STRUCTURE
GEOTECHNICAL REPORT

Bridge Replacement
C.H. 12 (St. Joseph Rd.)
Over Salt Fork Vermilion River

Existing S. N. 010-0090
Proposed S. N. 010-0293

F.A.S. 516
Section 77-00089-01-BR-1
Champaign County, Illinois
Station 26+61.50
Contract No.: 70616
PTB: 186-10 WO #3
Job No.: D-95-130-06
BFW No. 18170

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January 7, 2019 (Original)

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1.0 General Project Description and Proposed Structure Information

1.1 Introduction

The purpose of this Structure Geotechnical Report (SGR) is to document subsurface conditions observed at the project site and provide geotechnical analysis of anticipated conditions related to the proposed structure and to provide engineering design and construction recommendations. This SGR was developed by Bacon Farmer Workman Engineering and Testing, Inc. (BFW) using drilling data provided by Geo Services and McCleary Engineering.

1.2 Project Description

The project will consist of the complete replacement of the existing three span bridge (SN 010-0090) with a two-span bridge (Proposed SN 010-0293) located on C.H. 12 (St. Joseph Road) crossing Salt Fork Vermilion River in Champaign County, Illinois. The project is located approximately 1.0 east of Sidney, Illinois.

A general structure location map is shown on a USGS Topographic Location Map, Appendix A. The site lies within the limits of Third Principal Meridian (T. 18N R. 10E Section 6) within Champaign County in the Bloomington Ridged Plain Physiographic Region.

1.3 Existing Structure Information

The existing structure (SN 010-0090) was originally build in 1914 as SA12, Section 89-15D and reconstructed in 1979 as F.A.S. Rte. 516 Section 77-00089-01-BR. The existing Structure consists of three simple spans of PPC deck beams supported by closed abutments on spread footings and solid wall piers on timber piles. Back to back abutments length measures 173'-11" and out-to-out width measures 30'-0"

1.4 Proposed Structure Information

The proposed structure (SN 029-2501) will consist of a two-span continuous 54" web plate girder (composite full length) with 8" reinforced concrete deck with 0-degree skew. The proposed structure length is 267'-0" back to back and deck width is 34'-10" out-to-out. The proposed bridge centerline station will be 26+61.50. Abutments will be supported by steel H-piles with center pier on a H-pile supported footing. The proposed grade of the roadway will have only slight variations when comparted to the existing. A preliminary Type, Size and Location Plan (TSL), as provided by BFW is included in Appendix B.

Based on TSL, the existing water static elevation is approximately EL 639.5 with approximately streambed elevation of EL. 635.49, respectively. Traffic will be detoured during construction.

2.0 Site Investigation, Subsurface Exploration and Generalized Subsurface Conditions

An initial subsurface investigation was conducted and logged by IDOT district in June 2018. Due to deep foundation requirements, additional depth was needed from soil boring data. An additional soil boring was advanced on October 4, 2018 by McCleary Engineering. BFW was not present on-site during any subsurface activities. Therefore, no observations were made by BFW concerning the conditions of subsurface surface samples or test results obtained.

Based on information provided, three Standard Penetration Test (SPT) borings have now been advanced on site. One boring was advanced on the south side of the existing structure and designated as B-1SW (Sta. 25+16 10.5 ft. Lt). The second boring was advanced on the north side of the structure and designated as B-2 NE (Sta. 28+50 11.0 ft. Rt). The third boring was advanced near the center pier and designated as B-3 (Sta. 26+54.2 22.0 Rt).

Subsurface boring locations are shown on the TSL Plan found in the Appendix B of this report. Boring logs provided by Geo Services, Inc and McCleary Engineering are included in Appendix C with a subsurface soil profile included in Appendix D.

2.1 Subsurface Conditions

Generalized subsurface conditions for all borings is provided. Surface coverage for the northern (El. 657.41) and southern (El. 658.11) borings included a surface coverage of approximately 1.0 ft. thick hot mix asphalt (HMA) followed by approximately 11 ft. of brown to red/brown firm, sandy clay to silty clay loam (embankment). Standard Penetration Tests (SPT) driving resistances (N-values) ranged between 7 to 9 with unconfined compressive strengths (Q_u) ranging from 0.9 to 2.1 tons per square foot (tsf) with soil moistures ranging from 12 to 18 percent. No surface coverage was encountered at the center pier boring (El.646.69). Below Elev. 646.69 in all borings, the sandy to silty clay loam continued to approximate El. 641.41 and 639.69 where a fine brown sand to loose gray silty fine to medium coarse sand was encountered in the southern and center pier borings. In the northern boring the clay loams continued with depth. The sands were very loose in consistency with SPT driving resistances (N-values) ranging from 3 to 9 with soil moistures ranging from 19 to 47 percent. The loose sands continued in the southern and center borings to approximately El.633.91 and 632.19 where all of the borings encountered a stiff to very stiff clay to sandy loam till. SPTs yielded N-values ranging from 6 to 15 with unconfined compressive strengths (Q_u) ranging from 0.5 to 2.3 tons per square foot (tsf) with soil moistures ranging from 12 to 18 percent. In each boring the silty to sandy clay loam till increase significantly in consistency at elevations between El. 624.50 to 620.11 where cobble or boulder layers were encountered. SPTs yielded N-values ranging from 58 to splitspoon refusal (50+). The hard, silty to sandy clay loam till continued with depth with intermittent sand and gravel layers with large cobbles to either planned boring termination or auger refusal elevations of between 597.41 to 598.11

in borings 1SW and 2NE. In the center pier boring, B-3, the sandy clay loam extended to El. 599.19 where the soil transitioned into a gray, dense, fine to medium sand with trace clay. The sand was dense in consistency with SPTs yielding N-values in the range of 46 to 64. The dense sand extended to El. 588.69 where it transitioned back to a sandy clay loam till. The sandy clay loam till was hard to very hard in consistency. SPTs yielded N-values ranging from 59 to 77 with unconfined compressive strengths (Q_u) ranging from 8.2 to 8.7 tons per square foot (tsf) with soil moistures ranging from 11 to 18 percent. The hard-silty clay loam till extended to boring termination of El. 575.19

2.2 Groundwater

Static groundwater elevations were recorded for where first encountered during drilling activities and upon completion. However, due to wash boring techniques being used, groundwater elevations upon completion were only available for the center pier boring, B-3.

Table 2.2.1. Groundwater Elevations

Boring	First Encountered	Upon Completion
1SW (South Abutment)	N/A	N/A (Wash Bored)
2NE (North Abutment)	642.1	N/A (Wash Bored)
B-3 (Center Pier)	638.7	639.7

Given the short time for groundwater elevation monitoring, the true groundwater elevation may not be known. However, we anticipated the groundwater level at the site is closely tied to the water level in the Salt Fork Vermilion River and will be subject to seasonal and rainfall variations.

3.0 Geotechnical Evaluations

3.1 Settlement

The new approach slabs on either end of the bridge will be supported by new engineered fill. It is anticipated that approximately 2.3 feet (at the north abutment) and 1.6 feet (at the south abutment) will be placed at the new embankment approaches. Based on preliminary settlement calculations, the increase in stress due to the increase in fill would produce only minor settlements in the range of less than 0.3-inch near the north and south abutments and should not adversely affect the approach pavements. Therefore, the anticipated settlement of the abutments due to the regrading activities is considered to be negligible.

3.3 Slope Stability

There is no increase in the roadway profile grades for the northern approach which have had historic stable slopes. On the southern approach embankment are being slightly widened with slopes being reduced from 2 horizontal to 1 vertical (2H:1V) to 3 horizontal to 1 vertical (3H:1V); therefore, no stability problems are expended for the new side embankments

3.4 Seismic Considerations

The seismic hazard for the site was analyzed per the IDOT Geotechnical Manual, IDOT Bridge Design Manual, and AASHTO LRDF Bride Design Specifications. The Seismic Soil Site Class was determined per the requirements of All Geotechnical Manual Users (AGMU) Memo 9.1, Design Guide for Seismic Site Class Determination, and the "Seismic Site class Determination" Excel spreadsheet provided by IDOT.

The proposed bridge has two individual spans less than 200 feet and a total length less than 750 feet; therefore, the calculated results at each substructure unit was averaged to obtain a global Site Class Definition. Based on subsurface information the Seismic Site Class is D. Based on the seismic hazard maps the following coefficients should be used in design:

$\mathbf{S_s}$=0.154 g, $\mathbf{F_a}$=1.60; therefore Design Spectral Accelerations at 0.2 sec, ($\mathbf{S_{Ds}}$)=0.246 g
$\mathbf{S_1}$=0.058 g, $\mathbf{F_v}$=2.40; therefore Design Spectral Accelerations at 1.0 sec, ($\mathbf{S_{D1}}$)=0.139 g

According to the AASHTO LRFD Bridge Design Specifications, a site coefficient, which is a function of the soil profile types, is required for the calculation of minimum earthquake design forces. Based on the soils encountered and the depth to bedrock, the Seismic Performance Zone (SPZ) = 1 (S_{D1} <0.15 g).

3.5 Liquefaction

Liquefaction analysis was conducted using Design Guide AGMU Memo 10.1 – Liquefaction Analysis. As noted in the previous paragraph the Seismic Performance Zone (SPZ) is SPZ – 1 and the Peak Ground Acceleration (PGA) modified by the zero-period site factor, $\mathbf{F_{pga}}$ is less than 0.15. Therefore, no liquefaction of soil layers is anticipated to occur.

3.6 Scour

Based on the preliminary TSL (Appendix B), both the southern and northern abutments contain Class A6 stone riprap cover; therefore, design scour elevations should correspond to the bottom of the abutment cap.

Design scour elevation reduction for the center pier was analyzed from soil data from boring, B-3. Based on the soil data, erodible sands and very stiff (Qu>1.5 tsf) clay loam tills were both encountered within the proposed scour depth range (sands layer was in the upper portion) A weighted average of the soils properties was used in consideration of the reduction of the scour depth. A reduction in design scour depth of 25% was recommended. Scour elevation are provided in the following table.

Table 3.6.1. Scour Elevations

Event / Limit State	Design Scour Elevations (ft.)			Item 113
	S. Abut	Pier	N. Abut	
Q100	649.04	627.24	650.79	5
Q200	649.04	626.24	650.79	
Design	649.04	627.24	650.79	
Check	649.04	626.24	650.79	

3.7 Mining Activity

According to the Illinois State Geological Survey (ISGS) "Coal Mines in Illinois Viewer", no coal mining has been conducted in the vicinity of the project site.

4.0 Foundation Evaluations and Design Recommendations

Based on the results of the subsurface exploration, current site conditions observed, and laboratory results, items of geotechnical interest and considerations are discussed in the following sections.

4.1 Foundation Type Feasibility

Based on the preliminary TSL, the proposed structure (SN 010-0293), Station 26+61.50 will be constructed of a 54" web plate girder (composite full length) on integral abutments with center pier with web wall. Abutments will bear on single row of vertical steel H-piles with the center pier bearing on a multi-row H-pile supported footing.

Metal shell (MS) piles were not feasible based on the lower lateral support provided by the vertical piles and presence of dense soils with cobble/boulders which increases the risk of pile damage during driving. Other alternatives such as shallow spread footings were considered. Shallow spread footings are not a viable option due to the risk of scour and the presence of soft soil zones.

A single row of H-pile pier bent with solid wall encasement was considered for the center pier location. However, scour depths cause significant unbraced pile lengths which coupled with larger lateral loading yielded unacceptable lateral movements.

Drilled shafts ranging from 4 to 7 feet in diameter at depths from 30 to 55 feet were also considered for structural support. The drill shaft design was deemed an inefficient design based on conversations with the TSL Structural Engineer and IDOT. The inefficient design determination was based on the shaft diameter and depth required for capacity, the accompanying reduction of capacity due to increased added self-weight and the need for a cofferdam for construction. After discussions with TSL Structural Engineer and IDOT, a multi-row H-pile supported footing was deemed an acceptable option.

4.2 Driven Pile Supported Foundations

The piles considered for this site include side friction and end bearing H-piles. Dense to hard glacial tills were encountered in each of the soil borings to boring termination depths. Due to indications of cobbles/boulders within the soil borings advanced, the use of metal shell piles is not recommended. No bedrock was encountered during drilling activities.

The Modified IDOT static method Excel spreadsheet was used to estimate the pile lengths as per AGMU Memo 10.2. Where possible the H-piles should be driven to their Maximum Nominal Required Bearing. Pile shoes are recommended due to the presence of boulders

The preliminary axial factored loads were provided by the structural engineer for each abutment and center pier and are provided in Table 4.2.1.

Table 4.2.1 – LRFD Total Vertical Loads

Location	Axial Loads (LRFD) (Kips)	
North Abutment	1430	Strength I
	1020	Service I
South Abutment	1200	Strength I
	850	Service I
Pier	3710	Strength I
	2715	Service I

No geotechnical losses due to down drag, liquefaction or scour were included in the axial capacity calculations for either abutment. Due to the proposed depth of the pile supported footing, geotechnical losses due to scour were included in the axial capacity calculations.

Tables 4.2.2, 4.2.3 and 4.2.4 summarize the estimated pile lengths for H-piles of various sizes for the north and south abutments and center pile supported footing, respectively. The pile cutoff elevations used for the analysis were taken at El. 652.79 and El. 651.04 for the north and south abutments, respectively (based on 2 feet of embedment into cap). The pile cutoff elevation used for the analysis of the pile supported footing was El. 631.0 (based on 1 feet of embedment into footing).

Based on subsurface data, pre-drilling may be required due to cobbles at elevations from El. 608 (B-3) to 620 (B-2NE). Test piles are recommended for center pier and each abutment location. It should be noted that the production piles should not be ordered until after the test piles have been driven.

Table 4.2.2. Pile Bearing Capacity – North Abutment

Pile Description	Nominal Required Bearing (kips)	Factored Resistance Available (kips)	Estimated Pile Length (ft)
HP 12 X 53	276	152	43
	345	190	48
	419*	230*	50
HP 12 X 74	538	296	61
	546	300	64
	589*	324*	68
HP 14 X 73	336	185	43
	420	231	48
	578*	318*	50
HP 14 X 89	655	360	61
	663	365	64
	705*	388*	68
HP 14 X 102	756	416	72
	745	410	74
	758	417	77
HP 14 X 117	766	421	72
	755	415	74
	767	422	77

* - Max Nominal Required Bearing

Table 4.2.3 Pile Bearing Capacity – South Abutment

Pile Description	Nominal Required Bearing (kips)	Factored Resistance Available (kips)	Estimated Pile Length (ft)
HP 12 X 53	373	205	70
	381	209	72
	391	215	75
HP 12 X 74	386	212	70
	392	215	72
	402	221	75
HP 14 X 73	452	248	70
	472	260	72
	490	269	75
HP 14 X 89	460	253	70
	480	264	72
	497	274	75
HP 14 X 102	465	256	70
	485	267	72
	503	277	75
HP 14 X 117	473	260	70
	492	271	72
	511	281	75

Table 4.2.4 Pile Bearing Capacity – Center Pier

Pile Description	Nominal Required Bearing (kips)	Factored Resistance Available (kips)	Estimated Pile Length (ft)
HP 12 X 53	329	180	17
	371	203	19
	419*	230*	23
HP 12 X 74	544	298	49
	557	305	52
	551	302	54
HP 14 X 73	539	295	37
	545	299	39
	578*	318	43
HP 14 X 89	667	366	49
	683	375	52
	672	369	54
HP 14 X 102	676	371	49
	692	380	52
	681	374	54
HP 14 X 117	686	376	49
	702	385	52
	690	379	54

* - Max Nominal Required Bearing

4.4 Lateral Pile Design Parameters

Based on Section 3.10.1.10 of the 2012 IDOT Bridge Manual, when lateral loadings exceed 3 kips for LRFD a detailed soil structure interaction analysis is needed. The lateral response can be developed by modeling the soil/pile interaction with the computer program LPILE which required soil input values determined soil interaction values. Approximate soil input parameters have been developed for LPILE static lateral load analysis and are included in Appendix D.

5.0 Construction Considerations

Based on the results of the subsurface exploration, current site conditions observed, and laboratory results, items of geotechnical interest and considerations are discussed in the following sections.

5.1 Construction Activities

Construction activities should be performed in accordance with the current IDOT Standard Specifications for Road and Bridge Construction and any pertinent Special Provisions or Policies. Should any design considerations that were assumed by BFW change, BFW should be contacted to determine if the recommendations are still valid.

5.2 Temporary Sheeting and Soil Retention

Based on the preliminary TSL, traffic will be detoured during construction of the bridge. Therefore, temporary soil retention used for staged construction will not be required.

5.3 Cofferdams

Based on the preliminary TSL, a pile supported footing with web wall is proposed for the center pier with the bottom of the footing at El. 630.0. The estimated surface water elevation (ESWE) was calculated as 639.5 feet. River levels will fluctuate and will likely affect center footing excavation and pile driving activities. Based on the footing location and sandy soil types at the footing bearing depth, surface water and groundwater control will be required during construction at the pier location. However, it is anticipated that reasonable pumping efforts would likely not keep the excavation free from groundwater therefore the use of cofferdam would be required. We recommend a Type 2 Cofferdam, as discussed in section 2.3.6.4.2 of the 2012 IDOT Bridge manual, for the pier construction given that the difference in EWSE and bottom of footing elevation is greater than 6 feet. The cofferdam design water elevation shall be 3 feet above the ESWE.

From soil data, the soils above the center pier footing depth, consist of stiff clays over a layer of soft fine to medium sands. Below the footing depth, clay loam tills are immediately encountered. It is anticipated that the cofferdam sheeting will penetrate through the upper sand stratum and into the underlying clay loam till. Penetration into the underlying clay loam till should effectively cut off the groundwater flow from the nearby river. Therefore, the use of a seal coat should not be required.

All excavations should be in accordance with OSHA side slope and egress regulations. Side slopes on the order of 1.5:1 (H:V) may be required for temporary foundation excavations extending to depths of 5 feet or deeper. Stockpiled construction materials should not be placed within the zone of influence of the excavation side slopes. If a slopes excavation is not feasible due to lateral restriction, cantilevered steel sheeting or cantilevered soldier pile and lagging walls would be suitable options for temporary earth retention.

The proposed improvements will likely be constructed adjacent to existing road and bridge structure prior to demolition. Care should be taken when excavating adjacent to the existing structures to prevent undermining the foundations and any adjacent utilities.

6.0 Computations

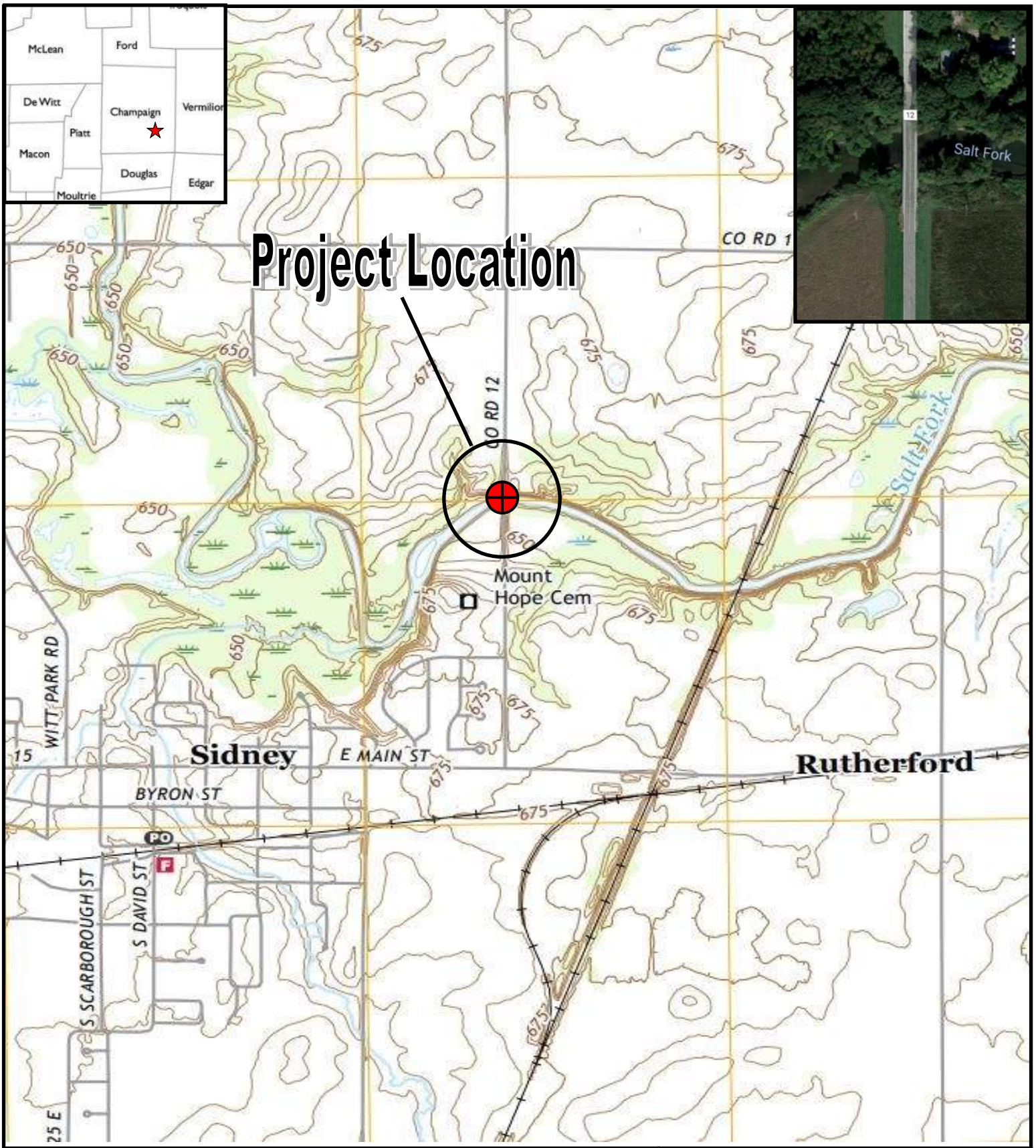
Any engineering computations that were conducted for special circumstances, if present, are provided in the appendix of this report.

7.0 Geotechnical Data

Subsurface boring logs and boring profile sheet are provided in the appendix of this report.

Appendix A

USGS Topographic Location Map



Project Location Map

C.H. 12 Over Salt Fork Vermilion River
010-0090 (E) 010-0293 (P)
Champaign County, Illinois

BFW
BACON | FARMER | WORKMAN
ENGINEERING & TESTING, INC.
500 SOUTH 17TH STREET
PADUCAH, KY 42003

Appendix B

Type, Size, and Location Plan (TS&L)

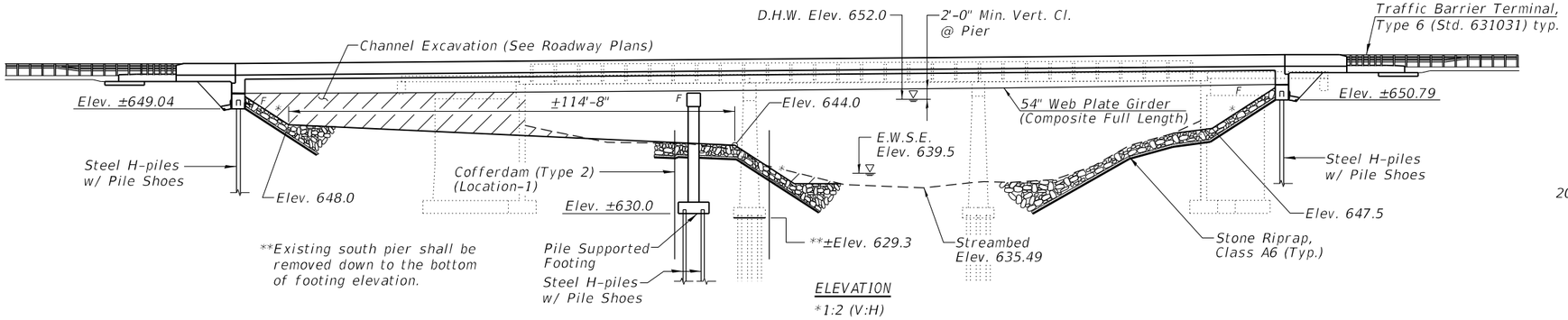
Bench Mark: Chiseled "□" Top of Northwest Wingwall of Structure 010-0090. Elevation 657.16.

Existing Structure: S.N. 010-0090 was originally built in 1914 as SA12, Section 89-15D and reconstructed in 1979 as F.A.S. Rte. 516, Section 77-00089-01-BR. The existing structure consists of three simple spans of PPC deck beams supported by closed abutments on spread footings and solid wall piers on timber piles. Bk. to Bk. of Abutment length measures 173'-11" and out-to-out deck width measures 30'-0". Structure to be removed and replaced. Traffic to be detoured during construction.

No Salvage

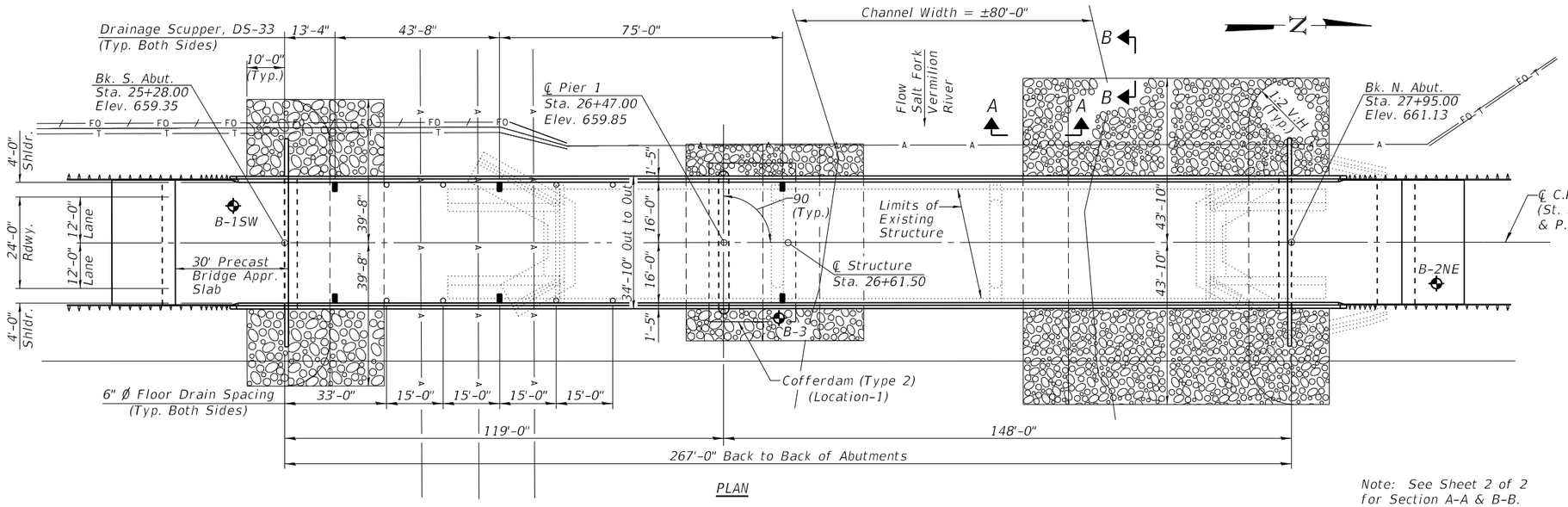
DESIGN SCOUR ELEVATION TABLE

Event/Limit State	Design Scour Elevations (ft.)			Item 113
	S. Abut.	Pier	N. Abut.	
Q100	649.04	627.24	650.79	5
Q200	649.04	626.24	650.79	
Design	649.04	627.24	650.79	
Check	649.04	626.24	650.79	



ELEVATION

*1:2 (V:H)



PLAN

Note: See Sheet 2 of 2 for Section A-A & B-B.

HIGHWAY CLASSIFICATION

F.A.S. Rte. 516 - C.H. 12 (St. Joseph Rd.)
Functional Class: Major Collector
ADT: 850 (2019); 950 (2039)
ADTT: 71 (2016); 79 (2035)
DHV: 120 (2035)
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 55:45

LOADING HL-93

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

DESIGN SPECIFICATIONS

2017 AASHTO LRFD Bridge Design Specifications, 8th Edition

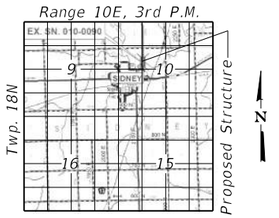
DESIGN STRESSES

FIELD UNITS

f'c = 3,500 psi
f'c = 4,000 psi (Superstructure Concrete)
fy = 50,000 psi (AASHTO M 270 Grade 50W)
fy = 60,000 psi (Reinforcement)

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (S_{D1}) = 0.139
Design Spectral Acceleration at 0.2 sec. (S_{DS}) = 0.246
Soil Site Class = D



LOCATION SKETCH

WATERWAY INFORMATION

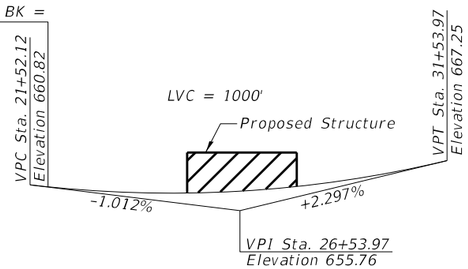
Existing Low Grade Elev. = 657.63 @ Sta. 25+03.19

Drainage Area = 298.00 mi.² Proposed Low Grade Elev. = 659.27 @ Sta. 24+50

Flood	Freq. Yr.	Q Ft³/s	Opening Sq. Ft. Exist.	Opening Sq. Ft. Prop.	Nat. H.W.E.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
	10	7510	1513	1782	650.2	0.3	0.2	650.5	650.4
Design	30	10,328	1810	2219	652.0	0.4	0.3	652.4	652.3
Base	100	13,601	2073	2618	653.6	0.6	0.4	654.2	654.0
Scour Design Check	200	15,709	2222	2743	654.5	0.7	0.5	655.2	655.0
Max. Calc.	500	18,496	2376	2768	655.6	1.6	0.6	657.2	656.2

10 Year Velocity Through Existing Bridge = 4.93 ft/s

10 Year Velocity Through Proposed Bridge = 4.17 ft/s

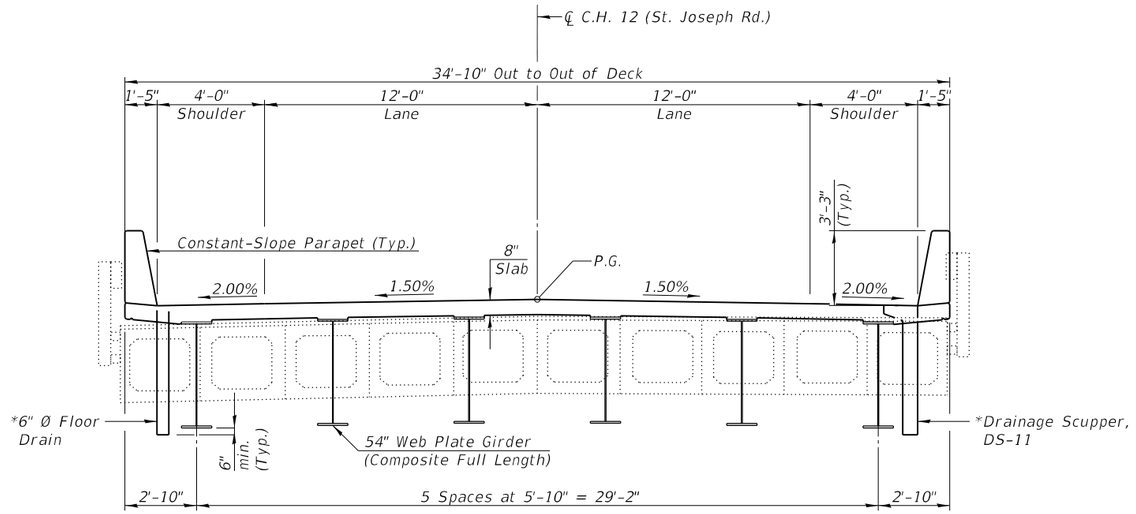


PROFILE GRADE

(Along ℄ C.H. 12 (St. Joseph Rd.))

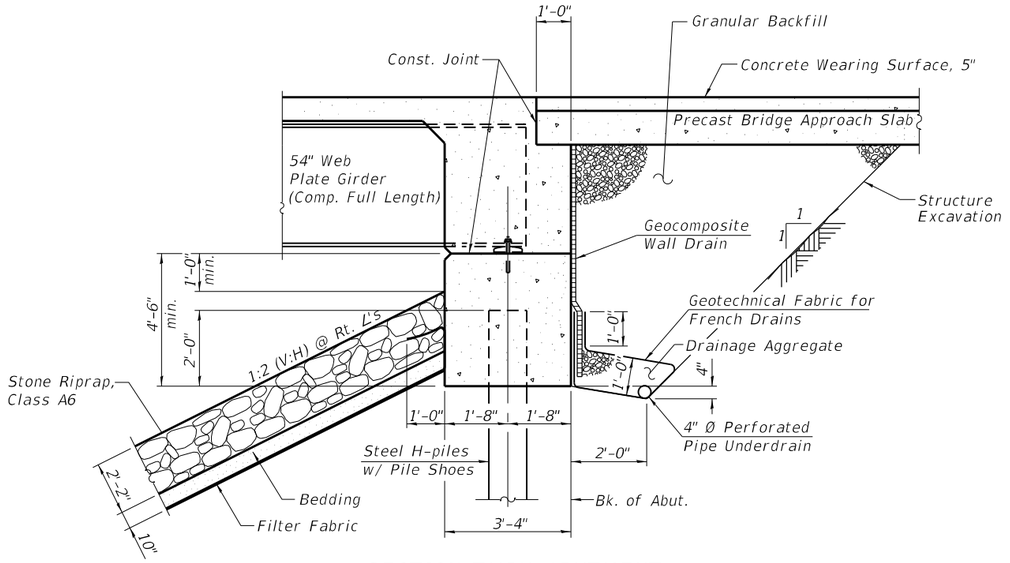
GENERAL PLAN & ELEVATION
C.H. 12 (ST. JOSEPH RD.) OVER SALT FORK VERMILION RIVER
F.A.S. 516 - SEC. 77-00089-01-BR-1
CHAMPAIGN COUNTY
STATION 26+61.50
STRUCTURE NO. 010-0293

FILE NAME = TSL-001.dgn	USER NAME =	DESIGNED - GBR	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION		F.A.S. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
BACON | FARMER | WORKMAN ENGINEERING & TESTING, INC. 421 SOUTH GRAND AVENUE WEST - SUITE 1A SPRINGFIELD, ILLINOIS 62704 PHONE - 217.679.6254		CHECKED - CMV	REVISED -			516	77-00089-01-BR-1	CHAMPAIGN		
	PLOT SCALE =	DRAWN - BJV	REVISED -						CONTRACT NO. 70616	
	PLOT DATE = 3/28/2019	CHECKED - GBR	REVISED -		SHEET NO. 1 OF 2 SHEETS			ILLINOIS	FED. AID PROJECT	



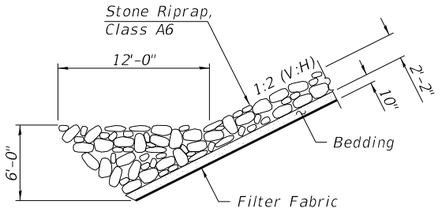
*See Sheet 1 of 2 for Location & Spacing

CROSS SECTION

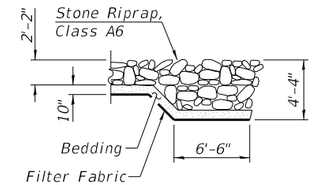


SECTION THRU ABUTMENT

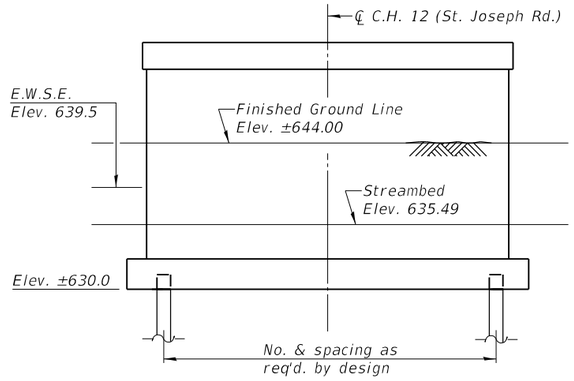
(Horiz. Dim. @ Rt. L's)



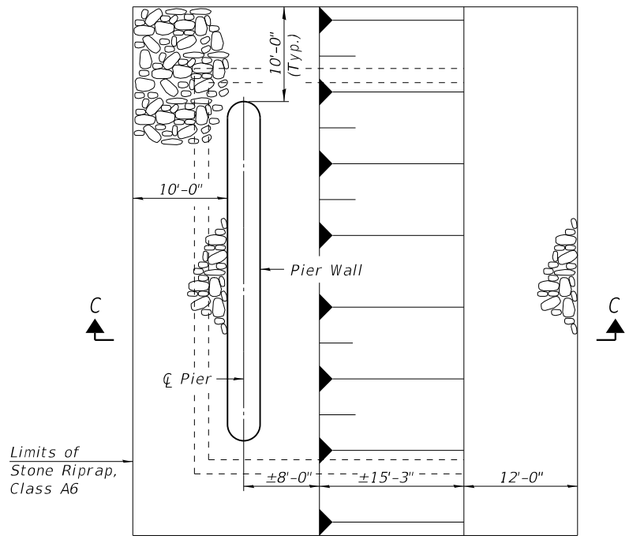
SECTION A-A



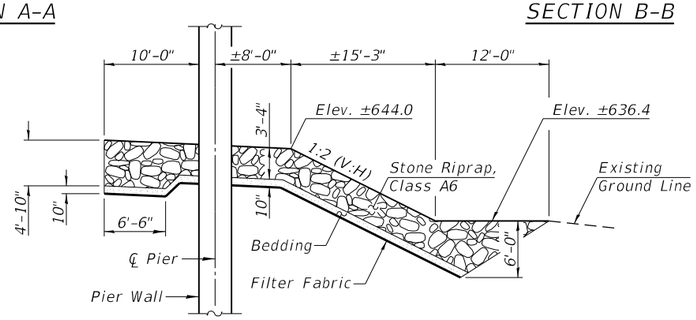
SECTION B-B



PIER SKETCH



PLAN - PIER RIPRAP PROTECTION DETAIL



SECTION C-C

DETAILS

C.H. 12 (ST. JOSEPH RD.) OVER SALT FORK VERMILION RIVER

F.A.S. 516 - SEC. 77-00089-01-BR-1

CHAMPAIGN COUNTY

STATION 26+61.50

STRUCTURE NO. 010-0293

FILE NAME = TSL-002.dgn	USER NAME =	DESIGNED - GBR	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION			
BACON | FARMER | WORKMAN ENGINEERING & TESTING, INC. 421 SOUTH GRAND AVENUE WEST - SUITE 1A SPRINGFIELD, ILLINOIS 62704 PHONE - 217.670.0249		CHECKED - CMV	REVISED -				
	PLOT SCALE =	DRAWN - BJV	REVISED -				
	PLOT DATE = 3/28/2019	CHECKED - GBR	REVISED -		SHEET NO. 2 OF 2 SHEETS		

F.A.S. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
516	77-00089-01-BR-1	CHAMPAIGN		
		CONTRACT NO. 70616		
		ILLINOIS FED. AID PROJECT		

Appendix C

Soil Boring Logs

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 6/27/18

ROUTE FAS 516 (CH 12) **DESCRIPTION** Salt Fork over C.H. 12 just NE of Sidney **LOGGED BY** RBK

SECTION 77-00089-01-BR-1 **LOCATION** NW, **SEC.** 10, **TWP.** 18N, **RNG.** 10E, 3rd **PM**,
GPS: 40.032820, -88.061980

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. 010-0090
Station 26+87.5

BORING NO. 1 SW Boring
Station 25+16
Offset 10.50ft Lt.
Ground Surface Elev. 657.41 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	SPT N (/6")	UCS Qu (tsf)	MOIST (%)	Description
657.41				Asphalt Pavement
656.41				Brown to Red/Brown Sandy Clay Loam (Embankment)
	3			
	4		15	
-5	3			
	2			
	3		18	
-10	2			
	2			
	5	0.9	20	
	3	B		
	4			
	3	0.9	24	
-15	4	B		
641.41				Fine Brown Sand
	2			
	2		22	
	2			
638.41				Fine Gray Sand
	2			
-20	7			
633.91				Clay Loam Till (Drilled Rough)
	3			
	5	2.1	13	
-25	7	B		
	2			
	3	0.5	13	
-30	3	B		
	26			
	29	0.8	12	
-35	29	B		
				(Drove Sampler on Boulder)
	9			
	10	1.9	12	
617.41 -40	16	B		

SOIL BORING 0100090 BORINGS.GPJ IL_DOT.GDT 7/5/18

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
Illinois Department of Transportation

SOIL BORING LOG

Date 6/27/18

ROUTE FAS 516 (CH 12) **DESCRIPTION** Salt Fork over C.H. 12 just NE of Sidney **LOGGED BY** RBK

SECTION 77-00089-01-BR-1 **LOCATION** NW, **SEC.** 10, **TWP.** 18N, **RNG.** 10E, 3rd **PM**,
GPS: 40.032820, -88.061980

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. 010-0090
Station 26+87.5

BORING NO. 1 SW Boring
Station 25+16
Offset 10.50ft Lt.
Ground Surface Elev. 657.41 ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter _____ ft
Upon Completion Wash Bored ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	SPT N (/6")	UCS Qu (tsf)	MOIST (%)
Gray Sandy Clay Loam Till (Very Hard)			
	34		
	22		7
-45	17		
	22		
	47		8
-50	50-5"		
	50-1"		
			9
-55			
599.41			
Dark Gray Sandy Clay Loam Till	18		
	23		11
597.41 -60	27		

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, from 137 (Rev. 8-99)

SOIL BORING 0100090 BORINGS.GPJ IL_DOT.GDT 7/5/18

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 6/27/18

ROUTE FAS 516 (CH 12) **DESCRIPTION** Salt Fork over C.H. 12 just NE of Sidney **LOGGED BY** RBK

SECTION 77-00089-01-BR-1 **LOCATION** NW, **SEC.** 10, **TWP.** 18N, **RNG.** 10E, 3rd **PM**,
GPS: 40.033738, -88.061899

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. 010-0090
Station 26+87.5

BORING NO. 2 NE Boring
Station 28+50
Offset 11.00ft Rt.
Ground Surface Elev. 658.11 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 642.1 ft ▼
Upon Completion Wash Bored ft
After Hrs. ft

DEPTH (ft)	SPT N (/6")	UCS Qu (tsf)	MOIST (%)
Pavement 658.11			
657.11 Brown Mottled Silty Clay			
	2		
-5	3 6	2.1 B	14
649.61 Gray Clay Loam Till			
	2		
-10	4 7	0.9 B	12
	4		
	5 6	1.4 B	11
	3		
-15	5 6	1.2 B	13
▼ (Trace of Free Water)	3		
	2 6	1 B	13
	4		
-20	4 6	2.9 B	12
Gray Clay Loam Till *(continued)*			
	4		
-25	5 8	2.2 B	12
	4		
-30	5 8	1.8 B	13
	4		
-35	3 12	2 B	13
621.11 Gray Sandy Clay Loam Till			
	30		
-40	50-5"		9

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

BBS, from 137 (Rev. 8-99)

SOIL BORING 0100090 BORINGS.GPJ IL_DOT.GDT 7/5/18

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 6/27/18

ROUTE FAS 516 (CH 12) **DESCRIPTION** Salt Fork over C.H. 12 just NE of Sidney **LOGGED BY** RBK

SECTION 77-00089-01-BR-1 **LOCATION** NW, **SEC.** 10, **TWP.** 18N, **RNG.** 10E, 3rd **PM**,
GPS: 40.033738, -88.061899

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. 010-0090
Station 26+87.5

BORING NO. 2 NE Boring
Station 28+50
Offset 11.00ft Rt.
Ground Surface Elev. 658.11 ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter 642.1 ft ▼
Upon Completion Wash Bored ft
After _____ **Hrs.** _____ ft

	DEPTH (ft)	SPT N (/6")	UCS Qu (tsf)	MOIST (%)
Gray Sandy Clay Loam Till *(continued)*		7		
		8	1.9	16
613.11	-45	14	B	
Brown Silty Clay Loam Till		50-1"		
608.11	-50			
Gray Sandy Clay Loam Till with Intermittent Sand/Gravel with Large Cobbles		50-3"		
	-55			
		50-2"		
(Auger Refusal) 598.11	-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, from 137 (Rev. 8-99)

SOIL BORING 0100090 BORINGS.GPJ IL_DOT.GDT 7/5/18

Mc Cleary Engineering
3705 Progress Blvd
Peru, Il 61354
815 780-8486

SOIL BORING LOG

Solutions You Can Build On

Date 10/4/18

ROUTE CH-12 St Joseph Rd. **DESCRIPTION** S. pier of bridge over Salt Fork Vermillion River **LOGGED BY** TLM

SECTION 77-00089-01-BR-1 **LOCATION** NE 1/4, **SEC.** 10, **TWP.** 18, **RNG.** 10, 3rd **PM**,
Latitude 40.033202, **Longitude** -88.061782

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 010-1293
Station 26+61.5

BORING NO. B-3
Station 26+54.2
Offset 22.0 ft Rt.
Ground Surface Elev. 646.69 ft

Surface Water Elev. 637.99 ft
Stream Bed Elev. 635.99 ft

Groundwater Elev.:
First Encounter 638.7 ft ▼
Upon Completion 639.7 ft ▽
After N/A **Hrs.** N/A ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very stiff dark brown to black Silty Clay Loam, moist		2		
		2 3	2.5 P	16
	643.69	2		
Very stiff dark brown to black Silty Clay, moist		3 5	3.0 P	22
	641.69 -5	2		
Stiff dark brown Silty Clay Loam, trace Sand, moist		3 3	1.5 P	23
	639.69 ▽			
Loose gray Silty Fine to Med. Coarse Sand, wet ▼		2		
		1 2		19
	-10	1		
		1 2		47
	634.69			
Loose gray Med. Coarse Sand to Fine Gravel, gravel is subrounded to angular, wet		WH		
		1 2		24
	632.19			
Stiff to very stiff gray Clay Loam Till, moist	-15	2		
		4 5	2.1 B	13
	629.69			
Stiff gray Silty Clay Loam Till, trace sand		3		
		5 7	2.0 S	18
	626.69 -20			

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very stiff gray Clay Loam Till with occasional 2" Silt Seams, moist		3		
		5 9	2.3 B	12
	-25	49		
	620.69	66 75		31
Very litle recovery (less than 1") likely Cobble or Boulder layer				
	618.69			
Very hard Sandy Clay Loam Till, moist				
	-30	29		
		70 100/5"	4.6 S	8
	-35	24		
		26 27	10.7 S	10
	-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)

McCleary Engineering
3705 Progress Blvd
Peru, Il 61354
815 780-8486

SOIL BORING LOG

Solutions You Can Build On

Date 10/4/18

ROUTE CH-12 St Joseph Rd. **DESCRIPTION** S. pier of bridge over Salt Fork Vermillion River **LOGGED BY** TLM

SECTION 77-00089-01-BR-1 **LOCATION** NE 1/4, **SEC.** 10, **TWP.** 18, **RNG.** 10, 3rd **PM**,
Latitude 40.033202, **Longitude** -88.061782

COUNTY Champaign **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 010-1293
Station 26+61.5

BORING NO. B-3
Station 26+54.2
Offset 22.0 ft Rt.
Ground Surface Elev. 646.69 ft

Surface Water Elev. 637.99 ft
Stream Bed Elev. 635.99 ft

Groundwater Elev.:
First Encounter 638.7 ft ▼
Upon Completion 639.7 ft ▽
After N/A **Hrs.** N/A ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	100/5"			Very hard Sandy Clay Loam Till, moist *(continued)*
			1	Rock in Shoe
-45	14			
	24 40	8.2 B	11	
599.19				
				Dense gray Fine to Med. Sand, trace Clay (ribbons very little, but holds shape)
-50	13			
	18 28		13	
-55				
590.69				Rod stuck in auger from blown in sand, augered past this sample to free rod
588.69				
				Very hard gray Sandy Clay Loam Till, moist
-60				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	16			Very hard gray Sandy Clay Loam Till, moist *(continued)*
	25 34	8.7 B	11	
583.69				
				Very hard brown Silty Clay Loam Till, moist
-65	15			
	30 47	8.2 B	18	
-70	15			
	27 40	5.8 B	16	
575.19				
				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)

Appendix D

Subsurface Soil Boring Profile

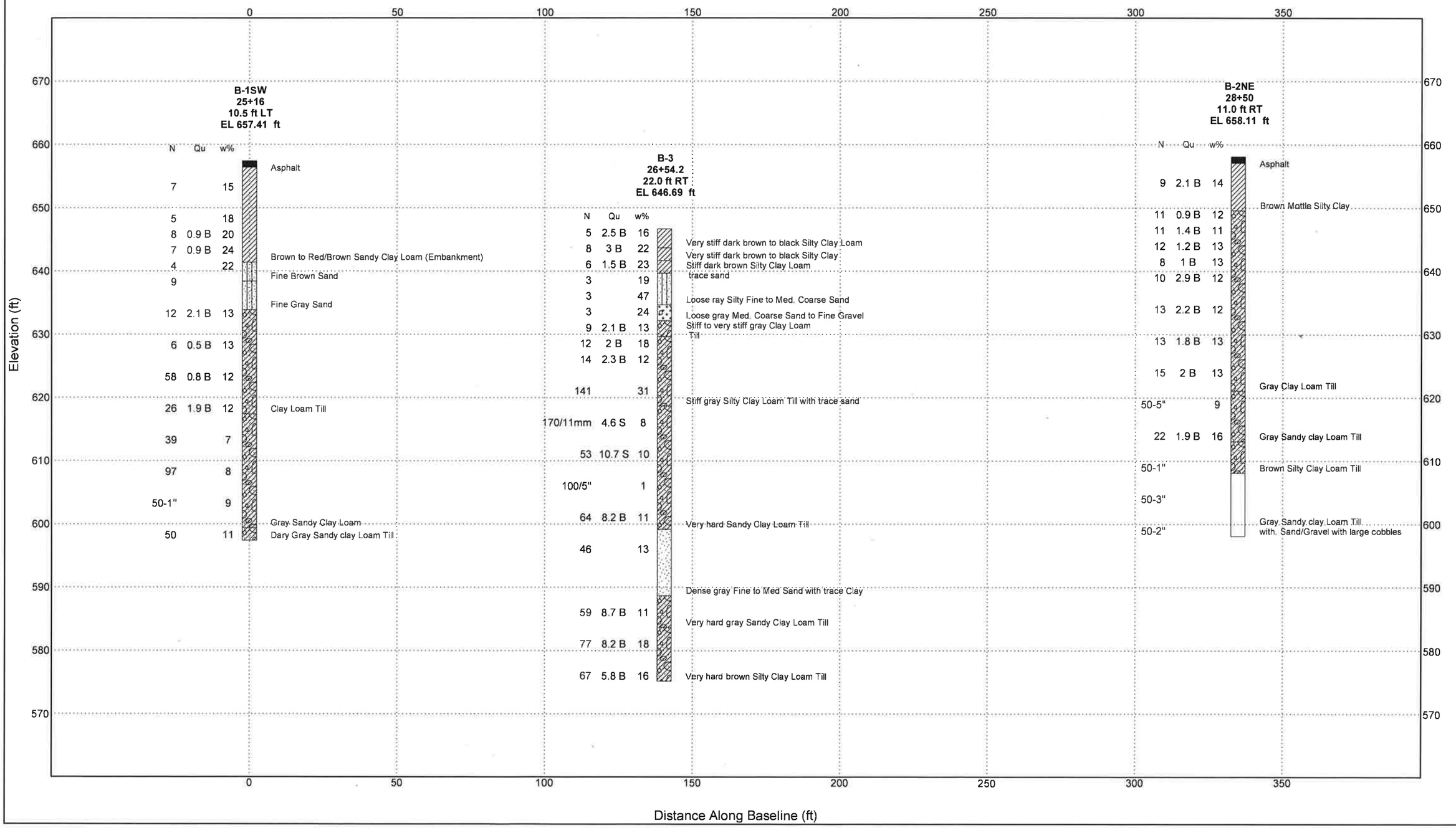
Illinois Department of Transportation
Division of Highways
Bacon Farmer Workman Engineering & Testing, Inc.

ROUTE C.H. 12 Over Salt Fork Vermilion River
SECTION 77-00089-01-BR-1
COUNTY Champaign County
PROJECT LOCATION Station 26+61.50

SUBSURFACE PROFILE

LEGEND
EL = Elevation (ft)
D = Depth Below Existing Ground Surface (ft)
N = SPT N-Value (AASHTO T206)
Qu = Unconfined compressive Strength (tsf)
Failure Mode (B= Bulge, S= shear, P= penetrometer)
w% = Moisture Content Percentage

WATER TABLE LEGEND
▼ = First Encountered
▽ = Upon Completion
▼ = After __ hours



ROADWAY PROFILE - BETA SOIL PROFILE SHEET GPJ IL_DOT_D4_9-15-10.GDT 12/21/18

Appendix E

IDOT Static Method of Estimating Pile Length – Capacity Sheets

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abut
REFERENCE BORING ========== B-2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 652.80 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 650.80 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1430 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 357.50 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 134.06 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area======== 0.108 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
418 KIPS	**345** KIPS	**190** KIPS	**48** 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.)
647.61	3.19	0.90			8.2		27.5	12.1		***14.2***	14	0	0	8	5
644.61	3.00	1.40			10.9	19.3	35.7	16.0	2.1	***29.8***	30	0	0	16	8
642.11	2.50	1.20			8.1	16.5	***41.1***	11.9	1.8	41.4	41	0	0	23	11
639.61	2.50	1.00			7.0	13.8	74.3	10.3	1.5	***54.6***	55	0	0	30	13
634.61	5.00	2.90			29.6	40.0	***94.3***	43.3	4.4	96.8	94	0	0	52	18
629.61	5.00	2.20			24.5	30.3	***113.3***	35.9	3.3	132.1	113	0	0	62	23
624.61	5.00	1.80			21.6	24.8	***137.6***	31.5	2.7	163.9	138	0	0	76	28
621.11	3.50	2.00			16.2	27.6	254.8	23.6	3.0	***198.6***	199	0	0	109	32
615.11	6.00		70	Hard Till	26.6	128.6	***179.0***	38.9	14.1	226.3	179	0	0	98	38
610.11	5.00	1.90			22.3	26.2	358.9	32.7	2.9	***276.2***	276	0	0	152	43
605.11	5.00		100	Hard Till	42.7	183.7	462.9	62.5	20.1	***345.4***	345	0	0	190	48
600.11	5.00		100	Sandy Gravel	139.0	245.0	601.9	203.2	26.8	***548.6***	549	0	0	302	53
599.19	0.92		100	Sandy Gravel	25.6	245.0	***495.1***	37.4	26.8	571.5	495	0	0	272	54
596.69	2.50		46	Fine Sand	9.9	112.7	***505.1***	14.5	12.3	586.0	505	0	0	278	56
594.19	2.50		46	Fine Sand	9.9	112.7	***515.0***	14.5	12.3	600.5	515	0	0	283	59
591.69	2.50		46	Fine Sand	9.9	112.7	***524.9***	14.5	12.3	615.0	525	0	0	289	61
588.69	3.00		46	Fine Sand	11.9	112.7	***532.5***	17.4	12.3	632.0	533	0	0	293	64
586.19	2.50		59	Hard Till	8.2	108.4	***540.8***	12.1	11.9	644.0	541	0	0	297	67
583.69	2.50		59	Hard Till	8.2	108.4	***582.1***	12.1	11.9	659.7	582	0	0	320	69
581.19	2.50		77	Hard Till	13.1	141.5	***595.2***	19.2	15.5	678.9	595	0	0	327	72
578.69	2.50		77	Hard Till	13.1	141.5	***590.0***	19.2	15.5	696.1	590	0	0	324	74
576.19	2.50		67	Hard Till	10.3	123.1	***600.2***	15.0	13.5	711.1	600	0	0	330	77
575.19	1.00		67	Hard Till		123.1			13.5						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abut
REFERENCE BORING ========== B-2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 652.80 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 650.80 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1430 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 357.50 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 134.06 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 74
Plugged Pile Perimeter========== 4.050 FT. Unplugged Pile Perimeter========== 5.908 FT.
Plugged Pile End Bearing Area========== 1.025 SQFT. Unplugged Pile End Bearing Area======== 0.151 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
589 KIPS	**554** KIPS	**305** KIPS	**67** FT.

BDT. DF 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.)
647.61	3.19	0.90			8.4		28.5	12.3		***15.3***	15	0	0	8	5
644.61	3.00	1.40			11.1	20.1	36.8	16.3	3.0	***31.1***	31	0	0	17	8
642.11	2.50	1.20			8.3	17.2	***42.2***	12.1	2.5	42.8	42	0	0	23	11
639.61	2.50	1.00			7.2	14.4	76.7	10.5	2.1	***57.3***	57	0	0	32	13
634.61	5.00	2.90			30.2	41.7	***96.9***	44.1	6.2	99.9	97	0	0	53	18
629.61	5.00	2.20			25.1	31.6	***116.2***	36.5	4.7	135.6	116	0	0	64	23
624.61	5.00	1.80			22.0	25.9	***141.1***	32.1	3.8	168.2	141	0	0	78	28
621.11	3.50	2.00			16.5	28.7	263.0	24.1	4.2	***207.8***	208	0	0	114	32
615.11	6.00		70	Hard Till	27.1	134.1	***183.3***	39.6	19.8	231.6	183	0	0	101	38
610.11	5.00	1.90			22.8	27.3	370.4	33.3	4.0	***289.2***	289	0	0	159	43
605.11	5.00		100	Hard Till	43.6	191.6	477.9	63.7	28.3	***362.3***	362	0	0	199	48
600.11	5.00		100	Sandy Gravel	141.9	255.4	619.8	207.0	37.7	***569.3***	569	0	0	313	53
599.19	0.92		100	Sandy Gravel	26.1	255.4	***508.0***	38.1	37.7	587.0	508	0	0	279	54
596.69	2.50		46	Fine Sand	10.1	117.5	***518.1***	14.8	17.4	601.8	518	0	0	285	56
594.19	2.50		46	Fine Sand	10.1	117.5	***528.2***	14.8	17.4	616.5	528	0	0	291	59
591.69	2.50		46	Fine Sand	10.1	117.5	***538.3***	14.8	17.4	631.3	538	0	0	296	61
588.69	3.00		46	Fine Sand	12.2	117.5	***546.0***	17.7	17.4	648.4	546	0	0	300	64
586.19	2.50		59	Hard Till	8.4	113.0	***554.4***	12.3	16.7	660.7	554	0	0	305	67
583.69	2.50		59	Hard Till	8.4	113.0	***597.3***	12.3	16.7	678.0	597	*0*	*0*	*329*	*69*
581.19	2.50		77	Hard Till	13.4	147.5	***610.8***	19.6	21.8	697.6	611	*0*	*0*	*336*	*72*
578.69	2.50		77	Hard Till	13.4	147.5	***605.0***	19.6	21.8	714.4	605	*0*	*0*	*333*	*74*
576.19	2.50		67	Hard Till	10.5	128.3	***615.5***	15.3	19.0	729.6	615	*0*	*0*	*339*	*77*
575.19	1.00		67	Hard Till		128.3			19.0						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abut
REFERENCE BORING ========== B-2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 652.80 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 650.80 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1430 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 357.50 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 134.06 KIPS

PILE TYPE AND SIZE ========== Steel HP 14 X 73
Plugged Pile Perimeter========== 4.700 FT. Unplugged Pile Perimeter========== 6.975 FT.
Plugged Pile End Bearing Area========== 1.379 SQFT. Unplugged Pile End Bearing Area======== 0.149 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
578 KIPS	**420** KIPS	**231** KIPS	**48** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER OESCRIPTION	NOMINAL PLUGGEO SIOE RESIST. (KIPS)	NOMINAL PLUGGEO END BRG. RESIST. (KIPS)	NOMINAL PLUGGEO TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIOE RESIST. (KIPS)	NOMINAL UNPLUG'D ENO BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'O BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or OO (KIPS)	FACTORED GEOTECH. LOSS LOAO FROM OO (KIPS)	FACTOREO RESISTANCE AVAILABLE (KIPS)	ESTIMATEO PILE LENGTH (FT.)
647.61	3.19	0.90			9.8		36.8	14.5		***17.4***	17	0	0	10	5
644.61	3.00	1.40			12.9	27.1	45.9	19.2	2.9	***36.2***	36	0	0	20	8
642.11	2.50	1.20			9.6	23.2	51.7	14.3	2.5	***50.1***	50	0	0	28	11
639.61	2.50	1.00			8.3	19.3	96.7	12.4	2.1	***66.4***	66	0	0	37	13
634.61	5.00	2.90			35.1	56.0	118.3	52.1	6.0	***117.0***	117	0	0	64	18
629.61	5.00	2.20			29.1	42.5	***139.6***	43.1	4.6	159.3	140	0	0	77	23
624.61	5.00	1.80			25.6	34.8	***169.1***	37.9	3.7	197.7	169	0	0	93	28
621.11	3.50	2.00			19.1	38.6	329.9	28.4	4.2	***241.4***	241	0	0	133	32
615.11	6.00		70	Hard Till	31.5	180.4	***217.8***	46.7	19.4	272.6	218	0	0	120	38
610.11	5.00	1.90			26.5	36.7	465.2	39.3	4.0	***335.7***	336	0	0	185	43
605.11	5.00		100	Hard Till	50.7	257.7	601.7	75.2	27.8	***420.2***	420	0	0	231	48
600.11	5.00		100	Sandy Gravel	164.7	343.5	766.4	244.4	37.0	***664.5***	665	*0*	*0*	*365*	*53*
599.19	0.92		100	Sandy Gravel	30.3	343.5	***611.2***	45.0	37.0	689.5	611	*0*	*0*	*336*	*54*
596.69	2.50		46	Fine Sand	11.8	158.0	***622.9***	17.4	17.0	707.0	623	*0*	*0*	*343*	*56*
594.19	2.50		46	Fine Sand	11.8	158.0	***634.7***	17.4	17.0	724.4	635	*0*	*0*	*349*	*59*
591.69	2.50		46	Fine Sand	11.8	158.0	***646.4***	17.4	17.0	741.8	646	*0*	*0*	*356*	*61*
588.69	3.00		46	Fine Sand	14.1	158.0	***654.5***	20.9	17.0	762.1	655	*0*	*0*	*360*	*64*
586.19	2.50		59	Hard Till	9.8	152.0	***664.3***	14.5	16.4	776.6	664	*0*	*0*	*365*	*67*
583.69	2.50		59	Hard Till	9.8	152.0	***720.4***	14.5	16.4	796.1	720	*0*	*0*	*396*	*69*
581.19	2.50		77	Hard Till	15.6	198.4	***736.0***	23.1	21.4	819.2	736	*0*	*0*	*405*	*72*
578.69	2.50		77	Hard Till	15.6	198.4	***725.8***	23.1	21.4	839.6	726	*0*	*0*	*399*	*74*
576.19	2.50		67	Hard Till	12.1	172.6	***738.0***	18.0	18.6	857.6	738	*0*	*0*	*406*	*77*
575.19	1.00		67	Hard Till		172.6			18.6						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abut
REFERENCE BORING ========== B-2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 652.80 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 650.80 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1430 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 357.50 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 134.06 KIPS

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area======== 0.181 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
705 KIPS	**673** KIPS	**370** KIPS	**67** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUGGED SIDE RESIST. (KIPS)	NOMINAL UNPLUGGED END BRG. RESIST. (KIPS)	NOMINAL UNPLUGGED 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.)
647.61	3.19	0.90			9.9		37.5	14.6		***18.2***	18	0	0	10	5
644.61	3.00	1.40			13.1	27.6	46.6	19.4	3.6	***37.0***	37	0	0	20	8
642.11	2.50	1.20			9.7	23.7	52.4	14.4	3.0	***50.9***	51	0	0	28	11
639.61	2.50	1.00			8.4	19.7	98.4	12.5	2.5	***68.2***	68	0	0	38	13
634.61	5.00	2.90			35.5	57.3	120.0	52.5	7.4	***119.0***	119	0	0	65	18
629.61	5.00	2.20			29.4	43.4	***141.5***	43.5	5.6	161.5	142	0	0	78	23
624.61	5.00	1.80			25.8	35.5	***171.3***	38.2	4.6	200.2	171	0	0	94	28
621.11	3.50	2.00			19.4	39.5	335.4	28.7	5.1	***247.5***	248	0	0	136	32
615.11	6.00		70	Hard Till	31.8	184.3	***220.5***	47.1	23.7	275.8	220	0	0	121	38
610.11	5.00	1.90			26.8	37.5	473.0	39.6	4.8	***344.4***	344	0	0	189	43
605.11	5.00		100	Hard Till	51.2	263.2	611.9	75.8	33.9	***431.5***	432	0	0	237	48
600.11	5.00		100	Sandy Gravel	166.4	351.0	778.3	246.4	45.2	***677.9***	678	0	0	373	53
599.19	0.92		100	Sandy Gravel	30.6	351.0	***619.4***	45.3	45.2	698.9	619	0	0	341	54
596.69	2.50		46	Fine Sand	11.9	161.5	***631.3***	17.6	20.8	716.5	631	0	0	347	56
594.19	2.50		46	Fine Sand	11.9	161.5	***643.2***	17.6	20.8	734.1	643	0	0	354	59
591.69	2.50		46	Fine Sand	11.9	161.5	***655.0***	17.6	20.8	751.7	655	0	0	360	61
588.69	3.00		46	Fine Sand	14.3	161.5	***663.2***	21.1	20.8	772.0	663	0	0	365	64
586.19	2.50		59	Hard Till	9.9	155.3	***673.0***	14.6	20.0	786.6	673	0	0	370	67
583.69	2.50		59	Hard Till	9.9	155.3	***730.3***	14.6	20.0	807.3	730	0	0	402	69
581.19	2.50		77	Hard Till	15.7	202.7	***746.0***	23.3	26.1	830.6	746	0	0	410	72
578.69	2.50		77	Hard Till	15.7	202.7	***735.4***	23.3	26.1	850.5	735	0	0	404	74
576.19	2.50		67	Hard Till	12.3	176.4	***747.7***	18.2	22.7	868.7	748	0	0	411	77
575.19	1.00		67	Hard Till		176.4			22.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abut
REFERENCE BORING ========== B-2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 652.80 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 650.80 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1430 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 357.50 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 134.06 KIPS

PILE TYPE AND SIZE ========== Steel HP 14 X 102
Plugged Pile Perimeter========== 4.800 FT. Unplugged Pile Perimeter========== 7.058 FT.
Plugged Pile End Bearing Area========== 1.439 SQFT. Unplugged Pile End Bearing Area======== 0.208 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
810 KIPS	**758** KIPS	**417** KIPS	*** Below Boring

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER OESCRIPTION	NOMINAL PLUGGEO SIDE RESIST. (KIPS)	NOMINAL PLUGGEO END BRG. RESIST. (KIPS)	NOMINAL PLUGGEO TOTAL RESIST. (KIPS)	NDMINAL UNPLUG'O SIOE RESIST. (KIPS)	NDMINAL UNPLUG'O ENO BRG. RESIST. (KIPS)	NDMINAL UNPLUG'O TOTAL RESIST. (KIPS)	NOMINAL REQ'O BEARING (KIPS)	FACTDRED GEOTECH. LOSS FROM SCOUR or OO (KIPS)	FACTDRED GEOTECH. LOSS LOAO FROM OD (KIPS)	FACTDREO RESISTANCE AVAILABLE (KIPS)	ESTIMATEO PILE LENGTH (FT.)
647.61	3.19	0.90			10.0		38.2	14.7		***18.8***	19	0	0	10	5
644.61	3.00	1.40			13.2	28.2	47.4	19.4	4.1	***37.6***	38	0	0	21	8
642.11	2.50	1.20			9.8	24.2	53.2	14.5	3.5	***51.5***	51	0	0	28	11
639.61	2.50	1.00			8.5	20.2	100.0	12.5	2.9	***69.6***	70	0	0	38	13
634.61	5.00	2.90			35.8	58.5	121.8	52.7	8.5	***120.2***	120	0	0	66	18
629.61	5.00	2.20			29.7	44.4	***143.4***	43.7	6.4	162.7	143	0	0	79	23
624.61	5.00	1.80			26.1	36.3	***173.5***	38.4	5.3	201.7	174	0	0	95	28
621.11	3.50	2.00			19.6	40.3	340.9	28.8	5.8	***251.8***	252	0	0	139	32
615.11	6.00		70	Hard Till	32.2	188.2	***223.2***	47.3	27.2	277.4	223	0	0	123	38
610.11	5.00	1.90			27.0	38.3	480.8	39.8	5.5	***350.6***	351	0	0	193	43
605.11	5.00		100	Hard Till	51.7	268.9	622.2	76.1	38.9	***439.6***	440	0	0	242	48
600.11	5.00		100	Sandy Gravel	168.2	358.5	790.3	247.3	51.9	***686.9***	687	0	0	378	53
599.19	0.92		100	Sandy Gravel	30.9	358.5	***627.7***	45.5	51.9	704.4	628	0	0	345	54
596.69	2.50		46	Fine Sand	12.0	164.9	***639.7***	17.7	23.9	722.0	640	0	0	352	56
594.19	2.50		46	Fine Sand	12.0	164.9	***651.7***	17.7	23.9	739.7	652	0	0	358	59
591.69	2.50		46	Fine Sand	12.0	164.9	***663.7***	17.7	23.9	757.3	664	0	0	365	61
588.69	3.00		46	Fine Sand	14.4	164.9	***671.8***	21.2	23.9	777.6	672	0	0	370	64
586.19	2.50		59	Hard Till	10.0	158.6	***681.8***	14.7	23.0	792.3	682	0	0	375	67
583.69	2.50		59	Hard Till	10.0	158.6	***740.2***	14.7	23.0	814.0	740	0	0	407	69
581.19	2.50		77	Hard Till	15.9	207.0	***756.1***	23.4	30.0	837.4	756	0	0	416	72
578.69	2.50		77	Hard Till	15.9	207.0	***745.1***	23.4	30.0	856.8	745	0	0	410	74
576.19	2.50		67	Hard Till	12.4	180.1	***757.5***	18.2	26.1	875.1	758	0	0	417	77
575.19	1.00		67	Hard Till		180.1			26.1						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abut
REFERENCE BORING ========== B-2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 652.80 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 650.80 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1430 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 357.50 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 134.06 KIPS

PILE TYPE AND SIZE ========== Steel HP 14 X 117
Pile Perimeter========== 4.850 FT. Unplugged Pile Perimeter========== 7.117 FT.
Pile End Bearing Area========== 1.469 SQFT. Unplugged Pile End Bearing Area======== 0.239 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
929 KIPS	**767** KIPS	**422** KIPS	*** Below Boring

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
647.61	3.19	0.90			10.1		38.9	14.8		***19.5***	19	0	0	11	5
644.61	3.00	1.40			13.3	28.8	48.1	19.6	4.7	***38.4***	38	0	0	21	8
642.11	2.50	1.20			9.9	24.7	54.0	14.6	4.0	***52.3***	52	0	0	29	11
639.61	2.50	1.00			8.6	20.6	101.7	12.6	3.3	***71.3***	71	0	0	39	13
634.81	5.00	2.90			36.2	59.7	123.5	53.1	9.7	***122.1***	122	0	0	67	18
629.61	5.00	2.20			30.0	45.3	***145.3***	44.0	7.4	164.8	145	0	0	80	23
624.61	5.00	1.80			26.4	37.1	***175.7***	38.7	6.0	204.2	176	0	0	97	28
621.11	3.50	2.00			19.8	41.2	346.5	29.0	6.7	***257.7***	258	0	0	142	32
615.11	6.00		70	Hard Till	32.5	192.2	***225.9***	47.7	31.2	280.5	226	0	0	124	38
610.11	5.00	1.90			27.3	39.1	488.7	40.1	6.4	***358.9***	359	0	0	197	43
605.11	5.00		100	Hard Till	52.3	274.6	632.5	76.7	44.6	***450.4***	450	0	0	248	48
600.11	5.00		100	Sandy Gravel	169.9	366.1	802.4	249.3	59.5	***699.8***	700	0	0	385	53
599.19	0.92		100	Sandy Gravel	31.3	366.1	***636.0***	45.9	59.5	713.5	636	0	0	350	54
596.89	2.50		46	Fine Sand	12.1	168.4	***648.1***	17.8	27.4	731.3	648	0	0	356	56
594.19	2.50		46	Fine Sand	12.1	168.4	***660.3***	17.8	27.4	749.1	660	0	0	363	59
591.69	2.50		46	Fine Sand	12.1	168.4	***672.4***	17.8	27.4	766.9	672	0	0	370	61
588.69	3.00		46	Fine Sand	14.6	168.4	***680.5***	21.4	27.4	787.2	681	0	0	374	64
586.19	2.50		59	Hard Till	10.1	162.0	***690.6***	14.8	26.3	802.0	691	0	0	380	67
583.69	2.50		59	Hard Till	10.1	162.0	***750.1***	14.8	26.3	824.9	750	0	0	413	69
581.19	2.50		77	Hard Till	16.1	211.4	***766.2***	23.6	34.4	848.4	766	0	0	421	72
578.69	2.50		77	Hard Till	16.1	211.4	***754.8***	23.6	34.4	867.5	755	0	0	415	74
576.19	2.50		67	Hard Till	12.5	183.9	***767.3***	18.4	29.9	885.9	767	0	0	422	77
575.19	1.00		67	Hard Till		183.9			29.9						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abut
REFERENCE BORING ========== SW1 & 3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 651.04 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 649.04 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 300.00 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 112.50 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area======== 0.108 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
418 KIPS	391 KIPS	215 KIPS	*** Below Boring

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.)
646.41	2.83	0.90			6.8		19.2	9.9		***11.3***	11	0	0	6	5
643.91	2.50	0.90			6.5	12.4	25.7	9.5	1.4	***20.8***	21	0	0	11	7
641.41	2.50	0.90			6.5	12.4	***29.5***	9.5	1.4	29.9	30	0	0	16	10
638.91	2.50		4	Fine Sand	0.7	9.8	42.5	1.0	1.1	***32.3***	32	0	0	18	12
633.91	5.00		9	Fine Sand	3.1	22.0	52.4	4.5	2.4	***37.5***	37	0	0	21	17
631.41	2.50	2.10	12		11.9	28.9	64.3	17.4	3.2	***54.9***	55	0	0	30	20
628.91	2.50	2.10	12		11.9	28.9	***54.2***	17.4	3.2	69.9	54	0	0	30	22
626.41	2.50	0.50	8		3.9	6.9	***58.0***	5.7	0.8	75.5	58	0	0	32	25
623.91	2.50	0.50	6		3.9	6.9	161.6	5.7	0.8	***92.1***	92	0	0	51	27
621.41	2.50		58	Hard Till	8.0	106.6	169.6	11.7	11.7	***103.8***	104	0	0	57	30
618.91	2.50		58	Hard Till	8.0	106.6	118.8	11.7	11.7	***109.1***	109	0	0	60	32
616.41	2.50		26	Hard Till	2.8	47.8	121.8	4.1	5.2	***113.2***	113	0	0	62	35
613.91	2.50		26	Hard Till	2.8	47.8	148.3	4.1	5.2	***119.9***	120	0	0	66	37
611.41	2.50		39	Hard Till	4.4	71.7	152.7	6.4	7.8	***126.4***	126	0	0	70	40
608.91	2.50		39	Hard Till	4.4	71.7	269.2	6.4	7.8	***145.1***	145	0	0	80	42
606.41	2.50		100	Hard Till	21.4	183.7	290.6	31.3	20.1	***176.3***	176	0	0	97	45
603.91	2.50		100	Hard Till	21.4	183.7	312.0	31.3	20.1	***207.6***	208	0	0	114	47
601.41	2.50		100	Hard Till	21.4	183.7	333.3	31.3	20.1	***238.8***	239	0	0	131	50
598.91	2.50		100	Hard Till	21.4	183.7	262.8	31.3	20.1	***260.0***	260	0	0	143	52
597.41	1.50		50	Hard Till	3.8	91.9	287.4	5.5	10.1	***267.9***	268	0	0	147	54
593.69	3.72		46	Medium Sand	17.2	112.7	304.6	25.1	12.3	***293.0***	293	0	0	161	57
591.19	2.50		46	Medium Sand	11.5	112.7	316.2	16.9	12.3	***309.8***	310	0	0	170	60
588.69	2.50		46	Medium Sand	11.5	112.7	***323.4***	16.9	12.3	326.2	323	0	0	178	62
586.19	2.50		59	Hard Till	8.2	108.4	***331.7***	12.1	11.9	338.3	332	0	0	182	65
583.69	2.50		59	Hard Till	8.2	108.4	373.0	12.1	11.9	***354.0***	354	0	0	195	67
581.19	2.50		77	Hard Till	13.1	141.5	386.1	19.2	15.5	***373.2***	373	0	0	205	70
578.69	2.50		77	Hard Till	13.1	141.5	***380.9***	19.2	15.5	390.4	381	0	0	209	72
576.19	2.50		67	Hard Till	10.3	123.1	***391.1***	15.0	13.5	405.4	391	0	0	215	75
573.69	2.50		67	Hard Till		123.1			13.5						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abut
REFERENCE BORING ========== SW1 & 3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 651.04 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 649.04 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 300.00 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 112.50 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
589 KIPS	402 KIPS	221 KIPS	*** Below Boring

PILE TYPE AND SIZE ========== Steel HP 12 X 74
Plugged Pile Perimeter========== 4.050 FT. Unplugged Pile Perimeter========== 5.908 FT.
Plugged Pile End Bearing Area========== 1.025 SQFT. Unplugged Pile End Bearing Area======== 0.151 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)	FACTOREO GEOTECH. LOSS LOAO FROM OO (KIPS)	FACTOREO RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
646.41	2.63	0.90			6.9		19.9	10.1		***12.0***	12	0	0	7	5
643.91	2.50	0.90			6.6	12.9	26.5	9.6	1.9	***21.7***	22	0	0	12	7
641.41	2.50	0.90			6.6	12.9	***30.4***	9.6	1.9	30.9	30	0	0	17	10
638.91	2.50		4	Fine Sand	0.7	10.2	43.8	1.0	1.5	***33.8***	34	0	0	19	12
633.91	5.00		9	Fine Sand	3.1	23.0	54.1	4.6	3.4	***39.4***	39	0	0	22	17
631.41	2.50	2.10	12		12.2	30.2	66.3	17.7	4.5	***57.1***	57	0	0	31	20
628.91	2.50	2.10	12		12.2	30.2	***55.5***	17.7	4.5	71.5	55	0	0	31	22
626.41	2.50	0.50	6		3.9	7.2	***59.4***	5.8	1.1	77.2	59	0	0	33	25
623.91	2.50	0.50	6		3.9	7.2	167.3	5.8	1.1	***98.3***	98	0	0	54	27
621.41	2.50		56	Hard Till	8.2	111.1	175.5	11.9	16.4	***110.3***	110	0	0	61	30
618.91	2.50		56	Hard Till	8.2	111.1	122.3	11.9	16.4	***113.2***	113	0	0	62	32
616.41	2.50		26	Hard Till	2.9	49.8	125.2	4.2	7.4	***117.4***	117	0	0	65	35
613.91	2.50		26	Hard Till	2.9	49.8	153.0	4.2	7.4	***125.2***	125	0	0	69	37
611.41	2.50		39	Hard Till	4.5	74.7	157.5	6.6	11.0	***131.8***	132	0	0	72	40
608.91	2.50		39	Hard Till	4.5	74.7	278.8	6.6	11.0	***155.6***	156	0	0	86	42
606.41	2.50		100	Hard Till	21.8	191.6	300.6	31.8	28.3	***187.4***	187	0	0	103	45
603.91	2.50		100	Hard Till	21.8	191.6	322.5	31.8	28.3	***219.3***	219	0	0	121	47
601.41	2.50		100	Hard Till	21.8	191.6	344.3	31.8	28.3	***251.1***	251	0	0	138	50
598.91	2.50		100	Hard Till	21.8	191.6	270.3	31.8	28.3	***268.8***	269	0	0	148	52
597.41	1.50		50	Hard Till	3.9	95.8	295.9	5.6	14.1	***277.6***	278	0	0	153	54
593.69	3.72		46	Medium Sand	17.5	117.5	313.4	25.6	17.4	***303.2***	303	0	0	167	57
591.19	2.50		46	Medium Sand	11.8	117.5	325.2	17.2	17.4	***320.4***	320	0	0	176	60
588.69	2.50		46	Medium Sand	11.8	117.5	***332.5***	17.2	17.4	336.9	333	0	0	183	62
586.19	2.50		59	Hard Till	8.4	113.0	***341.0***	12.3	16.7	349.2	341	0	0	188	65
583.69	2.50		59	Hard Till	8.4	113.0	383.9	12.3	16.7	***366.6***	367	0	0	202	67
581.19	2.50		77	Hard Till	13.4	147.5	397.3	19.6	21.8	***386.2***	386	0	0	212	70
578.69	2.50		77	Hard Till	13.4	147.5	***391.5***	19.6	21.8	402.9	392	0	0	215	72
576.19	2.50		67	Hard Till	10.5	128.3	***402.0***	15.3	19.0	418.2	402	0	0	221	75
573.69	2.50		67	Hard Till		128.3			19.0						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abut
REFERENCE BORING ========== SW1 & 3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 651.04 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 649.04 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 0.00 ft
TOP ELEV. OF LIOUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 300.00 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 112.50 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
578 KIPS	490 KIPS	269 KIPS	*** Below Boring

PILE TYPE AND SIZE ========== Steel HP 14 X 73
Plugged Pile Perimeter========== 4.700 FT. Unplugged Pile Perimeter========== 6.975 FT.
Plugged Pile End Bearing Area========== 1.379 SQFT. Unplugged Pile End Bearing Area======== 0.149 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.)
646.41	2.63	0.90			8.1		25.5	12.0		***13.8***	14	0	0	8	5
643.91	2.50	0.90			7.7	17.4	33.1	11.4	1.9	***25.2***	25	0	0	14	7
641.41	2.50	0.90			7.7	17.4	***35.3***	11.4	1.9	36.0	35	0	0	19	10
638.91	2.50		4	Fine Sand	0.8	11.9	55.1	1.2	1.3	***39.2***	39	0	0	22	12
633.91	5.00		9	Fine Sand	3.6	30.9	68.4	5.4	3.3	***45.6***	46	0	0	25	17
631.41	2.50	2.10	12		14.1	40.6	82.5	20.9	4.4	***66.6***	67	0	0	37	20
628.91	2.50	2.10	12		14.1	40.6	***65.7***	20.9	4.4	84.2	66	0	0	36	22
626.41	2.50	0.50	6		4.6	9.7	***70.3***	6.8	1.0	91.0	70	0	0	39	25
623.91	2.50	0.50	6		4.6	9.7	214.6	6.8	1.0	***112.8***	113	0	0	62	27
621.41	2.50		58	Hard Till	9.5	149.4	224.1	14.1	16.1	***126.9***	127	0	0	70	30
618.91	2.50		58	Hard Till	9.5	149.4	151.2	14.1	16.1	***132.1***	132	0	0	73	32
616.41	2.50		26	Hard Till	3.3	67.0	154.5	4.9	7.2	***137.1***	137	0	0	75	35
613.91	2.50		26	Hard Till	3.3	67.0	191.3	4.9	7.2	***145.6***	146	0	0	80	37
611.41	2.50		39	Hard Till	5.2	100.5	196.5	7.7	10.8	***153.4***	153	0	0	84	40
608.91	2.50		39	Hard Till	5.2	100.5	358.9	7.7	10.8	***178.1***	178	0	0	98	42
606.41	2.50		100	Hard Till	25.3	257.7	384.3	37.6	27.8	***215.6***	216	0	0	119	45
603.91	2.50		100	Hard Till	25.3	257.7	409.6	37.6	27.8	***253.2***	253	0	0	139	47
601.41	2.50		100	Hard Till	25.3	257.7	434.9	37.6	27.8	***290.8***	291	0	0	160	50
598.91	2.50		100	Hard Till	25.3	257.7	331.4	37.6	27.8	***314.5***	315	0	0	173	52
597.41	1.50		50	Hard Till	4.5	128.8	365.1	6.7	13.9	***324.3***	324	0	0	178	54
593.69	3.72		46	Medium Sand	20.3	158.0	385.4	30.2	17.0	***354.5***	355	0	0	195	57
591.19	2.50		46	Medium Sand	13.7	158.0	399.1	20.3	17.0	***374.8***	375	0	0	206	60
588.69	2.50		48	Medium Sand	13.7	158.0	406.8	20.3	17.0	***394.4***	394	0	0	217	62
586.19	2.50		59	Hard Till	9.8	152.0	416.5	14.5	16.4	***408.9***	409	0	0	225	65
583.69	2.50		59	Hard Till	9.8	152.0	472.7	14.5	16.4	***428.4***	428	0	0	236	67
581.19	2.50		77	Hard Till	15.6	198.4	488.3	23.1	21.4	***451.5***	452	0	0	248	70
578.69	2.50		77	Hard Till	15.6	198.4	478.1	23.1	21.4	***471.9***	472	0	0	260	72
576.19	2.50		87	Hard Till	12.1	172.6	490.2	18.0	18.6	***489.9***	490	0	0	289	75
573.69	2.50		87	Hard Till		172.6			18.6						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abut
REFERENCE BORING ========== SW1 & 3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 651.04 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 649.04 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========= 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 300.00 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 112.50 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
705 KIPS	497 KIPS	274 KIPS	*** Below Boring

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area======== 0.181 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)	FACTDRED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
646.41	2.63	0.90			8.1		25.9	12.1		***14.3***	14	0	0	8	5
643.91	2.50	0.90			7.7	17.8	33.7	11.5	2.3	***25.8***	26	0	0	14	7
641.41	2.50	0.90			7.7	17.8	***35.8***	11.5	2.3	36.6	36	0	0	20	10
638.91	2.50		4	Fine Sand	0.8	12.2	56.0	1.2	1.6	***40.3***	40	0	0	22	12
633.91	5.00		9	Fine Sand	3.7	31.6	69.6	5.4	4.1	***46.9***	47	0	0	26	17
631.41	2.50	2.10	12		14.3	41.5	83.8	21.1	5.3	***68.1***	68	0	0	37	20
628.91	2.50	2.10	12		14.3	41.5	***66.5***	21.1	5.3	85.1	66	0	0	37	22
626.41	2.50	0.50	8		4.6	9.9	***71.1***	6.9	1.3	92.0	71	0	0	39	25
623.91	2.50	0.50	6		4.6	9.9	218.6	6.9	1.3	***117.2***	117	0	0	64	27
621.41	2.50		58	Hard Till	9.6	152.7	228.1	14.2	19.6	***131.4***	131	0	0	72	30
618.91	2.50		58	Hard Till	9.6	152.7	153.5	14.2	19.6	***134.8***	135	0	0	74	32
616.41	2.50		26	Hard Till	3.4	68.4	156.9	5.0	8.8	***139.8***	140	0	0	77	35
613.91	2.50		26	Hard Till	3.4	68.4	194.5	5.0	8.8	***149.1***	149	0	0	82	37
611.41	2.50		39	Hard Till	5.3	102.7	199.7	7.8	13.2	***156.9***	157	0	0	86	40
608.91	2.50		39	Hard Till	5.3	102.7	365.6	7.8	13.2	***185.4***	185	0	0	102	42
606.41	2.50		100	Hard Till	25.6	263.2	391.2	37.9	33.9	***223.3***	223	0	0	123	45
603.91	2.50		100	Hard Till	25.6	263.2	416.8	37.9	33.9	***261.2***	261	0	0	144	47
601.41	2.50		100	Hard Till	25.6	263.2	442.4	37.9	33.9	***299.1***	299	0	0	165	50
598.91	2.50		100	Hard Till	25.6	263.2	336.3	37.9	33.9	***320.1***	320	0	0	176	52
597.41	1.50		50	Hard Till	4.5	131.6	370.7	6.7	16.9	***330.6***	331	0	0	182	54
593.69	3.72		46	Medium Sand	20.6	161.5	391.3	30.4	20.8	***361.1***	361	0	0	199	57
591.19	2.50		46	Medium Sand	13.8	161.5	405.1	20.5	20.8	***381.5***	382	0	0	210	60
588.69	2.50		46	Medium Sand	13.8	161.5	412.8	20.5	20.8	***401.2***	401	0	0	221	62
586.19	2.50		59	Hard Till	9.9	155.3	422.6	14.6	20.0	***415.8***	416	0	0	229	65
583.69	2.50		59	Hard Till	9.9	155.3	479.9	14.6	20.0	***436.5***	437	0	0	240	67
581.19	2.50		77	Hard Till	15.7	202.7	495.6	23.3	26.1	***459.8***	460	0	0	253	70
578.69	2.50		77	Hard Till	15.7	202.7	485.0	23.3	26.1	***479.8***	480	0	0	264	72
576.19	2.50		67	Hard Till	12.3	176.4	***497.3***	18.2	22.7	497.9	497	0	0	274	75
573.69	2.50		67	Hard Till		176.4			22.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abut
REFERENCE BORING ========== SW1 & 3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 651.04 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 649.04 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 300.00 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 112.50 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
810 KIPS	**503** KIPS	**277** KIPS	*** Below Boring

PILE TYPE AND SIZE ========== Steel HP 14 X 102
Plugged Pile Perimeter========== 4.800 FT. Unplugged Pile Perimeter========== 7.058 FT.
Plugged Pile End Bearing Area========== 1.439 SQFT. Unplugged Pile End Bearing Area======== 0.208 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.)
646.41	2.63	0.90			8.2		26.4	12.1		***14.7***	15	0	0	8	5
643.91	2.50	0.90			7.8	18.1	34.2	11.5	2.6	***26.2***	26	0	0	14	7
641.41	2.50	0.90			7.8	18.1	***36.3***	11.5	2.6	36.9	36	0	0	20	10
638.91	2.50		4	Fine Sand	0.8	12.5	57.0	1.2	1.8	***41.0***	41	0	0	23	12
633.91	5.00		9	Fine Sand	3.7	32.3	70.7	5.4	4.7	***47.9***	48	0	0	26	17
631.41	2.50	2.10	12		14.4	42.3	85.2	21.2	6.1	***69.1***	69	0	0	38	20
628.91	2.50	2.10	12		14.4	42.3	***67.3***	21.2	6.1	85.6	67	0	0	37	22
626.41	2.50	0.50	6		4.7	10.1	***72.0***	6.9	1.5	92.5	72	0	0	40	25
623.91	2.50	0.50	6		4.7	10.1	222.5	6.9	1.5	***120.5***	120	0	0	66	27
621.41	2.50		56	Hard Till	9.7	155.9	232.2	14.3	22.6	***134.7***	135	0	0	74	30
618.91	2.50		56	Hard Till	9.7	155.9	155.9	14.3	22.6	***136.5***	137	0	0	75	32
616.41	2.50		26	Hard Till	3.4	69.9	159.3	5.0	10.1	***141.5***	142	0	0	78	35
613.91	2.50		26	Hard Till	3.4	69.9	197.6	5.0	10.1	***151.6***	152	0	0	83	37
611.41	2.50		39	Hard Till	5.3	104.9	203.0	7.8	15.2	***159.4***	159	0	0	88	40
608.91	2.50		39	Hard Till	5.3	104.9	372.3	7.8	15.2	***191.0***	191	0	0	105	42
606.41	2.50		100	Hard Till	25.9	268.9	398.2	38.0	38.9	***229.0***	229	0	0	126	45
603.91	2.50		100	Hard Till	25.9	268.9	424.0	38.0	38.9	***267.1***	267	0	0	147	47
601.41	2.50		100	Hard Till	25.9	268.9	449.9	38.0	38.9	***305.1***	305	0	0	168	50
598.91	2.50		100	Hard Till	25.9	268.9	341.3	38.0	38.9	***323.7***	324	0	0	178	52
597.41	1.50		50	Hard Till	4.6	134.4	376.4	6.7	19.5	***334.8***	335	0	0	184	54
593.69	3.72		46	Medium Sand	20.8	164.9	397.1	30.6	23.9	***365.4***	365	0	0	201	57
591.19	2.50		46	Medium Sand	14.0	164.9	411.1	20.5	23.9	***385.9***	386	0	0	212	60
588.69	2.50		46	Medium Sand	14.0	164.9	418.8	20.5	23.9	***405.5***	406	0	0	223	62
586.19	2.50		59	Hard Till	10.0	158.6	428.8	14.7	23.0	***420.2***	420	0	0	231	65
583.69	2.50		59	Hard Till	10.0	158.6	487.2	14.7	23.0	***441.9***	442	0	0	243	67
581.19	2.50		77	Hard Till	15.9	207.0	503.1	23.4	30.0	***465.3***	465	0	0	256	70
578.69	2.50		77	Hard Till	15.9	207.0	492.1	23.4	30.0	***484.8***	485	0	0	267	72
576.19	2.50		67	Hard Till	12.4	180.1	504.5	18.2	26.1	***503.0***	503	0	0	277	75
573.69	2.50		67	Hard Till		180.1			26.1						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abut
REFERENCE BORING ========== SW1 & 3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 651.04 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 649.04 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 0.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 300.00 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 112.50 KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Baring	Maximum Factored Resistance Available in Baring	Maximum Pile Driveable Length in Baring
929 KIPS	511 KIPS	281 KIPS	*** Below Boring

PILE TYPE AND SIZE ========== Steel HP 14 X 117
Pile Perimeter========== 4.850 FT. Unplugged Pile Perimeter========== 7.117 FT.
Pile End Bearing Area========== 1.469 SQFT. Unplugged Pile End Bearing Area======== 0.239 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR DR RDCK LAYER DESCRIPTIDN	NDMINAL SIDE RESIST. (KIPS)	NDMINAL END BRG. RESIST. (KIPS)	NDMINAL TOTAL RESIST. (KIPS)	NDMINAL UNPLUG'D SIDE RESIST. (KIPS)	NDMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NDMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or OO (KIPS)	FACTORED GEDTECH. LDSS LDAD FRDM DD (KIPS)	FACTDRED RESISTANCE AVAILABLE (KIPS)	ESTIMATEO PILE LENGTH (FT.)
646.41	2.63	0.90			8.3		26.8	12.2		***15.2***	15	0	0	8	5
643.91	2.50	0.90			7.9	18.5	34.8	11.6	3.0	***26.8***	27	0	0	15	7
641.41	2.50	0.90			7.9	18.5	***36.8***	11.6	3.0	37.5	37	0	0	20	10
638.91	2.50		4	Fine Sand	0.8	12.7	57.9	1.2	2.1	***42.0***	42	0	0	23	12
633.91	5.00		9	Fine Sand	3.7	32.9	71.9	5.5	5.4	***49.1***	49	0	0	27	17
631.41	2.50	2.10	12		14.6	43.2	86.5	21.4	7.0	***70.5***	70	0	0	39	20
628.91	2.50	2.10	12		14.6	43.2	***68.1***	21.4	7.0	86.5	68	0	0	37	22
626.41	2.50	0.50	8		4.7	10.3	***72.8***	6.9	1.7	93.4	73	0	0	40	25
623.91	2.50	0.50	6		4.7	10.3	226.5	6.9	1.7	***124.6***	125	0	0	69	27
621.41	2.50		58	Hard Till	9.8	159.2	236.3	14.4	25.9	***139.0***	139	0	0	76	30
618.91	2.50		58	Hard Till	9.8	159.2	158.2	14.4	25.9	***139.1***	139	0	0	76	32
616.41	2.50		26	Hard Till	3.4	71.4	161.7	5.0	11.6	***144.1***	144	0	0	79	35
613.91	2.50		26	Hard Till	3.4	71.4	200.8	5.0	11.6	***154.9***	155	0	0	85	37
611.41	2.50		39	Hard Till	5.4	107.1	206.2	7.9	17.4	***162.8***	163	0	0	90	40
608.91	2.50		39	Hard Till	5.4	107.1	379.1	7.9	17.4	***198.0***	198	0	0	109	42
606.41	2.50		100	Hard Till	26.1	274.6	405.2	38.3	44.6	***236.3***	236	0	0	130	45
603.91	2.50		100	Hard Till	26.1	274.6	431.3	38.3	44.6	***274.7***	275	0	0	151	47
601.41	2.50		100	Hard Till	26.1	274.6	457.5	38.3	44.6	***313.0***	313	0	0	172	50
598.91	2.50		100	Hard Till	26.1	274.6	346.3	38.3	44.6	***329.1***	329	0	0	181	52
597.41	1.50		50	Hard Till	4.6	137.3	382.1	6.8	22.3	***340.9***	341	0	0	187	54
593.69	3.72		46	Medium Sand	21.0	168.4	403.1	30.8	27.4	***371.7***	372	0	0	204	57
591.19	2.50		46	Medium Sand	14.1	168.4	417.2	20.7	27.4	***392.4***	392	0	0	216	60
588.69	2.50		46	Medium Sand	14.1	168.4	424.9	20.7	27.4	***412.1***	412	0	0	227	62
586.19	2.50		59	Hard Till	10.1	162.0	434.9	14.8	26.3	***426.9***	427	0	0	235	65
583.69	2.50		59	Hard Till	10.1	162.0	494.4	14.8	26.3	***449.7***	450	0	0	247	67
581.19	2.50		77	Hard Till	16.1	211.4	510.5	23.6	34.4	***473.3***	473	0	0	260	70
578.69	2.50		77	Hard Till	16.1	211.4	499.1	23.6	34.4	***492.4***	492	0	0	271	72
576.19	2.50		67	Hard Till	12.5	183.9	511.7	18.4	29.9	***510.8***	511	0	0	281	75
573.69	2.50		67	Hard Till		183.9			29.9						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Center Pier
REFERENCE BORING ========== B-3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 631.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 630.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 627.24 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 3162 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 32.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 790.50 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 296.44 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area======== 0.108 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
418 KIPS	**378** KIPS	**207** KIPS	**22** FT.

BDT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLDWS)	GRANULAR OR RDCK 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.)
629.69	0.31	2.10			1.5		29.0	2.2		***5.2***	5	1	0	2	1
626.69	3.00	2.00			13.9	27.6	47.0	20.3	3.0	***25.9***	26	1	0	13	4
624.19	2.50	2.30	14		12.6	31.7	59.7	18.5	3.5	***44.3***	44	1	0	24	7
621.69	2.50	2.30	14		12.6	31.7	299.7	18.5	3.5	***87.7***	88	1	0	47	9
619.19	2.50		141	Hard Till	41.6	259.1	341.2	60.8	28.3	***148.5***	148	1	0	81	12
616.69	2.50		141	Hard Till	41.6	259.1	472.8	60.8	28.3	***219.1***	219	1	0	120	14
614.19	2.50		190	Hard Till	75.0	349.1	547.8	109.6	38.2	***328.7***	329	1	0	180	17
611.69	2.50		190	Hard Till	75.0	349.1	***371.0***	109.6	38.2	410.7	371	1	0	203	19
609.19	2.50		53	Hard Till	6.9	97.4	***377.9***	10.1	10.7	420.9	378	1	0	207	22
606.69	2.50		53	Hard Till	6.9	97.4	471.2	10.1	10.7	***440.4***	440	1	0	241	24
604.19	2.50		100	Hard Till	21.4	183.7	492.6	31.3	20.1	***471.7***	472	1	0	259	27
601.69	2.50		100	Hard Till	21.4	183.7	***447.8***	31.3	20.1	495.7	448	1	0	245	29
599.19	2.50		64	Hard Till	9.5	117.6	***457.3***	13.8	12.9	509.5	457	1	0	251	32
596.69	2.50		64	Hard Till	9.5	117.6	***433.7***	13.8	12.9	519.8	434	1	0	238	34
594.19	2.50		46	Hard Till	5.6	84.5	***439.2***	8.1	9.2	527.9	439	1	0	241	37
591.69	2.50		46	Hard Till	5.6	84.5	***444.8***	8.1	9.2	536.0	445	1	0	244	39
589.19	2.50		46	Hard Till	5.6	84.5	***450.3***	8.1	9.2	544.1	450	1	0	247	42
586.69	2.50		46	Hard Till	5.6	84.5	***479.8***	8.1	9.2	554.9	480	1	0	263	44
584.19	2.50		59	Hard Till	8.2	108.4	***488.0***	12.1	11.9	566.9	488	1	0	268	47
581.69	2.50		59	Hard Till	8.2	108.4	***529.3***	12.1	11.9	582.6	529	1	0	290	49
579.19	2.50		77	Hard Till	13.1	141.5	***542.5***	19.2	15.5	601.8	542	1	0	298	52
576.69	2.50		77	Hard Till	13.1	141.5	***537.3***	19.2	15.5	619.0	537	1	0	295	54
575.19	1.50		67	Hard Till		123.1			13.5						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Center Pier
REFERENCE BORING ========== B-3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 631.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 630.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 627.24 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 3710 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 36.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 412.22 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 154.58 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
589 KIPS	**551** KIPS	**302** KIPS	*** Below Boring

PILE TYPE AND SIZE ========== Steel HP 12 X 74
Plugged Pile Perimeter========== 4.050 FT. Unplugged Pile Perimeter========== 5.908 FT.
Plugged Pile End Bearing Area========== 1.025 SQFT. Unplugged Pile End Bearing Area======== 0.151 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.)
629.69	0.31	2.10			1.5		30.2	2.2		***6.4***	6	1	0	3	1
626.69	3.00	2.00			14.1	28.7	48.7	20.6	4.2	***27.7***	28	1	0	14	4
624.19	2.50	2.30	14		12.9	33.0	61.6	18.8	4.9	***46.5***	47	1	0	25	7
621.69	2.50	2.30	14		12.9	33.0	311.5	18.8	4.9	***100.3***	100	1	0	54	9
619.19	2.50		141	Hard Till	42.4	270.1	354.0	61.9	39.9	***162.3***	162	1	0	88	12
616.69	2.50		141	Hard Till	42.4	270.1	490.3	61.9	39.9	***238.0***	238	1	0	130	14
614.19	2.50		190	Hard Till	76.5	364.0	566.8	111.6	53.8	***349.7***	350	1	0	191	17
611.69	2.50		190	Hard Till	76.5	364.0	***380.9***	111.6	53.8	422.5	381	1	0	209	19
609.19	2.50		53	Hard Till	7.1	101.5	***388.0***	10.3	15.0	432.9	388	1	0	213	22
606.69	2.50		53	Hard Till	7.1	101.5	485.0	10.3	15.0	***456.5***	456	1	0	250	24
604.19	2.50		100	Hard Till	21.8	191.6	506.9	31.8	28.3	***488.3***	488	1	0	268	27
601.89	2.50		100	Hard Till	21.8	191.6	***459.7***	31.8	28.3	509.9	460	1	0	252	29
599.19	2.50		64	Hard Till	9.7	122.6	***469.4***	14.1	18.1	524.0	469	1	0	257	32
596.69	2.50		64	Hard Till	9.7	122.6	***444.6***	14.1	18.1	533.1	445	1	0	244	34
594.19	2.50		46	Hard Till	5.7	88.1	***450.3***	8.3	13.0	541.3	450	1	0	247	37
591.69	2.50		46	Hard Till	5.7	88.1	***455.9***	8.3	13.0	549.6	456	1	0	250	39
589.19	2.50		46	Hard Till	5.7	88.1	***461.6***	8.3	13.0	557.9	462	1	0	253	42
586.69	2.50		46	Hard Till	5.7	88.1	***492.2***	8.3	13.0	569.8	492	1	0	270	44
584.19	2.50		59	Hard Till	8.4	113.0	***500.6***	12.3	16.7	582.1	501	1	0	275	47
581.69	2.50		59	Hard Till	8.4	113.0	***543.5***	12.3	16.7	599.5	544	1	0	298	49
579.19	2.50		77	Hard Till	13.4	147.5	***556.9***	19.6	21.8	619.1	557	1	0	305	52
576.69	2.50		77	Hard Till	13.4	147.5	***551.2***	19.6	21.8	635.8	551	1	0	302	54
575.19	1.50		67	Hard Till		128.3			19.0						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Center Pier
REFERENCE BORING ========== B-3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 631.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 630.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 627.24 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 3710 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 36.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 412.22 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 154.58 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
578 KIPS	**552** KIPS	**303** KIPS	**42** FT.

PILE TYPE AND SIZE ========== Steel HP 14 X 73
Plugged Pile Perimeter========== 4.700 FT. Unplugged Pile Perimeter========== 6.975 FT.
Plugged Pile End Bearing Area========== 1.379 SQFT. Unplugged Pile End Bearing Area======== 0.149 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER OESCRIPTION	NOMINAL PLUGGEO			NOMINAL UNPLUG'O			NOMINAL REQ'O BEARING (KIPS)	FACTOREO GEOTECH. LOSS FROM SCOUR or OO (KIPS)	FACTDRED GEOTECH. LOSS LOAO FROM OO (KIPS)	FACTOREO RESISTANCE AVAILABLE (KIPS)	ESTIMATEO PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
629.69	0.31	2.10			1.7		40.4	2.6		***6.8***	7	1	0	3	1
626.69	3.00	2.00			16.4	38.6	62.6	24.4	4.2	***31.7***	32	1	0	16	4
624.19	2.50	2.30	14		15.0	44.4	77.6	22.2	4.8	***54.0***	54	1	0	29	7
621.69	2.50	2.30	14		15.0	44.4	411.4	22.2	4.8	***110.5***	111	1	0	60	9
619.19	2.50		141	Hard Till	49.2	363.3	460.6	73.1	39.2	***183.6***	184	1	0	100	12
616.69	2.50		141	Hard Till	49.2	363.3	636.1	73.1	39.2	***270.3***	270	1	0	148	14
614.19	2.50		190	Hard Till	88.8	489.5	724.9	131.8	52.8	***402.1***	402	1	0	220	17
611.69	2.50		190	Hard Till	88.8	489.5	***460.8***	131.8	52.8	495.9	461	1	0	252	19
609.19	2.50		53	Hard Till	8.2	136.6	***469.0***	12.2	14.7	508.0	469	1	0	257	22
606.69	2.50		53	Hard Till	8.2	136.6	598.3	12.2	14.7	***533.2***	533	1	0	292	24
604.19	2.50		100	Hard Till	25.3	257.7	623.6	37.6	27.8	***570.8***	571	1	0	313	27
601.69	2.50		100	Hard Till	25.3	257.7	***556.1***	37.6	27.8	598.4	556	1	0	305	29
599.19	2.50		64	Hard Till	11.2	164.9	***567.4***	16.7	17.8	615.1	567	1	0	311	32
596.69	2.50		64	Hard Till	11.2	164.9	***532.2***	16.7	17.8	626.7	532	1	0	292	34
594.19	2.50		46	Hard Till	6.6	118.5	***538.8***	9.8	12.8	636.5	539	1	0	295	37
591.69	2.50		46	Hard Till	6.6	118.5	***545.4***	9.8	12.8	646.3	545	1	0	299	39
589.19	2.50		46	Hard Till	6.6	118.5	***552.0***	9.8	12.8	656.0	552	1	0	303	42
586.69	2.50		46	Hard Till	6.6	118.5	***592.0***	9.8	12.8	669.4	592	*1*	*0*	*325*	*44*
584.19	2.50		59	Hard Till	9.8	152.0	***601.8***	14.5	16.4	683.9	602	*1*	*0*	*330*	*47*
581.69	2.50		59	Hard Till	9.8	152.0	***658.0***	14.5	16.4	703.4	658	*1*	*0*	*361*	*49*
579.19	2.50		77	Hard Till	15.6	198.4	***673.5***	23.1	21.4	726.5	674	*1*	*0*	*369*	*52*
576.69	2.50		77	Hard Till	15.6	198.4	***663.3***	23.1	21.4	746.8	663	*1*	*0*	*364*	*54*
575.19	1.50		67	Hard Till		172.6			18.6						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Center Pier
REFERENCE BORING ========== B-3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 631.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 630.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 627.24 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 3710 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 36.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 412.22 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 154.58 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
705 KIPS	**672** KIPS	**369** KIPS	*** Below Boring

PILE TYPE AND SIZE ========== Steel HP 14 X 89
Plugged Pile Perimeter========== 4.750 FT. Unplugged Pile Perimeter========== 7.033 FT.
Plugged Pile End Bearing Area========== 1.409 SQFT. Unplugged Pile End Bearing Area======== 0.181 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.)
629.69	0.31	2.10			1.8		41.3	2.6		***7.7***	8	1	0	3	1
626.69	3.00	2.00			16.6	39.5	63.8	24.6	5.1	***33.0***	33	1	0	17	4
624.19	2.50	2.30	14		15.1	45.4	78.9	22.4	5.8	***55.4***	55	1	0	30	7
621.69	2.50	2.30	14		15.1	45.4	419.8	22.4	5.8	***119.7***	120	1	0	65	9
619.19	2.50		141	Hard Till	49.8	371.2	469.5	73.7	47.8	***193.4***	193	1	0	105	12
616.69	2.50		141	Hard Till	49.8	371.2	648.3	73.7	47.8	***283.7***	284	1	0	155	14
614.19	2.50		190	Hard Till	89.8	500.1	738.0	132.9	64.4	***416.6***	417	1	0	228	17
611.69	2.50		190	Hard Till	89.8	500.1	***467.2***	132.9	64.4	503.1	467	1	0	256	19
609.19	2.50		53	Hard Till	8.3	139.5	***475.5***	12.3	18.0	515.4	475	1	0	261	22
606.69	2.50		53	Hard Till	8.3	139.5	607.5	12.3	18.0	***543.6***	544	1	0	298	24
604.19	2.50		100	Hard Till	25.6	263.2	633.1	37.9	33.9	***581.5***	581	1	0	319	27
601.69	2.50		100	Hard Till	25.6	263.2	***563.9***	37.9	33.9	607.2	564	1	0	309	29
599.19	2.50		64	Hard Till	11.3	168.5	***575.2***	16.8	21.7	624.0	575	1	0	315	32
596.69	2.50		64	Hard Till	11.3	168.5	***539.2***	16.8	21.7	634.6	539	1	0	296	34
594.19	2.50		46	Hard Till	6.7	121.1	***545.8***	9.9	15.6	644.5	546	1	0	299	37
591.69	2.50		46	Hard Till	6.7	121.1	***552.5***	9.9	15.6	654.4	552	1	0	303	39
589.19	2.50		46	Hard Till	6.7	121.1	***559.1***	9.9	15.6	664.2	559	1	0	307	42
586.69	2.50		46	Hard Till	6.7	121.1	***600.0***	9.9	15.6	678.5	600	1	0	329	44
584.19	2.50		59	Hard Till	9.9	155.3	***609.9***	14.6	20.0	693.1	610	1	0	334	47
581.69	2.50		59	Hard Till	9.9	155.3	***667.2***	14.6	20.0	713.8	667	1	0	366	49
579.19	2.50		77	Hard Till	15.7	202.7	***682.9***	23.3	26.1	737.1	683	1	0	375	52
576.69	2.50		77	Hard Till	15.7	202.7	***672.3***	23.3	26.1	757.0	672	1	0	369	54
575.19	1.50		67	Hard Till		176.4			22.7						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Center Pier
REFERENCE BORING ========== B-3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 631.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 630.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 627.24 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 3710 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 36.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 412.22 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 154.58 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
810 KIPS	681 KIPS	374 KIPS	*** Below Boring

PILE TYPE AND SIZE ========== Steel HP 14 X 102
Plugged Pile Perimeter========== 4.800 FT. Unplugged Pile Perimeter========== 7.058 FT.
Plugged Pile End Bearing Area========== 1.439 SQFT. Unplugged Pile End Bearing Area========= 0.208 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.)
629.69	0.31	2.10			1.8		42.1	2.6		***8.5***	8	1	0	4	1
626.69	3.00	2.00			16.8	40.3	64.9	24.6	5.8	***34.0***	34	1	0	18	4
624.19	2.50	2.30	14		15.3	46.4	80.2	22.5	6.7	***56.5***	56	1	0	30	7
621.69	2.50	2.30	14		15.3	46.4	428.2	22.5	6.7	***127.1***	127	1	0	69	9
619.19	2.50		141	Hard Till	50.3	379.1	478.5	74.0	54.9	***201.1***	201	1	0	110	12
616.69	2.50		141	Hard Till	50.3	379.1	660.6	74.0	54.9	***294.1***	294	1	0	161	14
614.19	2.50		190	Hard Till	90.7	510.8	751.3	133.4	74.0	***427.5***	427	1	0	234	17
611.69	2.50		190	Hard Till	90.7	510.8	***473.6***	133.4	74.0	507.5	474	1	0	259	19
609.19	2.50		53	Hard Till	8.4	142.5	***482.0***	12.3	20.6	519.8	482	1	0	264	22
606.69	2.50		53	Hard Till	8.4	142.5	616.7	12.3	20.6	***550.4***	550	1	0	302	24
604.19	2.50		100	Hard Till	25.9	268.9	642.6	38.0	38.9	***588.5***	588	1	0	323	27
601.69	2.50		100	Hard Till	25.9	268.9	***571.6***	38.0	38.9	612.5	572	1	0	313	29
599.19	2.50		64	Hard Till	11.5	172.1	***583.1***	16.8	24.9	629.3	583	1	0	320	32
596.69	2.50		64	Hard Till	11.5	172.1	***546.2***	16.8	24.9	639.2	546	1	0	299	34
594.19	2.50		46	Hard Till	6.7	123.7	***552.9***	9.9	17.9	649.1	553	1	0	303	37
591.69	2.50		46	Hard Till	6.7	123.7	***559.6***	9.9	17.9	659.0	560	1	0	307	39
589.19	2.50		46	Hard Till	6.7	123.7	***566.3***	9.9	17.9	668.8	566	1	0	311	42
586.69	2.50		46	Hard Till	6.7	123.7	***608.0***	9.9	17.9	683.8	608	1	0	333	44
584.19	2.50		59	Hard Till	10.0	158.6	***618.0***	14.7	23.0	698.5	618	1	0	339	47
581.69	2.50		59	Hard Till	10.0	158.6	***676.4***	14.7	23.0	720.1	676	1	0	371	49
579.19	2.50		77	Hard Till	15.9	207.0	***692.3***	23.4	30.0	743.5	692	1	0	380	52
576.69	2.50		77	Hard Till	15.9	207.0	***681.3***	23.4	30.0	763.0	681	1	0	374	54
575.19	1.50		67	Hard Till		180.1			26.1						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Center Pier
REFERENCE BORING ========== B-3
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 631.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 630.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 627.24 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 0.00 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 3710 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 36.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 412.22 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 154.58 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
929 KIPS	**690** KIPS	**379** KIPS	*** Below Boring

PILE TYPE AND SIZE ========== Steel HP 14 X 117
Pile Perimeter========== 4.850 FT. Unplugged Pile Perimeter========== 7.117 FT.
Pile End Bearing Area========== 1.469 SQFT. Unplugged Pile End Bearing Area======== 0.239 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER OESCRIPTION	NOMINAL SIOE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'O SIOE RESIST. (KIPS)	NOMINAL UNPLUG'O ENO BRG. RESIST. (KIPS)	NOMINAL UNPLUG'O TOTAL RESIST. (KIPS)	NOMINAL REQ'O BEARING (KIPS)	FACTOREO GEOTECH. LOSS FROM SCOUR or OO (KIPS)	FACTOREO GEOTECH. LOSS LOAO FROM OO (KIPS)	FACTOREO RESISTANCE AVAILABLE (KIPS)	ESTIMATEO PILE LENGTH (FT.)
629.69	0.31	2.10			1.8		43.0	2.6		***9.3***	9	1	0	4	1
626.69	3.00	2.00			16.9	41.2	66.1	24.9	6.7	***35.2***	35	1	0	18	4
624.19	2.50	2.30	14		15.4	47.4	81.5	22.7	7.7	***57.9***	58	1	0	31	7
621.69	2.50	2.30	14		15.4	47.4	436.7	22.7	7.7	***135.8***	136	1	0	74	9
619.19	2.50		141	Hard Till	50.8	387.1	487.6	74.6	62.9	***210.3***	210	1	0	115	12
616.69	2.50		141	Hard Till	50.8	387.1	672.9	74.6	62.9	***306.8***	307	1	0	168	14
614.19	2.50		190	Hard Till	91.6	521.6	764.6	134.5	84.8	***441.2***	441	1	0	242	17
611.89	2.50		190	Hard Till	91.6	521.6	***480.1***	134.5	84.8	514.6	480	1	0	263	19
609.19	2.50		53	Hard Till	8.5	145.5	***488.5***	12.4	23.7	527.0	489	1	0	268	22
606.69	2.50		53	Hard Till	8.5	145.5	626.0	12.4	23.7	***560.4***	560	1	0	307	24
604.19	2.50		100	Hard Till	26.1	274.6	652.2	38.3	44.6	***598.7***	599	1	0	328	27
601.69	2.50		100	Hard Till	26.1	274.6	***579.4***	38.3	44.6	621.0	579	1	0	318	29
599.19	2.50		64	Hard Till	11.6	175.7	***591.0***	17.0	28.6	638.0	591	1	0	324	32
596.69	2.50		64	Hard Till	11.6	175.7	***553.2***	17.0	28.6	646.9	553	1	0	303	34
594.19	2.50		46	Hard Till	6.8	126.3	***560.0***	10.0	20.5	656.9	560	1	0	307	37
591.69	2.50		46	Hard Till	6.8	126.3	***566.8***	10.0	20.5	666.9	567	1	0	311	39
589.19	2.50		46	Hard Till	6.8	126.3	***573.6***	10.0	20.5	676.8	574	1	0	314	42
586.69	2.50		46	Hard Till	6.8	126.3	***616.1***	10.0	20.5	692.6	616	1	0	338	44
584.19	2.50		59	Hard Till	10.1	162.0	***626.1***	14.8	26.3	707.4	626	1	0	343	47
581.69	2.50		59	Hard Till	10.1	162.0	***685.6***	14.8	26.3	730.2	686	1	0	376	49
579.19	2.50		77	Hard Till	16.1	211.4	***701.7***	23.6	34.4	753.8	702	1	0	385	52
576.69	2.50		77	Hard Till	16.1	211.4	***690.3***	23.6	34.4	772.9	690	1	0	379	54
575.19	1.50		67	Hard Till		183.9			29.9						

Appendix F

Profile and Soil Parameters – LPILE Static Lateral Load Analysis

Profile and Soil Parameters for use in Static Lateral Load Analysis

North Abutment (Boring B-2NE)

Soil Type	Elevation at Top of Layer (ft.)	Unit Weight (pcf)	Effective Unit Weight	Angle of Internal Friction (degrees)	Average Undrained shear Strength, Su or cohesion (ksf)	Static Soil Modulus, K (pci)	Soil Strain Parameter E50 (%)
Silty Clay	650.80 – 649.61	120	57.6	- -	2.1	500	0.005
Clay Loam Till (upper elev.)	649.61 – 650.11	120	57.6	- -	0.9	100	0.007
Clay Loam Till (lower elev.)	650.11 - 621.11	120	57.6	- -	1.8	500	0.005
Silty/Sandy Clay Loam Till	621.11 – 613.11	125	62.6	28	1.9	600	0.005
Sandy Clay Loam Till w int gravel	613.11 – 598.11	125	62.6	28	2.0	800	0.005

South Abutment (Boring B-1SW)

Soil Type	Elevation at Top of Layer (ft.)	Unit Weight (pcf)	Effective Unit Weight	Angle of Internal Friction (degrees)	Average Undrained shear Strength, Su or cohesion (ksf)	Static Soil Modulus, K (pci)	Soil Strain Parameter E50 (%)
Sandy Clay Loam	649.04 – 641.41	120	57.6	28	0.9	100	0.010
Fine Sand (loose)	641.41 – 633.91	115	52.6	30	- -	20	- -
Clay Loam Till (upper elev.)	633.91 – 628.91	120	57.6	- -	2.1	500	0.005
Clay Loam Till (mid elev.)	628.91 – 623.91	125	62.6	- -	0.5	100	0.007
Clay Loam Till (lower elev.)	623.91 – 617.41	125	62.6	28	1.9	500	0.005
Sandy Clay Loam Till	617.41 – 597.41	125	62.6	30	2.0	900	0.004

Center Pier (Boring B-3)

Soil Type	Elevation at Top of Layer (ft.)	Unit Weight (pcf)	Effective Unit Weight	Angle of Internal Friction (degrees)	Average Undrained shear Strength, Su or cohesion (ksf)	Static Soil Modulus, K (pci)	Soil Strain Parameter E50 (%)
Clay Loam Till (very stiff)	626.0 – 618.69	120	57.6	- -	2.0	500	0.005
Sandy Clay Loam Till (hard)	618.69 – 599.19	120	57.6	29	3.0	800	0.005
Fine to Medium Sand (dense)	599.19 – 588.69	115	52.6	36	- -	125	
Sandy Clay Loam (hard)	588.69 – 583.69	125	62.6	30	4.0	900	0.004
Silty Clay Loam Till (hard)	583.69 – 575.19	125	62.6	29	5.8	950	0.004