STRUCTURE GEOTECHNICAL REPORT

F.A.I. 474 over Plank Road (IL 116)

S.N. 072-0252 (E.B.)
S.N. 072-0253 (W.B.)

F.A.I. ROUTE 474 (I-474)
SECTION (72-3HB-2)BR
PEORIA COUNTY, ILLINOIS
JOB NO. P-94-038-12
PTB 191/008 WO 2
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EXHIBITS

1.0 PROJECT DESCRIPTION AND PROPOSED STRUCTURE INFORMATION

1.1 Introduction

The geotechnical study summarized in this report was performed for the proposed dual 3-span structures for I-474 over Plank Road (IL 116) in Peoria County, Illinois. The purpose of this report is to present design and construction recommendations for the proposed structure.

1.2 Project Description

The project consists of construction of dual three-span structures (SN 072-0252 EB & SN 072-0253 WB) carrying I-474 over Plank Road (IL116). The general location of the structure is shown on a Location Map, Exhibit A. The site lies east of the Fourth Principal Meridian (T. 8N R. 7E Section 11) within the Galesburg Plain of the Till Plains Section of the Central Lowland Province. The Bloomington Ridged Plain and Ancient Illinois Floodplain are also located near the project.

1.3 Proposed Bridge Information

The proposed structures (SN 072-0252 EB & 072-0253 WB) located at I-474 over Plank Road (IL 116) will consist of dual, three-span structures built on a 27° 1’ 8” skew from the centerline of IL 116. The structures will have a combined overall width of 88’-0” from the centerline to centerline of the westbound and eastbound structures. The westbound structure will have an out-to-out width of 42’-10”, and the eastbound structure will have a varying width from 45’-10.5” to 41’-5” The structures will be located at approximate station 223+71.15 (I-474) and station 20+00 (IL-116).

Both structures will measure 220’-4”, from back-to-back of abutments. The westbound and eastbound structures will support two 12’ lanes. The westbound structure will consist of 6’ inside and 10’ outside shoulders. The eastbound structure will consist of 6’ inside shoulders and a varying width outside shoulder.

2.0 SITE INVESTIGATION, SUBSURFACE EXPLORATION, AND GENERALIZED SUBSURFACE CONDITIONS

The site investigation was performed by the Illinois Department of Transportation (IDOT).

Four (4) standard penetration test (SPT) borings, designated SB-1, SB-2, SB-4 and SB-5 were drilled between July 15 and 17, 2019. Three (3) additional rock probe borings were obtained by the District on July 6 through 7, 2020. Four (4) historical borings drilled in 1970 were also provided by the District. The stations and offsets of the borings are listed in Table 2.0. The boring locations for SB-1, SB-2, SB-4 and SB-5 are shown on the Type, Size, and Location Plan (TS&L), Exhibit B, as provided by The Upchurch Group (Upchurch). Detailed information regarding the nature and thickness of the soils and bedrock encountered and the results of the field sampling and laboratory testing are shown on the Boring Logs, Exhibit C. A soil profile for borings SB-1, SB-2, SB-4, and SB-5 and the rock probe borings can be found under Subsurface Profiles, Exhibit D.

Table 2.0 - Boring Stations and Offsets

Designation	Stationing	Offset from Proposed Centerline (ft.)	Surface Elevation (ft.)
SB-1	222+95	100.5 RT	596.28
SB-2	224+30.5	85.5 LT	582.38
SB-4	222+53	11.0 RT	618.31
SB-5	225+02	0.0	617.10
RP-1	224+58	68.0 RT	618.51
RP-2	225+52	62.0 LT	619.39
RP-3	223+94	2.0 LT	586.79
Boring 1 (1970)	221+80	25 LT	581.0
Boring 3 (1970)	224+30	56 LT	581.8
Boring 5 (1970)	221+70	50 RT	577.1
Boring 7 (1970)	224+26	32 RT	587.6

2.1 Subsurface Conditions

The stratigraphy of the borings exhibited layers of clay loam fill, clay loam, and silty clay loam overburden material on top of bedrock that transitions from mudstone, to shale, and then to limestone. In general, the lithologic succession beneath the ground surface is as follows: Borings SB-1, SB-2, SB-4, and SB-5 were advanced through a 1-foot thick layer of topsoil. Below the topsoil, a layer of clay loam material was encountered with average N-values ranging from 9 to 18 blows per foot (bpf), average unconfined compressive strengths (Q_u) of 0.9 to 1.5 tons per square foot (tsf), and average moisture contents between 22 and 28 percent. Below the clay loam material, a silty clay loam was typically encountered with N-values of greater than 50 bpf, Q_u values between 1.6 and 3.5 tsf, and moisture contents ranging from 18 to 19 percent. It should be noted, that an approximate 11.5-foot-thick layer of clay loam fill was encountered in Boring SB-4 below the topsoil. The clay loam fill material had an average N-value of 14 bpf, an average Q_u value of 1.2 tsf, and an average moisture content of 20 percent.

Depending on the ground surface elevation of the specific borings, between 23 and 60 feet of overburden soils were advanced through prior to encountering bedrock. Rock coring was performed in Borings SB-1 and SB-2.

In SB-1 and SB-2 a mudstone material was first encountered below the overburden soils. The mudstone had moisture contents between 5.6 and 6.7 percent and Q_u values from 3.5 to 4.2 tsf. The dry density of the mudstone ranged from 135.9 to 139.3 pounds per cubic foot (pcf). Below the mudstone, the borings advanced through a shale material. The shale had moisture contents between 2.4 and 5.6 percent and Q_u values from 14.4 to 168 tsf. The dry density of the shale ranged from 142.6 to 153.4 pcf. Below the shale, a limestone material was encountered. The limestone had moisture contents between 0.3 and 0.7 percent, and Q_u values from 289.4 to 645.1 tsf. The dry density of the limestone material ranged from 151.4 to 163.9 pcf. It should be noted, that a 3.5-foot-thick layer of coal was encountered in SB-2 below the limestone material prior to transitioning back into a shale material. Borings SB-4 and SB-5 were terminated in a shale material and not advanced deeper with coring techniques. RP-1, RP-2, and RP-3 were blind drilled to depths between 23.5 and 38.5 feet when shale was encountered. The moisture contents of the shale encountered in SB-4, SB-5, RP-1, RP-2, and RP-3 ranged between 7 and 18 percent. The blow counts for the shale that was encountered in the rock probes exceeded 100 bpf.

2.2 Bedrock

Bedrock consisting of mudstone and shale was encountered below the overburden soils. Table 2.2 shows the elevations of top of rock for the borings.

Table 2.2 - Elevation of Top of Rock

Designation	Station	Offset (ft.)	Top of Rock Elevation (ft.)
SB-1	222+95	100.5 RT	573.28
SB-2	224+30.5	85.5 LT	559.38
SB-4	222+53	11.0 RT	558.31
SB-5	225+02	0.0	579.10
RP-1	224+58	68.0 RT	580.51
RP-2	225+52	62.0 LT	565.89
RP-3	223+94	2.0 LT	563.29
Boring 1 (1970)	221+80	25 Lt	570.5
Boring 3 (1970)	224+30	56 LT	561.3
Boring 5 (1970)	221+70	50 RT	566.6
Boring 7 (1970)	224+26	32 RT	569.6

2.3 Groundwater

Groundwater was encountered in Borings SB-1, SB-2 and SB-5 at depths of 10 to 23 ft (El. 572.4 to El. 594.2). Groundwater elevations were taken into consideration for the geotechnical evaluations and recommendations that follow. Due to the use of deep foundations for the proposed structure and the anticipated elevations of groundwater that was encountered during the subsurface exploration, groundwater is not anticipated to have an impact during construction. It should be noted that the groundwater level is subject to seasonal and climatic variations. In addition, without extended periods of observation, measurement of true groundwater levels may not be possible.

3.0 GEOTECHNICAL EVALUATIONS

3.1 Settlement

It is our understanding additional fill will be placed for raising the median on the approaches to the new structures. Fill depths are currently anticipated to be minimal at depths of less than 3 feet. Therefore, based on the conditions of the existing embankment soils encountered in the field exploration and the anticipated fill depths over the existing soils, it is estimated that the existing embankments will experience settlements of less than 0.30 inches.

3.2 Slope Stability

The proposed construction of the new I-474 structures will result in new end slopes at the abutment locations.

The proposed abutments include endslopes at 1 Vertical to 2 Horizontal (1V:2H). Slope stability of the endslopes was analyzed using SLOPE/W; the soil properties at the site, including those in

Borings SB-4 and SB-5; and endslope geometrics. KEG modeled the slopes at both abutment locations. Two conditions were modeled for each: end-of-construction (E-O-C) and long-term (L-T). 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.

To model the E-O-C condition, undrained soil strength parameters were used with a friction angle of 0° assumed for cohesive soils. Drained soil strength parameters with assumed friction angles ranging from 12° to 28° were used to model the L-T cases where excess pore water pressure from construction has dissipated. For clay and silty clay materials, a nominal cohesion of 100 psf was included in the drained strength parameters.

The Modified Bishop Method, which generates circular-arc failure surfaces, was used to calculate the critical failure surfaces and FOS for the proposed conditions. The FOS obtained in the analysis are shown in Table 3.2. SLOPE/W program output from this analysis can be found in SLOPE/W Slope Stability Analysis, Exhibit E.

Table 3.2 - Slope Stability Critical FOS

Location	Slope	Calculated Critical FOS	
		End-of-Construction	Long-Term
North Abutment: Eastbound and Westbound Structures (SB-4)	1V:2H	2.1	1.5
South Abutment: Eastbound and Westbound Structures (SB-5)	1V:2H	3.2	1.5

The results of the analysis, as provided in Table 3.2, indicate an acceptable FOS will exist at the north and south abutments of both structures under short-term and long-term conditions.

3.3 Seismic Considerations

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

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

Table 3.3 - Summary of Seismic Parameters

Parameter	Value
Soil Site Class	C
Spectral Response Acceleration, 0.2 Sec, S_{DS}	0.132 g (Site Class C)
Spectral Response Acceleration, 1.0 Sec, S_{D1}	0.079 g (Site Class C)
Seismic Performance Zone	2

As indicated in the table above, the Seismic Performance Zone is 2, based on S_{D1} and Table 3.15.2 in the IDOT Bridge Manual, the Soil Site Class C, and Figure 2.3.10-2 in the IDOT Bridge Manual. Because these structures are considered critical, the appropriate Response Modification Factors as indicated in the American Association of State Highway and Transportation Officials (AASHTO) Bridge Design Specifications, Table 3.10.7.1-1 shall be applied.

3.4 Scour

Scour is not anticipated for the structure since it is not spanning a waterway.

3.5 Liquefaction

A liquefaction analysis is not required to be performed for structures located in SPZ 1. Therefore, liquefaction was not considered as a reduction for the pile design capacity or other foundation considerations included herein.

4.0 FOUNDATION EVALUATIONS AND DESIGN RECOMMENDATIONS

4.1 General Feasibility

Due to the depths to bedrock and anticipated foundation loads, driven piles appear applicable for support of the bridge abutments. Drilled shafts or driven piles appear applicable for support of Pier 1 and Pier 2. The Modified IDOT Static Method of Estimating Pile Length, as provided by IDOT Bureau of Bridges and Foundations (BBS) Foundations and Geotechnical Unit, were used to estimate the capacities of the driven piles end bearing in competent clay shale.

The preliminary design loads, as provided by Quigg Engineering, are provided in Table 4.1.

Table 4.1 - Preliminary Design Loads

Substructure Unit	Factored Reactions (kips)
Westbound: North Abutment	846
Westbound: Pier 1	1,760
Westbound: Pier 2	1760
Westbound: South Abutment	846
Eastbound: North Abutment	880
Eastbound: Pier 1	1,845
Eastbound: Pier 2	1,813
Eastbound: South Abutment	854

4.2 Pile Supported Foundations

The foundations supporting the proposed bridges must provide sufficient support to resist dead, live, and wind loads, including seismic loadings. Based on the encountered subsurface conditions, the Modified IDOT Static Method of Estimating Pile Length provided by IDOT BBS Foundations and Geotechnical Unit, and the information available to date, KEG recommends using H-piles. The Modified IDOT Static Method uses the LRFD Pile Design Guide Procedure to estimate the pile lengths (Pile Length/Pile Type, Exhibit F).

The estimated pile lengths for the pile types considered are shown in Table 4.2.1 through 4.2.5 below and under Exhibit F, Pile Length/Pile Type. The Nominal Required Bearing (RN) represents the resistance the pile will experience during driving and will assist 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.

As shown in the tables and under Pile Length/Pile Type, Exhibit F; down drag, scour, and liquefaction have not been considered at the pile locations.

Table 4.2.1 - Estimated Pile Lengths for HP 10x42 H-Pile

Substructure Location	R_n Nominal Required Bearing (kips)	R_F Allowable Resistance Available (LRFD Criteria) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
North Abutment (westbound) SB-4	140	77	49	612.5
	232	127	57	612.5
	335	184	59	612.5
North Abutment (eastbound) SB-4	140	77	49	612.6
	232	127	57	612.6
	335	184	59	612.6
Pier 1 (westbound & eastbound) SB-1	117	64	38	610.0
	238	131	40	610.0
	335	184	42	610.0
Pier 2 (westbound & eastbound) SB-2	109	60	51	610.2
	230	127	53	610.2
	335	184	55	610.2

Substructure Location	R_n Nominal Required Bearing (kips)	R_F Allowable Resistance Available (LRFD Criteria) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
South Abutment (westbound) SB-5	148	81	40	613.6
	260	143	42	613.6
	335	184	44	613.6
South Abutment (eastbound) SB-5	260	143	41	613.2
	301	166	42	613.2
	335	184	43	613.2

Table 4.2.2 - Estimated Pile Lengths for HP 12x53 H-Pile

Substructure Location	R_n Nominal Required Bearing (kips)	R_F Allowable Resistance Available (LRFD Criteria) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
North Abutment (westbound) SB-4	171	94	49	612.5
	277	152	57	612.5
	418	230	59	612.5
North Abutment (eastbound) SB-4	171	94	49	612.6
	277	152	57	612.6
	418	230	59	612.6
Pier 1 (westbound & eastbound) SB-1	140	77	38	610.0
	285	157	40	610.0
	418	230	42	610.0
Pier 2 (westbound & eastbound) SB-2	131	72	51	610.2
	275	151	53	610.2
	418	230	55	610.2

Substructure Location	R_n Nominal Required Bearing (kips)	R_F Allowable Resistance Available (LRFD Criteria) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
South Abutment (westbound) SB-5	177	98	40	613.6
	322	177	42	613.6
	418	230	44	613.6
South Abutment (eastbound) SB-5	322	177	41	613.2
	383	211	42	613.2
	418	230	43	613.2

Table 4.2.3 - Estimated Pile Lengths for HP 12x63 H-Pile

Substructure Location	R_n Nominal Required Bearing (kips)	R_F Allowable Resistance Available (LRFD Criteria) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
North Abutment (westbound) SB-4	284	156	57	612.5
	431	237	59	612.5
	497	273	61	612.5
North Abutment (eastbound) SB-4	284	156	57	612.6
	431	237	59	612.6
	497	273	61	612.6
Pier 1 (westbound & eastbound) SB-1	218	120	39	610.0
	361	199	41	610.0
	497	273	43	610.0
Pier 2 (westbound & eastbound) SB-2	208	115	52	610.2
	355	195	54	610.2
	497	273	56	610.2

Substructure Location	R_n Nominal Required Bearing (kips)	R_F Allowable Resistance Available (LRFD Criteria) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
South Abutment (westbound) SB-5	255	140	41	613.6
	387	213	43	613.6
	497	273	45	613.6
South Abutment (eastbound) SB-5	387	213	42	613.2
	437	240	43	613.2
	497	273	44	613.2

Table 4.2.4 - Estimated Pile Lengths for HP 14x73 H-Pile

Substructure Location	R_n Nominal Required Bearing (kips)	R_F Allowable Resistance Available (LRFD Criteria) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
North Abutment (westbound) SB-4	336	185	57	612.5
	532	293	59	612.5
	578	318	60	612.5
North Abutment (eastbound) SB-4	336	185	57	612.6
	466	256	58	612.6
	578	318	60	612.6
Pier 1 (westbound & eastbound) SB-1	258	142	39	610.0
	431	237	41	610.0
	578	318	43	610.0
Pier 2 (westbound & eastbound) SB-2	247	136	52	610.2
	420	231	54	610.2
	578	318	56	610.2

Substructure Location	R_n Nominal Required Bearing (kips)	R_F Allowable Resistance Available (LRFD Criteria) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
South Abutment (westbound) SB-5	302	166	41	613.6
	476	262	43	613.6
	578	318	45	613.6
South Abutment (eastbound) SB-5	302	166	40	613.2
	476	262	42	613.2
	578	318	44	613.2

Table 4.2.5 - Estimated Pile Lengths for HP 14x89 H-Pile

Substructure Location	R_n Nominal Required Bearing (kips)	R_F Allowable Resistance Available (LRFD Criteria) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
North Abutment (westbound) SB-4	342	188	57	612.5
	599	329	60	612.5
	705	388	62	612.5
North Abutment (eastbound) SB-4	474	261	58	612.6
	599	329	60	612.6
	705	388	62	612.6
Pier 1 (westbound & eastbound) SB-1	439	241	41	610.0
	575	316	43	610.0
	705	388	45	610.0
Pier 2 (westbound & eastbound) SB-2	428	235	54	610.2
	567	312	56	610.2
	705	388	58	610.2

Substructure Location	R_n Nominal Required Bearing (kips)	R_F Allowable Resistance Available (LRFD Criteria) (kips)	Estimated Pile Length (ft.)	Assumed Pile Cut-off Elevation (ft.)
South Abutment (westbound) SB-5	484	266	43	613.6
	606	333	45	613.6
	705	388	47	613.6
South Abutment (eastbound) SB-5	484	266	42	613.2
	606	333	44	613.2
	705	388	46	613.2

KEG recommends two test piles be performed. One on the south abutment of the westbound structure and one on the north abutment of the eastbound structure. Test piles are performed prior to production driving so that actual, on-site field data can be gathered to further evaluate pile driving requirements for the project. This also is the way the contractor's proposed equipment and methodologies identified in their Pile Installation Plan can be assessed.

4.3 Piles Set in Rock

Table 4.3 provides side resistance and end bearing values to be used for piles set into rock in the underlying shale or limestone. The socket diameter should be sized in 0.5-foot increments and be just large enough to allow placement of the pile inside the socket and allow concrete placement that will fully encase the pile. Once the minimum socket length and diameter are determined to carry the axial load, the lateral load capacity should be checked. If necessary, the socket length can be increased. Due to the lack of high driving stresses, the nominal capacity of piles set in rock is 100 percent of the pile yield strength. In addition, piles set in rock use an AASHTO (2020) resistance factor of 0.7.

Table 4.3 – Design Parameters for Piles Set in Rock

Substructure Location	Estimated Groundwater Elevation (ft)	Pile Type and Size	Material Type	Side Resistance (kips/ft socket)	End Bearing Resistance (kips)	Top of Rock Elevation (ft.)	
						Pier 1 (SB-1)	Pier 2 (SB-2)
Piers Eastbound & Westbound	581.0[1]	10X42 H-Pile	Shale	41	85	565.3	555.4
			Limestone	82	170	554.3	550.9
		12X53 H-Pile	Shale	50	123	565.3	555.4
			Limestone	99	245	554.3	550.9
		12X63 H-Pile	Shale	50	125	565.3	555.4
			Limestone	100	249	554.3	550.9
		14X73 H-Pile	Shale	59	172	565.3	555.4
			Limestone	117	344	554.3	550.9
		14X89 H-Pile	Shale	59	175	565.3	555.4
			Limestone	118	351	554.3	550.9

1. Estimated groundwater elevation based off borings SB-1 and SB-2 performed in July 2019. Groundwater elevations may fluctuate with climatic and seasonal variations.

Per IDOT Geotechnical Manual, revised December 4, 2020; when setting piles into rock is specified on the plans, a special provision (GBSP 56) should be provided in the contract documents.

4.4 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 4.4 is included for the structural engineer's use in evaluating lateral pile response. The values were estimated based on the descriptions as listed on the boring logs. No specific hydrometer analyses were performed on the site soils.

Table 4.4 - Soil Parameters for Lateral Pile Load Analysis

Boring	Elev. at Bottom of Layer	γ (pcf)	Short Term		Long Term		N	Assumed % fines < #200	K (pci)	ε50
			Φ (deg.)	c (psf)	Φ (deg.)	c (psf)				
SB-1	590.28	120	0	1600	26	100	11	65	500	0.007
	578.28	120	0	540	26	50	8	65	100	0.010
	576.28	120	0	1200	26	100	13	65	500	0.007
	573.28	120	0	3500	27	100	63	85	1000	0.005
	554.28	125	12	5000	12	5000	100+	--	2000	0.004
SB-2	580.38	125	0	625*	27	50	5	65	100	0.010
	572.38	125	0	1500*	26	100	12	85	500	0.007
	559.38	120	0	975	27	100	9	65	100	0.007
	550.88	125	12	5000	12	5000	100+	--	2000	0.004
SB-4	610.31	125	0	1100	27	100	13	65	500	0.007
	605.81	125	0	1450	27	100	16	65	500	0.007
	560.31	120	0	1400	26	100	18	65	500	0.007
	548.31	125	12	4500	12	4500	100+	--	2000	0.004
SB-5	592.1	125	0	1030	27	100	17	65	500	0.007
	579.1	120	0	1600	27	100	55	85	500	0.007
	572.1	125	12	4500	12	4500	100+	--	2000	0.004

*indicates Q_u estimated…Q_u=N/8

4.5 Foundations on Drilled Shafts

The foundations supporting the proposed bridge must provide sufficient support to resist dead and live loads, including horizontal forces.

Competent shale bedrock is generally encountered as indicated above in Section 2.2 and Table 2.2 – Elevation of Top of Rock.

Recommendations for drilled shafts with sockets extending various depths into the underlying shale, developing capacity from tip and side resistance, are provided for design support for Pier 1 and Pier 2. The provided capacities are based on boring information as summarized in Section 2.0 above, laboratory unconfined compressive strength tests performed on rock core samples from Borings SB-1 and SB-2, top of shale elevations from RP-1 thru RP-3, and utilizing the IDOT Drilled Shaft Axial Capacity in Shale spreadsheet as provided by IDOT BBS Foundations and Geotechnical Unit. LRFD Resistance Factors of 0.5 for side resistance and 0.5 for tip resistance are incorporated into the allowable capacities, respectively.

Tables 4.5.1 thru 4.5.4 – Drilled Shaft Axial Capacity below contain a summary of Factored Shaft Resistances available for various shaft diameters based on socket depths into the underlying shale for each substructure. IDOT Drilled Shaft in Shale Input sheets and Design Tables are included in Exhibit G, Drilled Shaft Design.

Table 4.5.1 – Estimated Drilled Shaft Axial Capacity for 36-inch Diameter Shaft

Substructure Unit	Socket Depth (ft.)	Nominal Total Side Resistance (kips)	Nominal Tip Resistance (kips)	Nominal Shaft Resistance (kips)	Factored Shaft Resistance (kips)	Tip Elevation (ft.)
Pier #1 Westbound and Eastbound SB-1	4	41	659	700	350	569.3
	6	61	1268	1330	665	567.3
	10	501	1949	2450	1225	563.3
Pier #2 Westbound and Eastbound SB-2/RP-3	2	25	477	501	251	561.3
	4	79	1259	1337	669	559.3
	6	163	2036	2199	1099	557.3

Table 4.5.2 – Estimated Drilled Shaft Axial Capacity for 42-inch Diameter Shaft

Substructure Unit	Socket Depth (ft.)	Nominal Total Side Resistance (kips)	Nominal Tip Resistance (kips)	Nominal Shaft Resistance (kips)	Factored Shaft Resistance (kips)	Tip Elevation (ft.)
Pier #1 Westbound and Eastbound SB-1	4	48	1106	1153	577	569.3
	6	72	1703	1774	887	567.3
	10	584	2772	3356	1678	563.3
Pier #2 Westbound and Eastbound SB-2/RP-3	2	29	1006	1035	517	561.3
	4	92	1932	2024	1012	559.3
	6	190	2848	3039	1519	557.3

Table 4.5.3 – Estimated Drilled Shaft Axial Capacity for 48-inch Diameter Shaft

Substructure Unit	Socket Depth (ft.)	Nominal Total Side Resistance (kips)	Nominal Tip Resistance (kips)	Nominal Shaft Resistance (kips)	Factored Shaft Resistance (kips)	Tip Elevation (ft.)
Pier #1 Westbound and Eastbound SB-1	4	55	1701	1756	878	569.3
	6	82	2197	2279	1139	567.3
	10	668	3729	4397	2198	563.3
Pier #2 Westbound and Eastbound SB-2/RP-3	2	33	1654	1686	843	561.3
	4	105	2830	2935	1467	559.3
	6	217	3787	4004	2002	557.3

Table 4.5.4 – Estimated Drilled Shaft Axial Capacity for 54-inch Diameter Shaft

Substructure Unit	Socket Depth (ft.)	Nominal Total Side Resistance (kips)	Nominal Tip Resistance (kips)	Nominal Shaft Resistance (kips)	Factored Shaft Resistance (kips)	Tip Elevation (ft.)
Pier #1 Westbound and Eastbound SB-1	4	61	2177	2239	1119	569.3
	6	92	3077	3169	1584	567.3
	10	751	4819	5570	2785	563.3
Pier #2 Westbound and Eastbound SB-2/RP-3	2	37	2419	2456	1228	561.3
	4	118	3749	3867	1934	559.3
	6	245	4849	5094	2547	557.3

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.

5.2 Temporary Sheeting and Soil Retention

Temporary sheet piling is feasible at each abutment location.

Temporary Soil Retention Systems may be required versus Temporary Sheet Piling, depending upon the surcharge loading and retained heights required to be supported during construction. An Illinois-licensed Structural Engineer is required to seal the design of Temporary Soil Retention Systems, if deemed necessary.

5.3 Site and Soil Conditions

Should any bridge or embankment design considerations assumed by either IDOT or KEG change, KEG should be contacted to determine if the recommendations stated in this report still apply. See Section 205 - Embankment, of the Standard Specifications of Road and Bridge Construction for specific information on embankment construction.

5.4 Foundation Construction

Conventional pile driving and drilled shaft equipment and methodologies should be assumed.

A JULIE locate shall be conducted to determine if any underground utilities are present around the proposed structure prior to construction. If utilities become a problem during construction, the appropriate owner shall be contacted immediately.

6.0 COMPUTATIONS

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

7.0 GEOTECHNICAL DATA

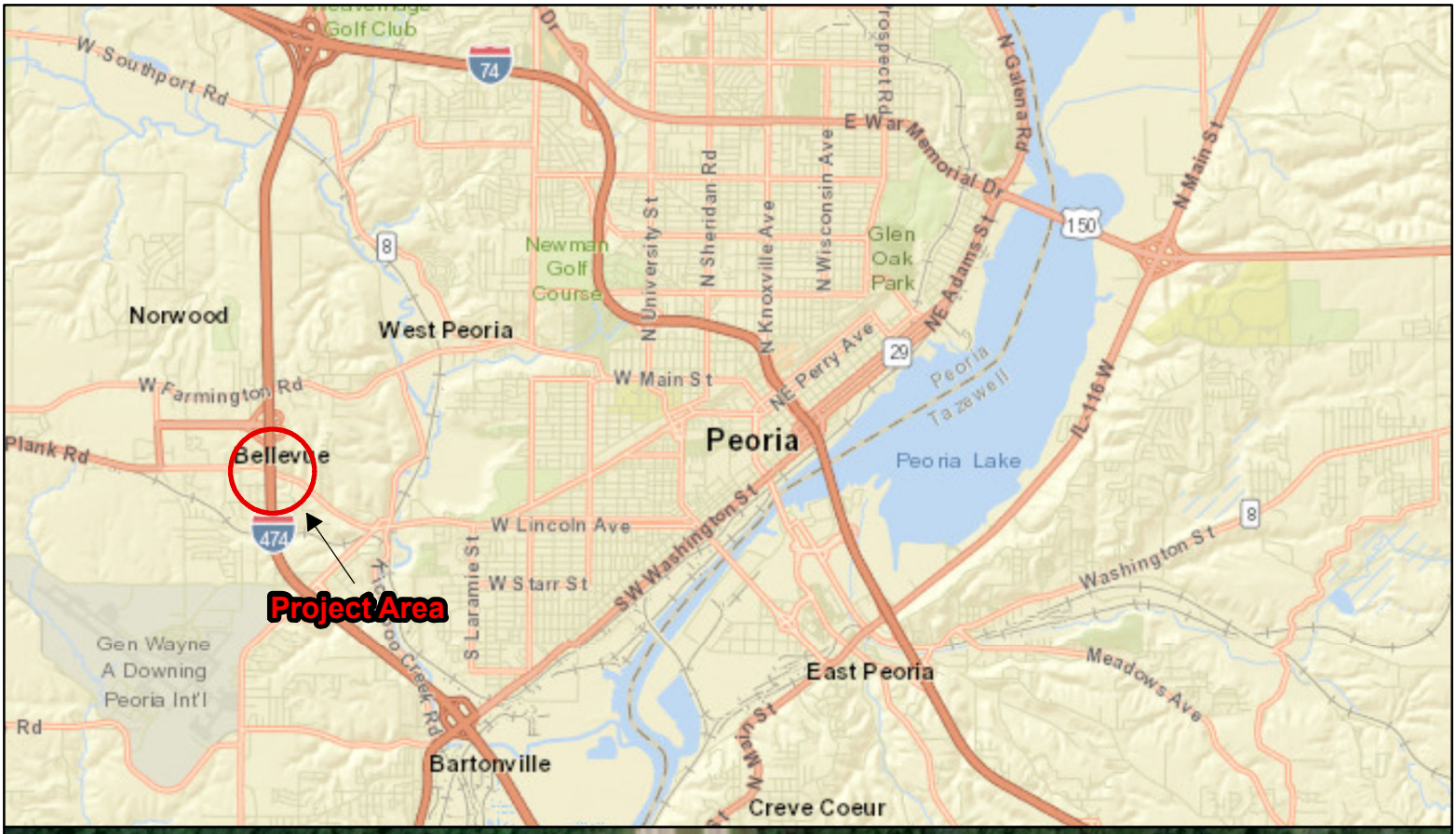
Soil borings can be found in Exhibit C. The Subsurface Profiles can be found in Exhibit D.

8.0 LIMITATIONS

The recommendations provided herein are for the exclusive use of The Upchurch Group and IDOT. They are specific only to the project described and are based on the subsurface information obtained by IDOT at seven recent boring and rock probe locations within the bridge area in 2019 and 2020. 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

Bridge Replacements
I-474 (FAI 474) over Plank Road (IL 116)
Section 73-3HB-2, Job No. P-94-038-12
SN 072-0121 and 072-0122 (Existing)
Peoria County, Illinois

Exhibit No.

A

KEG JOB #19-1033.02

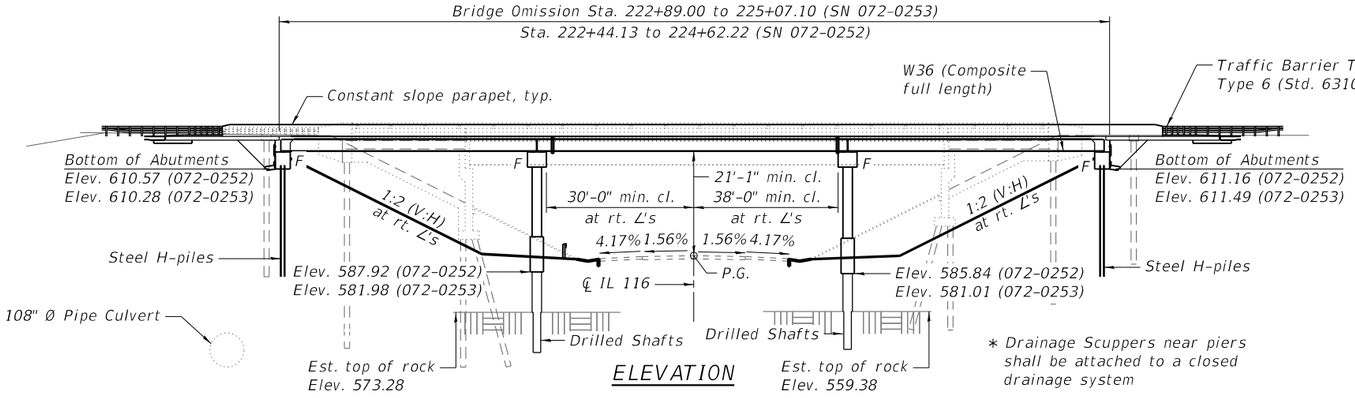
EXHIBIT B

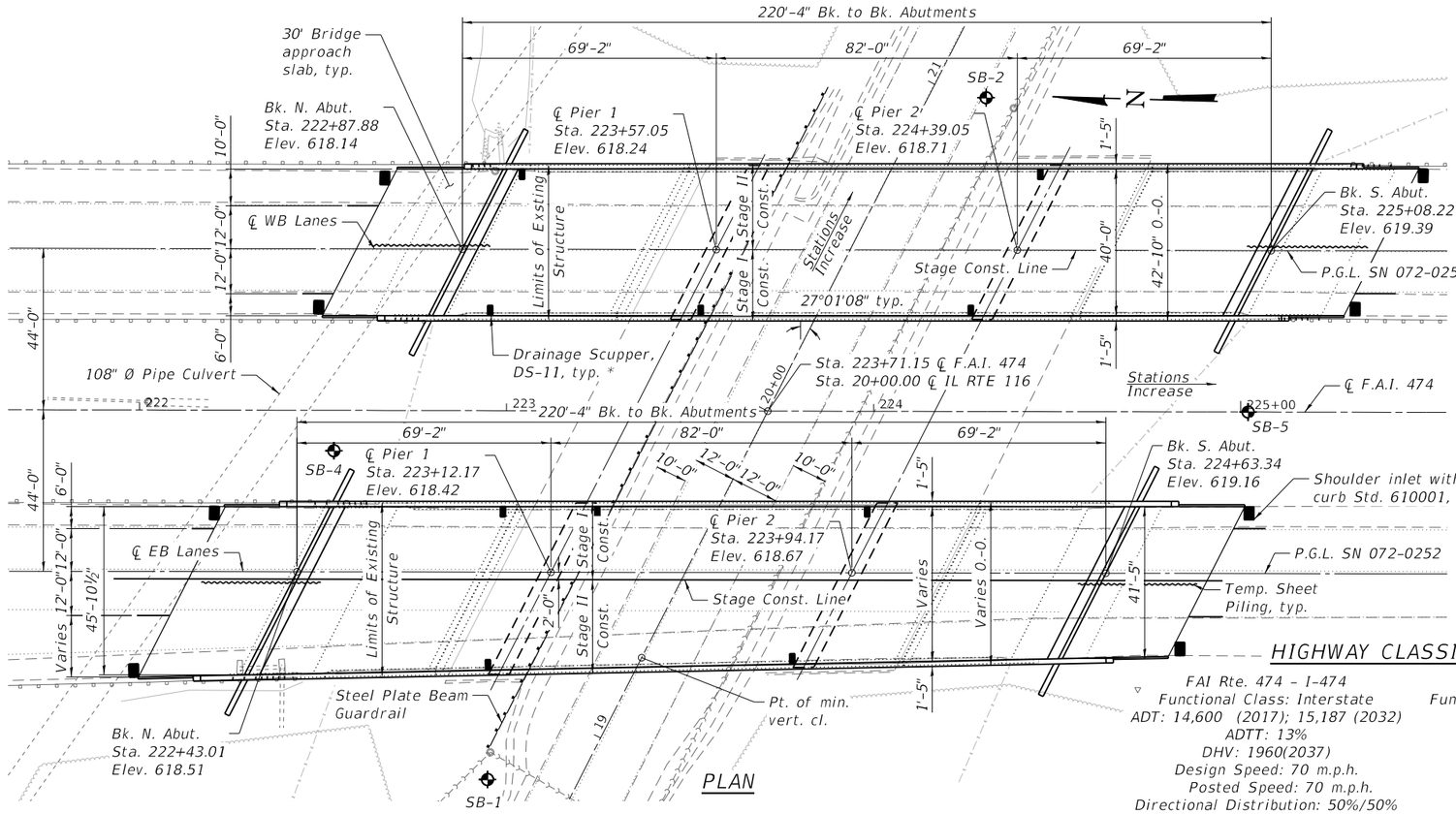
TYPE, SIZE, AND LOCATION PLAN (TS&L)

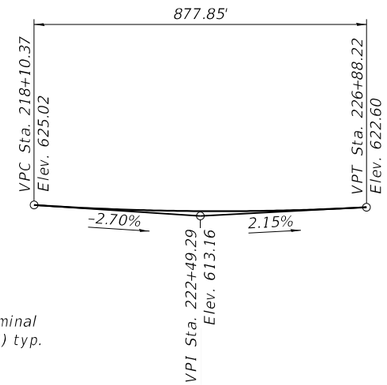
Benchmark: BM #10 – ⅝" Iron Rod with Control Cap. Sta. 203+18.28, Elev. 691.49

Existing Structure: S.N. 072-0121 (SB) & 072-0122 (NB) Built in 1978 as F.A.I. Rte. 474, Section 72-3HB-2, at Sta. 223+71.15. Existing dual structures each consist of a 124' single span 74" welded steel plate girder supporting an 8" thick reinforced concrete deck. Approach spans consist of a PPC I-Beam superstructure. The substructure consists of reinforced concrete vaulted abutments and approach bents supported on steel H-piles. The concrete approach slabs are supported on timber piles. The NB structure is 218'-2" back-to-back of abutments and has an out-to-out width of 42'-0". The SB structure is 188'-2" back-to-back of abutments and has an out-to-out width that varies from 43'-8¼" to 47'-6". The skew is 27°01'08". A bituminous overlay was placed on the structures and adjoining mainline pavement in 2009. Structures to be removed and replaced. Traffic to be maintained utilizing stage construction.

No Salvage

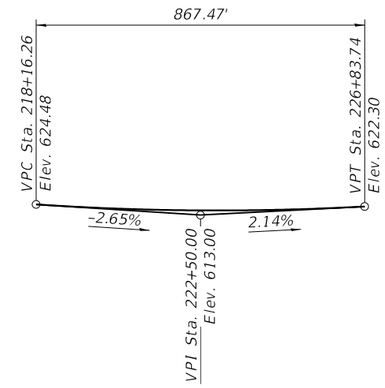






PROFILE GRADE F.A.I. EB 474

(Along ℄ Roadway)



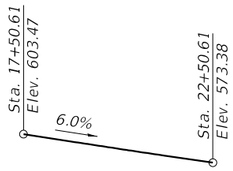
Notes:

The profile grade shows the final elevations after grinding.

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

PROFILE GRADE F.A.I. WB 474

(Along ℄ Roadway)



PROFILE GRADE IL 116

(Along ℄ Roadway)

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)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

HIGHWAY CLASSIFICATION

FAI Rte. 474 – I-474
Functional Class: Interstate
ADT: 14,600 (2017); 15,187 (2032)
ADTT: 13%
DHV: 1960(2037)
Design Speed: 70 m.p.h.
Posted Speed: 70 m.p.h.
Directional Distribution: 50%/50%

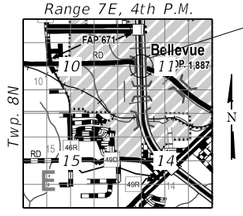
FAP IL Rte. 116 (Plank Road)
Functional Class: Other Principal Arterial
ADT: 4,700 (2018); 6,903 (2032)
ADTT: 6%
DHV: 620(2037)
Design Speed: 45 m.p.h.
Posted Speed: 45 m.p.h.
Directional Distribution: 50%/50%

LOADING HL-93

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

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 =



LOCATION SKETCH

GENERAL PLAN AND ELEVATION
I-474 OVER IL ROUTE 116
F.A.I. RTE 474 – SECTION (72-3HB-2)BR
PEORIA COUNTY
STA. 223+71.15
STRUCTURE NO. 072-0252 (EB)
STRUCTURE NO. 072-0253 (WB)

MODEL: GPE
FILE NAME: S:\2019\19L063 Var Ph I\IDOT D4 Upchurch PTB 191-08\Work Order 2 - I-474 over Plank Rd\CADD\CADD Drawings\TSL_Working Drawings_LMC.dgn
6/25/2020 9:19:45 PM

QUIGG ENGINEERING INC

USER NAME = lcriscione	DESIGNED - KWB	REVISED -
TSL_Working Drawings_LMC.dgn	CHECKED - KFO	REVISED -
PLOT SCALE = 40.000 ' / in.	DRAWN - LMC	REVISED -
PLOT DATE =	CHECKED -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GENERAL PLAN & ELEVATION
SN. 072-0252 & 072-0253
SHEET 1 OF 4 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
474	(72-3HB-2)BR	PEORIA		
		CONTRACT NO. 68884		
	ILLINOIS FED. AID PROJECT			

EXHIBIT C

BORING LOGS

Illinois Department of Transportation
Division of Highways
Terracon

SOIL BORING LOG

Date 7/15/19

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for bridge replacement **LOGGED BY** BI (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over IL 116 (Plank Rd), **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**, **Latitude** 40°41'18.74"N, **Longitude** 89°40'33.41"W

COUNTY Peoria **DRILLING METHOD** Solid Stem/ Rotary **HAMMER TYPE** AUTO SPT Hammer

STRUCT. NO. 072-0121 & 0122 EX 072-0252 & 0253 PR
Station 223+71 (CL median)

BORING NO. SB-1
Station 222+95
Offset 100.5 ft RT
Ground Surface Elev. 596.28 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter ft
Upon Completion ft
After 96 **Hrs.** 581.2 ft

Material Description	Elev. (ft)	Depth (ft)	Blows (/6")	UCS Qu (tsf)	Moist (%)
TOPSOIL	595.28				11
CLAY LOAM: brown, moist, very stiff, with traces of sand and gravel			3		
			4 11	1.7	18
			3		
		-5	4 3	1.5	20
	590.28		1		
CLAY LOAM: brown, moist, very soft to soft, with traces of sand and gravel			3 4	0.2	23 16
			3		
	586.28	-10	5 4	0.4	22
CLAY LOAM: brown and grayish brown, moist, medium stiff, with traces of sand and gravel			1		
			3 4	0.8	26
			4		
		▽15	4 5	0.8	31
			2		
			3 6	0.5	22
	578.28				
CLAY LOAM: grayish brown, moist, stiff, with sand and gravel			5		
			6 7	1.2	22
	576.28	-20			

Material Description	Elev. (ft)	Depth (ft)	Blows (/6")	UCS Qu (tsf)	Moist (%)
SILTY CLAY LOAM: gray, moist, very stiff, with traces of gravel			6		
			13 50/4	3.5 P	19
	573.28				
MUDSTONE: gray, moist, completely weathered, soft			35		
		-25	50/5		13
Borehole continued with rock coring.		-30			
		-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
Terracon

ROCK CORE LOG

Date 7/15/19

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for bridge replacement **LOGGED BY** BI (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over IL 116 (Plank Rd), **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**,
Latitude 40°41'18.74"N, **Longitude** 89°40'33.41"W

COUNTY Peoria **CORING METHOD** Rotary Wash

STRUCT. NO. 072-0121 & 0122 EX
072-0252 & 0253 PR
Station 223+71 (CL median)

CORING BARREL TYPE & SIZE NX-2

Core Diameter 1.9 **in**
Top of Rock Elev. 573.28 **ft**
Begin Core Elev. 571.28 **ft**

BORING NO. SB-1
Station 222+95
Offset 100.5 ft RT
Ground Surface Elev. 596.28 **ft**

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
MUDSTONE: gray, moist, completely weathered, soft *(continued)*	RUN 1	72	43		
-30					
Mosture Content: 6.7%; Dry Density: 135.9 pcf					3.5
565.28					
SHALE: gray, moist, highly weathered, soft					
Mosture Content: 4.8%; Dry Density: 142.6 pcf					71.7
-35					
	RUN 2	92	78		
Mosture Content: 4%; Dry Density: 147.0 pcf					47.9
Mosture Content: 2.8%; Dry Density: 153.4 pcf					132.3
-40					
Mosture Content: 2.4%; Dry Density: 151.4 pcf					168.0
554.28					
LIMESTONE: gray, weak					
Mosture Content: 0.7%; Dry Density: 151.4 pcf	RUN 3	69	72		289.4
551.28 -45					

End of Boring

Color pictures of the cores Yes

Cores will be stored for examination until

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

BBS, form 138 (Rev. 8-99)

ROCK CORE I-474 OVER PLANK RD.GPJ IL_DOT.GDT 5/13/20

Illinois Department of Transportation
Division of Highways
Terracon

SOIL BORING LOG

Date 7/15/19

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for bridge replacement **LOGGED BY** BI (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over IL 116 (Plank Rd), **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**, **Latitude** 40°41'17.35"N, **Longitude** 89°40'30.96"W

COUNTY Peoria **DRILLING METHOD** Solid Stem/ Rotary **HAMMER TYPE** AUTO SPT Hammer

STRUCT. NO. 072-0121 & 0122 EX 072-0252 & 0253 PR
Station 223+71 (CL median)

BORING NO. SB-2
Station 224+30.5
Offset 85.5 ft LT
Ground Surface Elev. 582.38 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 572.4 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
ASPHALT PAVEMENT: about 6 inches (581.88)				2
FILL - CLAY LOAM: brown and dark gray, moist, medium stiff, with traces of sand and gravel (580.38)		2		
		2 3		27
SILTY CLAY LOAM: brown, moist, stiff, with traces of sand and gravel		4		
	-5	6 6		17
		4		
		5 9		18
		4		
(572.38 ▼)	-10	6 4		21
CLAY LOAM: brown, moist, stiff, with traces of sand and gravel		2		
		3 4	1.2	25
		2		
	-15	3 4	1.2	27
		2		
		4 6	0.8	21 35
brownish gray		4		
	-20	3 6	0.7	28
CLAY LOAM: brown, moist, stiff, with traces of sand and gravel *(continued)*		9		
		8 4		34
(559.38)				
MUDSTONE: gray, moist, completely weathered, soft Borehole continued with rock coring.		50/5		
	-25			
	-30			
	-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
Terracon

ROCK CORE LOG

Date 7/15/19

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for bridge replacement **LOGGED BY** BI (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over IL 116 (Plank Rd), **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**,
Latitude 40°41'17.35"N, **Longitude** 89°40'30.96"W

COUNTY Peoria **CORING METHOD** Rotary Wash

STRUCT. NO. 072-0121 & 0122 EX / 072-0252 & 0253 PR
Station 223+71 (CL median)

BORING NO. SB-2
Station 224+30.5
Offset 85.5 ft LT
Ground Surface Elev. 582.38 ft

CORING BARREL TYPE & SIZE NX-2
Core Diameter 1.9 in
Top of Rock Elev. 558.38 ft
Begin Core Elev. 558.38 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
MUDSTONE: gray, moist, completely weathered, soft *(continued)*	-25	RUN 1	82	79		
Mosture Content: 5.8%; Dry Density: 139.3 pcf						4.2
	555.38					
SHALE: gray, most, highly weathered, soft						
Mosture Content: 5.2%; Dry Density: 144.7 pcf						14.4
	-30					
	550.88					
LIMESTONE: gray, weak						
Mosture Content: 0.3%; Dry Density: 163.9 pcf						645.1
Mosture Content: 0.2%; Dry Density: 164.5 pcf	-35	RUN 2	93	73		640.9
	546.38					
COAL: black, moist, highly weathered						
	542.38	-40				
SHALE: gray, highly weathered, weak, trace sand seams						
Mosture Content: 10.3%; Dry Density: 121.1 pcf						1.9
Mosture Content: 11.0%; Dry Density: 119.2 pcf						0.9
	538.38					

End of Boring

Color pictures of the cores Yes

Cores will be stored for examination until

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

BBS, form 138 (Rev. 8-99)

ROCK CORE I-474 OVER PLANK RD.GPJ IL_DOT.GDT 5/13/20

Illinois Department of Transportation
Division of Highways
Terracon

SOIL BORING LOG

Date 7/17/19

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for bridge replacement **LOGGED BY** BI (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over IL 116 (Plank Rd), **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**, **Latitude** 40°41'19.12"N, **Longitude** 89°40'32.23"W

COUNTY Peoria **DRILLING METHOD** Solid Stem/ Rotary **HAMMER TYPE** AUTO SPT Hammer

STRUCT. NO. 072-0121 & 0122 EX, 072-0252 & 0253 PR
Station 223+71 (CL median)

BORING NO. SB-4
Station 222+53
Offset 11.0 ft RT
Ground Surface Elev. 618.31 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 (%)	Material
			14	TOPSOIL
				617.31
	4			FILL - CLAY LOAM: dark brown, moist, medium stiff to stiff, with traces of sand and gravel
	4 6	0.9	18	
	3			brownish gray
	8	1.4	17	
-5	8			
	3			
	5	0.9	18	
	7			
				610.31
	4			POSSIBLE FILL - CLAY LOAM: brown and dark gray, moist, very stiff, with traces of sand and gravel
	8	1.4	23	
-10	12			
	3			
	6	1.5	24	
	5			
				605.81
	2			CLAY LOAM: brown, moist, stiff, with traces of sand and gravel
	5	2.0	28	
-15	7			
	2			brownish gray
	5	1.4	28	
	5			
	3			
	5	1.6	23	
-20	7		23	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	4			CLAY LOAM: brown, moist, stiff, with traces of sand and gravel *(continued)* brown
	6 9	1.5	20	
	4			
	6	1.7	20	
-25	9			
	4			
	9	1.9	19	
	9			
	3			with silt seams 28.5 to 30 feet
	7	1.2	30	
-30	7			
	4			reddish brown
	12	1.1	21	
-35	10		17	
	4			
	8	1.4	22	
-40	13			

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
Terracon

SOIL BORING LOG

Date 7/17/19

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for bridge replacement **LOGGED BY** BI (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over IL 116 (Plank Rd), **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**, **Latitude** 40°41'19.12"N, **Longitude** 89°40'32.23"W

COUNTY Peoria **DRILLING METHOD** Solid Stem/ Rotary **HAMMER TYPE** AUTO SPT Hammer

STRUCT. NO. 072-0121 & 0122 EX, 072-0252 & 0253 PR
Station 223+71 (CL median)

BORING NO. SB-4
Station 222+53
Offset 11.0 ft RT
Ground Surface Elev. 618.31 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 (%)
CLAY LOAM: brown, moist, stiff, with traces of sand and gravel *(continued)*			
	4		
	11	1.4	26
-45	16		20
	10		
	8	0.5	22
-50	11		16
	6		
	10	1.3	65
-55	18		
560.31			
LIMESTONE FRAGEMENTS: gray	50/5		
			18
558.31 -60			
SHALE: gray, weak, highly weathered			
	50/1		
-65			18
	50/1		
548.31 -70			8
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
Division of Highways
Terracon

SOIL BORING LOG

Date 7/17/19

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for bridge replacement **LOGGED BY** BI (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over IL 116 (Plank Rd), **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**, **Latitude** 40°41'16.73"N, **Longitude** 89°40'32.09"W

COUNTY Peoria **DRILLING METHOD** Solid Stem/ Rotary **HAMMER TYPE** AUTO SPT Hammer

STRUCT. NO. 072-0121 & 0122 EX 072-0252 & 0253 PR
Station 223+71 (CL median)

BORING NO. SB-5
Station 225+02
Offset 0.0 ft
Ground Surface Elev. 617.10 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter ft
Upon Completion ft
After 108 **Hrs.** 594.2 ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
			22	TOPSOIL
				616.10
	3			CLAY LOAM: brown, moist, medium stiff to stiff, with traces of sand and gravel
	5 6	1.4	25	
	3			
-5	4 6		29	
	4			
	5 7	1.2	34	
	4			
-10	5 6	0.9	22	
	4			reddish brown
	5 5	1.5	19	
	5			
-15	5 6	0.7	27 29	
	3			
	5 6	1.4	25	
	5			brown
-20	7 7	0.7	21	
	5			CLAY LOAM: brown, moist, medium stiff to stiff, with traces of sand and gravel *(continued)*
	8 15	0.7	20 12	
	28			
-25	24 29	0.8	12	
				592.10
	14			SILTY CLAY LOAM: brownish gray, moist, medium stiff to very stiff, with traces gravel
	22 36	0.7	21	
	28			
-30	21 50/4	2.4	17	
	8			
-35	16 19	1.6	17	
	25			
-40	50/5	3.2	11	
				579.10
				SHALE: gray, weak, highly weathered

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
Terracon

SOIL BORING LOG

Date 7/17/19

ROUTE FAI 474 (I-474) **DESCRIPTION** Structure boring for bridge replacement **LOGGED BY** BI (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over IL 116 (Plank Rd), **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**, **Latitude** 40°41'16.73"N, **Longitude** 89°40'32.09"W

COUNTY Peoria **DRILLING METHOD** Solid Stem/ Rotary **HAMMER TYPE** AUTO SPT Hammer

STRUCT. NO. 072-0121 & 0122 EX, 072-0252 & 0253 PR
Station 223+71 (CL median)

BORING NO. SB-5
Station 225+02
Offset 0.0 ft
Ground Surface Elev. 617.10 ft

Surface Water Elev. ____ ft
Stream Bed Elev. ____ ft

Groundwater Elev.:
First Encounter ____ ft
Upon Completion ____ ft
After 108 **Hrs.** 594.2 ft ▽

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
SHALE: gray, weak, highly weathered *(continued)*				
	50/2			
572.10 -45			18	
End of Boring				
-50				
-55				
-60				

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

Terracon

Rock Quality Designation (RQD) of Rock Core ASTM D 6032

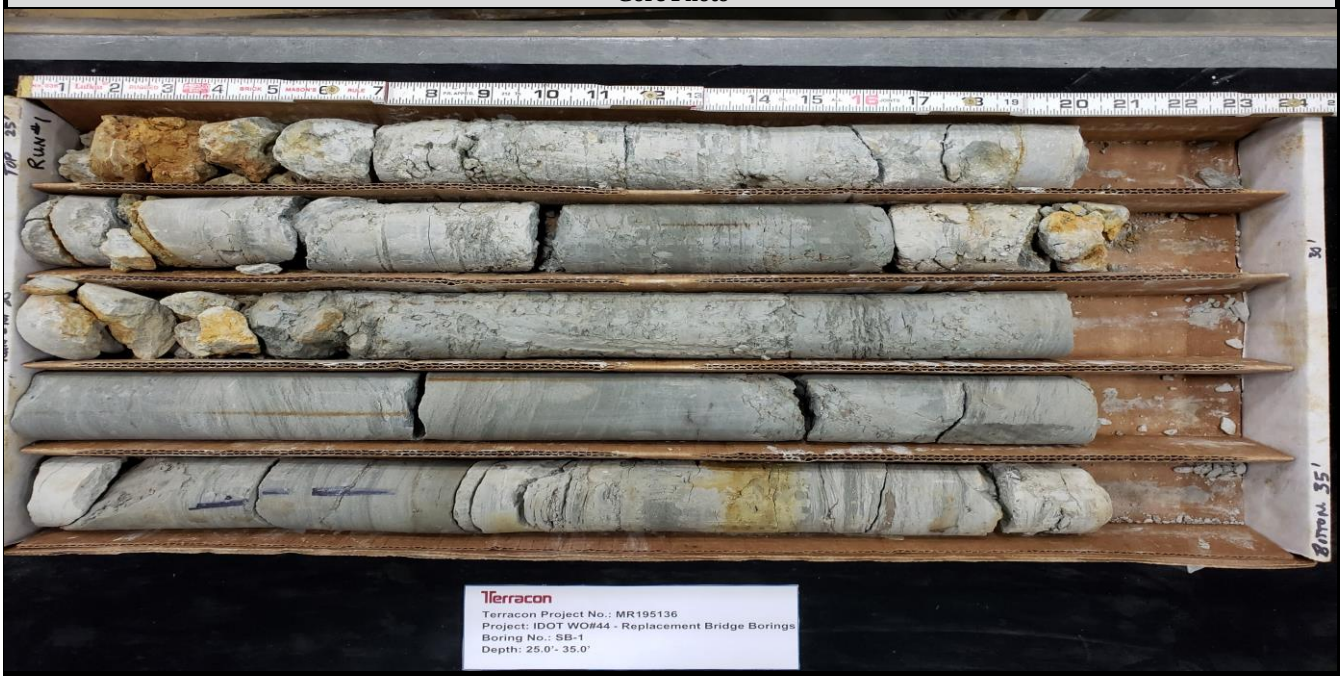
Laboratory Services Group *192 Exchange Boulevard* *Glendale Heights, Illinois 60139* *Phone: (630) 717-4263* *Fax: (630) 357-9489*

Project No.: **MR195136** **Date:** **7/23/19**
Project Name: **IDOT WO#44 - Replacement Bridge Borings**

Summary of Test Results

Boring No. / Run No.	Depth (ft)	Total Length ≥ 4 in	Length of Core Recovery (in)	Total Length of Core Run (in)	Recovery (%)	RQD (%)	Rock Quality Classification	Fracture Frequency Per Foot
SB-1	25.0'-35.0'	37	120	86	72	43	Poor	3

Core Photo



Terracon

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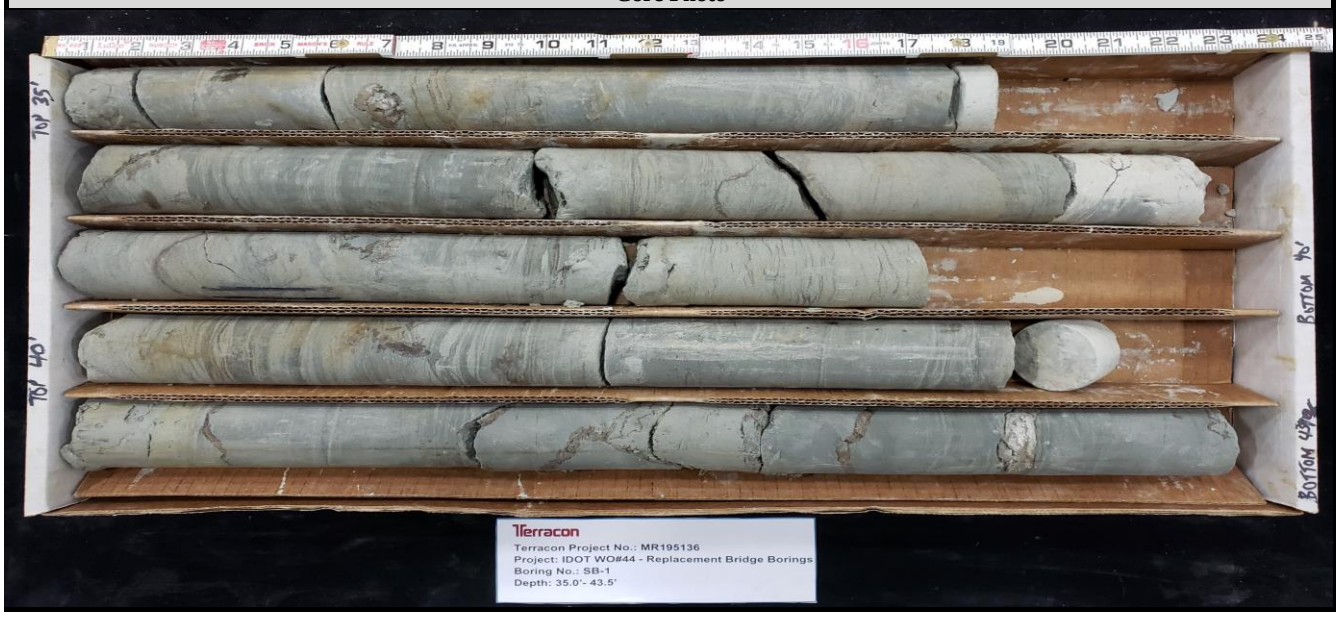
Project No.: **MR195136** **Date:** **7/23/19**
Project Name: **IDOT WO#44 - Replacement Bridge Borings**

Summary of Test Results

Boring No. / Run No.	Depth (ft)	Total Length ≥ 4 in	Length of Core Recovery (in)	Total Length of Core Run (in)	Recovery (%)	RQD (%)	Rock Quality Classification	Fracture Frequency Per Foot
SB-1	35.0'-43.5'	72.5	102	93	92	78	Good	2

Core Photo



Terracon

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Project No.: **MR195136** **Date: 7/23/19**
Project Name: **IDOT WO#44 - Replacement Bridge Borings**

Summary of Test Results

Boring No. / Run No.	Depth (ft)	Total Length ≥ 4 in	Length of Core Recovery (in)	Total Length of Core Run (in)	Recovery (%)	RQD (%)	Rock Quality Classification	Fracture Frequency Per Foot
SB-1	43.5'-45.0'	9	18	13	69	72	Fair	1

Core Photo

Terracon

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying Stress and Temperatures
ASTM D 7012
Method C

Laboratory Services Group *192 Exchange Boulevard Glendale Heights, Il 60139* *Phone: (224) 352-7000* *Fax: (224)352-7024*

Project No.:	MR195136	Tested By:	KP	Date:	8/5/19
Project Name:	IDOT WO #44 Replacement Bridge Borings	Calculated By:	SJH	Date:	8/5/19
Boring No.	SB-1 Sample: -	Checked By:	WPQ	Date:	8/5/19
Depth (ft):	30.66'-31.00'				
Description:	Gray Mudstone				

Rock Sample Moisture Condition at Test: [X] As Received [ ] See Remarks [ ] Saturated [ ] Oven Dry

TOLERANCE CHECK

Side Straightness		Maxumum Gap ≤ 0.020 in						Tolerance Met	No
End Flatness: Max.	Diameter 1a	0.0021	in	Diameter 1b	0.0018	in	≤ 0.002 in	Tolerance Met	No
End Flatness: Max.	Diameter 2a	0.0023	in	Diameter 2b	0.0020	in	≤ 0.002 in	Tolerance Met	No
Perpendicularity Slope	Diameter 1a	0.0041		Diameter 1b	0.0039		≤ 0.0043	Tolerance Met	Yes
Perpendicularity Slope	Diameter 2a	0.0040		Diameter 2b	0.0043		≤ 0.0043	Tolerance Met	Yes

Length (in):	1) 3.880	2) 3.880	3) 3.886	Avg.	3.882	in	
Diameter (in):	1) 1.936	2) 1.957	3) 1.996	Avg.	1.963	in	
Uniaxial Compressive Strength:		**3.47**	tsf	Mass	447.30	grams	
Load:		**146**	lbs	Mass	0.986	lb	
L/D:		**2.0**		**Wet Unit Weight:**	**145.0**	pcf	
Water Content:		**6.7**	%	**Dry Unit Weight:**	**135.9**	pcf	

YOUNG'S MODULUS	
E_t (50% Co)	-

POISSON'S RATIO	
υ_t (50% Co)	-

REMARKS:
The specimen did not meet the ASTM requirements for Side Straightness and End Flatness

Before

After

Terracon

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying Stress and Temperatures
ASTM D 7012
Method C

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Project No.:	MR195136	Tested By:	KP	Date:	8/5/19
Project Name:	IDOT WO #44 Replacement Bridge Borings	Calculated By:	SJH	Date:	8/5/19
Boring No.	SB-1 Sample: -	Checked By:	WPQ	Date:	8/5/19
Depth (ft):	32.17'-32.50'				
Description:	Gray Shale				

Rock Sample Moisture Condition at Test: [X] As Received [ ] See Remarks [ ] Saturated [ ] Oven Dry

TOLERANCE CHECK

Side Straightness		Maxumum Gap ≤ 0.020 in						Tolerance Met	Yes
End Flatness: Max.	Diameter 1a	0.0019	in	Diameter 1b	0.0017	in	≤ 0.002 in	Tolerance Met	Yes
End Flatness: Max.	Diameter 2a	0.0018	in	Diameter 2b	0.0018	in	≤ 0.002 in	Tolerance Met	Yes
Perpendicularity Slope	Diameter 1a	0.0035		Diameter 1b	0.0038		≤ 0.0043	Tolerance Met	Yes
Perpendicularity Slope	Diameter 2a	0.0033		Diameter 2b	0.0035		≤ 0.0043	Tolerance Met	Yes

Length (in):	1) 3.929	2) 3.932	3) 3.935	Avg. 3.932	in		
Diameter (in):	1) 2.035	2) 2.028	3) 2.024	Avg. 2.029	in		
Uniaxial Compressive Strength:		**71.70**	tsf	Mass 499.00	grams		
Load:		**3,220**	lbs	Mass 1.100	lb		
L/D:		**1.9**		**Wet Unit Weight:**	**149.5**	pcf	
Water Content:		**4.8**	%	**Dry Unit Weight:**	**142.6**	pcf	

YOUNG'S MODULUS	
E_t (50% Co)	-

POISSON'S RATIO	
υ_t (50% Co)	-

REMARKS:

Before

After

Terracon

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying Stress and Temperatures
ASTM D 7012
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Project No.:	MR195136	Tested By:	KP	Date:	8/5/19
Project Name:	IDOT WO #44 Replacement Bridge Borings	Calculated By:	SJH	Date:	8/5/19
Boring No.	SB-1 Sample: -	Checked By:	WPQ	Date:	8/5/19
Depth (ft):	36.00'-36.33'				
Description:	Gray Shale				

Rock Sample Moisture Condition at Test: [X] As Received [ ] See Remarks [ ] Saturated [ ] Oven Dry

TOLERANCE CHECK

Side Straightness		Maxumum Gap ≤ 0.020 in						Tolerance Met	Yes
End Flatness: Max.	Diameter 1a	0.0015	in	Diameter 1b	0.0017	in	≤ 0.002 in	Tolerance Met	Yes
End Flatness: Max.	Diameter 2a	0.0018	in	Diameter 2b	0.0014	in	≤ 0.002 in	Tolerance Met	Yes
Perpendicularity Slope	Diameter 1a	0.0031		Diameter 1b	0.0036		≤ 0.0043	Tolerance Met	Yes
Perpendicularity Slope	Diameter 2a	0.0035		Diameter 2b	0.0038		≤ 0.0043	Tolerance Met	Yes

Length (in):	1) 4.025	2) 4.020	3) 4.019	Avg.	4.021	in	
Diameter (in):	1) 2.035	2) 2.039	3) 2.039	Avg.	2.038	in	
Uniaxial Compressive Strength:		**47.91**	tsf	Mass	526.00	grams	
Load:		**2,170**	lbs	Mass	1.160	lb	
L/D:		**2.0**		**Wet Unit Weight:**	**152.8**	pcf	
Water Content:		**4.0**	%	**Dry Unit Weight:**	**147.0**	pcf	

YOUNG'S MODULUS	
E_t (50% Co)	-

POISSON'S RATIO	
υ_t (50% Co)	-

REMARKS:

Before

After

Terracon

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying Stress and Temperatures
ASTM D 7012
Method C

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Project No.:	MR195136	Tested By:	KP	Date:	8/5/19
Project Name:	IDOT WO #44 Replacement Bridge Borings	Calculated By:	SJH	Date:	8/5/19
Boring No.	SB-1 Sample: -	Checked By:	WPQ	Date:	8/5/19
Depth (ft):	37.33'-37.66'				
Description:	Gray Hard Shale				

Rock Sample Moisture Condition at Test: [X] As Received [ ] See Remarks [ ] Saturated [ ] Oven Dry

TOLERANCE CHECK

Side Straightness		Maxumum Gap ≤ 0.020 in						Tolerance Met	Yes
End Flatness: Max.	Diameter 1a	0.0013	in	Diameter 1b	0.0015	in	≤ 0.002 in	Tolerance Met	Yes
End Flatness: Max.	Diameter 2a	0.0016	in	Diameter 2b	0.0015	in	≤ 0.002 in	Tolerance Met	Yes
Perpendicularity Slope	Diameter 1a	0.0029		Diameter 1b	0.0031		≤ 0.0043	Tolerance Met	Yes
Perpendicularity Slope	Diameter 2a	0.0027		Diameter 2b	0.0036		≤ 0.0043	Tolerance Met	Yes

Length (in):	1) 3.990	2) 3.991	3) 3.990	Avg. 3.990	in		
Diameter (in):	1) 2.042	2) 2.044	3) 2.042	Avg. 2.043	in		
Uniaxial Compressive Strength:	**132.26**	tsf		Mass 541.30	grams		
Load:	**6,020**	lbs		Mass 1.193	lb		
L/D:	**2.0**			**Wet Unit Weight:**	**157.7**	pcf	
Water Content:	**2.8**	%		**Dry Unit Weight:**	**153.4**	pcf	

YOUNG'S MODULUS	
E_t (50% Co)	-

POISSON'S RATIO	
υ_t (50% Co)	-

REMARKS:

Before

After

Terracon

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying Stress and Temperatures
ASTM D 7012
Method C

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Project No.:	MR195136	Tested By:	KP	Date:	8/5/19
Project Name:	IDOT WO #44 Replacement Bridge Borings	Calculated By:	SJH	Date:	8/5/19
Boring No.	SB-1 Sample: -	Checked By:	WPQ	Date:	8/5/19
Depth (ft):	41.08'-41.42'				
Description:	Gray Hard Shale				

Rock Sample Moisture Condition at Test: [X] As Received [ ] See Remarks [ ] Saturated [ ] Oven Dry

TOLERANCE CHECK

Side Straightness		Maxumum Gap ≤ 0.020 in						Tolerance Met	Yes
End Flatness: Max.	Diameter 1a	0.0013	in	Diameter 1b	0.0010	in	≤ 0.002 in	Tolerance Met	Yes
End Flatness: Max.	Diameter 2a	0.0016	in	Diameter 2b	0.0014	in	≤ 0.002 in	Tolerance Met	Yes
Perpendicularity Slope	Diameter 1a	0.0025		Diameter 1b	0.0024		≤ 0.0043	Tolerance Met	Yes
Perpendicularity Slope	Diameter 2a	0.0029		Diameter 2b	0.0024		≤ 0.0043	Tolerance Met	Yes

Length (in):	1) 4.027	2) 4.023	3) 4.021	Avg.	4.024	in	
Diameter (in):	1) 2.030	2) 2.031	3) 2.033	Avg.	2.031	in	
Uniaxial Compressive Strength:		**167.96**	tsf	Mass	530.50	grams	
Load:		**7,560**	lbs	Mass	1.170	lb	
L/D:		**2.0**		**Wet Unit Weight:**	**155.0**	pcf	
Water Content:		**2.4**	%	**Dry Unit Weight:**	**151.4**	pcf	

YOUNG'S MODULUS	
E_t (50% Co)	-

POISSON'S RATIO	
υ_t (50% Co)	-

REMARKS:

Before

After

Terracon

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying Stress and Temperatures
ASTM D 7012
Method C

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Project No.:	MR195136	Tested By:	KP	Date:	8/5/19
Project Name:	IDOT WO #44 Replacement Bridge Borings	Calculated By:	SJH	Date:	8/5/19
Boring No.	SB-1 Sample: -	Checked By:	WPQ	Date:	8/5/19
Depth (ft):	43.66'-44.00'				
Description:	Gray Limestone				

Rock Sample Moisture Condition at Test: [X] As Received [ ] See Remarks [ ] Saturated [ ] Oven Dry

TOLERANCE CHECK

Side Straightness		Maxumum Gap ≤ 0.020 in						Tolerance Met	Yes
End Flatness: Max.	Diameter 1a	0.0011	in	Diameter 1b	0.0008	in	≤ 0.002 in	Tolerance Met	Yes
End Flatness: Max.	Diameter 2a	0.0009	in	Diameter 2b	0.0007	in	≤ 0.002 in	Tolerance Met	Yes
Perpendicularity Slope	Diameter 1a	0.0023		Diameter 1b	0.0016		≤ 0.0043	Tolerance Met	Yes
Perpendicularity Slope	Diameter 2a	0.0020		Diameter 2b	0.0017		≤ 0.0043	Tolerance Met	Yes

Length (in):	1) 3.996	2) 3.995	3) 3.999	Avg. 3.997	in		
Diameter (in):	1) 2.041	2) 2.040	3) 2.042	Avg. 2.041	in		
Uniaxial Compressive Strength:		**289.39**	tsf	Mass 523.60	grams		
Load:		**13,150**	lbs	Mass 1.154	lb		
L/D:		**2.0**		**Wet Unit Weight:**	**152.5**	pcf	
Water Content:		**0.7**	%	**Dry Unit Weight:**	**151.4**	pcf	

YOUNG'S MODULUS	
E_t (50% Co)	-

POISSON'S RATIO	
υ_t (50% Co)	-

REMARKS:

Before

After

Terracon

Rock Quality Designation (RQD) of Rock Core ASTM D 6032

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Project No.: **MR195136** **Date: 7/23/19**
Project Name: **IDOT WO#44 - Replacement Bridge Borings**

Summary of Test Results

Boring No. / Run No.	Depth (ft)	Total Length ≥ 4 in	Length of Core Recovery (in)	Total Length of Core Run (in)	Recovery (%)	RQD (%)	Rock Quality Classification	Fracture Frequency Per Foot
SB-2	24.0'-34.0'	77.8	120	99	82	79	Good	1

Core Photo

Terracon

Rock Quality Designation (RQD) of Rock Core ASTM D 6032

Laboratory Services Group *192 Exchange Boulevard Glendale Heights, Illinois 60139 Phone: (630) 717-4263 Fax: (630) 357-9489*

Project No.: **MR195136** **Date: 7/23/19**
Project Name: **IDOT WO#44 - Replacement Bridge Borings**

Summary of Test Results

Boring No. / Run No.	Depth (ft)	Total Length ≥ 4 in	Length of Core Recovery (in)	Total Length of Core Run (in)	Recovery (%)	RQD (%)	Rock Quality Classification	Fracture Frequency Per Foot
SB-2	34.0'-44.0'	81	120	111	93	73	Fair	2

Core Photo

Terracon

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying Stress and Temperatures
ASTM D 7012
Method C

Laboratory Services Group *192 Exchange Boulevard Glendale Heights, Il 60139* *Phone: (224) 352-7000* *Fax: (224)352-7024*

Project No.:	MR195136	Tested By:	KP	Date:	8/5/19
Project Name:	IDOT WO #44 Replacement Bridge Borings	Calculated By:	SJH	Date:	8/5/19
Boring No.	SB-2 Sample: -	Checked By:	WPQ	Date:	8/5/19
Depth (ft):	25.00'-25.33'				
Description:	Gray Mudstone				

Rock Sample Moisture Condition at Test: [X] As Received [ ] See Remarks [ ] Saturated [ ] Oven Dry

TOLERANCE CHECK

Side Straightness		Maxumum Gap ≤ 0.020 in						Tolerance Met	No
End Flatness: Max.	Diameter 1a	0.0028	in	Diameter 1b	0.0029	in	≤ 0.002 in	Tolerance Met	No
End Flatness: Max.	Diameter 2a	0.0026	in	Diameter 2b	0.0030	in	≤ 0.002 in	Tolerance Met	No
Perpendicularity Slope	Diameter 1a	0.0043		Diameter 1b	0.0047		≤ 0.0043	Tolerance Met	No
Perpendicularity Slope	Diameter 2a	0.0041		Diameter 2b	0.0049		≤ 0.0043	Tolerance Met	No

Length (in):	1) 4.023	2) 4.006	3) 4.009	Avg.	4.013	in	
Diameter (in):	1) 2.000	2) 2.002	3) 1.997	Avg.	2.000	in	
Uniaxial Compressive Strength:		**4.17**	tsf	Mass	487.80	grams	
Load:		**182**	lbs	Mass	1.075	lb	
L/D:		**2.0**		**Wet Unit Weight:**	**147.5**	pcf	
Water Content:		**5.8**	%	**Dry Unit Weight:**	**139.3**	pcf	

YOUNG'S MODULUS	
E_t (50% Co)	-

POISSON'S RATIO	
υ_t (50% Co)	-

REMARKS:
The specimen did not meet the ASTM requirements for Side Straightness, End Flatness and Perpendicularity

Before

After

Terracon

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying Stress and Temperatures
ASTM D 7012
Method C

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Project No.:	MR195136	Tested By:	KP	Date:	8/5/19
Project Name:	IDOT WO #44 Replacement Bridge Borings	Calculated By:	SJH	Date:	8/5/19
Boring No.	SB-2 Sample: -	Checked By:	WPQ	Date:	8/5/19
Depth (ft):	28.17'-28.50'				
Description:	Gray Shale				

Rock Sample Moisture Condition at Test: [X] As Received [ ] See Remarks [ ] Saturated [ ] Oven Dry

TOLERANCE CHECK

Side Straightness		Maxumum Gap ≤ 0.020 in						Tolerance Met	Yes
End Flatness: Max.	Diameter 1a	0.0018	in	Diameter 1b	0.0018	in	≤ 0.002 in	Tolerance Met	Yes
End Flatness: Max.	Diameter 2a	0.0019	in	Diameter 2b	0.0017	in	≤ 0.002 in	Tolerance Met	Yes
Perpendicularity Slope	Diameter 1a	0.0036		Diameter 1b	0.0037		≤ 0.0043	Tolerance Met	Yes
Perpendicularity Slope	Diameter 2a	0.0038		Diameter 2b	0.0034		≤ 0.0043	Tolerance Met	Yes

Length (in):	1) 3.978	2) 3.970	3) 3.971	Avg.	3.973	in	
Diameter (in):	1) 1.967	2) 1.972	3) 1.976	Avg.	1.972	in	
Uniaxial Compressive Strength:		**14.41**	tsf	Mass	484.80	grams	
Load:		**611**	lbs	Mass	1.069	lb	
L/D:		**2.0**		**Wet Unit Weight:**	**152.3**	pcf	
Water Content:		**5.2**	%	**Dry Unit Weight:**	**144.7**	pcf	

YOUNG'S MODULUS		POISSON'S RATIO	
E_t (50% Co)	-	υ_t (50% Co)	-

REMARKS:

Before

After

Terracon

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Method C

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Project No.:	MR195136	Tested By:	KP	Date:	8/5/19
Project Name:	IDOT WO #44 Replacement Bridge Borings	Calculated By:	SJH	Date:	8/5/19
Boring No.	SB-2 Sample: -	Checked By:	WPQ	Date:	8/5/19
Depth (ft):	32.25'-32.58'				
Description:	Gray Limestone				

Rock Sample Moisture Condition at Test: [X] As Received [ ] See Remarks [ ] Saturated [ ] Oven Dry

TOLERANCE CHECK

Side Straightness		Maxumum Gap ≤ 0.020 in						Tolerance Met	Yes
End Flatness: Max.	Diameter 1a	0.0017	in	Diameter 1b	0.0013	in	≤ 0.002 in	Tolerance Met	Yes
End Flatness: Max.	Diameter 2a	0.0015	in	Diameter 2b	0.0016	in	≤ 0.002 in	Tolerance Met	Yes
Perpendicularity Slope	Diameter 1a	0.0024		Diameter 1b	0.0022		≤ 0.0043	Tolerance Met	Yes
Perpendicularity Slope	Diameter 2a	0.0027		Diameter 2b	0.0020		≤ 0.0043	Tolerance Met	Yes

Length (in):	1) 3.995	2) 3.990	3) 3.996	Avg. 3.994	in			
Diameter (in):	1) 2.055	2) 2.050	3) 2.054	Avg. 2.053	in			
Uniaxial Compressive Strength:		**645.11**	tsf	Mass 570.60	grams			
Load:		**29,660**	lbs	Mass 1.258	lb			
L/D:		**1.9**		**Wet Unit Weight:**	**164.4**	pcf		
Water Content:		**0.3**	%	**Dry Unit Weight:**	**163.9**	pcf		

YOUNG'S MODULUS	
E_t (50% Co)	-

POISSON'S RATIO	
υ_t (50% Co)	-

REMARKS:

Before

After

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Project No.:	MR195136	Tested By:	KP	Date:	8/5/19
Project Name:	IDOT WO #44 Replacement Bridge Borings	Calculated By:	SJH	Date:	8/5/19
Boring No.	SB-2 Sample: -	Checked By:	WPQ	Date:	8/5/19
Depth (ft):	34.58'-34.92'				
Description:	Gray Limestone				

Rock Sample Moisture Condition at Test: [X] As Received [ ] See Remarks [ ] Saturated [ ] Oven Dry

TOLERANCE CHECK

Side Straightness		Maxumum Gap ≤ 0.020 in						Tolerance Met	Yes
End Flatness: Max.	Diameter 1a	0.0012	in	Diameter 1b	0.0014	in	≤ 0.002 in	Tolerance Met	Yes
End Flatness: Max.	Diameter 2a	0.0010	in	Diameter 2b	0.0015	in	≤ 0.002 in	Tolerance Met	Yes
Perpendicularity Slope	Diameter 1a	0.0018		Diameter 1b	0.0016		≤ 0.0043	Tolerance Met	Yes
Perpendicularity Slope	Diameter 2a	0.0020		Diameter 2b	0.0019		≤ 0.0043	Tolerance Met	Yes

Length (in):	1) 4.023	2) 4.021	3) 4.024	Avg.	4.023	in	
Diameter (in):	1) 2.051	2) 2.050	3) 2.048	Avg.	2.050	in	
Uniaxial Compressive Strength:		**640.88**	tsf	Mass	574.40	grams	
Load:		**29,370**	lbs	Mass	1.266	lb	
L/D:		**2.0**		**Wet Unit Weight:**	**164.9**	pcf	
Water Content:		**0.2**	%	**Dry Unit Weight:**	**164.5**	pcf	

YOUNG'S MODULUS		POISSON'S RATIO	
E_t (50% Co)	-	υ_t (50% Co)	-

REMARKS:

Before

After

Terracon

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying Stress and Temperatures
ASTM D 7012
Method C

Laboratory Services Group *192 Exchange Boulevard Glendale Heights, Il 60139* *Phone: (224) 352-7000* *Fax: (224)352-7024*

Project No.:	MR195136	Tested By:	KP	Date:	8/5/19
Project Name:	IDOT WO #44 Replacement Bridge Borings	Calculated By:	SJH	Date:	8/5/19
Boring No.	SB-2 Sample: -	Checked By:	WPQ	Date:	8/5/19
Depth (ft):	41.42'-41.75'				
Description:	Gray Shale				

Rock Sample Moisture Condition at Test: [X] As Received [ ] See Remarks [ ] Saturated [ ] Oven Dry

TOLERANCE CHECK

Side Straightness		Maxumum Gap ≤ 0.020 in						Tolerance Met	No
End Flatness: Max.	Diameter 1a	0.0028	in	Diameter 1b	0.0032	in	≤ 0.002 in	Tolerance Met	No
End Flatness: Max.	Diameter 2a	0.0030	in	Diameter 2b	0.0034	in	≤ 0.002 in	Tolerance Met	No
Perpendicularity Slope	Diameter 1a	0.0047		Diameter 1b	0.0046		≤ 0.0043	Tolerance Met	No
Perpendicularity Slope	Diameter 2a	0.0051		Diameter 2b	0.0049		≤ 0.0043	Tolerance Met	No

Length (in):	1) 3.921	2) 3.924	3) 3.920	Avg.	3.922	in	
Diameter (in):	1) 2.033	2) 2.022	3) 2.038	Avg.	2.031	in	
Uniaxial Compressive Strength:		**1.93**	tsf	Mass	445.40	grams	
Load:		**87**	lbs	Mass	0.982	lb	
L/D:		**1.9**		**Wet Unit Weight:**	**133.5**	pcf	
Water Content:		**10.3**	%	**Dry Unit Weight:**	**121.1**	pcf	

YOUNG'S MODULUS	
E_t (50% Co)	-

POISSON'S RATIO	
υ_t (50% Co)	-

REMARKS:
The specimen did not meet the ASTM requirements for Side Straightness, End Flatness and Perpendicularity

Before

After

Terracon

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying Stress and Temperatures
ASTM D 7012
Method C

Laboratory Services Group *192 Exchange Boulevard Glendale Heights, Il 60139* *Phone: (224) 352-7000* *Fax: (224)352-7024*

Project No.:	MR195136	Tested By:	KP	Date:	8/5/19
Project Name:	IDOT WO #44 Replacement Bridge Borings	Calculated By:	SJH	Date:	8/5/19
Boring No.	SB-2 Sample: -	Checked By:	WPQ	Date:	8/5/19
Depth (ft):	42.83'-43.17'				
Description:	Gray Shale				

Rock Sample Moisture Condition at Test: [X] As Received [ ] See Remarks [ ] Saturated [ ] Oven Dry

TOLERANCE CHECK

Side Straightness	Maxumum Gap ≤ 0.020 in						Tolerance Met	No
End Flatness: Max.	Diameter 1a	0.0029	in	Diameter 1b	0.0030	in	≤ 0.002 in	Tolerance Met	No
End Flatness: Max.	Diameter 2a	0.0035	in	Diameter 2b	0.0033	in	≤ 0.002 in	Tolerance Met	No
Perpendicularity Slope	Diameter 1a	0.0046		Diameter 1b	0.0050		≤ 0.0043	Tolerance Met	No
Perpendicularity Slope	Diameter 2a	0.0051		Diameter 2b	0.0048		≤ 0.0043	Tolerance Met	No

Length (in):	1) 4.117	2) 4.103	3) 4.106	Avg.	4.109	in	
Diameter (in):	1) 2.081	2) 2.081	3) 2.060	Avg.	2.074	in	
Uniaxial Compressive Strength:		**0.94**	tsf	Mass	482.00	grams	
Load:		**44**	lbs	Mass	1.063	lb	
L/D:		**2.0**		**Wet Unit Weight:**	**132.3**	pcf	
Water Content:		**11.0**	%	**Dry Unit Weight:**	**119.2**	pcf	

YOUNG'S MODULUS	
E_t (50% Co)	-

POISSON'S RATIO	
υ_t (50% Co)	-

REMARKS:
The specimen did not meet the ASTM requirements for Side Straightness, End Flatness and Perpendicularity

Before

After

Illinois Department of Transportation
Division of Highways
Terracon

SOIL BORING LOG

Date 7/6/20

ROUTE FAI 474 (I-474) **DESCRIPTION** Rock probe boring **LOGGED BY** BT (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over Plank Road, **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**,
Latitude 40d 41' 17" N, **Longitude** 89d 40' 33" W

COUNTY Peoria **DRILLING METHOD** Solid Stem/ Rotary **HAMMER TYPE** AUTO SPT Hammer

STRUCT. NO. 072-0121 & 0122 EX, 072-0252 & 0253 PR
Station 223+71

BORING NO. RP-1
Station 224+58
Offset 68.0 ft RT
Ground Surface Elev. 618.51 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
				BLANK DRILLED TO 33.5 FEET
-5				
-10				
-15				
-20				
-25				BLANK DRILLED TO 33.5 FEET *(continued)*
-30				
585.21				
	53			COAL: black, moist, completely weathered, soft
	50		37	
583.51 -35	37			
				SILTY CLAY LOAM: gray, moist, very stiff, with sand
	8			
	10		17	
	17			
580.51				
	22			SHALE: gray, completely weathered, exteremely weak
	100/3		13	
-40				

SOIL BORING WO 50 PLANK RD ROCK PROBES.GPJ IL_DOT.GDT 7/17/20

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
Terracon

SOIL BORING LOG

Date 7/6/20

ROUTE FAI 474 (I-474) **DESCRIPTION** Rock probe boring **LOGGED BY** BT (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over Plank Road, **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**,
Latitude 40d 41' 17" N, **Longitude** 89d 40' 33" W

COUNTY Peoria **DRILLING METHOD** Solid Stem/ Rotary **HAMMER TYPE** AUTO SPT Hammer

STRUCT. NO. 072-0121 & 0122 EX, 072-0252 & 0253 PR
Station 223+71

BORING NO. RP-1
Station 224+58
Offset 68.0 ft RT
Ground Surface Elev. 618.51 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 (%)
SHALE: gray, completely weathered, exteremely weak *(continued)*		40		
		100/2		18
		100		
				14
	573.51 -45			
End of Boring	-50			
	-55			
	-60			

SOIL BORING WO 50 PLANK RD ROCK PROBES.GPJ IL_DOT.GDT 7/17/20

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
Terracon

SOIL BORING LOG

Date 7/7/20

ROUTE FAI 474 (I-474) **DESCRIPTION** Rock probe boring **LOGGED BY** BT (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over Plank Road, **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**,
Latitude 40d 41' 16" N, **Longitude** 89d 40' 31" W

COUNTY Peoria **DRILLING METHOD** Solid Stem/ Rotary **HAMMER TYPE** AUTO SPT Hammer

STRUCT. NO. 072-0121 & 0122 EX 072-0252 & 0253 PR
Station 223+71

BORING NO. RP-2
Station 225+52
Offset 62.0 ft LT
Ground Surface Elev. 619.39 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 (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
BLANK DRILLED TO 38.5 FEET				BLANK DRILLED TO 38.5 FEET *(continued)*			
-5				-25			
-10				-30			
-15				-35			19
				580.89			
				CLAY LOAM: brown and light gray, moist, stiff, with traces of sand and gravel	2		
-20				579.39 -40	4 6		21

SOIL BORING WO 50 PLANK RD ROCK PROBES.GPJ IL_DOT.GDT 7/17/20

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
Terracon

SOIL BORING LOG

Date 7/7/20

ROUTE FAI 474 (I-474) **DESCRIPTION** Rock probe boring **LOGGED BY** BT (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over Plank Road, **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**,
Latitude 40d 41' 16" N, **Longitude** 89d 40' 31" W

COUNTY Peoria **DRILLING METHOD** Solid Stem/ Rotary **HAMMER TYPE** AUTO SPT Hammer

STRUCT. NO. 072-0121 & 0122 EX 072-0252 & 0253 PR
Station 223+71

BORING NO. RP-2
Station 225+52
Offset 62.0 ft LT
Ground Surface Elev. 619.39 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 (%)
CLAY LOAM: brown, moist, stiff to medium stiff, with traces of sand and gravel		1		
		2		19
	-45	7		
- gray 48.5 to 53.5 feet		3		
- with shale fragments 48.5 to 50 feet		3		23
	-50	2		
565.89				
SHALE: gray, completely weathered, exteremely weak		50/1		
				7
	-55			
		100/3		
		50/3		
				18
559.39	-60			

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)

BBS, form 137 (Rev. 8-99)

SOIL BORING WO 50 PLANK RD ROCK PROBES.GPJ IL_DOT.GDT 7/17/20

Illinois Department of Transportation
Division of Highways
Terracon

SOIL BORING LOG

Date 7/6/20

ROUTE FAI 474 (I-474) **DESCRIPTION** Rock probe boring **LOGGED BY** BT (Terracon)

SECTION 73-3HB-2 **LOCATION** I-474 over Plank Road, **SEC.** 11, **TWP.** 8N, **RNG.** 7E, 4th **PM**,
Latitude 40d 41' 18" N, **Longitude** 89d 40' 32" W

COUNTY Peoria **DRILLING METHOD** Solid Stem/ Rotary **HAMMER TYPE** AUTO SPT Hammer

STRUCT. NO. 072-0121 & 0122 EX
072-0252 & 0253 PR
Station 223+71

BORING NO. RP-3
Station 223+94
Offset 2.0 ft LT
Ground Surface Elev. 586.79 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
				BLANK DRILLED TO 23.5 FEET
-5				
-10				
-15				
-20				
				BLANK DRILLED TO 23.5 FEET *(continued)*
563.29				
	100/4			SHALE: light gray, completely weathered, extremely weak
-25			14	
	100/3			
			15	
	42			
	74		13	
556.79 -30	26/3			
				End of Boring
-35				
-40				

SOIL BORING WO 50 PLANK RD ROCK PROBES.GPJ IL_DOT.GDT 7/17/20

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)

FORM NO. 3. D. 137 REV. 9-60

SN 072-0121
SN 072-0122

Sh. 1 of 4 Sh.

BRIDGE FOUNDATION BORING LOG

PROJECT

ROUTE FAI 474

SEC. ~~72-3HB-2~~

COUNTY PEORIA

Boring No. 1
Station 221+80
Offset 25' LT ℄ FAI 474

BRIDGE FAI 474 OVER ILL. ROUTE 116

STA. FAI 474 223+71.15

Date 9-2-70
Bored By R. L. Irwin
Checked By R. E. Dalton

Surface Water El. ——
Groundwater El. at Completion NONE
After 48 Hours 561.5

Elevation	N	Qu t/s.f.	w (%)	Description
581.0				Ground Surface
				BROWN MOIST CLAY TRACE OF SAND AND GRAVEL
	8	1.5 E	-	
575.5	16	-	-	
				BROWN MOIST CLAY LOAM TRACE OF SAND AND GRAVEL
573.0	9	1.6 S	-	
				BROWN AND GRAY MOIST CLAY
570.5	28	3.5 S	-	
				BROWN AND GRAY DAMP SHALEY CLAY TRACES OF SANDSTONE
	27	4.2 S	-	
	50	9.4 S	-	
	32	4.2 S	-	
563.0				
				GRAY DAMP SHALEY CLAY TRACES OF SANDSTONE
	82	7.4 S	-	
560.5				
				CONTINUED NEXT COLUMN

Elevation	N	Qu t/s.f.	w (%)	Description
				GRAY DAMP SHALEY CLAY LOAM TRACES OF SANDSTONE
	50/3"	-	-	
-25	50/6"	-	-	
	50/6"	-	-	
553.0				END OF BORING
-30				
-35				
-40				
-45				

N – Standard Penetration Test – Blows per foot to drive 2" O.D. Split Spoon Sampler 12" with 140# hammer falling 30".

Qu – Unconfined Compressive Strength – t/sf

w – Water Content – percentage of oven dry weight – %.

Type failure:
B – Bulge Failure
S – Shear Failure
E – Estimated Value
P – Penetrometer

BRIDGE FOUNDATION BORING LOG

PROJECT

ROUTE FAI 474

SEC. 72-3HB-2

COUNTY PEORIA

Boring No. 3

Station 224+30

Offset 56' LT ℄

BRIDGE FAI 474 OVER ILL. ROUTE 116

STA. FAI 474, 223+71.15

Date 8-11-70

Bored By R. L. Irwin

Checked By R. E. Dalton

Surface Water El. —

Groundwater El. at Completion NONE

After — Hours —

Elevation	N	Qu t/s.f.	w (%)	
581.8				Ground Surface
0				LIGHT BROWN AND GRAY, MOIST CLAY LOAM (TRACES OF SANDSTONE)
	100	1.6 S	-	
-5				
576.3	22	-	-	
				LIGHT BROWN AND GRAY, MOIST CLAY (TRACE OF SANDSTONE)
	47	1.7 S	-	
-10				
	8	2.1 S	-	
				BROWN, MOIST CLAY
568.8	7	1.3 S	-	
-15				
566.3	8	1.8 S	-	
				GRAY, MOIST CLAY LOAM (TRACES OF COAL)
	8	1.1 S	-	
-20				
561.3	6	1.2 S	-	
				CONTINUED NEXT COLUMN

Elevation	N	Qu t/s.f.	w (%)	
	36	-	-	GRAY, DAMP SHALEY CLAY LOAM
-25				
556.3	50 4"	-	-	
	50 4"	-	-	GRAY, DAMP SHALEY CLAY (TRACE OF SANDSTONE)
-30				
551.3	24	-	-	
				GRAY, DRY LIMESTONE
	50 5"	-	-	
547.8				
547.3				LIMESTONE CORE END OF BORING
-35				
-40				
-45				

N – Standard Penetration Test – Blows per foot to drive 2" O.D. Split Spoon Sampler 12" with 140# hammer falling 30".

Qu – Unconfined Compressive Strength – t/sf

w – Water Content – percentage of oven dry weight – %.

Type failure:
B – Bulge Failure
S – Shear Failure
E – Estimated Value
P – Penetrometer

BRIDGE FOUNDATION BORING LOG

PROJECT

ROUTE FAI 474

SEC. 72-3HB-2

COUNTY Peoria

Boring No. 5

Station 221+70

Offset 50' RT ℄ FAI 474

BRIDGE FAI 474 OVER ILL. ROUTE 116

STA. FAI 474, 223+71.15

Date 9-4-70

Bored By R. L. Irwin

Checked By R. E. Dalton

Surface Water El. —

Groundwater El. at Completion NONE

After — Hours —

Elevation	N	Qu t/s.f.	w (%)	
577.1				Ground Surface
				BROWN MOIST CLAY
574.1	11	2.7 S	21	BROWN DAMP CLAY LOAM TRACE OF SAND AND GRAVEL
	17	5.0 S	14	
569.1	22	-	-	BROWN AND GRAY DAMP CLAY TRACE OF SAND AND GRAVEL
	29	4.6 S	17	
566.6				BROWN DAMP SHALEY CLAY
564.1	54	5.0 S	14	GRAY DAMP SHALEY CLAY
	83	9.2 S	11	
	88	6.8 S	12	
	50/5"	-	12	

CONTINUED NEXT COLUMN

Elevation	N	Qu t/s.f.	w (%)	
	50/6"	-	-	GRAY DAMP SHALEY CLAY
551.6	100/11"	-	8	END OF BORING

N – Standard Penetration Test – Blows per foot to drive 2" O.D. Split Spoon Sampler 12" with 140# hammer falling 30".

Qu – Unconfined Compressive Strength – t/sf

w – Water Content – percentage of oven dry weight – %.

Type failure:
B – Bulge Failure
S – Shear Failure
E – Estimated Value
P – Penetrometer

BRIDGE FOUNDATION BORING LOG

PROJECT

ROUTE FAI 474

SEC. 72-3HB-2

COUNTY Peoria

Boring No. 7

Station 224+26

Offset 32' RT ℄

BRIDGE FAI 474 OVER ILL. ROUTE 116

STA. FAI 474, 223+71.15

Date 8-19-70

Bored By R. L. Irwin

Checked By R. E. Dalton

Surface Water El.

Groundwater El. at Completion 569.6

After ____ Hours

Elevation	N	Qu t/s.f.	w (%)	Description
587.6				Ground Surface
0				BROWN, MOIST CLAY
	15	2.0 E	21	
-5	26	2.2 S	21	
	13		-	
-10				
577.1	14		-	GRAY, MOIST CLAY
574.6	11	2.0 E	27	BROWN AND GRAY, MOIST CLAY (TRACE OF SAND)
-15		3.1		
572.1	12	S	15	BROWN, MOIST CLAY LOAM (TRACE OF SAND AND GRAVEL)
569.6	11	1.0 S	28	GRAY, DAMP SHALEY CLAY (TRACE OF SANDSTONE)
-20	50/6"	-	11	
				CONTINUED NEXT COLUMN

END OF BORING

Elevation	N	Qu t/s.f.	w (%)
	50/6"	-	8
-25			
562.1	50/3"	-	6
-30			
-35			
-40			
-45			

N – Standard Penetration Test – Blows per foot to drive 2" O.D. Split Spoon Sampler 12" with 140# hammer falling 30".

Qu – Unconfined Compressive Strength – t/sf

w – Water Content – percentage of oven dry weight – %.

Type failure:
B – Bulge Failure
S – Shear Failure
E – Estimated Value
P – Penetrometer

EXHIBIT D

SUBSURFACE PROFILES

Elevation (ft)

620 610 600 590 580 570 560 550 540 530

SB-4
222+53
11.0 ft RT
618.31
TOPSOIL
FILL - CLAY LOAM: dark brown, moist, medium stiff to stiff, with trace sand and gravel
BTM North Abutment
610.57 072-0252
610.28 072-0253
POSSIBLE FILL - CLAY LOAM: brown and dark gray, moist, very stiff, with trace sand and gravel
CLAY LOAM: brown, moist, stiff, with traces of sand and gravel
LIMESTONE FRAGMENTS: gray
SHALE: gray, weak, highly weathered
BTM
548.3

SB-1
222+95
100.5 ft RT
596.28
TOPSOIL
CLAY LOAM: brown, moist, very stiff, with trace sand and gravel
CLAY LOAM: brown, moist, very soft to soft, 2.0 ft LT with trace sand and gravel
CLAY LOAM: grayish brown, moist, stiff, with sand and gravel
581.2
CLAY LOAM: grayish brown, moist, stiff, with sand and gravel
SILTY CLAY LOAM: gray, moist, very stiff, with traces of gravel
MUDSTONE: gray, moist, completely weathered, soft
Moisture Content: 6.7%; Dry Density: 135.9 pcf
SHALE: gray, moist, highly weathered, soft
Moisture Content: 4.8%; Dry Density: 142.6 pcf
Moisture Content: 4%; Dry Density: 147.0 pcf
Moisture Content: 2.8%; Dry Density: 153.4 pcf
Moisture Content: 2.4%; Dry Density: 151.4 pcf
LIMESTONE: gray, weak
BTM
551.3

Existing Ground Surface
Proposed Ground Surface

RP-3
223+94
586.79
Pier 1
587.92
072-0252
Pier 1
581.98
072-0253
BLANK DRILLED TO 23.5 FEET
SHALE: light gray, completely weathered, extremely weak
556.8

SB-2
224+30.5
85.5 ft LT
582.38
ASPHALT PAVEMENT: about 6 inches
FILL - CLAY LOAM: brown and dark gray, moist, medium stiff, with trace sand and gravel
SILTY CLAY LOAM: brown, moist, stiff, with trace sand and gravel
572.4
CLAY LOAM: brown, moist, stiff, with trace sand and gravel
MUDSTONE: gray, moist, completely weathered, soft
Moisture Content: 5.8%; Dry Density: 139.3 pcf
SHALE: gray, moist, highly weathered, soft
Moisture Content: 5.2%; Dry Density: 144.7 pcf
LIMESTONE: gray, weak
Moisture Content: 0.3%; Dry Density: 163.9 pcf
Moisture Content: 0.2%; Dry Density: 164.5 pcf
COAL: black, moist, highly weathered
SHALE: gray, highly weathered, weak, trace sand seams
BTM
538.4
Moisture Content: 11.0%;; Dry Density: 119.2 pcf
Moisture Content: 10.3%; Dry Density: 121.1 pcf

RP-1
224+58
68.0 ft RT
618.51
BLANK DRILLED TO 33.5 FEET
COAL: black, moist, completely weathered, soft
SILTY CLAY LOAM: gray, moist, very stiff, with sand
SHALE: gray, completely weathered, extremely weak
BTM
573.5
Pier 2
585.84
072-0252
Pier 2
581.01
072-0253

SB-5
225+02
0.0 ft
617.1
TOPSOIL
BTM South Abutment
611.16 072-0252
611.49 072-0253
CLAY LOAM: brown, moist, medium stiff to stiff, with trace sand and gravel
594.2
SILTY CLAY LOAM: brownish gray, moist, medium stiff to very stiff, with trace gravel
SHALE: gray, weak, highly weathered
BTM
572.1

RP-2
225+52
62.0 ft LT
619.39
BLANK DRILLED TO 38.5 FEET
CLAY LOAM: brown, moist, stiff to medium stiff, with traces of sand and gravel
SHALE: gray, completely weathered, extremely weak
BTM
559.4

NOT TO HORIZONTAL SCALE

Kaskaskia Engineering Group, LLC

SUBSURFACE PROFILE

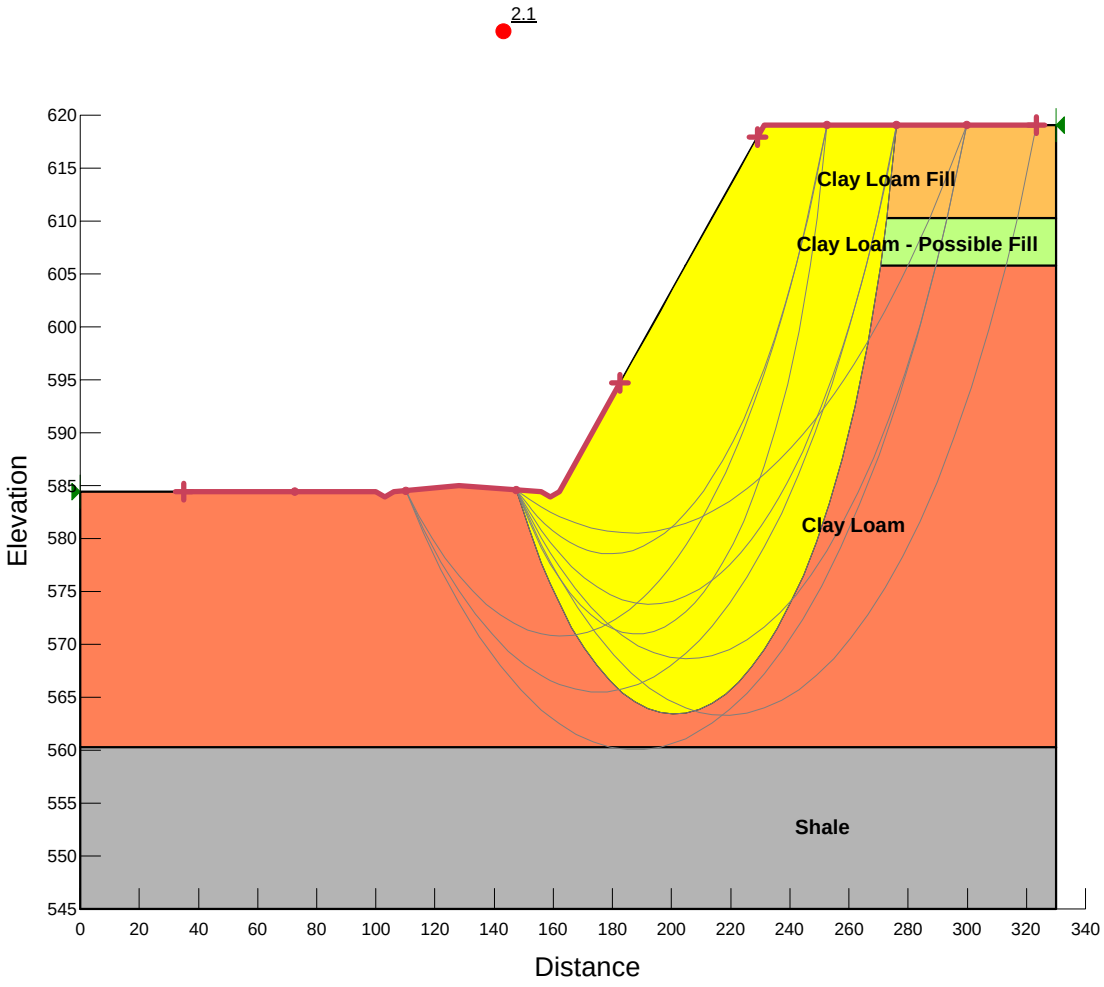
Route: FAI 474 (I-474)
Section: 73-3HB-2
County: Peoria

PRINTERMOD2 11X17 19-1033.02 FAI 474 (I-474).GPJ IL_DOT.GDT 12/8/20

EXHIBIT E

SLOPE/W SLOPE STABILITY ANALYSIS

WO 2 I-474 over Plank Road
Boring SB-4 - Station 222+53
End-of-Construction (Undrained Condition)



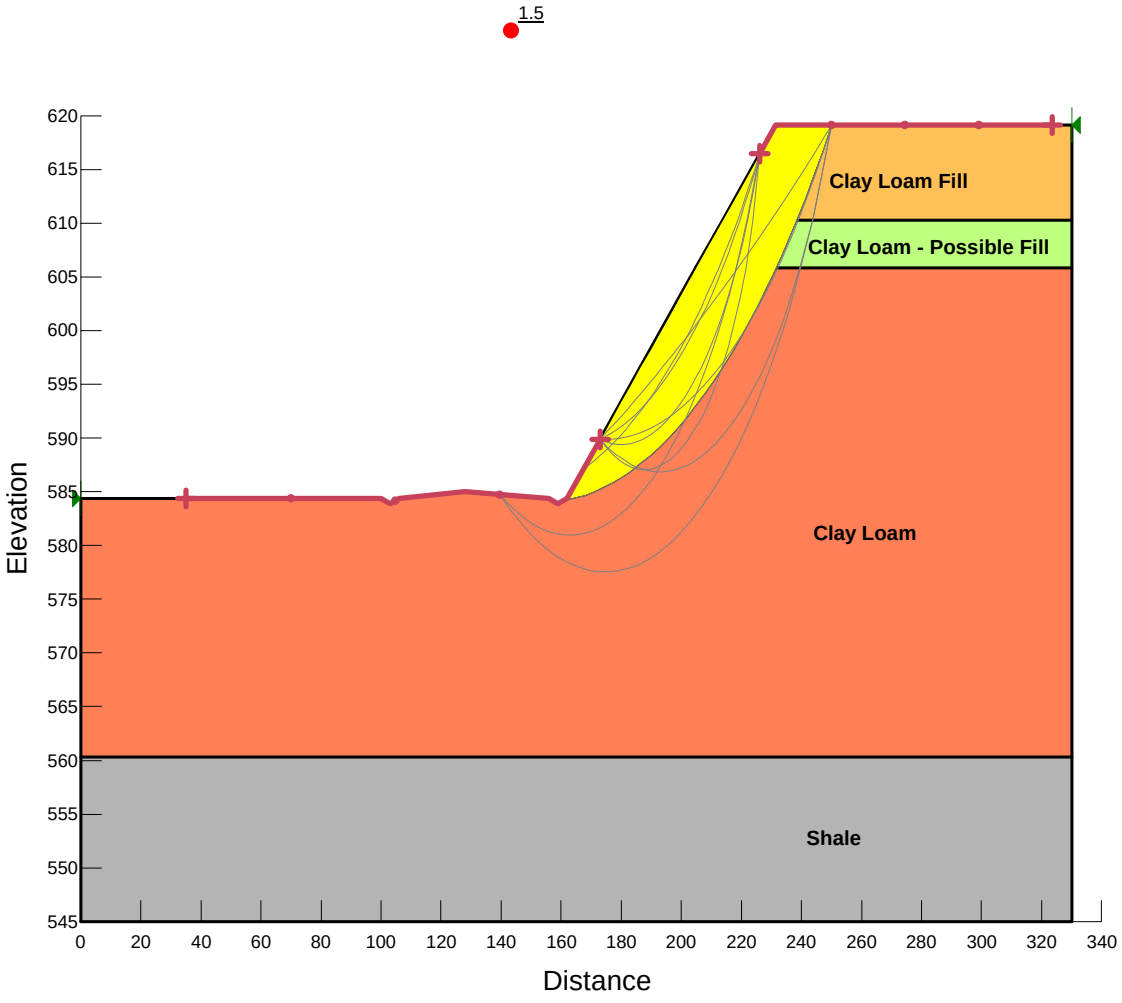
Name: Clay Loam Fill
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 0 °

Name: Clay Loam - Possible Fill
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,450 psf
Phi': 0 °

Name: Clay Loam
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,400 psf
Phi': 0 °

Name: Shale
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 4,500 psf
Phi': 12 °

WO 2 I-474 over Plank Road
Boring SB-4 - Station 222+53
Long Term Analysis (Drained Condition)



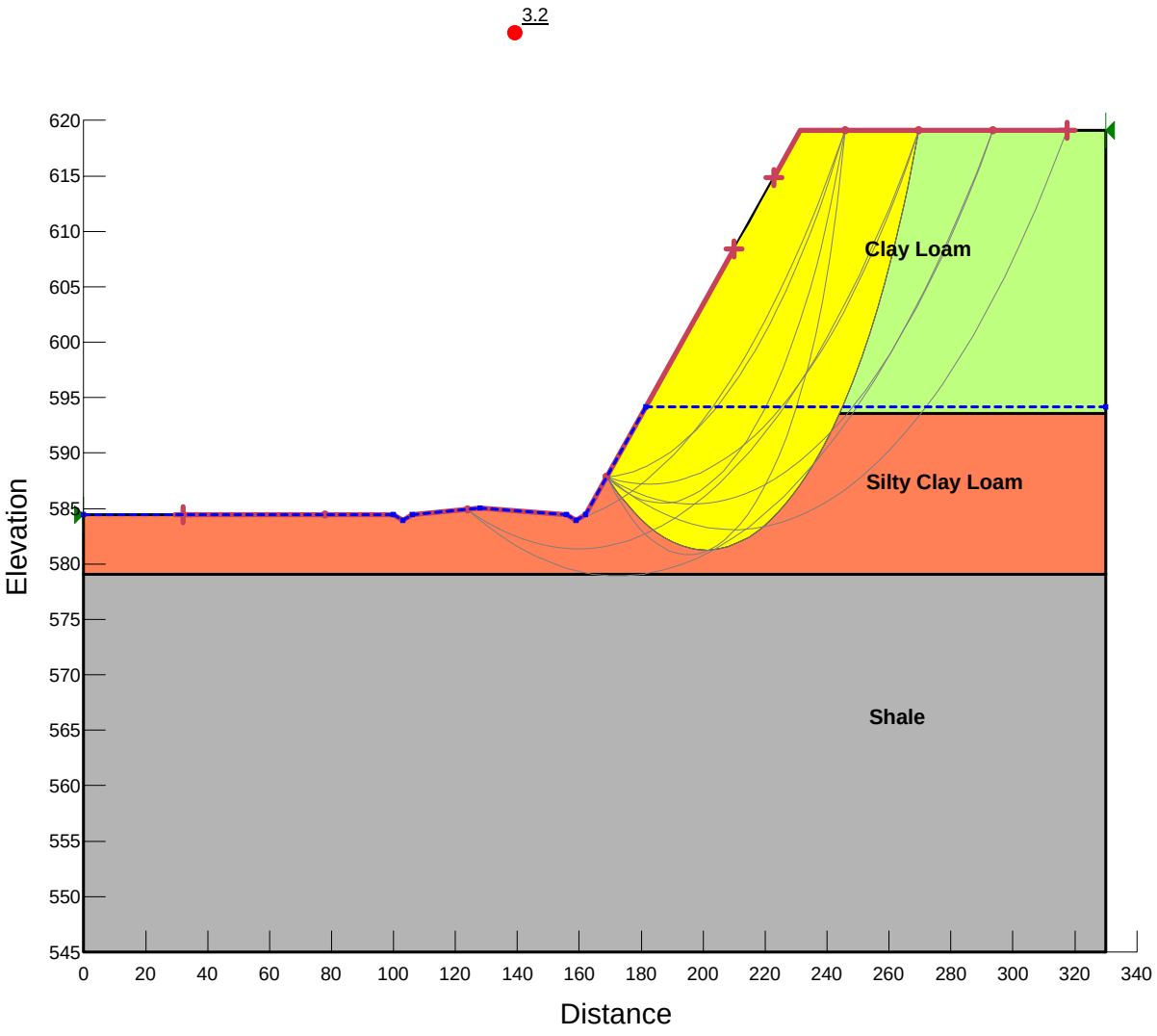
Name: Clay Loam Fill
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 27 °

Name: Clay Loam - Possible Fill
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 27 °

Name: Clay Loam
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 27 °

Name: Shale
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 500 psf
Phi': 12 °

WO 2 I-474 over Plank Road
Boring SB-5 - Station 225+02
End-of-Construction (Undrained Condition)

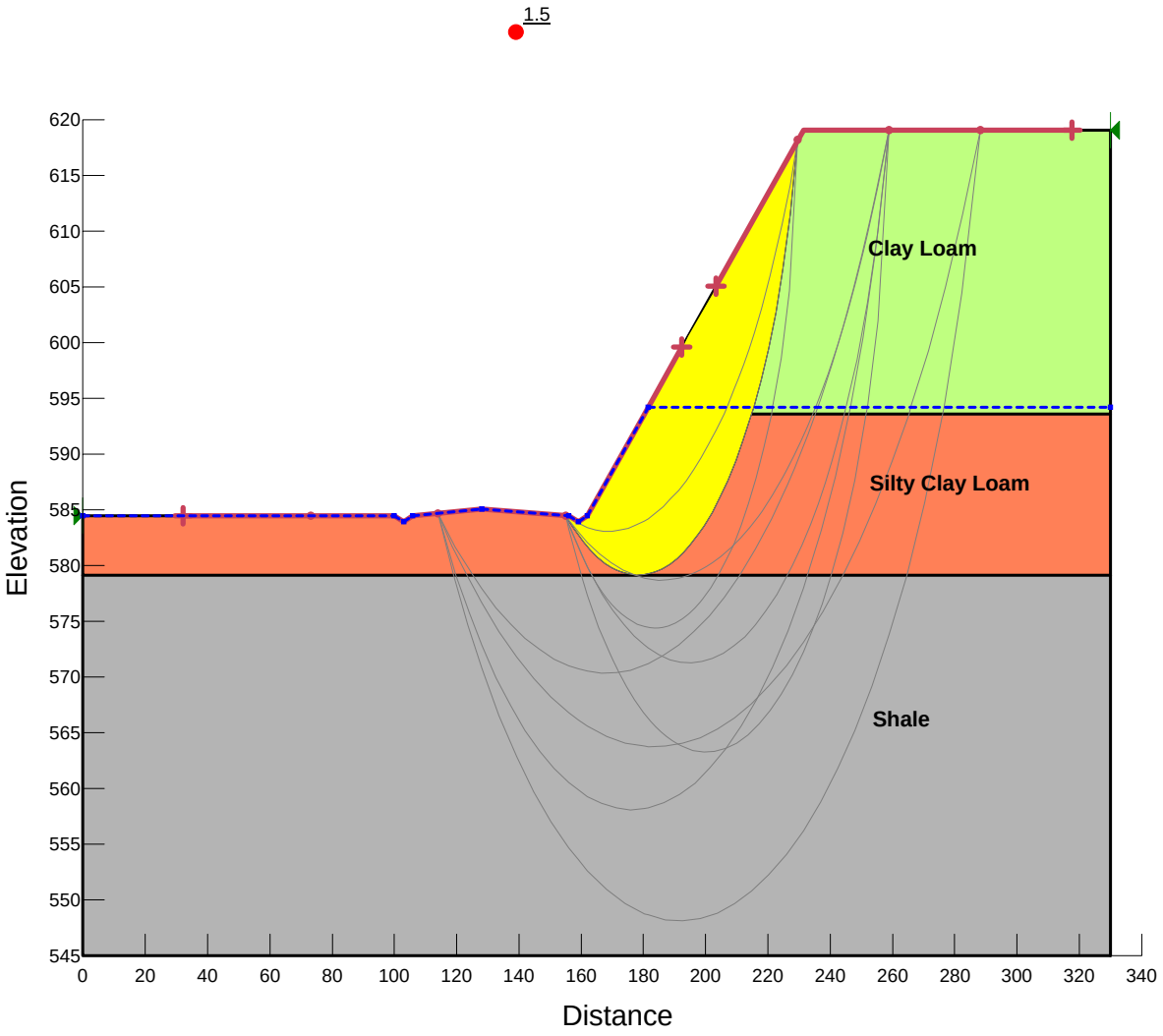


Name: Clay Loam
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,100 psf
Phi': 0 °
Piezometric Line: 1

Name: Silty Clay Loam
Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion': 2,000 psf
Phi': 0 °
Piezometric Line: 1

Name: Shale
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 4,500 psf
Phi': 12 °
Piezometric Line: 1

WO 2 I-474 over Plank Road
Boring SB-5 - Station 225+02
Long Term Analysis (Drained Condition)



Name: Clay Loam
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 100 psf
Phi': 27 °
Piezometric Line: 1

Name: Silty Clay Loam
Model: Mohr-Coulomb
Unit Weight: 110 pcf
Cohesion': 250 psf
Phi': 28 °
Piezometric Line: 1

Name: Shale
Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 500 psf
Phi': 12 °
Piezometric Line: 1

EXHIBIT F

PILE LENGTH/PILE

TYPE

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abutment (northbound)
REFERENCE BORING ========== SB-4
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 612.50 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 608.50 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 ========== 1004 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.80 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 187.66 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 70.37 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	**59** 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.)
605.81	2.69	0.90	12		5.8		19.1	8.5		***10.2***	10	0	0	6	7
603.31	2.50	1.40	20		7.6	13.3	27.7	11.1	1.7	***21.5***	21	0	0	12	9
601.31	2.00	1.50	11		6.3	14.3	38.8	9.3	1.8	***31.4***	31	0	0	17	11
598.81	2.50	2.00	12		9.6	19.1	***42.7***	14.1	2.4	44.8	43	0	0	23	14
596.31	2.50	1.40	10		7.6	13.3	***52.1***	11.1	1.7	56.2	52	0	0	29	16
593.81	2.50	1.60	12		8.3	15.3	***59.5***	12.2	1.9	68.3	59	0	0	33	19
591.31	2.50	1.50	15		7.9	14.3	***69.3***	11.7	1.8	80.2	69	0	0	38	21
588.81	2.50	1.70	15		8.6	16.2	***79.9***	12.7	2.1	93.2	80	0	0	44	24
586.31	2.50	1.90	18		9.3	18.1	***82.5***	13.7	2.3	106.0	82	0	0	45	26
583.81	2.50	1.20	14		6.8	11.4	***88.3***	10.0	1.4	115.9	88	0	0	49	29
578.81	5.00	1.10	22		12.6	10.5	***103.8***	18.6	1.3	134.8	104	0	0	57	34
573.81	5.00	1.40	21		15.1	13.3	***118.9***	22.3	1.7	157.1	119	0	0	65	39
568.81	5.00	1.40	27		15.1	13.3	***125.5***	22.3	1.7	178.3	125	0	0	69	44
563.81	5.00	0.50	19		6.4	4.8	***139.5***	9.5	0.6	188.7	140	0	0	77	49
555.81	8.00	1.30	28		23.0	12.4	234.8	33.8	1.6	***231.7***	232	0	0	127	57
555.31	0.50			Shale	20.6	84.8	***255.4***	30.3	10.7	262.0	255	0	0	140	57.2
554.81	0.50			Shale	20.6	84.8	***276.0***	30.3	10.7	292.2	276	0	0	152	57.7
554.31	0.50			Shale	20.6	84.8	***296.5***	30.3	10.7	322.5	297	0	0	163	58.2
553.81	0.50			Shale	20.6	84.8	***317.1***	30.3	10.7	352.7	317	0	0	174	58.7
553.31	0.50			Shale	20.6	84.8	***337.6***	30.3	10.7	383.0	~~338~~	~~0~~	~~0~~	~~186~~	~~59.2~~
552.81	0.50			Shale	20.6	84.8	***358.2***	30.3	10.7	413.3	~~358~~	~~0~~	~~0~~	~~197~~	~~59.7~~
552.31	0.50			Shale	20.6	84.8	***378.7***	30.3	10.7	443.5	~~379~~	~~0~~	~~0~~	~~208~~	~~60.2~~
551.81	0.50			Shale	20.6	84.8	***399.3***	30.3	10.7	473.8	~~399~~	~~0~~	~~0~~	~~220~~	~~60.7~~
551.31	0.50			Shale	20.6	84.8	***419.8***	30.3	10.7	504.0	~~420~~	~~0~~	~~0~~	~~231~~	~~61.2~~
550.81	0.50			Shale	20.6	84.8	***440.4***	30.3	10.7	534.3	~~440~~	~~0~~	~~0~~	~~242~~	~~61.7~~
550.31	0.50			Shale	20.6	84.8	***460.9***	30.3	10.7	564.6	~~461~~	~~0~~	~~0~~	~~254~~	~~62.2~~
549.81	0.50			Shale	20.6	84.8	***481.5***	30.3	10.7	594.8	~~481~~	~~0~~	~~0~~	~~265~~	~~62.7~~
549.31	0.50			Shale	20.6	84.8	***502.1***	30.3	10.7	625.1	~~502~~	~~0~~	~~0~~	~~276~~	~~63.2~~
548.81	0.50			Shale	20.6	84.8	***522.6***	30.3	10.7	655.3	~~523~~	~~0~~	~~0~~	~~287~~	~~63.7~~
547.81	1.00			Shale	41.1	84.8	***563.7***	60.5	10.7	715.9	~~564~~	~~0~~	~~0~~	~~310~~	~~64.7~~
546.81	1.00			Shale	41.1	84.8	***604.8***	60.5	10.7	776.4	~~605~~	~~0~~	~~0~~	~~333~~	~~65.7~~
545.81	1.00			Shale	41.1	84.8	***645.9***	60.5	10.7	836.9	~~646~~	~~0~~	~~0~~	~~355~~	~~66.7~~
544.81	1.00			Shale	41.1	84.8	***602.3***	60.5	10.7	886.7	~~602~~	~~0~~	~~0~~	~~331~~	~~67.7~~
543.81	1.00					0.0			0.0						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abutment (northbound)
REFERENCE BORING ========== SB-5
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 613.60 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 608.60 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 ========== 1004 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.80 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 187.66 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 70.37 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	**44** 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.)
606.10	2.50	1.30	10		7.2		18.6	10.6		***12.0***	12	0	0	7	8
603.60	2.50	1.20	12		6.8	11.4	22.5	10.0	1.4	***21.6***	22	0	0	12	10
601.10	2.50	0.90	11		5.4	8.6	33.6	7.9	1.1	***30.2***	30	0	0	17	13
598.60	2.50	1.50	10		7.9	14.3	***33.9***	11.7	1.8	41.0	34	0	0	19	15
596.10	2.50	0.70	11		4.3	6.7	***44.9***	6.4	0.8	48.2	45	0	0	25	18
593.60	2.50	1.40	11		7.6	13.3	***45.8***	11.1	1.7	58.5	46	0	0	25	20
591.10	2.50	0.70	14		4.3	6.7	***50.2***	6.4	0.8	64.9	50	0	0	28	23
588.60	2.50	0.70	23		4.3	6.7	***55.5***	6.4	0.8	71.4	55	0	0	31	25
586.70	1.90	0.80	53		3.7	7.6	***58.2***	5.5	1.0	76.7	58	0	0	32	27
584.20	2.50	0.70	58		4.3	6.7	***78.8***	6.4	0.8	85.2	79	0	0	43	29
581.70	2.50	2.40	71		10.8	22.9	***82.0***	15.9	2.9	100.1	82	0	0	45	32
576.70	5.00	1.60	35		16.6	15.3	***98.5***	24.4	1.9	124.5	99	0	0	54	37
573.70	3.00	1.60	35		10.0	15.3	178.0	14.7	1.9	***148.0***	148	0	0	81	40
573.20	0.50			Shale	20.6	84.8	198.5	30.3	10.7	***178.3***	178	0	0	98	40.4
572.70	0.50			Shale	20.6	84.8	219.1	30.3	10.7	***208.5***	209	0	0	115	40.9
572.20	0.50			Shale	20.6	84.8	239.7	30.3	10.7	***238.8***	239	0	0	131	41.4
571.70	0.50			Shale	20.6	84.8	***260.2***	30.3	10.7	269.0	260	0	0	143	41.9
571.20	0.50			Shale	20.6	84.8	***280.8***	30.3	10.7	299.3	281	0	0	154	42.4
570.70	0.50			Shale	20.6	84.8	***301.3***	30.3	10.7	329.6	301	0	0	166	42.9
570.20	0.50			Shale	20.6	84.8	***321.9***	30.3	10.7	359.8	322	0	0	177	43.4
569.70	0.50			Shale	20.6	84.8	***342.4***	30.3	10.7	390.1	~~342~~	~~0~~	~~0~~	~~188~~	~~43.9~~
569.20	0.50			Shale	20.6	84.8	***363.0***	30.3	10.7	420.3	~~363~~	~~0~~	~~0~~	~~200~~	~~44.4~~
568.70	0.50			Shale	20.6	84.8	***383.5***	30.3	10.7	450.6	~~384~~	~~0~~	~~0~~	~~211~~	~~44.9~~
568.20	0.50			Shale	20.6	84.8	***404.1***	30.3	10.7	480.9	~~404~~	~~0~~	~~0~~	~~222~~	~~45.4~~
567.70	0.50			Shale	20.6	84.8	***424.6***	30.3	10.7	511.1	~~425~~	~~0~~	~~0~~	~~234~~	~~45.9~~
567.20	0.50			Shale	20.6	84.8	***445.2***	30.3	10.7	541.4	~~445~~	~~0~~	~~0~~	~~245~~	~~46.4~~
566.70	0.50			Shale	20.6	84.8	***465.8***	30.3	10.7	571.6	~~466~~	~~0~~	~~0~~	~~256~~	~~46.9~~
566.20	0.50			Shale	20.6	84.8	***486.3***	30.3	10.7	601.9	~~486~~	~~0~~	~~0~~	~~267~~	~~47.4~~
565.70	0.50			Shale	20.6	84.8	***506.9***	30.3	10.7	632.2	~~507~~	~~0~~	~~0~~	~~279~~	~~47.9~~
565.20	0.50			Shale	20.6	84.8	***527.4***	30.3	10.7	662.4	~~527~~	~~0~~	~~0~~	~~290~~	~~48.4~~
564.70	0.50			Shale	20.6	84.8	***548.0***	30.3	10.7	692.7	~~548~~	~~0~~	~~0~~	~~301~~	~~48.9~~
564.20	0.50			Shale	20.6	84.8	***568.5***	30.3	10.7	722.9	~~569~~	~~0~~	~~0~~	~~313~~	~~49.4~~
563.70	0.50			Shale	20.6	84.8	***589.1***	30.3	10.7	753.2	~~589~~	~~0~~	~~0~~	~~324~~	~~49.9~~
563.20	0.50			Shale	20.6	84.8	***609.6***	30.3	10.7	783.5	~~610~~	~~0~~	~~0~~	~~335~~	~~50.4~~
562.70	0.50			Shale	20.6	84.8	***630.2***	30.3	10.7	813.7	~~630~~	~~0~~	~~0~~	~~347~~	~~50.9~~
562.20	0.50			Shale	20.6	84.8	***650.7***	30.3	10.7	844.0	~~651~~	~~0~~	~~0~~	~~358~~	~~51.4~~
561.70	0.50			Shale	20.6	84.8	***586.5***	30.3	10.7	863.5		0	0		
	.					0.0			0.0						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abutment (Southbound)
REFERENCE BORING ========== SB-4
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 612.60 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 608.60 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 ========== 1004 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 46.50 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 172.73 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 64.77 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	**59** 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.)
605.91	2.69	0.90	12		5.8		19.1	8.5		***10.2***	10	0	0	6	7
603.41	2.50	1.40	20		7.6	13.3	27.7	11.1	1.7	***21.5***	21	0	0	12	9
601.41	2.00	1.50	11		6.3	14.3	38.8	9.3	1.8	***31.4***	31	0	0	17	11
598.91	2.50	2.00	12		9.6	19.1	***42.7***	14.1	2.4	44.8	43	0	0	23	14
596.41	2.50	1.40	10		7.6	13.3	***52.1***	11.1	1.7	56.2	52	0	0	29	16
593.91	2.50	1.60	12		8.3	15.3	***59.5***	12.2	1.9	68.3	59	0	0	33	19
591.41	2.50	1.50	15		7.9	14.3	***69.3***	11.7	1.8	80.2	69	0	0	38	21
588.91	2.50	1.70	15		8.6	16.2	***79.9***	12.7	2.1	93.2	80	0	0	44	24
586.41	2.50	1.90	18		9.3	18.1	***82.5***	13.7	2.3	106.0	82	0	0	45	26
583.91	2.50	1.20	14		6.8	11.4	***88.3***	10.0	1.4	115.9	88	0	0	49	29
578.91	5.00	1.10	22		12.6	10.5	***103.8***	18.6	1.3	134.8	104	0	0	57	34
573.91	5.00	1.40	21		15.1	13.3	***118.9***	22.3	1.7	157.1	119	0	0	65	39
568.91	5.00	1.40	27		15.1	13.3	***125.5***	22.3	1.7	178.3	125	0	0	69	44
563.91	5.00	0.50	19		6.4	4.8	***139.5***	9.5	0.6	188.7	140	0	0	77	49
555.91	8.00	1.30	28		23.0	12.4	234.8	33.8	1.6	***231.7***	232	0	0	127	57
555.41	0.50			Shale	20.6	84.8	***255.4***	30.3	10.7	262.0	255	0	0	140	57.2
554.91	0.50			Shale	20.6	84.8	***276.0***	30.3	10.7	292.2	276	0	0	152	57.7
554.41	0.50			Shale	20.6	84.8	***296.5***	30.3	10.7	322.5	297	0	0	163	58.2
553.91	0.50			Shale	20.6	84.8	***317.1***	30.3	10.7	352.7	317	0	0	174	58.7
553.41	0.50			Shale	20.6	84.8	***337.6***	30.3	10.7	383.0	~~338~~	~~0~~	~~0~~	~~186~~	~~59.2~~
552.91	0.50			Shale	20.6	84.8	***358.2***	30.3	10.7	413.3	~~358~~	~~0~~	~~0~~	~~197~~	~~59.7~~
552.41	0.50			Shale	20.6	84.8	***378.7***	30.3	10.7	443.5	~~379~~	~~0~~	~~0~~	~~208~~	~~60.2~~
551.91	0.50			Shale	20.6	84.8	***399.3***	30.3	10.7	473.8	~~399~~	~~0~~	~~0~~	~~220~~	~~60.7~~
551.41	0.50			Shale	20.6	84.8	***419.8***	30.3	10.7	504.0	~~420~~	~~0~~	~~0~~	~~231~~	~~61.2~~
550.91	0.50			Shale	20.6	84.8	***440.4***	30.3	10.7	534.3	~~440~~	~~0~~	~~0~~	~~242~~	~~61.7~~
550.41	0.50			Shale	20.6	84.8	***460.9***	30.3	10.7	564.6	~~461~~	~~0~~	~~0~~	~~254~~	~~62.2~~
549.91	0.50			Shale	20.6	84.8	***481.5***	30.3	10.7	594.8	~~481~~	~~0~~	~~0~~	~~265~~	~~62.7~~
549.41	0.50			Shale	20.6	84.8	***502.1***	30.3	10.7	625.1	~~502~~	~~0~~	~~0~~	~~276~~	~~63.2~~
548.91	0.50			Shale	20.6	84.8	***522.6***	30.3	10.7	655.3	~~523~~	~~0~~	~~0~~	~~287~~	~~63.7~~
547.91	1.00			Shale	41.1	84.8	***563.7***	60.5	10.7	715.9	~~564~~	~~0~~	~~0~~	~~310~~	~~64.7~~
546.91	1.00			Shale	41.1	84.8	***604.8***	60.5	10.7	776.4	~~605~~	~~0~~	~~0~~	~~333~~	~~65.7~~
545.91	1.00			Shale	41.1	84.8	***645.9***	60.5	10.7	836.9	~~646~~	~~0~~	~~0~~	~~355~~	~~66.7~~
544.91	1.00			Shale	41.1	84.8	***602.3***	60.5	10.7	886.7	~~602~~	~~0~~	~~0~~	~~331~~	~~67.7~~
543.91	1.00					0.0			0.0						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier 1 Northbound & Southbou
REFERENCE BORING ========== SB-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 610.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 587.60 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 ========== 2208 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.80 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 412.71 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 154.77 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	**321** KIPS	**177** KIPS	**42** 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.)
586.28	1.32	0.40	9		1.4		9.0	2.0		***3.0***	3	0	0	2	24
583.78	2.50	0.80	7		4.9	7.6	13.9	7.2	1.0	***10.2***	10	0	0	6	26
581.28	2.50	0.80	9		4.9	7.6	***15.9***	7.2	1.0	17.0	16	0	0	9	29
578.28	3.00	0.50	9		3.9	4.8	26.4	5.7	0.6	***23.5***	24	0	0	13	32
575.78	2.50	1.20	13		6.8	11.4	101.8	10.0	1.4	***42.2***	42	0	0	23	34
572.78	3.00		63	Hard Till	9.2	80.1	115.7	13.5	10.1	***56.3***	56	0	0	31	37
571.78	1.00			Shale	41.1	84.8	156.8	60.5	10.7	***116.8***	117	0	0	64	38.2
570.78	1.00			Shale	41.1	84.8	197.9	60.5	10.7	***177.3***	177	0	0	98	39.2
569.78	1.00			Shale	41.1	84.8	239.0	60.5	10.7	***237.8***	238	0	0	131	40.2
568.78	1.00			Shale	41.1	84.8	***280.1***	60.5	10.7	298.4	280	0	0	154	41.2
567.78	1.00			Shale	41.1	84.8	***321.2***	60.5	10.7	358.9	321	0	0	177	42.2
566.78	1.00			Shale	41.1	84.8	***362.4***	60.5	10.7	419.4	~~362~~	~~0~~	~~0~~	~~199~~	~~43.2~~
565.78	1.00			Shale	41.1	84.8	***403.5***	60.5	10.7	479.9	~~403~~	~~0~~	~~0~~	~~222~~	~~44.2~~
564.78	1.00			Shale	41.1	84.8	***444.6***	60.5	10.7	540.5	~~445~~	~~0~~	~~0~~	~~245~~	~~45.2~~
563.78	1.00			Shale	41.1	84.8	***485.7***	60.5	10.7	601.0	~~486~~	~~0~~	~~0~~	~~267~~	~~46.2~~
562.78	1.00			Shale	41.1	84.8	***526.8***	60.5	10.7	661.5	~~527~~	~~0~~	~~0~~	~~290~~	~~47.2~~
561.78	1.00			Shale	41.1	84.8	***567.9***	60.5	10.7	722.0	~~568~~	~~0~~	~~0~~	~~312~~	~~48.2~~
560.78	1.00			Shale	41.1	84.8	***609.0***	60.5	10.7	782.5	~~609~~	~~0~~	~~0~~	~~335~~	~~49.2~~
559.78	1.00			Shale	41.1	84.8	***650.1***	60.5	10.7	843.1	~~650~~	~~0~~	~~0~~	~~358~~	~~50.2~~
558.78	1.00			Shale	41.1	84.8	***691.2***	60.5	10.7	903.6	~~691~~	~~0~~	~~0~~	~~380~~	~~51.2~~
557.78	1.00			Shale	41.1	84.8	***732.3***	60.5	10.7	964.1	~~732~~	~~0~~	~~0~~	~~403~~	~~52.2~~
556.78	1.00			Shale	41.1	84.8	***773.4***	60.5	10.7	1024.6	~~773~~	~~0~~	~~0~~	~~425~~	~~53.2~~
555.78	1.00			Shale	41.1	84.8	***814.5***	60.5	10.7	1085.1	~~815~~	~~0~~	~~0~~	~~448~~	~~54.2~~
554.78	1.00			Shale	41.1	84.8	***855.7***	60.5	10.7	1145.7	~~856~~	~~0~~	~~0~~	~~471~~	~~55.2~~
554.28	0.50			Shale	20.6	84.8	***961.0***	30.3	10.7	1186.6	~~961~~	~~0~~	~~0~~	~~529~~	~~55.7~~
553.78	0.50			Limestone	41.1	169.5	***1002.1***	60.5	21.5	1247.2	~~1002~~	~~0~~	~~0~~	~~551~~	~~56.2~~
553.28	0.50			Limestone	41.1	169.5	***1043.2***	60.5	21.5	1307.7	~~1043~~	~~0~~	~~0~~	~~574~~	~~56.7~~
552.78	0.50			Limestone	41.1	169.5	***1084.3***	60.5	21.5	1368.2	~~1084~~	~~0~~	~~0~~	~~596~~	~~57.2~~
552.28	0.50			Limestone	41.1	169.5	***1125.4***	60.5	21.5	1428.7	~~1125~~	~~0~~	~~0~~	~~619~~	~~57.7~~
551.78	0.50			Limestone	41.1	169.5	***1166.5***	60.5	21.5	1489.3	~~1167~~	~~0~~	~~0~~	~~642~~	~~58.2~~
551.28	0.50			Limestone		169.5			21.5						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== SN 072-0252 & 072-0253
REFERENCE BORING ========== SB-2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 610.20 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 587.60 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 ========== 2303 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 42.80 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 430.47 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 161.43 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	**316** KIPS	**174** KIPS	**55** 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.)
582.38	5.22	1.00	8		12.2		***18.0***	18.0		18.7	18	0	0	10	28
580.38	2.00	0.60	5		3.0	5.7	29.6	4.5	0.7	***24.3***	24	0	0	13	30
577.88	2.50	1.50	12		7.9	14.3	37.5	11.7	1.8	***36.0***	36	0	0	20	32
575.38	2.50	1.50	14		7.9	14.3	***38.8***	11.7	1.8	46.8	39	0	0	21	35
572.38	3.00	0.80	10		5.8	7.6	***48.4***	8.6	1.0	55.9	48	0	0	27	38
569.88	2.50	1.20	7		6.8	11.4	***55.2***	10.0	1.4	65.9	55	0	0	30	40
567.38	2.50	1.20	7		6.8	11.4	***58.1***	10.0	1.4	75.3	58	0	0	32	43
564.88	2.50	0.80	10		4.9	7.6	***62.1***	7.2	1.0	82.4	62	0	0	34	45
562.38	2.50	0.70	9		4.3	6.7	***69.3***	6.4	0.8	89.1	69	0	0	38	48
559.38	3.00	1.00	12		7.0	9.5	151.5	10.4	1.2	***109.0***	109	0	0	60	51
558.38	1.00			Shale	41.1	84.8	192.6	60.5	10.7	***169.5***	170	0	0	93	51.8
557.38	1.00			Shale	41.1	84.8	233.7	60.5	10.7	***230.1***	230	0	0	127	52.8
556.38	1.00			Shale	41.1	84.8	***274.8***	60.5	10.7	290.6	275	0	0	151	53.8
555.38	1.00			Shale	41.1	84.8	***315.9***	60.5	10.7	351.1	316	0	0	174	54.8
554.38	1.00			Shale	41.1	84.8	***357.1***	60.5	10.7	411.6	~~357~~	~~0~~	~~0~~	~~196~~	~~55.8~~
553.38	1.00			Shale	41.1	84.8	***398.2***	60.5	10.7	472.1	~~398~~	~~0~~	~~0~~	~~219~~	~~56.8~~
552.38	1.00			Shale	41.1	84.8	***439.3***	60.5	10.7	532.7	~~439~~	~~0~~	~~0~~	~~242~~	~~57.8~~
551.38	1.00			Shale	41.1	84.8	***480.4***	60.5	10.7	593.2	~~480~~	~~0~~	~~0~~	~~264~~	~~58.8~~
550.88	0.50			Shale		84.8			10.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abutment (southbound)
REFERENCE BORING ========== SB-5
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 613.20 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 609.20 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 ========== 1012 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 41.40 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 195.56 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 73.33 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	**43** 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.)
606.70	2.50	1.30	10		7.2		18.6	10.6		***12.0***	12	0	0	7	7
604.20	2.50	1.20	12		6.8	11.4	22.5	10.0	1.4	***21.6***	22	0	0	12	9
601.70	2.50	0.90	11		5.4	8.6	33.6	7.9	1.1	***30.2***	30	0	0	17	12
599.20	2.50	1.50	10		7.9	14.3	***33.9***	11.7	1.8	41.0	34	0	0	19	14
596.70	2.50	0.70	11		4.3	6.7	***44.9***	6.4	0.8	48.2	45	0	0	25	17
594.20	2.50	1.40	11		7.6	13.3	***45.8***	11.1	1.7	58.5	46	0	0	25	19
591.70	2.50	0.70	14		4.3	6.7	***50.2***	6.4	0.8	64.9	50	0	0	28	22
589.20	2.50	0.70	23		4.3	6.7	***55.5***	6.4	0.8	71.4	55	0	0	31	24
587.30	1.90	0.80	53		3.7	7.6	***58.2***	5.5	1.0	76.7	58	0	0	32	26
584.80	2.50	0.70	58		4.3	6.7	***78.8***	6.4	0.8	85.2	79	0	0	43	28
582.30	2.50	2.40	71		10.8	22.9	***82.0***	15.9	2.9	100.1	82	0	0	45	31
577.30	5.00	1.60	35		16.6	15.3	***98.5***	24.4	1.9	124.5	99	0	0	54	36
574.30	3.00	1.60	35		10.0	15.3	178.0	14.7	1.9	***148.0***	148	0	0	81	39
573.80	0.50			Shale	20.6	84.8	198.5	30.3	10.7	***178.3***	178	0	0	98	39.4
573.30	0.50			Shale	20.6	84.8	219.1	30.3	10.7	***208.5***	209	0	0	115	39.9
572.80	0.50			Shale	20.6	84.8	239.7	30.3	10.7	***238.8***	239	0	0	131	40.4
572.30	0.50			Shale	20.6	84.8	***260.2***	30.3	10.7	269.0	260	0	0	143	40.9
571.80	0.50			Shale	20.6	84.8	***280.8***	30.3	10.7	299.3	281	0	0	154	41.4
571.30	0.50			Shale	20.6	84.8	***301.3***	30.3	10.7	329.6	301	0	0	166	41.9
570.80	0.50			Shale	20.6	84.8	***321.9***	30.3	10.7	359.8	322	0	0	177	42.4
570.30	0.50			Shale	20.6	84.8	***342.4***	30.3	10.7	390.1	~~342~~	~~0~~	~~0~~	~~188~~	~~42.9~~
569.80	0.50			Shale	20.6	84.8	***363.0***	30.3	10.7	420.3	~~363~~	~~0~~	~~0~~	~~200~~	~~43.4~~
569.30	0.50			Shale	20.6	84.8	***383.5***	30.3	10.7	450.6	~~384~~	~~0~~	~~0~~	~~211~~	~~43.9~~
568.80	0.50			Shale	20.6	84.8	***404.1***	30.3	10.7	480.9	~~404~~	~~0~~	~~0~~	~~222~~	~~44.4~~
568.30	0.50			Shale	20.6	84.8	***424.6***	30.3	10.7	511.1	~~425~~	~~0~~	~~0~~	~~234~~	~~44.9~~
567.80	0.50			Shale	20.6	84.8	***445.2***	30.3	10.7	541.4	~~445~~	~~0~~	~~0~~	~~245~~	~~45.4~~
567.30	0.50			Shale	20.6	84.8	***465.8***	30.3	10.7	571.6	~~466~~	~~0~~	~~0~~	~~256~~	~~45.9~~
566.80	0.50			Shale	20.6	84.8	***486.3***	30.3	10.7	601.9	~~486~~	~~0~~	~~0~~	~~267~~	~~46.4~~
566.30	0.50			Shale	20.6	84.8	***506.9***	30.3	10.7	632.2	~~507~~	~~0~~	~~0~~	~~279~~	~~46.9~~
565.80	0.50			Shale	20.6	84.8	***527.4***	30.3	10.7	662.4	~~527~~	~~0~~	~~0~~	~~290~~	~~47.4~~
565.30	0.50			Shale	20.6	84.8	***548.0***	30.3	10.7	692.7	~~548~~	~~0~~	~~0~~	~~301~~	~~47.9~~
564.80	0.50			Shale	20.6	84.8	***568.5***	30.3	10.7	722.9	~~569~~	~~0~~	~~0~~	~~313~~	~~48.4~~
564.30	0.50			Shale	20.6	84.8	***589.1***	30.3	10.7	753.2	~~589~~	~~0~~	~~0~~	~~324~~	~~48.9~~
563.80	0.50			Shale	20.6	84.8	***609.6***	30.3	10.7	783.5	~~610~~	~~0~~	~~0~~	~~335~~	~~49.4~~
563.30	0.50			Shale	20.6	84.8	***630.2***	30.3	10.7	813.7	~~630~~	~~0~~	~~0~~	~~347~~	~~49.9~~
562.80	0.50			Shale	20.6	84.8	***650.7***	30.3	10.7	844.0	~~651~~	~~0~~	~~0~~	~~358~~	~~50.4~~
562.30	0.50			Shale	20.6	84.8	***586.5***	30.3	10.7	863.5		0	0		
	.					0.0			0.0						

EXHIBIT G

DRILLED SHAFT

DESIGN

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN SHALE < 100 KSF

STRUCTURE ========== SN 072-0252
SUBSTRUCTURE & REFERENCE BORING ==== Pier 1 SB-1

ESTIMATED TOP OF SHALE ELEVATION ===== 573.28 FT
DRILLED SHAFT DIAMETER IN SHALE ======= 36 IN.
FACTORED AXIAL LOAD ================= 2208 KIPS

DRILLED SHAFT DIA.'S FOR DESIGN TABLE

36	IN.
42	IN.
48	IN.
54	IN.
	IN.
	IN.

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	NOMINAL SIDE RESIST. (KIPS)	CUMULATIVE SIDE RESIST. (KIPS)	DEPTH CORR. FACTORS k	DEPTH CORR. FACTORS d_c	NOMINAL TIP RESIST. (KIPS)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RANGE OF SERVICE LOADING AND CORRESPONDING SETTLEMENT LOAD (KIPS)	SETTLEMENT (IN.)	LOAD (KIPS)	SETTLEMENT (IN.)
1.00	572.28	1.00	3.5	3.5	10	10	0.333	1.07	79	89	45	20	0.10	40	0.22
2.00	571.28	1.00	3.5	3.5	10	20	0.667	1.13	84	105	52	20	0.08	50	0.22
3.00	570.28	1.00	3.5	14.9	10	31	1.000	1.20	378	409	204	100	0.11	170	0.22
4.00	569.28	1.00	3.5	26.2	10	41	0.927	1.19	659	700	350	170	0.11	300	0.23
5.00	568.28	1.00	3.5	37.6	10	51	1.030	1.21	962	1013	506	250	0.12	425	0.23
6.00	567.28	1.00	3.5	49.0	10	61	1.107	1.22	1268	1330	665	325	0.12	550	0.23
7.00	566.28	1.00	3.5	56.4	10	72	1.166	1.23	1474	1546	773	375	0.12	650	0.24
8.00	565.28	1.00	3.5	63.8	10	82	1.212	1.24	1680	1762	881	425	0.12	750	0.25
9.00	564.28	1.00	71.7	68.5	209	291	1.249	1.25	1815	2106	1053	500	0.11	850	0.21
10.00	563.28	1.00	71.7	73.2	209	501	1.279	1.26	1949	2450	1225	600	0.11	1000	0.20
11.00	562.28	1.00	71.7	77.9	209	710	1.305	1.26	2083	2794	1397	650	0.11	1200	0.21
12.00	561.28	1.00	71.7	82.6	209	920	1.326	1.27	2217	3137	1568	750	0.11	1300	0.20
13.00	560.28	1.00	47.9	91.3	140	1060	1.344	1.27	2457	3517	1758	850	0.11	1500	0.21
14.00	559.28	1.00	47.9		140	1200									
15.00	558.28	1.00	100.0		283	1482									
16.00	557.28	1.00	100.0		283	1765									
17.00	556.28	1.00	100.0		283	2048									
18.00	555.28	1.00	100.0		283	2331									
19.00	554.28	1.00	100.0		283	2613									

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN SHALE < 100 KSF

STRUCTURE ========== SN 072-0253
SUBSTRUCTURE & REFERENCE BORING ==== Pier 1 SB-1

ESTIMATED TOP OF SHALE ELEVATION ===== 573.28 FT
DRILLED SHAFT DIAMETER IN SHALE ======= 36 IN.
FACTORED AXIAL LOAD ================= 2303 KIPS

DRILLED SHAFT DIA.'S FOR DESIGN TABLE

36	IN.
42	IN.
48	IN.
54	IN.
	IN.
	IN.

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	NOMINAL SIDE RESIST. (KIPS)	CUMULATIVE SIDE RESIST. (KIPS)	DEPTH CORR. FACTORS k	DEPTH CORR. FACTORS d_c	NOMINAL TIP RESIST. (KIPS)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RANGE OF SERVICE LOADING AND CORRESPONDING SETTLEMENT LOAD (KIPS)	SETTLEMENT (IN.)	LOAD (KIPS)	SETTLEMENT (IN.)
1.00	572.28	1.00	3.5	3.5	10	10	0.333	1.07	79	89	45	20	0.10	40	0.22
2.00	571.28	1.00	3.5	3.5	10	20	0.667	1.13	84	105	52	20	0.08	50	0.22
3.00	570.28	1.00	3.5	14.9	10	31	1.000	1.20	378	409	204	100	0.11	170	0.22
4.00	569.28	1.00	3.5	26.2	10	41	0.927	1.19	659	700	350	170	0.11	300	0.23
5.00	568.28	1.00	3.5	37.6	10	51	1.030	1.21	962	1013	506	250	0.12	425	0.23
6.00	567.28	1.00	3.5	49.0	10	61	1.107	1.22	1268	1330	665	325	0.12	550	0.23
7.00	566.28	1.00	3.5	56.4	10	72	1.166	1.23	1474	1546	773	375	0.12	650	0.24
8.00	565.28	1.00	3.5	63.8	10	82	1.212	1.24	1680	1762	881	425	0.12	750	0.25
9.00	564.28	1.00	71.7	68.5	209	291	1.249	1.25	1815	2106	1053	500	0.11	850	0.21
10.00	563.28	1.00	71.7	73.2	209	501	1.279	1.26	1949	2450	1225	600	0.11	1000	0.20
11.00	562.28	1.00	71.7	77.9	209	710	1.305	1.26	2083	2794	1397	650	0.11	1200	0.21
12.00	561.28	1.00	71.7	82.6	209	920	1.326	1.27	2217	3137	1568	750	0.11	1300	0.20
13.00	560.28	1.00	47.9	91.3	140	1060	1.344	1.27	2457	3517	1758	850	0.11	1500	0.21
14.00	559.28	1.00	47.9		140	1200									
15.00	558.28	1.00	100.0		283	1482									
16.00	557.28	1.00	100.0		283	1765									
17.00	556.28	1.00	100.0		283	2048									
18.00	555.28	1.00	100.0		283	2331									
19.00	554.28	1.00	100.0		283	2613									

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN SHALE < 100 KSF

STRUCTURE ========== SN 072-0252
SUBSTRUCTURE & REFERENCE BORING ==== Pier 2 SB-2/RP-3

ESTIMATED TOP OF SHALE ELEVATION ===== 563.29 FT
DRILLED SHAFT DIAMETER IN SHALE ======= 48 IN.
FACTORED AXIAL LOAD ========== 2208 KIPS

DRILLED SHAFT DIA.'S FOR DESIGN TABLE

36	IN.
42	IN.
48	IN.
54	IN.
	IN.
	IN.

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	NOMINAL SIDE RESIST. (KIPS)	CUMULATIVE SIDE RESIST. (KIPS)	DEPTH CORR. FACTORS k	DEPTH CORR. FACTORS d_c	NOMINAL TIP RESIST. (KIPS)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RANGE OF SERVICE LOADING AND CORRESPONDING SETTLEMENT LOAD (KIPS)	SETTLEMENT (IN.)	LOAD (KIPS)	SETTLEMENT (IN.)
1.00	562.29	1.00	4.2	27.9	16	16	0.250	1.05	1104	1121	560	275	0.16	450	0.30
2.00	561.29	1.00	4.2	39.9	16	33	0.500	1.10	1654	1686	843	400	0.15	700	0.32
3.00	560.29	1.00	4.2	51.9	16	49	0.750	1.15	2248	2297	1148	550	0.16	950	0.32
4.00	559.29	1.00	14.4	62.6	56	105	1.000	1.20	2830	2935	1467	700	0.16	1200	0.31
5.00	558.29	1.00	14.4	73.3	56	161	0.896	1.18	3256	3418	1709	850	0.16	1400	0.31
6.00	557.29	1.00	14.4	84.0	56	217	0.983	1.20	3787	4004	2002	1000	0.17	1700	0.32
7.00	556.29	1.00	14.4	94.7	56	273	1.052	1.21	4319	4592	2296	1100	0.16	1900	0.31
7.50	555.79	0.50	14.4	100.0	28	302	1.081	1.22	4585	4886	2443	1200	0.17	2000	0.31
8.50	554.79	1.00	100.0		377	679									
9.50	553.79	1.00	100.0		377	1055									
10.00	553.29	0.50	100.0		188	1244									
11.00	552.29	1.00	100.0		377	1621									
12.00	551.29	1.00	100.0		377	1998									
13.00	550.29	1.00	100.0		377	2375									
14.00	549.29	1.00	100.0		377	2752									
15.00	548.29	1.00	100.0		377	3129									
16.00	547.29	1.00	100.0		377	3506									

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN SHALE < 100 KSF

STRUCTURE ========== SN 072-0253
SUBSTRUCTURE & REFERENCE BORING ==== Pier 2 SB-2/RP-3

ESTIMATED TOP OF SHALE ELEVATION ===== 563.29 FT
DRILLED SHAFT DIAMETER IN SHALE ======= 48 IN.
FACTORED AXIAL LOAD ================= 2265 KIPS

DRILLED SHAFT DIA.'S FOR DESIGN TABLE

36	IN.
42	IN.
48	IN.
54	IN.
	IN.
	IN.

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	NOMINAL SIDE RESIST. (KIPS)	CUMULATIVE SIDE RESIST. (KIPS)	DEPTH CORR. FACTORS k	DEPTH CORR. FACTORS d_c	NOMINAL TIP RESIST. (KIPS)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RANGE OF SERVICE LOADING AND CORRESPONDING SETTLEMENT LOAD (KIPS)	SETTLEMENT (IN.)	LOAD (KIPS)	SETTLEMENT (IN.)
1.00	562.29	1.00	4.2	27.9	16	16	0.250	1.05	1104	1121	560	275	0.16	450	0.30
2.00	561.29	1.00	4.2	39.9	16	33	0.500	1.10	1654	1686	843	400	0.15	700	0.32
3.00	560.29	1.00	4.2	51.9	16	49	0.750	1.15	2248	2297	1148	550	0.16	950	0.32
4.00	559.29	1.00	14.4	62.6	56	105	1.000	1.20	2830	2935	1467	700	0.16	1200	0.31
5.00	558.29	1.00	14.4	73.3	56	161	0.896	1.18	3256	3418	1709	850	0.16	1400	0.31
6.00	557.29	1.00	14.4	84.0	56	217	0.983	1.20	3787	4004	2002	1000	0.17	1700	0.32
7.00	556.29	1.00	14.4	94.7	56	273	1.052	1.21	4319	4592	2296	1100	0.16	1900	0.31
7.50	555.79	0.50	14.4	100.0	28	302	1.081	1.22	4585	4886	2443	1200	0.17	2000	0.31
8.50	554.79	1.00	100.0		377	679									
9.50	553.79	1.00	100.0		377	1055									
10.00	553.29	0.50	100.0		188	1244									
11.00	552.29	1.00	100.0		377	1621									
12.00	551.29	1.00	100.0		377	1998									
13.00	550.29	1.00	100.0		377	2375									
14.00	549.29	1.00	100.0		377	2752									
15.00	548.29	1.00	100.0		377	3129									
16.00	547.29	1.00	100.0		377	3506									