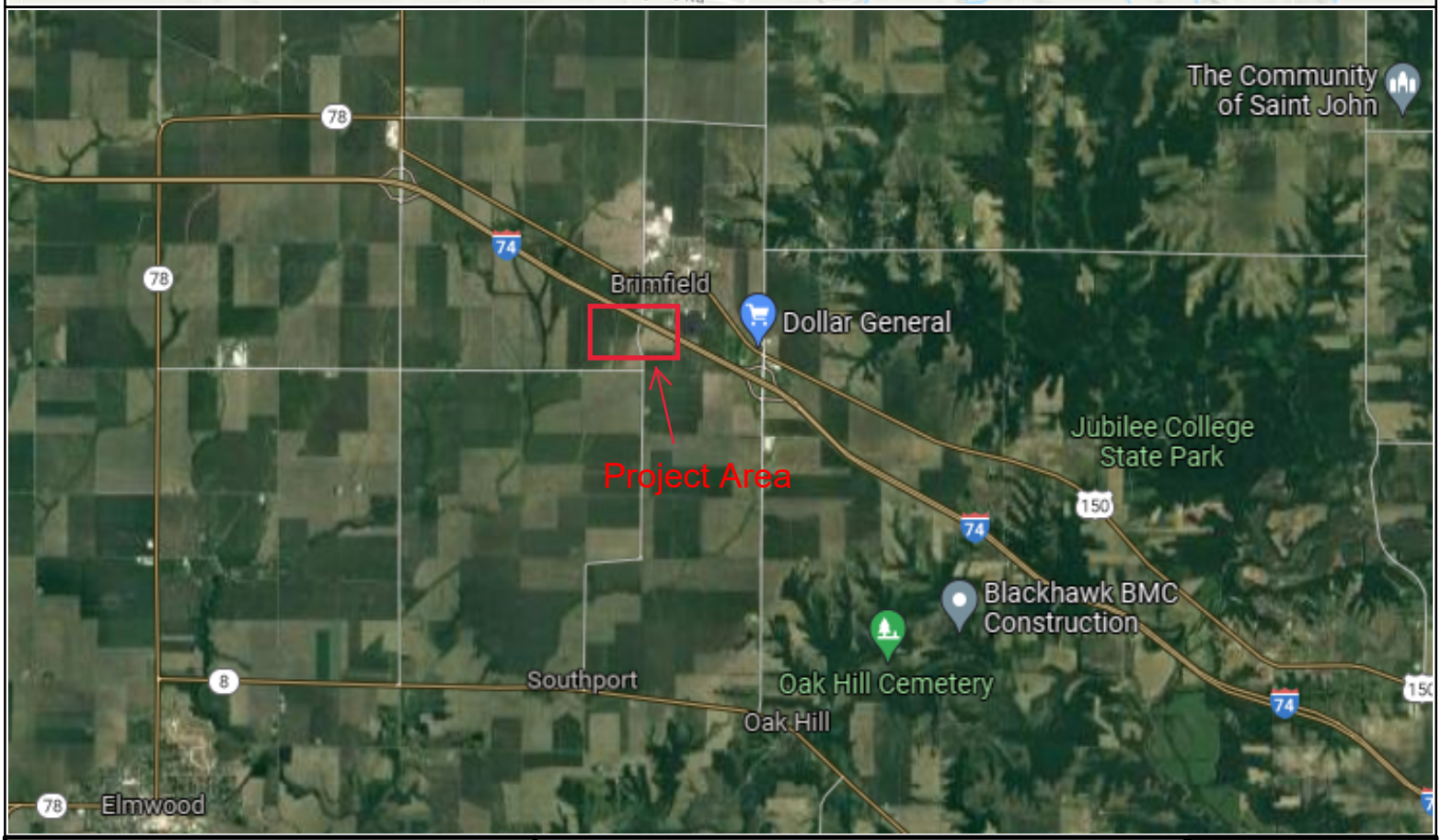
8.0 Limitations

The recommendations provided herein are for the exclusive use of Veenstra & Kimm and the Illinois Department of Transportation (IDOT) District 4. They are specific only to the project described and are based on the subsurface information obtained by KEG at six boring locations within the structure areas, 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

I-74 Over CH R23 and Abandoned Railroad
Peoria County, IL

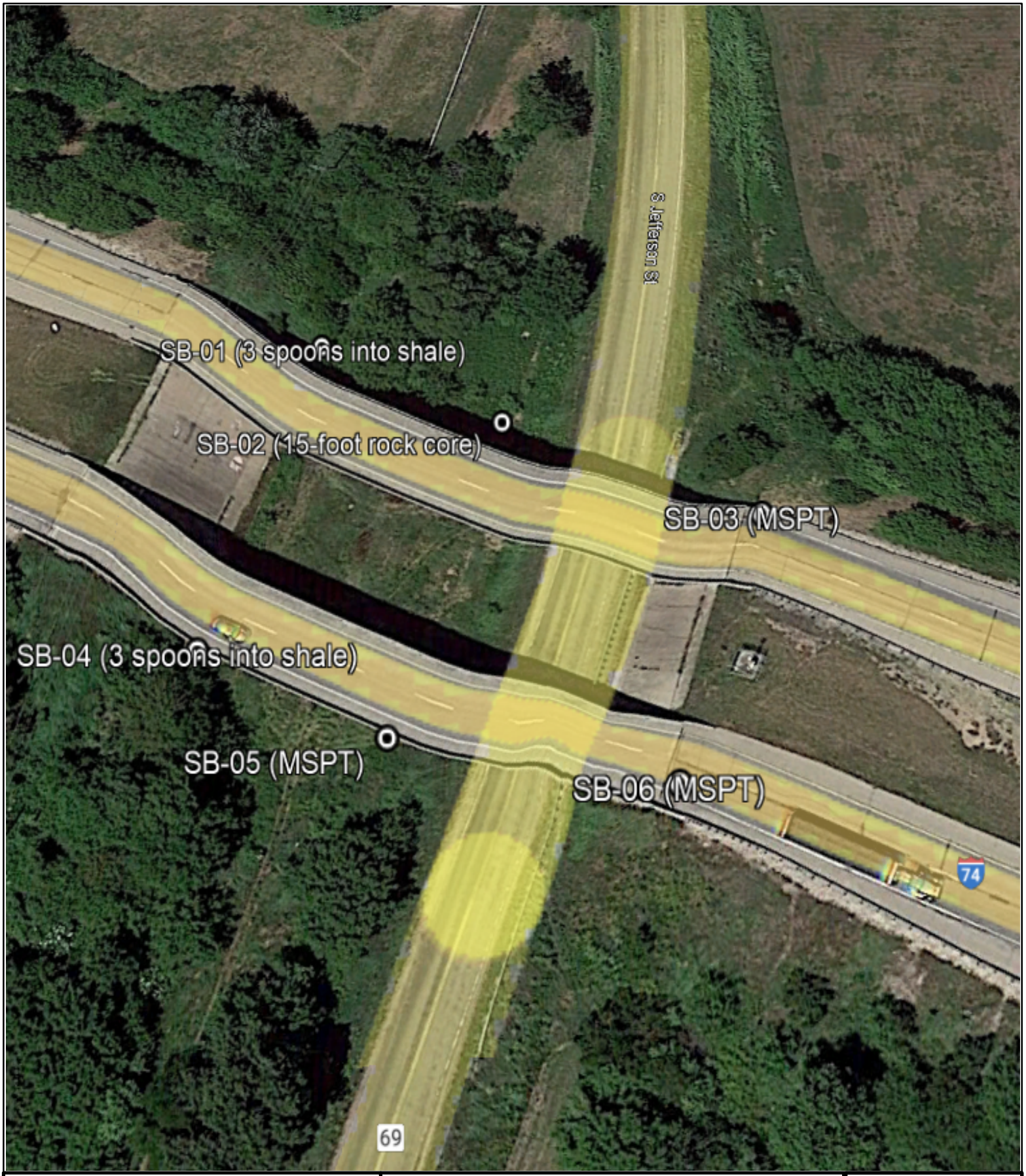
Exhibit No.

A

KEG JOB #21-1008.01

EXHIBIT B

BORING PLAN



Kaskaskia Engineering Group, LLC

BORING LOCATION MAP

I-74 Over CH R23 and Abandoned Railroad
Peoria County, IL

Exhibit No.

B

KEG JOB #21-1008.01

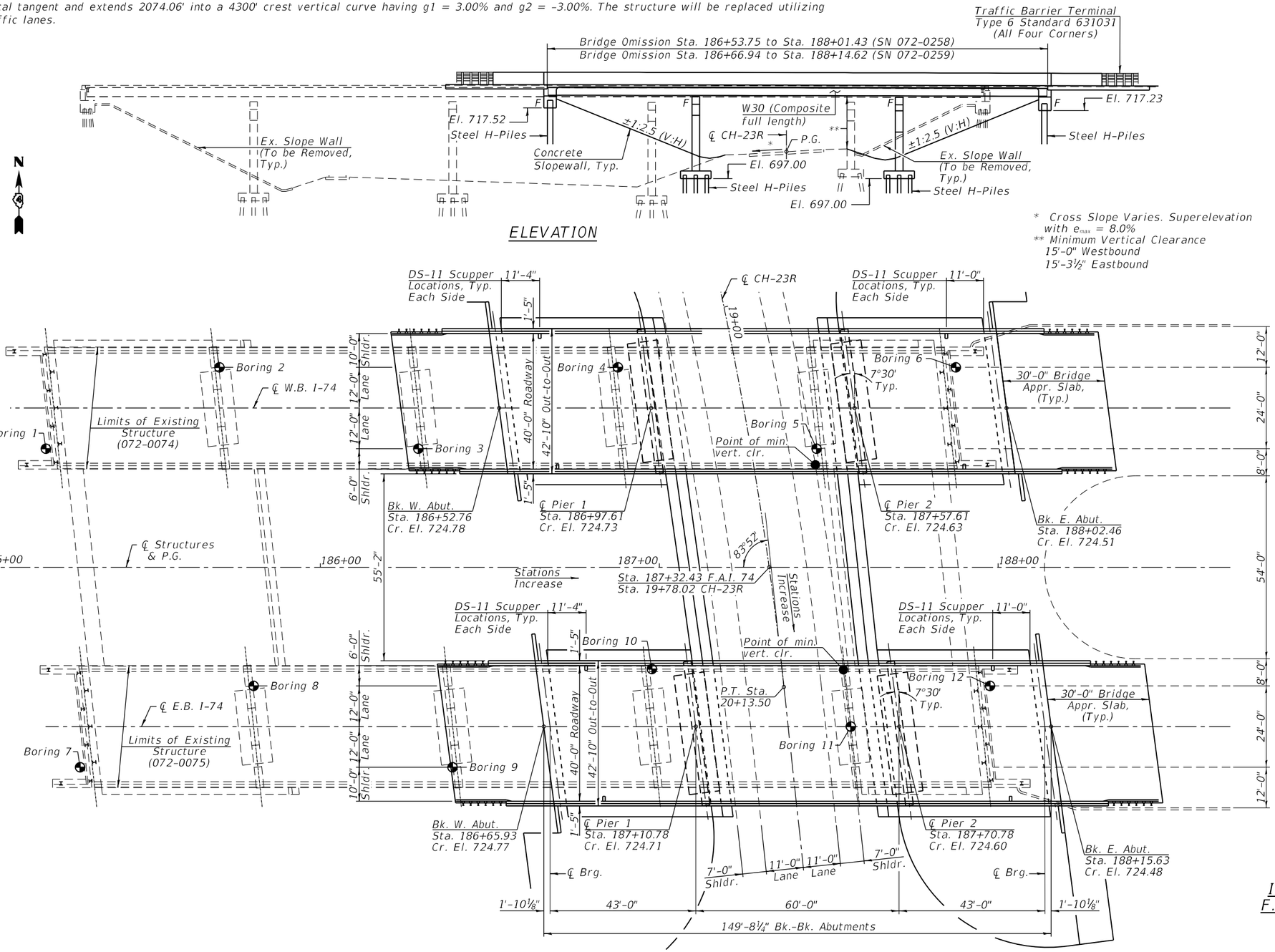
EXHIBIT C

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

Bench Mark: BM #2: Chiseled "□" on concrete fence corner foundation at northwest corner of weather station. Top of overpass at Sta. 188+00. Elevation – 722.643

Existing Structure: Structure Numbers 027-0074 (W.B.) and 072-0075 (E.B.) were originally constructed along FAI Route 74 under Section 72-3HVB in 1968 as a five span reinforced concrete deck/steel beam superstructure with pile bent abutments supported by two rows of steel piles and reinforced concrete hammerhead piers founded on pile supported footings. In 2002-2203 the decks, expansion joints, slopewalls, and floor drains were replaced. The face-face of parapets width is 32'-6" and the out-out deck width is 36'-0". Both structures are 268'-6" back-back abutments with a 6°-08' right forward skew to the local tangent and extends 2074.06' into a 4300' crest vertical curve having g1 = 3.00% and g2 = -3.00%. The structure will be replaced utilizing cross over traffic lanes.

No salvage.



LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition.

DESIGN STRESSES

FIELD UNITS

f'_c = 3,500 psi
f'_c = 4,000 psi (Superstructure Concrete)
f_y = 60,000 psi (Reinforcement)
*f_y = 50,000 psi (M270 Grade 50)
*All new structural steel shall be galvanized

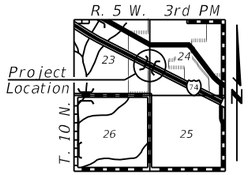
SEISMIC DATA

Seismic Performance Zone (SPZ) =
Design Spectral Acceleration at 1.0 sec. (SD1) =
Design Spectral Acceleration at 0.2 sec. (SDS) =
Soil Site Class =

HIGHWAY CLASSIFICATION

F.A.I. Route 74 – (I-74)
Functional Class: Interstate
ADT: 17200 (2021); 16780 (2032)
ADTT: 4988 (2021); 4867 (2032)
DHV: 1720
Design Speed: 70 m.p.h.
Posted Speed; 70 m.p.h.
One-way traffic
Directional Dist.: 100

County Highway 23R
Functional Class: Minor Collector
ADT: 700 (2017); 584 (2032)
ADTT: 7 (2017); 6 (2032)
DHV: 70
Design Speed: 50 m.p.h.
Posted Speed; 50 m.p.h.
Two-way traffic
Directional Dist.: 50:50



LOCATION SKETCH

GENERAL PLAN & ELEVATION
I-74 OVER CH-23R & C.B.&Q. RAILROAD
F.A.I. ROUTE 74 - SEC. 72-(3RS-3;4RS-2)
PEORIA COUNTY
STA. 187+32.43
STRUCTURE NO. 072-0258 (W.B.)
STRUCTURE NO. 072-0259 (E.B.)

Veenstra & Kimm, Inc.
IL Design Firm License No. 184.001939

USER NAME = _____	DESIGNED - K. Smith	REVISED - _____	
	CHECKED - ---	REVISED - _____	
PLOT SCALE = _____	DRAWN - ---	REVISED - _____	
PLOT DATE = 12/15/2021	CHECKED - ---	REVISED - _____	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GENERAL PLAN & ELEVATION
STRUCTURE NO. 072-0258 (W.B.) & 072-0259 (E.B.)
SHEET 1 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
74	72-(3RS-3;4RS-2)	PEORIA	2	1
		CONTRACT NO. _____		
		ILLINOIS	FED. AID PROJECT	

MODEL: 001
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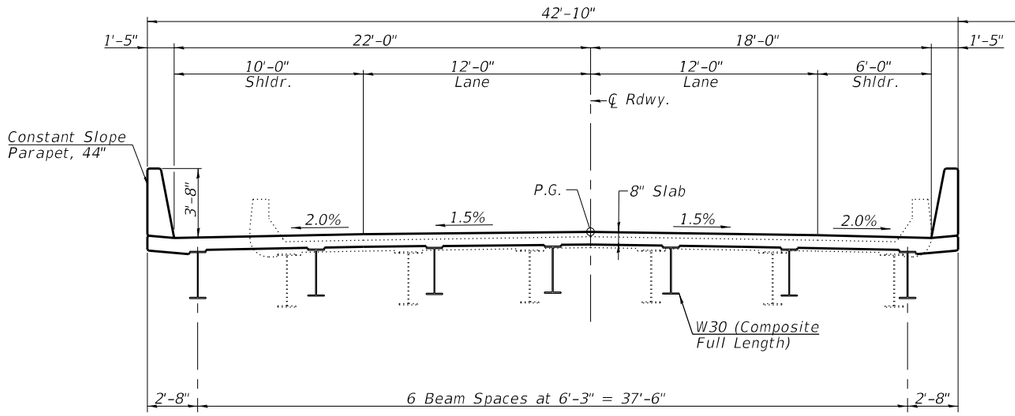
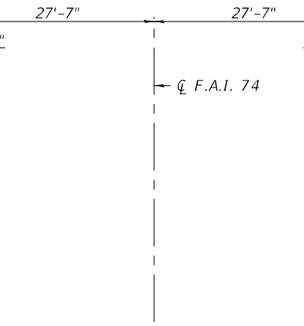
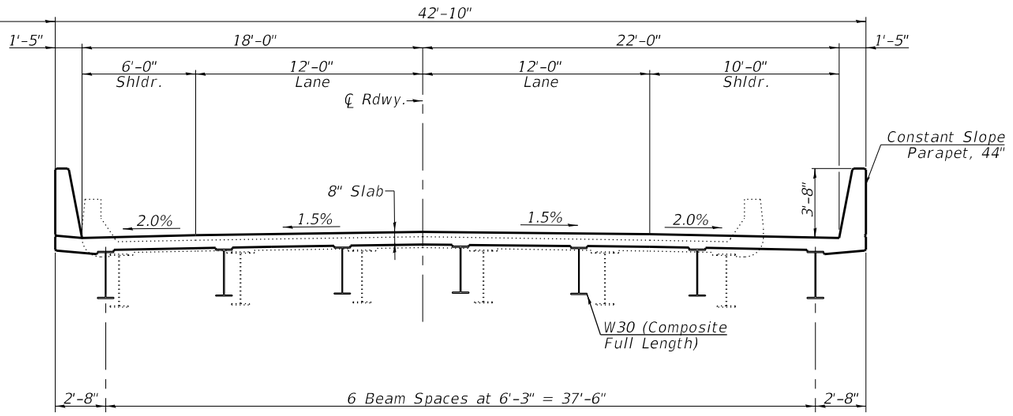
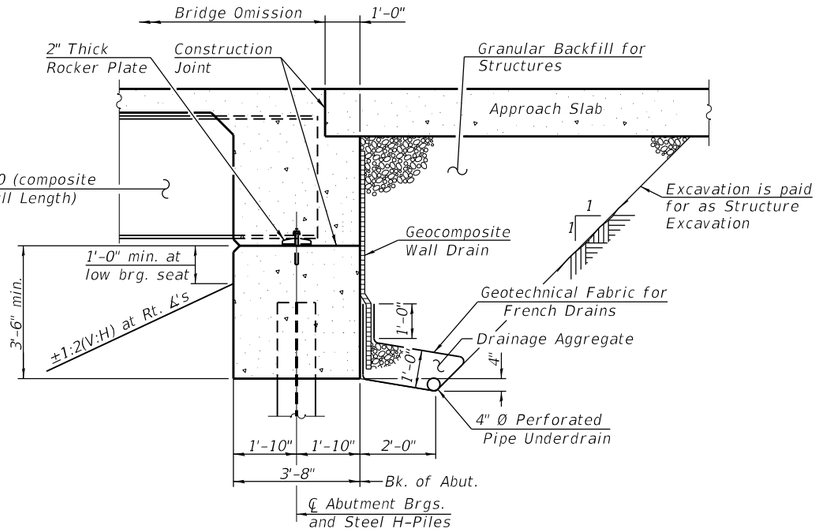
12/15/2021 9:14:30 AM

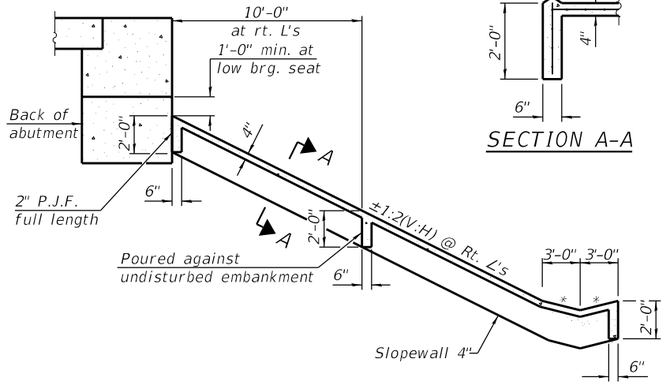








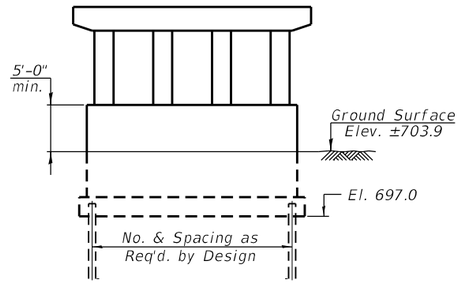
SECTION THRU INTEGRAL ABUTMENT
(Horiz. dim. @ Rt. L's)



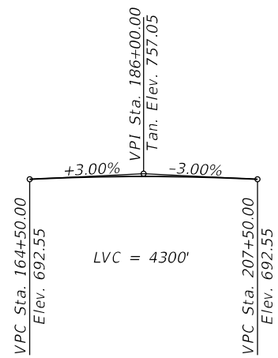
SECTION THRU
CONCRETE SLOPEWALL

*1:6 (V:H)

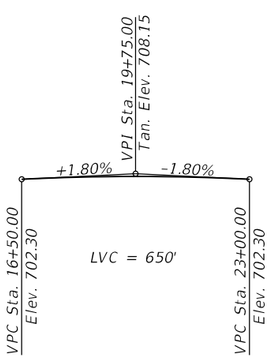
SECTION A-A



PIER SKETCH



PROFILE GRADE
(Along ℄ F.A.I. 74)



PROFILE GRADE
(Along ℄ CH-23)

V&K Veenstra & Kimm, Inc. IL Design Firm License No. 184.001939	USER NAME = ----------	DESIGNED - K. Smith	REVISED - ----------	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
		CHECKED - ---	REVISED - ----------	
	PLOT SCALE = ----------	DRAWN - ---	REVISED - ----------	
	PLOT DATE = 12/15/2021	CHECKED - ---	REVISED - ----------	

DETAILS
STRUCTURE NO. 072-0258 (W.B.) & 072-0259 (E.B.)
SHEET 2 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
74	72-(3RS-3;4RS-2)	PEORIA	2	2
		CONTRACT NO. ____		
		ILLINOIS	FED. AID PROJECT	

EXHBIT D

BORING LOGS

Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 10/25/21

ROUTE FAI 74 **DESCRIPTION** I-74 Over CH R23 and Abandoned Railroad **LOGGED BY** KEG

SECTION 72-(3RS-3;4RS-2) **LOCATION** Brimfield, IL

COUNTY Peoria **DRILLING METHOD** HSA **HAMMER TYPE** Auto

STRUCT. NO. 072-0074/0075
Station

BORING NO. SB-01
Station
Offset
Ground Surface Elev. 697.07 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 683.6 ft ▼
Upon Completion 677.1 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
696.3				TOPSOIL-Black w/ Roots and Organic Material
	2			SILTY CLAY-Black, Soft to Medium-Stiff
	3	0.2	28	
	4	B		
693.1	3			
	2	0.3	34	CLAY LOAM-Brown and Gray, Soft to Medium-Stiff
-5	3	B		
	2			
	3	0.4	24	
	3	B		
	N/A			Shelby Tube (8.0-10.0) 16" Recovery
	N/A	0.8		
	N/A	P		
-10				
	5			
	3	0.4	25	
	4	B		
683.6 ▼				
	3			SILTY CLAY-Brown, Soft to Medium-Stiff, Wet
	3	0.9	27	
-15	3	B		
681.1				
	4			CLAY-Brown and Gray, Stiff
	5	1.5	25	
	7	B		
678.6				
	4			SILTY CLAY-Brown, Medium-Stiff, w/ Trace Gravels
	3	0.8	25	
677.1 ▽ -20	6	B		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SILTY CLAY-Brown, Very Stiff to Hard, w/ Gravels and Shale Fragments
	10			
	13	3.9	14	
	25	B		
673.6				
	10			CLAYEY SHALE-Brown and Gray, Hard, w/ Shale and Sandstone Fragments
	35	1.9	15	
-25	23	S		
671.1				
	15			SHALE-Gray, Hard
	23	3.3	19	
	44	S		
	20			
	30	1.0	17	
667.1 -30	50/5"	S		
				End of Boring
-35				
-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 10/26/21

ROUTE FAI 74 **DESCRIPTION** I-74 Over CH R23 and Abandoned Railroad **LOGGED BY** KEG

SECTION 72-(3RS-3;4RS-2) **LOCATION** Brimfield, IL

COUNTY Peoria **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** Auto

STRUCT. NO. 072-0074/0075
Station

BORING NO. SB-02
Station
Offset
Ground Surface Elev. 695.99 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 690.0 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				TOPSOIL-Black, w/ Roots and Organic Material
695.0				
	3			SILTY CLAY-Brown and Black, Stiff to Very Stiff
	5	2.1	28	
	5	B		
692.5				
	2			CLAY LOAM-Brown and Gray, Soft to Medium-Stiff
	3	0.4	24	
-5	2	B		
				Becomes Wet
	3			
	4	1.1	23	
	5	B		
	3			
	3	1.1	26	
-10	4	B		
	1			
	2	0.4	29	
	2	B		
	2			
	3	0.9	27	
-15	4	B		
680.0				
	4			SILTY CLAY-Brown and Gray, Stiff, w/ Gravel Fragments
	4	1.3	24	
	5	B		
	3			
	4	1.4	21	
676.0	7	B		
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SILTY CLAY-Brown and Gray, Very Stiff to Hard, w/ Shale and Sandstone Fragments
	17			
	18	0.7	18	
	19	S		
	12			
	14	2.8	18	
-25	20	S		
670.0				
	15			SHALE-Gray, Very Stiff to Hard
	34	4.2	16	
	47	S		
	18			
	28	3.7	15	
666.0	33	S		
-30				
				Borehole continued with rock coring.
-35				
-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

ROCK CORE LOG

Date 10/26/21

ROUTE FAI 74 **DESCRIPTION** I-74 Over CH R23 and Abandoned Railroad **LOGGED BY** KEG

SECTION 72-(3RS-3;4RS-2) **LOCATION** Brimfield, IL

COUNTY Peoria **CORING METHOD** Rotary Diamond Bit

STRUCT. NO. 072-0074/0075 **CORING BARREL TYPE & SIZE** NX (5')
Station

Core Diameter 2 in
Top of Rock Elev. 665.99 ft
Begin Core Elev. 665.99 ft

BORING NO. SB-02
Station
Offset
Ground Surface Elev. 695.99 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
SHALE-Gray, Thin Bedding, Highly Weathered, Aphanitic	665.99	1	84	84	4	2.4
LIMESTONE-Gray, Thin Bedding, Highly Weathered, Very Finely Crystalline, Hard	664.99					
COAL SEAM-Black, Highly Weathered, Fractured	663.99					
CORE LOSS (9.5")	662.49					
COAL SEAM-Black, Highly Weathered, Fractured	661.69					
	-35	2	88	0	2.5	
CORE LOSS (4")	659.29 / 658.99					
COAL SEAM-Black, Highly Weathered, Fractured						
CORE LOSS (3")	657.24 / 656.99					
COAL SEAM-Black, Highly-Weathered, Fractured						
	-40	3	95	52	5	
CORE LOSS (3")	655.32 / 655.07					
SHALE-Gray, Thin Bedding, Highly Weathered, Aphanitic, w/ Some Fractures						
	650.99 -45					
End of Boring						
	-50					

Color pictures of the cores Yes
Cores will be stored for examination until Yes
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 10/28/21

ROUTE FAI 74 **DESCRIPTION** I-74 Over CH R23 and Abandoned Railroad **LOGGED BY** KEG

SECTION 72-(3RS-3;4RS-2) **LOCATION** Brimfield, IL

COUNTY Peoria **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** Auto

STRUCT. NO. 072-0074/0075
Station

BORING NO. SB-03
Station
Offset
Ground Surface Elev. 724.89 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				ASPHALT (14")
723.7				
	2			SILTY CLAY-Black and Brown, Medium-Stiff, w/ Trace Gravel
	3 4	0.5 P	20	
721.4				
	4			SILTY CLAY FILL-Black and Gray, Stiff to Very Stiff
	6 7	1.3 B	23	
-5				
	4			
	6 9	1.6 B	22	
	N/A			Shelby Tube (8.0-10.0) 10" Recovery
	N/A N/A	N/A		
-10				
	4			
	6 7	2.3 P	24	
711.4				
	3			SILTY CLAY-Brown and Gray, Medium-Stiff to Stiff
	3 4	0.8 B	23	
-15				
	4			
	7 7	1.2 B	24	
	4			Becomes Very Stiff w/ Trace Coal Fragments
	7 10	2.5 P	24	
704.9				
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SILTY CLAY-Brown and Gray, Stiff to Very Stiff, w/ Trace Gravels and Shale Fragments
	4			
	6 9	2.3 P	22	
	7			
	9 12	1.5 B	21	
-25				
	7			
	11 13	2.2 B	19	
	7			
	9 13	3.3 B	19	
-30				
691.4				
	3			CLAY LOAM-Brown and Gray, Medium-Stiff to Stiff
	3 4	0.7 B	25	
-35				
	4			
	3 4	1.0 P		
-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 10/28/21

ROUTE FAI 74 **DESCRIPTION** I-74 Over CH R23 and Abandoned Railroad **LOGGED BY** KEG

SECTION 72-(3RS-3;4RS-2) **LOCATION** Brimfield, IL

COUNTY Peoria **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** Auto

STRUCT. NO. 072-0074/0075
Station

BORING NO. SB-03
Station
Offset
Ground Surface Elev. 724.89 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CLAY LOAM-Brown and Gray, Medium-Stiff to Stiff *(continued)*
	N/A			Shelby tube (43.0-45.0) 24" Recovery
	N/A N/A	1.0 P	33	
-45				
675.9	6			
	24 37	3.0 P	17	SILTY CLAY-Brown and Gray, Very Stiff, w/ Fine Sand Grains and Shale Fragments
-50				
671.4				
	16			SHALE-Gray, Very Stiff to Hard
	32 50/6"	>4.5 P	17	
-55				
				Begin MSPT Sample
-60		1.9 S	18	
				SHALE-Gray, Very Stiff to Hard *(continued)*
660.4				
-65				COAL SEAM-Black, Brittle
			17	
				Shale Fragments
654.9			43	
-70				
				End of Boring
-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

Modified SPT Log

Route: FAI 74 Structure No.: 72-074/75 (Exist.) (Prop.) Date: 10/28/21 Page: 1 of 1

Section: 72-(3RS-3;4RS-2) Description: I-74 Over CH R23 and Abandoned

County: Peoria Logged by: KEG Sampler Tube Length: 30 in.

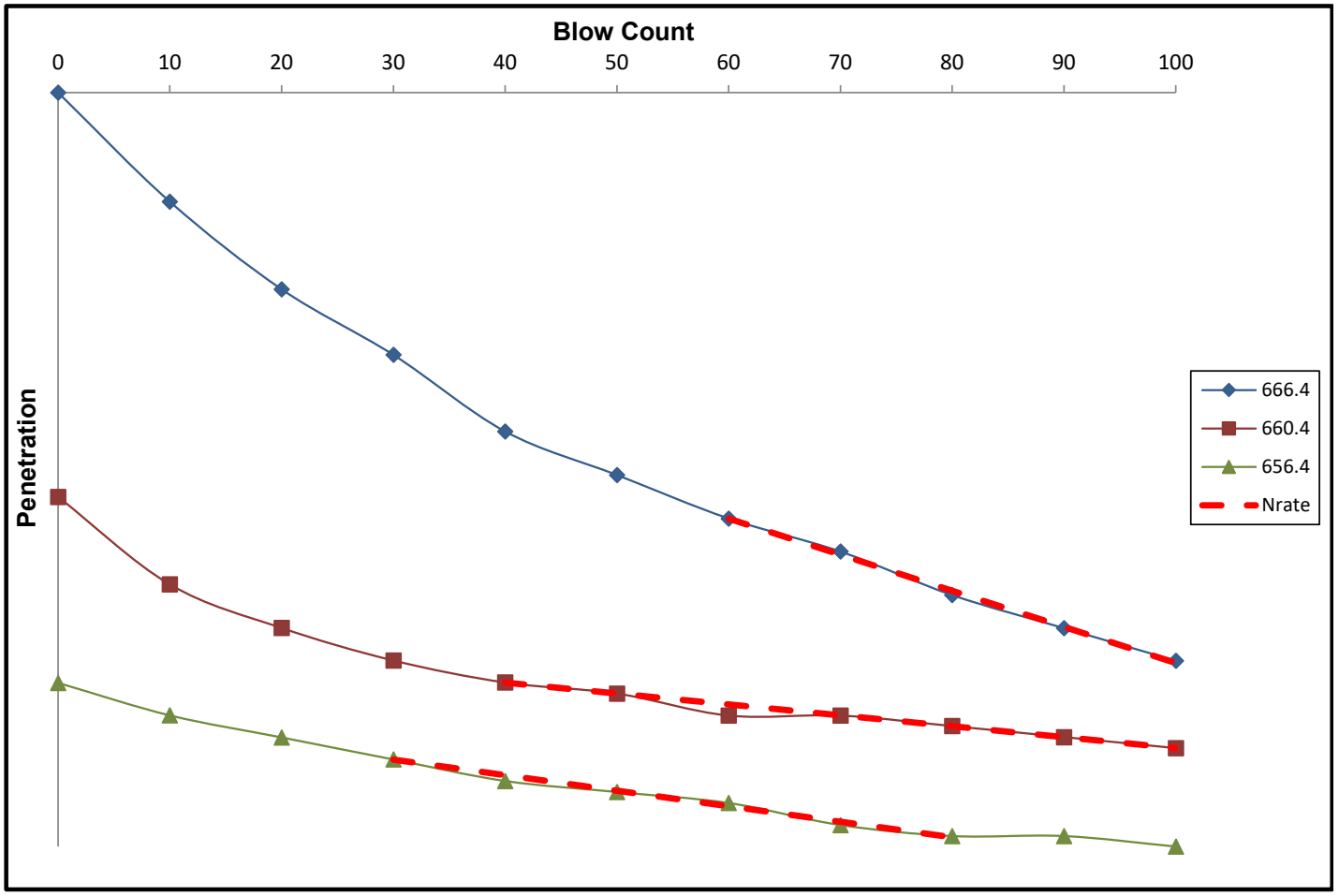
Boring No.: SB-03 Station: Offset: Latitude: 40.835071 Longitude: -89.889091

Drill Rig: Dietrich D50 Hammer Type: Auto Hammer Efficiency (%): 70 Surface Elevation: 724.89

Borehole Diameter. (in.) 2.5 to 4.5 Split-barrel Sampler Description: 1.375-in. I.D.

Measured Rod Length (ft)	Blows where exposed rod length is measured (blows)											$N_{rate,90}$ (bpf)	q_u (ksf)	Young's Modulus (ksi)
Test Elevation	0	10	20	30	40	50	60	70	80	90	100			
666.39	2	1.792	1.625	1.5	1.354	1.271	***1.19***	***1.13***	***1.04***	***0.98***	***0.92***	113.0	10.9	2.51
660.39	2	1.833	1.75	1.688	***1.65***	***1.625***	1.583	***1.58***	***1.56***	***1.54***	***1.52***	374.0	35.9	8.34
656.39	2	1.938	1.896	***1.85***	1.813	***1.792***	***1.77***	***1.73***	***1.71***	1.708	1.688	262.7	25.2	5.64

Note: "***Values***" indicates data used to calculate $N_{rate,90}$.



Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 10/25/21

ROUTE FAI 74 **DESCRIPTION** I-74 Over CH R23 and Abandoned Railroad **LOGGED BY** KEG

SECTION 72-(3RS-3;4RS-2) **LOCATION** Brimfield, IL

COUNTY Peoria **DRILLING METHOD** HSA **HAMMER TYPE** Auto

STRUCT. NO. 072-0074/0075
Station

BORING NO. SB-04
Station
Offset
Ground Surface Elev. 698.17 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 677.2 ft ▼
Upon Completion 678.2 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
TOPSOIL-Black w/ Roots and Organic Material 697.2			
SILTY CLAY-Brown, Stiff	4		
	4 5	1.3 P	32
694.7			
CLAY LOAM-Brown and Gray, Medium-Stiff to Stiff	3		
	3 3	0.5 P	30
-5			
	3		
	3 4	0.6 B	21
	4		
	5 6	1.0 B	21
-10			
	4		
	3 3	0.5 B	22
684.7			
CLAY LOAM-Brown and Gray, Soft to Medium-Stiff, w/ Trace Sand	4		
	4 4	0.4 B	28
-15			
	3		
681.7			
SILTY CLAY-Brown and Gray, Stiff	3 5	0.9 B	26
	2		
	4 6	1.1 B	25
▽ -20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY-Brown and Gray, Stiff *(continued)* 677.2 ▼			
	5		
SILTY CLAY-Brown, Stiff, w/ Fine Sand and Gravels, Wet	9 10	1.3 B	20
	10		
674.2			
CLAY-Gray, Very Stiff to Hard, w/ Shale Fragmetns	12 26	2.1 S	18
-25			
	8		
671.7			
SHALE-Gray, Hard	26 44	4.2 S	15
	16		
	15 50/5.5"	>4.5 P	20
-30			
664.5			
	50/2"		
Split-Spoon Refusal on Limestone	- -	>4.5 P	16
-35			
End of Boring			
-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 10/26/21

ROUTE FAI 74 **DESCRIPTION** I-74 Over CH R23 and Abandoned Railroad **LOGGED BY** KEG

SECTION 72-(3RS-3;4RS-2) **LOCATION** Brimfield, IL

COUNTY Peoria **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** Auto

STRUCT. NO. 072-0074/0075
Station

BORING NO. SB-05
Station
Offset
Ground Surface Elev. 699.21 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 693.2 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				TOPSOIL-Black, w/ Roots and Organic Material
698.2				
	3			SILTY CLAY-Black and Brown, Stiff
	4	1.8	32	
	5	B		
695.7				
	2			CLAY-Brown and Gray, Medium Stiff to Stiff
	3	0.5	29	
-5	3	B		
▼				
	N/A			Becomes Wet
	N/A	-		
	N/A			
	3			
	3	1.3	23	
-10	4	B		
	2			Becomes Soft to Medium-Stiff
	2	0.6	26	
	2	B		
	WH			
	WH	0.9	28	
-15	3	B		
	5			
682.7				
	5	1.7	25	SILTY CLAY-Brown and Gray, Stiff, w/ Trace Sands and Gravels
	7	B		
	4			
	5	1.8	25	
679.2	7	B		
-20				
	13			SILTY CLAY-Brown and Gray, Very Stiff to Hard, w/ Shale and Sandstone Fragments
	24	3.1	11	
	28	S		
	20			
	24	2.0	24	
-25	38	P		
673.2				
	23			SHALE-Gray, Hard
	31	4.6	17	
	32	S		
				Begin MSPT Sample
		>4.5	22	
-30		P		
665.7				
				LIMESTONE
664.7				
-35				SHALE-Gray, Hard, w/ Coal Fragments
		4.4	17	
		B		
660.7				
				COAL-Black, Brittle
		0.5	51	
659.2		B		
-40				

End of Boring

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

Modified SPT Log

Route: FAI 74 Structure No.: 72-074/75 (Exist.) (Prop.) Date: 10/26/21 Page: 1 of 1

Section: 72-(3RS-3;4RS-2) Description: I-74 Over CH R23 and Abandoned Railroad

County: Peoria Logged by: KEG Sampler Tube Length: 30 in.

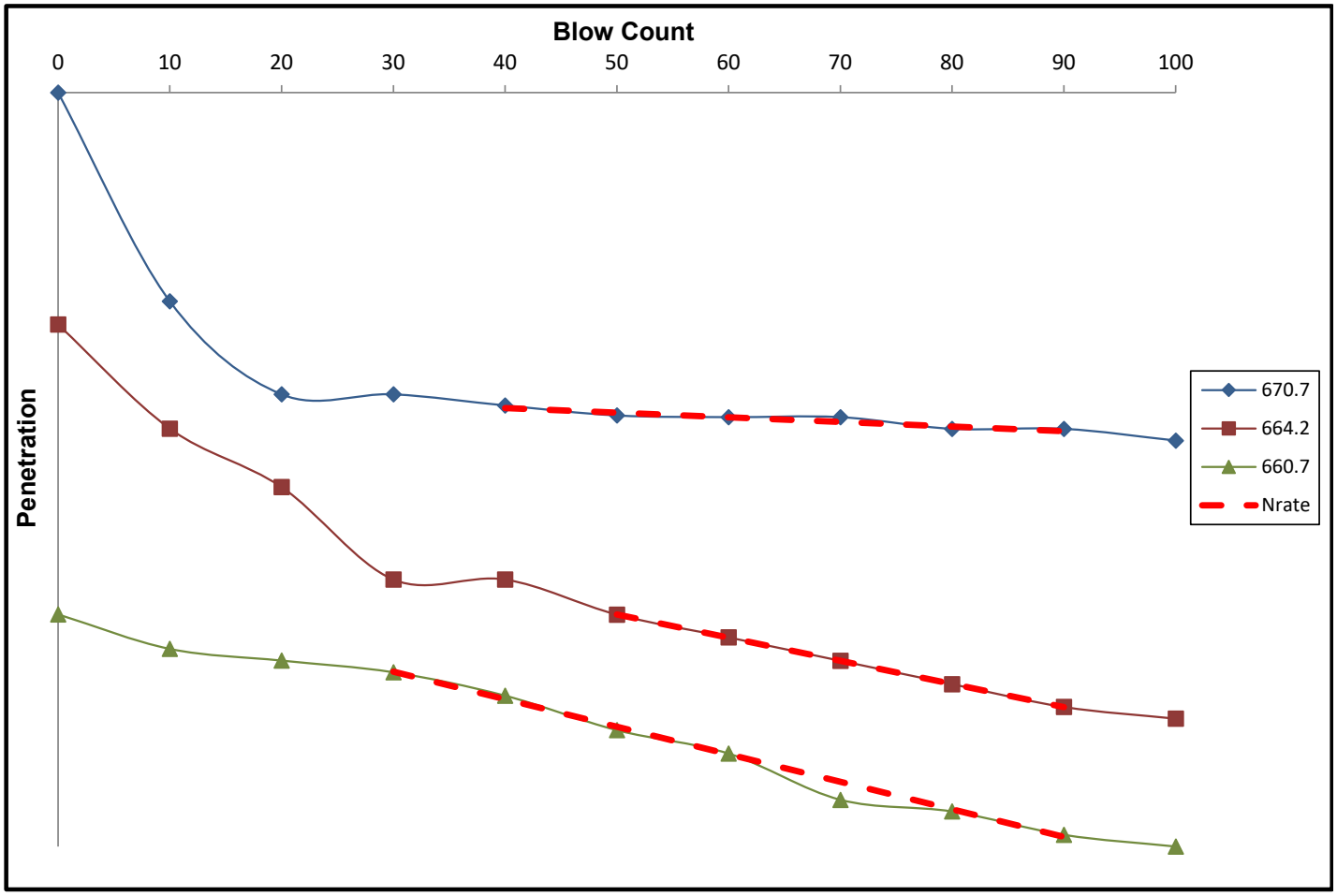
Boring No.: SB-05 Station: Offset: Latitude: 40.834915 Longitude: -89.889791

Drill Rig: Dietrich D50 Hammer Type: Auto Hammer Efficiency (%): 70 Surface Elevation: 699.21

Borehole Diameter. (in.) 2.5 to 4.5 Split-barrel Sampler Description: 1.375-in. I.D.

Measured Rod Length (ft)	Blows where exposed rod length is measured (blows)											$N_{rate,90}$ (bpf)	q_u (ksf)	Young's Modulus (ksi)
Test Elevation	0	10	20	30	40	50	60	70	80	90	100			
670.71	2	1.625	1.458	1.458	***1.44***	***1.42***	***1.42***	1.417	***1.4***	***1.4***	1.375	936.8	89.9	28.03
664.21	2	1.813	1.708	1.542	1.542	***1.479***	***1.44***	***1.4***	***1.35***	***1.31***	1.292	187.0	17.9	4.00
660.71	2	1.938	1.917	***1.9***	***1.85***	***1.792***	***1.75***	1.667	***1.65***	***1.6***	1.583	157.3	15.1	3.40

Note: "***Values***" indicates data used to calculate $N_{rate,90}$.



Illinois Department of Transportation
Division of Highways

SOIL BORING LOG

Date 10/27/21

ROUTE FAI 74 **DESCRIPTION** I-74 Over CH R23 and Abandoned Railroad **LOGGED BY** KEG

SECTION 72-(3RS-3;4RS-2) **LOCATION** Brimfield, IL

COUNTY Peoria **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** Auto

STRUCT. NO. 072-0074/0075
Station

BORING NO. SB-06
Station
Offset
Ground Surface Elev. 723.94 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
722.9				ASPHALT
	2			SILTY CLAY FILL-Brown and Gray, Stiff
	3 4	1.3 P	20	
	3			
	5 7	1.8 P	16	Gravel and Sandstone Fragments
-5				
717.9				
	9			SILTY CLAY FILL-Brown and Gray, Very Stiff, w/ Gravels
	9 10	2.1 S	16	
	5			
	6 9	3.7 S	23	
-10				
712.9				
	3			SILTY CLAY-Brown and Gray, Stiff to Very Stiff, w/ Trace Gravels
	6 7	2.8 S	28	
	3			
	5 5	1.0 P	20	
-15				
	4			
	5 8	3.1 B	24	
	4			
	5 7	1.5 P	24	
703.9	-20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	6			SILTY CLAY-Brown and Gray, Stiff to Very Stiff, w/ Sandstone and Coal Fragments
	5 9	3.7 B	14	
	4			
	5 7	1.8 P	21	
-25				
697.9				
	5			SILTY CLAY-Brown and Gray, Very Stiff, w/ Trace Gravels
	8 10	2.8 B	31	
	7			
694.9				
	16 50/4"	3.3 P	12	SILTY CLAY-Brown and Black, Very Stiff, w/ Shale Fragments
-30				
690.4				
	4			CLAY LOAM-Brown and Gray, Medium-Stiff to Stiff
	4 5	1.7 B	28	
-35				
	N/A			Shelby Tube (38.0-40.0) 24" Recovery
	N/A N/A	0.5 P	27	
683.9	-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 10/27/21

ROUTE FAI 74 **DESCRIPTION** I-74 Over CH R23 and Abandoned Railroad **LOGGED BY** KEG

SECTION 72-(3RS-3;4RS-2) **LOCATION** Brimfield, IL

COUNTY Peoria **DRILLING METHOD** MUD ROTARY **HAMMER TYPE** Auto

STRUCT. NO. 072-0074/0075
Station

BORING NO. SB-06
Station
Offset
Ground Surface Elev. 723.94 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SILTY CLAY LOAM-Brown and Gray, Medium-Stiff to Stiff			
	3		
-45	3 5	1.3 B	26
	5		
674.4			
	8 11	1.9 B	26
-50 SILTY CLAY LOAM-Brown and Gray, Stiff to Very Stiff, w/ Trace Sands			
670.4			
CLAYEY SHALE-Gray, Hard	19		
	29 50/5.75"	4.6 B	18
-55			
665.4			
SHALE-Gray, Hard (Begin MSPT Sample)		4.8 S	16
-60			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SHALE-Gray, Hard (Begin MSPT Sample) *(continued)*			
-65		>4.5 P	14
655.4			
COAL SEAM-Black, Brittle		1.5 P	20
653.9 -70			
End of Boring			
-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

Modified SPT Log

Route: FAI 74 Structure No.: 72-074/75 (Exist.) (Prop.) Date: 10/26/21 Page: 1 of 1

Section: 72-(3RS-3;4RS-2) Description: I-74 Over CH R23 and Abandoned Railroad

County: Peoria Logged by: KEG Sampler Tube Length: 30 in.

Boring No.: SB-06 Station: Offset: Latitude: 40.334759 Longitude: -89.889248

Drill Rig: Dietrich D50 Hammer Type: Auto Hammer Efficiency (%): 70 Surface Elevation: 723.94

Borehole Diameter. (in.) 2.5 to 4.5 Split-barrel Sampler Description: 1.375-in. I.D.

Measured Rod Length (ft)	Blows where exposed rod length is measured (blows)											$N_{rate,90}$ (bpf)	q_u (ksf)	Young's Modulus (ksi)
Test Elevation	0	10	20	30	40	50	60	70	80	90	100			
665.44	2	1.833	1.729	1.625	1.521	***1.438***	***1.38***	1.292	***1.23***	***1.17***	***1.1***	114.9	11.0	2.53
660.44	2	1.833	1.667	1.521	1.375	1.208	***1.1***	***1***	***0.96***	***0.92***	***0.85***	133.4	12.8	2.91
655.44	2	1.896	1.854	1.792	1.75	***1.708***	***1.69***	***1.67***	***1.65***	1.65	***1.63***	466.8	44.8	10.91

Note: "***Values***" indicates data used to calculate $N_{rate,90}$.

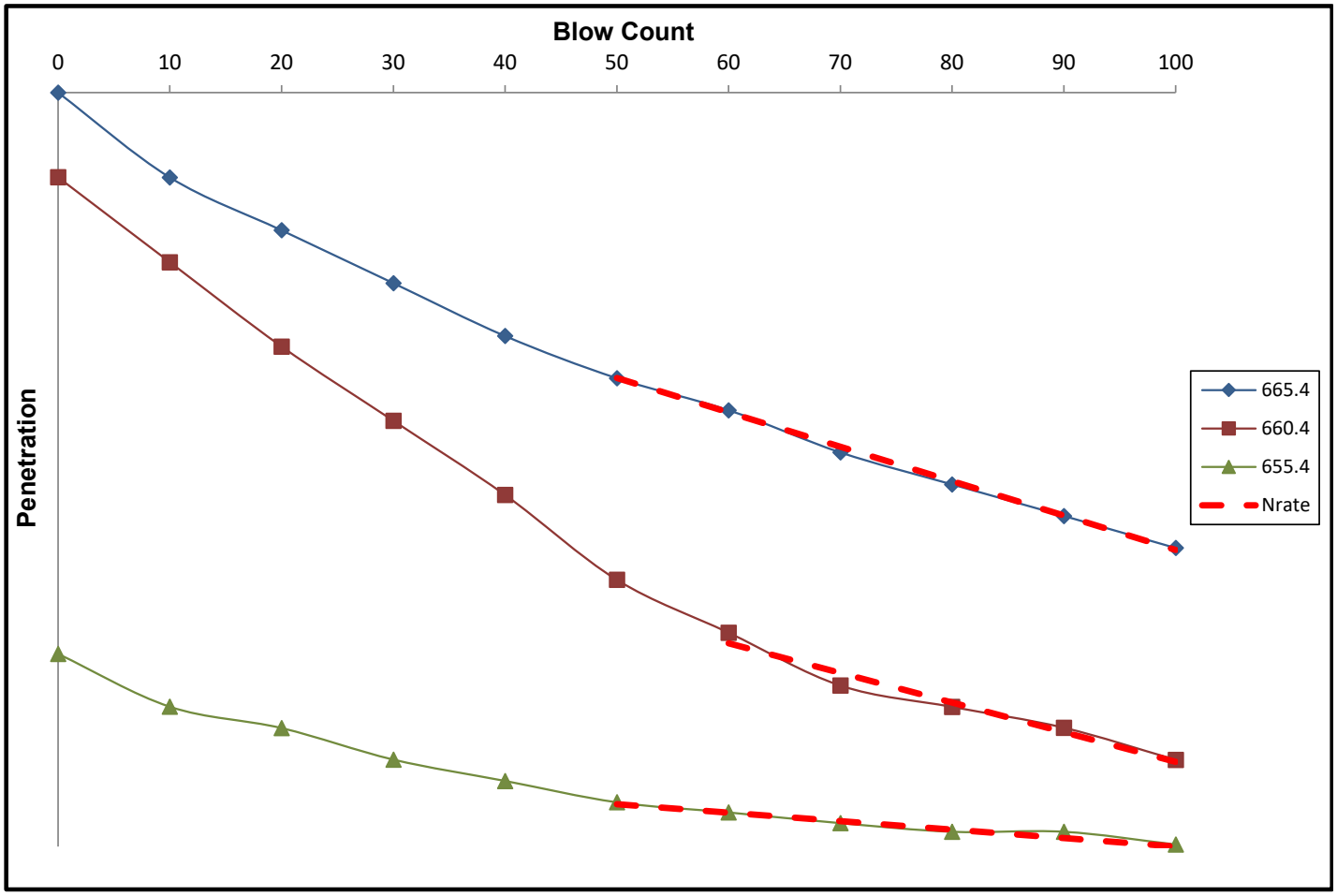


EXHIBIT E

SUBSURFACE PROFILE

Elevation (ft)

730
720
710
700
690
680
670
660
650

SB-01

N	Qu	w%	
			697.07 TOPSOIL-Black w/ Roots and Organic Material
7	0.2	28	SILTY CLAY-Black, Soft to Medium-Stiff
5	0.3	34	
6	0.4	24	CLAY LOAM-Brown and Gray, Soft to Medium-Stiff
N/A	0.8		
7	0.4	25	
6	0.9	27	SILTY CLAY-Brown, Soft to Medium-Stiff, Wet
12	1.5	25	CLAY-Brown and Gray, Stiff
9	0.8	25	SILTY CLAY-Brown, Medium-Stiff, w/ Trace Gravels
38	3.9	14	SILTY CLAY-Brown, Very Stiff to Hard, w/ Gravels and Shale Fragments
58	1.9	15	CLAYEY SHALE-Brown and Gray, Hard, w/ Shale and Sandstone Fragments
67	3.3	19	SHALE-Gray, Hard
50/5"	1.0	17	667.1

SB-02

N	Qu	w%	
			695.99 TOPSOIL-Black, w/ Roots and Organic Material
10	2.1	28	SILTY CLAY-Brown and Black, Stiff to Very Stiff
5	0.4	24	
9	1.1	23	
7	1.1	26	CLAY LOAM-Brown and Gray, Soft to Medium-Stiff
4	0.4	29	
7	0.9	27	
9	1.3	24	SILTY CLAY-Brown and Gray, Stiff, w/ Gravel Fragments
11	1.4	21	
37	0.7	18	SILTY CLAY-Brown and Gray, Very Stiff to Hard, w/ Shale and Sandstone
34	2.8	18	Fragments
81	4.2	16	SHALE-Gray, Very Stiff to Hard
61	3.7	15	SHALE-Gray, Thin Bedding, Highly Weathered, Aphanitic
			LIMESTONE-Gray, Thin Bedding, Highly Weathered, Very Finely Crystalline, Hard
			COAL SEAM-Black, Highly Weathered, Fractured
			CORE LOSS (9.5")
			COAL SEAM-Black, Highly Weathered, Fractured
			CORE LOSS (4")
			COAL SEAM-Black, Highly Weathered, Fractured
			CORE LOSS (3")
			COAL SEAM-Black, Highly-Weathered, Fractured
			CORE LOSS (3")
			SHALE-Gray, Thin Bedding, Highly Weathered, Aphanitic, w/ Some Fractures
			651.0

SB-03

N	Qu	w%	
			724.89 ASPHALT (14")
7	0.5	20	SILTY CLAY-Black and Brown, Medium-Stiff, w/ Trace Gravel
13	1.3	23	
15	1.6	22	SILTY CLAY FILL-Black and Gray, Stiff to Very Stiff
N/A	N/A		
13	2.3	24	
7	0.8	23	SILTY CLAY-Brown and Gray, Medium-Stiff to Stiff
14	1.2	24	
17	2.5	24	
15	2.3	22	
21	1.5	21	
24	2.2	19	SILTY CLAY-Brown and Gray, Stiff to Very Stiff, w/ Trace Gravels and Shale Fragments
22	3.3	19	
7	0.7	25	
7	1.0		CLAY LOAM-Brown and Gray, Medium-Stiff to Stiff
N/A	1.0	33	
61	3.0	17	SILTY CLAY-Brown and Gray, Very Stiff, w/ Fine Sand Grains and Shale Fragments
50/6"	>4.5	17	
1.9		18	SHALE-Gray, Very Stiff to Hard
17			COAL SEAM-Black, Brittle
43			654.9

PRINTERMOD2 11X17 21-1008.01 I-74 OVER CH R23.GPJ IL_DOT.GDT 2/8/22

Illinois Department of Transportation
Division of Highways

NOT TO HORIZONTAL SCALE

SUBSURFACE DATA PROFILE

Route: FAI 74
Section: 72-(3RS-3;4RS-2)
County: Peoria

Elevation (ft)

730
720
710
700
690
680
670
660
650

SB-04

N	Qu	w%	
			698.17 TOPSOIL-Black w/ Roots and Organic Material
9	1.3	32	SILTY CLAY-Brown, Stiff
P			
6	0.5	30	
P			
7	0.6	21	CLAY LOAM-Brown and Gray, Medium-Stiff to Stiff
B			
11	1.0	21	
B			
6	0.5	22	
B			
8	0.4	28	CLAY LOAM-Brown and Gray, Soft to Medium-Stiff, w/ Trace Sand
B			
8	0.9	26	
B			
10	1.1	25	SILTY CLAY-Brown and Gray, Stiff
B			
19	1.3	20	SILTY CLAY-Brown, Stiff, w/ Fine Sand and Gravels, Wet
B			
38	2.1	18	CLAY-Gray, Very Stiff to Hard, w/ Shale Fragmetns
S			
70	4.2	15	
S			
50/5.5"	>4.5	20	SHALE-Gray, Hard
P			
-	>4.5	16	663.2
P			

SB-05

N	Qu	w%	
			699.21 TOPSOIL-Black, w/ Roots and Organic Material
9	1.8	32	SILTY CLAY-Black and Brown, Stiff
B			
6	0.5	29	
B			
N/A	-		
7	1.3	23	CLAY-Brown and Gray, Medium Stiff to Stiff
B			
4	0.6	26	
B			
3	0.9	28	
B			
12	1.7	25	
B			
12	1.8	25	SILTY CLAY-Brown and Gray, Stiff, w/ Trace Sands and Gravels
B			
52	3.1	11	
S			
62	2.0	24	SILTY CLAY-Brown and Gray, Very Stiff to Hard, w/ Shale and Sandstone Fragments
P			
63	4.6	17	
S			
>4.5		22	SHALE-Gray, Hard
P			
			LIMESTONE
4.4		17	SHALE-Gray, Hard, w/ Coal Fragments
B			
0.5		51	COAL-Black, Brittle
B			659.2

SB-06

N	Qu	w%	
			723.94 ASPHALT
7	1.3	20	SILTY CLAY FILL-Brown and Gray, Stiff
P			
12	1.8	16	
P			
19	2.1	16	SILTY CLAY FILL-Brown and Gray, Very Stiff, w/ Gravels
S			
15	3.7	23	
S			
13	2.8	28	
S			
10	1.0	20	SILTY CLAY-Brown and Gray, Stiff to Very Stiff, w/ Trace Gravels
P			
13	3.1	24	
B			
12	1.5	24	
P			
14	3.7	14	SILTY CLAY-Brown and Gray, Stiff to Very Stiff, w/ Sandstone and Coal Fragments
B			
12	1.8	21	
P			
18	2.8	31	SILTY CLAY-Brown and Gray, Very Stiff, w/ Trace Gravels
B			
50/4"	3.3	12	
P			SILTY CLAY-Brown and Black, Very Stiff, w/ Shale Fragments
9	1.7	28	
B			CLAY LOAM-Brown and Gray, Medium-Stiff to Stiff
N/A	0.5	27	
P			
8	1.3	26	SILTY CLAY LOAM-Brown and Gray, Medium-Stiff to Stiff
B			
19	1.9	26	
B			SILTY CLAY LOAM-Brown and Gray, Stiff to Very Stiff, w/ Trace Sands
50/5.75"	4.6	18	
B			CLAYEY SHALE-Gray, Hard
4.8		16	
S			
>4.5		14	SHALE-Gray, Hard (Begin MSPT Sample)
P			
1.5		20	COAL SEAM-Black, Brittle
P			653.9

PRINTERMOD2 11X17 21-1008.01 I-74 OVER CH R23.GPJ IL_DOT.GDT 2/8/22

Illinois Department of Transportation
Division of Highways

NOT TO HORIZONTAL SCALE

SUBSURFACE DATA PROFILE

Route: FAI 74
Section: 72-(3RS-3;4RS-2)
County: Peoria

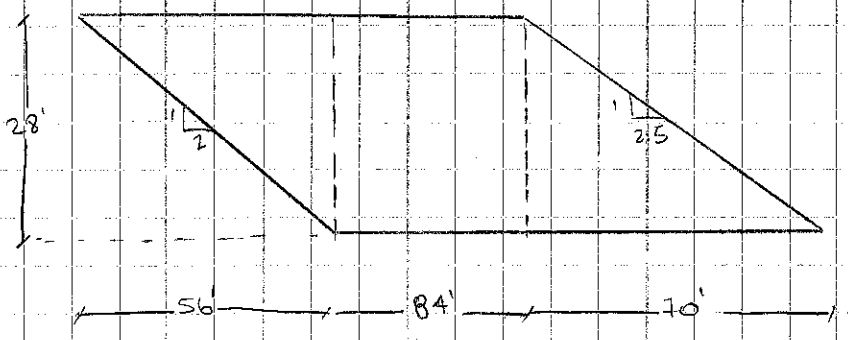
EXHIBIT F

SETTLEMENT CALCULATIONS

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: I-74 over CH 223 and A.R. Sheet: 1 of 2
Project Number: 21-1008.01
Calculated By: TG Date: 1/21/22
Checked By: MDM Date: 1/21/2022
Comments:

West Abutment Fill (Boring SB-05)

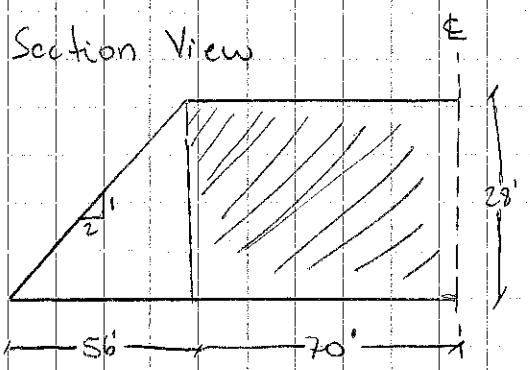


Profile View

$A = \frac{(140+154)28}{2} = 4116\ ft^2$

$V = A \cdot 70 = 288120\ ft^3$

Section View



$A = \frac{56 \times 28}{2} = 784\ ft^2$

$V = A \cdot 140 = 109760\ ft^3$

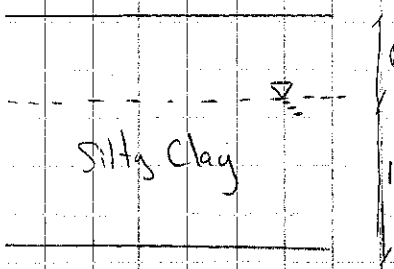
Approximate total Volumen: $397880\ ft^3$

$\gamma_{fill} = 125\ pcf$

$P = \gamma_{fill} \times V = 125 \times 397880 = 49735000\ lb$

For stress distribution Method 2:1, L = 126ft, B = 154 ft

Soft layer = 20 ft



Consolidation test Results (SB-05)

$e_o = 0.695$
$C_c = 0.091$
$C_s = 0.019$
$\gamma_{assumed} = 120\ pcf$

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: I-74 over CH R23 and ΔR8 Sheet: 2 of 2
Project Number: 21-1009.01
Calculated By: TG Date: 1/21/22
Checked By: MDM Date: 1/21/2022
Comments:

Layer	Δz(ft)	z(ft)	P_o(psf)	ΔP(psf)	P_o + ΔP(psf)	P_c(psf)	Case	S_e(in)
1	4	2	240	2490.74	2730.74	793	III	1.709
2	4	6	720	2354.88	3074.88	793	III	1.59
3	4	10	950.4	2229.87	3180.27	793	I	1.401
4	4	14	1180.8	2114.58	3295.38	793	I	1.191
5	4	18	1411.2	2008.03	3419.23	793	I	1.027

ΣS_e = 6.92 in

S_p = 6.92 in

Time Rate of consolidation

Without wick drains
C_v = 0.307 ft^2/day
H = 20 ft

	days	months	years
t_{50}	260.59	8.69	0.71
t_{90}	1081.43	36.05	2.96

With wick drains
$C_{v\,horizontal}$ = 0.614 ft^2/day
triangular Spacing = 5 ft
d_e = 1.05 (5) = 5.25 ft

	days	months	years
t_{50}	18	0.60	0.05
t_{90}	74.52	2.48	0.20

EXHIBIT G

SLOPE W SLOPE STABILITY ANALYSIS

Name: Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 2,200 psf
Phi': 0 °

Name: Silty Clay
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 2,500 psf
Phi': 0 °

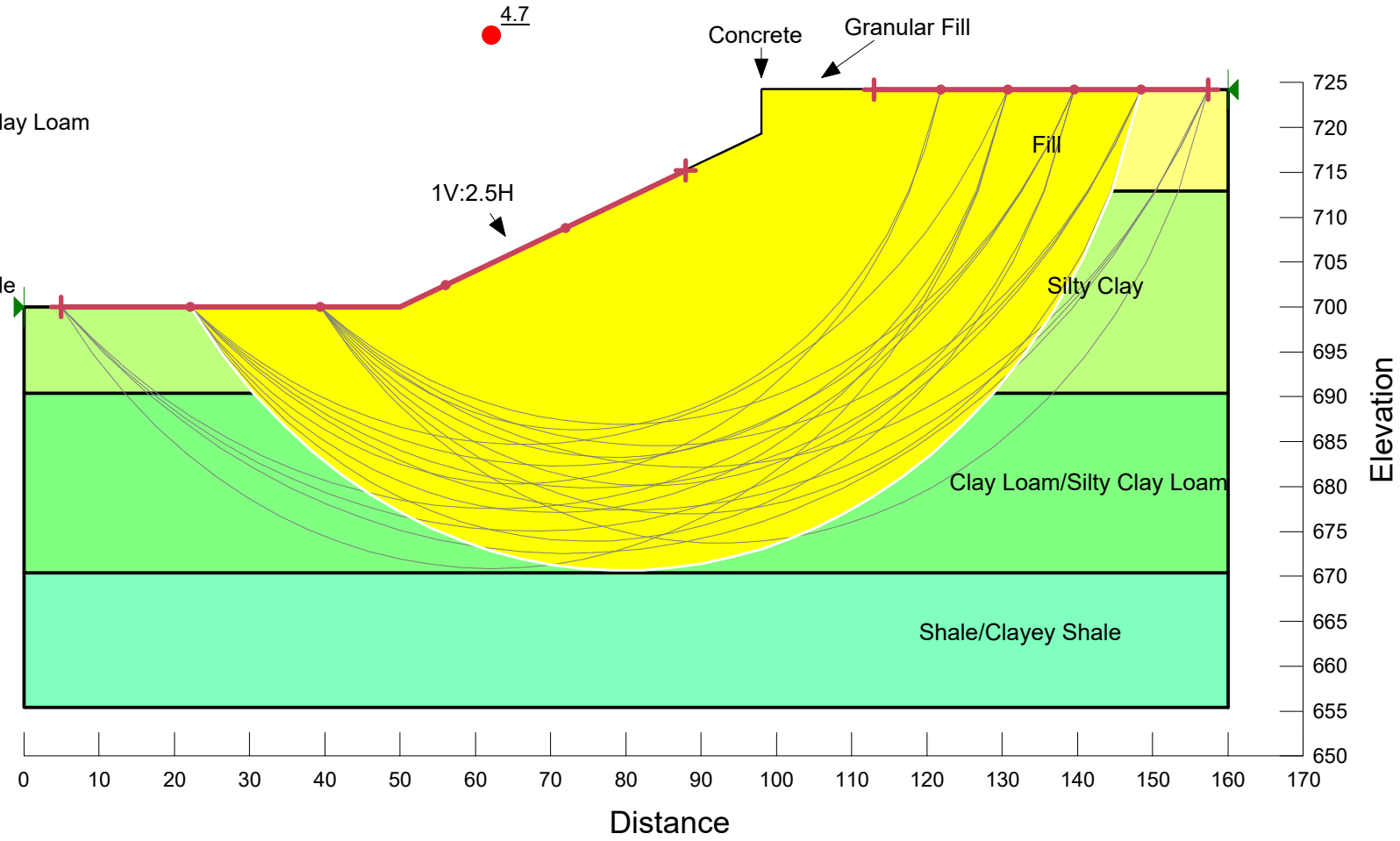
Name: Clay Loam/Silty Clay Loam
Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion': 2,300 psf
Phi': 0 °

Name: Shale/Clayey Shale
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 4,500 psf
Phi': 0 °

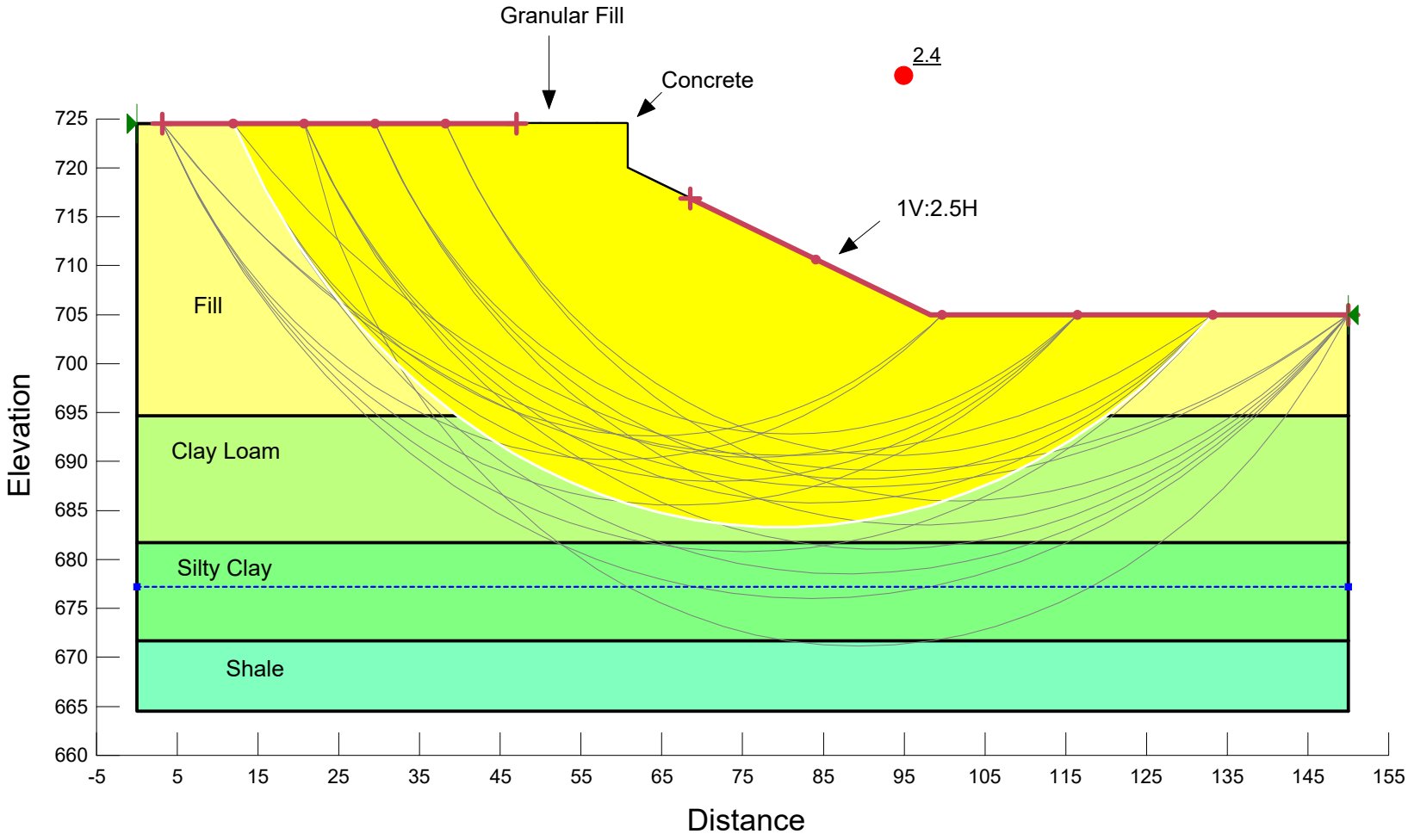
Name: Granular Fill
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,500 psf
Phi': 0 °

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 5,000 psf
Phi': 45 °

Eastbound I-74 Over CH R23
East Abutment (SB-06)
End-of-Construction (Undrained Analysis)



Eastbound I-74 Over CH R23
West Abutment (SB-04)
End-of-Construction (Undrained Analysis)



Name: Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 1,500 psf
Phi': 0 °

Name: Clay Loam
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 600 psf
Phi': 0 °

Name: Silty Clay
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,100 psf
Phi': 0 °

Name: Shale
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 4,200 psf
Phi': 0 °

Name: Granular Fill
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,500 psf
Phi': 0 °

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 5,000 psf
Phi': 45 °

Name: Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 100 psf
Phi': 26 °

Name: Silty Clay
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °

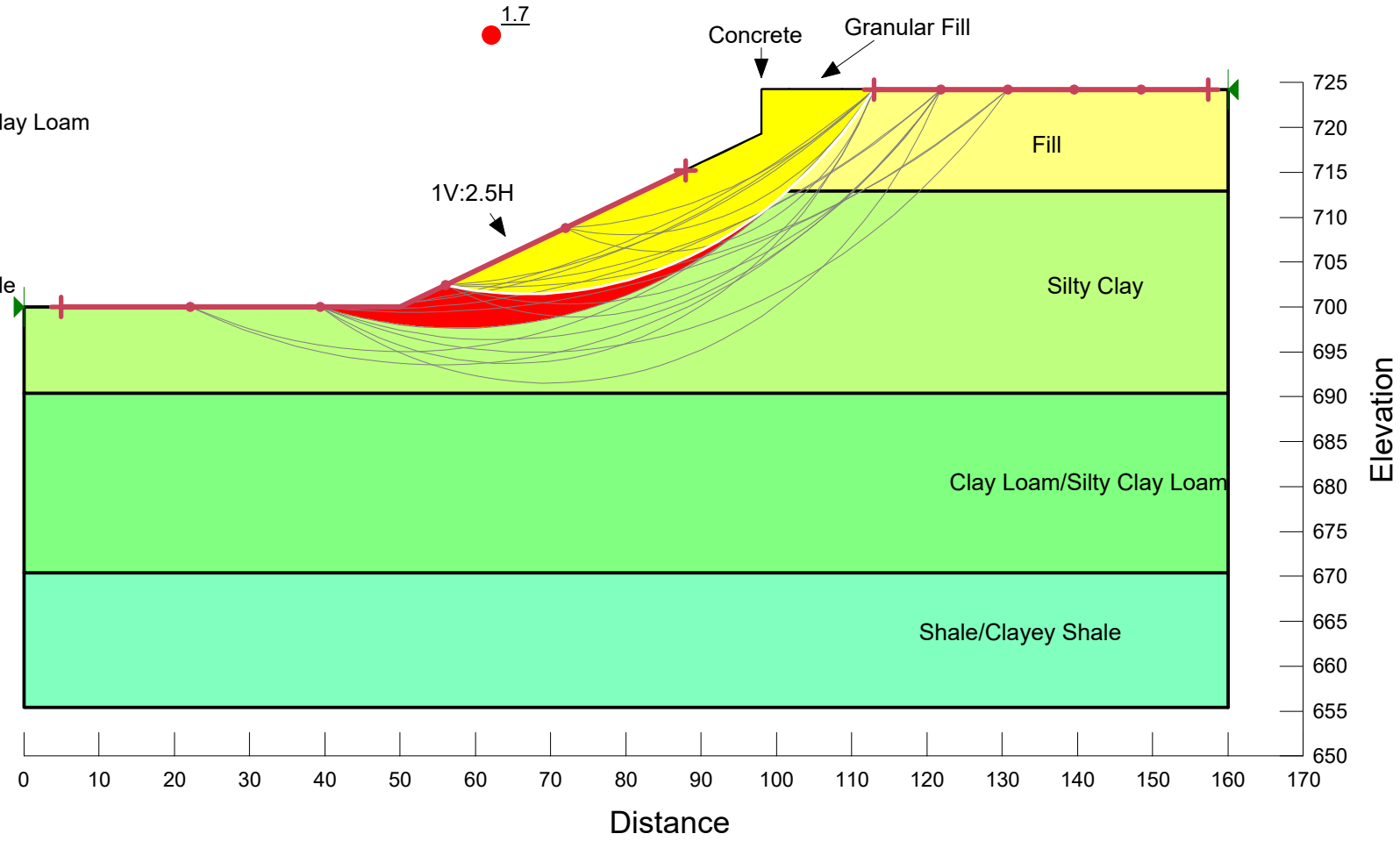
Name: Clay Loam/Silty Clay Loam
Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion': 100 psf
Phi': 26 °

Name: Shale/Clayey Shale
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 250 psf
Phi': 12 °

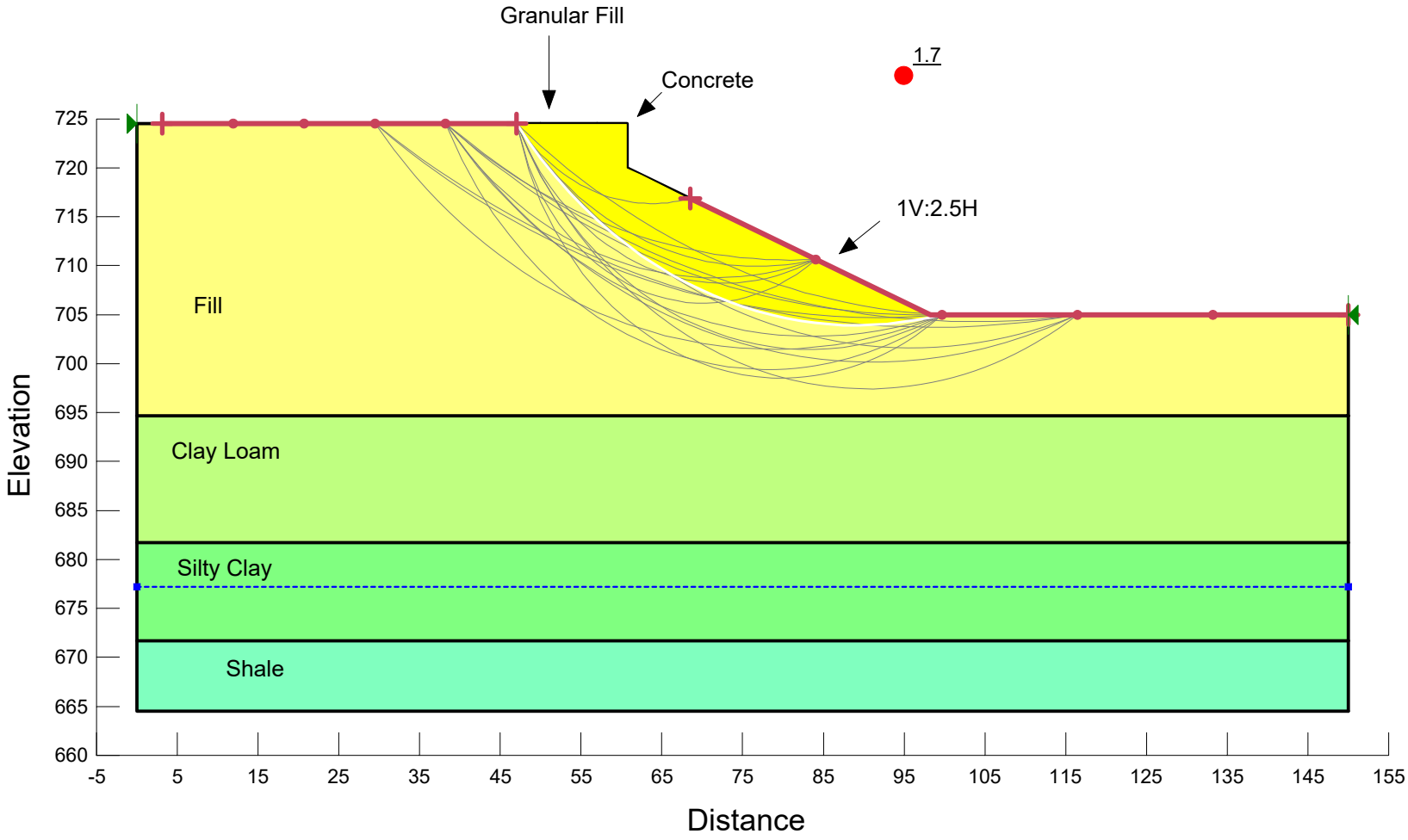
Name: Granular Fill
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 150 psf
Phi': 26 °

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 5,000 psf
Phi': 45 °

Eastbound I-74 Over CH R23
East Abutment (SB-06)
Long Term (Drained Analysis)



Eastbound I-74 Over CH R23
West Abutment (SB-04)
Long Term (Drained Analysis)



Name: Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 100 psf
Phi': 26 °

Name: Clay Loam
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °

Name: Silty Clay
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °

Name: Shale
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 250 psf
Phi': 12 °

Name: Granular Fill
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 150 psf
Phi': 26 °

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 5,000 psf
Phi': 45 °

Name: Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 1,500 psf
Phi': 0 °

Name: Silty Clay I
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 2,000 psf
Phi': 0 °

Name: Silty Clay II
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 3,000 psf
Phi': 0 °

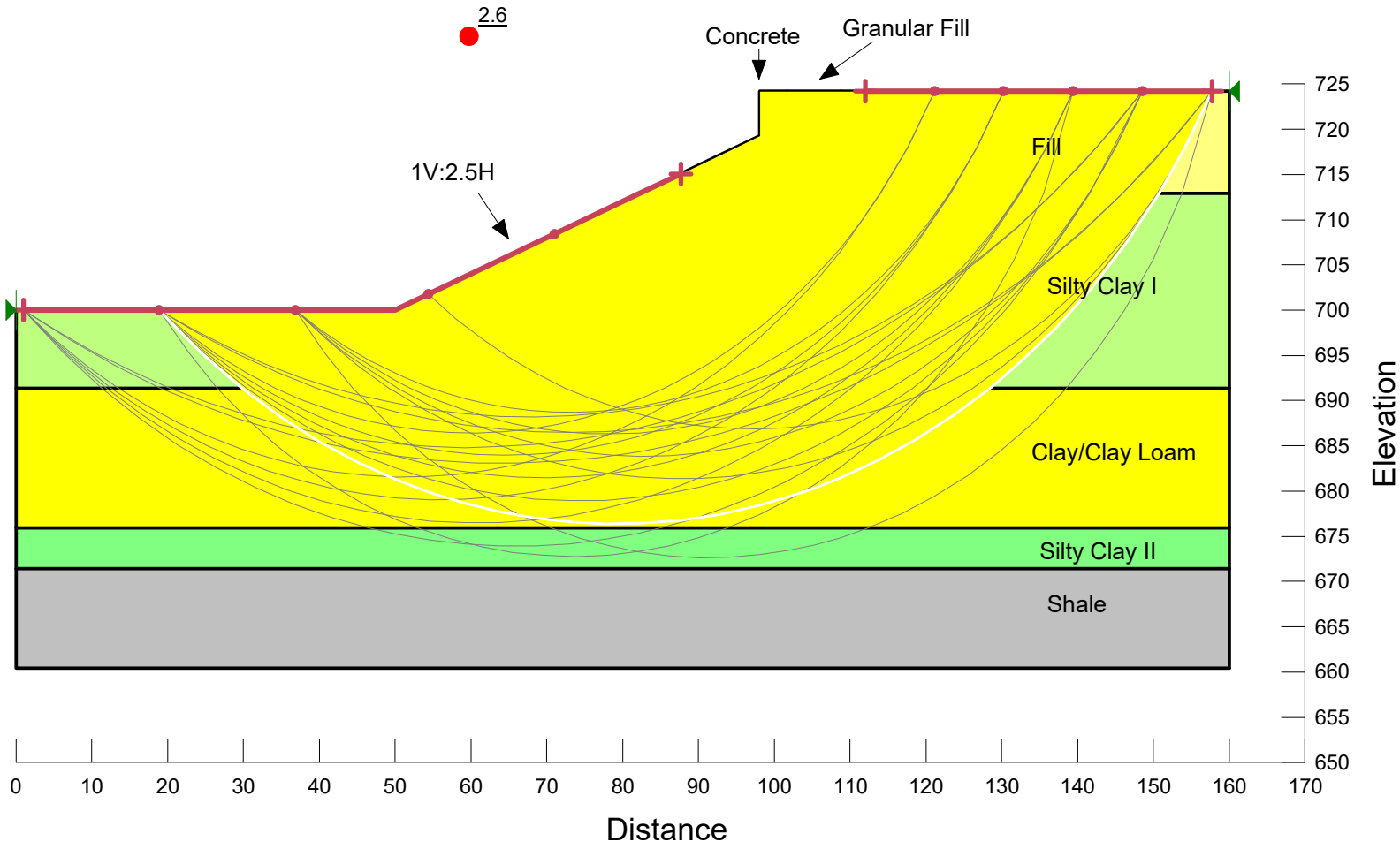
Name: Shale
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 4,500 psf
Phi': 0 °

Name: Granular Fill
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,500 psf
Phi': 0 °

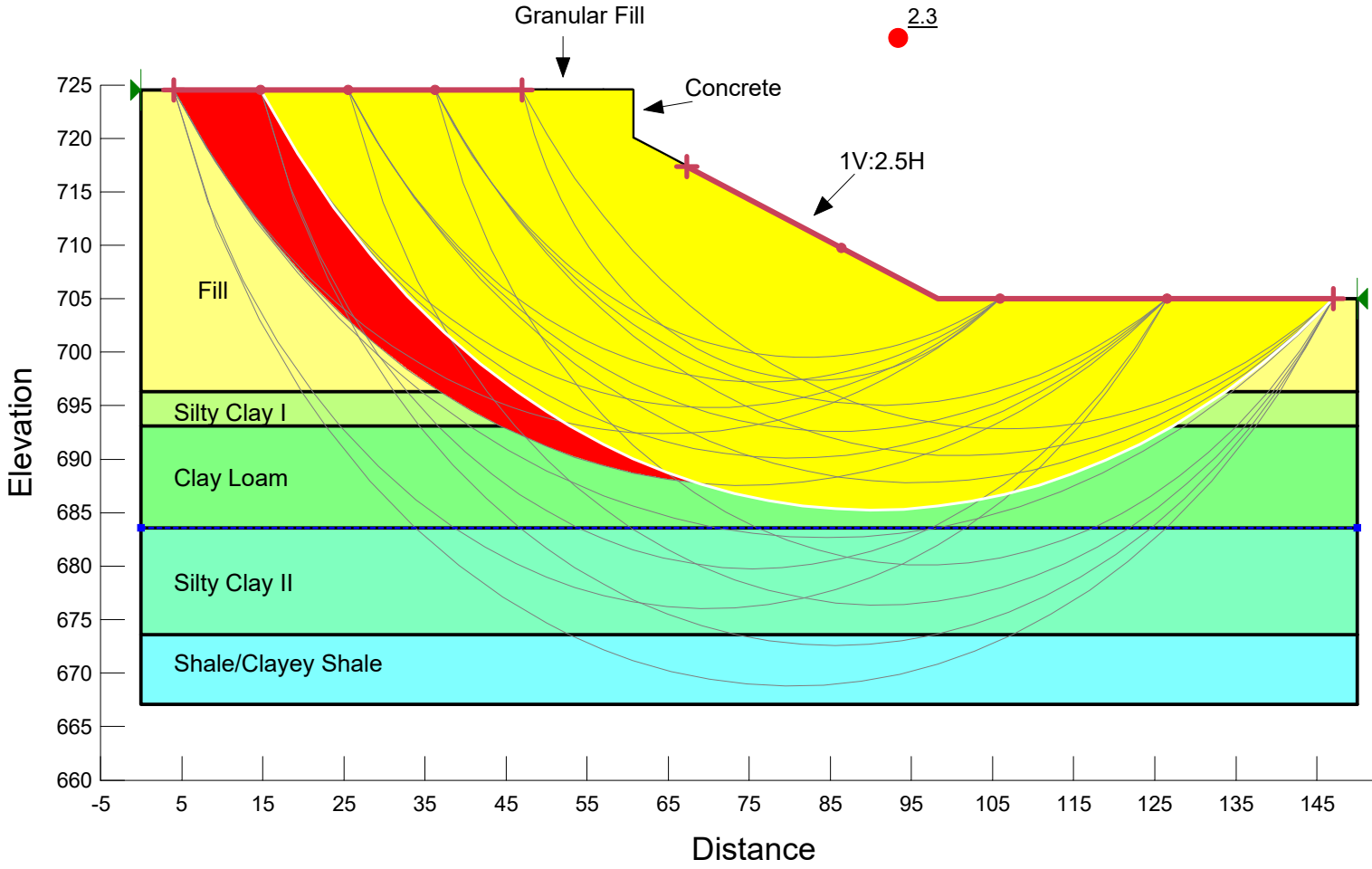
Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 5,000 psf
Phi': 45 °

Name: Clay/Clay Loam
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 900 psf
Phi': 0 °

Westbound I-74 Over CH R23
East Abutment (SB-03)
End-of-Construction (Undrained Analysis)



Westbound I-74 Over CH R23
West Abutment (SB-01)
End-of-Construction (Undrained Analysis)



Name: Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 1,500 psf
Phi': 0 °

Name: Silty Clay I
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 200 psf
Phi': 0 °

Name: Clay Loam
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 475 psf
Phi': 0 °

Name: Silty Clay II
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,500 psf
Phi': 0 °

Name: Shale/Clayey Shale
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 3,300 psf
Phi': 0 °

Name: Granular Fill
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,500 psf
Phi': 0 °

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 5,000 psf
Phi': 45 °

Name: Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 26 °

Name: Silty Clay I
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 150 psf
Phi': 26 °

Name: Silty Clay II
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 150 psf
Phi': 26 °

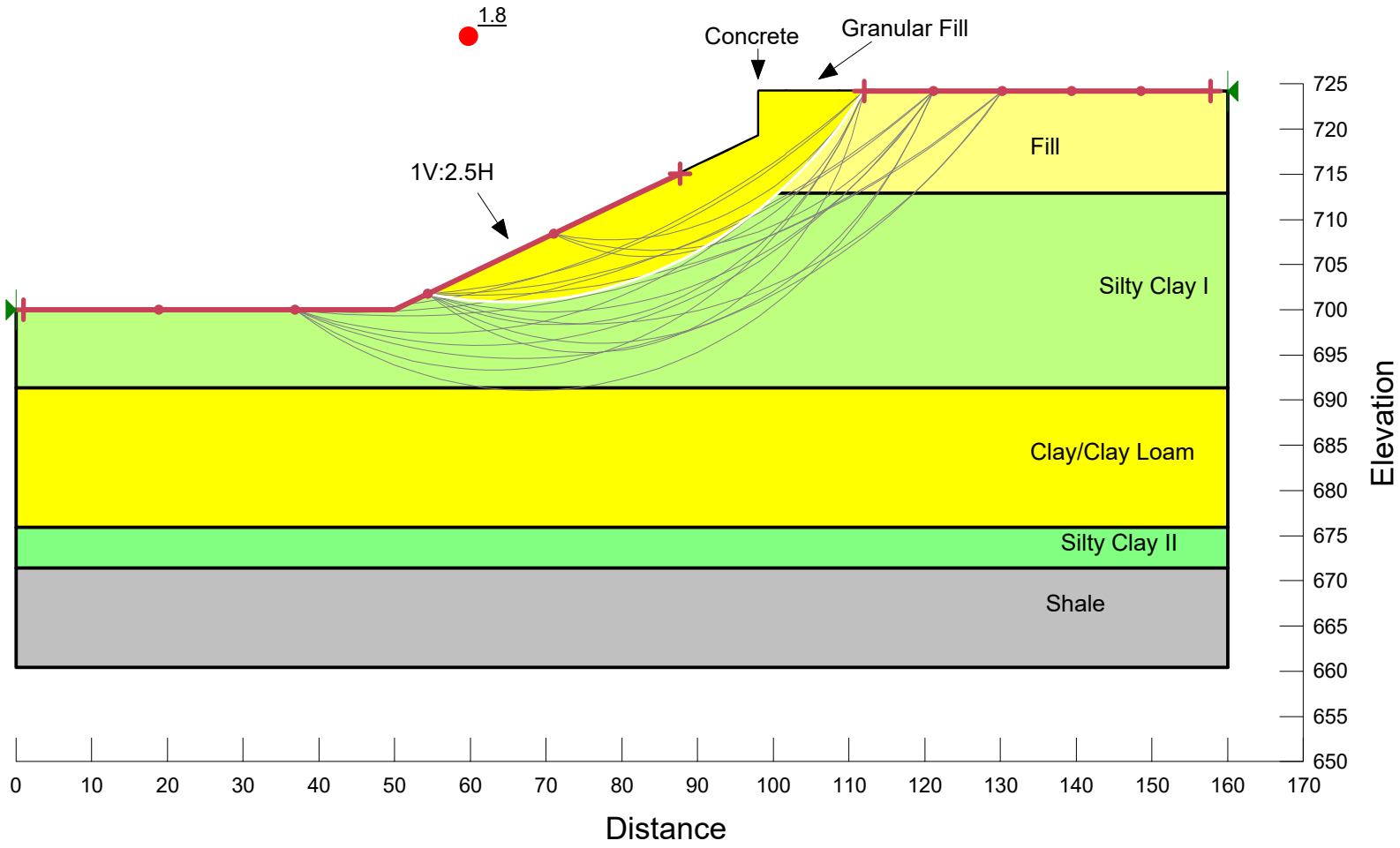
Name: Shale
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 250 psf
Phi': 12 °

Name: Granular Fill
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 150 psf
Phi': 26 °

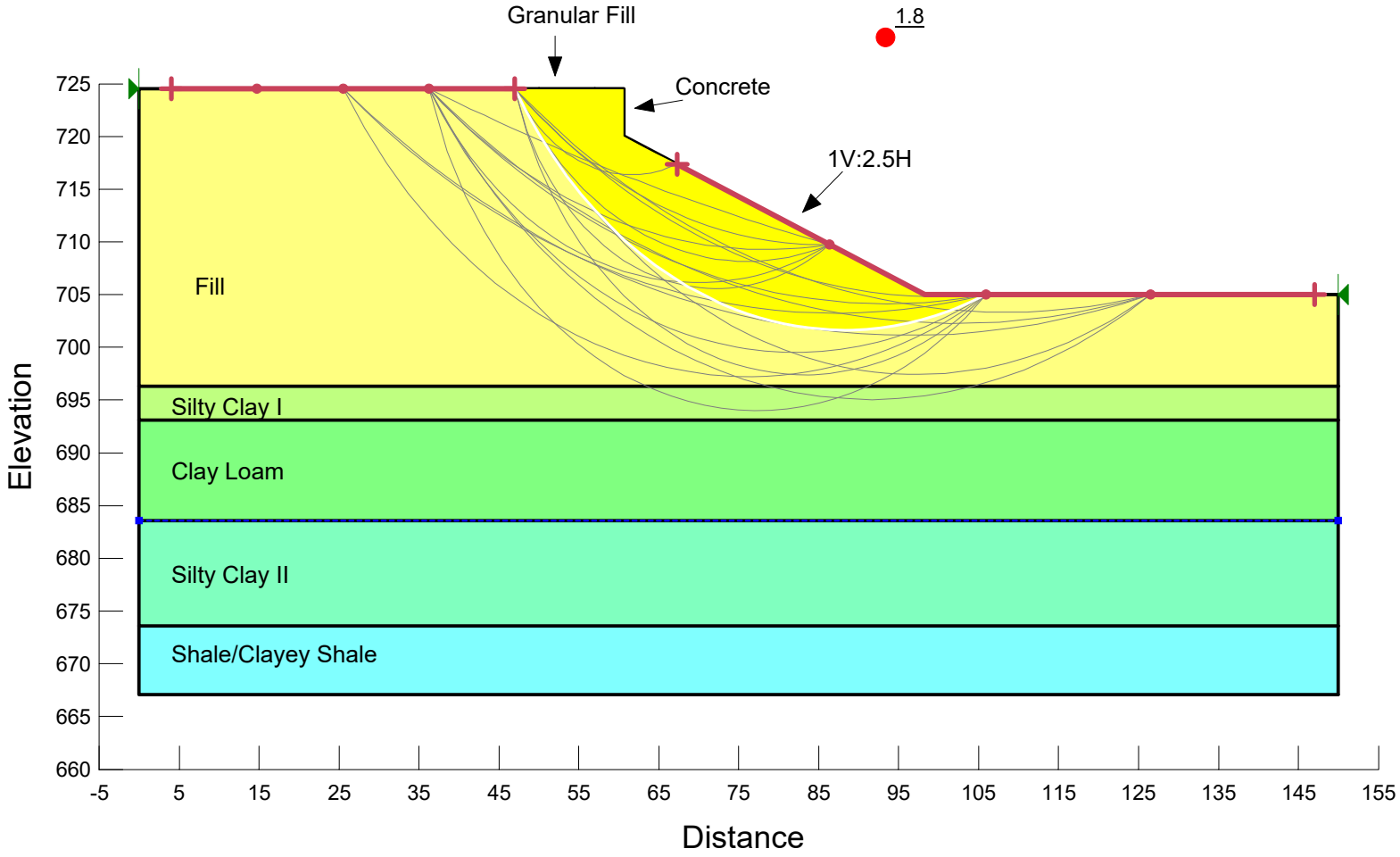
Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 5,000 psf
Phi': 45 °

Name: Clay/Clay Loam
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °

Westbound I-74 Over CH R23
East Abutment (SB-03)
Long Term (Drained Analysis)



Westbound I-74 Over CH R23
West Abutment (SB-01)
Long Term (Drained Analysis)



Name: Fill
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 100 psf
Phi': 26 °

Name: Silty Clay I
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °

Name: Clay Loam
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °

Name: Silty Clay II
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 26 °

Name: Shale/Clayey Shale
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 150 psf
Phi': 12 °

Name: Granular Fill
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 150 psf
Phi': 26 °

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 5,000 psf
Phi': 45 °

EXHIBIT H

PILE LENGTH/PILE TYPE

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment (EB)
REFERENCE BORING ========== SB-04
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 719.52 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 717.52 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 ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 224.14 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 84.05 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	**52** 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.)
698.17	19.35	1.50	10		61.4		***73.8***	90.4		92.0	74	0	0	41	21
694.67	3.50	1.30	9		10.0	12.4	***76.2***	14.8	1.6	105.8	76	0	0	42	25
693.17	1.50	0.50	6		1.9	4.8	***79.1***	2.8	0.6	108.8	79	0	0	44	26
690.67	2.50	0.60	7		3.8	5.7	***86.7***	5.6	0.7	114.8	87	0	0	48	29
688.17	2.50	1.00	11		5.9	9.5	***87.8***	8.6	1.2	122.9	88	0	0	48	31
684.67	3.50	0.50	6		4.5	4.8	***91.4***	6.6	0.6	129.4	91	0	0	50	35
681.67	3.00	0.40	8		3.1	3.8	***99.3***	4.6	0.5	134.6	99	0	0	55	38
680.67	1.00	0.90	8		2.2	8.6	***103.3***	3.2	1.1	138.0	103	0	0	57	39
677.17	3.50	1.10	10		8.9	10.5	***114.1***	13.0	1.3	151.3	114	0	0	63	42
674.17	3.00	1.30	19		8.6	12.4	***130.3***	12.7	1.6	164.9	130	0	0	72	45
671.67	2.50	2.10	38		9.9	20.0	205.0	14.6	2.5	***187.7***	188	0	0	103	48
670.67	1.00			Shale	41.1	84.8	***246.1***	60.5	10.7	248.2	246	0	0	135	48.9
669.67	1.00			Shale	41.1	84.8	***287.2***	60.5	10.7	308.7	287	0	0	158	49.9
668.67	1.00			Shale	41.1	84.8	***328.3***	60.5	10.7	369.3	328	0	0	181	50.9
667.67	1.00			Shale	41.1	84.8	***369.4***	60.5	10.7	429.8	~~369~~	~~0~~	~~0~~	~~203~~	~~51.9~~
666.67	1.00			Shale	41.1	84.8	***410.5***	60.5	10.7	490.3	~~411~~	~~0~~	~~0~~	~~226~~	~~52.9~~
665.67	1.00			Shale	41.1	84.8	***451.6***	60.5	10.7	550.8	~~452~~	~~0~~	~~0~~	~~248~~	~~53.9~~
664.67	1.00			Shale	41.1	84.8	***492.7***	60.5	10.7	611.3	~~493~~	~~0~~	~~0~~	~~271~~	~~54.9~~
663.67	1.00			Shale	41.1	84.8	***533.8***	60.5	10.7	671.9	~~534~~	~~0~~	~~0~~	~~294~~	~~55.9~~
662.67	1.00			Shale	41.1	84.8	***574.9***	60.5	10.7	732.4	~~575~~	~~0~~	~~0~~	~~316~~	~~56.9~~
661.67	1.00			Shale	41.1	84.8	***616.0***	60.5	10.7	792.9	~~616~~	~~0~~	~~0~~	~~339~~	~~57.9~~
660.67	1.00			Shale	41.1	84.8	***657.2***	60.5	10.7	853.4	~~657~~	~~0~~	~~0~~	~~361~~	~~58.9~~
659.67	1.00			Shale	41.1	84.8	***698.3***	60.5	10.7	913.9	~~698~~	~~0~~	~~0~~	~~384~~	~~59.9~~
658.67	1.00			Shale	41.1	84.8	***739.4***	60.5	10.7	974.5	~~739~~	~~0~~	~~0~~	~~407~~	~~60.9~~
657.67	1.00			Shale	41.1	84.8	***780.5***	60.5	10.7	1035.0	~~780~~	~~0~~	~~0~~	~~429~~	~~61.9~~
656.67	1.00			Shale	41.1	84.8	***821.6***	60.5	10.7	1095.5	~~822~~	~~0~~	~~0~~	~~452~~	~~62.9~~
655.67	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment (EB)
REFERENCE BORING ========== SB-04
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 719.52 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 717.52 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== DD
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 679.20 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 224.14 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 84.05 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	**328** KIPS	**27** KIPS	**51** 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.)
698.17	19.35	1.50	10		61.4		***73.8***	90.4		92.0	74	34	68	-61	21
694.67	3.50	1.30	9		10.0	12.4	***76.2***	14.8	1.6	105.8	76	39	79	-76	25
693.17	1.50	0.50	6		1.9	4.8	***79.1***	2.8	0.6	108.8	79	40	81	-78	26
690.67	2.50	0.60	7		3.8	5.7	***86.7***	5.6	0.7	114.8	87	42	85	-80	29
688.17	2.50	1.00	11		5.9	9.5	***87.8***	8.6	1.2	122.9	88	46	92	-89	31
684.67	3.50	0.50	6		4.5	4.8	***91.4***	6.6	0.6	129.4	91	48	97	-94	35
681.67	3.00	0.40	8		3.1	3.8	***99.3***	4.6	0.5	134.6	99	50	100	-95	38
680.67	1.00	0.90	8		2.2	8.6	***103.3***	3.2	1.1	138.0	103	51	102	-97	39
677.17	3.50	1.10	10		8.9	10.5	***114.1***	13.0	1.3	151.3	114	51	102	-91	42
674.17	3.00	1.30	19		8.6	12.4	***130.3***	12.7	1.6	164.9	130	51	102	-82	45
671.67	2.50	2.10	38		9.9	20.0	205.0	14.6	2.5	***187.7***	188	51	102	-50	48
670.67	1.00			Shale	41.1	84.8	***246.1***	60.5	10.7	248.2	246	51	102	-18	48.9
669.67	1.00			Shale	41.1	84.8	***287.2***	60.5	10.7	308.7	287	51	102	5	49.9
668.67	1.00			Shale	41.1	84.8	***328.3***	60.5	10.7	369.3	328	51	102	27	50.9
667.67	1.00			Shale	41.1	84.8	***369.4***	60.5	10.7	429.8	~~369~~	~~51~~	~~102~~	~~50~~	~~51.9~~
666.67	1.00			Shale	41.1	84.8	***410.5***	60.5	10.7	490.3	~~411~~	~~51~~	~~102~~	~~72~~	~~52.9~~
665.67	1.00			Shale	41.1	84.8	***451.6***	60.5	10.7	550.8	~~452~~	~~51~~	~~102~~	~~95~~	~~53.9~~
664.67	1.00			Shale	41.1	84.8	***492.7***	60.5	10.7	611.3	~~493~~	~~51~~	~~102~~	~~118~~	~~54.9~~
663.67	1.00			Shale	41.1	84.8	***533.8***	60.5	10.7	671.9	~~534~~	~~51~~	~~102~~	~~140~~	~~55.9~~
662.67	1.00			Shale	41.1	84.8	***574.9***	60.5	10.7	732.4	~~575~~	~~51~~	~~102~~	~~163~~	~~56.9~~
661.67	1.00			Shale	41.1	84.8	***616.0***	60.5	10.7	792.9	~~616~~	~~51~~	~~102~~	~~185~~	~~57.9~~
660.67	1.00			Shale	41.1	84.8	***657.2***	60.5	10.7	853.4	~~657~~	~~51~~	~~102~~	~~208~~	~~58.9~~
659.67	1.00			Shale	41.1	84.8	***698.3***	60.5	10.7	913.9	~~698~~	~~51~~	~~102~~	~~231~~	~~59.9~~
658.67	1.00			Shale	41.1	84.8	***739.4***	60.5	10.7	974.5	~~739~~	~~51~~	~~102~~	~~253~~	~~60.9~~
657.67	1.00			Shale	41.1	84.8	***780.5***	60.5	10.7	1035.0	~~780~~	~~51~~	~~102~~	~~276~~	~~61.9~~
656.67	1.00			Shale	41.1	84.8	***821.6***	60.5	10.7	1095.5	~~822~~	~~51~~	~~102~~	~~298~~	~~62.9~~
655.67	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier 1 & Pier 2 (EB)
REFERENCE BORING ========== SB-05
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 699.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 697.00 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 ========== 2010 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 3
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 125.14 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 46.93 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	**31** 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.)
695.70	1.30	1.80	9		4.7		9.4	6.9		***7.5***	7	0	0	4	3
692.70	3.00	0.50	6		3.9	4.8	20.9	5.7	0.6	***14.1***	14	0	0	8	6
689.20	3.50	1.30	7		10.0	12.4	***24.3***	14.8	1.6	28.1	24	0	0	13	10
686.70	2.50	0.60	4		3.8	5.7	***30.9***	5.6	0.7	34.0	31	0	0	17	12
684.70	2.00	0.90	3		4.3	8.6	***35.2***	6.3	1.1	40.3	35	0	0	19	14
682.70	2.00	0.90	3		4.3	8.6	***47.2***	6.3	1.1	47.6	47	0	0	26	16
681.70	1.00	1.70	12		3.5	16.2	***51.6***	5.1	2.1	52.8	52	0	0	28	17
679.20	2.50	1.80	12		9.0	17.2	109.5	13.2	2.2	***72.3***	72	0	0	40	20
676.70	2.50		52	Hard Till	5.6	66.1	***68.0***	8.2	8.4	74.5	68	0	0	37	22
673.20	3.50	2.00	62		13.4	19.1	147.2	19.8	2.4	***102.6***	103	0	0	56	26
672.20	1.00			Shale	41.1	84.8	188.3	60.5	10.7	***163.1***	163	0	0	90	26.8
671.20	1.00			Shale	41.1	84.8	229.4	60.5	10.7	***223.7***	224	0	0	123	27.8
670.20	1.00			Shale	41.1	84.8	***270.5***	60.5	10.7	284.2	270	0	0	149	28.8
669.20	1.00			Shale	41.1	84.8	***311.6***	60.5	10.7	344.7	312	0	0	171	29.8
668.20	1.00			Shale	41.1	84.8	***352.7***	60.5	10.7	405.2	~~353~~	~~0~~	~~0~~	~~194~~	~~30.8~~
667.20	1.00			Shale	41.1	84.8	***393.8***	60.5	10.7	465.7	~~394~~	~~0~~	~~0~~	~~217~~	~~31.8~~
666.20	1.00			Shale	41.1	84.8	***519.7***	60.5	10.7	537.0	~~520~~	~~0~~	~~0~~	~~286~~	~~32.8~~
665.70	0.50			Limestone	41.1	169.5	***476.0***	60.5	21.5	586.8	~~476~~	~~0~~	~~0~~	~~262~~	~~33.3~~
664.70	1.00			Shale	41.1	84.8	***517.1***	60.5	10.7	647.3	~~517~~	~~0~~	~~0~~	~~284~~	~~34.3~~
663.70	1.00			Shale	41.1	84.8	***558.3***	60.5	10.7	707.8	~~558~~	~~0~~	~~0~~	~~307~~	~~35.3~~
662.70	1.00			Shale	41.1	84.8	***599.4***	60.5	10.7	768.4	~~599~~	~~0~~	~~0~~	~~330~~	~~36.3~~
661.70	1.00			Shale	41.1	84.8	***640.5***	60.5	10.7	828.9	~~640~~	~~0~~	~~0~~	~~352~~	~~37.3~~
660.70	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== East Abutment (EB)
REFERENCE BORING ========== SB-06
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 719.23 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 717.23 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 ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 224.12 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 84.05 KIPS

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	**56** FT.

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.

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.)
716.40	0.83	2.10	19		3.3		38.6	4.8		***9.3***	9	0	0	5	3
712.90	3.50	3.70	15		20.6	35.3	50.6	30.4	4.5	***38.6***	39	0	0	21	6
711.40	1.50	2.80	13		7.2	26.7	***40.7***	10.6	3.4	47.0	41	0	0	22	8
708.90	2.50	1.00	10		5.9	9.5	66.5	8.6	1.2	***58.2***	58	0	0	32	10
706.40	2.50	3.10	13		12.9	29.6	***64.2***	19.0	3.7	75.3	64	0	0	35	13
703.90	2.50	1.50	12		7.9	14.3	93.1	11.7	1.8	***89.6***	90	0	0	49	15
701.40	2.50	3.70	14		14.7	35.3	***89.7***	21.7	4.5	109.0	90	0	0	49	18
697.90	3.50	1.80	12		12.6	17.2	***111.8***	18.5	2.2	128.7	112	0	0	62	21
694.90	3.00	2.80	18		14.4	26.7	183.5	21.2	3.4	***157.2***	157	0	0	86	24
690.40	4.50		66	Hard Till	15.0	83.9	***130.7***	22.0	10.6	170.7	131	0	0	72	29
685.90	4.50	1.70	9		15.6	16.2	***134.8***	22.9	2.1	192.1	135	0	0	74	33
680.40	5.50	0.50	9		7.1	4.8	***149.5***	10.4	0.6	203.5	150	0	0	82	39
675.40	5.00	1.30	8		14.3	12.4	***169.6***	21.1	1.6	225.3	170	0	0	93	44
674.40	1.00	1.90	19		3.7	18.1	***173.3***	5.5	2.3	230.8	173	0	0	95	45
670.40	4.00	1.90	19		14.9	18.1	270.5	21.9	2.3	***263.1***	263	0	0	145	49
665.40	5.00		79	Hard Till	22.9	100.4	***277.7***	33.7	12.7	294.9	278	0	0	153	54
664.40	1.00			Shale	41.1	84.8	***318.9***	60.5	10.7	355.4	319	0	0	175	54.8
663.40	1.00			Shale	41.1	84.8	***360.0***	60.5	10.7	415.9	~~360~~	~~0~~	~~0~~	~~198~~	~~55.8~~
662.40	1.00			Shale	41.1	84.8	***401.1***	60.5	10.7	476.4	~~401~~	~~0~~	~~0~~	~~221~~	~~56.8~~
661.40	1.00			Shale	41.1	84.8	***442.2***	60.5	10.7	536.9	~~442~~	~~0~~	~~0~~	~~243~~	~~57.8~~
660.40	1.00			Shale	41.1	84.8	***483.3***	60.5	10.7	597.5	~~483~~	~~0~~	~~0~~	~~266~~	~~58.8~~
659.40	1.00			Shale	41.1	84.8	***524.4***	60.5	10.7	658.0	~~524~~	~~0~~	~~0~~	~~288~~	~~59.8~~
658.40	1.00			Shale	41.1	84.8	***565.5***	60.5	10.7	718.5	~~566~~	~~0~~	~~0~~	~~311~~	~~60.8~~
657.40	1.00			Shale	41.1	84.8	***606.6***	60.5	10.7	779.0	~~607~~	~~0~~	~~0~~	~~334~~	~~61.8~~
656.40	1.00			Shale	41.1	84.8	***647.7***	60.5	10.7	839.5	~~648~~	~~0~~	~~0~~	~~356~~	~~62.8~~
655.40	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment (WB)
REFERENCE BORING ========== SB-01
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 719.52 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 717.52 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 ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 224.14 KIPS 342.265156 188.245836
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 84.05 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	**52** 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.)
697.07	20.45	1.50	10		64.9		***66.8***	95.6		95.8	67	0	0	37	22
693.07	4.00	0.20	7		2.2	1.9	***69.9***	3.2	0.2	99.1	70	0	0	38	26
692.07	1.00	0.30	5		0.8	2.9	***71.7***	1.2	0.4	100.4	72	0	0	39	27
689.57	2.50	0.40	6		2.6	3.8	***78.1***	3.9	0.5	104.8	78	0	0	43	30
687.07	2.50	0.80			4.9	7.6	***79.2***	7.2	1.0	111.4	79	0	0	44	32
683.57	3.50	0.40	7		3.7	3.8	***87.6***	5.4	0.5	117.4	88	0	0	48	36
681.07	2.50	0.90	6		5.4	8.6	***98.7***	7.9	1.1	126.1	99	0	0	54	38
678.57	2.50	1.50	12		7.9	14.3	***100.0***	11.7	1.8	136.9	100	0	0	55	41
677.07	1.50	0.80	9		2.9	7.6	***143.6***	4.3	1.0	146.4	144	0	0	79	42
673.57	3.50		38	Hard Till	5.0	48.3	***118.3***	7.3	6.1	149.9	118	0	0	65	46
671.07	2.50	1.90	58		9.3	18.1	194.3	13.7	2.3	***172.0***	172	0	0	95	48
670.07	1.00			Shale	41.1	84.8	235.4	60.5	10.7	***232.5***	232	0	0	128	49.4
669.07	1.00			Shale	41.1	84.8	***276.5***	60.5	10.7	293.0	276	0	0	152	50.4
668.57	0.50			Shale	20.6	84.8	***297.0***	30.3	10.7	323.3	297	0	0	163	50.9
668.07	0.50			Shale	20.6	84.8	***317.6***	30.3	10.7	353.5	318	0	0	175	51.4
667.07	1.00			Shale	41.1	84.8	***358.7***	60.5	10.7	414.1	~~359~~	~~0~~	~~0~~	~~197~~	~~52.4~~
666.07	1.00			Shale	41.1	84.8	***399.8***	60.5	10.7	474.6	~~400~~	~~0~~	~~0~~	~~220~~	~~53.4~~
665.07	1.00			Shale	41.1	84.8	***440.9***	60.5	10.7	535.1	~~441~~	~~0~~	~~0~~	~~243~~	~~54.4~~
664.07	1.00			Shale	41.1	84.8	***482.0***	60.5	10.7	595.6	~~482~~	~~0~~	~~0~~	~~265~~	~~55.4~~
663.07	1.00			Shale	41.1	84.8	***523.1***	60.5	10.7	656.1	~~523~~	~~0~~	~~0~~	~~288~~	~~56.4~~
662.07	1.00			Shale	41.1	84.8	***564.3***	60.5	10.7	716.7	~~564~~	~~0~~	~~0~~	~~310~~	~~57.4~~
661.07	1.00			Shale	41.1	84.8	***605.4***	60.5	10.7	777.2	~~605~~	~~0~~	~~0~~	~~333~~	~~58.4~~
660.07	1.00			Shale	41.1	84.8	***646.5***	60.5	10.7	837.7	~~646~~	~~0~~	~~0~~	~~356~~	~~59.4~~
659.07	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment (WB)
REFERENCE BORING ========== SB-01
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 719.52 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 717.52 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== DD
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 679.20 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 224.14 KIPS 342.265156 48.7552206
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 84.05 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	**318** KIPS	**35** KIPS	**51** 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.)
697.07	20.45	1.50	10		64.9		***66.8***	95.6		95.8	67	36	72	-71	22
693.07	4.00	0.20	7		2.2	1.9	***69.9***	3.2	0.2	99.1	70	37	74	-72	26
692.07	1.00	0.30	5		0.8	2.9	***71.7***	1.2	0.4	100.4	72	37	75	-73	27
689.57	2.50	0.40	6		2.6	3.8	***78.1***	3.9	0.5	104.8	78	39	78	-74	30
687.07	2.50	0.80			4.9	7.6	***79.2***	7.2	1.0	111.4	79	41	83	-81	32
683.57	3.50	0.40	7		3.7	3.8	***87.6***	5.4	0.5	117.4	88	43	87	-82	36
681.07	2.50	0.90	6		5.4	8.6	***98.7***	7.9	1.1	126.1	99	46	93	-85	38
678.57	2.50	1.50	12		7.9	14.3	***100.0***	11.7	1.8	136.9	100	46	93	-85	41
677.07	1.50	0.80	9		2.9	7.6	***143.6***	4.3	1.0	146.4	144	46	93	-61	42
673.57	3.50		38	Hard Till	5.0	48.3	***118.3***	7.3	6.1	149.9	118	46	93	-74	46
671.07	2.50	1.90	58		9.3	18.1	194.3	13.7	2.3	***172.0***	172	46	93	-45	48
670.07	1.00			Shale	41.1	84.8	235.4	60.5	10.7	***232.5***	232	46	93	-12	49.4
669.07	1.00			Shale	41.1	84.8	***276.5***	60.5	10.7	293.0	276	46	93	13	50.4
668.57	0.50			Shale	20.6	84.8	***297.0***	30.3	10.7	323.3	297	46	93	24	50.9
668.07	0.50			Shale	20.6	84.8	***317.6***	30.3	10.7	353.5	318	46	93	35	51.4
667.07	1.00			Shale	41.1	84.8	***358.7***	60.5	10.7	414.1	~~359~~	~~46~~	~~93~~	~~58~~	~~52.4~~
666.07	1.00			Shale	41.1	84.8	***399.8***	60.5	10.7	474.6	~~400~~	~~46~~	~~93~~	~~80~~	~~53.4~~
665.07	1.00			Shale	41.1	84.8	***440.9***	60.5	10.7	535.1	~~441~~	~~46~~	~~93~~	~~103~~	~~54.4~~
664.07	1.00			Shale	41.1	84.8	***482.0***	60.5	10.7	595.6	~~482~~	~~46~~	~~93~~	~~126~~	~~55.4~~
663.07	1.00			Shale	41.1	84.8	***523.1***	60.5	10.7	656.1	~~523~~	~~46~~	~~93~~	~~148~~	~~56.4~~
662.07	1.00			Shale	41.1	84.8	***564.3***	60.5	10.7	716.7	~~564~~	~~46~~	~~93~~	~~171~~	~~57.4~~
661.07	1.00			Shale	41.1	84.8	***605.4***	60.5	10.7	777.2	~~605~~	~~46~~	~~93~~	~~193~~	~~58.4~~
660.07	1.00			Shale	41.1	84.8	***646.5***	60.5	10.7	837.7	~~646~~	~~46~~	~~93~~	~~216~~	~~59.4~~
659.07	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier 1 & Pier 2 (WB)
REFERENCE BORING ========== SB-02
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 699.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 697.00 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 ========== 2010 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 3
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 125.14 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 46.93 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	**34** 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.)
695.99	1.01	1.50	10		3.2		23.2	4.7		***7.3***	7	0	0	4	3
692.49	3.50	2.10	10		13.9	20.0	***20.9***	20.4	2.5	25.6	21	0	0	11	7
690.99	1.50	0.40	5		1.6	3.8	29.1	2.3	0.5	***28.8***	29	0	0	16	8
688.49	2.50	1.10	9		6.3	10.5	***35.5***	9.3	1.3	38.1	35	0	0	19	11
685.99	2.50	1.10	7		6.3	10.5	***35.1***	9.3	1.3	46.5	35	0	0	19	13
683.49	2.50	0.40	4		2.6	3.8	***42.5***	3.9	0.5	51.0	42	0	0	23	16
679.99	3.50	0.90	7		7.5	8.6	***53.8***	11.1	1.1	62.6	54	0	0	30	19
678.49	1.50	1.30	9		4.3	12.4	***59.1***	6.3	1.6	69.0	59	0	0	32	21
675.99	2.50	1.40	11		7.6	13.3	***60.0***	11.1	1.7	79.3	60	0	0	33	23
673.49	2.50	0.70	37		4.3	6.7	***84.3***	6.4	0.8	88.3	84	0	0	46	26
669.99	3.50	2.80	34		16.8	26.7	159.2	24.8	3.4	***120.4***	120	0	0	66	29
668.99	1.00			Shale	41.1	84.8	200.3	60.5	10.7	***180.9***	181	0	0	99	30
667.99	1.00			Shale	41.1	84.8	241.4	60.5	10.7	***241.4***	241	0	0	133	31
666.99	1.00			Shale	41.1	84.8	***282.6***	60.5	10.7	301.9	283	0	0	155	32
665.99	1.00			Shale	41.1	84.8	***323.7***	60.5	10.7	362.5	324	0	0	178	33
664.99	1.00			Shale	41.1	84.8	449.5	60.5	10.7	***433.7***	~~434~~	~~0~~	~~0~~	~~239~~	~~34~~
663.99	1.00			Limestone	82.2	169.5	***447.0***	121.0	21.5	544.0	~~447~~	~~0~~	~~0~~	~~246~~	~~35~~
662.99	1.00			Shale	41.1	84.8	***488.1***	60.5	10.7	604.5	~~488~~	~~0~~	~~0~~	~~268~~	~~36~~
661.99	1.00			Shale	41.1	84.8	***529.2***	60.5	10.7	665.1	~~529~~	~~0~~	~~0~~	~~291~~	~~37~~
660.99	1.00			Shale	41.1	84.8	***570.3***	60.5	10.7	725.6	~~570~~	~~0~~	~~0~~	~~314~~	~~38~~
659.99	1.00			Shale	41.1	84.8	***611.4***	60.5	10.7	786.1	~~611~~	~~0~~	~~0~~	~~336~~	~~39~~
658.99	1.00			Shale	41.1	84.8	***652.5***	60.5	10.7	846.6	~~653~~	~~0~~	~~0~~	~~359~~	~~40~~
657.99	1.00			Shale	41.1	84.8	***693.6***	60.5	10.7	907.1	~~694~~	~~0~~	~~0~~	~~382~~	~~41~~
656.99	1.00			Shale	41.1	84.8	***734.7***	60.5	10.7	967.7	~~735~~	~~0~~	~~0~~	~~404~~	~~42~~
655.99	1.00			Shale	41.1	84.8	***775.9***	60.5	10.7	1028.2	~~776~~	~~0~~	~~0~~	~~427~~	~~43~~
654.99	1.00			Shale	41.1	84.8	***817.0***	60.5	10.7	1088.7	~~817~~	~~0~~	~~0~~	~~449~~	~~44~~
653.99	1.00			Shale	41.1	84.8	***858.1***	60.5	10.7	1149.2	~~858~~	~~0~~	~~0~~	~~472~~	~~45~~
652.99	1.00			Shale	41.1	84.8	***899.2***	60.5	10.7	1209.7	~~899~~	~~0~~	~~0~~	~~495~~	~~46~~
651.99	1.00			Shale	41.1	84.8	***940.3***	60.5	10.7	1270.3	~~940~~	~~0~~	~~0~~	~~517~~	~~47~~
650.99	1.00			Shale	41.1	84.8	***981.4***	60.5	10.7	1330.8	~~981~~	~~0~~	~~0~~	~~540~~	~~48~~
649.99	1.00			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== East Abutment (WB)
REFERENCE BORING ========== SB-03
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 719.23 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 717.23 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 ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 42.83 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 224.14 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 84.05 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	**51** 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.)
714.90	2.33	1.60	15		7.7		29.7	11.4		***14.2***	14	0	0	8	4
711.40	3.50	2.30	13		14.7	21.9	***30.1***	21.7	2.8	34.0	30	0	0	17	8
709.90	1.50	0.80	7		2.9	7.6	***36.8***	4.3	1.0	38.8	37	0	0	20	9
707.40	2.50	1.20	14		6.8	11.4	56.0	10.0	1.4	***50.3***	50	0	0	28	12
704.90	2.50	2.50	17		11.1	23.8	***65.2***	16.4	3.0	66.4	65	0	0	36	14
702.40	2.50	2.30	15		10.5	21.9	***68.0***	15.5	2.8	80.9	68	0	0	37	17
699.90	2.50	1.50	21		7.9	14.3	***82.7***	11.7	1.8	93.5	83	0	0	45	19
697.40	2.50	2.20	24		10.2	21.0	***103.4***	15.0	2.7	109.8	103	0	0	57	22
694.90	2.50	3.30	22		13.5	31.5	***116.9***	19.9	4.0	129.7	117	0	0	64	24
691.40	3.50	3.30	22		18.9	31.5	***111.0***	27.9	4.0	154.5	111	0	0	61	28
689.90	1.50	0.70	7		2.6	6.7	***116.5***	3.8	0.8	158.7	116	0	0	64	29
687.40	2.50	1.00	7		5.9	9.5	***122.4***	8.6	1.2	167.3	122	0	0	67	32
684.90	2.50	1.00	7		5.9	9.5	***128.2***	8.6	1.2	175.9	128	0	0	71	34
682.40	2.50	1.00	7		5.9	9.5	***134.1***	8.6	1.2	184.6	134	0	0	74	37
679.90	2.50	1.00	7		5.9	9.5	***139.9***	8.6	1.2	193.2	140	0	0	77	39
677.90	2.00	1.00	7		4.7	9.5	***144.6***	6.9	1.2	200.1	145	0	0	80	41
675.90	2.00	1.00	7		4.7	9.5	***168.4***	6.9	1.2	209.4	168	0	0	93	43
674.90	1.00	3.00	61		5.0	28.6	***173.4***	7.4	3.6	216.8	173	0	0	95	44
673.90	1.00	3.00	61		5.0	28.6	***178.5***	7.4	3.6	224.3	178	0	0	98	45
672.90	1.00	3.00	61		5.0	28.6	***183.5***	7.4	3.6	231.7	184	0	0	101	46
671.40	1.50	3.00	61		7.6	28.6	***247.3***	11.1	3.6	250.0	247	0	0	136	48
670.40	1.00			Shale	41.1	84.8	***288.4***	60.5	10.7	310.5	288	0	0	159	48.8
669.40	1.00			Shale	41.1	84.8	***329.5***	60.5	10.7	371.0	329	0	0	181	49.8
668.40	1.00			Shale	41.1	84.8	***370.6***	60.5	10.7	431.5	~~371~~	~~0~~	~~0~~	~~204~~	~~50.8~~
667.40	1.00			Shale	41.1	84.8	***411.7***	60.5	10.7	492.1	~~412~~	~~0~~	~~0~~	~~226~~	~~51.8~~
666.40	1.00			Shale	41.1	84.8	***452.8***	60.5	10.7	552.6	~~453~~	~~0~~	~~0~~	~~249~~	~~52.8~~
665.40	1.00			Shale	41.1	84.8	***493.9***	60.5	10.7	613.1	~~494~~	~~0~~	~~0~~	~~272~~	~~53.8~~
664.40	1.00			Shale	41.1	84.8	***535.0***	60.5	10.7	673.6	~~535~~	~~0~~	~~0~~	~~294~~	~~54.8~~
663.40	1.00			Shale	41.1	84.8	***576.1***	60.5	10.7	734.1	~~576~~	~~0~~	~~0~~	~~317~~	~~55.8~~
662.40	1.00			Shale	41.1	84.8	***617.2***	60.5	10.7	794.7	~~617~~	~~0~~	~~0~~	~~339~~	~~56.8~~
661.40	1.00			Shale	41.1	84.8	***658.3***	60.5	10.7	855.2	~~658~~	~~0~~	~~0~~	~~362~~	~~57.8~~
660.40	1.00			Shale		84.8			10.7						