Structure Geotechnical Report

Replacement of Dual Structures Carrying I-155 over Indian Creek
Tazewell County, IL

August 11, 2022
Terracon Project No. MR215028

Prepared for:
IDOT Region 3 – District 4
Peoria, Illinois

Prepared by:
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Glendale Heights, Illinois

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Peoria, Illinois

REPORT TOPICS

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the ***GeoReport*** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

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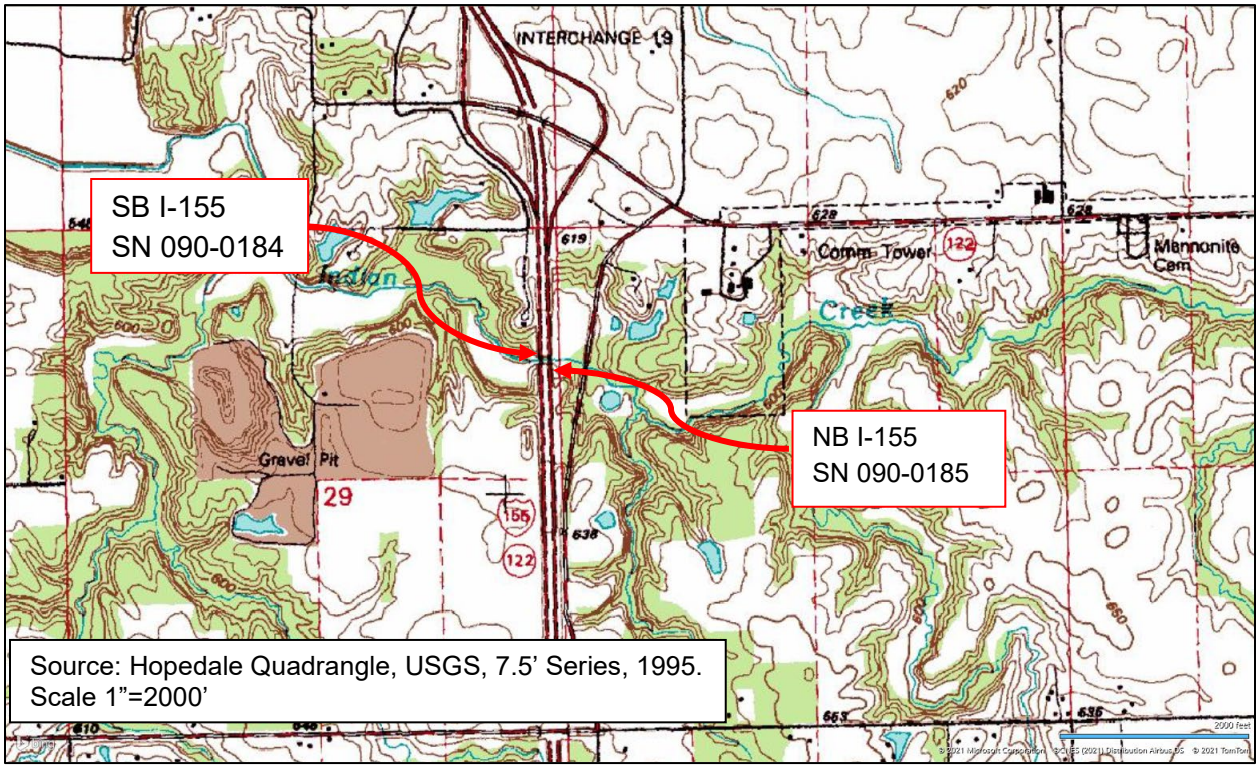
PROJECT DESCRIPTION AND SCOPE

The geotechnical study summarized in this report was performed for the proposed replacement of dual structures that carry I-155 over Indian Creek in Tazewell County, Illinois. The site is located 1.8 miles west of Hopedale and is located in Section 29, Township 23 North, Range 3 West of the Third Principal Meridian. Each of the structures are identified on the map below, along with proposed IDOT Structure Numbers (SN).



Source: Hopedale Quadrangle, USGS, 7.5' Series, 1995.
Scale 1"=2000'

EXISTING STRUCTURES

The original bridges were constructed in 1971 as FA Route 73, Section 108-B-2, each being a 3-span, 42" Precast Prestressed Concrete (PPC) structure with a reinforced, cast-in-place concrete deck with open stub abutments on concrete piles and reinforced concrete piers on spread

footings. Concrete slope walls extend down from each abutment to the edge of the Indian Creek channel. Both structures have a back-to-back abutment length of 177'-10" and an out-to-out deck width of 42'-0". The structures are built perpendicular to the channel of Indian Creek, with each structure offset 44'-0" from the centerline of I-155.

PROPOSED STRUCTURES

Complete structure replacements were recommended in the October 19, 2020 Bridge Condition Report (BCR) prepared by IDOT District 4. The proposed scope of work was approved by IDOT Bridges and Structures on November 16, 2020.

The Type, Size, and Location (TSL) plan prepared by Veenstra & Kimm, Inc. and approved on June 9, 2022 is included in the Appendix. Based on the TSL, each new bridge will be a 3-span structure with an 8" deck supported by 33" deep, rolled W-shape steel beams. Both structures will have back-to-back abutment length of 186'-10" and an out-to-out deck width of 42'-10". The proposed structures will be built perpendicular to the channel of Indian Creek, with each structure offset 44'-0" from the centerline of I-155. According to the BCR, the substructure for each bridge should consist of pile supported abutments and piers. The following table lists the LRFD factored loads at each foundation unit as calculated by Veenstra & Kimm.

Location	Foundation	Factored Load (kips)
Southbound I-155 SN 090-0184	Abutments	1,020
	Piers	2,080
Northbound I-155 SN 090-0185	Abutments	1,020
	Piers	2,080

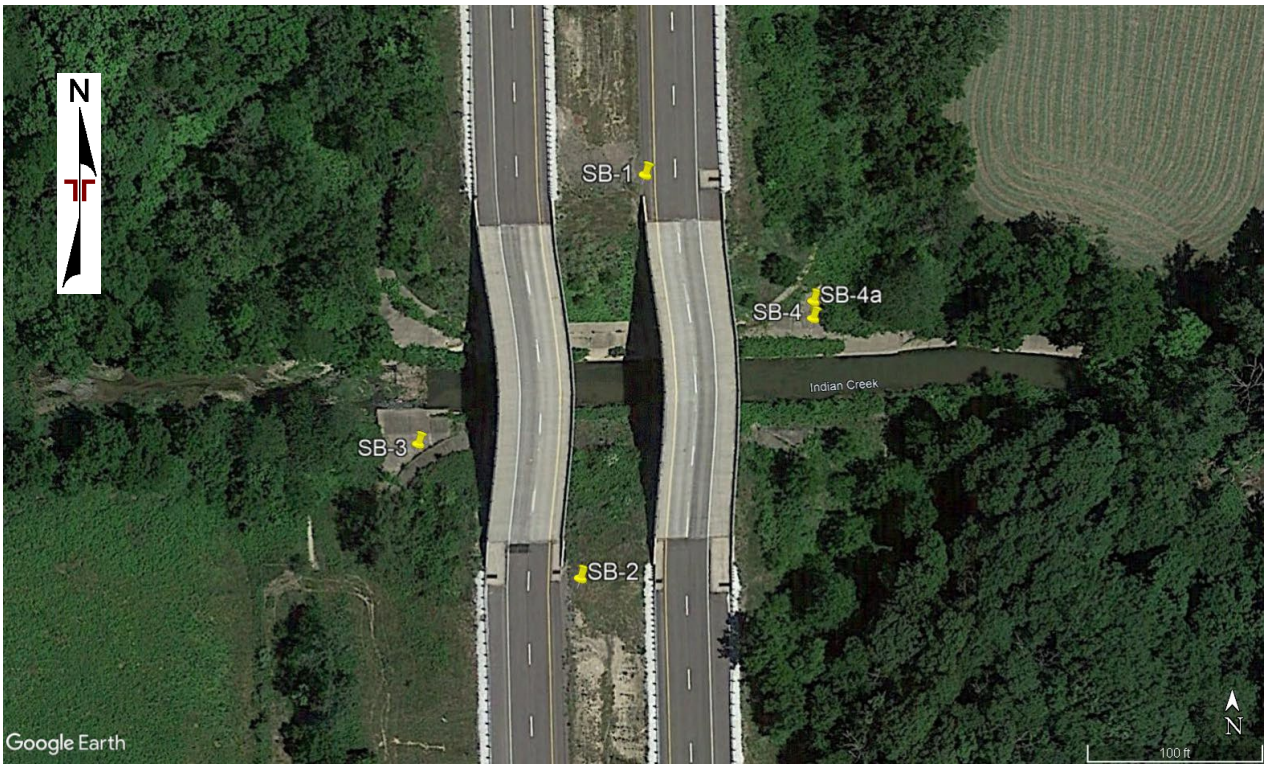
Structure replacement is expected to include removal of the existing abutments, concrete slope walls, and piers. Existing abutment piles will be removed at least 12" below the excavation line for the proposed construction. Bridge replacement will be accomplished with cross-over lanes to avoid stage construction of either structure.

FIELD EXPLORATION

Subsurface Exploration and Testing

I-155 runs north and south and crosses over Indian Creek, which flows from east to west, about 0.5 miles south of the interchange of I-155 and IL 122 East. The site is mostly surrounded by wooded and grassy areas. Beyond the wooded area southwest of the bridge is part of the Indian Creek Landfill, approximately 650 feet from the west structure. Beyond the wooded area northeast of the bridge is a farm field. Drainage is primarily from the north and south towards Indian Creek, which flows from east to west. Based on the USDA Web Soil Survey, the areas adjacent to Indian Creek (flood plain) consist of nearly level, somewhat poorly to well drained soils. These soils are frequently flooded for brief periods from October through June.

To conduct the subsurface investigation for the proposed structures, Terracon directed drilling of four standard penetration test (SPT) borings. Terracon subconsultants included Geo Services, Inc. (GSI), Kaskaskia Engineering Group (KEG), and Rubino Engineering, Inc (Rubino). GSI drilled SB-1, SB-2, and SB-3 on March 9 and 10, 2021. KEG logged the borings and collected samples for laboratory testing. On April 28, 2021, Rubino drilled, logged, and sampled SB-4. On April 8, 2022, Rubino drilled, logged, and sampled SB-4a, which was drilled within ten feet of SB-4 . SB-1 and SB-2 were drilled for the north and south abutments, respectively, each to a depth of 80 feet below existing grade. SB-3, SB-4, and SB-4a were drilled for the piers, respectively to depths of 50, 70, and 100 feet below grade. SB-4a was drilled to essentially extend the depth of SB-4 and confirm that bedrock was not present within the first 100 feet below the estimated bottom of pier encasement. The boring locations are shown below.



SB-1, SB-2, and SB-3 were drilled with a truck-mounted rig. A smaller, track-mounted ATV rig was used to drill SB-4 and SB-4a. SB-1 and SB-2 were drilled with solid stemmed augers to about 10 feet below grade followed by mud-rotary techniques to the boring termination depths. SB-3 and SB-4 were advanced using hollow stem augers. SPT blow counts were measured with an automatic hammer on 2.5-ft intervals to 30 feet and then at 5-ft intervals to the boring termination depths. Corresponding split spoon samples were collected with each SPT. Mud-rotary techniques were employed on SB-4a to blind drill to 63.5 feet followed by SPT and sampling on 5-ft intervals to the boring termination depth. KEG and Rubino field staff logged the soil samples and performed unconfined compressive strength (Q_u) tests on cohesive soil samples using a RIMAC spring tester. Representative samples were also collected and stored in glass jars to be returned to Terracon's soils lab for moisture content testing.

Subsurface Conditions

In addition to the following descriptions, subsurface conditions are presented on the Soil Boring Logs and Subsurface Data Profile included in the Appendix. Abutment borings SB-1 and SB-2 were drilled through the I-155 embankments on either side of Indian Creek. Embankment fill materials comprised primarily of stiff to very stiff clay loam with varying amounts of silt were encountered to about El. 565. These materials were observed with SPT N-values ranging from 6 to 24 blows per foot (bpf) with an average of 13 bpf, Qu values ranging from 0.7 to 4.5 tons per square foot (tsf) with an average of 2.4 tsf, and moisture contents ranging from about 11 to 60 percent with an average of 17 percent. Pier borings SB-3, SB-4, and SB-4a were drilled through

a 6-inch concrete apron on the creek bank. Fill materials comprised primarily of silty clay were encountered to El. 565. These materials were observed with an average SPT N-value of 6 bpf, average Qu of 1.6 tsf, and average moisture content of 15 percent.

The native soil encountered beneath the fill materials is primarily comprised of stiff to very stiff clay to clay loam to about El. 551. On the north side of the creek, a medium dense sand layer was encountered within this interval from El. 561 to El. 557. In all, these materials were observed with SPT N-values ranging from 1 to 34 bpf with an average of 13 bpf, Qu values ranging from 0.2 to 5.0 tsf with an average of 2.4 tsf, and moisture contents ranging from 11 to 31 percent with an average of 17 percent. The low end of the N and Qu ranges correlate with higher moisture contents, indicating a static water table level around El. 560.

Below this, very stiff to hard silty clay to clay was encountered to about El. 543. The bottom 4 feet of this interval at SB-3 is comprised of very dense silt loam. These materials were observed with SPT N-values ranging from 29 to 100+ bpf with an average of 63 bpf, Qu values ranging from 4.1 to 9.0 tsf with an average of 6.9 tsf, and moisture contents ranging from 7 to 12 percent with an average of 10 percent. Below this to about El. 533, the subsurface varies from dense to very dense sand on the north side of the creek to very stiff to hard silty clay loam on the south side of the creek. These materials were observed with SPT N-values ranging from 24 to 85 bpf with an average of 54 bpf, Qu values ranging from 3.0 to 4.9 tsf with an average of 4.2 tsf, and moisture contents ranging from 9 to 21 percent with an average of 14 percent. Below this, very dense silt loam was encountered to about El. 525. The silt loam was not encountered in SB-3. These materials were observed with SPT N-values ranging from 67 to 100+ bpf with an average of 84 bpf and moisture contents ranging from 13 to 23 percent with an average of 17 percent. Below this, medium dense to very dense sand with varying amounts of silt and gravel was noted to the boring termination depths (El. 518 to 469). These soils were observed with SPT N-values ranging from 12 to 100+ bpf with an average of 42 bpf and moisture contents ranging from about 7 to 25 percent with an average of 18 percent.

The following table lists the boring elevations for existing ground surface, end of boring, and groundwater as observed at the time of drilling.

Boring Number	Foundation Element	Ground Surface Elevation (ft)	End of Boring Elevation (ft)	Groundwater Elevation (ft)[1]
SB-1	North Abutment	600.19	520.19	Not encountered
SB-2	South Abutment	598.78	518.76	Not encountered
SB-3	Pier 2	568.16	518.16	Not encountered
SB-4	Pier 1	568.73	498.73	562.23
SB-4a	Pier 1	568.73	468.73	Not applicable due to mud-rotary drilling

1. At the time of drilling.

GEOTECHNICAL EVALUATIONS AND RECOMMENDATIONS

Settlement

Minimal grade changes are proposed for the new structures and no grading changes are planned for the endslopes. Therefore, settlement is expected to be insignificant. No additional analysis or field treatment is warranted or recommended at this time.

Slope Stability

The embankment endslopes will remain at 2H:1V with a maximum vertical height of about 35 feet above streambed elevation. The existing concrete slope walls will be replaced with stone riprap. Slope stability under static and seismic loading was checked using Slide version 5.0, a 2D slope stability analysis program using limit equilibrium method.

Seismic loading was modeled by applying a horizontal acceleration coefficient 0.069g. This value was calculated using the USGS Seismic Design Maps Web Services and the 2009 AASHTO Guide Specifications. A circular failure was analyzed for short term (undrained) and long term (drained) conditions. The analyses were performed assuming a maximum vertical slope height of 35 feet and using the weakest soil conditions as represented by boring SB-2. Factors of safety (FOS) against slope failure exceeded 1.5 for static loading and 1.0 for seismic loading. No additional analysis or field treatment is necessary. The Appendix includes outputs from the Slide program showing the analyzed sections, input parameters, and resulting factors of safety.

Scour

An IDOT memorandum dated January 3, 2022 approved the hydraulic report and proposed unadjusted scour depths of 17', 19', and 20' for the 50-, 100-, and 200-year flood events, respectively. These scour depths are not applicable to the proposed abutments since the new slopewalls will be armored with Class A5 riprap. The A5 riprap will be placed in the channel of Indian Creek and extended up to the abutments. Therefore, the design scour elevations for the abutments listed in the table below are set at the bottom of each abutment.

In accordance with Section 2.3.6.3.2 of the Bridge Manual, the scour depths at the piers have been reduced by 50% based on very stiff to hard cohesive soil layers below the average streambed El. 558.6. The design scour elevations for the piers were calculated using the adjusted scour depths, i.e., 9.5' for the 100-year event and 10' for the 200-year event. The following tables summarize the design scour elevations for each structure.

SN 090-0184 (Southbound Structure)

Event/Limit State	Design Scour Elevations (ft)				Item 113
	North Abutment	Pier 1	Pier 2	South Abutment	
Q100	593.16	548.9	548.9	592.23	5
Q200	593.16	548.4	548.4	592.23	
Design	593.16	548.9	548.9	592.23	
Check	593.16	548.4	548.4	592.23	

SN 090-0185 (Northbound Structure)

Event/Limit State	Design Scour Elevations (ft)				Item 113
	North Abutment	Pier 1	Pier 2	South Abutment	
Q100	593.16	549.5	549.5	592.23	5
Q200	593.16	549.0	549.0	592.23	
Design	593.16	549.5	549.5	592.23	
Check	593.16	549.0	549.0	592.23	

Seismic Considerations

Soil Site Class D controls for this site, as calculated using the IDOT Seismic Site Class Determination spreadsheet. Because Site Class D controls, Figure 2.3.10-3 from the IDOT Bridge Manual was used to determine the Seismic Performance Zone (SPZ). SPZ 1 is recommended for the site. Horizontal response spectral acceleration coefficients (SD1 and SDS) were calculated using the 2007 AASHTO Guide Specifications. The following table summarizes the recommended seismic design parameters.

Parameter	Value
Seismic Performance Zone	SPZ 1
Design Spectral Acceleration at 1.0 sec. (S_{D1})	0.122g
Design Spectral Acceleration at 0.2 sec. (S_{DS})	0.198g
Soil Site Class	D

These parameters are recommended so that the new bridges are designed for a seismic event with 7% probability of exceedance in 75 years, which is approximately a 1000-year return period. Because the site located in SPZ 1, liquefaction analysis was not performed.

FOUNDATION RECOMMENDATIONS

The foundations supporting the proposed structures must provide sufficient support to resist dead and live loads, including seismic loading. The factored loads calculated by Veenstra & Kimm are 1,020 kips at each abutment and 2,080 kips at each pier. Shallow foundations were considered for the piers since the existing piers are supported on spread footings and very stiff cohesive soils were identified at shallow depths in the pier borings. However, it was determined that shallow foundations are not feasible due to concerns with scour.

Deep foundations such as driven H-piles and metal shell piles were considered for the abutments and piers, and both of those are viable options. H-piles are less desirable since rock was not encountered in the borings. H-pile lengths at the piers are estimated to be around 100 feet. Metal shell piles at the abutments and piers will be shorter than H-pile and may be more cost-effective. There is concern with driving metal shell piles due to an 8-foot thick layer of hard cohesive soil within 10 feet of the streambed El. 558.71. Metal shell piles for the abutments are not expected to encounter the hard layer, but the pier piles will need to penetrate it without overstressing before reaching Nominal Required Bearing. This concern can be addressed by specifying a shoe (conical tip) on the end of the metal shell piles and using a minimum wall thickness of 0.312”. Risk of damaging a metal shell pile can be further reduced by precoring through the hard soil at the piers. Based on the borings, the soils above the hard layers should be relatively easy to drill and are cohesive enough to stand open while the pile is inserted and driven to bearing. Another way to mitigate the risk of pile damage is limit the nominal required bearing to 75% of the maximum to provided sufficient steel strength while reducing the driving stresses due to the lower specified bearing.

The Modified IDOT Static Method of Estimating Pile Length spreadsheet was used to estimate pile lengths at various axial geotechnical resistances for driven piles per AGMU 10.2. The recommended pile design tables generated by the IDOT spreadsheets are summarized below. Estimated lengths and factored resistance available are provided for H-piles and metal shell piles. Precoring is assumed for metal shell piles at Piers 1 and 2. Geotechnical losses due to scour were applied to the pier piles using the adjusted scour elevations for the 100-year flood event. No geotechnical losses were applied to the abutment piles. For Pier 2, the data from boring SB-3 was supplemented with the subsurface information from SB-4 and SB-4a.

Four test piles are recommended: one at the southwest abutment, one at the northeast abutment, one at the southeast pier, and one at the northwest pier.

Estimated Pile Lengths for Steel HP 12 X 53

Substructure Unit	Nominal Required Bearing (kip)	Factored Resistance Available (kip)	Estimated Pile Length (ft)	Pile Cutoff Elevation (ft)
North Abutment (SB-1)	389	214	50	595
Pier 1 (SB-4 & 4a)	397	171	95	595
Pier 2 (SB-3, SB-4 & 4a)	393	194	101	594
South Abutment (SB-2)	394	216	68	594

Estimated Pile Lengths for Steel HP 12 X 74

Substructure Unit	Nominal Required Bearing (kip)	Factored Resistance Available (kip)	Estimated Pile Length (ft)	Pile Cutoff Elevation (ft)
North Abutment (SB-1)	564	310	65	595
Pier 1 (SB-4 & 4a)	498*	226	121	595
Pier 2 (SB-3, SB-4 & 4a)	476*	239	121	594
South Abutment (SB-2)	479*	263	73	594

*Maximum Nominal Required Bearing of pile may not be reached within the boring depth.

Estimated Pile Lengths for Steel HP 14 X 73

Substructure Unit	Nominal Required Bearing (kip)	Factored Resistance Available (kip)	Estimated Pile Length (ft)	Pile Cutoff Elevation (ft)
North Abutment (SB-1)	522	287	60	595
Pier 1 (SB-4 & 4a)	508	223	101	595
Pier 2 (SB-3, SB-4 & 4a)	482	239	101	594
South Abutment (SB-2)	556	306	71	594

Estimated Pile Lengths for Steel HP 14 X 102

Substructure Unit	Nominal Required Bearing (kip)	Factored Resistance Available (kip)	Estimated Pile Length (ft)	Pile Cutoff Elevation (ft)
North Abutment (SB-1)	755	415	67	595
Pier 1 (SB-4 & 4a)	606*	276	121	595
Pier 2 (SB-3, SB-4 & 4a)	580*	292	121	594
South Abutment (SB-2)	599*	329	73	594

*Maximum Nominal Required Bearing of pile may not be achieved within the boring depth.

Estimated Pile Lengths for Steel HP 14 X 117

Substructure Unit	Nominal Required Bearing (kip)	Factored Resistance Available (kip)	Estimated Pile Length (ft)	Pile Cutoff Elevation (ft)
North Abutment (SB-1)	785	432	72	595
Pier 1 (SB-4 & 4a)	613*	279	121	595
Pier 2 (SB-3, SB-4 & 4a)	587*	296	121	594
South Abutment (SB-2)	608	334	73	594

*Maximum Nominal Required Bearing of pile may not be achieved within the boring depth.

Estimated Pile Lengths for Metal Shell 12"Φ w/.25" walls

Substructure Unit	Nominal Required Bearing (kip)	Factored Resistance Available (kip)	Estimated Pile Length (ft)	Pile Cutoff Elevation (ft)
North Abutment (SB-1)	292	161	40	595
Pier 1 Precore to El. 540 (SB-4 & 4a)	389	214	70	595
Pier 2 Precore to El. 540 (SB-3, SB-4 & 4a)	346	190	59	594
South Abutment (SB-2)	326	179	43	594

Estimated Pile Lengths for Metal Shell 14"Φ w/.25" walls

Substructure Unit	Nominal Required Bearing (kip)	Factored Resistance Available (kip)	Estimated Pile Length (ft)	Pile Cutoff Elevation (ft)
North Abutment (SB-1)	345	189	40	595
Pier 1 Precore to El. 540 (SB-4 & 4a)	452	249	68	595
Pier 2 Precore to El. 540 (SB-3, SB-4 & 4a)	404	222	59	594
South Abutment (SB-2)	405	223	43	594

Estimated Pile Lengths for Metal Shell 14"Φ w/.312" walls

Substructure Unit	Nominal Required Bearing (kip)	Factored Resistance Available (kip)	Estimated Pile Length (ft)	Pile Cutoff Elevation (ft)
North Abutment (SB-1)	526	289	45	595
Pier 1 Precore to El. 540 (SB-4 & 4a)	504	277	70	595
Pier 2 Precore to El. 540 (SB-3, SB-4 & 4a)	538	296	62	594
South Abutment (SB-2)	405	223	43	594

Estimated Pile Lengths for Metal Shell 16”Φ w/.312” walls

Substructure Unit	Nominal Required Bearing (kip)	Factored Resistance Available (kip)	Estimated Pile Length (ft)	Pile Cutoff Elevation (ft)
North Abutment (SB-1)	629	346	45	595
Pier 1 Precore to El. 540 (SB-4 & 4a)	575	316	68	595
Pier 2 Precore to El. 540 (SB-3, SB-4 & 4a)	521	287	59	594
South Abutment SB-2	491	270	43	594

Estimated Pile Lengths for Metal Shell 16"Φ w/.375" walls

Substructure Unit	Nominal Required Bearing (kip)	Factored Resistance Available (kip)	Estimated Pile Length (ft)	Pile Cutoff Elevation (ft)
North Abutment (SB-1)	629	346	45	595
Pier 1 Precore to El. 540 (SB-4 & 4a)	603	332	90	595
Pier 2 Precore to El. 540 (SB-3, SB-4 & 4a)	685	377	62	594
South Abutment (SB-2)	491	270	43	594

Lateral Analysis

Section 3.10.1.10 of the 2012 IDOT Bridge Manual requires detailed soil/structure interaction analysis if the factored lateral loading per pile exceeds 3 kips. The lateral response can be developed by modeling the soil/shaft interaction with the computer program LPILE. Discrete elements are used in LPILE to represent the shaft and non-linear soil using springs, commonly referred to as p-y curves. The table below provides soil modulus and soil strain parameters based on the encountered subsurface conditions that can be used for laterally loaded pile analysis using p-y curves.

Approximate Bottom Elevation (feet)	Soil Type	Cohesion (ksf)	Friction Angle (degrees)	Unit Weight (pcf)	E50	Subgrade Modulus k (pci)
590	Clay	2.0	--	120	0.005	500
581	Clay	1.0	--	120	0.007	100
561	Clay	3.5	--	125	0.004	1,000
556	Sand	--	31	125	--	125
543	Clay	4.5	--	128	0.004	1,000
520	Sand	--	40	130	--	125

CONSTRUCTION CONSIDERATIONS

Temporary soil retention will not be needed since stage construction is not planned for either of the bridge structures.

Cofferdams will not be needed since the proposed bottom of pier encasement El. 567.7 is 3.1 feet above the Estimated Water Surface El. 564.6.

APPENDIX

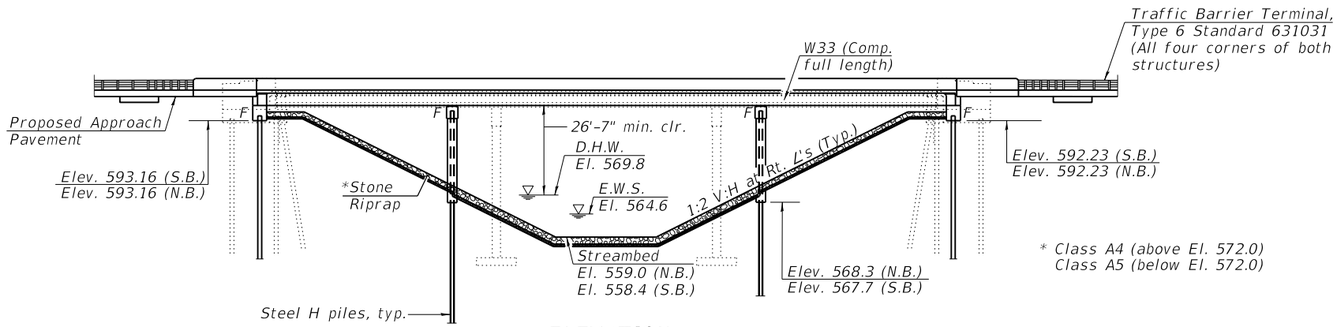
- Type, Size, and Location Plan
- Soil Boring Logs
- Subsurface Data Profile
- Slope Stability Analysis Results from SLIDE
- Selected Spreadsheets from IDOT Static Method of Estimating Pile Length

Bench Mark: BM #505, Cut on corner of concrete headwall on NW corner of SN 090-0094. Elev. 602.353
Bench Mark: BM #506, Cut on corner of concrete headwall on SE corner of SN 090-0093. Elev. 601.388

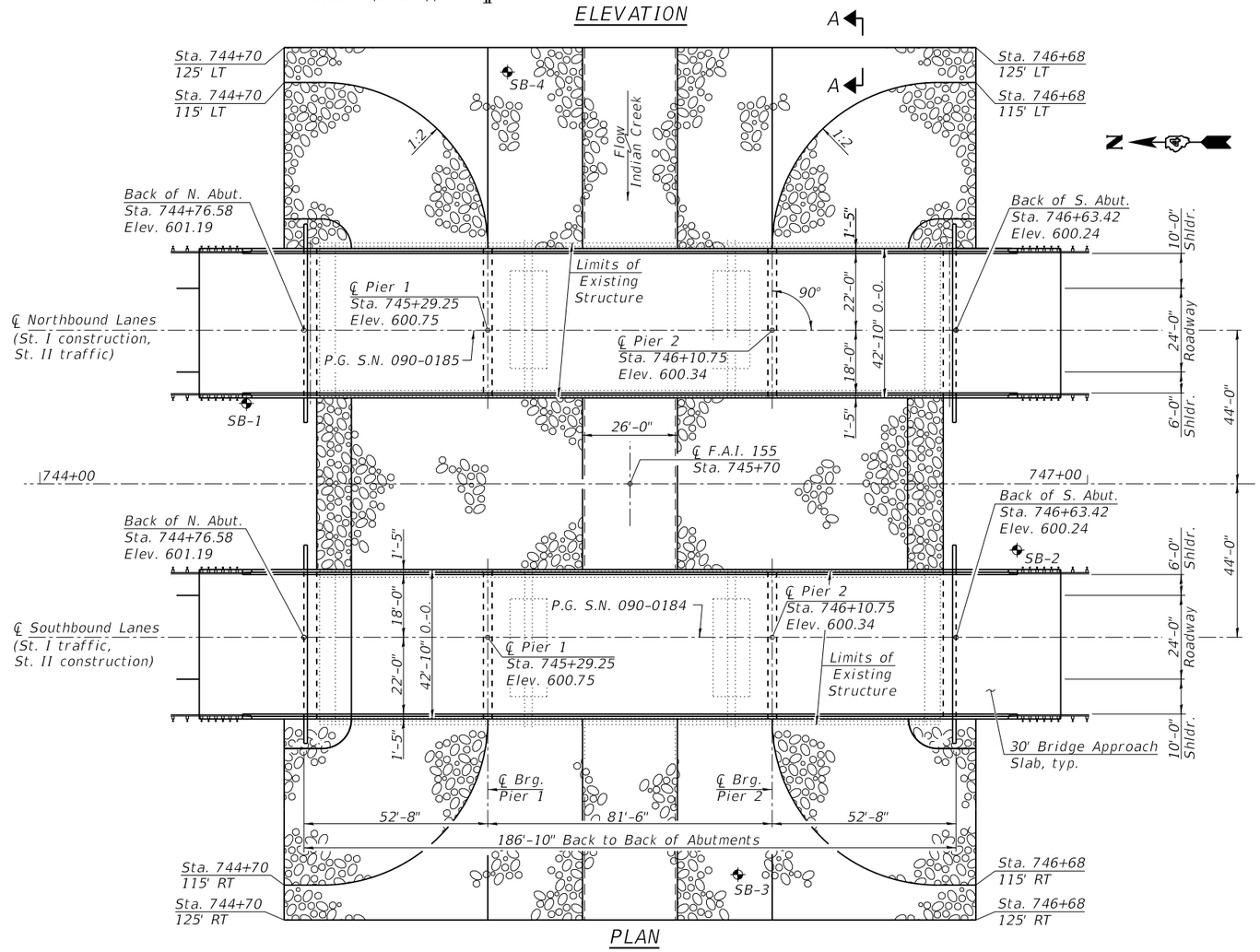
Existing Structures: Structure Nos. 090-0093 (S.B.) and 090-0094 (N.B.) were orginally built in 1971 as F.A. Route 73, Section 108B-2 at Sta. 745+70. The existing dual structures each consist of three span reinforced concrete decks on 42" prestressed concrete I beams. The structures are supported by spill thru pile bent abutments and hammerhead piers supported by spread footings. 177'-10" back to back abutments. 44'-0" out to out bridge deck. Structures to be removed and replaced.

Traffic to be maintained utilizing cross overs.

No salvage.



ELEVATION



PLAN

LOADING HL-93

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

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition.

DESIGN STRESSES

FIELD UNITS

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

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.132
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.155
Soil Site Class = D

HIGHWAY CLASSIFICATION

F.A.I. Route 155 - (I-155)
Functional Class: Interstate
ADT: 6100 (2019); 7450 (2039)
ADTT: 1175 (2019); 1430 (2039)
DHV: 610
Design Speed: 70 m.p.h.
Posted Speed; 70 m.p.h.
One-way traffic
Directional Dist.: 100

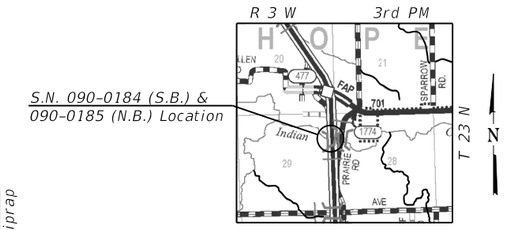
APPROVED

JUNE 09, 2022

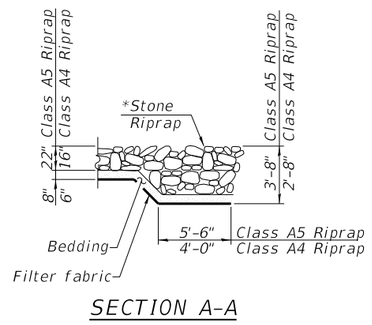
AS A BASIS FOR
PREPARATION OF DETAILED PLANS

PROFILE GRADE

Along ℄ Roadway
(N.B. and S.B. Lanes)



LOCATION SKETCH



SECTION A-A

GENERAL PLAN & ELEVATION
I-155 OVER INDIAN CREEK
F.A.I. ROUTE 155 - SEC. (108-B-2)BR
TAZEWELL COUNTY
STA. 745+70.00
STRUCTURE NO. 090-0184 (S.B.)
STRUCTURE NO. 090-0185 (N.B.)

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

USER NAME = _____	DESIGNED - K. Smith	REVISED - _____	
	CHECKED - M. Henderson	REVISED - _____	
PLOT SCALE = _____	DRAWN - K. Fair	REVISED - _____	
PLOT DATE = 6-3-2022	CHECKED - V. Vootukuri	REVISED - _____	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GENERAL PLAN
STRUCTURE NO. 090 - 0184 (S.B.) & 090 - 0185 (N.B.)
SHEET 1 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
155	(108-B-2)BR	TAZEWELL	2	1
		CONTRACT NO. 68E42		
	ILLINOIS	FED. AID PROJECT		

MODEL: TSL1
FILE NAME: Z:\0 V and K Jobs\523 - Illinois Department of Transportation - District 4\5237-006 PTB 198-018 WO-6 I-155 over Indian Cr TSL Plans\CADD Sheets\5237-006-sht-tsl.dgn
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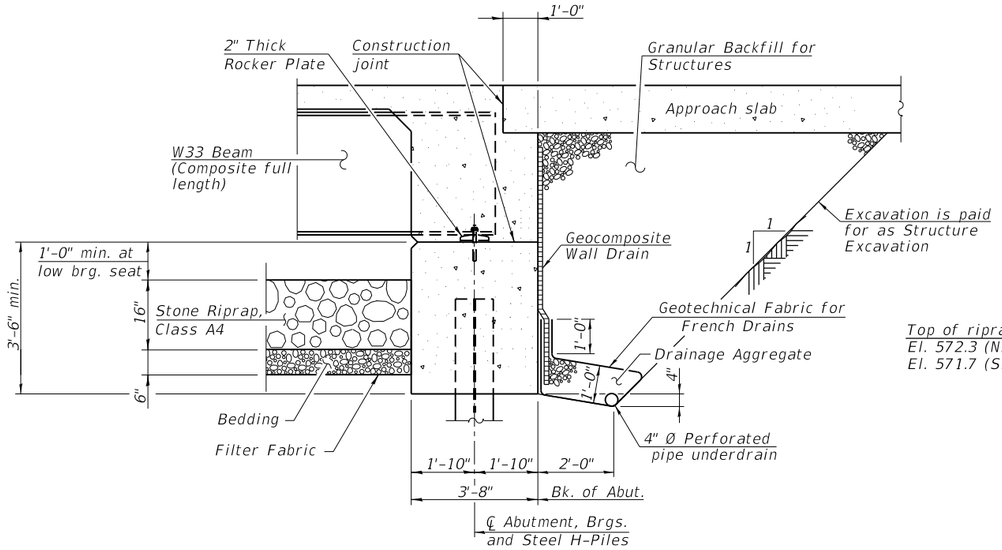
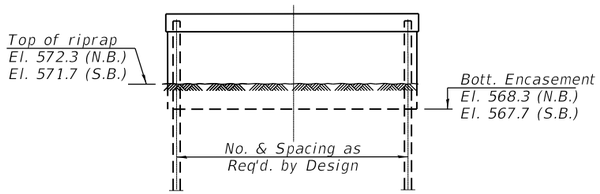


SECTION THRU INTEGRAL ABUTMENT

APPROVED

JUNE 09, 2022

AS A BASIS FOR
PREPARATION OF DETAILED PLANS



PIER SKETCH

WATERWAY INFORMATION

Drainage Area = 10.9 mi

Flood	Freq. Yr.	Q C.F.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	1800	400	400	568.5	1.4	1.4	569.9	569.9
Design	50	2980	481	481	569.8	1.4	1.4	571.2	571.2
Base	100	3510	513	513	570.4	1.4	1.4	571.8	571.8
Scour Check	200	3800	530	530	570.6	1.4	1.4	572.0	572.0
Max. Calc.	500	4830	587	587	571.5	1.6	1.6	573.1	573.1

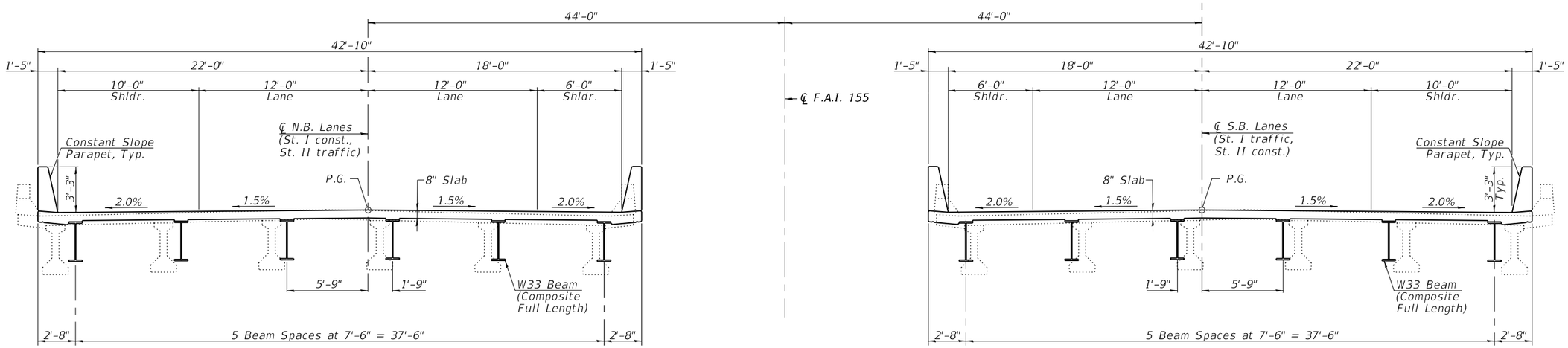
10 year velocity through existing bridge = 4.5 fps
10 year velocity through prop. bridge = 4.5 fps

SCOUR DESIGN TABLE – S.N. 090-0184 (S.B.)

Event/Limit State	Design Scour Elevations (ft.) N. Abut.	Pier 1	Pier 2	S. Abut.	Item 113
Q100	593.16	548.9	548.9	592.23	5
Q200	593.16	548.4	548.4	592.23	
Design	593.16	548.9	548.9	592.23	
Check	593.16	548.4	548.4	592.23	

SCOUR DESIGN TABLE – S.N. 090-0185 (N.B.)

Event/Limit State	Design Scour Elevations (ft.) N. Abut.	Pier 1	Pier 2	S. Abut.	Item 113
Q100	593.16	549.5	549.5	592.23	5
Q200	593.16	549.0	549.0	592.23	
Design	593.16	549.5	549.5	592.23	
Check	593.16	549.0	549.0	592.23	



CROSS SECTION
(Looking South)

DETAILS
I-155 OVER INDIAN CREEK
F.A.I. ROUTE 155 - SEC. (108-B-2)BR
TAZEWELL COUNTY
STA. 745+70.00
STRUCTURE NO. 090-0184 (S.B.)
STRUCTURE NO. 090-0185 (N.B.)

MODEL: TSL2
FILE NAME: I:\V and K Jobs\523 - Illinois Department of Transportation - District 4\5237-006 PTB 198-018 WO-6 I-155 over Indian Cr TSL Plans\CADD Sheets\5237-006-sht-tsl.dgn
6/8/2022 3:16:37 PM

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

USER NAME = _____
PLOT SCALE = _____
PLOT DATE = 6-03-2022

DESIGNED - K. Smith
CHECKED - M. Henderson
DRAWN - K. Fair
CHECKED - V. Vootukuri

REVISED - _____
REVISED - _____
REVISED - _____
REVISED - _____

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

DETAILS
STRUCTURE NO. 090 - 0184 (S.B.) & 090 - 0185 (N.B.)
SHEET 02 OF 02 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
155	(108-B-2)BR	TAZEWELL	2	2
		CONTRACT NO. 68E42		
	ILLINOIS	FED. AID PROJECT		

Illinois Department of Transportation
Division of Highways
TERRACON

SOIL BORING LOG

Date 3/9/21

ROUTE FAI 155 (I-155) **DESCRIPTION** Structure boring for north abutments **LOGGED BY** KEG (CG)

SECTION (108-B-2) BR **LOCATION** I-155 over Indian Creek, **SEC.** 29, **TWP.** 23N, **RNG.** 3W, 3rd **PM**,
Latitude 40°25'15.08379N, **Longitude** 89°27'24.46397W

COUNTY Tazewell **DRILLING METHOD** SFA to 10', then mud rotary **HAMMER TYPE** Automatic

STRUCT. NO. 090-0093 (SB) 090-0094 (NB)
Station 745+70

BORING NO. SB-1
Station 744+59
Offset 23.0 ft LT
Ground Surface Elev. 600.19 ft

Surface Water Elev. None ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter Not encountered ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
	4			SILTY CLAY LOAM, trace gravel, brown, very stiff (FILL)
	5 4	2.0 B	12	
	4			
	6 4	2.3 B	17	
-5				
594.19	5			
	7 7	2.1 S	11	CLAY LOAM, trace gravel, brown, very stiff
	3			
	5 4	3.9 B	12	
-10				
589.69	2			CLAY LOAM, trace gravel, brown and gray, stiff
	5 4	1.8 S	12	
	3			
	3 4	1.3 B	12	
-15				
584.19	3			SILTY CLAY, brown, very stiff
	4 6	2.0 B	21	
582.19	4			CLAY LOAM, trace gravel, brown, very stiff to hard
	6 9	4.3 B	17	
-20				
	6			CLAY LOAM, trace gravel, brown, very stiff to hard *(continued)*
	8 10	4.5 B	17	
	4			
	6 9	3.5 B	23	
-25				
	5			
	8 11	4.1 B	12	
	5			
	7 9	3.1 B	16	
-30				
	6			
	9 13	3.9 B	16	
-35				
561.19	5			
	7 6		21	SAND, fine grained, gray, medium dense
-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)

BBS, form 137 (Rev. 8-99)

SOIL BORING ILDOT_MR215028 IDOT WO #2 - COPY.GPJ IL_DOT.GDT 6/7/21

Illinois Department of Transportation
Division of Highways
TERRACON

SOIL BORING LOG

Date 3/9/21

ROUTE FAI 155 (I-155) **DESCRIPTION** Structure boring for north abutments **LOGGED BY** KEG (CG)

SECTION (108-B-2) BR **LOCATION** I-155 over Indian Creek, **SEC.** 29, **TWP.** 23N, **RNG.** 3W, 3rd **PM**, **Latitude** 40°25'15.08379N, **Longitude** 89°27'24.46397W

COUNTY Tazewell **DRILLING METHOD** SFA to 10', then mud rotary **HAMMER TYPE** Automatic

STRUCT. NO. 090-0093 (SB) 090-0094 (NB)
Station 745+70

BORING NO. SB-1
Station 744+59
Offset 23.0 ft LT
Ground Surface Elev. 600.19 ft

Surface Water Elev. None ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter Not encountered ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SAND, fine grained, gray, medium dense *(continued)*
556.69				
	3			CLAY LOAM, trace gravel, gray, very stiff
	2	2.1	13	
-45	6	B		
551.69				
	11			SILTY CLAY, trace gravel, gray, hard
	13	7.4	12	
-50	21	B		
	31			
	50	4.5	10	
-55		P		
543.19				
	7			SAND, fine grained, gray, dense to very dense
	38		19	
-60	38			
				End of Boring

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SAND, fine grained, gray, dense to very dense *(continued)*
	26			
	20		21	
-65	19			
533.19				
				SILT LOAM, trace gravel, gray, very dense
	50		13	
-70				
526.69				
	34			SAND, trace gravel, fine to coarse, dense to very dense
	50		15	
-75				
	21			
	31		20	
520.19 -80	24			

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

BBS, form 137 (Rev. 8-99)

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Illinois Department of Transportation
Division of Highways
TERRACON

SOIL BORING LOG

Date 3/9/21

ROUTE FAI 155 (I-155) **DESCRIPTION** Structure boring for south abutments **LOGGED BY** KEG (CG)

SECTION (108-B-2) BR **LOCATION** I-155 over Indian Creek, **SEC.** 29, **TWP.** 23N, **RNG.** 3W, 3rd **PM**,
Latitude 40°25'12.89960N, **Longitude** 89°27'24.92541W

COUNTY Tazewell **DRILLING METHOD** SFA to 10', then mud rotary **HAMMER TYPE** Automatic

STRUCT. NO. 090-0093 (SB) 090-0094 (NB)
Station 745+70

BORING NO. SB-2
Station 746+80
Offset 19.0 ft RT
Ground Surface Elev. 598.76 ft

Surface Water Elev. None ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter Not encountered ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
	2			SILTY CLAY, trace gravel and sand, brown, stiff
	3 6	1.1 B	13	
595.26				
	6			CLAY LOAM, brown, stiff
-5	6 7	2.2 B	13	
	2			
	5 4	1.5 S	15	
	1			
-10	2 4	0.7 B	15	
587.76				
	4			SILTY CLAY, trace gravel, stiff
	4 3	1.7 S	12	
	2			
-15	3 6	1.2 B	13	
	4			
	3 5	1.8 P	15	
	3			
-20	4 7	1.7 B	12	
	3			SILTY CLAY, trace gravel, stiff *(continued)*
	4 6	1.8 B	15	
	5			
-25	7 9	2.0	60	
572.76				
	5			SILT LOAM, trace gravel, brown, medium dense
	9 10		14	
570.76				
	8			CLAY LOAM, trace gravel, brown, stiff to very stiff
-30	9 10	3.2 S	19	
	5			
-35	8 8	1.2 B	19	-coal pieces in sample
560.26				
	WOH			SANDY CLAY, gray, soft
-40	1 1	0.3 P	21	

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

BBS, form 137 (Rev. 8-99)

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Illinois Department of Transportation
Division of Highways
TERRACON

SOIL BORING LOG

Date 3/9/21

ROUTE FAI 155 (I-155) **DESCRIPTION** Structure boring for south abutments **LOGGED BY** KEG (CG)

SECTION (108-B-2) BR **LOCATION** I-155 over Indian Creek, **SEC.** 29, **TWP.** 23N, **RNG.** 3W, 3rd **PM**, **Latitude** 40°25'12.89960N, **Longitude** 89°27'24.92541W

COUNTY Tazewell **DRILLING METHOD** SFA to 10', then mud rotary **HAMMER TYPE** Automatic

STRUCT. NO. 090-0093 (SB) 090-0094 (NB)
Station 745+70

BORING NO. SB-2
Station 746+80
Offset 19.0 ft RT
Ground Surface Elev. 598.76 ft

Surface Water Elev. None ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter Not encountered ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SANDY CLAY, gray, soft *(continued)*			
555.26			
CLAY, trace gravel, gray, very stiff to hard	6		
	5	3.0	13
-45	12	B	
	10		
	12	7.6	11
-50	22	S	
	36		
	50	4.5	9
-55		P	
	39		
	45	4.1	10
-60	40	S	
	17		
	17	4.9	11
-65	50	S	
530.26			
SILT, gray, very dense	29		
	50		23
-70			
525.26			
SILTY SAND, with gravel, dense to very dense	20		
	20		16
-75	20		
	24		
	29		19
518.76 -80	31		

End of Boring

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

BBS, form 137 (Rev. 8-99)

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Illinois Department of Transportation
Division of Highways
TERRACON

SOIL BORING LOG

Date 3/10/21

ROUTE FAI 155 (I-155) **DESCRIPTION** Structure boring for west piers **LOGGED BY** KEG (CG)

SECTION (108-B-2) BR **LOCATION** I-155 over Indian Creek, **SEC.** 29, **TWP.** 23N, **RNG.** 3W, 3rd **PM**,
Latitude 40°25'13.61102N, **Longitude** 89°27'26.14916W

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

STRUCT. NO. 090-0093 (SB) 090-0094 (NB)
Station 745+70

BORING NO. SB-3
Station 746+00
Offset 112.0 ft RT
Ground Surface Elev. 568.16 ft

Surface Water Elev. None ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter Not encountered ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				CONCRETE PAD [5 inches] 567.74
				SILTY CLAY, brown, stiff (FILL)
	2			
	2	1.3	13	
	3	P		
				564.16
	4			
	6		15	SILTY SAND, dark gray, fine grained, medium dense [FILL]
-5	5			
				562.16
	1			SILTY CLAY LOAM, dark gray, soft [FILL]
	2	0.6	22	
	1	B		
	1			
	WOH	0.2	31	
-10	1	B		
				557.16
	2			CLAY, trace gravel, gray, very stiff to hard
	6	3.5	12	
	8	B		
	15			
	18	5.0	12	
-15	16	B		
	8			
	15	3.5	11	
	18	B		
	9			
	15	3.9	11	
-20	22	B		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				CLAY, trace gravel, gray, very stiff to hard *(continued)*
	10			
	15	8.9	10	
	28	B		
				544.66
	5			SILT with gravel, gray, medium dense
	6		7	
-25	12			SILT LOAM, trace gravel, gray, dense 543.16
	12			
	40		11	
	46			
				539.66
	23			SILTY CLAY LOAM, trace gravel, trace sand, gray, very stiff to hard
	17	3.0	11	
-30	18			
	19			
	35	4.7	9	
-35	50	S		
				529.66
	19			SAND with gravel, gray, dense
	33		7	
-40	34			

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

BBS, form 137 (Rev. 8-99)

SOIL BORING ILDOT_MR215028 IDOT WO #2 - COPY.GPJ IL_DOT.GDT 6/7/21

Illinois Department of Transportation
Division of Highways
TERRACON

SOIL BORING LOG

Date 3/10/21

ROUTE FAI 155 (I-155) **DESCRIPTION** Structure boring for west piers **LOGGED BY** KEG (CG)

SECTION (108-B-2) BR **LOCATION** I-155 over Indian Creek, **SEC.** 29, **TWP.** 23N, **RNG.** 3W, 3rd **PM**,
Latitude 40°25'13.61102N, **Longitude** 89°27'26.14916W

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

STRUCT. NO. 090-0093 (SB) 090-0094 (NB)
Station 745+70

BORING NO. SB-3
Station 746+00
Offset 112.0 ft RT
Ground Surface Elev. 568.16 ft

Surface Water Elev. None ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter Not encountered ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SAND with gravel, gray, dense *(continued)*			
524.66	8		
SILTY SAND, trace gravel, dense	20		25
-45	26		
	11		
	18		24
518.16 -50	20		
End of Boring			
-55			
-60			

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

Illinois Department of Transportation
Division of Highways
TERRACON

SOIL BORING LOG

Date 4/28/21

ROUTE FAI 155 (I-155) **DESCRIPTION** Structure boring for east piers **LOGGED BY** RUBINO (JL)

SECTION (108-B-2) BR **LOCATION** I-155 over Indian Creek, **SEC.** 29, **TWP.** 23N, **RNG.** 3W, 3rd **PM**,
Latitude 40°25'14.32171N, **Longitude** 89°27'23.20664W

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

STRUCT. NO. 090-0093 (SB) 090-0094 (NB)
Station 745+70

BORING NO. SB-4
Station 745+34
Offset 118.0 ft LT
Ground Surface Elev. 568.73 ft

Surface Water Elev. 6.5' ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				CONCRETE PAD [8 inches] 568.07
	2			SILTY CLAY, trace gravel, brown, stiff [FILL]
	2	1.8	16	
	5	B		
				565.73
	1			SILTY CLAY LOAM, trace roots, dark brown [FILL]
	2	3.9	18	
-5	5	B		
	0			562.23
	1	1.2	21	CLAY LOAM, with sand lenses, dark brown, stiff
	2	B		
	0			559.73
	1	0.3	27	SILTY CLAY, brown and gray, soft
-10	1	B		
				558.23
	1		14	SAND, some gravel, brown
				557.23
	3	2.1	16	SILTY CLAY, trace gravel, brown and gray, very stiff
	4	B		
	3			
	6	2.9	13	
-15	9	B		
				553.23
	5			SILTY CLAY, trace gravey, gray, very stiff to hard
	12	8.8	11	
	17	B		
	36			
	12	9.0	11	
-20	22	B		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SILTY CLAY, trace gravey, gray, very stiff to hard *(continued)*
	47			
	31			
	50			-no recovery
	56			
	50			
-25				-small rock fragments recovered [<1"]
	11			542.23
	22	3.7	13	SAND, fine to coarse, medium dense
	30	B	13	
	6			
	7		17	
-30	17			
	6			
	13	4.5	15	534.23
-35	14	P	10	SILTY CLAY LOAM, trace gravel, gray, hard
				530.23
	24			SILT, gray, very dense
	27		18	
-40	43			

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

BBS, form 137 (Rev. 8-99)

SOIL BORING ILDOT_MR215028 IDOT WO #2 - COPY.GPJ IL_DOT.GDT 6/7/21

Illinois Department of Transportation
Division of Highways
TERRACON

SOIL BORING LOG

Date 4/28/21

ROUTE FAI 155 (I-155) **DESCRIPTION** Structure boring for east piers **LOGGED BY** RUBINO (JL)

SECTION (108-B-2) BR **LOCATION** I-155 over Indian Creek, **SEC.** 29, **TWP.** 23N, **RNG.** 3W, 3rd **PM**,
Latitude 40°25'14.32171N, **Longitude** 89°27'23.20664W

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

STRUCT. NO. 090-0093 (SB) 090-0094 (NB)
Station 745+70

BORING NO. SB-4
Station 745+34
Offset 118.0 ft LT
Ground Surface Elev. 568.73 ft

Surface Water Elev. 6.5' ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				SILT, gray, very dense *(continued)*
526.73				
	21			SILT LOAM, trace gravel and sand lenses, gray, dense
	25		15	
523.73 -45	42			
				SAND, fine to medium grain, trace gravel, medium dense
	5			
	10		20	
-50	17			
	3			
	9		19	
-55	16			
	9			
	4		20	
-60	8			
507.73				SAND, fine to medium grain, trace gravel, medium dense *(continued)*
				SAND, fine to medium grained, trace gravel, gray, dense to very dense
	48			
	50		17	
-65				
	7			
	18		20	
498.73 -70	18			
				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)

BBS, form 137 (Rev. 8-99)

SOIL BORING ILDOT_MR215028 IDOT WO #2 - COPY.GPJ IL_DOT.GDT 6/7/21

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 4/8/22

ROUTE FAI 155 (I-155) **DESCRIPTION** Structure boring for east piers **LOGGED BY** RUBINO (PP)

SECTION (108-B-2) BR **LOCATION** I-155 over Indian Creek, **SEC.** 29, **TWP.** 23N, **RNG.** 3W, 3rd **PM**,
Latitude 40.4206717, **Longitude** -89.456447

COUNTY Tazewell **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 090-0093 (SB) 090-0094 (NB)
Station 745+70

BORING NO. SB-4a
Station 745+49
Offset 118.0 ft LT
Ground Surface Elev. 568.73 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
CONCRETE - approximate thickness of 8" 567.93 BLIND DRILLED - REFER TO PREVIOUS BORING SB-4				BLIND DRILLED - REFER TO PREVIOUS BORING SB-4 *(continued)*			
-5				-25			
-10				-30			
-15				-35			
-20				-40			

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

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 4/8/22

ROUTE FAI 155 (I-155) **DESCRIPTION** Structure boring for east piers **LOGGED BY** RUBINO (PP)

SECTION (108-B-2) BR **LOCATION** I-155 over Indian Creek, **SEC.** 29, **TWP.** 23N, **RNG.** 3W, 3rd **PM**,
Latitude 40.4206717, **Longitude** -89.456447

COUNTY Tazewell **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 090-0093 (SB) 090-0094 (NB)
Station 745+70

BORING NO. SB-4a
Station 745+49
Offset 118.0 ft LT
Ground Surface Elev. 568.73 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
BLIND DRILLED - REFER TO PREVIOUS BORING SB-4 *(continued)*				
	-45			
	-50			
	-55			
	-60			

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
BLIND DRILLED - REFER TO PREVIOUS BORING SB-4 *(continued)*				
505.23				
SANDY LOAM, trace gravel, gray, dense, wet		15		
	-65	21 25		21
		14		
	-70	18 20		26
		21		
	-75	24 26		24
490.23				
SAND, trace gravel, gray, dense to very dense, wet		18		
	-80	16 15		21

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
IDOT

SOIL BORING LOG

Date 4/8/22

ROUTE FAI 155 (I-155) **DESCRIPTION** Structure boring for east piers **LOGGED BY** RUBINO (PP)

SECTION (108-B-2) BR **LOCATION** I-155 over Indian Creek, **SEC.** 29, **TWP.** 23N, **RNG.** 3W, 3rd **PM**, **Latitude** 40.4206717, **Longitude** -89.456447

COUNTY Tazewell **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 090-0093 (SB) 090-0094 (NB)
Station 745+70

BORING NO. SB-4a
Station 745+49
Offset 118.0 ft LT
Ground Surface Elev. 568.73 ft

Surface Water Elev. ft
Stream Bed Elev. ft

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

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
SAND, trace gravel, gray, dense to very dense, wet *(continued)*		23		
		29		16
	-85	35		
	480.23			
SAND, trace gravel, gray, medium dense, very moist		24		
		15		14
	-90	13		
	475.23			
SAND, trace gravel, gray, dense, very moist		21		
		21		14
	-95	14		
	470.23			
SAND, with gravel, gray, medium dense, very moist		24		
		12		10
	468.73 -100	16		

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
End of Boring				
	-105			
	-110			
	-115			
	-120			

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)

SUBSURFACE PROFILE
I-155 OVER INDIAN CREEK

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
155	(108-B-2)BR	TAZEWELL		
			CONTRACT NO. 68E42	
	ILLINOIS	FED. AID PROJECT		

SCALE: _____ | SHEET __ OF __ SHEETS | STA. 744+20 TO STA. 747+20

MODEL: Default
FILE NAME: pw:\\dot-pw.bentley.com:PWIDOT\Documents\IDOT Offices\District 4\Projects\Geotech\Kath-155 Indian Crk\I-155 over Indian Creek.dgn

SB-1
744+59
23 L
600.19

9/2.0B/12
10/2.3B/17
14/2.1S/11
9/3.9B/12
9/1.8S/12
7/1.3B/12
10/2.0B/21
15/4.3B/17
18/4.5B/17
15/3.5B/23
19/4.1B/12
16/3.1B/16
22/3.9B/16
13/NA/21
8/2.1B/13
34/7.4B/12
50/4.5P/10
76/NA/19
39/NA/21
50/NA/13
50/NA/15
55/NA/20

SILTY CLAY LOAM (FILL)
CLAY LOAM (FILL)
SILTY CLAY (FILL)
CLAY LOAM (FILL)
SILTY CLAY (FILL)
CLAY LOAM
SAND
CLAY LOAM
SILTY CLAY
SAND
SILT LOAM
SAND

SB-4
745+34
118 L
568.73

7/1.8B/16
7/3.9B/18
3/1.2B/21
NA/NA/21
2/0.3B/27
7/2.1B/NA
NA/NA/16
15/2.9B/13
29/8.8B/11
34/9.0B/11
81/NA/NA
50/NA/NA
52/3.7B/13
NA/NA/13
24/NA/17
27/4.5P/15
NA/NA/10
70/NA/18
67/NA/15
27/NA/20
25/NA/19
12/NA/20
50/NA/17
36/NA/20

SILTY CLAY (FILL)
CLAY LOAM
SILTY CLAY
SAND
SILT
SILT LOAM
SAND

SB-3
746+00
112 R
568.16

5/1.3P/13
11/NA/15
3/0.6B/22
1/0.2B/31
14/3.5B/12
34/5.0B/12
33/3.5B/11
37/3.9B/11
43/8.9B/10
18/NA/7
86/NA/11
35/3/11
85/4.7S/9
67/NA/7
46/NA/25
38/NA/24

SILTY CLAY (FILL)
SILTY CLAY
SILT to SILT LOAM
SILTY CLAY LOAM
SAND
SILTY SAND

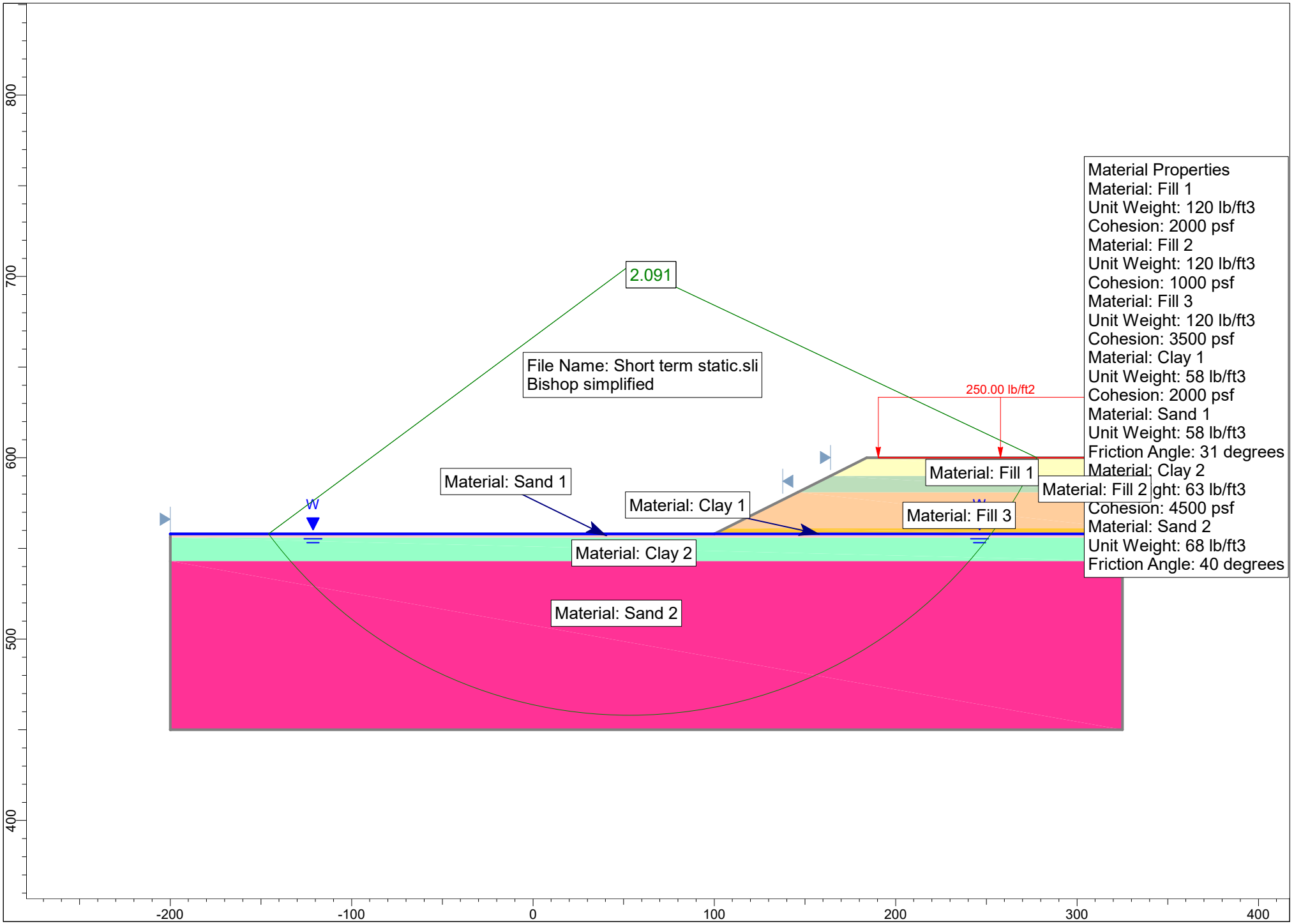
SB-2
746+80
19 R
598.76

9/1.1B/13
13/2.2B/13
9/1.5S/15
6/0.7B/15
7/1.7S/12
9/1.2B/13
8/1.8P/15
11/1.7B/12
10/1.8B/15
16/2/60
19/NA/14
19/3.2S/19
16/1.2B/19
2/0.3P/21
17/3.0B/13
34/7.6S/11
50/4.5P/9
85/4.1S/10
67/4.9S/11
50/NA/23
40/NA/16
60/NA/19

CLAY LOAM (FILL)
SILTY CLAY (FILL)
SILT LOAM (FILL)
CLAY LOAM (FILL)
CLAY LOAM
SANDY CLAY
CLAY to SILTY CLAY
SILT
SILTY SAND

600
595
590
585
580
575
570
565
560
555
550
545
540
535
530
525
520
515
510
505
500

744+50
745+00
745+50
746+00
746+50
747+00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Bishop simplified
250.00 lb/ft2
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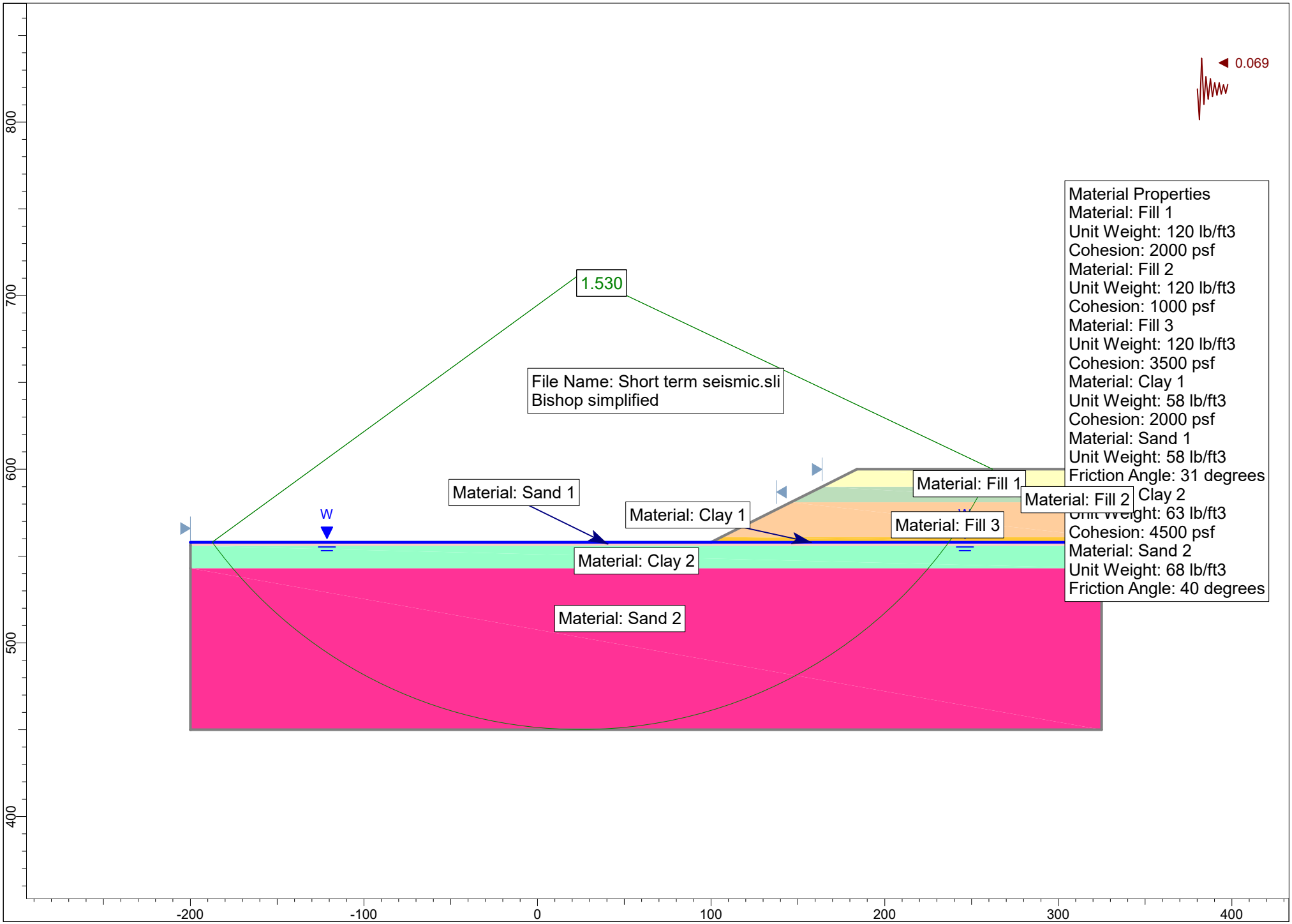
Material: Clay 1
Material: Fill 1
Material: Fill 2
Material: Fill 3
Material: Clay 2
Material: Sand 2
W
Material Properties
Material: Fill 1
Unit Weight: 120 lb/ft3
Cohesion: 2000 psf
Material: Fill 2
Unit Weight: 120 lb/ft3
Cohesion: 1000 psf
Material: Fill 3
Unit Weight: 120 lb/ft3
Cohesion: 3500 psf
Material: Clay 1
Unit Weight: 58 lb/ft3
Cohesion: 2000 psf
Material: Sand 1
Unit Weight: 58 lb/ft3
Friction Angle: 31 degrees
Material: Clay 2
ght: 63 lb/ft3
Cohesion: 4500 psf
Material: Sand 2
Unit Weight: 68 lb/ft3
Friction Angle: 40 degrees
800
700
600
500
400
-200
-100
0
100
200
300
400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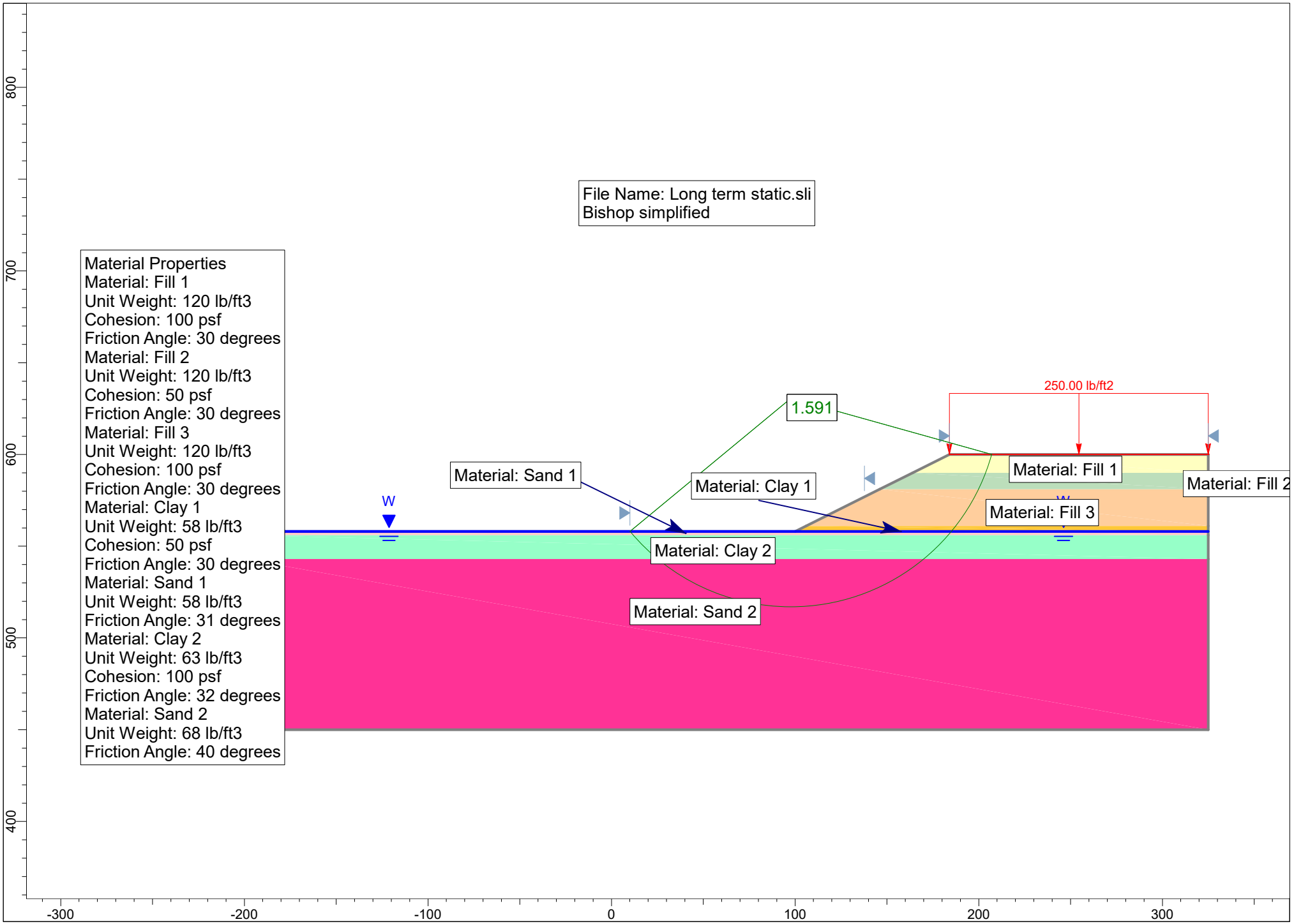
Bishop simplified
Material: Sand 1
Material: Clay 1
Material: Fill 1
Material: Fill 2
Material: Fill 3
Material: Clay 2
Material: Sand 2
W
Material Properties
Material: Fill 1
Unit Weight: 120 lb/ft3
Cohesion: 2000 psf
Material: Fill 2
Unit Weight: 120 lb/ft3
Cohesion: 1000 psf
Material: Fill 3
Unit Weight: 120 lb/ft3
Cohesion: 3500 psf
Material: Clay 1
Unit Weight: 58 lb/ft3
Cohesion: 2000 psf
Material: Sand 1
Unit Weight: 58 lb/ft3
Friction Angle: 31 degrees
Clay 2
ght: 63 lb/ft3
Cohesion: 4500 psf
Material: Sand 2
Unit Weight: 68 lb/ft3
Friction Angle: 40 degrees
800
700
600
500
400
-200
-100
0
100
200
300
400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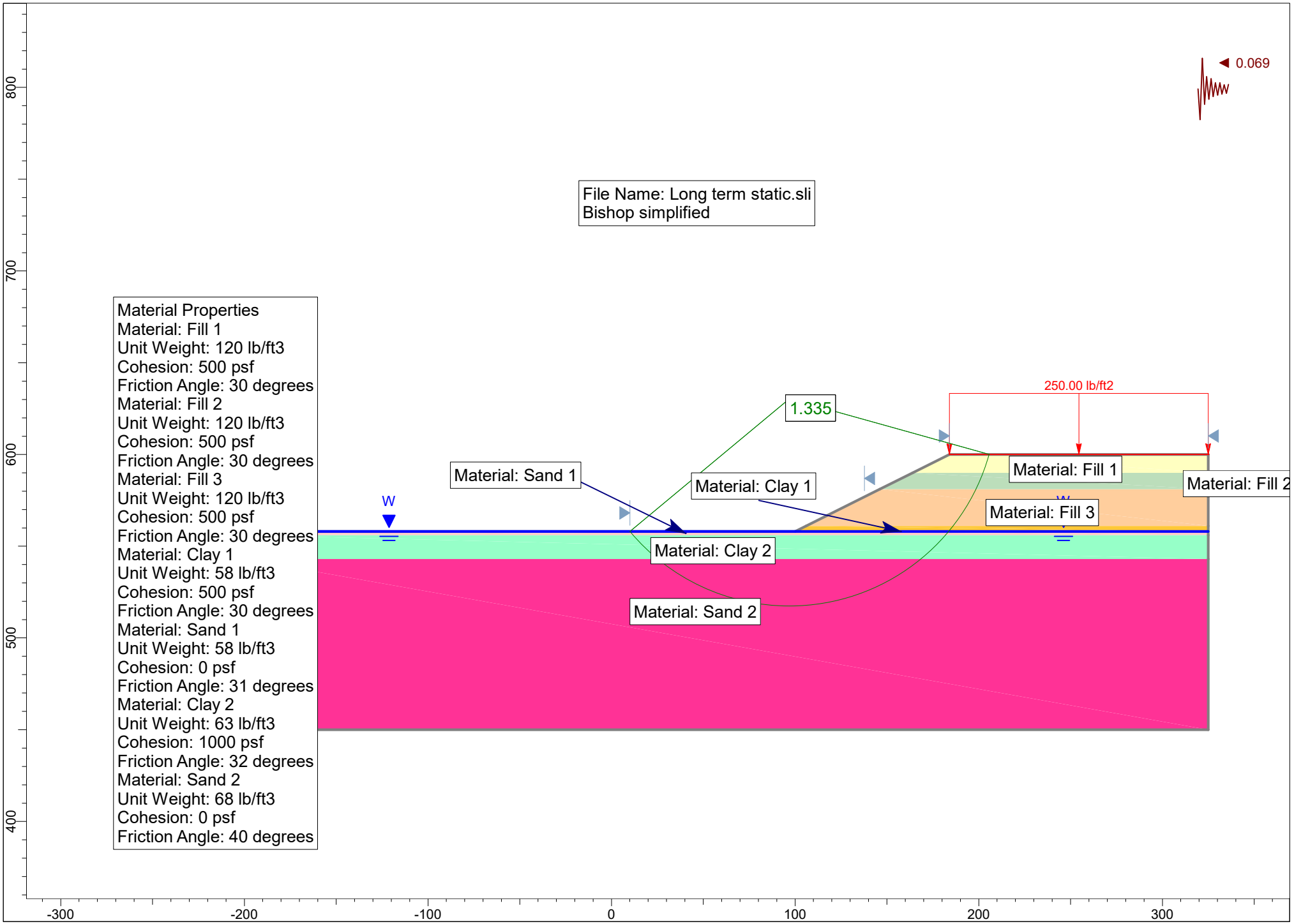
Bishop simplified
Material Properties
Material: Fill 1
Unit Weight: 120 lb/ft3
Cohesion: 100 psf
Friction Angle: 30 degrees
Material: Fill 2
Unit Weight: 120 lb/ft3
Cohesion: 50 psf
Friction Angle: 30 degrees
Material: Fill 3
Unit Weight: 120 lb/ft3
Cohesion: 100 psf
Friction Angle: 30 degrees
Material: Clay 1
Unit Weight: 58 lb/ft3
Cohesion: 50 psf
Friction Angle: 30 degrees
Material: Sand 1
Unit Weight: 58 lb/ft3
Friction Angle: 31 degrees
Material: Clay 2
Unit Weight: 63 lb/ft3
Cohesion: 100 psf
Friction Angle: 32 degrees
Material: Sand 2
Unit Weight: 68 lb/ft3
Friction Angle: 40 degrees
250.00 lb/ft2
1.591
Material: Sand 1
Material: Clay 1
Material: Fill 1
Material: Fill 2
Material: Fill 3
Material: Clay 2
Material: Sand 2
W
800
700
600
500
400
-300
-200
-100
0
100
200
300


0.069
File Name: Long term static.sli
Bishop simplified
Material Properties
Material: Fill 1
Unit Weight: 120 lb/ft3
Cohesion: 500 psf
Friction Angle: 30 degrees
Material: Fill 2
Unit Weight: 120 lb/ft3
Cohesion: 500 psf
Friction Angle: 30 degrees
Material: Fill 3
Unit Weight: 120 lb/ft3
Cohesion: 500 psf
Friction Angle: 30 degrees
Material: Clay 1
Unit Weight: 58 lb/ft3
Cohesion: 500 psf
Friction Angle: 30 degrees
Material: Sand 1
Unit Weight: 58 lb/ft3
Cohesion: 0 psf
Friction Angle: 31 degrees
Material: Clay 2
Unit Weight: 63 lb/ft3
Cohesion: 1000 psf
Friction Angle: 32 degrees
Material: Sand 2
Unit Weight: 68 lb/ft3
Cohesion: 0 psf
Friction Angle: 40 degrees
250.00 lb/ft2
1.335
Material: Sand 1
Material: Clay 1
Material: Fill 1
Material: Fill 2
Material: Fill 3
Material: Clay 2
Material: Sand 2
W
W
800
700
600
500
400
-300
-200
-100
0
100
200
300

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier 1_Precore
REFERENCE BORING ========== SB-4 & 4a
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 595.16 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 540.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 549.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 2080 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 40.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 416.00 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 156.00 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.312" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 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
570 KIPS	**504** KIPS	**277** KIPS	**70** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
537.50	2.50		52	Hard Till	31.3		***100.5***				101	0	0	55	58
535.00	2.50		24	Medium Sand	20.2	69.2	***155.4***				155	0	0	85	60
532.50	2.50		24	Medium Sand	20.2	103.8	***208.1***				208	0	0	114	63
530.00	2.50		27	Hard Till	13.6	136.3	***221.7***				222	0	0	122	65
527.50	2.50		27	Hard Till	13.6	136.3	***452.4***				452	0	0	249	68
525.00	2.50		70	Hard Till	51.7	353.3	***504.1***				504	0	0	277	70
522.50	2.50		70	Hard Till	51.7	353.3	***540.7***				541	0	0	297	73
520.00	2.50		67	Very Fine Silty Sand	70.6	338.2	***611.3***				~~611~~	~~0~~	~~0~~	~~336~~	~~75~~
517.50	2.50		67	Very Fine Silty Sand	70.6	338.2	***525.4***				525	0	0	289	78
515.00	2.50		27	Fine Sand	21.4	181.7	***546.8***				547	0	0	301	80
512.50	2.50		27	Fine Sand	21.4	181.7	***554.8***				555	0	0	305	83
510.00	2.50		25	Fine Sand	19.8	168.2	***574.6***				~~575~~	~~0~~	~~0~~	~~316~~	~~85~~
507.50	2.50		25	Fine Sand	19.8	168.2	***507.0***				507	0	0	279	88
505.00	2.50		12	Fine Sand	9.5	80.8	***516.5***				516	0	0	284	90
504.00	1.00		12	Fine Sand	3.8	80.8	***1112.5***				~~1112~~	~~0~~	~~0~~	~~612~~	~~91~~
501.50	2.50		100	Medium Sand	191.1	672.9	***1303.5***				~~1304~~	~~0~~	~~0~~	~~717~~	~~94~~
499.00	2.50		100	Medium Sand	191.1	672.9	***1063.9***				~~1064~~	~~0~~	~~0~~	~~585~~	~~96~~
496.50	2.50		36	Medium Sand	35.0	242.3	***1099.0***				~~1099~~	~~0~~	~~0~~	~~604~~	~~99~~
495.50	1.00		36	Medium Sand	14.0	242.3	***1207.2***				~~1207~~	~~0~~	~~0~~	~~664~~	~~100~~
490.50	5.00		50	Medium Sand	126.1	336.5	***1205.4***				~~1205~~	~~0~~	~~0~~	~~663~~	~~105~~
485.50	5.00		31	Medium Sand	55.5	208.6	***1483.0***				~~1483~~	~~0~~	~~0~~	~~816~~	~~110~~
480.50	5.00		64	Medium Sand	197.3	430.7	***1438.1***				~~1438~~	~~0~~	~~0~~	~~791~~	~~115~~
475.50	5.00		28	Medium Sand	48.2	188.4	***1533.5***				~~1533~~	~~0~~	~~0~~	~~843~~	~~120~~
470.50	5.00		35	Medium Sand	66.9	235.5	***1553.3***				~~1553~~	~~0~~	~~0~~	~~854~~	~~125~~
465.50	5.00		28	Medium Sand		188.4									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier 2 precore 540
REFERENCE BORING ========== SB-3, SB-4 & 4a
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 594.23 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 540.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 549.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 2080 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 40.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 416.00 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 156.00 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.312" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 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
570 KIPS	**538** KIPS	**296** KIPS	**62** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
537.50	2.50		35	Hard Till	17.9		***118.9***				119	0	0	65	57
535.00	2.50		35	Hard Till	17.9	100.9	***403.5***				404	0	0	222	59
532.50	2.50		85	Hard Till	73.6	367.7	***538.4***				538	0	0	296	62
530.00	2.50		85	Hard Till	73.6	429.0	***633.8***				~~634~~	~~0~~	~~0~~	~~349~~	~~64~~
527.50	2.50		67	Medium Sand	106.4	450.9	***740.2***				~~740~~	~~0~~	~~0~~	~~407~~	~~67~~
525.00	2.50		67	Medium Sand	106.4	450.9	***705.2***				~~705~~	~~0~~	~~0~~	~~388~~	~~69~~
522.50	2.50		46	Medium Sand	53.9	309.6	***759.1***				~~759~~	~~0~~	~~0~~	~~418~~	~~72~~
520.00	2.50		46	Medium Sand	53.9	309.6	***759.1***				~~759~~	~~0~~	~~0~~	~~418~~	~~74~~
517.50	2.50		38	Medium Sand	38.3	255.7	***710.0***				~~710~~	~~0~~	~~0~~	~~390~~	~~77~~
515.00	2.50		25	Fine Sand	19.8	168.2	***729.8***				~~730~~	~~0~~	~~0~~	~~401~~	~~79~~
512.00	3.00		25	Fine Sand	23.8	168.2	***666.1***				~~666~~	~~0~~	~~0~~	~~366~~	~~82~~
509.00	3.00		12	Fine Sand	11.4	80.8	***677.5***				~~678~~	~~0~~	~~0~~	~~373~~	~~85~~
506.50	2.50		12	Fine Sand	9.5	80.8	***1279.2***				~~1279~~	~~0~~	~~0~~	~~704~~	~~88~~
504.00	2.50		100	Medium Sand	191.1	672.9	***1470.3***				~~1470~~	~~0~~	~~0~~	~~809~~	~~90~~
501.50	2.50		100	Medium Sand	191.1	672.9	***1230.7***				~~1231~~	~~0~~	~~0~~	~~677~~	~~93~~
499.00	2.50		36	Medium Sand	35.0	242.3	***1265.7***				~~1266~~	~~0~~	~~0~~	~~696~~	~~95~~
498.04	0.96		36	Medium Sand	13.4	242.3	***1373.4***				~~1373~~	~~0~~	~~0~~	~~755~~	~~96~~
493.04	5.00		50	Medium Sand	126.1	336.5	***1371.6***				~~1372~~	~~0~~	~~0~~	~~754~~	~~101~~
488.04	5.00		31	Medium Sand	55.5	208.6	***1649.2***				~~1649~~	~~0~~	~~0~~	~~907~~	~~106~~
483.04	5.00		64	Medium Sand	197.3	430.7	***1604.3***				~~1604~~	~~0~~	~~0~~	~~882~~	~~111~~
478.04	5.00		28	Medium Sand	48.2	188.4	***1699.7***				~~1700~~	~~0~~	~~0~~	~~935~~	~~116~~
473.04	5.00		35	Medium Sand	66.9	235.5	***1719.5***				~~1719~~	~~0~~	~~0~~	~~946~~	~~121~~
468.04	5.00		28	Medium Sand		188.4									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abutments
REFERENCE BORING ========== SB-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 595.16 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 593.16 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1020 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 40.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 204.00 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 76.50 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	**755** KIPS	**415** KIPS	**67** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
593.02	0.14	3.90	9		1.2		79.9	1.8		***13.2***	13	0	0	7	2
590.52	2.50	3.90	9		22.3	78.6	59.9	32.8	11.4	***39.9***	40	0	0	22	5
588.02	2.50	1.80	9		13.1	36.3	62.8	19.2	5.3	***57.6***	58	0	0	32	7
585.52	2.50	1.30	7		10.4	26.2	87.4	15.3	3.8	***75.0***	75	0	0	41	10
583.02	2.50	2.00	10		14.0	40.3	147.7	20.5	5.8	***102.3***	102	0	0	56	12
580.52	2.50	4.30	15		24.1	86.7	175.8	35.4	12.6	***138.2***	138	0	0	76	15
578.02	2.50	4.50	18		24.9	90.7	180.6	36.7	13.1	***172.0***	172	0	0	95	17
575.52	2.50	3.50	15		20.6	70.6	213.3	30.2	10.2	***204.0***	204	0	0	112	20
573.02	2.50	4.10	19		23.2	82.7	***216.3***	34.1	12.0	235.2	216	0	0	119	22
570.52	2.50	3.10	16		18.8	62.5	***235.1***	27.6	9.0	262.8	235	0	0	129	25
568.02	2.50	3.10	16		18.8	62.5	***270.0***	27.6	9.0	292.8	270	0	0	149	27
565.52	2.50	3.90	22		22.3	78.6	***292.3***	32.8	11.4	325.6	292	0	0	161	30
563.02	2.50	3.90	22		22.3	78.6	***282.6***	32.8	11.4	353.8	283	0	0	155	32
560.52	2.50		13	Fine Sand	2.7	46.6	***285.3***	3.9	6.7	357.7	285	0	0	157	35
558.02	2.50		13	Fine Sand	2.7	46.6	***283.7***	3.9	6.7	361.0	284	0	0	156	37
555.52	2.50	2.10	8		14.4	42.3	***298.1***	21.2	6.1	382.2	298	0	0	164	40
553.02	2.50	2.10	8		14.4	42.3	***361.6***	21.2	6.1	410.5	362	0	0	199	42
550.52	2.50		34	Hard Till	4.5	91.4	***366.0***	6.6	13.2	417.1	366	0	0	201	45
548.02	2.50		34	Hard Till	4.5	91.4	548.0	6.6	13.2	***449.4***	449	0	0	247	47
545.52	2.50		100	Hard Till	25.9	268.9	573.8	38.0	38.9	***487.4***	487	0	0	268	50
543.02	2.50		100	Hard Till	25.9	268.9	603.3	38.0	38.9	***525.9***	526	0	0	289	52
540.52	2.50		76	Fine Sand	28.2	272.5	631.5	41.5	39.4	***567.4***	567	0	0	312	55
538.02	2.50		76	Fine Sand	28.2	272.5	***527.1***	41.5	39.4	589.7	527	0	0	290	57
535.52	2.50		39	Fine Sand	9.1	139.8	***536.1***	13.3	20.2	603.0	536	0	0	295	60
533.02	2.50		39	Fine Sand	9.1	139.8	674.3	13.3	20.2	***635.1***	635	0	0	349	62
530.52	2.50		100	Very Fine Silty Sand	36.4	268.9	710.7	53.6	38.9	***688.6***	689	0	0	379	65
528.02	2.50		100	Very Fine Silty Sand	36.4	268.9	836.8	53.6	38.9	***755.2***	755	0	0	415	67
525.52	2.50		100	Medium Sand	49.5	358.5	886.3	72.8	51.9	***828.0***	~~828~~	~~0~~	~~0~~	~~455~~	~~70~~
523.02	2.50		100	Medium Sand	49.5	358.5	***774.5***	72.8	51.9	877.5	774	0	0	426	72
521.02	2.00		55	Medium Sand		197.2			28.5						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== North Abutments
REFERENCE BORING ========== SB-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 595.16 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 593.16 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1020 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 40.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 204.00 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 76.50 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.312" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 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
570 KIPS	**526** KIPS	**289** KIPS	**45** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
593.02	0.14	3.90	9		1.5		***47.2***				47	0	0	26	2
590.52	2.50	3.90	9		26.7	45.7	***49.3***				49	0	0	27	5
588.02	2.50	1.80	9		15.6	21.1	***59.0***				59	0	0	32	7
585.52	2.50	1.30	7		12.5	15.2	***79.7***				80	0	0	44	10
583.02	2.50	2.00	10		16.7	23.5	***123.3***				123	0	0	68	12
580.52	2.50	4.30	15		28.8	50.4	***154.5***				154	0	0	85	15
578.02	2.50	4.50	18		29.8	52.8	***172.5***				173	0	0	95	17
575.52	2.50	3.50	15		24.6	41.0	***204.2***				204	0	0	112	20
573.02	2.50	4.10	19		27.7	48.1	***220.1***				220	0	0	121	22
570.52	2.50	3.10	16		22.5	36.3	***242.6***				243	0	0	133	25
568.02	2.50	3.10	16		22.5	36.3	***274.5***				274	0	0	151	27
565.52	2.50	3.90	22		26.7	45.7	***301.1***				301	0	0	166	30
563.02	2.50	3.90	22		26.7	45.7	***369.5***				370	0	0	203	32
560.52	2.50		13	Fine Sand	10.3	87.5	***379.9***				380	0	0	209	35
558.02	2.50		13	Fine Sand	10.3	87.5	***327.3***				327	0	0	180	37
555.52	2.50	2.10	8		17.2	24.6	***344.5***				345	0	0	189	40
553.02	2.50	2.10	8		17.2	24.6	***508.7***				509	0	0	280	42
550.52	2.50		34	Hard Till	17.3	171.6	***526.0***				526	0	0	289	45
548.02	2.50		34	Hard Till	17.3	171.6	***876.4***				~~876~~	~~0~~	~~0~~	~~482~~	~~47~~
545.52	2.50		100	Hard Till	99.8	504.7	***976.2***				~~976~~	~~0~~	~~0~~	~~537~~	~~50~~
543.02	2.50		100	Hard Till	99.8	504.7	***1082.8***				~~1083~~	~~0~~	~~0~~	~~596~~	~~52~~
540.52	2.50		76	Fine Sand	108.8	511.4	***1191.6***				~~1192~~	~~0~~	~~0~~	~~655~~	~~55~~
538.02	2.50		76	Fine Sand	108.8	511.4	***1051.4***				~~1051~~	~~0~~	~~0~~	~~578~~	~~57~~
535.52	2.50		39	Fine Sand	35.0	262.4	***1086.5***				~~1086~~	~~0~~	~~0~~	~~598~~	~~60~~
533.02	2.50		39	Fine Sand	35.0	262.4	***1363.7***				~~1364~~	~~0~~	~~0~~	~~750~~	~~62~~
530.52	2.50		100	Very Fine Silty Sand	140.6	504.7	***1504.3***				~~1504~~	~~0~~	~~0~~	~~827~~	~~65~~
528.02	2.50		100	Very Fine Silty Sand	140.6	504.7	***1813.1***				~~1813~~	~~0~~	~~0~~	~~997~~	~~67~~
525.52	2.50		100	Medium Sand	191.1	672.9	***2004.2***				~~2004~~	~~0~~	~~0~~	~~1102~~	~~70~~
523.02	2.50		100	Medium Sand	191.1	672.9	***1892.5***				~~1892~~	~~0~~	~~0~~	~~1041~~	~~72~~
521.02	2.00		55	Medium Sand		370.1									

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abutments
REFERENCE BORING ========== SB-2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 594.23 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 592.23 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1020 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 40.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 204.00 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 76.50 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	**599** KIPS	**329** 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.)
591.00	1.23	1.50	9		5.7		19.8	8.4		***10.4***	10	0	0	6	3
588.50	2.50	0.70	6		6.3	14.1	46.3	9.3	2.0	***22.6***	23	0	0	12	6
586.00	2.50	1.70	7		12.6	34.3	48.8	18.5	5.0	***39.6***	40	0	0	22	8
583.50	2.50	1.20	9		9.8	24.2	70.7	14.5	3.5	***55.8***	56	0	0	31	11
581.00	2.50	1.80	8		13.1	36.3	81.7	19.2	5.3	***74.7***	75	0	0	41	13
578.50	2.50	1.70	11		12.6	34.3	96.3	18.5	5.0	***93.5***	93	0	0	51	16
576.00	2.50	1.80	10		13.1	36.3	113.4	19.2	5.3	***113.3***	113	0	0	62	18
573.50	2.50	2.00	16		14.0	40.3	138.1	20.5	5.8	***135.4***	135	0	0	74	21
571.00	2.50		19	Very Fine Silty Sand	3.6	51.1	155.1	5.2	7.4	***142.5***	143	0	0	78	23
568.50	2.50	3.20	19		19.2	64.5	174.3	28.3	9.3	***170.8***	171	0	0	94	26
566.00	2.50	3.20	19		19.2	64.5	***153.3***	28.3	9.3	193.3	153	0	0	84	28
563.50	2.50	1.20	16		9.8	24.2	***163.1***	14.5	3.5	207.7	163	0	0	90	31
561.00	2.50	1.20	16		9.8	24.2	***154.8***	14.5	3.5	219.6	155	0	0	85	33
558.50	2.50	0.30	2		2.9	6.0	***157.7***	4.3	0.9	223.8	158	0	0	87	36
556.00	2.50	0.30	2		2.9	6.0	***215.0***	4.3	0.9	236.0	215	0	0	118	38
553.50	2.50	3.00	17		18.4	60.5	***264.3***	27.0	8.8	267.5	264	0	0	145	41
551.00	2.50		34	Hard Till	4.5	91.4	***268.8***	6.6	13.2	274.1	269	0	0	148	43
548.50	2.50		34	Hard Till	4.5	91.4	450.7	6.6	13.2	***306.3***	306	0	0	168	46
546.00	2.50		100	Hard Till	25.9	268.9	476.6	38.0	38.9	***344.4***	344	0	0	189	48
543.50	2.50		100	Hard Till	25.9	268.9	462.1	38.0	38.9	***376.6***	377	0	0	207	51
541.00	2.50		85	Hard Till	19.1	228.5	481.2	28.0	33.1	***404.6***	405	0	0	223	53
538.50	2.50		85	Hard Till	19.1	228.5	451.9	28.0	33.1	***425.6***	426	0	0	234	56
536.00	2.50		67	Hard Till	12.4	180.1	464.3	18.2	26.1	***443.9***	444	0	0	244	58
533.50	2.50		67	Hard Till	12.4	180.1	565.4	18.2	26.1	***475.0***	475	0	0	261	61
531.00	2.50		100	Hard Till	25.9	268.9	591.3	38.0	38.9	***513.0***	513	0	0	282	63
528.50	2.50		100	Hard Till	25.9	268.9	***491.7***	38.0	38.9	532.9	492	0	0	270	66
526.00	2.50		40	Fine Sand	9.5	143.4	***501.1***	13.9	20.8	546.8	501	0	0	276	68
523.50	2.50		40	Fine Sand	9.5	143.4	582.3	13.9	20.8	***571.1***	571	0	0	314	71
521.00	2.50		60	Fine Sand	18.8	215.1	601.1	27.6	31.1	***598.7***	599	0	0	329	73
519.50	1.50		60	Fine Sand		215.1			31.1						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== South Abutments
REFERENCE BORING ========== SB-2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 594.23 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 592.23 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1020 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 40.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 204.00 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 76.50 KIPS

PILE TYPE AND SIZE ========== Metal Shell 14"Φ w/.312" walls
Pile Perimeter========== 3.665 FT.
Pile End Bearing Area========== 1.069 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
570 KIPS	**405** KIPS	**223** KIPS	**43** 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 SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL 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.)
591.00	1.23	1.50	9		6.8		***15.0***				15	0	0	8	3
588.50	2.50	0.70	6		7.6	8.2	***34.3***				34	0	0	19	6
586.00	2.50	1.70	7		15.0	19.9	***43.4***				43	0	0	24	8
583.50	2.50	1.20	9		11.8	14.1	***62.2***				62	0	0	34	11
581.00	2.50	1.80	8		15.6	21.1	***76.6***				77	0	0	42	13
578.50	2.50	1.70	11		15.0	19.9	***92.8***				93	0	0	51	16
576.00	2.50	1.80	10		15.6	21.1	***110.8***				111	0	0	61	18
573.50	2.50	2.00	16		16.7	23.5	***199.9***				200	0	0	110	21
571.00	2.50		19	Very Fine Silty Sand	13.7	95.9	***155.2***				155	0	0	85	23
568.50	2.50	3.20	19		23.0	37.5	***178.2***				178	0	0	98	26
566.00	2.50	3.20	19		23.0	37.5	***177.8***				178	0	0	98	28
563.50	2.50	1.20	16		11.8	14.1	***189.5***				190	0	0	104	31
561.00	2.50	1.20	16		11.8	14.1	***190.7***				191	0	0	105	33
558.50	2.50	0.30	2		3.5	3.5	***194.2***				194	0	0	107	36
556.00	2.50	0.30	2		3.5	3.5	***229.3***				229	0	0	126	38
553.50	2.50	3.00	17		21.9	35.2	***387.7***				388	0	0	213	41
551.00	2.50		34	Hard Till	17.3	171.6	***405.0***				405	0	0	223	43
548.50	2.50		34	Hard Till	17.3	171.6	***755.4***				~~755~~	~~0~~	~~0~~	~~415~~	~~46~~
546.00	2.50		100	Hard Till	99.8	504.7	***855.2***				~~855~~	~~0~~	~~0~~	~~470~~	~~48~~
543.50	2.50		100	Hard Till	99.8	504.7	***879.3***				~~879~~	~~0~~	~~0~~	~~484~~	~~51~~
541.00	2.50		85	Hard Till	73.6	429.0	***952.9***				~~953~~	~~0~~	~~0~~	~~524~~	~~53~~
538.50	2.50		85	Hard Till	73.6	429.0	***935.6***				~~936~~	~~0~~	~~0~~	~~515~~	~~56~~
536.00	2.50		67	Hard Till	47.9	338.2	***983.5***				~~983~~	~~0~~	~~0~~	~~541~~	~~58~~
533.50	2.50		67	Hard Till	47.9	338.2	***1197.9***				~~1198~~	~~0~~	~~0~~	~~659~~	~~61~~
531.00	2.50		100	Hard Till	99.8	504.7	***1297.7***				~~1298~~	~~0~~	~~0~~	~~714~~	~~63~~
528.50	2.50		100	Hard Till	99.8	504.7	***1162.0***				~~1162~~	~~0~~	~~0~~	~~639~~	~~66~~
526.00	2.50		40	Fine Sand	36.5	269.2	***1198.5***				~~1198~~	~~0~~	~~0~~	~~659~~	~~68~~
523.50	2.50		40	Fine Sand	36.5	269.2	***1369.6***				~~1370~~	~~0~~	~~0~~	~~753~~	~~71~~
521.00	2.50		60	Fine Sand	72.5	403.8	***1442.1***				~~1442~~	~~0~~	~~0~~	~~793~~	~~73~~
519.50	1.50		60	Fine Sand		403.8									