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Final Structure Geotechnical Report

BRIDGE REPLACEMENT
I270 OVER MISSISSIPPI RIVER AT CHAIN OF ROCKS
STRUCTURE NO. 060-0350
SECTION 60B-1
MADISON COUNTY, ILLINOIS

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March 26, 2021
Revised October 5, 2021

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Exp. Date: 10/5/2021

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SCI No. 2017-3167.10

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10/5/2021

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October 5, 2021

Mr. Brad E. Riechmann, P.E.
Horner & Shifrin, Inc.
604 Pierce Boulevard #300
O'Fallon, Illinois 62269

RE: Final Structure Geotechnical Report
Bridge Replacement
I270 over Mississippi River at Chain of Rocks
Structure No. 060-0350
Section 60B-1
Madison County, Illinois
SCI No. 2017-3167.10

Dear Mr. Riechmann:

Enclosed is our *Final Structure Geotechnical Report* dated March 2021 and revised October 5, 2021. It should be read in its entirety, and our recommendations considered in the design of the proposed bridge replacement.

This report is submitted to establish design information related to the above referenced project. The recommendations provided within the report are based on the boring and sounding locations drilled as of report date. Please call if you have any questions.

Respectfully,

SCI ENGINEERING, INC.

Prakash Paudel, E.I.T.
Staff Engineer

Thomas J. Casey, P.E.
Chief Geotechnical Engineer

PP/TJC/tlw

Enclosure

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I270 OVER MISSISSIPPI RIVER AT CHAIN OF ROCKS
STRUCTURE NO. 060-0350
SECTION 60B-1
MADISON COUNTY, ILLINOIS

1.0 PROJECT DESCRIPTION

The project will feature replacement of the existing bridge that carries I270 over the Mississippi River in Madison County, Illinois. The project will feature construction of a new multi-span double-structure bridge. We understand that the roadway will remain at or close to the existing elevation. A detailed grading plan was not available at the time of this report, however, we anticipated fill placement of up to 25 feet to the south for the east abutment approach to the bridge. Details regarding the extent and location of the roadway improvements will be addressed in a separate Roadway Geotechnical Report (RGR). SCI provided geotechnical engineering services for the project to include structure borings and a structure geotechnical report (SGR) for the bridge structure.

2.0 SUBSURFACE EXPLORATION

The station, offset, and elevation at each boring and sounding location were interpreted by SCI. The field exploration was performed in general accordance with procedures outlined in the *2016 IDOT Geotechnical Manual* and *2020 IDOT Geotechnical Manual* for 2018 dated borings and 2020-2021 dated borings respectively.

2.1 Drilling Exploration Methods

Sixty-six (66) standard penetration test (SPT) borings, designated B-# and BB-# were drilled for construction of the new bridge. Detailed boring locations are shown on the *Aerial Photograph*, Figures 2A-2B. Among the borings, sixty (60) borings were utilized for the design of the bridge. Also, six (6) borings (one at the west approach and five at the east approach) were drilled for use in evaluating the approach embankments. Fifty-six (56) of the structure borings were continued with rock coring techniques to evaluate the type and quality of the underlying bedrock, while the remaining four (4) structure borings were advanced to auger refusal. Auger refusal is a designation applied to any material that cannot be further penetrated by the power auger without extraordinary effort and is indicative of a very hard or very dense material, usually boulders or bedrock. Several of the structure borings were drilled during a preliminary phase of the project, prior to several interior bents being relocated. As such,

these borings no longer align with the substructure unit, but are included for complete documentation. The five (5) borings performed for the Illinois approach embankment were terminated at nominal depths ranging from 25 to 50 feet below the existing ground surface.

A Diedrich D-50 turbo drill rig, Diedrich B-57 truck-mounted drill rig, or CME-550 drill rig with hollow-stem or continuous flight augers were used to drill the borings. Samples were collected using a standard split-spoon sampler according to the methods outlined in ASTM D1586, "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils." Split-spoon samples were obtained on 2½-foot intervals in the upper 30 feet and on 5-foot intervals thereafter. In three (3) borings at the west overland section, continuous and/or full spoon (24-inches) samples were taken at the upper 10 feet to collect more samples for the determination of D_{50} (soil grain size corresponding to 50 percent finer), which is considered as one of the critical parameters for scour analysis. Shelby tube samples were collected at select locations within selected borings in place of SPT samples. Unconfined compressive strengths of cohesive split-spoon samples were measured with a Rimac testing apparatus or a pocket penetrometer when the sample was not conducive to Rimac testing. A geologist or geotechnical engineer from SCI was with the drill rig to supervise drilling, log the borings, and perform field unconfined compressive strength tests using a Rimac testing apparatus. Detailed information regarding the nature and thickness of the soils and rock encountered, and the results of the field sampling and laboratory testing are shown on the Boring Logs in Appendix A.

2.2 CPTu Exploration Methods

Additionally, a total of seven CPTu soundings (denoted as C-# on the Figures) were advanced at the approximate locations shown on the *Aerial Photograph,* Figures 2A through 2B, and *Site Plan,* Figure 3A through 3E. The site is in the flood plain and the geology features interbedded fluvial deposits and sand, silt and clay. The CPTu locations were selected to assess the range of properties in these deposits. The CPTu soundings were conducted in accordance with ASTM D5778 "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils." The equipment used was a Vertek Scorpion S4 mounted on a trailer.

The trailer rig is equipped with two auger anchors which, when deployed, can provide up to 20 tons of down pressure reaction. Refusal is determined when the anchors fail or pull from the ground. Alternatively, refusal can be achieved when the pressure tolerances of the cone are exceeded. This is indicated by a warning message when performing a sounding. Refusal to penetration is indicative of very dense or hard material, typically bedrock, boulders, or debris.

The CPTu hydraulically pushes an instrumented cone through the soil while continuous readings are recorded on a portable computer. The cone is advanced through the ground at a constant rate of 2 centimeters per second (2 cm/sec). Load cells or strain gauges within the cone measure the in-situ parameters of the soil: tip resistance, friction and pore water pressure. These in-situ measurements of tip, side resistance, and porewater pressure are recorded every 2 centimeters (approximately 1 inch). These measurements are an evaluation of soil strength, which is used to interpret how they will behave due to loading.

The *CPTu Logs* in Appendix B of this report graphically illustrate the relative strength of the soils encountered and provide an approximate soil stratigraphy. Stratification lines on the *CPTu Logs* represent approximate boundaries between ***soil behavior types*** based on accepted correlations between the tip, side, and porewater pressure measurements.

2.3 Laboratory Procedures

Advanced laboratory testing was conducted to classify the samples, determine index properties, and characterize the soil's behavior. These tests include:

- Sieve Analysis / Grain Size Analysis (ASTM D422);
- Sieve Analysis / Wash <#200 (ASTM D1140);
- Unconfined Compressive Strength testing (ASTM D2166);
- One Dimensional Consolidation (ASTM D2435);
- Classification of Soils for Engineering Purposes (USCS) (ASTM D2487);
- Visual Soil Classification (ASTM D2488);
- Unconsolidated Undrained Triaxial (ASTM D2850);
- Unit Weight Determination (ASTM D2937);
- Atterberg Limits (ASTM D4318);
- Moisture Content (ASTM D4959);
- Unconfined Compressive Strength of Rock Core Specimen (ASTM D7012); and
- Sieve Analysis / Hydrometer (ASTM D7928).

The results of the laboratory testing are included on the Boring Logs in Appendix A and are also included as separate sheets within Appendix A.

2.4 Generalized Subsurface Profiles

The following sections summarize the subsurface soil conditions encountered within each of the borings and are broken up into defined project areas along the bridge alignment. The subsurface profiles are graphically presented in Figures 4A through 4E.

2.4.1 West Abutment

The overburden encountered in borings within this region of the project (BB-01, BB-02 and B-101) generally consisted of 3 to 20 feet of fill, consisting of silt, clay, and loam with various amounts of sand and crushed rock. The fill was medium stiff to stiff in consistency. Borings B-101 and BB-02 were drilled at the base of the embankment and do not include the full height of the embankment fill. BB-01 was drilled through the bridge deck and near the top of the embankment. Beneath the fill are interbedded natural deposits of clay (A-6 and A-7) and silt (A-4) to depths of approximately 28 to 33 feet (El 389.6 to 377.6). The native soils were generally very soft to medium stiff in consistency. In boring B-101, the overburden soils were underlain by a gray clayey shale, which extended to a nominal depth of 38.8 feet (El 381.3). Beneath the shale and the overburden, boring B-101 encountered weathered limestone bedrock with interbedded clayey shale seams, which extended to the termination of boring at depth of 41.5 feet (El 377.6). Auger refusal was encountered at the termination depths of all three borings. Auger refusal is indicative of very dense or hard material, which is typically bedrock, boulders, or debris. No rock coring was performed beyond the auger refusal depth in these borings.

Groundwater was encountered during drilling in all three borings at depths ranging from 3.5 to 27.5 feet (El 415.6 to El. 409.6). Based on the proximity to the Mississippi River, we anticipate that the groundwater elevation will be highly influenced by the elevation of the river.

2.4.2 West Over-Land Section

The overburden encountered in two borings (BB-03 and BB-05) drilled for this section generally consisted of 11 to 20 feet of fill, consisting of very soft to medium stiff silt to silty clay and loam with various percentage of sand. These borings were also drilled at the base of the embankment and do not include the full height of the embankment fill. Boring BB-03 was drilled through the bridge deck while BB-05 was drilled directly from the ground surface underneath the existing bridge. The fill layer was underlain by the natural soils consisting of clay loam (A-6) and sandy loam (A-2) down to the auger

refusal depth of boring BB-03 at approximately 33.5 feet (El 386.5). Similarly, the natural soils in boring BB-05 consisted of silt (A-4) to silty loam and clay (A-6) with various amounts of sand to the refusal depth at approximately 36 feet (El 384.4).

The limestone bedrock was cored using NQ wireline rock coring methods to a nominal depth of 30 feet into bedrock at both locations. The recovery was 100 percent for all the rock core runs. The RQD ranged from 76 to 98 percent, with an average RQD value of 84 percent. The overall rock quality ranged from Good to Excellent and was generally Good. The uniaxial compressive strength on select rock core samples ranged from 350 to 911 tsf with an average strength of approximately 616 tsf.

Groundwater was not encountered in boring BB-03 while it was encountered after drilling at 34.1 feet (El 386.3) in boring BB-05. Based on the proximity to the Mississippi river, we anticipate that the groundwater elevation will be highly influenced by the elevation of the river.

2.4.3 Over-Water Section

For the over-water section, thirty-five (35) bent locations were explored. Borings BB-23, BB-36, and BB-38 had to be offset once while BB-16 had to be offset twice to drill them down to the planned depth. The depths to mudline within the Mississippi River varied from 2.1 to 37.2 feet. The mudline soils at the river bottom generally consisted of very soft silts and clays, very loose sands, and gravels and extended to depths ranging from 0.7 to 28.5 feet below the mudline. The mudline soils at all boring locations were underlain by limestone bedrock. As an exception, the bedrock was encountered at the river bottom without any mudline soils in borings BB-10 and BB-12. The bedrock generally appeared to dip towards the east with its top elevations ranging from 391.5 feet (at BB-08 on the west end) down to 340.7 feet (at BB-34 on the east end).

The limestone bedrock was cored using NQ wireline rock coring methods to a nominal depth of 30 feet into bedrock at all the locations except BB-10, BB-16A, BB-16B, BB-23, and BB-36 where the coring was stopped at a shallower depth due to drilling issues (tool breakage, casing movement resulting in binding due to river flow, etc…). The recovery ranged from 38 to 100 percent with an average recovery of 96 percent. The RQD ranged from 0 to 100 percent, with an average RQD value of 80 percent. The overall rock quality ranged from Very Poor to Excellent and was generally Good. The uniaxial compressive strength on select rock core samples ranged from 212 to 1,404 tsf with an average strength of approximately 693 tsf.

2.4.4 East Over-Land Section

The overburden encountered in the over-land generally consisted of interbedded colluvial deposits to depths ranging from 4 to 34 feet (elevation 417.4 to 376.8 feet). The upper colluvial soils consisted of sandy silts (A-4), silty to sandy clays, (A-6 and A-7) and clays (A-7). The fine-grained materials were very soft to stiff and were typically soft in consistency. Beneath the upper soils are silty to clean sands (A-1 and A-2) with various amounts of gravel, which extend to the top of bedrock. The bedrock depth varied from 71 to 81.6 feet and its top elevations from 327.2 to 345.1 with an average depth of 76.5 and average elevation of 337.6. The depth of rock tended to be deeper as the alignment moved to the east. Weathered limestone was encountered within seventeen (17) of the twenty (20) borings within this section and ranged in thickness from 0.8 feet to 5.0 feet with an average thickness of 2.1 feet.

The limestone bedrock was cored using NX rock coring methods an additional 15.5 to 40 feet beyond auger refusal in seventeen (17) of the twenty (20) borings within this section. The recovery ranged from 0 to 100 percent with an average recovery of 95 percent. The RQD ranged from 0 to 96 percent, with an average RQD value of 57 percent. The uniaxial compressive strength on random rock core samples ranged from 208 to 1,413 tsf with an average strength of 789 tsf. The overall rock quality ranged from Very Poor to Excellent and was generally Fair.

Groundwater was encountered during drilling in several of the borings at elevations ranging from 409 to 397.8 feet with an average elevation of 403.7 feet. Based on the proximity to the Mississippi River, we anticipate that the groundwater elevation will be highly influenced by the elevation of the river.

2.4.5 East Approach and Abutment

The overburden encountered in the east approach abutment area generally consisted of fill underlain by interbedded colluvial deposits to depths ranging from 8 to 34 feet (El 398.5 to 417.4) with an average depth of 20 feet (El 409.2). The upper colluvial soils consisted of sandy silts (A-4), silty to sandy clays, (A-6 and A-7) and clays (A-7). Generally, the deeper surficial deposits were associated with the existing I-270 embankment, which is approximately $\pm$22 feet higher in elevation than the surrounding ground surface. The fine-grained materials were soft to stiff and were typically medium stiff in consistency. Beneath the upper soils are silty to clean sands (A-1 and A-2) with various amounts of gravel, which extend to the top of bedrock. The bedrock depth varies from 95.3 to 96.0 feet (El 330.9 to 331.3) with an average depth of 95.7 (El 331.1). Weathered bedrock was encountered within both deep borings that encountered limestone and ranged in thickness from 0.4 feet to 0.7 feet with an average thickness of 0.5 feet. The limestone bedrock was not cored at the abutment or approach embankment locations.

Groundwater was encountered during drilling in several of the borings and CPTu soundings at depths ranging from 8 to 41 feet (El 401 to 413.9) with an average depth of 17.9 feet (El 406.7). Based on the proximity to the Mississippi River, we anticipate that the groundwater elevation will be highly influenced by the elevation of the river.

3.0 GEOTECHNICAL EVALUATIONS

In order to provide design recommendations for supporting the structures, we performed the following evaluations based on all available data collected and reviewed at the time of this report. This information includes subsurface explorations performed by SCI, preliminary TS&L plans, and communications with Horner & Shifrin, Inc. (H&S) and Parsons Transportation Group (PTG) personnel familiar with the project. The preliminary TS&L is attached to the SGR as Appendix G.

3.1 Seismic Considerations

3.1.1 Design Earthquake

For the purposes of seismic design, the bridge has been classified as *Critical*. According to the Illinois Department of Transportation, the structure should be designed to a design earthquake with a 2 percent Probability of Exceedance (PE) over a 50-year exposure period (i.e. a 2,500-year design earthquake). According to the procedures outlined in the All Geotechnical Manual Users (AGMU) 10.1, *Liquefaction Analysis Procedure,* and data provided by the United States Geological Survey (USGS) National Seismic Hazard Mapping Project, the design earthquake has a Moment Magnitude (Mw) of 5.3 and a Peak Ground Acceleration (PGA) of 0.48, for the purposes of evaluating the liquefaction potential at the project site.

3.1.2 Site Class Determination

The seismic site soil classification for the bridge site was determined from the design earthquake data, the subsurface data, and the procedures described in the AASHTO Bridge Manual with modifications from IDOT Bureau of Bridges and Structures (BBS) [Refer to the Structural Design Criteria, dated May 2020 for additional information]. The Site Class was evaluated using methods defined as A, which include evaluating the shear wave velocity (Vs) profiles for the site. Generally, method A is considered the most accurate method of determining the soil site class and is typically required when bedrock is encountered at a relatively shallow depth. For the overwater section, the drilled shaft foundations are assumed to be supported entirely within the underlying bedrock as the resultant scour would remove a majority of the soft underconsolidated soils encountered at the river bottom. For this section, the average shear wave

velocity was measured on each side of the river and only the values measured within the limestone were considered as representative for the limestone bedrock within the river. The results of this evaluation are summarized in Table 3.1. Seismic design parameters are summarized in Tables 3.2A through 3.2C.

Table 3.1 - Site Class Determination Results for Various Structure Segments

Section	Weighted Average Vs (ft/sec)	Site Class
West Approach (Unit 1 – W. Abut, Piers 1 to 3)	1,430	C
Overwater section (Units 2&3 – Piers 4 to 16)	3,600	AB
Over-Land/East Approach (Units 4&5 – Piers 17-25, E. Abut)	1,025	CD

Table 3.2A – Seismic Design Parameters for West Approach

Seismic Design Parameters	
Site Class	C
Design Spectral Acceleration at 0.2 sec (S_{DS})	0.608
Design Spectral Acceleration at 1.0 sec. (S_{D1})	0.204
Site Coefficient (As)	0.303
Seismic Performance Zone	2
Seismic Design Category	D

Table 3.2B – Seismic Design Parameters for River Section

Seismic Design Parameters	
Site Class	AB
Design Spectral Acceleration at 0.2 sec (S_{DS})	0.465
Design Spectral Acceleration at 1.0 sec. (S_{D1})	0.153
Site Coefficient (As)	0.307
Seismic Performance Zone	2
Seismic Design Category	C

Table 3.2C – Seismic Design Parameters for East Approach and Over-Land Section

Seismic Design Parameters	
Site Class	CD
Design Spectral Acceleration at 0.2 sec (S_{DS})	0.668
Design Spectral Acceleration at 1.0 sec. (S_{D1})	0.279
Site Coefficient (As)	0.300
Seismic Performance Zone	2
Seismic Design Category	D

3.1.3 Liquefaction Potential Analysis

The analysis to assess the liquefaction potential for the site was conducted in general accordance with the guidelines outlined in AGMU 10.1. The analysis was conducted using the soil test boring data, as well as the CPTu and shear wave velocity data collected for the project as well. The soil test boring data was analyzed initially using the IDOT-developed spreadsheets. All of the sources of information were then evaluated using the software program, *CLiq and LiqSVs* published by Geologismiki Geotechnical Software. The software program utilizes up to five different state-of-practice methods for evaluating CPTu data and two different methods for evaluating soil test boring and shear wave velocity data. In addition to evaluating the potential for liquefaction, the program offers tools to evaluate the overall probability of liquefaction occurring as well as the range of settlements possible.

To better understand the dynamic behavior of the soils, we performed a two-phase approach. The first phase was a basic liquefaction potential analysis, while the second phase was a broader risk assessment. The overall risk assessment consisted of a parametric study to evaluate the probability of liquefaction utilizing all the various methods and available data, and the potential outcome if liquefaction were to occur. The results of the liquefaction analysis are provided in Appendix C2.

For seismic hazard evaluations, it is generally not prescribed to assume that earthquakes would coincide with other extreme loading events, (i.e. reoccurring flood events). The average seasonal groundwater elevation used in the analysis was estimated from the typical pool elevation of the Mississippi River. This was done by evaluating 13+ years of river elevation data available for the St. Louis gage, which was the primary gage referenced for the geotechnical portions of the project. This “median” pool elevation was then adjusted up 7.51 feet to account for the distance upstream from the gage to the project site. The value was derived by measuring a surface elevation of the water at the project site and comparing it to the gage reading at that time. Based on the data, the mean elevation of 402.6 was utilized for the

overall liquefaction analysis. This elevation corresponds to a flood stage height of approximately 15.5 at the St. Louis gage. Additionally, for the initial evaluation using the IDOT spreadsheets, an elevation approximately 4 feet higher was selected to provide a conservative first estimate of liquefaction potential.

Sands located above the groundwater table are not susceptible to liquefaction. Additionally, research has shown that liquefaction below 50 to 60 feet is unlikely to occur except for rare instances. Guidance within the CLiq manual indicates that 50 feet is typically adequate stating "*Experience has shown that the 50-foot (15-m) depth may be adequate for the evaluation of liquefaction potential in most cases, however, there may be situations where this depth may not be sufficiently deep."* The California Department of Transportation guidelines for Liquefaction Evaluation and DMG Special Publication 1171 [1](SP117) "*Recommended Procedures for Implementation of Guidelines for Analyzing and Mitigating Liquefaction Hazards in California,"* reiterate this guidance and require a minimum depth of investigation of 50 feet below finished grade when evaluating for liquefaction unless deep foundations or below grade structures may be influenced, at which point deeper investigations may be required. For the purposes of this analysis, the lower limit of liquefaction was set at 50 feet below existing grades as all the foundations will penetrate the overburden soils and bear on or in the underlying bedrock.

Based on our analyses, most of the soils have sufficient strength and/or a plasticity index that make the threat of liquefaction minimal during the design earthquake. However, isolated relatively thin (~5 feet or less) layers of loose sands encountered at the top of the sand layer may be susceptible to liquefaction during a design event. The potentially liquefiable soils were encountered within a portion of the bridge borings evaluated. A majority of the occurrences happened just below the groundwater table surface, where it's possible that sample disturbance and differential head condition may have existed at the time of sample collection. This can sometimes result in SPT N-values being lower than actual. Additionally, some deeper occurrences of isolated liquefaction were predicted as well.

As part of the hazard analysis, SCI considered the probability that the soils would liquefy during the design event based on three indices: Liquefaction Probability Index (LPI), Liquefaction Severity Number (LSN), and the overall probability to liquefy. Then from that, an estimate of potential settlements is predicted if liquefaction were to occur. The methods assess the overall likelihood of the soils liquefying as well as the likelihood of the liquefaction manifesting itself as a surface disruption. Table 3.3 presents the ranges and values for each index.

[1] Arulmoli, K, Baez, J.I., Blake, T.F., Earnest, J., Gharib, F., Goldhammer, J., Hsu, D., Kupferman, S., O'Tousa, J., Real, C.R., Reeder, W., Simantob, E., and Youd, T.L. (1999), "Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction Hazards in California."

Table 3.3 – Summary of Scale for Probability Analysis Results

Probability		Liquefaction Probability Index (LPI)	
0 to 12	Low Probability	0 to 5	Minor/Low
12 to 55	High Probability	5 to 15	Moderate/Medium
>55	Very High Probability	>15	Major/High

For the CPTu testing data, the four primary soundings were evaluated using five different methods for estimating liquefaction potential, for a total of twenty data points.

When considering the probability, 15 of the 20 total iterations, or 75 percent, fell below 12, indicating a low probability of liquefaction even occurring. Of the five iterations to fall within the range of high probability, four of the occurrences were associated with soundings C-107 and C-118. Similarly, for the LPI, 33 of 39 iterations, fell into the low risk category with a value below 5. The six remaining analyses fell in the range between 5.5 and 14.5 were again four of the instances were associated with sounding C-107 and C-118. While evaluating the LSN, which is an indicator of the level of severity of the effects of liquefaction, 37 of 39, or 95 percent, fell within a range of little to minor impacts. The remaining two instances fall within the range of moderate to severe impacts, but are also only associated with a single sounding, C-118. When evaluating the potential outcome of the liquefaction, the parametric study indicated that in 31 of the 39 iterations, the predicted settlement was less than 2 inches, while the remaining eight iterations ranged from 2.1 to 5.1 inches. The four highest predictions of settlement occurred within four of the soil test borings, that also had a low probability of occurrence.

As previously referenced, it is anticipated that all of the piles and/or drilled shafts will extend through the potentially liquefiable soils and bear on or in the underlying bedrock. Additionally, the unbraced length of the piles during liquefaction should not be a concern as the potentially liquefiable layers are relatively thin (less than 5 feet thick) and do not uniformly occur across the site. While the amount of the seismically-induced settlement is dependent on the magnitude and distance from the seismic event, SCI estimates that the impacts from the design earthquake will be negligible.

3.2 Abutment Approach Settlement

Preliminary information provided by Horner & Shifrin, Inc. indicated up to 25 feet of fill could be placed near the west and east abutment approaches. The following preliminary evaluations are based on the data obtained in the STBs and CPTs performed in the vicinity of the approach embankments.

3.2.1 East Abutment

Based on the soils encountered in the STBs and CPTs performed within the proposed footprint of the east embankment, settlement due to the additional fill placed along the south side of the existing east approach abutment was estimated to be less than 1 inch. Although the predicted settlement is greater than the 0.4 inch typically used by the Department as a limiting value for effecting the structure, based on the stiffness of the soils, the settlement will be primarily elastic deformation and will occur prior to placing the bridges in operation. To minimize the effects of settlement on the embankment approach slab, we recommend the eastern embankment should be constructed and in place a minimum of 120 days prior to constructing the approach slabs or performing final paving. Due to the elastic nature of the estimated settlement and the fact that the abutment piles will be installed to the top of rock, downdrag effects on the piles for the east abutment bay be neglected.

3.2.2 West Abutment

After the beginning of the project, it was determined that the west approach embankment would be included within the design of the Riverview Drive project as that project already included a large portion of the approach embankment and associated ramps. Based on that report, by others, dated May 2020, settlement due to the new fill could range up to 10 inches. The report also indicates a majority of the settlement could take up to 12 months. To minimize the effects of settlement on the structure (i.e. abutment foundations), we recommend the approach embankment be constructed and in place a minimum of 270 days prior to constructing the approach slabs. Based on the anticipated settlement time, the effects of downdrag should be considered in the design of the piles for the west abutment. Also, as an alternative, the pile locations could be pre-cored through the soil layers contributing to downdrag. However, pre-coring would need to terminate near the top of bedrock at a nominal elevation of 389. Downdrag effects on the piles due to settlement are addressed further in the Bridge Foundation Section of this report.

3.3 Bridge Approach Slabs

The bridge approach slabs should be designed to bear on existing embankment fill or newly placed low plastic structural fill. In evaluating the bearing resistance of the slabs, we recommend using a modulus of subgrade reaction of 150 pounds per square inch per inch of deflection (pci). Based on the planned fill height and the soils encountered at abutments, we do not anticipate any bearing capacity concerns for the approach slabs.

3.4 Slope Stability

The global slope stability of the east approach embankment was analyzed for end-of-construction (short-term), long-term, and seismic (pseudo-static) loading conditions, at two cross-sections, as shown on Figure 3. The analyses were conducted using limit equilibrium slope stability methods and the commercially available software program Slide 2018 (developed by Rocscience, Inc.). The analyses considered soil properties from the subsurface exploration data, and the given slope geometries. To account for traffic loading, a surcharge load of 250 psf was applied to the analyses. For the seismic evaluation, the peak ground acceleration (PGA) from the design earthquake along with procedures for seismic slope stability outlined in Federal Highway Administration (FHWA) publication FHWA-HI-99-012 *Geotechnical Earthquake Engineering* were utilized. Soil parameters used in the analyses and the results of the analyses are shown on the output plots in Appendix C3.

A Morgenstern-Price analysis with a circular mode of failure was used to search for the critical factor of safety (FS). The required minimum factors of safety were obtained from Section 6.10.4 of the 2020 IDOT Geotechnical Manual for the global slope stability. The results of the global slope stability analyses are presented in Table 3.4 below.

Table 3.4 – Summary of Estimated Global Slope Stability Factors of Safety

Analyzed Cross-section	Short-Term Static Condition		Long-Term Static Condition		Seismic Condition	
	Required FOS	Estimated FOS	Required FOS	Estimated FOS	Required FOS	Estimated FOS
A-A	1.3	2.2	1.3	1.6	1.0	1.1
B-B	1.3	2.6	1.3	1.7	1.0	1.7

3.5 Scour Considerations

We understand that scour protection will be provided at the bridge abutments and along the roadway embankments. Therefore, data to be used in evaluating scour in these areas was not evaluated, nor should it affect the project during the lifespan of the structure.

We understand that scour may occur adjacent to the Mississippi River bridge bents to the depth of rock. Additionally, we understand that the bridge bents founded on land will be susceptible to scour. To evaluate the potential scour elevation, the particle size distribution of select samples collected within the upper 40 feet of the landside bridge bents were measured. The D95 and the D50 were determined using Sieve Analysis / Grain Size Analysis (ASTM D422) and Sieve Analysis / Hydrometer (ASTM D7928). The D95 corresponds to the particle size greater than 95 percent of all of the particle sizes within the sample by weight. The D50 value corresponds to the median grain size, by weight. This sieve analysis data is presented in Appendix A. Based on the provided TS&L, the design scour elevations for the 100-year and 200-year events for the abutment and interior bents are shown in Table 3.5 below.

Table 3.5 – Summary of Design Scour Elevations

Pier	Eastbound Bridge		Westbound Bridge	
	Q100	Q200	Q100	Q200
West Abutment	441.5	441.5	441.6	441.6
Pier 1	386.5	386.5	385.6	385.6
Pier 2	385.9	385.9	385.9	385.9
Pier 3	391.5	391.5	389.1	389.1
Pier 4	385.6	385.6	380.9	380.9
Pier 5	384.7	384.7	385.7	385.7
Pier 6	383.7	383.7	385.4	385.4
Pier 7	380.9	380.9	382.6	382.6
Pier 8	373.0	373.0	374.6	374.6
Pier 9	372.9	372.9	368.9	368.9
Pier 10	370.3	370.3	367.7	367.7
Pier 11	364.7	364.7	366.4	366.4
Pier 12	364.7	364.7	356.3	356.3
Pier 13	347.3	347.3	346.5	346.5
Pier 14	342.4	342.4	343.1	343.1
Pier 15	340.7	340.7	344.6	344.6
Pier 16	347.6	347.6	345.5	345.5
Pier 17	346.3	346.3	344.1	344.1
Pier 18	345.0	345.0	343.6	343.6
Pier 19	381.2	371.8	381.2	371.8
Pier 20	381.2	371.8	381.2	371.8

Table 3.5 – Summary of Design Scour Elevations (continued)

Pier	Eastbound Bridge		Westbound Bridge	
	Q100	Q200	Q100	Q200
Pier 21	381.2	371.8	381.2	371.8
Pier 22	381.2	371.8	381.2	371.8
Pier 23	381.2	371.8	381.2	371.8
Pier 24	381.2	371.8	381.2	371.8
Pier 25	381.2	371.8	381.2	371.8
East Abutment	439.8	439.8	439.7	439.7
Item 113	5		5	

3.6 Bridge Foundations

The foundation supporting the proposed bridge must provide sufficient support to resist dead and live loads, including seismic loads. Two potential foundation options were considered for supporting the new bridge structure that include driven steel H-piles at the abutments and drilled shafts socketed into bedrock for the interior bents. For the driven pile option, we recommend a minimum of one test pile be installed for each abutment to verify capacity and overall pile length. Recommendations for all the potential foundation options are provided below.

3.6.1 Driven Steel Piles

The structural capacity of driven piles depends on the allowable stress and cross-sectional areas of steel. The pile recommendations in this report assume that Steel H-piles will conform to AASHTO M270 Grade 50 (ASTM 709 Grade 50) or equivalent with a minimum yield stress of 50 kips per square inch (ksi).

Based on the Bridge Manual, a geotechnical resistance factor (φ_G) of 0.55 was used for the design of the H-pile foundations. Due to the potential for downdrag on the west abutment we recommend the use of bond breakers or pre-coring, as previously discussed, to reduce the effects of downdrag on the piles. Tables for both downdrag and no downdrag are included in the pile design tables in Appendix E. For the east abutment, geotechnical losses associated with down-drag due to settlement were not considered during the static and seismic pile design for the abutment piles. Although isolated liquefaction is a potential concern, geotechnical losses due to liquefaction were not considered in the seismic pile design (see discussion presented in Section 3.1.3 Liquefaction Potential Analysis). During the seismic event, the Bridge Manual allows the use of a Geotechnical Resistance Factor (φ_G) of 1.0. All estimates of capacity were calculated using the "Modified IDOT Static Method" spreadsheet associated with the Bridge Manual and assume construction verification will follow the "WSDOT" formula outlined in the Bridge

Manual. The top elevations of the piles were obtained from the information provided by H&S on the preliminary TS&L included in Appendix G. The tip elevations were calculated from the Modified IDOT Static Method spreadsheets based on the available factored resistance.

SCI recommends a minimum driven pile center-to-center spacing of three pile diameters, as recommended by the Bridge Manual. The maximum spacing shall be limited to 3.5 times the effective footing thickness plus 1 foot, but not to exceed 8 feet. Once the final spacing is determined, the piles should be evaluated for group effects.

A summary of the design capacities, or factored resistance available (R_F), seismic factored resistance (R_{Fseis}), and nominal required bearing (RN) is presented in Appendix E for each steel pile size. The summary of estimated maximum drivable pile length is given below in Table 3.6.

Table 3.6 – Summary of Estimated Pile Lengths

Pile Type and Size	Estimated Maximum Pile Length (feet)		$R_{N\ max}$ (kips)
	West Abutment	East Abutment	
Steel HP 12×53	55	106	419
Steel HP 12×63	56	106	497
Steel HP 12×74	56	112	589
Steel HP 12×84	57	112	664
Steel HP 14×73	56	111	578
Steel HP 14×89	56	112	705
Steel HP 14×102	57	113	810
Steel HP 14×117	58	113	929

SCI was provided with the foundation loads for HP piles for both Eastbound and Westbound structures in July 2021 and are summarized in Table 3.7 below.

Table 3.7 – Summary of Foundation Loads for HP Piles

	West Abutment	East Abutment	
Total Factored Substructure Load - LRFD	2800	2500	[kip]
Total Factored Substructure Load - SEISMIC	1700	1700	[kip]
Total Length of Substructure (along skew)	68.326	60.146	[ft]
Number of rows of piles per substructure	2	2	

3.6.2 Drilled shafts

We anticipate that drilled shaft foundations will be suitable to support the river bents and the interior land bridge bents. For the purpose of determining the economic feasibility for the drilled shaft option, the factored tip resistance and/or a factored skin friction are provided in the summary design tables detailed in Appendix F. Drilled shafts should be spaced no closer than three shaft diameters, center to center. Due to the observed groundwater table, and the sands and gravels encountered during our exploration, casing will be required in the soil to prevent collapsing of the side walls during installation. Drilled shafts for the interior bents should be socketed into bedrock. It is not anticipated that drilled shafts would be used at that abutment locations.

The values presented in Appendix F reflect a geotechnical resistance factor (φ_G) of 0.50 for tip resistance and 0.55 for skin friction, for strength limit design. For seismic considerations, a (φ_G) of 1.0 should be used to calculate the seismic factored resistance available (R_{fseis}). Foundation loads for a single drilled shaft at each pier location were provided to SCI in July 2021 are summarized in Table 3.8 below.

Table 3.8 – Summary of Foundation Loads on a Single Drilled Shaft

Pier	Extreme [kip]	Strength [kip]	Service [kip]
Pier 1	3000	3200	2500
Pier 2	3000	3200	2500
Pier 3	3600	4000	2800
Pier 4	3400	4000	3100
Pier 5	3600	4000	3100
Pier 6	3900	4000	3100
Pier 7	3600	4000	3100
Pier 8	3600	4000	3100
Pier 9	3600	4000	3100
Pier 10	3200	4000	2800
Pier 11	3600	4600	3200
Pier 12	3600	4600	3200
Pier 13	3800	4800	3400
Pier 14	4000	4800	3400
Pier 15	4000	4800	3400
Pier 16	4000	4800	3400
Pier 17	4600	4200	3000

Table 3.8 – Summary of Foundation Loads on a Single Drilled Shaft

Pier	Extreme [kip]	Strength [kip]	Service [kip]
Pier 18	4800	5200	3800
Pier 19	5400	5000	3600
Pier 20	5400	5000	3600
Pier 21	5400	5000	3600
Pier 22	5400	5000	3600
Pier 23	4600	5000	3600
Pier 24	4000	4200	3200
Pier 25	5200	4800	3600

3.6.2.1 Drilled Shaft QA/QC and Construction Considerations

A construction method using a casing for the interior bents will be required due to the various sand layers that were encountered during the investigation. The auger cuttings should be observed as the shafts are drilled to document that competent materials are present. QA/QC for the drilled shafts should include a combination of using a shaft inspection device (SID camera) to ensure the bottom is clean and the socket is uniform and stable. This will also verify that the estimated uplift capacities are present. Crosshole Sonic Logging (CSL) testing should be performed to verify the integrity of the concrete after placement.

3.7 Lateral Pile Response

A representation of the shaft response under lateral loading exceeding 3 kips per pile is required for design of the bridge superstructure per Section 3.10.1.10 of the 2009 Bridge Manual. 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. The non-linear soil springs are commonly referred to as P-Y curves.

Based on the encountered subsurface conditions, tables summarizing approximate soil modulus parameters (k) for the LPILE analyses at each boring are included in Appendix D (Reference: LPILE User's Manual, Ensoft, Inc., 2019). When pile/shaft design details and load information are refined in the development of the structure plans, LPILE analyses, if warranted, can be performed.

4.0 CONSTRUCTION CONSIDERATIONS

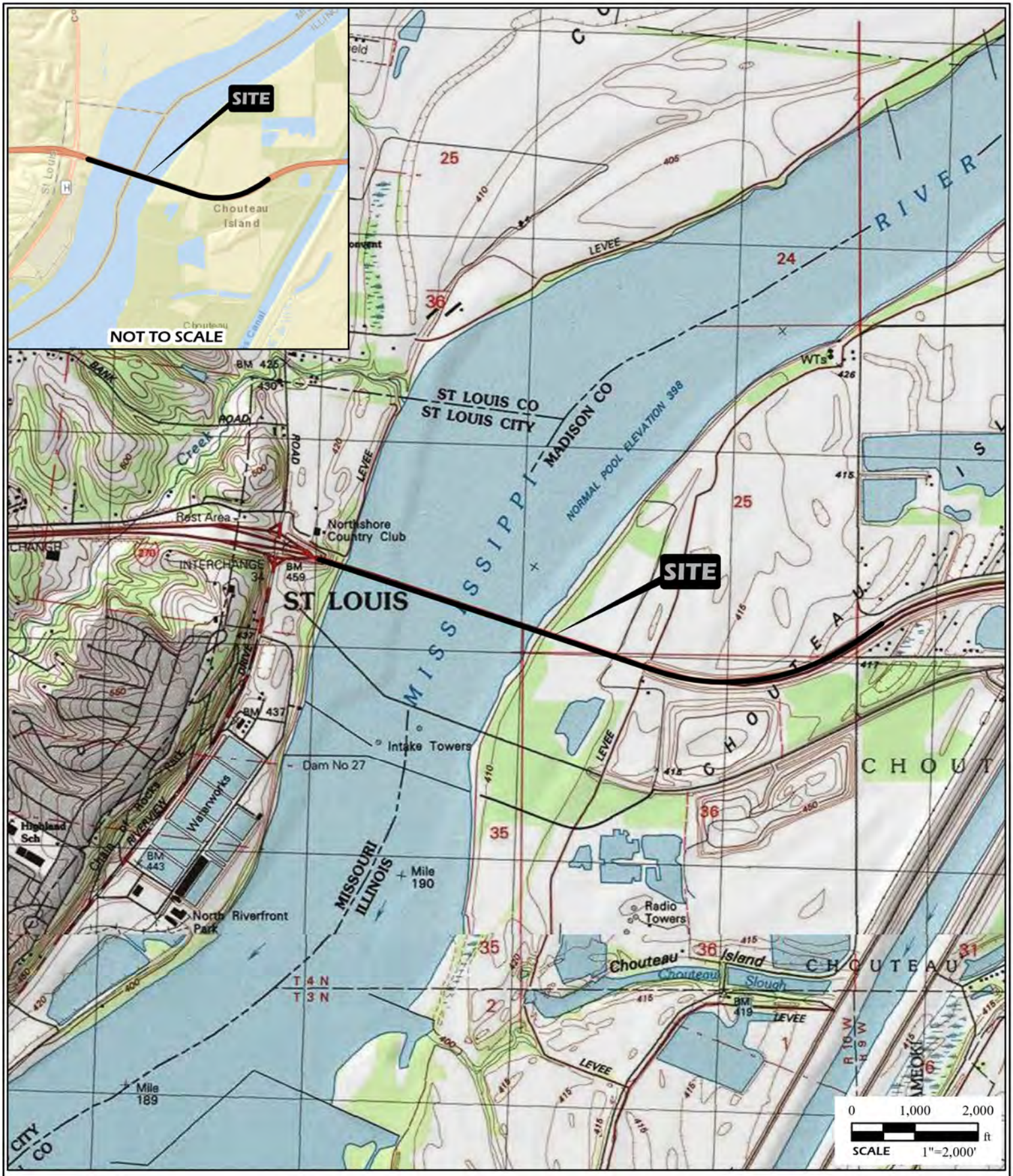
The construction activities should be performed in accordance with the current *IDOT Standard Specifications for Road and Bridge Construction* and any pertinent Special Provisions or policies. We anticipate that temporary sheeting, including cantilever temporary sheet piling, will be feasible according to *Section 3.13.1 – Temporary Sheet Piling Design*. As such, staged construction will be required for this project. Temporary sheeting will have an anticipated maximum retained height of 12 feet. A minimum embedment depth of 18 feet with a minimum section modulus of 25 cubic inches per foot should be used for planning purposes.

A Hydraulic No-Rise during construction shall be maintained. The removal of the existing substructure below ground is assumed to be removed using construction barges with excavators with concrete breakers and processors. Broken pieces of concrete are allowed to settle to the bottom of the river prior to removal from the site. The use of cofferdams for pier removal will need to be approved to ensure the hydraulic no-rise condition will be met.

Placement of the rip rap scour protection in front of the west abutment may encounter very soft soils, which may be difficult to work on and retain the rip rap. If this condition is encountered, a combination of excavation and replacement along with the use of a geotechnical separation fabric can be utilized to create a stable subgrade. The excavation may extend to a depth of 2 to 4 feet and the geotechnical separation fabric placed on the subgrade. Approximately 2 feet of 4-inch minus material could be placed on the fabric to create a stable platform. The crushed rock should be completely encapsulated with the filter fabric. The rip rap could then be placed on top of the crushed rock mat to design grades. The amount of undercut may be adjusted, either up or down, based on the river elevation at the time of construction.

5.0 LIMITATIONS

The recommendations provided herein are for the exclusive use of our client, Horner & Shifrin, Inc. and IDOT. They are specific only to the project described, and are based on subsurface information obtained at the boring locations performed for the project, our understanding of the project as described herein, and geotechnical engineering practice consistent with the standard of care. No other warranty is expressed or implied. SCI should be contacted if conditions encountered during construction are not consistent with those described.



PROJECT NAME: I-270 OVER MISSISSIPPI RIVER ST. LOUIS CITY, MISSOURI AND MADISON COUNTY, ILLINOIS				GENERAL NOTES/LEGEND: USGS TOPOGRAPHIC MAP; COLUMBIA BOTTOM, MISSOURI - ILLINOIS QUADRANGLE; GRANITE CITY, ILLINOIS - MISSOURI QUADRANGLE; DATED 1998; 10' CONTOURS
VICINITY AND TOPOGRAPHIC MAP				STREET MAP HTTP://GOTO.ARCGISONLINE.COM/MAPS/WORLD_STREET_MAP
DRAWN BY: RCV	DATE: 10/2021	JOB NUMBER: 2017-3167.10		FIGURE: 1
CHECKED BY: TJC				

B-101
BB-01
BB-02
BB-03
BB-05
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BB-23 OS
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BB-36
BB-37
BB-38
BB-39
BB-41
BB-44
BB-45
BB-25
BB-29
BB-47
BB-32
C-107

COMPLETED SPT BORING LOCATION
COMPLETED CPT SOUNDING LOCATION

0 150 300 ft
SCALE 1"=300'

GENERAL NOTES/LEGEND

AERIAL PHOTOGRAPH OBTAINED FROM ARCGIS ONLINE, WORLD IMAGERY AND SCI UAV FLIGHT - 2/24/2021.

DIMENSIONS AND LOCATIONS ARE APPROXIMATE; ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

PROJECT NAME
I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

AERIAL PHOTOGRAPH

N
W E
S

JOB NUMBER

DATE 10/2021

DRAWN BY RCV

CHECKED BY BLB

FIGURE 2A

BB-23 OS
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BB-24
BB-27
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BB-31
BB-28
BB-33
BB-30
BB-37
BB-34
BB-25
BB-39
BB-41
BB-36
BB-45
BB-29
BB-38
C-107
BB-47
BB-44
BB-51
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BB-42
C-108
BB-54
BB-55
C-118
BB-49
BB-43
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BB-58
BB-57
BB-48
B-110
C-110
BB-59
BB-50
B-111
C-111
B-118
C-112
B-112
B-119
B-113
B-120
C-113

COMPLETED SPT BORING LOCATION
COMPLETED CPT SOUNDING LOCATION

0 150 300 ft
SCALE 1"=300'

GENERAL NOTES/LEGEND

AERIAL PHOTOGRAPH OBTAINED FROM ARCGIS ONLINE, WORLD IMAGERY AND SCI UAV FLIGHT - 2/24/2021.

DIMENSIONS AND LOCATIONS ARE APPROXIMATE; ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

PROJECT NAME
I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

AERIAL PHOTOGRAPH

N
W E
S

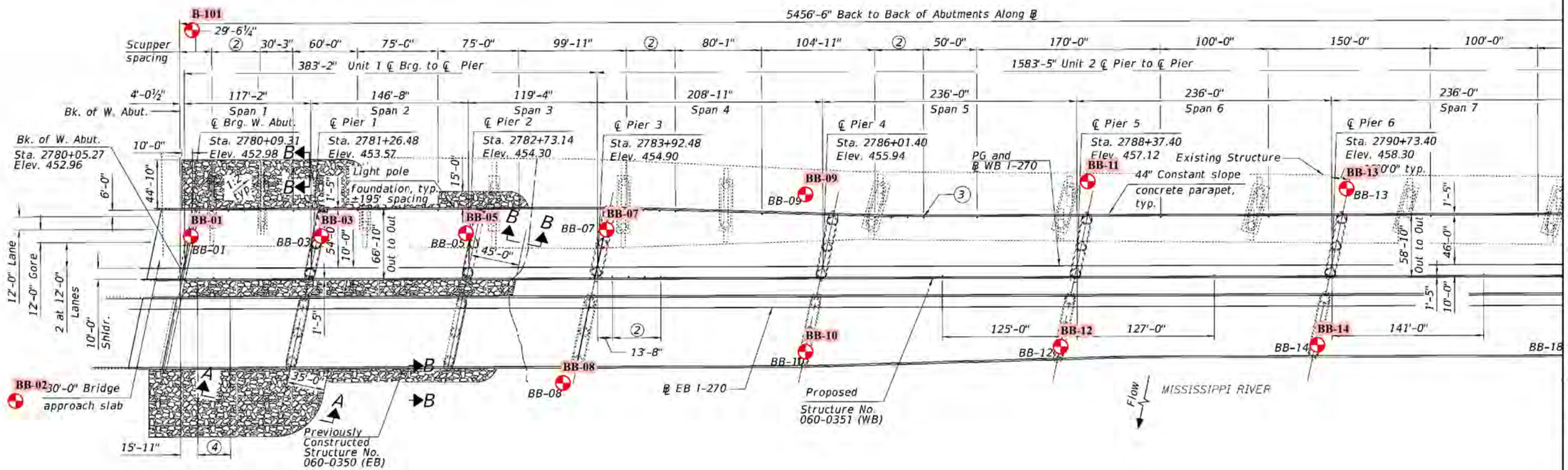
JOB NUMBER

DATE 10/2021

DRAWN BY RCV

CHECKED BY BLB

FIGURE 2B



COMPLETED SPT BORING LOCATION

COMPLETED CPT SOUNDING LOCATION

0 50 100 ft

SCALE 1"=100'

GENERAL NOTES/LEGEND

PLAN DATED 6/23/2021 BY HORNER & SHIFRIN.

DIMENSIONS AND LOCATIONS ARE APPROXIMATE; ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

PROJECT NAME

I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

SITE PLAN

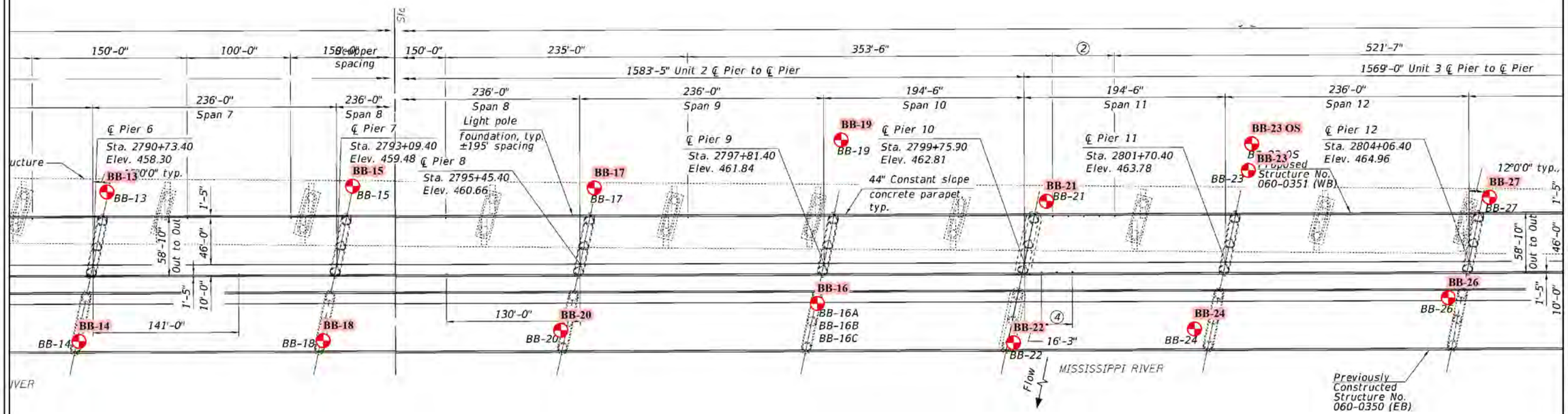
JOB NUMBER

DATE 10/2021

DRAWN BY RCV

CHECKED BY BLB

FIGURE 3A



COMPLETED SPT BORING LOCATION

COMPLETED CPT SOUNDING LOCATION

0 50 100 ft

SCALE 1"=100'

GENERAL NOTES/LEGEND

PLAN DATED 6/23/2021 BY HORNER & SHIFRIN.

DIMENSIONS AND LOCATIONS ARE APPROXIMATE; ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

PROJECT NAME

I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

SITE PLAN

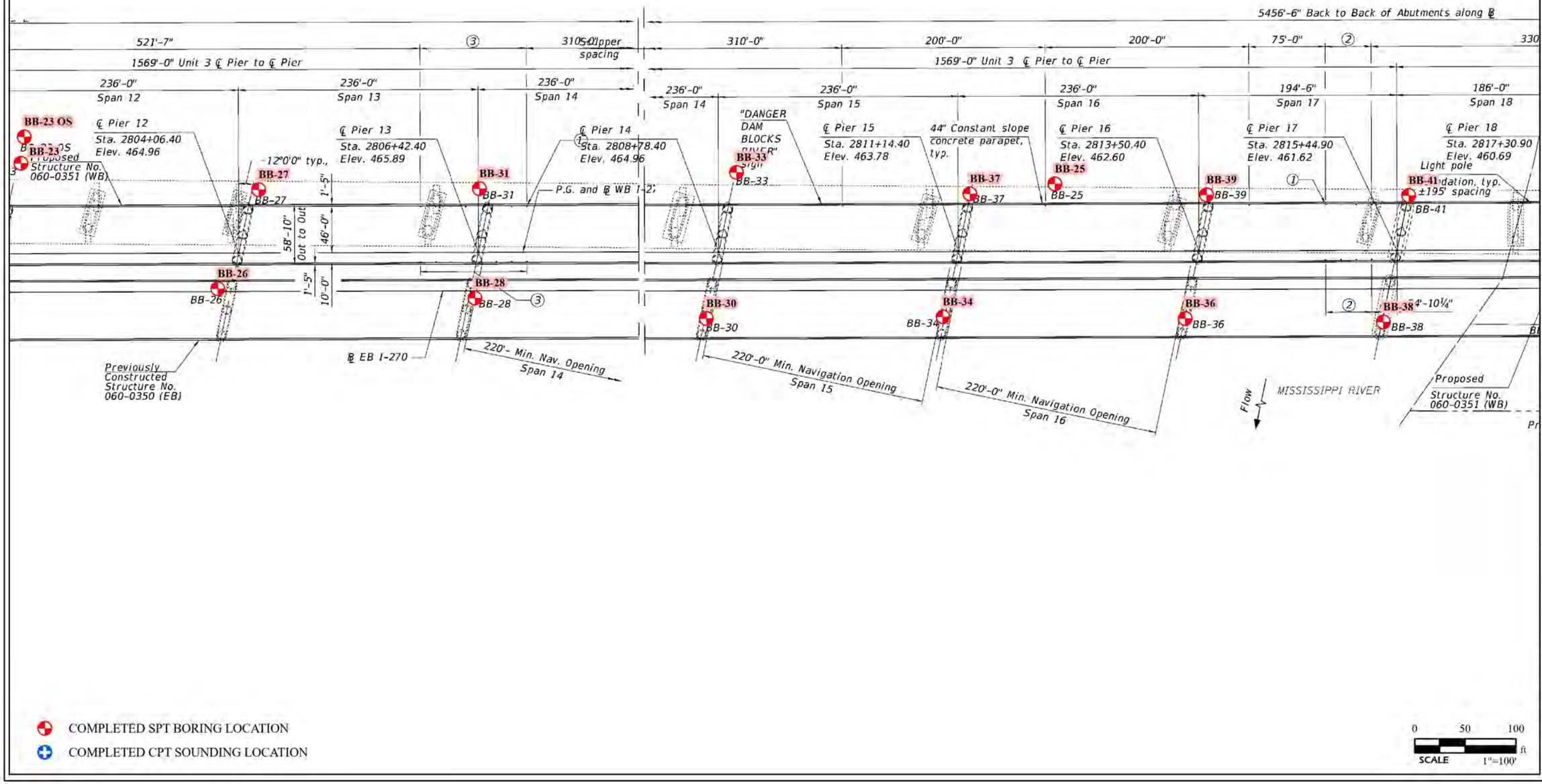
JOB NUMBER

DATE 10/2021

DRAWN BY RCV

CHECKED BY BLB

FIGURE 32



COMPLETED SPT BORING LOCATION

COMPLETED CPT SOUNDING LOCATION

0 50 100 ft

SCALE 1"=100'

GENERAL NOTES/LEGEND

PLAN DATED 6/23/2021 BY HORNER & SHIFRIN.

DIMENSIONS AND LOCATIONS ARE APPROXIMATE. ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

PROJECT NAME

I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

SITE PLAN

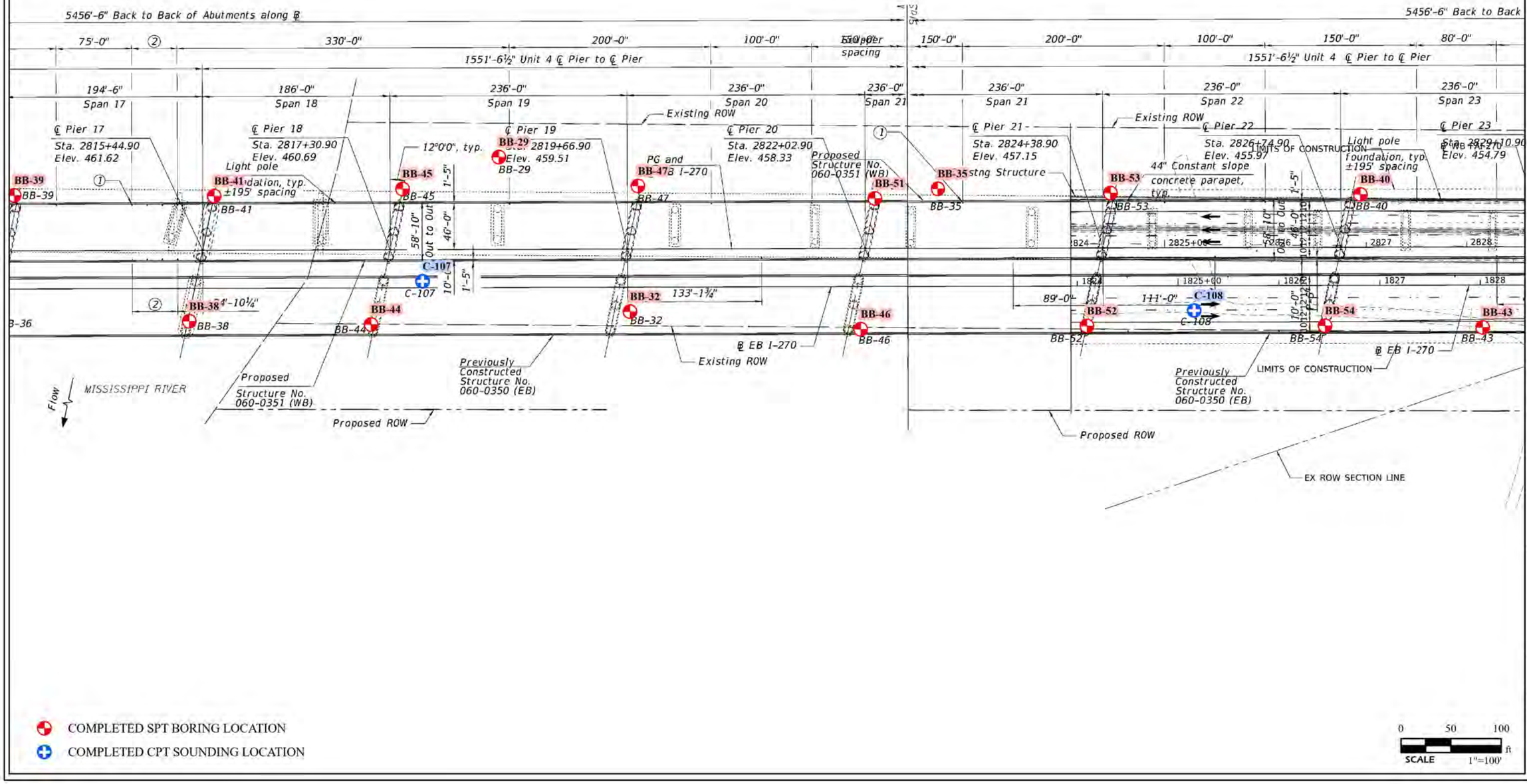
JOB NUMBER

DATE 10/2021

DRAWN BY RCV

CHECKED BY BLB

FIGURE 3C



COMPLETED SPT BORING LOCATION

COMPLETED CPT SOUNDING LOCATION

0 50 100 ft

SCALE 1"=100'

GENERAL NOTES/LEGEND

PLAN DATED 6/23/2021 BY HORNER & SHIFRIN.

DIMENSIONS AND LOCATIONS ARE APPROXIMATE; ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

PROJECT NAME

I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

SITE PLAN

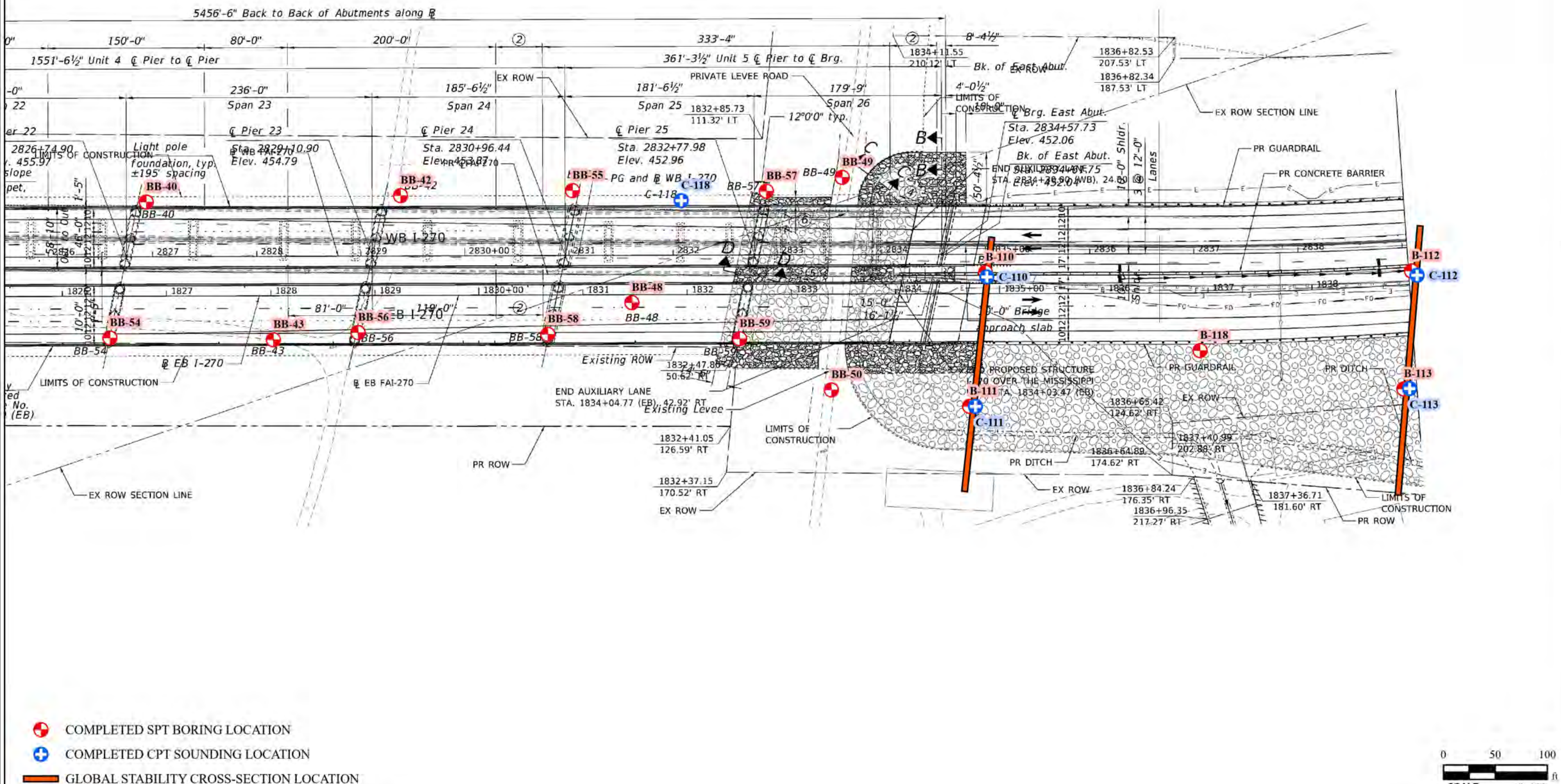
JOB NUMBER

DATE 10/2021

DRAWN BY RCV

CHECKED BY BLB

FIGURE 3D



COMPLETED SPT BORING LOCATION

COMPLETED CPT SOUNDING LOCATION

GLOBAL STABILITY CROSS-SECTION LOCATION

GENERAL NOTES/LEGEND

PLAN DATED 6/23/2021 BY HORNER & SHIFRIN.

DIMENSIONS AND LOCATIONS ARE APPROXIMATE; ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

PROJECT NAME

I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

SITE PLAN

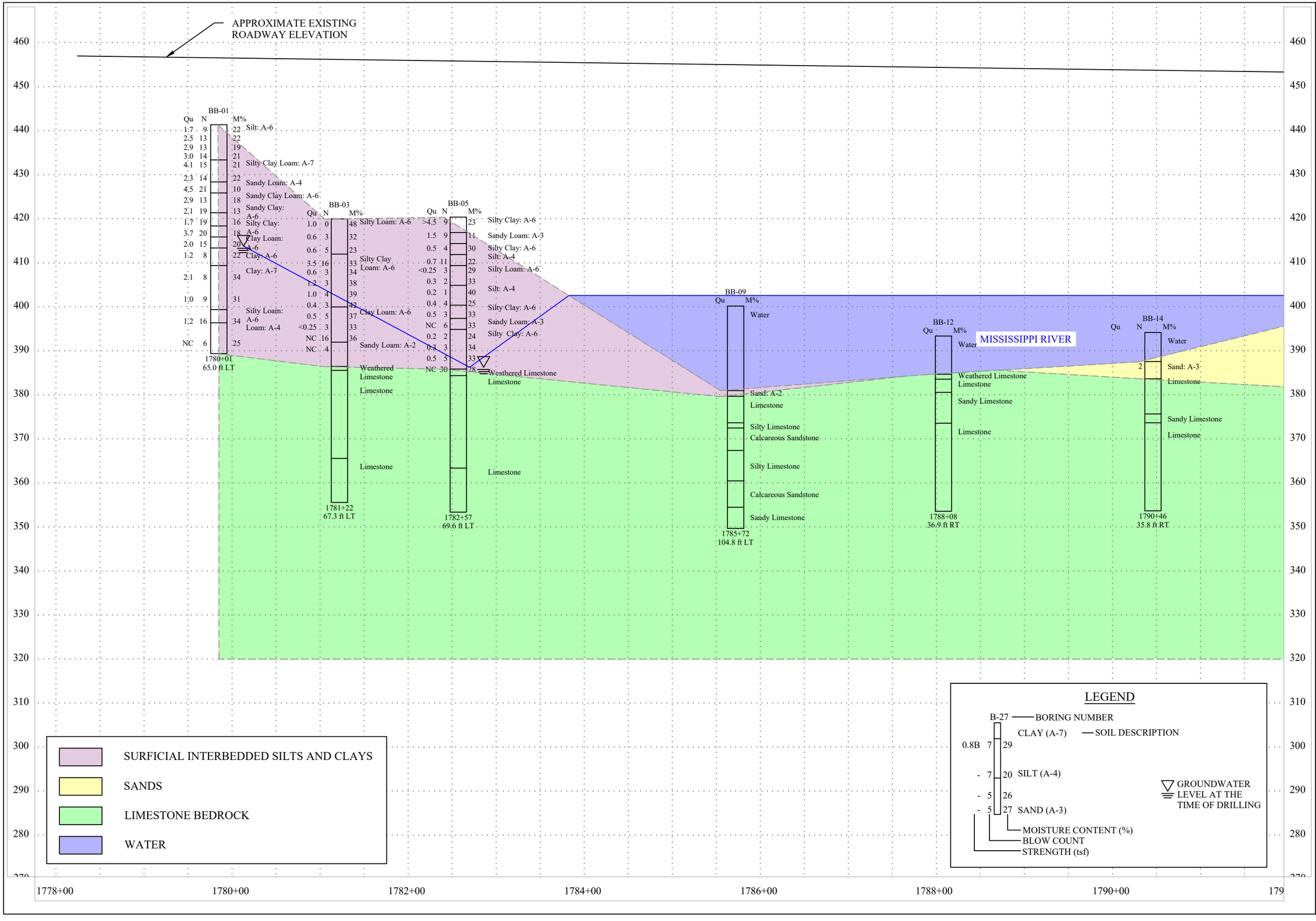
JOB NUMBER

DATE 10/2021

DRAWN BY RCV

CHECKED BY BLB

FIGURE 3E



General Notes/Legend

VARIATIONS IN SUBSURFACE CONDITIONS MAY AND LIKELY EXIST BETWEEN BORINGS. DASHED HORIZONS ARE INTERPRETED AND ARE SHOWN FOR ILLUSTRATION ONLY.

PROJECT NAME

I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

SUBSURFACE PROFILE

SCALE 1" = 20' V, 1" = 100' H

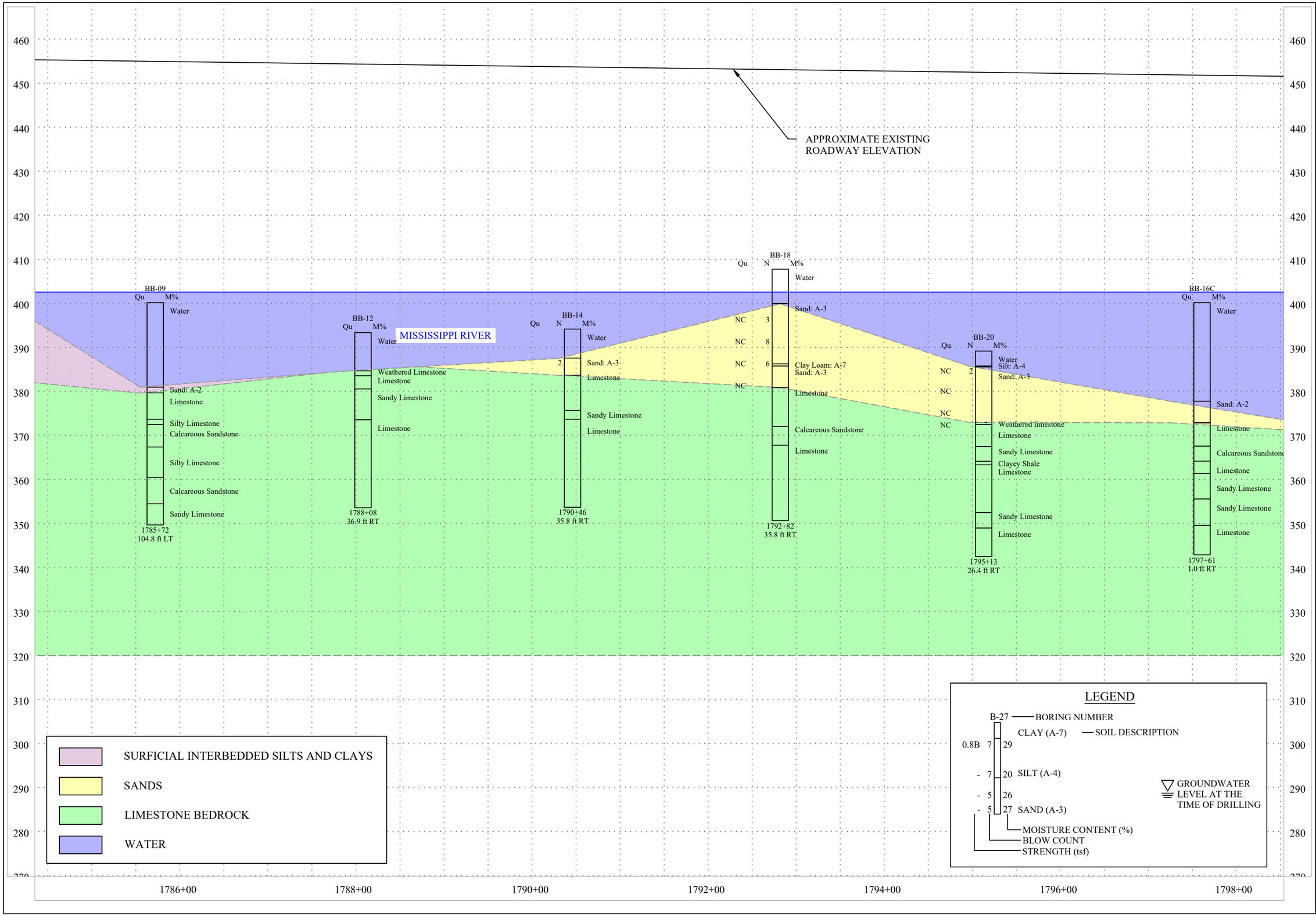
JOB NUMBER 2017-3167.10

DATE 10/2021

DRAWN BY RCV

CHECKED BY BLB

FIGURE 4A



General Notes/Legend

VARIATIONS IN SUBSURFACE CONDITIONS MAY AND LIKELY EXIST BETWEEN BORINGS. DASHED HORIZONS ARE INTERPRETED AND ARE SHOWN FOR ILLUSTRATION ONLY.

PROJECT NAME
I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

SUBSURFACE PROFILE

SCALE 1" = 20' V
1" = 100' H

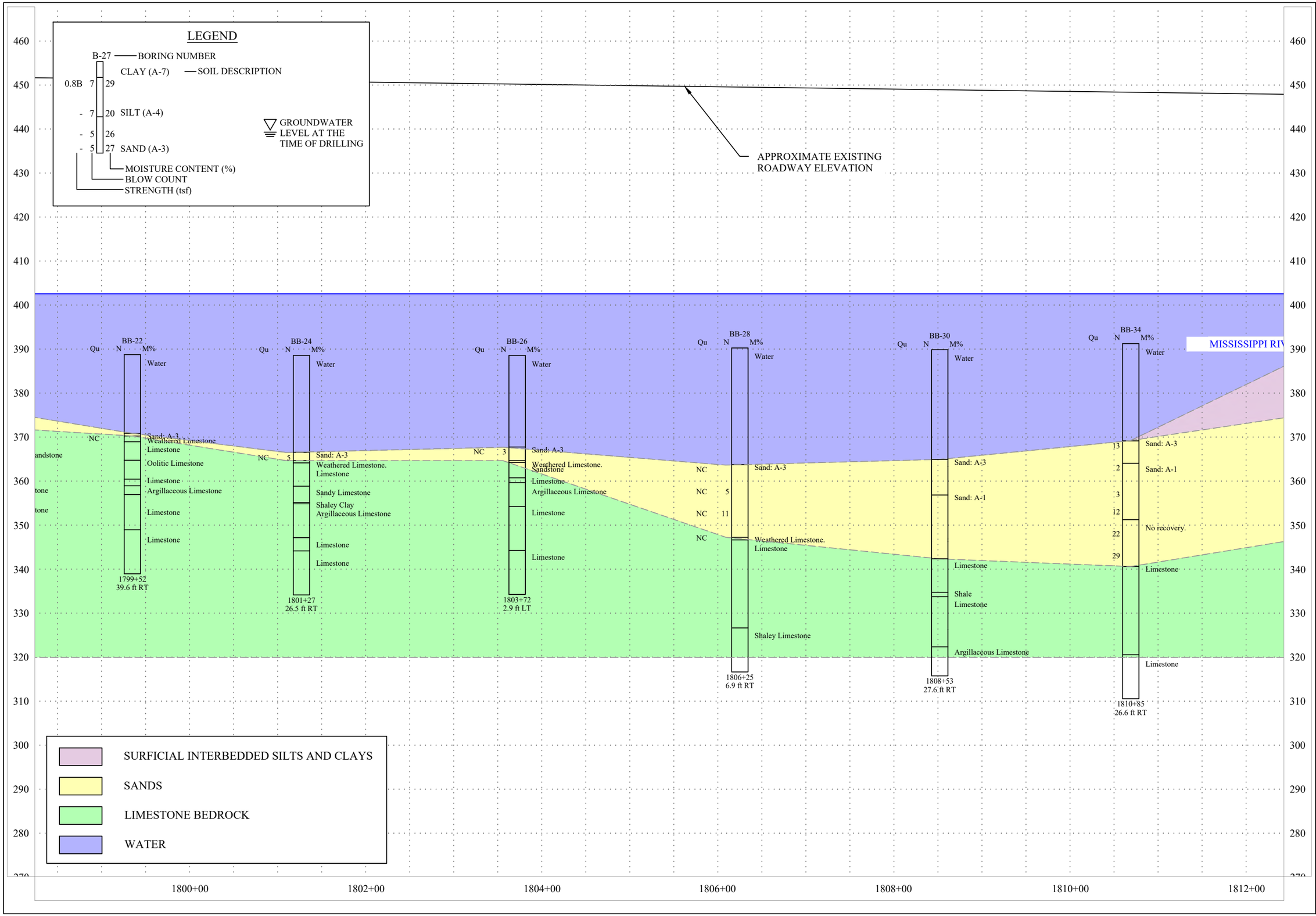
JOB NUMBER 2017-3167.10

DATE 10/2021

DRAWN BY RCV

CHECKED BY BLB

FIGURE 4B



General Notes/Legend

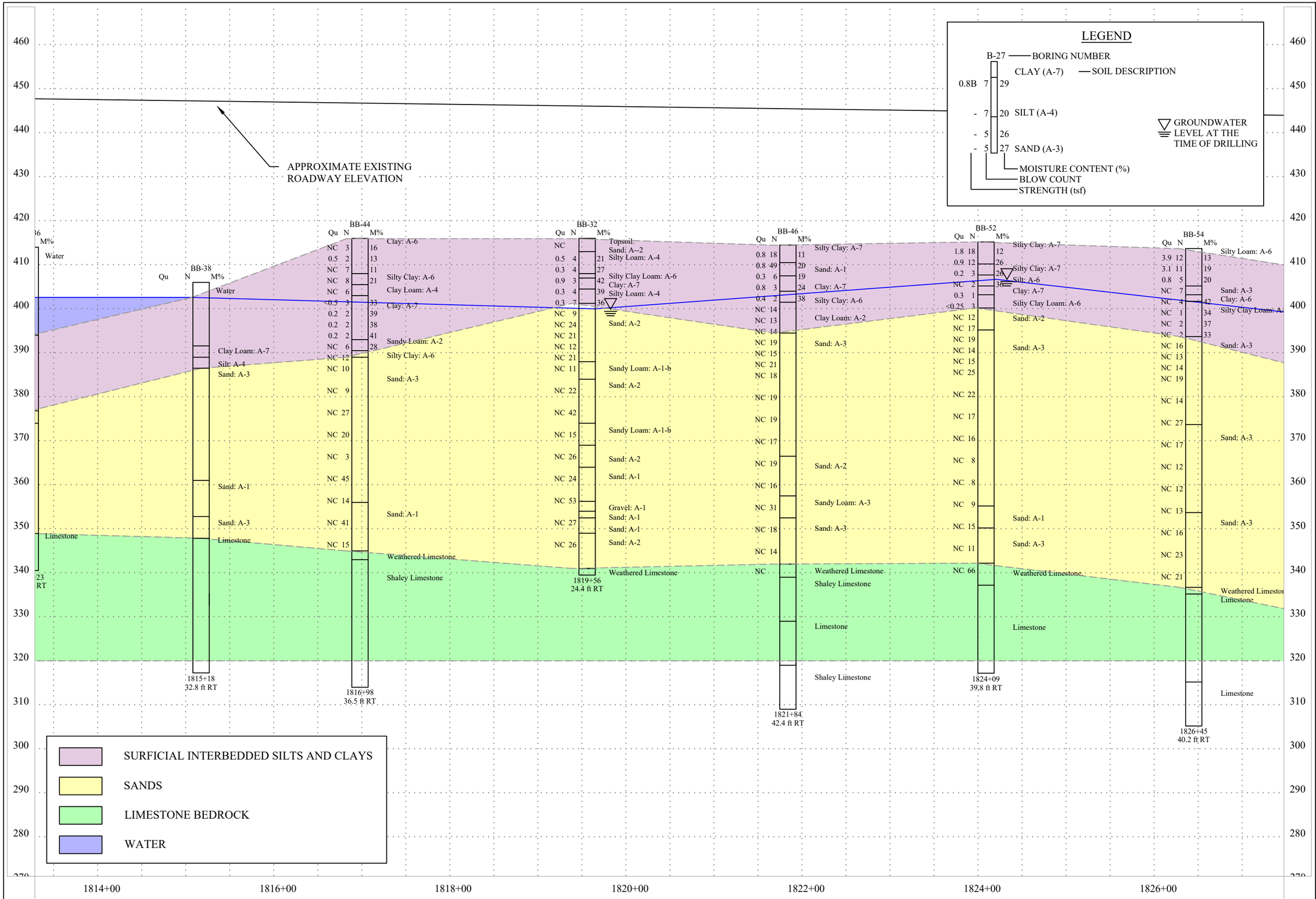
VARIATIONS IN SUBSURFACE CONDITIONS MAY AND LIKELY EXIST BETWEEN BORINGS. DASHED HORIZONS ARE INTERPRETED AND ARE SHOWN FOR ILLUSTRATION ONLY.

PROJECT NAME

I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

SUBSURFACE PROFILE

SCALE	1" = 20' V 1" = 100' H
JOB NUMBER	2017-3167.10
DATE	10/2021
DRAWN BY	RCV
CHECKED BY	BLB
FIGURE	4C



General Notes/Legend

VARIATIONS IN SUBSURFACE CONDITIONS MAY AND LIKELY EXIST BETWEEN BORINGS. DASHED HORIZONS ARE INTERPRETED AND ARE SHOWN FOR ILLUSTRATION ONLY.

PROJECT NAME
I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

SUBSURFACE PROFILE

SCALE 1" = 20' V, 1" = 100' H

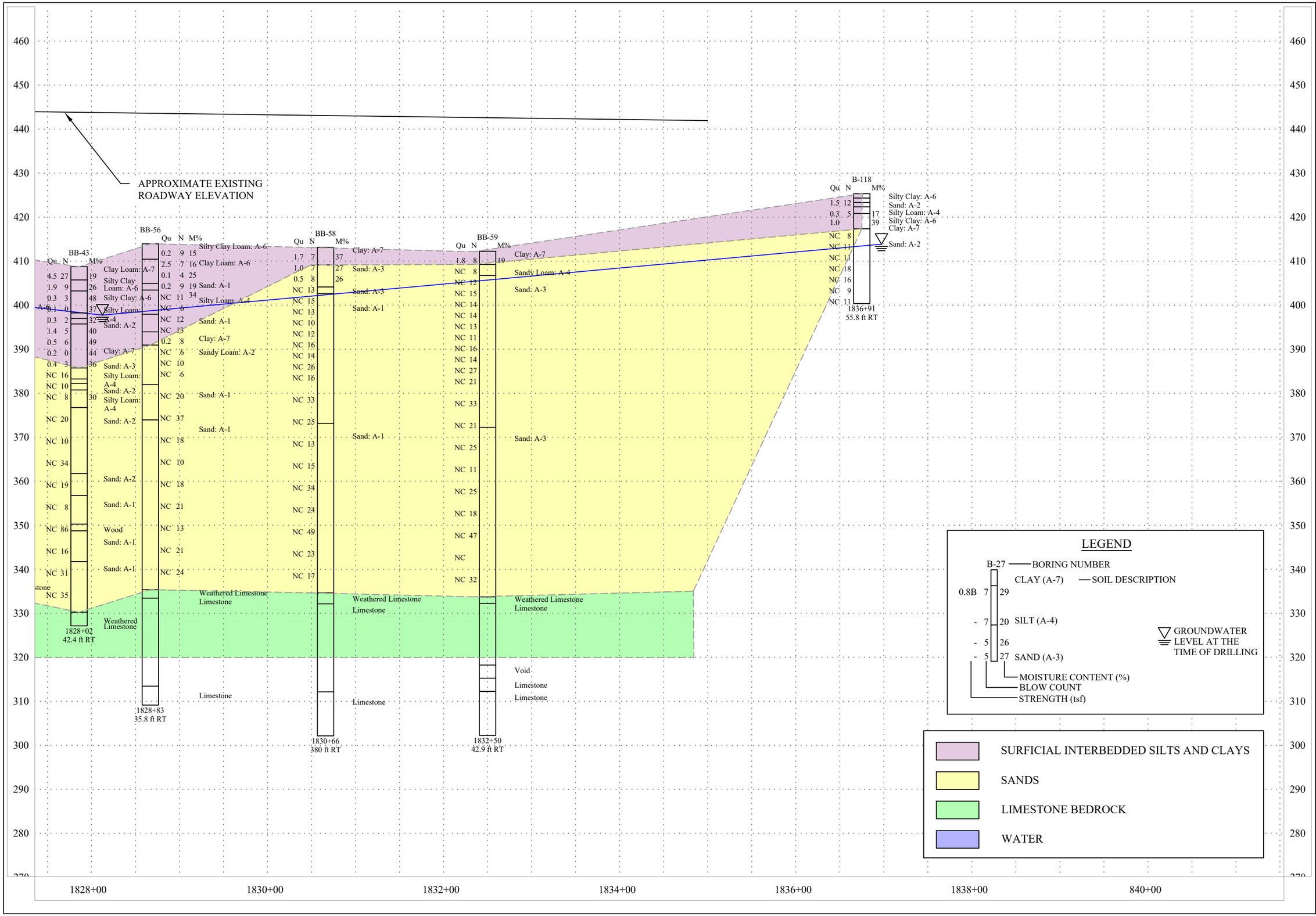
JOB NUMBER 2017-3167.10

DATE 10/2021

DRAWN BY RCV

CHECKED BY BLB

FIGURE 4D



General Notes/Legend

VARIATIONS IN SUBSURFACE CONDITIONS MAY AND LIKELY EXIST BETWEEN BORINGS. DASHED HORIZONS ARE INTERPRETED AND ARE SHOWN FOR ILLUSTRATION ONLY.

PROJECT NAME
I-270 OVER MISSISSIPPI RIVER
ST. LOUIS CITY, MISSOURI AND
MADISON COUNTY, ILLINOIS

SUBSURFACE PROFILE

SCALE	1" = 20' V 1" = 100' H
JOB NUMBER	2017-3167.10
DATE	10/2021
DRAWN BY	RCV
CHECKED BY	BLB
FIGURE	4E

APPENDIX A
SGR Boring Logs and Lab Test Results

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 2/2-3/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** West Abutment, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76632939 **Long** -90.1799847

COUNTY St. Louis **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-01
Station 1780+01.52
Offset 67.5 ft L (EB)
Ground Surface Elev. 441.4 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 413.9 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	2 5 4 6	1.7 S/10	22	Silt: Brown, moist, stiff, trace crushed rock, fill, A-6.
	2 5 8 7	2.5 P	22	No crushed rock. *Particle Size Analysis performed.*
-5	3 5 8 10	2.9 S/15	19	
	3 6 8 8	3.0 P	21	
433.4				
	2 7 8 10	4.1 S/15	21	Silty Clay Loam: Brown and gray, moist, stiff to very stiff, fill, A-7. *Particle Size Analysis performed.*
-10				
	4 5 9	2.3 B/20	22	
428.4				
	10 11 10	4.5 S/15	10	Sandy Loam: Brown and gray, moist, dense, fill, A-4. *Particle Size Analysis performed.*
-15				
425.9				
	4 5 8	2.9 B/20	18	Sandy Clay Loam: Brown and gray, moist, very stiff, fill, A-6.
	6 7 12	2.1 B/20	13	Trace crushed rock and cinders
421.4 -20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sandy Clay: Brown, fine-grained, moist, medium dense, A-6.
	5 10 9	1.7 S/15	16	
418.4				
	5 10 10	3.7 S/15	18	Silty Clay: Brown, trace gray, moist, very stiff, A-6.
-25				
415.9				
	6 6 9	2.0 P	20	Clay Loam: Brown, moist, stiff, A-6. ▼
413.4				
	2 3 5	1.2 B/20	22	Clay: Gray, moist, stiff to very stiff, A-6.
-30				
409.4				
	2 4 4	2.1 B/20	34	Clay: Gray, moist, medium stiff to stiff, A-7.
-35				
	1 3 6	1.0 B/20	31	
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 2/2-3/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** West Abutment, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76632939 **Long** -90.1799847

COUNTY St. Louis **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-01
Station 1780+01.52
Offset 67.5 ft L (EB)
Ground Surface Elev. 441.4 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 413.9 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Clay: Gray, moist, medium stiff to stiff, A-7. *(continued)*				
399.4				
Silty Loam: Gray, moist, stiff, A-6. *Particle Size Analysis performed.*				
		1 3 13	1.2 B/20	34
396.4	-45			
Loam: Gray, moist, medium stiff, A-4.				
		1 3 3	NC	25
	-50			
389.4				
Auger refusal at 52.0 feet. Patched the deck hole with rapid hardening concrete. Backfilled borehole with bentonite chips. Sampling began 16.2 feet below top of deck. Top of deck elevation 457.6 feet.	-55			
	-60			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
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SOIL BORING LOG

Date 09/20/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** West Abutment, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76606961 **Long** -90.18069305

COUNTY St. Louis **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-02
Station 1778+38.55
Offset 84.7 ft R (EB)
Ground Surface Elev. 420.6 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 409.6 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sandy Clay Loam: Brown and gray, loose, trace fine gravel, trace organics, moist, fill, A-6.	1 3 4	1.7 S/15	19
417.6			
Sandy Clay Loam: Gray, loose, trace fine gravel, trace organics, very moist, A-6.	1 2 3	0.3 P	19
-5			
415.1			
Silty Clay Loam: Gray, medium stiff, moist, A-6.	2 3 4	1.2 B/20	24
412.6			
Silty Loam: Gray and brown, soft, moist, A-4.	2 2 1	0.2 B/20	34
-10			
410.1			
Silty Clay Loam: Gray, very soft to soft, moist to wet, A-6. ▼	1 2 1	0.3 P	36
No recovery.	0 0 0	NC	--
-15			
	1 1 2	0.3 P	31
402.6			
Silty Loam: Gray, medium stiff, very moist, A-4.	2 2 3	0.3 P	33
400.6 -20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Silty Clay Loam: Gray, soft, very moist, A-6.	1 1 2	0.1 B/20	34
397.6			
Silty Loam: Gray, very soft to medium stiff, very moist, A-4.	1 2 3	0.3 P	--
-25			
	0 0 0	0.3 B/20	57
393.6			
Silty Clay Loam: Gray, very soft, very moist, A-6.			
392.6			
Clay: Gray, very soft, very moist, A-7.	0 0 0	0.4 B/20	65
-30			
389.6			
Weathered Limestone: Gray	100/0"	NC	--
388.6			
Boring terminated at 32.0 feet. Boring grouted to 32 feet.	100/0"	NC	--
-35			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

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SOIL BORING LOG

Date 02/03/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 1, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76622632 **Long** -90.17958162

COUNTY St. Louis **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-03
Station 1781+22.43
Offset 67.3 ft L (EB)
Ground Surface Elev. 420.0 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None. ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	1 0 0 0	1.0 P	48	Silty Loam: Dark brown, moist, very soft to soft, fill A-6.
				Particle Size Analysis performed.
-5	0 1 2 2	0.6 B/20	32	
				Medium stiff to stiff.
412.0	2 2 3 4	0.6 B/15	23	
				Silty Clay Loam: Brown, moist, very soft to soft, fill, A-6. *Grain Size Analysis performed.*
-10	4 7 9 10	3.5 S/15	33	
	2 1 2	0.6 S/15	34	Soft to very soft.
-15	1 1 2	1.2 B/20	38	
				Particle Size Analysis performed.
	0 2 2	1.0 B/20	39	
400.0 -20	1 1 2	0.4 B/20	42	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Clay Loam: Gray, moist, soft to medium stiff, A-6.
	1 3 2	0.5 P	37	
397.0				
				Silty Clay Loam: Gray, moist, medium stiff, A-6. *Grain Size Analysis performed.*
-25	1 1 2	<0.25 P	33	
				Very stiff.
	1 7 9	NC	36	
392.0				
				Sandy Loam: Gray, fine to coarse grained, moist, loose, A-2.
-30	2 2 2	NC		
386.5				
	50/2"	NC	--	Weathered limestone.
385.6				Borehole continued with rock coring.
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 02/03/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 1, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76622632 **Long** -90.17958162

COUNTY St. Louis **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 386.5 ft
Begin Core Elev. 385.6 ft

BORING NO. BB-03
Station 1781+22.43
Offset 67.3 ft L (EB)
Ground Surface Elev. 420.0 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Hard, aphanitic to very finely crystalline, thin to medium bedded, moderately weathered, dense, calcareous, cherty	385.6	-35	1	100	76	5.1		
No chert.								
Trace styolites.							619.9	0.6
Depth 36.5', Dry Density: 164.1 pcf.								
		-40						
Depth 41.9', Dry Density: 166.4 pcf.							685.5	0.4
Trace clay seams.								
No clay seams or styolites.		-45	2	100	80	4		
Trace shale seams.								
Depth 47.1', Dry Density: 161.9 pcf.							504.3	1
No shale.		-50						
Depth 53.3', Dry Density: 164.3 pcf.							425.1	0.8
	365.6							

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 02/03/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 1, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76622632 **Long** -90.17958162

COUNTY St. Louis **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 386.5 ft
Begin Core Elev. 385.6 ft

BORING NO. BB-03
Station 1781+22.43
Offset 67.3 ft L (EB)
Ground Surface Elev. 420.0 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Hard, aphanitic to very finely crystalline, thin to medium bedded, slightly weathered, dense *(Continued)*	3	100	85	2.4		
Depth 55.4', Dry Density: 164.0 pcf.					736.1	0.8
Depth 63.4', Dry Density: 160.5 pcf.					792.8	1.3
355.6						
Boring terminated at 64.4 feet. Patched deck hole with rapid hardening concrete. Backfilled borehole with bentonite chips. Sampling began 37.9 feet below top of deck. Top of deck elevation 457.9 feet.						

-55
-60
-65
-70

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

BORING BB-03

DEPTH
34.4 ft.

DEPTH
44.4 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	34.4-44.4	100	76

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	ROCK CORE PHOTOGRAPH
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BORING BB-03

DEPTH
44.4 ft.

DEPTH
54.4 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	44.4-54.4	100	80

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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BORING BB-03

DEPTH
54.4 ft.

DEPTH
64.4 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	54.4-64.4	100	85

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ROCK CORE PHOTOGRAPH

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Illinois Department of Transportation
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sci engineering inc

SOIL BORING LOG

Date 02/10/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 2, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.7661185 **Long** -90.17912998

COUNTY St. Louis **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-05
Station 1782+57.04
Offset 69.6 ft L (EB)
Ground Surface Elev. 420.4 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	4 4 5 6	>4.5 P	23	Silty Clay: Dark gray, moist, stiff, fill, A-6.
416.9				
-5	2 3 6 5	1.5 P	11	Sandy Loam: Light gray and brown, fine-grained, moist, medium dense, fill, A-3. *Particle Size Analysis performed.*
414.4				
	2 3 1 3	0.5 P	30	Silty Clay: Light gray and brown, moist, soft to medium stiff, fill, A-6.
411.9				
-10	2 5 6 7	0.7 S/10	22	Silt: Gray, moist, stiff, fill, A-4.
409.4				
	1 2 1	<0.25 P	29	Silty Loam: Gray, moist, soft, with layers of silt and fine sandy loam, A-6.
-15	1 1 1	0.3 B/20	33	*Particle Size Analysis performed.*
404.9				
	0 0 1	0.2 B/20	40	Silt: Gray, moist, soft to very soft, A-4.
-20	1 2 2	0.4 B/20	25	
400.4				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Silty Clay: Gray, moist, soft, A-6.
	0 1 2	0.5 B/20	33	
397.4				
-25	1 3 3	NC	33	SILTY LOAM Loam: Gray, moist, medium stiff, with layers of clay and sandy loam, A-3. *Particle Size Analysis performed.*
394.9				
	1 1 1	0.2 B/20	24	Silty Clay: Gray, moist, very soft to soft, A-6.
-30	0 2 1	0.3 B/20	34	
	0 1 4	0.5 B/20	33	
385.9				
-35	0 3 27	NC	28	Weathered Limestone.
384.4				Borehole continued with rock coring.
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 02/10/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 2, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.7661185 **Long** -90.17912998

COUNTY St. Louis **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 384.4 ft
Begin Core Elev. 383.4 ft

BORING NO. BB-05
Station 1782+57.04
Offset 69.6 ft L (EB)
Ground Surface Elev. 420.4 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Hard, aphanitic to very finely crystalline, thinly bedded, moderately weathered, dense, trace clay seams. *Depth 37.3', Dry Density: 165.2 pcf.*	1	100	80	4.3	349.5	0.1
-40						
-45						
Depth 45.7', Dry Density: 163.8 pcf.					429.1	0.1
Hard to very hard, thickly bedded, slightly weathered, no clay seams.	2	100	87	2.1		
Depth 49.5', Dry Density: 163.9 pcf. -50					546.1	0.1
Depth 53.2', Dry Density: 162.4 pcf.					779.1	0.1
-55						
363.4						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 02/10/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 2, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.7661185 **Long** -90.17912998

COUNTY St. Louis **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 384.4 ft
Begin Core Elev. 383.4 ft

BORING NO. BB-05
Station 1782+57.04
Offset 69.6 ft L (EB)
Ground Surface Elev. 420.4 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Hard to very hard, thickly bedded, slightly weathered, dense. *(Continued)*	3	100	88	2.3		
-60						
Depth 60.3', Dry Density: 161.8 pcf.					617.8	0.1
Depth 63.1', Dry Density: 161.4 pcf.					910.6	0.1
-65						
353.4						
Boring terminated at 67.0 feet. Backfilled borehole with bentonite chips. Sampling began 37.9 feet below top of deck. Top of deck elevation 458.3 feet.						
-70						
-75						

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

BORING BB-05

DEPTH
37.0 ft.

DEPTH
47.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	37.0-47.0	100	80

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BORING BB-05

DEPTH
47.0 ft.

DEPTH
57.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	47.0-57.0	100	87

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-05

DEPTH
57.0 ft.

DEPTH
67.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	57.0-67.0	100	98

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
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SOIL BORING LOG

Date 3/31-4/1/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 3, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765890 **Long** -90.178645

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-07
Station 1783+87.45
Offset 72.6 ft L (EB)
Ground Surface Elev. 410.3 ft

Surface Water Elev. 403.2 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 410.3 (+/-) feet. Surface elevation at river bottom = 395.0 (+/-) feet. Sampling began 16.7 feet below water level.			
-5			
-10			
-15			
393.6			
Silty Loam: Gray, wet, very soft, trace wood, A-4.	WOH WOH 1	<0.25 P	--
-20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
389.1			
No recovery. 389.0	50/2"		
Borehole continued with rock coring.			
-25			
-30			
-35			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 3/31-4/1/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 3, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765890 **Long** -90.178645

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 389.1 ft
Begin Core Elev. 389.0 ft

BORING NO. BB-07
Station 1783+87.45
Offset 72.6 ft L (EB)
Ground Surface Elev. 410.3 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Wood.	389.0	1	95	78	3.1	824.4	0.1
Limestone: Light gray, hard to very hard, very finely to finely crystalline, thin to thickly bedded, slightly weathered, dense, with clayey shale deposits.	388.9						
Depth 21.4', Dry Density: 167.6 pcf.							
Depth 24.9', Dry Density: 165.1 pcf.	-25					647.0	0.1
	-30						
	379.0						
Clayey Shale: Gray.		2	100	100	1.8		
	377.6						
Limestone: Gray, hard to very hard, very finely to finely crystalline, medium bedded, slightly weathered, dense.		3	99	84	3.3		
Depth 33.6', Dry Density: 162.7 pcf.						763.0	0.1
	375.8						
Sandstone: Gray to greenish-gray, hard to very hard, very finely to finely crystalline, massive bedding, slightly weathered, dense.	-35						
Trace clayey shale deposits.	373.8						
Limestone: Gray, hard to very hard, very finely to finely crystalline, medium bedded, slightly weathered, dense.							
	-40						
Depth 40.2', Dry Density: 159.0 pcf.						679.8	0.1

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

Illinois Department of Transportation
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ROCK CORE LOG

Date 3/31-4/1/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 3, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765890 **Long** -90.178645

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX

Core Diameter 2.06 in
Top of Rock Elev. 389.1 ft
Begin Core Elev. 389.0 ft

BORING NO. BB-07
Station 1783+87.45
Offset 72.6 ft L (EB)
Ground Surface Elev. 410.3 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
368.6						
Limestone: Gray, hard to very hard, very finely to finely crystalline, massive bedding, slightly weathered, dense. *(continued)*	4	97	80	4.6		
Depth 42.7', Dry Density: 158.3 pcf.					353.9	0.1
-45						
Depth 48.7', Dry Density: 161.7 pcf.					990.9	0.2
-50						
358.6						
Boring terminated at 51.73 feet.						
-55						
-60						

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

BORING BB-07

DEPTH
21.3 ft.

DEPTH
31.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	21.3-31.3	95	78

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	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-07

DEPTH
31.3 ft.

DEPTH
41.7 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	31.3-32.7	100	100
3	32.7-41.7	99	84

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-07

DEPTH
41.7 ft.

DEPTH
51.7 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	41.7-51.7	97	80

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Illinois Department of Transportation
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SOIL BORING LOG

Date 03/30/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 3, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.7657626 **Long** -90.01789774

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-08
Station 1783+46.58
Offset 69.4 ft R (EB)
Ground Surface Elev. 410.4 ft

Surface Water Elev. 402.9 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
				River surface elevation at 410.4 (+/-) feet. Surface elevation at river bottom = 397.7 (+/-) feet. Sampling began 12.1 feet below water level.
-5				
-10				
398.3				
397.7	3 1 1	<0.25 P	--	Silty Loam: Dark gray, wet, very soft, A-4.
				Clay: Dark gray, very moist, soft, A-7.
-15				
392.8	1 2 50/3"	NC	--	Wood
391.5				Weathered Limestone
391.3				Borehole continued with rock coring.
-20				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 03/30/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 3, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.7657626 **Long** -90.01789774

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 **in**
Top of Rock Elev. 391.5 **ft**
Begin Core Elev. 391.3 **ft**

BORING NO. BB-08
Station 1783+46.58
Offset 69.4 ft R (EB)
Ground Surface Elev. 410.4 **ft**

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray to white, hard to very hard, very finely crystalline, medium to thick bedding, fractured, slightly weathered, dense.	391.3	1	94	79	2.9		
Depth 20.1', Dry Density: 160.2 pcf.	-20					745.9	0.1
Depth 25.7', Dry Density: 165.4 pcf.	-25					783.4	0.1
		2	96	80	2.1		
	-30						
	377.0						
Calcareous Sandstone: Gray to greenish gray, hard to very hard, very finely to finely crystalline, medium to thick bedded, slightly weathered, dense. *Depth 33.4', Dry Density: 151.6 pcf.*	-35					577.3	0.2
	373.8						
Limestone: Light gray to white, hard to very hard, finely crystalline, medium to thick bedding, fractured, slightly weathered, dense. *Depth 38.1', Dry Density: 162.2 pcf.*						579.8	0.1

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

Illinois Department of Transportation
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ROCK CORE LOG

Date 03/30/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 3, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.7657626 **Long** -90.01789774

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 391.5 ft
Begin Core Elev. 391.3 ft

BORING NO. BB-08
Station 1783+46.58
Offset 69.4 ft R (EB)
Ground Surface Elev. 410.4 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray to white, hard to very hard, finely crystalline, medium to thick bedding, fractured, slightly weathered, dense. *(continued)*	3	95	81	2.7		
-40						
Medium to massive bedding (banded from 41.5 to 42.2 feet).						
Depth 40.5', Dry Density: 165.4 pcf.					690.3	0.1
-45						
Depth 45.9', Dry Density: 163.9 pcf.					792.1	0.1
361.3						
Boring terminated at 49.07 feet.						
-50						
-55						

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

BORING BB-08

DEPTH
19.1 ft.

DEPTH
29.1 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	19.1-29.1	94	79

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	ROCK CORE PHOTOGRAPH
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BORING BB-08

DEPTH
29.1 ft.

DEPTH
39.1 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	29.1-39.1	96	80

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
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BORING BB-08

DEPTH
39.1 ft.

DEPTH
49.1 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	39.1-49.1	95	81

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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Illinois Department of Transportation
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SOIL BORING LOG

Date 11/29-30/2018

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 4, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.7659437 **Long** -90.17804158

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-09
Station 1785+71.90
Offset 104.8 ft L (EB)
Ground Surface Elev. 400.2 ft

Surface Water Elev. 400.2 ft
Stream Bed Elev. ft

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

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 400.2 (+/-) feet. Surface elevation at river bottom = 380.4 (+/-) feet. Sampling began 19.8 feet below water level.				
	-5			
	-10			
	-15			
Borehole continued with rock coring.	-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 11/29-30/2018

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 4, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.7659437 **Long** -90.17804158

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.85 in
Top of Rock Elev. 381.0 ft
Begin Core Elev. 380.4 ft

BORING NO. BB-09
Station 1785+71.90
Offset 104.8 ft L (EB)
Ground Surface Elev. 400.2 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, very hard, finely crystalline, with fine grained sand, banded to thinly bedded, moderately weathered, moderately fractured. 380.4		1	88	55	2.4		
Depth 20.4, Dry Density: 159.3 pcf.						212.2	0.2
		2	98	77	3.2		
	-25						
Depth 24.35', Dry Density: 164.1 pcf.						398.3	0.3
374.5							
Silty Limestone: Light gray, hard, finely crystalline, thinly bedded, moderately weathered, highly fractured, with open vertical fractures infilled with siltstone. 373.2							
Calcareous Sandstone: Light gray and greenish-gray, hard, fine grained, laminated to banded, wary-cross beddings, moderately weathered, slightly fractured. Banded to thinly bedded, slightly weathered, slightly fractured.		3	100	95	3.5		
Depth 29.4', Dry Density: 157.6 pcf.	-30					228.8	0.5
		4	96	82	2.9		
368.2							
Silty Limestone: Gray, moderately hard to hard, finely crystalline, with fine sand, laminated to thinly bedded, slightly weathered, slightly fractured.							
Moderately weathered, moderately fractured.	-35						
Depth 37.3', Dry Density: 165.6 pcf.						455.8	0.4
361.2							
Calcareous Sandstone: Light gray, very hard, fine grained, banded to thinly bedded, slightly weathered, slightly fractured.							

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

Illinois Department of Transportation
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ROCK CORE LOG

Date 11/29-30/2018

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 4, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.7659437 **Long** -90.17804158

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.85 in
Top of Rock Elev. 381.0 ft
Begin Core Elev. 380.4 ft

BORING NO. BB-09
Station 1785+71.90
Offset 104.8 ft L (EB)
Ground Surface Elev. 400.2 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Calcareous Sandstone: Light gray, very hard, fine grained, banded to thinly bedded, slightly weathered, slightly fractured. *(continued)* Some high angle cross-bedding.		5	100	79	2.2		
Depth 43.0', Dry Density: 163.0 pcf.						228.3	0.4
	355.2 -45						
Sandy Limestone: Light gray, hard, finely crystalline, sand is fine grained, thinly bedded, slightly weathered, slightly fractured.		6	100	86	1.4		
Depth 48.9', Dry Density: 167.0 pcf.						1341.5	0.2
	350.4 -50						
Boring terminated at 49.8 feet. Boring grouted to 49.8 feet.	-55						

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

BORING BB-09

DEPTH
19.8 ft.

DEPTH
29.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	19.8-23.1	88	55
2	23.1-27.6	98	77
3	27.6-29.8	100	95

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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BORING BB-09

DEPTH
29.8 ft.

DEPTH
39.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	29.8-39.8	96	82

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BORING BB-09

DEPTH
39.8 ft.

DEPTH
49.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
5	39.8-45.6	100	79
6	45.6-49.8	100	86

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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SOIL BORING LOG

Date 04/11/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 4, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765505 **Long** -90.178189

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-10
Station 1785+71.61
Offset 40.9 ft R (EB)
Ground Surface Elev. 409.2 ft

Surface Water Elev. 379.6 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 409.2 (+/-) feet. Surface elevation at river bottom = 385.4 (+/-) feet. Sampling began 23.5 feet below water level.			
-5			
-10			
-15			
389.2 -20			
386.5			
Samples not obtained of river deposits (sediment and sand). 385.6			
Borehole continued with rock coring.	50/1"	NC	--
-25			
-30			
-35			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 04/11/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 4, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765505 **Long** -90.178189

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-10
Station 1785+71.61
Offset 40.9 ft R (EB)
Ground Surface Elev. 409.2 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 385.6 ft
Begin Core Elev. 385.6 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, very finely crystalline to aphanitic, thin to thick bedding, slightly weathered, dense. *(continued)*	1	97	64	8.2		
-25						
Depth 29.1', Dry Density: 161.0 pcf.					715.8	0.1
379.4						
-30						
Calcareous Sandstone: Gray to greenish-gray, very hard to hard, finely crystalline to aphanitic, thin to thick bedding, slightly weathered, dense, with clayey shale deposits.						
	2	96	70	3.5		
Depth 31.7', Dry Density: 156.7 pcf.					454.2	0.2
375.3						
Limestone: Light gray, hard to very hard, finely crystalline to aphanitic, thin to thick bedding, slightly weathered, dense.	3	98	89	5.7		
-35					770.8	0.2
Depth 34.5', Dry Density: 161.2 pcf.						
Depth 38.9', Dry Density: 163.4 pcf.					778.8	0.2
-40						
365.6						

Boring terminated at 43.6 feet.
Color pictures of the cores Yes
Cores will be stored for examination until competion
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

BORING BB-10

DEPTH
23.6 ft.

DEPTH
31.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	23.6-31.3	97	64

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BORING BB-10

DEPTH
31.3 ft.

DEPTH
43.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	31.3-33.9	96	70
3	33.9-43.6	98	89

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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Illinois Department of Transportation
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SOIL BORING LOG

Date 04/09/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 5, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765761 **Long** -90.177109

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-11
Station 1788+34.02
Offset 116.3 ft L (EB)
Ground Surface Elev. 406.6 ft

Surface Water Elev. 399.0 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 406.6 (+/-) feet. Surface elevation at river bottom = 387.6 (+/-) feet. Sampling began 21.0 feet below water level.			
-5			
-10			
-15			
387.6			
Samples not obtained of river deposits (sediment and sand).			
-20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Samples not obtained of river deposits (sediment and sand). (continued)			
385.7			
Borehole continued with rock coring.			
-25			
-30			
-35			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 04/09/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 5, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765761 **Long** -90.177109

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-11
Station 1788+34.02
Offset 116.3 ft L (EB)
Ground Surface Elev. 406.6 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 385.7 ft
Begin Core Elev. 385.7 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, finely to very finely crystalline, thin to thickly bedded, slighty weathered,	385.7		1	95	87	2.4		
With clayey shale deposits.		-25						
Depth 25.6', Dry Density: 154.3 pcf.							524.6	1.1
Calcareous Sandstone: Greenish-gray and gray, hard to very hard, very finely crystalline, medium to massive bedding, slightly weathered, dense.	378.6	-30						
Depth 30.5', Dry Density: 155.4 pcf.	375.7						576.2	0.2
Limestone: Light gray, hard to very hard, very finely crystalline, thin to thick bedding, slightly weathered, dense.			2	97	75	3.6		
Depth 33.2', Dry Density: 165.6 pcf.		-35					847.1	0.1
Depth 33.4', Dry Density: 169.3 pcf.		-40					910.6	0.2
	365.7							

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 04/09/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 5, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765761 **Long** -90.177109

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 385.7 ft
Begin Core Elev. 385.7 ft

BORING NO. BB-11
Station 1788+34.02
Offset 116.3 ft L (EB)
Ground Surface Elev. 406.6 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, very finely crystalline, massive bedding, slightly weathered, dense. *(continued)*		3	100	89	3.6		
Depth 41.9', Dry Density: 160.7 pcf.						765.4	0.2
	-45						
Depth 48.2', Dry Density: 166.2 pcf.						717.8	0.1
	-50						
	355.7						
Boring terminated at 50.9 feet.							
	-55						
	-60						

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

BORING BB-11

DEPTH
20.9 ft.

DEPTH
30.9 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	20.9-30.9	95	87

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BORING BB-11

DEPTH
30.9 ft.

DEPTH
40.9 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	30.9-40.9	97	75

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-11

DEPTH
40.9 ft.

DEPTH
50.9 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	40.9-50.9	100	89

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/28/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 5, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76537354 **Long** -90.17740575

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-12
Station 1788+08.41
Offset 36.9 ft R (EB)
Ground Surface Elev. 393.4 ft

Surface Water Elev. 393.4 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 393.4 (+/-) feet. Surface elevation at river bottom = 383.6 (+/-) feet. Sampling began 9.8 feet below water level.			
-5			
384.7 Weathered Limestone			
383.6 Borehole continued with rock coring. -10			
-15			
-20			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 10/28/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 5, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76537354 **Long** -90.17740575

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 384.7 ft
Begin Core Elev. 383.6 ft

BORING NO. BB-12
Station 1788+08.41
Offset 36.9 ft R (EB)
Ground Surface Elev. 393.4 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, moderately hard, very finely crystalline, thin to medium bedding, slightly to moderately weathered, dense.	383.6		1	88	61	5		
	380.6							
Sandy Limestone: Light gray, very hard, fine to coarse grained, banded to thinly bedded, fresh, interbedded with dark gray sandstone bands. *Depth 13.0', Dry Density: 162.4 pcf.*		-15					539.8	0.1
Depth 18.0', Dry Density: 156.8 pcf.							475.5	0.3
	373.6	-20						
Limestone: Light gray, moderately hard, very finely crystalline, thin to medium bedding, slightly to moderately weathered, dense. *Depth 20.6', Dry Density: 160.6 pcf.*			2	95	88	5	564.6	0.2
		-25						
Depth 25.1', Dry Density: 159.9 pcf.							414.3	0.2

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

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 10/28/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 5, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76537354 **Long** -90.17740575

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 384.7 ft
Begin Core Elev. 383.6 ft

BORING NO. BB-12
Station 1788+08.41
Offset 36.9 ft R (EB)
Ground Surface Elev. 393.4 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, moderately hard, very finely crystalline, thin to medium bedding, slightly to moderately weathered, dense. *(continued)* *Depth 30.0', Dry Density: 162.6 pcf.*		3	99	88	4	740.1	0.1
Depth 34.8', Dry Density: 159.9 pcf.	-35					710.0	0.3
	353.6 -40						
Boring terminated at 39.8 feet.	-45						

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

BORING BB-12

DEPTH
9.8 ft.

DEPTH
19.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	9.8-19.8	88	61

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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BORING BB-12

DEPTH
19.8 ft.

DEPTH
29.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	19.8-29.8	95	88

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BORING BB-12

DEPTH
29.8 ft.

DEPTH
39.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	29.8-39.8	99	88

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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SOIL BORING LOG

Date 04/08/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 6, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765611 **Long** -90.176314

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-13
Station 1790+73.68
Offset 108.9 ft L (EB)
Ground Surface Elev. 405.4 ft

Surface Water Elev. 397.8 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
				River surface elevation at 405.4 +/- feet. Surface elevation at river bottom = 394.7 (+/-) feet. Sampling began 11.4 feet below water level.
-5				
-10				
394.7				
	1 1 2	NC	--	Sand: Brown, fine to coarse grained, very loose, trace fine gravel. A-3
-15				
	2 2 2	NC	--	Gray and loose.
385.4 -20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Borehole continued with rock coring.
-25				
-30				
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 04/08/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 6, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765611 **Long** -90.176314

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 385.4 ft
Begin Core Elev. 385.2 ft

BORING NO. BB-13
Station 1790+73.68
Offset 108.9 ft L (EB)
Ground Surface Elev. 405.4 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, micritic to very finely crystalline, thin to medium bedding, slighty weathered, dense. With clayey shale deposits.		1	95	80	4.5		
Depth 23.7', Dry Density: 166.1 pcf.	-25					613.7	0.1
	378.4						
Sandstone: Gray to greenish-gray, hard to very hard, very finely crystalline, medium to thick bedding, slightly weathered, dense.		2	87	59	4.3		
Depth 29.4', Dry Density: 157.8 pcf.	-30					561.0	0.4
With clayey shale deposits.	375.2						
Limestone: Light gray, hard to very hard, micritic to very finely crystalline, thin to medium bedding, slighty weathered, dense.		3	94	83	5.1		
Depth 33.6', Dry Density: 166.1 pcf.	-35					562.3	0.3
Depth 37.4', Dry Density: 161.5 pcf.	-40					470.6	0.7

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

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 04/08/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 6, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765611 **Long** -90.176314

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 385.4 ft
Begin Core Elev. 385.2 ft

BORING NO. BB-13
Station 1790+73.68
Offset 108.9 ft L (EB)
Ground Surface Elev. 405.4 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, micritic to very finely crystalline, thin to medium bedding, slighty weathered, dense. *(continued)*	4	100	90	4.2		
Depth 41.5', Dry Density: 166.2 pcf.					913.6	0.1
-45						
Depth 48.9', Dry Density: 163.8 pcf.					678.3	0.2
-50						
355.2 Boring terminated at 50.24 feet.						
-55						
-60						

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

BORING BB-13

DEPTH
20.2 ft.

DEPTH
30.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	20.2-27.0	95	80
2	27.0-30.2	87	59

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BORING BB-13

DEPTH
30.2 ft.

DEPTH
40.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	30.2-40.2	94	83

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I-270 Bridge Over COR

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BORING BB-13

DEPTH
40.2 ft.

DEPTH
50.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	40.2-50.2	100	90

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SOIL BORING LOG

Date 10/27/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 6, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76517488 **Long** -90.17661147

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-14
Station 1790+46.17
Offset 35.8 ft R (EB)
Ground Surface Elev. 394.2 ft

Surface Water Elev. 394.2 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
				River surface elevation at 394.2 (+/-) feet. Surface elevation at river bottom = 387.6 (+/-) feet. Sampling began 6.6 feet below water level.
-5				
387.6				
	2 1 1	NC	--	Sand: Brown, fine to coarse grained, very loose, A-3.
-10				
383.7				
				Borehole continued with rock coring.
-15				
-20				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
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ROCK CORE LOG

Date 10/27/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 6, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76517488 **Long** -90.17661147

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 383.7 ft
Begin Core Elev. 383.7 ft

BORING NO. BB-14
Station 1790+46.17
Offset 35.8 ft R (EB)
Ground Surface Elev. 394.2 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, very finely crystalline, banded to thinly bedded, fresh, dense.	383.7		1	91	83	4.5		
Depth 12.5', Dry Density: 163.8 pcf.							462.8	0.1
		-15						
	375.7							
Sandy Limestone: Light gray, very hard, fine to coarse grained, banded to thinly bedded, fresh, interbedded with dark gray sandstone bands. *Depth 18.6', Dry Density: 163.7 pcf.*							621.1	0.1
		-20						
	373.7							
Limestone: Light gray, very finely crystalline, thin to thick bedding, fresh, dense.			2	95	64	6.2		
Depth 24.6', Dry Density: 163.0 pcf.		-25					581.4	0.2
Depth 28.6', Dry Density: 165.5 pcf.							650.1	0.2
		-30						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/27/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 6, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76517488 **Long** -90.17661147

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 383.7 ft
Begin Core Elev. 383.7 ft

BORING NO. BB-14
Station 1790+46.17
Offset 35.8 ft R (EB)
Ground Surface Elev. 394.2 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, very finely crystalline, thin to thick bedding, fresh, dense. *(continued)*		3	100	66	6.7		
Depth 34.6', Dry Density: 165.3 pcf.	-35					837.9	0.2
Depth 39.6', Dry Density: 165.7 pcf.	-40					617.3	0.2
	353.7						
Boring terminated at 40.5 feet.	-45						
	-50						

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

BORING BB-14

DEPTH
10.5 ft.

DEPTH
20.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	10.5-20.5	91	83

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BORING BB-14

DEPTH
20.5 ft.

DEPTH
30.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	20.5-30.5	95	64

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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BORING BB-14

DEPTH
30.5 ft.

DEPTH
40.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	30.5-40.5	100	66

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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SOIL BORING LOG

Date 04/05/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 7, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.7652016 **Long** -90.1757276

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-15
Station 1793+11.37
Offset 113.9 ft L (EB)
Ground Surface Elev. 406.6 ft

Surface Water Elev. 399.2 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
				River surface elevation at 406.6 (+/-) feet. Surface elevation at river bottom = 400.9 (+/-) feet. Sampling began 5.9 feet below water level.
-5				
400.9				
	1 1 2	NC	--	Sand: Brown, fine to coarse grained, very loose, A-3.
-10				
	4 2 6	NC	--	*No recovery - piece of wood and fine gravel lodged in shoe.*
	4 8 8	NC	--	Gray and medium dense.
-15				
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Brown, fine to coarse grained, very loose, A-3. *(continued)*
	2 0 2	NC	--	
382.6				
382.4	50/1"	NC	--	Weathered Limestone.
-25				Borehole continued with rock coring.
-30				
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
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ROCK CORE LOG

Date 04/05/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 7, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.7652016 **Long** -90.1757276

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 382.6 ft
Begin Core Elev. 382.4 ft

BORING NO. BB-15
Station 1793+11.37
Offset 113.9 ft L (EB)
Ground Surface Elev. 406.6 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, very finely crystalline, medium bedding, slighty weathered, dense.	382.4	-25	1	88	53	5.6		
Depth 28.8', Dry Density: 165.4 pcf.							593.3	0.1
	376.6	-30						
Sandstone: Greenish-gray to gray, hard to very hard, very finely crystalline, medium bedding, slightly weathered, dense.								
Depth 32.3', Dry Density: 160.1 pcf.							627.5	0.3
	372.4							
Clayey Shale: Gray	371.8	-35	2	97	73	3.8		
Limestone: Light gray, hard to very hard, very finely crystalline, medium to massive bedding, slighty weathered, dense. *Depth 35.3', Dry Density: 164.7 pcf.*							579.7	0.1
Depth 39.9', Dry Density: 162.5 pcf.		-40					467.4	0.7

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

Illinois Department of Transportation
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ROCK CORE LOG

Date 04/05/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 7, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.7652016 **Long** -90.1757276

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 382.6 ft
Begin Core Elev. 382.4 ft

BORING NO. BB-15
Station 1793+11.37
Offset 113.9 ft L (EB)
Ground Surface Elev. 406.6 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, very finely crystalline, medium to massive bedding, slighty weathered, dense. *(continued)* Massive.	-45	3	100	100	4		
Depth 46.8', Dry Density: 161.8 pcf.	-50					781.2	0.2
Depth 53.2', Dry Density: 166.8 pcf.						751.0	0.1
	352.4						
Boring terminated at 54.2 feet.	-55						
	-60						

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

BORING BB-15

DEPTH
24.2 ft.

DEPTH
34.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	24.2-34.2	88	53

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	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-15

DEPTH
34.2 ft.

DEPTH
44.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	34.2-44.2	97	73

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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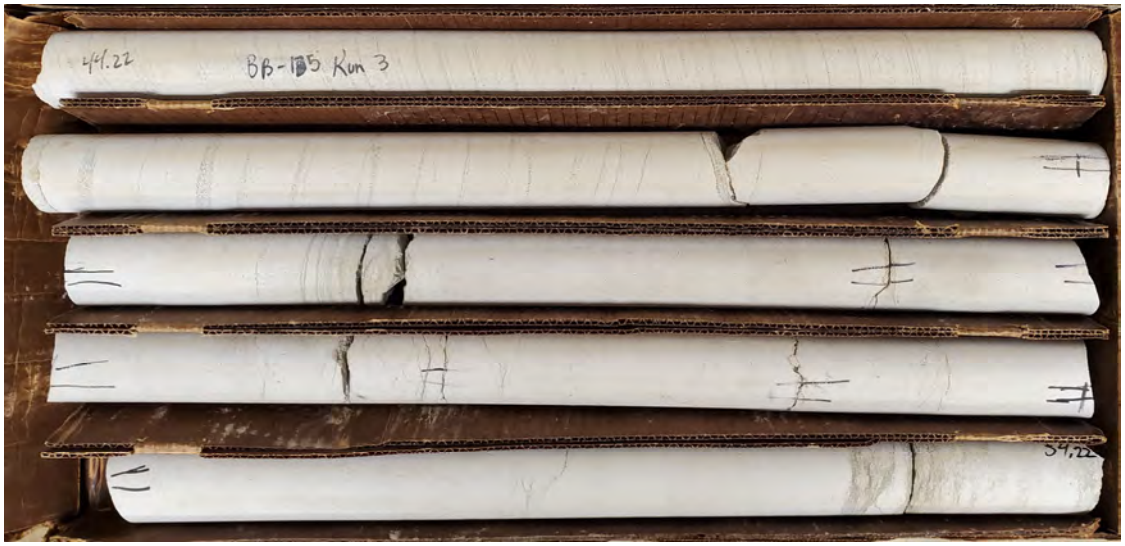
BORING BB-15

DEPTH
44.2 ft.



DEPTH
54.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	44.2-54.2	100	100

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

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SOIL BORING LOG

Date 11/27/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 9, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76466 **Long** -90.174188

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-16A
Station 1797+61.34
Offset 1.0 ft R (EB)
Ground Surface Elev. 400.2 ft

Surface Water Elev. 400.2 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 400.2 (+/-) feet. Surface elevation at river bottom = 380.1 (+/-) feet. Sampling began 20.1 feet below water level.			
-5			
-10			
-15			
-20			
-25			
-30			
-35			
-40			
380.1 Sand: Brown, fine grained, loose to very dense, A-2.	5 4 4	NC	--
366.6 Borehole continued with rock coring.	100	NC	--

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 11/27/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 9, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76466 **Long** -90.174188

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 366.6 ft
Begin Core Elev. 366.6 ft

BORING NO. BB-16A
Station 1797+61.34
Offset 1.0 ft R (EB)
Ground Surface Elev. 400.2 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, moderately hard to hard, banded to thinly bedded, slightly weathered, dense. *Depth 34.2'. Dry Density: 165.7 pcf.*	366.6	-35	1	93	45	6.8	771.3	0.2
4" Closed vertical fracture.	362.9							
Boring terminated at 37.3 feet.		-40 -45 -50						

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

BORING BB-16a

DEPTH
33.6 ft.

DEPTH
37.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	33.6-37.3	93	45

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 11/28/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 9, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76462 **Long** -90.17426

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-16B
Station 1797+61.34
Offset 1.0 ft R (EB)
Ground Surface Elev. 400.2 ft

Surface Water Elev. 400.2 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 400.2 (+/-) feet. Surface elevation at river bottom = 378.2 (+/-) feet. Sampling began 22.0 feet below water level.			
-5			
-10			
-15			
380.2 -20			
378.2			
Sand: Gray, fine to coarse grained, Sampling not performed. See BB-16A. A-2.			
-25			
-30			
367.4			
Borehole continued with rock coring.			
-35			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 11/28/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 9, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76462 **Long** -90.17426

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 367.4 ft
Begin Core Elev. 367.4 ft

BORING NO. BB-16B
Station 1797+61.34
Offset 1.0 ft R (EB)
Ground Surface Elev. 400.2 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, moderately hard, very finely crystalline, banded to thinly bedded, slightly weathered, dense. 367.4	1	90	52	5.4		
-35						
Tan.						
Depth 36.0', Dry Density: 164.3 pcf.					871.0	0.2
Thinly to medium bedded.						
361.2						
Boring terminated at 39.0 feet.						
-40						
-45						
-50						

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

BORING BB-16b

DEPTH
32.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	32.8-39.0	90	52

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
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SOIL BORING LOG

Date 11/29/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 9, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76463 **Long** -90.17427

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-16C
Station 1797+61.34
Offset 1.0 ft R (EB)
Ground Surface Elev. 400.2 ft

Surface Water Elev. 400.2 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)

River surface elevation at 400.2 (+/-) feet. Surface elevation at river bottom = 377.8 (+/-) feet. Sampling began 22.4 feet below water level.

-5
-10
-15
380.2 -20

377.8
Sand: Gray, fine to coarse grained, Sampling not performed. See BB-16A.
A-2.

-25
372.9
Borehole continued with rock coring.

-30
-35
-40

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation

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ROCK CORE LOG

Date 11/29/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76463 **Long** -90.17427

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 373.6 ft
Begin Core Elev. 372.9 ft

BORING NO. BB-16C
Station 1797+61.34
Offset 1.0 ft R (EB)
Ground Surface Elev. 400.2 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, very hard, finely crystalline, banded to thinly bedded, slightly weathered, moderately fractured, with fine sand. *Depth 27.55', Dry Density: 167.8 pcf.*	372.9	1	100	36	6	689.1	0.1
Moderately weathered, highly fractured, with fractures infilled by light green shaley clay.	-30						
Calcareous Sandstone: Light greenish-gray, and olive, very hard, fine grained, parted to banded, cross-bedding, slightly weathered, slightly fractured, glauconitic. *Depth 33.4', Dry Density: 152.8 pcf.*	367.6	2	100	70	3.8	301.9	0.4
Fine to coarse grained.	-35						
With interbedded shale laminations and partings.	364.2						
Limestone: Gray, very hard, finely crystalline, banded to thinly bedded, slightly weathered, slightly fractured, with fine sand. Thinly bedded, trace siltstone laminations along fracture planes.		3	97	72	3		
Sandy Limestone: Light gray, very hard, finely crystalline, sand is fine grained, laminated bedding, slightly weathered, moderately fractured, with interbedded siltstone laminations.	361.4 -40						
Slightly weathered, slightly fractured.							
Depth 44.1', Dry Density: 161.9 pcf.	355.6						
Sandy Limestone: Light gray, very hard, fine to coarse grained, banded to thinly bedded, fresh, slightly fractured, oolitic, interbedded with dark gray sandstone bands.	-45					344.9	0.9

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

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 11/29/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76463 **Long** -90.17427

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-16C
Station 1797+61.34
Offset 1.0 ft R (EB)
Ground Surface Elev. 400.2 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 373.6 ft
Begin Core Elev. 372.9 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Sandy Limestone: Light gray, very hard, fine to coarse grained, banded to thinly bedded, fresh, slightly fractured, oolitic, interbedded with dark gray sandstone bands. *(continued)*	4	98	84	5.6		
-50						
Depth 49.9', Dry Density: 166.0 pcf.						
349.6						
Limestone: Light gray and white, very hard, finely crystalline, banded, slightly weathered, slightly fractured, some interbedded fine grained sandstone beds.					850.8	0.2
Thickly bedded, no sandstone interbeds, trace fine sand.						
-55						
342.9						
Boring terminated at 56.6 feet.						
-60						
-65						

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

BORING BB-16c

DEPTH
27.3 ft.

DEPTH
37.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	27.3-32.3	100	36
2	32.3-37.3	100	70

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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BORING BB-16c

DEPTH
37.3 ft.

DEPTH
47.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	37.3-47.3	97	72

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BORING BB-16c

DEPTH
47.3 ft.

DEPTH
57.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	47.3-57.3	98	84

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	ROCK CORE PHOTOGRAPH
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SOIL BORING LOG

Date 10/05/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 8, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765200 **Long** -90.174740

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-17
Station 1795+45.76
Offset 111.5 ft L (EB)
Ground Surface Elev. 389.6 ft

Surface Water Elev. 389.6 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
				River surface elevation at 389.6 (+/-) feet. Surface elevation at river bottom = 387.5 (+/-) feet. Sampling began 2.1 feet below water level.
387.5				
387.2	1 1 2	NC	--	Silt: Gray, wet, very soft, A-2.
				Sand: Gray, wet, loose, A-2.
-5				
	3 4 4	NC	--	
-10				
	2 3 4	NC	--	
374.6 -15				
374.3	50/4.5"	NC	--	Weathered Limestone: Gray.
				Borehole continued with rock coring.
-20				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 10/05/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 8, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765200 **Long** -90.174740

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-17
Station 1795+45.76
Offset 111.5 ft L (EB)
Ground Surface Elev. 389.6 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 374.3 ft
Begin Core Elev. 374.3 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, very finely crystalline, thin to medium bedded, slightly to moderately weathered, dense, with styolites.	374.3	1	96	62	2.4		
Depth 19.8', Dry Density: 164.4 pcf.	-20					507.4	0.1
	368.7						
Sandy Limestone: Light gray, hard, finely to medium crystalline, thin to medium bedded, slightly weathered, pitted, with shale partings.							
Depth 22.5', Dry Density: 149.4 pcf.						583.1	0.2
	364.9						
Shale: Green.	-25						
	364.3						
Argillaceous Limestone: Gray and greenish-gray, moderately hard.		2	92	0	3.2		
	-30						
	359.3						
Limestone: Gray, very hard, very finely crystalline, medium to thickly bedded, slightly weathered, dense.		3	91	73	2.8		
Depth 32.3', Dry Density: 165.9 pcf.						1344.7	0.1
Vertical joint at 34.7 feet.	-35						
	354.3						

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

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 10/05/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 8, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765200 **Long** -90.174740

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-17
Station 1795+45.76
Offset 111.5 ft L (EB)
Ground Surface Elev. 389.6 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 374.3 ft
Begin Core Elev. 374.3 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, very hard, aphanitic, thickly bedded, fresh, dense. *(continued)*	4	99	91	2.3		
Depth 36.6', Dry Density: 163.8 pcf.					626.4	0.1
-40						
Depth 42.6', Dry Density: 165.4 pcf.					496.0	0.1
-45						
344.3 Boring terminated at 45.3 feet.						
-50						
-55						

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

BORING BB-17

DEPTH
15.3 ft.

DEPTH
25.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	15.3-25.3	96	62

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ROCK CORE PHOTOGRAPH

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BORING BB-17

DEPTH
25.3 ft.

DEPTH
35.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	25.3-30.3	92	0
3	30.3-35.3	91	73

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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BORING BB-17

DEPTH
35.3 ft.

DEPTH
45.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	35.3-45.3	99	91

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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Division of Highways
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SOIL BORING LOG

Date 04/10/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 7, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765035 **Long** -90.175830

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-18
Station 1792+82.43
Offset 35.8 ft R (EB)
Ground Surface Elev. 407.8 ft

Surface Water Elev. 399.1 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 407.8 (+/-) feet. Surface elevation at river bottom = 400.0 (+/-) feet. Sampling began 11.5 feet below water level.			
-5			
400.0			
Sand: Brown, fine-grained, very loose, A-3.			
-10			
	1 2 1	NC	--
-15			
	3 4 4	NC	--
-20			
Sand: Brown, fine-grained, very loose, A-3. *(continued)*			
386.3			
Clay Loam: Dark gray, soft, A-7.			
385.8			
Sand: Gray, fine-grained, loose, A-3.	2 3 3	NC	--
-25			
-30			
-35			
380.9	50/1"	NC	--
Borehole continued with rock coring.			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 04/10/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 7, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765035 **Long** -90.175830

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 **in**
Top of Rock Elev. 380.9 **ft**
Begin Core Elev. 380.7 **ft**

BORING NO. BB-18
Station 1792+82.43
Offset 35.8 ft R (EB)
Ground Surface Elev. 407.8 **ft**

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, very finely crystalline to aphanitic, banded to medium bedding, slightly weathered, dense, with clayey shale deposits. *(continued)*		1	96	69	4.1		
Depth 28.5', Dry Density: 165.5 pcf.						834.7	0.1
	-30						
Depth 34.4', Dry Density: 165.4 pcf.						827.5	0.1
	-35						
	372.1						
Calcareous Sandstone: Light gray to greenish-gray, hard to very hard, finely crystalline, medium bedding, slightly weathered, dense, calcareous, dense, with clayey shale deposits.		2	98	70	5.4		
	367.8 -40						
Limestone: Gray, hard to very hard, very finely crystalline, banded to massive bedding, slightly weathered, dense. *Depth 40.3', Dry Density: 165.9 pcf.*						585.5	0.3
Depth 43.7', Dry Density: 161.2 pcf.						370.4	0.5
	-45						
	360.7						

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

Illinois Department of Transportation
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ROCK CORE LOG

Date 04/10/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 7, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765035 **Long** -90.175830

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 380.9 ft
Begin Core Elev. 380.7 ft

BORING NO. BB-18
Station 1792+82.43
Offset 35.8 ft R (EB)
Ground Surface Elev. 407.8 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard to very hard, very finely crystalline, banded to massive bedding, slightly weathered, dense. *(continued)* *Depth 47.3', Dry Density: 162.8 pcf.*	-50	3	98	80	4.8	503.4	0.2
Depth 54.8', Dry Density: 164.8 pcf.	-55					549.2	0.1
	350.7						
Boring terminated at 57.1 feet,	-60						
	-65						

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

BORING BB-18

DEPTH
27.1 ft.

DEPTH
37.1 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	27.1-37.1	96	69

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BORING BB-18

DEPTH
37.1 ft.

DEPTH
47.1 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	37.1-47.1	98	70

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	I-270 Bridge Over COR
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BORING BB-18

DEPTH
47.1 ft.

DEPTH
57.1 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	47.1-57.1	98	80

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SOIL BORING LOG

Date 10/07/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 9, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765047 **Long** -90.173932

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-19
Station 1797+84.85
Offset 157.5 ft L (EB)
Ground Surface Elev. 389.5 ft

Surface Water Elev. 389.5 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 389.5 (+/-) feet. Surface elevation at river bottom = 372.6 (+/-) feet. Sampling began 16.9 feet below water level.			
-5			
-10			
-15			
372.6			
Sandy Loam: Brownish-gray, wet, very loose, A-2.			
	50/4.5"	NC	--
-20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
368.9	4	NC	--
Borehole continued with rock coring.	1		
-25	WOH		
-30			
-35			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

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ROCK CORE LOG

Date 10/07/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 9, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765047 **Long** -90.173932

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 368.9 ft
Begin Core Elev. 368.9 ft

BORING NO. BB-19
Station 1797+84.85
Offset 157.5 ft L (EB)
Ground Surface Elev. 389.5 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, micritic, banded, slightly weathered, dense.	368.9	1	76	0	4		
3 inch shaley clay seam.							
		2	95	22	2.3		
	365.5						
Sandy Limestone: Gray, hard, fine to medium crystalline, thinly bedded, slightly weathered, dense, with clayey shale seams.	-25						
Depth 26.6', Dry Density: 164.1 pcf.	362.4					415.6	0.2
Argillaceous Limestone: Gray, hard, micritic, thinly bedded, slightly weathered, with shale partings.	-30						
		3	100	61	2		
Depth 31.4', Dry Density: 160.3 pcf.						434.3	0.8
	355.1						
Limestone: Gray, hard to very hard, very finely crystalline, thick to massive bedding, fresh.	-35						
Depth 37.9', Dry Density: 163.3 pcf.						522.6	0.1
	-40						
	348.9						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/07/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 9, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.765047 **Long** -90.173932

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-19
Station 1797+84.85
Offset 157.5 ft L (EB)
Ground Surface Elev. 389.5 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 368.9 ft
Begin Core Elev. 368.9 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard to very hard, aphanitic, thick to massive bedding, fresh. *(continued)*		4	100	92	2		
Depth 42.2', Dry Density: 164.9 pcf.						810.2	0.1
	-45						
Vertical joint.							
Depth 49.9', Dry Density: 164.7 pcf.	-50						
Trace clay partings and styolites. 338.9						709.5	0.1
Boring terminated at 50.6 feet.							
	-55						
	-60						

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

BORING BB-19

DEPTH
20.6 ft.

DEPTH
30.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	20.6-30.6	76	0
2	30.6-40.6	85	22

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-19

DEPTH
30.6 ft.

DEPTH
40.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	30.6-40.6	100	61

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-19

DEPTH
40.6 ft.

DEPTH
50.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	40.6-50.6	100	92

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
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SOIL BORING LOG

Date 10/06/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 8, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764797 **Long** -90.175038

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-20
Station 1795+12.94
Offset 26.4 ft R (EB)
Ground Surface Elev. 389.2 ft

Surface Water Elev. 389.2 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
				River surface elevation at 389.2 (+/-) feet. Surface elevation at river bottom = 385.8 (+/-) feet. Sampling began 3.4 feet below water level.
				385.8
	1 1 1	NC	--	Silt: Gray, wet, soft, A-4. 385.6
-5				Sand: Gray, wet, fine-grained, very loose, A-3.
	2 2 3	NC	--	
-10				
	4 5 5	NC	--	Medium dense.
-15				
				373.0
	50/1.5"	NC	--	Weathered limestone: Gray. 372.5
				Borehole continued with rock coring.
-20				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/06/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 8, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764797 **Long** -90.175038

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 373.0 ft
Begin Core Elev. 372.5 ft

BORING NO. BB-20
Station 1795+12.94
Offset 26.4 ft R (EB)
Ground Surface Elev. 389.2 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, aphanitic, thinly bedded, slightly weathered, dense.	372.5	1	100	0	4		
		2	95	49	2.5		
	-20						
Depth 20.1', Dry Density: 164.8 pcf.						1173.9	0.1
	367.5						
Sandy Limestone: Gray, soft, very finely crystalline, thinly bedded, slightly weathered, dense.							
	364.2 -25						
Clayey Shale: Green.							
	363.3						
Limestone: Gray, soft, aphanitic, thinly bedded, slightly weathered, dense. *Depth 25.9', Dry Density: 164.2 pcf.*						1029.0	0.1
		3	96	83	2.8		
Depth 27.9', Dry Density: 164.8 pcf.						855.3	0.2
	-30						
	-35						
Depth 35.5', Dry Density: 164.6 pcf.						864.5	0.7
	352.5						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/06/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 8, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764797 **Long** -90.175038

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 373.0 ft
Begin Core Elev. 372.5 ft

BORING NO. BB-20
Station 1795+12.94
Offset 26.4 ft R (EB)
Ground Surface Elev. 389.2 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Sandy Limestone: Light gray, soft, finely crystalline, thinly bedded, slightly weathered, dense.		4	100	98	2.4		
Depth 39.2', Dry Density: 164.0 pcf.	-40					929.8	0.1
349.0							
Limestone: Light gray, hard, aphanitic, medium to thickly bedded, slightly weathered, dense.	-45						
Depth 45.8', Dry Density: 165.7 pcf.						570.7	0.1
342.5							
Boring terminated at 46.7 feet.	-50						
	-55						

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

BORING BB-20

DEPTH
16.7 ft.

DEPTH
26.7 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	16.7-17.0	100	0
2	17-26.7	95	49

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-20

DEPTH
26.7 ft.

DEPTH
46.7 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	26.7-46.7	96	83

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-20

DEPTH
36.7 ft.

DEPTH
46.7 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	36.7-46.7	100	98

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 10/09/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 10, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76472944 **Long** -90.1733395

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-21
Station 1799+83.72
Offset 97.6 ft L (EB)
Ground Surface Elev. 388.7 ft

Surface Water Elev. 388.7 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 388.7 (+/-) feet. Surface elevation at river bottom = 371.2 (+/-) feet. Sampling began 17.5 feet below water level.			
-5			
-10			
-15			
371.2			
Sand: Brown, wet, fine to coarse grained, very loose, A-3.	WOH	NC	
	WOH		
-20	2		
-25			
-30			
-35			
367.7	50/3"	NC	
Borehole continued with rock coring.			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/09/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 10, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76472944 **Long** -90.1733395

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 367.7 ft
Begin Core Elev. 366.2 ft

BORING NO. BB-21
Station 1799+83.72
Offset 97.6 ft L (EB)
Ground Surface Elev. 388.7 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, soft, aphanitic, banded to thinly bedded, slightly weathered, dense. 366.2	1	55	0	3		
Depth 23.7', Dry Density: 162.6 pcf.	2	95	35	4.4	597.6	0.2
-25						
Moderately hard, banded, moderately weathered.						
Banded to thinly bedded.						
-30						
Depth 29.9', Dry Density: 161.5 pcf.					517.8	0.8
	3	100	100	2		
	4	100	85	2.7		
-35						
Thinly to medium bedded.						
Depth 35.4', Dry Density: 163.4 pcf.					1097.3	0.1
-40						
Depth 40.9', Dry Density: 162.5 pcf.					418.3	0.1
346.2						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/09/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 10, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76472944 **Long** -90.1733395

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 367.7 ft
Begin Core Elev. 366.2 ft

BORING NO. BB-21
Station 1799+83.72
Offset 97.6 ft L (EB)
Ground Surface Elev. 388.7 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, moderately hard, aphanitic to very finely crystalline, thin to medium bedding, moderately weathered, dense. *(continued)*	5	98	94	2.8		
Depth 43.5', Dry Density: 166.6 pcf.					606.6	0.1
-45						
-50						
Depth 52.1', Dry Density: 165.6 pcf.					676.1	0.1
336.2 Boring terminated at 52.5 feet.						
-55						
-60						

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

BORING BB-21

DEPTH
22.5 ft.

DEPTH
32.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	22.5-23.4	54	0
2	23.4-32.5	95	35
3	32.5-32.9	100	100

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-21

DEPTH
32.5 ft.

DEPTH
42.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	32.5-42.5	100	87

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-21

DEPTH
42.5 ft.

DEPTH
52.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
5	42.5-52.5	94	94

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 10/08/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 10, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764391 **Long** -90.173589

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-22
Station 1799+51.58
Offset 39.6 ft R (EB)
Ground Surface Elev. 388.8 ft

Surface Water Elev. 388.8 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
				River surface elevation at 388.8 (+/-) feet. Surface elevation at river bottom = 370.9 (+/-) feet. Sampling began 17.9 feet below water level.
-5				
-10				
-15				
370.9				
	1 3 50/4"	NC	--	Sand: Brownish-gray, fine-grained, loose, A-3.
370.3				
				Weathered Limestone.
369.0				
-20				

Borehole continued with rock coring.

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/08/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 10, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764391 **Long** -90.173589

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 369.0 ft
Begin Core Elev. 369.0 ft

BORING NO. BB-22
Station 1799+51.58
Offset 39.6 ft R (EB)
Ground Surface Elev. 388.8 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, very finely crystalline, thinly bedded, slightly weathered, some styolites	369.0		1	95	35	3.1		
Depth 22.2', Dry Density: 166.0 pcf.							567.2	0.1
Oolitic Limestone: Gray, hard, finely to medium crystalline, thinly bedded, slightly weathered, dense.	364.8	-25						
Limestone: Gray, hard, very finely crystalline, thickly bedded, slightly weathered, dense, trace styolites. *Depth 28.8', Dry Density: 165.6 pcf.*	360.5		2	100	100	3.5	838.8	0.2
Argillaceous Limestone: Gray, hard, very finely crystalline, thickly bedded, slightly weathered, dense. *Depth 31.0', Dry Density: 162.9 pcf.*	359.0	-30	3	98	89	2.2	691.2	0.2
Limestone: Gray, hard, very finely crystalline, thickly bedded, slightly weathered, dense.	357.0	-35						
Depth 38.0', Dry Density: 164.2 pcf. Finely crystalline, thick to massive bedding, fresh to slightly weathered, trace shale partings.	349.0						690.2	0.2

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/08/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 10, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764391 **Long** -90.173589

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 **in**
Top of Rock Elev. 369.0 **ft**
Begin Core Elev. 369.0 **ft**

BORING NO. BB-22
Station 1799+51.58
Offset 39.6 ft R (EB)
Ground Surface Elev. 388.8 **ft**

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, finely crystalline, thick to massive bedding, fresh to slightly weathered, dense.		4	99	97	2		
Depth 41.9', Dry Density: 166.3 pcf.						602.1	0.1
	-45						
Depth 45.9', Dry Density: 167.2 pcf.						658.3	0.1
1 inch shaley clay seam							
2 inch vertical fracture							
	339.0 -50						
Boring terminated at 49.8 feet.							
	-55						

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

BORING BB-22

DEPTH
19.8 ft.

DEPTH
29.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	19.8-27.9	95	35
2	27.9-29.8	100	100

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-22

DEPTH
29.8 ft.

DEPTH
39.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	29.8-39.8	98	89

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-22

DEPTH
39.8 ft.

DEPTH
49.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	39.8-49.8	99	97

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/12/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 11, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764633 **Long** -90.172650

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-23
Station 1801+79.10
Offset 126.8 ft L (EB)
Ground Surface Elev. 389.7 ft

Surface Water Elev. 389.7 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	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
				River surface elevation at 389.7 (+/-) feet. Surface elevation at river bottom = 368.7 (+/-) feet. Sampling began 21.0 feet below water level.	368.7			
				Sand: Brown, fine to coarse grained, medium dense, A-3.		6 6 5	NC	--
					367.2			
				Weathered Limestone.	366.7			
				Borehole continued with rock coring.				
-5					-25			
-10					-30			
-15					-35			
-20					-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/12/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 11, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764633 **Long** -90.172650

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-23
Station 1801+79.10
Offset 126.8 ft L (EB)
Ground Surface Elev. 389.7 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 367.2 ft
Begin Core Elev. 366.5 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, finely crystalline, thinly bedded, slightly weathered, dense. *(continued)*	1	98	55	4.4		
-25						
363.7						
Sandy Limestone: Gray, hard, finely to medium crystalline, medium bedding, slightly weathered to fresh, dense, some shale partings. *Depth 26.6', Dry Density: 157.5 pcf.*					623.7	0.2
Depth 29.3', Dry Density: 163.6 pcf.					612.9	0.2
-30						
357.0						
Argillaceous Limestone: Light gray, aphanitic, moderately hard, thickly bedded, slightly weathered to fresh, dense, some shale partings.						
356.5						
Boring terminated at 33.2 feet.						
-35						
-40						

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

BORING BB-23

DEPTH
23.2 ft.

DEPTH
33.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	23.2-32.2	98	55

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	ROCK CORE PHOTOGRAPH
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Illinois Department of Transportation
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SOIL BORING LOG

Date 10/13/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 11, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764698 **Long** -90.172611

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-23 Offset
Station 1801+82.38
Offset 152.8 ft L (EB)
Ground Surface Elev. 389.2 ft

Surface Water Elev. 389.2 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 (%)
River surface elevation at 389.2 (+/-) feet. Surface elevation at river bottom = 368.2 (+/-) feet. Sampling began 21.0 feet below water level.				368.2 Sand: Brown, fine to coarse grained, loose, A-2.	2 50/1"	NC	--
				366.4 Weathered Limestone. 366.0 Borehole continued with rock coring.			
-5				-25			
-10				-30			
-15				-35			
-20				-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 10/13/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 11, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764698 **Long** -90.172611

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 366.2 ft
Begin Core Elev. 366.0 ft

BORING NO. BB-23 Offset
Station 1801+82.38
Offset 152.8 ft L (EB)
Ground Surface Elev. 389.2 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, very finely crystalline, thinly bedded, slightly weathered, dense, with styolites.	366.0		1	94	28	3.3		
		-25						
	363.3							
Sandy Limestone: Greenish-gray, hard, very finely crystalline, thinly bedded, slightly weathered, dense, trace shale partings.			2	100	73	4.4		
Depth 29.3', Dry Density: 16.7 pcf.							738.0	0.1
	359.2	-30						
Argillaceous Limestone: Light gray, moderately hard to hard, aphanitic, medium bedding, fresh, dense, with shale partings.							719.3	0.2
Depth 30.4', Dry Density: 164.4 pcf.								
			3	100	93	3.8		
		-35						
Depth 35.9', Dry Density: 165.1 pcf.							883.4	0.1
	352.6							
Limestone: Light gray, hard, finely crystalline, thickly bedded, fresh, dense.								
		-40						
Depth 40.3', Dry Density: 163.8 pcf.							432.2	0.1

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/13/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 11, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764698 **Long** -90.172611

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-23 Offset
Station 1801+82.38
Offset 152.8 ft L (EB)
Ground Surface Elev. 389.2 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 366.2 ft
Begin Core Elev. 366.0 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, finely crystalline, thickly bedded, fresh, dense. *(continued)*	4	96	96	3.6		
Depth 44.5', Dry Density: 163.1 pcf. -45					658.0	0.1
Very finely crystalline.						
-50						
Depth 50.3', Dry Density: 165.4 pcf.					794.4	0.2
336.0						
Boring terminated at 52.8 feet.						
-55						
-60						

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

BORING BB-23 Offset

DEPTH
23.2 ft.

DEPTH
33.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	23.2-26.2	94	28
2	26.2-33.2	100	73

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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BORING BB-23 Offset

DEPTH
33.2 ft.

DEPTH
43.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	33.2-43.2	100	93

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BORING BB-23 Offset

DEPTH
43.2 ft.

DEPTH
53.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	43.2-53.2	96	96

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SOIL BORING LOG

Date 10/14/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 11, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764277 **Long** -90.172991

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-24
Station 1801+26.60
Offset 26.5 ft R (EB)
Ground Surface Elev. 388.6 ft

Surface Water Elev. 388.6 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 388.6 (+/-) feet. Surface elevation at river bottom = 366.9 (+/-) feet. Sampling began 22.0 feet below water level.			
366.6			
Sand: Brown, fine to coarse grained, loose, A-3.	2 2 3	NC	--
364.7			
Weathered Limestone. 364.2			
Borehole continued with rock coring.			
-5			
-10			
-15			
368.6 -20			
-25			
-30			
-35			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 10/14/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 11, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764277 **Long** -90.172991

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-24
Station 1801+26.60
Offset 26.5 ft R (EB)
Ground Surface Elev. 388.6 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 364.7 ft
Begin Core Elev. 364.2 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, very finely crystalline, thinly bedded, slightly to moderately weathered, dense.	364.2	-25	1	88	48	6.4		
Depth 29.0 feet. Dry Density: 166.1 pcf.							799.9	0.1
	358.9	-30						
Sandy Limestone: Gray, hard, fine-grained, thinly to medium bedded, slightly weathered, dense to pitted.								
Depth 32.6 feet. Dry Density: 163.7 pcf.							558.3	0.2
	355.2							
Shaley Clay: Greenish-gray	354.9							
Argillaceous Limestone: Light gray, hard, aphanitic, thinly bedded, slightly weathered. Moderately hard to hard, medium bedding, with shale partings. *Depth 35.0 feet. Dry Density: 165.3 pcf.*		-35	2	100	93	3.9	800.0	0.3
		-40						
	347.2							
Limestone: Gray, hard finely crystalline, medium bedded, slightly weathered, dense. 8.5 inch vertical joint at 46.9 feet.								
Depth 43.6 feet. Dry Density: 164.1 pcf.							604.9	0.2
	344.2							

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

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ROCK CORE LOG

Date 10/14/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 11, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.764277 **Long** -90.172991

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 364.7 ft
Begin Core Elev. 364.2 ft

BORING NO. BB-24
Station 1801+26.60
Offset 26.5 ft R (EB)
Ground Surface Elev. 388.6 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: gray, hard, very finely crystalline, medium to thickly bedded, slightly weathered.	-45	3	100	90	2.3		
Depth 45.1 feet. Dry Density: 161.9 pcf.						744.3	0.2
	-50						
Depth 52.6 feet. Dry Density: 166.1 pcf.						773.8	0.1
	334.2						
Boring terminated at 54.4 feet.	-55						
	-60						

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

BORING BB-24

DEPTH
24.4 ft.

DEPTH
34.4 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	24.4-34.4	88	48

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BORING BB-24

DEPTH
34.4 ft.

DEPTH
44.4 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	34.4-44.4	100	92

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BORING BB-24

DEPTH
44.4 ft.

DEPTH
54.4 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	44.4-54.4	100	90

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SOIL BORING LOG

Date 11/30/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76371911 **Long** -90.16928955

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-25
Station 1811+95.77
Offset 103.8 ft L (EB)
Ground Surface Elev. 400.2 ft

Surface Water Elev. 400.2 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 (%)
River surface elevation at 400.2 (+/-) feet. Surface elevation at river bottom = 371.9 (+/-) feet. Sampling began 28.3 feet below water level.							
-5				-25			
				371.9			
				Sand: Brown, fine to coarse grained, very loose to very dense, A-2.			
-10				-30			
					5 2 2	NC	--
-15				-35			
				Gray.	2 0 1	NC	--
380.2 -20				-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 11/30/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76371911 **Long** -90.16928955

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-25
Station 1811+95.77
Offset 103.8 ft L (EB)
Ground Surface Elev. 400.2 ft

Surface Water Elev. 400.2 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
359.2			
Gravel: Coarse, with limestone fragments, A-1.	1 1 1	NC	--
-45			
No recovery.	4 7 8	NC	--
-50			
	15 22 10	NC	--
-55	15 50/2" 50/1"	NC	--
344.5			
Borehole continued with rock coring.			
-60			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 11/30/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76371911 **Long** -90.16928955

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 344.5 ft
Begin Core Elev. 344.5 ft

BORING NO. BB-25
Station 1811+95.77
Offset 103.8 ft L (EB)
Ground Surface Elev. 400.2 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Gravel: Fine to coarse, with weathered limestone. A-1.	344.5	1	38	0	1.5		
With weathered limestone.	343.2						
Limestone: Light gray, hard, finely crystalline, banded to thinly bedded, moderately weathered, moderately fractured. Trace fine sand.		2	91	47	4.1		
Depth 58.75', Dry Density: 165.2 pcf.	341.3					389.9	0.3
Shaley limestone: Gray and green, soft to moderately hard, finely crystalline, laminated to banded, with interbedded shale seams. 4.5" Shale seam.	-60 339.9						7.5
Limestone: Light gray, hard, finely crystalline, thin to medium bedded, slightly weathered, slightly fractured, some fine sand. With fine sand.		3	100	87	3.6		
Depth 63.1', Dry Density: 162.9 pcf.						607.5	0.1
5" Open vertical fracture overlies sandy shale seam.	-65						
		4	100	96	3.3		
9" Open vertical fracture.							
	332.2						
Sandy Limestone: Gray, very hard, fine grained, thin to medium bedded, some chert, slightly weathered, slightly fractured.	-70						
Depth 71.0', Dry Density: 167.3 pcf.						710.8	0.1
		5	97	93	3		
Depth 74.3', Dry Density: 164.6 pcf.	-75					301.2	0.5

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

Illinois Department of Transportation
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ROCK CORE LOG

Date 11/30/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76371911 **Long** -90.16928955

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 344.5 ft
Begin Core Elev. 344.5 ft

BORING NO. BB-25
Station 1811+95.77
Offset 103.8 ft L (EB)
Ground Surface Elev. 400.2 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
323.7	6	99	97	2.6		
Calcareous Siltstone: Green and light gray, soft to moderately hard, thickly bedded, slightly weathered, no fracturing. *Depth 77.1', Dry Density: 178.6 pcf.*					263.7	1.2
322.2						
Sandy Limestone: Gray, very hard, fine grained, thickly bedded, some chert, slightly weathered, slightly fractured.						
-80						
Thinly to medium bedded.						
Banded to thinly bedded.						
-85						
314.5						
Boring terminated at 85.7 feet. Boring grouted to 85.7 feet.						
-90						
-95						

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

BORING BB-25

DEPTH
55.7 ft.

DEPTH
65.7ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	55.7-57.0	38	0
2	57.0-60.4	91	47
3	60.4-65.7	100	87

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BORING BB-25

DEPTH
65.7 ft.

DEPTH
75.7 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	65.7-72.7	100	96
5	72.7-75.7	100	96

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BORING BB-25

DEPTH
75.7ft.

DEPTH
85.7 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
6	75.7-85.7	99	97

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SOIL BORING LOG

Date 10/15/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 12, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764146 **Long** -90.172140

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-26
Station 1803+72.15
Offset 2.9 ft L (EB)
Ground Surface Elev. 388.6 ft

Surface Water Elev. 388.6 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 388.6 (+/-) feet. Surface elevation at river bottom = 367.8 (+/-) feet. Sampling began 20.8 feet below water level.			
-5			
-10			
-15			
368.6 -20			
367.8			
Sand: Brown, fine to coarse grained, very loose, A-3.	1 1 2	NC	--
364.7			
Weathered Limestone. 364.3			
Borehole continued with rock coring.			
-25			
-30			
-35			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/15/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 12, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764146 **Long** -90.172140

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 364.7 ft
Begin Core Elev. 364.3 ft

BORING NO. BB-26
Station 1803+72.15
Offset 2.9 ft L (EB)
Ground Surface Elev. 388.6 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Sandstone: Gray, with brown bands, fine to coarse grained, hard, banded to thinly bedded, slightly weathered, dense.	364.3	1	99	40	3.7		
	-25						
	360.8						
Limestone: Light gray, hard, finely crystalline, thinly bedded, slightly weathered, dense.							
With greenish-gray, shaley clay	359.7						
Argillaceous Limestone: Light gray, moderately hard, aphanitic, thinly bedded, slightly weathered, dense, with shale partings.	-30						
Depth 31.6 feet. Dry Density: 161.1 pcf.						794.9	0.8
Depth 33.3 feet. Dry Density: 166.8 pcf.						957.8	0.2
	354.3						
Limestone: Light gray, hard, very finely crystalline, medium to thickly bedded, slightly weathered, dense, with shale partings.	-35	2	99	96	2.9		
Depth 35.5 feet. Dry Density: 165.0 pcf.						1030.6	0.1
	-40						
Depth 41.7 feet. Dry Density: 164.8 pcf.						939.8	0.1
	344.3						

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

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 10/15/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 12, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764146 **Long** -90.172140

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-26
Station 1803+72.15
Offset 2.9 ft L (EB)
Ground Surface Elev. 388.6 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 364.7 ft
Begin Core Elev. 364.3 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, very finely crystalline to aphanitic, thickly bedded, fresh, dense, some styolites.	3	100	100	3.5		
-45					597.9	0.1
Depth 44.6 feet. Dry Density: 166.6 pcf.						
Depth 46.0 feet. Dry Density: 164.9 pcf.					813.4	0.1
-50						
2 inch vertical joint.						
3 inch vertical joint.						
334.3						
Boring terminated at 54.3 feet.						
-55						
-60						

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

BORING BB-26

DEPTH
24.3 ft.

DEPTH
34.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	24.3-34.3	99	40

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-26

DEPTH
34.3 ft.

DEPTH
44.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	34.3-44.3	99	96

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-26

DEPTH
44.3 ft.

DEPTH
54.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	44.3-54.3	100	100

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 10/16/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 12, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764366 **Long** -90.171900

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-27
Station 1804+12.53
Offset 100.3 ft L (EB)
Ground Surface Elev. 388.5 ft

Surface Water Elev. 388.5 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 388.5 (+/-) feet. Surface elevation at river bottom = 359.2 (+/-) feet. Sampling began 29.3 feet below water level.			
-5			
-10			
-15			
368.5 -20			
-25			
359.2 -30	2 50/3"	NC	--
Sand: Brown, fine to coarse grained, A-3.			
356.3 -35			
Borehole continued with rock coring.			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/16/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 12, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764366 **Long** -90.171900

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 **in**
Top of Rock Elev. 358.5 **ft**
Begin Core Elev. 356.3 **ft**

BORING NO. BB-27
Station 1804+12.53
Offset 100.3 ft L (EB)
Ground Surface Elev. 388.5 **ft**

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Sandy Limestone: Light gray, soft, thinly bedded, slightly weathered, dense. 356.3		1	100	0	0.6		
		2	100	56	3		
	-35						
351.7							
Limestone: Light gray, moderately hard, very finely crystalline, thin to medium bedding, fresh, dense.						939.2	0.1
Depth 37.0 feet. Dry Density: 164.0 pcf.	-40						
		3	100	96	3.6		
Depth 43.0 feet. Dry Density: 164.7 pcf.						854.3	0.2
Depth 44.4 feet. Dry Density: 165.8 pcf.	-45					924.5	0.1
Depth 49.6 feet. Dry Density: 156.3 pcf.	-50					726.6	1.3
Gray.							

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/16/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 12, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764366 **Long** -90.171900

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-27
Station 1804+12.53
Offset 100.3 ft L (EB)
Ground Surface Elev. 388.5 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 358.5 ft
Begin Core Elev. 356.3 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
335.7						
Limestone: Gray, moderately hard, very finely crystalline, thin to medium bedding, fresh, dense.	4	100	100	3.4		
Depth 54.4 feet. Dry Density: 159.5 pcf. -55					830.1	0.1
-60						
Depth 60.9 feet. Dry Density: 165.6 pcf.					542.5	0.2
325.7						
Boring terminated at 62.8 feet.						
-65						
-70						

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

BORING BB-27

DEPTH
32.2 ft.

DEPTH
42.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	32.2-32.8	100	0
2	32.8-42.8	100	56

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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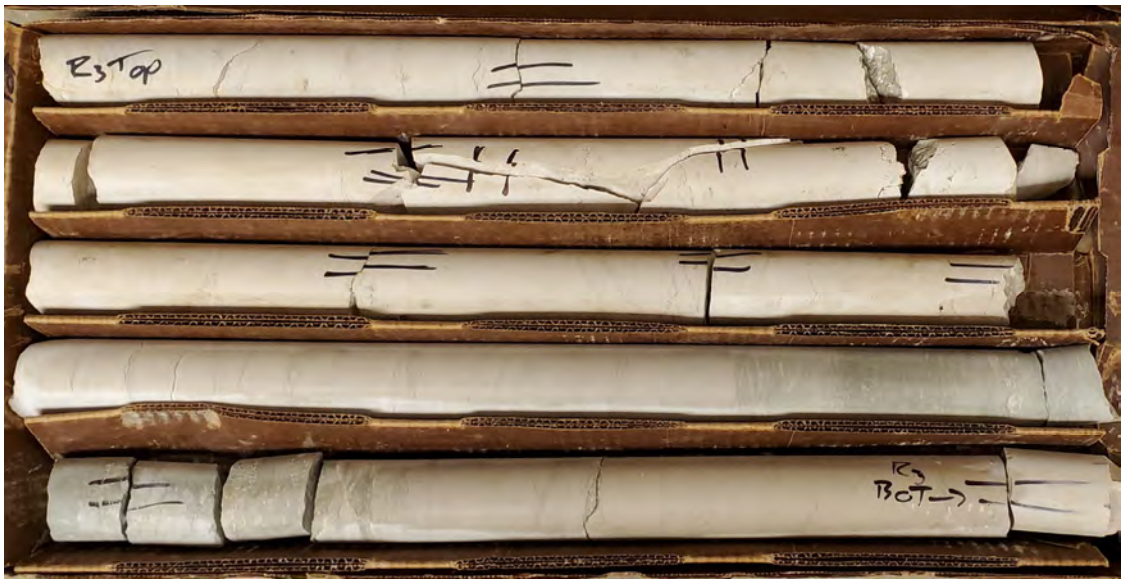
BORING BB-27

DEPTH
42.8 ft.



DEPTH
52.8

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	42.8-52.8	100	96

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BORING BB-27

DEPTH
52.8 ft.

DEPTH
62.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	52.8-62.8	100	100

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Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/21/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 13, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763906 **Long** -90.171306

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-28
Station 1806+25.33
Offset 6.9 ft R (EB)
Ground Surface Elev. 390.3 ft

Surface Water Elev. 390.3 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
				River surface elevation at 390.3 (+/-) feet. Surface elevation at river bottom = 363.8 (+/-) feet. Sampling began 26.5 feet below water level.
-5				
-10				
-15				
370.3 -20				
-25				
363.8				
	1 WOH 2	NC	--	Sand: Gray, fine to coarse grained, very loose to loose, A-3.
-30				
	3 2 3	NC	--	
-35				
	4 5 6	NC	--	
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/21/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 13, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763906 **Long** -90.171306

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-28
Station 1806+25.33
Offset 6.9 ft R (EB)
Ground Surface Elev. 390.3 ft

Surface Water Elev. 390.3 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
				Sand: Gray, fine to coarse grained, very loose to loose, A-3. *(continued)*
	2 5	NC	--	
347.3				
	50/5"			Weathered Limestone.
346.7				Borehole continued with rock coring.
-45				
-50				
-55				
-60				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation

Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/21/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 13, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763906 **Long** -90.171306

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-28
Station 1806+25.33
Offset 6.9 ft R (EB)
Ground Surface Elev. 390.3 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 347.3 ft
Begin Core Elev. 346.7 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, very finely crystalline, medium to thickly bedded, slightly weathered, dense.	346.7	1	99	88	3.2		
	-45						
Depth 46.1 feet. Dry Density: 166.0 pcf.						1097.1	0.1
	-50						
Depth 50.5 feet. Dry Density: 166.2 pcf.						1404.0	0.1
Aphanitic, trace shaley limestone.		2	99	94	3.2		
	-55						
Depth 56.0 feet. Dry Density: 165.5 pcf.						1255.4	0.2
	-60						
Depth 61.3 feet. Dry Density: 166.9 pcf.						819.3	0.1
	326.7						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/21/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 13, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763906 **Long** -90.171306

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-28
Station 1806+25.33
Offset 6.9 ft R (EB)
Ground Surface Elev. 390.3 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 347.3 ft
Begin Core Elev. 346.7 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Shaley Limestone: Gray, aphanitic, medium to thickly bedded, slightly weathered, dense.	3	100	97	3.2		
-65						
Depth 65.2 feet. Dry Density: 166.7 pcf.					1012.5	0.1
-70						
Depth 71.0 feet. Dry Density: 166.6 pcf.					1041.7	0.1
316.7						
Boring terminated at 73.6 feet.						
-75						
-80						

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

BORING BB-28

DEPTH
43.6 ft.

DEPTH
53.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	43.6-53.6	99	88

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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BORING BB-28

DEPTH
53.6 ft.

DEPTH
63.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	53.6-63.6	99	94

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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BORING BB-28

DEPTH
63.6 ft.

DEPTH
73.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	63.6-73.6	100	97

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 11/28/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76323037 **Long** -90.16716985

COUNTY Madison **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-29
Station 1818+26.03
Offset 129.5 ft L (EB)
Ground Surface Elev. 418.0 ft

Surface Water Elev. 418.0 ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 409.0 ft
Upon Completion ft
After 16.0 **Hrs.** 409.0 ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Topsoil. 417.8
	2 1 3	0.5 P	17	Loam: Brown, very loose, trace fine gravel, A-4.
	1 1 1	0.3 S/20	27	*Particle Size Analysis Test performed.*
-5				
	1 1 2	0.8 P	28	With intercede of silty clay.
410.0				
	2 1 1	NC	--	Sand: Brown, fine grained, very loose, A-2.
-10				
	0 1 1	NC	--	With silt.
405.0				
	1 1 2	0.8 B/20	30	Silty Clay: Brown, soft, A-6.
-15				
	1 2 1	1.0 B/20	49	
400.0				
	4 6 9	NC	--	Sandy Loam: Brown, fine grained, loose to medium dense, A-4. *Grain Size Analysis Test performed.*
398.0 -20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Brown, fine to coarse grained, loose to medium dense, A-2.
	7 6 11	NC	--	
	7 7 9	NC	--	Trace gravel.
-25				
	7 9 10	NC	--	
390.0				
	5 7 7	NC	--	Sandy Loam: Brown, fine to coarse grained, loose to medium dense, A-2. *Grain Size Analysis Test performed.*
-30				
	5 5 5	NC	--	Dark gray and reddish-brown.
-35				
381.0				
	9 10 11	NC	--	Sand: Gray, fine to coarse grained, loose to medium dense, A-2.
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 11/28/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76323037 **Long** -90.16716985

COUNTY Madison **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-29
Station 1818+26.03
Offset 129.5 ft L (EB)
Ground Surface Elev. 418.0 ft

Surface Water Elev. 418.0 ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 409.0 ft ▼
Upon Completion ft
After 16.0 **Hrs.** 409.0 ft ▽

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Gray, fine to coarse grained, loose to medium dense, A-2. *(continued)*
-45	5 4 4	NC	--	
-50	13 16 20	NC	--	*Poor recovery.* *Trace fine gravel.*
-55	14 11 12	NC	--	
-60	14 10 7	NC	--	
				Sand: Gray, fine to coarse grained, loose to medium dense, A-2. *(continued)*
-65	14 29 39	NC	--	Some gravel.
-70	10 9 8	NC	--	
				345.1
	100/0"	NC	--	Weathered Limestone. 344.5 Borehole continued with rock coring.
-75				
-80				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 11/28/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76323037 **Long** -90.16716985

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-29
Station 1818+26.03
Offset 129.5 ft L (EB)
Ground Surface Elev. 418.0 ft

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 in
Top of Rock Elev. 345.1 ft
Begin Core Elev. 344.5 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, very finely crystalline, banded, slightly weathered, dense.	344.5		1	100	55	5		
		-75						
3" Open vertical fracture.								
Thinly to medium bedded.	342.5							
Sandy Limestone: Brownish-gray, finely crystalline, fine grained, thinly to medium bedded, moderately weathered, with fractures infilled by light green clayey shale.	341.5							
Limestone: Gray, hard, very finely crystalline, thinly to medium bedded, slightly weathered, dense.								
Finely crystalline.								
		-80						
Depth 80.05', Dry Density: 166.3 pcf.							863.1	0.2
4.5" Open vertical fracture.								
No recovery 83.5-84.6 feet.								
Thinly bedded.		-85	2	100	49	1.7		
2" Open vertical fracture.								
Depth 86.6', Dry Density: 166.5 pcf.								
Thinly to medium bedded.							913.9	0.1
Banded to thinly bedded.								
		-90						
	324.5							

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 11/28/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76323037 **Long** -90.16716985

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 345.1 ft
Begin Core Elev. 344.5 ft

BORING NO. BB-29
Station 1818+26.03
Offset 129.5 ft L (EB)
Ground Surface Elev. 418.0 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, finely crystalline, banded to thinly bedded, slightly weathered, dense.*(Continued)*						
Thinly to medium bedded.	3	100	30	3.1	876.1	0.1
-95						
Depth 94.5', Dry Density: 168.6 pcf.						
Banded to thinly bedded.						
-100						
	4	100	79	4.1		
-105						
8" Open vertical fracture.						
3" Open vertical fracture.						
-110						
Depth 110.5', Dry Density: 168.6 pcf.					823.6	0.1
3" Open vertical fracture.						
Thinly bedded.						
304.5						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 11/28/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76323037 **Long** -90.16716985

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-29
Station 1818+26.03
Offset 129.5 ft L (EB)
Ground Surface Elev. 418.0 ft

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 in
Top of Rock Elev. 345.1 ft
Begin Core Elev. 344.5 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, finely crystalline, thinly bedded, slightly weathered, dense.*(Continued)* 304.2						
Boring terminated at 113.8 feet. Boring grouted to 113.8 feet.						
-115						
-120						
-125						
-130						

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

BORING BB-29

DEPTH
73.5 ft.

DEPTH
83.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	73.5-83.5	100	55

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-29

DEPTH
84.6 ft.

DEPTH
94.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	84.6-94.2	100	49

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-29

DEPTH
94.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	94.2-103.8	100	30

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

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BORING BB-29

DEPTH
103.8 ft.

DEPTH
113.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	103.8-113.8	100	79

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	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 10/22/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 14, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763645 **Long** -90.170586

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-30
Station 1808+52.52
Offset 27.6 ft R (EB)
Ground Surface Elev. 389.9 ft

Surface Water Elev. 389.9 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 389.9 (+/-) feet. Surface elevation at river bottom = 365.0 (+/-) feet. Sampling began 24.9 feet below water level.			
-5			
365.0 Sand: Brown, fine to coarse grained, very loose, moist, A-3.			
-10			
-15			
356.9 Sand: White and tan, fine to coarse grained, with gravel, medium dense, A-1.	WOH WOH 2		
353.4 Sand: fine to coarse grained, medium dense, A-1.	1 2 3		
369.9 -20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-25			
-30			
-35			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/22/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 14, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763645 **Long** -90.170586

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-30
Station 1808+52.52
Offset 27.6 ft R (EB)
Ground Surface Elev. 389.9 ft

Surface Water Elev. 389.9 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
				Sand: fine to coarse grained, medium dense, A-1. *(continued)*
-45				
342.4				Borehole continued with rock coring.
-50				
-55				
-60				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/22/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 14, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763645 **Long** -90.170586

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-30
Station 1808+52.52
Offset 27.6 ft R (EB)
Ground Surface Elev. 389.9 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 342.7 ft
Begin Core Elev. 342.4 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, moderately hard to hard, very finely crystalline, medium bedding, slightly weathered, dense.	342.4		1	95	89	3.5		
		-50						
Depth 50.7 feet. Dry Density: 168.9 pcf.							692.4	0.1
Depth 54.7 feet. Dry Density: 165.7 pcf.	334.8	-55					732.4	0.4
Shale: Greenish-gray.	333.9							
Shaley Clay: Greenish-gray.	333.8							
Limestone: Light gray, moderately hard to hard, very finely crystalline, medium bedding, slightly weathered, dense. 1 inch vertical fracture.			2	100	92	3.3		
Depth 58.9 feet. Dry Density: 166.9 pcf.							907.7	0.1
With shale partings.		-60						
Depth 63.9 feet. Dry Density: 165.8 pcf.							867.1	0.2
		-65						
	322.4							

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

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 10/22/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 14, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763645 **Long** -90.170586

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 342.7 ft
Begin Core Elev. 342.4 ft

BORING NO. BB-30
Station 1808+52.52
Offset 27.6 ft R (EB)
Ground Surface Elev. 389.9 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Argillaceous Limestone: Light gray, hard, very finely crystalline, thickly bedded, dense, trace styolites. *Depth 67.7 feet. Dry Density: 166.8 pcf.*		3	100	97	3.3	545.6	0.1
	-70						
Moderately hard. With shale partings.							
Hard.							
Depth 74.1 feet. Dry Density: 167.3 pcf.						585.0	0.1
	-75						
	312.4						
Boring terminated at 77.5 feet.							
	-80						
	-85						

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

BORING BB-30

DEPTH
47.5 ft.

DEPTH
57.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	47.5-57.5	95	89

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-30

DEPTH
57.5 ft.

DEPTH
57.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	57.5-67.5	100	92

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-30

DEPTH
67.5 ft.

DEPTH
77.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	73.0-83.0	100	97

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/19-20/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 13, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764183 **Long** -90.171174

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-31
Station 1806+30.02
Offset 100.7 ft L (EB)
Ground Surface Elev. 390.0 ft

Surface Water Elev. 390.0 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 (%)
River surface elevation at 390.0 (+/-) feet. Surface elevation at river bottom = 365.1 (+/-) feet. Sampling began 23.1 feet below water level.				366.9			
				Sand: Brownish-gray, fine to coarse grained, very loose, A-3.	1 WOH WOH	NC	--
-5				-25			
				Gray.	WOH 1 2	NC	--
-10				-30			
					3 5 5	NC	--
-15				-35			
					6 4 1	NC	--
370.0 -20				350.0 -40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/19-20/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 13, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764183 **Long** -90.171174

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-31
Station 1806+30.02
Offset 100.7 ft L (EB)
Ground Surface Elev. 390.0 ft

Surface Water Elev. 390.0 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: Gray, fine to coarse grained, very loose, A-3. *(continued)*
	11 8 4	NC	--	
	3 50/1"	NC	--	
346.5				
346.4				Weathered Limestone.
				Borehole continued with rock coring.
-45				
-50				
-55				
-60				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/19-20/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 13, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764183 **Long** -90.171174

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 346.5 ft
Begin Core Elev. 346.4 ft

BORING NO. BB-31
Station 1806+30.02
Offset 100.7 ft L (EB)
Ground Surface Elev. 390.0 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, very finely crystalline, thin to medium bedding, slightly weathered, trace fine clay seams and styolites. 346.4		1	99	83	3.3		
	-45						
Depth 46.1 feet. Dry Density: 166.3 pcf.						482.3	0.2
	-50						
17 inch vertical fracture.							
Depth 52.8 feet. Dry Density: 165.4 pcf.						768.2	0.1
		2	100	92	3.1		
With shale partings.	-55						
Medium bedded.							
Depth 57.8 feet. Dry Density: 135.9 pcf.						999.9	0.1
15 inch vertical fracture.	-60						
Depth 62.9 feet. Dry Density: 135.3 pcf. 326.4						1008.5	0.2

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

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 10/19-20/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 13, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764183 **Long** -90.171174

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 346.5 ft
Begin Core Elev. 346.4 ft

BORING NO. BB-31
Station 1806+30.02
Offset 100.7 ft L (EB)
Ground Surface Elev. 390.0 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, very finely crystalline, thickly bedded, slightly weathered, dense.		3	98	98	3.3		
	-65						
Depth 65.2 feet. Dry Density: 165.9 pcf.						576.7	0.1
	319.9 -70						
Shaley Limestone: Gray, hard, aphanitic, thickly bedded, slightly weathered, dense.							
3 inch vertical fracture.	317.9						
Limestone: Light gray, hard, very finely crystalline, thickly bedded, slightly weathered, dense.							
Depth 73.1 feet. Dry Density: 167.5 pcf.	316.4					497.6	0.1
Boring terminated at 73.2 feet.							
	-75						
	-80						

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

BORING BB-31

DEPTH
43.6 ft.

DEPTH
53.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	43.6-53.6	99	83

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-31

DEPTH
53.6 ft.

DEPTH
63.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	53.6-63.6	100	92

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-31

DEPTH
63.6 ft.

DEPTH
73.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	63.6-73.6	98	98

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 9/05-06/2018

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 19, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76274067 **Long** -90.16689324

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-32
Station 1819+55.69
Offset 24.4 ft R (EB)
Ground Surface Elev. 416.0 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 400.0 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
416.0				Topsoil.
	58 50/3"	NC	--	Sand: Light gray, fine grained, very dense, with fine concrete gravel, dry, fill, A-2.
413.0				
	3 2 2	0.5 S/10	21	Silty Loam: Brown, very soft, moist to wet, A-4.
-5				
	0 2 2	0.3 P	27	
408.0				
407.0	0 2 1	0.9 S/15	42	Silty Clay Loam: Brown, very soft, wet, A-6.
-10				Clay: Brown, very soft, moist to wet, A-7.
404.5	1 2 2	0.3 P	39	Silty Loam: Gray, soft. very moist to wet, A-4.*Particle Size Analysis Test performed.*
	2 1 6	0.3 P	36	
401.3				
-15				Sand: Brown, fine grained, loose to medium dense, wet, A-2.
▼				
	1 4 5	NC	--	
	6 11 13	NC	--	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Brown, fine grained, loose to medium dense, wet, A-2. *(continued)*
	8 11 10	NC	--	
	7 5 7	NC	--	
-25				
	9 11 10	NC	--	
388.0				
	5 5 6	NC	--	Sandy Loam: Brown, fine to coarse grained, medium dense, A-1-b. *Grain Size Analysis Test performed.*
-30				
384.0				
	15 13 9	NC	--	Sand: Gray, fine to coarse grained, medium dense to dense, trace fine gravel, A-2.
-35				
	17 20 22	NC	--	
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 9/05-06/2018

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 19, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76274067 **Long** -90.16689324

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-32
Station 1819+55.69
Offset 24.4 ft R (EB)
Ground Surface Elev. 416.0 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 400.0 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Gray, fine to coarse grained, medium dense to dense, trace fine gravel, A-2. *(continued)*
374.0				
				Sandy Loam: Gray, fine to coarse grained, medium dense, trace coal, A-1-b.
	5 6 9	NC	--	*Grain Size Analysis Test performed.*
-45				
369.0				
				Sand: Gray, fine to coarse grained, medium dense, A-2.
	16 17 9	NC	--	
-50				
364.0				
				Sand: Gray, fine to coarse grained, medium dense to very dense, trace fine gravel, A-1.
	11 12 12	NC	--	
-55				
	41 30 23	NC	--	
356.3				
-60				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Gravel: fine to coarse grained, very dense, with fine to coarse sand, possible cobbles, A-1. *(continued)*
354.0				
				Sand: coarse grained, medium dense, possible cobbles and boulders, A-1.
352.5				
	55 14 13	NC	--	Sand: Gray, fine to coarse grained, medium dense, with fine to coarse gravel, A-1.
-65				
349.0				
				Sand: Gray, fine to coarse grained, medium dense, trace fine gravel, A-2.
	13 13 13	NC	--	
-70				
	50/4.5" 50/0.5"	NC	--	Cobble.
341.0 -75				
				Weathered Limestone: Gray. *No recovery at 76 and 76.5 ft.*
				End of drilling on 9/4 at 76 feet.
339.5	100/0" 100/0" 100/0"	NC NC	-- --	Boring terminated at 76.5 feet. Boring grouted to 76.5 feet.
-80				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/23-24/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 14, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764009 **Long** -90.170315

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-33
Station 1808+82.57
Offset 116.0 ft L (EB)
Ground Surface Elev. 392.1 ft

Surface Water Elev. 392.1 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 (%)
River surface elevation at 392.1 (+/-) feet. Surface elevation at river bottom = 367.2 (+/-) feet. Sampling began 22.8 feet below water level.				369.3			
				Sand: Brown, fine to coarse grained, very loose, A-3.			
-5				-25	1 WOH 1	NC	--
-10				-30	2 1 2	NC	--
				Brownish-gray.			
-15				-35	3 2 3	NC	--
372.1 -20				352.1 -40	2 4	NC	--

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/23-24/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 14, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764009 **Long** -90.170315

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-33
Station 1808+82.57
Offset 116.0 ft L (EB)
Ground Surface Elev. 392.1 ft

Surface Water Elev. 392.1 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
	5			Sand: Gray, fine to coarse grained, medium dense, A-3. *(continued)*
-45				
346.9				
346.6	17 13 10	NC	12 --	Clay: Gray, very stiff, clayey shale, A-7.
				Sand: Gray, fine to coarse grained, medium dense, A-3.
343.1				
				Borehole continued with rock coring.
-50				
-55				
-60				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/23-24/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 14, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764009 **Long** -90.170315

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 343.1 ft
Begin Core Elev. 343.1 ft

BORING NO. BB-33
Station 1808+82.57
Offset 116.0 ft L (EB)
Ground Surface Elev. 392.1 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, very finely crystalline, thinly bedded, slightly weathered, dense.	343.1		1	98	80	4.5		
2.3 inch chert.		-50						
Depth 51.7 feet. Dry Density: 166.4 pcf.							652.7	0.5
Thickly bedded.		-55						
Depth 57.4 feet. Dry Density: 166.5 pcf.							1131.4	0.1
			2	100	88	3.5		
Depth 59.4 feet. Dry Density: 167.5 pcf.		-60					1027.0	0.1
With interbedded shale.		-65						
2 inch shaley limestone. *Depth 57.1 feet. Dry Density: 161.8 pcf.*							1048.0	0.7
	323.1							

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/23-24/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 14, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.764009 **Long** -90.170315

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 343.1 ft
Begin Core Elev. 343.1 ft

BORING NO. BB-33
Station 1808+82.57
Offset 116.0 ft L (EB)
Ground Surface Elev. 392.1 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, very finely crystalline, medium bedded, slightly weathered, dense. *(continued)*	-70	3	98	97	3.9		
Depth 70.0 feet. Dry Density: 167.0 pcf.						660.0	0.2
	-75						
Depth 76.5 feet. Dry Density: 166.6 pcf.						953.6	0.1
	313.1						
Boring terminated at 79.0 feet.	-80						
	-85						

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

BORING BB-33

DEPTH
49.0 ft.

DEPTH
59.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	49.0-59.0	98	80

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-33

DEPTH
59.0 ft.

DEPTH
69.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	59.0-69.0	100	88

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-33

DEPTH
69.0 ft.

DEPTH
79.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	69.0-79.0	98	97

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 11/05/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 15, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76347218 **Long** -90.16979886

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-34
Station 1810+85.36
Offset 26.6 ft R (EB)
Ground Surface Elev. 391.3 ft

Surface Water Elev. 391.3 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 (%)
River surface elevation at 391.3 (+/-) feet. Surface elevation at river bottom = 369.2 (+/-) feet. Sampling began 22.1 feet below water level.				369.2			
				Sand: Brown, fine to coarse grained, medium dense, A-3.	2 6 7	NC	--
-5				-25			
				364.1			
				Sand: Brown, fine to coarse grained, very loose, A-1.	1 1 1	NC	--
-10				-30			
					1 1 2	NC	--
-15				-35			
				Medium dense.	4 6 6	NC	--
371.3 -20				351.3 -40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 11/05/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 15, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76347218 **Long** -90.16979886

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-34
Station 1810+85.36
Offset 26.6 ft R (EB)
Ground Surface Elev. 391.3 ft

Surface Water Elev. 391.3 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: Brown, fine to coarse grained, medium dense, A-1. *(continued)*
	1 9 13	NC	--	
-45				
	9 13 16	NC	--	*No recovery.*
-50				
340.7				Borehole continued with rock coring.
-55				
-60				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 11/05/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 15, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76347218 **Long** -90.16979886

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 340.7 ft
Begin Core Elev. 340.6 ft

BORING NO. BB-34
Station 1810+85.36
Offset 26.6 ft R (EB)
Ground Surface Elev. 391.3 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, moderately hard, very finely crystalline, banded to thinly bedded, slightly weathered, dense. *(continued)*	1	95	88	7		
Gravel bed at 52.0-52.5 feet.						
Medium to thickly bedded.						
Depth 52.9', Dry Density: 166.3 pcf.					1062.8	0.1
-55						
Depth 59.2', Dry Density: 166.3 pcf.					608.6	0.1
-60						
	2	99	97	6		
Depth 63.8', Dry Density: 166.2 pcf.					936.6	0.4
-65						
Depth 69.8', Dry Density: 163.7 pcf.					571.3	0.5
-70						
320.6						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 11/05/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 15, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76347218 **Long** -90.16979886

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 340.7 ft
Begin Core Elev. 340.6 ft

BORING NO. BB-34
Station 1810+85.36
Offset 26.6 ft R (EB)
Ground Surface Elev. 391.3 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, moderately hard, very finely crystalline, medium to thickly bedded, slightly weathered, dense. *(continued)*	3	98	98	5		
Brecciated at 73.0-74.5 feet. *Depth 73.2', Dry Density: 160.0 pcf.*					274.4	0.8
-75						
Depth 76.0', Dry Density: 164.5 pcf.					923.4	0.3
-80						
310.6 Boring terminated at 80.7 feet.						
-85						
-90						

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

BORING BB-34

DEPTH
50.7 ft.

DEPTH
60.7 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	50.7-60.7	95	88

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
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BORING BB-34

DEPTH
60.7 ft.

DEPTH
70.7 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	60.7-70.7	99	97

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-34

DEPTH
70.7 ft.

DEPTH
80.7 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	70.7-80.7	98	98

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
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Illinois Department of Transportation
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SOIL BORING LOG

Date 12/04/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76282598 **Long** -90.16573044

COUNTY Madison **DRILLING METHOD** HSA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-35
Station 1822+61.70
Offset 96.8 ft L (EB)
Ground Surface Elev. 415.2 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				Silty Loam: Brown, stiff, A-4.
	3 4 5	0.7 S/10	20	
412.2				
				Sand: Brown, fine grained, loose, A-2.
	4 3 2	NC	--	
-5				
	2 1 1	0.5 P	--	
408.2				
				Silty Loam: Brown, very soft, A-4.
407.2				
				Silty Clay: Brown, soft, A-6.
406.2				
	1 1 2	0.6 S/15	43	Clay: Brown and gray, soft, A-7.
-10				
404.7				
				Silty Loam: Brown, very soft, A-4. *Particle Size Analysis performed.*
	1 1 2	0.3 P	34	
401.2				
	2 3 6	NC	--	Sand: Brown and reddish brown, fine grained, A-2.
-15				
				Brown.
	6 10 9	NC	--	
	7 7 10	NC	--	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				Sand: Brown and reddish brown, fine grained, A-2. *(continued)*
	5 9 8	NC	--	
393.0				
				Sandy Loam: Brown, fine to coarse grained, medium dense, trace fine gravel, A-2.
	5 6 8	NC	--	
-25				
				Grain Size Analysis performed.
	11 11 12	NC	--	
				Grain Size Analysis performed.
	9 6 9	NC	--	
-30				
383.2				
				Sand: Gray, fine to coarse grained, medium dense, trace fine gravel, A-1.
	11 12 13	NC	--	
-35				
378.2				
				Sand: Gray, fine grained, medium dense to dense, A-2.
	11 13 17	NC	--	
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 12/04/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76282598 **Long** -90.16573044

COUNTY Madison **DRILLING METHOD** HSA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-35
Station 1822+61.70
Offset 96.8 ft L (EB)
Ground Surface Elev. 415.2 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None. ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Gray, fine grained, medium dense to dense, A-2. *(continued)*
-45	15 17 18	NC	--	
-50	13 15 16	NC	--	
-55	15 18 25	NC	--	
358.2				
-60	9 8 5	NC	--	Sand: Gray, fine to coarse grained, medium dense, trace fine gravel, A-1.
				Sand: Gray, fine to coarse grained, medium dense, trace fine gravel, A-1. *(continued)*
353.2				
-65	18 17 24	NC	--	Sand: Grayish brown, fine grained, dense, trace fine gravel, A-2.
348.2				
-70	13 10 14	NC	--	Sand: Grayish brown, fine to coarse grained, medium dense to very dense, trace fine gravel, A-1.
-75	11 13 13	NC	--	
340.1				Borehole continued with rock coring.
-80				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 12/04/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76282598 **Long** -90.16573044

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX

Core Diameter 2.06 in
Top of Rock Elev. 340.1 ft
Begin Core Elev. 339.1 ft

BORING NO. BB-35
Station 1822+61.70
Offset 96.8 ft L (EB)
Ground Surface Elev. 415.2 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard to very hard, very finely crystalline, thinly to medium bedded, slightly weathered, dense.	1	100	45	2.7		
Banded to thinly bedded. 2" Open Vertical Fracture.						
Thinly to medium bedded. *Depth 79.2', Dry Density: 164.6 pcf.*					797.1	0.1
-80						
Trace clayey shale laminations.						
7" Open vertical fracture.						
2" Open vertical fracture.						
-85						
	2	94	48	2.4		
-90						
Thinly to medium bedded. *Depth 93.2', Dry Density: 166.2 pcf.*					489.1	0.1
-95						
319.1						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 12/04/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76282598 **Long** -90.16573044

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX

Core Diameter 2.06 in
Top of Rock Elev. 340.1 ft
Begin Core Elev. 339.1 ft

BORING NO. BB-35
Station 1822+61.70
Offset 96.8 ft L (EB)
Ground Surface Elev. 415.2 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard to very hard, very finely crystalline, thinly to bedded, slightly weathered, dense. *(continued)*	3	100	76	2		
-100						
Depth 101.7', Dry Density: 165.7 pcf.					797.4	0.2
-105						
Thickly bedded.						
309.1						
Boring terminated at 106.1 feet. Boring grouted to 106.1 feet.						
-110						
-115						

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

BORING BB-35

DEPTH
76.1 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	76.1-86.6	100	45

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-35

DEPTH
86.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	86.6-96.1	94	48

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-35

DEPTH
96.1 ft.

DEPTH
106.1 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	96.1-106.1	100	76

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
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SOIL BORING LOG

Date 04/12/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763280 **Long** -90.168989

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-36
Station 1813+23.34
Offset 28.8 ft R (EB)
Ground Surface Elev. 414.0 ft

Surface Water Elev. 406.3 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 414.0 (+/-) feet. Surface elevation at river bottom = 376.8 (+/-) feet.			
-5			
-10			
-15			
394.0 -20			
-25			
-30			
-35			
376.8 *Samples not obtained of river deposits (sediment and sand).*			
374.0 -40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
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SOIL BORING LOG

Date 04/12/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763280 **Long** -90.168989

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-36
Station 1813+23.34
Offset 28.8 ft R (EB)
Ground Surface Elev. 414.0 ft

Surface Water Elev. 406.3 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-45			
-50			
-55			
-60			
-65	50/0"	NC	--
-70			
-75			
-80			

349.0

Borehole continued with rock coring.

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 04/12/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763280 **Long** -90.168989

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-36
Station 1813+23.34
Offset 28.8 ft R (EB)
Ground Surface Elev. 414.0 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 349.0 ft
Begin Core Elev. 349.0 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, very finely crystalline, banded to thinly bedded, slightly weathered, dense, with clayey shale deposits.	349.0		1	100	66	4.2		
		-70						
Depth 71.3', Dry Density: 168.6 pcf.							880.7	0.1
With vertical fractures possibly caused by coring process.								
	340.5							
Boring terminated at 73.5 feet.		-75						
		-80						
		-85						

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

BORING BB-36

DEPTH
65.0 ft.

DEPTH
73.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	65.0-73.5	100	66

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 04/21/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763356 **Long** -90.169075

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-36a
Station 1813+23.34
Offset 28.8 ft R (EB)
Ground Surface Elev. 404.2 ft

Surface Water Elev. 396.8 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 404.2 (+/-) feet. Surface elevation at river bottom = 374.3 (+/-) feet.			
-5			
-10			
-15			
384.2 -20			
-25			
377.3			
No sampling from the mudline to top of bedrock. See BB-36 for sampled materials.			
-30			
-35			
364.2 -40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 04/21/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763356 **Long** -90.169075

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-36a
Station 1813+23.34
Offset 28.8 ft R (EB)
Ground Surface Elev. 404.2 ft

Surface Water Elev. 396.8 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-45			
-50			
-55			
347.6			
Borehole continued with rock coring.			
-60			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 04/21/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763356 **Long** -90.169075

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 347.6 ft
Begin Core Elev. 347.6 ft

BORING NO. BB-36a
Station 1813+23.34
Offset 28.8 ft R (EB)
Ground Surface Elev. 404.2 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, aphanitic, thin to thick bedding, slightly weathered, dense.	347.6	1	97	63	4.1		
Interbedded with clayey shale from about 57.8 to 58.6 feet. *Depth 57.8', Dry Density: 167.2 pcf.*						697.3	0.1
	-60						
Massive bedded.		2	100	100	3.5		
	-65						
Depth 65.9', Dry Density: 168.0 pcf.						936.9	0.1
		3	99	98	3.9		
	-70						
Depth 70.8', Dry Density: 166.5 pcf.						652.5	0.3
	-75						
Depth 76.1', Dry Density: 163.7 pcf.						564.3	0.1

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

Illinois Department of Transportation
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ROCK CORE LOG

Date 04/21/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.763356 **Long** -90.169075

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-36a
Station 1813+23.34
Offset 28.8 ft R (EB)
Ground Surface Elev. 404.2 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 2.06 in
Top of Rock Elev. 347.6 ft
Begin Core Elev. 347.6 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, aphanitic, thin to thick bedding, slightly weathered, dense. *(continued)* Massive to thinly bedded.	4	100	84	3.9		
Depth 78.8', Dry Density: 165.5 pcf.					604.3	0.3
-80						
Depth 84.2', Dry Density: 167.1 pcf.					555.3	0.1
-85						
317.6						
Boring terminated at 86.6 feet.						
-90						
-95						

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

BORING BB-36a

DEPTH
56.6 ft.

DEPTH
66.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	56.6-61.6	97	63
2	61.6-66.6	100	100

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-36a

DEPTH
66.6 ft.

DEPTH
76.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	66.6-76.6	99	98

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-36a

DEPTH
76.6 ft.

DEPTH
86.6 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
4	76.6-86.6	100	84

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
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SOIL BORING LOG

Date 10/29/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 15, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76376494 **Long** -90.16957779

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-37
Station 1811+12.43
Offset 94.3 ft L (EB)
Ground Surface Elev. 393.8 ft

Surface Water Elev. 393.8 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 393.8 (+/-) feet. Surface elevation at river bottom = 367.1 (+/-) feet. Sampling began 26.7 feet below water level.			
-5			
-10			
-15			
373.8 -20			
-25			
367.1			
Sand: Brown, fine to coarse grained, loose, A-3.	2 3 4	NC	--
-30			
	1 1 WOH	NC	--
-35			
Very loose.	2 4 4	NC	--
353.8 -40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/29/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 15, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76376494 **Long** -90.16957779

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-37
Station 1811+12.43
Offset 94.3 ft L (EB)
Ground Surface Elev. 393.8 ft

Surface Water Elev. 393.8 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: Brown, fine to coarse grained, loose, A-3.				
		2 1 3	NC	--
	-45			
Gray.		4 14 17	NC	--
	344.6			
Borehole continued with rock coring.	-50			
	-55			
	-60			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/29/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 15, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76376494 **Long** -90.16957779

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ

Core Diameter 1.86 in
Top of Rock Elev. 344.6 ft
Begin Core Elev. 344.6 ft

BORING NO. BB-37
Station 1811+12.43
Offset 94.3 ft L (EB)
Ground Surface Elev. 393.8 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, very finely crystalline, banded to thinly bedded, fresh, dense.	344.6	1	98	97	7		
	-50						
Thin to medium bedded. *Depth 53.7', Dry Density: 164.9 pcf.*						365.4	0.3
	-55						
Depth 58.3', Dry Density: 166.5 pcf.						843.4	0.1
		2	98	96	6		
	-60						
Depth 61.3', Dry Density: 164.2 pcf.						559.9	0.2
	-65						
Depth 67.3', Dry Density: 166.7 pcf.						634.5	0.2
	325.6						
Sandy Limestone: Light gray, very hard, fine to coarse grained, medium bedded, fresh, interbedded with dark gray sandstone bands.	324.6						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/29/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 15, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76376494 **Long** -90.16957779

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NQ
Station 806+89.23

Core Diameter 1.86 in
Top of Rock Elev. 344.6 ft
Begin Core Elev. 344.6 ft

BORING NO. BB-37
Station 1811+12.43
Offset 94.3 ft L (EB)
Ground Surface Elev. 393.8 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, very finely crystalline, thin to thickly bedded, fresh, dense. *Depth 69.4', Dry Density: 166.0 pcf.*	-70	3	95	95	10	551.8	0.2
	-75						
Depth 75.6', Dry Density: 165.4 pcf.						828.6	0.3
Banded to thinly bedded.							
	314.6						
Boring terminated at 79.2 feet.	-80						
	-85						

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

BORING BB-37

DEPTH
49.2 ft.

DEPTH
59.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	49.2-59.2	98	97

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BORING BB-37

DEPTH
59.2 ft.

DEPTH
69.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	59.2-69.2	98	96

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-37

DEPTH
69.2 ft.

DEPTH
79.2 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	69.2-79.2	95	95

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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SOIL BORING LOG

Date 4/06-07/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 17, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.763122 **Long** -90.168363

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-38
Station 1815+17.74
Offset 32.8 ft R (EB)
Ground Surface Elev. 406.0 ft

Surface Water Elev. 398.6 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
				River surface elevation at 406.0 (+/-) feet. Surface elevation at river bottom = 391.6 (+/-) feet. Sampling began 16.7 feet below water level.
-5				
-10				
391.6				
-15				Clay Loam: Gray, very soft, very moist. A-7.
389.0	1 2 1	NC	--	Silt: Gray, very, soft, very moist. A-4.
386.5				
-20				
-25				Sand: Gray, fine to coarse grained, very loose to medium dense, very moist to wet. A-3. *(continued)*
	1 1 1	NC	--	With clay lumps.
-30	3 8 9	NC	--	Trace fine gravel.
-35	4 8 14	NC	--	Fine grained and no gravel.
-40	4 2 4	NC	--	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 4/06-07/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 17, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.763122 **Long** -90.168363

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-38
Station 1815+17.74
Offset 32.8 ft R (EB)
Ground Surface Elev. 406.0 ft

Surface Water Elev. 398.6 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: Gray, fine to coarse grained, very loose to medium dense, very moist to wet. A-3. *(continued)*			
Trace coarse sand and fine gravel.	10 8 5	NC	--
361.0 -45			
Sand: Gray, fine to coarse grained, medium dense, trace fine gravel, very moist to wet. A-1.	5 6 5	NC	--
-50			
352.8	5 10 11	NC	--
Sand: Gray, fine grained, medium dense, very moist to wet. A-3.			
-55			
347.9			
Limestone	50/1"	NC	--
Boring abandoned due to outer casing locked in sand (22 ft of casing removed with the lower 346.6			
-60			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
portion remaining below the mud line). See BB-38a.			
Boring terminated at 59.4 feet.			
-65			
-70			
-75			
-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 04/07/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 17, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.763155 **Long** -90.168357

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-38a
Station 1815+17.74
Offset 32.8 ft R (EB)
Ground Surface Elev. 405.1 ft

Surface Water Elev. 397.8 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 405.1 (+/-) feet. Surface elevation at river bottom = 392.3 (+/-) feet.			
-5			
-10			
392.3			
No SPT sampling from the mudline to top of bedrock. See BB-38 for SPT sampled materials.			
-15			
385.1 -20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-25			
-30			
-35			
365.1 -40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 04/07/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 17, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.763155 **Long** -90.168357

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-38a
Station 1815+17.74
Offset 32.8 ft R (EB)
Ground Surface Elev. 405.1 ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-45			
-50			
-55			
346.3 Borehole continued with rock coring. -60			

Surface Water Elev. 397.8 ft
Stream Bed Elev. ft

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

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

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ROCK CORE LOG

Date 04/07/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 17, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.763155 **Long** -90.168357

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-38a
Station 1815+17.74
Offset 32.8 ft R (EB)
Ground Surface Elev. 405.1 ft

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 346.3 ft
Begin Core Elev. 346.3 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, very finely crystalline, massive bedding, slightly weathered, dense. 346.3	-60	1	98	87	3.5		
Depth 61.9', Dry Density: 167.6 pcf.						615.3	0.1
	-65						
Depth 68.0', Dry Density: 166.9 pcf.						800.7	0.1
	-70	2	99	98	3.2		
Depth 71.2', Dry Density: 165.6 pcf.						318.3	0.2
	-75						
Depth 77.0', Dry Density: 166.0 pcf.						656.1	0.1

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

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 04/07/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 17, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.763155 **Long** -90.168357

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NQ
Core Diameter 1.86 in
Top of Rock Elev. 346.3 ft
Begin Core Elev. 346.3 ft

BORING NO. BB-38a
Station 1815+17.74
Offset 32.8 ft R (EB)
Ground Surface Elev. 405.1 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Thin to thick bedded. Limestone: Light gray, hard to very hard, very finely crystalline, massive bedding, slightly weathered, dense. *(continued)* *Depth 78.9', Dry Density: 165.4 pcf.*	-80	3	100	90	3.7	696.2	0.2
	-85						
Depth 86.1', Dry Density: 166.5 pcf.						485.5	0.1
	316.4						
Boring terminated at 88.7 feet.	-90						
	-95						

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

BORING BB-38a

DEPTH
58.8 ft.

DEPTH
68.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	58.8-68.8	98	87

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	ROCK CORE PHOTOGRAPH
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BORING BB-38a

DEPTH
68.8 ft.

DEPTH
78.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	68.8-78.8	99	98

	SCI ENGINEERING, INC. www.sciengineering.com
	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-38a

DEPTH
78.7 ft.

DEPTH
87.7 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	78.7-87.7	100	90

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 04/22/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.7658485 **Long** -90.16882821

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-39
Station 1813+44.51
Offset 92.7 ft L (EB)
Ground Surface Elev. 403.9 ft

Surface Water Elev. 396.5 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
River surface elevation at 403.9 (+/-) feet. Surface elevation at river bottom = 370.0 (+/-) feet. Sampling began 41.2 feet below water level.							
-5				-25			
-10				-30			
-15				-35			
383.9 -20				-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

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SOIL BORING LOG

Date 04/22/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.7658485 **Long** -90.16882821

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-39
Station 1813+44.51
Offset 92.7 ft L (EB)
Ground Surface Elev. 403.9 ft

Surface Water Elev. 396.5 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
362.7				
	2 3 2	NC	--	Sand: Brown, fine to coarse grained, loose, wet, trace fine gravel. A-1
359.9				
-45				Sand: Brown, fine to coarse grained, loose, wet. A-3
	3 3 4	NC	--	
-50				
352.7				
	5 3 4	NC	--	*Poor recovery - coarse gravel lodged in shoe.*
350.9				
-55				Sand: Gray, fine to coarse grained, medium dense, wet, with trace fine to coarse gravel. A-1
	24 50/3"	NC	--	
346.6				Clayey Shale: Gray
345.5				Borehole continued with rock coring.
-60				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 04/22/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.7658485 **Long** -90.16882821

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX

Core Diameter 2.06 in
Top of Rock Elev. 346.3 ft
Begin Core Elev. 345.5 ft

BORING NO. BB-39
Station 1813+44.51
Offset 92.7 ft L (EB)
Ground Surface Elev. 403.9 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, very finely crystalline to aphanitic, medium to massive bedding, slightly weathered, dense. 345.5	1	92	74	4		
With clayey shale deposits						
Depth 59.6', Dry Density: 164.9 pcf. -60					670.1	0.1
Vertical fracturing caused by coring process.						
-65						
Depth 65.7', Dry Density: 166.3 pcf.					1024.3	0.1
	2	100	96	3.5		
Massive bedding. -70						
Depth 71.7', Dry Density: 166.2 pcf.					1017.5	0.2
Depth 74.0', Dry Density: 163.7 pcf.					392.2	0.4
-75						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 04/22/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 16, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.7658485 **Long** -90.16882821

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-39
Station 1813+44.51
Offset 92.7 ft L (EB)
Ground Surface Elev. 403.9 ft

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 in
Top of Rock Elev. 346.3 ft
Begin Core Elev. 345.5 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, very finely crystalline to aphanitic, medium to massive bedding, slightly weathered, dense. *(continued)*	3	99	88	3.3		
-80						
Depth 79.0', Dry Density: 166.4 pcf.					990.8	0.1
-85						
Depth 85.5', Dry Density: 167.6 pcf.					784.6	0.1
315.5						
Boring terminated at 88.4 feet.						
-90						
-95						

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

BORING BB-39

DEPTH
58.4 ft.

DEPTH
68.4 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	58.4-68.4	92	74

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-39

DEPTH
68.4 ft.

DEPTH
78.4 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	68.4-78.4	100	96

	SCI ENGINEERING, INC. www.sciengineering.com
	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-39

DEPTH
78.4 ft.

DEPTH
88.4 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	78.4-88.4	99	88

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 12/10/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 22, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76242593 **Long** -90.16435141

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-40
Station 1826+80.53
Offset 90.2 ft L (EB)
Ground Surface Elev. 412.6 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 407.1 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Clay: Brown, moist, A-7.
411.6				
	3 3 5	3.0 B/20	18	Clay Loam: Brown, moist, A-7.
409.6				
				Clay: Brown, moist, A-7.
408.6	2 2 2	1.0 P	38 39	Silty Loam: Brown, moist, A-6. *Particle Size Analysis Test performed.*
-5		0.6 B/20		
407.1 ▼				Sand: Brown, fine grained, wet, A-2.
	0 0 0	NC	--	
	1 2 3	NC		
-10				
402.1				Clay: Gray, very moist to wet, A-7.
	1 1 1	<0.25 P	66	
	1 1 1	0.2 B/20	62	
398.1 -15				Sand: Gray, fine grained, wet, A-2.
397.1				Clay: Gray, very moist to wet, with fine sand deposits, A-7.
	1 0 1	<0.25 P	42	
393.6	3 1 1	<0.25 P	31	Silt: Gray, wet, A-4.
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
392.1				Sandy Loam: Gray, fine to coarse grained, wet, A-2. *Grain Size Analysis Test performed.*
	5 5 5	NC	--	
	6 3 5	NC	--	
-25				
	3 4 6	NC	--	
	5 5 5	NC	--	
-30				
	10 11 10	NC	--	*Grain Size Analysis Test performed.*
-35				
	9 8 10	NC	--	
372.6 -40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 12/10/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 22, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76242593 **Long** -90.16435141

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-40
Station 1826+80.53
Offset 90.2 ft L (EB)
Ground Surface Elev. 412.6 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 407.1 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sandy Loam: Gray, fine to coarse grained, wet, A-2.*(Continued)*
370.6				
				Sand: Gray, fine to coarse grained, wet, A-1.
-45	8 8 12	NC	--	
-50	6 4 5	NC	--	
-55	9 4 6	NC	--	Trace fine gravel.
355.6				
				Sand: Gray, fine to coarse grained, wet, A-2.
-60	11 14 17	NC	--	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Gray, fine to coarse grained, wet, A-2. *(continued)*
350.6				
				Sand: Gray, fine to coarse grained, wet, trace fine gravel, A-1.
-65	7 7 10	NC	--	
-70	10 8 8	NC	--	
-75	9 8 7	NC	--	
335.6				
				Weathered Limestone: Gray.
334.8				Borehole continued with rock coring.
-80				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 12/10/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 22, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76242593 **Long** -90.16435141

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-40
Station 1826+80.53
Offset 90.2 ft L (EB)
Ground Surface Elev. 412.6 ft

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 in
Top of Rock Elev. 335.6 ft
Begin Core Elev. 334.8 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard to very hard, very finely crystalline, thin to medium bedded, slightly weathered, dense. 334.8	1	98	78	2.5		
-80						
Depth 81.2', Dry Density: 166.5 pcf.					568.6	0.1
-85						
	2	100	83	1.9		
-90						
Depth 93.6', Dry Density: 160.8 pcf.					369.5	0.2
317.9						
-95						
Calcareous Siltstone: Brownish-gray, moderately hard, very finely crystalline, slightly weathered, dense.						
Depth 95.6', Dry Density: 130.2 pcf.					331.6	1.1
315.5						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 12/10/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 22, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76242593 **Long** -90.16435141

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 335.6 ft
Begin Core Elev. 334.8 ft

BORING NO. BB-40
Station 1826+80.53
Offset 90.2 ft L (EB)
Ground Surface Elev. 412.6 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, moderately hard, very finely crystalline, thinly bedded, slightly weathered, dense. *(continued)*						
Thin to medium bedded.	3	99	96	3.6		
-100						
Some chert laminations.						
Thickly bedded.						
Depth 101.8', Dry Density: 152.6 pcf.					406.9	0.3
Pitted.						
Gray.						
-105						
					782.6	0.2
304.3						
Boring terminated at 108.3 feet.						
-110						
-115						

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

BORING BB-40

DEPTH
77.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	77.8-88.3	98	78

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-40

DEPTH
88.3 ft.

DEPTH
98.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	88.3-98.3	100	83

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-40

DEPTH
98.3 ft.

DEPTH
108.3 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	98.3-108.3	99	96

	SCI ENGINEERING, INC. www.sciengineering.com
	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 04/21/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 17, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76340375 **Long** -90.16818102

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-41
Station 1815+42.88
Offset 91.5 ft L (EB)
Ground Surface Elev. 403.2 ft

Surface Water Elev. 395.9 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)

River surface elevation at 403.2 (+/-) feet. Surface elevation at river bottom = 381.1 (+/-) feet.

-5
-10
-15
383.2 -20

381.1
Samples not obtained of river deposits (sediment and sand).

-25
-30
-35
363.2 -40

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 04/21/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 17, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76340375 **Long** -9016818102

COUNTY Madison **DRILLING METHOD** HSA, NQ Casing **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-41
Station 1815+42.88
Offset 91.5 ft L (EB)
Ground Surface Elev. 403.2 ft

Surface Water Elev. 395.9 ft
Stream Bed Elev. ft

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

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-45			
-50			
-55			
-60			

Driller observed harder drilling from 50 to 59 feet. Possible cobbles or boulders.

344.1
Borehole continued with rock coring.

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 04/21/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 17, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76340375 **Long** -9016818102

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 344.1 ft
Begin Core Elev. 344.1 ft

BORING NO. BB-41
Station 1815+42.88
Offset 91.5 ft L (EB)
Ground Surface Elev. 403.2 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, very finely crystalline to aphantic, thin to massive bedding, slightly weathered, dense. 344.1 Thin brown sandstone from 59.6 to 59.7 feet with thin greenish-gray clayey shale deposit. Vertical fracturing caused by coring process.	1	97	78	4.2		
-60						
Depth 62.2', Dry Density: 166.4 pcf.					540.5	0.2
-65						
Depth 66.6', Dry Density: 166.2 pcf.					346.3	0.3
	2	100	94	4		
-70 Massive. *Depth 69.9', Dry Density: 162.4 pcf.*					460.5	0.9
-75						
Depth 78.4', Dry Density: 167.4 pcf.					414.3	0.1

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 04/21/21

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 17, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76340375 **Long** -9016818102

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 344.1 ft
Begin Core Elev. 344.1 ft

BORING NO. BB-41
Station 1815+42.88
Offset 91.5 ft L (EB)
Ground Surface Elev. 403.2 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Thin to thick bedded. Limestone: Light gray, hard to very hard, very finely crystalline to aphantic, thin to massive bedding, slightly weathered, dense. *(continued)*	3	100	94	4.5		
-80						
Medium to thick bedding.					424.0	0.1
Depth 80.4', Dry Density: 167.0 pcf.						
-85						
Depth 87.6', Dry Density: 167.2 pcf.					496.2	0.1
314.1						
Boring terminated at 89.1 feet.						
-90						
-95						

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

BORING BB-41

DEPTH
58.4 ft.

DEPTH
68.4 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	58.4-68.4	92	74

	SCI ENGINEERING, INC. www.sciengineering.com
	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-41

DEPTH
68.4 ft.

DEPTH
78.4 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	68.4-78.4	100	96

	SCI ENGINEERING, INC. www.sciengineering.com
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BORING BB-41

DEPTH
78.4 ft.

DEPTH
88.4 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	78.4-88.4	99	88

	SCI ENGINEERING, INC. www.sciengineering.com
	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 09/05/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 23, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76228293 **Long** -90.16347466

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-42
Station 1829+24.65
Offset 95.6 ft L (EB)
Ground Surface Elev. 410.2 ft

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

Groundwater Elev.:
First Encounter 399.2 ft ▼
Upon Completion ____ ft
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Loam: Brown, stiff, dry A-4. *Particle Size Analysis Test performed.*
	10 8 7	0.8 S/10	15	408.5 Silty Clay Loam: Brown, stiff to medium stiff, poor recovery, A-6.
-5	5 3 5	0.8 S/10	15	
				404.7 Sand: Brown, fine grained, loose, dry to very moist, A-2.
	5 4 4	NC	--	
-10	5 2 8	NC	--	
				▼ Fine to coarse grained, loose to medium dense, wet.
	3 3 3	NC	--	
-15	4 5 7	NC	--	
	5 6 10	NC	--	
				392.2 Sandy Loam: Brown, fine grained, loose. A-2. *Grain Size Analysis Test*
-20	4 4 4	NC	--	
				performed. 389.7 Clay: Gray, high plasticity, very soft, moist, A-7.
	3 1 2	0.5 B/20	65	
-25	6 5 7	NC	--	387.2 Sandy Loam: Gray, fine grained, medium dense to very loose, A-2. *Grain Size Analysis Test performed.*
	5 4 5	NC	--	*No recovery.*
-30	3 1 0	NC	--	*No recovery.*
				378.2 Sand: Gray, fine to coarse grained, medium dense, A-2.
-35	6 7 12	NC	--	
				373.2 Sandy Loam: Gray, fine to coarse grained, medium dense, trace coal, A-2. *Grain Size Analysis Test performed.*
-40	10 9 11	NC	--	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 09/05/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 23, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76228293 **Long** -90.16347466

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-42
Station 1829+24.65
Offset 95.6 ft L (EB)
Ground Surface Elev. 410.2 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 399.2 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sandy Loam: Gray, fine to coarse grained, medium dense, trace coal, A-2. *(continued)*
368.2				
				Sand: Gray, fine to coarse grained, medium dense to dense, trace fine gravel, A-2.
	17 16 14	NC	--	
-45				
363.2				
				Sandy Loam: Gray, fine and coarse grained, medium dense, trace fine gravel, A-1-b. *Grain Size Analysis Test performed.*
	6 6 6	NC	--	
-50				
358.2				
				Sand: Gray, fine to coarse grained, medium dense to dense, trace fine gravel, A-2.
	13 9 13	NC	--	
-55				
				No gravel.
	15 19 21	NC	--	
-60				
				Sand: Gray, fine to coarse grained, medium dense to dense, trace fine gravel, A-2. *(continued)*
				Trace fine gravel.
	28 15 12	NC	--	
-65				
343.2				
				Sand: Gray, fine to coarse grained, medium dense, trace fine gravel, A-1.
	14 14 14	NC	--	
-70				
	14 8 8	NC	--	
-75				
332.2				
				Weathered Limestone: Gray.
331.6				
	100/1"	NC	--	Boring terminated at 78.6 feet. Boring grouted to 78.6 feet.
-80				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 9/19-20/2018

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76194319 **Long** -90.16417755

COUNTY Madison **DRILLING METHOD** HSA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-43
Station 1828+02.07
Offset 42.4 ft R (EB)
Ground Surface Elev. 408.8 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 397.8 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Clay Loam: Brown, very stiff, with gravel, fill, A-7.
	8 18 9	4.5 P	19	
405.8				
				Silty Clay Loam: Brown and gray, stiff, trace organics, moist, fill, A-6. *Particle Size Analysis Test performed.*
-5	3 4 5	1.9 B/20	26	
403.3				
				Silty Clay: Gray, very soft to soft, with thin silt deposits and clay deposits, very moist, A-6.
	1 1 2	0.3 P	48	
	0 0 0	0.1 B/20	37	
-10				
398.3				
▼				Silty Loam: Gray, very soft, very moist, A-4.
397.1	1 1 1	0.3 P	32	
				Sand: Gray, fine grained, very loose, very moist, A-2.
395.8				
				Clay: Gray, medium stiff, very moist, A-7. *Particle Size Analysis Test performed.*
-15	2 2 3	1.4 B/20	40	
	3 3 3	0.5 B/20	49	Dark gray.
	0 0 0	0.2 B/20	44	With silty clay deposits.
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Clay: Gray, medium stiff, very moist, A-7. *(continued)*
	1 1 2	0.4 B/20	36	
385.8				
				Sand: Gray, fine grained, medium dense, A-3. *Grain Size Analysis Test performed.*
-25	4 6 10	NC	--	
383.3				
				Silty Loam: Gray, stiff, very moist, A-4.
382.3	5 6 4	NC	--	
				Sand: Gray, fine grained, medium dense, A-2.
380.8				
				Silty Loam: Gray, medium stiff, wet, A-4. *Grain Size Analysis Test performed.*
-30	4 4 4	NC	--	
376.8				
				Sand: Gray, fine grained, medium dense to dense, A-2.
	6 10 10	NC	--	
-35				
	4 5 5	NC	--	
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 9/19-20/2018

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76194319 **Long** -90.16417755

COUNTY Madison **DRILLING METHOD** HSA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-43
Station 1828+02.07
Offset 42.4 ft R (EB)
Ground Surface Elev. 408.8 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 397.8 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Gray, fine grained, medium dense to dense, A-2. *(continued)*
-45	16 18 16	NC	--	
				End of drilling and sampling at 45 feet on 9/19/18.
361.8				
				Sand: Gray, fine to coarse grained, medium dense, A-2.
-50	9 9 10	NC	--	
356.8				
				Sand: Gray, fine to coarse grained, loose, trace fine gravel, A-1.
-55	3 3 5	NC	--	
350.3				
				Wood: Very dark brown (14 inches recovered).
348.8 -60	40 66 20	NC	--	
				Sand: Gray, fine to coarse grained, medium dense to dense, trace fine gravel, A-1.
-65	8 8 8	NC	--	
341.8				
				Sand: Gray, fine to coarse grained, dense, trace fine gravel, A-1.
-70	10 15 16	NC	--	
-75	11 15 20	NC	--	
330.3				
				Weathered Limestone: Gray.
-80	100/5.75"	NC	--	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 9/19-20/2018

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76194319 **Long** -90.16417755

COUNTY Madison **DRILLING METHOD** HSA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-43
Station 1828+02.07
Offset 42.4 ft R (EB)
Ground Surface Elev. 408.8 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 397.8 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
				Weathered Limestone: Gray. *(continued)*
327.2				
	100/0.5"	NC	--	Boring terminated at 81.6 feet. Boring grouted to 81.6 feet.
-85				
-90				
-95				
-100				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

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SOIL BORING LOG

Date 11/5-6/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 18, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76292731 **Long** -90.16776551

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-44
Station 1816+98.12
Offset 36.5 ft R (EB)
Ground Surface Elev. 416.0 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Clay: Gray, soft, moist, fill, with layers of fine sand, A-6.
	2 2 1	NC	16	
				Dark gray. *Atterberg Limits test performed.*
-5	1 1 1	0.5 S/5	13	
				Medium stiff, with crushed rock.
	1 2 5	NC	11	
408.0				
				Silty Clay: Light to dark gray, medium stiff, moist, fill, with layers of fine sand, A-6.
-10	3 4 4	NC	21	
405.5				
				Clay Loam: Gray, medium stiff, moist, A-4. *Grain Size Analysis performed.*
	2 3 3	NC	--	
403.0				
				Clay: Gray, soft, moist, A-7.
-15	1 1 2	<0.5 P	33	
				Atterberg Limits test performed.
	1 1 1	0.2 B/20	39	
-20	0 1 1	0.2 B/20	38	
				Clay: Gray, soft, moist, A-7. *(continued)*
	0 1 1	0.2 B/20	41	
393.0				
				Sandy Loam: Gray, very loose to loose, moist, fine grained, A-2. *Grain Size Analysis performed.*
-25	2 3 3	NC	28	
390.5				
				Silty Clay: Gray, medium stiff, moist, A-6.
389.0	2 5 7	NC	--	
				Sand: Gray, medium dense, moist, fine to coarse grained, A-3.
-30	5 5 5	NC	--	
				Gray and brown.
-35	6 4 5	NC	--	
				Gray.
-40	13 12 15	NC	--	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 11/5-6/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 18, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76292731 **Long** -90.16776551

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-44
Station 1816+98.12
Offset 36.5 ft R (EB)
Ground Surface Elev. 416.0 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Gray, medium dense, moist, fine to coarse grained, A-3. *(continued)*
	10 10 10	NC	--	Trace organics.
-45				
	1 1 2	NC	--	
-50				
	19 23 22	NC	--	
-55				
	7 7 7	NC	--	With wood.
356.0 -60				
	22 18 23	NC	--	Sand: Gray, dense, moist, trace organics, A-1.
-65				
	13 8 7	NC	--	Medium dense, trace limestone gravel.
-70				
345.0				Weathered Limestone.
343.0				Borehole continued with rock coring.
-75				
-80				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 11/5-6/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 18, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76292731 **Long** -90.16776551

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 345.0 ft
Begin Core Elev. 343.0 ft

BORING NO. BB-44
Station 1816+98.12
Offset 36.5 ft R (EB)
Ground Surface Elev. 416.0 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Shaley Limestone: Gray, hard to very hard, aphanitic to very finely crystalline, banded to thinly bedded, moderately weathered, dense, with clay seams.	343.0		1	92	35	4.5		
Depth 74.6 feet. Dry Density: 166.6 pcf.		-75					976.0	0.3
Depth 78.0 feet. Dry Density: 167.3 pcf.		-80					1358.0	0.1
Thinly bedded.			2	96	58	4.9		
Depth 83.6 feet. Dry Density: 166.0 pcf.		-85					1292.3	0.2
Depth 88.4 feet. Dry Density: 167.3 pcf.		-90					687.4	0.1
Depth 91.2 feet. Dry Density: 167.0 pcf.			3	86	48	2.3	844.3	0.1

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

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 11/5-6/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 18, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76292731 **Long** -90.16776551

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX

Core Diameter 2.06 in
Top of Rock Elev. 345.0 ft
Begin Core Elev. 343.0 ft

BORING NO. BB-44
Station 1816+98.12
Offset 36.5 ft R (EB)
Ground Surface Elev. 416.0 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Shaley Limestone: Gray, hard to very hard, aphanitic to very finely crystalline, banded to thinly bedded, moderately weathered, dense, with clay seams. *(continued)*						
-95						
Depth 96.3 feet. Dry Density: 168.2 pcf.					1026.9	0.1
-100						
314.0						
Boring terminated at 102.0 feet.						
-105						
-110						

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

BORING BB-44

DEPTH
73.0 ft.

DEPTH
83.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	73.0-83.0	92	35

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BORING BB-44

DEPTH
83.0 ft.

DEPTH
91.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	83.0-91.0	96	58

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BORING BB-44

DEPTH
91.0 ft.

DEPTH
102.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	91.0-102.0	86	48

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SOIL BORING LOG

Date 11/09/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 18, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76325207 **Long** -90.16751444

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-45
Station 1817+29.74
Offset 98.2 ft L (EB)
Ground Surface Elev. 417.1 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Silty Clay: Gray, soft, moist, trace roots, with layers of fine sandy loam, fill, A-6.
	1 1 1	<0.25 P	22	
414.1				
				Sandy Loam: Gray, loose, moist, trace crushed rock, fine grained, A-2
-5	2 3 4	NC	--	
	4 4 2	NC	--	
409.6				
				Loam: Gray, soft to medium stiff, moist, with layers of silty clay and sandy loam, A-4.
-10	3 2 2	<0.25 P	28	
	3 2 1	<0.25 P	31	
404.1				
				Silty Clay: gray, soft to very soft, moist, A-4. *Grain Size Analysis performed.*
-15	2 1 1	NC	33	
	1 1 2	0.9 B/20	--	
400.1				
				Clay: Gray, moist, soft, A-7.
399.1				
				Loam: Gray, soft to medium stiff, moist, with layers of silty clay and sandy loam, A-4.
398.1	1 1 1	NC	35	
397.1 -20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Clay: Gray, moist, soft, A-7.
	1 1 0	NC	35	Loam: Gray, moist, very soft, moist, A-4.
-25	3 1 5	NC	30	With layers of sandy loam and clay.
391.6				
	7 6 5	NC	--	Loam: Gray, moist, soft, with layers of clay, A-2.
389.1				
-30	1 1 1	0.1 S/10	33	Clay: Gray, soft, moist, with layers of sandy clay loam, A-6. *Grain Size Analysis performed.*
385.1				
				Sand: Gray, moist, fine to coarse grained, A-2.
-35	3 3 7	NC	--	
-40	6 8 12	NC	--	
377.1				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

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SOIL BORING LOG

Date 11/09/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 18, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76325207 **Long** -90.16751444

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-45
Station 1817+29.74
Offset 98.2 ft L (EB)
Ground Surface Elev. 417.1 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None. ft
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Gray, medium dense, moist, fine to coarse grained, A-3.				
	-45	7 9 10	NC	--
	-50	9 10 8	NC	--
	-55	10 13 13	NC	--
	357.1 -60	12 12 15	NC	--
Sand: Gray, medium dense, moist, fine to coarse grained, with gravel, A-1.				
	-65	10 14 13	NC	--
	-70	8 9 10	NC	--
	343.6			
Weathered Limestone.		50/3"	NC	--
	342.1 -75			
Borehole continued with rock coring.	-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 11/09/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 18, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76325207 **Long** -90.16751444

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-45
Station 1817+29.74
Offset 98.2 ft L (EB)
Ground Surface Elev. 417.1 ft

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 in
Top of Rock Elev. 343.6 ft
Begin Core Elev. 342.1 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, aphanitic to very finely crystalline, thinly bedded, slightly to moderately weathered, dense. 342.1		1	92	46	2.2		
Depth 77.4 feet. Dry Density: 167.0 pcf.						757.7	0.1
	-80						
Trace clay seams.							
Depth 83.1 feet. Dry Density: 166.9 pcf.						558.3	0.1
333.1							
Shaley Limestone: Dark gray, thinly bedded, slightly weathered, dense.	-85						
331.8		2	100	60	2.4		
Limestone: Gray, hard, aphanitic to very finely crystalline, thin to massive bedding, fresh to slightly weathered, dense.							
Depth 87.9 feet. Dry Density: 165.0 pcf.						1020.9	0.3
	-90						
Depth 93.3 feet. Dry Density: 167.7 pcf.						963.1	0.1
	-95						

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

Illinois Department of Transportation
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ROCK CORE LOG

Date 11/09/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 18, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76325207 **Long** -90.16751444

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 343.6 ft
Begin Core Elev. 342.1 ft

BORING NO. BB-45
Station 1817+29.74
Offset 98.2 ft L (EB)
Ground Surface Elev. 417.1 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, aphanitic to very finely crystalline, thin to massive bedding, fresh to slightly weathered, dense. *(continued)* Thin to medium bedding.		3	100	58	2.6		
Depth 97.9 feet. Dry Density: 166.6 pcf.	-100					903.3	0.2
Depth 104.3 feet. Dry Density: 167.1 pcf.	312.1 -105					1322.3	0.1
Boring terminated at 105.0 feet.	-110 -115						

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

BORING BB-45

DEPTH
75.0 ft.

DEPTH
85.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	75.0-85.0	92	46

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BORING BB-45

DEPTH
85.0 ft.

DEPTH
95.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	85.0-95.0	100	60

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ROCK CORE PHOTOGRAPH

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BORING BB-45

DEPTH
95.0 ft.

DEPTH
105.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	95.0-105.0	100	58.3

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SOIL BORING LOG

Date 11/9-10/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 20, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.7624999 **Long** -90.16614979

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-46
Station 1821+84.41
Offset 42.4 ft R (EB)
Ground Surface Elev. 414.5 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 406.0 ft ▼
Upon Completion ft
After Hrs. None ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Silty Clay: Gray, medium stiff, moist, fill, A-7.			
	2 8 10	0.8 B/20	11
410.5			
Sand: Gray, loose, coarse-grained, crushed rock, fill, A-1. *Grain Size Analysis performed.*	8 18 31	0.8 S/20	20
-5			
407.5	3 3 3	0.3 S/10	19
Clay: Gray, trace brown, soft, A-7. *Atterberg Limits test performed.* ▼	1 1 2	0.8 S/15	38
-10			
404.0			
Silty Clay: Gray, soft, moist, A-6.	1 1 1	0.4 B/20	35
401.5			
Sandy Loam: Gray, medium dense, moist, A-2.	5 7 7	NC	--
-15			
	6 6 7	NC	--
	3 5 9	NC	--
394.5 -20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Gray, loose to medium dense, moist, fine to coarse grained, A-3. *Grain Size Analysis performed.*			
	8 10 9	NC	--
	4 5 10	NC	--
-25			
	7 12 9	NC	--
	5 7 11	NC	--
-30			
	9 9 10	NC	--
-35			
	10 10 9	NC	--
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 11/9-10/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 20, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.7624999 **Long** -90.16614979

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-46
Station 1821+84.41
Offset 42.4 ft R (EB)
Ground Surface Elev. 414.5 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 406.0 ft ▼
Upon Completion ft
After Hrs. None ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Gray, loose to medium dense, moist, fine to coarse grained, A-3. *(continued)*			
-45	6 9 8	NC	--
366.5			
Sand: Gray, medium dense, moist, fine grained, A-2.			
-50	6 8 11	NC	--
-55	4 7 9	NC	--
357.5			
Sandy Loam: Gray, dense, moist, fine-grained, A-3.			
-60	4 10 21	NC	--
Sandy Loam: Gray, dense, moist, fine-grained, A-3. *(continued)*			
352.5			
Sand: Gray, medium dense, moist, fine to coarse grained, A-3.			
-65	9 8 10	NC	--
-70	9 7 7	NC	--
342.0			
Weathered Limestone.			
-75	50/1"	NC	--
339.0			
Borehole continued with rock coring.			
-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 11/9-10/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 20, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.7624999 **Long** -90.16614979

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 341.0 ft
Begin Core Elev. 339.0 ft

BORING NO. BB-46
Station 1821+84.41
Offset 42.4 ft R (EB)
Ground Surface Elev. 414.5 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Shaley Limestone: Gray, aphanitic to very finely crystalline, banded to medium bedding, slightly to moderately weathered, dense.	339.0	1	93	60	5		
Depth 78.2 feet. Dry Density: 167.3 pcf.						1412.8	0.1
	-80						
Depth 82.2 feet. Dry Density: 174.2 pcf.						1196.6	0.1
	-85						
	329.0						
Limestone: Gray, hard, aphanitic to very finely crystalline, thinly bedded, slightly weathered, dense.		2	100	53	3.9		
Depth 89.6 feet. Dry Density: 166.6 pcf.	-90					1208.3	0.1
Depth 91.7 feet. Dry Density: 175.4 pcf.						874.7	0.1
	-95						
	319.0						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 11/9-10/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 20, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.7624999 **Long** -90.16614979

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 341.0 ft
Begin Core Elev. 339.0 ft

BORING NO. BB-46
Station 1821+84.41
Offset 42.4 ft R (EB)
Ground Surface Elev. 414.5 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Shaley Limestone: Gray, hard, aphanitic to very finely crystalline, banded to medium bedded, slightly weathered, dense. *(continued)*	3	98	44	3.3		
Depth 97.5 feet. Dry Density: 173.7 pcf.					1186.4	0.1
-100						
Depth 102.5 feet. Dry Density: 168.7 pcf.					555.2	0.2
-105						
309.0						
Boring terminated at 105.5 feet.						
-110						
-115						

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

BORING BB-46

DEPTH
75.5 ft.

DEPTH
85.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	75.5-85.5	93	60

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	July 2021 SCI No. 2017-3167.10

BORING BB-46

DEPTH
85.5 ft.

DEPTH
95.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	85.5-95.5	100	53

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-46

DEPTH
95.5 ft.

DEPTH
105.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	95.5-105.5	98	44

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

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SOIL BORING LOG

Date 5/19-20/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 19, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76305976 **Long** -90.16673113

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-47
Station 1819+62.82
Offset 100.4 ft L (EB)
Ground Surface Elev. 416.5 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None. ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Clay: Dark gray, medium stiff, moist, A-6.
	1 3 2	1.0 P	37	
412.5				
-5	2 4 3	1.0 P	31	Sandy Loam: Gray, fine grained, loose, moist, A-2.
411.0				
	1 3 1	<0.25 P	30	Silt: Gray, soft, moist, A-4
409.5				Clay: Gray, with brown, medium stiff, moist, A-7.
-10	1 2 2	1.0 B/20	31	*Atterberg Limits test performed.*
404.0	1 1 2	0.8 B/20	38	
				Sand: Gray and brown, fine grained, loose, moist, A-2.
-15	4 4 4	NC	--	
	4 4 5	NC	--	
396.5 -20	6 8 10	NC	--	Medium dense.
				Sandy Loam: Gray and brown, fine grained, loose to medium dense, moist, A-2.
	6 8 10	NC	--	
-25	6 5 5	NC	--	
	7 8 11	NC	--	
386.5 -30	3 3 7	NC	--	
				Sand: Gray, fine to coarse grained, medium dense, moist, A-2.
-35	5 9 8	NC	--	
	7 13 13	NC	--	
376.5 -40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 5/19-20/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 19, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76305976 **Long** -90.16673113

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-47
Station 1819+62.82
Offset 100.4 ft L (EB)
Ground Surface Elev. 416.5 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None. ft
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Gray, fine to coarse grained, loose to medium dense, moist, A-2.				
	-45	7 6 7	NC	--
		4 3 1	NC	--
367.0				
Coal. 366.5	-50			
Sand: Gray, fine to coarse grained, loose to medium dense, moist, A-2.				
Trace organics.		10 6 6	NC	--
361.5	-55			
Sand: Gray, fine to coarse grained sand and gravel, dense, moist, A-1.				
		28 19 26	NC	--
356.5	-60			
Sand: Gray, fine to coarse grained, medium dense, moist, A-2.				
	-65	11 8 5	NC	--
		11 11 11	NC	--
	-70			
344.0				
Borehole continued with rock coring.				
	-75			
	-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 5/19-20/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 19, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76305976 **Long** -90.16673113

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 344.0 ft
Begin Core Elev. 342.5 ft

BORING NO. BB-47
Station 1819+62.82
Offset 100.4 ft L (EB)
Ground Surface Elev. 416.5 ft

Description	Depth (ft)	Core (#)	Recovery (%)	R.Q.D. (%)	Core Time (min/ft)	Strength (tsf)	Moisture (%)
Limestone: Gray, hard to very hard, micritic, thin bedding, slightly weathered, dense.	342.5	1	100	40	6.9		
Cherty from 74.0 to 75.0 feet.	-75						
Depth 78.2', Dry Density: 166.3 pcf.						666.6	0.2
Shaley from 79.0 to 81.0 feet.	-80						
Very finely crystalline. *Depth 81.0', Dry Density: 165.1 pcf.*						827.6	0.5
With styolites. *Depth 84.1', Dry Density: 166.8 pcf.*	-85	2	100	30	3.7	754.1	0.1
	-90						
Depth 90.5', Dry Density: 167.0 pcf.						854.0	0.2
	322.5						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 5/19-20/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 19, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76305976 **Long** -90.16673113

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-47
Station 1819+62.82
Offset 100.4 ft L (EB)
Ground Surface Elev. 416.5 ft

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 in
Top of Rock Elev. 344.0 ft
Begin Core Elev. 342.5 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, moderatley hard, micritic to very finely crystalline, thin bedding, moderately weathered, dense, with styolites.	3	98	18	4.7		
-95						
-100						
Depth 102.2', Dry Density: 159.8 pcf.					438.5	0.2
312.5						
Boring terminated at 104.0 feet.						
-105						
-110						

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

BORING BB-47

DEPTH
74.0 ft.

DEPTH
84.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	74.0-84.0	100	40

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	ROCK CORE PHOTOGRAPH
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BORING BB-47

DEPTH
84.0 ft.

DEPTH
94.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	84.0-94.0	100	30

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-47

DEPTH
94.0 ft.

DEPTH
104.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	94.0-104.0	98	18

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	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
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SOIL BORING LOG

Date 12/05/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76177512 **Long** -90.16290325

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-48
Station 1831+46.47
Offset 7.9 ft R (EB)
Ground Surface Elev. 414.3 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 406.8 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Clay: Brown, medium stiff, A-7.			
Particle Size Analysis Test performed.	2 3 5	1.4 S/15	36
409.8	2 3 3	1.5 P	--
-5 Sandy Loam: Brown, fine grained, medium dense, A-2.			
	2 3 4 ▼	NC	--
Grain Size Analysis Test performed.	1 3 3	NC	--
-10 403.8			
Sand: Brown, fine grained, medium dense, A-3.	4 4 7	NC	--
	6 7 7	NC	--
-15			
	3 4 8	NC	--
3.7% Passing the No. 200 Sieve.	4 5 6	NC	--
394.3 -20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Brown, fine grained, medium dense, A-3. *(continued)*			
	6 10 10	NC	--
	7 11 11	NC	--
-25			
	13 17 15	NC	--
	8 10 15	NC	--
-30			
	8 10 13	NC	--
-35			
377.3 Sandy Loam: Gray, fine to coarse grained, medium dense, trace fine gravel, A-1. *Grain Size Analysis Test performed.*	7 10 12	NC	--
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 12/05/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76177512 **Long** -90.16290325

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-48
Station 1831+46.47
Offset 7.9 ft R (EB)
Ground Surface Elev. 414.3 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 406.8 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sandy Loam: Gray, fine to coarse grained, medium dense, trace fine gravel, A-1. *(continued)*
				372.3
				Sand: Gray, fine grained, dense, A-2.
-45	14 16 17	NC	--	
				367.3
				Sand: Gray, fine to coarse grained, medium dense, A-1.
				2.6% Passing the No. 200 Sieve.
-50	6 7 6	NC	--	
-55	9 11 13	NC	--	
-60	7 10 6	NC	--	
-65	18 10 9	NC	--	Sand: Gray, fine to coarse grained, medium dense, A-1. *(continued)*
-70	12 12 13	NC	--	
				342.3
				Sand: Gray, fine grained, dense, A-2.
-75	15 15 41	NC	--	
				340.0 / 339.8
				Gravel: Fine grained, dense, fine to coarse, A-1.
				Weathered Limestone: Gray.
				337.3
				Sand: Gray, coarse grained, trace fine gravel, A-1.
-80	32 13 11	NC	--	
	14 15 100/5"	NC	--	

Borehole continued with rock coring.

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 12/05/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76177512 **Long** -90.16290325

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX

Core Diameter 2.06 in
Top of Rock Elev. 333.8 ft
Begin Core Elev. 333.8 ft

BORING NO. BB-48
Station 1831+46.47
Offset 7.9 ft R (EB)
Ground Surface Elev. 414.3 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard to very hard, very finely crystalline, banded to thinly bedded, slightly weathered, dense.	333.8		1	96	26	2.1		
		-85						
Thinly to medium bedded.								
3.5" Open vertical fracture.								
2" Open vertical fracture.		-90						
Depth 90.15', Dry Density: 167.5 pcf.	323.8						745.4	0.1
No recovery.			2	0	0	3.8		
		-95						
	318.8							
Boring terminated at 95.5 feet. Boring grouted to 95.5 feet.								
		-100						

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

BORING BB-48

DEPTH
80.5 ft.

DEPTH
90.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	80.5-90.5	96	26

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

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SOIL BORING LOG

Date 09/06/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Abutment, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76191647 **Long** -90.16209908

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-49
Station 1833+48.72
Offset 111.9 ft L (EB)
Ground Surface Elev. 426.9 ft

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

Groundwater Elev.:
First Encounter 403.4 ft ▼
Upon Completion ____ ft
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				Silty Loam: Brown, medium stiff, moist, fill, A-4.
	6 4 4	3.0 P	19	
424.9				
				Clay Loam: Brown, medium stiff to stiff, moist, fill, A-7.
423.1				
	4 6 6	2.0 P	17	Silty Loam: Brown, stiff, moist, fill, A-4.
-5				
421.4				
	3 3 3	1.5 P	11	Silty Clay Loam: Brown, medium stiff moist, fill, A-6.
418.9				
	3 2 3	1.5 P	21	Silty Loam: Brown, medium stiff, moist, A-4.
-10				
416.4				
	3 4 5	0.6 S/15	28	Silt: Brown, stiff, moist, A-4.
413.9				
	3 4 5	1.4 B/20	35	Clay: Brown, stiff, moist, A-7.
-15				
410.4				
	4 7 5	NC	--	Sand: Brown, fine grained, medium dense to dense, moist, A-2.
	7 10 12	NC	--	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				Sand: Brown, fine grained, medium dense to dense, moist, A-2. *(continued)*
	11 13 12	NC	--	
▼				
	10 11 14	NC	--	
-25				
	10 12 17	NC	--	
398.9				
	13 15 16	NC	--	Sandy Loam: Brown, fine grained, medium dense to dense, moist, A-2. *Grain Size Analysis Test performed.*
-30				
394.9				
	13 11 11	NC	--	Sandy Loam: Brown, fine grained, medium dense to dense, moist, A-4. With silt. *Grain Size Analysis Test performed.*
-35				
	13 10 10	NC	--	
386.9 -40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 09/06/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Abutment, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76191647 **Long** -90.16209908

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-49
Station 1833+48.72
Offset 111.9 ft L (EB)
Ground Surface Elev. 426.9 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 403.4 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				Sand: Gray, fine to coarse grained, medium dense to dense, trace coarse sand, A-2-4.
-45	11 9 18	NC	--	
-50	9 16 10	NC	--	
-55	8 11 14	NC	--	
-60	8 11 14	NC	--	
				Sand: Gray, fine to coarse grained, medium dense to dense, trace coarse sand, A-2-4. *(continued)*
-65	9 11 12	NC	--	
-70	15 19 22	NC	--	
352.9				
-75	19 15 26	NC	--	Sand: Gray, fine to coarse grained, dense to very dense, trace fine gravel, A-1.
-80	19 49 43	NC	--	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 09/06/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Abutment, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76191647 **Long** -90.16209908

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-49
Station 1833+48.72
Offset 111.9 ft L (EB)
Ground Surface Elev. 426.9 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 403.4 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Gray, fine to coarse grained, dense to very dense, trace fine gravel, A-1. *(continued)*				
Cobble. Trace weathered limestone and coal.	-85	41 34 35	NC	--
339.9				
Sand: Gray, fine to coarse grained, very dense to dense, A-1.	-90	25 29 25	NC	--
	-95	16 17 21	NC	--
330.9				
Weathered Limestone: Gray. 330.5		100/1"	NC	--
Boring terminated at 96.4 feet. Boring grouted to 96.4 feet.	-100			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 9/17-18/2018

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Abutment, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76139275 **Long** -90.16235709

COUNTY Madison **DRILLING METHOD** HSA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-50
Station 1833+37.59
Offset 92.3 ft R (EB)
Ground Surface Elev. 426.6 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 405.6 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Clay: Brown, stiff, moist, fill, A-7.
	6 7 8	4.5 P	21	
423.6				
				Silty Clay Loam: Brown and gray, medium stiff, moist, fill, A-6.
	5 7 7	4.5 P	15	
-5				
420.1				
419.6	3 3 3	1.6 S/15	32	Clay: Brown, medium stiff, moist, fill, A-7.
				Silty Loam: Brown, medium stiff to stiff, moist, fill, A-4.
	3 4 5	NC	18	
-10				
415.1				
	4 3 2	0.4 S/10	27	Silty Loam: Brown, medium stiff, very moist, A-4.
413.6				
				Clay: Brown, medium stiff, moist, A-7.
	3 2 4	1.4 B/20	36	
-15				
411.1				
				Sand: Brown, fine grained, very loose, moist, A-2.
409.6	3 2 1	0.5 P	--	
				Silt: Brown, soft, moist, A-4.
407.9				
	4 7 7	NC	--	Sand: Brown, fine to coarse grained, medium dense to dense, A-2.
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Brown, fine to coarse grained, medium dense to dense, A-2. *(continued)* Fine grained.
▼				
	6 8 10	NC	--	
	6 9 10	NC	--	
-25				
	9 8 8	NC	--	
398.6				
				Sandy Loam: Brown, fine grained, medium dense to dense, A-2.
	5 9 11	NC	--	
-30				
				20.7% Finer than the No. 200 Sieve.
	6 4 5	NC	--	
-35				
389.6				
				Sand: Brown, fine grained, medium dense to dense, A-2.
	10 11 12	NC	--	
386.6 -40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 9/17-18/2018

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Abutment, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76139275 **Long** -90.16235709

COUNTY Madison **DRILLING METHOD** HSA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-50
Station 1833+37.59
Offset 92.3 ft R (EB)
Ground Surface Elev. 426.6 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 405.6 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Brown, fine grained, medium dense to dense, A-2. *(Continued)*
-45	9 11 12	NC	--	Trace coal.
-50	13 20 17	NC	--	
				Fine to coarse grained.
-55	8 6 9	NC	--	
366.6 -60	11 12 13	NC	--	
				Sand: Brown, fine to coarse grained, dense, A-2. (Continued)
				Gray, dense.
-65	11 21 18	NC	--	
				Fine grained.
-70	8 22 18	NC	--	
354.6				Sand: Gray, fine to coarse grained, medium dense, trace fine gravel, A-1.
-75	5 3 10	NC	--	
349.6				Sand: Gray, fine to coarse grained, very dense, A-2.
346.6 -80	12 18 32	NC	--	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 9/17-18/2018

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Abutment, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76139275 **Long** -90.16235709

COUNTY Madison **DRILLING METHOD** HSA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-50
Station 1833+37.59
Offset 92.3 ft R (EB)
Ground Surface Elev. 426.6 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 405.6 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Gray, fine to coarse grained, dense to very dense, with fine gravel, A-1. *End of drilling at 80 feet on 9/17.*				
	-85	35 23 24	NC	--
Trace fine gravel.	-90	18 21 24	NC	--
	-95	20 21 29	NC	--
331.3				
Weathered Limestone: Gray. 330.6				
Boring terminated at 96.0 feet. Boring grouted to 96 feet.		100/1"	NC	--
	-100			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 5/17-18/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 20, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76282684 **Long** -90.16596147

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-51
Station 1821+98.76
Offset 87.4 ft L (EB)
Ground Surface Elev. 415.7 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Clay: Dark gray, medium stiff, moist, A-6.				
		3 4 6	1.0 P	21
	-5	4 8 7	2.5 P	18
410.2				
SILTY CLAY: Gray, soft to medium stiff, moist, A-4. *Atterberg Limits test performed.*		2 2 2	0.7 B/20	29
408.2				
Clay: Gray, soft, moist, A-7.				
		2 1 2	0.4 S/15	42
405.7	-10			
Clay: Dark gray, soft, moist, A-6. *Began mud rotary.*				
		1 1 2	1.2 B/20	37
403.2				
Sandy Loam: Brown and gray, fine to coarse grained, medium dense, moist, A-2.				
		3 5 8	NC	--
	-15			
		5 9 10	NC	--
Fine grained.				
	-20	5 4 3	NC	--
Sandy Loam: Brown and gray, fine to coarse grained, medium dense, moist, A-2. *(continued)*				
		5 8 11	NC	--
Fine to coarse grained.				
	-25	6 8 6	NC	--
		7 7 10	NC	--
		6 12 12	NC	--
385.7	-30			
Sand: Gray, fine to coarse grained, medium dense, moist, A-2.				
	-35	5 10 12	NC	--
Trace organics.				
375.7	-40	8 15 16	NC	--

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 5/17-18/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 20, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76282684 **Long** -90.16596147

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-51
Station 1821+98.76
Offset 87.4 ft L (EB)
Ground Surface Elev. 415.7 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None. ft
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Gray, fine to coarse grained, medium dense, moist, A-2. *(continued)*				
Dark gray, fine grained.	-45	4 10 15	NC	--
Gray, dense.	-50	15 15 15	NC	--
Dark brown.	-55	7 7 7	NC	--
Medium dense.	355.7 -60			
Sand: Dark brown, fine grained, dense, moist, A-2.				
	350.7 -65	11 16 25	NC	--
Sand: Brown and gray, fine to coarse grained sand and gravel, dense, A-3.				
	-70	7 16 15	NC	--
	341.7	50/5"	NC	--
Borehole continued with rock coring.	-75			
	-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 5/17-18/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 20, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76282684 **Long** -90.16596147

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 341.7 ft
Begin Core Elev. 340.2 ft

BORING NO. BB-51
Station 1821+98.76
Offset 87.4 ft L (EB)
Ground Surface Elev. 415.7 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, moderately hard to hard, aphanitic, thin bedding, slightly weathered, dense, with syolites.		1	100	50	5.1		
Cherty.							
Clay seams from 79.5 to 80.0 feet.	-80						
Shaley from 79.5 to 81.5 feet.						875.3	0.4
Depth 80.1', Dry Density: 166.6 pcf.							
Depth 84.1', Dry Density: 167.0 pcf.	-85					505.1	0.2
	330.2						
Limestone: Gray, moderately hard, aphanitic, banded to thin bedding, moderately weathered, dense.		2	100	28	5.9		
Depth 87.1', Dry Density: 167.6 pcf.						825.1	0.1
	-90						
Depth 91.1', Dry Density: 166.8 pcf.						772.8	0.1
	-95						
	320.2						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 5/17-18/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 20, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76282684 **Long** -90.16596147

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-51
Station 1821+98.76
Offset 87.4 ft L (EB)
Ground Surface Elev. 415.7 ft

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 in
Top of Rock Elev. 341.7 ft
Begin Core Elev. 340.2 ft

Description	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Cherty Limestone: Gray, hard to very hard, aphanitic, thin bedding, fresh, dense.		3	100	41	3.7		
Depth 99.6', Dry Density: 163.8 pcf.	-100					588.6	0.5
Depth 102.7', Dry Density: 156.2 pcf.						575.5	0.5
	-105						
	310.2						
Boring terminated at 105.5 feet.							
	-110						
	-115						

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

BORING BB-51

DEPTH
75.5 ft.

DEPTH
85.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	75.5-85.5	100	50

	SCI ENGINEERING, INC. www.sciengineering.com
	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-51

DEPTH
85.5 ft.

DEPTH
95.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	85.5-95.5	100	28

	SCI ENGINEERING, INC. www.sciengineering.com
	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-51

DEPTH
95.5 ft.

DEPTH
105.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	95.5-105.5	100	41

	SCI ENGINEERING, INC. www.sciengineering.com
	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/28/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 21, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76231612 **Long** -90.16539652

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-52
Station 1824+09.39
Offset 39.8 ft R (EB)
Ground Surface Elev. 415.2 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 406.7 ft
Upon Completion ft
After Hrs. 406.7 ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Silty Clay: Brown and gray, moist, trace crushed rock, fill, A-7.				
		5 10 8	1.8 S/10	12
Atterberg Limits test performed.		5 5 7	0.9 S/5	26
410.2	-5			
Silty Clay: Gray and light gray, soft, moist, A-7		2 2 1	0.2 B/20	26
407.7				
Silt: Gray, trace brown, soft, moist, trace organics A-6				
Grain Size Analysis performed.		1 1 1	NC	36
405.2	-10			
Clay: Gray, very soft, moist, A-7.		2 1 0	0.3 P	--
403.2				
Silty Clay Loam: Gray, trace brown, soft, moist, A-6.				
Grain Size Analysis performed.		0 0 3	<0.25 P	--
400.2	-15			
Sand: Gray, medium dense, moist, fine to coarse grained, A-2.		6 6 6	NC	--
		8 9 8	NC	--
395.2	-20			

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Gray, medium dense to dense, moist, A-3.				
		7 10 9	NC	--
		5 6 8	NC	--
	-25			
		5 5 10	NC	--
		13 14 11	NC	--
	-30			
		9 12 10	NC	--
	-35			
		4 7 10	NC	--
	-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/28/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 21, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76231612 **Long** -90.16539652

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-52
Station 1824+09.39
Offset 39.8 ft R (EB)
Ground Surface Elev. 415.2 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 406.7 ft
Upon Completion ft
After Hrs. 406.7 ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Gray, medium dense to dense, moist, A-3. *(continued)*				Sand: Gray, medium dense, moist, A-1.			
-45	8 8 8	NC	--	-65	8 8 7	NC	--
				350.2 Sand: Gray, medium dense, moist, A-3.			
Loose. -50	5 5 3	NC	--	-70	4 6 5	NC	--
				342.2 Weathered Limestone.			
-55	4 4 4	NC	--	-75	36 45 21	NC	--
				337.2 Borehole continued with rock coring.			
355.2 -60	3 5 4	NC	--	-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/28/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 21, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76231612 **Long** -90.16539652

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX

Core Diameter 2.06 in
Top of Rock Elev. 338.7 ft
Begin Core Elev. 337.2 ft

BORING NO. BB-52
Station 1824+09.39
Offset 39.8 ft R (EB)
Ground Surface Elev. 415.2 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, very finely crystalline, thinly bedded, moderately weathered, dense.	337.2		1	100	61	5		
Depth 78.3 feet. Dry Density: 166.8 pcf.							827.6	0.1
		-80						
Soft, highly weathered.								
Hard, slightly to moderately weathered.		-85						
Depth 84.9 feet. Dry Density: 166.1 pcf.							669.3	0.3
			2	100	41	2.5		
Depth 88.4 feet. Dry Density: 167.6 pcf.							1062.2	0.1
		-90						
		-95						
Depth 94.9 feet. Dry Density: 167.6 pcf.							1197.3	0.1
	317.2							

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/28/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 21, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76231612 **Long** -90.16539652

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX

Core Diameter 2.06 in
Top of Rock Elev. 338.7 ft
Begin Core Elev. 337.2 ft

BORING NO. BB-52
Station 1824+09.39
Offset 39.8 ft R (EB)
Ground Surface Elev. 415.2 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, very finely crystalline, thin to medium bedded, moderately weathered, dense.		3	100	70	3.2		
	-100						
Depth 101.3 feet. Dry Density: 167.0 pcf.						630.1	0.1
	-105						
Depth 107.2 feet. Dry Density: 156.0 pcf.						416.0	0.1
Boring terminated at 108.0 feet.							
	-110						
	-115						

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

BORING BB-52

DEPTH
78.0 ft.

DEPTH
88.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	78.0-88.0	100	61

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-52

DEPTH
88.0 ft.

DEPTH
98.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	88.0-98.0	100	41

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-52

DEPTH
98.0 ft.

DEPTH
108.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	98.0-108.0	100	70

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

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SOIL BORING LOG

Date 11/11-12/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 21, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76264092 **Long** -90.16517544

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-53
Station 1824+32.86
Offset 92.2 ft L (EB)
Ground Surface Elev. 414.9 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 406.4 ft
Upon Completion ft
After Hrs. 406.4 ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Silty Loam: Gray, soft to medium stiff, moist, fill, A-4. *Grain Size Analysis performed.*		2 2 2	0.8 P	15
411.9				
Silty Clay: Gray, medium stiff, moist, fill, A-6.		3 4 7	2.5 P	15
409.9	-5			
Silty Clay: Gray, trace brown, medium stiff moist, A-6.		3 4 3	1.5 S/20	20
407.4				
Clay: Gray, trace brown, soft, moist, A-6. *Atterberg Limits test performed.* ▼		1 1 2	1.2 B/20	43
404.9	-10			
Silty Clay: Gray, trace brown, medium stiff moist, A-6.		1 1 3	0.5 B/20	43
402.9				
Silty Clay Loam: Gray, soft, moist, A-6. *Grain Size Analysis performed.*		0 0 3	0.2 B/20	40
399.9	-15			
Sandy Loam: Gray, loose to medium dense, moist, A-2.		3 4 6	0.2 B/20	--
398.4				
Sand: Gray, medium dense, moist, A-3.		5 6 6	NC	--
	-20			
Sand: Gray, medium dense, moist, A-3. *(continued)*		8 9 8	NC	--
391.9				
Sand: Gray, medium dense, moist, A-1.		7 11 8	NC	--
	-25			
		6 8 7	NC	--
		9 9 7	NC	--
	-30			
		7 11 7	NC	--
	-35			
Loose.		3 2 6	NC	--
	-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 11/11-12/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 21, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76264092 **Long** -90.16517544

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-53
Station 1824+32.86
Offset 92.2 ft L (EB)
Ground Surface Elev. 414.9 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 406.4 ft
Upon Completion ft
After Hrs. 406.4 ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Gray, medium dense, moist, A-1. *(continued)*				
Medium dense.	-45	7 8 4	NC	--
Loose.	-50	5 4 4	NC	--
Trace organics.	-55	8 14 15	NC	--
356.4				
Sand: Dark gray, loose to medium dense, moist, with organics, A-3.	-60	5 4 6	NC	--
354.9				
Sand: Gray, medium dense, moist, A-1.	-65	10 14 14	NC	--
Possible boulder.				
	-70	7 9 10	NC	--
	-75	8 12 17	NC	--
338.9				
Weathered Limestone.				
337.4				
Borehole continued with rock coring.	-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 11/11-12/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 21, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76264092 **Long** -90.16517544

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 in
Top of Rock Elev. 338.9 ft
Begin Core Elev. 337.4 ft

BORING NO. BB-53
Station 1824+32.86
Offset 92.2 ft L (EB)
Ground Surface Elev. 414.9 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, aphanitic to very finely crystalline, moderately hard to hard, banded to thickly bedded, slightly to moderately weathered, dense.	337.4		1	98	63	2.7		
Depth 78.7 feet. Dry Density: 166.5 pcf.							1115.6	0.2
		-80						
	332.9							
Shaley Limestone: Gray, thinly bedded, slightly weathered, dense, trace clay seams.	332.4							
Limestone: Gray, aphanitic to very finely crystalline, moderately hard to hard, banded to thickly bedded, slightly to moderately weathered, dense.							885.2	0.2
Depth 83.1 feet. Dry Density: 166.7 pcf.								
		-85						
Hard, thinly bedded, slightly weathered, trace clay seams.			2	100	35	2.9		
		-90						
Depth 90.0 feet. Dry Density: 167.1 pcf.							1045.7	0.1
		-95						
Depth 96.3 feet. Dry Density: 166.1 pcf.							698.2	0.2
	317.4							

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 11/11-12/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 21, **SEC.** 25, **TWP.** 4N, **RNG.** 10W
Lat 38.76264092 **Long** -90.16517544

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-53
Station 1824+32.86
Offset 92.2 ft L (EB)
Ground Surface Elev. 414.9 ft

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 in
Top of Rock Elev. 338.9 ft
Begin Core Elev. 337.4 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, aphanitic to very finely crystalline, hard, thin to massive bedding, fresh to slightly weathered, dense.	3	100	89	2.7		
-100						
Depth 100.4 feet. Dry Density: 167.1 pcf.					634.2	0.2
-105						
Depth 106.1 feet. Dry Density: 152.9 pcf.					586.4	0.4
307.4						
Boring terminated at 107.5 feet.						
-110						
-115						

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

BORING BB-53

DEPTH
77.5 ft.

DEPTH
87.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	77.5-87.5	98	63

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	ROCK CORE PHOTOGRAPH
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BORING BB-53

DEPTH
87.5 ft.

DEPTH
97.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	87.5-97.5	100	35

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-53

DEPTH
97.5 ft.

DEPTH
107.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	97.5-107.5	100	89

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
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SOIL BORING LOG

Date 10/20,27-28/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 22, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76211524 **Long** -90.16461049

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-54
Station 1826+45.17
Offset 40.2 ft R (EB)
Ground Surface Elev. 413.7 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 405.2 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Silty Loam: Brown, stiff, moist, with wood and crushed concrete, fill, A-6.	7 6 6	3.9 S/10	13
No crushed concrete or wood. -5	5 5 6	3.1 S/20	19
Grain Size Analysis performed.	3 2 3	0.8 S/20	20
405.2 ▼			
Sand: Brown, fine to coarse grained, loose, moist, A-3. -10	2 3 4	NC	
403.2			
Clay: Dark gray, soft to medium stiff, moist, A-6.	5 2 2	NC	42
401.7			
Silty Clay Loam: Gray, very soft to soft, moist, A-6.			
Grain Size Analysis performed. -15	1 1 0	NC	34
	2 1 1	NC	37
Dense.	2 2 0	NC	33
393.7 -20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Gray, medium dense, wet, A-3.	5 7 9	NC	--
-25	6 8 5	NC	--
	6 5 9	NC	--
-30	6 8 11	NC	--
-35	7 8 6	NC	--
	10 13 14	NC	--
373.7 -40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/20,27-28/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 22, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76211524 **Long** -90.16461049

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-54
Station 1826+45.17
Offset 40.2 ft R (EB)
Ground Surface Elev. 413.7 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 405.2 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-45	3 6 11	NC	--
-50	6 6 6	NC	--
-55	6 6 6	NC	--
-60	6 7 6	NC	--
353.7			

Sand: Gray, dense, wet, A-3.

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-65	13 9 7	NC	--
-70	6 9 14	NC	--
-75	6 9 12	NC	--
-80			
336.7			

Sand: Gray, dense, wet, A-3.

Borehole continued with rock coring.

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/20,27-28/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 22, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76211524 **Long** -90.16461049

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX

Core Diameter 2.06 in
Top of Rock Elev. 336.7 ft
Begin Core Elev. 335.2 ft

BORING NO. BB-54
Station 1826+45.17
Offset 40.2 ft R (EB)
Ground Surface Elev. 413.7 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard, very finely crystalline, thin to medium bedded, slightly to moderately weathered, dense, with shale partings. 335.2 *Depth 78.7 feet. Dry Density: 167.5 pcf.*	-80	1	98	85	2.4	877.0	0.1
Depth 87.3 feet. Dry Density: 167.5 pcf.	-85					614.0	0.1
Depth 89.1 feet. Dry Density: 167.4 pcf.	-90	2	100	67	1.7	874.8	0.1
Gray. *Depth 95.4 feet. Dry Density: 152.2 pcf.*	-95					689.4	3.2
12 inch vertical fracture.							
315.2							

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

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 10/20,27-28/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 22, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76211524 **Long** -90.16461049

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 336.7 ft
Begin Core Elev. 335.2 ft

BORING NO. BB-54
Station 1826+45.17
Offset 40.2 ft R (EB)
Ground Surface Elev. 413.7 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, very finely crystalline, thin to medium bedded, slightly to moderately weathered, dense.		3	100	92	3.4		
	-100						
6 inch vertical fracture.							
Depth 101.3 feet. Dry Density: 159.3 pcf.						785.9	0.2
4 inch vertical fracture.							
	-105						
Depth 107.7 feet. Dry Density: 168.7 pcf.						931.1	0.2
	305.2						
Boring terminated at 108.5 feet.							
	-110						
	-115						

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

BORING BB-54

DEPTH
78.5 ft.

DEPTH
88.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	78.5-88.5	97.5	85.4

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-54

DEPTH
88.5 ft.

DEPTH
98.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	88.5-98.5	100	67

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-54

DEPTH
98.5 ft.

DEPTH
108.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	98.5-108.5	100	92

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 11/12-13/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 24, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76210452 **Long** -90.16297566

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-55
Station 1830+89.82
Offset 99.9 ft L (EB)
Ground Surface Elev. 410.9 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** None ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
				Silty Clay: Gray, medium stiff to stiff, moist, A-6.
	4 4 4	1.5 P	24	*Grain Size Analysis performed.*
407.9				
				Sandy Loam: Gray, trace brown, loose, moist, A-3.
-5	3 4 5	NC	--	
405.4				
				Silty Clay: Gray, medium stiff, moist, A-6.
	3 3 4	0.4 B/20	24	
402.9				
				Sand: Gray, trace brown, medium dense, moist, A-3.
-10	4 7 6	NC	--	
	5 7 7	NC	--	
-15	5 6 9	NC	--	Loose.
				Grain Size Analysis performed.
	4 4 5	NC	--	
-20	3 4 5	NC	--	
				Sand: Gray, trace brown, medium dense, moist, A-3. *(continued)*
-25	4 8 10	NC	-	
	6 6 7	NC	--	
-30	5 6 7	NC	--	
				Gray.
-35	5 7 10	NC	--	
	6 10 11	NC	--	
370.9 -40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 11/12-13/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 24, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76210452 **Long** -90.16297566

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-55
Station 1830+89.82
Offset 99.9 ft L (EB)
Ground Surface Elev. 410.9 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None. ft
Upon Completion ft
After Hrs. None ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sandy Loam: Dark gray, very loose, moist, A-3.
-45	3 1 2	NC	--	
365.9				
				Sand: Gray, medium dense, moist, A-1.
-50	4 4 6	NC	--	
-55	5 7 9	NC	--	
-60	5 5 6	NC	--	
				Sand: Gray, medium dense, moist, A-1. *(continued)*
-65	19 17 8	NC	--	
-70	7 8 13	NC	--	
337.4				
-75	10 38 44	NC	--	Weathered Limestone.
330.9				
-80				Borehole continued with rock coring.

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 11/12-13/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 24, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76210452 **Long** -90.16297566

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX

Core Diameter 2.06 in
Top of Rock Elev. 332.9 ft
Begin Core Elev. 330.9 ft

BORING NO. BB-55
Station 1830+89.82
Offset 99.9 ft L (EB)
Ground Surface Elev. 410.9 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, aphanitic to very finely crystalline, thinly bedded, moderately weathered, dense.	330.9		1	98	68	3.6		
		-85					851.6	0.4
		-90					311.1	0.1
Hard to very hard, thin to thickly bedded, fresh to slightly weathered.			2	97	91	2.8		
		-95					429.3	0.1
Trace chert. No chert.								
Pitted to vuggy.							778.3	0.1
	310.9	-100						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 11/12-13/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 24, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76210452 **Long** -90.16297566

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 332.9 ft
Begin Core Elev. 330.9 ft

BORING NO. BB-55
Station 1830+89.82
Offset 99.9 ft L (EB)
Ground Surface Elev. 410.9 ft

Limestone: Gray, moderately hard to hard, aphanitic to very finely crystalline, thinly bedded, moderately weathered, pitted, cherty, trace clay seams. Dense, no chert.	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
		3	90	60	3.7		
						465.1	0.1
	-105						
						872.5	0.1
	300.9 -110						
Boring terminated at 110.0 feet.	-115						
	-120						

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

BORING BB-55

DEPTH
80.0 ft.

DEPTH
90.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	80.0-90.0	98	68

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-55

DEPTH
90.0 ft.

DEPTH
100.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	90.0-100.0	97	91

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-55

DEPTH
100.0 ft.

DEPTH
110.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	100.0-110.0	90	60

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
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SOIL BORING LOG

Date 10/16/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 23, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76192505 **Long** -90.16381082

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-56
Station 1828+83.45
Offset 35.8 ft R (EB)
Ground Surface Elev. 414.0 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Silty Clay Loam: Brown, medium stiff, moist, A-6.
	4 4 5	0.2 B/20	15	*Grain Size Analysis performed.*
410.5				
	5 4 3	2.5 P	16	Clay Loam: Brown, medium stiff, moist, A-6.
-5				
	2 2 2	0.1 S/15	25	
405.0				
	1 4 5	0.2 S/10	34 19	Sand: Brown, fine to coarse grained, loose, moist, A-1.
-10				
403.5				
	6 5 6	NC	--	Silty Loam: Brown, medium stiff to stiff, moist, A-4.
				Grain Size Analysis performed.
	1 2 4	NC	--	
-15				
398.0				
	4 6 6	NC	--	Sand: Brown and gray, fine to coarse grained, medium dense, moist, A-1.
	8 7 6	NC	--	
394.0 -20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Clay: Brownish gray, medium stiff, moist, A-7.
	2 2 6	0.2 B/20	--	
391.0				
	5 3 3	NC	--	Sandy Loam: Brown and gray, fine to coarse grained, loose to medium stiff, moist, A-2.
-25				
	2 5 5	NC	--	
	3 3 3	NC	--	
-30				
382.0				
				Sand: Brown and gray, fine to coarse grained, loose to medium stiff, moist, A-1.
	8 9 11	NC	--	
-35				
	15 16 21	NC	--	
374.0 -40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 10/16/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 23, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76192505 **Long** -90.16381082

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-56
Station 1828+83.45
Offset 35.8 ft R (EB)
Ground Surface Elev. 414.0 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None. ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Brown and gray, fine to coarse grained, loose to medium stiff, moist, A-1.
-45	7 9 9	NC	--	
-50	5 5 5	NC	--	
-55	7 9 9	NC	--	
-60	10 11 10	NC	--	
				Sand: Brown and gray, fine to coarse grained, loose to medium stiff, moist, A-1. *(continued)*
-65	6 7 6	NC	--	
-70	10 10 11	NC	--	
-75	10 9 15	NC	--	
335.4				
-80	50/1"	NC	--	Weathered Limestone.

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

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Division of Highways
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SOIL BORING LOG

Date 10/16/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 23, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76192505 **Long** -90.16381082

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-56
Station 1828+83.45
Offset 35.8 ft R (EB)
Ground Surface Elev. 414.0 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
Weathered Limestone. *(continued)* 333.5				
Borehole continued with rock coring.				
-85				
-90				
-95				
-100				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
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ROCK CORE LOG

Date 10/16/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 23, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76192505 **Long** -90.16381082

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 335.5 ft
Begin Core Elev. 333.5 ft

BORING NO. BB-56
Station 1828+83.45
Offset 35.8 ft R (EB)
Ground Surface Elev. 414.0 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, moderately hard, aphanitic to very finely crystalline, banded to medium bedding, slightly to moderately weathered, dense. 333.5		1	100		4		
Depth 83.2 feet. Dry Density: 166.9 pcf.						1037.0	0.1
	-85						
Depth 89.8 feet. Dry Density: 166.9 pcf.	-90					1136.6	0.1
Thin to medium bedded.		2	100	83	3		
Depth 93.1 feet. Dry Density: 164.4 pcf.						504.4	0.1
	-95						
Depth 97.3 feet. Dry Density: 162.5 pcf.						811.5	0.1
	-100						
313.5							

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/16/20

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 23, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76192505 **Long** -90.16381082

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-56
Station 1828+83.45
Offset 35.8 ft R (EB)
Ground Surface Elev. 414.0 ft

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 in
Top of Rock Elev. 335.5 ft
Begin Core Elev. 333.5 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, moderately hard, aphanitic to very finely crystalline, banded to medium bedding, moderately weathered, dense, cherty.		3	100	78	3.7		
Depth 103.9 feet. Dry Density: 151.9 pcf.						543.0	0.1
	309.2 -105						
Boring terminated at 104.8 feet.							
	-110						
	-115						
	-120						

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

BORING BB-56

DEPTH
80.5 ft.

DEPTH
90.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	80.5-90.5	100	35

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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BORING BB-56

DEPTH
90.5 ft.

DEPTH
100.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	90.5-100.5	100	83

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-56

DEPTH
100.5 ft.

DEPTH
104.8 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	100-104.8	100	78

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Illinois Department of Transportation
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SOIL BORING LOG

Date 4/26-27/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 25, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76194423 **Long** -90.16235613

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-57
Station 1832+75.88
Offset 98.9 ft L (EB)
Ground Surface Elev. 412.9 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 406.9 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Clay Loam: Brown, stiff, moist, fill. A-6.
	3 3 7	2.5 P	15	*Atterberg Limits test performed.* Trace crushed rock.
410.4				
				Silty Clay Loam: Brown, soft, moist. A-6.
-5	3 1 2	0.1 B/20	34	
407.4				
				Sandy Loam: Brown, loose, very moist. A-4 ▼
405.9	3 4 4	NC	--	
				Sand: Brown, fine grained, medium dense, moist to wet, A-2.
-10	2 4 8	NC	--	
				Mud rotary drilling started at 10 feet.
	5 7 7	NC	--	
				Loose.
-15	1 3 5	NC	--	
	3 4 6	NC	--	
-20	5 6 7	NC	--	
				Sand: Brown, fine grained, medium dense, moist to wet, A-2. *(continued)*
	4 6 7	NC	--	
-25	7 8 9	NC	--	
	3 6 11	NC	--	
-30	7 11 15	NC	--	
380.9				
				Sand: Brown, fine to coarse grained, dense, very moist to wet, A-3.
-35	9 23 23	NC	--	Trace coarse grained.
				Brown, medium dense.
372.9	7 13 13	NC	--	
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
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SOIL BORING LOG

Date 4/26-27/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 25, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76194423 **Long** -90.16235613

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-57
Station 1832+75.88
Offset 98.9 ft L (EB)
Ground Surface Elev. 412.9 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 406.9 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Brown, fine to coarse grained, medium dense, very moist to wet, A-3.
-45	7 10 13	NC	--	Trace fine to coarse gravel.
				Gray.
-50	5 7 6	NC	--	
-55	5 6 6	NC	--	
-60	5 5 6	NC	--	Trace fine gravel.
				Sand: Brown, fine to coarse grained, medium dense, very moist to wet, A-3. *(continued)*
-65	17 19 25	NC	--	Trace fine to coarse gravel.
				Gravel encountered during drilling from 65 to 68.6 feet. Possible cobble or boulder at 67.5 feet.
-70	50/6"	NC	--	
				340.9
				Sand: Gray, fine to coarse grained, medium to very dense, moist to wet, A-1.
-75	11 10 13	NC	--	
-80	12 17 33	NC	--	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 4/26-27/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 25, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76194423 **Long** -90.16235613

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-57
Station 1832+75.88
Offset 98.9 ft L (EB)
Ground Surface Elev. 412.9 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 406.9 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Gray, fine to coarse grained, medium to very dense, moist to wet, A-1. *(continued)* *Tri-cone refusal at 80.5 feet.* *Tri-cone advanced to 82.5 feet prior to rock coring.*	330.4			
Borehole continued with rock coring.	-85			
	-90			
	-95			
	-100			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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ROCK CORE LOG

Date 4/26-27/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 25, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76194423 **Long** -90.16235613

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 332.4 ft
Begin Core Elev. 330.4 ft

BORING NO. BB-57
Station 1832+75.88
Offset 98.9 ft L (EB)
Ground Surface Elev. 412.9 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, aphanitic, thin bedding, slightly weathered, dense.	330.4	1	100	41	3.6		
	-85						
Depth 85.5', Dry Density: 166.3 pcf.						718.4	0.2
Medium to thick bedded.	-90						
Depth 91.2', Dry Density: 151.5 pcf.						404.4	0.2
		2	98	91	3		
Thick bedded.	-95						
Depth 95.3', Dry Density: 147.6 pcf.						525.5	0.4
	-100						
Slightly pitted and with chert inclusions.		3	98	60	3.2		
No return water at 101.5 feet to termination. *Depth 101.4', Dry Density: 150.8 pcf.*						524.7	0.6
	310.4						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 4/26-27/2021

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 25, **SEC.** 26, **TWP.** 4N, **RNG.** 10W
Lat 38.76194423 **Long** -90.16235613

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-57
Station 1832+75.88
Offset 98.9 ft L (EB)
Ground Surface Elev. 412.9 ft

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 in
Top of Rock Elev. 332.4 ft
Begin Core Elev. 330.4 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Light gray, hard to very hard, aphanitic, thick bedding, slightly weathered, dense. *(continued)*							
Thin to medium bedded.	-105						
	-110						
Vertical fractures caused by coring process.		4	100	33	4.2		
	300.4					944.8	0.2
Depth 113.5', Dry Density: 150.6 pcf. Boring terminated at 112.50 feet.	-115						
	-120						

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

BORING BB-57

DEPTH
82.5 ft.

DEPTH
92.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	82.5-92.5	100	41

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BORING BB-57

DEPTH
92.5 ft.

DEPTH
102.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	92.5-100.0	98	91
3	100.0-110.0	98	60

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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BORING BB-57

DEPTH
102.5 ft.

DEPTH
112.5 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	100.0-110.0	98	60
4	110.0-112.5	100	33

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

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Illinois Department of Transportation
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SOIL BORING LOG

Date 10/14-15/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 24, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76176476 **Long** -90.16320494

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-58
Station 1830+65.81
Offset 38.0 ft R (EB)
Ground Surface Elev. 413.2 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Clay: Brown, soft, moist, with crushed limestone, fill, A-7.
	2 3 4	1.7 B/20	37	
409.2				
-5	2 3 4	1.0 P	27	Sand: Brown and gray, with clay, fine grained, loose, moist, fill, A-3.
	3 4 4	0.5 P	26	
404.2				
-10	4 5 8	NC	--	Sand: Brown and gray, fine grained, medium dense, moist, A-3. *Grain Size Analysis performed.*
402.7				
	6 7 8	NC	--	Sand: Gray, trace brown, medium dense, moist, A-1.
-15	6 7 6	NC	--	
	3 4 6	NC	--	
-20	5 5 7	NC	--	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Gray, trace brown, medium dense, moist, A-1. *(continued)* *Grain Size Analysis performed.*
	4 6 10	NC	--	
-25	5 5 9	NC	--	
	8 12 14	NC	--	
-30	4 6 10	NC	--	
-35	7 13 20	NC	--	Dense.
373.2 -40	6 9 16	NC	--	Medium dense.

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/14-15/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 24, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76176476 **Long** -90.16320494

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-58
Station 1830+65.81
Offset 38.0 ft R (EB)
Ground Surface Elev. 413.2 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None. ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Gray, trace brown, medium dense to dense, moist, A-1.
-45	6 6 7	NC	--	
-50	7 5 10	NC	--	
-55	10 14 20	NC	--	
-60	6 10 14	NC	--	
				Sand: Gray, trace brown, medium dense to dense, moist, A-1. *(continued)*
-65	25 33 16	NC	--	
-70	11 11 12	NC	--	
-75	16 8 9	NC	--	
334.7				Weathered Limestone.
-80				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/14-15/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 24, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76176476 **Long** -90.16320494

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-58
Station 1830+65.81
Offset 38.0 ft R (EB)
Ground Surface Elev. 413.2 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
Weathered Limestone. *(continued)* 332.2				
Borehole continued with rock coring.				
-85				
-90				
-95				
-100				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation

Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/14-15/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 24, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76176476 **Long** -90.16320494

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX

Core Diameter 2.06 in
Top of Rock Elev. 334.7 ft
Begin Core Elev. 332.2 ft

BORING NO. BB-58
Station 1830+65.81
Offset 38.0 ft R (EB)
Ground Surface Elev. 413.2 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, aphanitic to very finely crystalline, thin bedding, slightly to moderately weathered, dense.	332.2	1	100	37	2.6		
Depth 82.2 feet. Dry Density: 167.6 pcf.						674.5	0.1
	-85						
Depth 89.4 feet. Dry Density: 167.4 pcf.	-90					768.3	0.1
Banded to thinly bedded, very finely crystalline to finely crystalline.		2	100	95	2.6		
Depth 93.6 feet. Dry Density: 160.2 pcf.						508.8	0.2
	-95						
Depth 97.7 feet. Dry Density: 167.0 pcf.						856.6	0.1
	-100						
	312.2						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/14-15/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 24, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76176476 **Long** -90.16320494

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 in
Top of Rock Elev. 334.7 ft
Begin Core Elev. 332.2 ft

BORING NO. BB-58
Station 1830+65.81
Offset 38.0 ft R (EB)
Ground Surface Elev. 413.2 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, aphanitic to very finely crystalline, thin bedding, slightly weathered, dense.	3	100	75	3		
Depth 101.6 feet. Dry Density: 167.5 pcf.					1166.2	0.1
-105						
Depth 109.5 feet. Dry Density: 165.3 pcf.					982.3	0.1
-110						
302.2						
Boring terminated at 111.0 feet.						
-115						
-120						

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

BORING BB-58

DEPTH
81.0 ft.

DEPTH
91.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	81.0-91.0	100	37

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-58

DEPTH
91.0 ft.

DEPTH
101.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	91.0-101.0	100	95

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

BORING BB-58

DEPTH
101.0 ft.

DEPTH
111.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	101.0-111.0	100	75

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
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SOIL BORING LOG

Date 10/13-14/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 25, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76159593 **Long** -90.16259632

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-59
Station 1832+49.87
Offset 42.9 ft R (EB)
Ground Surface Elev. 412.3 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Clay: Dark brown, medium stiff to stiff, moist, fill, A-7.
	2 3 5	1.8 B/20	19	
409.3				
				Sandy Loam: Brown, medium stiff to stiff, moist, A-4. *Grain Size Analysis performed.*
-5	2 3 5	NC	--	
406.8				
				Sand: Brown, fine-grained, medium dense to dense, moist, A-3.
	3 5 7	NC	--	
-10	5 6 9	NC	--	
	5 6 8	NC	--	
-15	6 7 7	NC	--	
	4 6 7	NC	--	
-20	4 5 6	NC	--	
				Sand: Brown, fine-grained, medium dense to dense, moist, A-3. *(continued)*
-25	6 7 7	NC	--	
-30	7 10 11	NC	--	
-35	7 15 18	NC	--	
372.3 -40	12 12 9	NC	--	Gray.

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 10/13-14/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 25, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76159593 **Long** -90.16259632

COUNTY Madison **DRILLING METHOD** CFA, Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-59
Station 1832+49.87
Offset 42.9 ft R (EB)
Ground Surface Elev. 412.3 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None. ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Gray, fine-grained, medium dense to dense, moist, A-3.
-45	9 16 9	NC	--	
-50	9 5 6	NC	--	
-55	7 12 13	NC	--	
-60	5 6 12	NC	---	
				Sand: Gray, fine-grained, medium dense to dense, moist, A-3. *(continued)*
-65	12 14 33	NC	--	
-70	6 17 50/4"	NC	--	
-75	12 14 18	NC	--	
333.8				
	50/3"	NC	--	Weathered Limestone
332.3 -80				Borehole continued with rock coring.

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/13-14/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 25, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76159593 **Long** -90.16259632

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB) **CORING BARREL TYPE & SIZE** Solid Barrel NX
Station 806+89.23

Core Diameter 2.06 in
Top of Rock Elev. 333.8 ft
Begin Core Elev. 332.3 ft

BORING NO. BB-59
Station 1832+49.87
Offset 42.9 ft R (EB)
Ground Surface Elev. 412.3 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, very finely crystalline, thin to medium bedding, slightly weathered, dense.	332.3	1	83	75	1.9		
Depth 84.2 feet. Dry Density: 170.3 pcf.	-85					621.3	0.1
Depth 86.7 feet. Dry Density: 172.8 pcf.						817.9	0.1
	-90	2	18	11	0.7		
Depth 91.2 feet. Dry Density: 167.3 pcf.						1099.5	0.1
	318.3						
Void.	-95						
	315.3						
Limestone: Gray, hard, very finely crystalline, thin to medium bedding, slightly weathered, dense.							
	312.3 -100						

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

Illinois Department of Transportation
Division of Highways
sci engineering inc

ROCK CORE LOG

Date 10/13-14/2020

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** Pier 25, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76159593 **Long** -90.16259632

COUNTY Madison **CORING METHOD** Conventional

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. BB-59
Station 1832+49.87
Offset 42.9 ft R (EB)
Ground Surface Elev. 412.3 **ft**

CORING BARREL TYPE & SIZE Solid Barrel NX
Core Diameter 2.06 **in**
Top of Rock Elev. 333.8 **ft**
Begin Core Elev. 332.3 **ft**

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)	MOISTURE (%)
Limestone: Gray, hard, very finely crystalline, thin to medium bedding, slightly weathered, dense.		3	100	82	2.5		
Depth 102.4 feet. Dry Density: 167.4 pcf.						207.7	0.1
	-105						
Depth 107.0 feet. Dry Density: 169.4 pcf.						978.7	0.2
	302.3 -110						
Boring terminated at 110.0 feet.							
	-115						
	-120						

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

BORING BB-59

DEPTH
80.0 ft.

DEPTH
90.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
1	80.0-90.0	83	75

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BORING BB-59

DEPTH
90.0 ft.

DEPTH
100.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
2	90.0-100.0	18	11

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	I-270 Bridge Over COR
	ROCK CORE PHOTOGRAPH
	July 2021 SCI No. 2017-3167.10

BORING BB-59

DEPTH
100.0 ft.

DEPTH
110.0 ft.

0.0 ft. 1.0 ft. 2.0 ft.

RUN NO.	DEPTH, FT.	RECOVERY %	RQD %
3	100.0-110.0	100	82

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I-270 Bridge Over COR

ROCK CORE PHOTOGRAPH

July 2021 SCI No. 2017-3167.10

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 09/21/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** West Approach, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76682699 **Long** -90.17977297

COUNTY St. Louis **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-101
Station 1780+03.06
Offset 258.6 ft L (EB)
Ground Surface Elev. 419.1 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 415.6 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				418.8
				Clay: Brown, moist, fill, A-7.
		NC	--	Crushed limestone, fill.
				416.8
				Clay: Brown, stiff, poor recovery. moist, fill, A-7. ▼
-5	4 5 8	0.8 P	40	
				413.1
				Clay: Brown to gray, stiff, with slag, brick, and gravel, moist, fill, A-7.
	2 5 5	1.7 S/15	31	
				410.6
-10	2 1 2	0.6 B/20	39	Clay: Brown to gray, soft to very soft, moist, A-7.
	ST	0.6 B	52	*Unconsolidated, Undrained Triaxial Strength and Atterberg Limits Tests performed.*
-15	0 0 0	0.2 B/20	45	
				403.1
	ST	0.5 B	40	Silty Clay: Brown to gray, soft, moist, A-6.
-20	0 0 4	0.2 B/20	41	
				398.6
	2 2 5	NC	--	Sandy Loam: Brown to gray, fine grained, loose, wet, A-2.
				395.1
-25	4 2 1	0.2 B/20	48	Clay: Brown to gray, soft, moist, A-7.
				394.6
				Silty Clay: Brown to gray, soft, moist, A-6.
				393.6
	2 2 2	0.3 P	32	Silty Loam: Brown to gray, soft, moist, A-4.
				391.1
-30	0 3 3	0.3 B/20	46	Clay: Brown to gray, medium stiff, moist, A-7.
				387.1
				Sandy Loam: Brown to gray, fine grained, medium dense, A-2.
-35	3 4 13	NC	12	
				384.6
				Clayey Shale: Gray.
				381.3
-40	100/2"	NC	--	Weathered Limestone: Gray, interbedded with clayey shale.

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 09/21/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** West Approach, **SEC.** , **TWP.** Land Grant 00114, **RNG.**
Lat 38.76682699 **Long** -90.17977297

COUNTY St. Louis **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-101
Station 1780+03.06
Offset 258.6 ft L (EB)
Ground Surface Elev. 419.1 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 415.6 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Weathered Limestone: Gray, interbedded with clayey shale. *(continued)*		100/0"	NC	--
377.6				
Boring terminated at 41.5 feet. Boring grouted to 41.5 feet.		100/0.5"	NC	--
	-45			
	-50			
	-55			
	-60			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 12/08/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Approach, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76156064 **Long** -90.16173939

COUNTY Madison **DRILLING METHOD** CFA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-110
Station 1834+86.27
Offset 20.2 ft L (EB)
Ground Surface Elev. 442.6 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 436.6 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Asphalt.
				441.6
	4 9 7	NC	--	Sand: Brown, moist, fill, A-2.
				440.6 Sandy Loam: Gray, moist, fill, A-6.
	3 5 5	1.4 S/15	17	
-5				
				▼
	ST	1.1 S	19	*Unconfined Compression and Atterberg Limits Tests performed.*
				434.6
	3 7 4	2.1 S/15	25	Clay: Gray, moist, fill, A-7.
-10				432.6 Sandy Loam: Brown, moist, fill, A-4.
				431.6
	7 15 16	NC	--	Sand: Brown, moist, fill, A-2.
				429.6
	9 19 14	NC	--	Sandy Loam: Brown, moist, fill, A-2.
-15				
				427.1
	11 12 15	0.6 S/15	--	Sandy Loam: Gray, moist, fill, A-4.
				424.6
	14 15 14	NC	--	Sand: Brown, with clay lumps, fill, A-2.
-20				
				Sand: Brown, with clay lumps, fill, A-2. *(continued)*
	11 15 18	NC	--	
	11 20 18	NC	--	
-25				
				417.1 Sandy Loam: Gray, moist, fill, A-4.
	9 11 14	NC	--	
				414.6
	4 8 9	3.5 B/20	24	Clay: Grayish brown, moist, A-7.
-30				
				410.6 Silty Clay Loam: Brown, A-6.
				408.6
	5 10 11	NC	35	Sand: Brown, fine grained, moist, A-2.
-35				
	9 8 11	NC	--	
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 12/08/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Approach, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76156064 **Long** -90.16173939

COUNTY Madison **DRILLING METHOD** CFA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-110
Station 1834+86.27
Offset 20.2 ft L (EB)
Ground Surface Elev. 442.6 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 436.6 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Sand: Brown, fine grained, moist, A-2. *(continued)*				
	-45	11 13 9	NC	--
	-50	8 15 13	NC	--
392.6				
Boring terminated at 50.0 feet. Boring grouted to 50 feet.				
	-55			
	-60			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
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SOIL BORING LOG

Date 09/18/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Approach, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.7612376 **Long** -90.16193083

COUNTY Madison **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-111
Station 1834+70.65
Offset 108.5 ft R (EB)
Ground Surface Elev. 419.1 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 405.6 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				Silty Clay Loam: Brown, very stiff, moist, fill, A-6.
417.6				
	5 7 9	2.5 P	--	Sand: Brown, fine grained, medium dense, moist, fill, A-2.
416.1				
	6 6 9	1.4 S/15	--	Sandy Loam: Gray and brown, stiff, moist, fill, A-2.
-5				
413.6				
	2 2 4	0.5 P	32	Silty Loam: Brown, medium stiff, very moist, A-4.
412.4				
				Clay: Brown, medium stiff to stiff, moist, A-7.
	3 4 6	1.3 S/15	38	
-10				
408.6				
	2 2 4	0.5 P	31	Silty Loam: Brown and gray, medium stiff, very moist, A-4.
406.1				
▼				Sand: Brown, fine grained, medium dense, wet, A-2.
	4 5 10	NC	--	
-15				
	6 11 10	NC	--	
	7 10 14	NC	--	
-20				

Sand: Brown, fine grained, medium dense, wet, A-2. *(continued)*

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
	9 9 12	NC	--
-25			
	6 9 12	NC	--
	7 8 9	NC	--
	9 10 11	NC	--
-30			
	6 7 9	NC	--
-35			
	9 13 14	NC	--
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 09/18/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Approach, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.7612376 **Long** -90.16193083

COUNTY Madison **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-111
Station 1834+70.65
Offset 108.5 ft R (EB)
Ground Surface Elev. 419.1 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 405.6 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Sand: Brown, fine grained, medium dense, wet, A-2. *(continued)*
377.1				
				Sand: Brown, fine to coarse grained, medium dense, trace fine gravel, wet, A-1.
-45	5 9 10	NC	--	
				Gray.
369.1 -50	5 9 8	NC	--	
				Boring terminated at 50.0 feet. Boring grouted to 50 feet.
-55				
-60				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 12/08/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Approach, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76121475 **Long** -90.16037622

COUNTY Madison **DRILLING METHOD** CFA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-112
Station 1838+95.92
Offset 12.4 ft L (EB)
Ground Surface Elev. 442.2 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter None. ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				Asphalt.
				441.2
	3 5 5	>4.5 P	18	Silty Clay Loam: Grayish brown, fill, A-6.
	3 5 5	2.6 B/20	20	
-5				
				436.7
	4 8 7	4.5 P	19	Sandy Loam: Brown, fill, A-4.
	7 11 8	3.0 P	20	
-10				432.7 Sand: Brown, moist, fill, A-2.
				431.2
	ST	NC	20	Clay Loam: Gray, moist, fill, A-4. *Unit Weight Determination and Atterberg Limits Tests performed.*
				429.2
	4 5 5	NC	--	Sand: Brown, moist, fill, A-2.
-15				
				426.7
	4 8 8	1.5 S/10	31	Clay Loam: Gray, fill, A-7.
				424.2
	7 9 12	NC 3.5	--	Loamy Sand: Gray, moist, fill, A-2.
-20				422.7

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
		P		421.7 Clay Loam: Gray, moist, fill, A-7. *(continued)*
	5 11 10	NC	28	Sandy Loam: Gray, with clay lumps, fill, A-4.
				419.2
				Clay Loam: Gray, moist, fill, A-7.
	5 11 9	2.0 B/20	32 -- 38	418.2 Silt: Brown, moist, fill, A-4.
-25				
				416.7
	3 7 7	1.9 B/20	23	Clay: Gray and brown, moist, fill, A-7
	4 8 9	2.8 S/15	--	Gray. Brown. 412.7
-30				Sand: Brown, fine grained, moist, A-2.
	7 10 10	NC	--	
-35				
	11 14 13	NC	--	
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 12/08/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Approach, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76121475 **Long** -90.16037622

COUNTY Madison **DRILLING METHOD** CFA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-112
Station 1838+95.92
Offset 12.4 ft L (EB)
Ground Surface Elev. 442.2 ft

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

Groundwater Elev.:
First Encounter None. ft
Upon Completion _____ ft
After _____ **Hrs.** _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
				Sand: Brown, fine grained, moist, A-2. *(continued)*
-45	5 9 11	NC	--	
392.2 -50	13 21 16	NC	--	
				Boring terminated at 25.0 feet. Boring grouted to 25 feet.
-55				
-60				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 09/19/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Approach, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76092513 **Long** -90.16052451

COUNTY Madison **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-113
Station 1838+81.05
Offset 100.2 ft R (EB)
Ground Surface Elev. 416.5 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 404.0 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				Silty Clay Loam: Brown, stiff, moist, fill, A-6.
	3 4 8	2.5 P	21	
413.5				
				Clay: Gray and brown, stiff, moist, A-7.
-5	5 5 7	2.2 S/10	33	
411.0				
				Sand: Brown, fine grained, medium dense, moist, A-2.
	4 5 5	NC	--	
	4 5 5	NC	--	
-10				
406.0				
				Silty Clay: Gray brown, soft, moist, A-6.
	2 1 3	0.4 B/20	35	
404.0 ▼				
				Sand: Brown, fine grained, loose, wet, A-2. *15.4% Passing the No. 200 Sieve.*
	ST	NC	--	
401.5 -15				
				Sandy Loam: Gray and brown, fine grained, loose, wet A-4.
	2 3 3	NC	--	
398.5				
				Sand: Brown, fine grained, loose, wet, A-2.
-20	3 3 6	NC	--	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				Sand: Brown, fine grained, loose, wet, A-2. *(continued)* Gray.
	3 3 4	NC	--	
	4 3 4	NC	--	
391.5 -25				
				Boring terminated at 25.0 feet. Boring grouted to 25 feet.
-30				
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SOIL BORING LOG

Date 09/19/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **LOGGED BY** SCI

SECTION 60B-1 **LOCATION** East Approach, **SEC.** 36, **TWP.** 4N, **RNG.** 10W
Lat 38.76118844 **Long** -90.16113571

COUNTY Madison **DRILLING METHOD** HSA **HAMMER TYPE** Automatic

STRUCT. NO. 060-0350 (EB)
Station 806+89.23

BORING NO. B-118
Station 1836+91.35
Offset 55.8 ft R (EB)
Ground Surface Elev. 425.4 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 413.9 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				Silty Clay: Brown, medium stiff to stiff, moist, fill, A-6.
424.4				
	3 4 8	1.5 P	--	Sand: Brown, fine grained, medium dense, moist, fill, A-2.
423.4				
				Silty Loam: Dark gray, medium stiff to stiff, trace slag, moist, fill, A-4.
422.4	2 2 3	0.3 P	17	
				Silty Clay: Brown, medium stiff, moist, A-6.
420.9				
-5				Clay: Brown, medium stiff, moist, A-7. *One-Dimensional Consolidation and Atterberg Limits Tests performed.*
	ST	1.0 P	39	
417.4				
	4 3 5	NC	--	Sand: Brown, fine grained, loose to medium dense, moist to wet, A-2.
-10				
▼	4 5 6	NC	--	
	4 5 6	NC	--	
-15				
	4 7 11	NC	--	
	8 7 9	NC	--	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				Sand: Brown, fine grained, loose to medium dense, moist to wet, A-2. *(continued)*
	3 4 5	NC	--	
	7 3 8	NC	--	
400.4 -25				Boring terminated at 25.0 feet. Boring grouted to 25 feet.
-30				
-35				
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
AASHTO Classifications are based on visual classifications unless otherwise noted BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SHELBY TUBE TEST RESULTS

Date 09/21/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **DRILLED BY** GeoServices, Inc.

SECTION 60B-1 **LOCATION** West Approach, **SEC.** , **TWP.** Land Grant 00114, **RNG.**

COUNTY St. Louis **STRUCT. NO.** 060-0350 (EB)
Station 806+89.23

BORING NO. B-101
Station 1780+03.06 **Ground Surface Elev.** 419.1 ft **Tube Length** in
Offset 258.6 ft L (EB) **Begin Sampling Depth** -10 ft **Tube Diameter** in

SOIL TYPE, DESCRIPTION, AND OBSERVATIONS	DEPTH (ft)	TRIAXIAL DATA: SPECIMEN (no)	RECOVERY (%)	UNIT WEIGHT (pcf)	STRENGTH (tsf)	MOISTURE (%)	COHESION (tsf)	PHI ANG. (deg)	TEST TYPE
Clay: Brown to gray, soft to very soft, moist, A-7.		ST-1	70	105	0.6	52	0.3		UU
	-15								
Silty Clay: Brown to gray, soft, moist, A-6.		ST-2	100	109	0.5	40	0.2		UU
	-20								

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.
The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).
The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.

BMPR FORM 1004A (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SHELBY TUBE TEST RESULTS

Date 12/08/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **DRILLED BY** GeoServices, Inc.

SECTION 60B-1 **LOCATION** East Approach, **SEC.** 36, **TWP.** 4N, **RNG.** 10W

COUNTY Madison **STRUCT. NO.** 060-0350 (EB)
Station 806+89.23

BORING NO. B-110
Station 1834+86.27 **Ground Surface Elev.** 442.6 ft **Tube Length** ____ in
Offset 20.2 ft L (EB) **Begin Sampling Depth** -6 ft **Tube Diameter** ____ in

SOIL TYPE, DESCRIPTION, AND OBSERVATIONS	DEPTH (ft)	SPECIMEN (no)	RECOVERY (%)	UNIT WEIGHT (pcf)	STRENGTH (tsf)	MOISTURE (%)	TRIAXIAL DATA: COHESION (tsf)	TRIAXIAL DATA: PHI ANG. (deg)	TRIAXIAL DATA: TEST TYPE
Sandy Loam: Gray, moist, fill, A-4.		ST-1	79	127	1.1	19			
	-10								
	-15								

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.
The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).
The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.

Illinois Department of Transportation
Division of Highways
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SHELBY TUBE TEST RESULTS

Date 12/08/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **DRILLED BY** GeoServices, Inc.

SECTION 60B-1 **LOCATION** East Approach, **SEC.** 36, **TWP.** 4N, **RNG.** 10W

COUNTY Madison **STRUCT. NO.** 060-0350 (EB)
Station 806+89.23

BORING NO. B-112
Station 1838+95.92 **Ground Surface Elev.** 442.2 ft **Tube Length** ____ in
Offset 12.4 ft L (EB) **Begin Sampling Depth** -11 ft **Tube Diameter** ____ in

SOIL TYPE, DESCRIPTION, AND OBSERVATIONS	DEPTH (ft)	SPECIMEN (no)	RECOVERY (%)	UNIT WEIGHT (pcf)	STRENGTH (tsf)	MOISTURE (%)	TRIAXIAL DATA: COHESION (tsf)	TRIAXIAL DATA: PHI ANG. (deg)	TRIAXIAL DATA: TEST TYPE
Clay Loam: Gray, moist, fill, A-4.		ST-1	46	128		20			
	-15								
	-20								

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.
The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).
The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.

BMPR FORM 1004A (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
sci engineering inc

SHELBY TUBE TEST RESULTS

Date 09/19/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **DRILLED BY** GeoServices, Inc.

SECTION 60B-1 **LOCATION** East Approach, **SEC.** 36, **TWP.** 4N, **RNG.** 10W

COUNTY Madison **STRUCT. NO.** 060-0350 (EB)
Station 806+89.23

BORING NO. B-113
Station 1838+81.05 **Ground Surface Elev.** 416.5 ft **Tube Length** ____ in
Offset 100.2 ft R (EB) **Begin Sampling Depth** -12.5 ft **Tube Diameter** ____ in

SOIL TYPE, DESCRIPTION, AND OBSERVATIONS	DEPTH (ft)	SPECIMEN (no)	RECOVERY (%)	UNIT WEIGHT (pcf)	TRIAXIAL DATA: STRENGTH (tsf)	TRIAXIAL DATA: MOISTURE (%)	TRIAXIAL DATA: COHESION (tsf)	TRIAXIAL DATA: PHI ANG. (deg)	TRIAXIAL DATA: TEST TYPE
Sand: Brown, fine grained, loose, wet, A-2.		ST-1				--			
	-15								
	-20								
	-25								

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.
The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).
The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.

Illinois Department of Transportation
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SHELBY TUBE TEST RESULTS

Date 09/19/18

ROUTE FAI 270 **DESCRIPTION** I-270 over the Mississippi River **DRILLED BY** GeoServices, Inc.

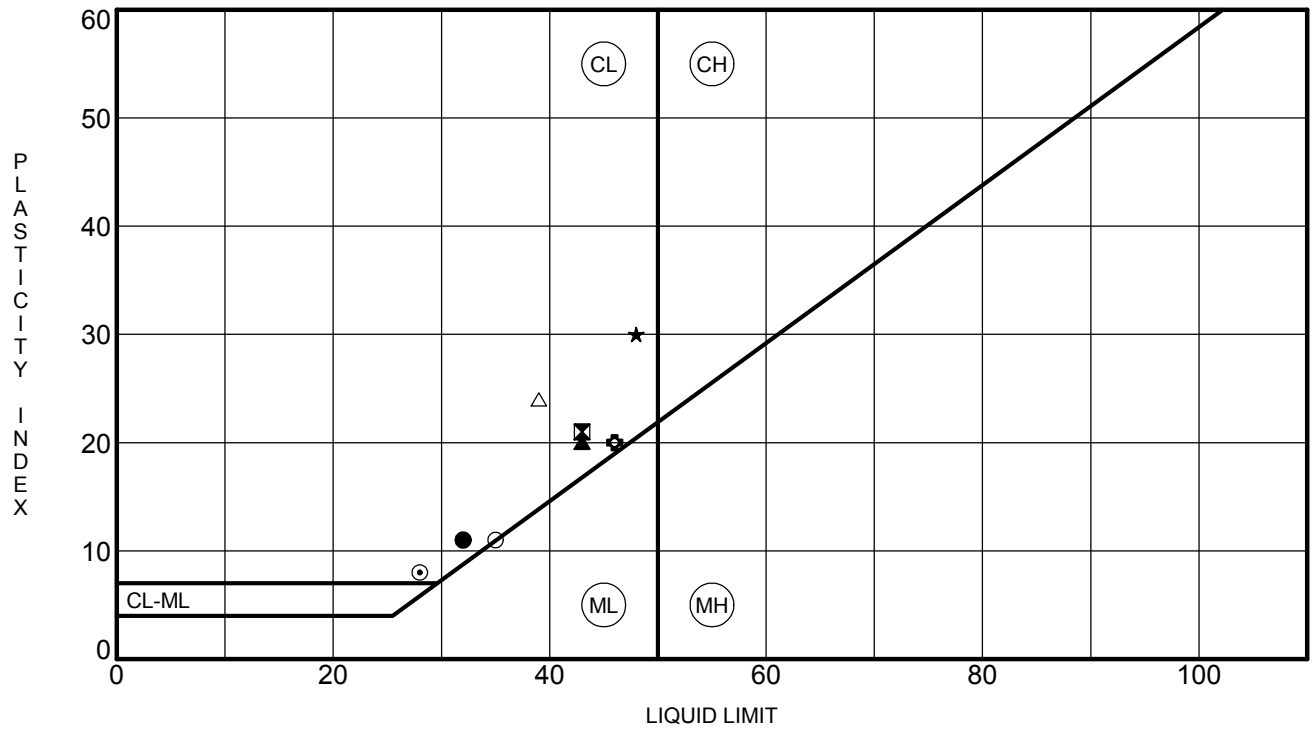
SECTION 60B-1 **LOCATION** East Approach, **SEC.** 36, **TWP.** 4N, **RNG.** 10W

COUNTY Madison **STRUCT. NO.** 060-0350 (EB)
Station 806+89.23

BORING NO. B-118
Station 1836+91.35 **Ground Surface Elev.** 425.4 ft **Tube Length** ____ in
Offset 55.8 ft R (EB) **Begin Sampling Depth** -5 ft **Tube Diameter** ____ in

SOIL TYPE, DESCRIPTION, AND OBSERVATIONS	DEPTH (ft)	SPECIMEN (no)	RECOVERY (%)	UNIT WEIGHT (pcf)	STRENGTH (tsf)	MOISTURE (%)	TRIAXIAL DATA: COHESION (tsf)	TRIAXIAL DATA: PHI ANG. (deg)	TRIAXIAL DATA: TEST TYPE
Clay: Brown, medium stiff, moist, A-7.		ST-1	54	117		39			
	-10								
	-15								

The "Unit Weight" column indicates the "wet" or "moist" unit weight of the sample.
The "Strength" column represents the "unconfined compressive" strength of the sample (AASHTO T 208).
The "Test Type" indicates if Unconsolidated Undrained (UU) or Consolidated Undrained (CU) test procedures (AASHTO T 296 or T 297) were used.



	Boring	Depth	LL	PL	PI	Fines	Classification
●	**BB-44**	**3.5**	**32**	**21**	**11**		
⊠	**BB-44**	**16.0**	**43**	**22**	**21**		
▲	**BB-46**	**8.5**	**43**	**23**	**20**		
★	**BB-47**	**8.5**	**48**	**18**	**30**		
⊙	**BB-51**	**6.0**	**28**	**20**	**8**		
✿	**BB-52**	**3.5**	**46**	**26**	**20**		
○	**BB-53**	**8.5**	**35**	**24**	**11**		
△	**BB-57**	**1.0**	**39**	**15**	**24**		

Illinois Department of Transportation
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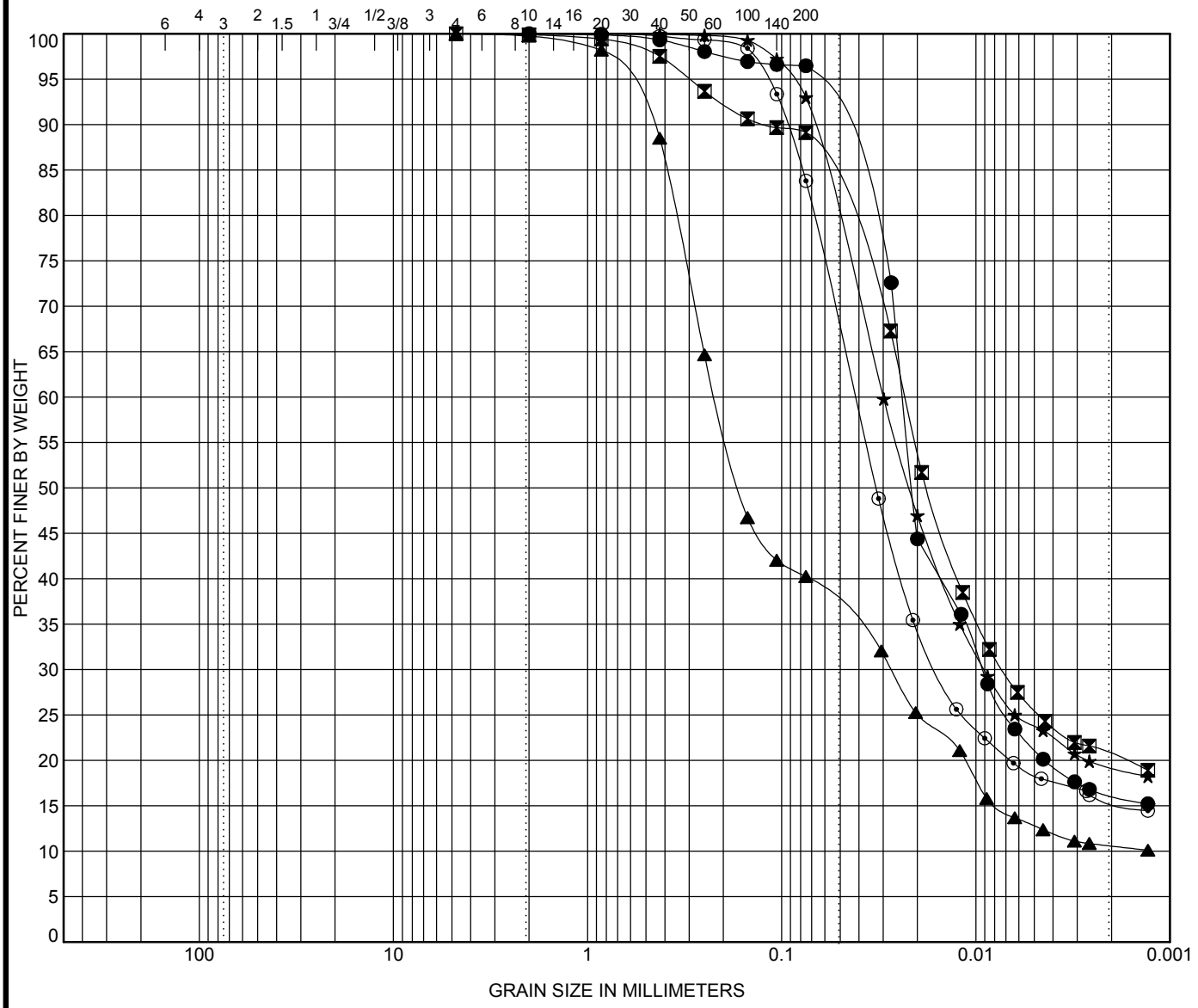
ATTERBERG LIMITS

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

ATTERBERG_LIMITS - IDH_2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL_DOT.GDT 7/9/21



Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	BB-01 2.0-4 ft	SILT					
⊠	BB-01 8.0-10 ft	SILTY CLAY LOAM					
▲	BB-01 13.5-15.5 ft	SANDY LOAM					
★	BB-01 43.5-45.5 ft	SILTY LOAM					
⊙	BB-03 3.0-5 ft	SILTY LOAM					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BB-01 2.0-4 ft	2.0	0.0	0.0		0.0	3.5	80.3	16.2
⊠	BB-01 8.0-10 ft	4.8	0.0	0.0		0.1	10.8	68.5	20.6
▲	BB-01 13.5-15.5 ft	4.8	0.2	0.0		0.3	59.5	29.7	10.6
★	BB-01 43.5-45.5 ft	0.4	0.0	0.0		0.0	7.0	73.7	19.3
⊙	BB-03 3.0-5 ft	2.0	0.0	0.0		0.0	16.2	68.3	15.5

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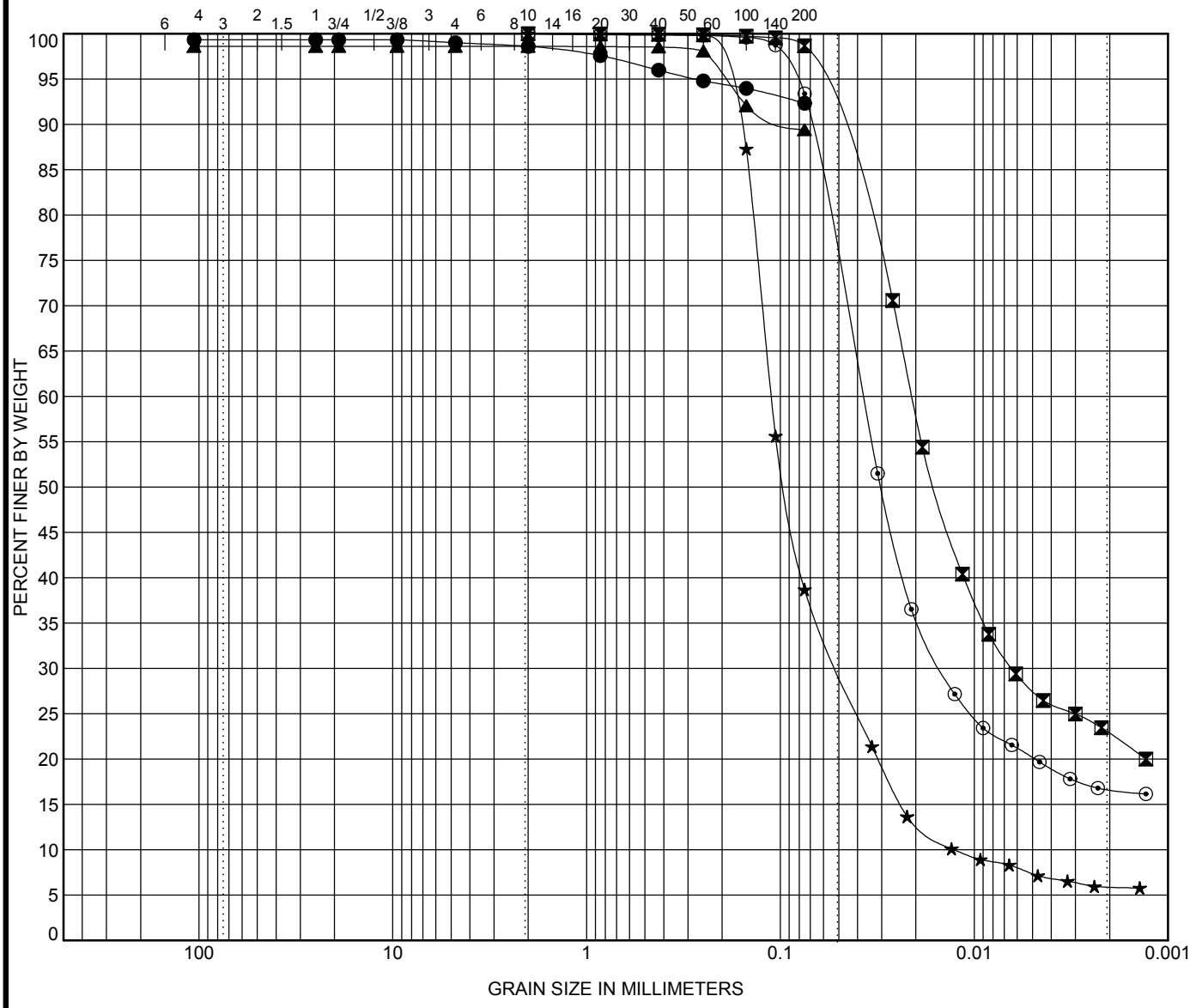
GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

GRAIN SIZE IDOT - IDH D8 2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 6/3/21



Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	BB-03 9.0-10.5 ft	SILTY CLAY LOAM					
⊠	BB-03 16.0-17.5 ft	SILTY CLAY LOAM					
▲	BB-03 23.5-25 ft	SILTY CLAY LOAM					
★	BB-05 3.0-4.5 ft	SANDY LOAM				1.78	8.75
⊙	BB-05 13.5-15 ft	SILTY LOAM					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BB-03 9.0-10.5 ft	106.0				0.7	6.3	92.3	
⊠	BB-03 16.0-17.5 ft	2.0	0.0	0.0		0.0	1.3	75.9	22.8
▲	BB-03 23.5-25 ft	106.0				0.0	9.2	89.4	
★	BB-05 3.0-4.5 ft	2.0	0.1	0.1	0.0	0.0	61.3	32.8	5.9
⊙	BB-05 13.5-15 ft	2.0	0.0	0.0		0.0	6.6	76.7	16.6

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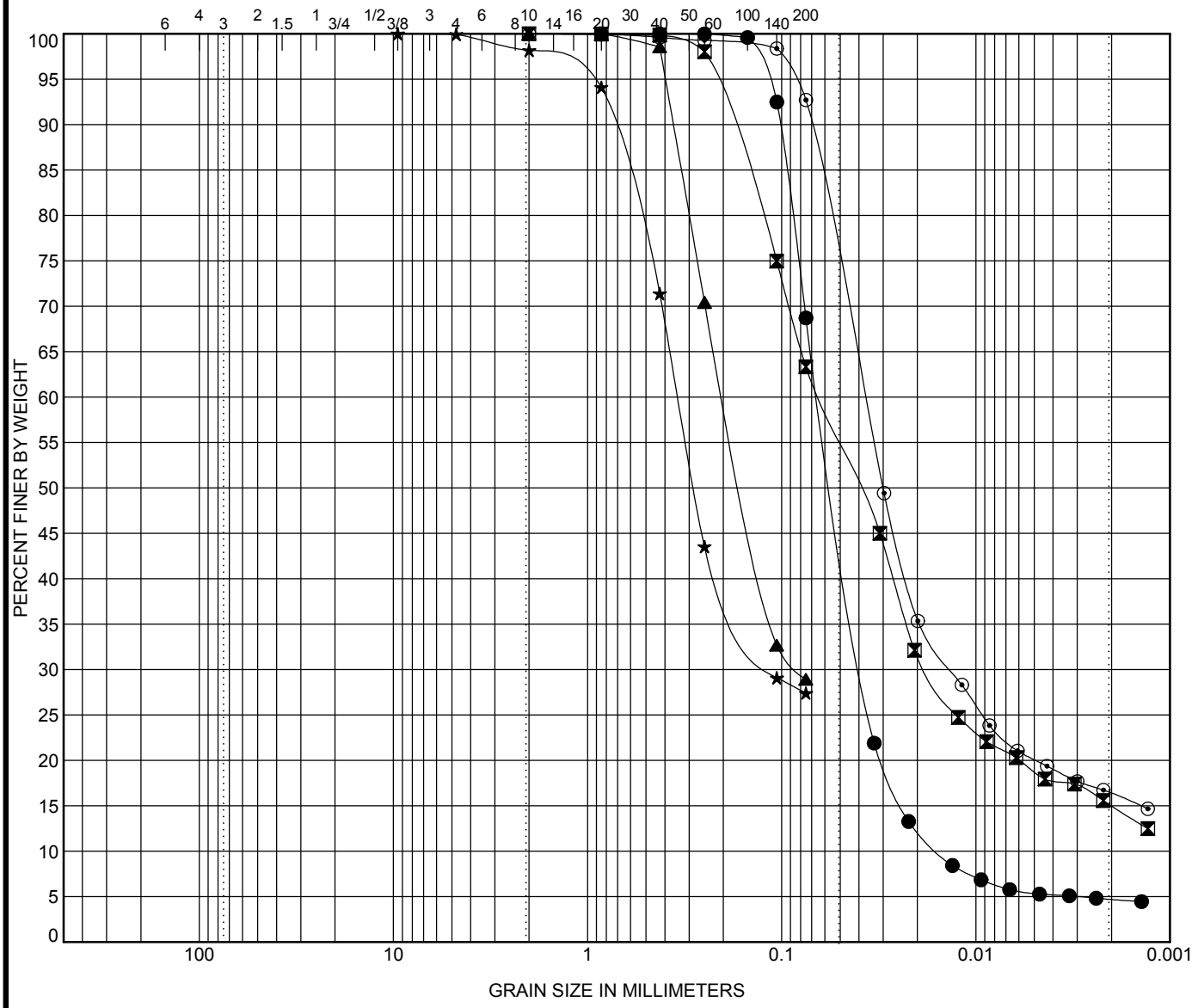
GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

GRAIN SIZE IDOT - IDH D8 2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL_DOT.GDT 6/3/21



Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	BB-05 23.5-25 ft	SILTY LOAM				1.46	4.13
⊠	BB-29 3.5-5 ft	LOAM					
▲	BB-29 18.5-20 ft	SANDY LOAM					
★	BB-29 28.5-30 ft	SANDY LOAM					
⊙	BB-32 11.0-12.5 ft	SILTY LOAM					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BB-05 23.5-25 ft	0.9	0.1	0.0	0.0	0.0	31.3	64.0	4.7
⊠	BB-29 3.5-5 ft	2.0	0.1	0.0		0.0	36.7	48.3	15.0
▲	BB-29 18.5-20 ft	2.0	0.2	0.1		0.0	71.1	28.9	
★	BB-29 28.5-30 ft	9.5	0.3	0.1		1.8	70.8	27.4	
⊙	BB-32 11.0-12.5 ft	2.0	0.0	0.0		0.0	7.3	76.4	16.4

Illinois Department of Transportation
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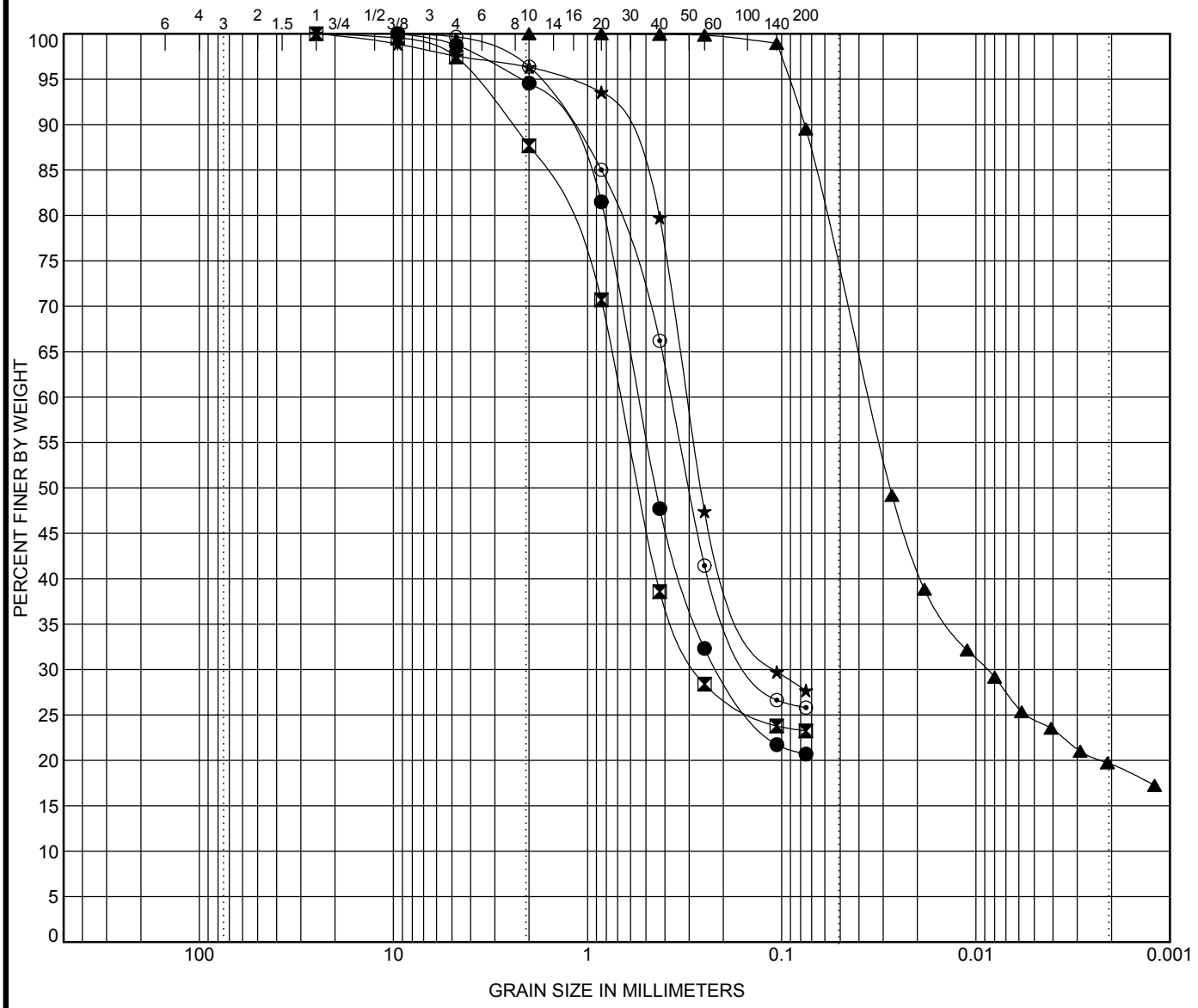
GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

GRAIN SIZE IDOT - IDH D8 2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 6/3/21



COBBLES	GRAVEL	SAND	SILT	CLAY

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	BB-32 28.5-30 ft	SANDY LOAM					
⊠	BB-32 43.5-45 ft	SANDY LOAM					
▲	BB-35 11.0-12.5 ft	SILTY LOAM					
★	BB-35 26.0-27.5 ft	SANDY LOAM					
⊙	BB-35 28.5-30 ft	SANDY LOAM					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BB-32 28.5-30 ft	9.5	0.5	0.2		5.4	73.9	20.7	
⊠	BB-32 43.5-45 ft	25.0	0.7	0.3		12.3	64.4	23.2	
▲	BB-35 11.0-12.5 ft	2.0	0.0	0.0		0.0	10.5	70.0	19.5
★	BB-35 26.0-27.5 ft	25.0	0.3	0.1		3.7	68.6	27.7	
⊙	BB-35 28.5-30 ft	9.5	0.4	0.1		3.6	70.6	25.8	

Illinois Department of Transportation
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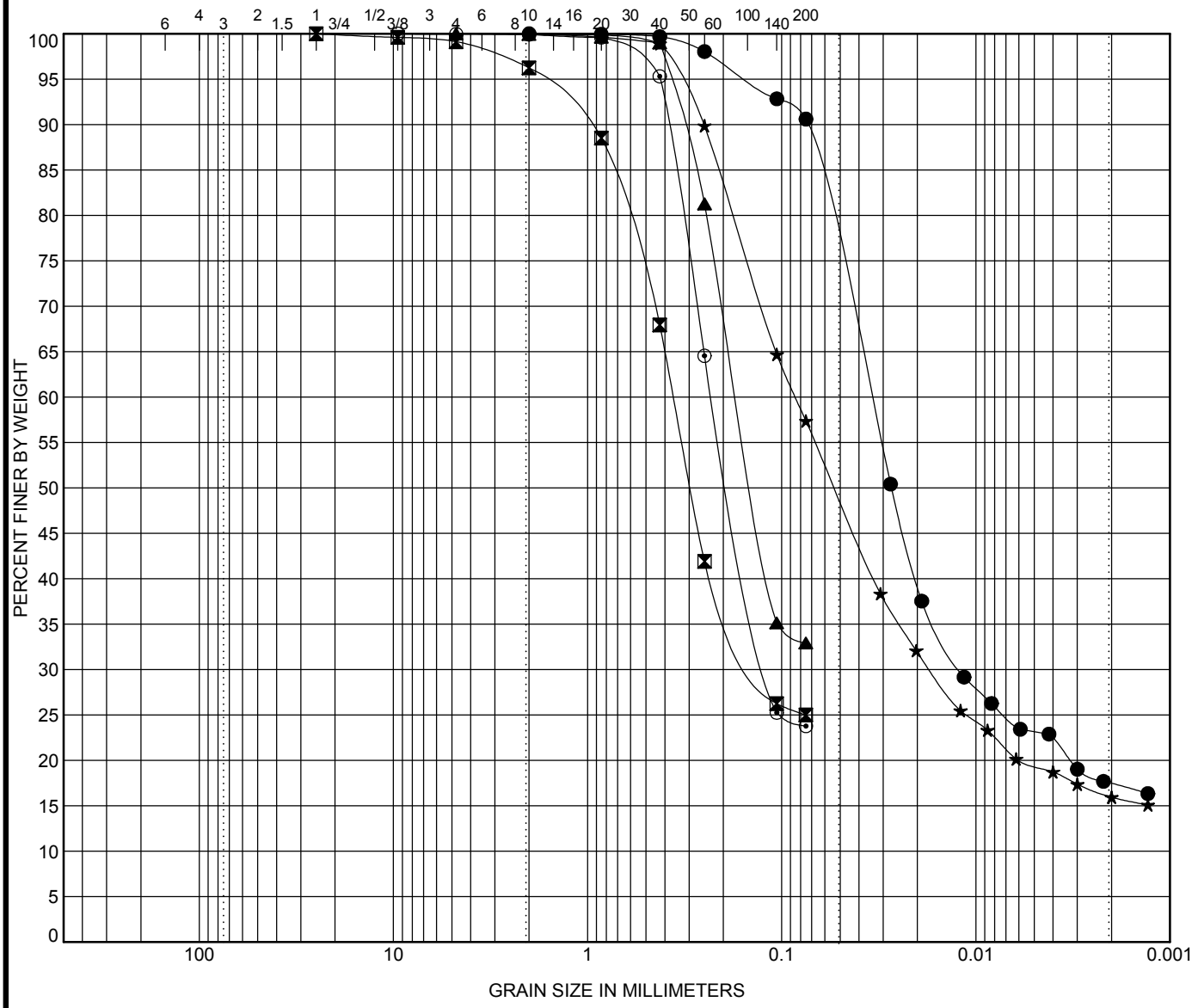
GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

GRAIN SIZE IDOT - IDH D8 2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 6/3/21



COBBLES	GRAVEL	SAND	SILT	CLAY

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● BB-40	3.5-5 ft	SILTY LOAM					
⊠ BB-40	21.0-22.5 ft	SANDY LOAM					
▲ BB-40	33.5-35 ft	SANDY LOAM					
★ BB-42	1.0-2.5 ft	LOAM					
⊙ BB-42	18.5-20 ft	SANDY LOAM					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BB-40	3.5-5 ft	2.0	0.0	0.0		0.0	9.4	73.2	17.4
⊠ BB-40	21.0-22.5 ft	25.0	0.4	0.1		3.8	71.3	25.0	
▲ BB-40	33.5-35 ft	4.8	0.2			0.1	67.0	32.9	
★ BB-42	1.0-2.5 ft	2.0	0.1	0.0		0.0	42.6	41.4	15.9
⊙ BB-42	18.5-20 ft	9.5	0.2	0.1		0.1	76.1	23.8	

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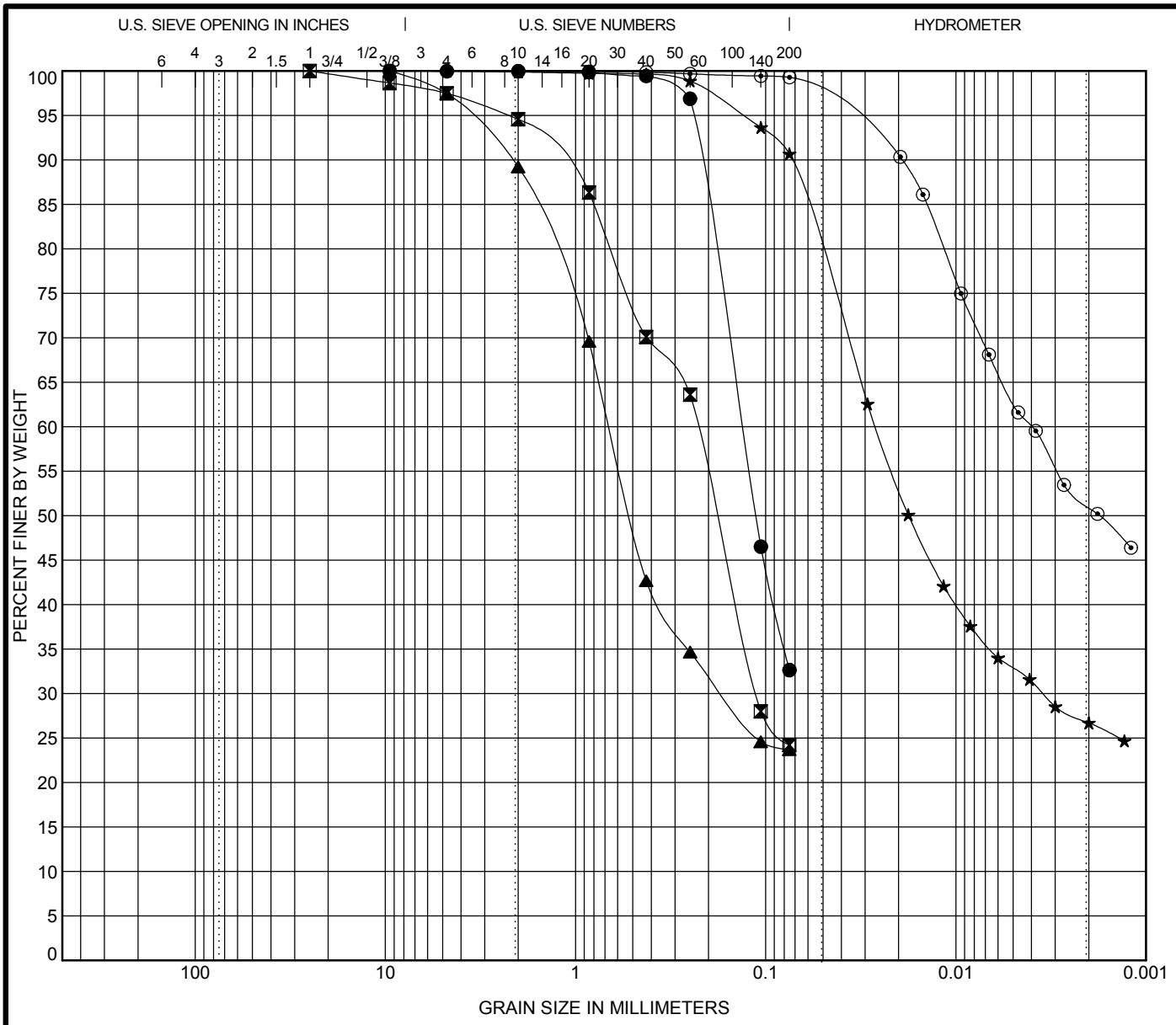
GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

GRAIN SIZE IDOT - IDH D8 2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 6/3/21



Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	BB-42 23.5-25 ft	SANDY LOAM					
⊠	BB-42 38.5-40 ft	SANDY LOAM					
▲	BB-42 48.5-50 ft	SANDY LOAM					
★	BB-43 3.5-5 ft	SILTY CLAY LOAM					
⊙	BB-43 13.5-15 ft	CLAY					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BB-42 23.5-25 ft	9.5	0.1			0.0	67.3	32.6	
⊠	BB-42 38.5-40 ft	25.0	0.2	0.1		5.4	70.4	24.2	
▲	BB-42 48.5-50 ft	9.5	0.7	0.2		10.8	65.5	23.7	
★	BB-43 3.5-5 ft	4.8	0.0	0.0		0.1	9.2	64.0	26.7
⊙	BB-43 13.5-15 ft	2.0	0.0			0.0	0.7	48.2	51.1

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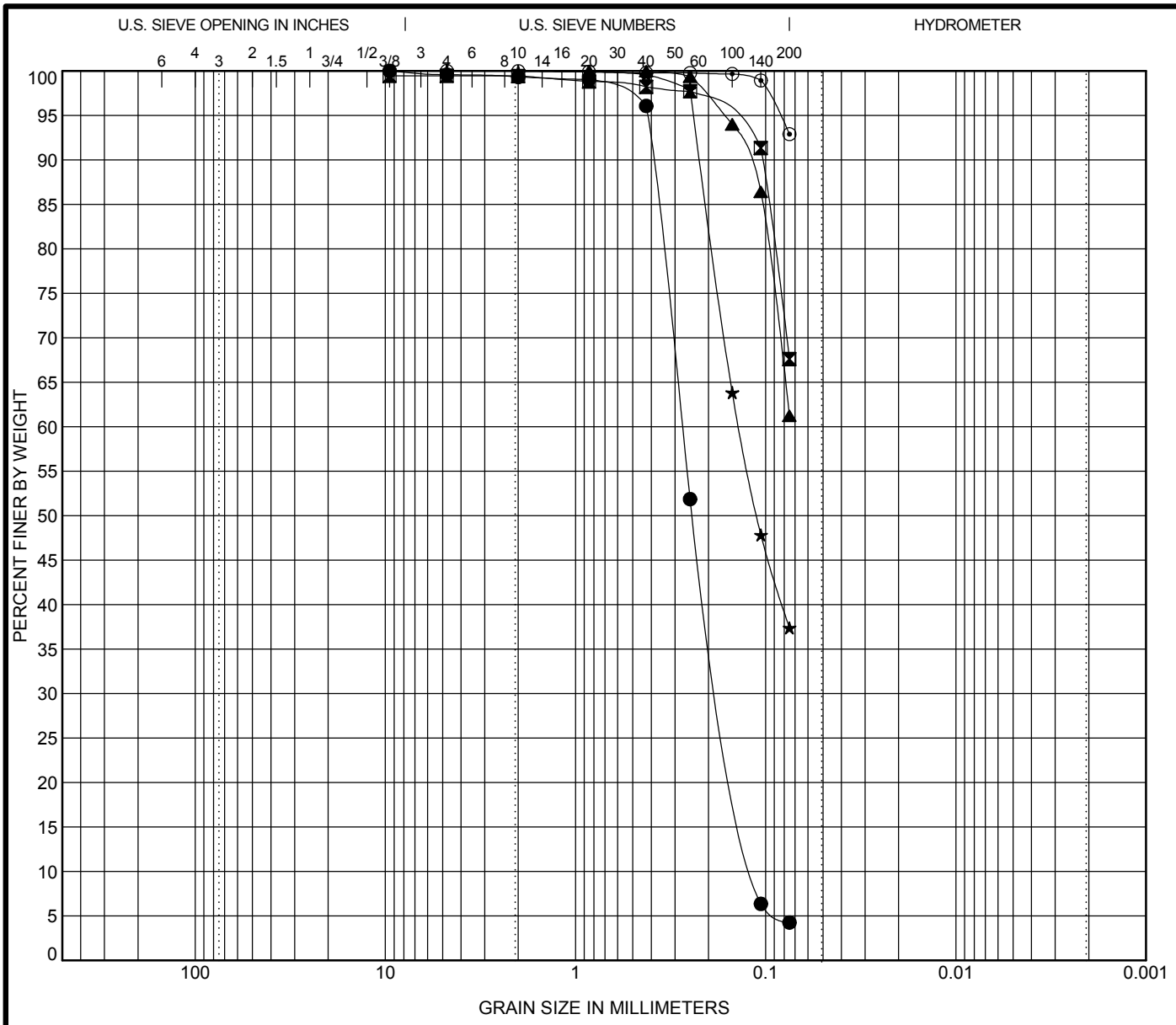
GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

GRAIN SIZE IDOT - IDH D8 2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 6/3/21



Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	BB-43 23.5-25 ft	SAND				0.88	2.43
⊠	BB-43 28.5-30 ft	SILTY LOAM					
▲	BB-44 11.0-12.5 ft	CLAY LOAM					
★	BB-44 23.5-25 ft	SANDY LOAM					
⊙	BB-45 13.5-15 ft	SILTY CLAY					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BB-43 23.5-25 ft	9.5	0.3	0.2	0.1	0.7	95.1	4.3	
⊠	BB-43 28.5-30 ft	9.5				0.0	31.8	67.6	
▲	BB-44 11.0-12.5 ft	0.9				0.0	38.8	61.2	
★	BB-44 23.5-25 ft	4.8	0.1			0.0	62.6	37.4	
⊙	BB-45 13.5-15 ft	4.8				0.0	7.1	92.9	

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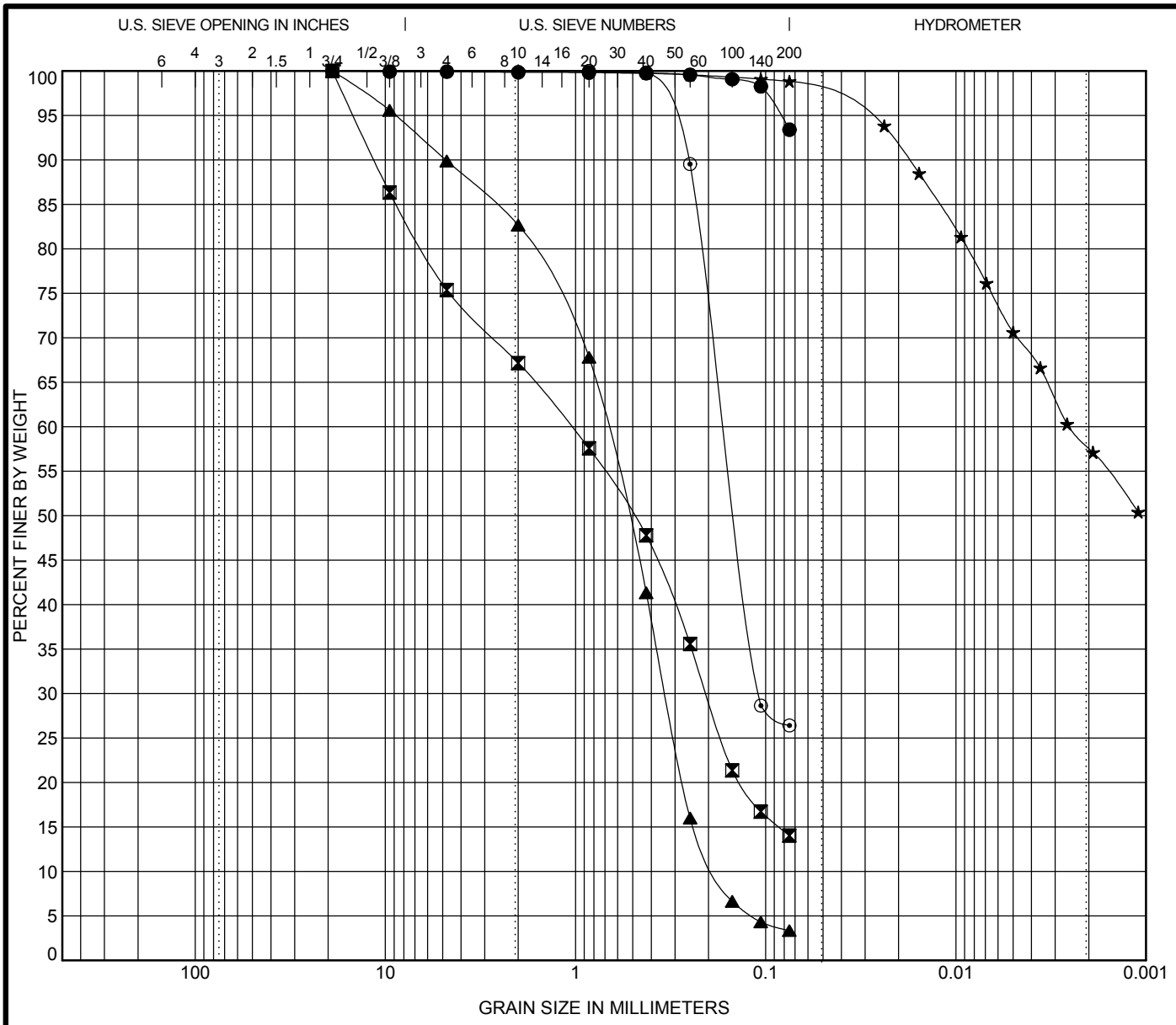
GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

GRAIN_SIZE IDOT - IDH D8 2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL_DOT.GDT 6/3/21



COBBLES	GRAVEL	SAND	SILT	CLAY

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● BB-45	28.5-30 ft	CLAY					
⊠ BB-46	3.5-5 ft	SAND					
▲ BB-46	21.0-22.5 ft	SAND				0.90	3.85
★ BB-48	1.0-2.5 ft	CLAY					
⊙ BB-48	8.5-10 ft	SANDY LOAM					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BB-45	28.5-30 ft	19.0				0.1	6.5	93.4	
⊠ BB-46	3.5-5 ft	19.0	1.1	0.2		32.8	53.1	14.0	
▲ BB-46	21.0-22.5 ft	19.0	0.7	0.3	0.2	17.3	79.3	3.3	
★ BB-48	1.0-2.5 ft	2.0	0.0			0.0	1.2	41.2	57.6
⊙ BB-48	8.5-10 ft	0.9	0.2	0.1		0.0	73.6	26.4	

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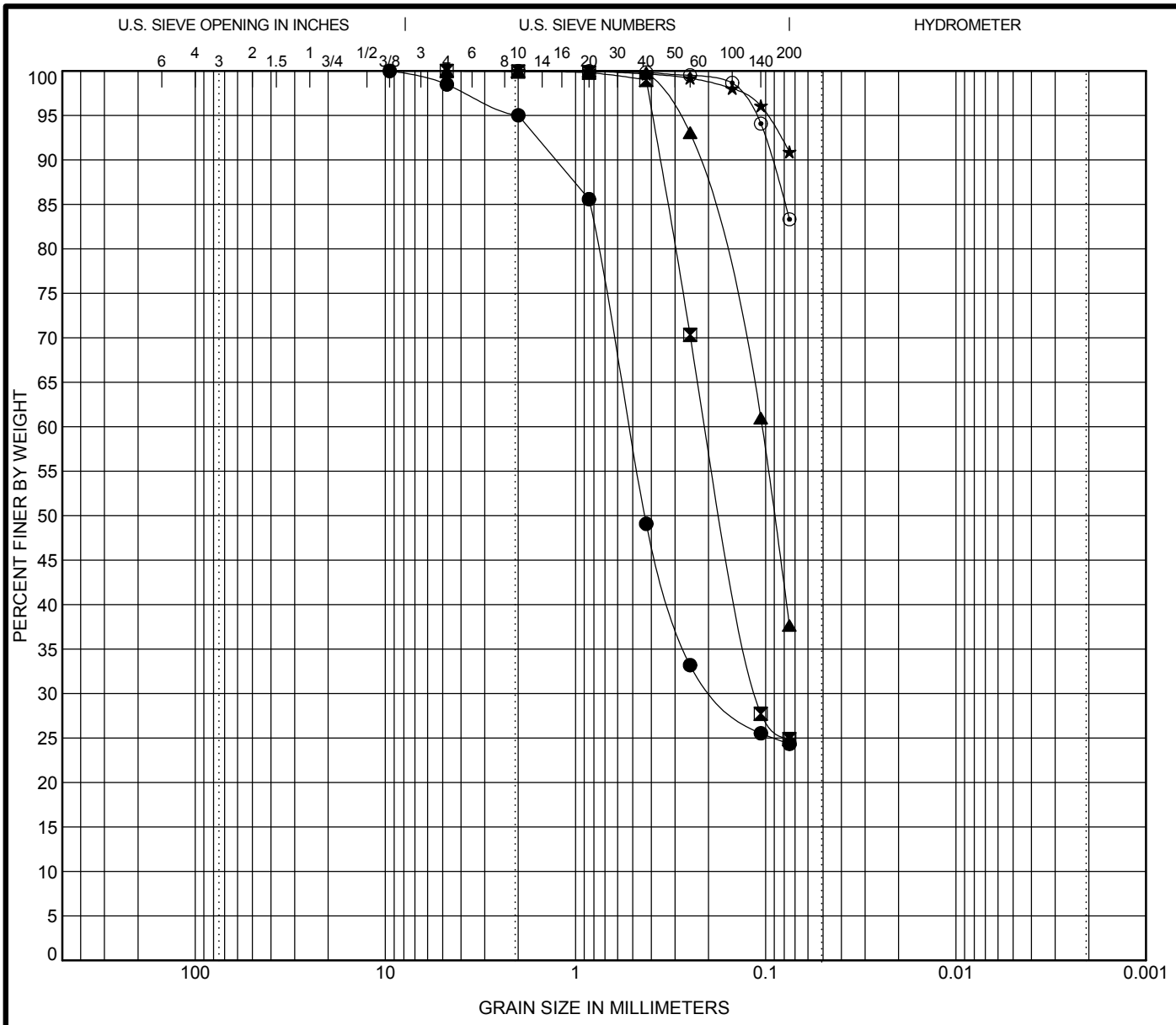
GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

GRAIN SIZE IDOT - IDH D8 2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 6/3/21



COBBLES	GRAVEL	SAND	SILT	CLAY

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● BB-48	38.5-40 ft	SAND					
⊠ BB-49	28.5-30 ft	SANDY LOAM					
▲ BB-49	33.5-35 ft	SANDY LOAM					
★ BB-52	8.5-10 ft	SILT					
⊙ BB-52	13.5-15 ft	SILTY CLAY LOAM					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BB-48	38.5-40 ft	9.5	0.5	0.2		5.0	70.7	24.3	
⊠ BB-49	28.5-30 ft	4.8	0.2	0.1		0.0	75.1	24.9	
▲ BB-49	33.5-35 ft	4.8	0.1			0.0	62.3	37.6	
★ BB-52	8.5-10 ft	2.0				0.0	9.1	90.9	
⊙ BB-52	13.5-15 ft	2.0				0.0	16.7	83.3	

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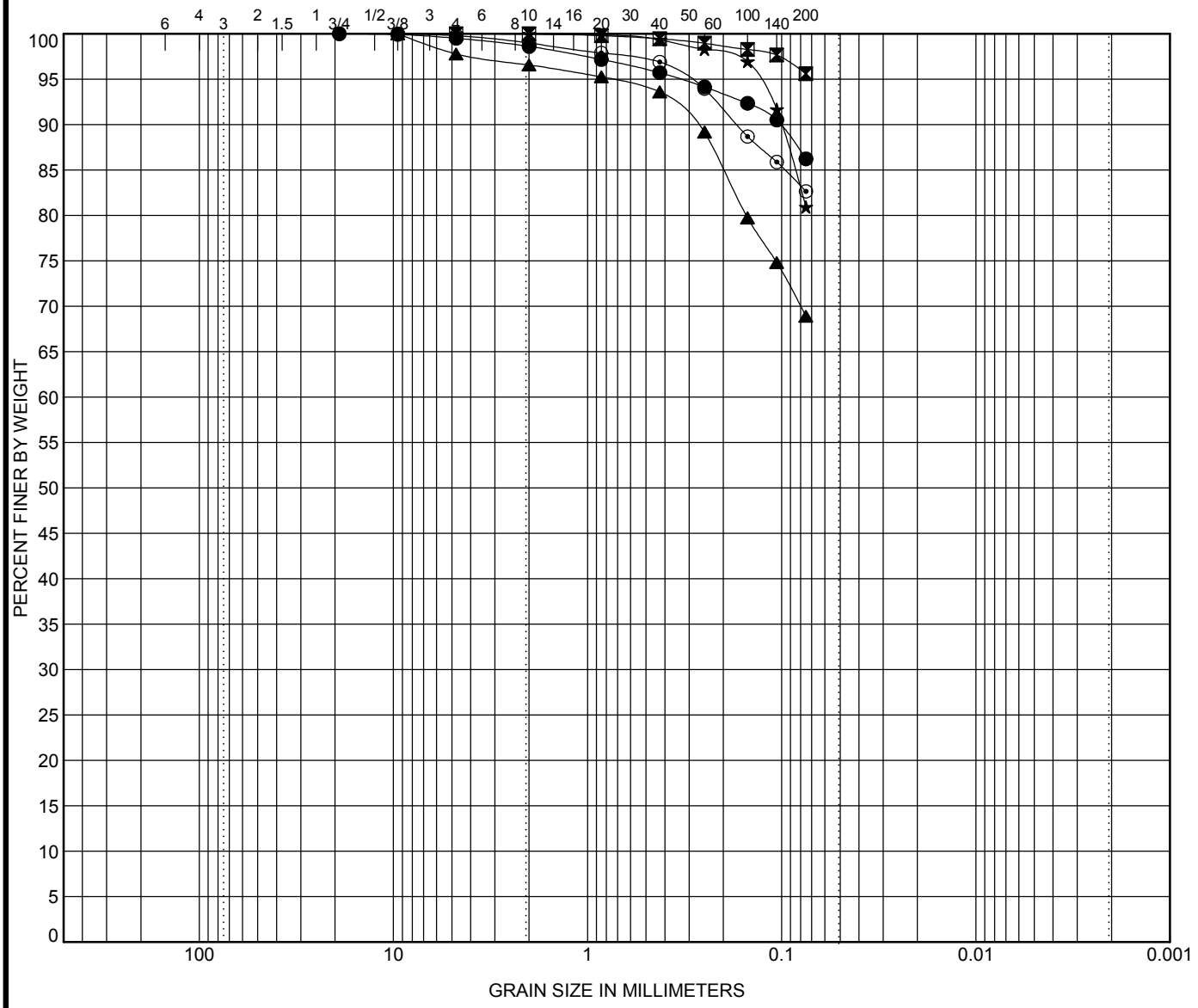
GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

GRAIN SIZE IDOT - IDH D8 2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL DOT.GDT 6/3/21



Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● BB-53	1.0-2.5 ft	SILTY LOAM					
⊠ BB-53	13.5-15 ft	SILTY CLAY LOAM					
▲ BB-54	6.0-7.5 ft	SILTY LOAM					
★ BB-54	13.5-15 ft	SILTY CLAY LOAM					
⊙ BB-55	1.0-2.5 ft	SILTY CLAY					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BB-53	1.0-2.5 ft	19.0				1.4	12.4	86.2	
⊠ BB-53	13.5-15 ft	4.8				0.0	4.4	95.6	
▲ BB-54	6.0-7.5 ft	9.5				3.4	27.7	68.9	
★ BB-54	13.5-15 ft	4.8				0.0	19.0	80.9	
⊙ BB-55	1.0-2.5 ft	9.5				1.0	16.3	82.6	

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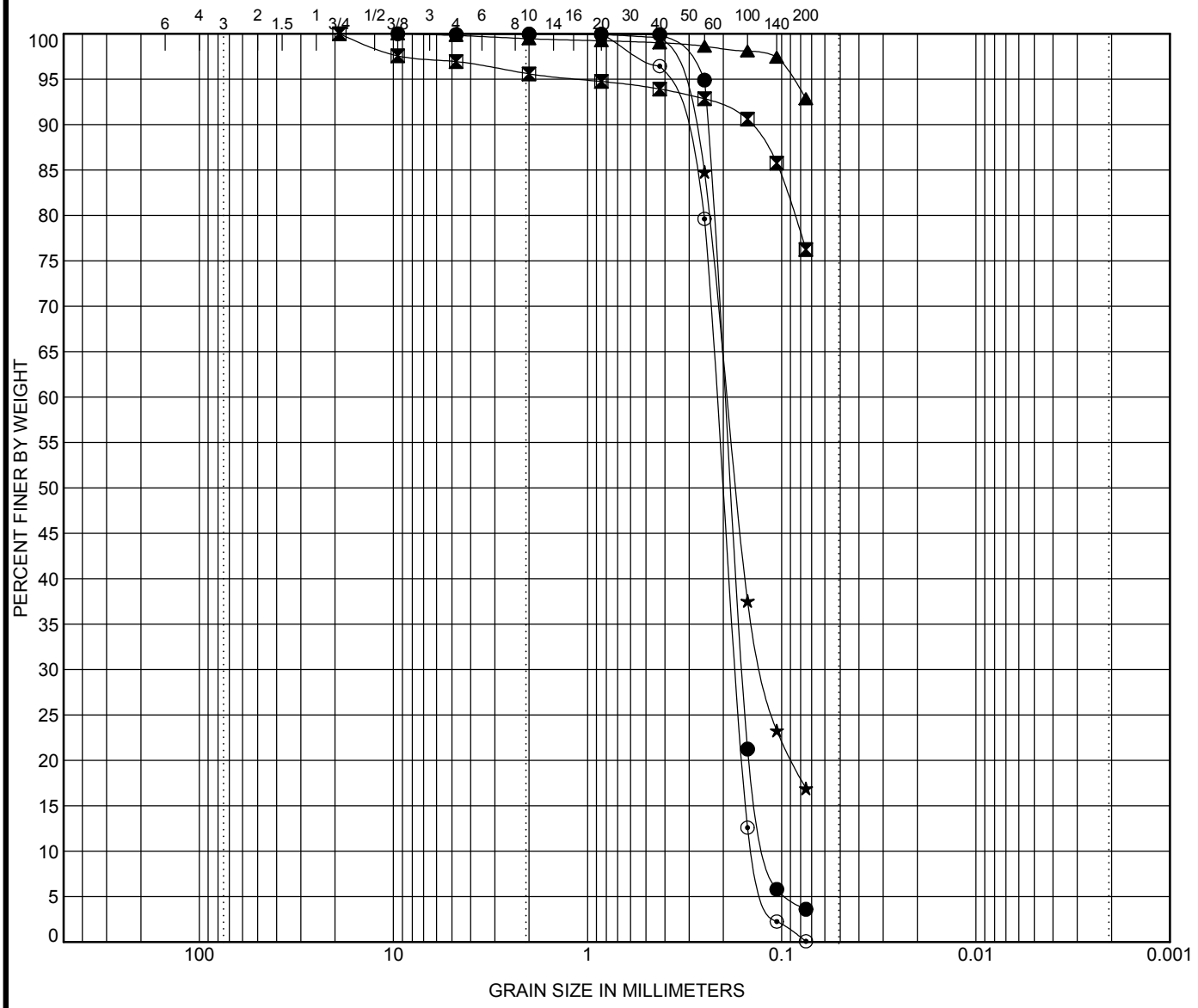
GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

GRAIN SIZE IDOT - IDH D8 2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL_DOT.GDT 6/3/21



COBBLES	GRAVEL	SAND	SILT	CLAY

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	BB-55	16.0-17.5 ft	SAND				1.11	1.68
⊠	BB-56	1.0-2.5 ft	SILTY CLAY LOAM					
▲	BB-56	13.5-15 ft	SILTY LOAM					
★	BB-58	8.5-10 ft	SAND					
⊙	BB-58	21.0-22.5 ft	SAND				0.99	1.57

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BB-55	16.0-17.5 ft	9.5	0.2	0.2	0.1	0.1	96.3	3.6	
⊠	BB-56	1.0-2.5 ft	19.0				4.4	19.3	76.2	
▲	BB-56	13.5-15 ft	9.5				0.5	6.6	92.8	
★	BB-58	8.5-10 ft	4.8	0.2	0.1		0.0	83.1	16.9	
⊙	BB-58	21.0-22.5 ft	2.0	0.2	0.2	0.1	0.0	99.9	0.1	

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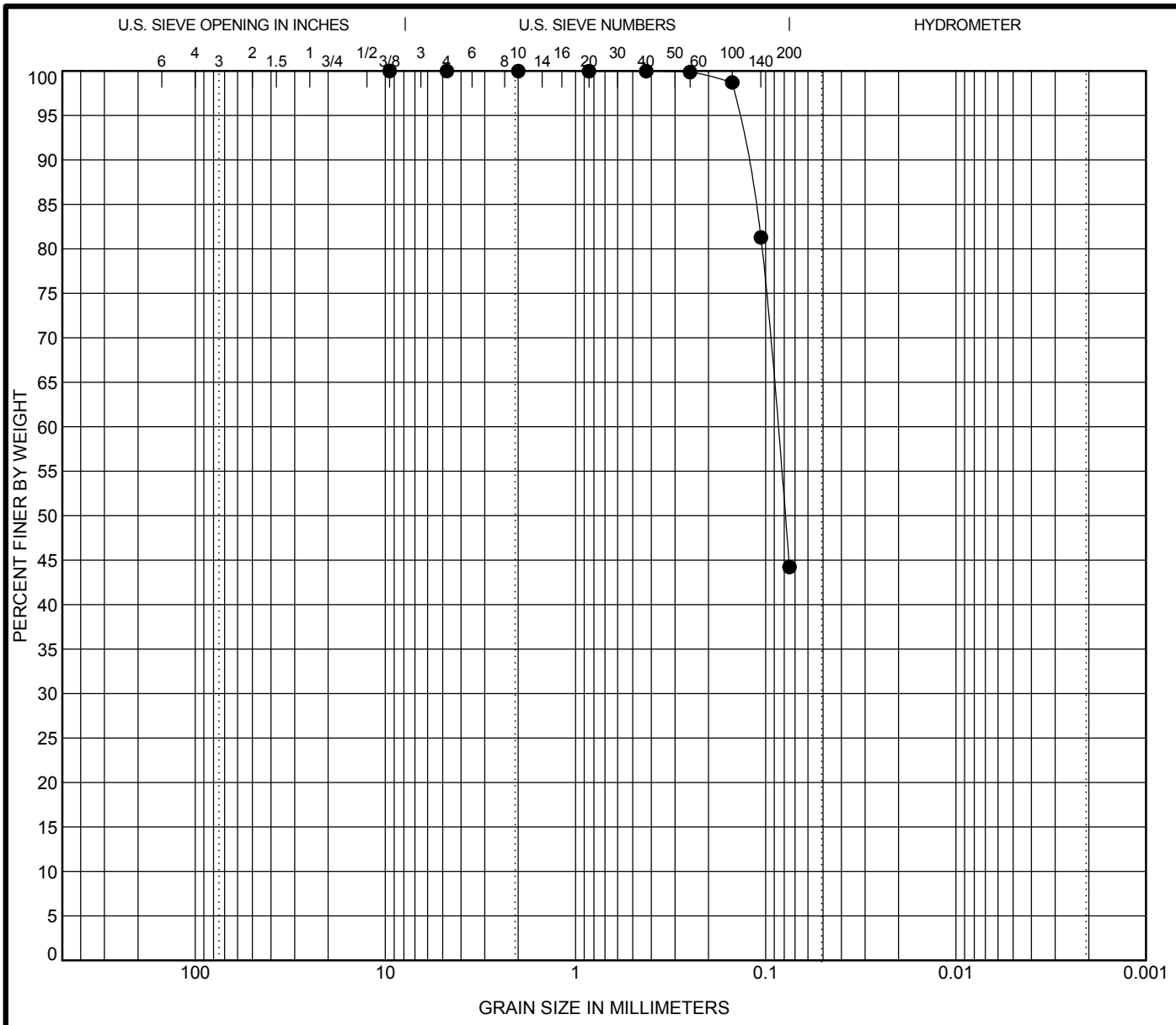
GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

GRAIN SIZE IDOT - IDH D8 2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL_DOT.GDT 6/3/21



COBBLES	GRAVEL	SAND	SILT	CLAY

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● **BB-59 21.0-22.5 ft**	**SANDY LOAM**					

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **BB-59 21.0-22.5 ft**	**9.5**	**0.1**			**0.0**	**55.8**	**44.2**	

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GRAIN SIZE DISTRIBUTION - IDH

Route: FAI 270
Section: 60B-1
County: Madison & St. Louis

GRAIN_SIZE IDOT - IDH D8 2017-3167.10 I270 COR BRIDGE - NO PLOG.GPJ IL_DOT.GDT 6/3/21

APPENDIX B
CPTu Logs and Shear Wave Velocity Profiles

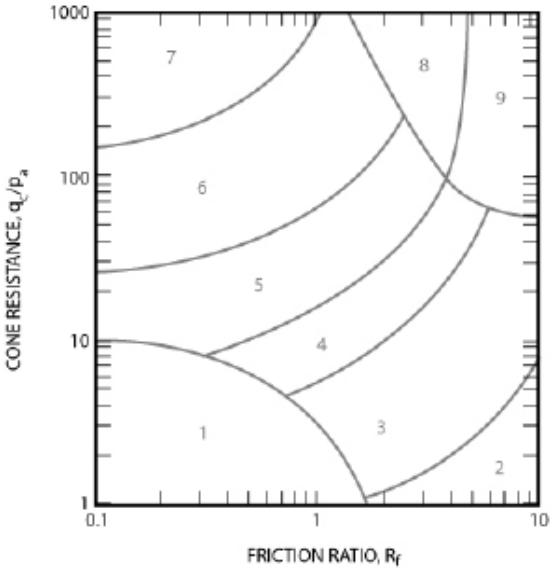
SCI ENGINEERING, INC.
650 Pierce Boulevard
O'Fallon, Illinois 62269
618-624-6969
www.sciengineering.com

USE and UNDERSTANDING of CPTu Logs

The CPTu logs show the corrected Tip Resistance (q_t), Friction (f_s), Porewater Pressure (U_2), SPT N_{60} correlation (N_{60}), and the Soil Behavior interpretation results. The corrected cone tip resistance (q_t) is measured as the maximum force over the projected area of the cone tip. It is a point stress related to the bearing capacity of the soil. The measured uncorrected tip value (q_c) must be corrected for porewater pressure effects (Lunne et al, 1997), especially in clays and silts where porewater pressures typically vary greatly from hydrostatic. The sleeve friction (fs) is used as a measure of soil type and can be expressed by friction ratio (R_F) which is used in the soil behavior classification. The u_2 position element is required for the measurement of penetration porewater pressures and the correction of tip resistance. Calculations of q_t, R_F, and the SPT N_{60} calculation are discussed below.

The estimated stratigraphic profiles included in the CPTu logs are based on relationships between q_t, f_s, and U2 as shown graphically in the figure below.

Non-normalized CPT Soil Behavior Type (SBT) chart



Z	*Soil Behavior Type*
1	*Sensitive, fine grained*
2	*Organic soils - clay*
3	*Clay – silty clay to clay*
4	*Silt mixtures – clayey silt to silty clay*
5	*Sand mixtures – silty sand to sandy silt*
6	*Sands – clean sand to silty sand*
7	*Gravelly sand to dense sand*
8	*Very stiff sand to clayey sand**
9	*Very stiff fine grained**

** Heavily overconsolidated or cemented*

P_a = atmospheric pressure = 100 kPa = 1 tsf

Derived Values from CPT

Corrected cone resistance: $q_t = q_c + u_2(1-a)$
Friction ratio: $R_f = (f_s/q_t) \times 100\%$

Equivalent SPT N60, (blows/ft) Lunne et al. (1997)

$$\frac{(q_t/p_a)}{N_{60}} = 8.5 \times \left(1 - \frac{I_c}{4.6}\right)$$

Where $I_c = ((3.47 - \log Q_{t1})2 + (\log R_F + 1.22)2)0.5$
And $Qt_n = ((q_t - sv_o)/p_a) \times (p_a/(s'v_o)n$, and
recalculate I_c, then iterate for n:

$$n = 0.381 \times I_c + 0.05 \times \left(\frac{s_{vo}'}{p_a}\right) - 0.15$$

Iterate until the change in n, $\Delta_n < 0.01$

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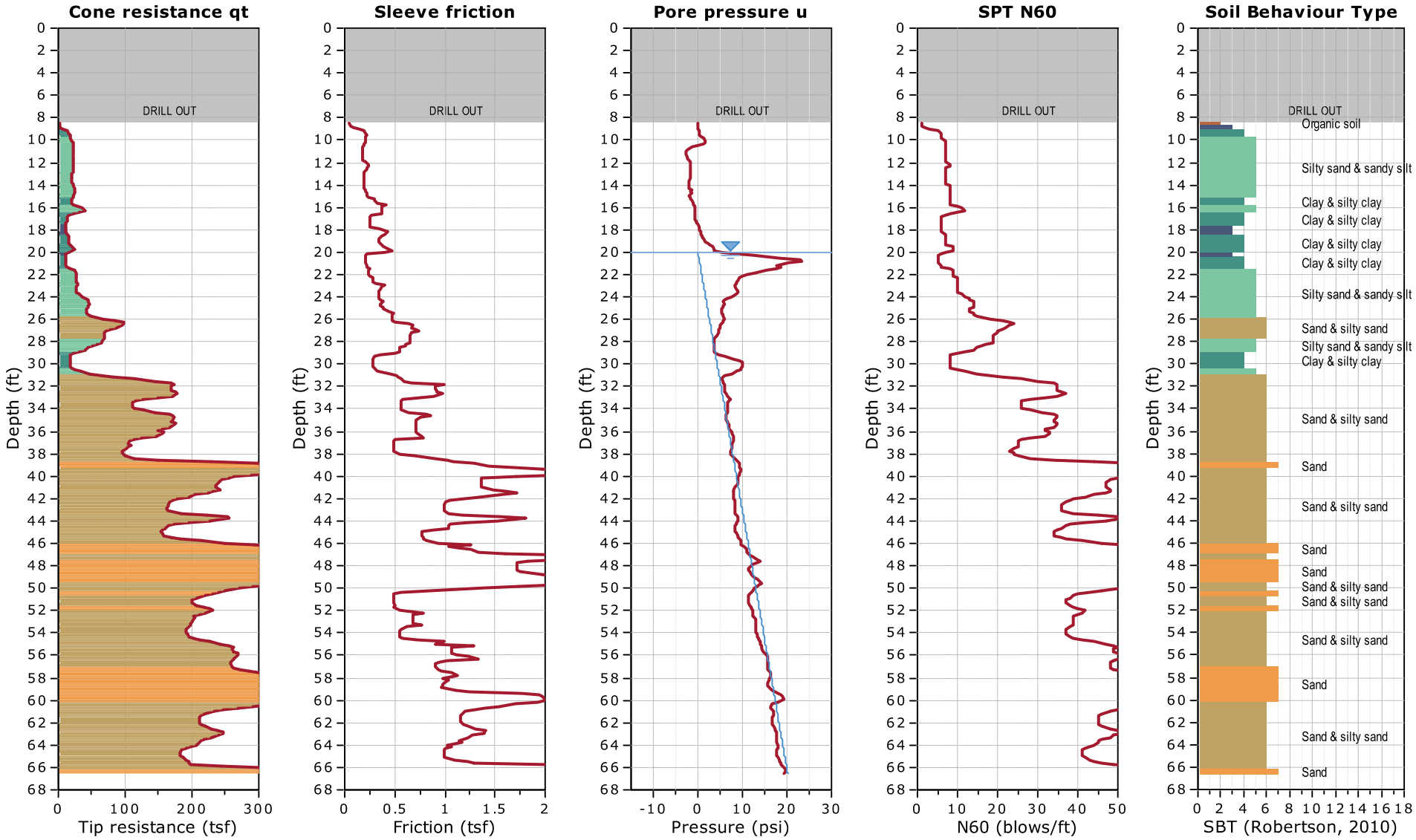
CPT: C-107
Total depth: 66.60 ft, Date: 2/1/2019
Surface Elevation: 417.00 ft

Coordinates: 38.76299558, -90.16754811
Station: 1817+49.42 (EB) Offset: 6.30 ft LT
Section: 25 Township: 4N Range :10W

Project: I-270 over Mississippi River (2017-3167.10 Task 200)
Location: Madison County, Illinois



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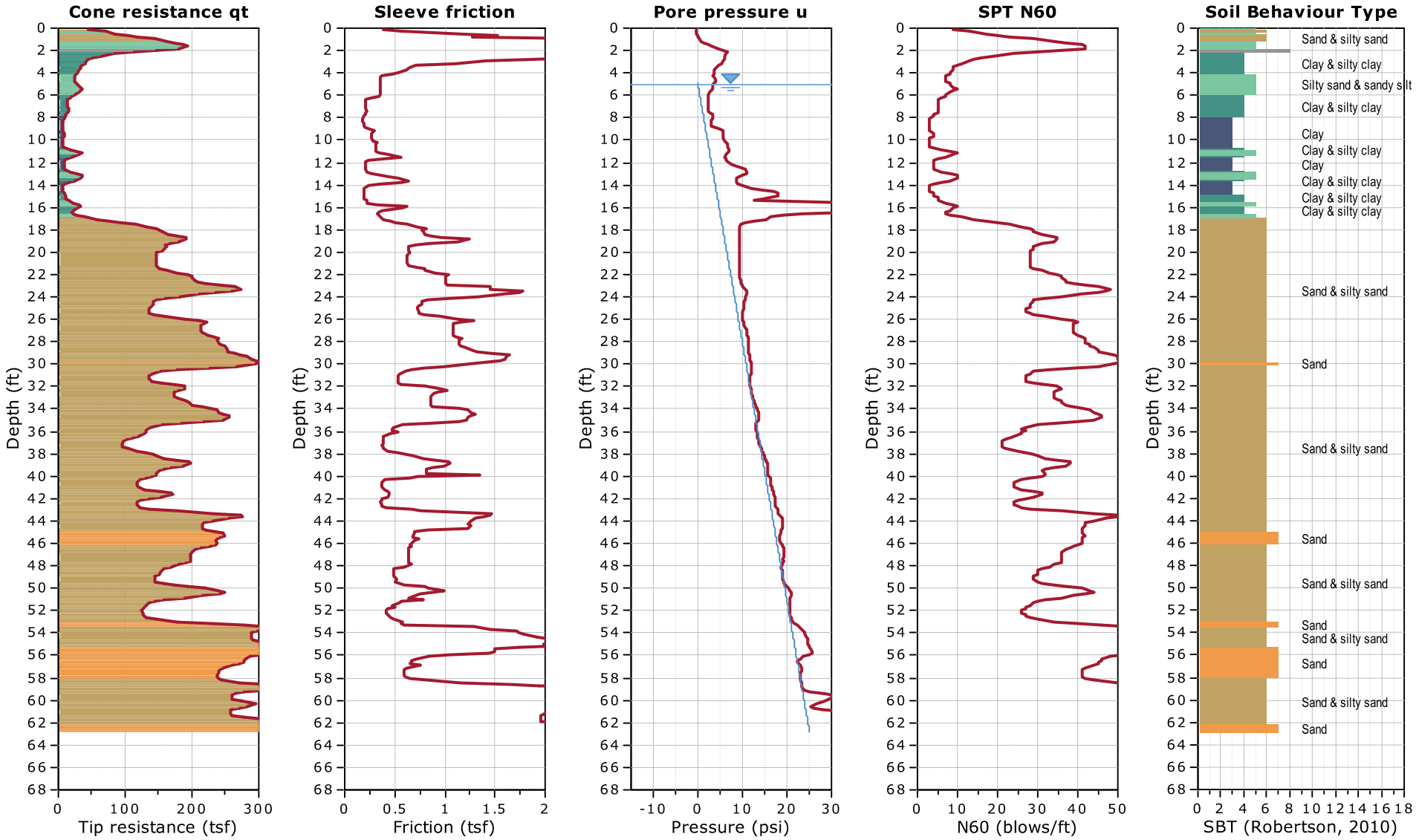
CPT: C-108
Total depth: 62.83 ft, Date: 9/21/2018
Surface Elevation: 412.70 ft

Coordinates: 38.76226523, -90.16502576
Station: 1825+15.67 (EB) Offset: 24.82 ft RT
Section: 36 Township: 4N Range: 10W

Project: **I-270 over Mississippi River (2017-3167.10 Task 200)**
Location: **Madison County, Illinois**



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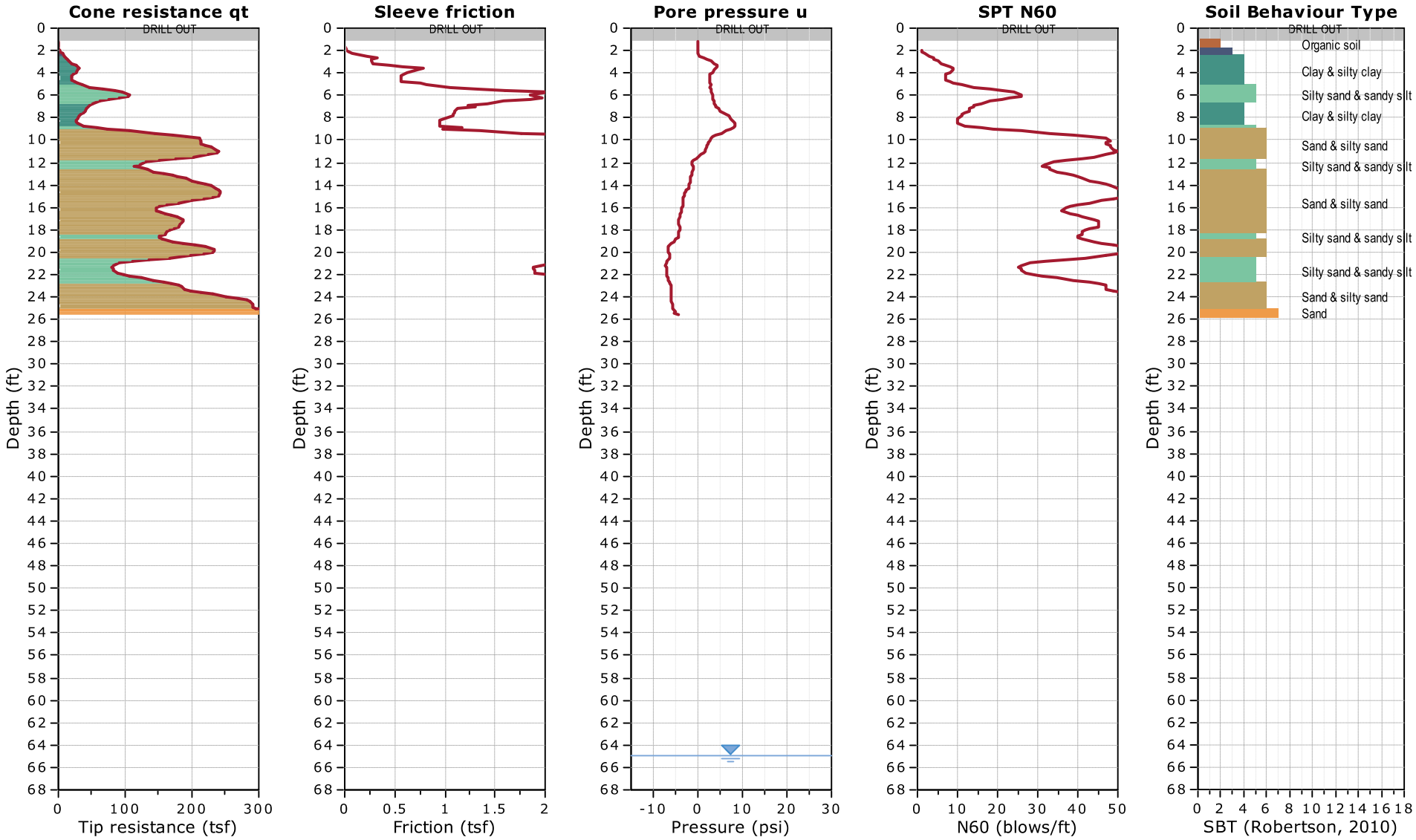
CPT: C-110
Total depth: 25.59 ft, Date: 12/3/2018
Surface Elevation: 442.60 ft

Coordinates: 38.76154808, -90.16174012
Station: 1834+87.48 (EB) Offset: 87.48 ft LT
Section: 36 Township: 4N Range: 10W

Project: I-270 over Mississippi River (2017-3167.10 Task 200)
Location: Madison County, Illinois



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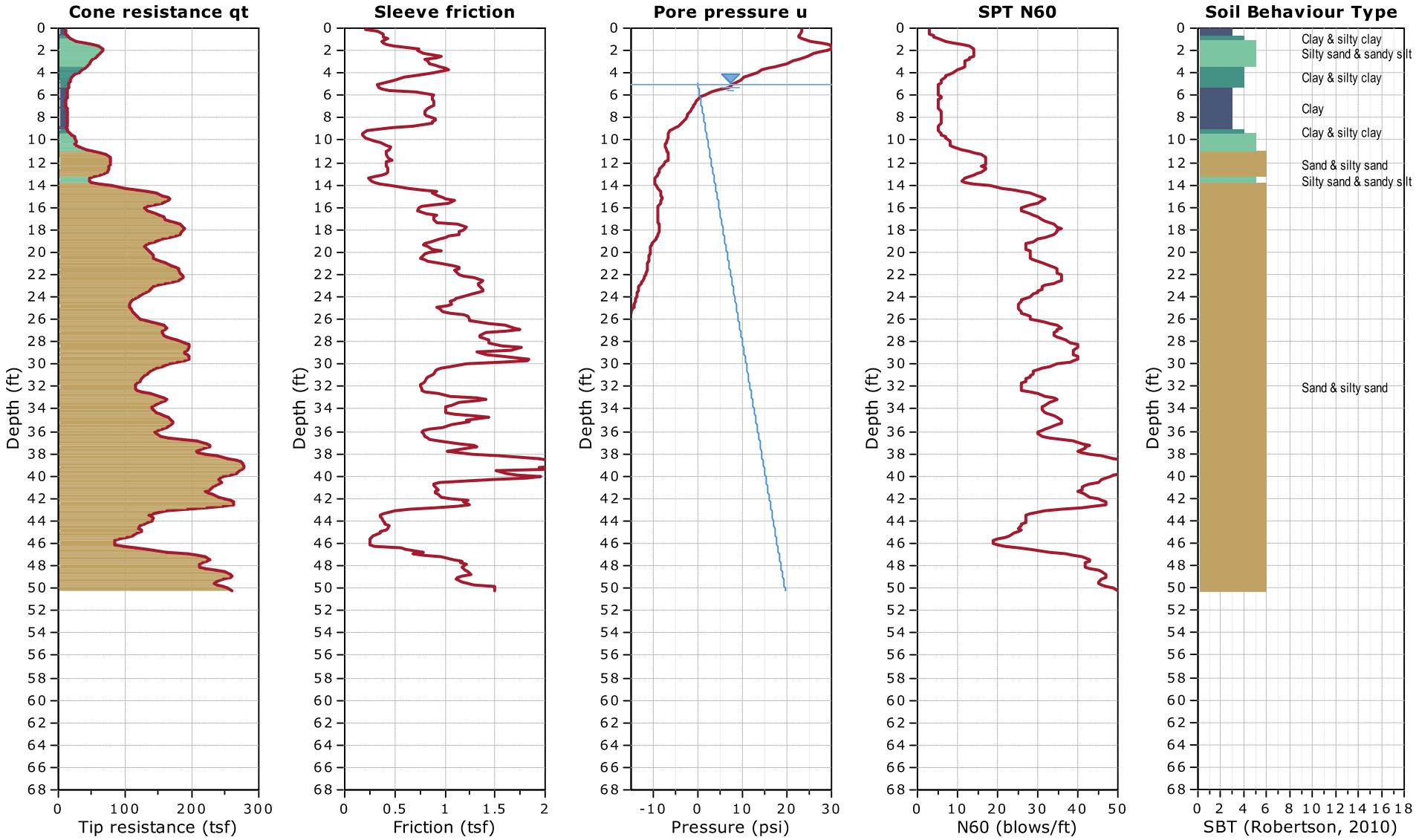
CPT: C-111
Total depth: 50.20 ft, Date: 9/21/2018
Surface Elevation: 419.00 ft
Coordinates: 38.76123311, -90.16191222
Station: 1834+76.20 (RT) Offset: 108.46 ft RT
Section: 36 Township: 4N Range: 10W

Project: I-270 over Mississippi River (2017-3167.10 Task 200)
Location: Madison County, Illinois



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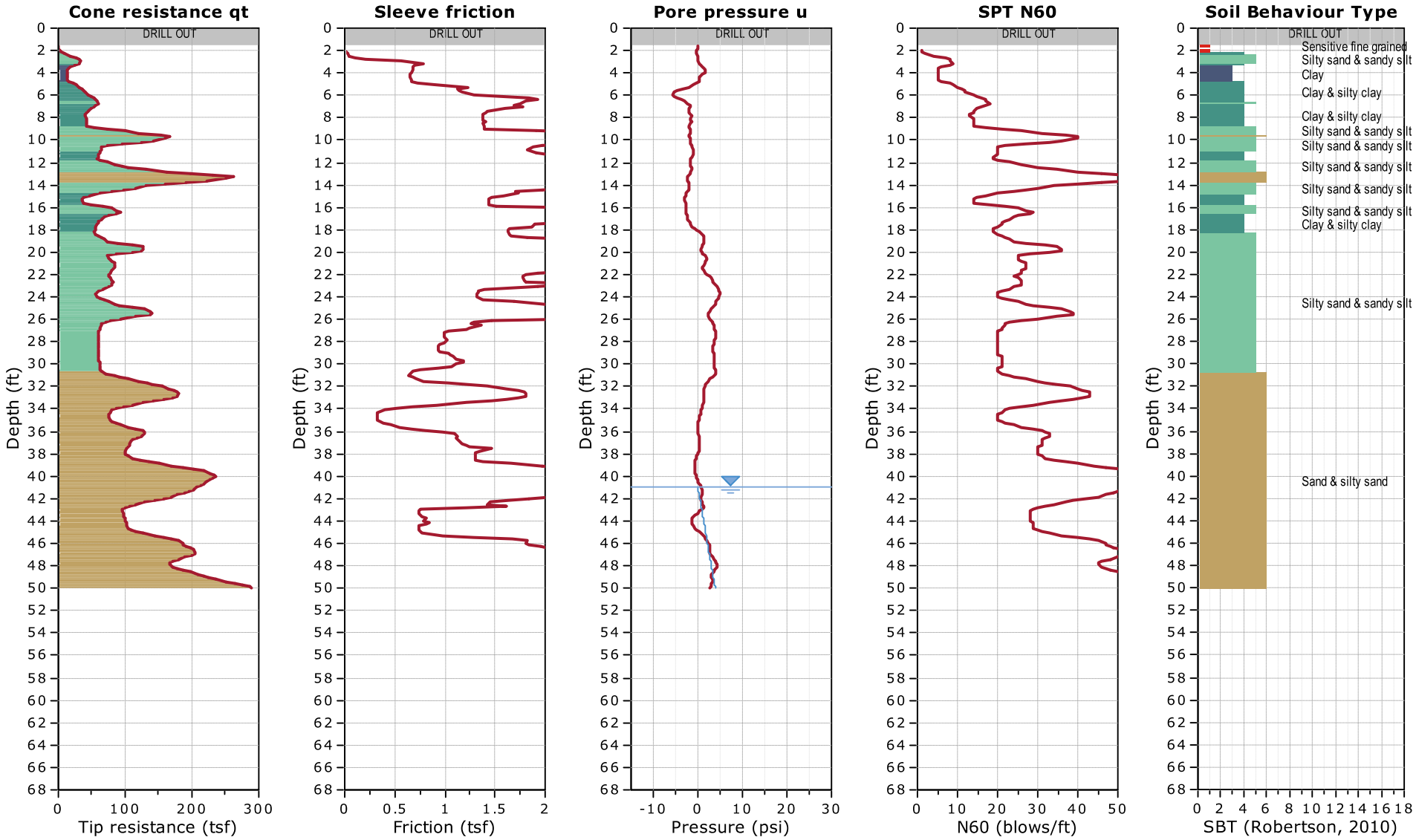
Project: **I-270 over Mississippi River (2017-3167.10 Task 200)**
Location: **Madison County, Illinois**

CPT: C-112
Total depth: 50.03 ft, Date: 12/3/2018
Surface Elevation: 442.20 ft

Coordinates: 38.76119926, -90.16036315
Station: 1839+00.92 (EB) Offset: 7.85 ft LT
Section: 36 Township: 4N Range: 10W



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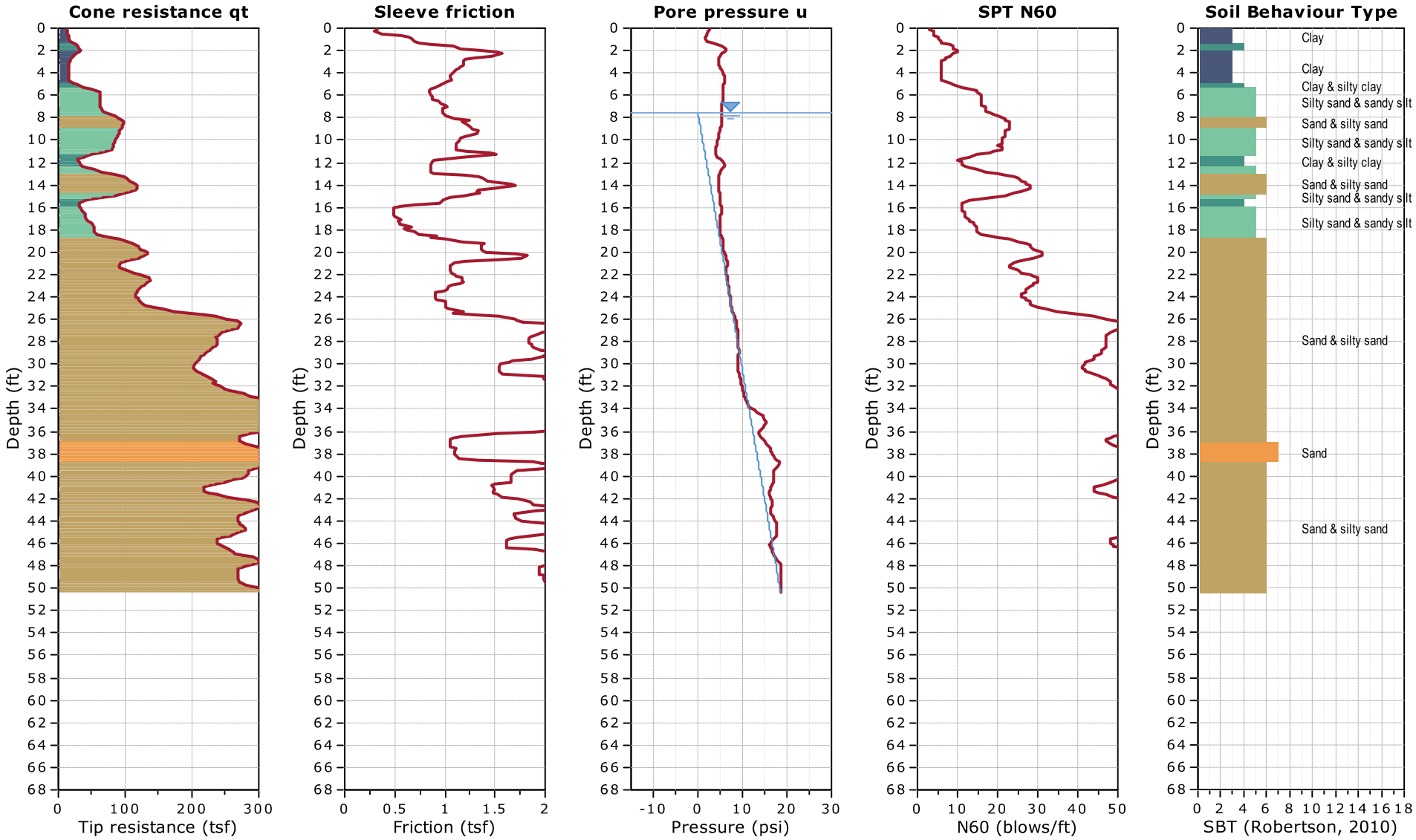
Project: I-270 over Mississippi River (2017-3167.10 Task 200)
Location: Madison County, Illinois

CPT: C-113
Total depth: 50.36 ft, Date: 9/21/2018
Surface Elevation: 416.70 ft

Coordinates: 38.76092138, -90.16050539
Station: 1838+86.51 (EB) Offset: 100.21 ft RT
Section: 36 Township: 4N Range: 10W



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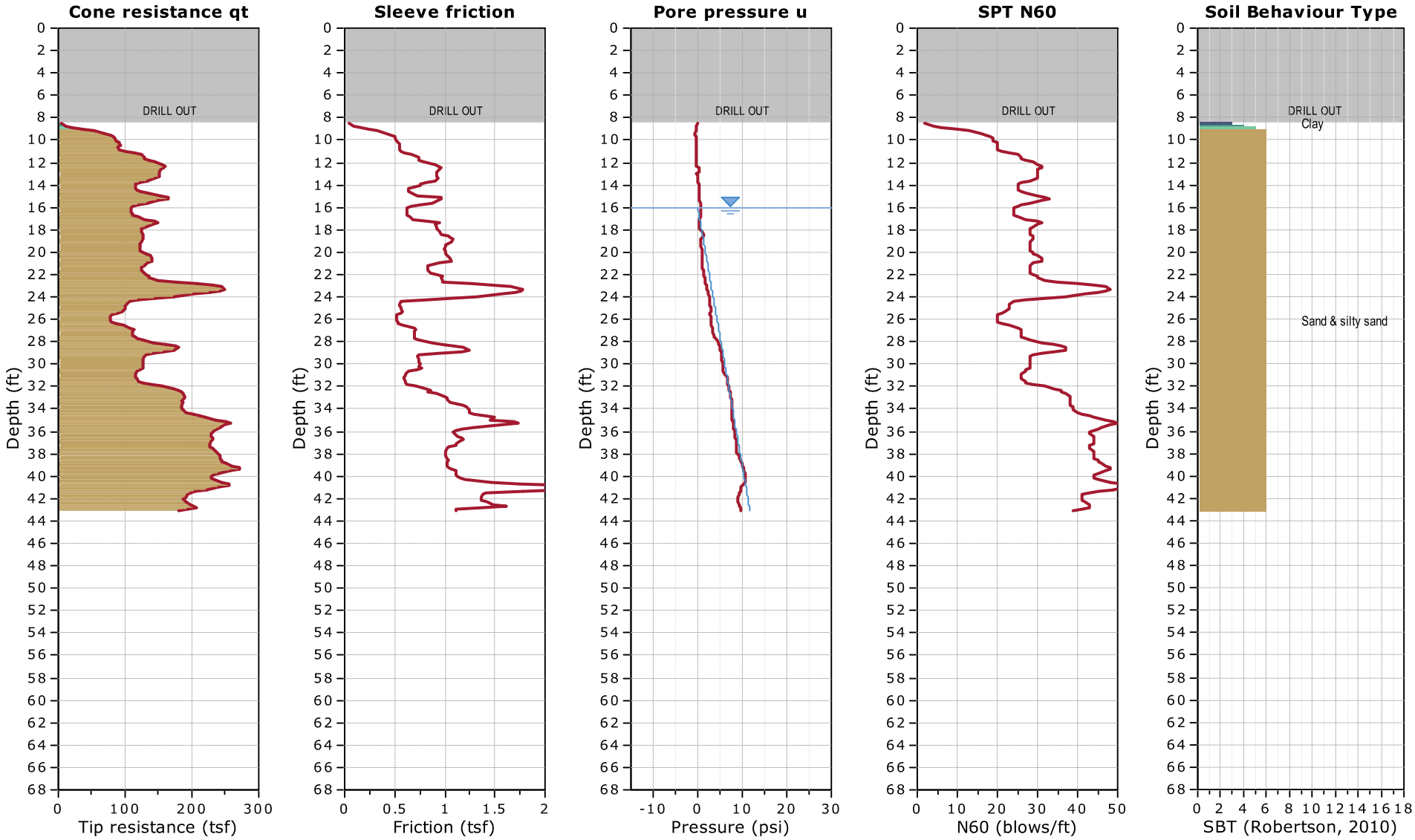
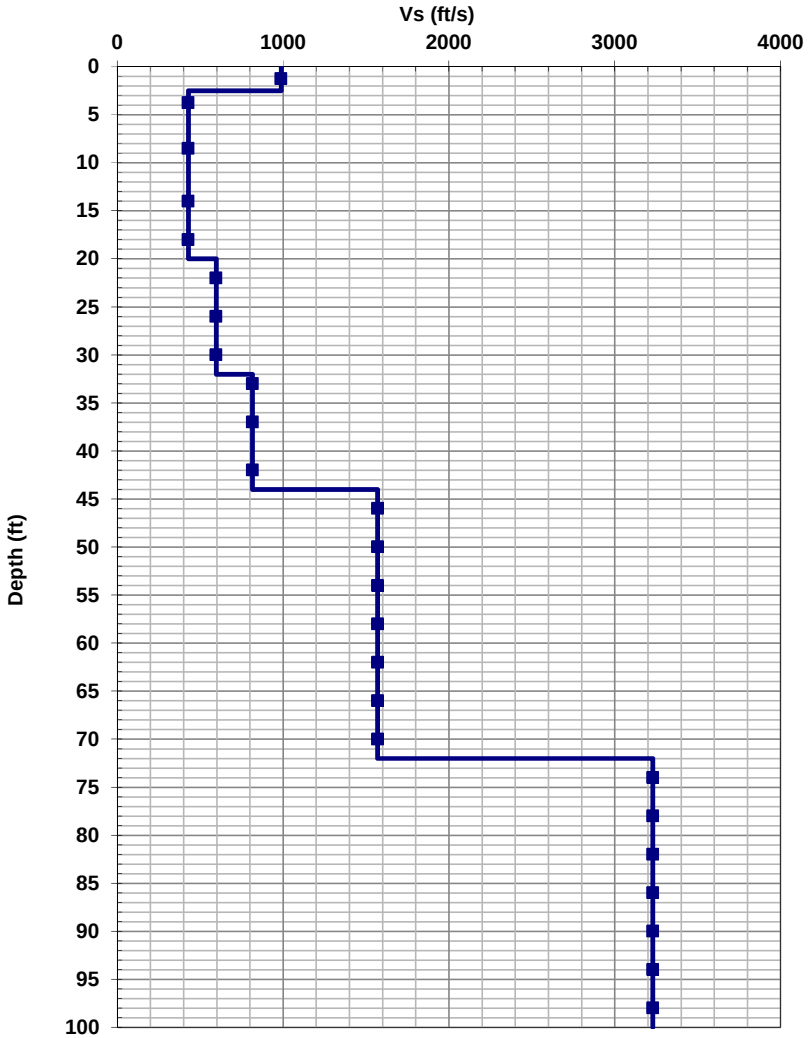
Project: **I-270 over Mississippi River (2017-3167.10 Task 200)**
Location: **Madison County, Illinois**

CPT: C-118
Total depth: 43.14 ft, Date: 2/1/2019
Surface Elevation: 412.00 ft

Coordinates: 38.7619903, -90.16263851
Station: 1831+94.10 (EB) Offset: 89.96 ft LT
Section: 36 Township: 4N Range: 10W



Project Name:	PTB 185-20 I270 BRIDGE OVER MISSISSIPPI			**Date:**	*8/23/2018*
Project #:	2017-3167.10			**Test Method**	*REMI*
Location:	Madison County, Illinois			**ASTM:**	*D 7400*
Traverse:	EAT-1			**Geophone Spacing (m):**	8
Operator:	BDG	**Latitude:**	n/a	**# of Geophones:**	12
Engineer:	TJC	**Longitude**	n/a	**Elevation:**	n/a

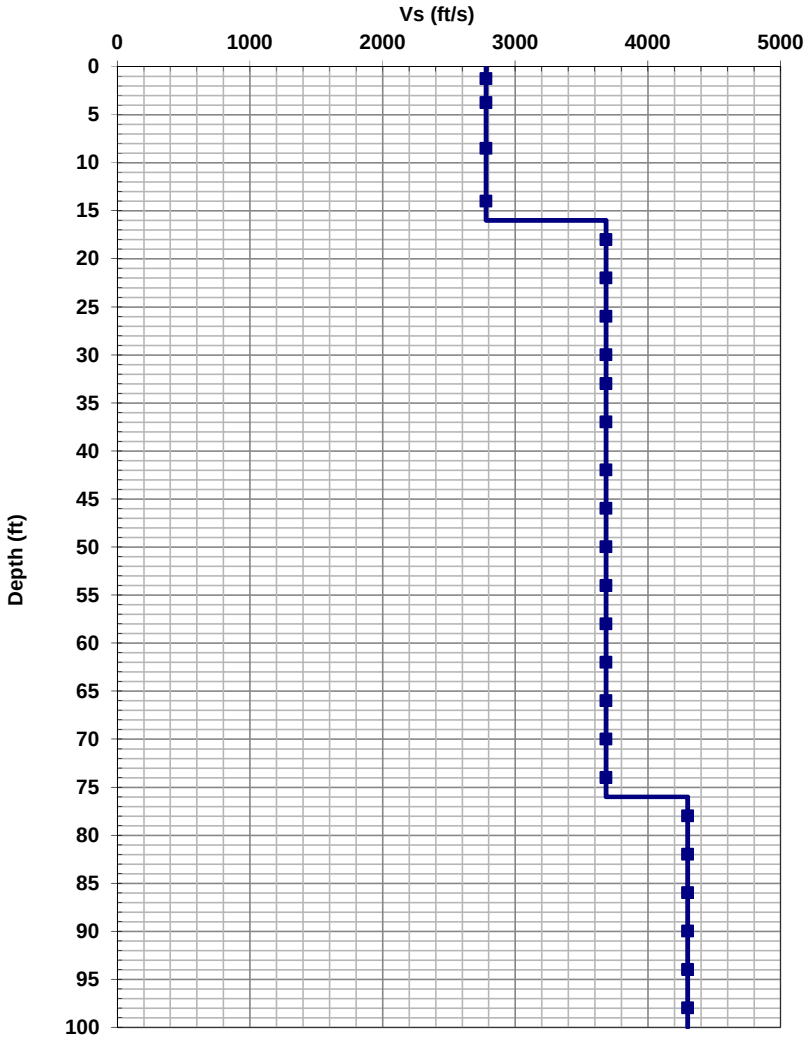


Depth	Vs
feet	ft/s
3	988
5	429
12	429
16	429
20	429
24	596
28	596
32	596
34	815
40	815
44	815
48	1570
52	1570
56	1570
60	1570
64	1570
68	1570
72	1570
76	3230
80	3230
84	3230
88	3230
92	3230
96	3230
100	3230

V_{S30} =	*1025*	*ft/s*
Site Class:*	*D*	

Per IBC Weighted Shear Wave Velocity Criterion (Liquefaction, Soft Clay, etc, Not Considered In This Calculation)

Project Name:	**PTB 185-20 I270 BRIDGE OVER MISSISSIPPI**			**Date:**	***1/20/2020***
Project #:	**2017-3167.10**			**Test Method**	***REMI***
Location:	**St. Louis County, Missouri & Madison County, Illinois**			**ASTM:**	***D 7400***
Traverse:	**RVRT-2**			**Geophone Spacing (m):**	**8**
Operator:	**BDG**	**Latitude:**	n/a	**# of Geophones:**	**12**
Engineer:	**TJC**	**Longitude**	n/a	**Elevation:**	n/a



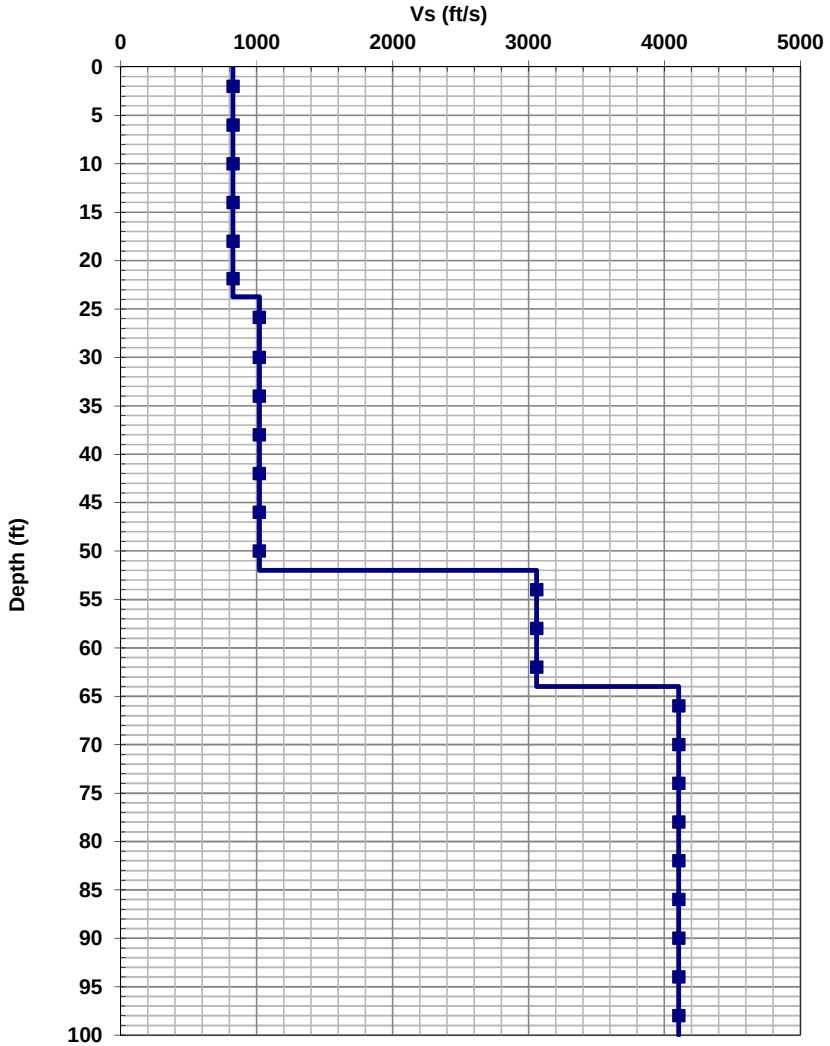
Depth	Vs
feet	ft/s
3	2780
5	2780
12	2780
16	2780
20	3685
24	3685
28	3685
32	3685
34	3685
40	3685
44	3685
48	3685
52	3685
56	3685
60	3685
64	3685
68	3685
72	3685
76	3685
80	4300
84	4300
88	4300
92	4300
96	4300
100	4300

V_{S30} =	***3600***	***ft/s***	**
Site Class*:	***B***		

****Per IBC Weighted Shear Wave Velocity Criterion (Liquefaction, Soft Clay, etc, Not Considered In This Calculation)***

***** Estimated from measured rock values***

Project Name:	**PTB 185-20 I270 BRIDGE OVER MISSISSIPPI**			**Date:**	***1/14/2020***
Project #:	**2017-3167.10**			**Test Method**	***REMI***
Location:	**St. Louis County, Missouri**			**ASTM:**	***D 7400***
Traverse:	**WAT-1**			**Geophone Spacing (m):**	**8**
Operator:	**BDG**	**Latitude:**	n/a	**# of Geophones:**	**12**
Engineer:	**TJC**	**Longitude**	n/a	**Elevation:**	n/a

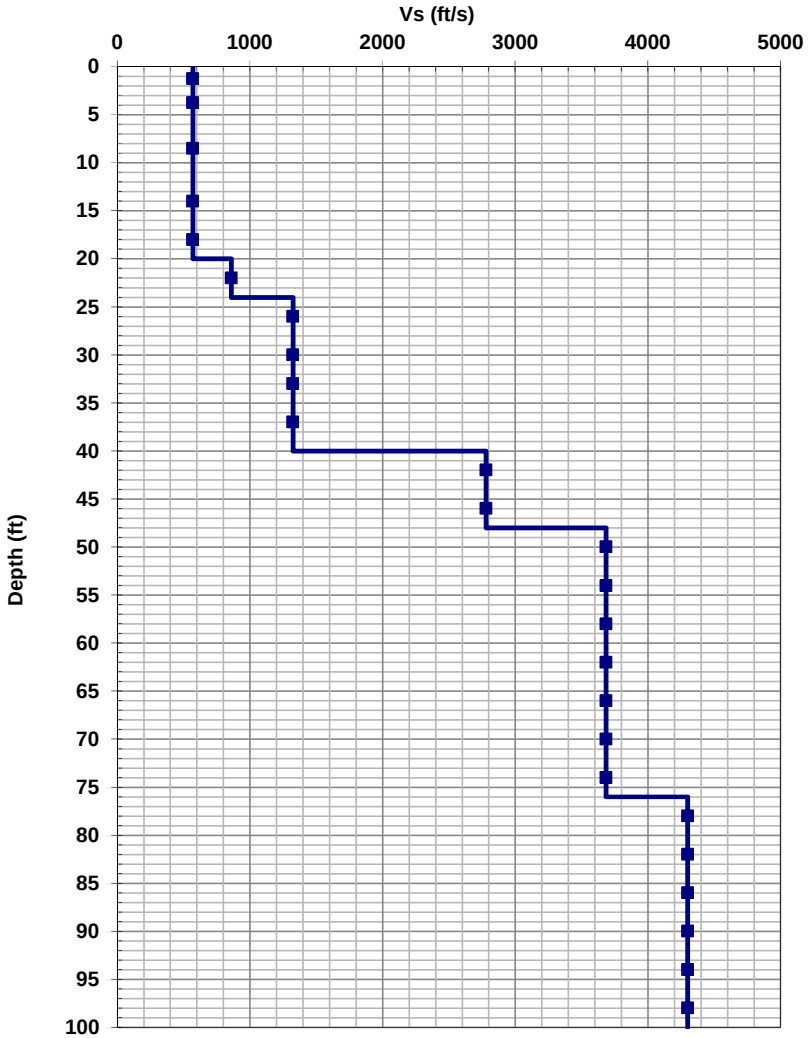


Depth	Vs
feet	ft/s
4	825
8	825
12	825
16	825
20	825
24	825
28	1020
32	1020
36	1020
40	1020
44	1020
48	1020
52	1020
56	3060
60	3060
64	3060
68	4105
72	4105
76	4105
80	4105
84	4105
88	4105
92	4105
96	4105
100	4105

V_{S30} =	***1451***	***ft/s***
Site Class*:	***C***	

****Per IBC Weighted Shear Wave Velocity Criterion (Liquefaction, Soft Clay, etc, Not Considered In This Calculation)***

Project Name:	PTB 185-20 I270 BRIDGE OVER MISSISSIPPI			**Date:**	*1/14/2020*
Project #:	2017-3167.10			**Test Method**	*REMI*
Location:	St. Louis County, Missouri			**ASTM:**	*D 7400*
Traverse:	WAT-2			**Geophone Spacing (m):**	8
Operator:	BDG	**Latitude:**	n/a	**# of Geophones:**	12
Engineer:	TJC	**Longitude**	n/a	**Elevation:**	n/a



Depth	Vs
feet	ft/s
3	570
5	570
12	570
16	570
20	570
24	860
28	1325
32	1325
34	1325
40	1325
44	2780
48	2780
52	3685
56	3685
60	3685
64	3685
68	3685
72	3685
76	3685
80	4300
84	4300
88	4300
92	4300
96	4300
100	4300

V_{S30} =	*1416*	*ft/s*
Site Class:*	*C*	

Per IBC Weighted Shear Wave Velocity Criterion (Liquefaction, Soft Clay, etc, Not Considered In This Calculation)

APPENDIX C
Liquefaction Analysis Output

SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-29
ELEVATION OF BORING GROUND SURFACE ========== 417.10 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 9.00 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 11.30 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$V_{s,40'}$ = **414** FT./SEC.

PGA CALCULATOR

Earthquake Moment Magnitude =	5.3
Source-To-Site Distance, R (km) =	10
Ground Motion Prediction Equations =	CEUS
PGA =	**0.357**

	BORING DATA							CONDITIONS DURING DRILLING						CONDITIONS DURING EARTHQUAKE								
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR	
414.6	2.5	4					17	0.108	0.270	8.232	8.232	0.098	0.108	0.270	0.270	1.500	**0.318**	0.964	**0.305**	**N.L. (1)**	
412.1	5	2	0.3		7	13	27	0.108	0.540	3.755	3.755	0.063	0.108	0.540	0.540	1.315	**0.180**	0.923	**0.292**	**N.L. (1)**	
409.6	7.5	3	0.8		7	13	28	0.119	0.838	5.171	5.171	0.073	0.119	0.838	0.838	1.206	**0.192**	0.876	**0.277**	**N.L. (1)**	
407.1	10	2						0.048	0.958	3.594	3.594	0.062	0.110	1.113	1.113	1.138	**0.153**	0.824	**0.261**	**N.L. (1)**	
404.1	13	2		25				0.048	1.102	3.674	8.386	0.099	0.048	1.257	1.363	1.123	**0.242**	0.757	**0.260**	**0.931**	**(C)**
402.1	15	3	0.8		12	25	30	0.057	1.216	5.503	5.503	0.076	0.057	1.371	1.601	1.093	**0.180**	0.711	**0.263**	**N.L. (2)**	
399.6	17.5	3	1		12	25	49	0.059	1.363	5.438	5.438	0.075	0.059	1.518	1.905	1.070	**0.175**	0.654	**0.260**	**N.L. (2)**	
397.1	20	15		28				0.065	1.526	28.338	36.814	-0.087	0.065	1.681	2.223	1.097	**-0.208**	0.598	**0.251**	**N.L. (3)**	
394.6	22.5	17						0.066	1.691	31.684	31.684	0.662	0.066	1.846	2.544	1.052	**1.511**	0.546	**0.238**	**N.L. (3)**	
392.1	25	16						0.065	1.853	28.562	28.562	0.391	0.065	2.008	2.863	1.019	**0.864**	0.498	**0.225**	**N.L. (3)**	
389.6	27.5	19						0.067	2.021	33.583	33.583	2.643	0.067	2.176	3.186	0.990	**5.676**	0.456	**0.212**	**N.L. (3)**	
387.1	30	14		27				0.064	2.181	22.906	30.369	0.496	0.064	2.336	3.502	0.966	**1.039**	0.420	**0.199**	**5.221**	**(D)**
382.1	35	10						0.061	2.486	14.969	14.969	0.160	0.061	2.641	4.119	0.944	**0.327**	0.364	**0.180**	**1.817**	**(D)**
377.1	40	21						0.068	2.826	31.849	31.849	0.696	0.068	2.981	4.771	0.882	**1.332**	0.326	**0.165**	**N.L. (3)**	
372.1	45	8						0.059	3.121	10.760	10.760	0.120	0.059	3.276	5.378	0.902	**0.235**	0.302	**0.157**	**1.497**	**(C)**
367.1	50	36						0.073	3.486	53.119	53.119	0.336	0.073	3.641	6.055	0.806	**0.588**	0.287	**0.151**	**N.L. (3)**	
362.1	55	23						0.068	3.826	29.461	29.461	0.434	0.068	3.981	6.707	0.801	**0.754**	0.278	**0.148**	**N.L. (3)**	
357.1	60	17						0.066	4.156	19.854	19.854	0.214	0.066	4.311	7.349	0.812	**0.376**	0.272	**0.147**	**2.558**	**(D)**
352.1	65	68						0.079	4.551	87.234	87.234	0.622	0.079	4.706	8.056	0.727	**0.981**	0.264	**0.143**	**N.L. (3)**	
347.1	70	17						0.066	4.881	17.744	17.744	0.189	0.066	5.036	8.698	0.785	**0.322**	0.257	**0.141**	**2.284**	**(D)**
343.1	74	100						0.083	5.213	######	117.394	0.853	0.083	5.368	9.280	0.690	**1.275**	0.251	**0.138**	**N.L. (3)**	

* FACTOR OF SAFETY DESCRIPTIONS

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

SCI Engineering, Inc
650 Pierce Blvd
O Fallon, IL 62293
618.624.6969

SPT BASED LIQUEFACTION ANALYSIS REPORT

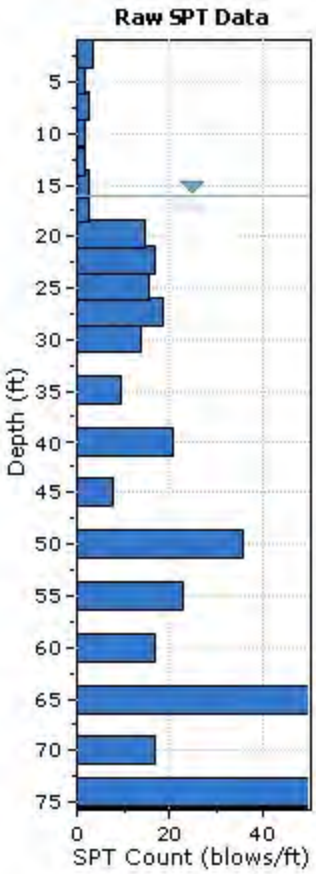
Project title : I-270 Bridge over COR

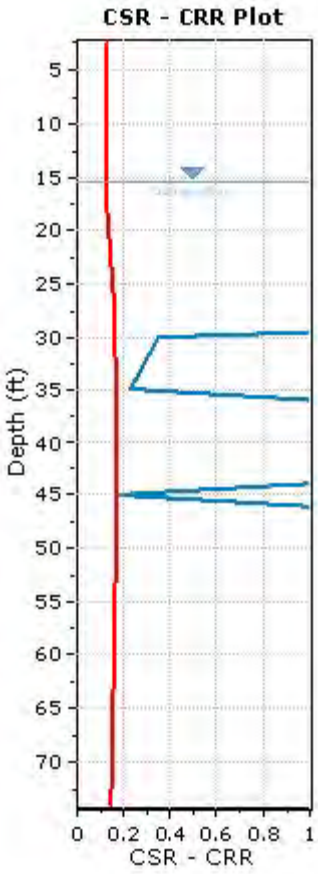
SPT Name: BB-29

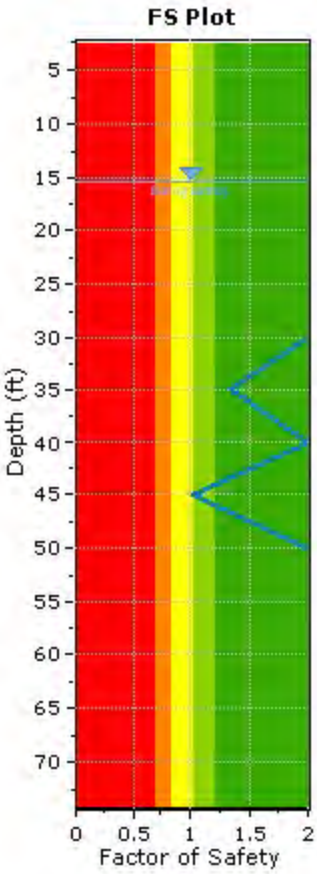
Location : Madison County, Illinois

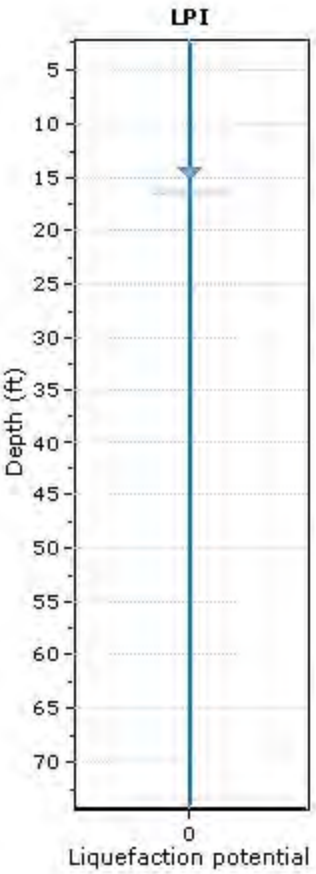
:: Input parameters and analysis properties ::

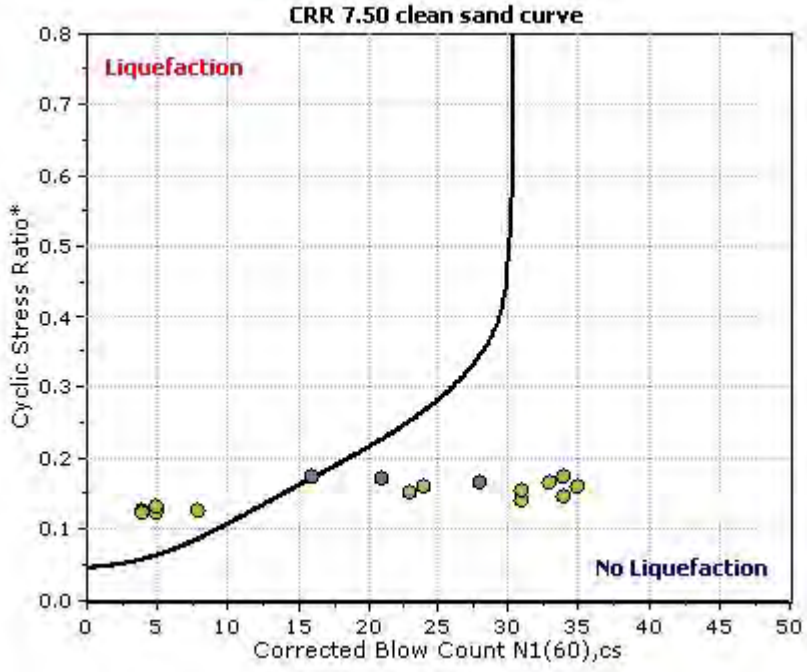
Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	15.40 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		











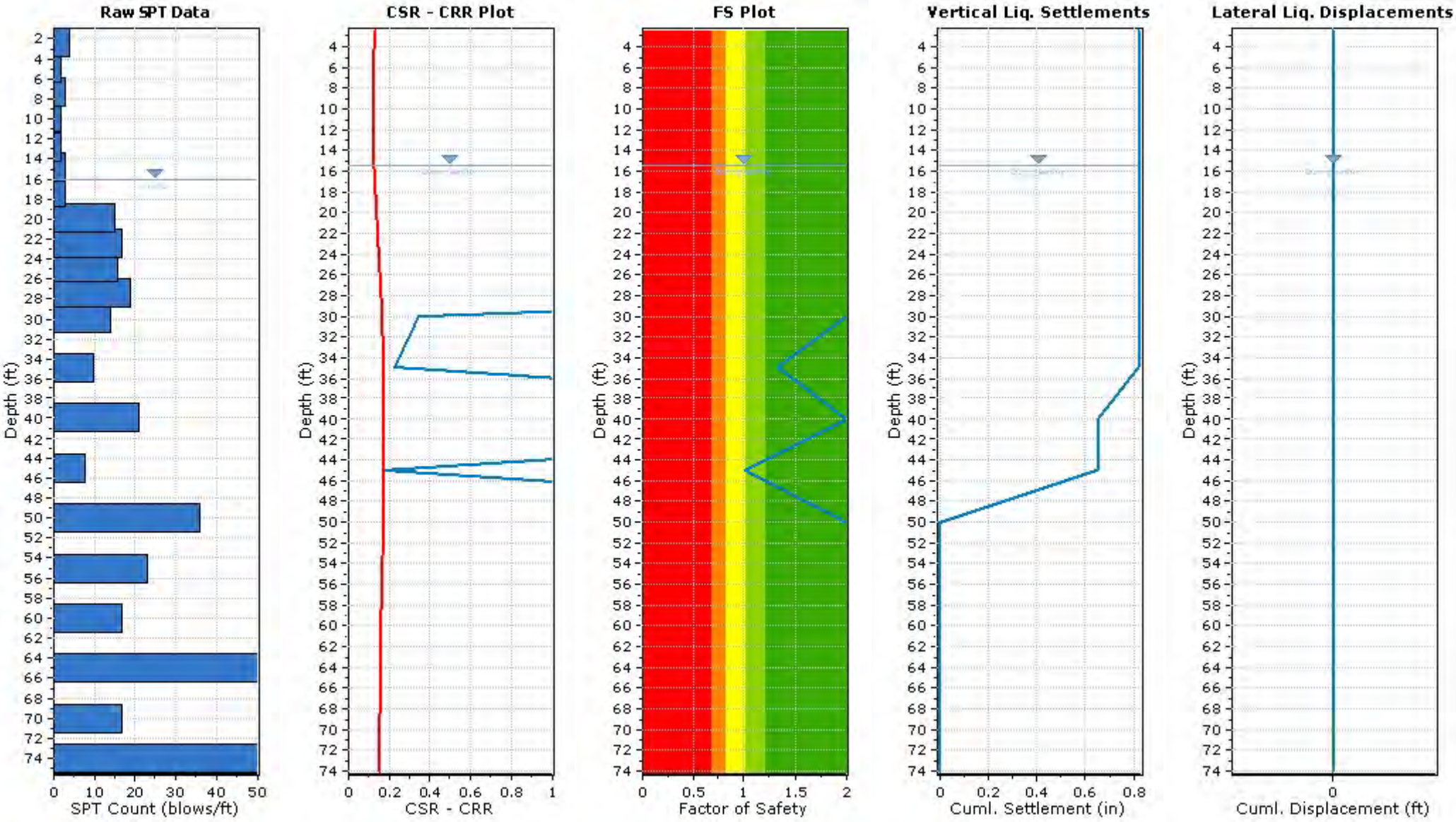
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-32
ELEVATION OF BORING GROUND SURFACE ========== 416.60 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 16.00 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 9.30 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$V_{s,40'}$ = **569** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
414.1	2.5	50						0.138	0.345	######	118.446	0.861	0.138	0.345	0.345	1.500	**2.800**	0.990	**0.314**	**N.L. (1)**
411.6	5	4	0.5				21	0.114	0.630	7.298	7.298	0.090	0.114	0.630	0.630	1.297	**0.254**	0.978	**0.310**	**N.L. (1)**
409.1	7.5	4	0.3				27	0.108	0.900	6.770	6.770	0.086	0.108	0.900	0.900	1.198	**0.223**	0.963	**0.305**	**N.L. (1)**
406.6	10	3	0.9		15	25	42	0.120	1.200	5.042	5.042	0.072	0.058	1.045	1.089	1.152	**0.181**	0.944	**0.312**	**N.L. (2)**
403.6	13	4		93	13	25	39	0.108	1.524	6.586	12.903	0.140	0.046	1.183	1.414	1.157	**0.350**	0.917	**0.347**	**N.L. (2)**
401.6	15	7		80			36	0.114	1.752	11.236	18.483	0.197	0.052	1.287	1.643	1.153	**0.493**	0.896	**0.362**	**1.362** (D)
399.1	17.5	9		15				0.060	1.902	14.336	17.524	0.187	0.060	1.437	1.949	1.114	**0.451**	0.866	**0.372**	**1.212** (D)
396.6	20	24						0.069	2.075	42.352	42.352	0.189	0.069	1.610	2.277	1.116	**0.458**	0.831	**0.372**	**N.L. (3)**
394.1	22.5	21						0.068	2.245	35.115	35.115	-0.641	0.068	1.780	2.603	1.070	**-1.488**	0.794	**0.368**	**N.L. (3)**
391.6	25	12						0.063	2.402	18.123	18.123	0.193	0.063	1.937	2.917	1.026	**0.430**	0.753	**0.359**	**1.198** (D)
389.1	27.5	21						0.068	2.572	33.042	33.042	1.284	0.068	2.107	3.243	1.002	**2.792**	0.712	**0.347**	**N.L. (3)**
386.6	30	11						0.062	2.727	15.590	15.590	0.166	0.062	2.262	3.554	0.983	**0.354**	0.671	**0.334**	**1.060** (D)
381.6	35	22						0.068	3.067	31.742	31.742	0.673	0.068	2.602	4.206	0.927	**1.355**	0.593	**0.304**	**N.L. (3)**
376.6	40	42						0.074	3.437	62.872	62.872	0.426	0.074	2.972	4.888	0.874	**0.808**	0.530	**0.276**	**N.L. (3)**
371.6	45	15						0.065	3.762	18.302	18.302	0.195	0.065	3.297	5.525	0.882	**0.374**	0.483	**0.256**	**1.461** (D)
366.6	50	26						0.069	4.107	32.163	32.163	0.778	0.069	3.642	6.182	0.819	**1.381**	0.450	**0.242**	**N.L. (3)**
361.6	55	24						0.069	4.452	27.788	27.788	0.362	0.069	3.987	6.839	0.805	**0.633**	0.429	**0.233**	**N.L. (3)**
356.6	60	53						0.076	4.832	65.353	65.353	0.447	0.076	4.367	7.531	0.749	**0.727**	0.416	**0.227**	**N.L. (3)**
351.6	65	27						0.070	5.182	28.454	28.454	0.387	0.070	4.717	8.193	0.758	**0.635**	0.395	**0.217**	**N.L. (3)**
346.6	70	26						0.069	5.527	25.944	25.944	0.312	0.069	5.062	8.850	0.750	**0.507**	0.388	**0.215**	**N.L. (3)**
342.6	74	100						0.083	5.859	######	108.363	0.784	0.083	5.394	9.431	0.688	**1.171**	0.383	**0.212**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS

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

SCI Engineering, Inc
650 Pierce Blvd
O Fallon, IL 62293
618.624.6969

SPT BASED LIQUEFACTION ANALYSIS REPORT

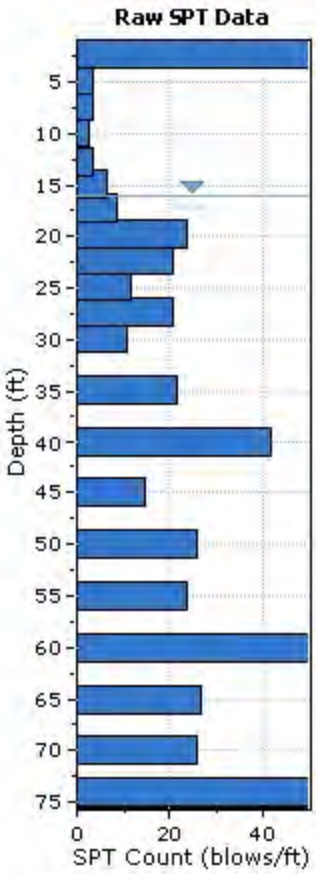
Project title : I-270 Bridge over COR

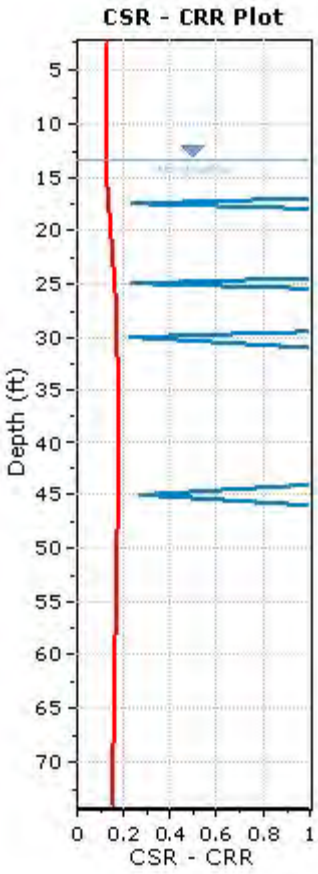
SPT Name: BB-32

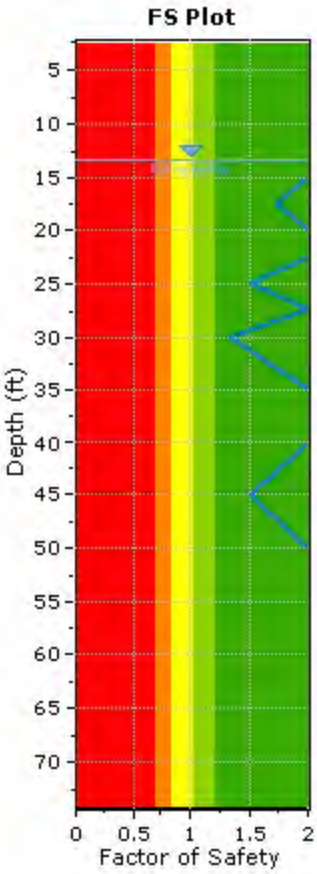
Location : Madison County, Illinois

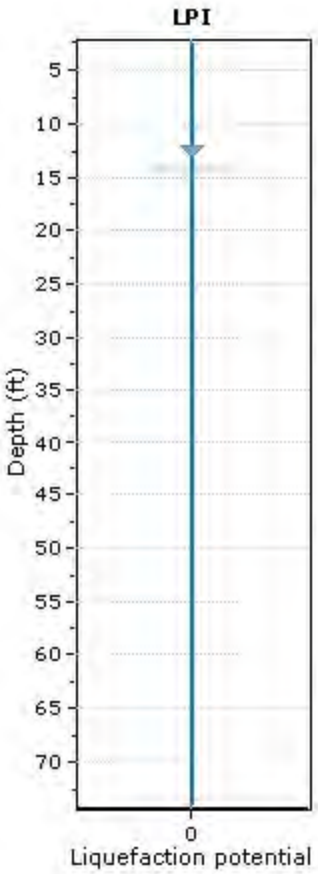
:: Input parameters and analysis properties ::

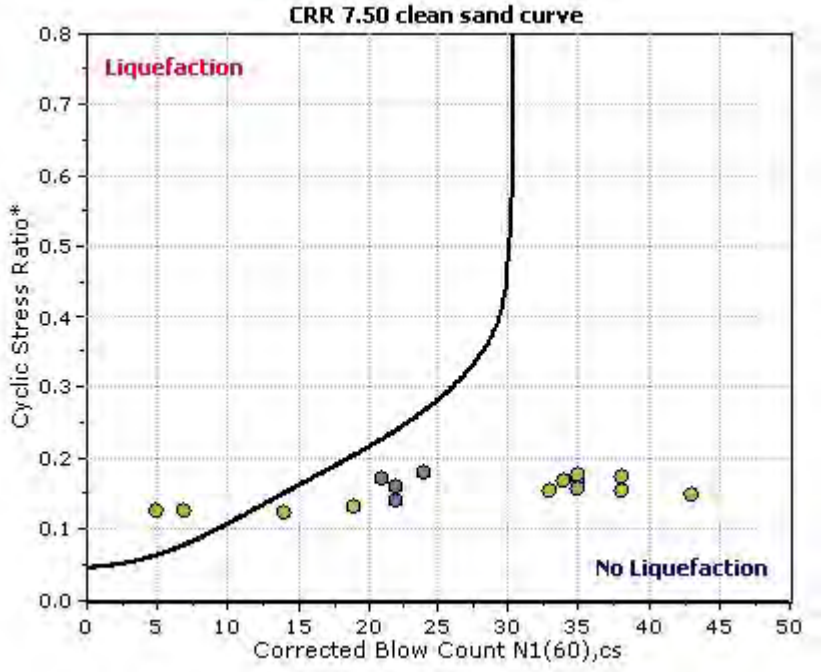
Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	13.40 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		











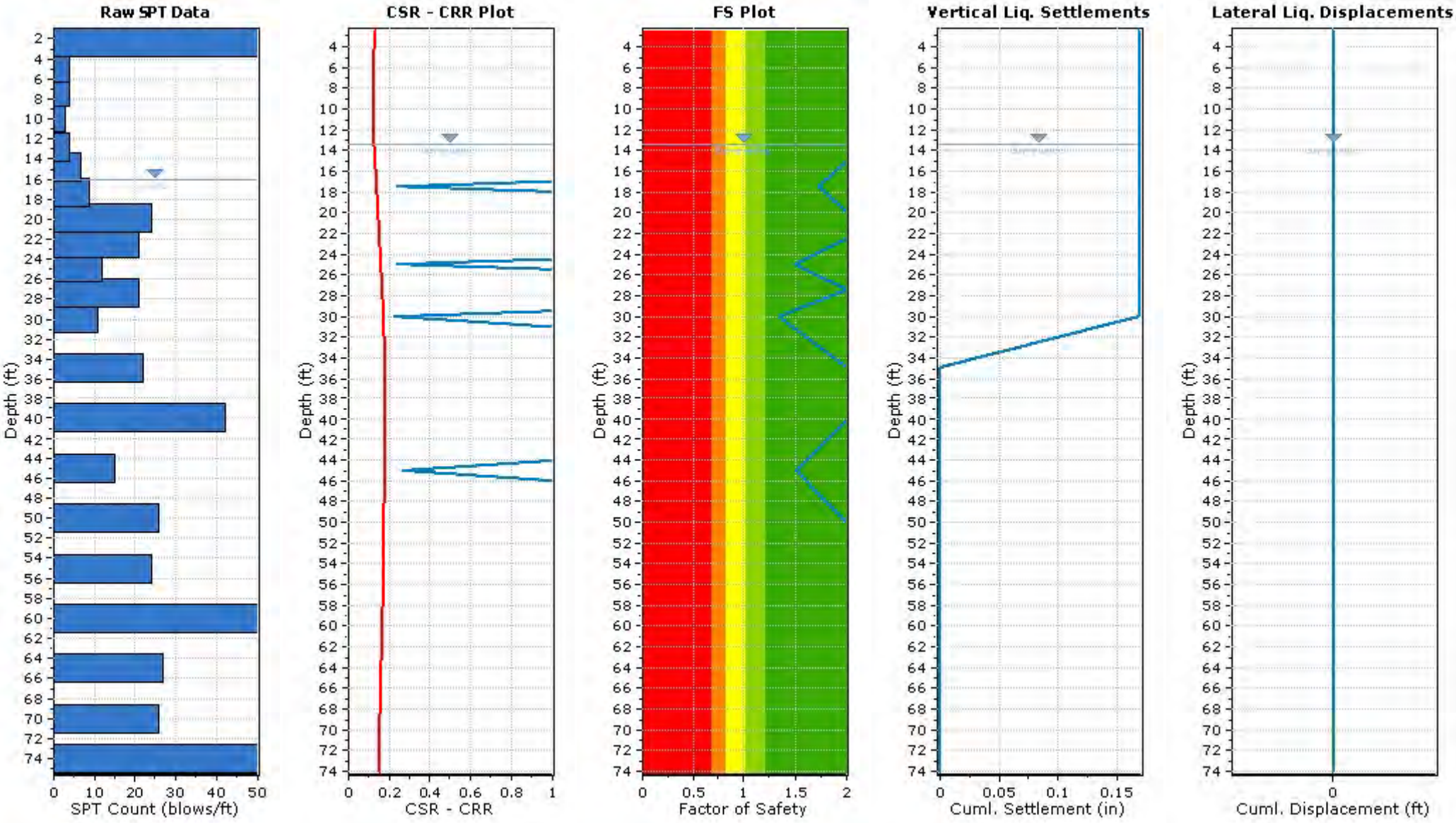
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-35
ELEVATION OF BORING GROUND SURFACE ========== 415.20 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 15.00 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 8.50 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$V_{s,40'}$ = **538** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING						CONDITIONS DURING EARTHQUAKE								
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR	
412.7	2.5	9	0.7				20	0.117	0.293	19.176	19.176	0.205	0.117	0.293	0.293	1.500	**0.668**	0.987	**0.313**	**N.L. (1)**	
410.2	5	5						0.111	0.570	9.298	9.298	0.107	0.111	0.570	0.570	1.348	**0.313**	0.971	**0.308**	**N.L. (1)**	
407.7	7.5	2	0.5					0.114	0.855	3.430	3.430	0.061	0.114	0.855	0.855	1.199	**0.159**	0.952	**0.301**	**N.L. (1)**	
405.2	10	3	0.6	90	15	25	43	0.116	1.145	5.117	11.141	0.123	0.054	0.990	1.084	1.199	**0.321**	0.928	**0.322**	**N.L. (2)**	
402.7	12.5	3	0.3	60	13	20	34	0.108	1.415	5.031	11.038	0.122	0.046	1.105	1.355	1.168	**0.310**	0.901	**0.350**	**N.L. (2)**	
400.2	15	9						0.117	1.708	14.598	14.598	0.156	0.179	1.553	1.958	1.084	**0.367**	0.869	**0.347**	**1.058**	**(D)**
397.7	17.5	19						0.067	1.875	33.233	33.233	1.546	0.067	1.720	2.282	1.082	**3.628**	0.832	**0.350**	**N.L. (3)**	
395.2	20	17						0.066	2.040	28.537	28.537	0.390	0.066	1.885	2.603	1.042	**0.881**	0.793	**0.346**	**N.L. (3)**	
392.7	22.5	17						0.066	2.205	27.769	27.769	0.362	0.066	2.050	2.924	1.012	**0.793**	0.750	**0.339**	**N.L. (3)**	
390.2	25	14						0.064	2.365	21.682	21.682	0.238	0.064	2.210	3.240	0.987	**0.509**	0.706	**0.328**	**1.552**	**(D)**
387.7	27.5	23						0.068	2.535	37.057	37.057	-0.057	0.068	2.380	3.566	0.955	**-0.119**	0.662	**0.314**	**N.L. (3)**	
385.2	30	15						0.065	2.698	22.029	22.029	0.242	0.065	2.543	3.884	0.946	**0.497**	0.620	**0.300**	**1.657**	**(D)**
380.2	35	25						0.069	3.043	37.020	37.020	-0.062	0.069	2.888	4.541	0.884	**-0.118**	0.544	**0.271**	**N.L. (3)**	
375.2	40	30						0.071	3.398	42.964	42.964	0.202	0.071	3.243	5.208	0.844	**0.369**	0.485	**0.247**	**N.L. (3)**	
370.2	45	35						0.072	3.758	48.433	48.433	0.285	0.072	3.603	5.880	0.809	**0.499**	0.443	**0.229**	**N.L. (3)**	
365.2	50	31						0.071	4.113	39.448	39.448	0.104	0.071	3.958	6.547	0.779	**0.176**	0.415	**0.217**	**N.L. (3)**	
360.2	55	43						0.074	4.483	54.930	54.930	0.354	0.074	4.328	7.229	0.752	**0.578**	0.397	**0.210**	**N.L. (3)**	
355.2	60	13						0.063	4.798	13.628	13.628	0.147	0.063	4.643	7.856	0.819	**0.260**	0.385	**0.207**	**1.256**	**(D)**
350.2	65	41						0.074	5.168	46.452	46.452	0.259	0.074	5.013	8.538	0.709	**0.398**	0.368	**0.199**	**N.L. (3)**	
345.2	70	24						0.069	5.513	23.756	23.756	0.269	0.069	5.358	9.195	0.745	**0.435**	0.361	**0.196**	**2.219**	**(D)**
341.2	74	26						0.069	5.789	25.037	25.037	0.293	0.069	5.634	9.721	0.728	**0.462**	0.356	**0.194**	**N.L. (3)**	

* FACTOR OF SAFETY DESCRIPTIONS

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

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SPT BASED LIQUEFACTION ANALYSIS REPORT

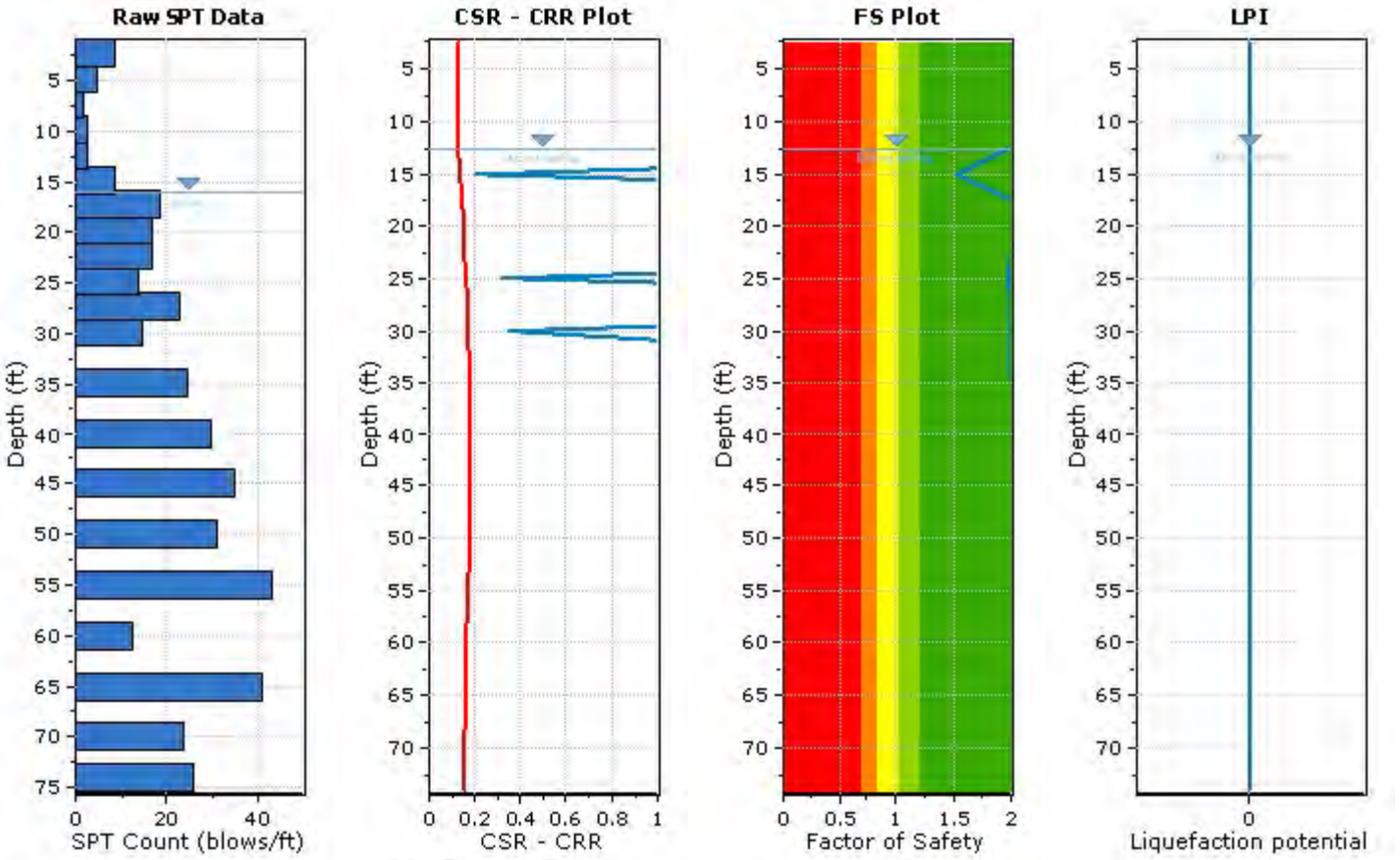
Project title : I-270 Bridge over COR

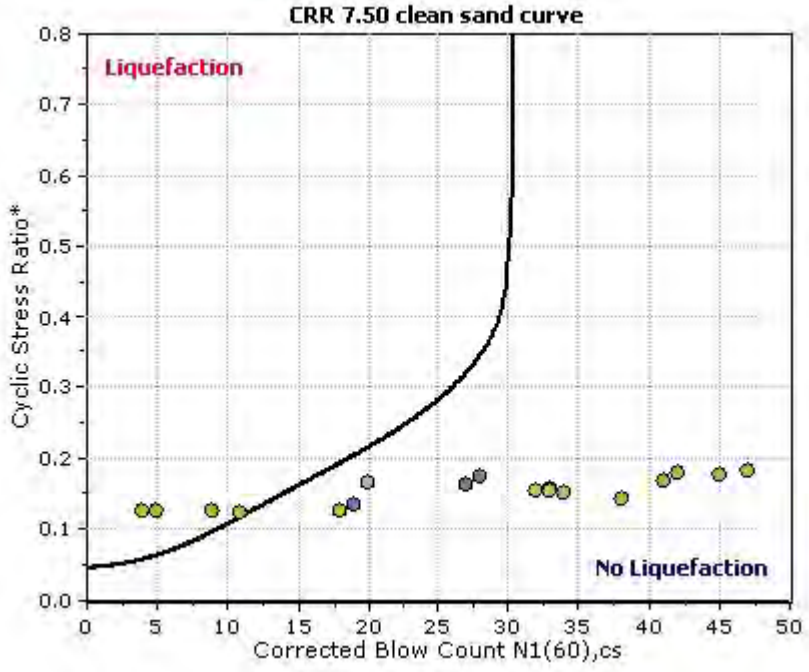
SPT Name: BB-35

Location : Madison County, Illinois

:: Input parameters and analysis properties ::

Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	12.60 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		





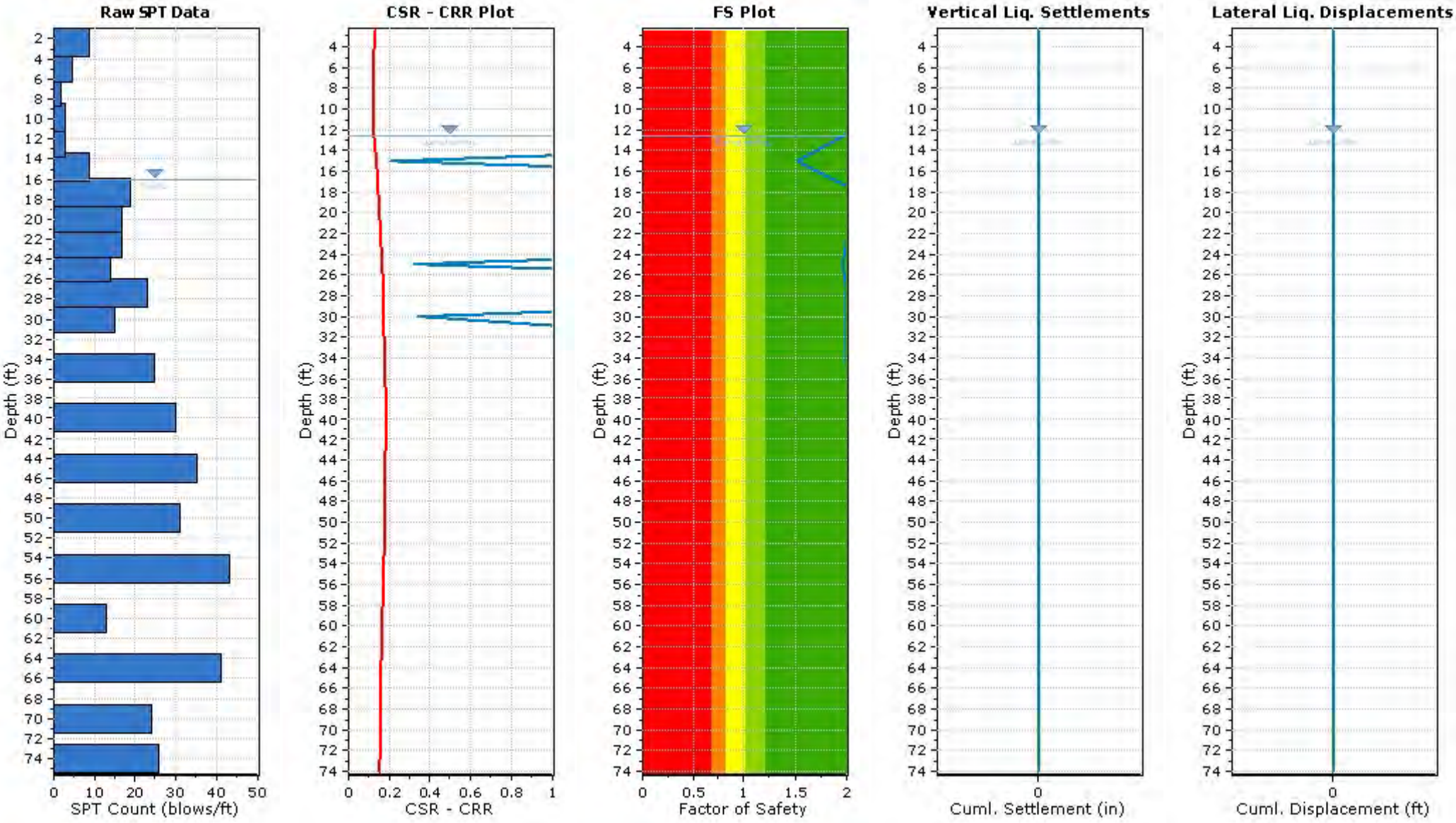
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-40
ELEVATION OF BORING GROUND SURFACE ========== 413.10 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 12.00 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 6.40 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$\bar{V}_{s,40'}$ = **355** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
410.6	2.5	8	3				18	0.135	0.338	16.509	16.509	0.176	0.135	0.338	0.338	1.500	**0.571**	0.946	**0.299**	**N.L. (1)**
408.1	5	4	0.6	90			38	0.116	0.628	7.304	13.764	0.148	0.116	0.628	0.628	1.364	**0.438**	0.885	**0.280**	**N.L. (1)**
405.6	7.5	1		10				0.095	0.865	1.710	2.616	0.056	0.033	0.710	0.779	1.245	**0.151**	0.821	**0.285**	**0.530 (C)**
403.1	10	5		10				0.111	1.143	8.535	9.589	0.110	0.049	0.833	1.057	1.239	**0.294**	0.753	**0.303**	**0.970 (C)**
400.6	12.5	2	0.2	90	25	41	66	0.042	1.248	3.502	9.203	0.106	0.042	0.938	1.318	1.203	**0.277**	0.685	**0.305**	**N.L. (2)**
398.1	15	2	0.2	40	25	41	62	0.042	1.353	3.540	9.247	0.107	0.042	1.043	1.579	1.175	**0.271**	0.619	**0.297**	**N.L. (2)**
395.6	17.5	1	0.2	90	25	41	42	0.042	1.458	1.770	7.124	0.089	0.042	1.148	1.840	1.140	**0.219**	0.557	**0.283**	**N.L. (2)**
393.1	20	2	0.2	90	12	25	31	0.042	1.563	3.515	9.217	0.106	0.042	1.253	2.101	1.127	**0.260**	0.500	**0.266**	**N.L. (2)**
390.6	22.5	5		25				0.055	1.700	8.615	13.894	0.149	0.055	1.390	2.395	1.114	**0.360**	0.450	**0.245**	**1.469 (C)**
388.1	25	8						0.059	1.848	13.446	13.446	0.145	0.059	1.538	2.698	1.085	**0.341**	0.406	**0.226**	**1.509 (D)**
385.6	27.5	10						0.061	2.000	16.395	16.395	0.174	0.061	1.690	3.007	1.063	**0.402**	0.369	**0.208**	**1.933 (D)**
383.1	30	10						0.061	2.153	15.906	15.906	0.169	0.061	1.843	3.315	1.038	**0.381**	0.338	**0.193**	**1.974 (D)**
378.1	35	21		32				0.068	2.493	34.086	44.744	0.234	0.068	2.183	3.967	0.988	**0.501**	0.292	**0.168**	**N.L. (3)**
373.1	40	18						0.066	2.823	26.714	26.714	0.331	0.066	2.513	4.609	0.945	**0.677**	0.263	**0.153**	**N.L. (3)**
368.1	45	20						0.067	3.158	28.270	28.270	0.379	0.067	2.848	5.256	0.903	**0.743**	0.244	**0.143**	**N.L. (3)**
363.1	50	9						0.060	3.458	11.479	11.479	0.126	0.060	3.148	5.868	0.909	**0.249**	0.233	**0.138**	**1.804 (C)**
358.1	55	10						0.061	3.763	12.180	12.180	0.133	0.061	3.453	6.485	0.887	**0.256**	0.226	**0.135**	**1.896 (C)**
353.1	60	31						0.071	4.118	39.625	39.625	0.111	0.071	3.808	7.152	0.791	**0.190**	0.222	**0.132**	**N.L. (3)**
348.1	65	17						0.066	4.448	18.953	18.953	0.203	0.066	4.138	7.794	0.825	**0.363**	0.216	**0.129**	**2.814 (D)**
343.1	70	16						0.065	4.773	16.873	16.873	0.179	0.065	4.463	8.431	0.815	**0.317**	0.209	**0.125**	**2.536 (D)**
338.1	75	15						0.065	5.098	15.127	15.127	0.161	0.065	4.788	9.068	0.807	**0.282**	0.202	**0.121**	**2.331 (D)**
334.6	78.5	100						0.083	5.388	######	114.945	0.834	0.083	5.078	9.577	0.705	**1.276**	0.197	**0.118**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS

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

SCI Engineering, Inc
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O Fallon, IL 62293
618.624.6969

SPT BASED LIQUEFACTION ANALYSIS REPORT

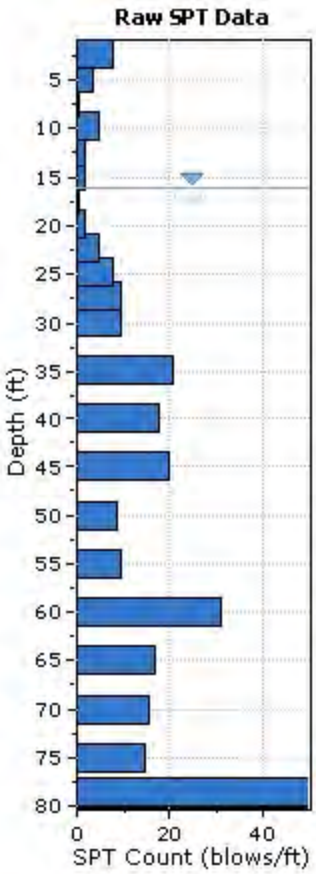
Project title : I-270 Bridge over COR

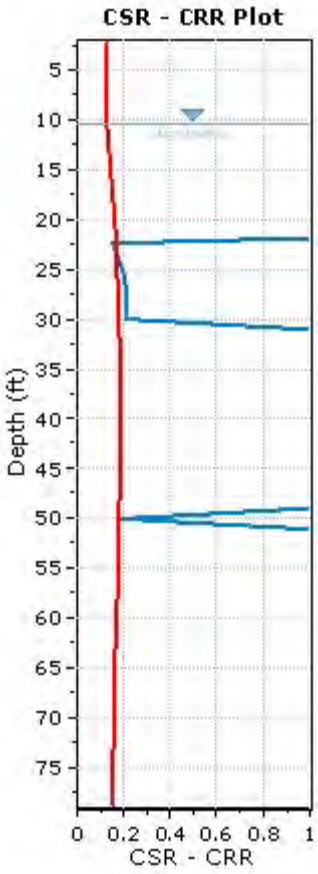
SPT Name: BB-40

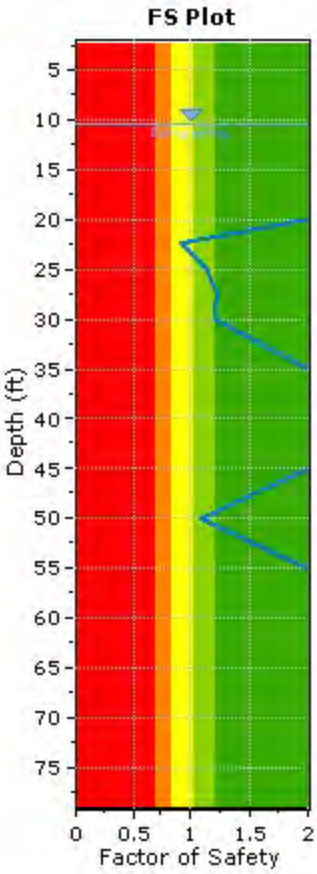
Location : Madison County, Illinois

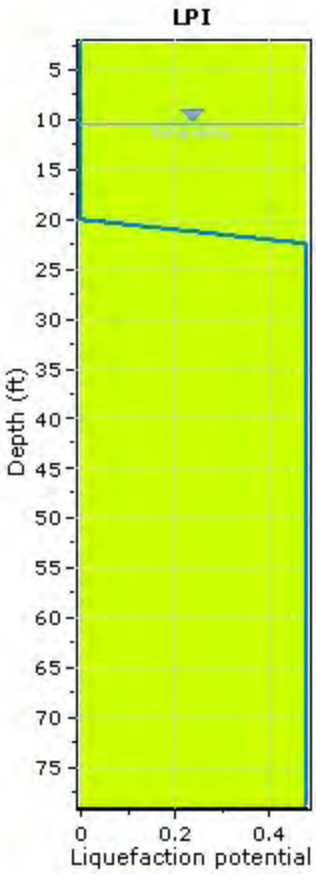
:: Input parameters and analysis properties ::

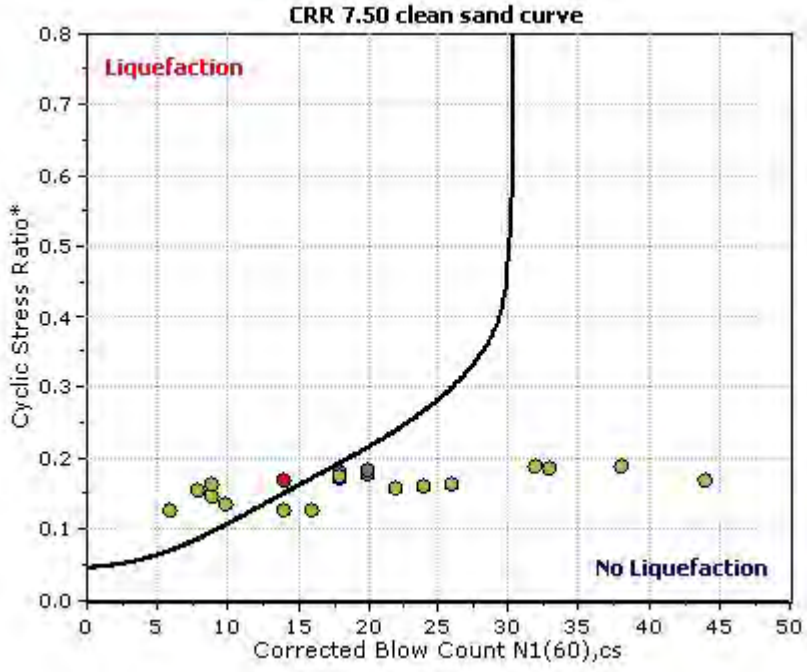
Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	10.50 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		











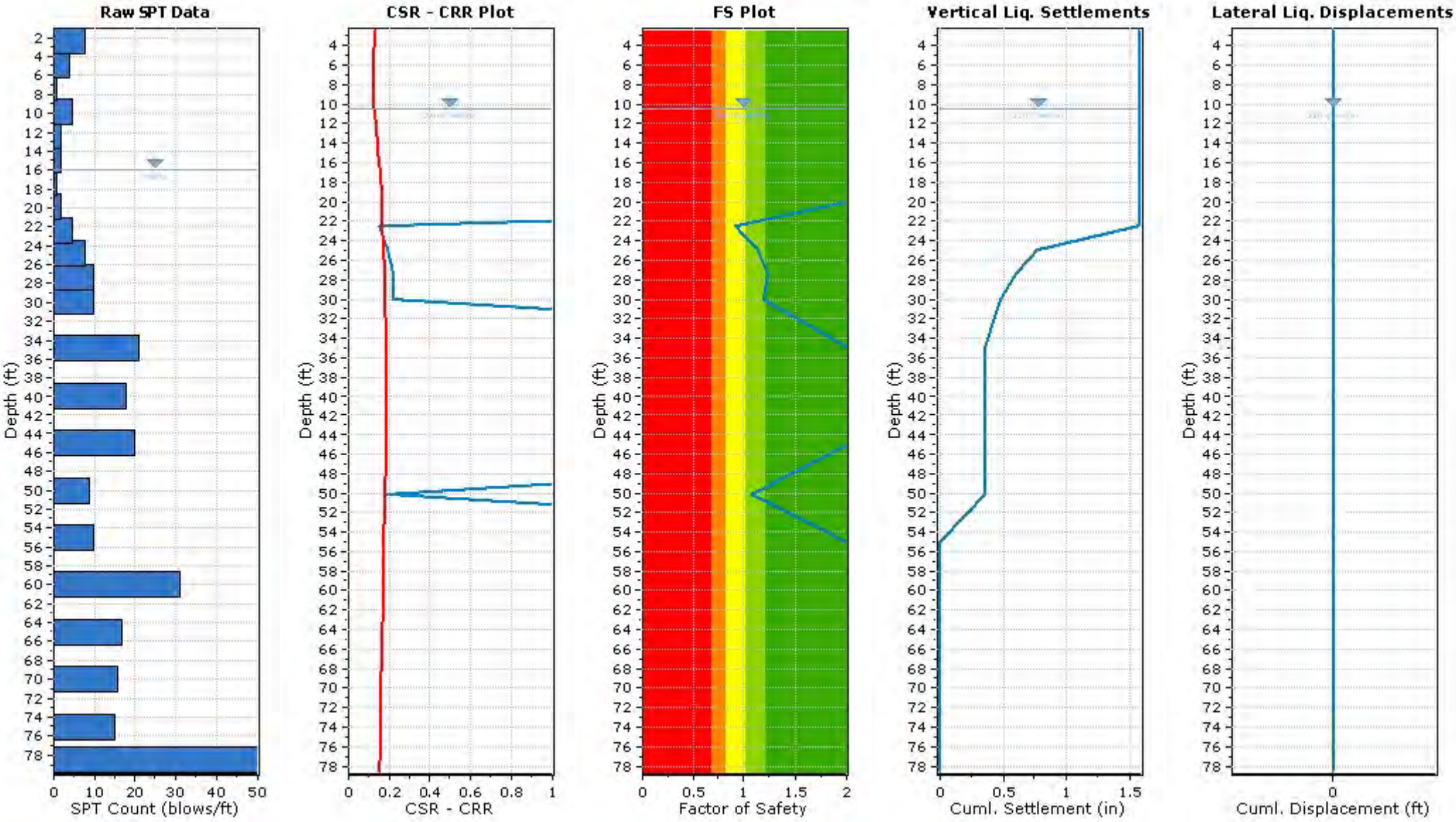
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-42
ELEVATION OF BORING GROUND SURFACE ========== 412.30 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 11.00 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 5.60 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$V_{s,40'}$ = **558** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING						CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
409.8	2.5	15	0.8	56			15	0.119	0.298	34.633	46.560	0.260	0.119	0.298	0.298	1.500	**0.847**	0.989	**0.313**	**N.L. (1)**
407.3	5	8	0.8				15	0.119	0.595	15.012	15.012	0.160	0.119	0.595	0.595	1.396	**0.485**	0.976	**0.309**	**N.L. (1)**
404.8	7.5	8						0.116	0.885	13.707	13.707	0.147	0.054	0.730	0.849	1.312	**0.419**	0.959	**0.353**	**1.187 (D)**
402.3	10	10						0.118	1.180	17.285	17.285	0.184	0.056	0.870	1.145	1.280	**0.511**	0.939	**0.391**	**1.307 (D)**
399.8	12.5	6		23.9				0.057	1.323	10.304	15.572	0.166	0.057	1.013	1.443	1.218	**0.438**	0.915	**0.413**	**1.061 (D)**
397.3	15	12						0.063	1.480	21.295	21.295	0.232	0.063	1.170	1.757	1.197	**0.603**	0.887	**0.422**	**1.429 (D)**
394.8	17.5	16						0.065	1.643	28.992	28.992	0.410	0.065	1.333	2.075	1.177	**1.046**	0.855	**0.421**	**N.L. (3)**
392.3	20	8		23.9				0.059	1.790	13.320	18.911	0.202	0.059	1.480	2.379	1.109	**0.486**	0.818	**0.416**	**1.168 (D)**
389.8	22.5	3	0.5		13	33	65	0.051	1.918	4.917	4.917	0.071	0.051	1.608	2.662	1.057	**0.164**	0.779	**0.408**	**N.L. (2)**
387.3	25	12		32				0.063	2.075	19.545	27.716	0.360	0.063	1.765	2.976	1.065	**0.831**	0.737	**0.394**	**2.109 (D)**
384.8	27.5	9		32				0.060	2.225	14.025	21.252	0.232	0.060	1.915	3.282	1.031	**0.518**	0.695	**0.377**	**1.374 (D)**
382.3	30	9		32				0.060	2.375	13.668	20.834	0.226	0.060	2.065	3.588	1.008	**0.494**	0.653	**0.359**	**1.376 (D)**
377.3	35	19						0.067	2.710	28.924	28.924	0.407	0.067	2.400	4.235	0.958	**0.845**	0.576	**0.322**	**N.L. (3)**
372.3	40	20						0.067	3.045	28.759	28.759	0.399	0.067	2.735	4.882	0.915	**0.792**	0.514	**0.291**	**N.L. (3)**
367.3	45	30						0.071	3.400	43.184	43.184	0.206	0.071	3.090	5.549	0.860	**0.385**	0.469	**0.267**	**N.L. (3)**
362.3	50	12						0.063	3.715	14.676	14.676	0.157	0.063	3.405	6.176	0.884	**0.301**	0.438	**0.251**	**1.199 (D)**
357.3	55	22						0.068	4.055	26.900	26.900	0.336	0.068	3.745	6.828	0.825	**0.601**	0.418	**0.241**	**N.L. (3)**
352.3	60	40						0.074	4.425	50.907	50.907	0.313	0.074	4.115	7.510	0.767	**0.521**	0.405	**0.234**	**N.L. (3)**
347.3	65	27						0.070	4.775	30.270	30.270	0.488	0.070	4.465	8.172	0.766	**0.810**	0.386	**0.224**	**N.L. (3)**
342.3	70	28						0.070	5.125	29.917	29.917	0.462	0.070	4.815	8.834	0.747	**0.748**	0.379	**0.220**	**N.L. (3)**
337.3	75	16						0.065	5.450	15.424	15.424	0.164	0.065	5.140	9.471	0.791	**0.282**	0.372	**0.217**	**1.300 (D)**
333.8	78.5	100						0.083	5.741	######	110.054	0.797	0.083	5.431	9.979	0.686	**1.187**	0.367	**0.213**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS

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

SCI Engineering, Inc
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618.624.6969

SPT BASED LIQUEFACTION ANALYSIS REPORT

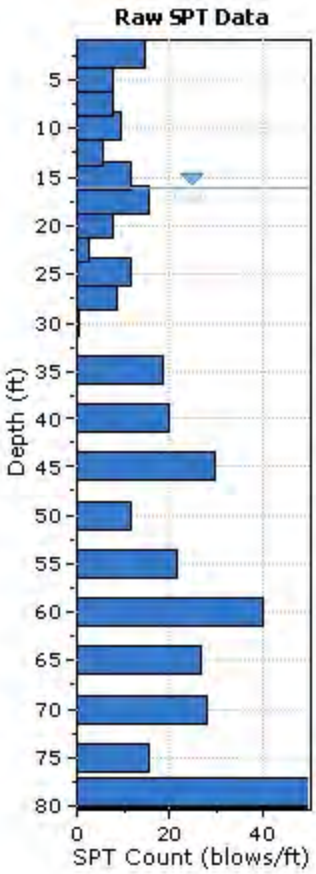
Project title : I-270 Bridge over COR

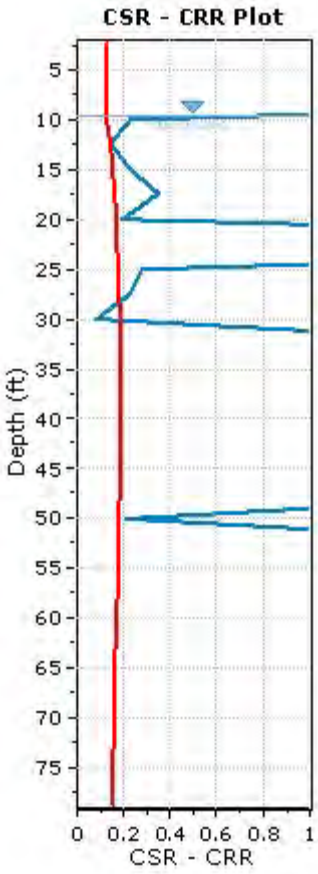
SPT Name: BB-42

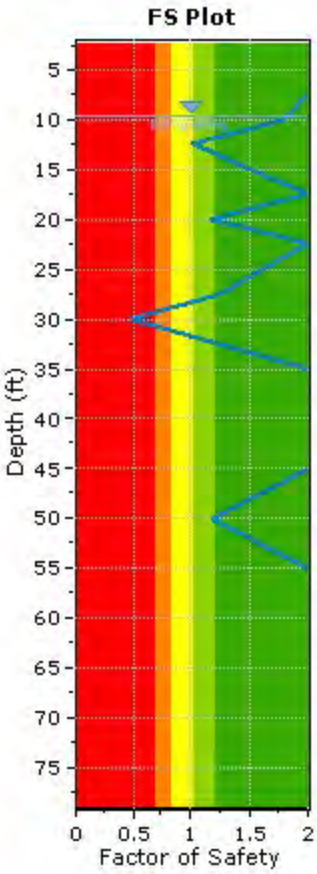
Location : Madison County, Illinois

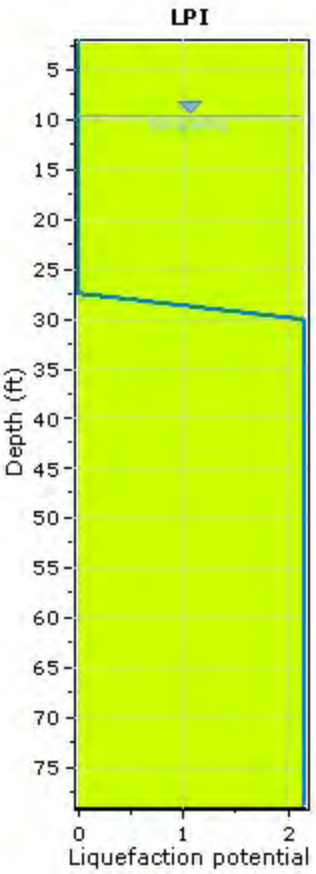
:: Input parameters and analysis properties ::

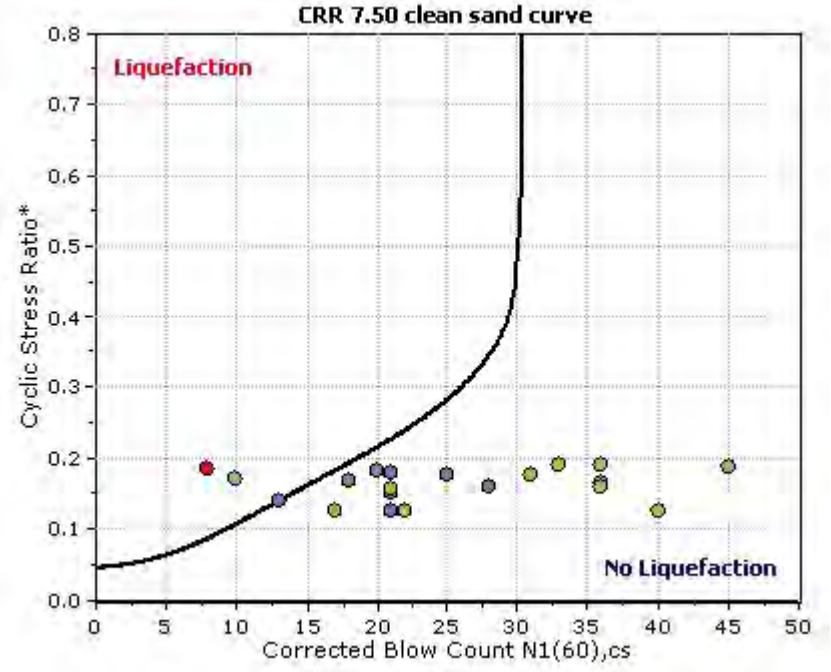
Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	9.70 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		











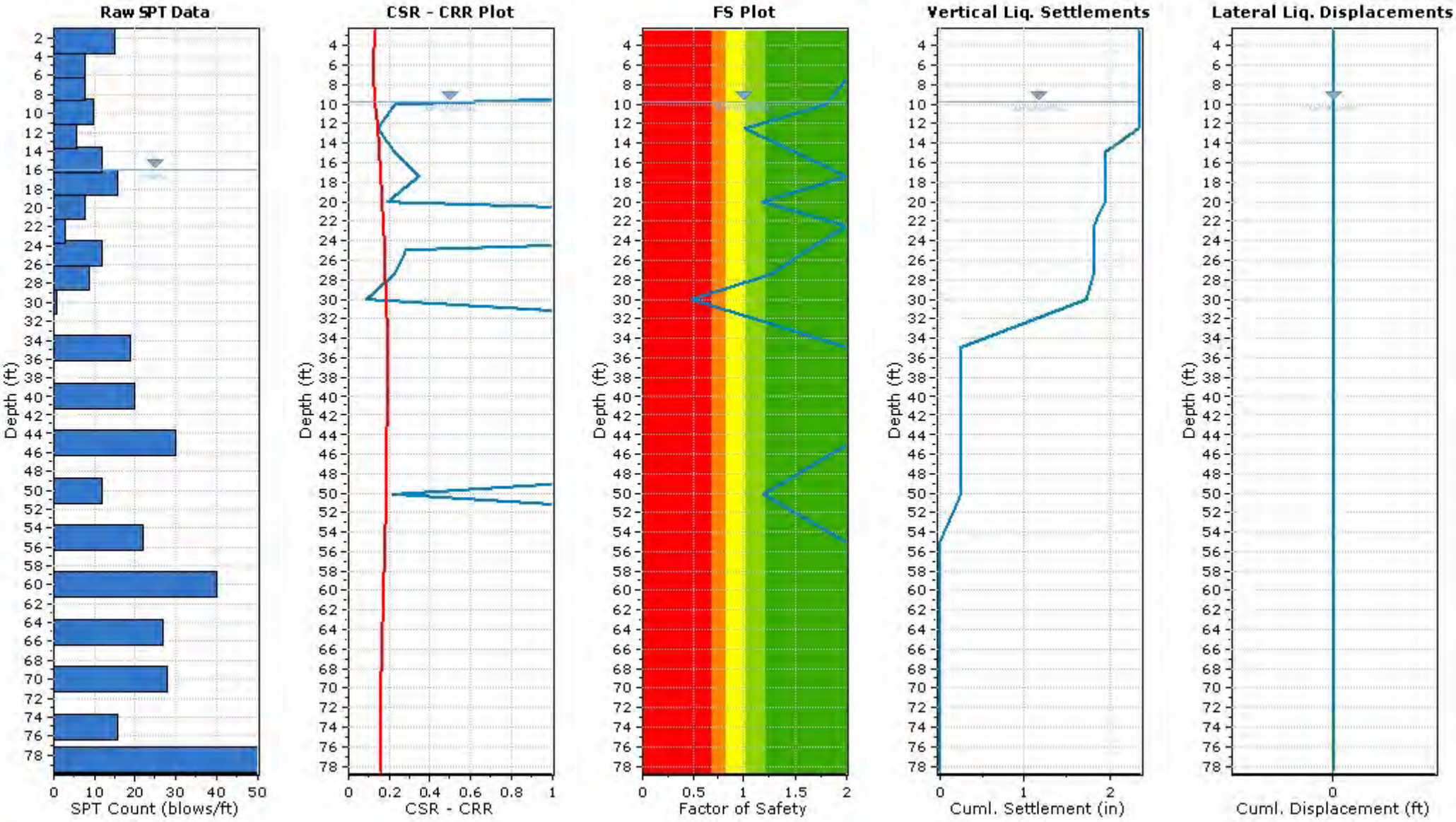
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-44
ELEVATION OF BORING GROUND SURFACE ========== 416.00 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 9.30 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 9.30 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$\bar{V}_{s,40'}$ = **385** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
413.5	2.5	3						0.105	0.263	6.190	6.190	0.081	0.105	0.263	0.263	1.500	**0.264**	0.956	**0.303**	**N.L. (1)**
411	5	2	0.5					0.114	0.548	3.746	3.746	0.063	0.114	0.548	0.548	1.311	**0.180**	0.906	**0.287**	**N.L. (1)**
408.5	7.5	7						0.114	0.833	12.084	12.084	0.132	0.114	0.833	0.833	1.257	**0.360**	0.850	**0.269**	**N.L. (1)**
406	10	8		90				0.059	0.980	14.362	22.234	0.245	0.059	0.980	1.024	1.268	**0.675**	0.791	**0.262**	**2.576 (D)**
403.5	12.5	6		10				0.057	1.123	10.866	11.970	0.131	0.057	1.123	1.322	1.168	**0.332**	0.729	**0.272**	**1.221 (D)**
401	15	3	0.5	90	13	25	33	0.051	1.250	5.453	11.543	0.127	0.051	1.250	1.606	1.136	**0.313**	0.667	**0.271**	**N.L. (2)**
398.5	17.5	2	0.2	90	13	25	39	0.042	1.355	3.633	9.359	0.108	0.042	1.355	1.867	1.107	**0.258**	0.607	**0.265**	**N.L. (2)**
396	20	2	0.2	90	13	25	38	0.042	1.460	3.605	9.325	0.107	0.042	1.460	2.128	1.088	**0.253**	0.550	**0.254**	**N.L. (2)**
393.5	22.5	2	0.2	90	13	25	41	0.042	1.565	3.559	9.271	0.107	0.042	1.565	2.389	1.071	**0.248**	0.498	**0.241**	**N.L. (2)**
391	25	6					28	0.057	1.708	10.417	10.417	0.117	0.057	1.708	2.687	1.052	**0.267**	0.452	**0.225**	**1.187 (C)**
388.5	27.5	12						0.063	1.865	20.723	20.723	0.225	0.063	1.865	3.001	1.039	**0.506**	0.412	**0.210**	**2.410 (D)**
386	30	10						0.061	2.018	16.411	16.411	0.175	0.061	2.018	3.309	1.014	**0.384**	0.379	**0.197**	**1.949 (D)**
381	35	9						0.060	2.318	13.937	13.937	0.150	0.060	2.318	3.921	0.977	**0.317**	0.328	**0.176**	**1.801 (D)**
376	40	27						0.070	2.668	44.303	44.303	0.226	0.070	2.668	4.583	0.912	**0.448**	0.294	**0.160**	**N.L. (3)**
371	45	20						0.067	3.003	29.174	29.174	0.419	0.067	3.003	5.230	0.885	**0.804**	0.273	**0.151**	**N.L. (3)**
366	50	3						0.051	3.258	3.958	3.958	0.065	0.051	3.258	5.797	0.918	**0.129**	0.260	**0.147**	**0.878 (C)**
361	55	45						0.075	3.633	66.138	66.138	0.454	0.075	3.633	6.484	0.806	**0.794**	0.252	**0.143**	**N.L. (3)**
356	60	14						0.064	3.953	16.592	16.592	0.176	0.064	3.953	7.116	0.844	**0.323**	0.248	**0.141**	**2.291 (D)**
351	65	41						0.074	4.323	53.444	53.444	0.340	0.074	4.323	7.798	0.752	**0.554**	0.241	**0.137**	**N.L. (3)**
346	70	15						0.065	4.648	16.065	16.065	0.171	0.065	4.648	8.435	0.809	**0.300**	0.234	**0.134**	**2.239 (D)**

* FACTOR OF SAFETY DESCRIPTIONS

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

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SPT BASED LIQUEFACTION ANALYSIS REPORT

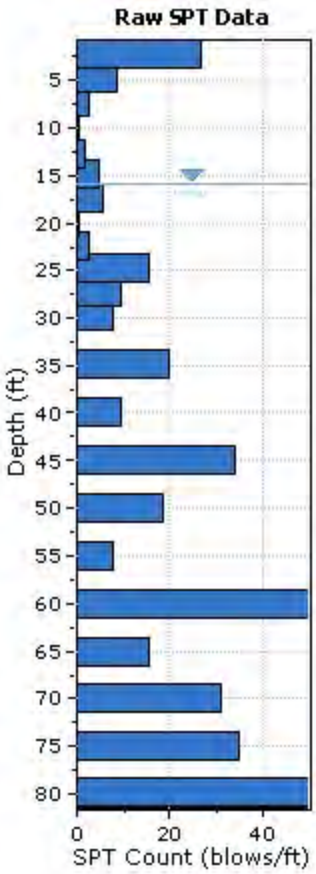
Project title : I-270 Bridge over COR

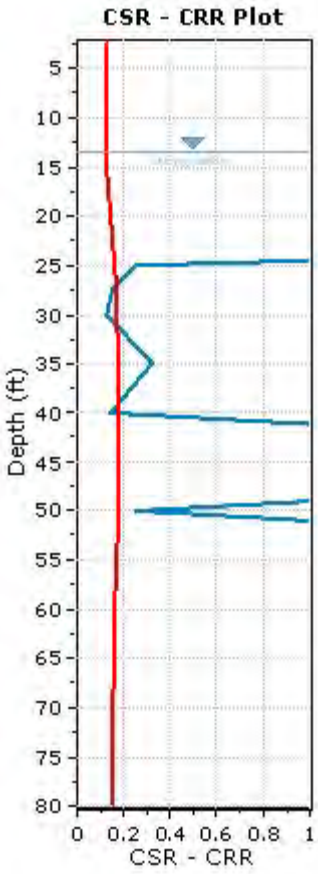
SPT Name: BB-44

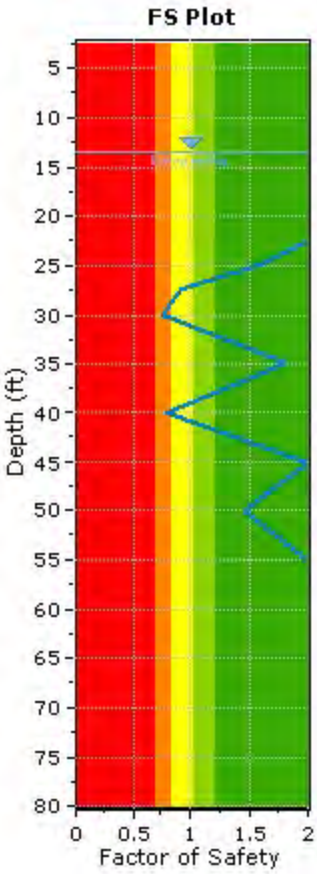
Location : Madison County, Illinois

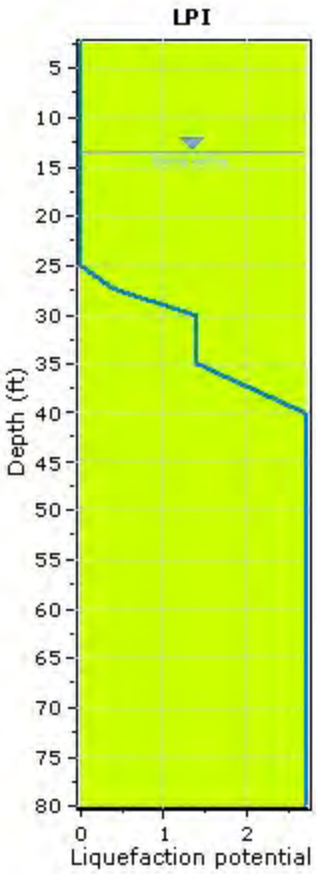
:: Input parameters and analysis properties ::

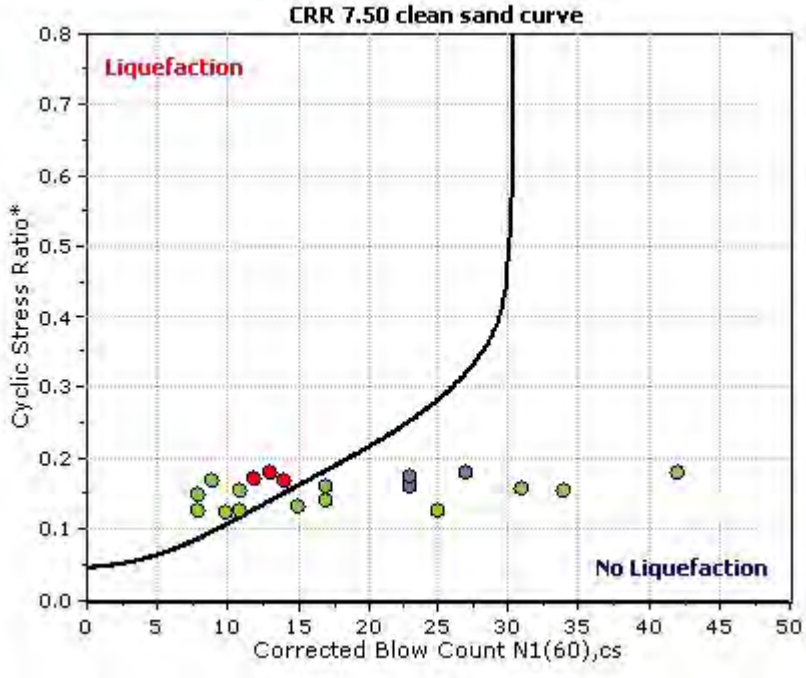
Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	13.40 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		











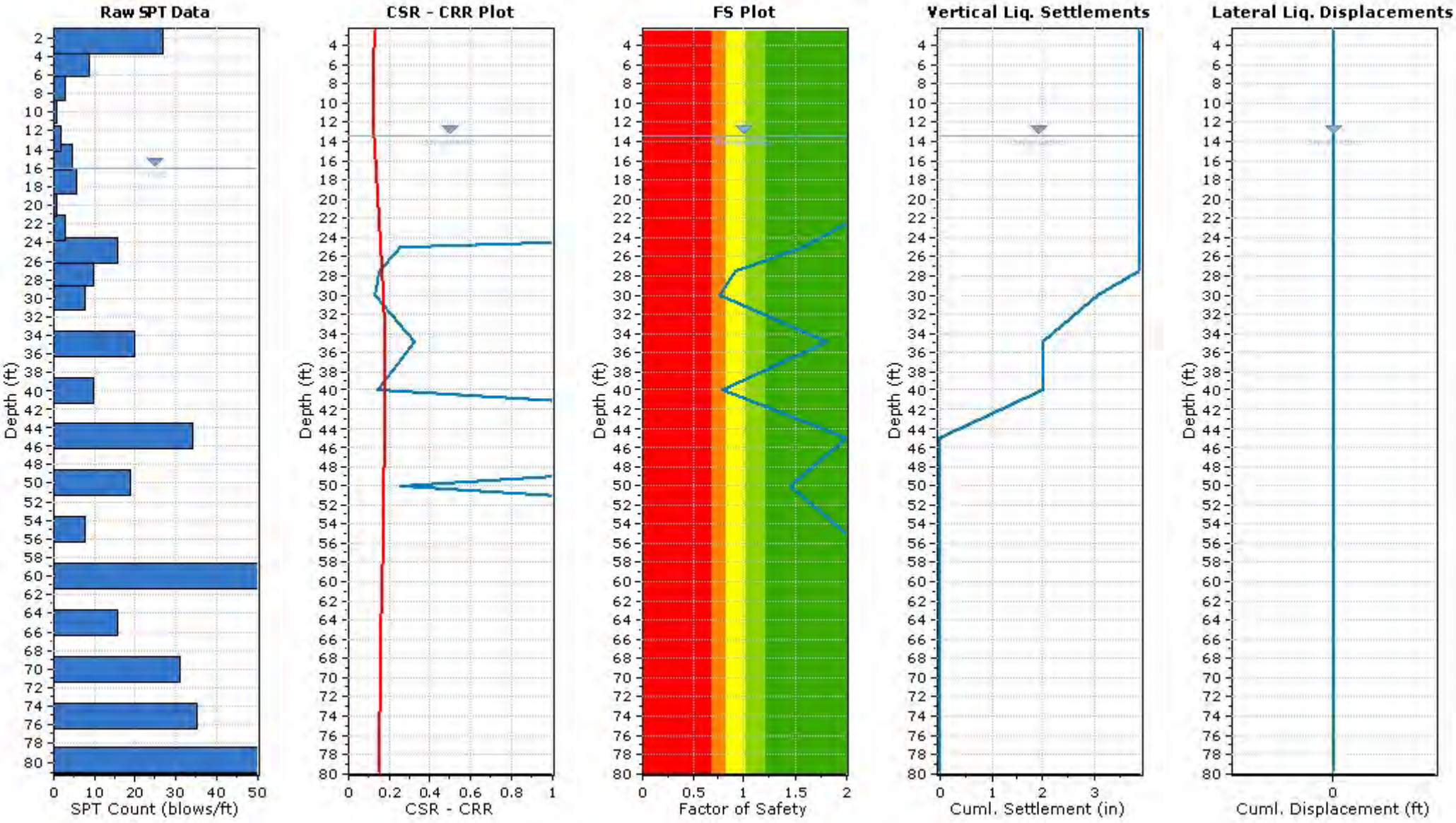
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-45
ELEVATION OF BORING GROUND SURFACE ========== 417.10 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 10.40 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 10.40 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$\bar{V}_{s,40'}$ = **342** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
414.6	2.5	2						0.101	0.253	4.142	4.142	0.066	0.101	0.253	0.253	1.500	**0.214**	0.941	**0.298**	**N.L. (1)**
412.1	5	7						0.114	0.538	13.226	13.226	0.143	0.114	0.538	0.538	1.412	**0.437**	0.876	**0.277**	**N.L. (1)**
409.6	7.5	6						0.113	0.820	10.396	10.396	0.117	0.113	0.820	0.820	1.249	**0.316**	0.807	**0.256**	**N.L. (1)**
407.1	10	4		50			28	0.108	1.090	6.926	13.312	0.144	0.108	1.090	1.090	1.183	**0.368**	0.736	**0.233**	**N.L. (1)**
404.6	12.5	3		50			31	0.051	1.218	5.296	11.355	0.125	0.051	1.218	1.349	1.142	**0.310**	0.666	**0.234**	**1.325 (C)**
402.1	15	2		50			33	0.048	1.338	3.553	9.264	0.107	0.048	1.338	1.625	1.110	**0.257**	0.599	**0.230**	**1.117 (C)**
399.6	17.5	3	0.9	80	13	25	33	0.058	1.483	5.277	11.332	0.125	0.058	1.483	1.926	1.090	**0.296**	0.536	**0.220**	**N.L. (2)**
397.1	20	2		90			35	0.048	1.603	3.481	9.177	0.106	0.048	1.603	2.202	1.065	**0.245**	0.479	**0.208**	**1.178 (C)**
394.6	22.5	1		50			35	0.043	1.710	1.719	7.063	0.088	0.043	1.710	2.465	1.047	**0.200**	0.429	**0.196**	**1.020 (C)**
392.1	25	6		50			30	0.057	1.853	10.073	17.088	0.182	0.057	1.853	2.764	1.038	**0.409**	0.387	**0.183**	**2.235 (C)**
389.6	27.5	11						0.062	2.008	18.169	18.169	0.194	0.062	2.008	3.075	1.016	**0.427**	0.351	**0.170**	**2.512 (D)**
387.1	30	2	0.1	90	15	25	33	0.035	2.095	3.221	8.865	0.103	0.035	2.095	3.318	1.003	**0.225**	0.321	**0.161**	**N.L. (2)**
382.1	35	10						0.061	2.400	15.227	15.227	0.162	0.061	2.400	3.935	0.968	**0.341**	0.277	**0.144**	**2.368 (D)**
377.1	40	20						0.067	2.735	30.703	30.703	0.526	0.067	2.735	4.582	0.912	**1.041**	0.249	**0.132**	**N.L. (3)**
372.1	45	19						0.067	3.070	27.140	27.140	0.342	0.067	3.070	5.229	0.882	**0.655**	0.232	**0.125**	**N.L. (3)**
367.1	50	18						0.066	3.400	24.050	24.050	0.274	0.066	3.400	5.871	0.860	**0.512**	0.221	**0.121**	**4.231 (D)**
362.1	55	26						0.069	3.745	34.435	34.435	-2.048	0.069	3.745	6.528	0.804	**-3.570**	0.215	**0.119**	**N.L. (3)**
357.1	60	27						0.070	4.095	33.850	33.850	6.917	0.070	4.095	7.190	0.778	**11.677**	0.211	**0.117**	**N.L. (3)**
352.1	65	27						0.070	4.445	31.919	31.919	0.712	0.070	4.445	7.852	0.761	**1.176**	0.205	**0.115**	**N.L. (3)**
347.1	70	19						0.067	4.780	20.362	20.362	0.220	0.067	4.780	8.499	0.786	**0.375**	0.198	**0.112**	**3.348 (D)**

* FACTOR OF SAFETY DESCRIPTIONS

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

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618.624.6969

SPT BASED LIQUEFACTION ANALYSIS REPORT

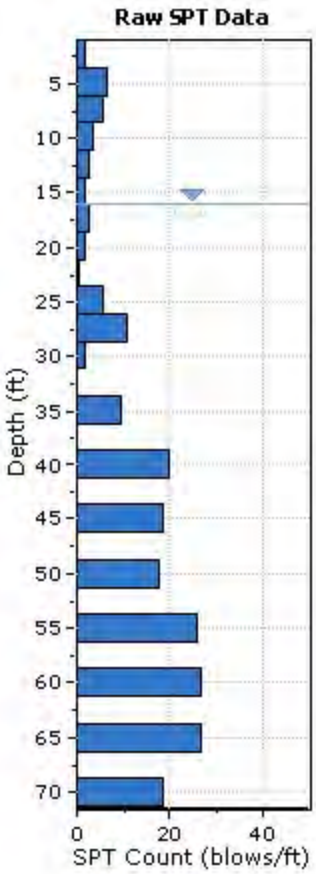
Project title : I-270 Bridge over COR

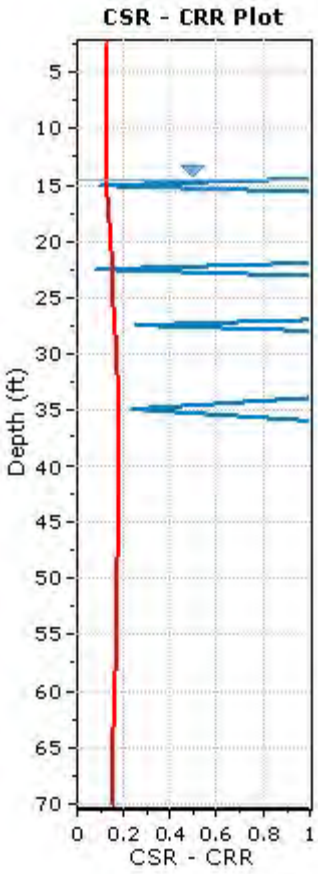
SPT Name: BB-45

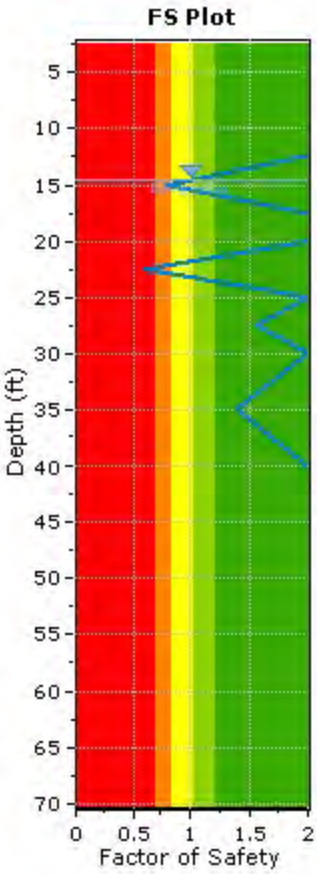
Location : Madison County, Illinois

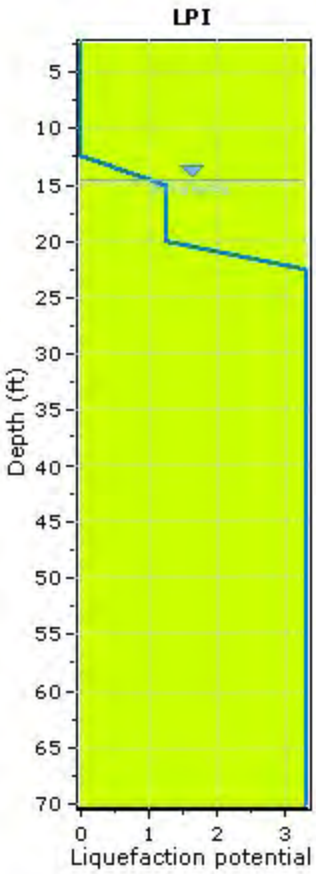
:: Input parameters and analysis properties ::

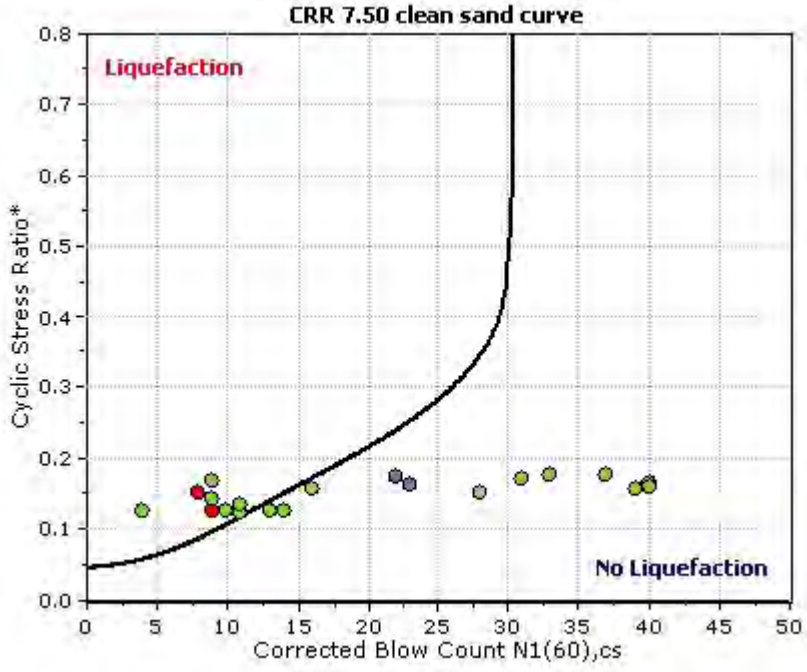
Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	14.50 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		











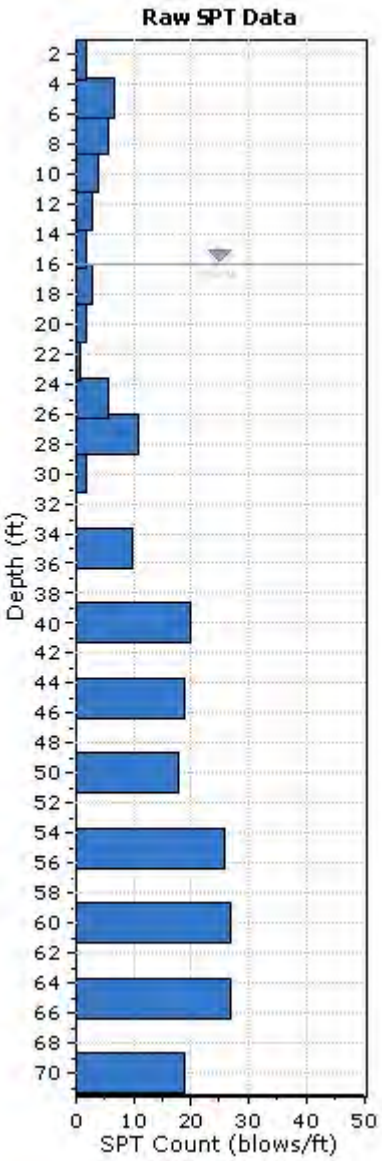
F.S. color scheme

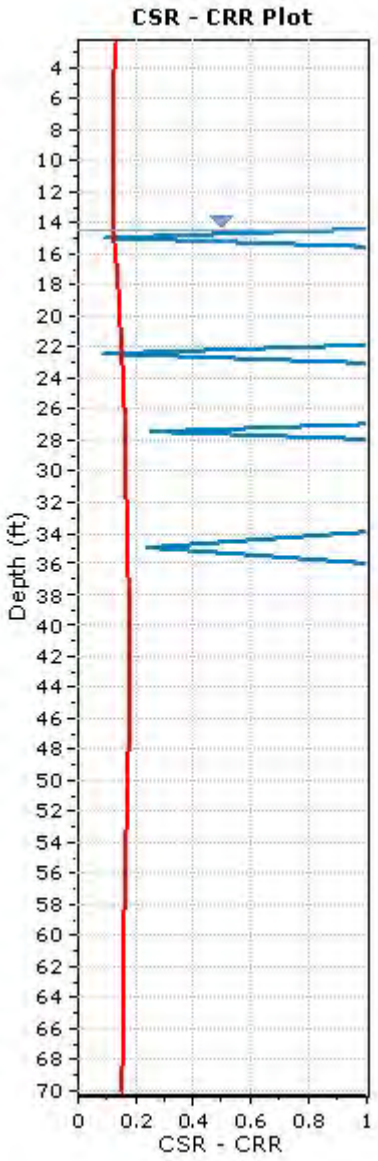
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

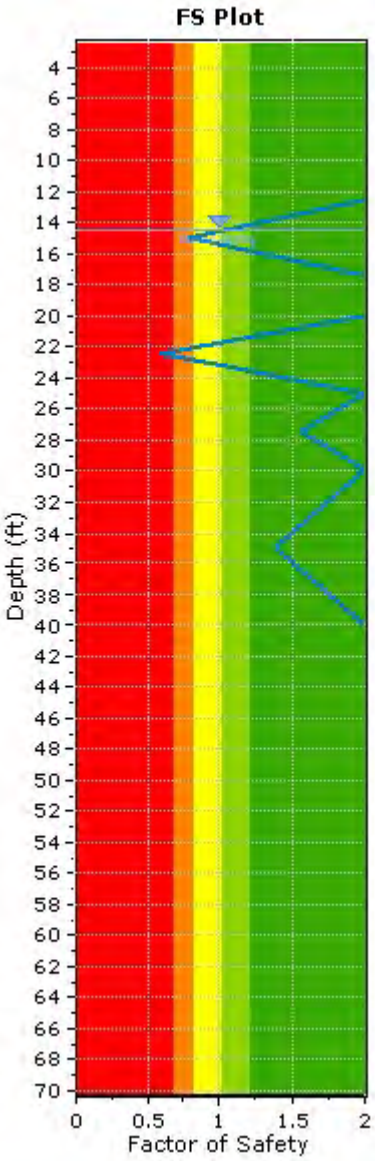
LPI color scheme

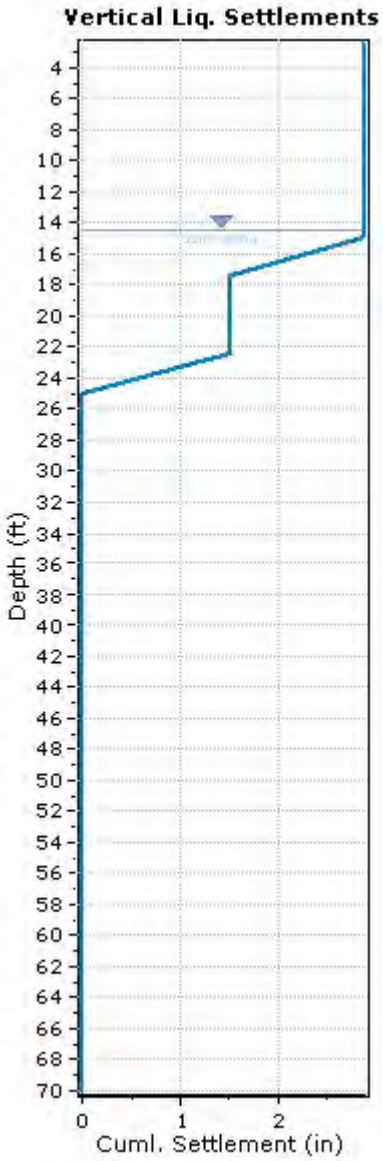
- Very high risk
- High risk
- Low risk

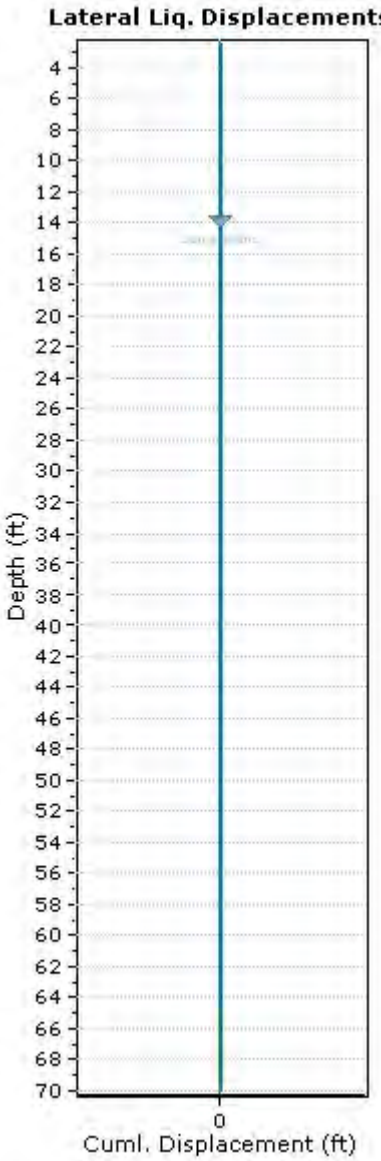
:: Overall Liquefaction Assessment Analysis Plots ::











SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-46
ELEVATION OF BORING GROUND SURFACE ========== 414.50 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 8.50 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 7.80 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$\bar{V}_{s,40'}$ = **597** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING						CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
412	2.5	18	0.8					0.119	0.298	43.202	43.202	0.207	0.119	0.298	0.298	1.500	**0.672**	0.992	**0.314**	**N.L. (1)**
409.5	5	51	0.8					0.119	0.595	######	111.193	0.806	0.119	0.595	0.595	1.500	**2.621**	0.983	**0.311**	**N.L. (1)**
407	7.5	6	0.3					0.108	0.865	10.259	10.259	0.115	0.108	0.865	0.865	1.232	**0.308**	0.971	**0.308**	**N.L. (1)**
404.5	10	3	0.8	90	15	25	23	0.057	1.008	5.315	11.379	0.125	0.057	1.008	1.145	1.196	**0.325**	0.957	**0.344**	**N.L. (2)**
402	12.5	2	0.4	90	15	25	35	0.049	1.130	3.614	9.337	0.107	0.049	1.130	1.423	1.154	**0.269**	0.939	**0.374**	**N.L. (2)**
399.5	15	14						0.064	1.290	26.790	26.790	0.333	0.064	1.290	1.739	1.182	**0.853**	0.917	**0.392**	**N.L. (3)**
397	17.5	13						0.063	1.448	24.154	24.154	0.276	0.063	1.448	2.053	1.130	**0.677**	0.892	**0.401**	**1.688 (D)**
394.5	20	14						0.064	1.608	25.602	25.602	0.304	0.064	1.608	2.369	1.095	**0.723**	0.863	**0.403**	**N.L. (3)**
392	22.5	19						0.067	1.775	35.243	35.243	-0.548	0.067	1.775	2.692	1.072	**-1.273**	0.830	**0.399**	**N.L. (3)**
389.5	25	15						0.065	1.938	25.966	25.966	0.312	0.065	1.938	3.011	1.030	**0.698**	0.794	**0.391**	**N.L. (3)**
387	27.5	21						0.068	2.108	36.925	36.925	-0.073	0.068	2.108	3.337	1.002	**-0.159**	0.756	**0.379**	**N.L. (3)**
384.5	30	28						0.070	2.283	50.059	50.059	0.304	0.070	2.283	3.668	0.971	**0.640**	0.716	**0.365**	**N.L. (3)**
379.5	35	19						0.067	2.618	29.519	29.519	0.437	0.067	2.618	4.315	0.928	**0.880**	0.640	**0.334**	**N.L. (3)**
374.5	40	19						0.067	2.953	27.645	27.645	0.358	0.067	2.953	4.962	0.893	**0.693**	0.573	**0.305**	**N.L. (3)**
369.5	45	17						0.066	3.283	22.958	22.958	0.256	0.066	3.283	5.604	0.872	**0.485**	0.522	**0.282**	**1.720 (D)**
364.5	50	19						0.067	3.618	24.545	24.545	0.283	0.067	3.618	6.251	0.842	**0.517**	0.485	**0.265**	**1.951 (D)**
359.5	55	16						0.065	3.943	19.206	19.206	0.206	0.065	3.943	6.888	0.836	**0.373**	0.461	**0.255**	**1.463 (D)**
354.5	60	31						0.071	4.298	38.401	38.401	0.053	0.071	4.298	7.555	0.754	**0.086**	0.445	**0.248**	**N.L. (3)**
349.5	65	18						0.066	4.628	19.629	19.629	0.211	0.066	4.628	8.197	0.796	**0.364**	0.421	**0.236**	**1.542 (D)**
344.5	70	14						0.064	4.948	14.393	14.393	0.154	0.064	4.948	8.829	0.803	**0.268**	0.414	**0.234**	**1.145 (D)**

* FACTOR OF SAFETY DESCRIPTIONS

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

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650 Pierce Blvd
O Fallon, IL 62293
618.624.6969

SPT BASED LIQUEFACTION ANALYSIS REPORT

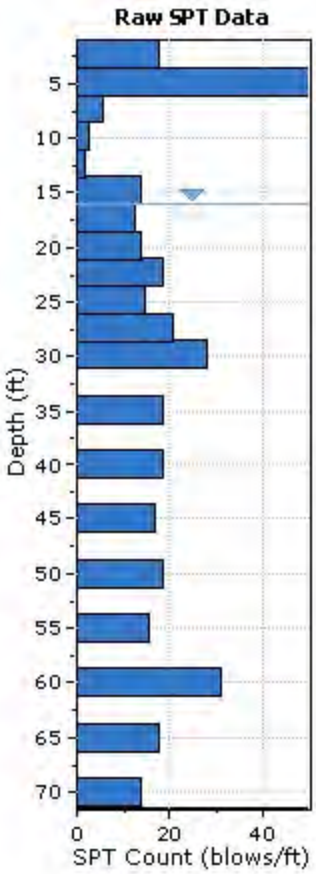
Project title : I-270 Bridge over COR

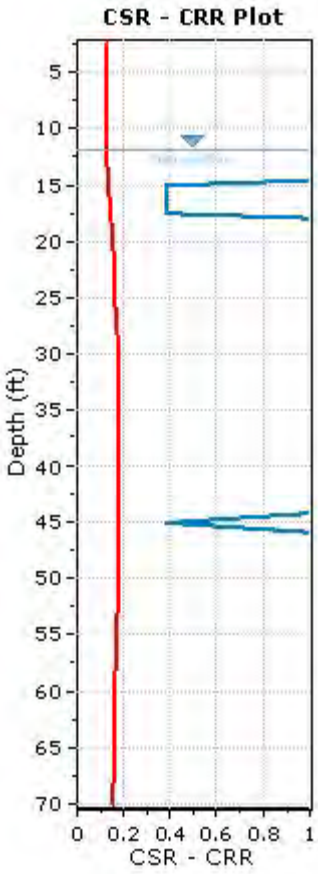
SPT Name: BB-46

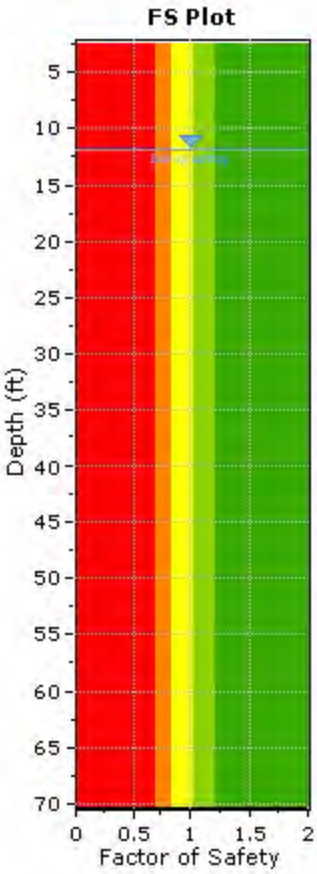
Location : Madison County, Illinois

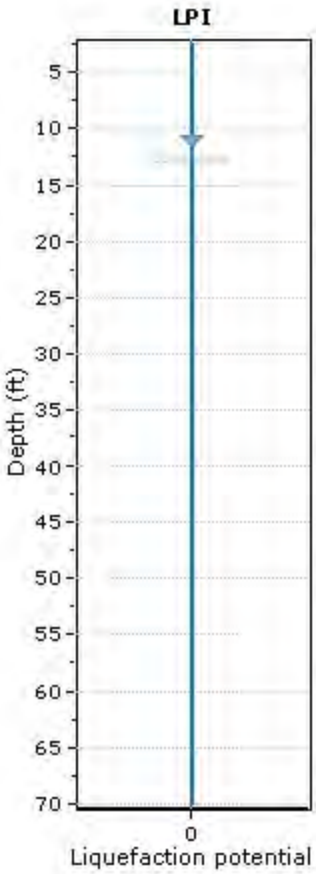
:: Input parameters and analysis properties ::

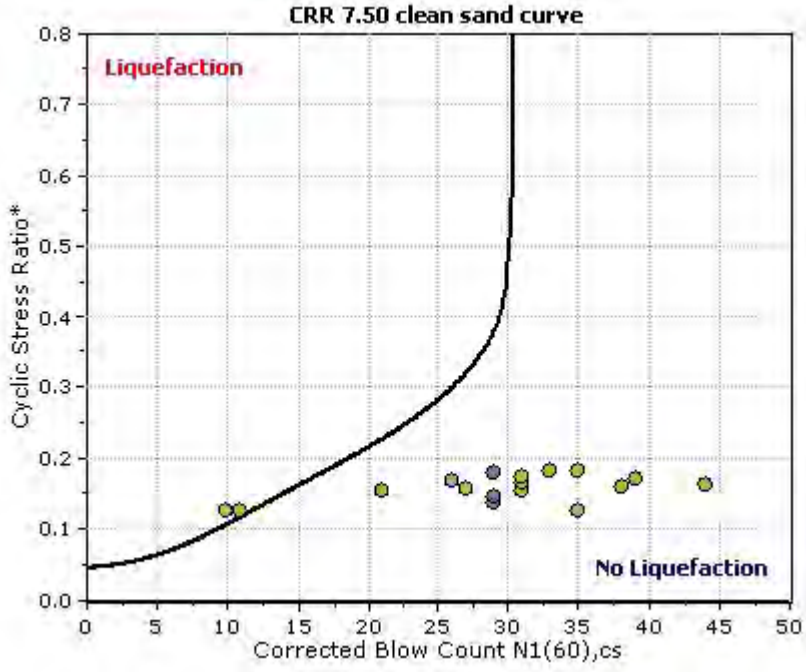
Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	11.90 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		











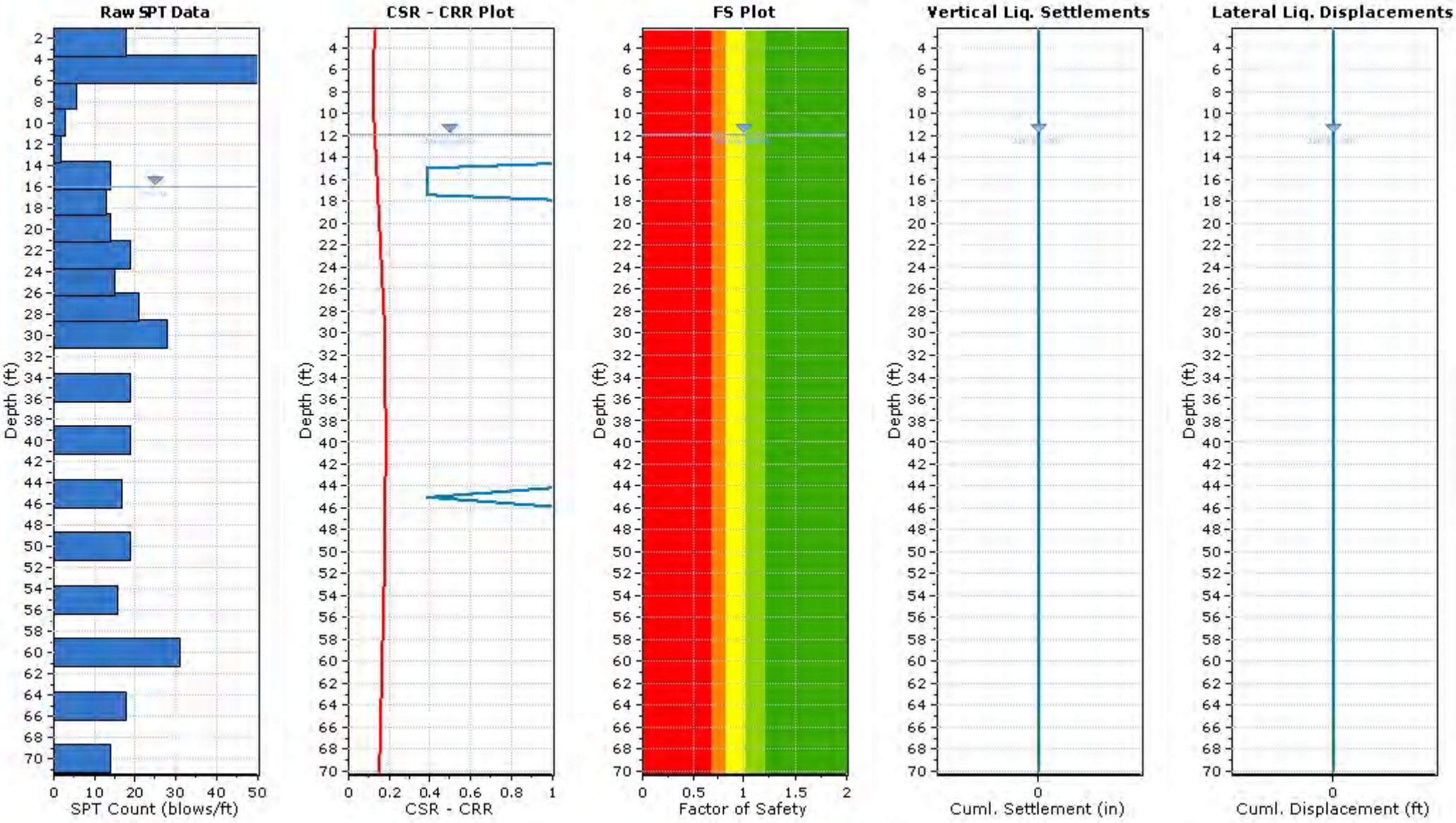
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-48
ELEVATION OF BORING GROUND SURFACE ========== 414.30 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 7.50 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 7.60 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$V_{s,40'}$ = **645** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	EFFECTIVE VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
411.8	2.5	8	1.4	98	25	41	36	0.125	0.313	16.670	25.004	0.292	0.125	0.313	0.313	1.500	**0.950**	0.995	**0.315**	**N.L. (1)**
409.3	5	6	0.75					0.118	0.608	11.025	11.025	0.122	0.118	0.608	0.608	1.346	**0.357**	0.989	**0.313**	**N.L. (1)**
406.8	7.5	7						0.114	0.893	11.873	11.873	0.130	0.114	0.893	0.893	1.234	**0.348**	0.981	**0.311**	**N.L. (1)**
404.3	10	6		26				0.057	1.035	10.549	16.231	0.173	0.057	1.035	1.185	1.214	**0.455**	0.972	**0.352**	**1.293 (D)**
401.8	12.5	11						0.062	1.190	20.225	20.225	0.218	0.062	1.190	1.496	1.186	**0.561**	0.960	**0.382**	**1.469 (D)**
399.3	15	14						0.064	1.350	26.318	26.318	0.321	0.064	1.350	1.812	1.162	**0.808**	0.945	**0.402**	**N.L. (3)**
396.8	17.5	12						0.063	1.508	21.704	21.704	0.238	0.063	1.508	2.125	1.109	**0.572**	0.927	**0.414**	**1.382 (D)**
394.3	20	11						0.062	1.663	19.247	19.247	0.206	0.062	1.663	2.436	1.073	**0.480**	0.906	**0.420**	**1.143 (D)**
391.8	22.5	20						0.067	1.830	36.878	36.878	-0.079	0.067	1.830	2.760	1.061	**-0.182**	0.881	**0.421**	**N.L. (3)**
389.3	25	22						0.068	2.000	39.824	39.824	0.119	0.068	2.000	3.086	1.024	**0.263**	0.853	**0.417**	**N.L. (3)**
386.8	27.5	32						0.071	2.178	59.528	59.528	0.397	0.071	2.178	3.419	0.989	**0.852**	0.821	**0.408**	**N.L. (3)**
384.3	30	25						0.069	2.350	42.958	42.958	0.202	0.069	2.350	3.748	0.960	**0.420**	0.787	**0.398**	**N.L. (3)**
379.3	35	23						0.068	2.690	36.239	36.239	-0.183	0.068	2.690	4.400	0.910	**-0.361**	0.716	**0.371**	**N.L. (3)**
374.3	40	22						0.068	3.030	32.187	32.187	0.785	0.068	3.030	5.052	0.876	**1.492**	0.648	**0.342**	**N.L. (3)**
369.3	45	33						0.072	3.390	48.506	48.506	0.286	0.072	3.390	5.724	0.829	**0.513**	0.591	**0.316**	**N.L. (3)**
364.3	50	13						0.063	3.705	15.924	15.924	0.169	0.063	3.705	6.351	0.861	**0.316**	0.547	**0.297**	**1.064 (D)**
359.3	55	24						0.069	4.050	29.730	29.730	0.450	0.069	4.050	7.008	0.795	**0.775**	0.517	**0.283**	**N.L. (3)**
354.3	60	16						0.065	4.375	17.924	17.924	0.191	0.065	4.375	7.645	0.816	**0.338**	0.497	**0.275**	**1.229 (D)**
349.3	65	19						0.067	4.710	20.577	20.577	0.223	0.067	4.710	8.292	0.789	**0.381**	0.464	**0.259**	**1.471 (D)**
344.3	70	25						0.069	5.055	26.570	26.570	0.327	0.069	5.055	8.949	0.747	**0.530**	0.457	**0.256**	**N.L. (3)**
339.3	75	56						0.077	5.440	63.880	63.880	0.435	0.077	5.440	9.646	0.686	**0.647**	0.450	**0.253**	**N.L. (3)**
334.55	79.75	24						0.069	5.768	22.991	22.991	0.257	0.069	5.768	10.270	0.731	**0.407**	0.444	**0.250**	**1.628 (D)**

* FACTOR OF SAFETY DESCRIPTIONS

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

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650 Pierce Blvd
O Fallon, IL 62293
618.624.6969

SPT BASED LIQUEFACTION ANALYSIS REPORT

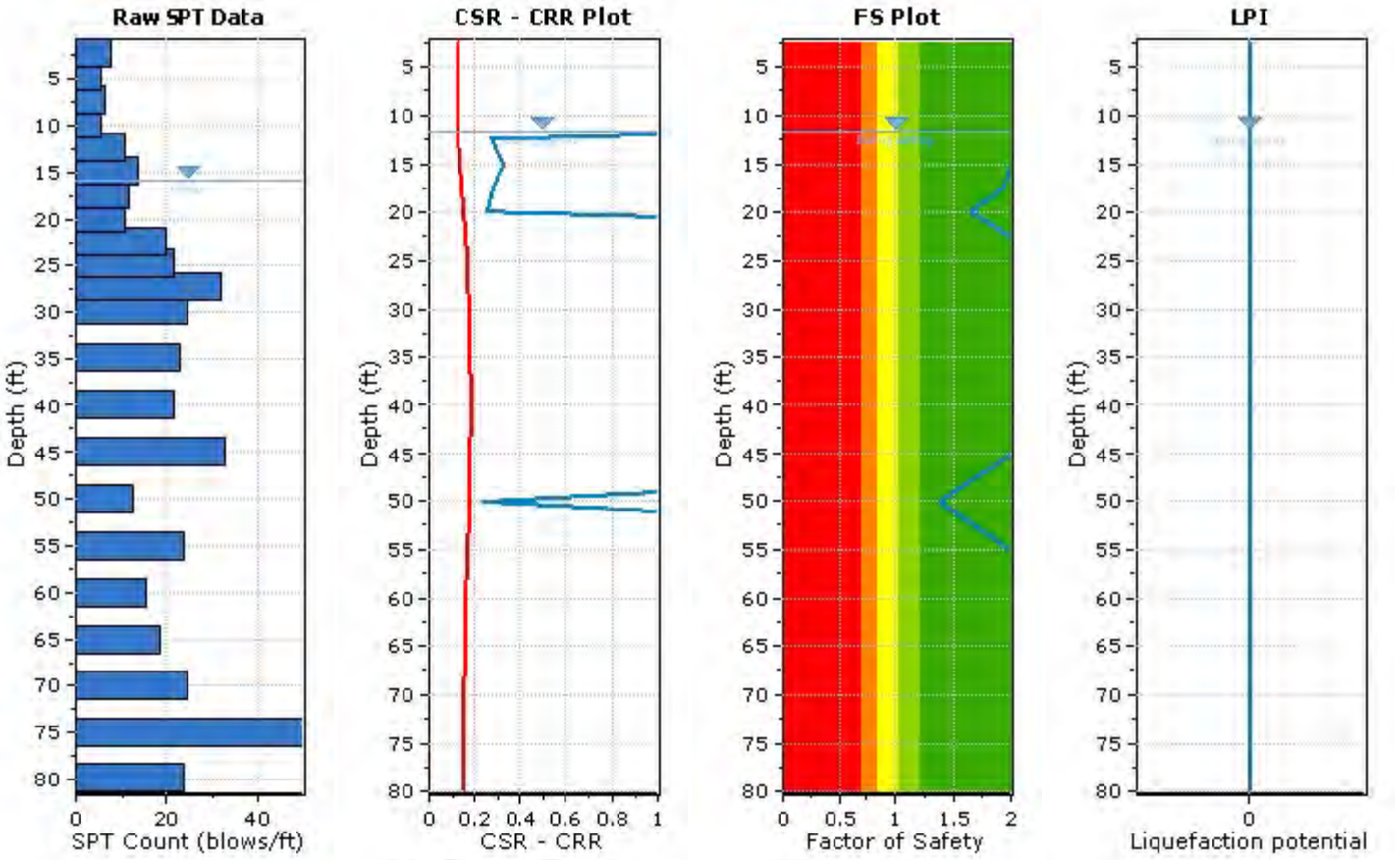
Project title : I-270 Bridge over COR

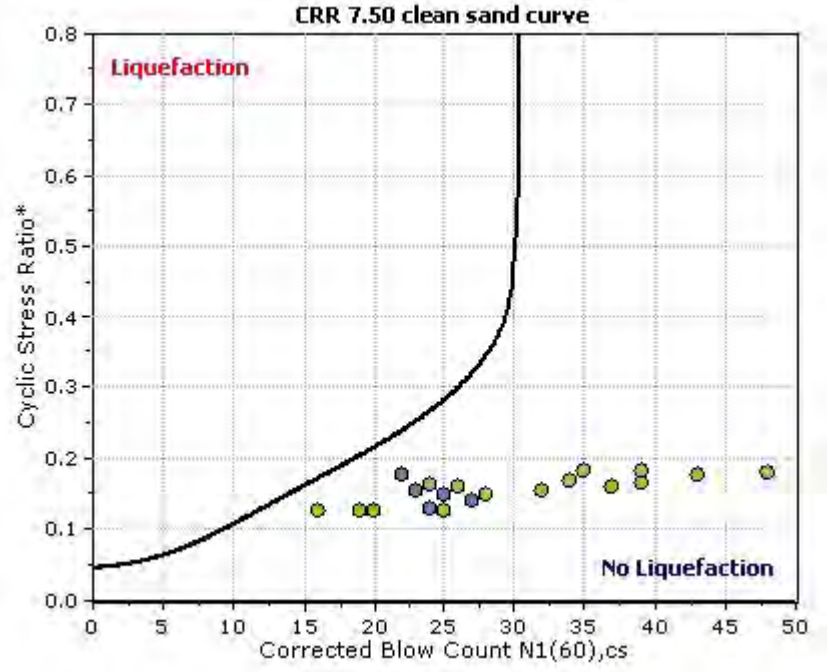
SPT Name: BB-48

Location : Madison County, Illinois

:: Input parameters and analysis properties ::

Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	11.70 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		





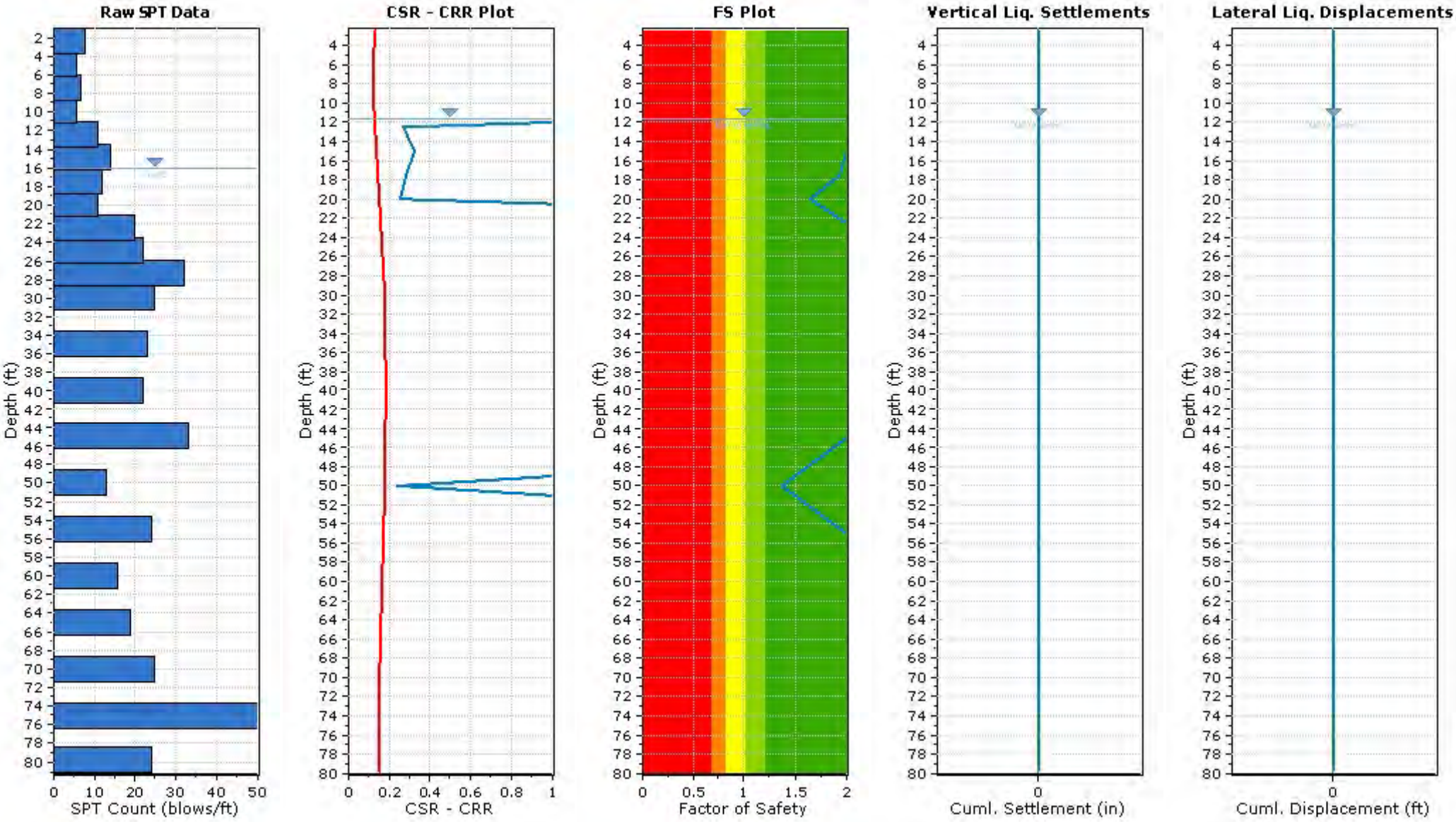
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-49
ELEVATION OF BORING GROUND SURFACE ========== 426.90 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 23.50 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 20.20 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$V_{s,40'}$ = **654** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

IF(P22="","",IF(B22>=(K$7+K$12-K$9),"N.L. (1)",IF(OR(G22>=12,AND(H22>0,I22>0

	BORING DATA							CONDITIONS DURING DRILLING						CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
424.4	2.5	8						0.116	0.290	16.818	16.818	0.179	0.116	0.290	0.290	1.500	**0.582**	0.996	**0.315**	**N.L. (1)**
421.9	5	12						0.120	0.590	23.757	23.757	0.269	0.120	0.590	0.590	1.500	**0.876**	0.990	**0.313**	**N.L. (1)**
419.4	7.5	6						0.113	0.873	10.236	10.236	0.115	0.113	0.873	0.873	1.230	**0.307**	0.983	**0.311**	**N.L. (1)**
416.9	10	5						0.111	1.150	8.517	8.517	0.100	0.111	1.150	1.150	1.146	**0.249**	0.974	**0.308**	**N.L. (1)**
414.4	12.5	9						0.117	1.443	15.062	15.062	0.161	0.117	1.443	1.443	1.107	**0.386**	0.963	**0.305**	**N.L. (1)**
411.9	15	9						0.117	1.735	14.504	14.504	0.155	0.117	1.735	1.735	1.053	**0.354**	0.949	**0.301**	**N.L. (1)**
409.4	17.5	12						0.120	2.035	18.935	18.935	0.203	0.120	2.035	2.035	1.012	**0.445**	0.933	**0.295**	**N.L. (1)**
406.9	20	22						0.127	2.353	35.652	35.652	-0.346	0.127	2.353	2.353	0.960	**-0.721**	0.913	**0.289**	**N.L. (1)**
404.4	22.5	25						0.129	2.675	38.957	38.957	0.082	0.067	2.520	2.664	0.933	**0.166**	0.889	**0.298**	**N.L. (3)**
401.9	25	25						0.069	2.848	37.844	37.844	0.015	0.069	2.693	2.992	0.909	**0.030**	0.862	**0.303**	**N.L. (3)**
399.4	27.5	29						0.071	3.025	43.727	43.727	0.216	0.071	2.870	3.326	0.886	**0.416**	0.832	**0.305**	**N.L. (3)**
396.9	30	31						0.071	3.203	45.854	45.854	0.251	0.071	3.048	3.659	0.865	**0.470**	0.800	**0.304**	**N.L. (3)**
391.9	35	22						0.068	3.543	28.909	28.909	0.406	0.068	3.388	4.311	0.849	**0.747**	0.730	**0.294**	**N.L. (3)**
386.9	40	20						0.067	3.878	24.566	24.566	0.284	0.067	3.723	4.958	0.834	**0.513**	0.662	**0.279**	**1.839 (D)**
381.9	45	27						0.070	4.228	32.751	32.751	1.039	0.070	4.073	5.620	0.784	**1.765**	0.604	**0.264**	**N.L. (3)**
376.9	50	26						0.069	4.573	29.756	29.756	0.451	0.069	4.418	6.277	0.771	**0.755**	0.559	**0.252**	**N.L. (3)**
371.9	55	25						0.069	4.918	27.052	27.052	0.340	0.069	4.763	6.934	0.761	**0.561**	0.528	**0.243**	**N.L. (3)**
366.9	60	25						0.069	5.263	25.752	25.752	0.308	0.069	5.108	7.591	0.748	**0.499**	0.507	**0.238**	**N.L. (3)**
361.9	65	23						0.068	5.603	22.368	22.368	0.247	0.068	5.448	8.243	0.747	**0.401**	0.473	**0.226**	**1.774 (D)**
356.9	70	41						0.074	5.973	41.276	41.276	0.164	0.074	5.818	8.925	0.668	**0.237**	0.466	**0.226**	**N.L. (3)**
351.9	75	41						0.074	6.343	39.278	39.278	0.097	0.074	6.188	9.607	0.652	**0.137**	0.459	**0.226**	**N.L. (3)**
346.9	80	92						0.082	6.753	90.288	90.288	0.646	0.082	6.598	10.329	0.635	**0.890**	0.452	**0.224**	**N.L. (3)**
341.9	85	69						0.079	7.148	64.968	64.968	0.444	0.079	6.993	11.036	0.620	**0.598**	0.445	**0.222**	**N.L. (3)**
336.9	90	54						0.076	7.528	47.047	47.047	0.267	0.076	7.373	11.728	0.607	**0.352**	0.438	**0.220**	**N.L. (3)**
331.9	95	38						0.073	7.893	29.898	29.898	0.461	0.073	7.738	12.405	0.631	**0.630**	0.431	**0.219**	**N.L. (3)**
326.9	100	100						0.083	8.308	82.424	82.424	0.585	0.083	8.153	13.132	0.583	**0.740**	0.424	**0.216**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS

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

SCI Engineering, Inc
650 Pierce Blvd
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618.624.6969

SPT BASED LIQUEFACTION ANALYSIS REPORT

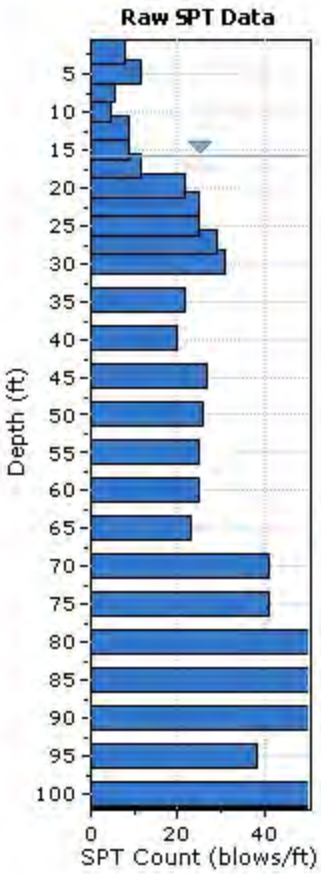
Project title : I-270 Bridge over COR

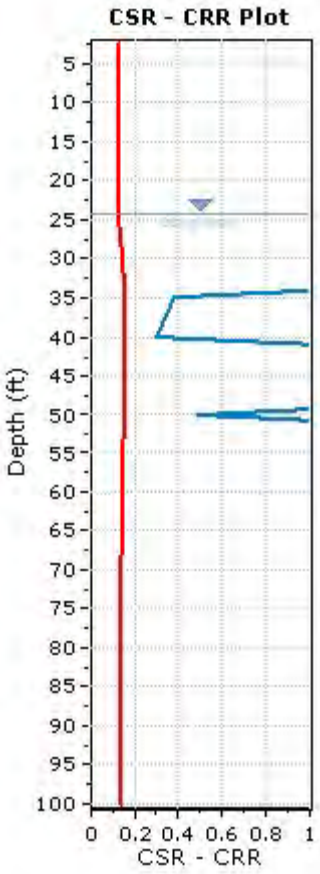
SPT Name: BB-49

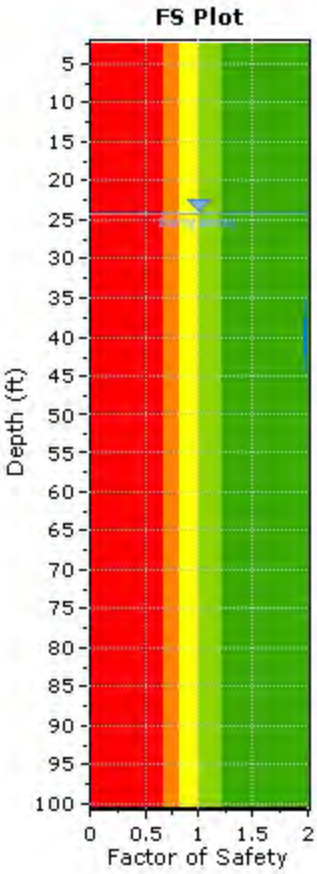
Location : Madison County, Illinois

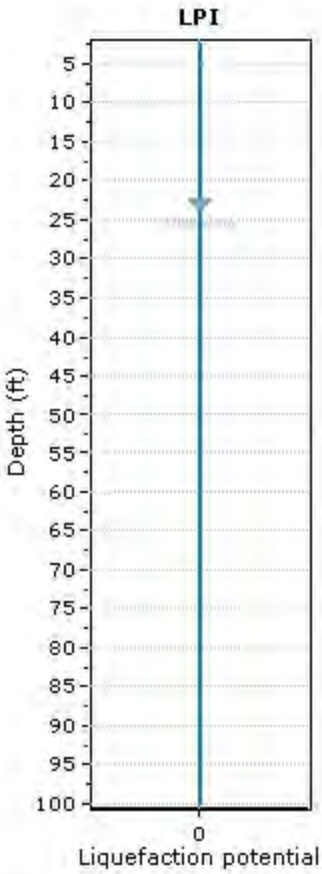
:: Input parameters and analysis properties ::

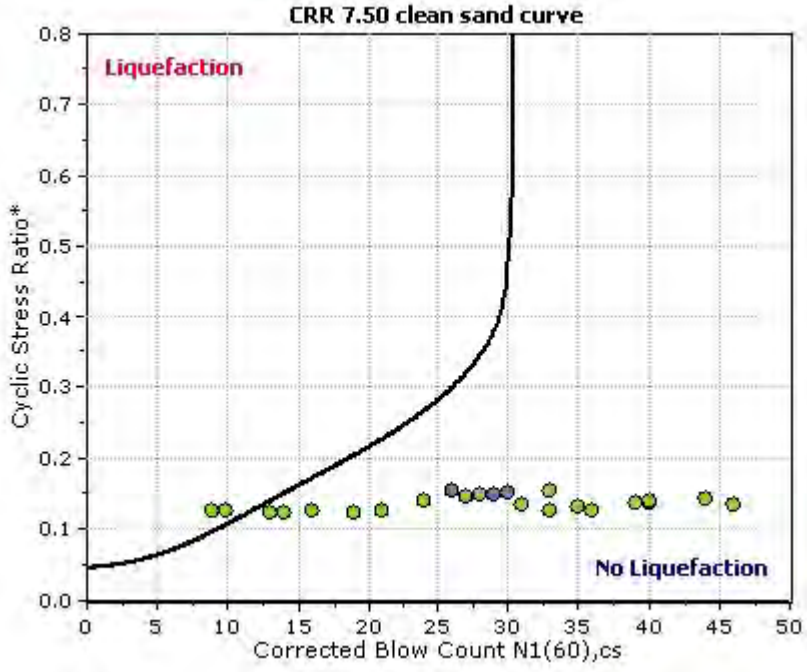
Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	24.30 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		











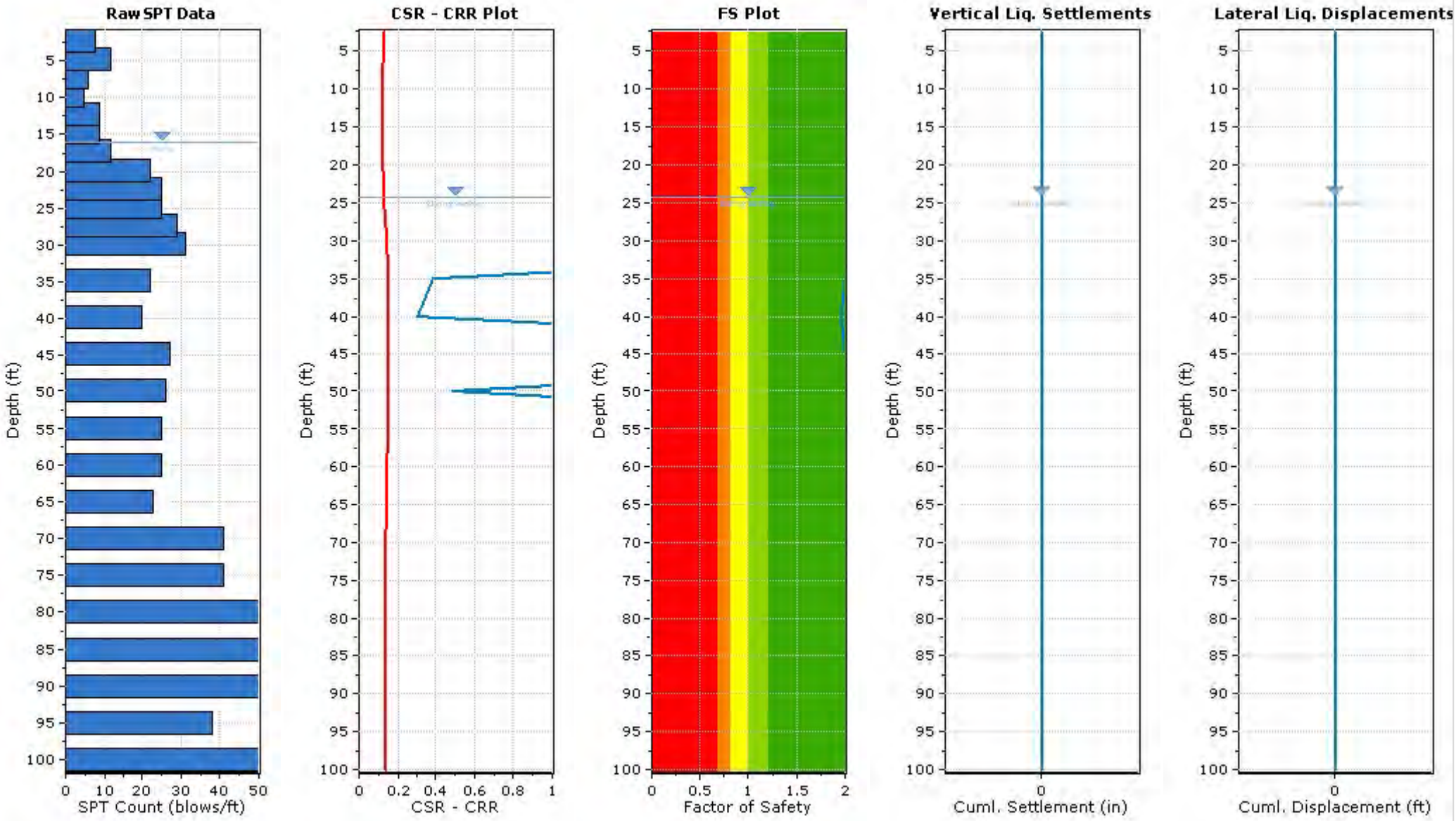
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-50
ELEVATION OF BORING GROUND SURFACE ========== 426.55 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 21.00 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 19.90 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$V_{s,40'}$ = **562** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
424.05	2.5	15						0.123	0.308	34.488	34.488	-1.800	0.123	0.308	0.308	1.500	**-5.856**	0.990	**0.313**	**N.L. (1)**
421.55	5	14						0.122	0.613	28.180	28.180	0.376	0.122	0.613	0.613	1.500	**1.223**	0.977	**0.309**	**N.L. (1)**
419.05	7.5	6						0.113	0.895	10.169	10.169	0.115	0.113	0.895	0.895	1.222	**0.304**	0.961	**0.304**	**N.L. (1)**
416.55	10	9						0.117	1.188	15.350	15.350	0.164	0.117	1.188	1.188	1.166	**0.414**	0.941	**0.298**	**N.L. (1)**
414.05	12.5	5						0.111	1.465	8.281	8.281	0.098	0.111	1.465	1.465	1.085	**0.231**	0.918	**0.291**	**N.L. (1)**
411.55	15	6						0.113	1.748	9.641	9.641	0.110	0.113	1.748	1.748	1.045	**0.249**	0.890	**0.282**	**N.L. (1)**
409.05	17.5	3						0.105	2.010	4.665	4.665	0.070	0.105	2.010	2.010	1.011	**0.153**	0.858	**0.272**	**N.L. (1)**
406.55	20	14						0.122	2.315	21.442	21.442	0.234	0.060	2.160	2.166	0.994	**0.505**	0.823	**0.261**	**1.935 (D)**
404.05	22.5	18						0.066	2.480	27.796	27.796	0.363	0.066	2.325	2.487	0.969	**0.762**	0.784	**0.265**	**N.L. (3)**
401.55	25	19						0.067	2.648	28.750	28.750	0.399	0.067	2.493	2.811	0.945	**0.818**	0.743	**0.265**	**N.L. (3)**
399.05	27.5	16						0.065	2.810	23.005	23.005	0.257	0.065	2.655	3.129	0.932	**0.520**	0.700	**0.261**	**1.992 (D)**
396.55	30	20						0.067	2.978	28.755	28.755	0.399	0.067	2.823	3.453	0.905	**0.783**	0.659	**0.255**	**N.L. (3)**
391.55	35	9						0.060	3.278	11.639	11.639	0.128	0.060	3.123	4.065	0.911	**0.253**	0.582	**0.240**	**1.054 (C)**
386.55	40	23						0.068	3.618	30.185	30.185	0.481	0.068	3.463	4.717	0.839	**0.876**	0.519	**0.224**	**N.L. (3)**
381.55	45	23						0.068	3.958	28.544	28.544	0.390	0.068	3.803	5.369	0.816	**0.691**	0.473	**0.212**	**N.L. (3)**
376.55	50	37						0.073	4.323	46.922	46.922	0.265	0.073	4.168	6.046	0.763	**0.439**	0.442	**0.203**	**N.L. (3)**
371.55	55	15						0.065	4.648	16.021	16.021	0.170	0.065	4.493	6.683	0.817	**0.302**	0.421	**0.198**	**1.525 (D)**
366.55	60	25						0.069	4.993	26.799	26.799	0.333	0.069	4.838	7.340	0.758	**0.547**	0.409	**0.196**	**N.L. (3)**
361.55	65	39						0.073	5.358	42.510	42.510	0.193	0.073	5.203	8.017	0.698	**0.292**	0.389	**0.190**	**N.L. (3)**
356.55	70	40						0.074	5.728	41.497	41.497	0.169	0.074	5.573	8.699	0.679	**0.249**	0.382	**0.189**	**N.L. (3)**
351.55	75	13						0.063	6.043	11.667	11.667	0.128	0.063	5.888	9.326	0.781	**0.217**	0.375	**0.188**	**1.154 (C)**
346.55	80	50						0.076	6.423	49.313	49.313	0.295	0.076	6.268	10.018	0.648	**0.415**	0.368	**0.186**	**N.L. (3)**
341.55	85	47						0.075	6.798	43.604	43.604	0.214	0.075	6.643	10.705	0.633	**0.294**	0.361	**0.184**	**N.L. (3)**
336.55	90	45						0.075	7.173	39.531	39.531	0.107	0.075	7.018	11.392	0.620	**0.144**	0.354	**0.182**	**N.L. (3)**
331.55	95	50						0.076	7.553	42.790	42.790	0.198	0.076	7.398	12.084	0.607	**0.261**	0.347	**0.179**	**N.L. (3)**
330.55	96	100						0.083	7.636	89.442	89.442	0.640	0.083	7.481	12.229	0.604	**0.838**	0.345	**0.179**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS

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

SCI Engineering, Inc
650 Pierce Blvd
O Fallon, IL 62293
618.624.6969

SPT BASED LIQUEFACTION ANALYSIS REPORT

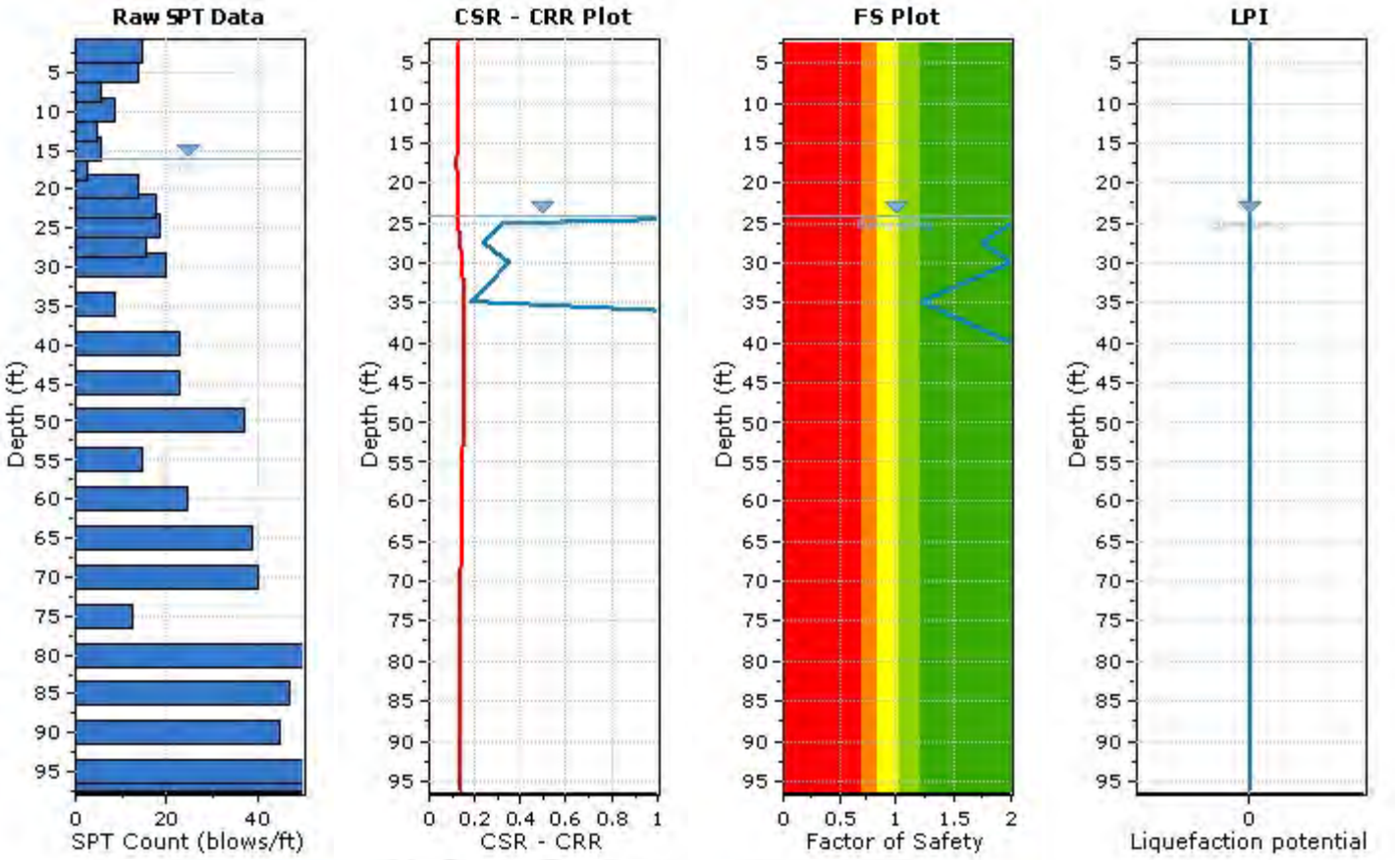
Project title : I-270 Bridge over COR

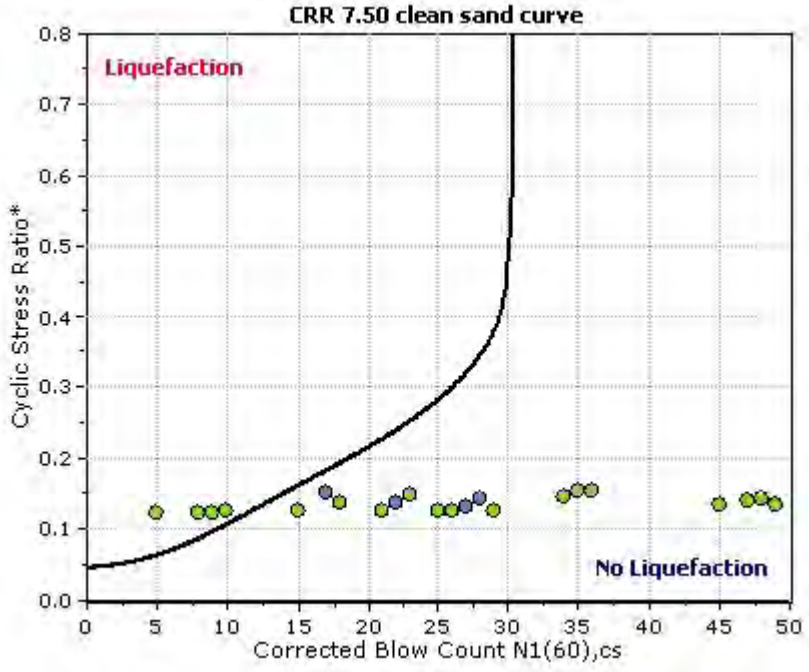
SPT Name: BB-50

Location : Madison County, Illinois

:: Input parameters and analysis properties ::

Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	24.00 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		





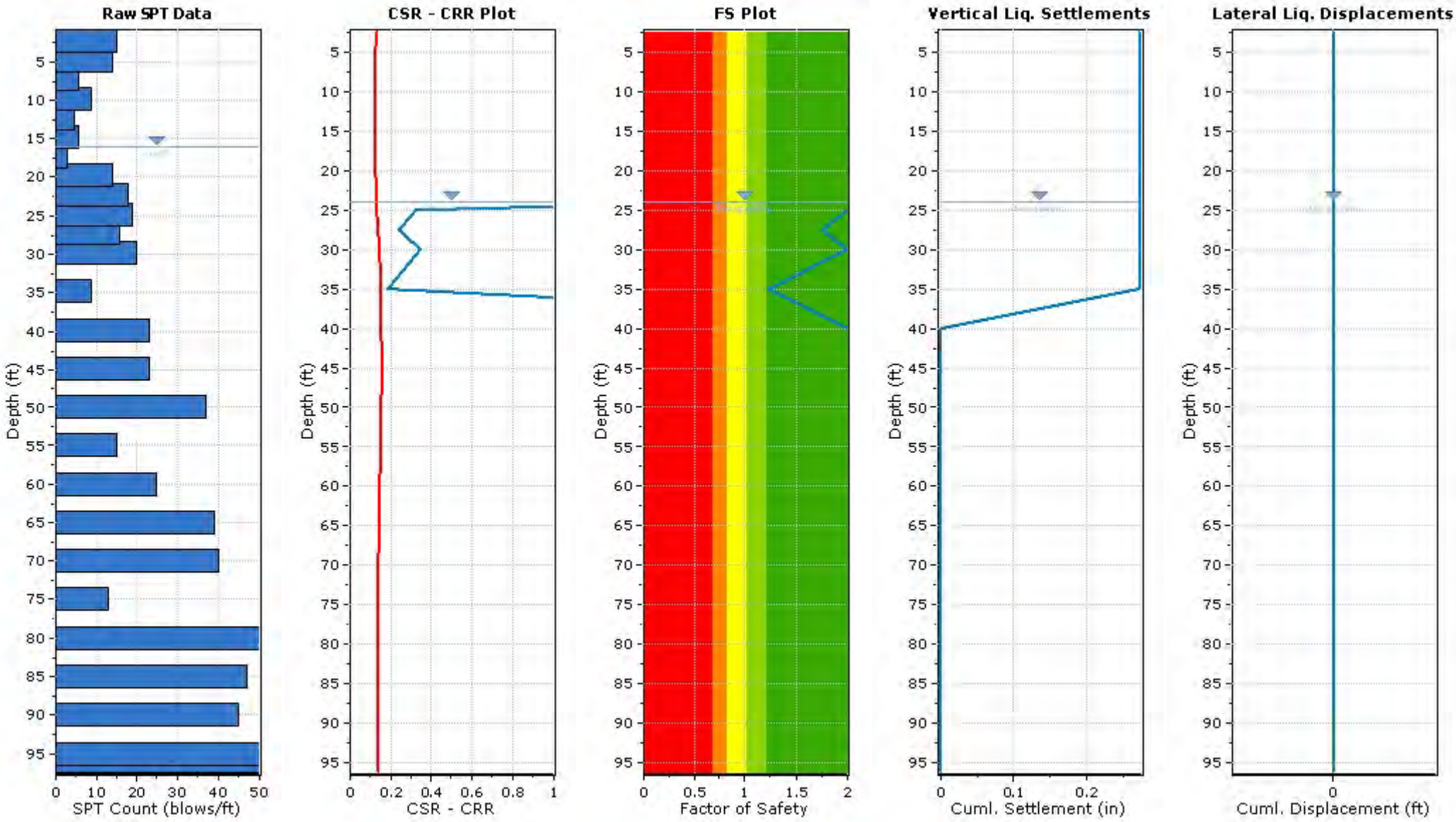
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-52
ELEVATION OF BORING GROUND SURFACE ========== 415.20 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 12.00 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 8.40 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$\bar{V}_{s,40'}$ = **481** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
412.7	2.5	18	1.8					0.128	0.320	42.786	42.786	0.198	0.128	0.320	0.320	1.500	**0.645**	0.979	**0.310**	**N.L. (1)**
410.2	5	12	0.9					0.120	0.620	23.498	23.498	0.265	0.120	0.620	0.620	1.475	**0.847**	0.954	**0.302**	**N.L. (1)**
407.7	7.5	3	0.2					0.104	0.880	5.107	5.107	0.073	0.104	0.880	0.880	1.193	**0.189**	0.923	**0.292**	**N.L. (1)**
405.2	10	2		90	13	25		0.101	1.133	3.423	9.108	0.105	0.039	0.978	1.077	1.191	**0.272**	0.888	**0.310**	**N.L. (2)**
402.7	12.5	1	0.3	90	13	25	36	0.046	1.248	1.751	7.101	0.088	0.046	1.093	1.348	1.152	**0.221**	0.848	**0.331**	**N.L. (2)**
400.2	15	3	0.2	83	13	25	36	0.042	1.353	5.309	11.371	0.125	0.042	1.198	1.609	1.147	**0.312**	0.804	**0.342**	**N.L. (2)**
397.7	17.5	12						0.063	1.510	21.689	21.689	0.238	0.063	1.355	1.923	1.146	**0.591**	0.757	**0.340**	**1.738 (D)**
395.2	20	17						0.066	1.675	31.401	31.401	0.613	0.066	1.520	2.244	1.129	**1.501**	0.708	**0.331**	**N.L. (3)**
392.7	22.5	19						0.067	1.843	34.610	34.610	-1.387	0.067	1.688	2.567	1.092	**-3.285**	0.658	**0.317**	**N.L. (3)**
390.2	25	14						0.064	2.003	23.630	23.630	0.267	0.064	1.848	2.883	1.045	**0.605**	0.610	**0.302**	**2.003 (D)**
387.7	27.5	15						0.065	2.165	24.719	24.719	0.286	0.065	2.010	3.202	1.017	**0.632**	0.565	**0.285**	**2.218 (D)**
385.2	30	25						0.069	2.338	43.089	43.089	0.204	0.069	2.183	3.530	0.988	**0.438**	0.524	**0.268**	**N.L. (3)**
380.2	35	22						0.068	2.678	34.503	34.503	-1.737	0.068	2.523	4.182	0.935	**-3.524**	0.456	**0.239**	**N.L. (3)**
375.2	40	17						0.066	3.008	24.102	24.102	0.275	0.066	2.853	4.824	0.909	**0.543**	0.407	**0.218**	**2.491 (D)**
370.2	45	16						0.065	3.333	21.252	21.252	0.232	0.065	3.178	5.461	0.885	**0.445**	0.374	**0.203**	**2.192 (D)**
365.2	50	8						0.059	3.628	9.923	9.923	0.112	0.059	3.473	6.068	0.892	**0.218**	0.352	**0.195**	**1.118 (C)**
360.2	55	8						0.059	3.923	9.503	9.503	0.109	0.059	3.768	6.675	0.877	**0.207**	0.339	**0.190**	**1.089 (C)**
355.2	60	9						0.060	4.223	10.236	10.236	0.115	0.060	4.068	7.287	0.859	**0.215**	0.331	**0.188**	**1.144 (C)**
350.2	65	15						0.065	4.548	16.289	16.289	0.173	0.065	4.393	7.924	0.821	**0.309**	0.319	**0.182**	**1.698 (D)**
345.2	70	11						0.062	4.858	11.447	11.447	0.126	0.062	4.703	8.546	0.826	**0.226**	0.312	**0.179**	**1.263 (C)**
340.2	75	66						0.078	5.248	77.147	77.147	0.543	0.078	5.093	9.248	0.704	**0.830**	0.305	**0.175**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS

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

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SPT BASED LIQUEFACTION ANALYSIS REPORT

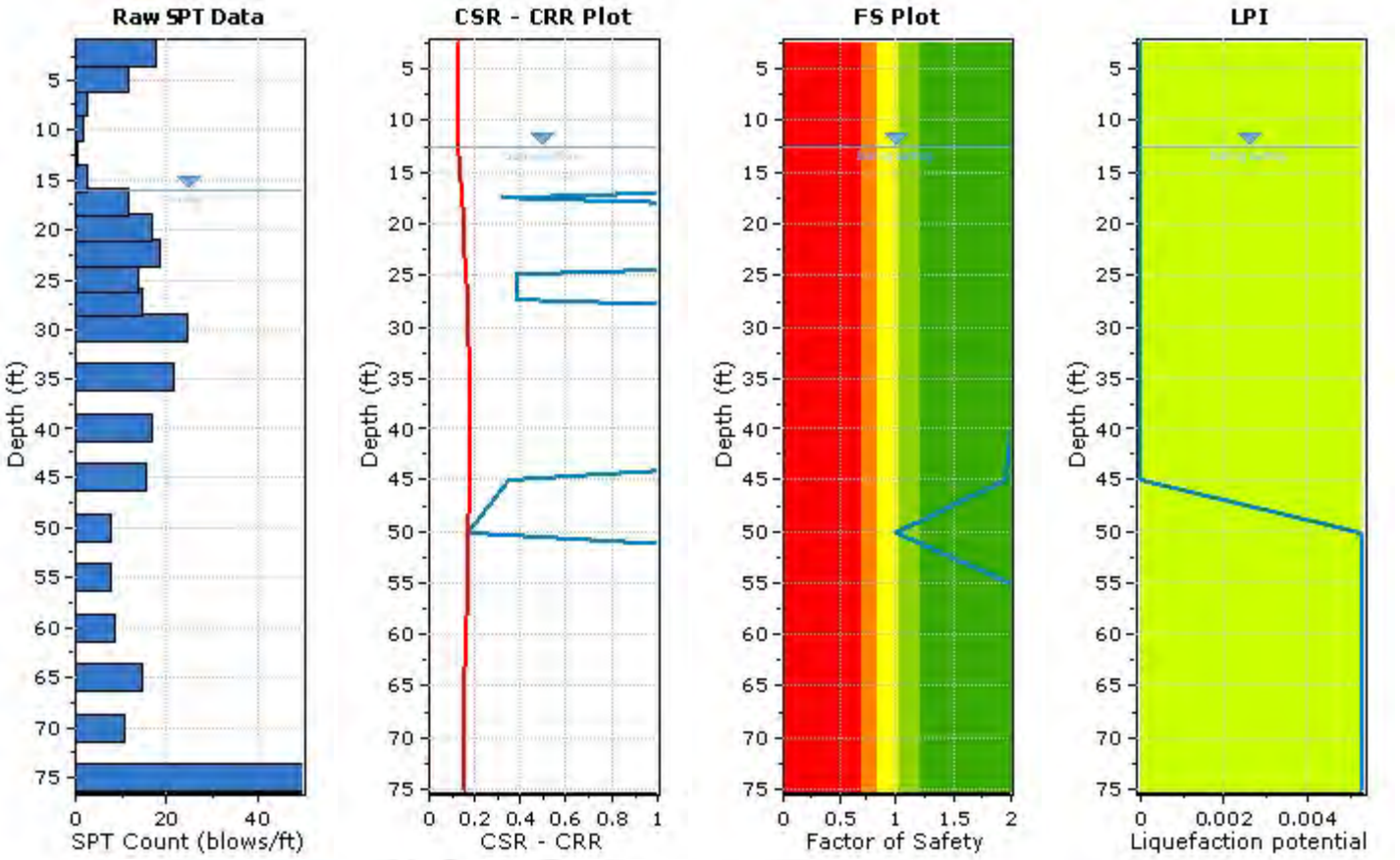
Project title : I-270 Bridge over COR

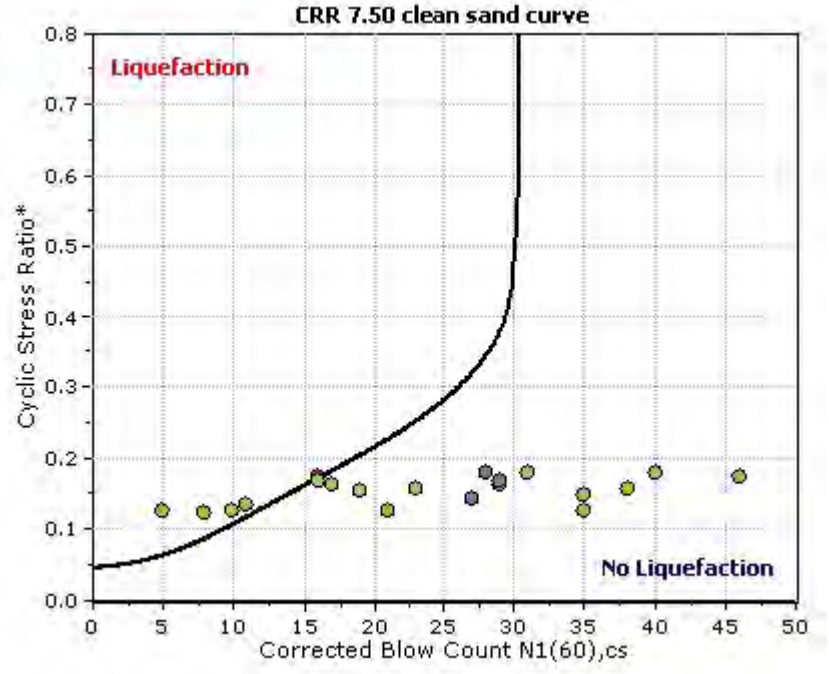
SPT Name: BB-52

Location : Madison County, Illinois

:: Input parameters and analysis properties ::

Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	12.60 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		





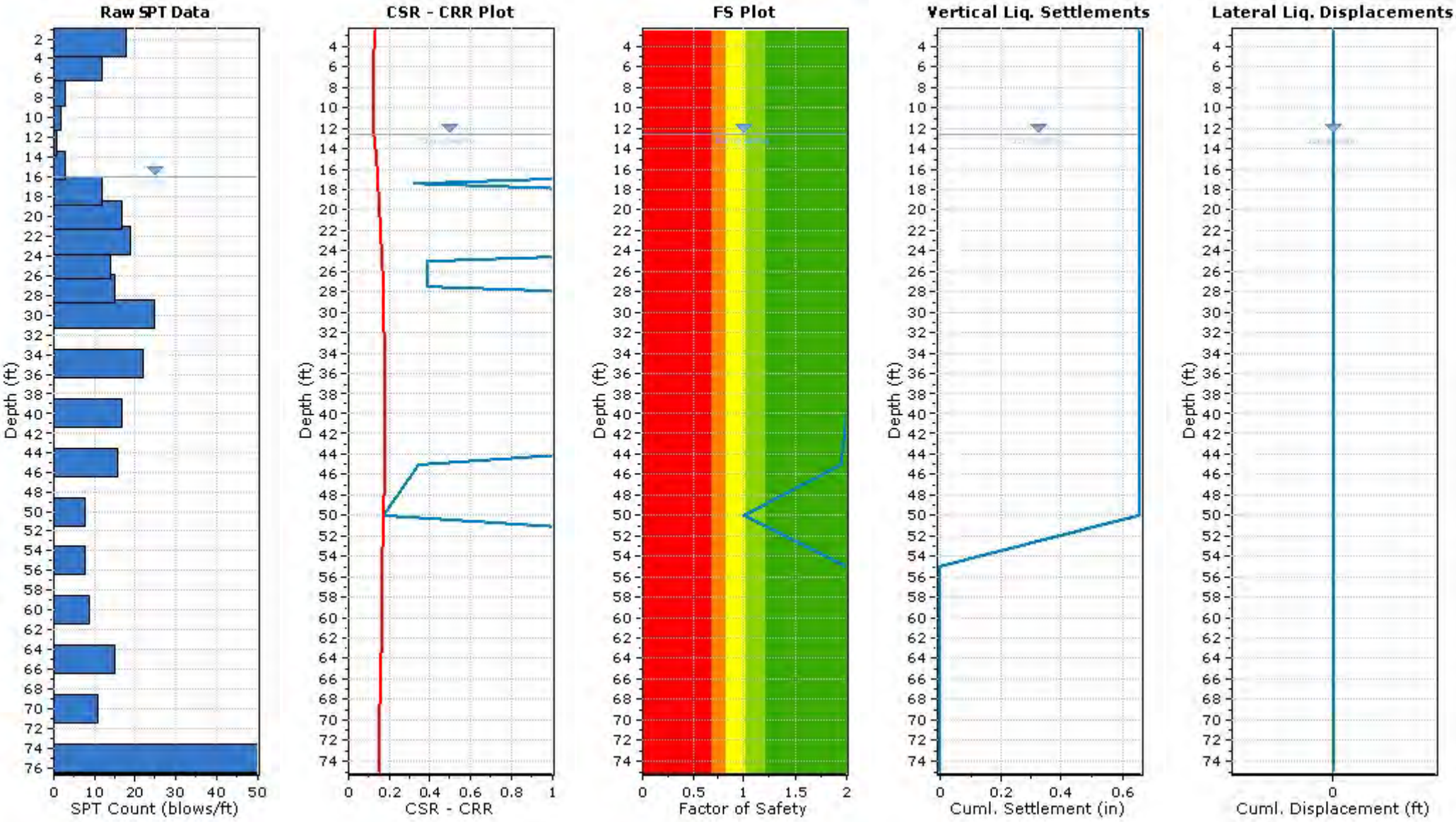
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-53
ELEVATION OF BORING GROUND SURFACE ========== 414.90 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 8.50 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 8.20 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$\bar{V}_{s,40'}$ = **533** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING						CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
412.4	2.5	44	0.8					0.119	0.298	######	105.975	0.766	0.119	0.298	0.298	1.500	**2.493**	0.987	**0.312**	**N.L. (1)**
409.9	5	11	2.5					0.133	0.630	21.194	21.194	0.231	0.133	0.630	0.630	1.442	**0.722**	0.970	**0.307**	**N.L. (1)**
407.4	7.5	7	1.5					0.126	0.945	11.694	11.694	0.128	0.126	0.945	0.945	1.216	**0.339**	0.950	**0.301**	**N.L. (1)**
404.9	10	3	1.2	90	15	25	43	0.061	1.098	5.184	11.221	0.124	0.061	1.098	1.210	1.171	**0.315**	0.925	**0.323**	**N.L. (2)**
402.4	12.5	4	0.5	90	13	25	43	0.051	1.225	7.047	13.456	0.145	0.051	1.225	1.493	1.149	**0.361**	0.896	**0.346**	**N.L. (2)**
399.9	15	3	0.2	90	13	25	40	0.042	1.330	5.340	11.408	0.126	0.042	1.330	1.754	1.119	**0.305**	0.863	**0.361**	**N.L. (2)**
397.4	17.5	10	0.2	50	7	15	40	0.042	1.435	18.077	26.693	0.330	0.042	1.435	2.015	1.140	**0.816**	0.826	**0.367**	**2.223 (D)**
394.9	20	12						0.063	1.593	21.606	21.606	0.236	0.063	1.593	2.329	1.091	**0.559**	0.785	**0.364**	**1.536 (D)**
392.4	22.5	17						0.066	1.758	31.114	31.114	0.572	0.066	1.758	2.650	1.071	**1.329**	0.742	**0.354**	**N.L. (3)**
389.9	25	19						0.067	1.925	34.186	34.186	-5.141	0.067	1.925	2.973	1.038	**-11.569**	0.697	**0.341**	**N.L. (3)**
387.4	27.5	15						0.065	2.088	25.187	25.187	0.296	0.065	2.088	3.292	1.005	**0.644**	0.653	**0.326**	**N.L. (3)**
384.9	30	16						0.065	2.250	26.194	26.194	0.318	0.065	2.250	3.610	0.980	**0.676**	0.611	**0.310**	**N.L. (3)**
379.9	35	18						0.066	2.580	27.981	27.981	0.369	0.066	2.580	4.252	0.935	**0.748**	0.536	**0.279**	**N.L. (3)**
374.9	40	8		10				0.059	2.875	11.184	12.295	0.134	0.059	2.875	4.859	0.928	**0.270**	0.477	**0.255**	**1.059 (C)**
369.9	45	12						0.063	3.190	15.944	15.944	0.170	0.063	3.190	5.486	0.896	**0.330**	0.436	**0.237**	**1.392 (D)**
364.9	50	8		10				0.059	3.485	10.157	11.246	0.124	0.059	3.485	6.093	0.888	**0.239**	0.409	**0.226**	**1.058 (C)**
359.9	55	29		10				0.071	3.840	38.441	40.142	0.130	0.071	3.840	6.760	0.789	**0.222**	0.391	**0.218**	**N.L. (3)**
354.9	60	10		10				0.061	4.145	11.505	12.623	0.137	0.061	4.145	7.377	0.847	**0.252**	0.380	**0.214**	**1.178 (C)**
349.9	65	28						0.070	4.495	33.015	33.015	1.255	0.070	4.495	8.039	0.754	**2.053**	0.363	**0.206**	**N.L. (3)**
344.9	70	19						0.067	4.830	20.209	20.209	0.218	0.067	4.830	8.686	0.784	**0.371**	0.356	**0.203**	**1.828 (D)**
339.9	75	29						0.071	5.185	30.886	30.886	0.545	0.071	5.185	9.353	0.723	**0.856**	0.349	**0.200**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS

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

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SPT BASED LIQUEFACTION ANALYSIS REPORT

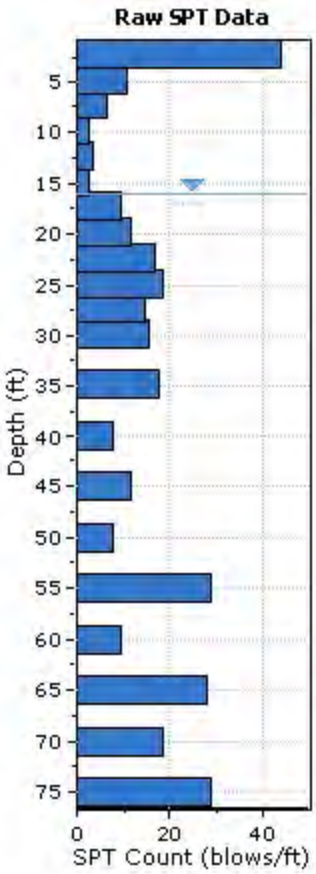
Project title : I-270 Bridge over COR

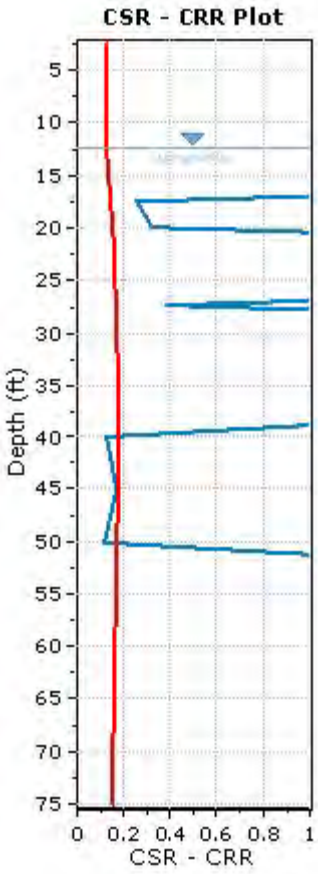
SPT Name: BB-53

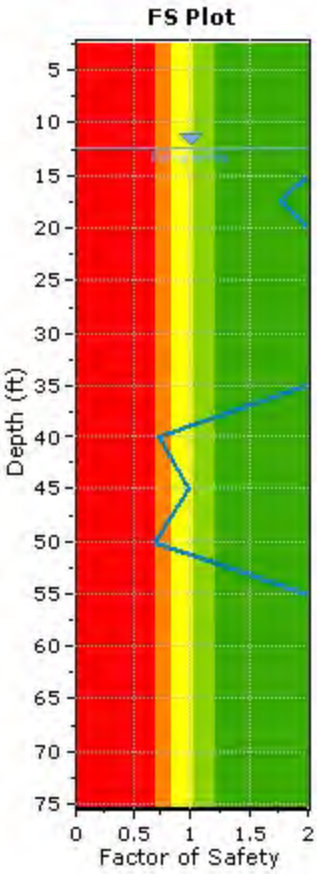
Location : Madison County, Illinois

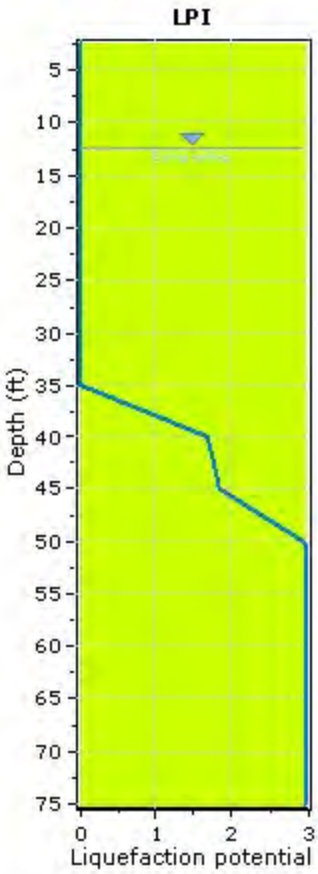
:: Input parameters and analysis properties ::

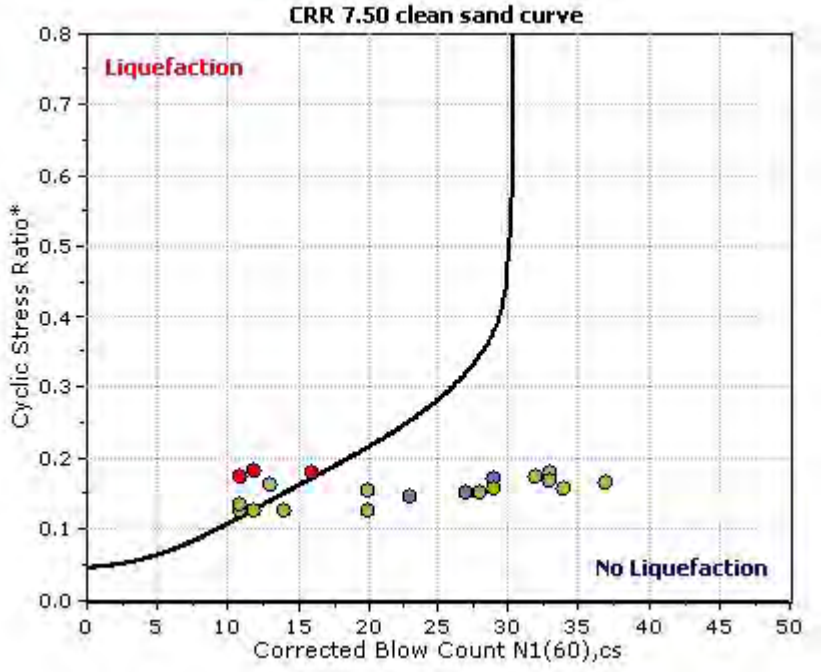
Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	12.30 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		











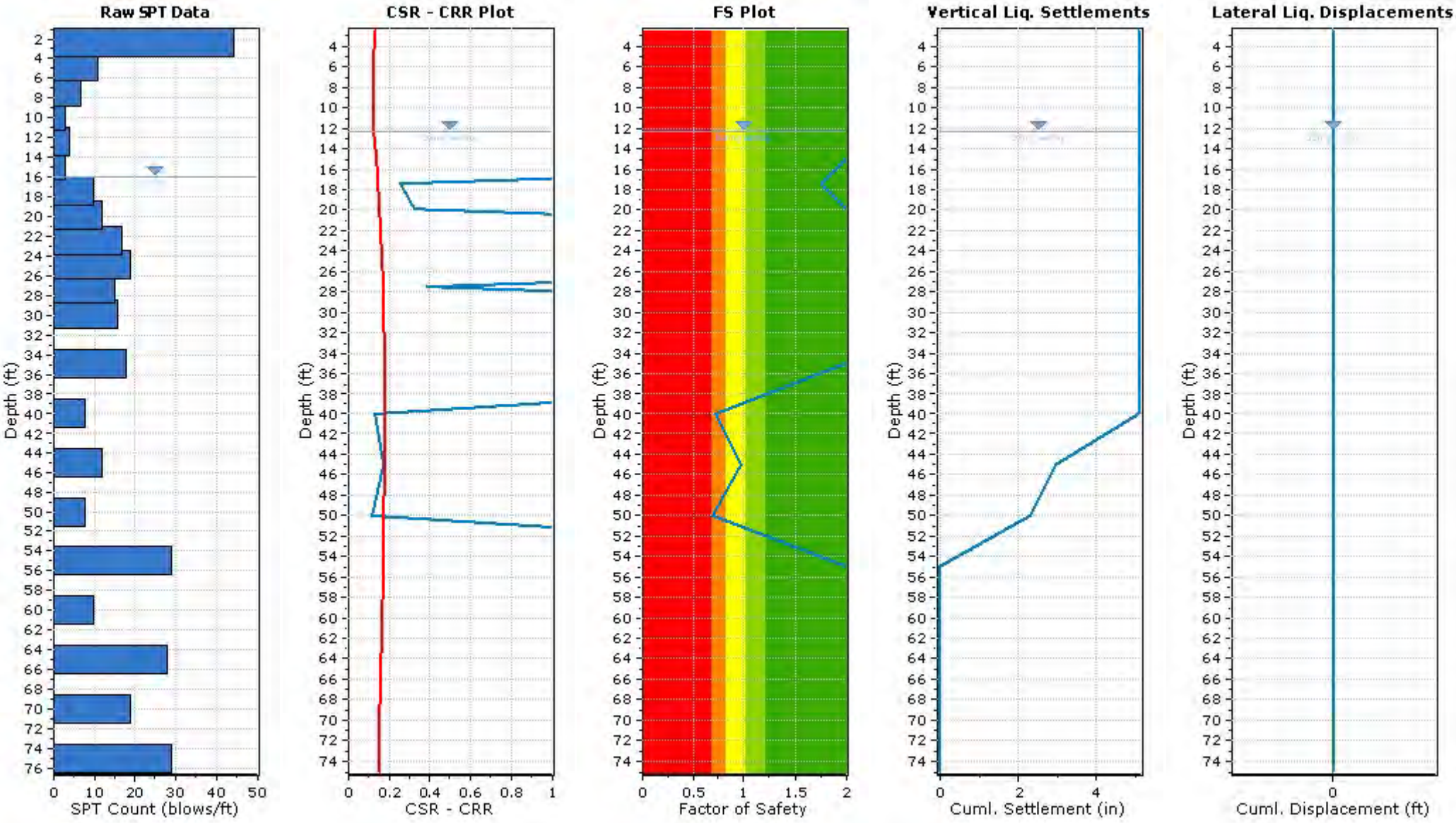
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-54
ELEVATION OF BORING GROUND SURFACE ========== 413.70 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 8.50 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 7.00 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$\bar{V}_{s,40'}$ = **442** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
411.2	2.5	12	3.9					0.138	0.345	26.103	26.103	0.316	0.138	0.345	0.345	1.500	**1.027**	0.971	**0.308**	**N.L. (1)**
408.7	5	11	3.1					0.135	0.683	20.802	20.802	0.226	0.135	0.683	0.683	1.403	**0.687**	0.937	**0.297**	**N.L. (1)**
406.2	7.5	5	0.8	90	13	25	20	0.119	0.980	8.270	14.924	0.159	0.057	0.825	0.856	1.281	**0.443**	0.898	**0.295**	**N.L. (2)**
403.7	10	7						0.058	1.125	12.006	12.006	0.131	0.058	0.970	1.157	1.210	**0.344**	0.854	**0.322**	**1.068 (D)**
401.2	12.5	4		95	13	25	42	0.053	1.258	6.987	13.384	0.144	0.053	1.103	1.446	1.180	**0.369**	0.805	**0.334**	**N.L. (2)**
398.7	15	1		95	13	25	34	0.043	1.365	1.764	7.117	0.089	0.043	1.210	1.709	1.127	**0.217**	0.753	**0.337**	**N.L. (2)**
396.2	17.5	2		95	13	25	37	0.048	1.485	3.516	9.219	0.106	0.048	1.330	1.985	1.111	**0.256**	0.699	**0.330**	**N.L. (2)**
393.7	20	2		95	13	25	33	0.048	1.605	3.479	9.174	0.106	0.048	1.450	2.261	1.090	**0.250**	0.645	**0.319**	**N.L. (2)**
391.2	22.5	16						0.065	1.768	28.939	28.939	0.407	0.065	1.613	2.580	1.100	**0.972**	0.594	**0.301**	**N.L. (3)**
388.7	25	13						0.063	1.925	22.168	22.168	0.244	0.063	1.770	2.893	1.057	**0.560**	0.545	**0.282**	**1.986 (D)**
386.2	27.5	14						0.064	2.085	23.316	23.316	0.262	0.064	1.930	3.209	1.030	**0.585**	0.502	**0.264**	**2.216 (D)**
383.7	30	19						0.067	2.253	31.872	31.872	0.701	0.067	2.098	3.533	1.004	**1.527**	0.463	**0.247**	**N.L. (3)**
378.7	35	14						0.064	2.573	21.117	21.117	0.230	0.064	2.418	4.165	0.961	**0.479**	0.401	**0.219**	**2.187 (D)**
373.7	40	27						0.070	2.923	41.853	41.853	0.178	0.070	2.768	4.827	0.899	**0.347**	0.359	**0.198**	**N.L. (3)**
368.7	45	17						0.066	3.253	23.091	23.091	0.258	0.066	3.098	5.469	0.888	**0.498**	0.331	**0.185**	**2.692 (D)**
363.7	50	12						0.063	3.568	15.030	15.030	0.160	0.063	3.413	6.096	0.882	**0.307**	0.314	**0.178**	**1.725 (D)**
358.7	55	12						0.063	3.883	14.343	14.343	0.154	0.063	3.728	6.723	0.864	**0.288**	0.303	**0.173**	**1.665 (D)**
353.7	60	13						0.063	4.198	14.840	14.840	0.158	0.063	4.043	7.350	0.845	**0.290**	0.297	**0.171**	**1.696 (D)**
348.7	65	16						0.065	4.523	17.525	17.525	0.187	0.065	4.368	7.987	0.818	**0.331**	0.287	**0.166**	**1.994 (D)**
343.7	70	23						0.068	4.863	24.892	24.892	0.290	0.068	4.708	8.639	0.772	**0.485**	0.280	**0.163**	**2.975 (D)**
338.7	75	21						0.068	5.203	21.393	21.393	0.234	0.068	5.048	9.291	0.769	**0.390**	0.273	**0.159**	**2.453 (D)**

* FACTOR OF SAFETY DESCRIPTIONS

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

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650 Pierce Blvd
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618.624.6969

SPT BASED LIQUEFACTION ANALYSIS REPORT

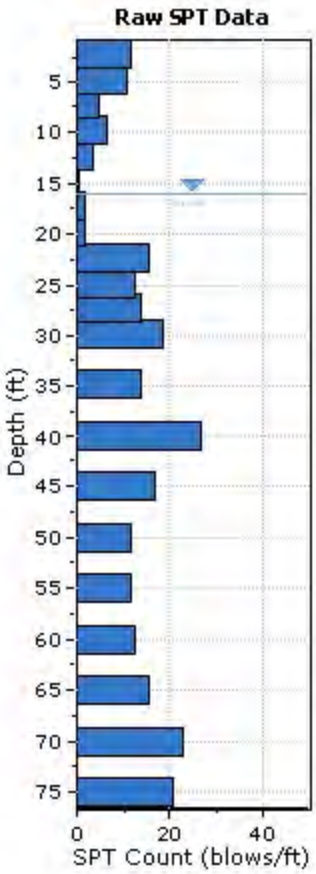
Project title : I-270 Bridge over COR

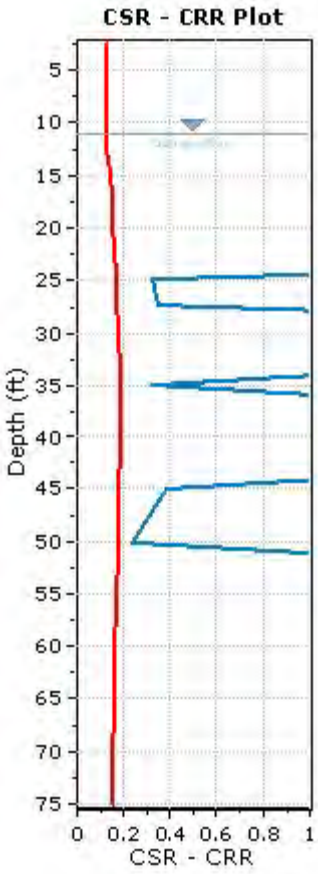
SPT Name: BB-54

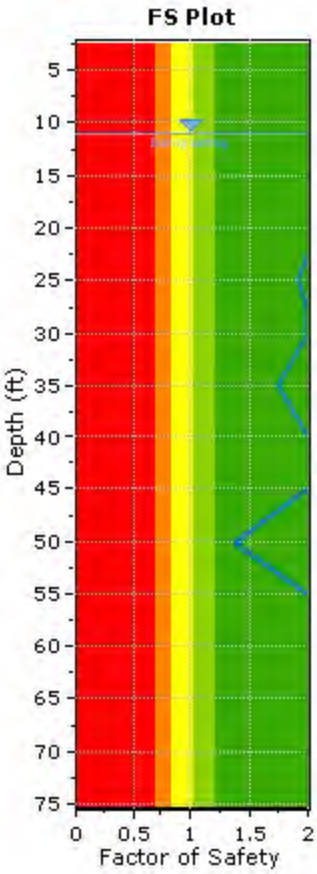
Location : Madison County, Illinois

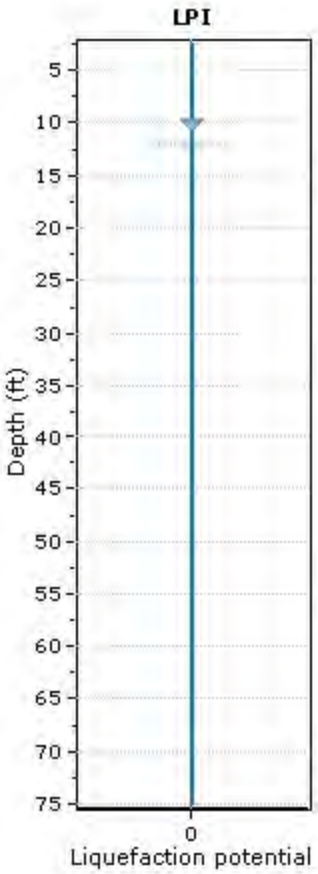
:: Input parameters and analysis properties ::

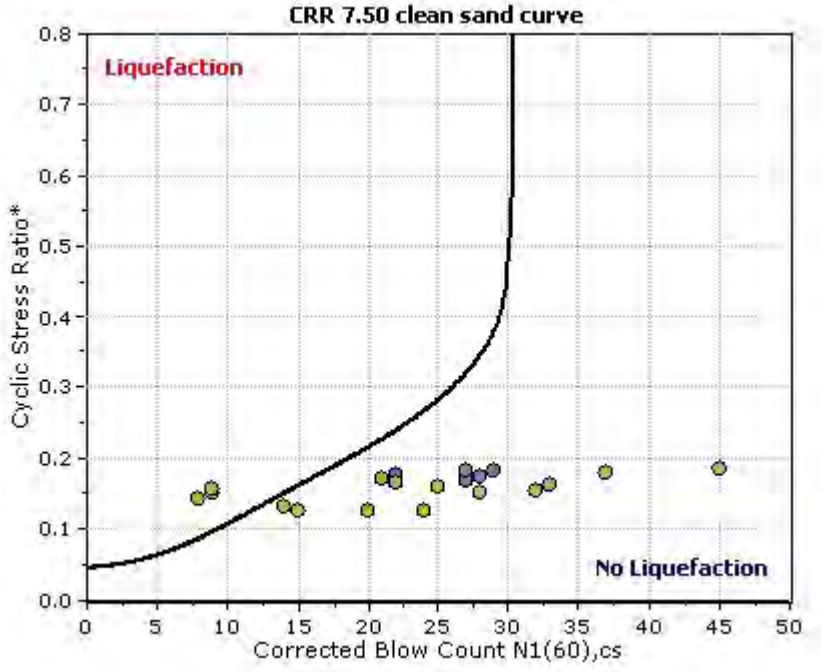
Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	11.10 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		











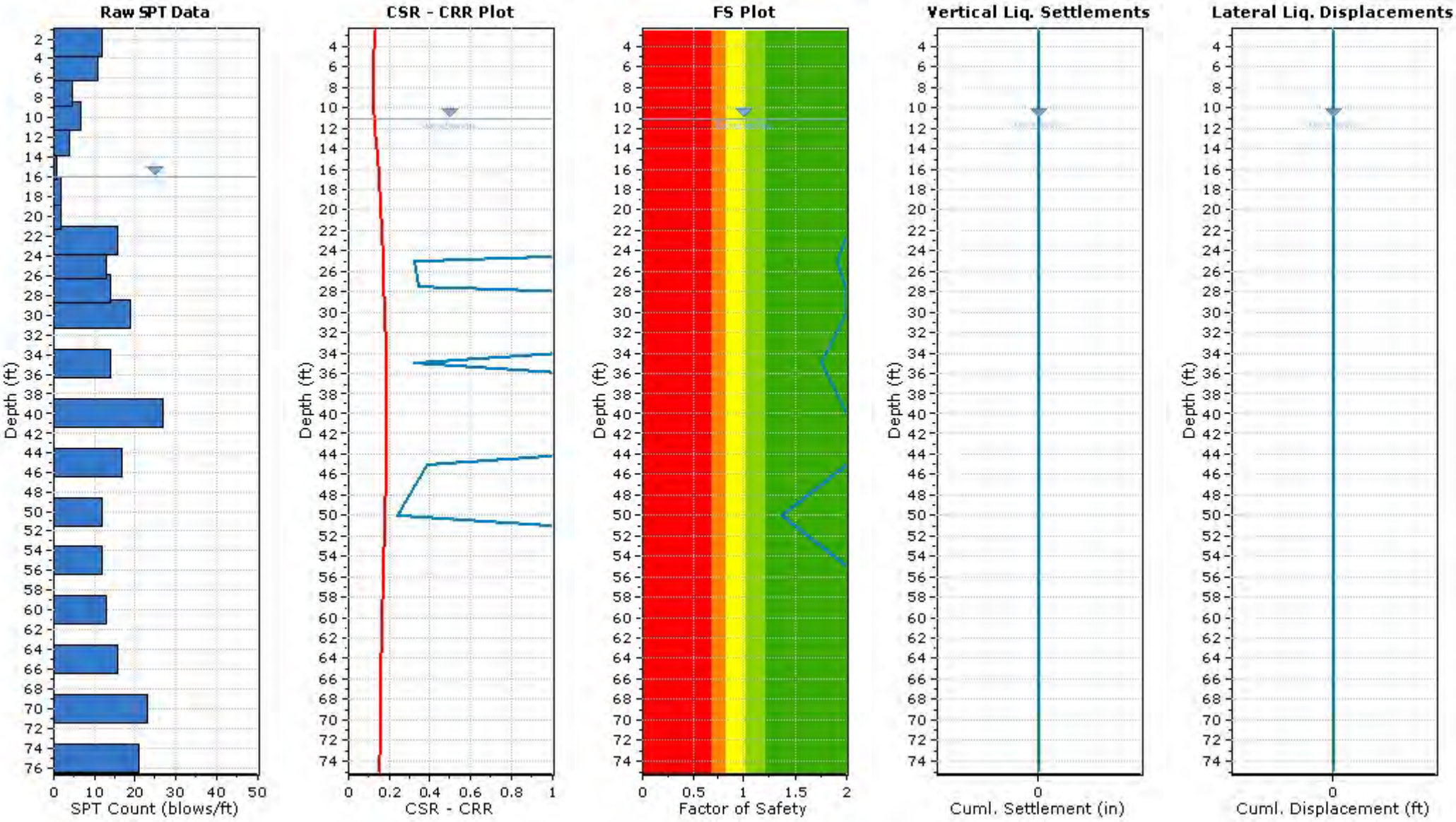
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-55
ELEVATION OF BORING GROUND SURFACE ========== 410.90 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 8.30 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 4.20 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$\bar{V}_{s,40'}$ = **625** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING						CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
408.4	2.5	8	1.5					0.126	0.315	16.653	16.653	0.177	0.126	0.315	0.315	1.500	**0.576**	0.994	**0.315**	**N.L. (1)**
405.9	5	9						0.117	0.608	17.037	17.037	0.181	0.055	0.453	0.502	1.500	**0.590**	0.987	**0.347**	**1.700 (D)**
403.4	7.5	7	0.4	90	15	25	24	0.111	0.885	11.899	19.278	0.207	0.049	0.575	0.781	1.459	**0.654**	0.978	**0.420**	**N.L. (2)**
400.9	10	13						0.063	1.043	24.241	24.241	0.278	0.063	0.733	1.094	1.406	**0.847**	0.966	**0.457**	**1.853 (D)**
398.4	12.5	14						0.064	1.203	26.487	26.487	0.325	0.064	0.893	1.410	1.336	**0.941**	0.952	**0.476**	**N.L. (3)**
395.9	15	15						0.065	1.365	28.361	28.361	0.383	0.065	1.055	1.729	1.273	**1.057**	0.934	**0.485**	**N.L. (3)**
393.4	17.5	9		4				0.060	1.515	15.752	15.752	0.168	0.060	1.205	2.035	1.163	**0.423**	0.914	**0.489**	**0.865 (D)**
390.9	20	9		4				0.060	1.665	15.430	15.430	0.164	0.060	1.355	2.341	1.126	**0.402**	0.889	**0.486**	**0.827 (D)**
388.4	22.5	15		20				0.065	1.828	26.460	32.177	0.782	0.065	1.518	2.659	1.132	**1.920**	0.861	**0.478**	**N.L. (3)**
385.9	25	18		20				0.066	1.993	31.552	37.673	0.002	0.066	1.683	2.980	1.097	**0.005**	0.829	**0.465**	**N.L. (3)**
383.4	27.5	13		20				0.063	2.150	21.128	26.421	0.323	0.063	1.840	3.294	1.048	**0.735**	0.795	**0.451**	**1.630 (D)**
380.9	30	13		20				0.063	2.308	20.472	25.713	0.307	0.063	1.998	3.607	1.020	**0.678**	0.758	**0.434**	**1.562 (D)**
375.9	35	17						0.066	2.638	25.891	25.891	0.311	0.066	2.328	4.249	0.970	**0.653**	0.684	**0.396**	**N.L. (3)**
370.9	40	21						0.068	2.978	30.840	30.840	0.540	0.068	2.668	4.901	0.920	**1.079**	0.616	**0.359**	**N.L. (3)**
365.9	45	3		23				0.051	3.233	3.957	8.412	0.099	0.051	2.923	5.468	0.931	**0.201**	0.561	**0.332**	**0.605 (C)**
360.9	50	10		23				0.061	3.538	12.587	17.908	0.191	0.061	3.228	6.085	0.889	**0.368**	0.520	**0.311**	**1.183 (D)**
355.9	55	16		23				0.065	3.863	19.471	25.482	0.302	0.065	3.553	6.722	0.844	**0.552**	0.493	**0.295**	**1.871 (D)**
350.9	60	11		23				0.062	4.173	12.604	17.927	0.191	0.062	3.863	7.344	0.845	**0.350**	0.474	**0.286**	**1.224 (C)**
345.9	65	25						0.069	4.518	28.878	28.878	0.405	0.069	4.208	8.001	0.787	**0.691**	0.446	**0.268**	**N.L. (3)**
340.9	70	21						0.068	4.858	22.495	22.495	0.249	0.068	4.548	8.653	0.790	**0.427**	0.439	**0.264**	**1.617 (D)**
335.9	75	82						0.081	5.263	95.665	95.665	0.687	0.081	4.953	9.370	0.712	**1.062**	0.432	**0.259**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS

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

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SPT BASED LIQUEFACTION ANALYSIS REPORT

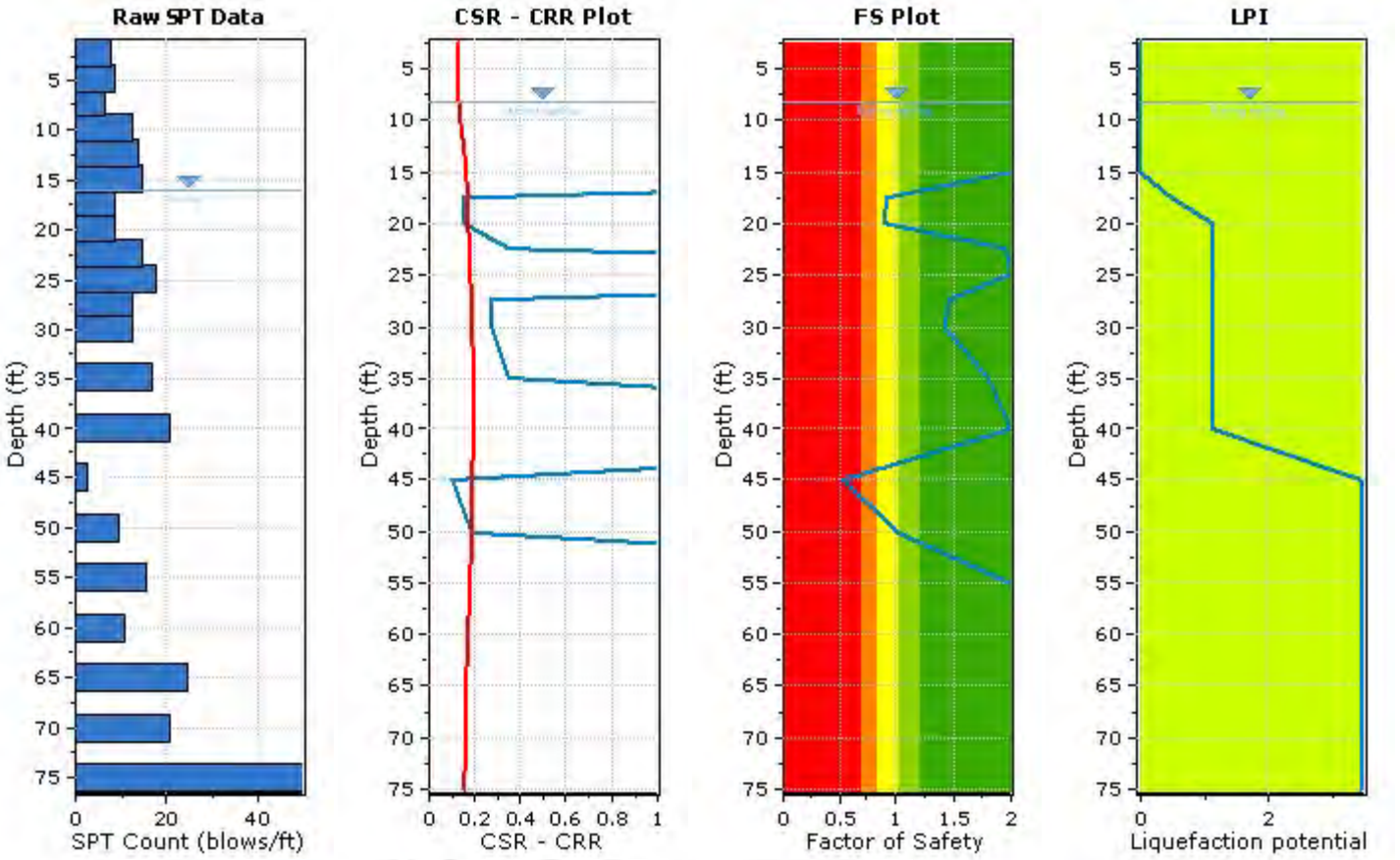
Project title : I-270 Bridge over COR

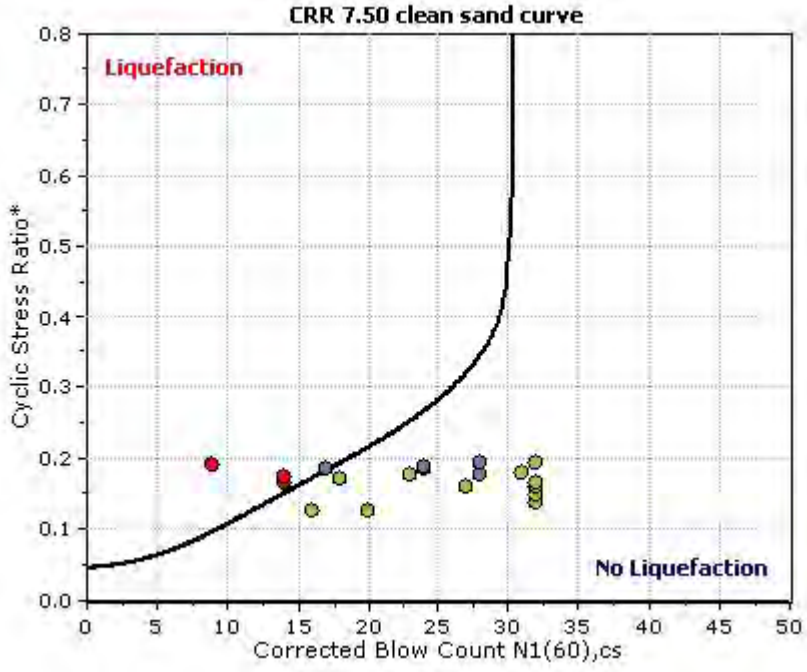
SPT Name: BB-55

Location : Madison County, Illinois

:: Input parameters and analysis properties ::

Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	8.30 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		





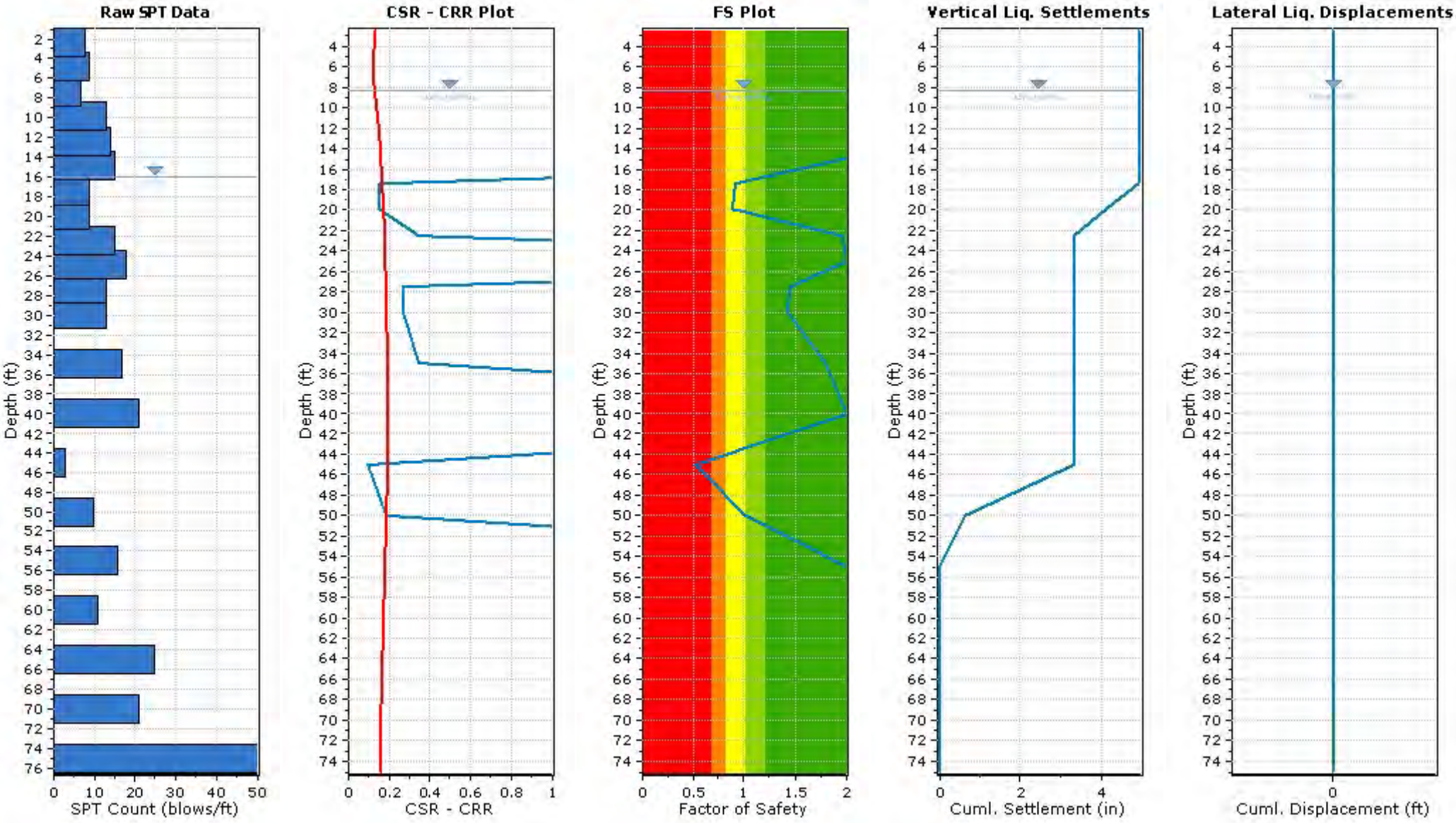
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-56
ELEVATION OF BORING GROUND SURFACE ========== 414.00 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 8.30 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 7.30 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$\bar{V}_{s,40'}$ = **551** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
411.5	2.5	9	0.2					0.104	0.260	19.427	19.427	0.208	0.104	0.260	0.260	1.500	**0.678**	0.989	**0.313**	**N.L. (1)**
409	5	7	2.5					0.133	0.593	12.972	12.972	0.140	0.133	0.593	0.593	1.375	**0.419**	0.974	**0.308**	**N.L. (1)**
406.5	7.5	4	0.1	90	15	25	25	0.098	0.838	6.895	13.274	0.143	0.036	0.683	0.695	1.331	**0.413**	0.957	**0.308**	**N.L. (2)**
404	10	9	0.2	90	15	25	34	0.042	0.943	16.545	24.854	0.289	0.042	0.788	0.956	1.379	**0.864**	0.936	**0.360**	**N.L. (2)**
401.5	12.5	11						0.062	1.098	20.803	20.803	0.226	0.062	0.943	1.267	1.274	**0.624**	0.910	**0.387**	**1.612 (D)**
399	15	6		92.8				0.057	1.240	10.934	18.121	0.193	0.057	1.085	1.565	1.208	**0.506**	0.881	**0.402**	**1.259 (D)**
396.5	17.5	12						0.063	1.398	22.385	22.385	0.248	0.063	1.243	1.879	1.179	**0.633**	0.847	**0.406**	**1.559 (D)**
394	20	13						0.063	1.555	23.883	23.883	0.271	0.063	1.400	2.192	1.141	**0.672**	0.809	**0.401**	**1.676 (D)**
391.5	22.5	8	0.2	90	15	25	30	0.042	1.660	13.915	21.698	0.238	0.042	1.505	2.453	1.110	**0.572**	0.769	**0.397**	**N.L. (2)**
389	25	6		12				0.057	1.803	10.189	12.064	0.132	0.057	1.648	2.752	1.064	**0.304**	0.726	**0.384**	**0.792 (C)**
386.5	27.5	10		12				0.061	1.955	16.574	18.651	0.199	0.061	1.800	3.060	1.048	**0.453**	0.683	**0.368**	**1.231 (D)**
384	30	6		12				0.057	2.098	9.657	11.515	0.127	0.057	1.943	3.359	1.021	**0.281**	0.641	**0.351**	**0.801 (C)**
379	35	20		12				0.067	2.433	32.661	35.246	-0.546	0.067	2.278	4.006	0.972	**-1.152**	0.565	**0.315**	**N.L. (3)**
374	40	37						0.073	2.798	62.018	62.018	0.419	0.073	2.643	4.683	0.916	**0.832**	0.504	**0.283**	**N.L. (3)**
369	45	18						0.066	3.128	25.235	25.235	0.297	0.066	2.973	5.325	0.895	**0.576**	0.459	**0.261**	**N.L. (3)**
364	50	10		20				0.061	3.433	12.808	17.440	0.186	0.061	3.278	5.942	0.886	**0.357**	0.429	**0.247**	**1.445 (D)**
359	55	18						0.066	3.763	22.584	22.584	0.251	0.066	3.608	6.584	0.848	**0.461**	0.410	**0.237**	**1.945 (D)**
354	60	21						0.068	4.103	25.363	25.363	0.299	0.068	3.948	7.236	0.816	**0.529**	0.398	**0.231**	**N.L. (3)**
349	65	13						0.063	4.418	14.381	14.381	0.154	0.063	4.263	7.863	0.835	**0.279**	0.379	**0.222**	**1.257 (D)**
344	70	21						0.068	4.758	22.839	22.839	0.254	0.068	4.603	8.515	0.785	**0.433**	0.372	**0.218**	**1.986 (D)**
339	75	24						0.069	5.103	25.208	25.208	0.296	0.069	4.948	9.172	0.758	**0.487**	0.365	**0.215**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS

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

SCI Engineering, Inc
650 Pierce Blvd
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618.624.6969

SPT BASED LIQUEFACTION ANALYSIS REPORT

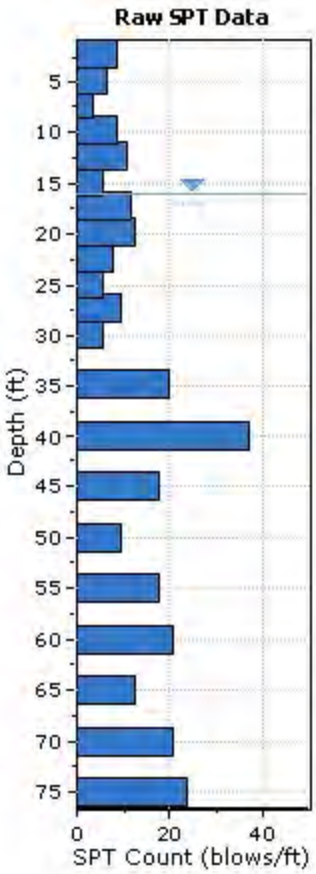
Project title : I-270 Bridge over COR

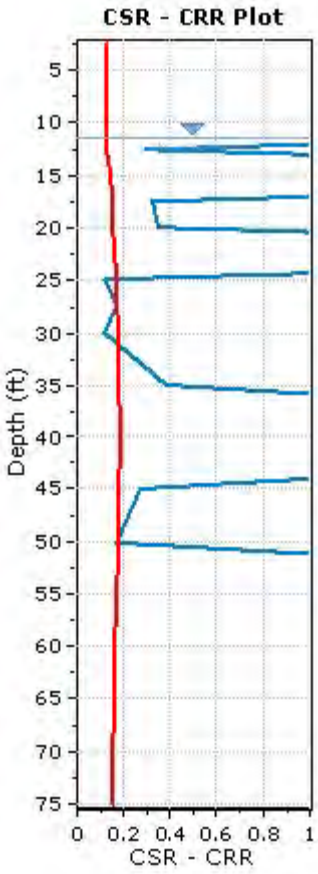
SPT Name: BB-56

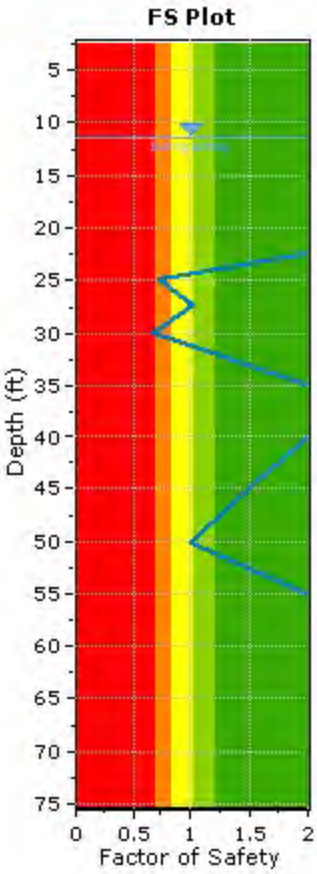
Location : Madison County, Illinois

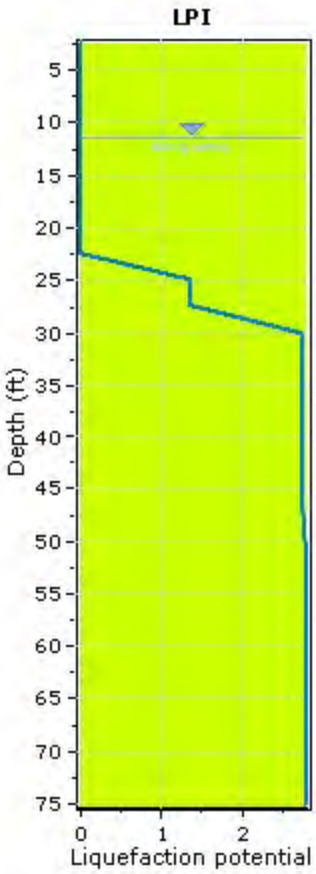
:: Input parameters and analysis properties ::

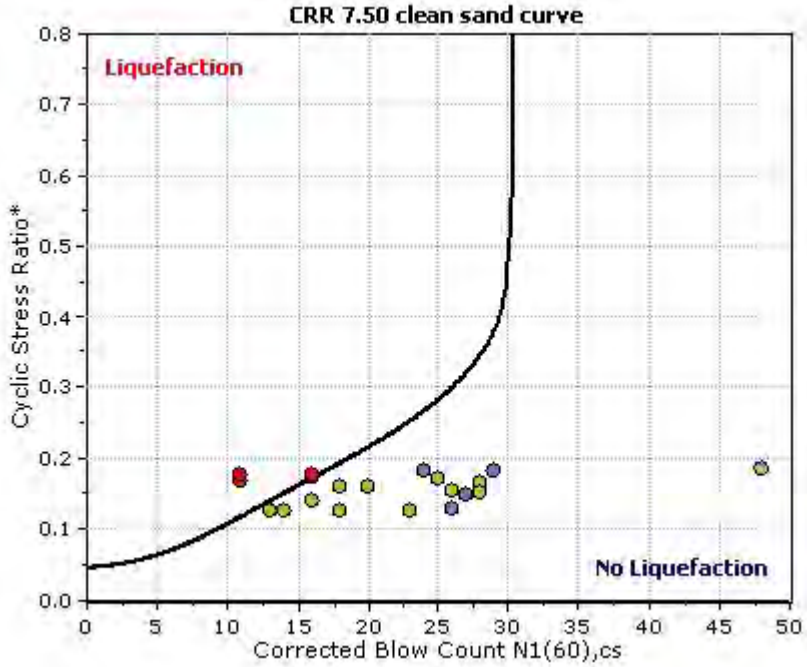
Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	11.40 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		











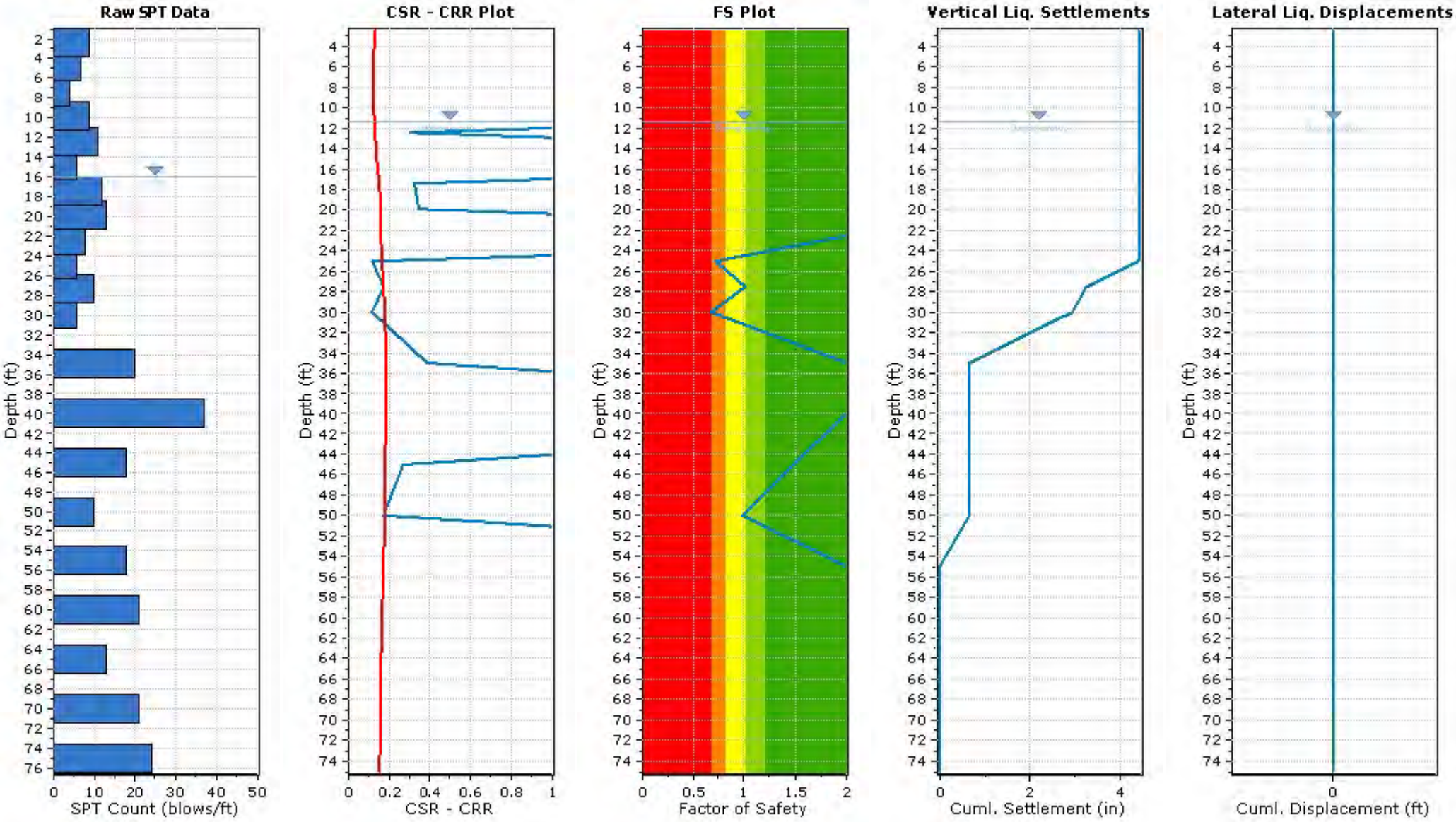
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



SCI LIQUEFACTION ANALYSIS

Modified from I.D.O.T. Bureau of Bridges and Structures FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 6/14/2013

REFERENCE BORING NUMBER ========== BB-58
ELEVATION OF BORING GROUND SURFACE ========== 413.20 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ========== 6.50 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ========== 6.50 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ========== 0.487
EARTHQUAKE MOMENT MAGNITUDE ========== 5.3
FINISHED GRADE FILL OR CUT FROM BORING SURFACE ========== 0.00 FT.
HAMMER EFFICIENCY========== 86 %
BOREHOLE DIAMETER========== 6 IN.
SAMPLING METHOD========== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.169**

AVG. SHEAR WAVE VELOCITY (top 40')
$\bar{V}_{s,40'}$ = **665** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.3
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.357**

	BORING DATA							CONDITIONS DURING DRILLING					CONDITIONS DURING EARTHQUAKE							
ELEV. OF SAMPLE (FT.)	BORING SAMPLE DEPTH (FT.)	SPT N VALUE (BLOWS)	UNCONF. COMPR. STR., Q_u (TSF.)	% FINES < #200 (%)	PLAST. INDEX PI	LIQUID LIMIT LL	MOIST. CONTENT w_c (%)	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	CORR. SPT N VALUE $(N_1)_{60}$	EQUIV. CLN. SAND SPT N VALUE $(N_1)_{60cs}$	CRR RESIST. MAG 7.5 $CRR_{7.5}$	EFFECTIVE UNIT WT. (KCF.)	VERT. STRESS (KSF.)	TOTAL VERT. STRESS (KSF.)	OVER-BURDEN CORR. FACT. (Ks)	CORR. RESIST. $CRR_{7.5}$ CRR	SOIL MASS PART. FACTOR (r_d)	EQ INDUCED CSR	FACTOR OF SAFETY * CRR/CSR
410.7	2.5	7	1.7					0.128	0.320	14.334	14.334	0.153	0.128	0.320	0.320	1.500	**0.499**	0.996	**0.315**	**N.L. (1)**
408.2	5	7	1					0.122	0.625	12.827	12.827	0.139	0.122	0.625	0.625	1.356	**0.408**	0.991	**0.314**	**N.L. (1)**
405.7	7.5	8	0.5	30	7	20	26	0.051	0.753	14.314	21.230	0.231	0.051	0.753	0.815	1.367	**0.686**	0.985	**0.338**	**2.030 (D)**
403.2	10	13						0.063	0.910	25.310	25.310	0.298	0.063	0.910	1.128	1.319	**0.853**	0.977	**0.383**	**N.L. (3)**
400.7	12.5	15						0.065	1.073	29.879	29.879	0.459	0.065	1.073	1.447	1.274	**1.270**	0.966	**0.413**	**N.L. (3)**
398.2	15	13						0.063	1.230	25.063	25.063	0.293	0.063	1.230	1.760	1.194	**0.759**	0.954	**0.432**	**N.L. (3)**
395.7	17.5	10						0.061	1.383	18.345	18.345	0.196	0.061	1.383	2.069	1.129	**0.479**	0.939	**0.445**	**1.076 (D)**
393.2	20	12						0.063	1.540	21.917	21.917	0.241	0.063	1.540	2.382	1.103	**0.576**	0.920	**0.451**	**1.277 (D)**
390.7	22.5	16						0.065	1.703	29.448	29.448	0.433	0.065	1.703	2.701	1.081	**1.015**	0.899	**0.451**	**N.L. (3)**
388.2	25	14						0.064	1.863	24.478	24.478	0.282	0.064	1.863	3.017	1.043	**0.638**	0.873	**0.448**	**1.424 (D)**
385.7	27.5	26						0.069	2.035	48.522	48.522	0.286	0.069	2.035	3.345	1.017	**0.630**	0.845	**0.440**	**N.L. (3)**
383.2	30	16						0.065	2.198	26.524	26.524	0.326	0.065	2.198	3.664	0.988	**0.698**	0.814	**0.430**	**N.L. (3)**
378.2	35	33						0.072	2.558	57.554	57.554	0.379	0.072	2.558	4.336	0.928	**0.763**	0.746	**0.401**	**N.L. (3)**
373.2	40	25						0.069	2.903	38.380	38.380	0.051	0.069	2.903	4.993	0.882	**0.098**	0.679	**0.370**	**N.L. (3)**
368.2	45	13						0.063	3.218	17.272	17.272	0.184	0.063	3.218	5.620	0.891	**0.355**	0.620	**0.343**	**1.035 (D)**
363.2	50	15						0.065	3.543	19.121	19.121	0.205	0.065	3.543	6.257	0.862	**0.383**	0.574	**0.321**	**1.193 (D)**
358.2	55	34						0.072	3.903	45.888	45.888	0.251	0.072	3.903	6.929	0.783	**0.426**	0.541	**0.304**	**N.L. (3)**
353.2	60	24						0.069	4.248	28.799	28.799	0.401	0.069	4.248	7.586	0.785	**0.682**	0.519	**0.293**	**N.L. (3)**
348.2	65	49						0.075	4.623	62.228	62.228	0.421	0.075	4.623	8.273	0.732	**0.668**	0.483	**0.274**	**N.L. (3)**
343.2	70	23						0.068	4.963	24.519	24.519	0.283	0.068	4.963	8.925	0.760	**0.466**	0.476	**0.271**	**1.720 (D)**
338.2	75	17						0.066	5.293	16.735	16.735	0.178	0.066	5.293	9.567	0.779	**0.301**	0.469	**0.268**	**1.123 (D)**

* FACTOR OF SAFETY DESCRIPTIONS

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

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SPT BASED LIQUEFACTION ANALYSIS REPORT

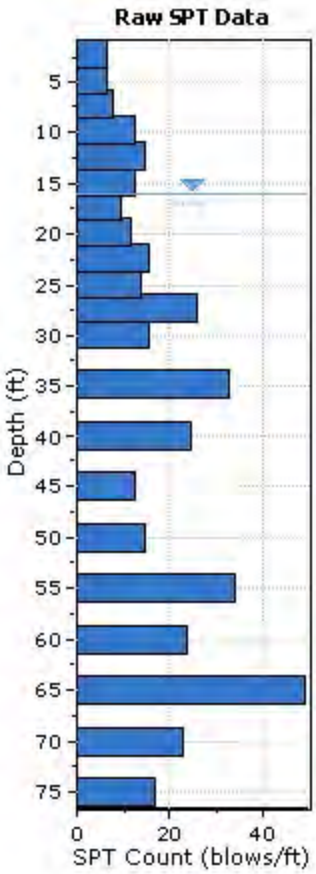
Project title : I-270 Bridge over COR

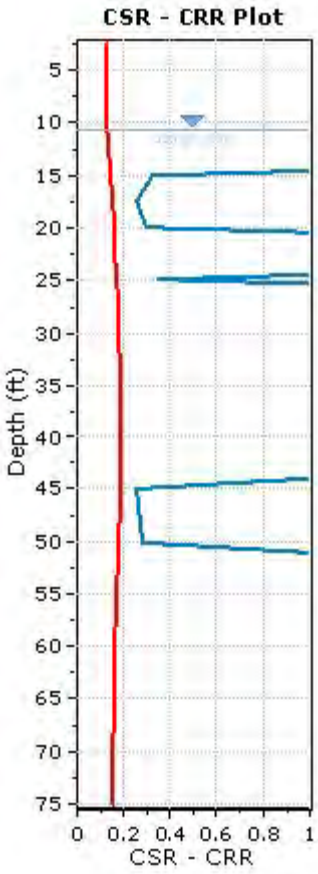
SPT Name: BB-58

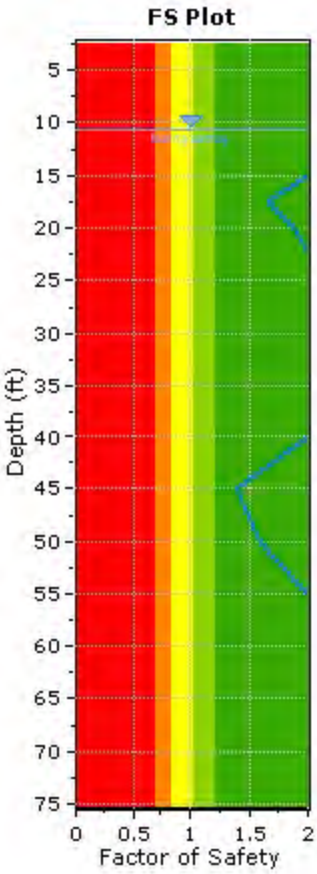
Location : Madison County, Illinois

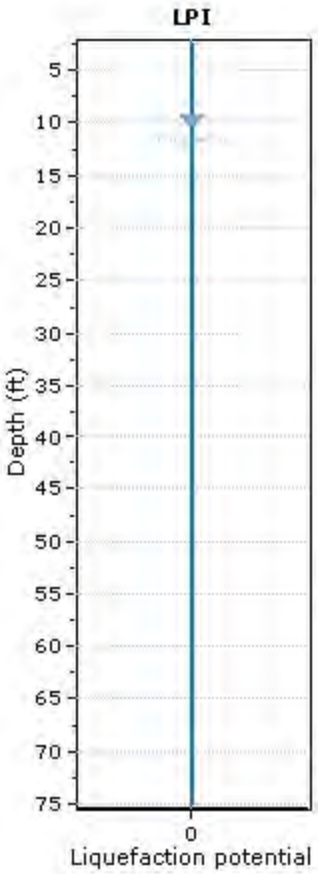
:: Input parameters and analysis properties ::

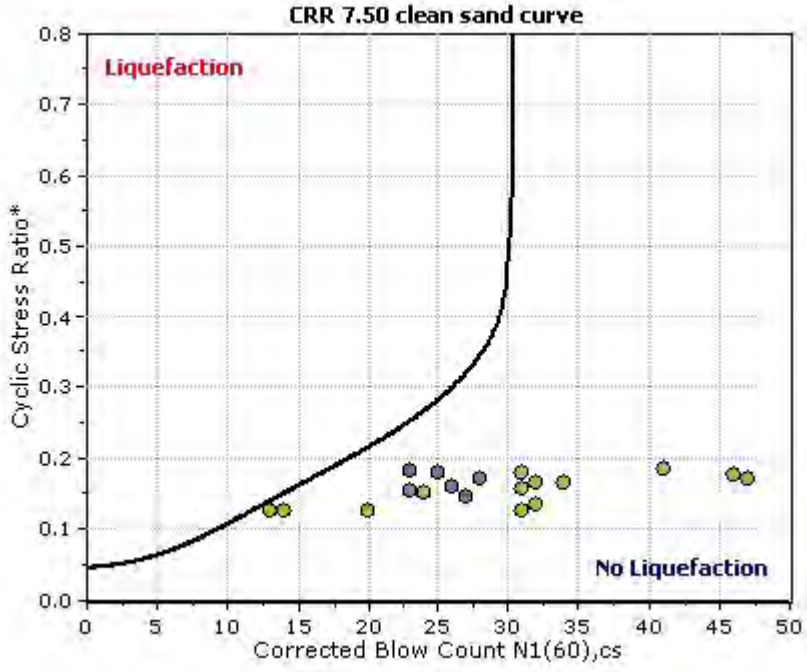
Analysis method:	NCEER 1998	G.W.T. (in-situ):	16.00 ft
Fines correction method:	NCEER 1998	G.W.T. (earthq.):	10.60 ft
Sampling method:	Standard Sampler	Earthquake magnitude M_w:	5.30 ft
Borehole diameter:	65mm to 115mm	Peak ground acceleration:	0.48 g
Rod length:	3.30 ft	Eq. external load:	0.00 tsf
Hammer energy ratio:	1.57		











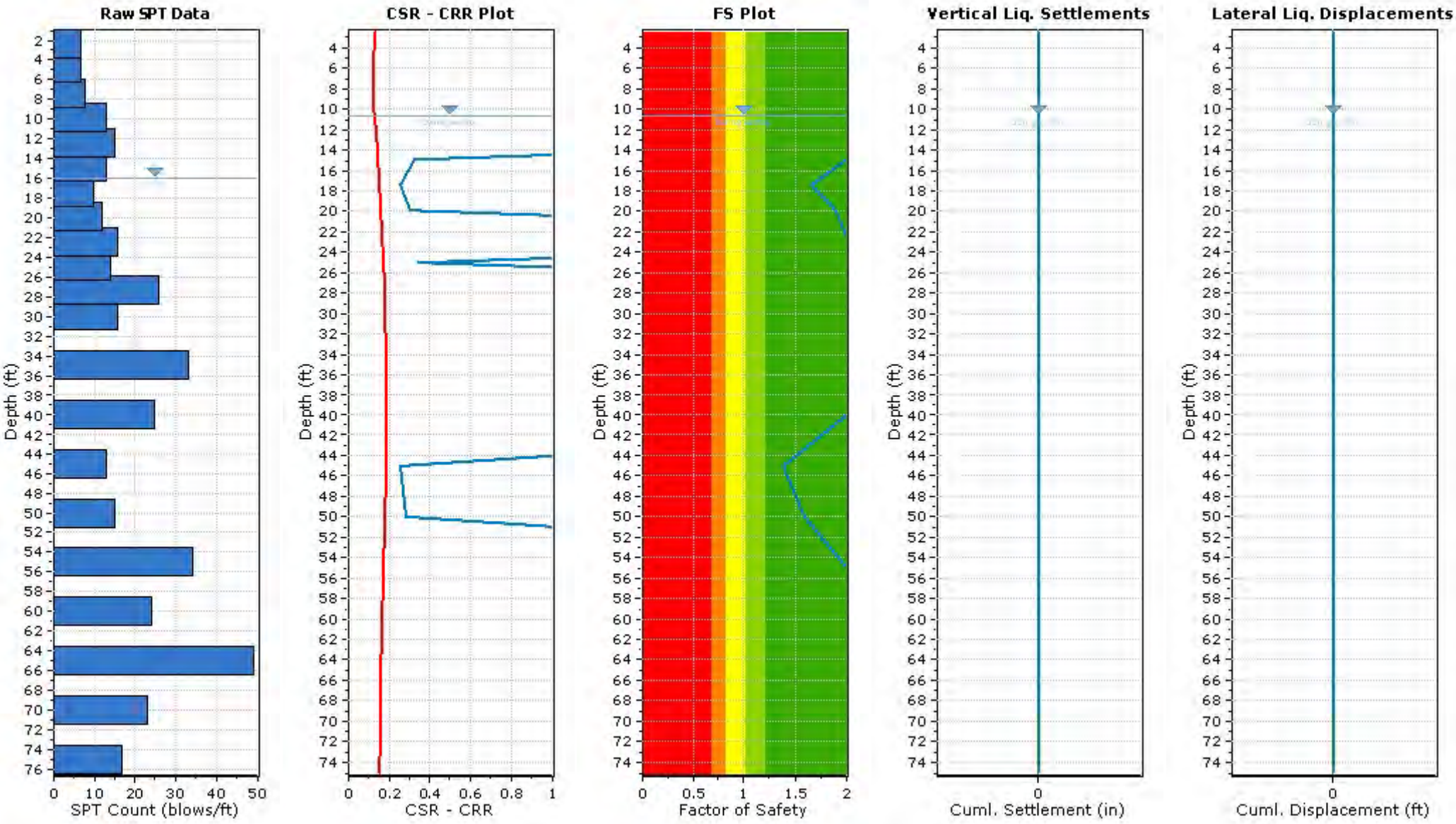
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



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V_s BASED LIQUEFACTION ANALYSIS REPORT

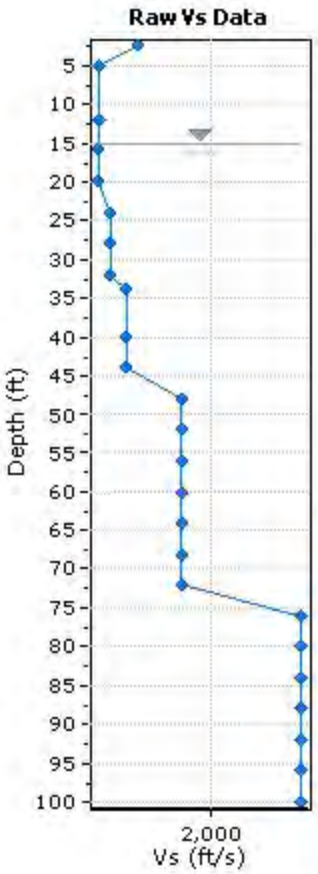
Project title : I-270 Bridge over COR

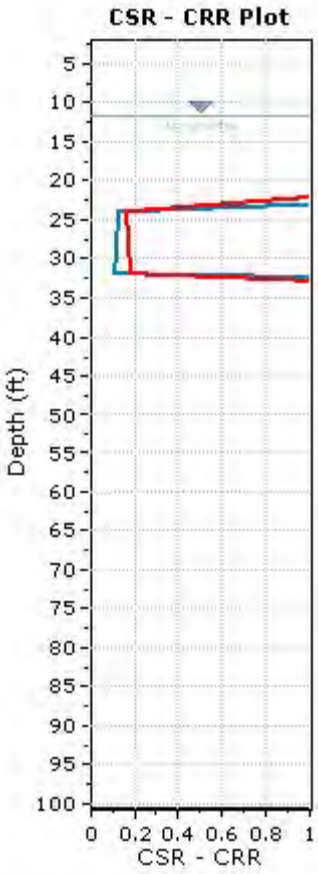
V_s Name: T-1

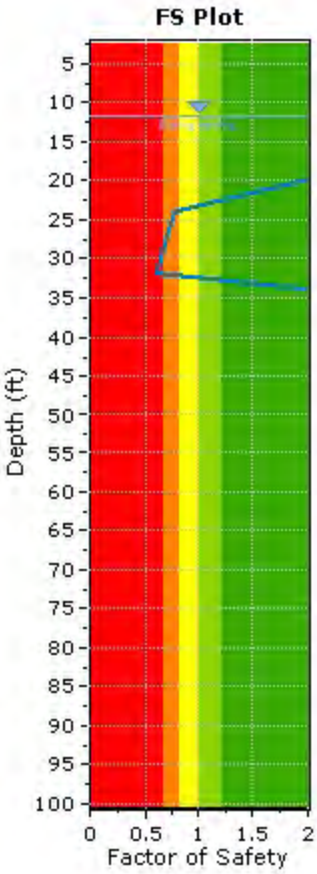
Location : Madison County, Illinois

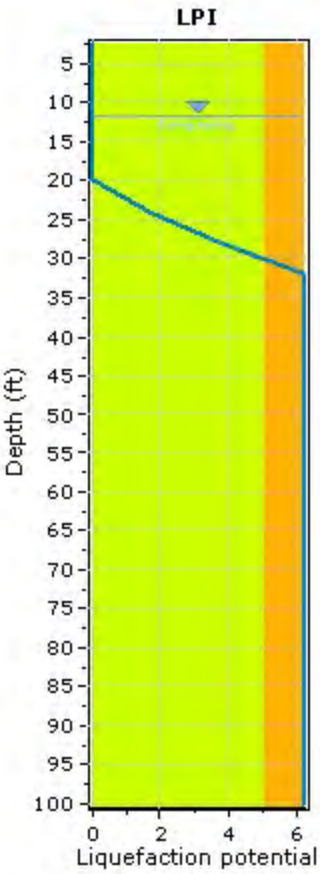
:: Input parameters and analysis properties ::

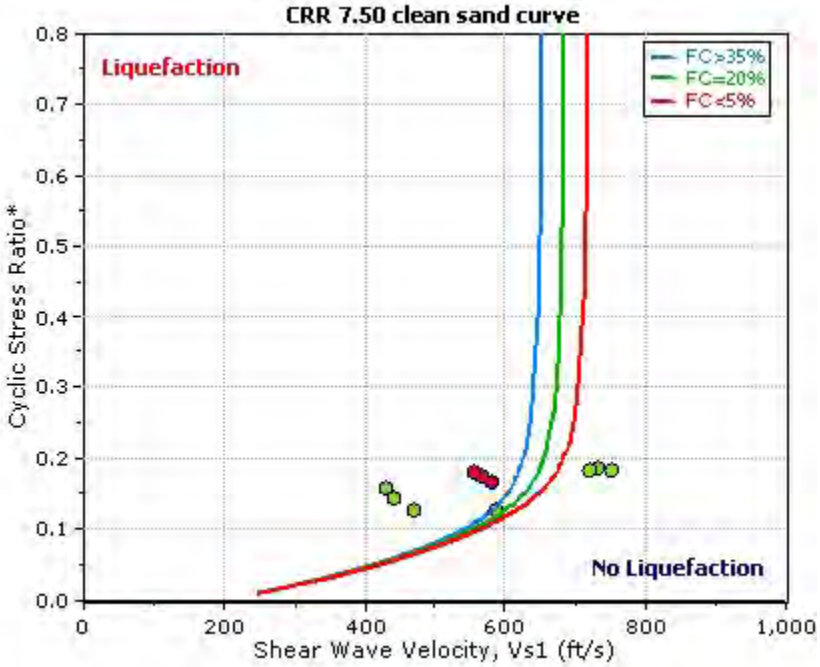
Analysis method:	NCEER 1998 (Youd et al. 2001)
G.W.T. (in-situ):	15.00 ft
G.W.T. (earthq.):	11.60 ft
Earthquake magnitude M_w:	5.30
Peak ground acceleration:	0.48 g
Eq. external load:	0.00 tsf











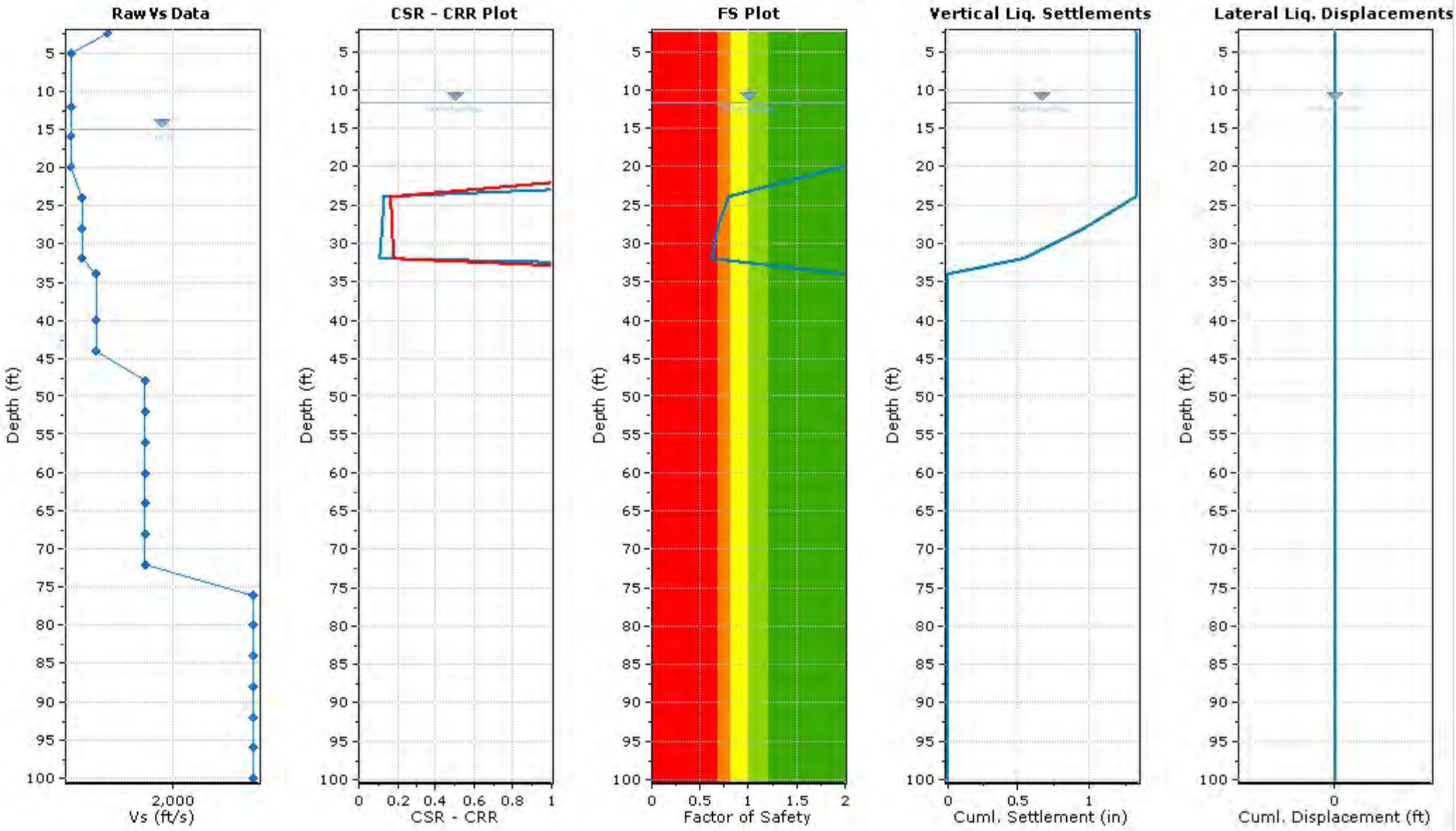
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

:: Overall Liquefaction Assessment Analysis Plots ::



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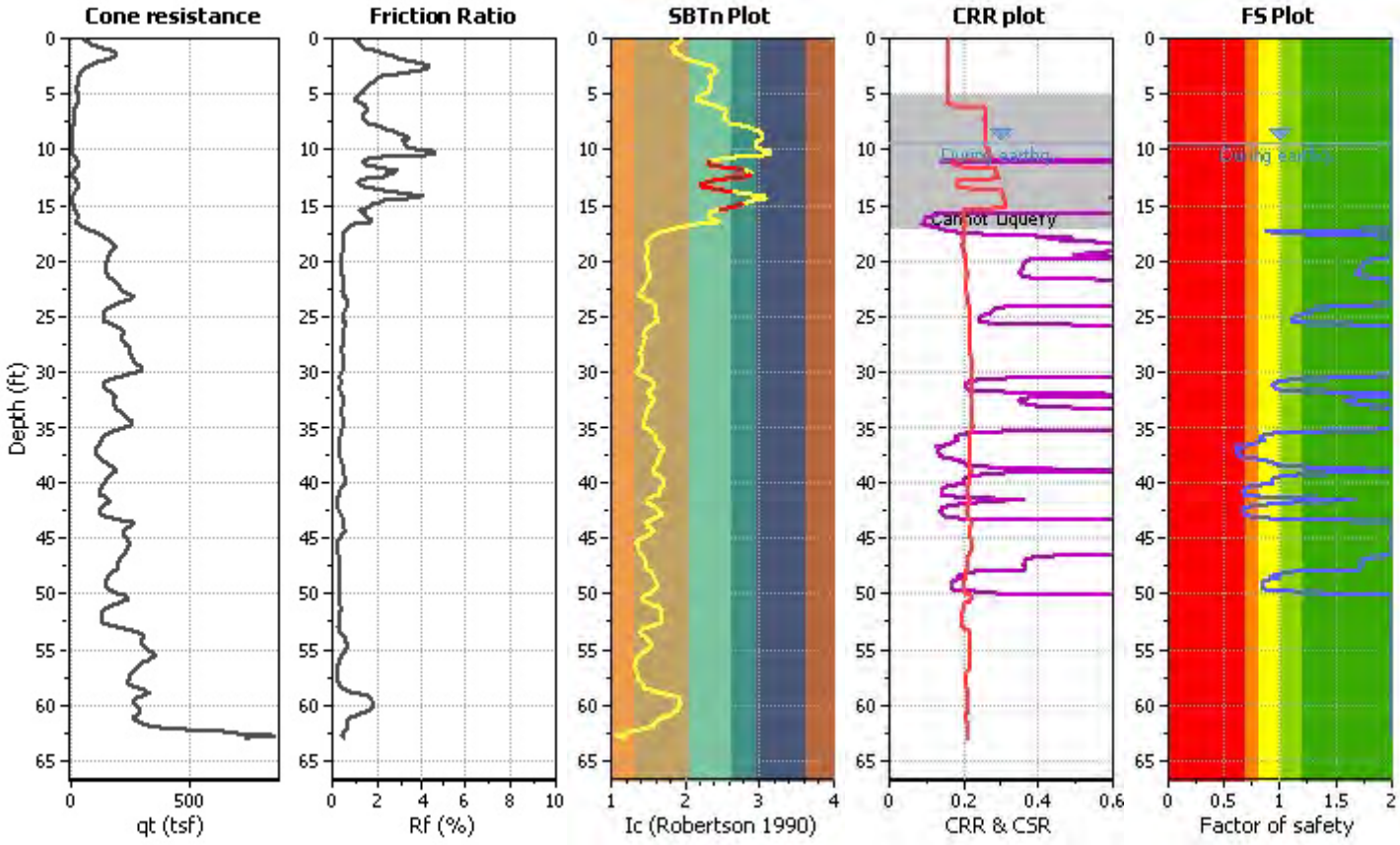
LIQUEFACTION ANALYSIS REPORT

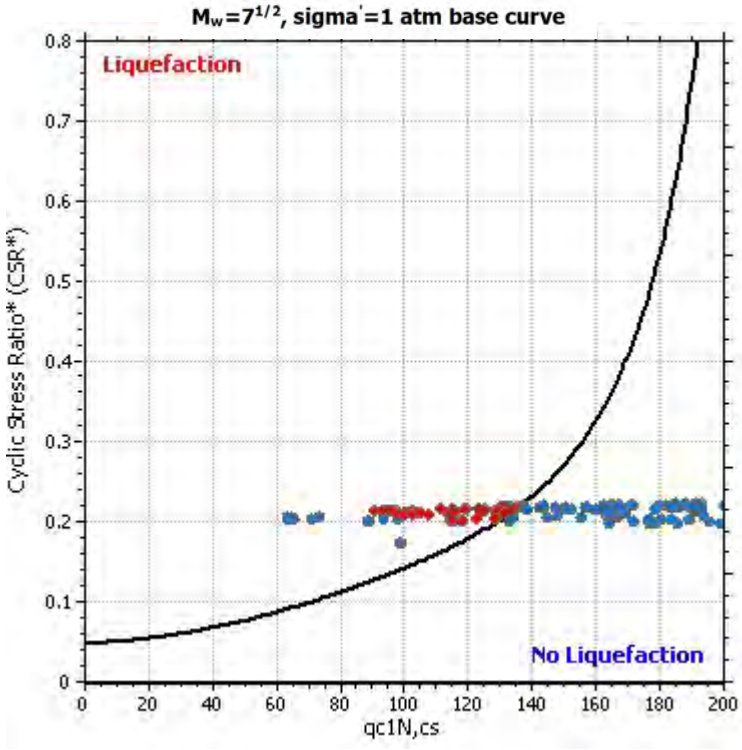
Project title : PTB 185-20 I270 Bridge: 2017-3167.10 **Location : Madison County, IL**

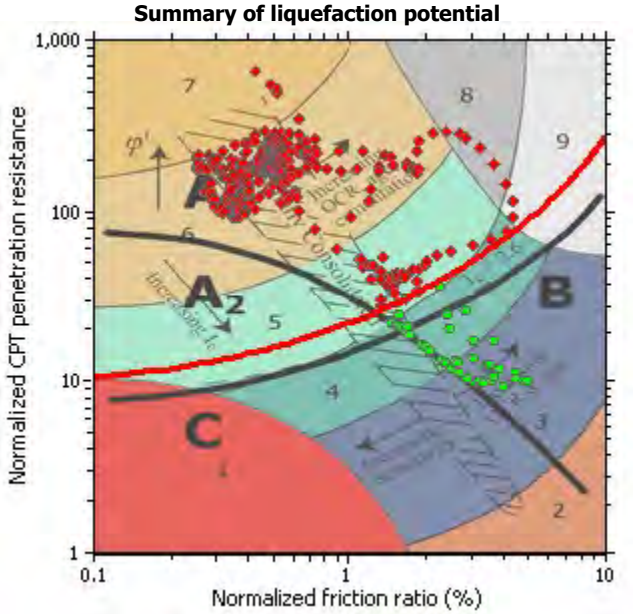
CPT file : C-108

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	5.00 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	9.40 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	5.30	Ic cut-off value:	2.45	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.48	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

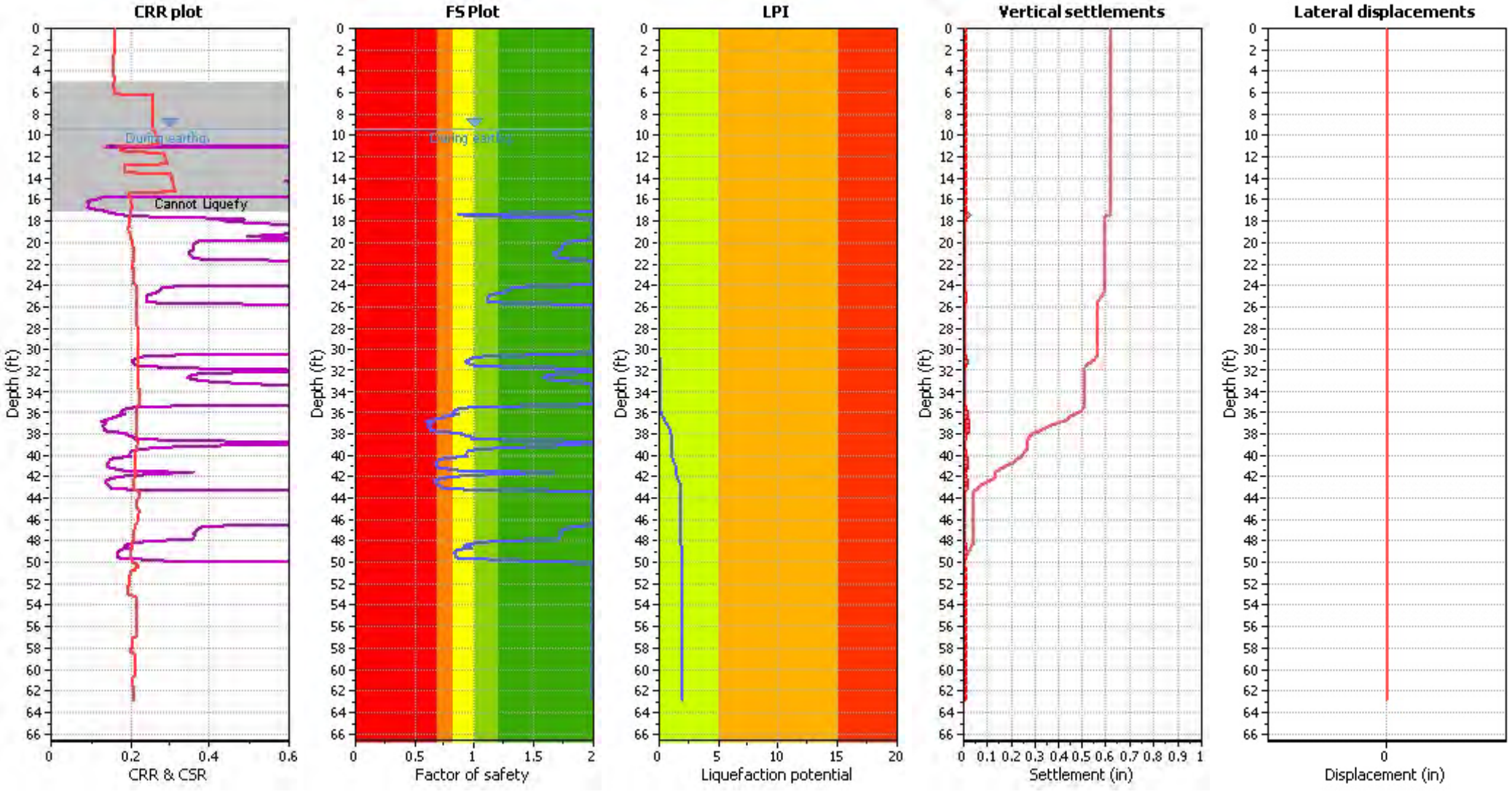






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	9.40 ft	Fill weight:	N/A
Fines correction method:	R&W (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.45	K_σ applied:	Yes
Earthquake magnitude M_w:	5.30	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.48	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	5.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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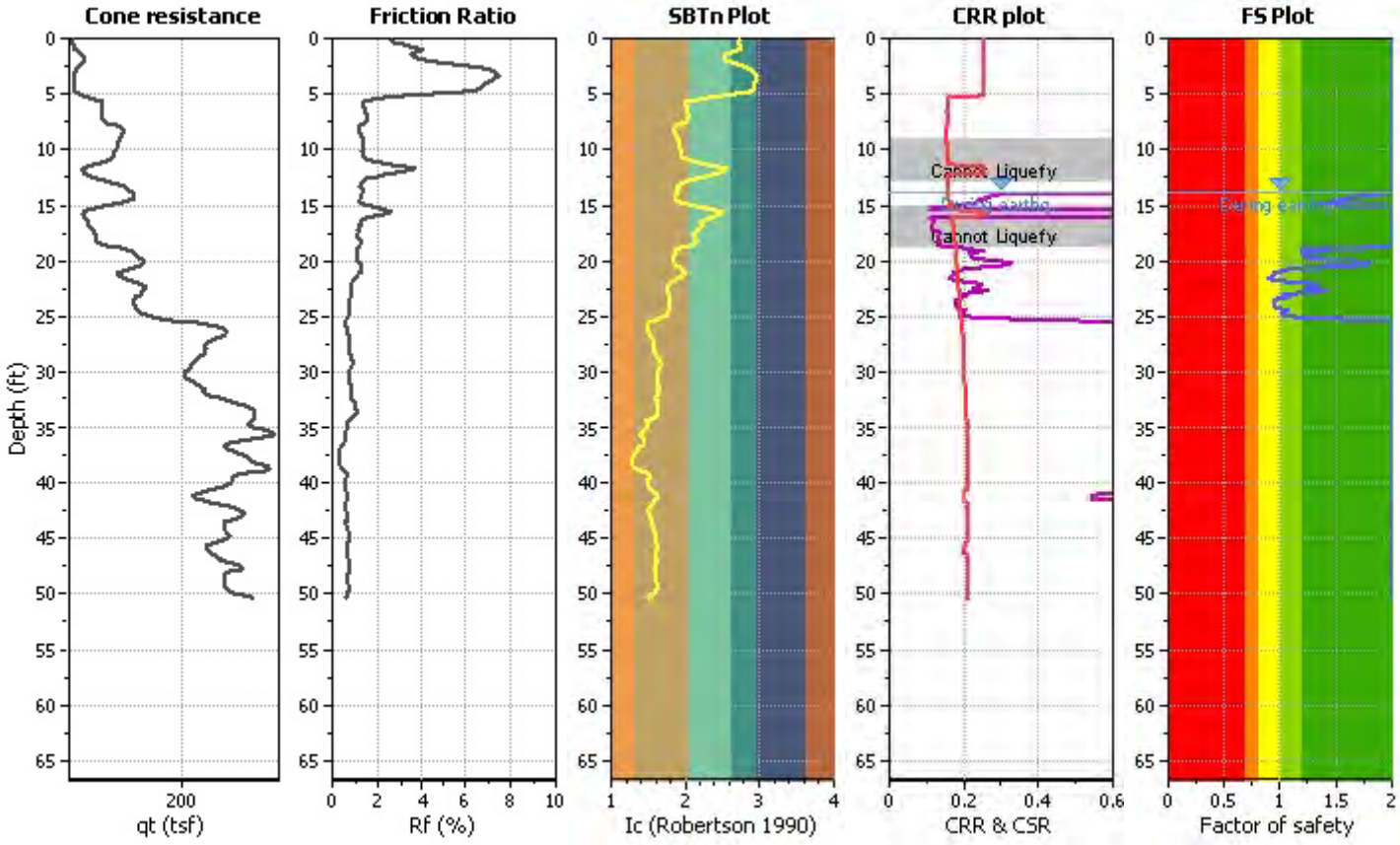
LIQUEFACTION ANALYSIS REPORT

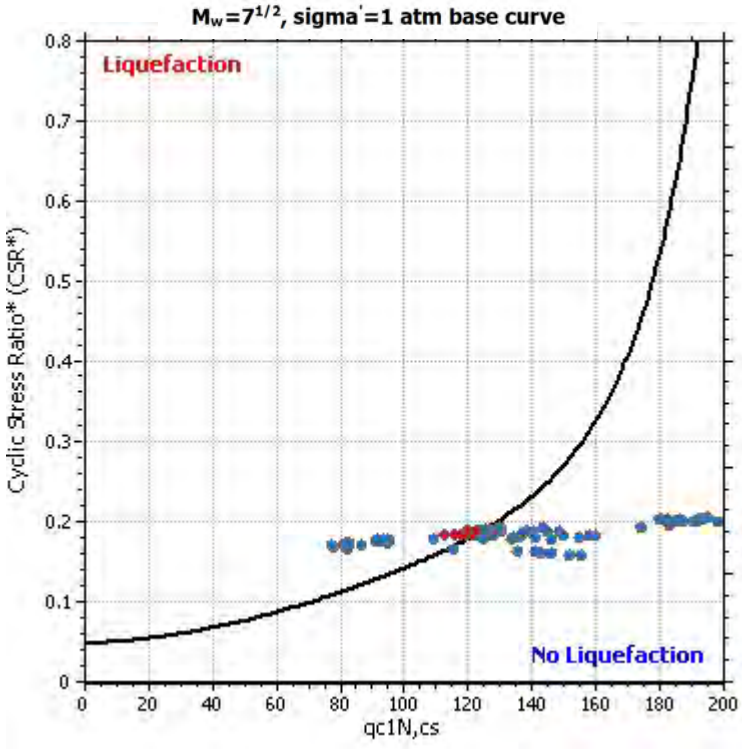
Project title : PTB 185-20 I270 Bridge: 2017-3167.10 **Location : Madison County, IL**

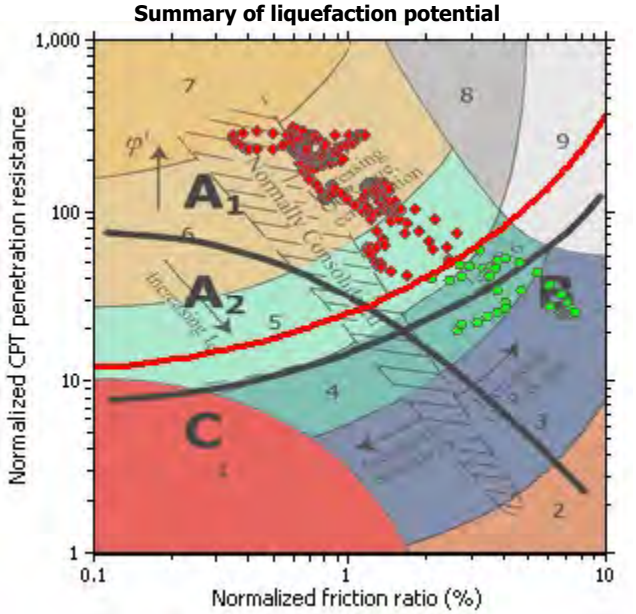
CPT file : C-113

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	8.00 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	13.90 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	5.30	Ic cut-off value:	2.40	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.48	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

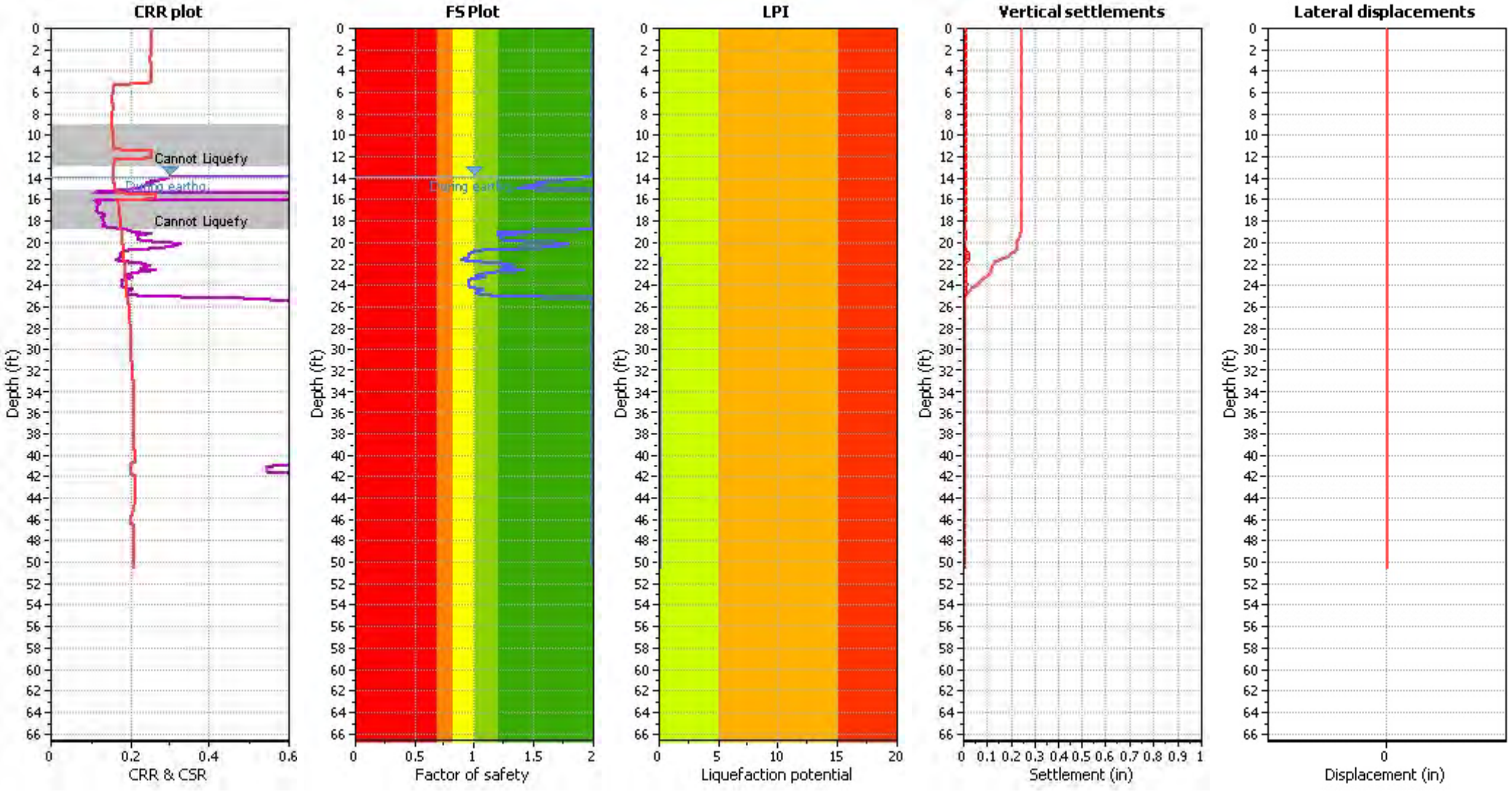






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	13.90 ft	Fill weight:	N/A
Fines correction method:	R&W (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.40	K_σ applied:	Yes
Earthquake magnitude M_w:	5.30	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.48	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	8.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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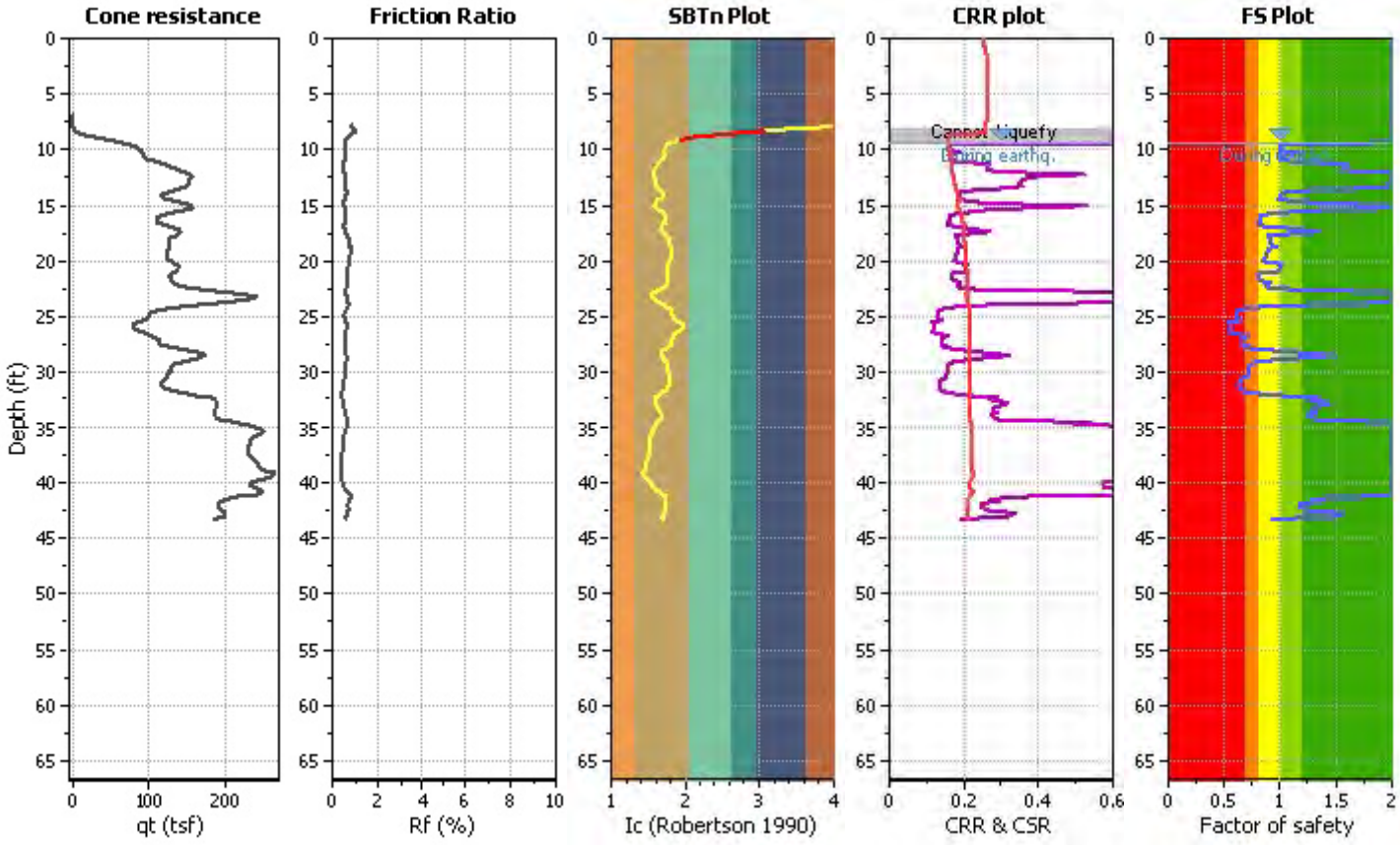
LIQUEFACTION ANALYSIS REPORT

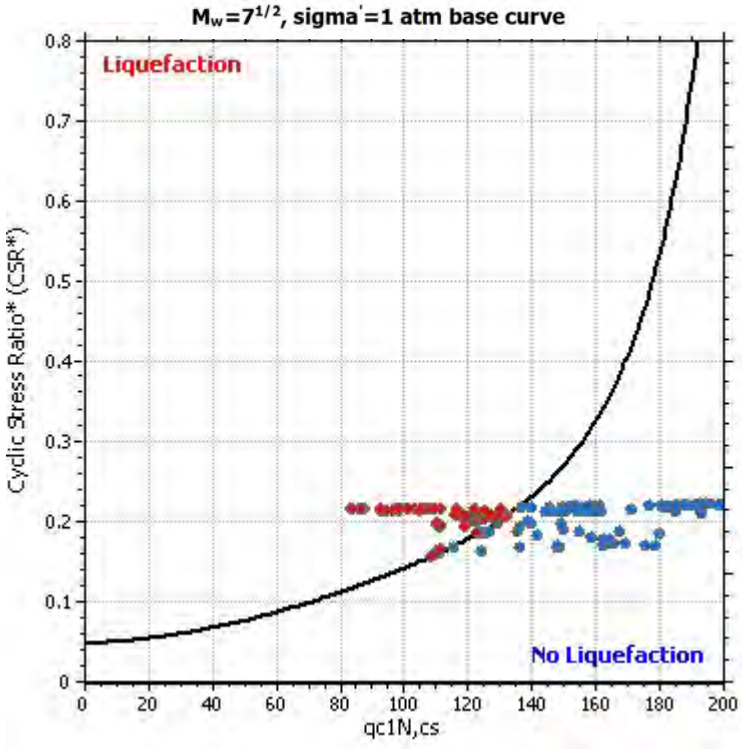
Project title : PTB 185-20 I270 Bridge: 2017-3167.10 **Location : Madison County, IL**

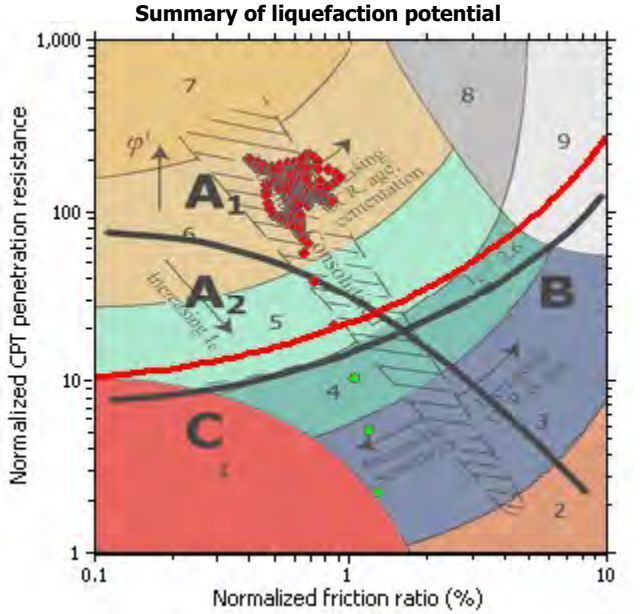
CPT file : C-118

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	18.00 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	9.40 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	5.30	Ic cut-off value:	2.45	Trans. detect. applied:	Yes	MSF method:	Method
Peak ground acceleration:	0.48	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

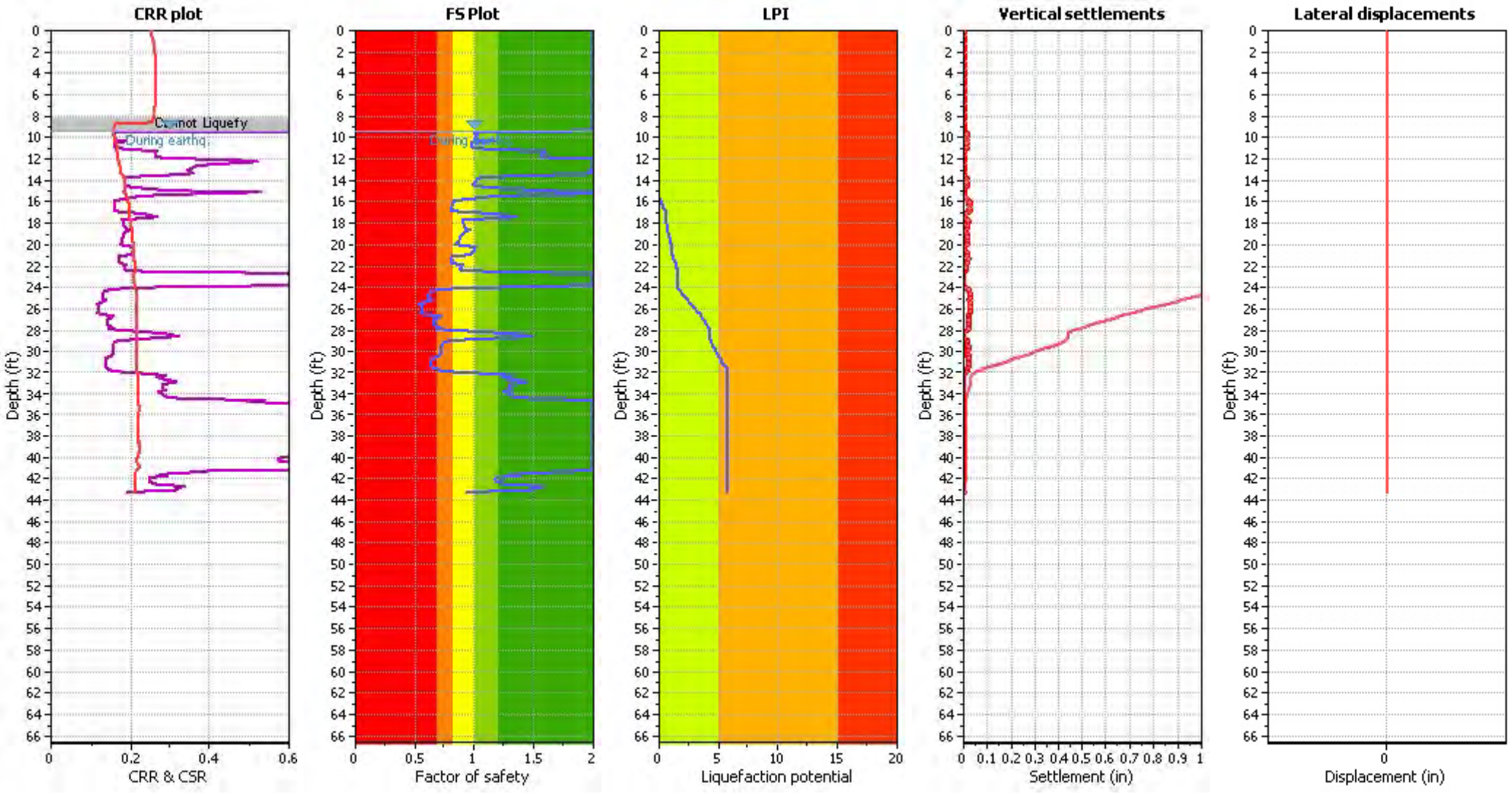






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	9.40 ft	Fill weight:	N/A
Fines correction method:	R&W (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.45	K_σ applied:	Yes
Earthquake magnitude M_w:	5.30	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.48	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	18.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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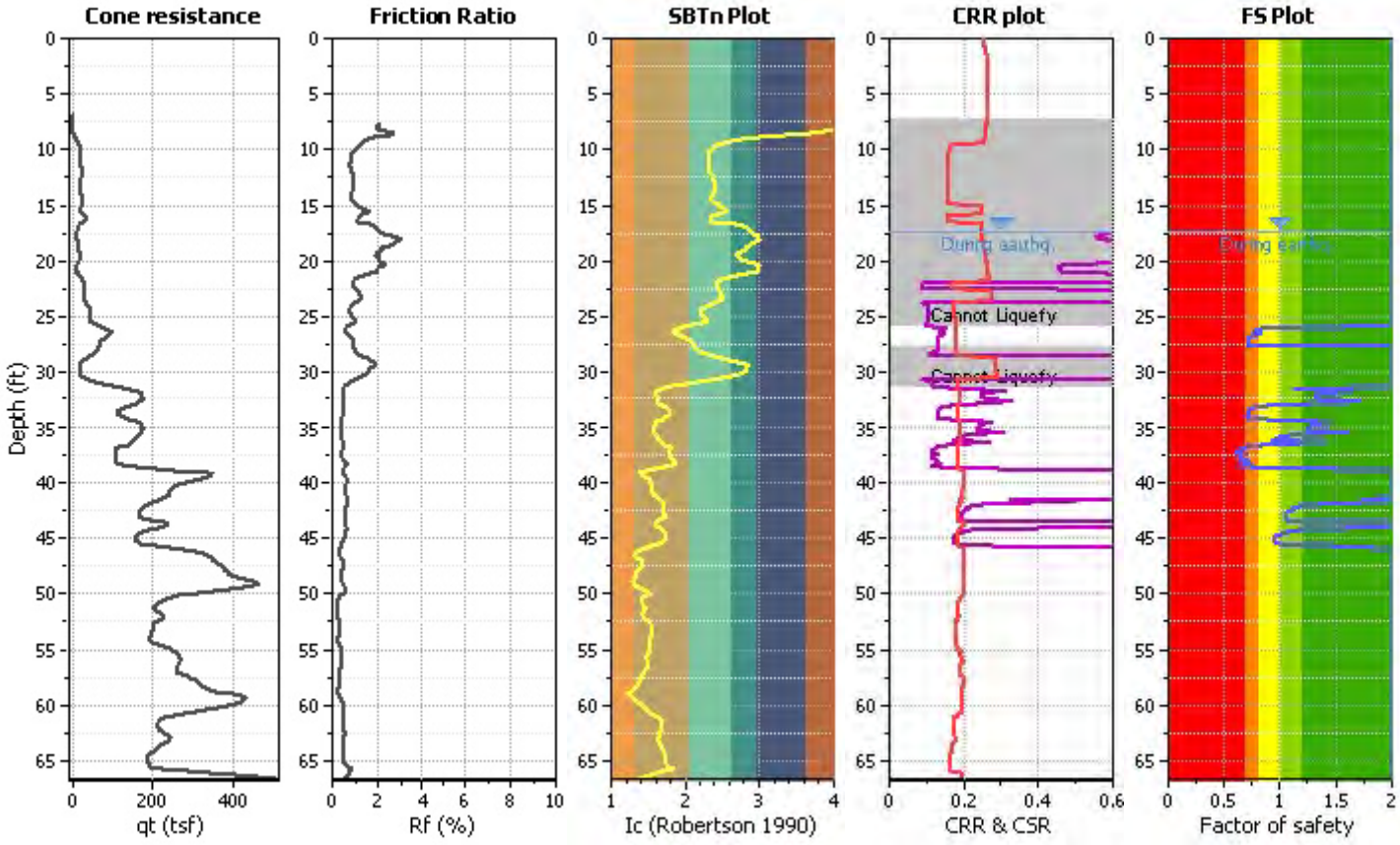
LIQUEFACTION ANALYSIS REPORT

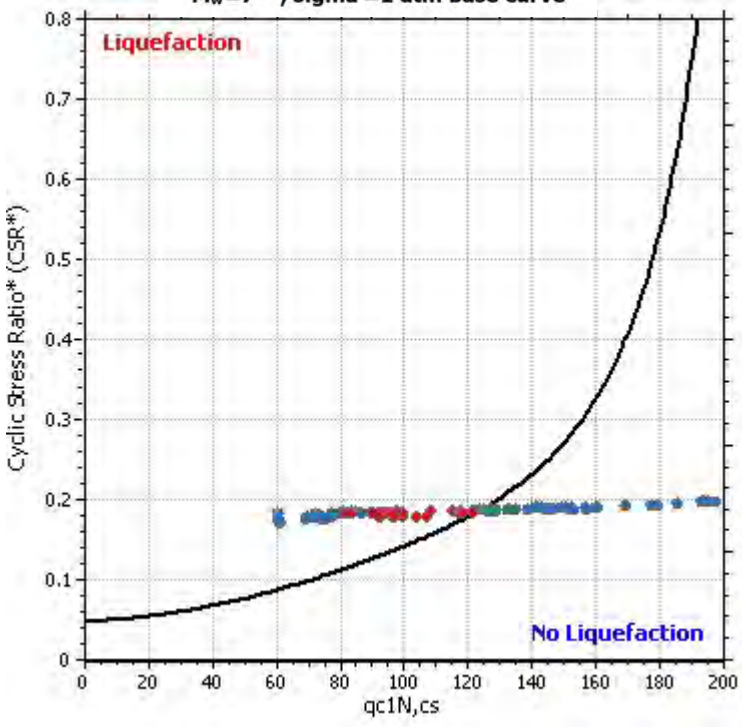
Project title : PTB 185-20 I270 Bridge: 2017-3167.10 **Location : Madison County, IL**

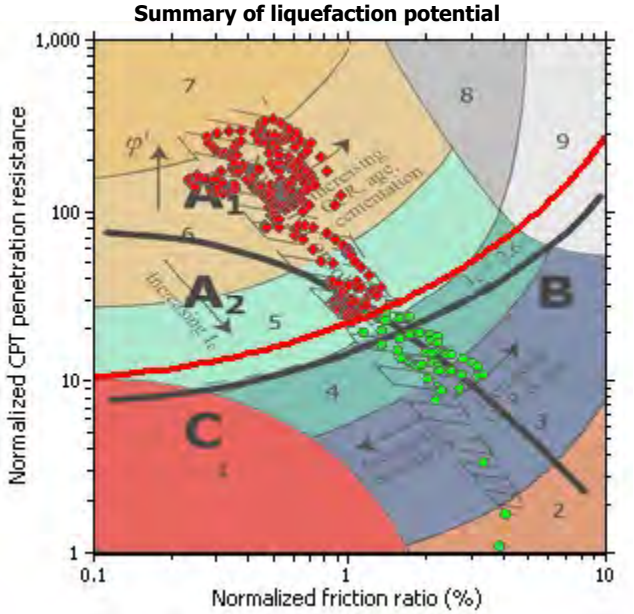
CPT file : C-107

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	18.00 ft	Use fill:	No	Clay like behavior applied:	Sand & Clay
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	17.40 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	50.00 ft
Earthquake magnitude M_w:	5.30	Ic cut-off value:	2.45	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.48	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

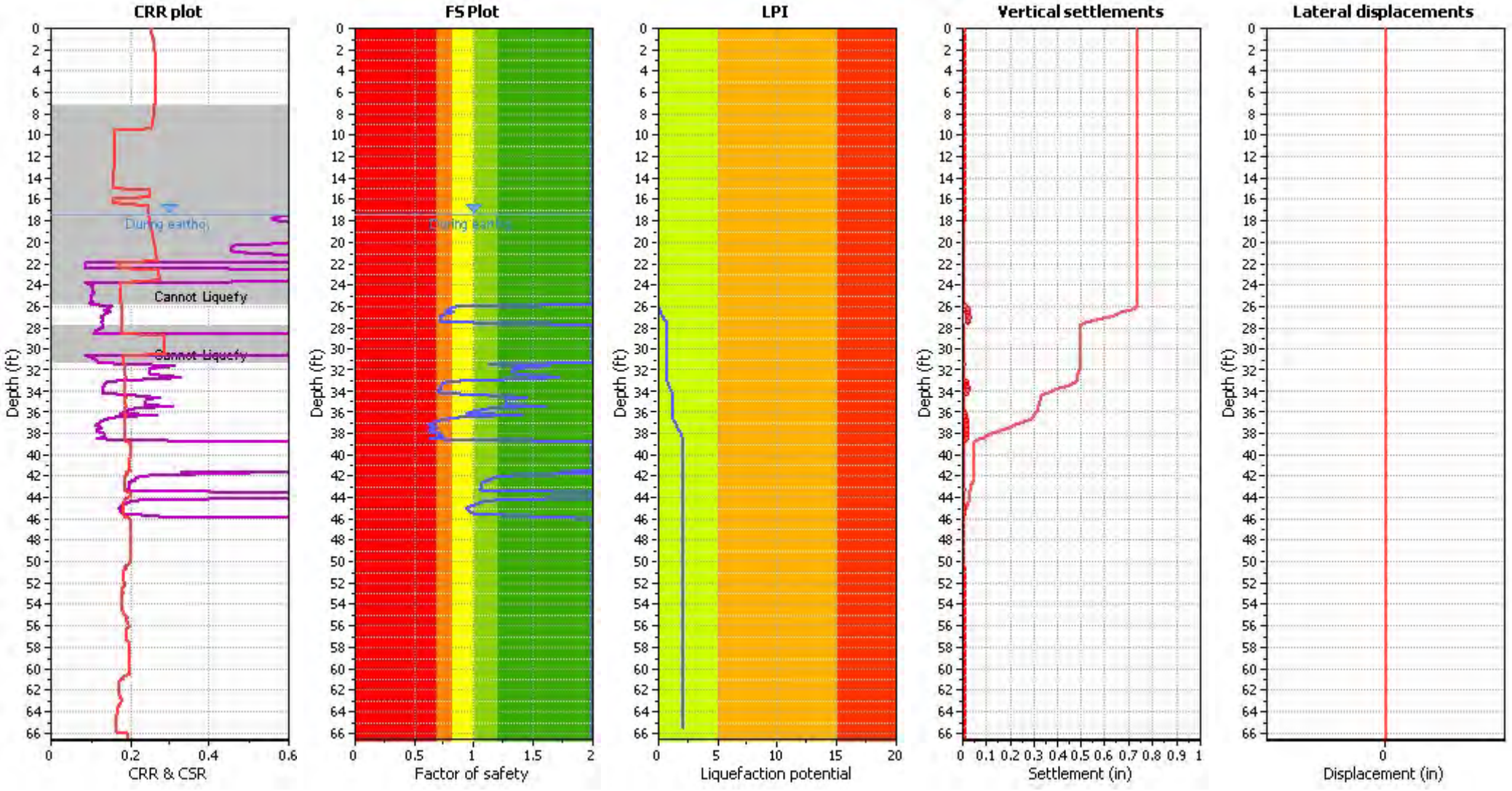






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	17.40 ft	Fill weight:	N/A
Fines correction method:	R&W (1998)	Average results interval:	5	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.45	K_σ applied:	Yes
Earthquake magnitude M_w:	5.30	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.48	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	18.00 ft	Fill height:	N/A	Limit depth:	50.00 ft

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

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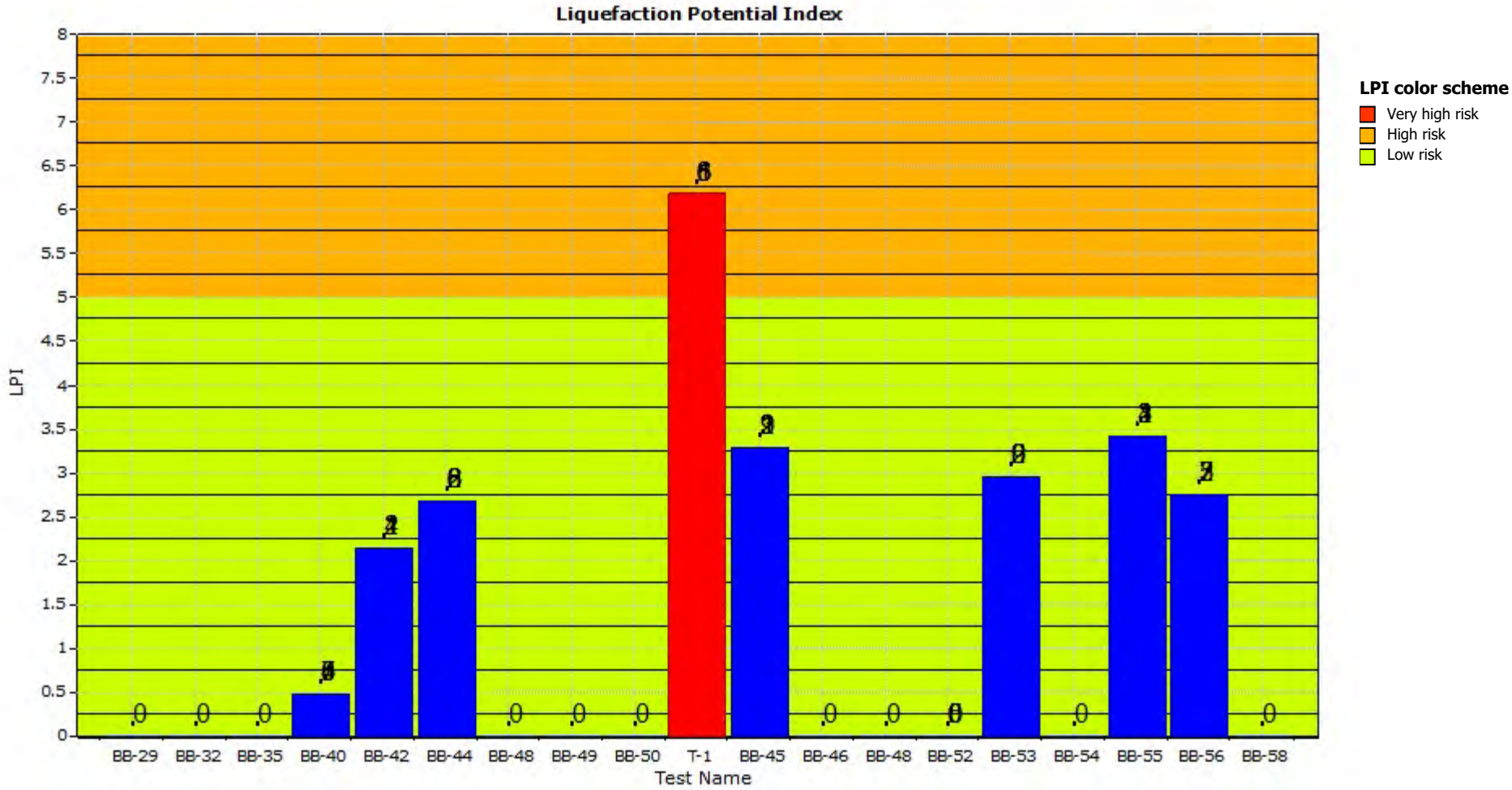
SUMMARY CALCULATION REPORT

Project title : I-270 Bridge over COR

Location : Madison County, Illinois



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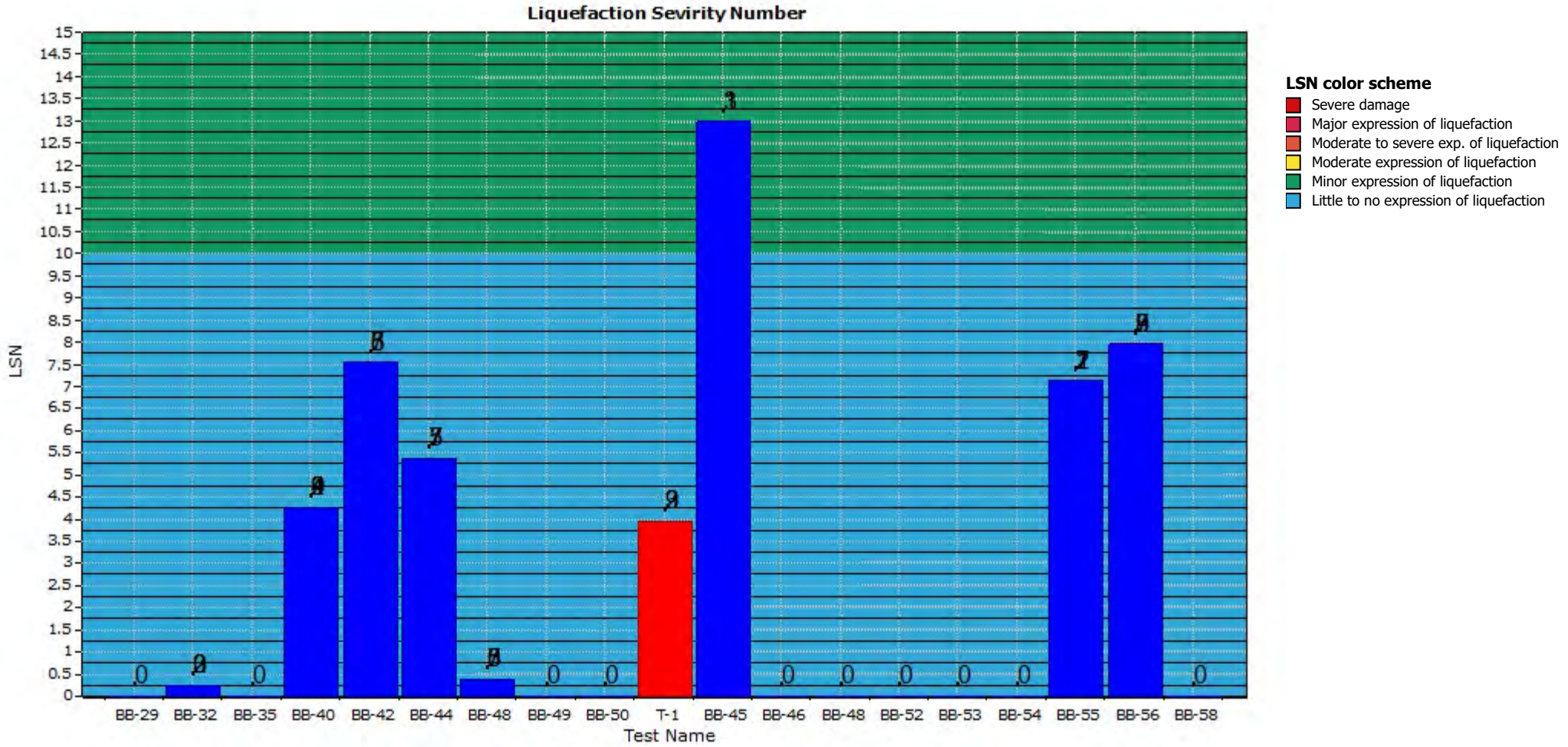
SUMMARY CALCULATION REPORT

Project title : I-270 Bridge over COR

Location : Madison County, Illinois



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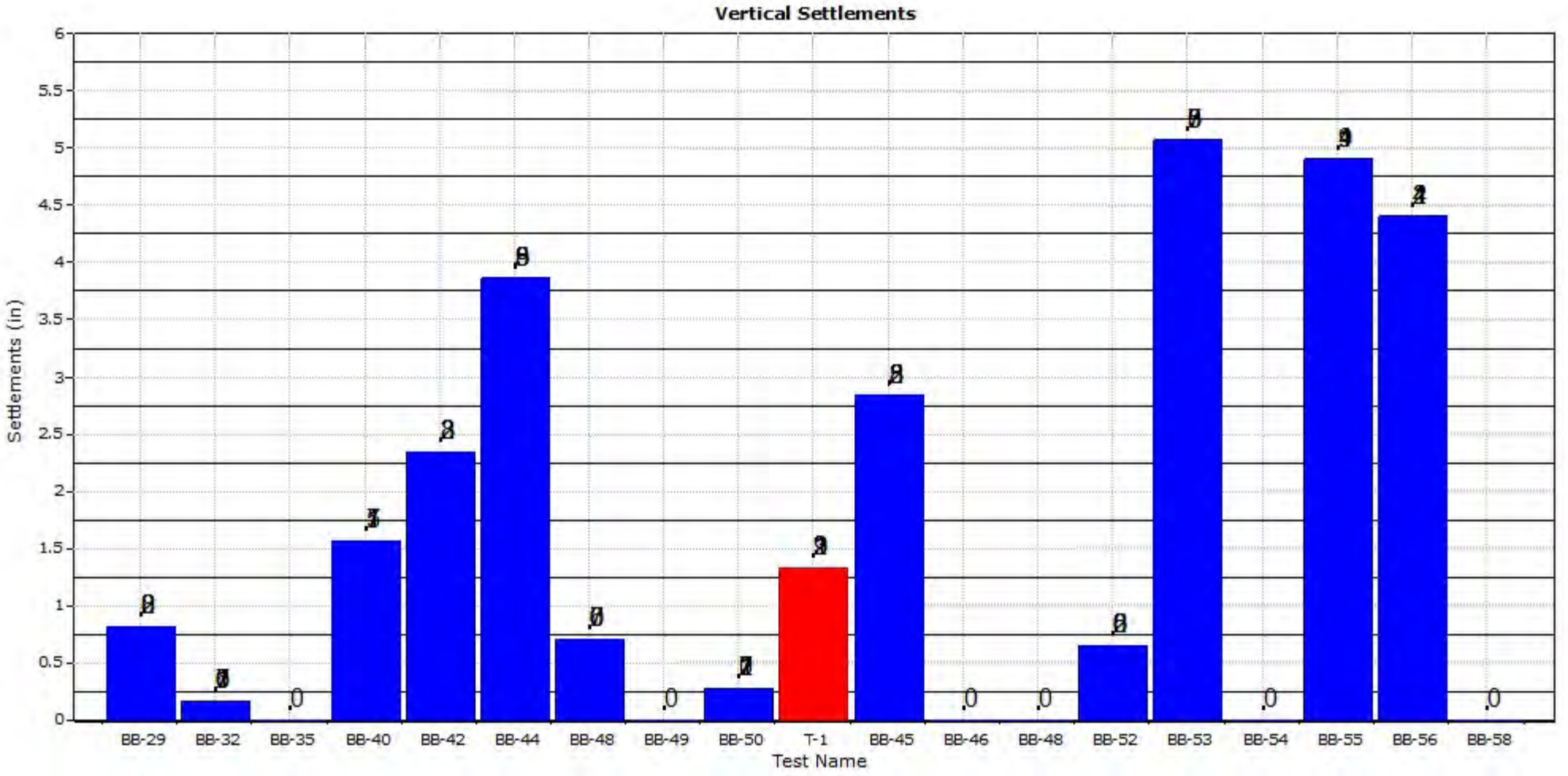
SUMMARY CALCULATION REPORT

Project title : I-270 Bridge over COR

Location : Madison County, Illinois



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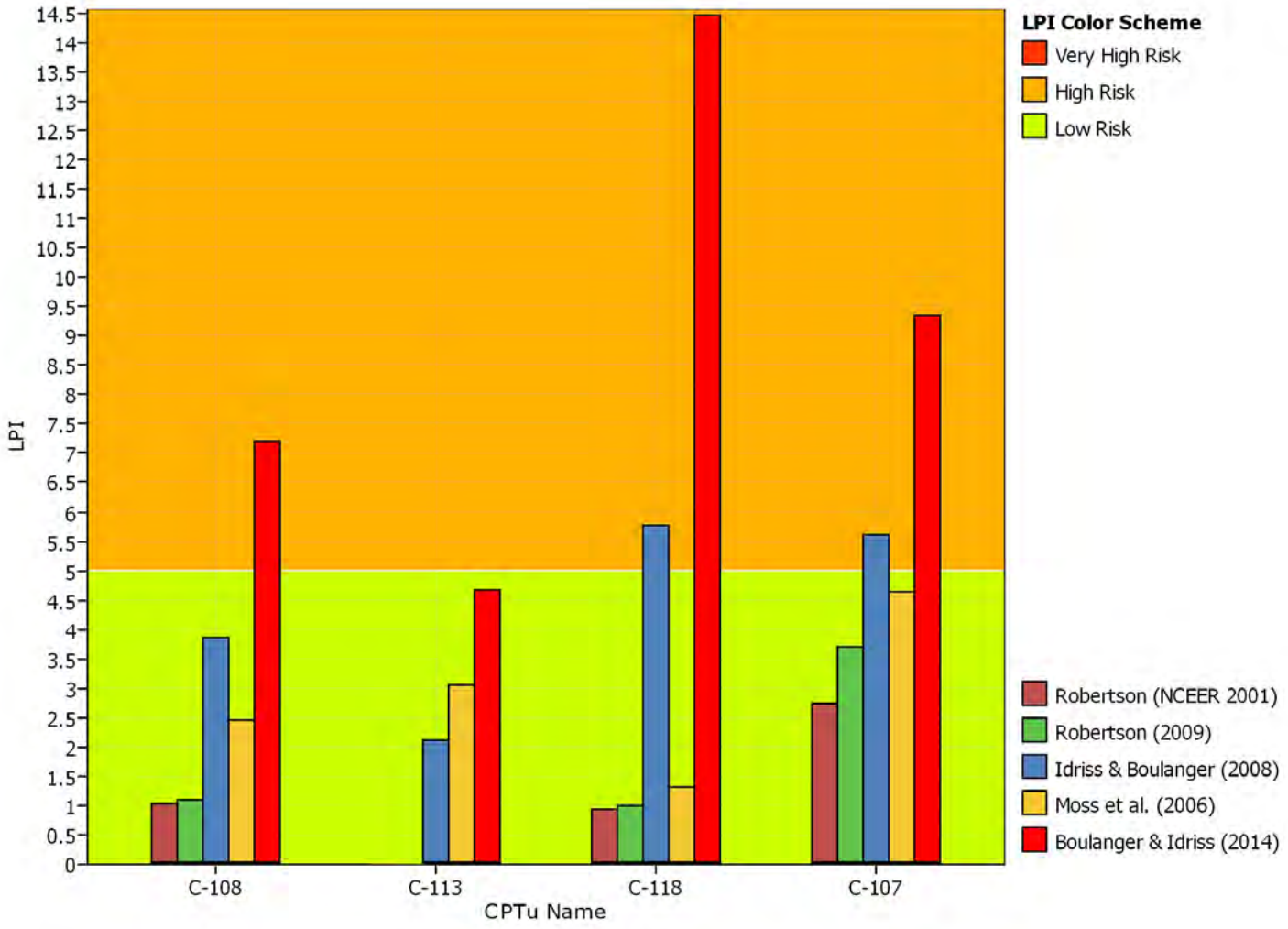
Overall Parametric Assessment Method



:: CPT main liquefaction parameters details ::

CPT Name	Earthquake Mag.	Earthquake Accel.	GWT in situ (ft)	GWT earthq. (ft)
C-108	5.50	0.48	5.00	9.40
C-113	5.50	0.48	8.00	13.90
C-118	5.50	0.48	18.00	9.40
C-107	5.50	0.48	18.00	17.40

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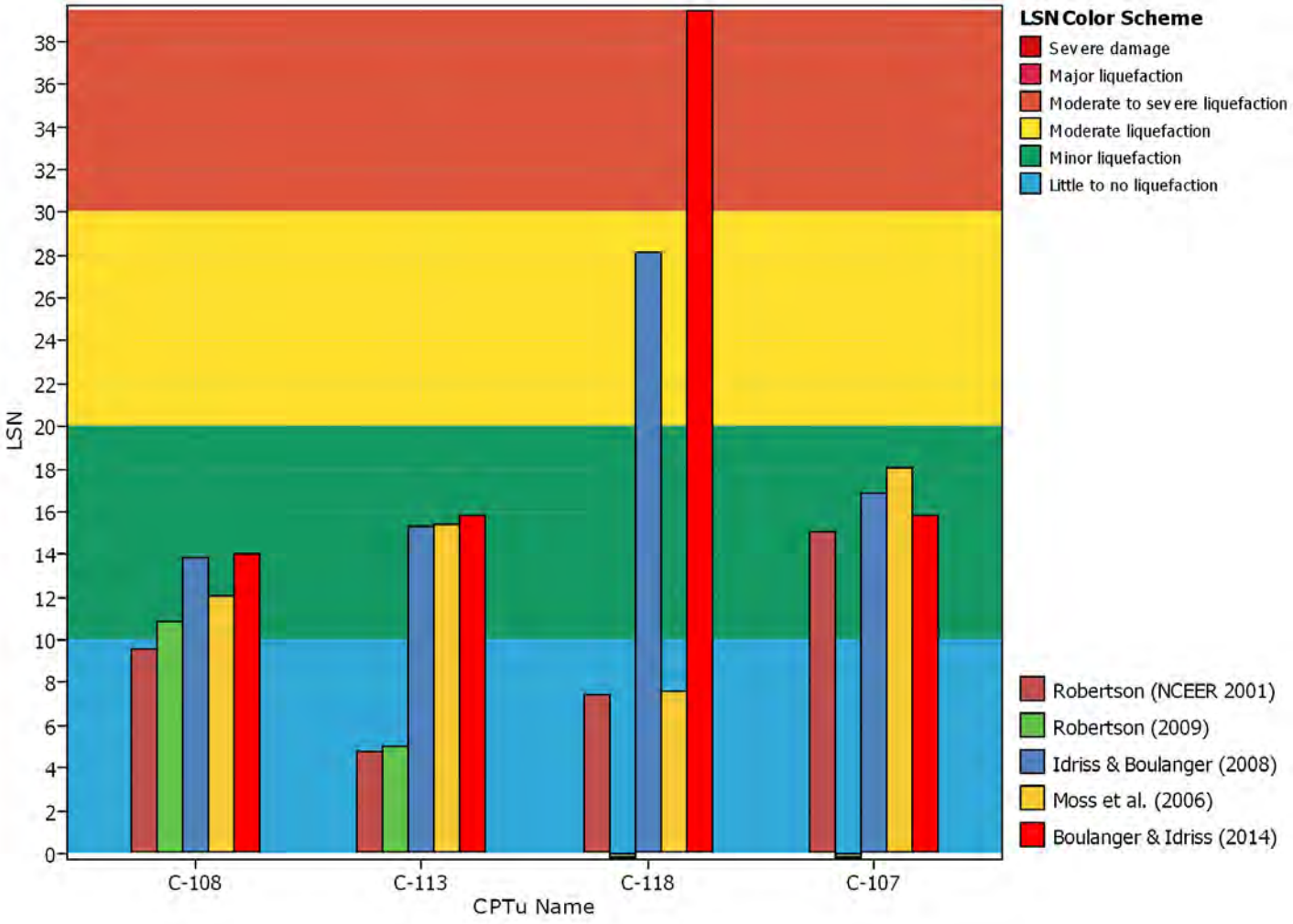
Overall Parametric Assessment Method



:: CPT main liquefaction parameters details ::

CPT Name	Earthquake Mag.	Earthquake Accel.	GWT in situ (ft)	GWT earthq. (ft)
C-108	5.50	0.48	5.00	9.40
C-113	5.50	0.48	8.00	13.90
C-118	5.50	0.48	18.00	9.40
C-107	5.50	0.48	18.00	17.40

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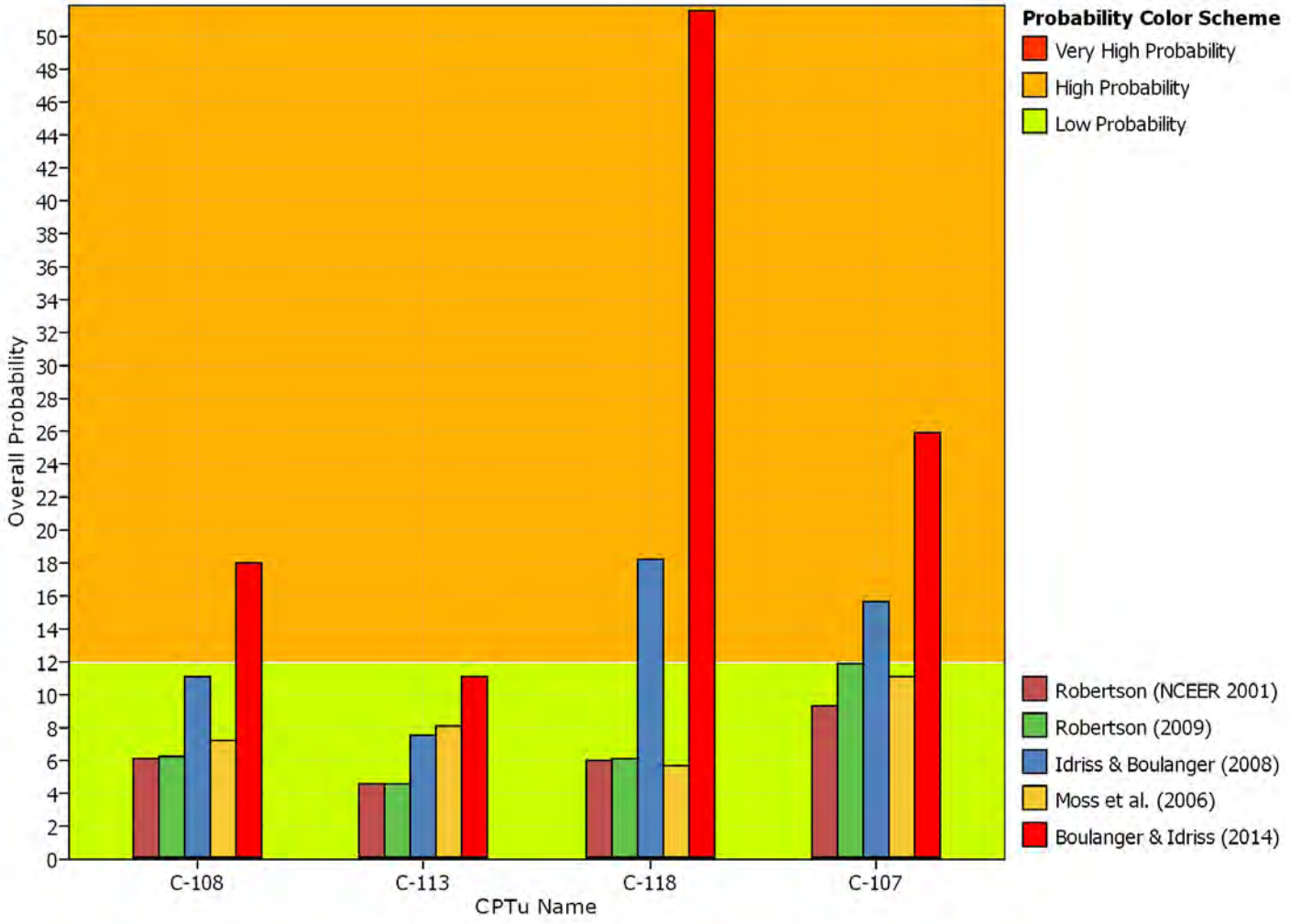
Overall Parametric Assessment Method



:: CPT main liquefaction parameters details ::

CPT Name	Earthquake Mag.	Earthquake Accel.	GWT in situ (ft)	GWT earthq. (ft)
C-108	5.50	0.48	5.00	9.40
C-113	5.50	0.48	8.00	13.90
C-118	5.50	0.48	18.00	9.40
C-107	5.50	0.48	18.00	17.40

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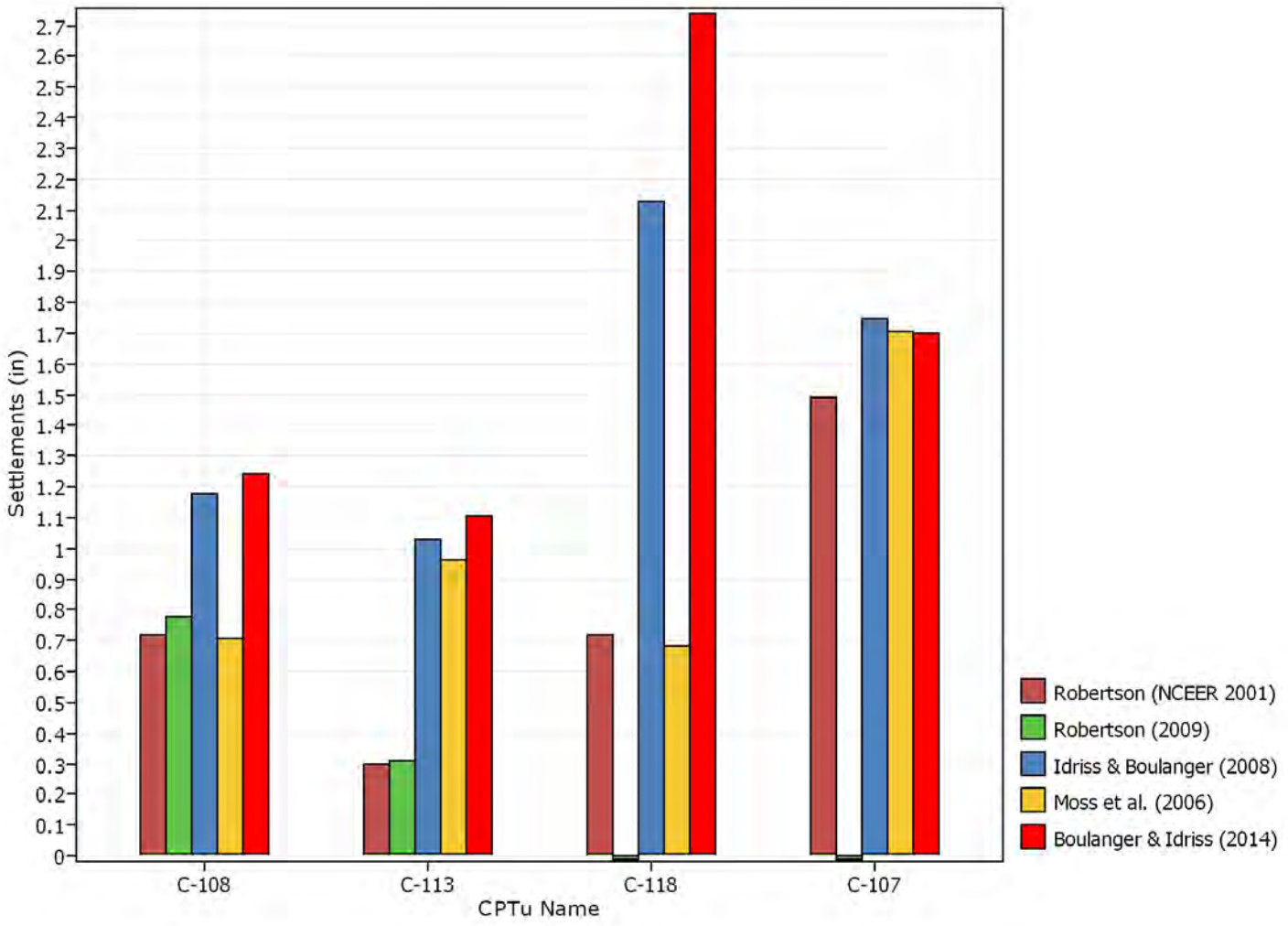
Overall Parametric Assessment Method



:: CPT main liquefaction parameters details ::

CPT Name	Earthquake Mag.	Earthquake Accel.	GWT in situ (ft)	GWT earthq. (ft)
C-108	5.50	0.48	5.00	9.40
C-113	5.50	0.48	8.00	13.90
C-118	5.50	0.48	18.00	9.40
C-107	5.50	0.48	18.00	17.40

APPENDIX C
Embankment Settlement Calculations

COHESIVE SOIL SETTLEMENT ESTIMATE

Illinois Department of Transportation

LOCATION AND BORING USED ========== BB-01
TYPE OF SURCHARGE ========== 2 (1=2:1 bridge cone, 2=continuous embank., 3=rectangular surch.)
DEPTH TO WATER TABLE (below top of existing embankment) == 36 FT

NEW EMBANKMENT:
- NEW EMBANKMENT FILL UNIT WEIGHT ========== 120 PCF
- NEW EMBANKMENT FILL HEIGHT ========== 28 FT
- PROPOSED WIDTH AT TOP ========== 80 FT
- PROPOSED WIDTH AT BOTTOM ========== 260 FT (which is a 3.2:1 slope)

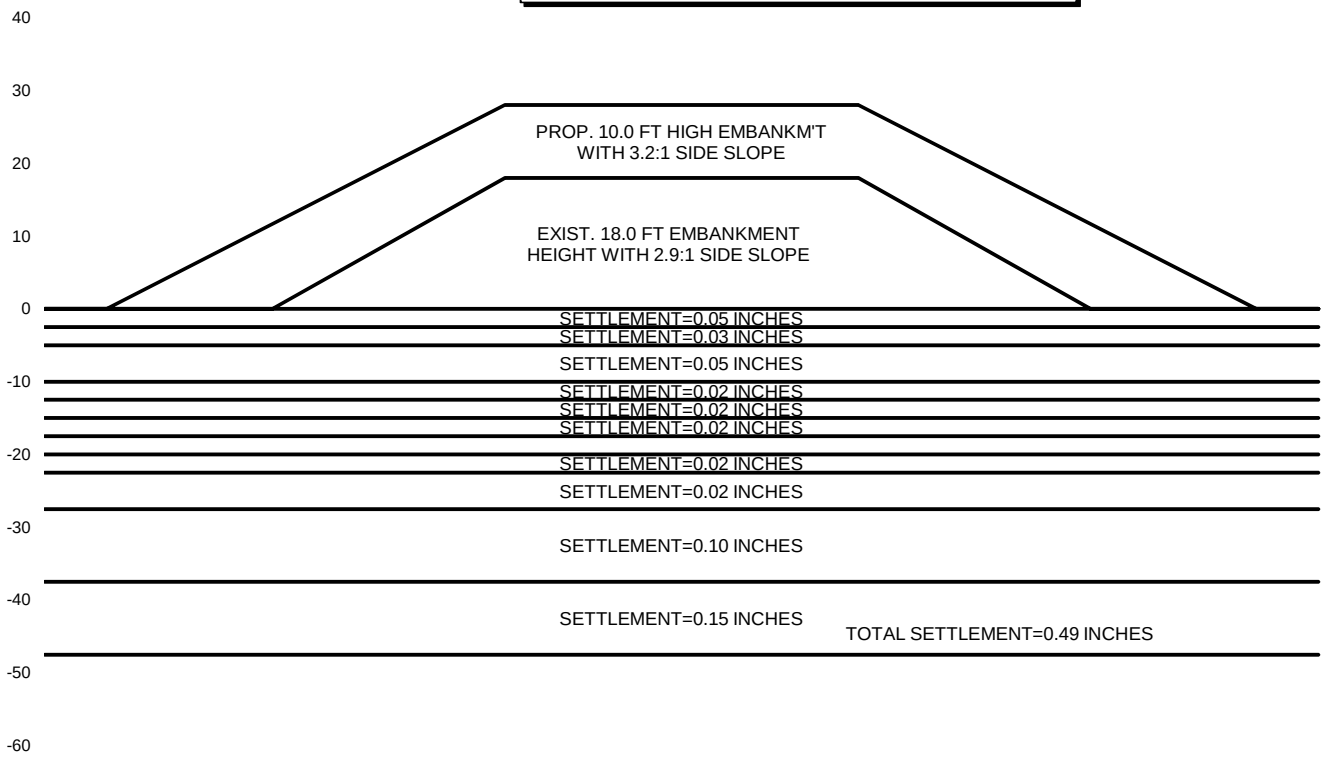
EXISTING EMBANKMENT (IF ANY):
- EXISTING EMBANKMENT UNIT WEIGHT ========== 120 PCF
- EXISTING EMBANKMENT HEIGHT ========== 18 FT
- EXISTING WIDTH AT TOP ========== 80 FT
- EXISTING WIDTH AT BASE ========== 185 FT (which is a 2.9:1 slope)

ASSUMPTIONS:
- Soil Deposit is Normally Consolidated
- Cohesive Layers are Saturated
- Soils have a Low Sensitivity
- Liquid Limit (LL)=Moist. Content (MC%)
- Initial Void Ratio (Eo)=2.7*(MC%)/100
- Comp. Index (Cc)=0.009*(LL-10)
- Neglecting Granular & Secondary Settlem't

LAYER THICK (FT)	*TOTAL UNIT WT. (PCF)*	*UNCONF. COMP. STRENGTH (Qu) (TSF)*	*MOIST. CONTENT (%)*	*EXISTING PRESSURE (KSF)*	*PRESSURE INCREASE (KSF)*	*INITIAL VOID RATIO*	*COMPRESSION INDEX (Cc)*	*Qu CORRECTION FACTOR*	*LAYER SETTLEMENT (IN.)*
2.5	120	1.70	22	2.310	1.200	0.594	0.108	0.127	**0.05**
2.5	120	2.50	22	2.610	1.200	0.594	0.108	0.100	**0.03**
5.0	120	2.90	19	3.058	1.200	0.513	0.081	0.100	**0.05**
2.5	120	4.10	21	3.504	1.200	0.567	0.099	0.100	**0.02**
2.5	120	2.30	21	3.799	1.200	0.567	0.099	0.100	**0.02**
2.5	120	4.50	22	4.093	1.200	0.594	0.108	0.100	**0.02**
2.5	120	2.90	10	4.338	1.199	0.270	0.000	0.100	**0.00**
2.5	120	2.10	18	4.472	1.199	0.486	0.072	0.106	**0.02**
5.0	120	2.50	16	4.669	1.198	0.432	0.054	0.100	**0.02**
10.0	120	1.60	22	5.051	1.196	0.594	0.108	0.134	**0.10**
10.0	120	1.60	34	5.542	1.188	0.918	0.216	0.134	**0.15**

TOTAL SETTLEMENT UNDER CENTER OF CONTINUOUS EMBANKMENT = 0.49 IN.

EMBANKMENT AND SOIL PROFILE



Illinois Department of Transportation

COHESIVE SOIL SETTLEMENT ESTIMATE

LOCATION AND BORING USED ==========: BB-02
TYPE OF SURCHARGE ==========: 1 (1=2:1 bridge cone, 2=continuous embank., 3=rectangular surch.)
DEPTH TO WATER TABLE (below top of existing embankment) ==: 36 FT

NEW EMBANKMENT:
- NEW EMBANKMENT FILL UNIT WEIGHT ==========: 120 PCF
- NEW EMBANKMENT FILL HEIGHT ==========: 30 FT
- PROPOSED WIDTH AT TOP ==========: 200 FT
- PROPOSED WIDTH AT BOTTOM ==========: 380 FT (which is a 3.0:1 slope)

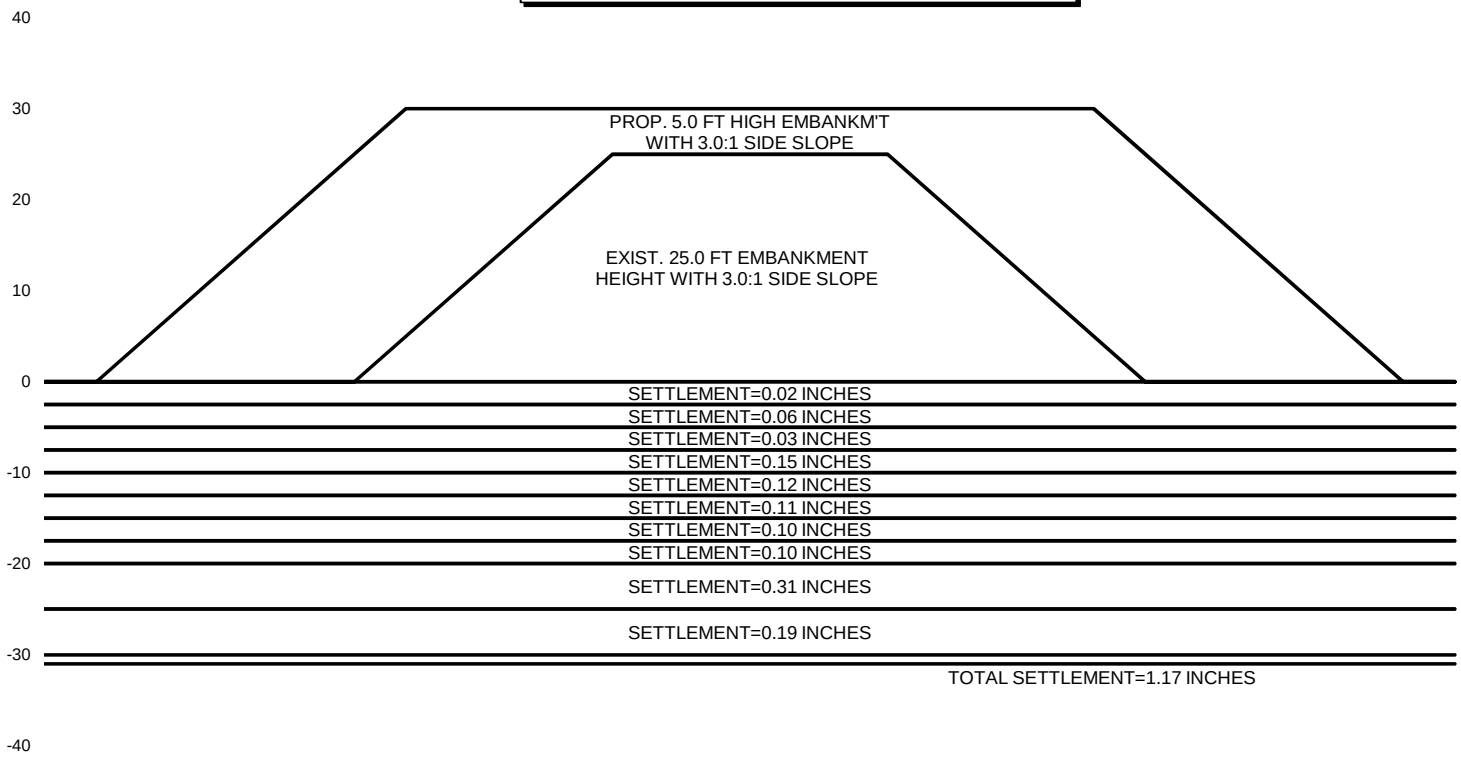
ASSUMPTIONS:
Soil Deposit is Normally Consolidated
Cohesive Layers are Saturated
Soils have a Low Sensitivity
Liquid Limit (LL)=Moist. Content (MC%)
Initial Void Ratio (Eo)=2.7*(MC%)/100
Comp. Index (Cc)=0.009*(LL-10)
Neglecting Granular & Secondary Settlem't

EXISTING EMBANKMENT (IF ANY):
- EXISTING EMBANKMENT UNIT WEIGHT ==========: 120 PCF
- EXISTING EMBANKMENT HEIGHT ==========: 25 FT
- EXISTING WIDTH AT TOP ==========: 80 FT
- EXISTING WIDTH AT BASE ==========: 230 FT (which is a 3.0:1 slope)

LAYER THICK (FT)	*TOTAL UNIT WT. (PCF)*	*UNCONF. COMP. STRENGTH (Qu) (TSF)*	*MOIST. CONTENT (%)*	*EXISTING PRESSURE (KSF)*	*PRESSURE INCREASE (KSF)*	*INITIAL VOID RATIO*	*COMPRESSION INDEX (Cc)*	*Qu CORRECTION FACTOR*	*LAYER SETTLEMENT (IN.)*
2.5	120	1.70	19	3.126	0.600	0.513	0.081	0.127	**0.02**
2.5	120	0.30	19	3.378	0.600	0.513	0.081	0.550	**0.06**
2.5	120	1.20	24	3.631	0.600	0.648	0.126	0.171	**0.03**
2.5	120	0.20	34	3.883	0.601	0.918	0.216	0.700	**0.15**
2.5	120	0.30	36	4.120	0.602	0.972	0.234	0.550	**0.12**
2.5	120	0.30	34	4.217	0.603	0.918	0.216	0.550	**0.11**
2.5	120	0.30	31	4.313	0.605	0.837	0.189	0.550	**0.10**
2.5	120	0.30	33	4.410	0.607	0.891	0.207	0.550	**0.10**
5.0	120	0.10	33	4.557	0.611	0.891	0.207	0.850	**0.31**
5.0	120	0.30	33	4.753	0.619	0.891	0.207	0.550	**0.19**
1.0	135	100.00	8	4.880	0.624	0.216	0.000	0.100	**0.00**

TOTAL SETTLEMENT UNDER CENTER OF BRIDGE CONE = 1.17 IN.

EMBANKMENT AND SOIL PROFILE



Illinois Department of Transportation

COHESIVE SOIL SETTLEMENT ESTIMATE

LOCATION AND BORING USED ========== BB-02
TYPE OF SURCHARGE ========== 2 (1=2:1 bridge cone, 2=continuous embank., 3=rectangular surch.)
DEPTH TO WATER TABLE (below top of existing embankment) == 36 FT

NEW EMBANKMENT:
- NEW EMBANKMENT FILL UNIT WEIGHT ========== 120 PCF
- NEW EMBANKMENT FILL HEIGHT ========== 30 FT
- PROPOSED WIDTH AT TOP ========== 80 FT
- PROPOSED WIDTH AT BOTTOM ========== 260 FT (which is a 3.0:1 slope)

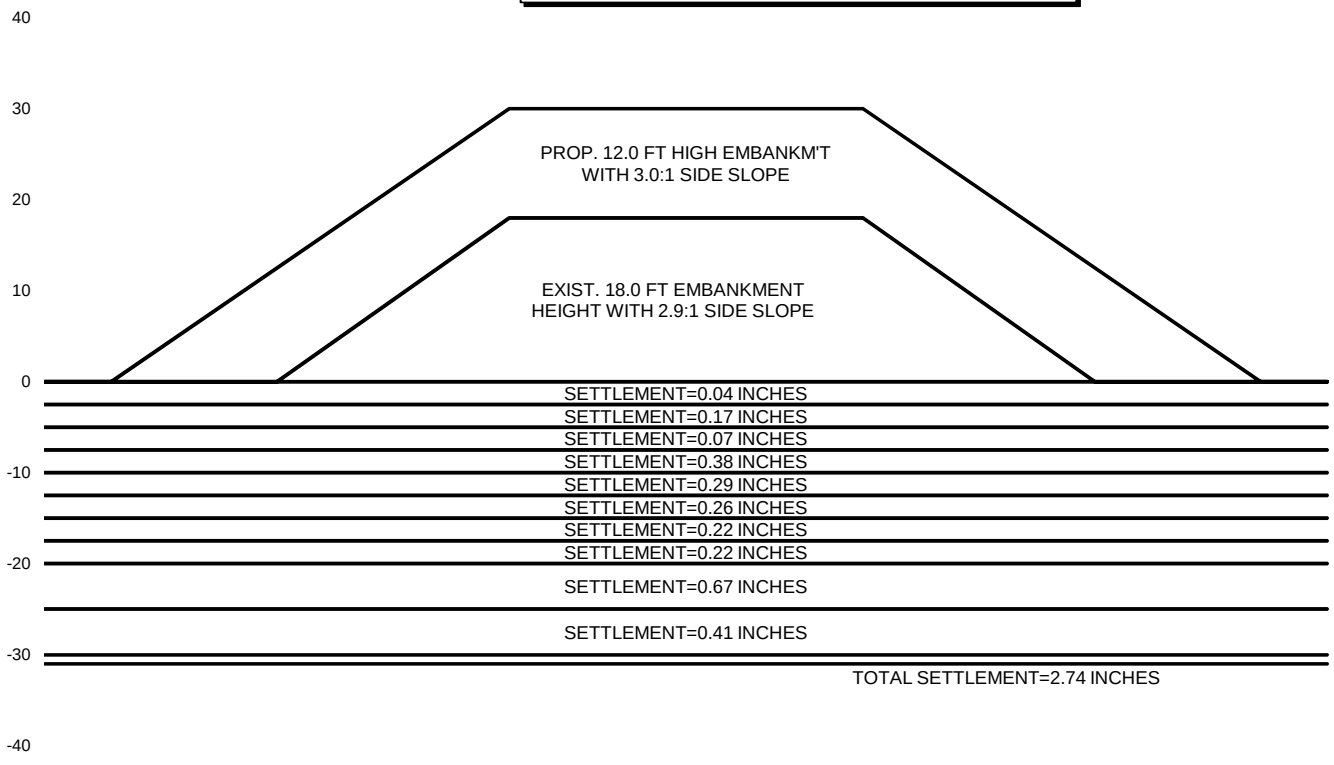
EXISTING EMBANKMENT (IF ANY):
- EXISTING EMBANKMENT UNIT WEIGHT ========== 120 PCF
- EXISTING EMBANKMENT HEIGHT ========== 18 FT
- EXISTING WIDTH AT TOP ========== 80 FT
- EXISTING WIDTH AT BASE ========== 185 FT (which is a 2.9:1 slope)

ASSUMPTIONS:
- Soil Deposit is Normally Consolidated
- Cohesive Layers are Saturated
- Soils have a Low Sensitivity
- Liquid Limit (LL)=Moist. Content (MC%)
- Initial Void Ratio (Eo)=2.7*(MC%)/100
- Comp. Index (Cc)=0.009*(LL-10)
- Neglecting Granular & Secondary Settlem't

LAYER THICK (FT)	*TOTAL UNIT WT. (PCF)*	*UNCONF. COMP. STRENGTH (Qu) (TSF)*	*MOIST. CONTENT (%)*	*EXISTING PRESSURE (KSF)*	*PRESSURE INCREASE (KSF)*	*INITIAL VOID RATIO*	*COMPRESSION INDEX (Cc)*	*Qu CORRECTION FACTOR*	*LAYER SETTLEMENT (IN.)*
2.5	120	1.70	19	2.310	1.440	0.513	0.081	0.127	**0.04**
2.5	120	0.30	19	2.610	1.440	0.513	0.081	0.550	**0.17**
2.5	120	1.20	24	2.909	1.440	0.648	0.126	0.171	**0.07**
2.5	120	0.20	34	3.207	1.440	0.918	0.216	0.700	**0.38**
2.5	120	0.30	36	3.504	1.439	0.972	0.234	0.550	**0.29**
2.5	120	0.30	34	3.799	1.439	0.918	0.216	0.550	**0.26**
2.5	120	0.30	31	4.093	1.438	0.837	0.189	0.550	**0.22**
2.5	120	0.30	33	4.338	1.438	0.891	0.207	0.550	**0.22**
5.0	120	0.10	33	4.538	1.436	0.891	0.207	0.850	**0.67**
5.0	120	0.30	33	4.798	1.432	0.891	0.207	0.550	**0.41**
1.0	135	100.00	8	4.958	1.430	0.216	0.000	0.100	**0.00**

TOTAL SETTLEMENT UNDER CENTER OF CONTINUOUS EMBANKMENT = 2.74 IN.

EMBANKMENT AND SOIL PROFILE



COHESIVE SOIL SETTLEMENT ESTIMATE

Illinois Department of Transportation

LOCATION AND BORING USED ========== B-101
TYPE OF SURCHARGE ========== 1 (1=2:1 bridge cone, 2=continuous embank., 3=rectangular surch.)
DEPTH TO WATER TABLE (below top of existing embankment) == 28 FT

NEW EMBANKMENT:
NEW EMBANKMENT FILL UNIT WEIGHT ========== 120 PCF
NEW EMBANKMENT FILL HEIGHT ========== 30 FT
PROPOSED WIDTH AT TOP ========== 200 FT
PROPOSED WIDTH AT BOTTOM ========== 380 FT (which is a 3.0:1 slope)

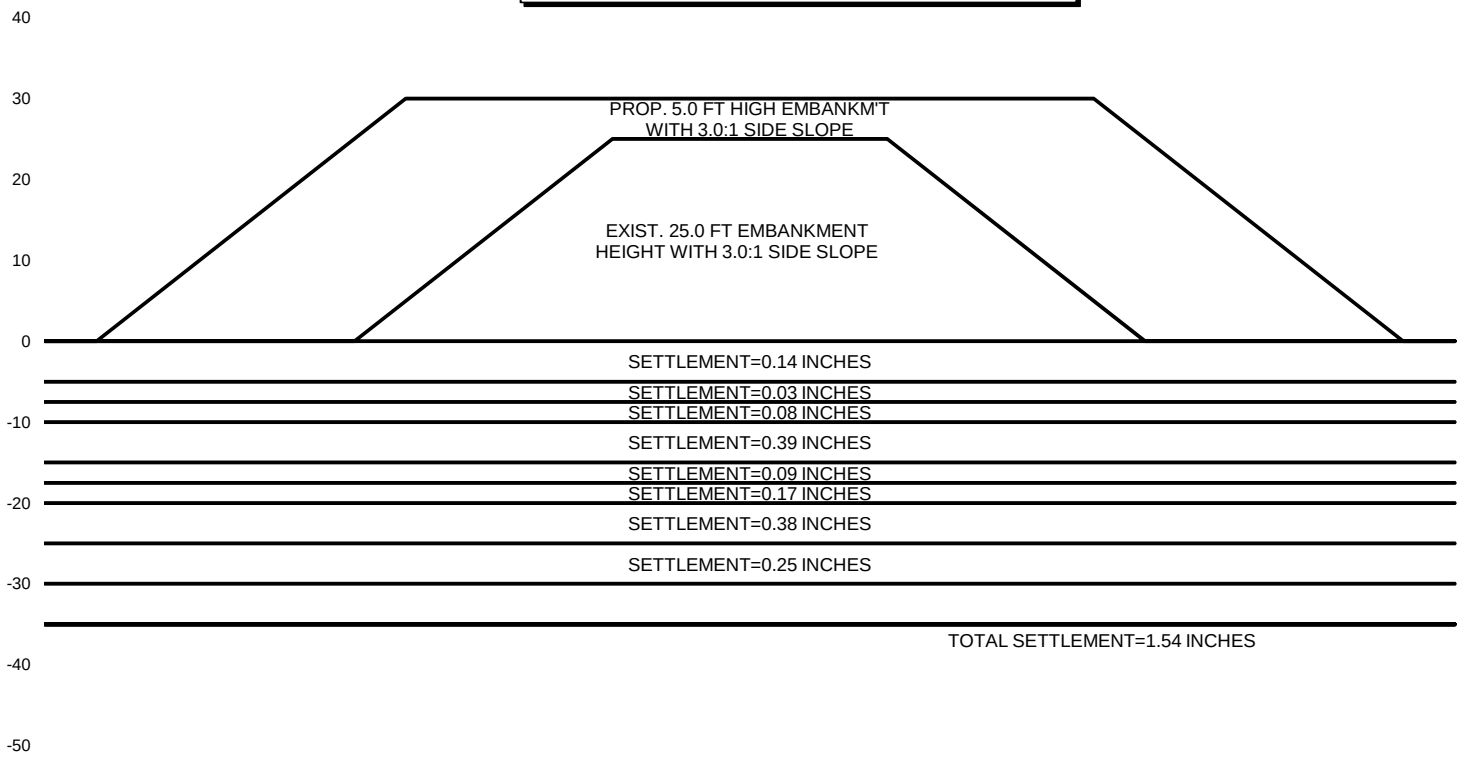
EXISTING EMBANKMENT (IF ANY):
EXISTING EMBANKMENT UNIT WEIGHT ========== 120 PCF
EXISTING EMBANKMENT HEIGHT ========== 25 FT
EXISTING WIDTH AT TOP ========== 80 FT
EXISTING WIDTH AT BASE ========== 230 FT (which is a 3.0:1 slope)

ASSUMPTIONS:
Soil Deposit is Normally Consolidated
Cohesive Layers are Saturated
Soils have a Low Sensitivity
Liquid Limit (LL)=Moist. Content (MC%)
Initial Void Ratio (Eo)=2.7*(MC%)/100
Comp. Index (Cc)=0.009*(LL-10)
Neglecting Granular & Secondary Settlem't

LAYER THICK (FT)	*TOTAL UNIT WT. (PCF)*	*UNCONF. COMP. STRENGTH (Qu) (TSF)*	*MOIST. CONTENT (%)*	*EXISTING PRESSURE (KSF)*	*PRESSURE INCREASE (KSF)*	*INITIAL VOID RATIO*	*COMPRESSION INDEX (Cc)*	*Qu CORRECTION FACTOR*	*LAYER SETTLEMENT (IN.)*
5.0	120	0.80	40	3.252	0.600	1.080	0.270	0.242	**0.14**
2.5	120	1.70	31	3.428	0.600	0.837	0.189	0.127	**0.03**
2.5	120	0.60	39	3.524	0.601	1.053	0.261	0.309	**0.08**
5.0	120	0.20	45	3.669	0.602	1.215	0.315	0.700	**0.39**
2.5	120	0.50	40	3.814	0.605	1.080	0.270	0.361	**0.09**
2.5	120	0.20	41	3.911	0.607	1.107	0.279	0.700	**0.17**
5.0	120	0.20	48	4.057	0.611	1.296	0.342	0.700	**0.38**
5.0	120	0.30	40	4.254	0.619	1.080	0.270	0.550	**0.25**
5.0	120		33	4.453	0.628	0.891	0.207	1.000	**Granular**

TOTAL SETTLEMENT UNDER CENTER OF BRIDGE CONE = 1.54 IN.

EMBANKMENT AND SOIL PROFILE



COHESIVE SOIL SETTLEMENT ESTIMATE

Illinois Department of Transportation

LOCATION AND BORING USED ========== B-101
TYPE OF SURCHARGE ========== 2 (1=2:1 bridge cone, 2=continuous embank., 3=rectangular surch.)
DEPTH TO WATER TABLE (below top of existing embankment) == 28 FT

NEW EMBANKMENT:
- NEW EMBANKMENT FILL UNIT WEIGHT ========== 120 PCF
- NEW EMBANKMENT FILL HEIGHT ========== 30 FT
- PROPOSED WIDTH AT TOP ========== 80 FT
- PROPOSED WIDTH AT BOTTOM ========== 260 FT (which is a 3.0:1 slope)

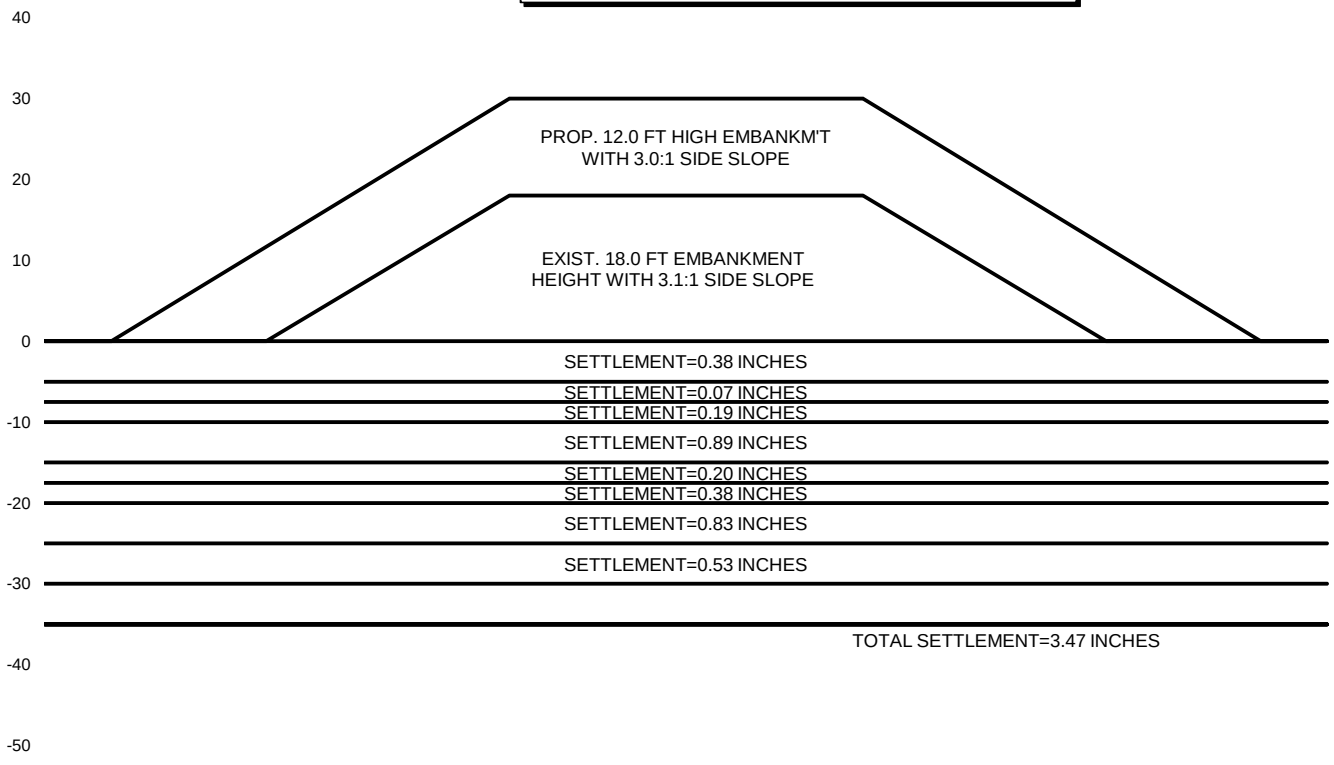
EXISTING EMBANKMENT (IF ANY):
- EXISTING EMBANKMENT UNIT WEIGHT ========== 120 PCF
- EXISTING EMBANKMENT HEIGHT ========== 18 FT
- EXISTING WIDTH AT TOP ========== 80 FT
- EXISTING WIDTH AT BASE ========== 190 FT (which is a 3.1:1 slope)

ASSUMPTIONS:
Soil Deposit is Normally Consolidated
Cohesive Layers are Saturated
Soils have a Low Sensitivity
Liquid Limit (LL)=Moist. Content (MC%)
Initial Void Ratio (Eo)=2.7*(MC%)/100
Comp. Index (Cc)=0.009*(LL-10)
Neglecting Granular & Secondary Settlem't

LAYER THICK (FT)	*TOTAL UNIT WT. (PCF)*	*UNCONF. COMP. STRENGTH (Qu) (TSF)*	*MOIST. CONTENT (%)*	*EXISTING PRESSURE (KSF)*	*PRESSURE INCREASE (KSF)*	*INITIAL VOID RATIO*	*COMPRESSION INDEX (Cc)*	*Qu CORRECTION FACTOR*	*LAYER SETTLEMENT (IN.)*
5.0	120	0.80	40	2.460	1.440	1.080	0.270	0.242	**0.38**
2.5	120	1.70	31	2.909	1.440	0.837	0.189	0.127	**0.07**
2.5	120	0.60	39	3.207	1.440	1.053	0.261	0.309	**0.19**
5.0	120	0.20	45	3.496	1.439	1.215	0.315	0.700	**0.89**
2.5	120	0.50	40	3.704	1.438	1.080	0.270	0.361	**0.20**
2.5	120	0.20	41	3.840	1.437	1.107	0.279	0.700	**0.38**
5.0	120	0.20	48	4.040	1.435	1.296	0.342	0.700	**0.83**
5.0	120	0.30	40	4.301	1.430	1.080	0.270	0.550	**0.53**
5.0	120		33	4.555	1.425	0.891	0.207	1.000	**Granular**

TOTAL SETTLEMENT UNDER CENTER OF CONTINUOUS EMBANKMENT = 3.47 IN.

EMBANKMENT AND SOIL PROFILE



Illinois Department of Transportation

COHESIVE SOIL SETTLEMENT ESTIMATE

LOCATION AND BORING USED ========== B-111
TYPE OF SURCHARGE ========== 1 (1=2:1 bridge cone, 2=continuous embank., 3=rectangular surch.)
DEPTH TO WATER TABLE (below top of existing embankment) == 38.5 FT

NEW EMBANKMENT:
NEW EMBANKMENT FILL UNIT WEIGHT ========== 120 PCF
NEW EMBANKMENT FILL HEIGHT ========== 30 FT
PROPOSED WIDTH AT TOP ========== 200 FT
PROPOSED WIDTH AT BOTTOM ========== 380 FT (which is a 3.0:1 slope)

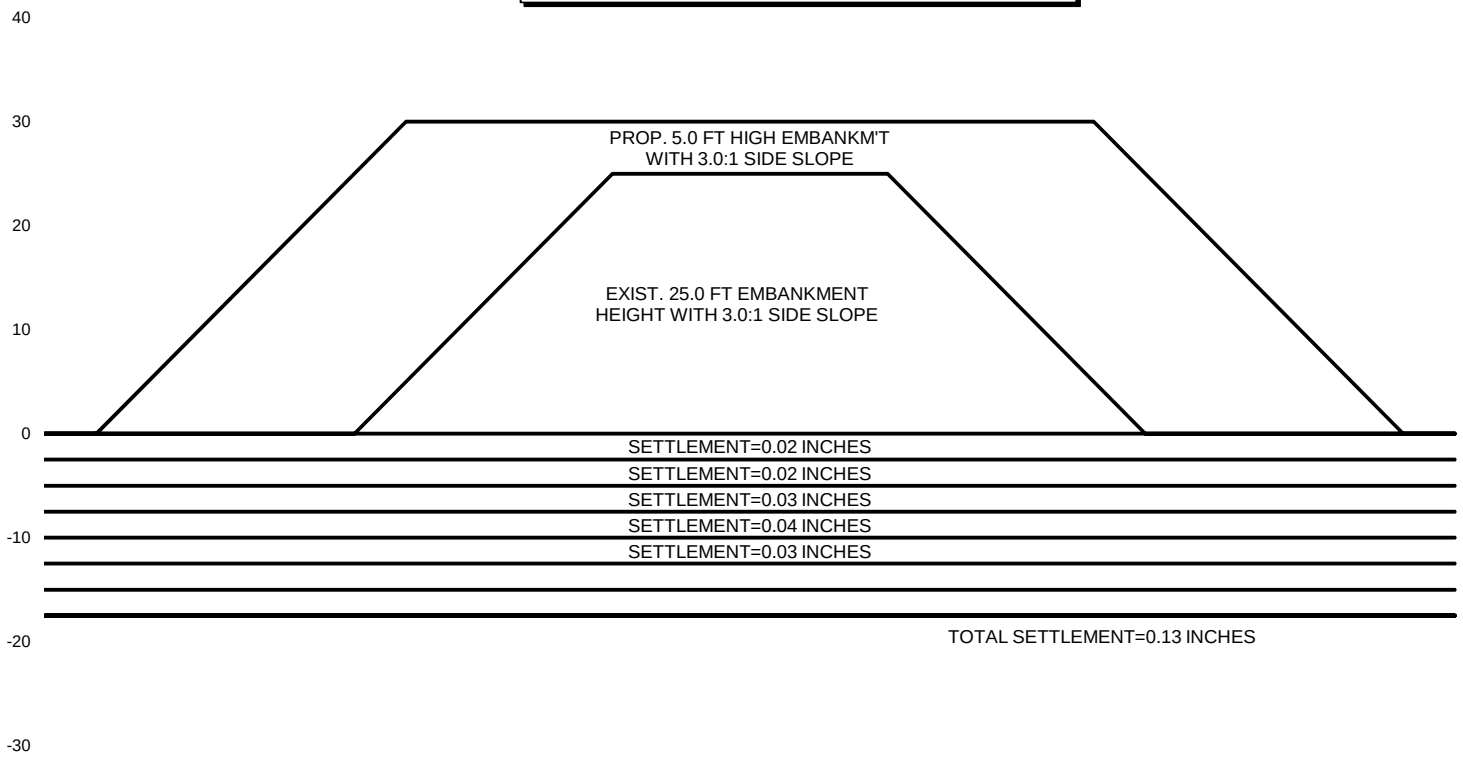
EXISTING EMBANKMENT (IF ANY):
EXISTING EMBANKMENT UNIT WEIGHT ========== 120 PCF
EXISTING EMBANKMENT HEIGHT ========== 25 FT
EXISTING WIDTH AT TOP ========== 80 FT
EXISTING WIDTH AT BASE ========== 230 FT (which is a 3.0:1 slope)

ASSUMPTIONS:
Soil Deposit is Normally Consolidated
Cohesive Layers are Saturated
Soils have a Low Sensitivity
Liquid Limit (LL)=Moist. Content (MC%)
Initial Void Ratio (Eo)=2.7*(MC%)/100
Comp. Index (Cc)=0.009*(LL-10)
Neglecting Granular & Secondary Settlem't

LAYER THICK (FT)	*TOTAL UNIT WT. (PCF)*	*UNCONF. COMP. STRENGTH (Qu) (TSF)*	*MOIST. CONTENT (%)*	*EXISTING PRESSURE (KSF)*	*PRESSURE INCREASE (KSF)*	*INITIAL VOID RATIO*	*COMPRESSION INDEX (Cc)*	*Qu CORRECTION FACTOR*	*LAYER SETTLEMENT (IN.)*
2.5	120	1.40	19	3.126	0.600	0.513	0.081	0.150	**0.02**
2.5	120	1.40	19	3.378	0.600	0.513	0.081	0.150	**0.02**
2.5	120	1.50	32	3.631	0.600	0.864	0.198	0.142	**0.03**
2.5	120	1.30	38	3.883	0.601	1.026	0.252	0.160	**0.04**
2.5	120	1.30	31	4.136	0.602	0.837	0.189	0.160	**0.03**
2.5	120	0.00	20	4.373	0.603	0.540	0.090	1.000	**Granular**
2.5	120	0.00	20	4.469	0.605	0.540	0.090	1.000	**Granular**

TOTAL SETTLEMENT UNDER CENTER OF BRIDGE CONE = 0.13 IN.

EMBANKMENT AND SOIL PROFILE



Illinois Department of Transportation

COHESIVE SOIL SETTLEMENT ESTIMATE

LOCATION AND BORING USED ========== B-111
TYPE OF SURCHARGE ========== 2 (1=2:1 bridge cone, 2=continuous embank., 3=rectangular surch.)
DEPTH TO WATER TABLE (below top of existing embankment) == 38.5 FT

NEW EMBANKMENT:
NEW EMBANKMENT FILL UNIT WEIGHT ========== 120 PCF
NEW EMBANKMENT FILL HEIGHT ========== 25 FT
PROPOSED WIDTH AT TOP ========== 80 FT
PROPOSED WIDTH AT BOTTOM ========== 230 FT (which is a 3.0:1 slope)

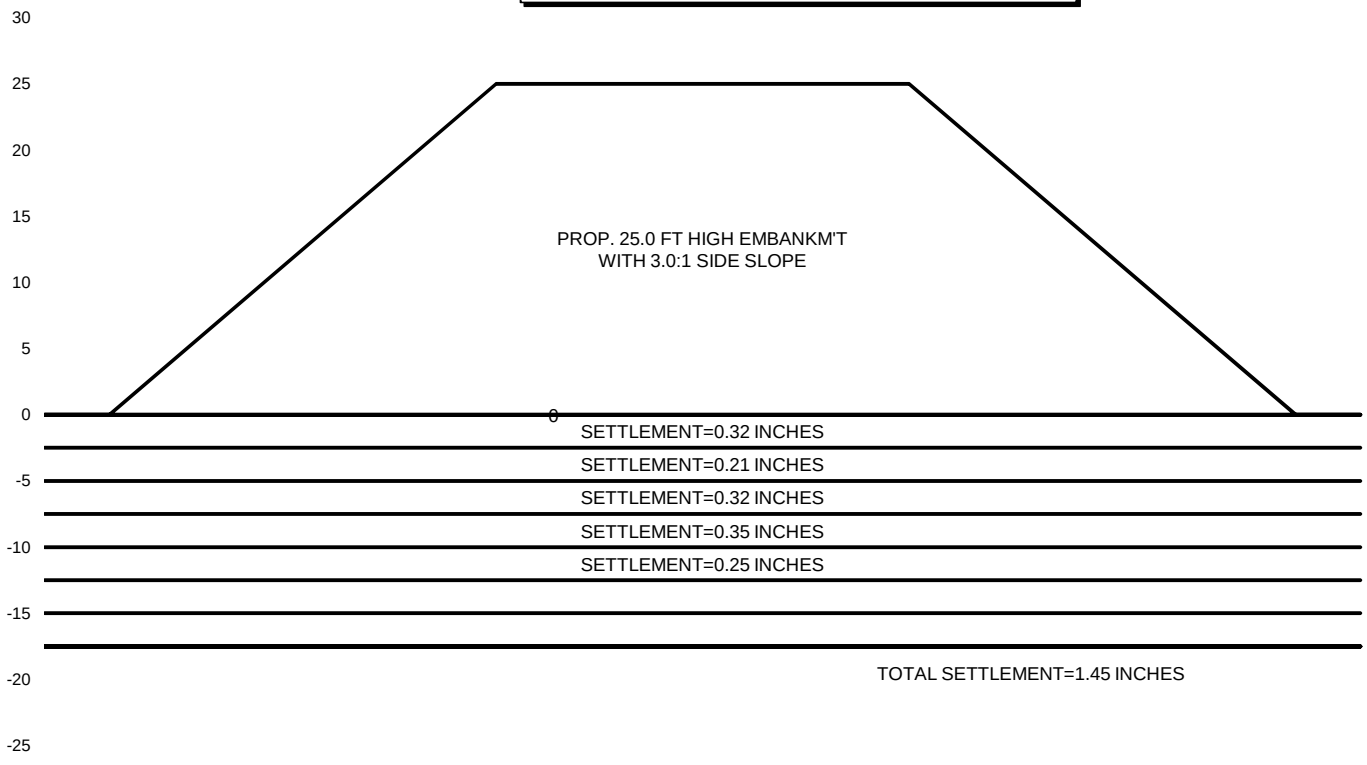
ASSUMPTIONS:
Soil Deposit is Normally Consolidated
Cohesive Layers are Saturated
Soils have a Low Sensitivity
Liquid Limit (LL)=Moist. Content (MC%)
Initial Void Ratio (Eo)=2.7*(MC%)/100
Comp. Index (Cc)=0.009*(LL-10)
Neglecting Granular & Secondary Settlem't

EXISTING EMBANKMENT (IF ANY):
EXISTING EMBANKMENT UNIT WEIGHT ========== 120 PCF
EXISTING EMBANKMENT HEIGHT ========== FT
EXISTING WIDTH AT TOP ========== FT
EXISTING WIDTH AT BASE ========== FT (which is a 0.0:1 slope)

LAYER THICK (FT)	*TOTAL UNIT WT. (PCF)*	*UNCONF. COMP. STRENGTH (Qu) (TSF)*	*MOIST. CONTENT (%)*	*EXISTING PRESSURE (KSF)*	*PRESSURE INCREASE (KSF)*	*INITIAL VOID RATIO*	*COMPRESSION INDEX (Cc)*	*Qu CORRECTION FACTOR*	*LAYER SETTLEMENT (IN.)*
2.5	120	1.40	19	0.150	3.000	0.513	0.081	0.150	**0.32**
2.5	120	1.40	19	0.450	3.000	0.513	0.081	0.150	**0.21**
2.5	120	1.50	32	0.750	2.999	0.864	0.198	0.142	**0.32**
2.5	120	1.30	38	1.050	2.997	1.026	0.252	0.160	**0.35**
2.5	120	1.30	31	1.350	2.994	0.837	0.189	0.160	**0.25**
2.5	120	0.00	20	1.650	2.989	0.540	0.090	1.000	**Granular**
2.5	120	0.00	20	1.950	2.982	0.540	0.090	1.000	**Granular**

TOTAL SETTLEMENT UNDER CENTER OF CONTINUOUS EMBANKMENT = 1.45 IN.

EMBANKMENT AND SOIL PROFILE



Illinois Department of Transportation

COHESIVE SOIL SETTLEMENT ESTIMATE

LOCATION AND BORING USED ========== B-113
TYPE OF SURCHARGE ========== 1 (1=2:1 bridge cone, 2=continuous embank., 3=rectangular surch.)
DEPTH TO WATER TABLE (below top of existing embankment) == 37.5 FT

NEW EMBANKMENT:
- NEW EMBANKMENT FILL UNIT WEIGHT ========== 120 PCF
- NEW EMBANKMENT FILL HEIGHT ========== 30 FT
- PROPOSED WIDTH AT TOP ========== 200 FT
- PROPOSED WIDTH AT BOTTOM ========== 380 FT (which is a 3.0:1 slope)

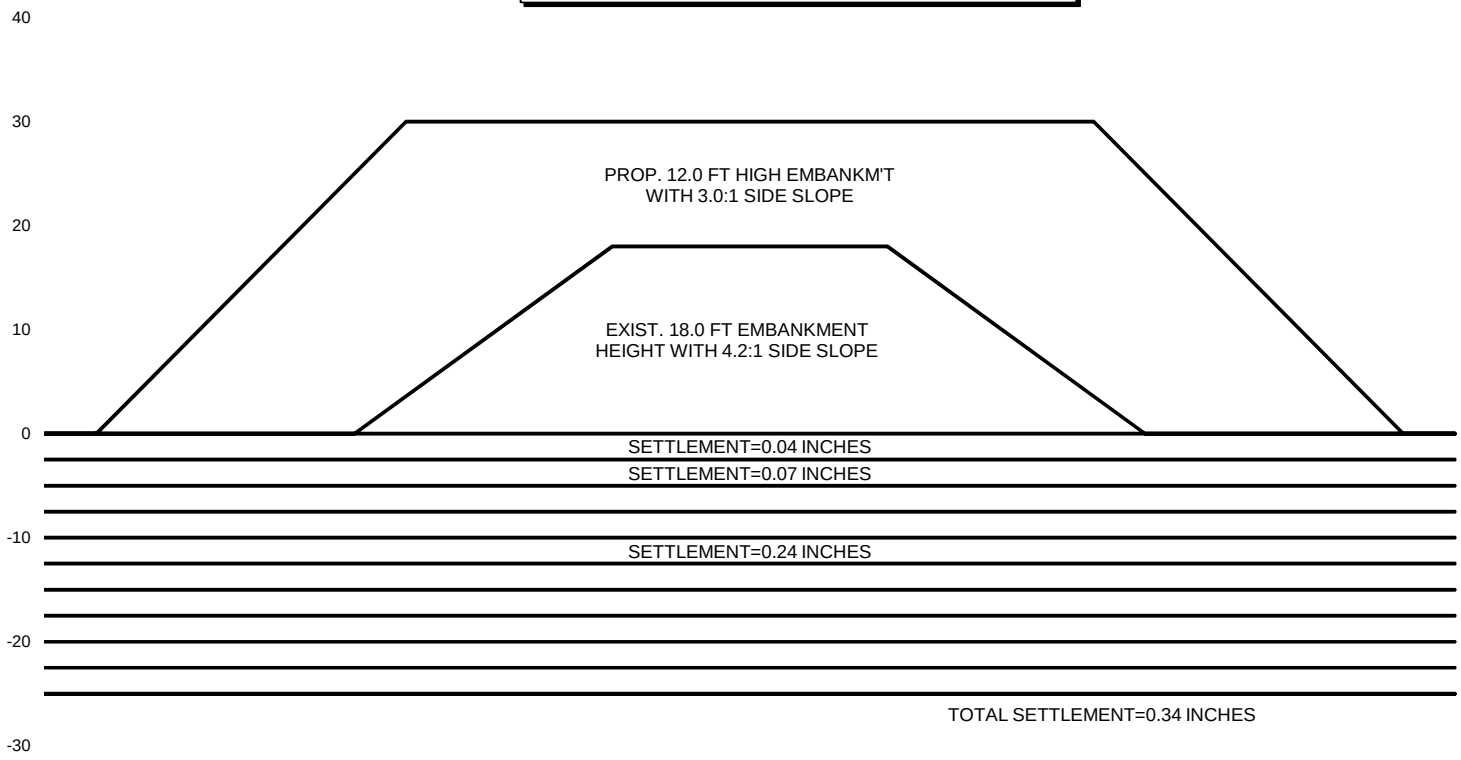
EXISTING EMBANKMENT (IF ANY):
- EXISTING EMBANKMENT UNIT WEIGHT ========== 120 PCF
- EXISTING EMBANKMENT HEIGHT ========== 18 FT
- EXISTING WIDTH AT TOP ========== 80 FT
- EXISTING WIDTH AT BASE ========== 230 FT (which is a 4.2:1 slope)

ASSUMPTIONS:
Soil Deposit is Normally Consolidated
Cohesive Layers are Saturated
Soils have a Low Sensitivity
Liquid Limit (LL)=Moist. Content (MC%)
Initial Void Ratio (Eo)=2.7*(MC%)/100
Comp. Index (Cc)=0.009*(LL-10)
Neglecting Granular & Secondary Settlem't

LAYER THICK (FT)	*TOTAL UNIT WT. (PCF)*	*UNCONF. COMP. STRENGTH (Qu) (TSF)*	*MOIST. CONTENT (%)*	*EXISTING PRESSURE (KSF)*	*PRESSURE INCREASE (KSF)*	*INITIAL VOID RATIO*	*COMPRESSION INDEX (Cc)*	*Qu CORRECTION FACTOR*	*LAYER SETTLEMENT (IN.)*
2.5	120	2.20	21	2.286	1.440	0.567	0.099	0.102	**0.04**
2.5	120	2.20	33	2.539	1.440	0.891	0.207	0.102	**0.07**
2.5	120			2.791	1.440			1.000	**Granular**
2.5	120			3.045	1.439			1.000	**Granular**
2.5	120	0.40	35	3.299	1.438	0.945	0.225	0.436	**0.24**
2.5	120			3.555	1.436			1.000	**Granular**
2.5	120			3.812	1.434			1.000	**Granular**
2.5	120			4.070	1.431			1.000	**Granular**
2.5	120			4.221	1.427			1.000	**Granular**
2.5	120			4.326	1.423			1.000	**Granular**

TOTAL SETTLEMENT UNDER CENTER OF BRIDGE CONE = 0.34 IN.

EMBANKMENT AND SOIL PROFILE



Illinois Department of Transportation

COHESIVE SOIL SETTLEMENT ESTIMATE

LOCATION AND BORING USED ========== B-113
TYPE OF SURCHARGE ========== 3 (1=2:1 bridge cone, 2=continuous embank., 3=rectangular surch.)
DEPTH TO WATER TABLE (below top of existing embankment) == 37.5 FT

NEW EMBANKMENT:
- NEW EMBANKMENT FILL UNIT WEIGHT ========== 120 PCF
- NEW EMBANKMENT FILL HEIGHT ========== 25 FT
- PROPOSED WIDTH AT TOP ========== 80 FT
- PROPOSED WIDTH AT BOTTOM ========== 80 FT (which is a MUST EQU/
- PROPOSED LENGTH OF RECTANGULAR SURCHARGE=== 400 FT

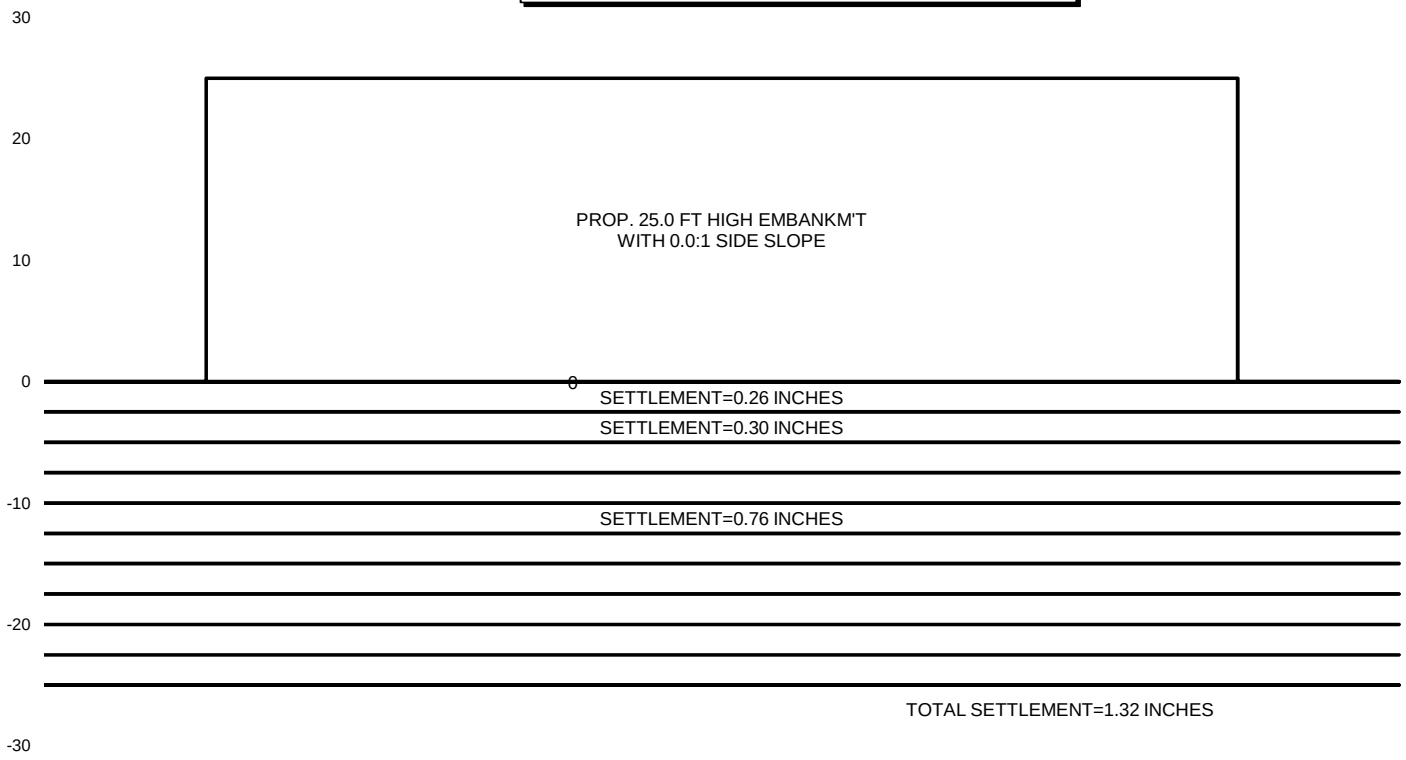
EXISTING EMBANKMENT (IF ANY):
- EXISTING EMBANKMENT UNIT WEIGHT ========== 120 PCF
- EXISTING EMBANKMENT HEIGHT ========== FT
- EXISTING WIDTH AT TOP ========== FT
- EXISTING WIDTH AT BASE ========== FT (which is a 0.0:1 slope)
- EXISTING LENGTH OF RECTANGULAR SURCHARGE========== FT

ASSUMPTIONS:
- Soil Deposit is Normally Consolidated
- Cohesive Layers are Saturated
- Soils have a Low Sensitivity
- Liquid Limit (LL)=Moist. Content (MC%)
- Initial Void Ratio (Eo)=2.7*(MC%)/100
- Comp. Index (Cc)=0.009*(LL-10)
- Neglecting Granular & Secondary Settlem't

LAYER THICK (FT)	*TOTAL UNIT WT. (PCF)*	*UNCONF. COMP. STRENGTH (Qu) (TSF)*	*MOIST. CONTENT (%)*	*EXISTING PRESSURE (KSF)*	*PRESSURE INCREASE (KSF)*	*INITIAL VOID RATIO*	*COMPRESSION INDEX (Cc)*	*Qu CORRECTION FACTOR*	*LAYER SETTLEMENT (IN.)*
2.5	120	2.20	21	0.150	3.000	0.567	0.099	0.102	**0.26**
2.5	120	2.20	33	0.450	2.999	0.891	0.207	0.102	**0.30**
2.5	120			0.750	2.995			1.000	**Granular**
2.5	120			1.050	2.987			1.000	**Granular**
2.5	120	0.40	35	1.350	2.974	0.945	0.225	0.436	**0.76**
2.5	120			1.650	2.955			1.000	**Granular**
2.5	120			1.950	2.929			1.000	**Granular**
2.5	120			2.250	2.897			1.000	**Granular**
2.5	120			2.550	2.858			1.000	**Granular**
2.5	120			2.850	2.815			1.000	**Granular**

TOTAL SETTLEMENT UNDER CENTER OF RECTANGULAR FOOTING = 1.32 IN.

EMBANKMENT AND SOIL PROFILE



Settlement Using Consolidation Data
Boring B-118

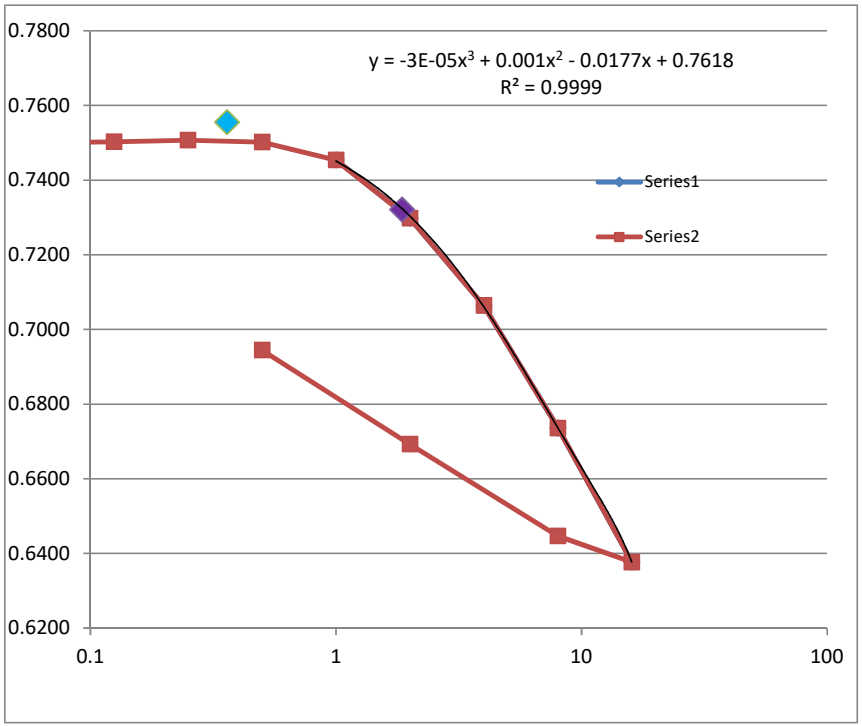
Data From Consolidation Test

Pressure tsf	Height in
0.001	0.7500
0.0625	0.7500
0.125	0.7503
0.25	0.7507
0.5	0.7502
1	0.7454
2	0.7298
4	0.7064
8	0.6736
16	0.6377
8	0.6447
2	0.6693
0.5	0.6945

Initial Pressure (tsf)	0.36	0.755556
Delta Pressure (tsf)	1.5	
Resultant Pressure (tsf)	1.86	0.732145
Strain		0.031
Compressible Layer Thickness (ft)	8	Maximum
Compressible Layer Thickness (ft)	4	Minimum
Compressible Layer Thickness (ft)	6	Average

Settlement	3.00	inches	Maximum
Settlement	1.50	inches	Minimum
Settlement	2.25	inches	Average

Don't edit
Provide values
Take formula from trendline. Adjust Trendline to maximize R^2 value



Time Rate of Consolidation Estimate

	86				Compressible layer thickness	8	feet	
LL =	0.000	cm/sec			T80	0.567		
Cv	55		0.0	ft/day	t=	**1269**	days	conservative
PI =	0.000	cm/sec			t=	**543**	days	
Cv			0.1	ft/day				
		Use:						
			0.0	ft/day	Conservative	Settlement	3.00	inches
			0.1	ft/day	Average	Percent needed for <0.4 inches	0.9	Use T 90

From Consol Data

					Compressible layer thickness	8	feet	
High	0.039	in2/min			T80	0.567		
Cv			0.4	ft/day	t=	**1210**	days	conservative
Low	0.003	in2/min			t=	**173**	days	
Cv			0.0	ft/day				
		Use:						
			0.0	ft/day	Conservative	Settlement	2.25	inches
			0.2	ft/day	Average	Percent needed for <0.4 inches	0.8	Use T 80

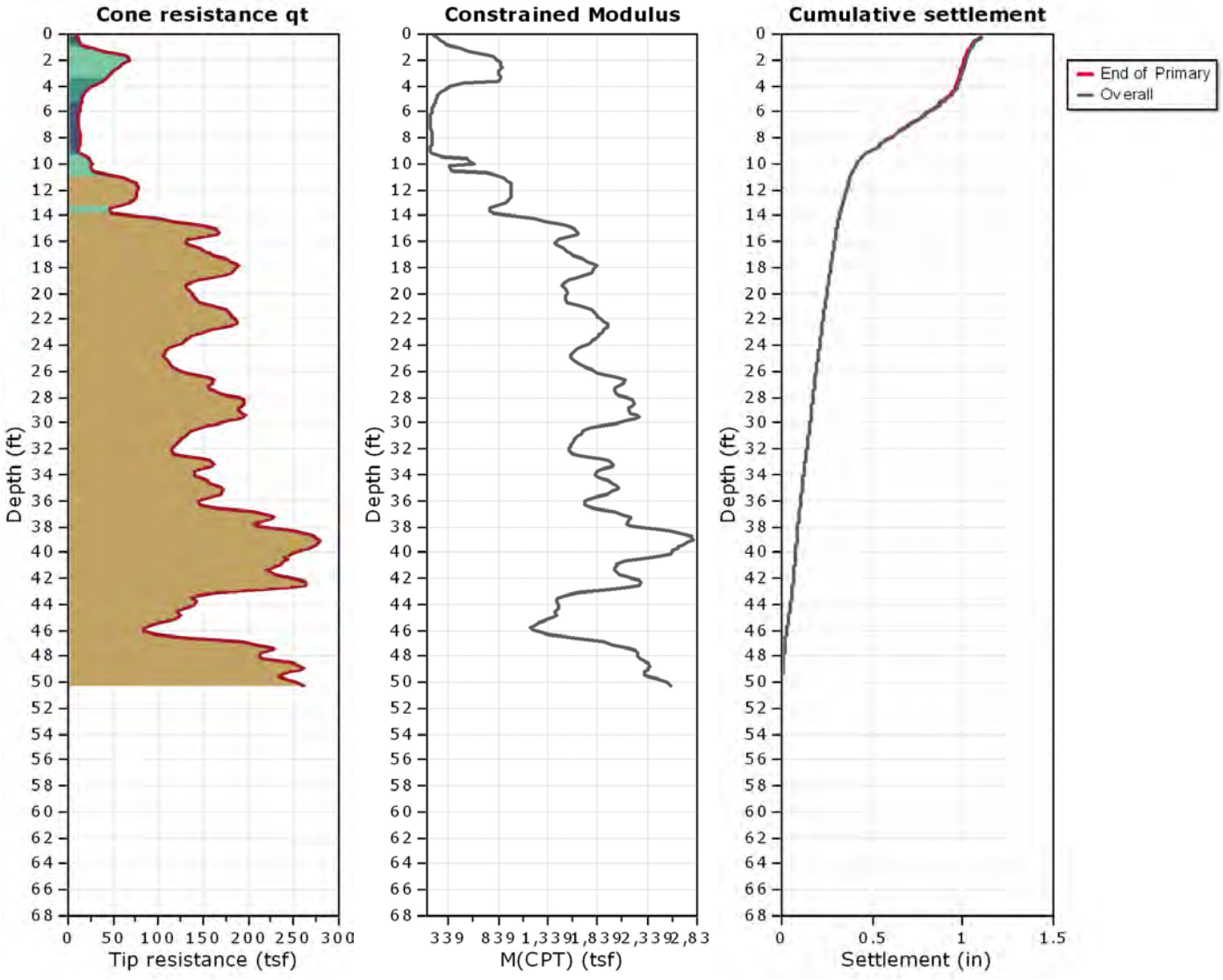
SCI Engineering, Inc.
650 Pierce Boulevard, O'Fallon, Illinois 62269

www.sciengineering.com

CPT: C-111
Total depth: 50.20 ft, Date: 9/21/2018
Surface Elevation: 419.00 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project: **PTB 185-20 I270 Bridge: 2017-3167.10**
Location: **Granite City, IL**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 80.00 (ft)
L/B: 10.0
Footing pressure: 1.50 (tsf)
Embedment depth: 0.00 (ft)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 60 months

* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$S = C_a \cdot \Delta z \cdot \log(t)$$

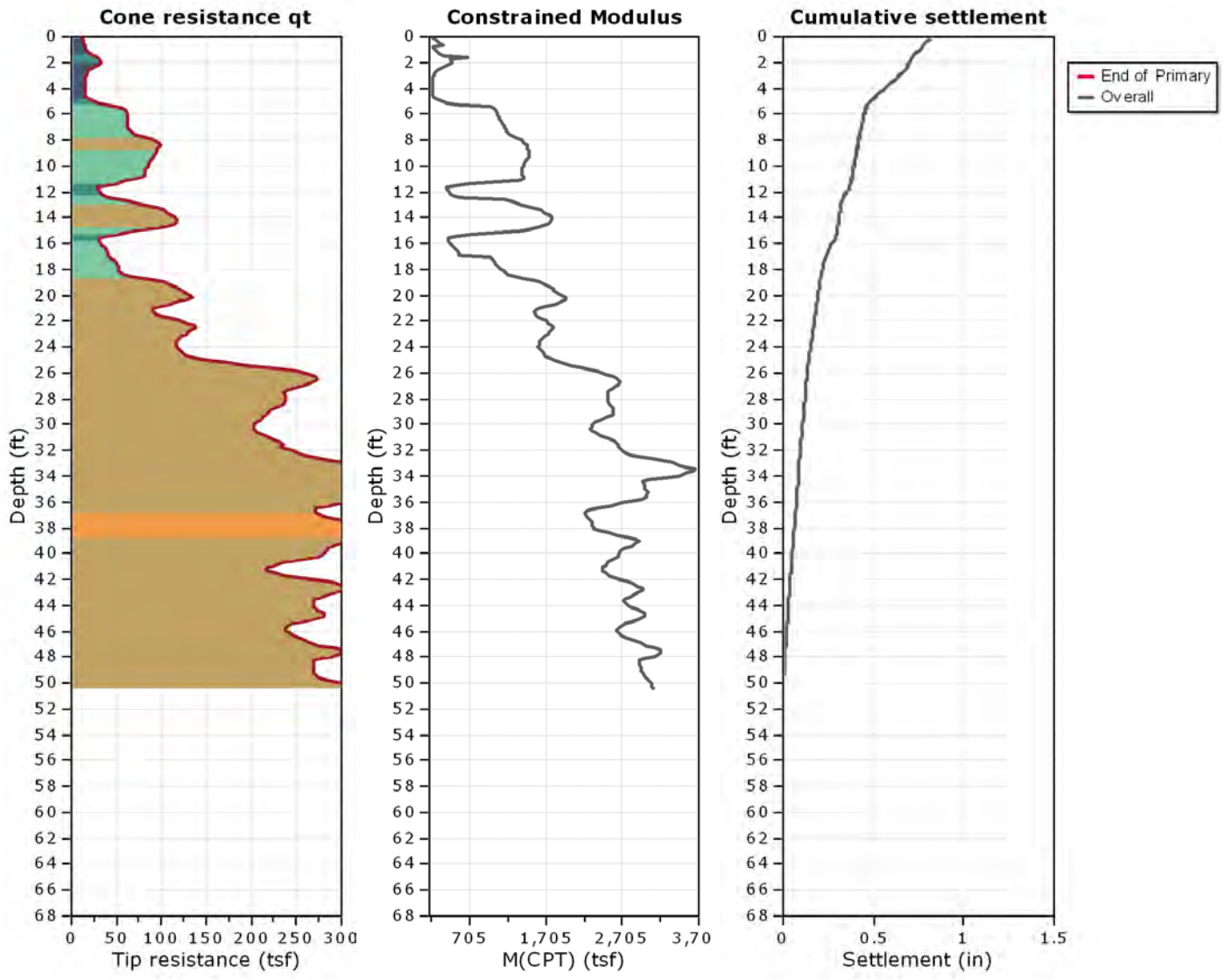
SCI Engineering, Inc.
650 Pierce Boulevard, O'Fallon, Illinois 62269

www.sciengineering.com

CPT: C-113
Total depth: 50.36 ft, Date: 9/21/2018
Surface Elevation: 416.70 ft
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project: **PTB 185-20 I270 Bridge: 2017-3167.10**
Location: **Granite City, IL**

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 80.00 (ft)
L/B: 10.0
Footing pressure: 1.50 (tsf)
Embedment depth: 0.00 (ft)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 60 months

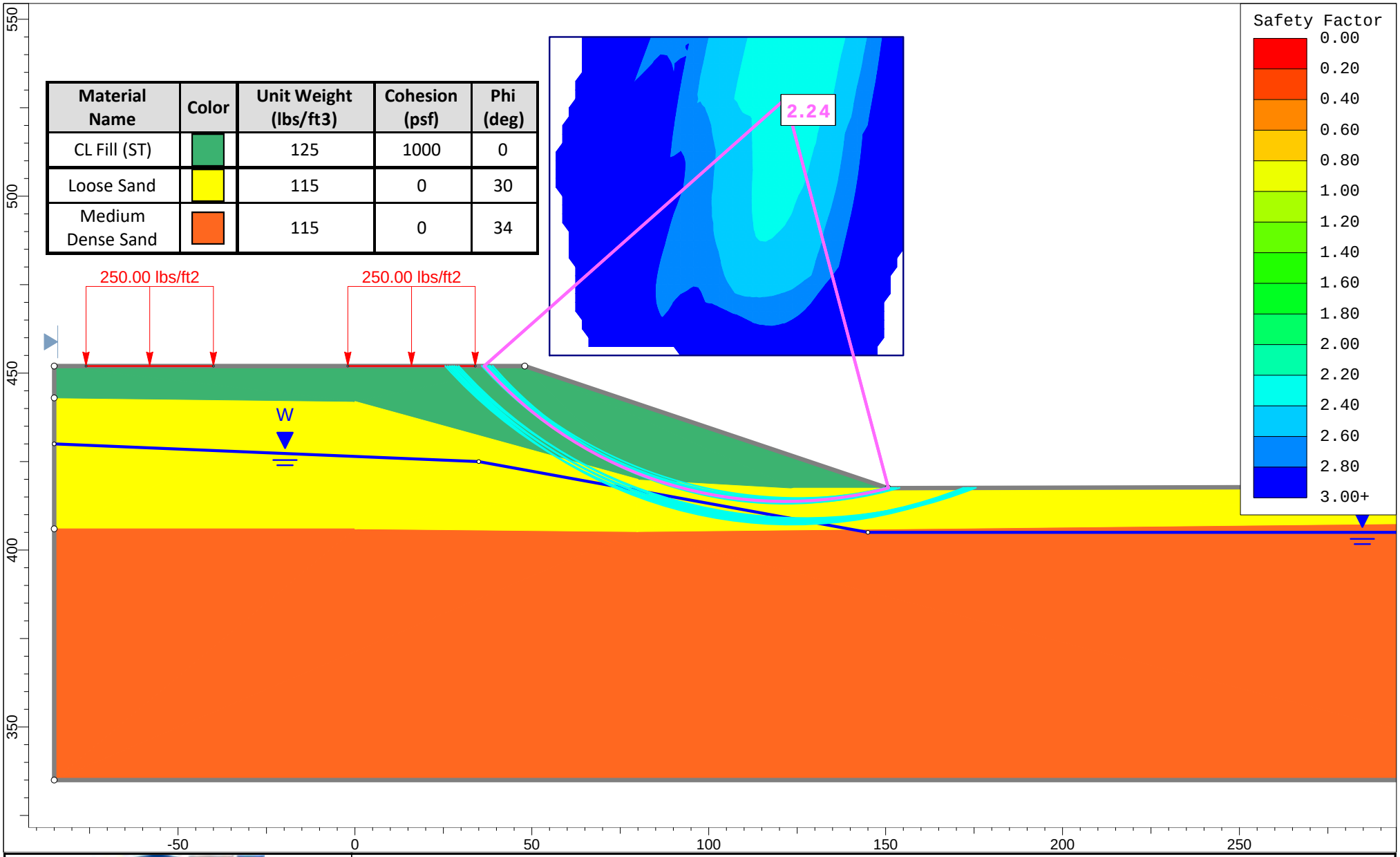
* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$S = C_a \cdot \Delta z \cdot \log(t)$$

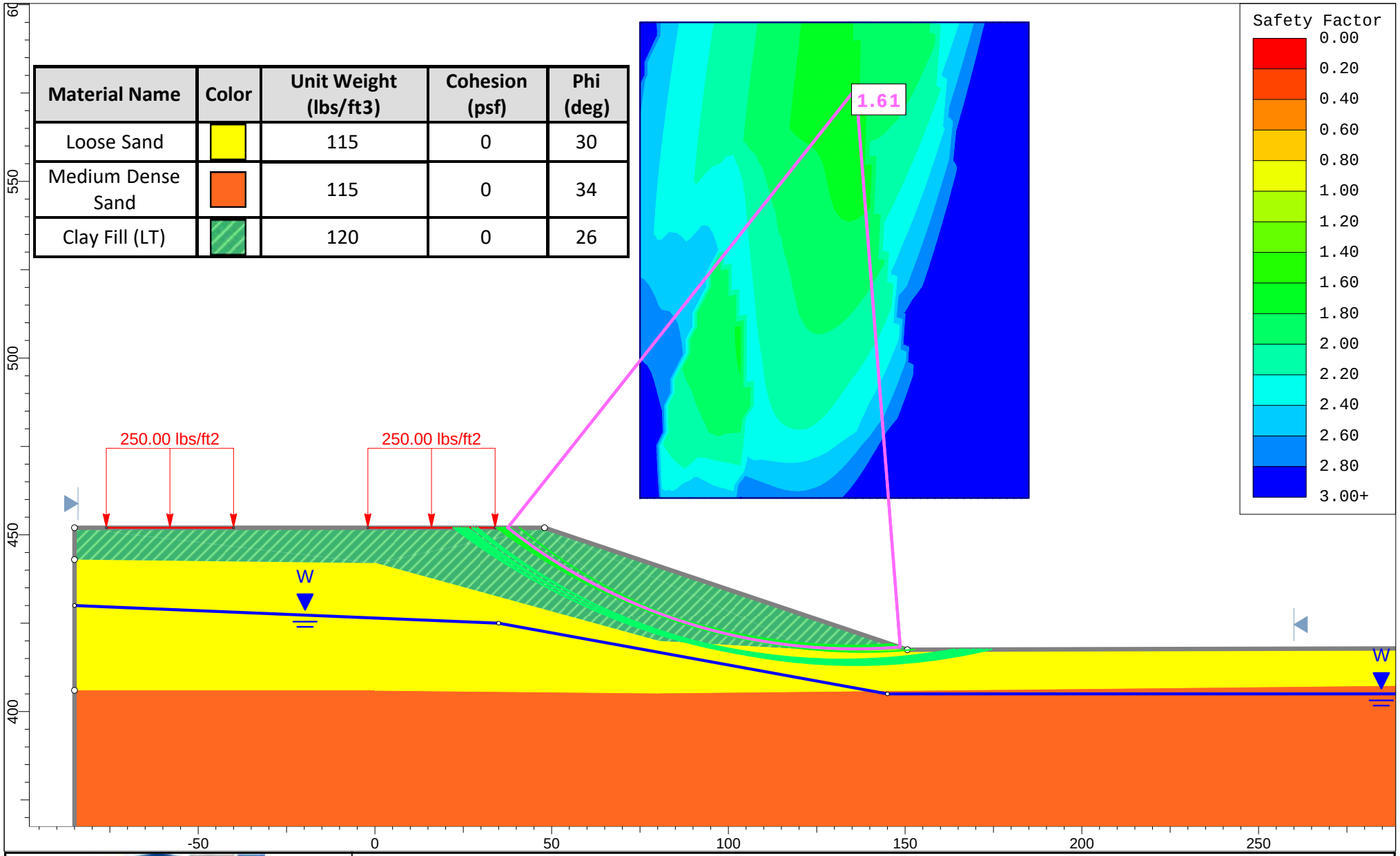
APPENDIX C
Slope Stability Analyses



SLIDEINTERPRET 9.012

Project	I-270 Over Chain of Rocks - Section A-A		
Analysis Description	Short Term (Undrained)	Location	Madison County ,IL
Drawn By	TJC	Scale 1:450	Company SCI Engineering
Date	3/25/2021, 10:27:36 AM	Project # 2017-3167.10	File Name long term.slmd

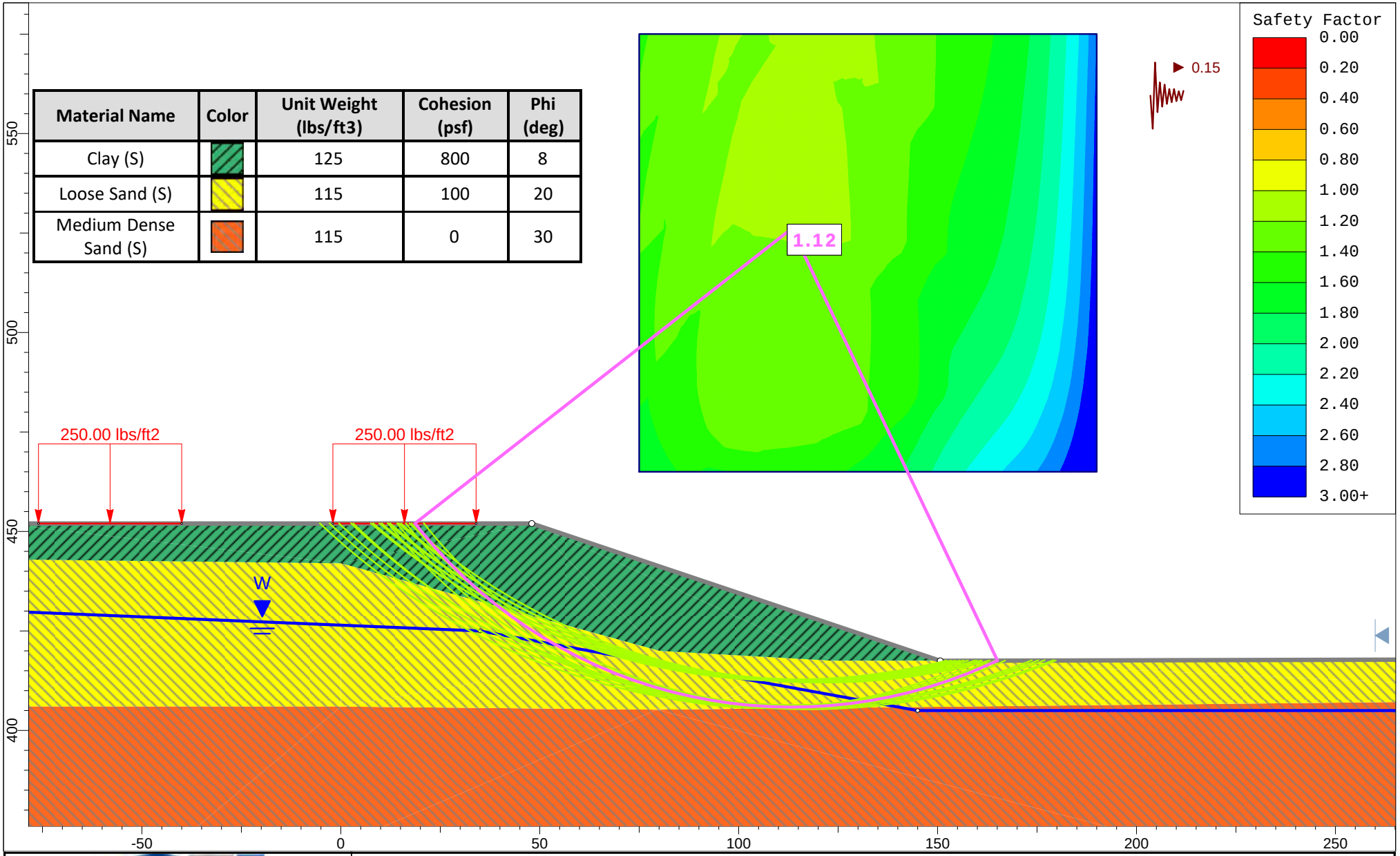
Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Loose Sand		115	0	30
Medium Dense Sand		115	0	34
Clay Fill (LT)		120	0	26



SLIDEINTERPRET 9.012

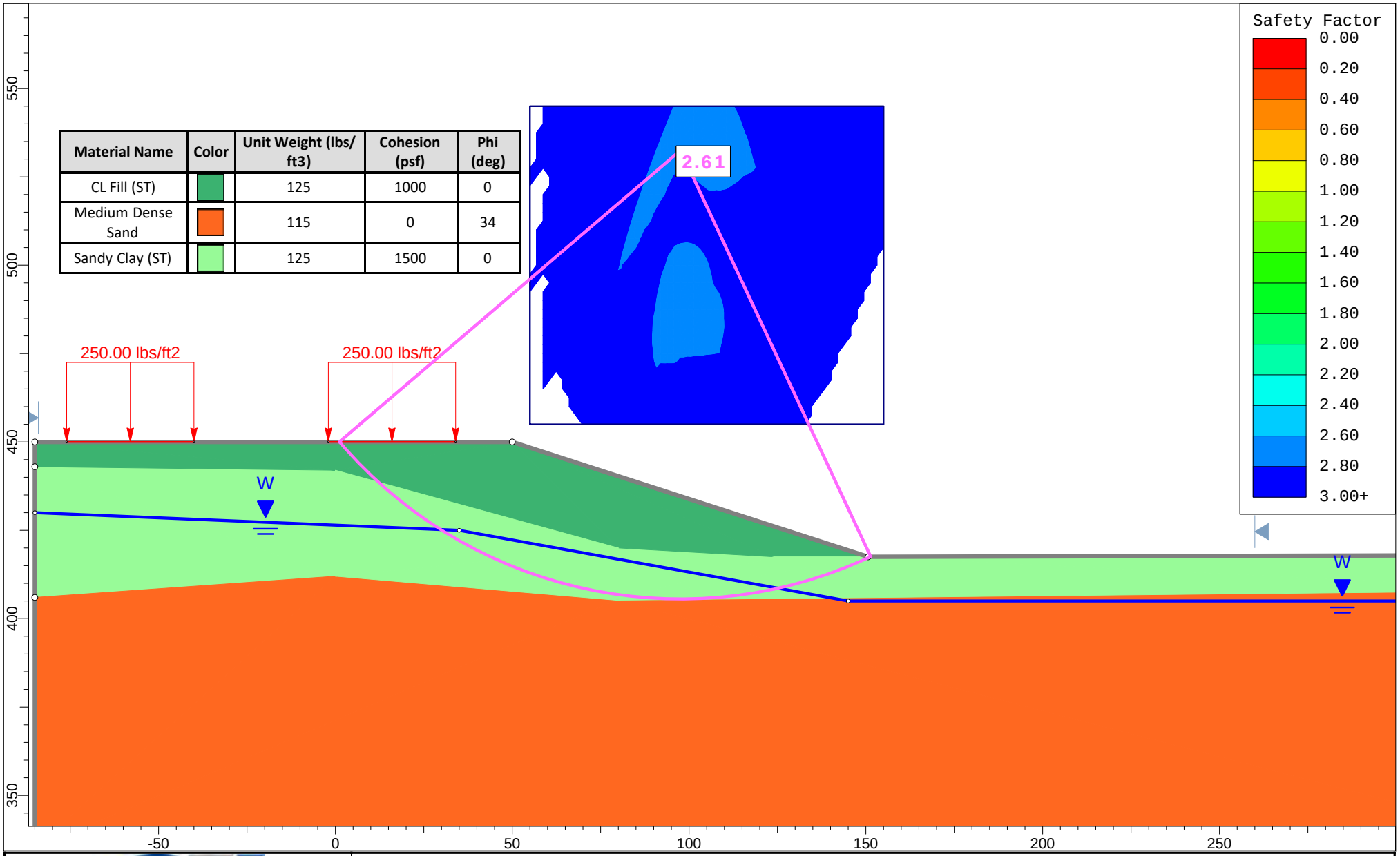
Project	I-270 Over Chain of Rocks - Section A-A		
Analysis Description	Long Term (Drained)		Location: Madison County ,IL
Drawn By: TJC	Scale: 1:450		Company: SCI Engineering
Date: 3/25/2021, 10:27:36 AM	Project #: 2017-3167.10		File Name: long term.slmd

Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Clay (S)		125	800	8
Loose Sand (S)		115	100	20
Medium Dense Sand (S)		115	0	30



SLIDEINTERPRET 9.012

Project	I-270 Over Chain of Rocks - Section A-A		
Analysis Description	Seismic	Location	Madison County ,IL
Drawn By	TJC	Scale 1:400	Company SCI Engineering
Date	3/25/2021, 10:27:36 AM	Project # 2017-3167.10	File Name long term.slmd

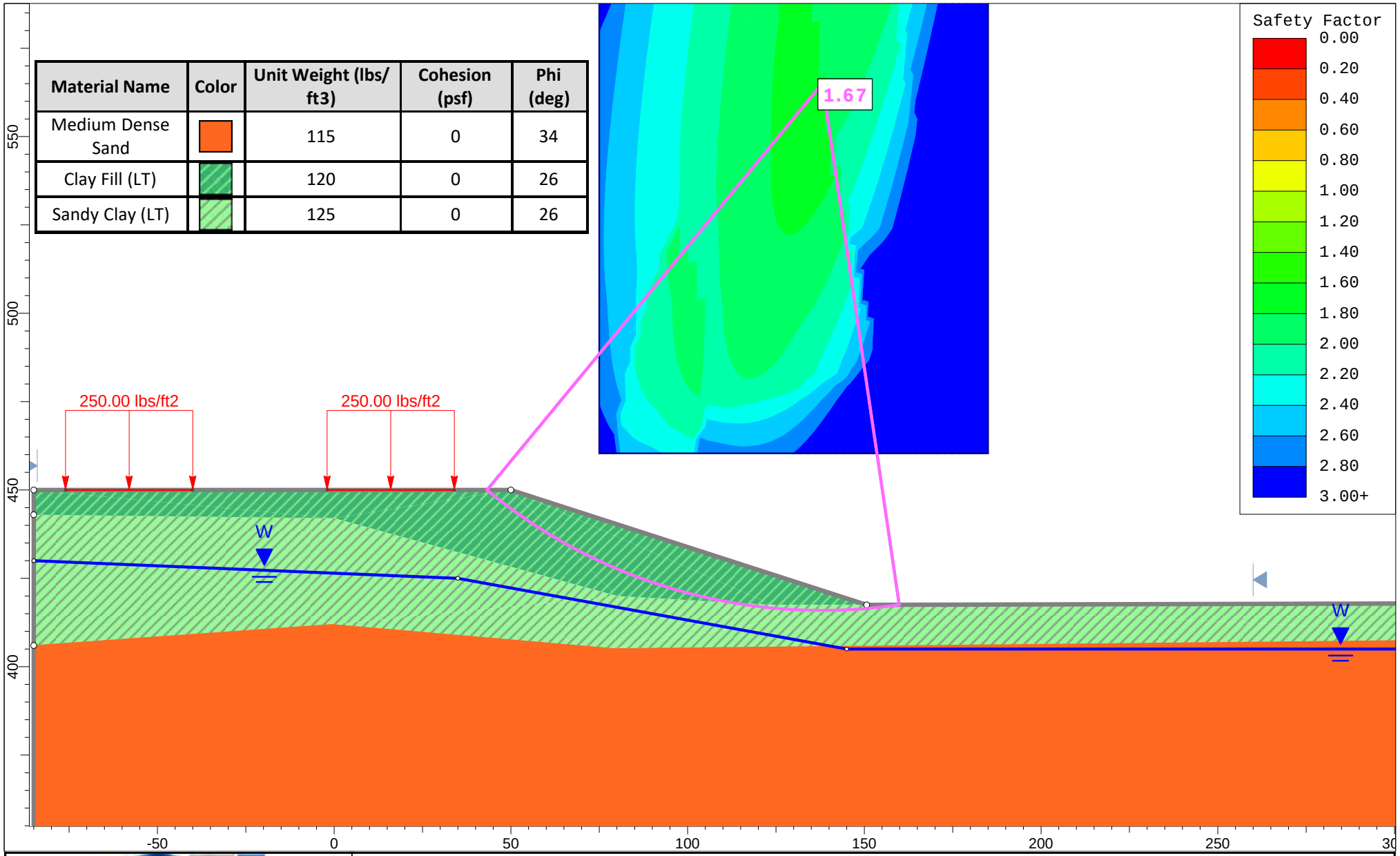


Material Name	Color	Unit Weight (lbs/ ft3)	Cohesion (psf)	Phi (deg)
CL Fill (ST)		125	1000	0
Medium Dense Sand		115	0	34
Sandy Clay (ST)		125	1500	0

SLIDEINTERPRET 9.012

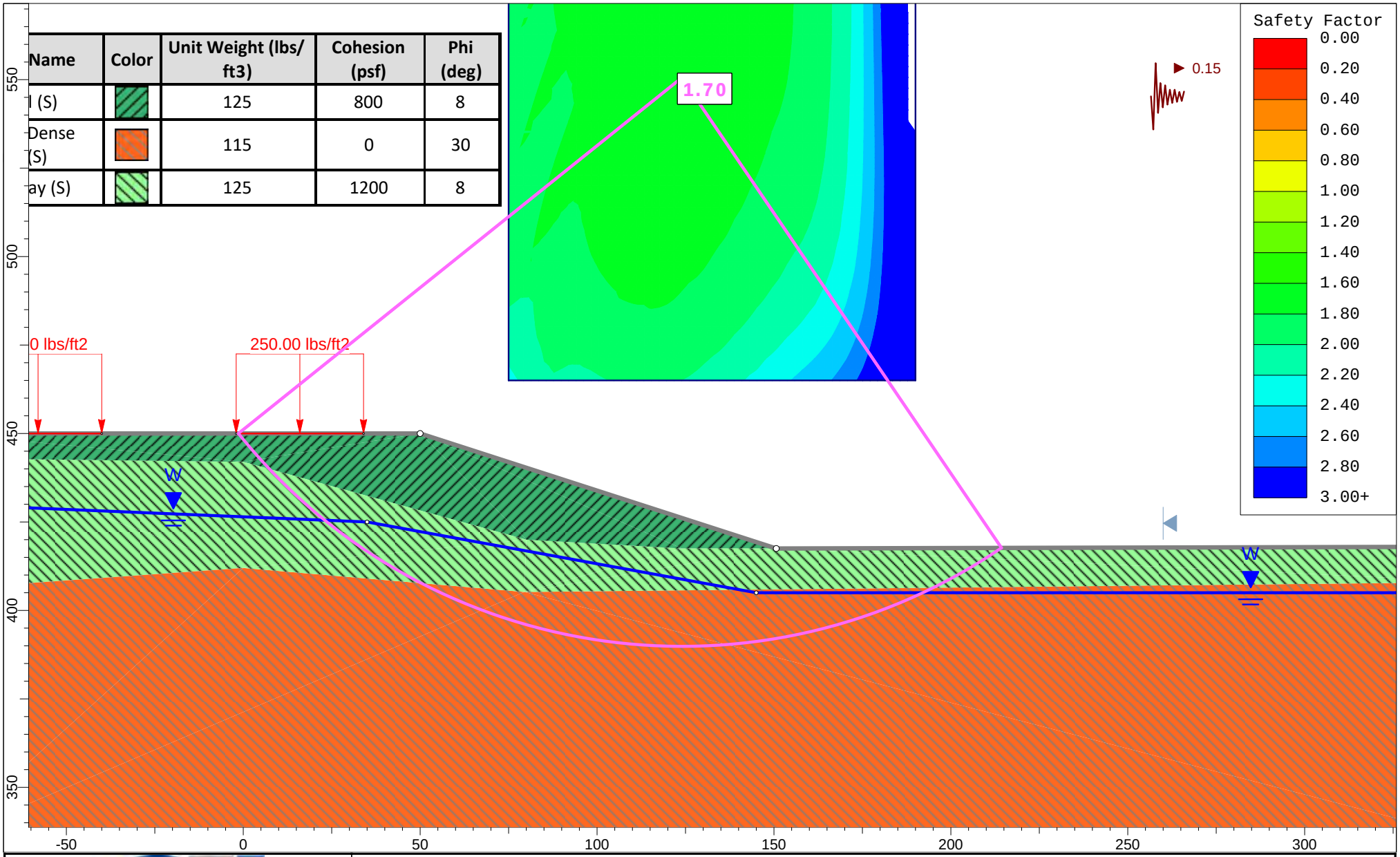
Project	I-270 Over Chain of Rocks - Section B-B		
Analysis Description	Short Term (undrained)	Location	Madison County ,IL
Drawn By	TJC	Scale 1:450	Company SCI Engineering
Date	3/25/2021, 10:27:36 AM	Project # 2017-3167.10	File Name long term.slmd

Material Name	Color	Unit Weight (lbs/ ft3)	Cohesion (psf)	Phi (deg)
Medium Dense Sand		115	0	34
Clay Fill (LT)		120	0	26
Sandy Clay (LT)		125	0	26



SLIDEINTERPRET 9.012

Project	I-270 Over Chain of Rocks - Section B-B		
Analysis Description	Long Term (drained)	Location	Madison County ,IL
Drawn By	TJC	Scale 1:450	Company SCI Engineering
Date	3/25/2021, 10:27:36 AM	Project # 2017-3167.10	File Name long term.slmd



SLIDEINTERPRET 9.012

Project	I-270 Over Chain of Rocks - Section B-B		
Analysis Description	Seismic	Location	Madison County ,IL
Drawn By	TJC	Scale	1:450
Company	SCI Engineering		
Date	3/25/2021, 10:27:36 AM	Project #	2017-3167.10
File Name	long term.slmd		

APPENDIX D
Soil Modulus Parameters (k) for LPILE Analysis

B-01 West Abutment

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 8	441.4 to 433.4	Fill: Medium Stiff to Stiff Silt (without free water)	115	1000	26	100	0.009
8 to 45	433.4 to 396.4	Fill: Medium Stiff to Stiff Clay and Loam (with free water)	55	1500	--	100	0.009
45 to 52	396.4 to 389.4	Submerged Loose Sand	45	--	28	20	--
52+	< 389.4	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	50	0.0001

B-02 West Abutment

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 3	420.6 to 417.6	Fill: Medium Stiff Sandy Clay Loam (without free water)	115	1000	--	100	0.02
3 to 31	417.6 to 389.6	Very Loose to Loose Silty Sand (with free water)	45	--	20	20	--
31 +	< 389.6	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	64	0.0001

BB-03 West

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 4	420 to 416	Fill: Very Soft to Soft Silty Loam (without free water)	110	--	26	20	--
4 to 11	416 to 409	Soft to Medium Stiff Clay Loam (with free water)	55	250	26	30	0.02
11 to 33.5	409 to 386.5	Submerged Loose Sand	45	--	28	20	--
33.5+	< 386.5	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	5,000	75	0.0001

BB-04 West Estimated

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
N/A	< 387	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	50	0.0001

B-05
West

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 3.5	420.4 to 416.9	Fill: Medium Stiff Silty Clay (without free water)	120	500	--	80	0.01
3.5 to 34.5	416.9 to 385.9	Submerged Loose to Medium Dense Silt and Loam	50	--	27	20	--
34.5+	< 385.9	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	4,000	90	0.0001

BB-06
River
Estimated

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
N/A	< 384.5	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	50	0.0001

BB-07
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
21.2+	< 381.9	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	80	0.0001

BB-08
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
18.9+	< 384	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	70	0.0001

BB-09
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
19.2+	< 381	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	79	0.0001

BB-10
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
23.6+	< 356	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	75	0.0001

BB-11 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
20.9+	< 378.1	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	4,000	84	0.0001

BB-12 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
8.7+	< 384.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	5,000	79	0.0001

BB-13 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
20+	< 377.8	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	5,000	80	0.0001

BB-14 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
10.5+	< 383.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	5,000	70	0.0001

BB-15 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
5.7 to 24	400.9 to 382.6	Loose Sand below WT	50	--	25	25	--
24+	< 382.6	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	45,000	5,000	75	0.0001

BB-16C River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
26.6+	< 373.6	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	60	0.0001

BB-17
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
15.3+	< 374.3	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	63	0.0001

BB-18
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
7.8 to 26.9	400 to 380.9	Loose Sand below WT	50	--	25	25	--
26.9+	< 380.9	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	75	0.0001

BB-19
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
20.6+	< 368.9	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	57	0.0001

BB-20
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
16.2+	< 373	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	76	0.0001

BB-21
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
21+	< 367.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	67	0.0001

BB-22 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
19.8+	< 369	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	77	0.0001

BB-23 (offset) River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
23+	< 366.2	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	79	0.0001

BB-24 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
23.9+	< 364.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	77	0.0001

BB-26 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
23.9+	< 364.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	78	0.0001

BB-27 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
30+	< 358.5	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	78	0.0001

BB-28 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
43+	< 347.3	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	93	0.0001

BB-30 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
47.2+	< 342.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	5,000	93	0.0001

BB-31 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
43.5+	< 346.5	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	91	0.0001

BB-32 East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 3	416 to 413	Fill: Dense Sand with Gravel (above WT)	120	--	33	100	--
3 to 15	413 to 401	Submerged Very Loose to Loose Silty Sand	50	--	26	20	--
15 to 76.5	401 to 339.5	Submerged Medium Dense Sand	50	--	32	50	--
76.5+	< 339.5	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	64	0.0001

BB-33 River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
43 to 49	349.1 to 343.1	Submerged Medium Dense Sand	55	--	30	60	--
49+	< 343.1	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	88	0.0001

BB-34
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
42.1 to 50.6	349.2 to 340.7	Submerged Medium Dense Sand	50	--	30	60	--
50.6+	< 340.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	93	0.0001

BB-36
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
56.6	< 347.6	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	55,000	5,000	90	0.0001

BB-37
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
41.2 to 49.2	352.6 to 344.6	Submerged Medium Dense Sand	50	--	30	60	--
49.2+	< 344.6	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	5,000	95	0.0001

BB-38a
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
28.9 to 58.8	376.2 to 346.3	Submerged Medium Dense Sand	50	--	30	60	--
58.8+	< 346.3	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	45,000	4,200	92	0.0001

BB-39
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
41.2 to 57.6	362.7 to 346.3	Submerged Loose Sand	50	--	25	25	--
57.6+	< 346.3	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	55,000	5,000	90	0.0001

BB-40
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 4	412.6 to 408.6	Medium Stiff Clay (without free water)	120	800	--	100	0.01
4 to 20	408.6 to 392.6	Submerged Very Loose to Loose Sand	45	--	26	20	--
20 to 77	392.6 to 335.6	Submerged Medium Dense Sand	50	--	32	50	--
77+	< 335.6	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	86	0.0005

BB-41
River

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
59.2+	< 336.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	3,800	89	0.0001

BB-42
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 5	412.3 to 407.3	Medium Stiff Silty Clay (without free water)	115	600	--	100	0.01
5 to 55	407.3 to 357.3	Submerged Loose to Medium Dense Sand	50	--	30	40	--
55 to 78.6	357.3 to 333.7	Submerged Dense Sand	55	--	34	100	--
78.6+	< 333.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	5,000	69	0.0001

BB-44
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 4	416 to 412	Fill: Loose Clayey Sand (above WT)	115	--	25	25	--
4 to 27	412 to 389	Submerged Very Loose to Loose Sand	45	--	27	20	--
27 to 50	389 to 366	Submerged Loose to Medium Dense Sand	50	--	30	40	--
50 to 71	366 to 345	Submerged Medium Dense to Dense Sand	55	--	33	80	--
71+	< 345	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	9,000	43	0.0001

BB-45
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 3	417.1 to 414.1	Fill: Very Loose Silty Sand above WT	115	--	25	25	--
3 to 32	414.1 to 385.1	Submerged Loose Sand	45	--	26	20	--
32 to 73.5	385.1 to 343.6	Submerged Medium Dense Sand	50	--	32	60	--
73.5+	< 343.6	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	4,000	52	0.0001

BB-46
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 4	414.5 to 410.5	Fill: Medium Stiff Silty Clay (without free water)	115	500	--	70	0.01
4 to 25.5	410.5 to 389	Submerged Loose to Medium Dense Sand	50	--	30	30	--
25.5 to 73.5	389 to 341	Submerged Medium Dense to Dense Sand	55	--	32	80	--
73.5+	< 341	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	5,000	49	0.0001

BB-47
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 4	416.5 to 412.5	Medium Stiff Clay (above WT)	115	500	--	70	0.01
4 to 20	412.5 to 396.5	Submerged Very Loose to Loose Silty Sand	50	--	26	20	--
20 to 72.5	396.5 to 344	Submerged Medium Dense Sand	50	--	32	50	--
72.5+	< 344	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	40,000	4,000	30	0.0001

BB-49
East
Abutment

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 4	426.9 to 422.9	Fill: Medium Stiff Silt (without free water)	115	600	25	60	0.01
4 to 16	422.9 to 410.9	Medium Stiff Silt (with free water)	55	600	25	60	0.01
16 to 74	410.9 to 352.9	Submerged Medium Dense Sand	50		32	60	--
74 to 96	352.9 to 330.9	Submerged Dense to Very Dense Sand	60	--	36	125	--
96+	< 330.9	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	50	0.0001

BB-50
East
Abutment

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 3	426.6 to 423.6	Medium Stiff Clay (without free water)	120	800	--	100	0.01
3 to 15.5	423.6 to 411.1	Soft Clay (with free water)	55	250	--	30	0.02
15.5 to 60	411.1 to 366.6	Submerged Medium Dense Sand	50	--	32	60	--
60 to 95.3	366.6 to 331.3	Submerged Dense Sand	55	--	34	125	--
95.3+	< 331.3	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	50	0.0001

BB-51
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 4	415.7 to 411.7	Medium Stiff Clay (without free water)	115	500	--	70	0.01
4 to 12	411.7 to 403.7	Soft Clay (with free water)	55	250	--	30	0.02
12 to 74	403.7 to 341.7	Submerged Medium Dense to Dense Sand	55	--	32	80	--
74+	< 341.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	40	0.0001

BB-52
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 5	415.2 to 410.2	Fill: Medium Stiff Silty Clay (without free water)	120	900	--	100	0.01
5 to 15	410.2 to 400.2	Submerged Very Loose Sand	45	--	26	30	--
15 to 76.5	400.2 to 338.7	Submerged Medium Dense Sand	50	--	32	60	--
76.5+	< 338.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	5,000	55	0.0001

BB-53
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 3	414.9 to 411.9	Fill: Very Loose Silty Loam (above WT)	110	--	26	20	--
3 to 12	411.9 to 402.9	Soft Silty Clay (with free water)	55	400	--	40	0.02
12 to 76	402.9 to 338.9	Submerged Loose to Medium Dense Sand	50	--	30	40	--
76+	< 338.9	Vuggy Limestone	136	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	6,000	59	0.0001

BB-54
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 4	413.7 to 409.7	Fill: Stiff Silty Clay (without free water)	120	1500	--	500	0.007
4 to 20	409.7 to 393.7	Submerged Very Loose to Loose Sand	45	--	26	20	--
20 to 77	393.7 to 336.7	Submerged Medium Dense Sand	50	--	32	60	--
77+	< 336.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	45,000	4,000	77	0.0001

BB-55
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 3	410.9 to 407.9	Medium Stiff Silty Clay (without free water)	115	150	--	50	0.01
3 to 45	407.9 to 365.9	Submerged Very Loose to Medium Dense Sand	50	--	26	20	--
45 to 78	365.9 to 332.9	Submerged Medium Dense Sand	55	--	32	60	--
78+	< 332.9	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	40,000	3,500	68	0.0001

BB-56
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 4	414 to 410	Loose Silty Sand (above WT)	110	--	27	25	--
4 to 78.5	410 to 335.5	Submerged Loose to Medium Dense Sand	50	--	30	40	--
78.5+	< 335.5	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	5,000	58	0.0001

BB-57
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 3	412.9 to 409.9	Fill: Medium Stiff Clay (without free water)	115	600	--	80	0.01
3 to 25	409.9 to 387.9	Submerged Loose to Medium Dense Sand	50	--	30	30	--
25 to 80.5	387.9 to 332.4	Submerged Medium Dense to Dense Sand	55	--	33	80	--
80.5+	< 332.4	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	42,000	4,000	58	0.0001

BB-58
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 4	413.2 to 409.2	Fill: Medium Stiff Clay (without free water)	115	600	--	80	0.01
4 to 34	409.2 to 379.2	Submerged Loose to Medium Dense Sand	50	--	30	30	--
34 to 78.5	379.2 to 334.7	Submerged Medium Dense to Dense Sand	55	--	33	80	--
78.5+	< 334.7	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	50,000	5,000	64	0.0001

BB-59
East

Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
0 to 3	412.3 to 409.3	Fill: Medium Stiff Clay (without free water)	115	600	--	80	0.01
3 to 25	409.3 to 387.3	Submerged Medium Dense Sand	50	--	32	60	--
25 to 78.5	387.3 to 333.8	Submerged Medium Dense to Dense Sand	55	--	33	80	--
78.5+	< 333.8	Vuggy Limestone	132	--	--	--	--

	Effective Unit Weight (pcf)	Initial Rock Mass Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	k rm (pci)
Vuggy Limestone	132	25,000	5,000	53	0.0001

APPENDIX E
Pile Capacity Tables

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment
REFERENCE BORING ========== BB-01
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 443.40 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 441.40 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 431.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 441.40 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 3000 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 66.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 181.82 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 68.18 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	**810** KIPS	**445** KIPS	**57** FT.

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.)
439.90	1.50	1.70			7.5		21.5	11.1		***13.1***	13	0	0	7	4
437.90	2.00		13	Medium Sand	2.3	14.0	68.3	3.3	2.0	***22.9***	23	0	0	13	6
435.90	2.00	2.90			14.3	58.5	56.4	21.1	8.5	***40.2***	40	0	0	22	8
433.90	2.00		14	Medium Sand	2.4	32.3	109.3	3.6	4.7	***51.1***	51	0	0	28	10
431.40	2.50	4.10	15		23.2	82.7	96.2	34.1	12.0	***79.9***	80	0	0	44	12
428.90	2.50	2.30			15.3	46.4	155.8	22.5	6.7	***108.8***	109	0	0	60	15
426.40	2.50	4.50	21		24.9	90.7	148.5	36.7	13.1	***140.8***	141	0	0	77	17
423.90	2.50	2.90			17.9	58.5	***150.3***	26.4	8.5	164.8	150	0	0	83	20
421.40	2.50	2.10			14.4	42.3	***156.6***	21.2	6.1	184.9	157	0	0	86	22
418.90	2.50	1.70			12.6	34.3	209.5	18.5	5.0	***209.2***	209	0	0	115	25
416.40	2.50	3.70	20		21.4	74.6	***210.1***	31.5	10.8	237.7	210	0	0	116	27
413.90	2.50		15	Medium Sand	3.3	53.8	***183.8***	4.8	7.8	238.2	184	0	0	101	30
411.40	2.50	1.20			9.8	24.2	***211.8***	14.5	3.5	255.3	212	0	0	116	32
406.40	5.00	2.10			28.8	42.3	***218.4***	42.4	6.1	294.5	218	0	0	120	37
401.40	5.00	1.00			17.1	20.2	***239.5***	25.1	2.9	320.1	240	0	0	132	42
396.40	5.00	1.20			19.7	24.2	***256.5***	28.9	3.5	348.7	256	0	0	141	47
389.40	7.00		6	Medium Sand	3.7	21.5	597.1	5.4	3.1	***402.8***	403	0	0	222	54
388.40	1.00			Limestone	119.6	358.5	716.7	175.9	51.9	***578.7***	579	0	0	318	55
387.40	1.00			Limestone	119.6	358.5	836.3	175.9	51.9	***754.5***	755	0	0	415	56
386.40	1.00			Limestone	119.6	358.5	955.9	175.9	51.9	***930.4***	~~930~~	~~0~~	~~0~~	~~512~~	~~57~~
385.40	1.00			Limestone	119.6	358.5	***1075.5***	175.9	51.9	1106.3	~~1076~~	~~0~~	~~0~~	~~592~~	~~58~~
384.40	1.00			Limestone	119.6	358.5	***1195.1***	175.9	51.9	1282.1	~~1195~~	~~0~~	~~0~~	~~657~~	~~59~~
383.40	1.00			Limestone		358.5			51.9						

Pile Design Table for West Abutment utilizing Boring #BB-01

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
121	67	30
137	75	32
146	80	37
159	88	42
172	94	47
335	184	55
Steel HP 10 X 57		
124	68	30
140	77	32
149	82	37
163	90	42
175	96	47
454	250	56
Steel HP 12 X 53		
118	65	20
125	68	22
148	82	30
169	93	32
178	98	37
194	107	42
209	115	47
418	230	55
Steel HP 12 X 63		
119	66	20
126	69	22
150	82	30
171	94	32
179	99	37
196	108	42
211	116	47
497	273	56
Steel HP 12 X 74		
121	67	20
128	70	22
152	84	30
173	95	32
182	100	37
199	109	42
214	117	47
589	324	56
Steel HP 12 X 84		
123	68	20
130	71	22
154	85	30
176	97	32
184	101	37
202	111	42
216	119	47
664	365	57
Steel HP 14 X 73		
104	57	15
137	75	17
146	80	20
153	84	22
179	99	30
207	114	32
213	117	37
234	129	42
251	138	47
578	318	56
Steel HP 14 X 89		
107	59	15
139	77	17
148	82	20
155	85	22
182	100	30
209	115	32
216	119	37
237	130	42
254	139	47
705	388	56
Steel HP 14 X 102		
109	60	15
141	77	17
150	83	20
157	86	22
184	101	30
212	116	32
218	120	37
240	132	42
256	141	47
810	445	57
Steel HP 14 X 117		
112	61	15
143	79	17
152	84	20
159	87	22
186	102	30
214	118	32
221	122	37
242	133	42
259	143	47
929	511	57

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment
REFERENCE BORING ========== BB-01
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 443.40 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 441.40 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== DD
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 431.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 441.40 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 3000 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 66.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 181.82 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 68.18 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	**333** KIPS	**56** 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.)
439.90	1.50	1.70			7.5		21.5	11.1		***13.1***	13	4	8	-5	4
437.90	2.00		13	Medium Sand	2.3	14.0	68.3	3.3	2.0	***22.9***	23	5	11	-4	6
435.90	2.00	2.90			14.3	58.5	56.4	21.1	8.5	***40.2***	40	13	27	-18	8
433.90	2.00		14	Medium Sand	2.4	32.3	109.3	3.6	4.7	***51.1***	51	15	29	-16	10
431.40	2.50	4.10	15		23.2	82.7	96.2	34.1	12.0	***79.9***	80	27	55	-38	12
428.90	2.50	2.30			15.3	46.4	155.8	22.5	6.7	***108.8***	109	27	55	-22	15
426.40	2.50	4.50	21		24.9	90.7	148.5	36.7	13.1	***140.8***	141	27	55	-5	17
423.90	2.50	2.90			17.9	58.5	***150.3***	26.4	8.5	164.8	150	27	55	0	20
421.40	2.50	2.10			14.4	42.3	***156.6***	21.2	6.1	184.9	157	27	55	4	22
418.90	2.50	1.70			12.6	34.3	209.5	18.5	5.0	***209.2***	209	27	55	33	25
416.40	2.50	3.70	20		21.4	74.6	***210.1***	31.5	10.8	237.7	210	27	55	33	27
413.90	2.50		15	Medium Sand	3.3	53.8	***183.8***	4.8	7.8	238.2	184	27	55	19	30
411.40	2.50	1.20			9.8	24.2	***211.8***	14.5	3.5	255.3	212	27	55	34	32
406.40	5.00	2.10			28.8	42.3	***218.4***	42.4	6.1	294.5	218	27	55	38	37
401.40	5.00	1.00			17.1	20.2	***239.5***	25.1	2.9	320.1	240	27	55	49	42
396.40	5.00	1.20			19.7	24.2	***256.5***	28.9	3.5	348.7	256	27	55	59	47
389.40	7.00		6	Medium Sand	3.7	21.5	597.1	5.4	3.1	***402.8***	403	27	55	139	54
388.40	1.00			Limestone	119.6	358.5	716.7	175.9	51.9	***578.7***	579	27	55	236	55
387.40	1.00			Limestone	119.6	358.5	836.3	175.9	51.9	***754.5***	755	27	55	333	56
386.40	1.00			Limestone	119.6	358.5	955.9	175.9	51.9	***930.4***	~~930~~	~~27~~	~~55~~	~~429~~	~~57~~
385.40	1.00			Limestone	119.6	358.5	***1075.5***	175.9	51.9	1106.3	~~1076~~	~~27~~	~~55~~	~~509~~	~~58~~
384.40	1.00			Limestone	119.6	358.5	***1195.1***	175.9	51.9	1282.1	~~1195~~	~~27~~	~~55~~	~~575~~	~~59~~
383.40	1.00			Limestone		358.5			51.9						

Pile Design Table for West Abutment utilizing Boring #BB-01 Down Drag

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42	172	38	47
Steel HP 10 X 57	394	159	55
Steel HP 12 X 53	209	47	47
Steel HP 12 X 63	471	190	55
Steel HP 12 X 74	479	194	55
Steel HP 12 X 84	634	278	56
Steel HP 14 X 73	558	226	55
Steel HP 14 X 89	570	232	55
Steel HP 14 X 102	755	333	56
Steel HP 14 X 117	768	339	56
F			
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Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment
REFERENCE BORING ========== BB-01
LRFD or ASD or SEISMIC ========== SEISMIC
PILE CUTOFF ELEV. ========== 443.40 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 441.40 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 431.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 441.40 ft

TOTAL SEISMIC SUBSTRUCTURE LOAD ========== 3000 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 66.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Seismic Loading Applied per pile spaced at 8 ft. Cts ======= 181.82 KIPS
Approx. Seismic Loading Applied per pile spaced at 3 ft. Cts ======= 68.18 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 Seismic Resistance Available in Boring	Maximum Pile Driveable Length in Boring
810 KIPS	**810** KIPS	**810** KIPS	**57** FT.

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	ULTIMATE PLUGGED SIDE RESIST. (KIPS)	ULTIMATE PLUGGED END BRG. RESIST. (KIPS)	ULTIMATE PLUGGED TOTAL RESIST. (KIPS)	ULTIMATE UNPLUGGED SIDE RESIST. (KIPS)	ULTIMATE UNPLUGGED END BRG. RESIST. (KIPS)	ULTIMATE UNPLUGGED TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	NOMINAL GEOTECH. LOSS FROM LIQUEF. & DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	SEISMIC RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
439.90	1.50	1.70			7.5		21.5	11.1		***13.1***	13	0	0	13	4
437.90	2.00		13	Medium Sand	2.3	14.0	68.3	3.3	2.0	***22.9***	23	0	0	23	6
435.90	2.00	2.90			14.3	58.5	56.4	21.1	8.5	***40.2***	40	0	0	40	8
433.90	2.00		14	Medium Sand	2.4	32.3	109.3	3.6	4.7	***51.1***	51	0	0	51	10
431.40	2.50	4.10	15		23.2	82.7	96.2	34.1	12.0	***79.9***	80	0	0	80	12
428.90	2.50	2.30			15.3	46.4	155.8	22.5	6.7	***108.8***	109	0	0	109	15
426.40	2.50	4.50	21		24.9	90.7	148.5	36.7	13.1	***140.8***	141	0	0	141	17
423.90	2.50	2.90			17.9	58.5	***150.3***	26.4	8.5	164.8	150	0	0	150	20
421.40	2.50	2.10			14.4	42.3	***156.6***	21.2	6.1	184.9	157	0	0	157	22
418.90	2.50	1.70			12.6	34.3	209.5	18.5	5.0	***209.2***	209	0	0	209	25
416.40	2.50	3.70	20		21.4	74.6	***210.1***	31.5	10.8	237.7	210	0	0	210	27
413.90	2.50		15	Medium Sand	3.3	53.8	***183.8***	4.8	7.8	238.2	184	0	0	184	30
411.40	2.50	1.20			9.8	24.2	***211.8***	14.5	3.5	255.3	212	0	0	212	32
406.40	5.00	2.10			28.8	42.3	***218.4***	42.4	6.1	294.5	218	0	0	218	37
401.40	5.00	1.00			17.1	20.2	***239.5***	25.1	2.9	320.1	240	0	0	240	42
396.40	5.00	1.20			19.7	24.2	***256.5***	28.9	3.5	348.7	256	0	0	256	47
389.40	7.00		6	Medium Sand	3.7	21.5	597.1	5.4	3.1	***402.8***	403	0	0	403	54
388.40	1.00			Limestone	119.6	358.5	716.7	175.9	51.9	***578.7***	579	0	0	579	55
387.40	1.00			Limestone	119.6	358.5	836.3	175.9	51.9	***754.5***	755	0	0	755	56
386.40	1.00			Limestone	119.6	358.5	955.9	175.9	51.9	***930.4***	~~930~~	~~0~~	~~0~~	~~930~~	~~57~~
385.40	1.00			Limestone	119.6	358.5	***1075.5***	175.9	51.9	1106.3	~~1076~~	~~0~~	~~0~~	~~1076~~	~~58~~
384.40	1.00			Limestone	119.6	358.5	***1195.1***	175.9	51.9	1282.1	~~1195~~	~~0~~	~~0~~	~~1195~~	~~59~~
383.40	1.00			Limestone		358.5			51.9						

Pile Design Table for West Abutment utilizing Boring #BB-01

Nominal Required Bearing (Kips)	Seismic Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
53	53	12
71	71	15
94	94	20
121	121	30
146	146	37
159	159	42
172	172	47
335	335	55
Steel HP 10 X 57		
54	54	12
74	74	15
96	96	20
124	124	30
149	149	37
163	163	42
175	175	47
454	454	56
Steel HP 12 X 53		
64	64	12
85	85	15
118	118	20
148	148	30
178	178	37
194	194	42
209	209	47
418	418	55
Steel HP 12 X 63		
65	65	12
88	88	15
119	119	20
150	150	30
179	179	37
196	196	42
211	211	47
497	497	56
Steel HP 12 X 74		
66	66	12
90	90	15
121	121	20
152	152	30
182	182	37
199	199	42
214	214	47
589	589	56
Steel HP 12 X 84		
67	67	12
91	91	15
123	123	20
154	154	30
184	184	37
202	202	42
216	216	47
664	664	57
Steel HP 14 X 73		
77	77	12
104	104	15
146	146	20
179	179	30
213	213	37
234	234	42
251	251	47
578	578	56
Steel HP 14 X 89		
79	79	12
107	107	15
148	148	20
182	182	30
216	216	37
237	237	42
254	254	47
705	705	56
Steel HP 14 X 102		
80	80	12
109	109	15
150	150	20
184	184	30
218	218	37
240	240	42
256	256	47
810	810	57
Steel HP 14 X 117		
82	82	12
112	112	15
152	152	20
186	186	30
221	221	37
242	242	42
259	259	47
929	929	57

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment
REFERENCE BORING ========== BB-02
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 443.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 441.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 389.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 420.60 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 3000 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 66.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 181.82 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 68.18 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	**810** KIPS	**445** KIPS	**58** 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.)
420.00	21.00	1.00			71.6		***105.9***	105.3		110.3	106	0	0	58	23
417.50	2.50	1.70			12.6	34.3	***90.2***	18.5	5.0	124.7	90	0	0	50	26
415.00	2.50	0.30			2.9	6.0	***111.3***	4.3	0.9	131.6	111	0	0	61	28
412.50	2.50	1.20			9.8	24.2	***101.0***	14.5	3.5	143.1	101	0	0	56	31
410.00	2.50	0.20			2.0	4.0	***104.9***	2.9	0.6	146.3	105	0	0	58	33
407.50	2.50	0.30			2.9	6.0	***107.9***	4.3	0.9	150.6	108	0	0	59	36
405.00	2.50	0.30			2.9	6.0	***110.8***	4.3	0.9	154.8	111	0	0	61	38
402.50	2.50	0.30			2.9	6.0	***113.7***	4.3	0.9	159.1	114	0	0	63	41
400.00	2.50	0.30			2.9	6.0	***112.5***	4.3	0.9	162.8	113	0	0	62	43
397.50	2.50	0.10			1.0	2.0	***117.6***	1.5	0.3	164.9	118	0	0	65	46
395.00	2.50	0.30			2.9	6.0	***120.5***	4.3	0.9	169.1	120	0	0	66	48
392.50	2.50	0.30			2.9	6.0	***125.4***	4.3	0.9	173.7	125	0	0	69	51
389.00	3.50	0.40			5.3	8.1	481.2	7.8	1.2	***232.3***	232	0	0	128	54
388.00	1.00			Limestone	119.6	358.5	600.7	175.9	51.9	***408.1***	408	0	0	224	55
387.00	1.00			Limestone	119.6	358.5	720.3	175.9	51.9	***584.0***	584	0	0	321	56
386.00	1.00			Limestone	119.6	358.5	839.9	175.9	51.9	***759.8***	760	0	0	418	57
385.20	0.80			Limestone	95.7	358.5	935.6	140.7	51.9	***900.5***	~~901~~	~~0~~	~~0~~	~~495~~	~~57.8~~
384.20	1.00			Limestone	119.6	358.5	***1055.2***	175.9	51.9	1076.4	~~1055~~	~~0~~	~~0~~	~~580~~	~~58.8~~
383.20	1.00			Limestone	119.6	358.5	***1174.8***	175.9	51.9	1252.2	~~1175~~	~~0~~	~~0~~	~~646~~	~~59.8~~
382.20	1.00			Limestone	119.6	358.5	***1294.4***	175.9	51.9	1428.1	~~1294~~	~~0~~	~~0~~	~~712~~	~~60.8~~
381.20	1.00			Limestone		358.5			51.9						

Pile Design Table for West Abutment utilizing Boring #BB-02

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
267	147	55
Steel HP 10 X 57		
397	218	56
Steel HP 12 X 53		
320	176	55
Steel HP 12 X 63		
475	261	56
Steel HP 12 X 74		
483	266	56
Steel HP 12 X 84		
638	351	57
Steel HP 14 X 73		
563	310	56
Steel HP 14 X 89		
119	66	48
124	68	51
705	388	57
Steel HP 14 X 102		
120	66	48
125	69	51
810	445	58
Steel HP 14 X 117		
122	67	48
127	70	51
929	511	59

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment
REFERENCE BORING ========== BB-02
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 443.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 441.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== DD
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 389.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 420.60 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 3000 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 66.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 181.82 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 68.18 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	**760** KIPS	**215** KIPS	**57** FT.

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.)
420.00	21.00	1.00			71.6		***105.9***	105.3		110.3	106	39	79	-60	23
417.50	2.50	1.70			12.6	34.3	***90.2***	18.5	5.0	124.7	90	46	93	-89	26
415.00	2.50	0.30			2.9	6.0	***111.3***	4.3	0.9	131.6	111	48	96	-83	28
412.50	2.50	1.20			9.8	24.2	***101.0***	14.5	3.5	143.1	101	53	107	-105	31
410.00	2.50	0.20			2.0	4.0	***104.9***	2.9	0.6	146.3	105	54	109	-106	33
407.50	2.50	0.30			2.9	6.0	***107.9***	4.3	0.9	150.6	108	56	112	-109	36
405.00	2.50	0.30			2.9	6.0	***110.8***	4.3	0.9	154.8	111	58	115	-112	38
402.50	2.50	0.30			2.9	6.0	***113.7***	4.3	0.9	159.1	114	59	119	-115	41
400.00	2.50	0.30			2.9	6.0	***112.5***	4.3	0.9	162.8	113	61	122	-121	43
397.50	2.50	0.10			1.0	2.0	***117.6***	1.5	0.3	164.9	118	61	123	-120	46
395.00	2.50	0.30			2.9	6.0	***120.5***	4.3	0.9	169.1	120	63	126	-123	48
392.50	2.50	0.30			2.9	6.0	***125.4***	4.3	0.9	173.7	125	65	129	-125	51
389.00	3.50	0.40			5.3	8.1	481.2	7.8	1.2	***232.3***	232	67	135	-75	54
388.00	1.00			Limestone	119.6	358.5	600.7	175.9	51.9	***408.1***	408	67	135	22	55
387.00	1.00			Limestone	119.6	358.5	720.3	175.9	51.9	***584.0***	584	67	135	118	56
386.00	1.00			Limestone	119.6	358.5	839.9	175.9	51.9	***759.8***	760	67	135	215	57
385.20	0.80			Limestone	95.7	358.5	935.6	140.7	51.9	***900.5***	~~901~~	~~67~~	~~135~~	~~293~~	~~57.8~~
384.20	1.00			Limestone	119.6	358.5	***1055.2***	175.9	51.9	1076.4	~~1055~~	~~67~~	~~135~~	~~378~~	~~58.8~~
383.20	1.00			Limestone	119.6	358.5	***1174.8***	175.9	51.9	1252.2	~~1175~~	~~67~~	~~135~~	~~443~~	~~59.8~~
382.20	1.00			Limestone	119.6	358.5	***1294.4***	175.9	51.9	1428.1	~~1294~~	~~67~~	~~135~~	~~509~~	~~60.8~~
381.20	1.00			Limestone		358.5			51.9						

Pile Design Table for West Abutment utilizing Boring #BB-02 With Down Drag

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42	267	7	55
Steel HP 10 X 57	397	76	56
Steel HP 12 X 53	320	8	55
Steel HP 12 X 63	475	93	56
Steel HP 12 X 74	483	95	56
Steel HP 12 X 84	638	178	57
Steel HP 14 X 73	563	111	56
Steel HP 14 X 89	575	116	56
Steel HP 14 X 102	760	215	57
Steel HP 14 X 117	915	299	58

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment
REFERENCE BORING ========== BB-02
LRFD or ASD or SEISMIC ========== SEISMIC
PILE CUTOFF ELEV. ========== 443.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 441.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 389.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 420.60 ft

TOTAL SEISMIC SUBSTRUCTURE LOAD ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 35.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Seismic Loading Applied per pile spaced at 8 ft. Cts ======= 274.29 KIPS
Approx. Seismic Loading Applied per pile spaced at 3 ft. Cts ======= 102.86 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 Seismic Resistance Available in Boring	Maximum Pile Driveable Length in Boring
810 KIPS	**810** KIPS	**810** KIPS	**58** 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	ULTIMATE PLUGGED SIDE RESIST. (KIPS)	ULTIMATE PLUGGED END BRG. RESIST. (KIPS)	ULTIMATE PLUGGED TOTAL RESIST. (KIPS)	ULTIMATE UNPLUGGED SIDE RESIST. (KIPS)	ULTIMATE UNPLUGGED END BRG. RESIST. (KIPS)	ULTIMATE UNPLUGGED TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	NOMINAL GEOTECH. LOSS FROM LIQUEF. & DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	SEISMIC RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
420.00	21.00	1.00			71.6		***105.9***	105.3		110.3	106	0	0	106	23
417.50	2.50	1.70			12.6	34.3	***90.2***	18.5	5.0	124.7	90	0	0	90	26
415.00	2.50	0.30			2.9	6.0	***111.3***	4.3	0.9	131.6	111	0	0	111	28
412.50	2.50	1.20			9.8	24.2	***101.0***	14.5	3.5	143.1	101	0	0	101	31
410.00	2.50	0.20			2.0	4.0	***104.9***	2.9	0.6	146.3	105	0	0	105	33
407.50	2.50	0.30			2.9	6.0	***107.9***	4.3	0.9	150.6	108	0	0	108	36
405.00	2.50	0.30			2.9	6.0	***110.8***	4.3	0.9	154.8	111	0	0	111	38
402.50	2.50	0.30			2.9	6.0	***113.7***	4.3	0.9	159.1	114	0	0	114	41
400.00	2.50	0.30			2.9	6.0	***112.5***	4.3	0.9	162.8	113	0	0	113	43
397.50	2.50	0.10			1.0	2.0	***117.6***	1.5	0.3	164.9	118	0	0	118	46
395.00	2.50	0.30			2.9	6.0	***120.5***	4.3	0.9	169.1	120	0	0	120	48
392.50	2.50	0.30			2.9	6.0	***125.4***	4.3	0.9	173.7	125	0	0	125	51
389.00	3.50	0.40			5.3	8.1	481.2	7.8	1.2	***232.3***	232	0	0	232	54
388.00	1.00			Limestone	119.6	358.5	600.7	175.9	51.9	***408.1***	408	0	0	408	55
387.00	1.00			Limestone	119.6	358.5	720.3	175.9	51.9	***584.0***	584	0	0	584	56
386.00	1.00			Limestone	119.6	358.5	839.9	175.9	51.9	***759.8***	760	0	0	760	57
385.00	1.00			Limestone		358.5			51.9						

Pile Design Table for West Abutment utilizing Boring #BB-02

	Nominal Required Bearing (Kips)	Seismic Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42			
	61	61	26
	69	69	31
	73	73	36
	77	77	41
	80	80	46
	84	84	51
	335	335	56
Steel HP 10 X 57			
	62	62	26
	70	70	31
	74	74	36
	78	78	41
	81	81	46
	86	86	51
	454	454	57
Steel HP 12 X 53			
	74	74	26
	83	83	31
	88	88	36
	96	96	46
	102	102	51
	418	418	56
Steel HP 12 X 63			
	74	74	26
	84	84	31
	89	89	36
	97	97	46
	103	103	51
	497	497	57
Steel HP 12 X 74			
	75	75	26
	85	85	31
	90	90	36
	98	98	46
	105	105	51
	589	589	57
Steel HP 12 X 84			
	76	76	26
	86	86	31
	91	91	36
	100	100	46
	106	106	51
	664	664	58
Steel HP 14 X 73			
	88	88	26
	99	99	31
	105	105	36
	115	115	46
	123	123	51
	578	578	57
Steel HP 14 X 89			
	89	89	26
	100	100	31
	107	107	36
	116	116	46
	124	124	51
	705	705	57
Steel HP 14 X 102			
	90	90	26
	101	101	31
	108	108	36
	118	118	46
	125	125	51
	810	810	58
Steel HP 14 X 117			
	91	91	26
	102	102	31
	109	109	36
	119	119	46
	127	127	51
	929	929	59

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== East Abutment
REFERENCE BORING ========== BB-49
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 442.20 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 438.20 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 426.90 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 426.90 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 35.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 274.29 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 102.86 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	**929** KIPS	**511** KIPS	**112** FT.

PILE TYPE AND SIZE ========== Steel HP 14 X 117
Plugged Pile Perimeter========== 4.850 FT. Unplugged Pile Perimeter========== 7.117 FT.
Plugged 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 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.)
426.90	11.30	1.00			38.9		100.7	57.1		***67.2***	67	0	0	37	15
424.40	2.50	3.00			18.5	61.8	98.7	27.2	10.0	***91.1***	91	0	0	50	18
421.90	2.50	2.00			14.1	41.2	***102.5***	20.7	6.7	110.1	102	0	0	56	20
419.40	2.50	1.50			11.7	30.9	***114.2***	17.1	5.0	127.2	114	0	0	63	23
416.90	2.50	1.50			11.7	30.9	***107.3***	17.1	5.0	141.3	107	0	0	59	25
414.40	2.50	0.60			5.6	12.4	***129.3***	8.2	2.0	152.2	129	0	0	71	28
411.90	2.50	1.40			11.1	28.8	***155.5***	16.3	4.7	170.9	156	0	0	86	30
409.40	2.50		12	Fine Sand	2.5	43.9	194.6	3.7	7.1	***180.5***	181	0	0	99	33
406.90	2.50		22	Fine Sand	4.6	80.5	210.2	6.7	13.1	***189.0***	189	0	0	104	35
404.40	2.50		25	Fine Sand	5.2	91.5	215.4	7.6	14.9	***196.6***	197	0	0	108	38
401.90	2.50		25	Fine Sand	5.2	91.5	235.2	7.6	14.9	***206.6***	207	0	0	114	40
399.40	2.50		29	Fine Sand	6.0	106.2	248.6	8.8	17.3	***216.7***	217	0	0	119	43
396.90	2.50		31	Fine Sand	6.5	113.5	222.1	9.6	18.5	***220.9***	221	0	0	121	45
391.90	5.00		22	Fine Sand	9.1	80.5	***224.0***	13.4	13.1	233.1	224	0	0	123	50
386.90	5.00		20	Fine Sand	8.3	73.2	257.9	12.2	11.9	***249.5***	249	0	0	137	55
381.90	5.00		27	Fine Sand	11.2	98.8	265.4	16.5	16.1	***265.3***	265	0	0	146	60
376.90	5.00		26	Fine Sand	10.8	95.2	***272.6***	15.8	15.5	280.6	273	0	0	150	65
371.90	5.00		25	Fine Sand	10.4	91.5	***283.0***	15.2	14.9	295.8	283	0	0	156	70
366.90	5.00		25	Fine Sand	10.4	91.5	***286.0***	15.2	14.9	309.9	286	0	0	157	75
361.90	5.00		23	Fine Sand	9.6	84.2	361.5	14.0	13.7	***334.6***	335	0	0	184	80
356.90	5.00		41	Fine Sand	19.9	150.1	381.4	29.2	24.4	***363.8***	364	0	0	200	85
351.90	5.00		41	Fine Sand	19.9	150.1	588.0	29.2	24.4	***423.4***	423	0	0	233	90
346.90	5.00		92	Clean Coarse Sand	101.3	336.8	605.1	148.6	54.8	***558.4***	558	0	0	307	95
341.90	5.00		69	Clean Coarse Sand	67.1	252.6	***617.3***	98.4	41.1	647.9	617	0	0	340	100
336.90	5.00		54	Clean Coarse Sand	44.8	197.7	***603.5***	65.7	32.1	704.1	604	0	0	332	105
330.90	6.00		38	Clean Coarse Sand	28.0	139.1	858.5	41.1	22.6	***782.0***	782	0	0	430	111
329.90	1.00			Limestone	120.8	366.1	979.3	177.3	59.5	***959.3***	~~959~~	~~0~~	~~0~~	~~528~~	~~112.3~~
328.90	1.00			Limestone	120.8	366.1	***1100.1***	177.3	59.5	1136.7	~~1100~~	~~0~~	~~0~~	~~605~~	~~113.3~~
327.90	1.00			Limestone	120.8	366.1	***1221.0***	177.3	59.5	1314.0	~~1221~~	~~0~~	~~0~~	~~672~~	~~114.3~~
326.90	1.00			Limestone	120.8	366.1	***1341.8***	177.3	59.5	1491.3	~~1342~~	~~0~~	~~0~~	~~738~~	~~115.3~~
325.90	1.00			Limestone	120.8	366.1	***1462.6***	177.3	59.5	1668.6	~~1463~~	~~0~~	~~0~~	~~804~~	~~116.3~~
324.90	1.00			Limestone	120.8	366.1	***1583.5***	177.3	59.5	1845.9	~~1583~~	~~0~~	~~0~~	~~871~~	~~117.3~~
323.90	1.00			Limestone		366.1			59.5						

Pile Design Table for East Abutment utilizing Boring #BB-49

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
176	97	75
213	117	80
227	125	85
271	149	90
Steel HP 10 X 57		
181	99	75
219	120	80
233	128	85
280	154	90
366	201	95
386	212	100
389	214	105
454	250	111
Steel HP 12 X 53		
172	95	50
196	108	55
203	112	60
209	115	65
218	120	70
221	122	75
264	145	80
288	158	85
325	179	90
Steel HP 12 X 63		
174	96	50
198	109	55
205	113	60
212	116	65
220	121	70
224	123	75
269	148	80
293	161	85
334	184	90
450	247	95
478	263	105
497	273	111
Steel HP 12 X 74		
177	97	50
202	111	55
209	115	60
215	118	65
224	123	70
227	125	75
273	150	80
297	163	85
341	187	90
456	251	95
485	267	105
589	324	111
Steel HP 14 X 73		
180	99	35
196	108	40
212	116	45
215	118	50
239	131	55
254	140	60
261	144	65
271	149	70
275	151	75
319	176	80
348	191	85
395	217	90
533	293	95
Steel HP 14 X 89		
183	101	35
200	110	40
215	118	45
218	120	50
243	134	55
258	142	60
265	146	65
275	151	70
278	153	75
325	179	80
354	195	85
406	223	90
542	298	95
588	324	105
705	388	111
Steel HP 14 X 102		
186	102	35
203	112	40
218	120	45
221	121	50
245	135	55
261	144	60
269	148	65
279	154	70
282	155	75
329	181	80
358	197	85
413	227	90
549	302	95
596	328	105
768	423	111
810	445	112

Pile Design Table for East Abutment utilizing Boring #BB-49

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)

Steel HP 12 X 84		
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
180	99	50
205	113	55
212	117	60
219	120	65
227	125	70
231	127	75
276	152	80
301	165	85
347	191	90
461	254	95
492	271	105
646	355	111
664	365	112

Steel HP 14 X 117		
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
156	86	30
189	104	35
207	114	40
221	121	45
224	123	50
249	137	55
265	146	60
273	150	65
283	156	70
286	157	75
335	184	80
364	200	85
423	233	90
558	307	95
604	332	105
782	430	111
929	511	112

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== East Abutment
REFERENCE BORING ========== BB-49
LRFD or ASD or SEISMIC ========== SEISMIC
PILE CUTOFF ELEV. ========== 442.20 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 438.20 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL SEISMIC SUBSTRUCTURE LOAD ========== 3000 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 66.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Seismic Loading Applied per pile spaced at 8 ft. Cts ======= 181.82 KIPS
Approx. Seismic Loading Applied per pile spaced at 3 ft. Cts ======= 68.18 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 Seismic Resistance Available in Boring	Maximum Pile Driveable Length in Boring
929 KIPS	**929** KIPS	**929** KIPS	**112** FT.

PILE TYPE AND SIZE ========== Steel HP 14 X 117
Plugged Pile Perimeter========== 4.850 FT. Unplugged Pile Perimeter========== 7.117 FT.
Plugged 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 DESCRIPTION	ULTIMATE PLUGGED SIDE RESIST. (KIPS)	ULTIMATE PLUGGED END BRG. RESIST. (KIPS)	ULTIMATE PLUGGED TOTAL RESIST. (KIPS)	ULTIMATE UNPLUGGED SIDE RESIST. (KIPS)	ULTIMATE UNPLUGGED END BRG. RESIST. (KIPS)	ULTIMATE UNPLUGGED TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	NOMINAL GEOTECH. LOSS FROM LIQUEF. & DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	SEISMIC RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
426.90	11.30	1.00			38.9		100.7	57.1		***67.2***	67	0	0	67	15
424.40	2.50	3.00			18.5	61.8	98.7	27.2	10.0	***91.1***	91	0	0	91	18
421.90	2.50	2.00			14.1	41.2	***102.5***	20.7	6.7	110.1	102	0	0	102	20
419.40	2.50	1.50			11.7	30.9	***114.2***	17.1	5.0	127.2	114	0	0	114	23
416.90	2.50	1.50			11.7	30.9	***107.3***	17.1	5.0	141.3	107	0	0	107	25
414.40	2.50	0.60			5.6	12.4	***129.3***	8.2	2.0	152.2	129	0	0	129	28
411.90	2.50	1.40			11.1	28.8	***155.5***	16.3	4.7	170.9	156	0	0	156	30
409.40	2.50		12	Fine Sand	2.5	43.9	194.6	3.7	7.1	***180.5***	181	0	0	181	33
406.90	2.50		22	Fine Sand	4.6	80.5	210.2	6.7	13.1	***189.0***	189	0	0	189	35
404.40	2.50		25	Fine Sand	5.2	91.5	215.4	7.6	14.9	***196.6***	197	0	0	197	38
401.90	2.50		25	Fine Sand	5.2	91.5	235.2	7.6	14.9	***206.6***	207	0	0	207	40
399.40	2.50		29	Fine Sand	6.0	106.2	248.6	8.8	17.3	***216.7***	217	0	0	217	43
396.90	2.50		31	Fine Sand	6.5	113.5	222.1	9.6	18.5	***220.9***	221	0	0	221	45
391.90	5.00		22	Fine Sand	9.1	80.5	***224.0***	13.4	13.1	233.1	224	0	0	224	50
386.90	5.00		20	Fine Sand	8.3	73.2	257.9	12.2	11.9	***249.5***	249	0	0	249	55
381.90	5.00		27	Fine Sand	11.2	98.8	265.4	16.5	16.1	***265.3***	265	0	0	265	60
376.90	5.00		26	Fine Sand	10.8	95.2	***272.6***	15.8	15.5	280.6	273	0	0	273	65
371.90	5.00		25	Fine Sand	10.4	91.5	***283.0***	15.2	14.9	295.8	283	0	0	283	70
366.90	5.00		25	Fine Sand	10.4	91.5	***286.0***	15.2	14.9	309.9	286	0	0	286	75
361.90	5.00		23	Fine Sand	9.6	84.2	361.5	14.0	13.7	***334.6***	335	0	0	335	80
356.90	5.00		41	Fine Sand	19.9	150.1	381.4	29.2	24.4	***363.8***	364	0	0	364	85
351.90	5.00		41	Fine Sand	19.9	150.1	588.0	29.2	24.4	***423.4***	423	0	0	423	90
346.90	5.00		92	Clean Coarse Sand	101.3	336.8	605.1	148.6	54.8	***558.4***	558	0	0	558	95
341.90	5.00		69	Clean Coarse Sand	67.1	252.6	***617.3***	98.4	41.1	647.9	617	0	0	617	100
336.90	5.00		54	Clean Coarse Sand	44.8	197.7	***603.5***	65.7	32.1	704.1	604	0	0	604	105
330.90	6.00		38	Clean Coarse Sand	28.0	139.1	858.5	41.1	22.6	***782.0***	782	0	0	782	111
329.90	1.00			Limestone	120.8	366.1	979.3	177.3	59.5	***959.3***	~~959~~	~~0~~	~~0~~	~~959~~	~~112.3~~
328.90	1.00			Limestone	120.8	366.1	***1100.1***	177.3	59.5	1136.7	~~1100~~	~~0~~	~~0~~	~~1100~~	~~113.3~~
327.90	1.00			Limestone	120.8	366.1	***1221.0***	177.3	59.5	1314.0	~~1221~~	~~0~~	~~0~~	~~1221~~	~~114.3~~
326.90	1.00			Limestone	120.8	366.1	***1341.8***	177.3	59.5	1491.3	~~1342~~	~~0~~	~~0~~	~~1342~~	~~115.3~~
325.90	1.00			Limestone	120.8	366.1	***1462.6***	177.3	59.5	1668.6	~~1463~~	~~0~~	~~0~~	~~1463~~	~~116.3~~
324.90	1.00			Limestone	120.8	366.1	***1583.5***	177.3	59.5	1845.9	~~1583~~	~~0~~	~~0~~	~~1583~~	~~117.3~~
323.90	1.00			Limestone		366.1			59.5						

Pile Design Table for East Abutment utilizing Boring #BB-49 Seismic

Nominal Required Bearing (Kips)	Seismic Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
96	96	30
123	123	35
134	134	45
136	136	50
154	154	55
160	160	60
166	166	65
173	173	70
176	176	75
213	213	80
227	227	85
271	271	90
Steel HP 10 X 57		
99	99	30
126	126	35
137.04	137.03743	45.30
140	140	50
157.96	157.95632	55.30
164	164	60
170	170	65
177	177	70
181	181	75
219	219	80
233	233	85
280	280	90
366	366	95
386	386	100
389	389	105
454	454	111
Steel HP 12 X 53		
101	101	28
121	121	30
149	149	35
162	162	40
170	170	45
172	172	50
196	196	55
203	203	60
209	209	65
218	218	70
221	221	75
264	264	80
288	288	85
325	325	90
Steel HP 12 X 63		
103	103	28
122	122	30
152	152	35
166	166	40
172	172	45
174	174	50
198	198	55
205	205	60
212	212	65
220	220	70
224	224	75
269	269	80
293	293	85
334	334	90
450	450	95
478	478	105
497	497	111
Steel HP 14 X 73		
98	98	20
104	104	25
149	149	30
180	180	35
196	196	40
212	212	45
215	215	50
239	239	55
254	254	60
261	261	65
271	271	70
275	275	75
319	319	80
348	348	85
395	395	90
533	533	95
Steel HP 14 X 89		
100	100	20
105	105	25
151	151	30
183	183	35
200	200	40
215	215	45
218	218	50
243	243	55
258	258	60
265	265	65
275	275	70
278	278	75
325	325	80
354	354	85
406	406	90
542	542	95
588	588	105
705	705	111

Pile Design Table for East Abutment utilizing Boring #BB-49 Seismic

Nominal Required Bearing (Kips)	Seismic Resistance Available (Kips)	Estimated Pile Length (Ft.)

Nominal Required Bearing (Kips)	Seismic Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 74		
104	104	28
124	124	30
154	154	35
168	168	40
174	174	45
177	177	50
202	202	55
209	209	60
215	215	65
224	224	70
227	227	75
273	273	80
297	297	85
341	341	90
456	456	95
485	485	105
589	589	111
Steel HP 12 X 84		
106	106	28
126	126	30
156	156	35
170	170	40
177	177	45
180	180	50
205	205	55
212	212	60
219	219	65
227	227	70
231	231	75
276	276	80
301	301	85
347	347	90
461	461	95
492	492	105
646	646	111
664	664	112

Nominal Required Bearing (Kips)	Seismic Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 14 X 102		
101	101	20
106	106	25
153	153	30
186	186	35
203	203	40
218	218	45
221	221	50
245	245	55
261	261	60
269	269	65
279	279	70
282	282	75
329	329	80
358	358	85
413	413	90
549	549	95
596	596	105
768	768	111
810	810	112
Steel HP 14 X 117		
102	102	20
107	107	25
156	156	30
189	189	35
207	207	40
221	221	45
224	224	50
249	249	55
265	265	60
273	273	65
283	283	70
286	286	75
335	335	80
364	364	85
423	423	90
558	558	95
604	604	105
782	782	111
929	929	112

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== East Abutment
REFERENCE BORING ========== BB-50
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 442.20 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 438.20 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 426.90 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 426.90 ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1200 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 35.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 274.29 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 102.86 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	**929** KIPS	**511** KIPS	**113** FT.

PILE TYPE AND SIZE ========== Steel HP 14 X 117
Plugged Pile Perimeter========== 4.850 FT. Unplugged Pile Perimeter========== 7.117 FT.
Plugged 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 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.)
426.60	11.60	1.00			40.0		132.6	58.7		***73.7***	74	0	0	41	16
424.10	2.50	4.50	15		25.2	92.7	157.8	37.0	15.1	***110.7***	111	0	0	61	18
421.60	2.50	4.50	14		25.2	92.7	***121.3***	37.0	15.1	137.6	121	0	0	67	21
419.10	2.50	1.50	6		11.7	30.9	***110.3***	17.1	5.0	151.1	110	0	0	61	23
416.60	2.50	0.40	9		3.8	8.2	***114.1***	5.6	1.3	156.7	114	0	0	63	26
414.10	2.50	0.40	5		3.8	8.2	***138.6***	5.6	1.3	165.7	139	0	0	76	28
411.60	2.50	1.40			11.1	28.8	***131.8***	16.3	4.7	179.1	132	0	0	73	31
409.10	2.50		3	Fine Sand	0.6	11.0	***172.7***	0.9	1.8	186.6	173	0	0	95	33
406.60	2.50		14	Fine Sand	2.9	51.2	***190.3***	4.3	8.3	193.2	190	0	0	105	36
404.10	2.50		18	Fine Sand	3.7	65.9	***197.7***	5.5	10.7	199.3	198	0	0	109	38
401.60	2.50		19	Fine Sand	3.9	69.6	***190.6***	5.8	11.3	203.3	191	0	0	105	41
399.10	2.50		16	Fine Sand	3.3	58.6	***208.6***	4.9	9.5	210.6	209	0	0	115	43
396.60	2.50		20	Fine Sand	4.2	73.2	***172.5***	6.1	11.9	210.1	173	0	0	95	46
391.60	5.00		9	Fine Sand	3.7	32.9	227.5	5.5	5.4	***224.0***	224	0	0	123	51
386.60	5.00		23	Fine Sand	9.6	84.2	***237.0***	14.0	13.7	238.0	237	0	0	130	56
381.60	5.00		23	Fine Sand	9.6	84.2	297.8	14.0	13.7	***260.3***	260	0	0	143	61
376.60	5.00		37	Fine Sand	16.8	135.4	***234.1***	24.7	22.0	271.9	234	0	0	129	66
371.60	5.00		15	Fine Sand	6.2	54.9	***277.0***	9.1	8.9	287.0	277	0	0	152	71
366.60	5.00		25	Fine Sand	10.4	91.5	338.6	15.2	14.9	***310.6***	311	0	0	171	76
361.60	5.00		39	Medium Sand	21.0	142.8	363.3	30.8	23.2	***342.0***	342	0	0	188	81
356.60	5.00		40	Clean Coarse Sand	25.5	146.4	***290.0***	37.5	23.8	363.4	290	0	0	159	86
351.60	5.00		13	Clean Coarse Sand	6.3	47.6	431.7	9.2	7.7	***394.6***	395	0	0	217	91
346.60	5.00		50	Clean Coarse Sand	38.8	183.0	459.5	57.0	29.8	***449.8***	450	0	0	247	96
341.60	5.00		47	Clean Coarse Sand	34.5	172.1	***486.7***	50.6	28.0	499.2	487	0	0	268	101
336.60	5.00		45	Clean Coarse Sand	31.8	164.7	***536.7***	46.6	26.8	548.8	537	0	0	295	106
331.30	5.30		50	Clean Coarse Sand	41.1	183.0	760.9	60.4	29.8	***638.9***	639	0	0	351	111
330.30	1.00			Limestone	120.8	366.1	881.8	177.3	59.5	***816.2***	816	0	0	449	111.9
329.30	1.00			Limestone	120.8	366.1	1002.6	177.3	59.5	***993.5***	~~994~~	~~0~~	~~0~~	~~546~~	~~112.9~~
328.30	1.00			Limestone	120.8	366.1	***1123.4***	177.3	59.5	1170.8	~~1123~~	~~0~~	~~0~~	~~618~~	~~113.9~~
327.30	1.00			Limestone	120.8	366.1	***1244.3***	177.3	59.5	1348.1	~~1244~~	~~0~~	~~0~~	~~684~~	~~114.9~~
326.30	1.00			Limestone	120.8	366.1	***1365.1***	177.3	59.5	1525.4	~~1365~~	~~0~~	~~0~~	~~751~~	~~115.9~~
325.30	1.00			Limestone	120.8	366.1	***1485.9***	177.3	59.5	1702.7	~~1486~~	~~0~~	~~0~~	~~817~~	~~116.9~~
324.30	1.00			Limestone		366.1			59.5						

Pile Design Table for East Abutment utilizing Boring #BB-50

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
187	103	86
254	140	91
275	151	96
295	162	101
325	179	106
335	184	111

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 57		
173	95	71
191	105	86
261	143	91
282	155	96
303	166	101
334	183	106
427	235	111
454	250	112
Steel HP 12 X 53		
183	101	66
213	117	71
230.08	126.543018	85.60
311	171	91
350	193	96
374	205	101
412	226	106
418	230	111
Steel HP 12 X 63		
185	102	66
215	118	71
232	128	86
317.55	174.655212	90.60
354	195	96
378	208	101
416	229	106
497	273	111
Steel HP 12 X 74		
186	103	56
188	103	66
219	120	71
236	130	86
322	177	91
360	198	96
384	211	101
423	233	106
519	285	111
589	324	112

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 14 X 73		
166	91	46
215	118	51
225	124	66
266	146	71
280	154	86
376	207	91
431	237	96
467	257	101
515	283	106
578	318	111
Steel HP 14 X 89		
168	93	46
218	120	51
228	125	66
269	148	71
283	156	86
383	211	91
438	241	96
473	260	101
522	287	106
618	340	111
705	388	112
Steel HP 14 X 102		
170	94	46
220	121	51
231	127	66
273	150	71
286	158	86
388	213	91
443	244	96
480	264	101
529	291	106
627	345	111
810	445	113

Pile Design Table for East Abutment utilizing Boring #BB-50

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)

Steel HP 12 X 84		
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
181	100	51
189	104	56
191	105	66
222	122	71
239	131	86
326	179	91
366	201	96
390	214	101
430	236	106
526	289	111
664	365	112

Steel HP 14 X 117		
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
173	95	46
224	123	51
234	129	66
277	152	71
290	159	86
395	217	91
450	247	96
487	268	101
537	295	106
639	351	111
929	511	113

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== East Abutment
REFERENCE BORING ========== BB-50
LRFD or ASD or SEISMIC ========== SEISMIC
PILE CUTOFF ELEV. ========== 442.20 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 438.20 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ====== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL SEISMIC SUBSTRUCTURE LOAD ========== 3000 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 66.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ======= 2
Approx. Seismic Loading Applied per pile spaced at 8 ft. Cts ======= 181.82 KIPS
Approx. Seismic Loading Applied per pile spaced at 3 ft. Cts ======= 68.18 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 Seismic Resistance Available in Boring	Maximum Pile Driveable Length in Boring
929 KIPS	**929** KIPS	**929** KIPS	**113** FT.

PILE TYPE AND SIZE ========== Steel HP 14 X 117
Plugged Pile Perimeter========== 4.850 FT. Unplugged Pile Perimeter========== 7.117 FT.
Plugged 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 DESCRIPTION	ULTIMATE PLUGGED SIDE RESIST. (KIPS)	ULTIMATE PLUGGED END BRG. RESIST. (KIPS)	ULTIMATE PLUGGED TOTAL RESIST. (KIPS)	ULTIMATE UNPLUGGED SIDE RESIST. (KIPS)	ULTIMATE UNPLUGGED END BRG. RESIST. (KIPS)	ULTIMATE UNPLUGGED TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	NOMINAL GEOTECH. LOSS FROM LIQUEF. & DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	SEISMIC RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
426.60	11.60	1.00			40.0		132.6	58.7		***73.7***	74	0	0	74	16
424.10	2.50	4.50	15		25.2	92.7	157.8	37.0	15.1	***110.7***	111	0	0	111	18
421.60	2.50	4.50	14		25.2	92.7	***121.3***	37.0	15.1	137.6	121	0	0	121	21
419.10	2.50	1.50	6		11.7	30.9	***110.3***	17.1	5.0	151.1	110	0	0	110	23
416.60	2.50	0.40	9		3.8	8.2	***114.1***	5.6	1.3	156.7	114	0	0	114	26
414.10	2.50	0.40	5		3.8	8.2	***138.6***	5.6	1.3	165.7	139	0	0	139	28
411.60	2.50	1.40			11.1	28.8	***131.8***	16.3	4.7	179.1	132	0	0	132	31
409.10	2.50		3	Fine Sand	0.6	11.0	***172.7***	0.9	1.8	186.6	173	0	0	173	33
406.60	2.50		14	Fine Sand	2.9	51.2	***190.3***	4.3	8.3	193.2	190	0	0	190	36
404.10	2.50		18	Fine Sand	3.7	65.9	***197.7***	5.5	10.7	199.3	198	0	0	198	38
401.60	2.50		19	Fine Sand	3.9	69.6	***190.6***	5.8	11.3	203.3	191	0	0	191	41
399.10	2.50		16	Fine Sand	3.3	58.6	***208.6***	4.9	9.5	210.6	209	0	0	209	43
396.60	2.50		20	Fine Sand	4.2	73.2	***172.5***	6.1	11.9	210.1	173	0	0	173	46
391.60	5.00		9	Fine Sand	3.7	32.9	227.5	5.5	5.4	***224.0***	224	0	0	224	51
386.60	5.00		23	Fine Sand	9.6	84.2	***237.0***	14.0	13.7	238.0	237	0	0	237	56
381.60	5.00		23	Fine Sand	9.6	84.2	297.8	14.0	13.7	***260.3***	260	0	0	260	61
376.60	5.00		37	Fine Sand	16.8	135.4	***234.1***	24.7	22.0	271.9	234	0	0	234	66
371.60	5.00		15	Fine Sand	6.2	54.9	***277.0***	9.1	8.9	287.0	277	0	0	277	71
366.60	5.00		25	Fine Sand	10.4	91.5	338.6	15.2	14.9	***310.6***	311	0	0	311	76
361.60	5.00		39	Medium Sand	21.0	142.8	363.3	30.8	23.2	***342.0***	342	0	0	342	81
356.60	5.00		40	Clean Coarse Sand	25.5	146.4	***290.0***	37.5	23.8	363.4	290	0	0	290	86
351.60	5.00		13	Clean Coarse Sand	6.3	47.6	431.7	9.2	7.7	***394.6***	395	0	0	395	91
346.60	5.00		50	Clean Coarse Sand	38.8	183.0	459.5	57.0	29.8	***449.8***	450	0	0	450	96
341.60	5.00		47	Clean Coarse Sand	34.5	172.1	***486.7***	50.6	28.0	499.2	487	0	0	487	101
336.60	5.00		45	Clean Coarse Sand	31.8	164.7	***536.7***	46.6	26.8	548.8	537	0	0	537	106
331.30	5.30		50	Clean Coarse Sand	41.1	183.0	760.9	60.4	29.8	***638.9***	639	0	0	639	111
330.30	1.00			Limestone	120.8	366.1	881.8	177.3	59.5	***816.2***	816	0	0	816	111.9
329.30	1.00			Limestone	120.8	366.1	1002.6	177.3	59.5	***993.5***	~~994~~	~~0~~	~~0~~	~~994~~	~~112.9~~
328.30	1.00			Limestone	120.8	366.1	***1123.4***	177.3	59.5	1170.8	~~1123~~	~~0~~	~~0~~	~~1123~~	~~113.9~~
327.30	1.00			Limestone	120.8	366.1	***1244.3***	177.3	59.5	1348.1	~~1244~~	~~0~~	~~0~~	~~1244~~	~~114.9~~
326.30	1.00			Limestone	120.8	366.1	***1365.1***	177.3	59.5	1525.4	~~1365~~	~~0~~	~~0~~	~~1365~~	~~115.9~~
325.30	1.00			Limestone	120.8	366.1	***1485.9***	177.3	59.5	1702.7	~~1486~~	~~0~~	~~0~~	~~1486~~	~~116.9~~
324.30	1.00			Limestone		366.1			59.5						

Pile Design Table for East Abutment utilizing Boring #BB-50 Seismic

Nominal Required Bearing (Kips)	Seismic Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 57		
89	89	31
113	113	46
140	140	51
147	147	56
151	151	66
173	173	71
191	191	86
261	261	91
282	282	96
303	303	101
334	334	106
427	427	111
454	454	112
Steel HP 12 X 53		
92	92	26
106	106	31
136	136	46
174	174	51
181	181	56
183	183	66
213	213	71
230	230	86
311	311	91
350	350	96
374	374	101
412	412	106
418	418	111
Steel HP 12 X 63		
93	93	26
107	107	31
138	138	46
175	175	51
183	183	56
185	185	66
215	215	71
232	232	86
318	318	91
354	354	96
378	378	101
416	416	106
497	497	111
Steel HP 14 X 73		
107	107	23
110	110	26
127	127	31
166	166	46
215	215	51
225	225	66
266	266	71
280	280	86
376	376	91
431	431	96
467	467	101
515	515	106
578	578	111
Steel HP 14 X 89		
108	108	23
112	112	26
129	129	31
168	168	46
218	218	51
228	228	66
269	269	71
283	283	86
383	383	91
438	438	96
473	473	101
522	522	106
618	618	111
705	705	112
Steel HP 14 X 102		
109	109	23
113	113	26
130	130	31
170	170	46
220	220	51
231	231	66
273	273	71
286	286	86
388	388	91
443	443	96
480	480	101
529	529	106
627	627	111
810	810	113

Pile Design Table for East Abutment utilizing Boring #BB-50 Seismic

Nominal Required Bearing (Kips)	Seismic Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
87	87	31
110	110	46
136	136	51
143	143	56
147	147	66
169	169	71
187	187	86
254	254	91
275	275	96
295	295	101
325	325	106
335	335	111

Nominal Required Bearing (Kips)	Seismic Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 74		
94	94	26
109	109	31
140	140	46
178	178	51
186	186	56
188	188	66
219	219	71
236	236	86
322	322	91
360	360	96
384	384	101
423	423	106
519	519	111
589	589	112
Steel HP 12 X 84		
95	95	26
110	110	31
142	142	46
181	181	51
189	189	56
191	191	66
222	222	71
239	239	86
326	326	91
366	366	96
390	390	101
430	430	106
526	526	111
664	664	112

Nominal Required Bearing (Kips)	Seismic Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 14 X 117		
110	110	23
114	114	26
132	132	31
173	173	46
224	224	51
234	234	66
277	277	71
290	290	86
395	395	91
450	450	96
487	487	101
537	537	106
639	639	111
929	929	113

APPENDIX F
Drilled Shaft Design Values

APPENDIX F
Drilled Shaft Design Values

Illinois Department of Transportation

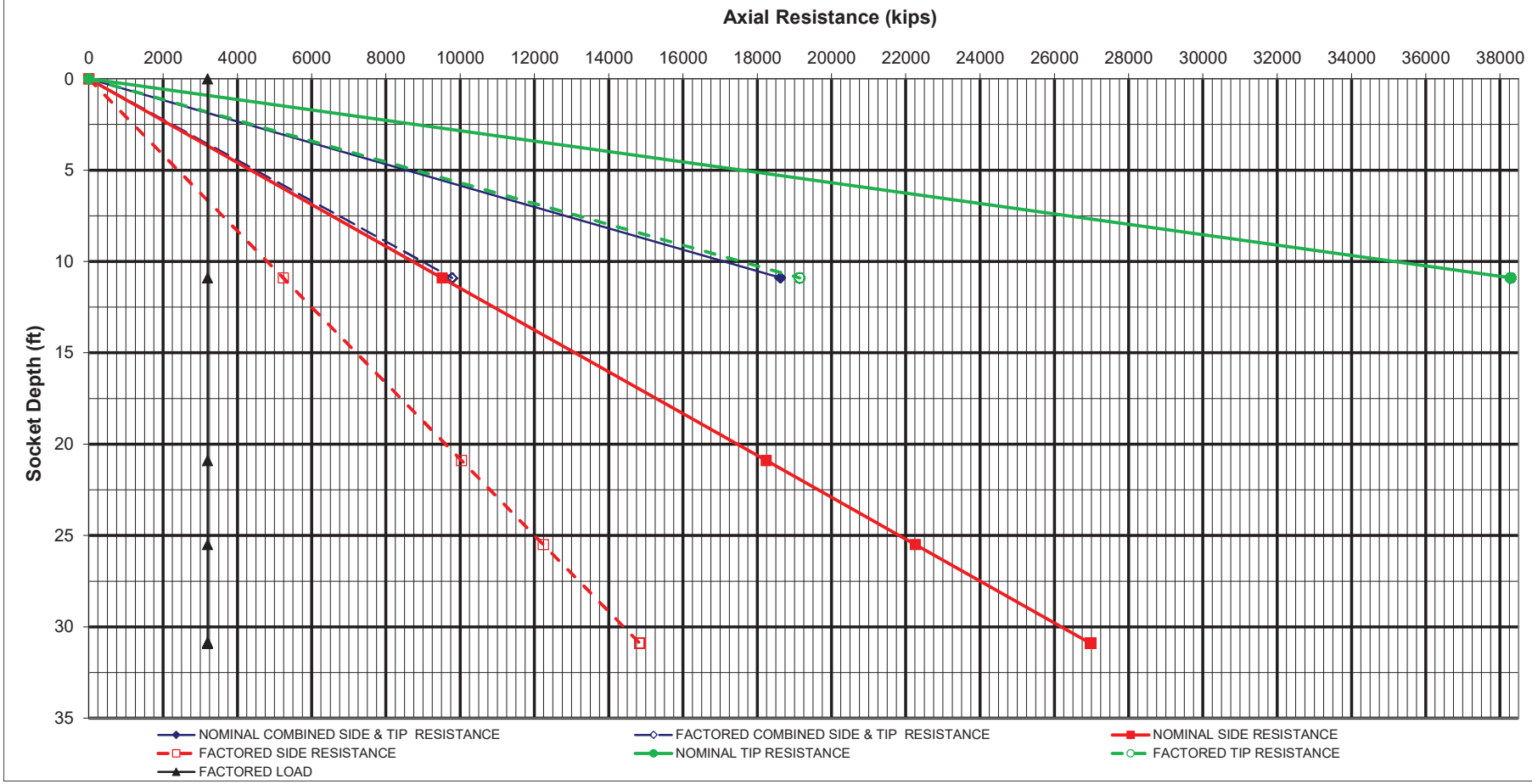
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-03
GROUND SURFACE ELEVATION ========== 420.00 FT
GROUND WATER ELEVATION ========== 416.00 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 386.50 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 3200 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)							Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
10.90	375.60	10.90	1230.0	Limestone	55	Normal	70	Closed	Yes	9514	9514	5233	4862	0.101	0.552	1147.1	38283	19141	1.571	0.49	18621	9786	8385	0.123	0.383
20.90	365.60	10.00	900.0	Limestone	55	Normal	80	Closed	Yes	8729	18243	10034	9346	0.157	0.659										
25.50	361.00	4.60	1500.0	Limestone	60	Normal	85	Closed	Yes	4015	22258	12242	12893	0.197	0.598										
30.90	355.60	5.40	1500.0	Limestone	60	Normal	85	Closed	Yes	4714	26972	14835	17781	0.253	0.561										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-03

Estimated Top of Rock Elevation: 386.50

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10.9	375.6	103084	51542	TIP	--	--	5.229
20.9	365.6	15024	8263	SIDE	8086	0.156	0.551
25.5	361	18330	10082	SIDE	11359	0.201	0.504
30.9	355.6	22212	12217	SIDE	16012	0.268	0.481
90 in. Diameter Drilled Shaft							
10.9	375.6	28757	14379	TIP	--	--	1.379
20.9	365.6	16097	8853	SIDE	8503	0.156	0.587
25.5	361	19640	10802	SIDE	11863	0.199	0.535
30.9	355.6	23799	13089	SIDE	16586	0.261	0.507
96 in. Diameter Drilled Shaft							
10.9	375.6	33353	16676	TIP	--	--	1.408
20.9	365.6	17170	9443	SIDE	8923	0.156	0.623
25.5	361	20949	11522	SIDE	12375	0.198	0.566
30.9	355.6	25385	13962	SIDE	17176	0.257	0.534
102 in. Diameter Drilled Shaft							
10.9	375.6	38283	19141	TIP	--	--	1.571
20.9	365.6	18243	10034	SIDE	9346	0.157	0.659
25.5	361	22258	12242	SIDE	12893	0.197	0.598
30.9	355.6	26972	14835	SIDE	17781	0.253	0.561
108 in. Diameter Drilled Shaft							
10.9	375.6	43547	21774	TIP	--	--	1.615
20.9	365.6	19316	10624	SIDE	9770	0.158	0.695
25.5	361	23568	12962	SIDE	13416	0.196	0.630
30.9	355.6	28558	15707	SIDE	18397	0.250	0.589
120 in. Diameter Drilled Shaft							
10.9	375.6	55078	27539	TIP	--	--	1.768
20.9	365.6	21462	11804	SIDE	10624	0.160	0.768
25.5	361	26186	14402	SIDE	14475	0.196	0.694
30.9	355.6	31732	17452	SIDE	19658	0.246	0.646

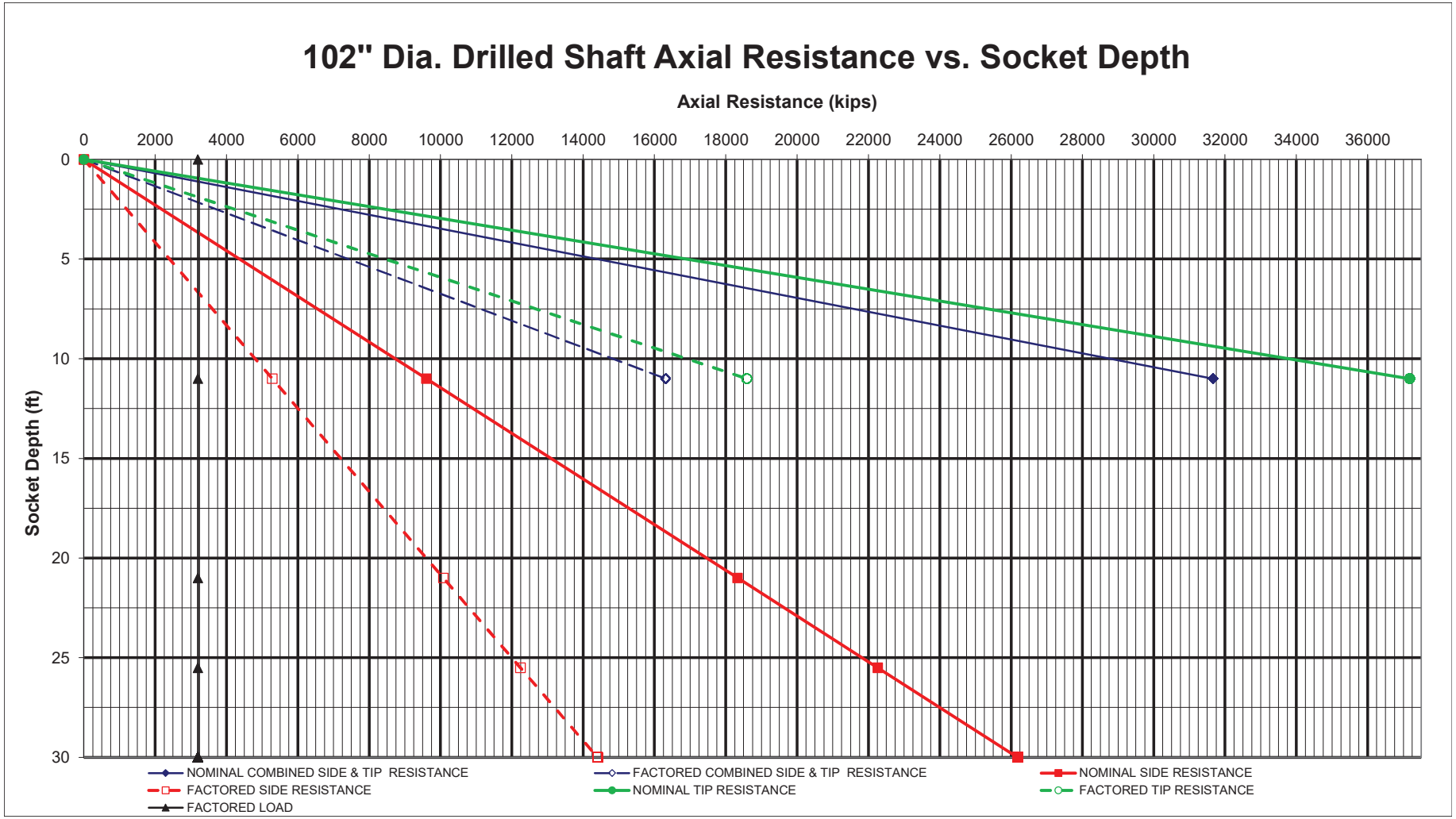
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-05
GROUND SURFACE ELEVATION ========== 420.40 FT
GROUND WATER ELEVATION ========== 416.40 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 384.40 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 3200 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
11.00	373.40	11.00	650.0	Limestone	50	Normal	80	Closed	No	9602	9602	5281	3022	0.077	1.254	1382.4	37176	18588	1.384	0.70	31665	16313	5538	0.090	0.844
21.00	363.40	10.00	1300.0	Limestone	55	Normal	87	Closed	Yes	8729	18330	10082	8295	0.153	0.839										
25.50	358.90	4.50	1500.0	Limestone	65	Normal	98	Closed	Yes	3928	22258	12242	11706	0.183	0.678										
30.00	354.40	4.50	1500.0	Limestone	65	Normal	98	Closed	Yes	3928	26186	14402	15756	0.223	0.595										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
36000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-05

Estimated Top of Rock Elevation: 384.40

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
11	373.4	130572	65286	TIP	--	--	6.349
21	363.4	15096	8303	SIDE	7110	0.150	0.701
25.5	358.9	18330	10082	SIDE	10236	0.185	0.571
30	354.4	21565	11861	SIDE	14073	0.234	0.507
90 in. Diameter Drilled Shaft							
11	373.4	28668	14334	TIP	--	--	1.267
21	363.4	16174	8896	SIDE	7503	0.151	0.747
25.5	358.9	19640	10802	SIDE	10721	0.184	0.606
30	354.4	23106	12708	SIDE	14623	0.229	0.536
96 in. Diameter Drilled Shaft							
11	373.4	32784	16392	TIP	--	--	1.326
21	363.4	17252	9489	SIDE	7898	0.152	0.793
25.5	358.9	20949	11522	SIDE	11212	0.183	0.642
30	354.4	24646	13555	SIDE	15185	0.226	0.565
102 in. Diameter Drilled Shaft							
11	373.4	37176	18588	TIP	--	--	1.384
21	363.4	18330	10082	SIDE	8295	0.153	0.839
25.5	358.9	22258	12242	SIDE	11706	0.183	0.678
30	354.4	26186	14402	SIDE	15756	0.223	0.595
108 in. Diameter Drilled Shaft							
11	373.4	41843	20922	TIP	--	--	1.443
21	363.4	19409	10675	SIDE	8692	0.154	0.885
25.5	358.9	23568	12962	SIDE	12204	0.183	0.715
30	354.4	27727	15250	SIDE	16336	0.221	0.625
120 in. Diameter Drilled Shaft							
11	373.4	11296	6213	SIDE	3520	0.080	1.461
21	363.4	21565	11861	SIDE	9490	0.157	0.977
25.5	358.9	26186	14402	SIDE	13208	0.184	0.788
30	354.4	30807	16944	SIDE	17515	0.218	0.687

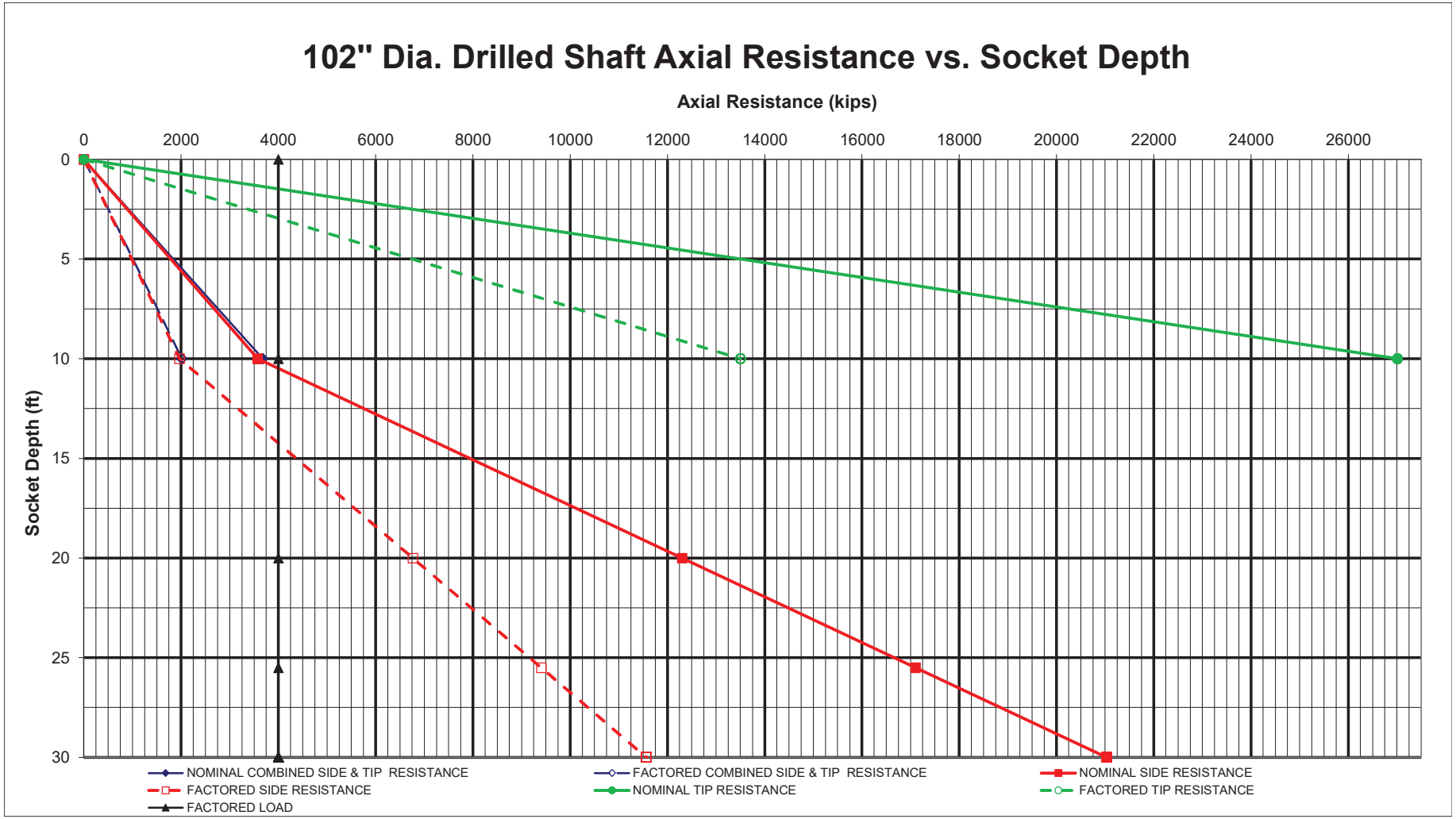
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-07
GROUND SURFACE ELEVATION ========== 395.00 FT
GROUND WATER ELEVATION ========== 410.30 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 389.10 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)								Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
10.00	379.10	10.00	1471.4	Limestone	45	Fractured	78	Open	No	3574	3574	1966	4817	0.158	#####	1342.8	27011	13506	1.484	0.03	3678	2018	8414	0.182	0.002
20.00	369.10	10.00	1442.8	Limestone	45	Normal	84	Open	No	8729	12303	6767	10412	0.264	0.417										
25.50	363.60	5.50	1200.0	Limestone	55	Normal	80	Open	Yes	4801	17104	9407	13842	0.289	0.479										
30.00	359.10	4.50	1200.0	Limestone	55	Normal	80	Open	Yes	3928	21032	11568	16971	0.321	0.514										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-07

Estimated Top of Rock Elevation: 389.10

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10	379.1	18677	9339	TIP	--	--	1.391
20	369.1	10132	5573	SIDE	8899	0.254	0.356
25.5	363.6	14086	7747	SIDE	12017	0.287	0.409
30	359.1	17320	9526	SIDE	14922	0.325	0.442
90 in. Diameter Drilled Shaft							
10	379.1	21285	10643	TIP	--	--	1.403
20	369.1	10856	5971	SIDE	9401	0.257	0.376
25.5	363.6	15092	8300	SIDE	12620	0.287	0.432
30	359.1	18558	10207	SIDE	15597	0.323	0.466
96 in. Diameter Drilled Shaft							
10	379.1	24064	12032	TIP	--	--	1.455
20	369.1	11579	6369	SIDE	9905	0.261	0.397
25.5	363.6	16098	8854	SIDE	13229	0.288	0.456
30	359.1	19795	10887	SIDE	16280	0.321	0.490
102 in. Diameter Drilled Shaft							
10	379.1	27011	13506	TIP	--	--	1.484
20	369.1	12303	6767	SIDE	10412	0.264	0.417
25.5	363.6	17104	9407	SIDE	13842	0.289	0.479
30	359.1	21032	11568	SIDE	16971	0.321	0.514
108 in. Diameter Drilled Shaft							
10	379.1	30129	15065	TIP	--	--	1.561
20	369.1	13027	7165	SIDE	10919	0.268	0.437
25.5	363.6	18110	9961	SIDE	14458	0.291	0.503
30	359.1	22269	12248	SIDE	17669	0.321	0.539
120 in. Diameter Drilled Shaft							
10	379.1	36874	18437	TIP	--	--	1.724
20	369.1	14474	7961	SIDE	11938	0.275	0.477
25.5	363.6	20122	11067	SIDE	15700	0.296	0.550
30	359.1	24743	13609	SIDE	19079	0.323	0.589

Illinois Department of Transportation

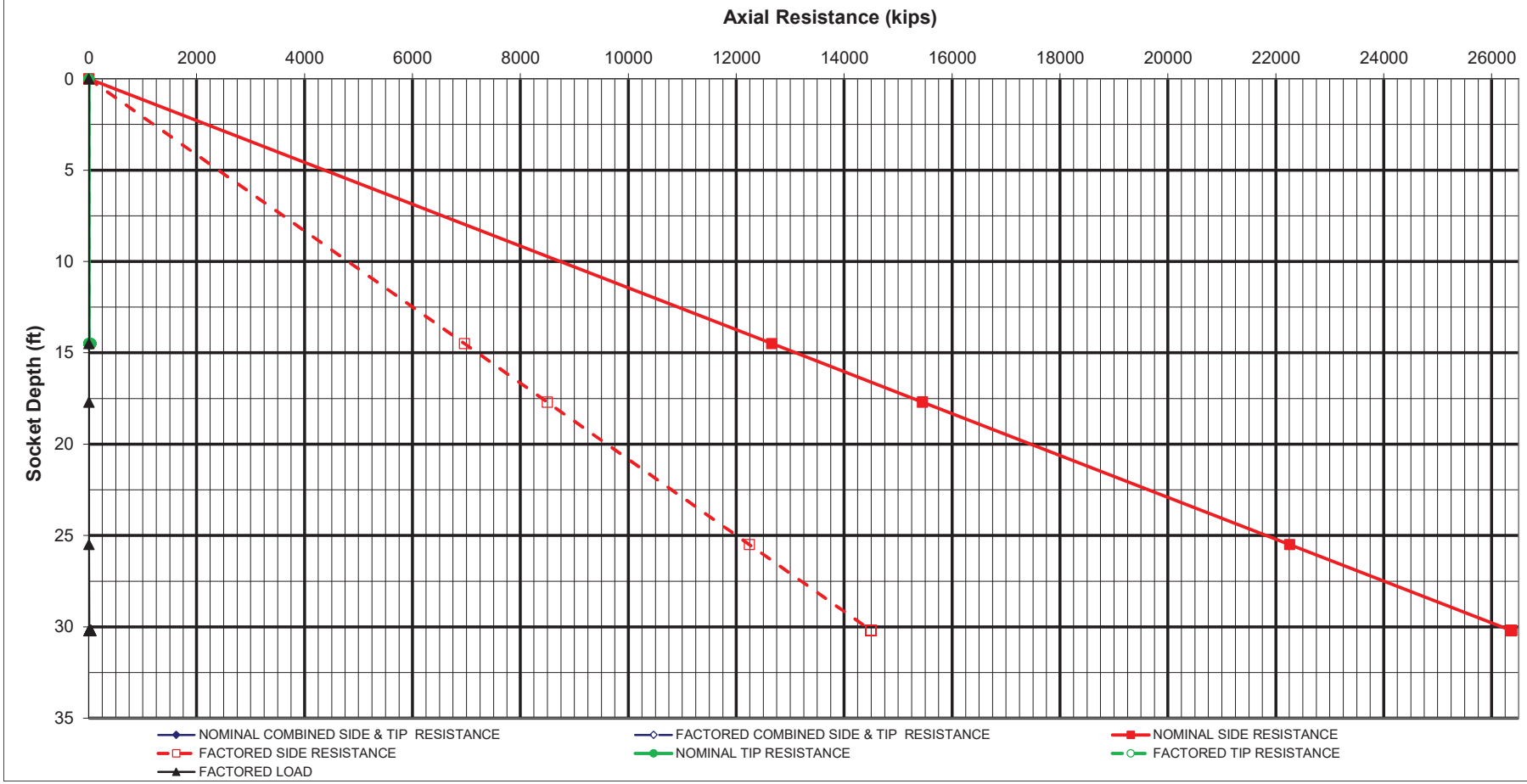
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-08
GROUND SURFACE ELEVATION ========== 410.40 FT
GROUND WATER ELEVATION ========== 410.40 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 391.50 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)								Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
14.50	377.00	14.50	1400.0	Limestone	55	Normal	79	Open	No	12657	12657	6961	7477	0.141	0.496										
17.70	373.80	3.20	1100.0	Limestone	50	Normal	80	Open	Yes	2793	15450	8497	9133	0.167	0.549										
25.50	366.00	7.80	1400.0	Limestone	55	Normal	51	Open	Yes	6808	22258	12242	14748	0.238	0.553										
30.20	361.30	4.70	1400.0	Limestone	55	Normal	51	Open	Yes	4103	26361	14498	18701	0.288	0.562										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-08

Estimated Top of Rock Elevation: 391.50

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
14.5	377	128098	64049	TIP	--	--	7.495
17.7	373.8	12723	6998	SIDE	7889	0.164	0.459
25.5	366	18330	10082	SIDE	13061	0.244	0.469
30.2	361.3	21709	11940	SIDE	16815	0.303	0.482
90 in. Diameter Drilled Shaft							
14.5	377	147557	73778	TIP	--	--	7.927
17.7	373.8	13632	7498	SIDE	8301	0.165	0.489
25.5	366	19640	10802	SIDE	13613	0.241	0.497
30.2	361.3	23260	12793	SIDE	17426	0.297	0.508
96 in. Diameter Drilled Shaft							
14.5	377	11912	6552	SIDE	7122	0.140	0.469
17.7	373.8	14541	7998	SIDE	8716	0.166	0.519
25.5	366	20949	11522	SIDE	14176	0.239	0.525
30.2	361.3	24810	13646	SIDE	18056	0.292	0.535
102 in. Diameter Drilled Shaft							
14.5	377	12657	6961	SIDE	7477	0.141	0.496
17.7	373.8	15450	8497	SIDE	9133	0.167	0.549
25.5	366	22258	12242	SIDE	14748	0.238	0.553
30.2	361.3	26361	14498	SIDE	18701	0.288	0.562
108 in. Diameter Drilled Shaft							
14.5	377	13401	7371	SIDE	7834	0.142	0.523
17.7	373.8	16359	8997	SIDE	9553	0.168	0.578
25.5	366	23568	12962	SIDE	15328	0.238	0.582
30.2	361.3	27911	15351	SIDE	19359	0.286	0.589
120 in. Diameter Drilled Shaft							
14.5	377	14890	8190	SIDE	8550	0.145	0.576
17.7	373.8	18176	9997	SIDE	10397	0.171	0.637
25.5	366	26186	14402	SIDE	16504	0.238	0.640
30.2	361.3	31013	17057	SIDE	20706	0.283	0.646

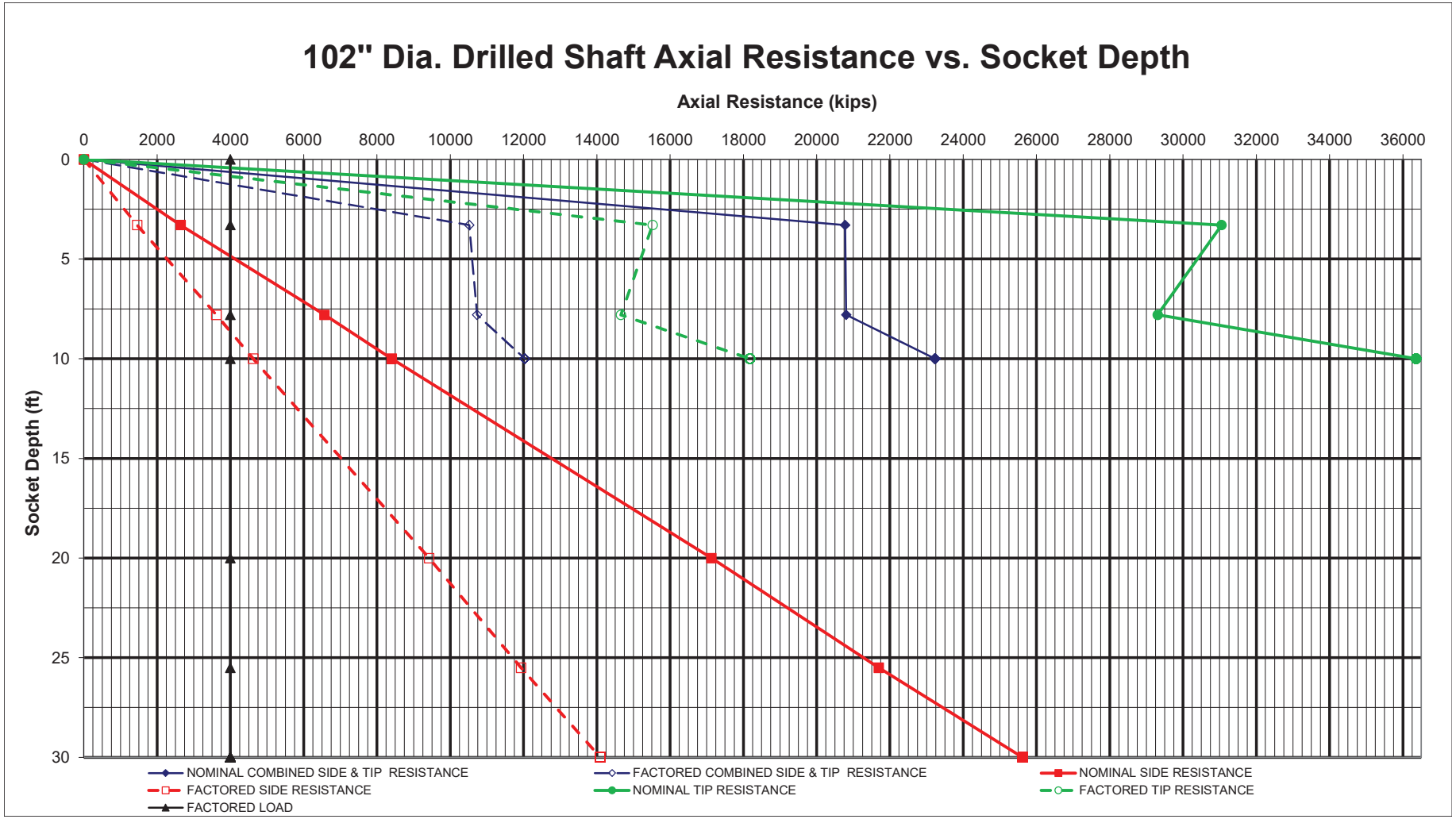
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-09
GROUND SURFACE ELEVATION ========== 400.20 FT
GROUND WATER ELEVATION ========== 400.20 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 381.00 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

									SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
3.30	377.70	3.30	424.0	Limestone	60	Normal	55	Open	No	2642	2642	1453	653	0.010	0.947	807.2	31049	15525	0.989	0.87	20778	10521	969	0.010	0.580
7.80	373.20	4.50	769.6	Limestone	60	Normal	77	Open	No	3928	6570	3613	2073	0.038	0.766	724.4	29310	14655	1.039	0.68	20806	10732	3388	0.042	0.492
10.00	371.00	2.20	457.6	Limestone	60	Normal	95	Open	No	1830	8400	4620	2595	0.044	0.812	904.5	36356	18178	1.239	0.64	23233	12036	4137	0.051	0.533
20.00	361.00	10.00	911.6	Limestone	60	Normal	82	Open	Yes	8729	17128	9421	6880	0.097	0.685										
25.50	355.50	5.50	456.6	Limestone	60	Normal	79	Open	Yes	4569	21698	11934	8596	0.114	0.742										
30.00	351.00	4.50	2500.0	Limestone	60	Normal	86	Open	Yes	3928	25626	14094	13667	0.175	0.590										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
36000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-09

Estimated Top of Rock Elevation: 381.00

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
3.3	377.7	20753	10377	TIP	--	--	0.811
7.8	373.2	21276	10638	TIP	--	--	0.892
10	371	21657	10828	TIP	--	--	0.978
20	361	14106	7758	SIDE	5925	0.096	0.568
25.5	355.5	17869	9828	SIDE	7462	0.116	0.620
30	351	21104	11607	SIDE	12166	0.184	0.501
90 in. Diameter Drilled Shaft							
3.3	377.7	24040	12020	TIP	--	--	0.916
7.8	373.2	23818	11909	TIP	--	--	0.924
10	371	24253	12126	TIP	--	--	0.971
20	361	15113	8312	SIDE	6242	0.096	0.607
25.5	355.5	19145	10530	SIDE	7838	0.115	0.660
30	351	22611	12436	SIDE	12659	0.181	0.530
96 in. Diameter Drilled Shaft							
3.3	377.7	27567	13784	TIP	--	--	0.936
7.8	373.2	26496	13248	TIP	--	--	0.957
10	371	29028	14514	TIP	--	--	1.080
20	361	16121	8867	SIDE	6560	0.096	0.646
25.5	355.5	20422	11232	SIDE	8216	0.114	0.701
30	351	24119	13265	SIDE	13160	0.178	0.559
102 in. Diameter Drilled Shaft							
3.3	377.7	31049	15525	TIP	--	--	0.989
7.8	373.2	29310	14655	TIP	--	--	1.039
10	371	36356	18178	TIP	--	--	1.239
20	361	17128	9421	SIDE	6880	0.097	0.685
25.5	355.5	21698	11934	SIDE	8596	0.114	0.742
30	351	25626	14094	SIDE	13667	0.175	0.590
108 in. Diameter Drilled Shaft							
3.3	377.7	34032	17016	TIP	--	--	0.996
7.8	373.2	33632	16816	TIP	--	--	1.068
10	371	44323	22161	TIP	--	--	1.445
20	361	18136	9975	SIDE	7200	0.097	0.724
25.5	355.5	22974	12636	SIDE	8977	0.114	0.784
30	351	27133	14923	SIDE	14180	0.173	0.621
120 in. Diameter Drilled Shaft							
3.3	377.7	40383	20191	TIP	--	--	1.143
7.8	373.2	50235	25118	TIP	--	--	1.422
10	371	62180	31090	TIP	--	--	1.859
20	361	20151	11083	SIDE	7844	0.098	0.803
25.5	355.5	25527	14040	SIDE	9743	0.114	0.867
30	351	30148	16581	SIDE	15220	0.171	0.683

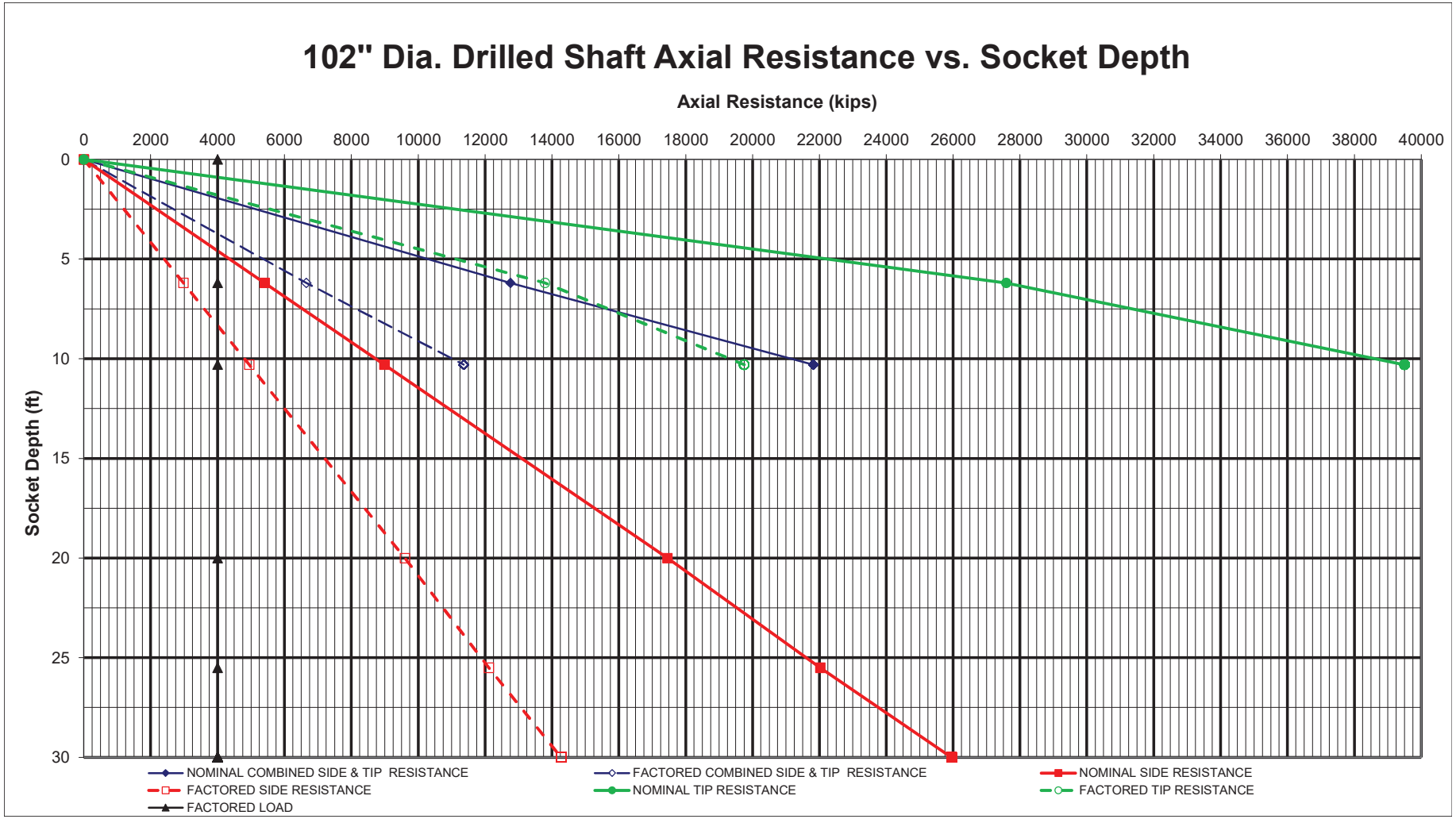
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-10
GROUND SURFACE ELEVATION ========== 409.20 FT
GROUND WATER ELEVATION ========== 409.20 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 385.60 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
6.20	379.40	6.20	1300.0	Limestone	50	Normal	64	Open	No	5412	5412	2977	2685	0.078	0.627	1077.7	27590	13795	1.791	0.58	12761	6651	4069	0.084	0.484
10.30	375.30	4.10	800.0	Sandstone	50	Normal	70	Open	Yes	3579	8991	4945	4020	0.131	0.990	1094.8	39502	19751	2.298	0.59	21825	11362	6805	0.148	0.750
20.00	365.60	9.70	1400.0	Limestone	55	Normal	89	Open	Yes	8467	17457	9602	9592	0.195	0.722										
25.50	360.10	5.50	456.6	Sandstone	55	Normal	79	Open	Yes	4569	22027	12115	11063	0.222	0.923										
30.00	355.60	4.50	1400.0	Limestone	55	Normal	86	Open	Yes	3928	25955	14275	14226	0.260	0.857										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
36000
38000
40000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-10

Estimated Top of Rock Elevation: 385.60

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
6.2	379.4	20708	10354	TIP	--	--	1.519
10.3	375.3	27096	13548	TIP	--	--	1.882
20	365.6	14377	7907	SIDE	8247	0.190	0.606
25.5	360.1	18140	9977	SIDE	9528	0.218	0.777
30	355.6	21375	11756	SIDE	12409	0.262	0.727
90 in. Diameter Drilled Shaft							
6.2	379.4	22907	11454	TIP	--	--	1.626
10.3	375.3	30114	15057	TIP	--	--	2.009
20	365.6	15404	8472	SIDE	8693	0.191	0.645
25.5	360.1	19436	10690	SIDE	10037	0.219	0.825
30	355.6	22901	12596	SIDE	13010	0.261	0.770
96 in. Diameter Drilled Shaft							
6.2	379.4	25201	12601	TIP	--	--	1.709
10.3	375.3	34497	17249	TIP	--	--	2.108
20	365.6	16431	9037	SIDE	9141	0.193	0.683
25.5	360.1	20731	11402	SIDE	10549	0.220	0.874
30	355.6	24428	13435	SIDE	13616	0.260	0.813
102 in. Diameter Drilled Shaft							
6.2	379.4	27590	13795	TIP	--	--	1.791
10.3	375.3	39502	19751	TIP	--	--	2.298
20	365.6	17457	9602	SIDE	9592	0.195	0.722
25.5	360.1	22027	12115	SIDE	11063	0.222	0.923
30	355.6	25955	14275	SIDE	14226	0.260	0.857
108 in. Diameter Drilled Shaft							
6.2	379.4	30073	15037	TIP	--	--	1.871
10.3	375.3	44841	22420	TIP	--	--	2.343
20	365.6	18484	10166	SIDE	10044	0.196	0.761
25.5	360.1	23323	12827	SIDE	11578	0.224	0.972
30	355.6	27482	15115	SIDE	14839	0.261	0.901
120 in. Diameter Drilled Shaft							
6.2	379.4	36339	18170	TIP	--	--	2.094
10.3	375.3	10577	5817	SIDE	4679	0.136	1.144
20	365.6	20538	11296	SIDE	10952	0.200	0.838
25.5	360.1	25914	14253	SIDE	12614	0.228	1.070
30	355.6	30535	16794	SIDE	16076	0.263	0.989

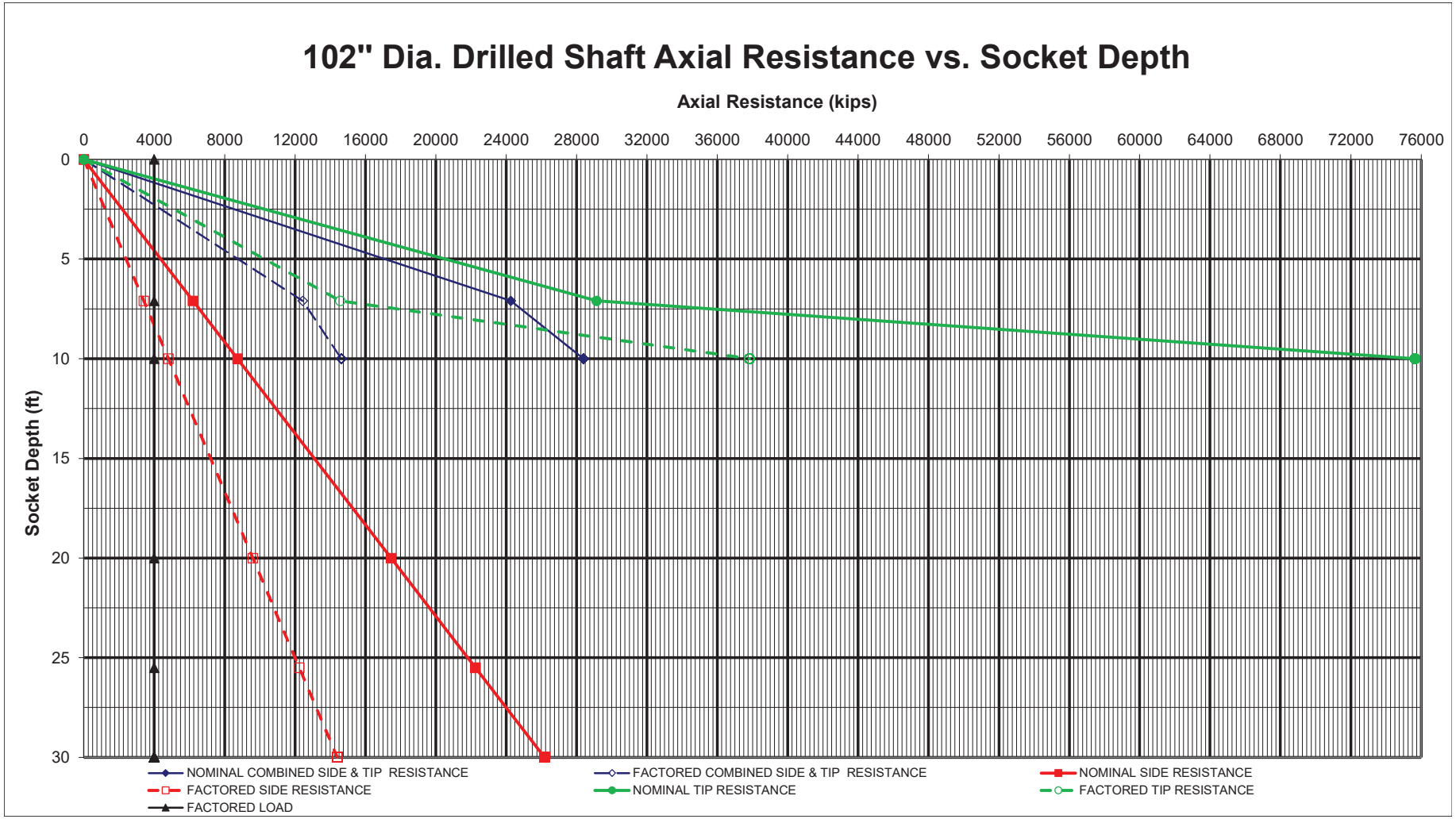
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-11
GROUND SURFACE ELEVATION ========== 406.60 FT
GROUND WATER ELEVATION ========== 406.60 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 385.70 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
7.10	378.60	7.10	900.0	Limestone	45	Normal	87	Open	No	6197	6197	3409	2367	0.084	1.157	1449.4	29138	14569	1.262	0.74	24262	12441	4581	0.094	0.806
10.00	375.70	2.90	1000.0	Sandstone	60	Normal	87	Open	Yes	2531	8729	4801	3468	0.115	1.161	1517.6	75649	37824	2.956	0.69	28389	14631	7108	0.135	0.793
20.00	365.70	10.00	1600.0	Limestone	55	Normal	75	Open	Yes	8729	17457	9602	9659	0.196	0.717										
25.50	360.20	5.50	1400.0	Limestone	60	Normal	89	Open	Yes	4801	22258	12242	13712	0.234	0.631										
30.00	355.70	4.50	1400.0	Limestone	60	Normal	89	Open	Yes	3928	26186	14402	17571	0.275	0.597										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
4000
8000
12000
16000
20000
24000
28000
32000
36000
40000
44000
48000
52000
56000
60000
64000
68000
72000
76000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-11

Estimated Top of Rock Elevation: 385.70

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
7.1	378.6	19886	9943	TIP	--	--	1.117
10	375.7	52069	26034	TIP	--	--	2.651
20	365.7	14377	7907	SIDE	8307	0.191	0.601
25.5	360.2	18330	10082	SIDE	12043	0.237	0.534
30	355.7	21565	11861	SIDE	15709	0.286	0.511
90 in. Diameter Drilled Shaft							
7.1	378.6	22774	11387	TIP	--	--	1.186
10	375.7	59442	29721	TIP	--	--	2.734
20	365.7	15404	8472	SIDE	8756	0.193	0.640
25.5	360.2	19640	10802	SIDE	12592	0.235	0.566
30	355.7	23106	12708	SIDE	16316	0.281	0.539
96 in. Diameter Drilled Shaft							
7.1	378.6	25858	12929	TIP	--	--	1.236
10	375.7	67302	33651	TIP	--	--	2.857
20	365.7	16431	9037	SIDE	9206	0.194	0.678
25.5	360.2	20949	11522	SIDE	13149	0.234	0.599
30	355.7	24646	13555	SIDE	16937	0.277	0.568
102 in. Diameter Drilled Shaft							
7.1	378.6	29138	14569	TIP	--	--	1.262
10	375.7	75649	37824	TIP	--	--	2.956
20	365.7	17457	9602	SIDE	9659	0.196	0.717
25.5	360.2	22258	12242	SIDE	13712	0.234	0.631
30	355.7	26186	14402	SIDE	17571	0.275	0.597
108 in. Diameter Drilled Shaft							
7.1	378.6	32614	16307	TIP	--	--	1.310
10	375.7	84483	42241	TIP	--	--	3.103
20	365.7	18484	10166	SIDE	10114	0.198	0.755
25.5	360.2	23568	12962	SIDE	14280	0.234	0.664
30	355.7	27727	15250	SIDE	18215	0.273	0.627
120 in. Diameter Drilled Shaft							
7.1	378.6	40153	20076	TIP	--	--	1.436
10	375.7	103612	51806	TIP	--	--	3.407
20	365.7	20538	11296	SIDE	11028	0.201	0.831
25.5	360.2	26186	14402	SIDE	15428	0.235	0.731
30	355.7	30807	16944	SIDE	19528	0.271	0.687

Illinois Department of Transportation

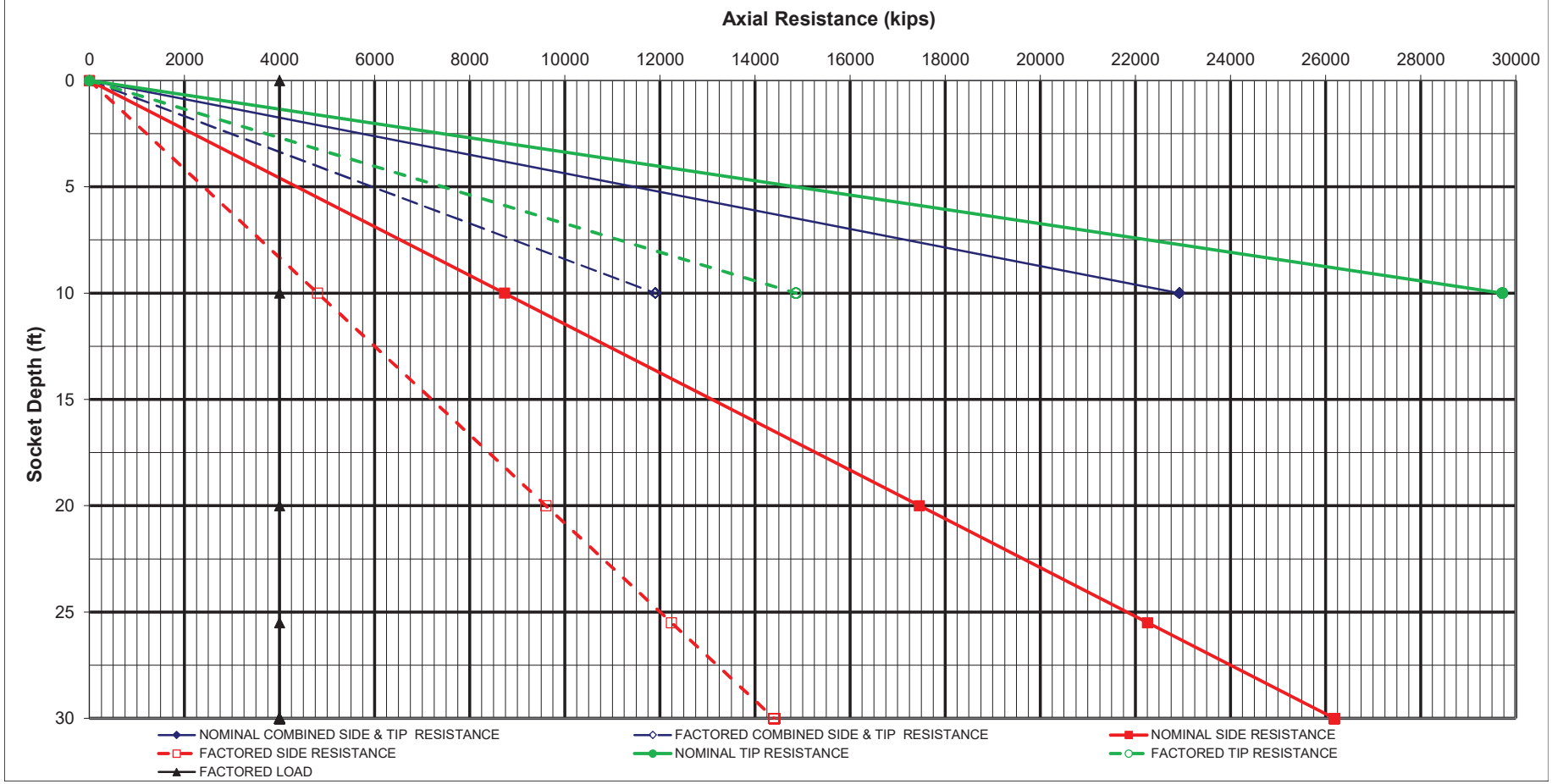
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-12
GROUND SURFACE ELEVATION ========== 393.40 FT
GROUND WATER ELEVATION ========== 393.40 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 384.70 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
10.00	374.70	10.00	1015.3	Limestone	50	Normal	61	Open	No	8729	8729	4801	3754	0.099	0.844	1172.9	29717	14859	1.146	0.62	22923	11898	6966	0.117	0.577
20.00	364.70	10.00	978.9	Limestone	55	Normal	88	Open	Yes	8729	17457	9602	8204	0.153	0.790										
25.50	359.20	5.50	1450.1	Limestone	60	Normal	88	Open	Yes	4801	22258	12242	12128	0.196	0.677										
30.00	354.70	4.50	1450.1	Limestone	60	Normal	88	Open	Yes	3928	26186	14402	15870	0.238	0.630										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-12

Estimated Top of Rock Elevation: 384.70

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10	374.7	19263	9632	TIP	--	--	1.006
20	364.7	14377	7907	SIDE	7033	0.150	0.660
25.5	359.2	18330	10082	SIDE	10607	0.198	0.570
30	354.7	21565	11861	SIDE	14119	0.248	0.537
90 in. Diameter Drilled Shaft							
10	374.7	22500	11250	TIP	--	--	1.035
20	364.7	15404	8472	SIDE	7422	0.150	0.703
25.5	359.2	19640	10802	SIDE	11109	0.197	0.605
30	354.7	23106	12708	SIDE	14692	0.243	0.567
96 in. Diameter Drilled Shaft							
10	374.7	25985	12992	TIP	--	--	1.103
20	364.7	16431	9037	SIDE	7812	0.152	0.747
25.5	359.2	20949	11522	SIDE	11616	0.196	0.641
30	354.7	24646	13555	SIDE	15277	0.240	0.598
102 in. Diameter Drilled Shaft							
10	374.7	29717	14859	TIP	--	--	1.146
20	364.7	17457	9602	SIDE	8204	0.153	0.790
25.5	359.2	22258	12242	SIDE	12128	0.196	0.677
30	354.7	26186	14402	SIDE	15870	0.238	0.630
108 in. Diameter Drilled Shaft							
10	374.7	33698	16849	TIP	--	--	1.238
20	364.7	18484	10166	SIDE	8598	0.154	0.833
25.5	359.2	23568	12962	SIDE	12643	0.196	0.713
30	354.7	27727	15250	SIDE	16471	0.236	0.662
120 in. Diameter Drilled Shaft							
10	374.7	42402	21201	TIP	--	--	1.428
20	364.7	20538	11296	SIDE	9387	0.157	0.920
25.5	359.2	26186	14402	SIDE	13683	0.197	0.786
30	354.7	30807	16944	SIDE	17691	0.235	0.727

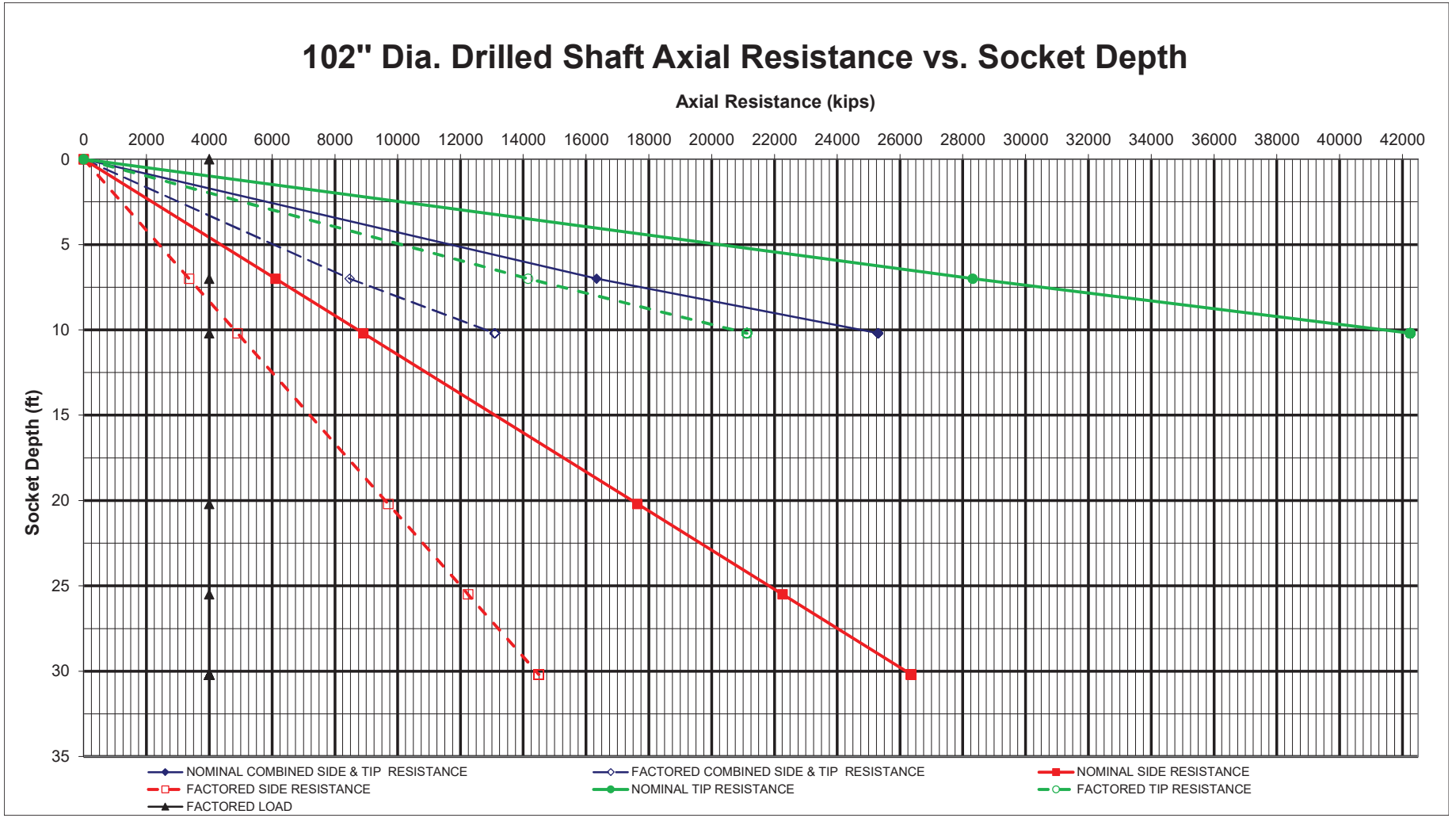
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-13
GROUND SURFACE ELEVATION ========== 405.40 FT
GROUND WATER ELEVATION ========== 405.40 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 385.40 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
7.00	378.40	7.00	1150.0	Limestone	50	Normal	80	Open	No	6110	6110	3361	2800	0.080	0.722	1111.8	28313	14156	1.426	0.63	16335	8473	4685	0.089	0.524
10.20	375.20	3.20	1000.0	Sandstone	50	Normal	59	Open	Yes	2793	8903	4897	4020	0.124	0.930	1205.9	42244	21122	1.535	0.65	25297	13094	8450	0.151	0.624
20.20	365.20	10.00	1000.0	Limestone	55	Normal	83	Open	Yes	8729	17632	9698	8556	0.169	0.814										
25.50	359.90	5.30	1500.0	Limestone	65	Normal	90	Open	Yes	4626	22258	12242	12685	0.202	0.636										
30.20	355.20	4.70	1500.0	Limestone	65	Normal	90	Open	Yes	4103	26361	14498	17128	0.245	0.561										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
36000
38000
40000
42000
Socket Depth (ft)
0
5
10
15
20
25
30
35
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-13

Estimated Top of Rock Elevation: 385.40

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
7	378.4	17951	8976	TIP	--	--	1.221
10.2	375.2	27416	13708	TIP	--	--	1.319
20.2	365.2	14521	7986	SIDE	7329	0.165	0.681
25.5	359.9	18330	10082	SIDE	11136	0.205	0.536
30.2	355.2	21709	11940	SIDE	15390	0.258	0.480
90 in. Diameter Drilled Shaft							
7	378.4	21150	10575	TIP	--	--	1.334
10.2	375.2	32008	16004	TIP	--	--	1.400
20.2	365.2	15558	8557	SIDE	7736	0.166	0.726
25.5	359.9	19640	10802	SIDE	11646	0.204	0.569
30.2	355.2	23260	12793	SIDE	15955	0.252	0.506
96 in. Diameter Drilled Shaft							
7	378.4	24604	12302	TIP	--	--	1.360
10.2	375.2	36951	18476	TIP	--	--	1.525
20.2	365.2	16595	9127	SIDE	8145	0.168	0.770
25.5	359.9	20949	11522	SIDE	12163	0.203	0.602
30.2	355.2	24810	13646	SIDE	16535	0.248	0.533
102 in. Diameter Drilled Shaft							
7	378.4	28313	14156	TIP	--	--	1.426
10.2	375.2	42244	21122	TIP	--	--	1.535
20.2	365.2	17632	9698	SIDE	8556	0.169	0.814
25.5	359.9	22258	12242	SIDE	12685	0.202	0.636
30.2	355.2	26361	14498	SIDE	17128	0.245	0.561
108 in. Diameter Drilled Shaft							
7	378.4	32277	16138	TIP	--	--	1.491
10.2	375.2	47888	23944	TIP	--	--	1.688
20.2	365.2	18669	10268	SIDE	8967	0.171	0.859
25.5	359.9	23568	12962	SIDE	13212	0.202	0.670
30.2	355.2	27911	15351	SIDE	17731	0.242	0.589
120 in. Diameter Drilled Shaft							
7	378.4	40969	20485	TIP	--	--	1.673
10.2	375.2	60226	30113	TIP	--	--	1.791
20.2	365.2	20744	11409	SIDE	9794	0.175	0.947
25.5	359.9	26186	14402	SIDE	14276	0.203	0.738
30.2	355.2	31013	17057	SIDE	18965	0.239	0.647

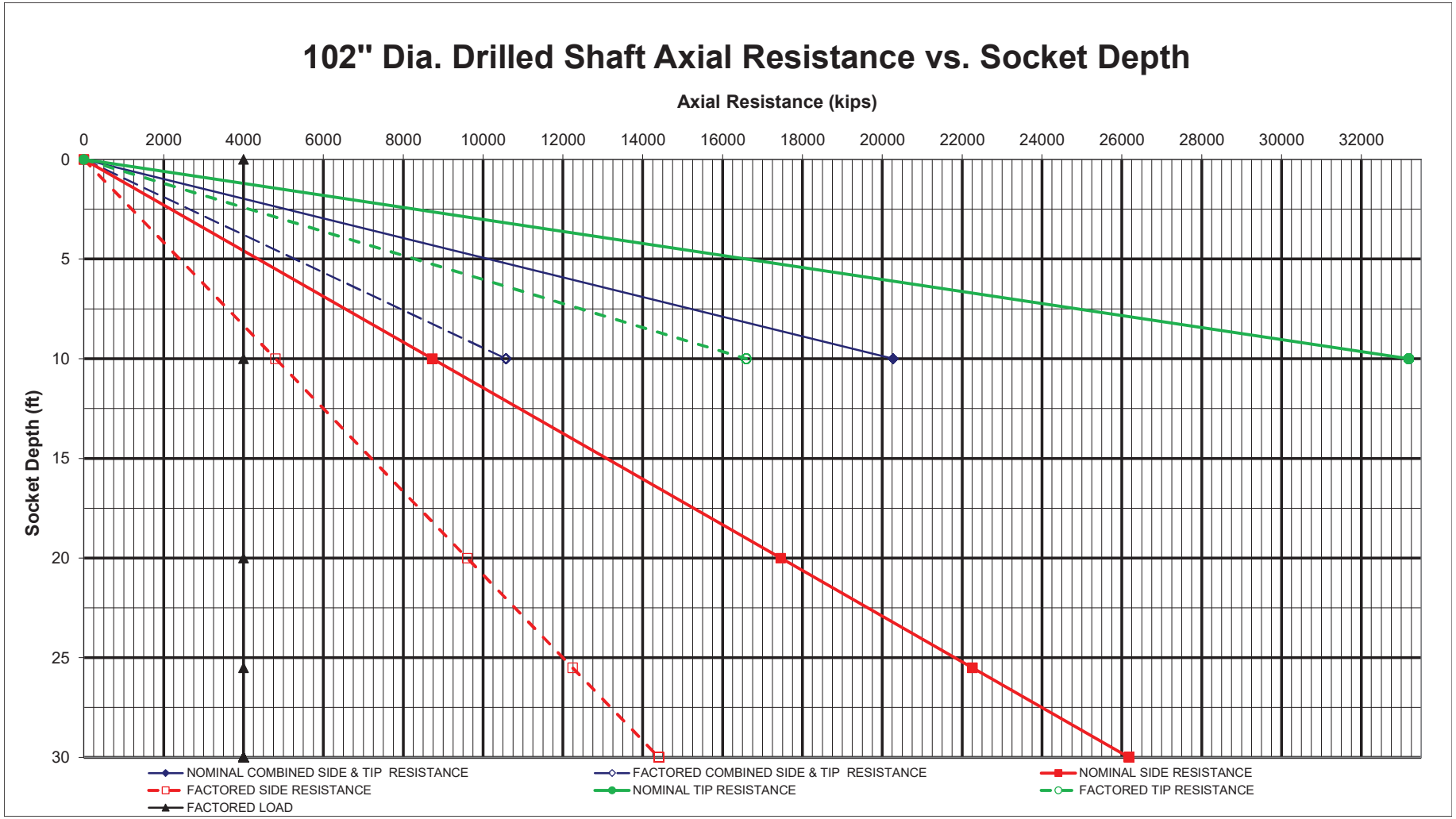
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-14
GROUND SURFACE ELEVATION ========== 394.20 FT
GROUND WATER ELEVATION ========== 394.20 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 383.70 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
10.00	373.70	10.00	1083.9	Limestone	50	Normal	83	Open	No	8729	8729	4801	3935	0.104	0.794	1323.6	33184	16592	1.585	0.57	20270	10571	6611	0.119	0.578
20.00	363.70	10.00	1231.5	Limestone	50	Normal	64	Open	Yes	8729	17457	9602	9033	0.187	0.793										
25.50	358.20	5.50	1455.2	Limestone	55	Normal	66	Open	Yes	4801	22258	12242	12832	0.234	0.728										
30.00	353.70	4.50	1455.2	Limestone	55	Normal	66	Open	Yes	3928	26186	14402	16355	0.278	0.702										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-14

Estimated Top of Rock Elevation: 383.70

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10	373.7	22084	11042	TIP	--	--	1.398
20	363.7	14377	7907	SIDE	7739	0.182	0.665
25.5	358.2	18330	10082	SIDE	11179	0.234	0.615
30	353.7	21565	11861	SIDE	14449	0.285	0.599
90 in. Diameter Drilled Shaft							
10	373.7	25534	12767	TIP	--	--	1.442
20	363.7	15404	8472	SIDE	8169	0.183	0.708
25.5	358.2	19640	10802	SIDE	11725	0.233	0.653
30	353.7	23106	12708	SIDE	15075	0.282	0.633
96 in. Diameter Drilled Shaft							
10	373.7	29234	14617	TIP	--	--	1.525
20	363.7	16431	9037	SIDE	8600	0.185	0.750
25.5	358.2	20949	11522	SIDE	12277	0.233	0.690
30	353.7	24646	13555	SIDE	15711	0.280	0.667
102 in. Diameter Drilled Shaft							
10	373.7	33184	16592	TIP	--	--	1.585
20	363.7	17457	9602	SIDE	9033	0.187	0.793
25.5	358.2	22258	12242	SIDE	12832	0.234	0.728
30	353.7	26186	14402	SIDE	16355	0.278	0.702
108 in. Diameter Drilled Shaft							
10	373.7	37383	18692	TIP	--	--	1.692
20	363.7	18484	10166	SIDE	9467	0.189	0.836
25.5	358.2	23568	12962	SIDE	13391	0.235	0.767
30	353.7	27727	15250	SIDE	17006	0.277	0.738
120 in. Diameter Drilled Shaft							
10	373.7	46531	23266	TIP	--	--	1.914
20	363.7	20538	11296	SIDE	10339	0.193	0.921
25.5	358.2	26186	14402	SIDE	14518	0.237	0.843
30	353.7	30807	16944	SIDE	18324	0.277	0.809

Illinois Department of Transportation

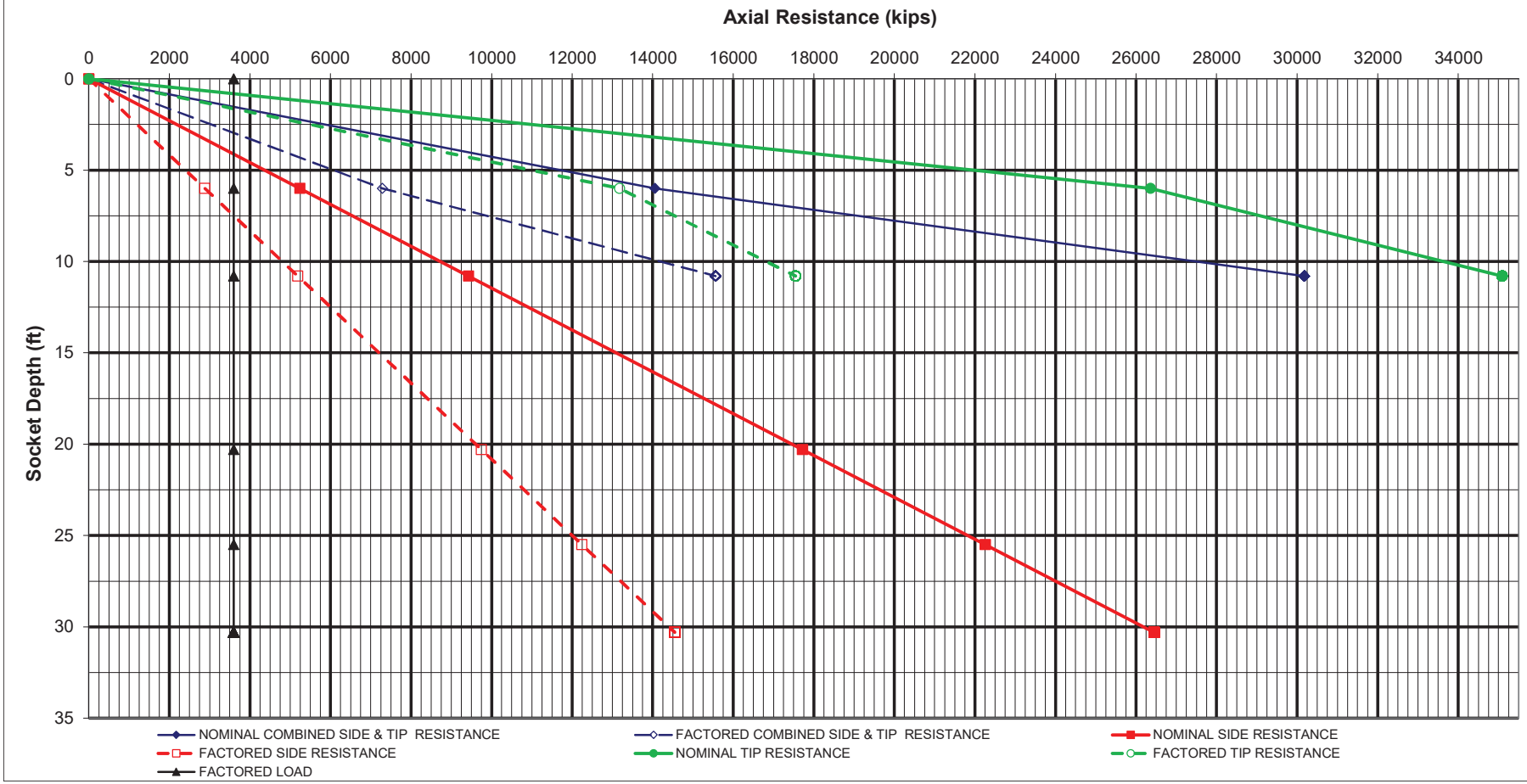
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-15
GROUND SURFACE ELEVATION ========== 406.60 FT
GROUND WATER ELEVATION ========== 406.60 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 382.60 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
6.00	376.60	6.00	1100.0	Limestone	50	Normal	53	Open	No	5237	5237	2880	2306	0.067	0.740	1023.5	26358	13179	1.678	0.63	14054	7289	3496	0.072	0.568
10.80	371.80	4.80	1000.0	Sandstone	45	Normal	53	Open	Yes	4190	9427	5185	4104	0.143	1.124	1164.7	35090	17545	1.188	0.69	30180	15561	9591	0.177	0.738
20.30	362.30	9.50	900.0	Limestone	55	Normal	73	Open	Yes	8292	17719	9746	8066	0.169	0.930										
25.50	357.10	5.20	1500.0	Limestone	70	Normal	100	Open	Yes	4539	22258	12242	12251	0.189	0.637										
30.30	352.30	4.80	1500.0	Limestone	70	Normal	100	Open	Yes	4190	26448	14546	17129	0.229	0.525										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-15

Estimated Top of Rock Elevation: 382.60

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
6	376.6	16529	8264	TIP	--	--	1.462
10.8	371.8	105145	52573	TIP	--	--	4.870
20.3	362.3	14592	8026	SIDE	6881	0.164	0.778
25.5	357.1	18330	10082	SIDE	10753	0.193	0.537
30.3	352.3	21781	11979	SIDE	15479	0.244	0.449
90 in. Diameter Drilled Shaft							
6	376.6	19421	9710	TIP	--	--	1.532
10.8	371.8	26496	13248	TIP	--	--	1.078
20.3	362.3	15635	8599	SIDE	7275	0.165	0.829
25.5	357.1	19640	10802	SIDE	11247	0.191	0.570
30.3	352.3	23337	12835	SIDE	16013	0.238	0.474
96 in. Diameter Drilled Shaft							
6	376.6	22762	11381	TIP	--	--	1.607
10.8	371.8	30645	15322	TIP	--	--	1.156
20.3	362.3	16677	9172	SIDE	7670	0.167	0.880
25.5	357.1	20949	11522	SIDE	11746	0.190	0.603
30.3	352.3	24892	13691	SIDE	16564	0.233	0.499
102 in. Diameter Drilled Shaft							
6	376.6	26358	13179	TIP	--	--	1.678
10.8	371.8	35090	17545	TIP	--	--	1.188
20.3	362.3	17719	9746	SIDE	8066	0.169	0.930
25.5	357.1	22258	12242	SIDE	12251	0.189	0.637
30.3	352.3	26448	14546	SIDE	17129	0.229	0.525
108 in. Diameter Drilled Shaft							
6	376.6	30208	15104	TIP	--	--	1.745
10.8	371.8	39832	19916	TIP	--	--	1.242
20.3	362.3	18762	10319	SIDE	8464	0.171	0.981
25.5	357.1	23568	12962	SIDE	12760	0.189	0.671
30.3	352.3	28004	15402	SIDE	17707	0.226	0.552
120 in. Diameter Drilled Shaft							
6	376.6	38675	19337	TIP	--	--	1.872
10.8	371.8	11091	6100	SIDE	4780	0.149	1.299
20.3	362.3	20846	11465	SIDE	9261	0.175	1.082
25.5	357.1	26186	14402	SIDE	13787	0.190	0.740
30.3	352.3	31115	17113	SIDE	18892	0.222	0.606

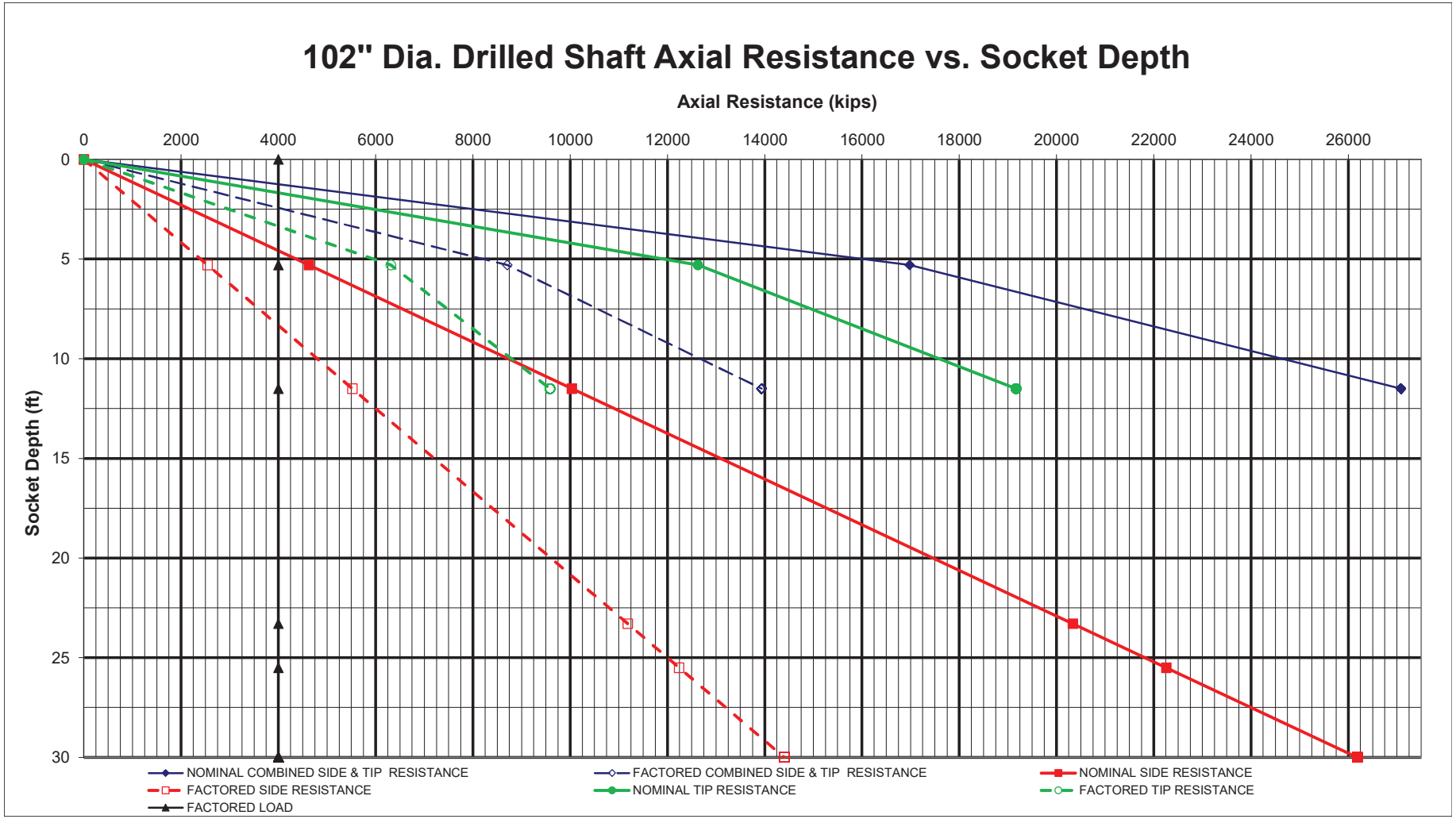
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-16A, BB-16B, BB-16C
GROUND SURFACE ELEVATION ========== 400.20 FT
GROUND WATER ELEVATION ========== 400.20 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 372.90 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)							Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
5.30	367.60	5.30	1300.0	Limestone	40	Normal	36	Open	No	4626	4626	2544	2235	0.102	0.984	657.2	12629	6314	0.601	0.74	16979	8707	4555	0.111	0.630
11.50	361.40	6.20	600.0	Limestone	40	Normal	70	Open	No	5412	10038	5521	3883	0.152	1.539	998.9	19168	9584	0.726	0.71	27082	13937	9361	0.185	0.699
23.30	349.60	11.80	690.0	Limestone	60	Normal	72	Open	Yes	10300	20338	11186	8166	0.146	0.987										
25.50	347.40	2.20	1700.0	Limestone	60	Normal	84	Open	Yes	1920	22258	12242	9800	0.166	0.890										
30.00	342.90	4.50	1700.0	Limestone	60	Normal	84	Open	Yes	3928	26186	14402	13534	0.211	0.765										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-16A, BB-16B, BB-16C

Estimated Top of Rock Elevation: 372.90

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
5.3	367.6	12104	6232	SIDE + TIP	3655	0.112	0.559
11.5	361.4	81656	40828	TIP	--	--	3.615
23.3	349.6	16749	9212	SIDE	6990	0.144	0.824
25.5	347.4	18330	10082	SIDE	8456	0.165	0.746
30	342.9	21565	11861	SIDE	11880	0.216	0.649
90 in. Diameter Drilled Shaft							
5.3	367.6	13637	7011	SIDE + TIP	3961	0.112	0.583
11.5	361.4	100006	50003	TIP	--	--	4.066
23.3	349.6	17945	9870	SIDE	7381	0.144	0.878
25.5	347.4	19640	10802	SIDE	8902	0.165	0.794
30	342.9	23106	12708	SIDE	12426	0.213	0.687
96 in. Diameter Drilled Shaft							
5.3	367.6	15262	7836	SIDE + TIP	4262	0.111	0.607
11.5	361.4	23712	12221	SIDE + TIP	8728	0.183	0.644
23.3	349.6	19142	10528	SIDE	7773	0.145	0.932
25.5	347.4	20949	11522	SIDE	9350	0.166	0.842
30	342.9	24646	13555	SIDE	12978	0.212	0.726
102 in. Diameter Drilled Shaft							
5.3	367.6	16979	8707	SIDE + TIP	4555	0.111	0.630
11.5	361.4	27082	13937	SIDE + TIP	9361	0.185	0.699
23.3	349.6	20338	11186	SIDE	8166	0.146	0.987
25.5	347.4	22258	12242	SIDE	9800	0.166	0.890
30	342.9	26186	14402	SIDE	13534	0.211	0.765
108 in. Diameter Drilled Shaft							
5.3	367.6	18789	9625	SIDE + TIP	4840	0.109	0.654
11.5	361.4	30656	15754	SIDE + TIP	9995	0.187	0.753
23.3	349.6	21534	11844	SIDE	8560	0.148	1.041
25.5	347.4	23568	12962	SIDE	10251	0.167	0.938
30	342.9	27727	15250	SIDE	14094	0.210	0.805
120 in. Diameter Drilled Shaft							
5.3	367.6	25030	12786	SIDE + TIP	5378	0.106	0.782
11.5	361.4	11809	6495	SIDE	4531	0.159	1.782
23.3	349.6	23927	13160	SIDE	9351	0.150	1.150
25.5	347.4	26186	14402	SIDE	11158	0.169	1.035
30	342.9	30807	16944	SIDE	15224	0.210	0.886

Illinois Department of Transportation

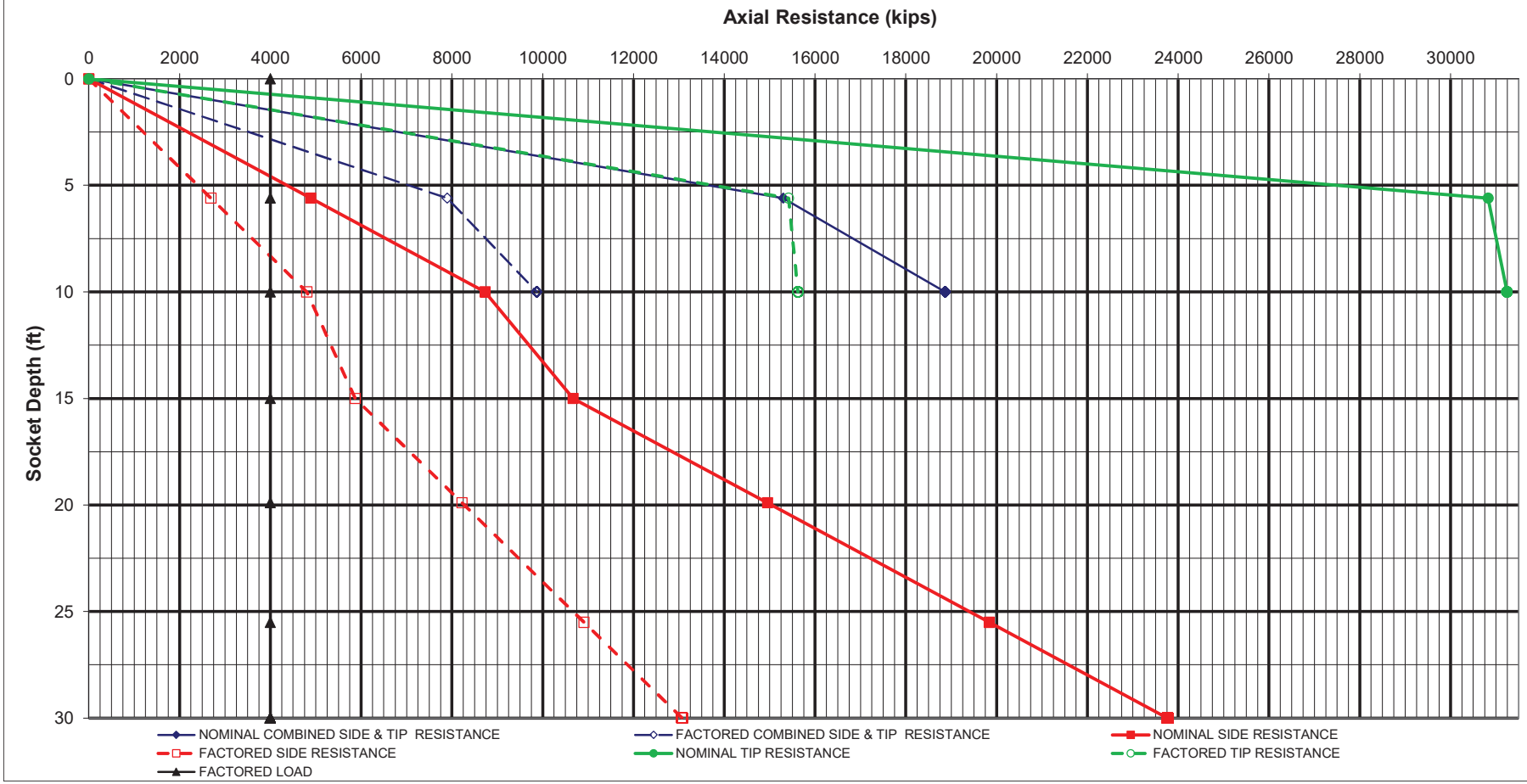
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-17
GROUND SURFACE ELEVATION ========== 389.60 FT
GROUND WATER ELEVATION ========== 389.60 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 374.30 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
5.60	368.70	5.60	1014.9	Limestone	50	Normal	62	Open	No	4888	4888	2688	2028	0.059	0.795	1264.0	30829	15414	1.778	0.68	15300	7894	3207	0.063	0.590
10.00	364.30	4.40	1166.1	Limestone	50	Normal	62	Open	No	3841	8729	4801	3926	0.104	0.796	1218.9	31244	15622	1.789	0.54	18866	9869	6101	0.116	0.606
15.00	359.30	5.00	100.0	Limestone	40	Normal	0	Open	No	1944	10673	5870	4317	0.112	1.050										
19.90	354.40	4.90	2689.5	Limestone	55	Normal	73	Open	No	4277	14950	8222	8529	0.182	0.677										
25.50	348.80	5.60	991.9	Limestone	50	Normal	91	Open	Yes	4888	19838	10911	11293	0.219	0.743										
30.00	344.30	4.50	991.9	Limestone	50	Normal	91	Open	Yes	3928	23766	13071	13691	0.252	0.785										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



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DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-17

Estimated Top of Rock Elevation: 374.30

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
5.6	368.7	21233	10617	TIP	--	--	1.535
10	364.3	21921	10960	TIP	--	--	1.639
15	359.3	18762	9381	TIP	--	--	1.179
19.9	354.4	12312	6771	SIDE	7285	0.176	0.568
25.5	348.8	16337	8985	SIDE	9744	0.217	0.627
30	344.3	19572	10765	SIDE	11906	0.253	0.666
90 in. Diameter Drilled Shaft							
5.6	368.7	24620	12310	TIP	--	--	1.595
10	364.3	24847	12424	TIP	--	--	1.670
15	359.3	21108	10554	TIP	--	--	1.295
19.9	354.4	13191	7255	SIDE	7698	0.178	0.604
25.5	348.8	17504	9627	SIDE	10258	0.217	0.665
30	344.3	20970	11533	SIDE	12497	0.252	0.705
96 in. Diameter Drilled Shaft							
5.6	368.7	27638	13819	TIP	--	--	1.707
10	364.3	27955	13978	TIP	--	--	1.741
15	359.3	10045	5525	SIDE	4084	0.110	0.992
19.9	354.4	14070	7739	SIDE	8113	0.180	0.640
25.5	348.8	18671	10269	SIDE	10774	0.218	0.704
30	344.3	22368	12302	SIDE	13092	0.252	0.745
102 in. Diameter Drilled Shaft							
5.6	368.7	30829	15414	TIP	--	--	1.778
10	364.3	31244	15622	TIP	--	--	1.789
15	359.3	10673	5870	SIDE	4317	0.112	1.050
19.9	354.4	14950	8222	SIDE	8529	0.182	0.677
25.5	348.8	19838	10911	SIDE	11293	0.219	0.743
30	344.3	23766	13071	SIDE	13691	0.252	0.785
108 in. Diameter Drilled Shaft							
5.6	368.7	34192	17096	TIP	--	--	1.849
10	364.3	34715	17357	TIP	--	--	1.884
15	359.3	11301	6215	SIDE	4550	0.114	1.108
19.9	354.4	15829	8706	SIDE	8946	0.184	0.713
25.5	348.8	21005	11553	SIDE	11814	0.221	0.782
30	344.3	25164	13840	SIDE	14292	0.253	0.825
120 in. Diameter Drilled Shaft							
5.6	368.7	41434	20717	TIP	--	--	1.991
10	364.3	42199	21100	TIP	--	--	2.085
15	359.3	12556	6906	SIDE	5017	0.117	1.223
19.9	354.4	17588	9673	SIDE	9783	0.188	0.785
25.5	348.8	23339	12836	SIDE	12861	0.224	0.861
30	344.3	27960	15378	SIDE	15503	0.255	0.906

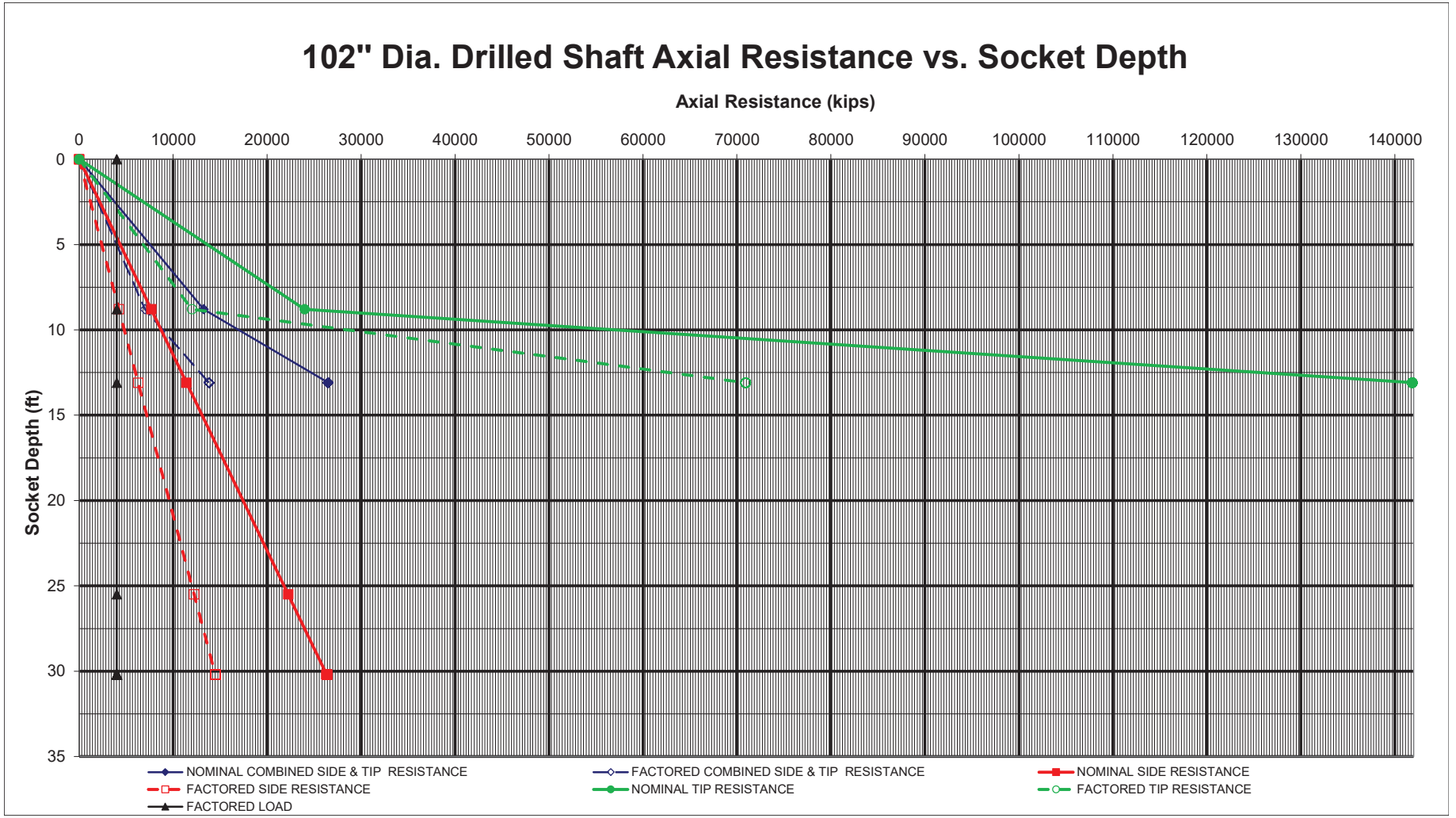
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-18
GROUND SURFACE ELEVATION ========== 407.80 FT
GROUND WATER ELEVATION ========== 407.80 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 380.90 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
8.80	372.10	8.80	1600.0	Limestone	50	Normal	69	Open	No	7681	7681	4225	4544	0.124	0.529	873.5	23991	11996	1.815	0.42	13249	7009	6642	0.137	0.424
13.10	367.80	4.30	500.0	Sandstone	40	Normal	69	Open	No	3738	11420	6281	5552	0.170	0.965	1000.0	141863	70931	6.286	0.57	26488	13815	10754	0.208	0.693
25.50	355.40	12.40	1000.0	Limestone	55	Normal	80	Open	Yes	10824	22243	12234	11660	0.220	0.832										
30.20	350.70	4.70	1000.0	Limestone	55	Normal	80	Open	Yes	4103	26346	14490	14380	0.250	0.824										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
110000
120000
130000
140000
Socket Depth (ft)
0
5
10
15
20
25
30
35
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-18

Estimated Top of Rock Elevation: 380.90

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
8.8	372.1	15853	7926	TIP	--	--	1.564
13.1	367.8	96211	48106	TIP	--	--	5.318
25.5	355.4	18318	10075	SIDE	10093	0.218	0.701
30.2	350.7	21697	11933	SIDE	12582	0.254	0.699
90 in. Diameter Drilled Shaft							
8.8	372.1	18380	9190	TIP	--	--	1.675
13.1	367.8	110447	55223	TIP	--	--	5.598
25.5	355.4	19627	10795	SIDE	10612	0.218	0.744
30.2	350.7	23246	12786	SIDE	13176	0.252	0.740
96 in. Diameter Drilled Shaft							
8.8	372.1	21092	10546	TIP	--	--	1.701
13.1	367.8	125664	62832	TIP	--	--	5.963
25.5	355.4	20935	11514	SIDE	11135	0.219	0.788
30.2	350.7	24796	13638	SIDE	13776	0.251	0.782
102 in. Diameter Drilled Shaft							
8.8	372.1	23991	11996	TIP	--	--	1.815
13.1	367.8	141863	70931	TIP	--	--	6.286
25.5	355.4	22243	12234	SIDE	11660	0.220	0.832
30.2	350.7	26346	14490	SIDE	14380	0.250	0.824
108 in. Diameter Drilled Shaft							
8.8	372.1	27076	13538	TIP	--	--	1.833
13.1	367.8	12091	6650	SIDE	5848	0.173	1.016
25.5	355.4	23552	12954	SIDE	12188	0.221	0.876
30.2	350.7	27896	15343	SIDE	14988	0.250	0.866
120 in. Diameter Drilled Shaft							
8.8	372.1	33802	16901	TIP	--	--	1.935
13.1	367.8	13435	7389	SIDE	6440	0.178	1.115
25.5	355.4	26169	14393	SIDE	13249	0.224	0.964
30.2	350.7	30995	17047	SIDE	16214	0.251	0.951

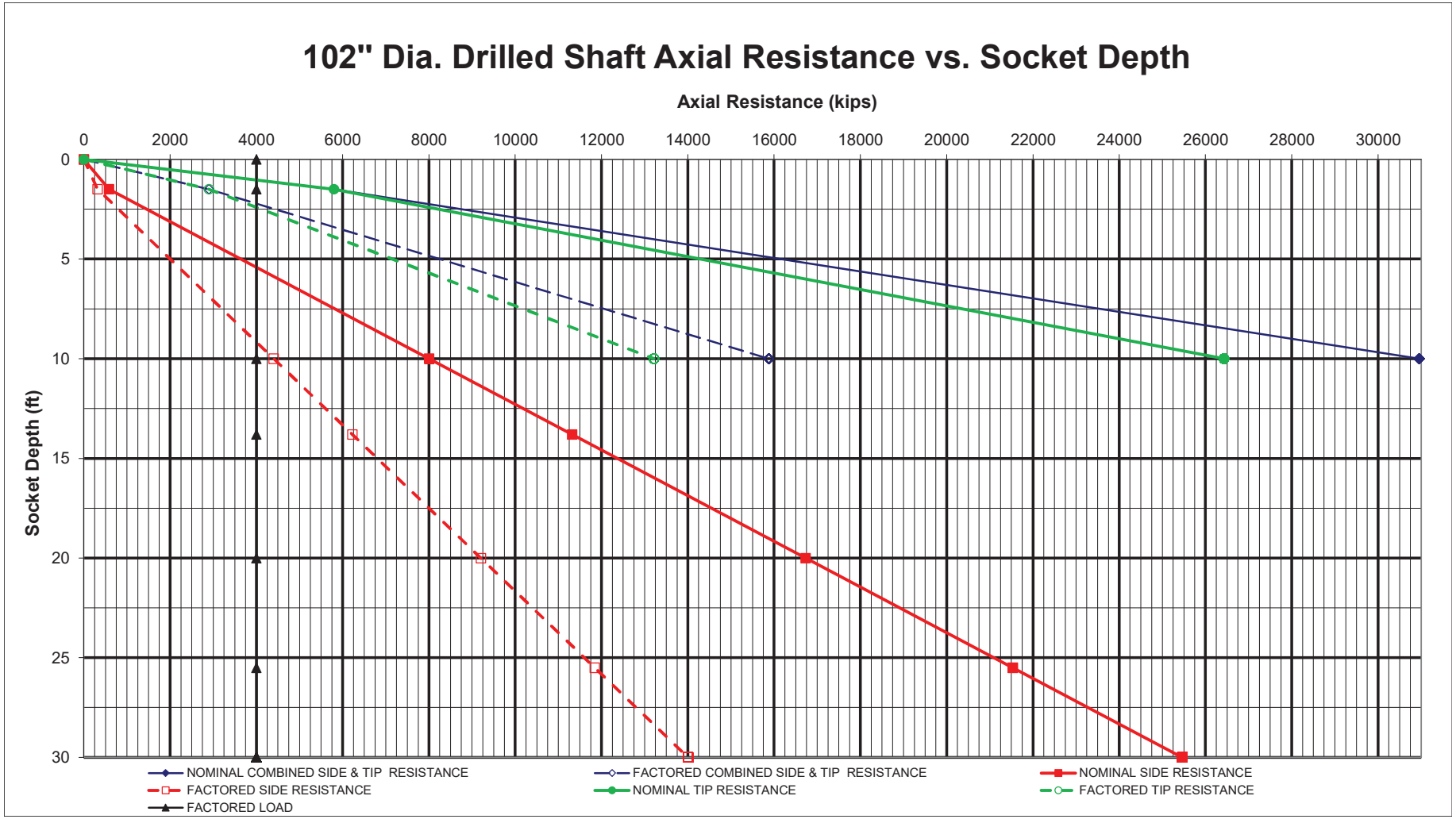
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-19
GROUND SURFACE ELEVATION ========== 389.50 FT
GROUND WATER ELEVATION ========== 389.50 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 368.90 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

									SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
1.50	367.40	1.50	100.0	Limestone	20	Normal	0	Open	No	583	583	321	0	0.000	7.553	898.7	5799	2900	0.304	1.00	5799	2900	0	0.000	0.304
10.00	358.90	8.50	831.1	Limestone	45	Normal	22	Open	No	7419	8003	4401	2810	0.102	1.478	1242.6	26431	13215	1.162	0.74	30956	15878	5467	0.116	1.046
13.80	355.10	3.80	868.6	Limestone	50	Normal	61	Open	No	3317	11320	6226	4161	0.122	1.331										
20.00	348.90	6.20	1045.2	Limestone	55	Normal	61	Open	No	5412	16731	9202	6924	0.152	1.065										
25.50	343.40	5.50	1620.5	Limestone	55	Normal	92	Open	Yes	4801	21532	11843	10645	0.202	0.879										
30.00	338.90	4.50	1620.5	Limestone	55	Normal	92	Open	Yes	3928	25460	14003	14116	0.248	0.803										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-19

Estimated Top of Rock Elevation: 368.90

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
1.5	367.4	3836	1918	TIP	--	--	0.219
10	358.9	22083	11371	SIDE + TIP	4375	0.111	0.891
13.8	355.1	24438	12219	TIP	--	--	1.332
20	348.9	13779	7578	SIDE	5869	0.146	0.889
25.5	343.4	17732	9753	SIDE	9171	0.199	0.739
30	338.9	20967	11532	SIDE	12331	0.251	0.682
90 in. Diameter Drilled Shaft							
1.5	367.4	4446	2223	TIP	--	--	0.274
10	358.9	24888	12797	SIDE + TIP	4738	0.113	0.943
13.8	355.1	28349	14175	TIP	--	--	1.490
20	348.9	14763	8120	SIDE	6220	0.148	0.948
25.5	343.4	18999	10449	SIDE	9660	0.200	0.785
30	338.9	22465	12356	SIDE	12921	0.249	0.722
96 in. Diameter Drilled Shaft							
1.5	367.4	5100	2550	TIP	--	--	0.266
10	358.9	27846	14300	SIDE + TIP	5102	0.114	0.995
13.8	355.1	32550	16275	TIP	--	--	1.521
20	348.9	15747	8661	SIDE	6572	0.150	1.007
25.5	343.4	20266	11146	SIDE	10151	0.201	0.832
30	338.9	23962	13179	SIDE	13516	0.248	0.762
102 in. Diameter Drilled Shaft							
1.5	367.4	5799	2900	TIP	--	--	0.304
10	358.9	30956	15878	SIDE + TIP	5467	0.116	1.046
13.8	355.1	11320	6226	SIDE	4161	0.122	1.331
20	348.9	16731	9202	SIDE	6924	0.152	1.065
25.5	343.4	21532	11843	SIDE	10645	0.202	0.879
30	338.9	25460	14003	SIDE	14116	0.248	0.803
108 in. Diameter Drilled Shaft							
1.5	367.4	6543	3272	TIP	--	--	0.319
10	358.9	34217	17532	SIDE + TIP	5832	0.117	1.098
13.8	355.1	11985	6592	SIDE	4388	0.125	1.403
20	348.9	17716	9744	SIDE	7276	0.154	1.124
25.5	343.4	22799	12539	SIDE	11140	0.203	0.926
30	338.9	26958	14827	SIDE	14719	0.248	0.845
120 in. Diameter Drilled Shaft							
1.5	367.4	8433	4216	TIP	--	--	0.332
10	358.9	41186	21064	SIDE + TIP	6561	0.119	1.199
13.8	355.1	13317	7324	SIDE	4842	0.129	1.547
20	348.9	19684	10826	SIDE	7983	0.158	1.240
25.5	343.4	25332	13933	SIDE	12134	0.207	1.020
30	338.9	29953	16474	SIDE	15934	0.249	0.928

Illinois Department of Transportation

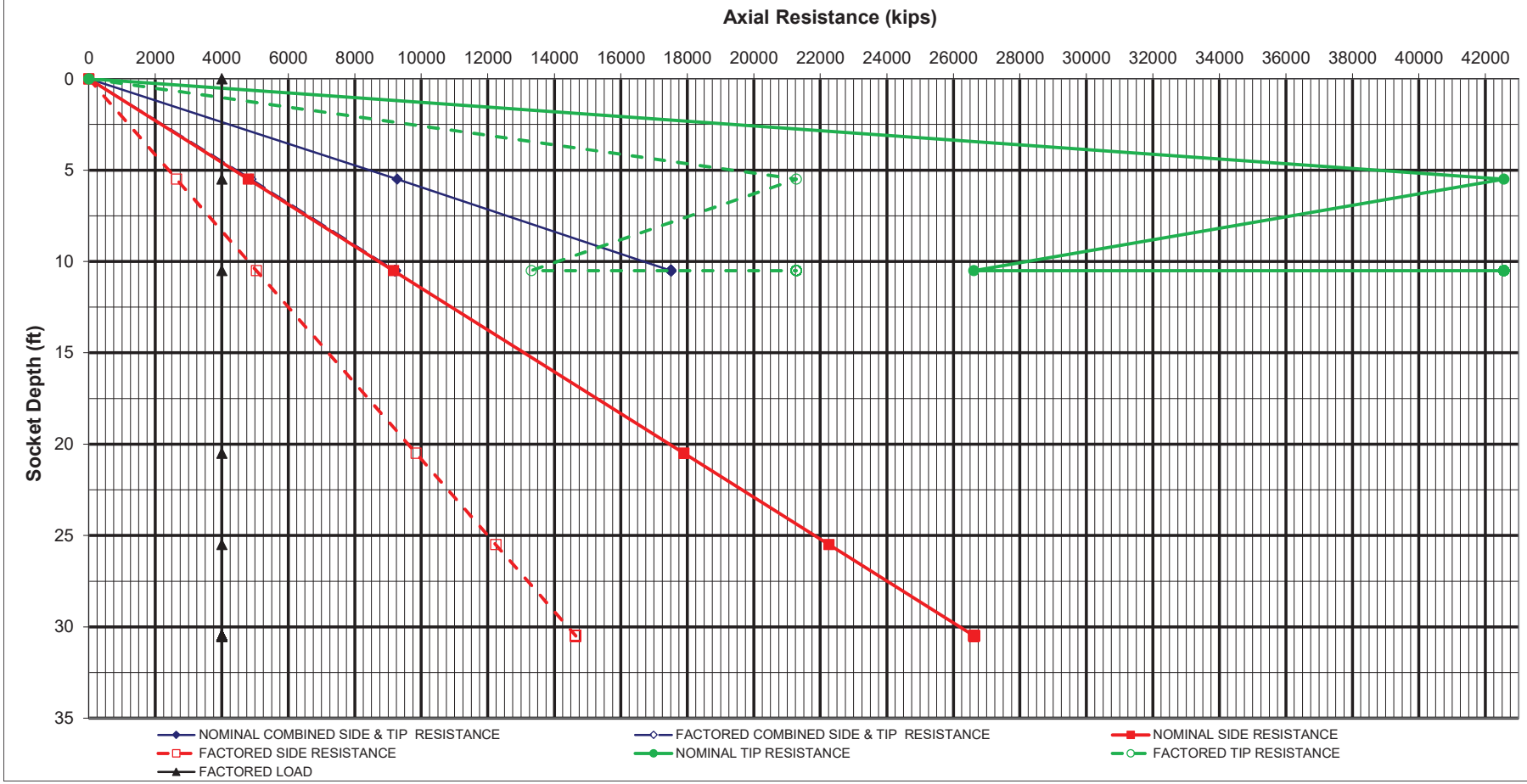
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-20
GROUND SURFACE ELEVATION ========== 389.20 FT
GROUND WATER ELEVATION ========== 389.20 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 373.00 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
5.50	367.50	5.50	2347.9	Limestone	50	Normal	49	Open	No	4801	4801	2640	3599	0.105	0.294	1799.8	42552	21276	2.021	0.48	9274	4877	6473	0.119	0.211
10.50	362.50	5.00	2058.0	Limestone	40	Normal	49	Open	No	4364	9165	5041	6875	0.215	0.472	1606.2	26616	13308	0.955	0.48	17506	9211	16467	0.293	0.319
20.50	352.50	10.00	1710.6	Limestone	60	Normal	83	Open	Yes	8729	17894	9842	15176	0.267	0.385										
25.50	347.50	5.00	1600.0	Limestone	60	Normal	98	Open	Yes	4364	22258	12242	20379	0.320	0.383										
30.50	342.50	5.00	1100.0	Limestone	55	Normal	98	Open	Yes	4364	26623	14642	24645	0.371	0.430										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-20

Estimated Top of Rock Elevation: 373.00

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
5.5	367.5	29374	14687	TIP	--	--	1.775
10.5	362.5	18722	9361	TIP	--	--	0.856
20.5	352.5	14736	8105	SIDE	13484	0.272	0.327
25.5	347.5	18330	10082	SIDE	18595	0.338	0.329
30.5	342.5	21925	12059	SIDE	22833	0.402	0.374
90 in. Diameter Drilled Shaft							
5.5	367.5	33580	16790	TIP	--	--	1.824
10.5	362.5	21436	10718	TIP	--	--	0.843
20.5	352.5	15789	8684	SIDE	14034	0.269	0.346
25.5	347.5	19640	10802	SIDE	19156	0.330	0.347
30.5	342.5	23491	12920	SIDE	23386	0.389	0.392
96 in. Diameter Drilled Shaft							
5.5	367.5	37934	18967	TIP	--	--	1.886
10.5	362.5	23958	11979	TIP	--	--	0.955
20.5	352.5	16841	9263	SIDE	14599	0.268	0.366
25.5	347.5	20949	11522	SIDE	19754	0.324	0.365
30.5	342.5	25057	13781	SIDE	23994	0.379	0.411
102 in. Diameter Drilled Shaft							
5.5	367.5	42552	21276	TIP	--	--	2.021
10.5	362.5	26616	13308	TIP	--	--	0.955
20.5	352.5	17894	9842	SIDE	15176	0.267	0.385
25.5	347.5	22258	12242	SIDE	20379	0.320	0.383
30.5	342.5	26623	14642	SIDE	24645	0.371	0.430
108 in. Diameter Drilled Shaft							
5.5	367.5	47435	23718	TIP	--	--	2.037
10.5	362.5	29410	14705	TIP	--	--	1.001
20.5	352.5	18947	10421	SIDE	15763	0.267	0.405
25.5	347.5	23568	12962	SIDE	21027	0.317	0.402
30.5	342.5	28189	15504	SIDE	25330	0.364	0.450
120 in. Diameter Drilled Shaft							
5.5	367.5	57994	28997	TIP	--	--	2.167
10.5	362.5	35406	17703	TIP	--	--	1.204
20.5	352.5	21052	11578	SIDE	16957	0.268	0.444
25.5	347.5	26186	14402	SIDE	22374	0.313	0.440
30.5	342.5	31321	17226	SIDE	26777	0.356	0.490

Illinois Department of Transportation

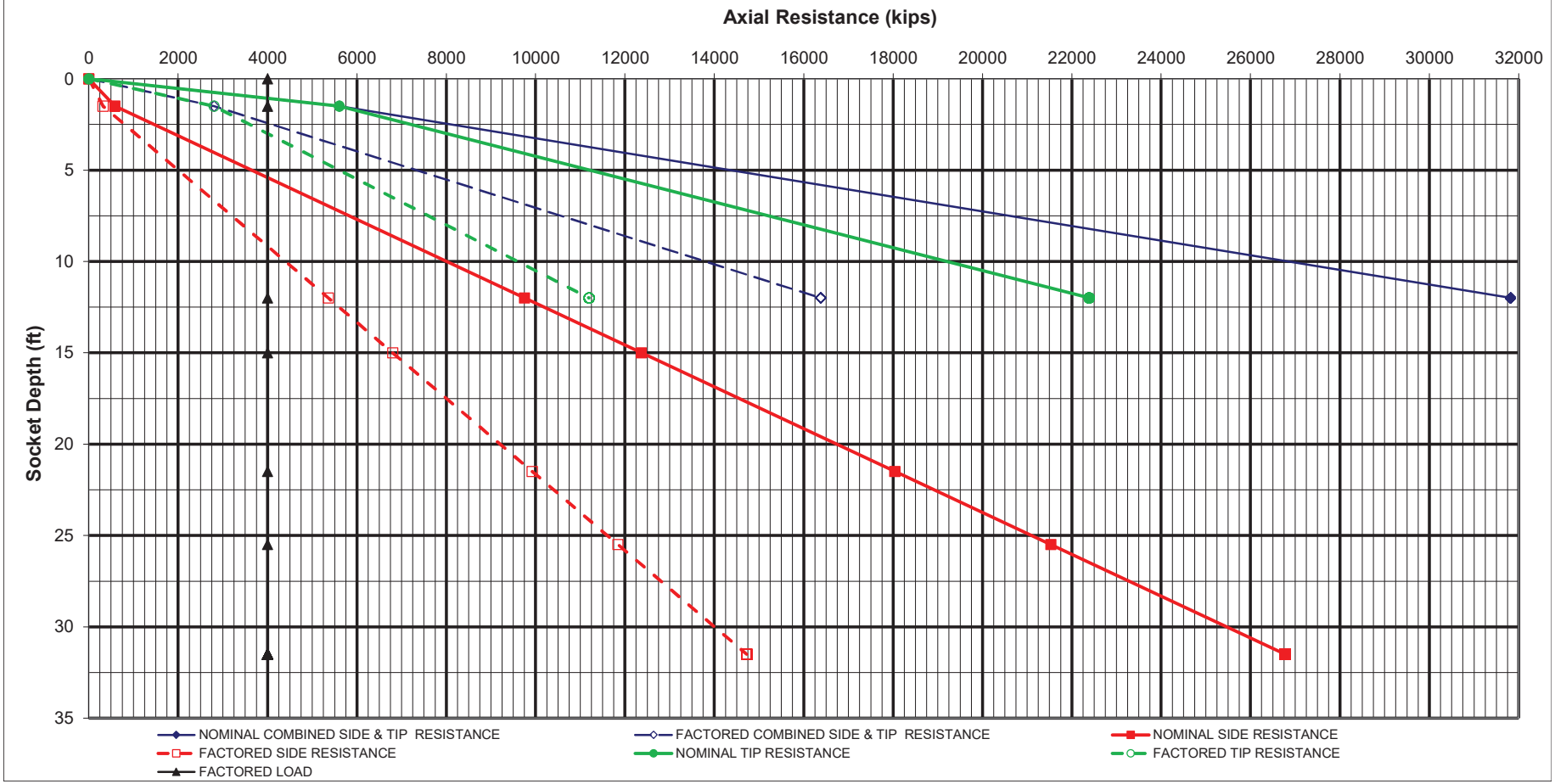
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-21
GROUND SURFACE ELEVATION ========== 388.70 FT
GROUND WATER ELEVATION ========== 388.70 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 367.70 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
1.50	366.20	1.50	100.0	Limestone	16	Normal	0	Open	No	583	583	321	0	0.000	9.067	1199.4	5608	2804	0.354	1.00	5608	2804	0	0.000	0.354
12.00	355.70	10.50	1036.0	Limestone	40	Normal	35	Open	No	9165	9748	5362	3998	0.167	1.541	1242.4	22389	11195	1.004	0.70	31817	16380	8427	0.195	1.052
15.00	352.70	3.00	2194.6	Limestone	60	Normal	85	Open	Yes	2619	12367	6802	6124	0.177	0.958										
21.50	346.20	6.50	836.7	Limestone	50	Normal	85	Open	Yes	5674	18041	9922	8728	0.204	1.001										
25.50	342.20	4.00	1213.1	Limestone	55	Normal	94	Open	Yes	3491	21532	11843	11035	0.227	0.925										
31.50	336.20	6.00	1213.1	Limestone	55	Normal	94	Open	Yes	5237	26769	14723	14891	0.271	0.865										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-21

Estimated Top of Rock Elevation: 367.70

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
1.5	366.2	3972	1986	TIP	--	--	0.281
12	355.7	120136	60068	TIP	--	--	6.933
15	352.7	99900	49950	TIP	--	--	6.141
21.5	346.2	14857	8171	SIDE	7428	0.196	0.840
25.5	342.2	17732	9753	SIDE	9487	0.223	0.779
31.5	336.2	22045	12125	SIDE	12998	0.274	0.737
90 in. Diameter Drilled Shaft							
1.5	366.2	4487	2243	TIP	--	--	0.331
12	355.7	137649	68824	TIP	--	--	7.319
15	352.7	115968	57984	TIP	--	--	6.608
21.5	346.2	15918	8755	SIDE	7860	0.198	0.894
25.5	342.2	18999	10449	SIDE	10000	0.224	0.828
31.5	336.2	23620	12991	SIDE	13624	0.273	0.779
96 in. Diameter Drilled Shaft							
1.5	366.2	5032	2516	TIP	--	--	0.320
12	355.7	28739	14814	SIDE + TIP	7846	0.192	1.004
15	352.7	133227	66614	TIP	--	--	7.014
21.5	346.2	16979	9339	SIDE	8293	0.201	0.947
25.5	342.2	20266	11146	SIDE	10517	0.225	0.876
31.5	336.2	25195	13857	SIDE	14255	0.272	0.822
102 in. Diameter Drilled Shaft							
1.5	366.2	5608	2804	TIP	--	--	0.354
12	355.7	31817	16380	SIDE + TIP	8427	0.195	1.052
15	352.7	12367	6802	SIDE	6124	0.177	0.958
21.5	346.2	18041	9922	SIDE	8728	0.204	1.001
25.5	342.2	21532	11843	SIDE	11035	0.227	0.925
31.5	336.2	26769	14723	SIDE	14891	0.271	0.865
108 in. Diameter Drilled Shaft							
1.5	366.2	6214	3107	TIP	--	--	0.366
12	355.7	35050	18024	SIDE + TIP	9011	0.198	1.100
15	352.7	13094	7202	SIDE	6447	0.180	1.008
21.5	346.2	19102	10506	SIDE	9163	0.206	1.055
25.5	342.2	22799	12539	SIDE	11554	0.229	0.974
31.5	336.2	28344	15589	SIDE	15530	0.272	0.909
120 in. Diameter Drilled Shaft							
1.5	366.2	7518	3759	TIP	--	--	0.361
12	355.7	11469	6308	SIDE	4667	0.176	1.783
15	352.7	14549	8002	SIDE	7095	0.185	1.108
21.5	346.2	21224	11673	SIDE	10036	0.212	1.161
25.5	342.2	25332	13933	SIDE	12598	0.234	1.072
31.5	336.2	31493	17321	SIDE	16817	0.273	0.998

Illinois Department of Transportation

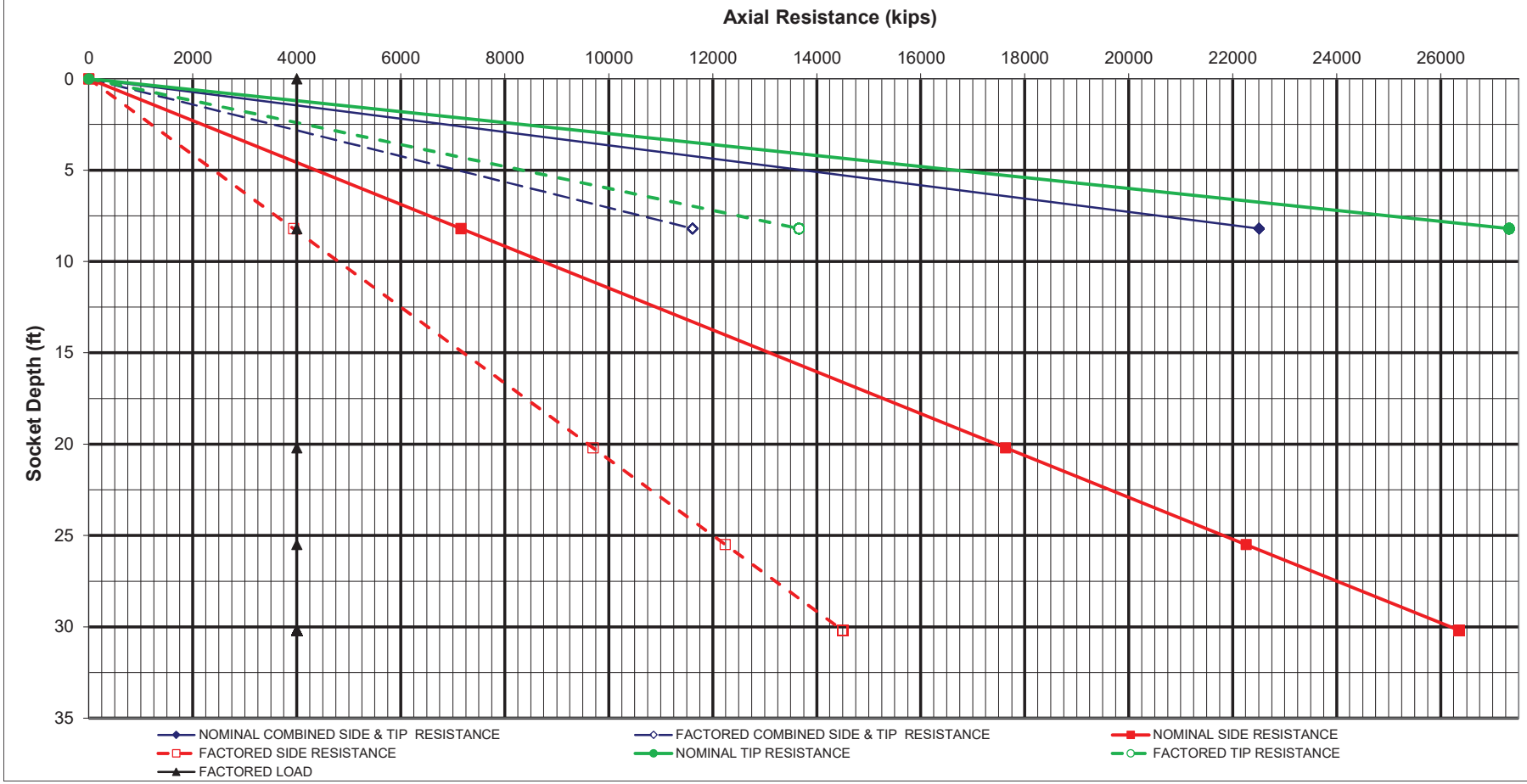
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-22
GROUND SURFACE ELEVATION ========== 388.80 FT
GROUND WATER ELEVATION ========== 388.80 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 369.00 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
8.20	360.80	8.20	1134.4	Limestone	45	Normal	35	Open	No	7158	7158	3937	3237	0.112	0.949	1328.6	27317	13658	1.191	0.68	22508	11612	6523	0.129	0.655
20.20	348.80	12.00	1380.4	Limestone	55	Normal	89	Open	Yes	10474	17632	9698	10036	0.195	0.671										
25.50	343.50	5.30	1204.4	Limestone	55	Normal	97	Open	Yes	4626	22258	12242	13400	0.235	0.667										
30.20	338.80	4.70	1204.4	Limestone	55	Normal	97	Open	Yes	4103	26361	14498	16730	0.275	0.670										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-22

Estimated Top of Rock Elevation: 369.00

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
8.2	360.8	18840	9420	TIP	--	--	1.014
20.2	348.8	14521	7986	SIDE	8657	0.192	0.564
25.5	343.5	18330	10082	SIDE	11730	0.236	0.563
30.2	338.8	21709	11940	SIDE	14836	0.284	0.572
90 in. Diameter Drilled Shaft							
8.2	360.8	21491	10746	TIP	--	--	1.073
20.2	348.8	15558	8557	SIDE	9114	0.193	0.599
25.5	343.5	19640	10802	SIDE	12281	0.235	0.598
30.2	338.8	23260	12793	SIDE	15457	0.280	0.604
96 in. Diameter Drilled Shaft							
8.2	360.8	24317	12159	TIP	--	--	1.087
20.2	348.8	16595	9127	SIDE	9574	0.194	0.635
25.5	343.5	20949	11522	SIDE	12838	0.235	0.632
30.2	338.8	24810	13646	SIDE	16089	0.277	0.636
102 in. Diameter Drilled Shaft							
8.2	360.8	27317	13658	TIP	--	--	1.191
20.2	348.8	17632	9698	SIDE	10036	0.195	0.671
25.5	343.5	22258	12242	SIDE	13400	0.235	0.667
30.2	338.8	26361	14498	SIDE	16730	0.275	0.670
108 in. Diameter Drilled Shaft							
8.2	360.8	30490	15245	TIP	--	--	1.174
20.2	348.8	18669	10268	SIDE	10500	0.197	0.707
25.5	343.5	23568	12962	SIDE	13967	0.235	0.701
30.2	338.8	27911	15351	SIDE	17379	0.274	0.703
120 in. Diameter Drilled Shaft							
8.2	360.8	37360	18680	TIP	--	--	1.312
20.2	348.8	20744	11409	SIDE	11434	0.200	0.779
25.5	343.5	26186	14402	SIDE	15111	0.237	0.771
30.2	338.8	31013	17057	SIDE	18695	0.273	0.771

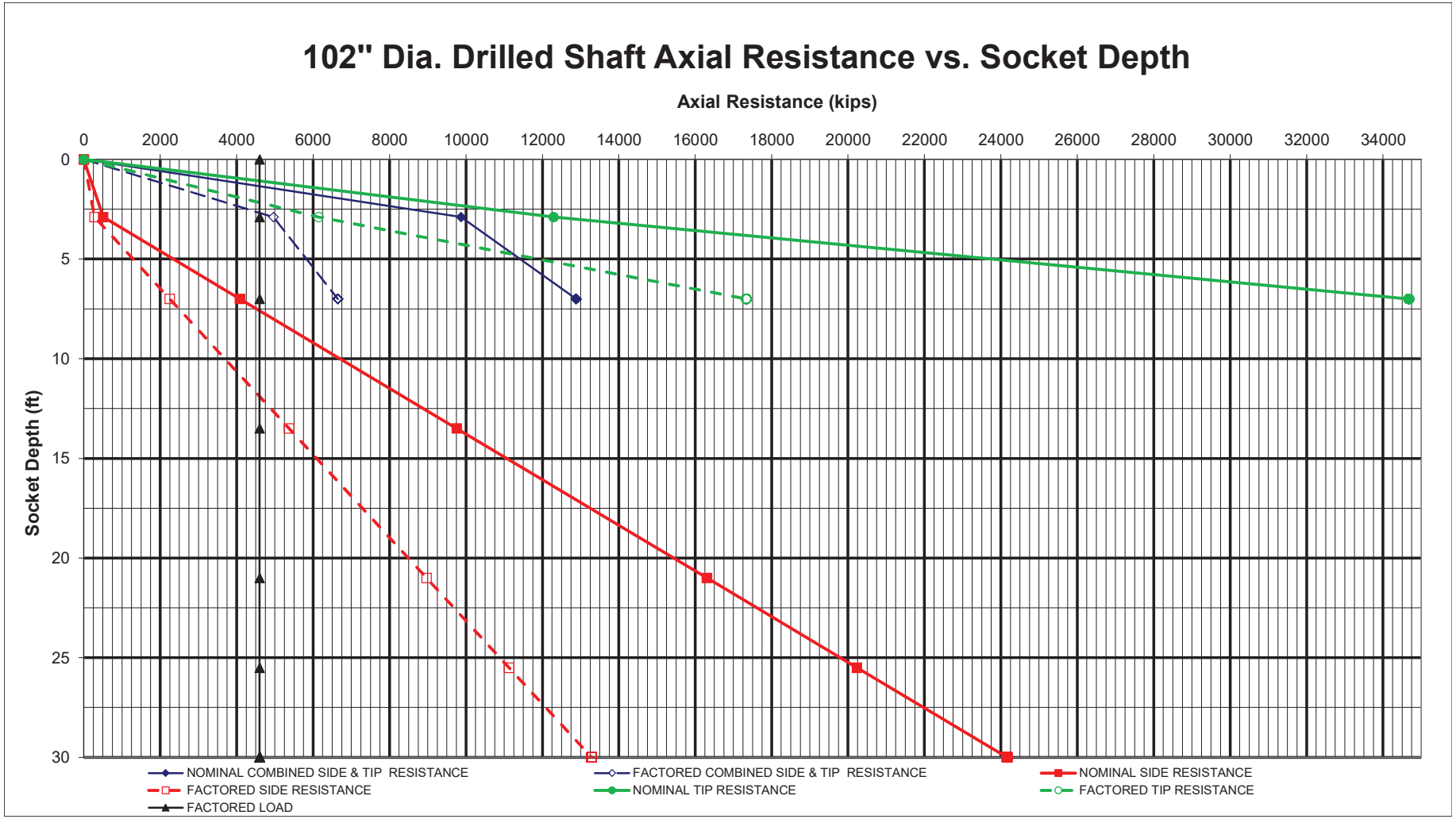
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-23, BB-23 (Offset)
GROUND SURFACE ELEVATION ========== 389.20 FT
GROUND WATER ELEVATION ========== 389.20 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 366.20 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4600 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)							Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
2.90	363.30	2.90	200.0	Limestone	30	Fractured	28	Open	No	508	508	279	341	0.016	0.579	1174.1	12290	6145	0.533	0.95	9875	4963	723	0.017	0.406
7.00	359.20	4.10	1400.0	Limestone	55	Normal	73	Open	Yes	3579	4087	2248	2194	0.069	0.570	1100.0	34676	17338	1.565	0.68	12886	6647	3953	0.076	0.403
13.50	352.70	6.50	1400.0	Limestone	50	Normal	73	Open	Yes	5674	9760	5368	5448	0.136	0.630										
21.00	345.20	7.50	800.0	Limestone	55	Normal	93	Open	Yes	6547	16307	8969	8479	0.164	0.720										
25.50	340.70	4.50	1200.0	Limestone	55	Normal	96	Open	Yes	3928	20235	11129	11124	0.197	0.705										
30.00	336.20	4.50	1400.0	Limestone	60	Normal	96	Open	Yes	3928	24163	13290	14551	0.234	0.652										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-23, BB-23 (Offset)

Estimated Top of Rock Elevation: 366.20

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
2.9	363.3	8773	4386	TIP	--	--	0.474
7	359.2	23109	11554	TIP	--	--	1.308
13.5	352.7	97586	48793	TIP	--	--	5.226
21	345.2	13429	7386	SIDE	7260	0.160	0.603
25.5	340.7	16664	9165	SIDE	9635	0.196	0.594
30	336.2	19899	10944	SIDE	12804	0.240	0.554
90 in. Diameter Drilled Shaft							
2.9	363.3	9882	4941	TIP	--	--	0.472
7	359.2	26705	13353	TIP	--	--	1.436
13.5	352.7	114864	57432	TIP	--	--	5.643
21	345.2	14388	7914	SIDE	7665	0.161	0.642
25.5	340.7	17854	9820	SIDE	10128	0.196	0.631
30	336.2	21320	11726	SIDE	13380	0.237	0.586
96 in. Diameter Drilled Shaft							
2.9	363.3	11054	5527	TIP	--	--	0.513
7	359.2	30561	15281	TIP	--	--	1.480
13.5	352.7	133518	66759	TIP	--	--	6.080
21	345.2	15348	8441	SIDE	8071	0.163	0.681
25.5	340.7	19045	10475	SIDE	10625	0.196	0.668
30	336.2	22741	12508	SIDE	13963	0.235	0.619
102 in. Diameter Drilled Shaft							
2.9	363.3	12290	6145	TIP	--	--	0.533
7	359.2	34676	17338	TIP	--	--	1.565
13.5	352.7	9760	5368	SIDE	5448	0.136	0.630
21	345.2	16307	8969	SIDE	8479	0.164	0.720
25.5	340.7	20235	11129	SIDE	11124	0.197	0.705
30	336.2	24163	13290	SIDE	14551	0.234	0.652
108 in. Diameter Drilled Shaft							
2.9	363.3	13590	6795	TIP	--	--	0.553
7	359.2	39051	19526	TIP	--	--	1.651
13.5	352.7	10334	5684	SIDE	5733	0.138	0.663
21	345.2	17266	9496	SIDE	8888	0.166	0.759
25.5	340.7	21425	11784	SIDE	11625	0.198	0.743
30	336.2	25584	14071	SIDE	15144	0.233	0.685
120 in. Diameter Drilled Shaft							
2.9	363.3	16808	8404	TIP	--	--	0.552
7	359.2	49162	24581	TIP	--	--	1.875
13.5	352.7	11483	6316	SIDE	6305	0.142	0.729
21	345.2	19185	10552	SIDE	9709	0.169	0.837
25.5	340.7	23806	13093	SIDE	12634	0.200	0.818
30	336.2	28427	15635	SIDE	16343	0.233	0.752

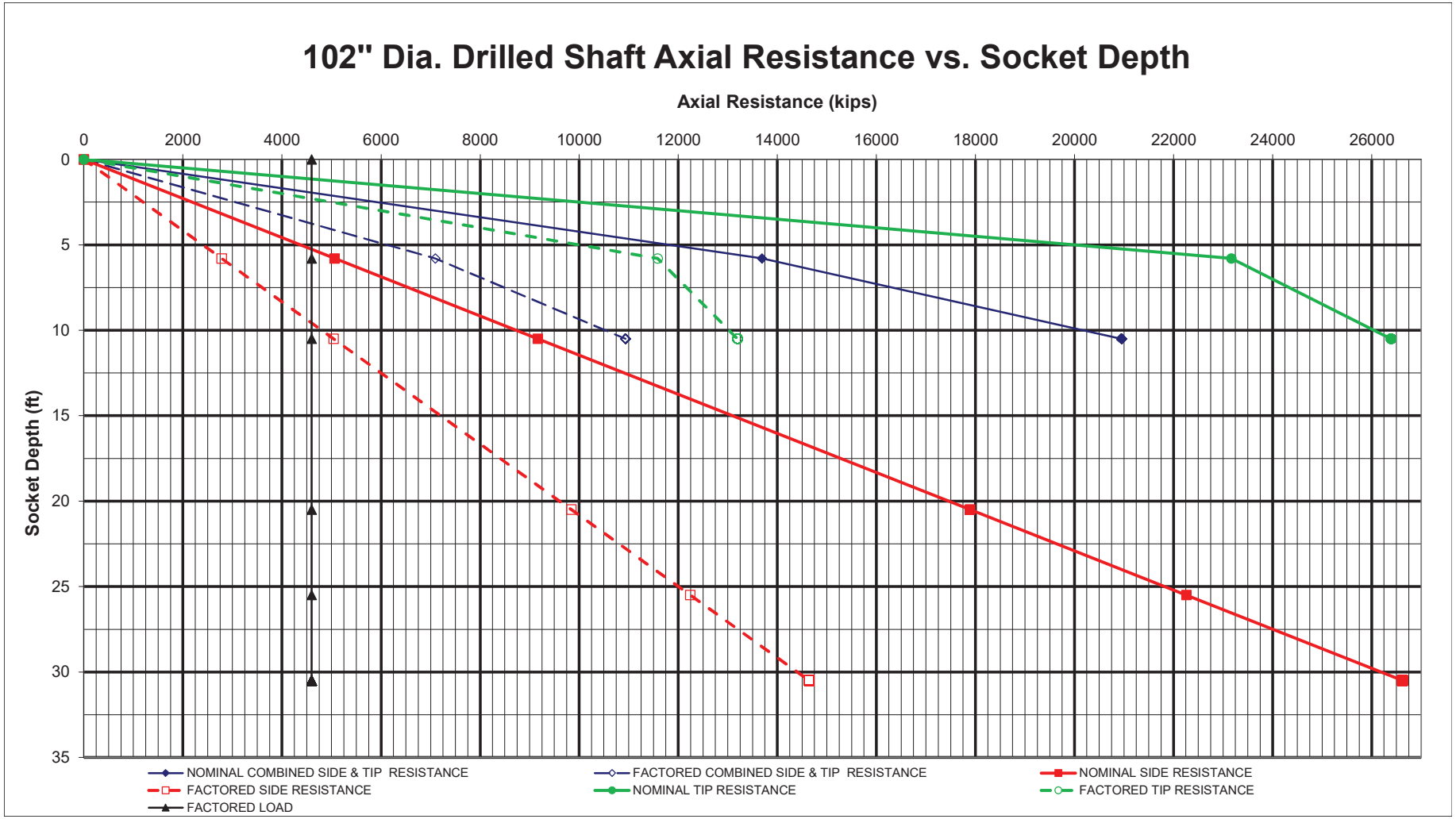
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-24
GROUND SURFACE ELEVATION ========== 388.60 FT
GROUND WATER ELEVATION ========== 388.60 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 364.70 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4600 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
5.80	358.90	5.80	1600.0	Limestone	45	Normal	48	Open	No	5063	5063	2784	2861	0.104	0.629	1115.5	23168	11584	1.225	0.63	13690	7098	5175	0.115	0.462
10.50	354.20	4.70	1116.6	Limestone	45	Normal	48	Open	No	4103	9165	5041	4840	0.156	0.813	1218.3	26391	13196	1.285	0.56	20949	10933	9000	0.184	0.594
20.50	344.20	10.00	1029.1	Limestone	50	Normal	93	Open	Yes	8729	17894	9842	9407	0.213	0.870										
25.50	339.20	5.00	1488.6	Limestone	55	Normal	90	Open	Yes	4364	22258	12242	12884	0.253	0.785										
30.50	334.20	5.00	1488.6	Limestone	55	Normal	90	Open	Yes	4364	26623	14642	16830	0.301	0.741										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
Socket Depth (ft)
0
5
10
15
20
25
30
35
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-24

Estimated Top of Rock Elevation: 364.70

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
5.8	358.9	15037	7519	TIP	--	--	1.013
10.5	354.2	17200	8600	TIP	--	--	1.103
20.5	344.2	14736	8105	SIDE	8041	0.206	0.731
25.5	339.2	18330	10082	SIDE	11182	0.251	0.663
30.5	334.2	21925	12059	SIDE	14838	0.307	0.633
90 in. Diameter Drilled Shaft							
5.8	358.9	17361	8680	TIP	--	--	1.057
10.5	354.2	20048	10024	TIP	--	--	1.117
20.5	344.2	15789	8684	SIDE	8495	0.208	0.777
25.5	339.2	19640	10802	SIDE	11745	0.251	0.703
30.5	334.2	23491	12920	SIDE	15493	0.304	0.669
96 in. Diameter Drilled Shaft							
5.8	358.9	20162	10081	TIP	--	--	1.152
10.5	354.2	23112	11556	TIP	--	--	1.257
20.5	344.2	16841	9263	SIDE	8950	0.210	0.823
25.5	339.2	20949	11522	SIDE	12312	0.252	0.744
30.5	334.2	25057	13781	SIDE	16158	0.302	0.705
102 in. Diameter Drilled Shaft							
5.8	358.9	23168	11584	TIP	--	--	1.225
10.5	354.2	26391	13196	TIP	--	--	1.285
20.5	344.2	17894	9842	SIDE	9407	0.213	0.870
25.5	339.2	22258	12242	SIDE	12884	0.253	0.785
30.5	334.2	26623	14642	SIDE	16830	0.301	0.741
108 in. Diameter Drilled Shaft							
5.8	358.9	26379	13190	TIP	--	--	1.272
10.5	354.2	29886	14943	TIP	--	--	1.358
20.5	344.2	18947	10421	SIDE	9865	0.215	0.916
25.5	339.2	23568	12962	SIDE	13458	0.254	0.826
30.5	334.2	28189	15504	SIDE	17510	0.300	0.778
120 in. Diameter Drilled Shaft							
5.8	358.9	33417	16708	TIP	--	--	1.496
10.5	354.2	37523	18761	TIP	--	--	1.616
20.5	344.2	21052	11578	SIDE	10784	0.220	1.008
25.5	339.2	26186	14402	SIDE	14615	0.258	0.907
30.5	334.2	31321	17226	SIDE	18884	0.301	0.853

Illinois Department of Transportation

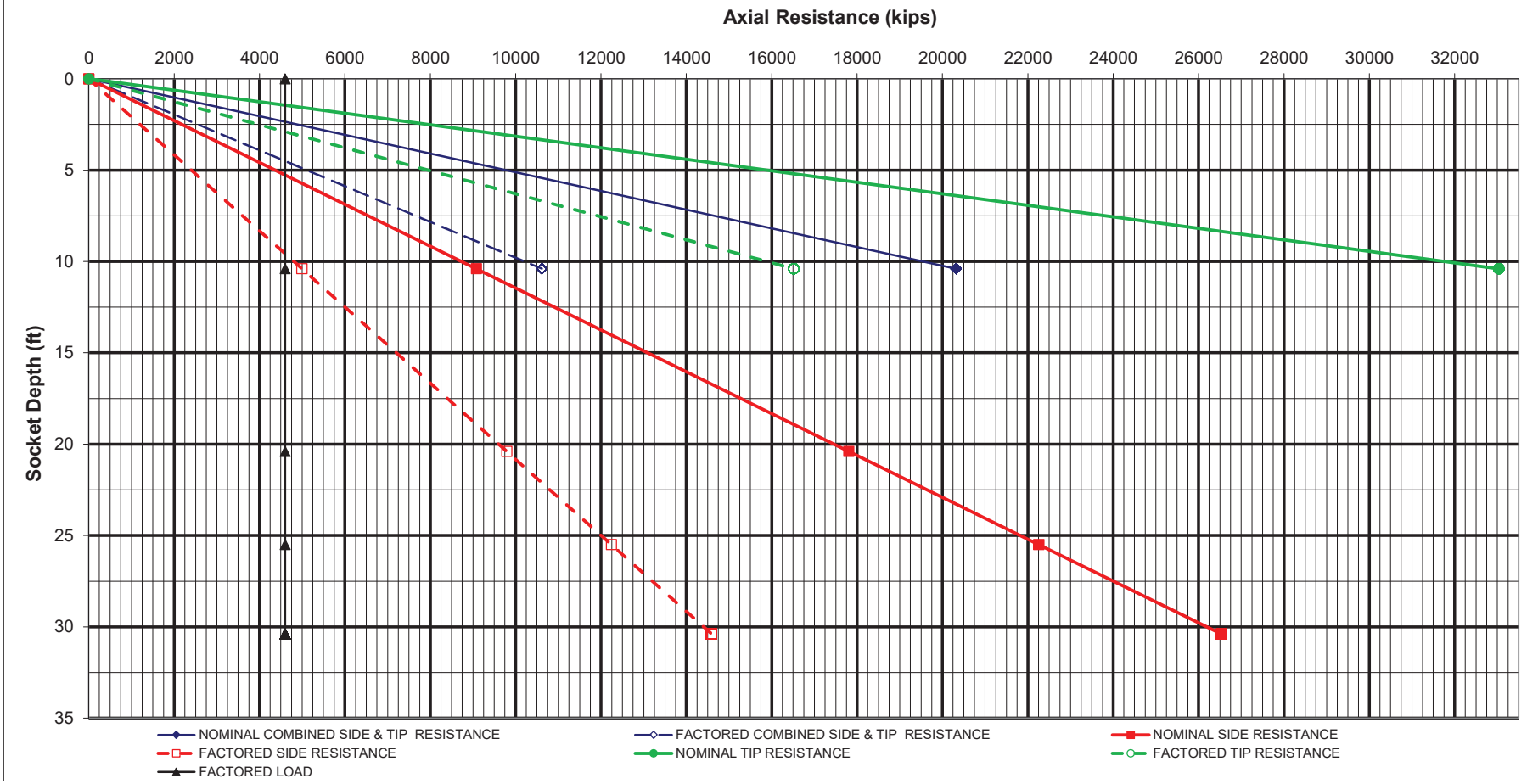
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-26
GROUND SURFACE ELEVATION ========== 388.60 FT
GROUND WATER ELEVATION ========== 388.60 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 364.70 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4600 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
10.40	354.30	10.40	1589.8	Limestone	45	Normal	40	Open	No	9078	9078	4993	5318	0.172	0.703	1598.0	33033	16517	1.372	0.55	20323	10615	10922	0.212	0.494
20.40	344.30	10.00	1879.6	Limestone	60	Normal	96	Open	Yes	8729	17807	9794	13439	0.239	0.445										
25.50	339.20	5.10	1195.8	Limestone	50	Normal	100	Open	Yes	4452	22258	12242	16872	0.288	0.509										
30.40	334.30	4.90	1195.8	Limestone	50	Normal	100	Open	Yes	4277	26535	14594	20482	0.339	0.561										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-26

Estimated Top of Rock Elevation: 364.70

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10.4	354.3	23420	11710	TIP	--	--	1.205
20.4	344.3	14664	8065	SIDE	11833	0.241	0.376
25.5	339.2	18330	10082	SIDE	15029	0.296	0.434
30.4	334.3	21853	12019	SIDE	18446	0.355	0.483
90 in. Diameter Drilled Shaft							
10.4	354.3	26445	13222	TIP	--	--	1.243
20.4	344.3	15712	8641	SIDE	12359	0.240	0.399
25.5	339.2	19640	10802	SIDE	15629	0.292	0.459
30.4	334.3	23414	12877	SIDE	19103	0.348	0.509
96 in. Diameter Drilled Shaft							
10.4	354.3	29649	14825	TIP	--	--	1.319
20.4	344.3	16759	9218	SIDE	12895	0.239	0.422
25.5	339.2	20949	11522	SIDE	16244	0.289	0.484
30.4	334.3	24974	13736	SIDE	19783	0.342	0.535
102 in. Diameter Drilled Shaft							
10.4	354.3	33033	16517	TIP	--	--	1.372
20.4	344.3	17807	9794	SIDE	13439	0.239	0.445
25.5	339.2	22258	12242	SIDE	16872	0.288	0.509
30.4	334.3	26535	14594	SIDE	20482	0.339	0.561
108 in. Diameter Drilled Shaft							
10.4	354.3	36597	18299	TIP	--	--	1.523
20.4	344.3	18854	10370	SIDE	13989	0.240	0.468
25.5	339.2	23568	12962	SIDE	17511	0.287	0.535
30.4	334.3	28096	15453	SIDE	21197	0.336	0.588
120 in. Diameter Drilled Shaft							
10.4	354.3	44264	22132	TIP	--	--	1.624
20.4	344.3	20949	11522	SIDE	15105	0.242	0.514
25.5	339.2	26186	14402	SIDE	18812	0.287	0.587
30.4	334.3	31218	17170	SIDE	22661	0.333	0.643

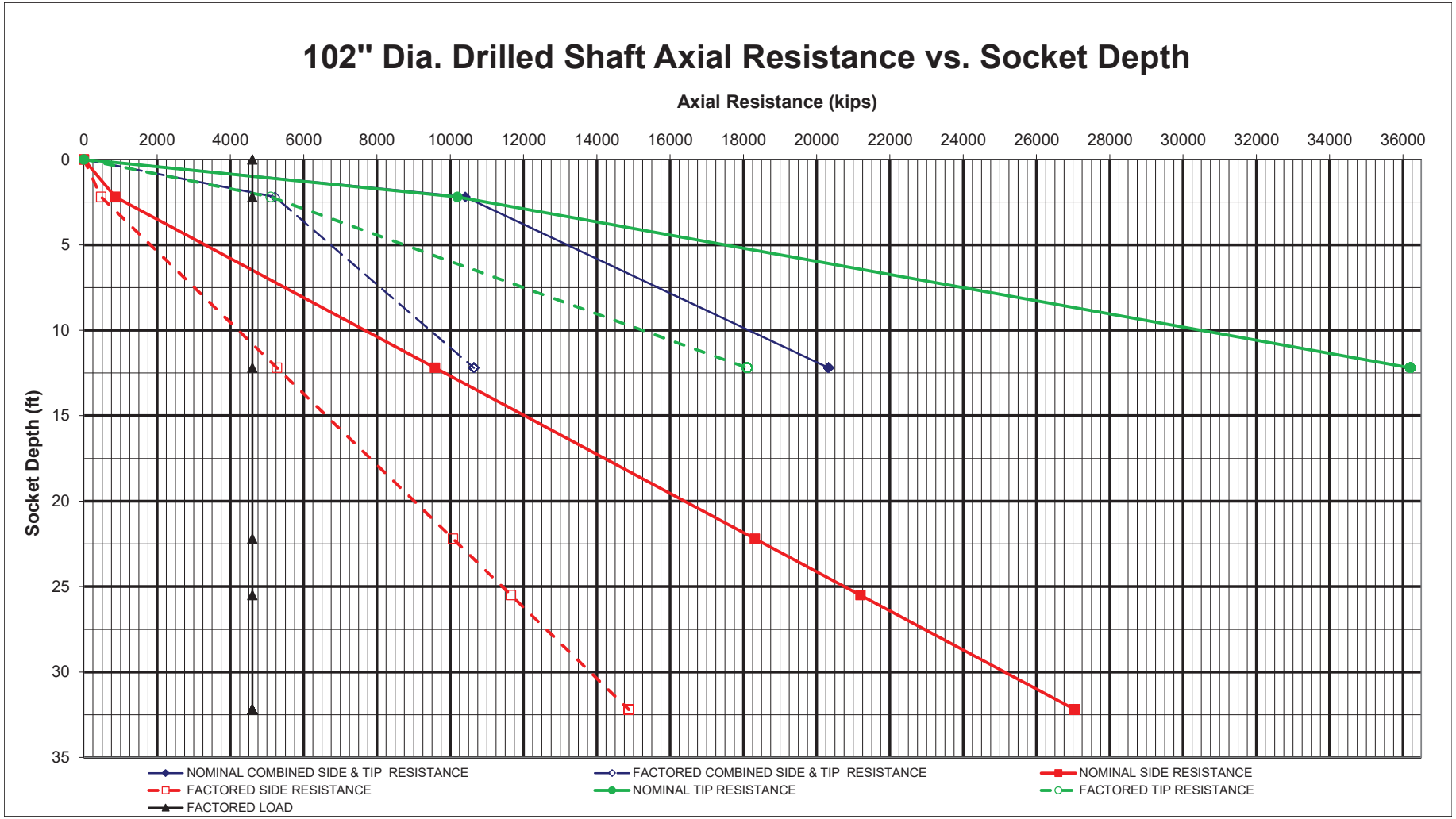
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-27
GROUND SURFACE ELEVATION ========== 388.50 FT
GROUND WATER ELEVATION ========== 388.50 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 358.50 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4600 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
2.20	356.30	2.20	100.0	Limestone	20	Normal	0	Open	No	855	855	470	163	0.003	7.643	1703.4	10192	5096	0.427	0.98	10412	5217	242	0.003	0.427
12.20	346.30	10.00	1878.5	Limestone	50	Normal	56	Open	No	8729	9584	5271	6004	0.170	0.589	1363.7	36204	18102	1.248	0.53	20328	10643	13412	0.226	0.394
22.20	336.30	10.00	1453.3	Limestone	60	Normal	96	Open	Yes	8729	18313	10072	12933	0.223	0.479										
25.50	333.00	3.30	1500.0	Limestone	65	Normal	100	Open	Yes	2880	21193	11656	16044	0.248	0.444										
32.20	326.30	6.70	1000.0	Limestone	60	Normal	100	Open	Yes	5848	27042	14873	21289	0.302	0.477										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
36000
Socket Depth (ft)
0
5
10
15
20
25
30
35
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-27

Estimated Top of Rock Elevation: 358.50

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
2.2	356.3	7252	3635	SIDE + TIP	326	0.010	0.380
12.2	346.3	138702	69351	TIP	--	--	5.934
22.2	336.3	15081	8295	SIDE	11354	0.225	0.404
25.5	333	17453	9599	SIDE	14345	0.257	0.378
32.2	326.3	22270	12248	SIDE	19463	0.325	0.413
90 in. Diameter Drilled Shaft							
2.2	356.3	8242	4131	SIDE + TIP	309	0.008	0.396
12.2	346.3	155973	77986	TIP	--	--	6.233
22.2	336.3	16158	8887	SIDE	11873	0.224	0.429
25.5	333	18700	10285	SIDE	14897	0.253	0.400
32.2	326.3	23860	13123	SIDE	20043	0.316	0.434
96 in. Diameter Drilled Shaft							
2.2	356.3	9296	4658	SIDE + TIP	282	0.006	0.411
12.2	346.3	174225	87112	TIP	--	--	6.475
22.2	336.3	17236	9480	SIDE	12400	0.223	0.454
25.5	333	19947	10971	SIDE	15464	0.250	0.422
32.2	326.3	25451	13998	SIDE	20654	0.308	0.455
102 in. Diameter Drilled Shaft							
2.2	356.3	10412	5217	SIDE + TIP	242	0.003	0.427
12.2	346.3	36204	18102	TIP	--	--	1.248
22.2	336.3	18313	10072	SIDE	12933	0.223	0.479
25.5	333	21193	11656	SIDE	16044	0.248	0.444
32.2	326.3	27042	14873	SIDE	21289	0.302	0.477
108 in. Diameter Drilled Shaft							
2.2	356.3	11592	5808	SIDE + TIP	190	0.001	0.442
12.2	346.3	40080	20040	TIP	--	--	1.297
22.2	336.3	19390	10665	SIDE	13471	0.224	0.504
25.5	333	22440	12342	SIDE	16635	0.247	0.467
32.2	326.3	28632	15748	SIDE	21945	0.297	0.500
120 in. Diameter Drilled Shaft							
2.2	356.3	13882	6941	TIP	--	--	0.530
12.2	346.3	48413	24207	TIP	--	--	1.366
22.2	336.3	21545	11850	SIDE	14560	0.225	0.554
25.5	333	24933	13713	SIDE	17841	0.246	0.513
32.2	326.3	31814	17498	SIDE	23304	0.291	0.546

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-28
GROUND SURFACE ELEVATION ========== 390.30 FT
GROUND WATER ELEVATION ========== 390.30 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 347.30 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4800 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)							Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
10.60	336.70	10.60	2194.2	Limestone	60	Normal	88	Open	Yes	9252	9252	5089	7713	0.130	0.216	1797.7	70080	35040	2.501	0.28	12935	6930	14779	0.182	0.148
20.60	326.70	10.00	1638.6	Limestone	60	Normal	94	Open	Yes	8729	17981	9890	16688	0.232	0.274										
25.50	321.80	4.90	2025.0	Limestone	60	Normal	97	Open	Yes	4277	22258	12242	23479	0.311	0.279										
30.60	316.70	5.10	2025.0	Limestone	60	Normal	97	Open	Yes	4452	26710	14690	32383	0.414	0.289										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-28

Estimated Top of Rock Elevation: 347.30

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10.6	336.7	168274	84137	TIP	--	--	7.353
20.6	326.7	14808	8144	SIDE	15255	0.246	0.232
25.5	321.8	18330	10082	SIDE	22229	0.344	0.241
30.6	316.7	21996	12098	SIDE	31979	0.484	0.256
90 in. Diameter Drilled Shaft							
10.6	336.7	53719	26859	TIP	--	--	2.147
20.6	326.7	15866	8726	SIDE	15703	0.240	0.245
25.5	321.8	19640	10802	SIDE	22570	0.330	0.253
30.6	316.7	23568	12962	SIDE	31931	0.454	0.266
96 in. Diameter Drilled Shaft							
10.6	336.7	61629	30814	TIP	--	--	2.288
20.6	326.7	16924	9308	SIDE	16183	0.236	0.259
25.5	321.8	20949	11522	SIDE	22993	0.319	0.266
30.6	316.7	25139	13826	SIDE	32084	0.432	0.277
102 in. Diameter Drilled Shaft							
10.6	336.7	70080	35040	TIP	--	--	2.501
20.6	326.7	17981	9890	SIDE	16688	0.232	0.274
25.5	321.8	22258	12242	SIDE	23479	0.311	0.279
30.6	316.7	26710	14690	SIDE	32383	0.414	0.289
108 in. Diameter Drilled Shaft							
10.6	336.7	79072	39536	TIP	--	--	2.570
20.6	326.7	19039	10471	SIDE	17212	0.230	0.288
25.5	321.8	23568	12962	SIDE	24013	0.304	0.292
30.6	316.7	28281	15555	SIDE	32793	0.400	0.301
120 in. Diameter Drilled Shaft							
10.6	336.7	98680	49340	TIP	--	--	2.935
20.6	326.7	21154	11635	SIDE	18305	0.227	0.317
25.5	321.8	26186	14402	SIDE	25188	0.294	0.320
30.6	316.7	31423	17283	SIDE	33850	0.379	0.327

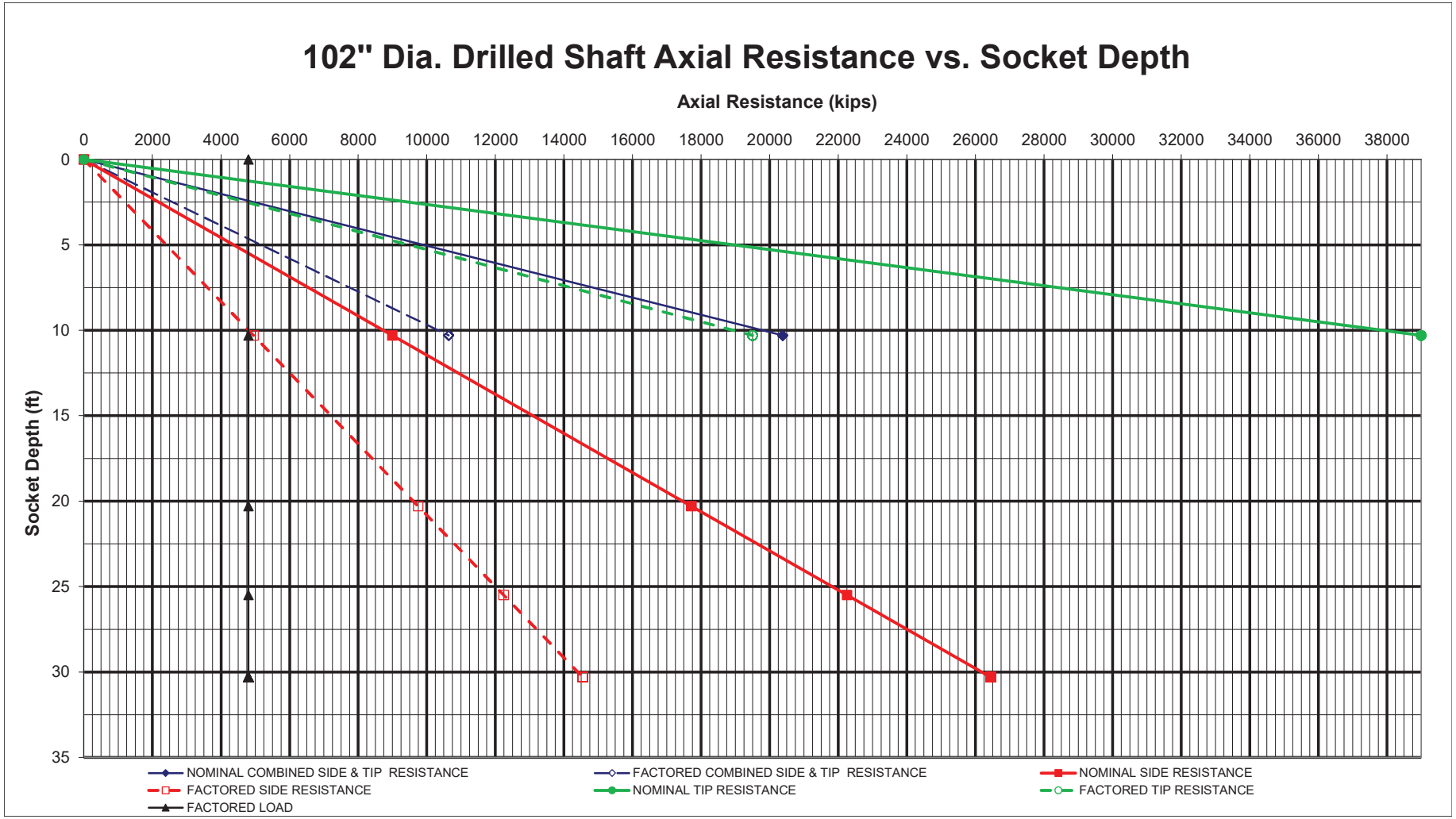
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-30
GROUND SURFACE ELEVATION ========== 389.90 FT
GROUND WATER ELEVATION ========== 389.90 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 342.70 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4800 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)							Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
10.30	332.40	10.30	1384.8	Limestone	50	Normal	89	Open	Yes	8991	8991	4945	4860	0.127	0.628	1457.8	38998	19499	1.408	0.56	20380	10640	10043	0.161	0.416
20.30	322.40	10.00	1734.2	Limestone	60	Normal	92	Open	Yes	8729	17719	9746	12462	0.207	0.447										
25.50	317.20	5.20	1050.0	Limestone	60	Normal	97	Open	Yes	4539	22258	12242	16120	0.242	0.466										
30.30	312.40	4.80	1100.0	Limestone	60	Normal	97	Open	Yes	4190	26448	14546	20072	0.283	0.481										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
36000
38000
Socket Depth (ft)
0
5
10
15
20
25
30
35
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-30

Estimated Top of Rock Elevation: 342.70

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10.3	332.4	27682	13841	TIP	--	--	1.204
20.3	322.4	14592	8026	SIDE	10971	0.209	0.377
25.5	317.2	18330	10082	SIDE	14457	0.252	0.396
30.3	312.4	21781	11979	SIDE	18316	0.304	0.414
90 in. Diameter Drilled Shaft							
10.3	332.4	31208	15604	TIP	--	--	1.255
20.3	322.4	15635	8599	SIDE	11460	0.208	0.400
25.5	317.2	19640	10802	SIDE	14995	0.247	0.419
30.3	312.4	23337	12835	SIDE	18874	0.295	0.436
96 in. Diameter Drilled Shaft							
10.3	332.4	34990	17495	TIP	--	--	1.284
20.3	322.4	16677	9172	SIDE	11957	0.207	0.424
25.5	317.2	20949	11522	SIDE	15550	0.244	0.442
30.3	312.4	24892	13691	SIDE	19462	0.288	0.458
102 in. Diameter Drilled Shaft							
10.3	332.4	38998	19499	TIP	--	--	1.408
20.3	322.4	17719	9746	SIDE	12462	0.207	0.447
25.5	317.2	22258	12242	SIDE	16120	0.242	0.466
30.3	312.4	26448	14546	SIDE	20072	0.283	0.481
108 in. Diameter Drilled Shaft							
10.3	332.4	43219	21610	TIP	--	--	1.388
20.3	322.4	18762	10319	SIDE	12972	0.207	0.471
25.5	317.2	23568	12962	SIDE	16700	0.240	0.490
30.3	312.4	28004	15402	SIDE	20703	0.279	0.504
120 in. Diameter Drilled Shaft							
10.3	332.4	52303	26152	TIP	--	--	1.521
20.3	322.4	20846	11465	SIDE	14006	0.208	0.518
25.5	317.2	26186	14402	SIDE	17888	0.238	0.538
30.3	312.4	31115	17113	SIDE	22008	0.274	0.552

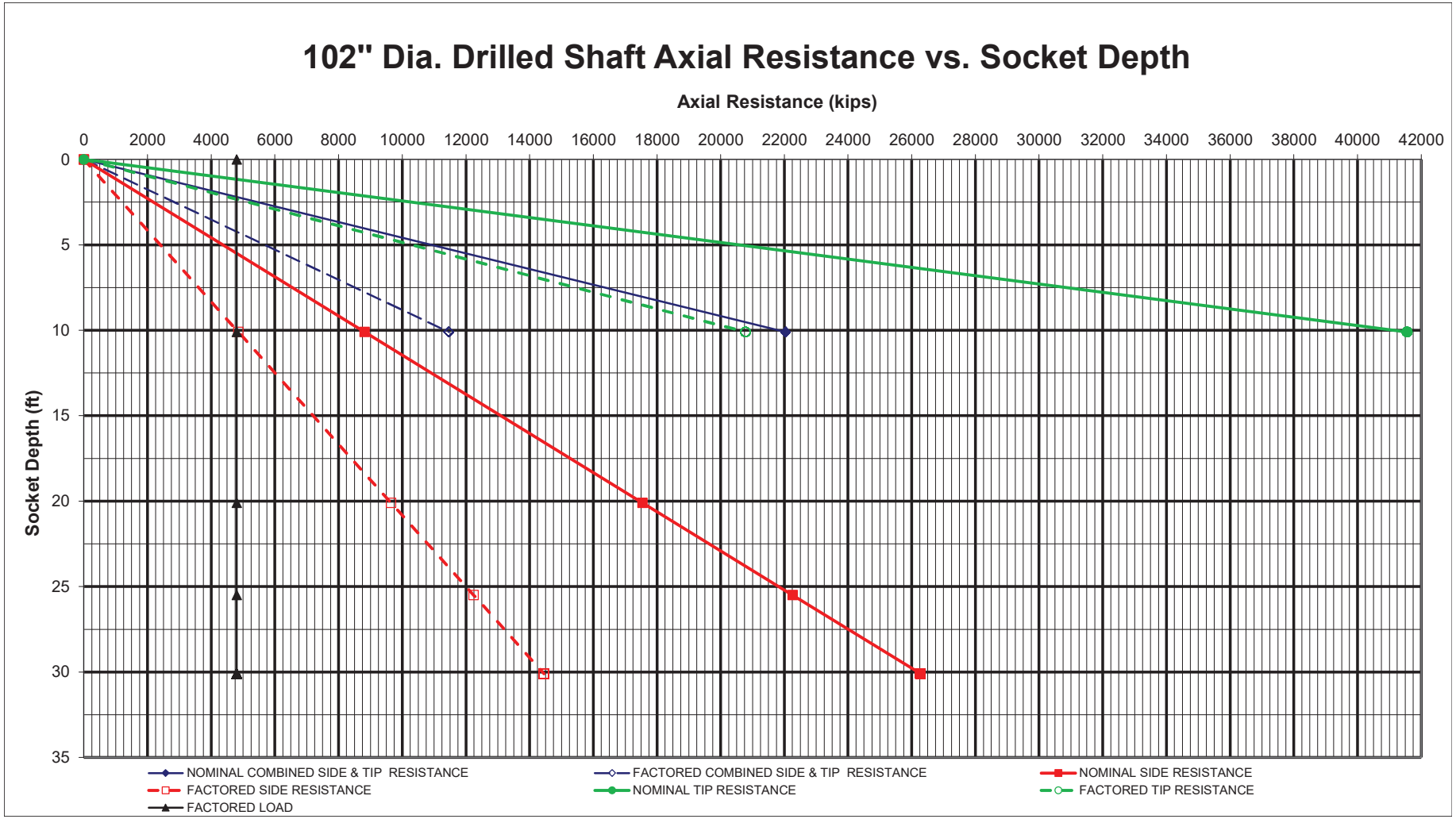
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-31
GROUND SURFACE ELEVATION ========== 390.00 FT
GROUND WATER ELEVATION ========== 390.00 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 346.50 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4800 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)								Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
10.10	336.40	10.10	964.7	Limestone	50	Normal	83	Open	Yes	8816	8816	4849	3657	0.096	0.885	1586.3	41556	20778	1.943	0.60	22039	11460	6191	0.110	0.637
20.10	326.40	10.00	2000.0	Limestone	55	Normal	92	Open	Yes	8729	17545	9650	11190	0.208	0.561										
25.50	321.00	5.40	995.2	Limestone	50	Normal	98	Open	Yes	4714	22258	12242	14151	0.249	0.634										
30.10	316.40	4.60	995.2	Limestone	50	Normal	98	Open	Yes	4015	26274	14450	16876	0.287	0.685										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
36000
38000
40000
42000
Socket Depth (ft)
0
5
10
15
20
25
30
35
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-31

Estimated Top of Rock Elevation: 346.50

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10.1	336.4	30098	15049	TIP	--	--	1.698
20.1	326.4	14449	7947	SIDE	9726	0.207	0.472
25.5	321	18330	10082	SIDE	12425	0.252	0.537
30.1	316.4	21637	11900	SIDE	14940	0.295	0.585
90 in. Diameter Drilled Shaft							
10.1	336.4	33722	16861	TIP	--	--	1.822
20.1	326.4	15481	8514	SIDE	10210	0.207	0.501
25.5	321	19640	10802	SIDE	12993	0.250	0.569
30.1	316.4	23183	12750	SIDE	15575	0.291	0.617
96 in. Diameter Drilled Shaft							
10.1	336.4	37541	18770	TIP	--	--	1.907
20.1	326.4	16513	9082	SIDE	10698	0.207	0.531
25.5	321	20949	11522	SIDE	13569	0.249	0.601
30.1	316.4	24728	13600	SIDE	16221	0.288	0.651
102 in. Diameter Drilled Shaft							
10.1	336.4	41556	20778	TIP	--	--	1.943
20.1	326.4	17545	9650	SIDE	11190	0.208	0.561
25.5	321	22258	12242	SIDE	14151	0.249	0.634
30.1	316.4	26274	14450	SIDE	16876	0.287	0.685
108 in. Diameter Drilled Shaft							
10.1	336.4	45766	22883	TIP	--	--	2.076
20.1	326.4	18577	10217	SIDE	11686	0.210	0.590
25.5	321	23568	12962	SIDE	14739	0.249	0.666
30.1	316.4	27819	15300	SIDE	17538	0.286	0.719
120 in. Diameter Drilled Shaft							
10.1	336.4	54772	27386	TIP	--	--	2.159
20.1	326.4	20641	11353	SIDE	12685	0.212	0.649
25.5	321	26186	14402	SIDE	15928	0.251	0.732
30.1	316.4	30910	17001	SIDE	18881	0.286	0.788

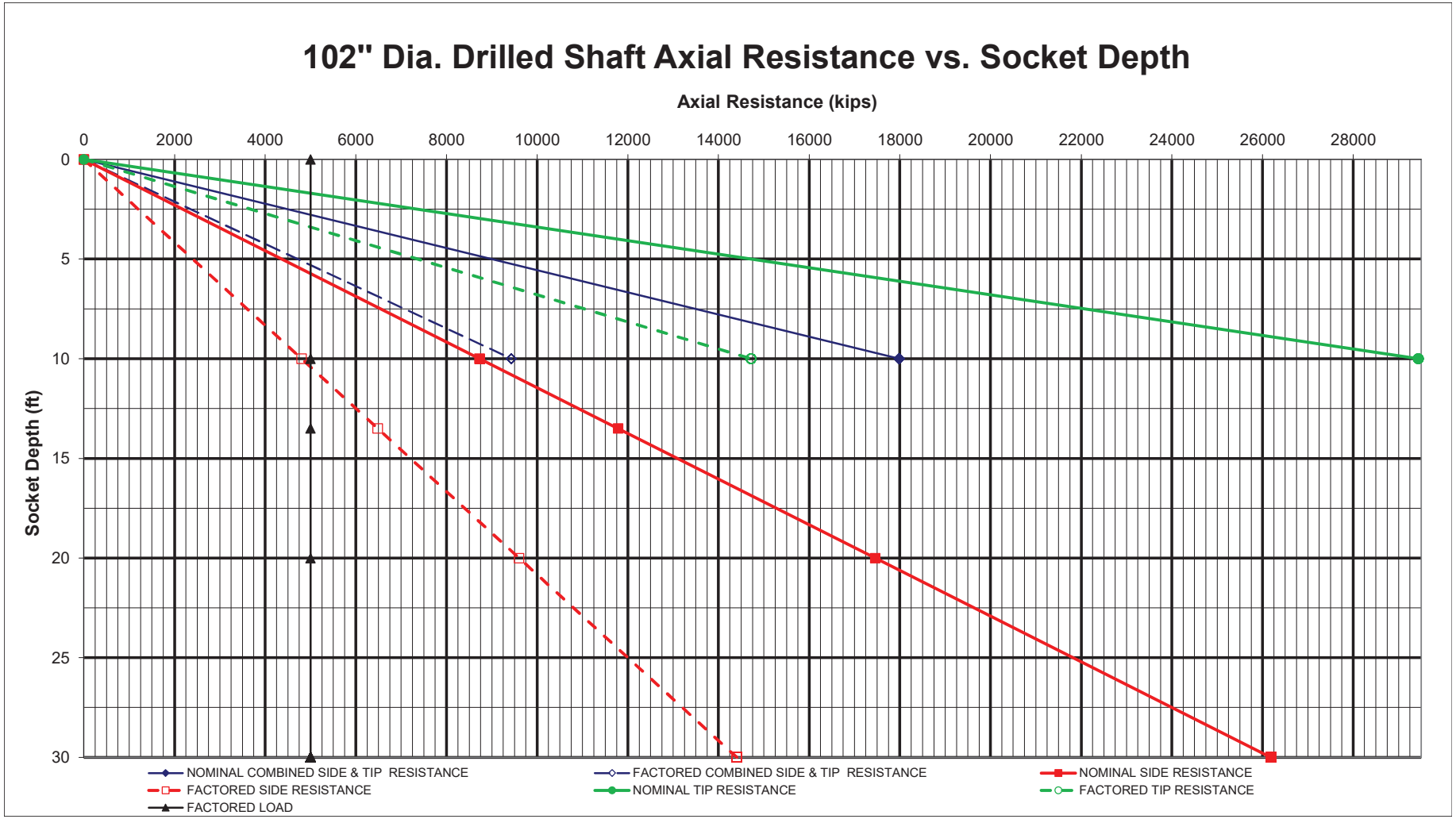
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-32
GROUND SURFACE ELEVATION ========== 416.00 FT
GROUND WATER ELEVATION ========== 412.00 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 341.00 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 5000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)							Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
10.00	331.00	10.00	1300.0	Limestone	45	Normal	40	Open	Yes	8729	8729	4801	4406	0.145	0.854	1191.2	29435	14718	2.082	0.51	17987	9430	6840	0.160	0.680
13.50	327.50	3.50	1400.0	Limestone	45	Normal	30	Open	Yes	3055	11784	6481	6200	0.183	0.869										
20.00	321.00	6.50	1500.0	Limestone	45	Normal	30	Open	Yes	5674	17457	9602	9988	0.253	0.875										
30.00	311.00	10.00	800.0	Limestone	40	Normal	18	Open	Yes	8729	26186	14402	14032	0.325	1.143										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-32

Estimated Top of Rock Elevation: 341.00

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10	331	21036	10518	TIP	--	--	1.840
13.5	327.5	108238	54119	TIP	--	--	10.003
20	321	14377	7907	SIDE	8523	0.244	0.738
30	311	21565	11861	SIDE	12079	0.319	0.970
90 in. Diameter Drilled Shaft							
10	331	23685	11842	TIP	--	--	1.903
13.5	327.5	121859	60930	TIP	--	--	10.534
20	321	15404	8472	SIDE	9010	0.247	0.784
30	311	23106	12708	SIDE	12727	0.320	1.027
96 in. Diameter Drilled Shaft							
10	331	26484	13242	TIP	--	--	2.005
13.5	327.5	136267	68133	TIP	--	--	11.091
20	321	16431	9037	SIDE	9498	0.250	0.830
30	311	24646	13555	SIDE	13378	0.322	1.085
102 in. Diameter Drilled Shaft							
10	331	29435	14718	TIP	--	--	2.082
13.5	327.5	11784	6481	SIDE	6200	0.183	0.869
20	321	17457	9602	SIDE	9988	0.253	0.875
30	311	26186	14402	SIDE	14032	0.325	1.143
108 in. Diameter Drilled Shaft							
10	331	32537	16269	TIP	--	--	2.207
13.5	327.5	12477	6862	SIDE	6526	0.186	0.914
20	321	18484	10166	SIDE	10478	0.257	0.921
30	311	27727	15250	SIDE	14688	0.328	1.201
120 in. Diameter Drilled Shaft							
10	331	39196	19598	TIP	--	--	2.465
13.5	327.5	13863	7625	SIDE	7179	0.191	1.003
20	321	20538	11296	SIDE	11463	0.264	1.011
30	311	30807	16944	SIDE	16004	0.334	1.318

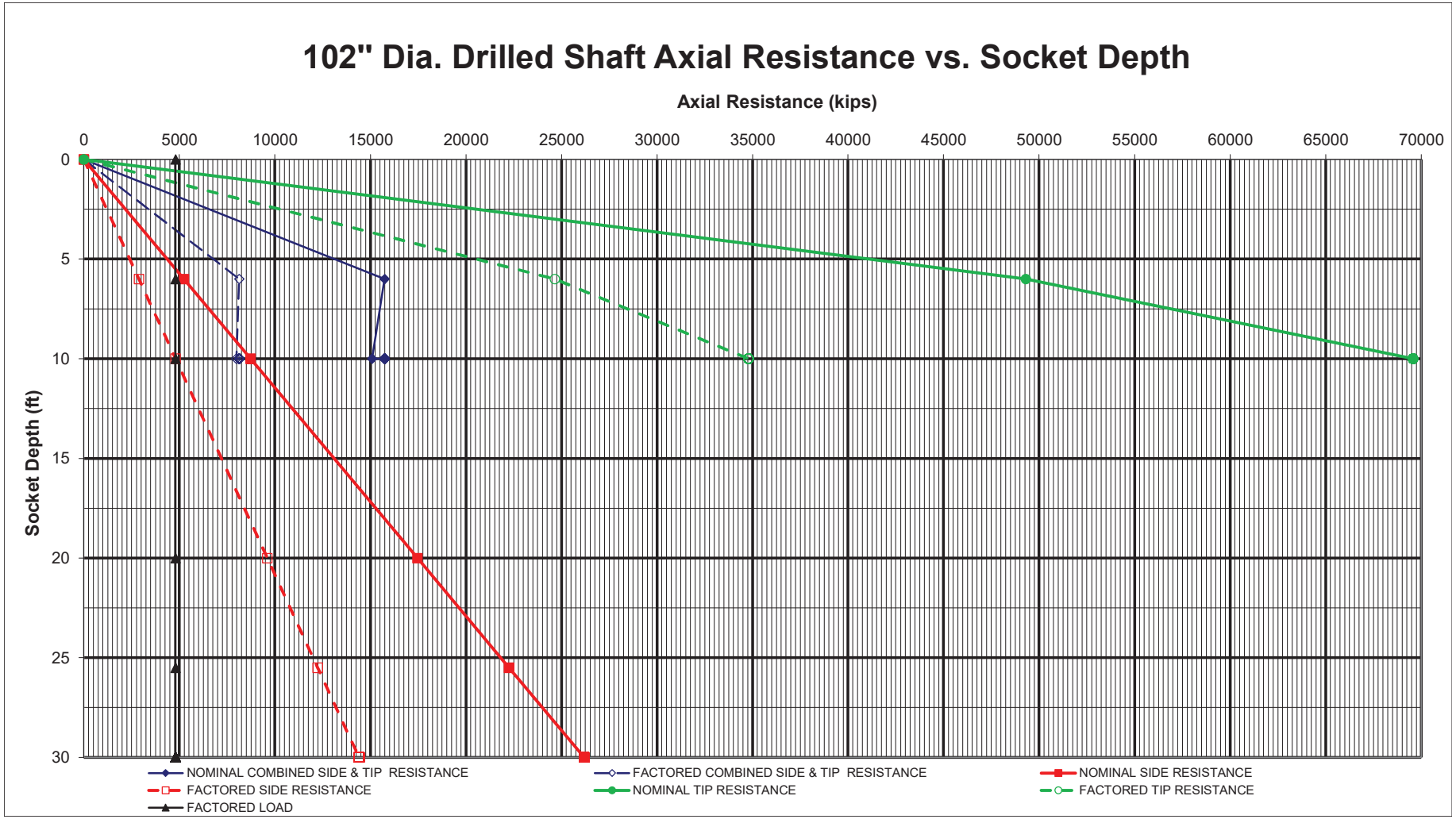
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-33
GROUND SURFACE ELEVATION ========== 392.10 FT
GROUND WATER ELEVATION ========== 392.10 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 343.10 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4800 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
6.00	337.10	6.00	1305.5	Limestone	50	Normal	80	Open	Yes	5237	5237	2880	2601	0.076	0.621	1973.6	49304	24652	1.926	0.67	15744	8134	4942	0.085	0.417
10.00	333.10	4.00	2262.7	Limestone	60	Normal	80	Open	Yes	3491	8729	4801	5538	0.120	0.407	1776.5	69574	34787	2.942	0.42	15085	7979	9637	0.147	0.289
20.00	323.10	10.00	2054.1	Limestone	55	Normal	88	Open	Yes	8729	17457	9602	14177	0.243	0.386										
25.50	317.60	5.50	1320.0	Limestone	55	Normal	97	Open	Yes	4801	22258	12242	18632	0.297	0.427										
30.00	313.10	4.50	1600.0	Limestone	55	Normal	97	Open	Yes	3928	26186	14402	23374	0.357	0.445										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
50000
55000
60000
65000
70000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-33

Estimated Top of Rock Elevation: 343.10

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
6	337.1	35527	17763	TIP	--	--	1.692
10	333.1	48828	24414	TIP	--	--	2.622
20	323.1	14377	7907	SIDE	12569	0.247	0.327
25.5	317.6	18330	10082	SIDE	16833	0.310	0.365
30	313.1	21565	11861	SIDE	21510	0.384	0.386
90 in. Diameter Drilled Shaft							
6	337.1	39878	19939	TIP	--	--	1.769
10	333.1	55081	27540	TIP	--	--	2.697
20	323.1	15404	8472	SIDE	13092	0.245	0.346
25.5	317.6	19640	10802	SIDE	17409	0.304	0.385
30	313.1	23106	12708	SIDE	22089	0.372	0.405
96 in. Diameter Drilled Shaft							
6	337.1	44470	22235	TIP	--	--	1.847
10	333.1	61979	30989	TIP	--	--	2.825
20	323.1	16431	9037	SIDE	13629	0.244	0.366
25.5	317.6	20949	11522	SIDE	18010	0.300	0.406
30	313.1	24646	13555	SIDE	22714	0.364	0.424
102 in. Diameter Drilled Shaft							
6	337.1	49304	24652	TIP	--	--	1.926
10	333.1	69574	34787	TIP	--	--	2.942
20	323.1	17457	9602	SIDE	14177	0.243	0.386
25.5	317.6	22258	12242	SIDE	18632	0.297	0.427
30	313.1	26186	14402	SIDE	23374	0.357	0.445
108 in. Diameter Drilled Shaft							
6	337.1	54379	27189	TIP	--	--	2.004
10	333.1	77608	38804	TIP	--	--	3.107
20	323.1	18484	10166	SIDE	14732	0.243	0.406
25.5	317.6	23568	12962	SIDE	19271	0.294	0.448
30	313.1	27727	15250	SIDE	24062	0.352	0.465
120 in. Diameter Drilled Shaft							
6	337.1	65465	32733	TIP	--	--	2.167
10	333.1	94988	47494	TIP	--	--	3.447
20	323.1	20538	11296	SIDE	15862	0.244	0.446
25.5	317.6	26186	14402	SIDE	20585	0.292	0.491
30	313.1	30807	16944	SIDE	25505	0.345	0.508

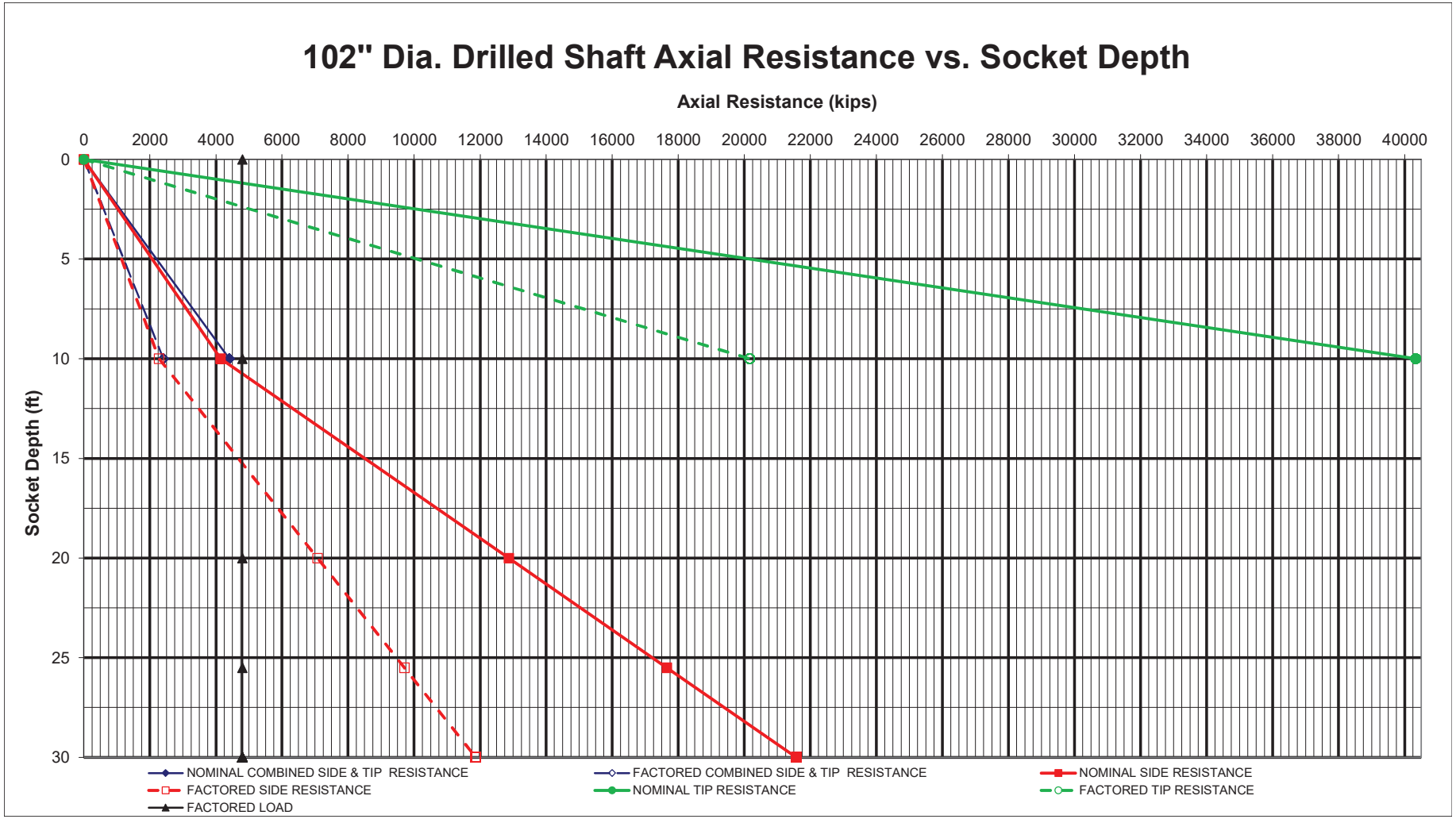
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-34
GROUND SURFACE ELEVATION ========== 391.30 FT
GROUND WATER ELEVATION ========== 391.30 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 340.70 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4800 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
10.00	330.70	10.00	1600.0	Limestone	55	Fractured	88	Open	No	4142	4142	2278	5381	0.114	0.002	1202.9	40331	20166	1.480	0.06	4403	2409	9956	0.144	0.013
20.00	320.70	10.00	1500.0	Limestone	60	Normal	97	Open	Yes	8729	12871	7079	12566	0.193	0.206										
25.50	315.20	5.50	500.0	Limestone	55	Normal	98	Open	Yes	4782	17652	9709	14659	0.215	0.328										
30.00	310.70	4.50	1800.0	Limestone	60	Normal	98	Open	Yes	3928	21580	11869	19624	0.273	0.333										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
36000
38000
40000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-34

Estimated Top of Rock Elevation: 340.70

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10	330.7	27573	13786	TIP	--	--	1.309
20	320.7	10599	5830	SIDE	11133	0.197	0.174
25.5	315.2	14537	7995	SIDE	13070	0.223	0.279
30	310.7	17772	9775	SIDE	17901	0.293	0.289
90 in. Diameter Drilled Shaft							
10	330.7	30591	15296	TIP	--	--	1.316
20	320.7	11356	6246	SIDE	11600	0.195	0.185
25.5	315.2	15576	8567	SIDE	13588	0.219	0.295
30	310.7	19041	10473	SIDE	18449	0.285	0.303
96 in. Diameter Drilled Shaft							
10	330.7	34779	17390	TIP	--	--	1.394
20	320.7	12113	6662	SIDE	12079	0.194	0.195
25.5	315.2	16614	9138	SIDE	14118	0.217	0.311
30	310.7	20311	11171	SIDE	19025	0.278	0.318
102 in. Diameter Drilled Shaft							
10	330.7	40331	20166	TIP	--	--	1.480
20	320.7	12871	7079	SIDE	12566	0.193	0.206
25.5	315.2	17652	9709	SIDE	14659	0.215	0.328
30	310.7	21580	11869	SIDE	19624	0.273	0.333
108 in. Diameter Drilled Shaft							
10	330.7	46279	23140	TIP	--	--	1.614
20	320.7	13628	7495	SIDE	13060	0.193	0.216
25.5	315.2	18691	10280	SIDE	15208	0.214	0.345
30	310.7	22850	12567	SIDE	20242	0.269	0.349
120 in. Diameter Drilled Shaft							
10	330.7	59363	29682	TIP	--	--	1.887
20	320.7	15142	8328	SIDE	14063	0.193	0.237
25.5	315.2	20767	11422	SIDE	16327	0.213	0.379
30	310.7	25388	13964	SIDE	21520	0.264	0.381

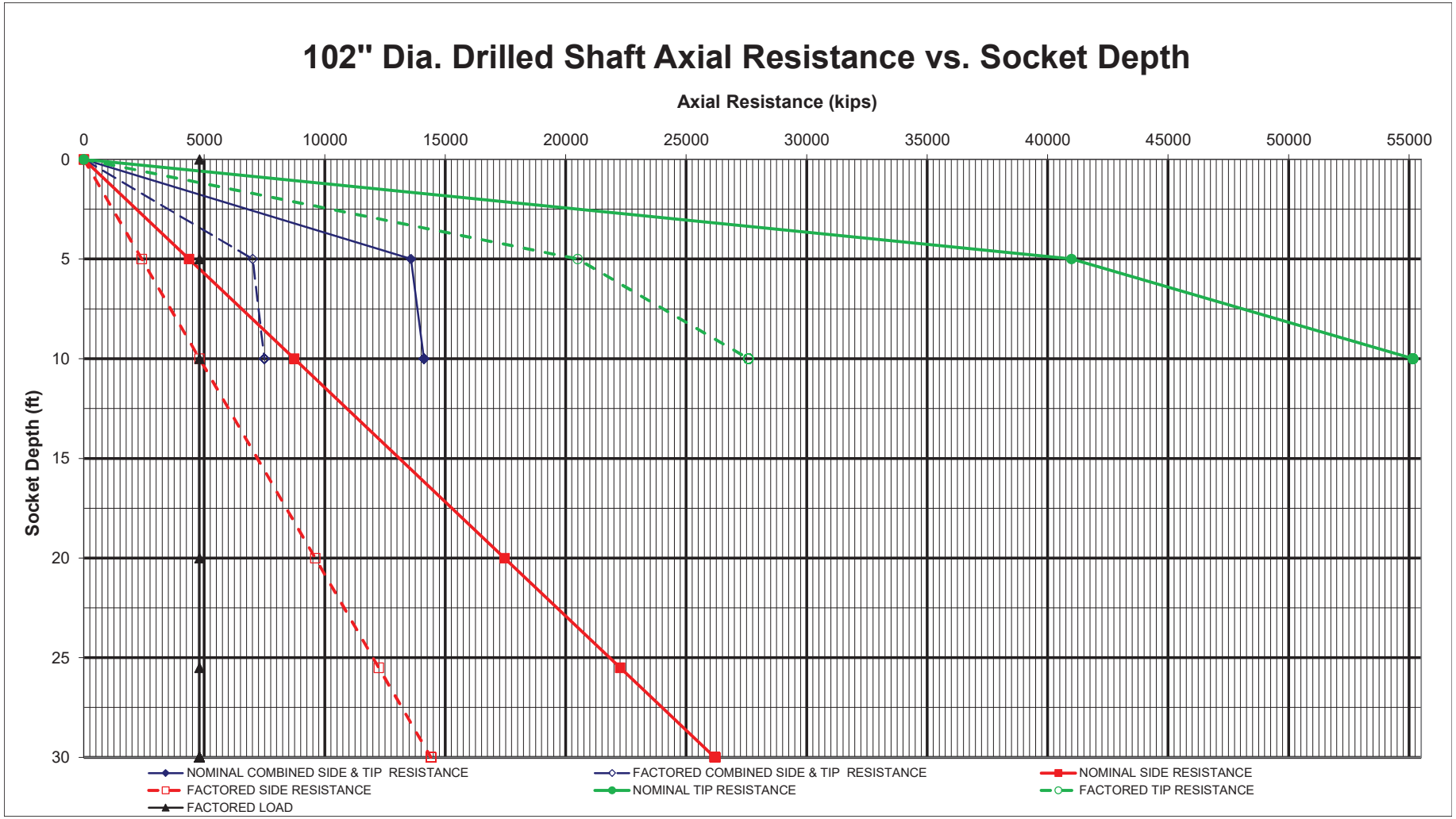
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-36, BB-36a
GROUND SURFACE ELEVATION ========== 404.20 FT
GROUND WATER ELEVATION ========== 404.20 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 347.60 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4800 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT							R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)		NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)				Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
5.00	342.60	5.00	1300.0	Limestone	55	Normal	63	Open	Yes	4364	4364	2400	2166	0.050	0.477	1258.8	40986	20493	1.274	0.68	13574	7005	4078	0.056	0.296
10.00	337.60	5.00	1800.0	Limestone	65	Normal	100	Open	Yes	4364	8729	4801	5438	0.091	0.322	1082.4	55164	27582	2.072	0.38	14108	7490	9124	0.114	0.222
20.00	327.60	10.00	1000.0	Limestone	60	Normal	98	Open	Yes	8729	17457	9602	10860	0.151	0.422										
25.50	322.10	5.50	1200.0	Limestone	55	Normal	84	Open	Yes	4801	22258	12242	14720	0.200	0.460										
30.00	317.60	4.50	1200.0	Limestone	55	Normal	84	Open	Yes	3928	26186	14402	18253	0.245	0.489										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
50000
55000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-36, BB-36a

Estimated Top of Rock Elevation: 347.60

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
5	342.6	28314	14157	TIP	--	--	1.020
10	337.6	36630	18315	TIP	--	--	1.726
20	327.6	14377	7907	SIDE	9592	0.154	0.352
25.5	322.1	18330	10082	SIDE	13211	0.210	0.389
30	317.6	21565	11861	SIDE	16591	0.262	0.419
90 in. Diameter Drilled Shaft							
5	342.6	32083	16041	TIP	--	--	1.098
10	337.6	42389	21194	TIP	--	--	1.823
20	327.6	15404	8472	SIDE	10007	0.153	0.375
25.5	322.1	19640	10802	SIDE	13700	0.205	0.413
30	317.6	23106	12708	SIDE	17124	0.255	0.441
96 in. Diameter Drilled Shaft							
5	342.6	36399	18199	TIP	--	--	1.209
10	337.6	48567	24283	TIP	--	--	1.960
20	327.6	16431	9037	SIDE	10431	0.152	0.398
25.5	322.1	20949	11522	SIDE	14204	0.202	0.436
30	317.6	24646	13555	SIDE	17679	0.249	0.465
102 in. Diameter Drilled Shaft							
5	342.6	40986	20493	TIP	--	--	1.274
10	337.6	55164	27582	TIP	--	--	2.072
20	327.6	17457	9602	SIDE	10860	0.151	0.422
25.5	322.1	22258	12242	SIDE	14720	0.200	0.460
30	317.6	26186	14402	SIDE	18253	0.245	0.489
108 in. Diameter Drilled Shaft							
5	342.6	45846	22923	TIP	--	--	1.388
10	337.6	62179	31090	TIP	--	--	2.232
20	327.6	18484	10166	SIDE	11295	0.151	0.445
25.5	322.1	23568	12962	SIDE	15246	0.198	0.485
30	317.6	27727	15250	SIDE	18842	0.241	0.513
120 in. Diameter Drilled Shaft							
5	342.6	56382	28191	TIP	--	--	1.538
10	337.6	77468	38734	TIP	--	--	2.562
20	327.6	20538	11296	SIDE	12176	0.150	0.492
25.5	322.1	26186	14402	SIDE	16322	0.196	0.534
30	317.6	30807	16944	SIDE	20057	0.236	0.563

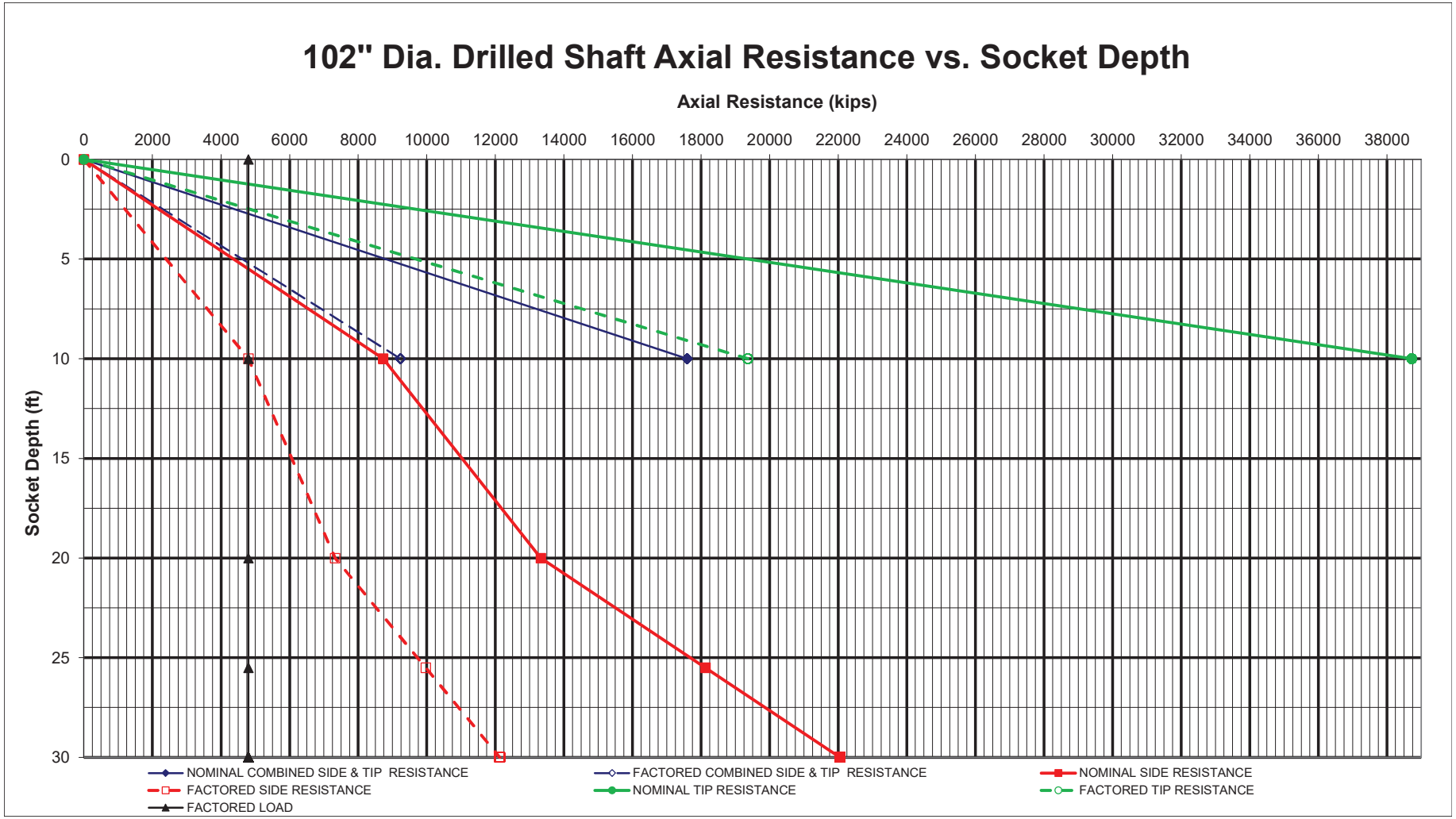
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-37
GROUND SURFACE ELEVATION ========== 393.80 FT
GROUND WATER ELEVATION ========== 393.80 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 344.60 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4800 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)							Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
10.00	334.60	10.00	1200.0	Limestone	55	Normal	97	Open	Yes	8729	8729	4801	4334	0.092	0.562	1150.0	38724	19362	1.627	0.50	17593	9233	7214	0.109	0.396
20.00	324.60	10.00	1180.0	Limestone	55	Fractured	96	Open	Yes	4596	13324	7328	9682	0.165	0.366										
25.50	319.10	5.50	1000.0	Limestone	55	Normal	95	Open	Yes	4801	18125	9969	12778	0.202	0.442										
30.00	314.60	4.50	1500.0	Limestone	55	Normal	95	Open	Yes	3928	22053	12129	16502	0.251	0.460										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
36000
38000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-37

Estimated Top of Rock Elevation: 344.60

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10	334.6	25846	12923	TIP	--	--	1.407
20	324.6	10973	6035	SIDE	8394	0.163	0.308
25.5	319.1	14927	8210	SIDE	11225	0.206	0.374
30	314.6	18161	9989	SIDE	14710	0.261	0.394
90 in. Diameter Drilled Shaft							
10	334.6	29479	14739	TIP	--	--	1.444
20	324.6	11757	6466	SIDE	8820	0.164	0.327
25.5	319.1	15993	8796	SIDE	11736	0.204	0.397
30	314.6	19459	10702	SIDE	15296	0.257	0.416
96 in. Diameter Drilled Shaft							
10	334.6	33747	16873	TIP	--	--	1.538
20	324.6	12541	6897	SIDE	9249	0.164	0.347
25.5	319.1	17059	9382	SIDE	12255	0.203	0.419
30	314.6	20756	11416	SIDE	15894	0.253	0.437
102 in. Diameter Drilled Shaft							
10	334.6	38724	19362	TIP	--	--	1.627
20	324.6	13324	7328	SIDE	9682	0.165	0.366
25.5	319.1	18125	9969	SIDE	12778	0.202	0.442
30	314.6	22053	12129	SIDE	16502	0.251	0.460
108 in. Diameter Drilled Shaft							
10	334.6	44039	22019	TIP	--	--	1.763
20	324.6	14108	7760	SIDE	10116	0.165	0.386
25.5	319.1	19191	10555	SIDE	13307	0.202	0.465
30	314.6	23350	12843	SIDE	17119	0.249	0.483
120 in. Diameter Drilled Shaft							
10	334.6	55678	27839	TIP	--	--	2.044
20	324.6	15676	8622	SIDE	10992	0.167	0.425
25.5	319.1	21324	11728	SIDE	14375	0.203	0.512
30	314.6	25945	14270	SIDE	18374	0.247	0.529

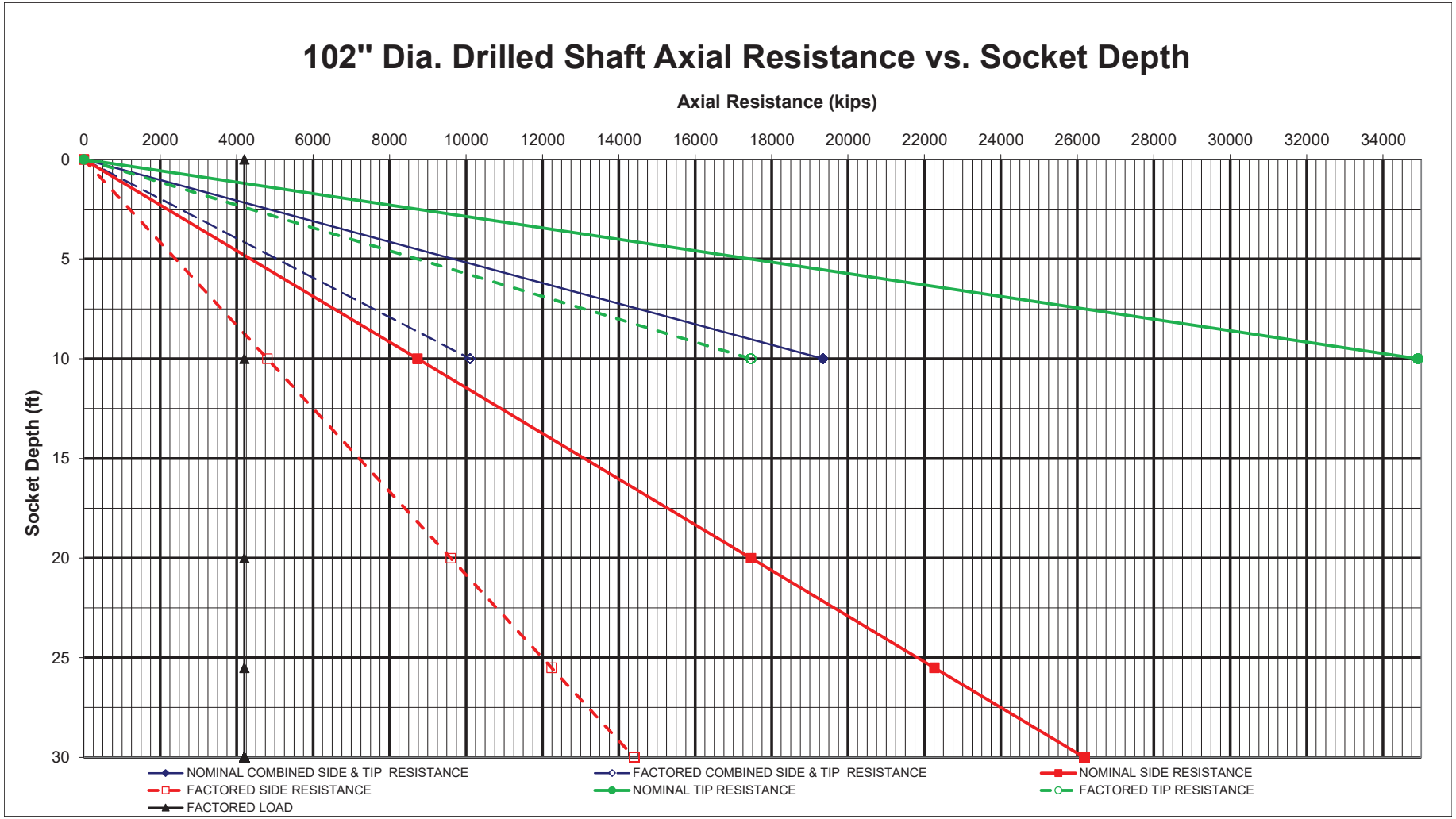
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-38, BB-38a
GROUND SURFACE ELEVATION ========== 405.10 FT
GROUND WATER ELEVATION ========== 405.10 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 346.30 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4200 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
10.00	336.30	10.00	1000.0	Limestone	55	Normal	87	Open	Yes	8729	8729	4801	3787	0.080	0.670	997.1	34910	17455	1.464	0.55	19343	10108	6201	0.094	0.471
20.00	326.30	10.00	900.0	Limestone	55	Normal	98	Open	Yes	8729	17457	9602	8051	0.137	0.730										
25.50	320.80	5.50	1200.0	Limestone	55	Normal	90	Open	Yes	4801	22258	12242	11357	0.180	0.708										
30.00	316.30	4.50	900.0	Limestone	55	Normal	90	Open	Yes	3928	26186	14402	13816	0.210	0.730										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-38, BB-38a

Estimated Top of Rock Elevation: 346.30

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10	336.3	23452	11726	TIP	--	--	1.280
20	326.3	14377	7907	SIDE	6923	0.135	0.609
25.5	320.8	18330	10082	SIDE	9907	0.181	0.596
30	316.3	21565	11861	SIDE	12162	0.216	0.619
90 in. Diameter Drilled Shaft							
10	336.3	27246	13623	TIP	--	--	1.334
20	326.3	15404	8472	SIDE	7297	0.135	0.649
25.5	320.8	19640	10802	SIDE	10386	0.180	0.633
30	316.3	23106	12708	SIDE	12708	0.213	0.656
96 in. Diameter Drilled Shaft							
10	336.3	31080	15540	TIP	--	--	1.417
20	326.3	16431	9037	SIDE	7673	0.136	0.690
25.5	320.8	20949	11522	SIDE	10870	0.180	0.671
30	316.3	24646	13555	SIDE	13260	0.211	0.693
102 in. Diameter Drilled Shaft							
10	336.3	34910	17455	TIP	--	--	1.464
20	326.3	17457	9602	SIDE	8051	0.137	0.730
25.5	320.8	22258	12242	SIDE	11357	0.180	0.708
30	316.3	26186	14402	SIDE	13816	0.210	0.730
108 in. Diameter Drilled Shaft							
10	336.3	38962	19481	TIP	--	--	1.560
20	326.3	18484	10166	SIDE	8431	0.138	0.771
25.5	320.8	23568	12962	SIDE	11847	0.180	0.747
30	316.3	27727	15250	SIDE	14377	0.209	0.768
120 in. Diameter Drilled Shaft							
10	336.3	47733	23866	TIP	--	--	1.760
20	326.3	20538	11296	SIDE	9192	0.140	0.852
25.5	320.8	26186	14402	SIDE	12835	0.181	0.823
30	316.3	30807	16944	SIDE	15511	0.209	0.845

Illinois Department of Transportation

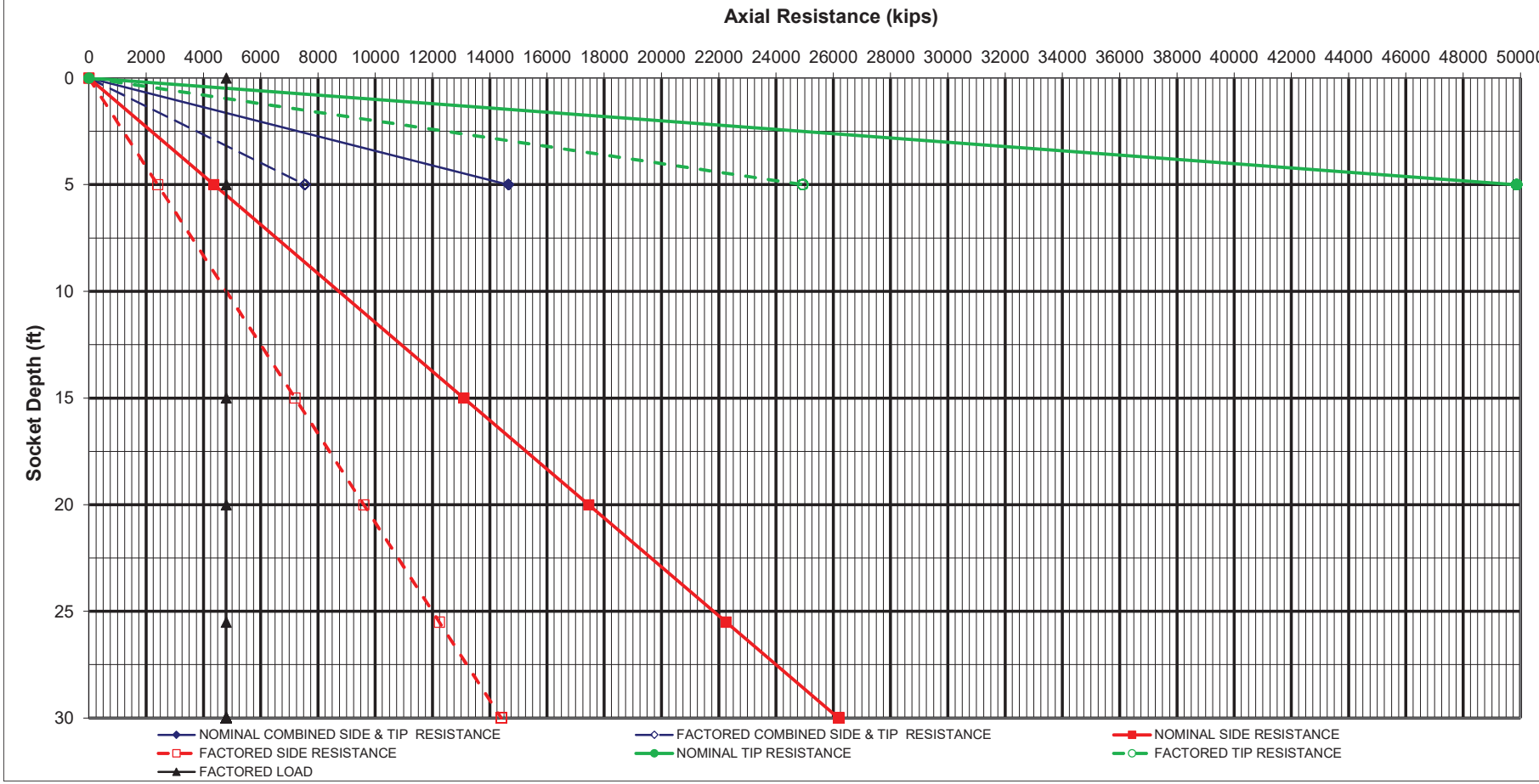
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-39
GROUND SURFACE ELEVATION ========== 403.90 FT
GROUND WATER ELEVATION ========== 403.90 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 346.30 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4800 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
5.00	341.30	5.00	1200.0	Limestone	55	Normal	74	Open	Yes	4364	4364	2400	2047	0.047	0.521	1570.6	49865	24932	1.496	0.70	14649	7543	3912	0.053	0.318
15.00	331.30	10.00	2000.0	Limestone	65	Normal	96	Open	Yes	8729	13093	7201	10023	0.140	0.267										
20.00	326.30	5.00	700.0	Limestone	55	Normal	92	Open	Yes	4364	17457	9602	12264	0.169	0.363										
25.50	320.80	5.50	1600.0	Limestone	65	Normal	88	Open	Yes	4801	22258	12242	18161	0.227	0.341										
30.00	316.30	4.50	1600.0	Limestone	65	Normal	88	Open	Yes	3928	26186	14402	24188	0.289	0.335										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-39

Estimated Top of Rock Elevation: 346.30

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
5	341.3	34925	17463	TIP	--	--	1.268
15	331.3	123013	61506	TIP	--	--	5.519
20	326.3	14377	7907	SIDE	10935	0.174	0.304
25.5	320.8	18330	10082	SIDE	16765	0.247	0.291
30	316.3	21565	11861	SIDE	23037	0.327	0.292
90 in. Diameter Drilled Shaft							
5	341.3	38736	19368	TIP	--	--	1.354
15	331.3	143581	71790	TIP	--	--	5.936
20	326.3	15404	8472	SIDE	11367	0.172	0.324
25.5	320.8	19640	10802	SIDE	17196	0.238	0.307
30	316.3	23106	12708	SIDE	23346	0.311	0.306
96 in. Diameter Drilled Shaft							
5	341.3	44125	22063	TIP	--	--	1.448
15	331.3	12323	6778	SIDE	9632	0.141	0.252
20	326.3	16431	9037	SIDE	11810	0.170	0.343
25.5	320.8	20949	11522	SIDE	17664	0.232	0.324
30	316.3	24646	13555	SIDE	23735	0.299	0.320
102 in. Diameter Drilled Shaft							
5	341.3	49865	24932	TIP	--	--	1.496
15	331.3	13093	7201	SIDE	10023	0.140	0.267
20	326.3	17457	9602	SIDE	12264	0.169	0.363
25.5	320.8	22258	12242	SIDE	18161	0.227	0.341
30	316.3	26186	14402	SIDE	24188	0.289	0.335
108 in. Diameter Drilled Shaft							
5	341.3	55956	27978	TIP	--	--	1.593
15	331.3	13863	7625	SIDE	10421	0.140	0.282
20	326.3	18484	10166	SIDE	12725	0.168	0.383
25.5	320.8	23568	12962	SIDE	18682	0.223	0.359
30	316.3	27727	15250	SIDE	24690	0.281	0.351
120 in. Diameter Drilled Shaft							
5	341.3	69189	34595	TIP	--	--	1.709
15	331.3	15404	8472	SIDE	11229	0.140	0.311
20	326.3	20538	11296	SIDE	13666	0.167	0.423
25.5	320.8	26186	14402	SIDE	19777	0.218	0.395
30	316.3	30807	16944	SIDE	25804	0.269	0.384

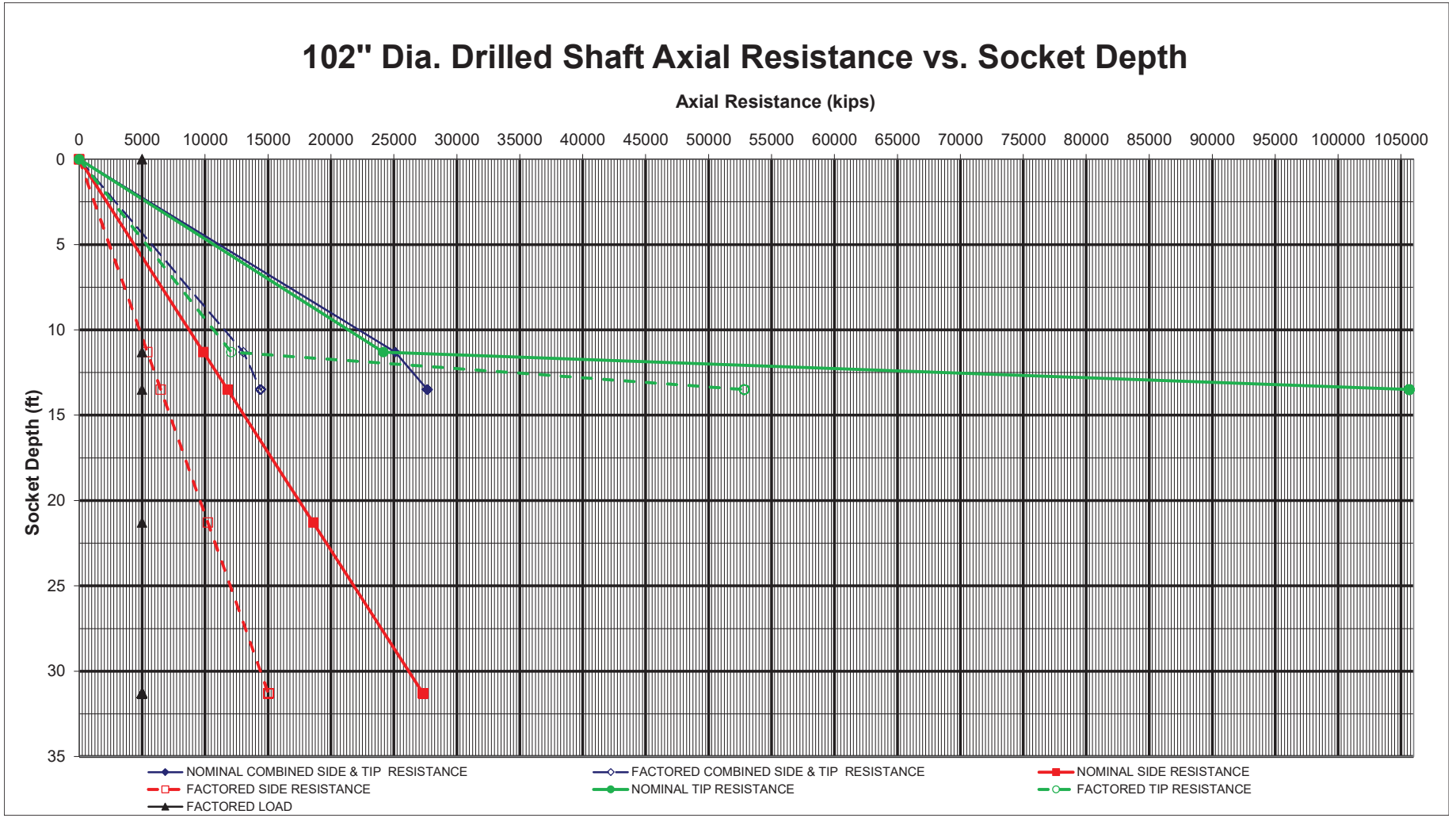
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-40
GROUND SURFACE ELEVATION ========== 412.60 FT
GROUND WATER ELEVATION ========== 408.60 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 335.60 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 5000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)								Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
11.30	324.30	11.30	800.0	Limestone	50	Normal	78	Open	Yes	9863	9863	5425	3608	0.092	1.053	725.2	24159	12079	1.233	0.61	25108	13047	5857	0.104	0.771
13.50	322.10	2.20	663.2	Limestone	50	Normal	83	Open	Yes	1920	11784	6481	4285	0.102	1.092	744.7	105645	52823	5.097	0.57	27653	14416	6859	0.118	0.806
21.30	314.30	7.80	663.2	Limestone	50	Normal	83	Open	Yes	6808	18592	10226	6831	0.138	1.174										
31.30	304.30	10.00	813.8	Limestone	55	Normal	96	Open	Yes	8729	27321	15027	11202	0.189	1.078										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
50000
55000
60000
65000
70000
75000
80000
85000
90000
95000
100000
105000
Socket Depth (ft)
0
5
10
15
20
25
30
35
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-40

Estimated Top of Rock Elevation: 335.60

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
11.3	324.3	67947	33974	TIP	--	--	4.216
13.5	322.1	70224	35112	TIP	--	--	4.323
21.3	314.3	15311	8421	SIDE	5796	0.134	0.978
31.3	304.3	22500	12375	SIDE	9678	0.190	0.909
90 in. Diameter Drilled Shaft							
11.3	324.3	78793	39396	TIP	--	--	4.549
13.5	322.1	81232	40616	TIP	--	--	4.611
21.3	314.3	16405	9023	SIDE	6141	0.135	1.043
31.3	304.3	24107	13259	SIDE	10184	0.189	0.965
96 in. Diameter Drilled Shaft							
11.3	324.3	22701	11815	SIDE + TIP	5480	0.103	0.733
13.5	322.1	93039	46520	TIP	--	--	4.924
21.3	314.3	17499	9624	SIDE	6485	0.137	1.109
31.3	304.3	25714	14143	SIDE	10693	0.189	1.021
102 in. Diameter Drilled Shaft							
11.3	324.3	25108	13047	SIDE + TIP	5857	0.104	0.771
13.5	322.1	105645	52823	TIP	--	--	5.097
21.3	314.3	18592	10226	SIDE	6831	0.138	1.174
31.3	304.3	27321	15027	SIDE	11202	0.189	1.078
108 in. Diameter Drilled Shaft							
11.3	324.3	27624	14334	SIDE + TIP	6235	0.105	0.808
13.5	322.1	12477	6862	SIDE	4514	0.104	1.152
21.3	314.3	19686	10827	SIDE	7176	0.140	1.239
31.3	304.3	28928	15910	SIDE	11713	0.189	1.135
120 in. Diameter Drilled Shaft							
11.3	324.3	33898	16949	TIP	--	--	1.338
13.5	322.1	13863	7625	SIDE	4972	0.107	1.271
21.3	314.3	21873	12030	SIDE	7869	0.144	1.368
31.3	304.3	32142	17678	SIDE	12738	0.191	1.250

Illinois Department of Transportation

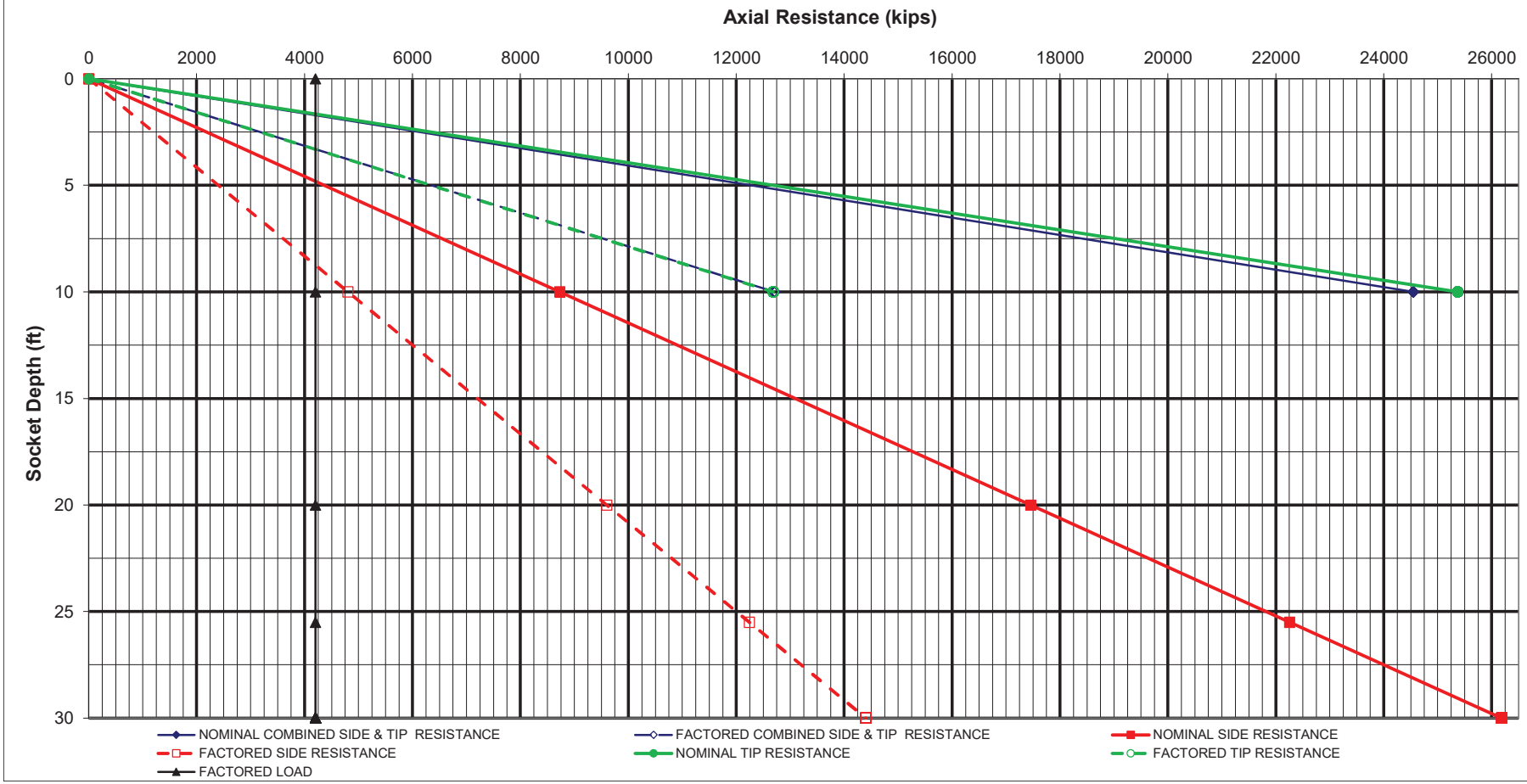
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-41
GROUND SURFACE ELEVATION ========== 403.20 FT
GROUND WATER ELEVATION ========== 403.20 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 344.10 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4200 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
10.00	334.10	10.00	850.0	Limestone	50	Normal	78	Open	Yes	8729	8729	4801	3304	0.087	0.990	836.5	25368	12684	1.058	0.64	24550	12711	5800	0.100	0.693
20.00	324.10	10.00	850.0	Limestone	55	Normal	94	Open	Yes	8729	17457	9602	7237	0.135	0.907										
25.50	318.60	5.50	800.0	Limestone	55	Normal	94	Open	Yes	4801	22258	12242	9604	0.162	0.907										
30.00	314.10	4.50	880.0	Limestone	55	Normal	94	Open	Yes	3928	26186	14402	11844	0.190	0.901										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-41

Estimated Top of Rock Elevation: 344.10

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10	334.1	17898	9308	SIDE + TIP	4733	0.097	0.588
20	324.1	14377	7907	SIDE	6175	0.131	0.756
25.5	318.6	18330	10082	SIDE	8280	0.162	0.760
30	314.1	21565	11861	SIDE	10300	0.192	0.761
90 in. Diameter Drilled Shaft							
10	334.1	20013	10392	SIDE + TIP	5088	0.099	0.623
20	324.1	15404	8472	SIDE	6528	0.132	0.806
25.5	318.6	19640	10802	SIDE	8720	0.162	0.808
30	314.1	23106	12708	SIDE	10812	0.191	0.807
96 in. Diameter Drilled Shaft							
10	334.1	22414	11207	TIP	--	--	1.022
20	324.1	16431	9037	SIDE	6882	0.134	0.857
25.5	318.6	20949	11522	SIDE	9161	0.162	0.857
30	314.1	24646	13555	SIDE	11327	0.190	0.854
102 in. Diameter Drilled Shaft							
10	334.1	25368	12684	TIP	--	--	1.058
20	324.1	17457	9602	SIDE	7237	0.135	0.907
25.5	318.6	22258	12242	SIDE	9604	0.162	0.907
30	314.1	26186	14402	SIDE	11844	0.190	0.901
108 in. Diameter Drilled Shaft							
10	334.1	28505	14253	TIP	--	--	1.141
20	324.1	18484	10166	SIDE	7592	0.136	0.957
25.5	318.6	23568	12962	SIDE	10049	0.163	0.956
30	314.1	27727	15250	SIDE	12364	0.190	0.949
120 in. Diameter Drilled Shaft							
10	334.1	35327	17663	TIP	--	--	1.317
20	324.1	20538	11296	SIDE	8305	0.139	1.058
25.5	318.6	26186	14402	SIDE	10941	0.165	1.055
30	314.1	30807	16944	SIDE	13408	0.191	1.045

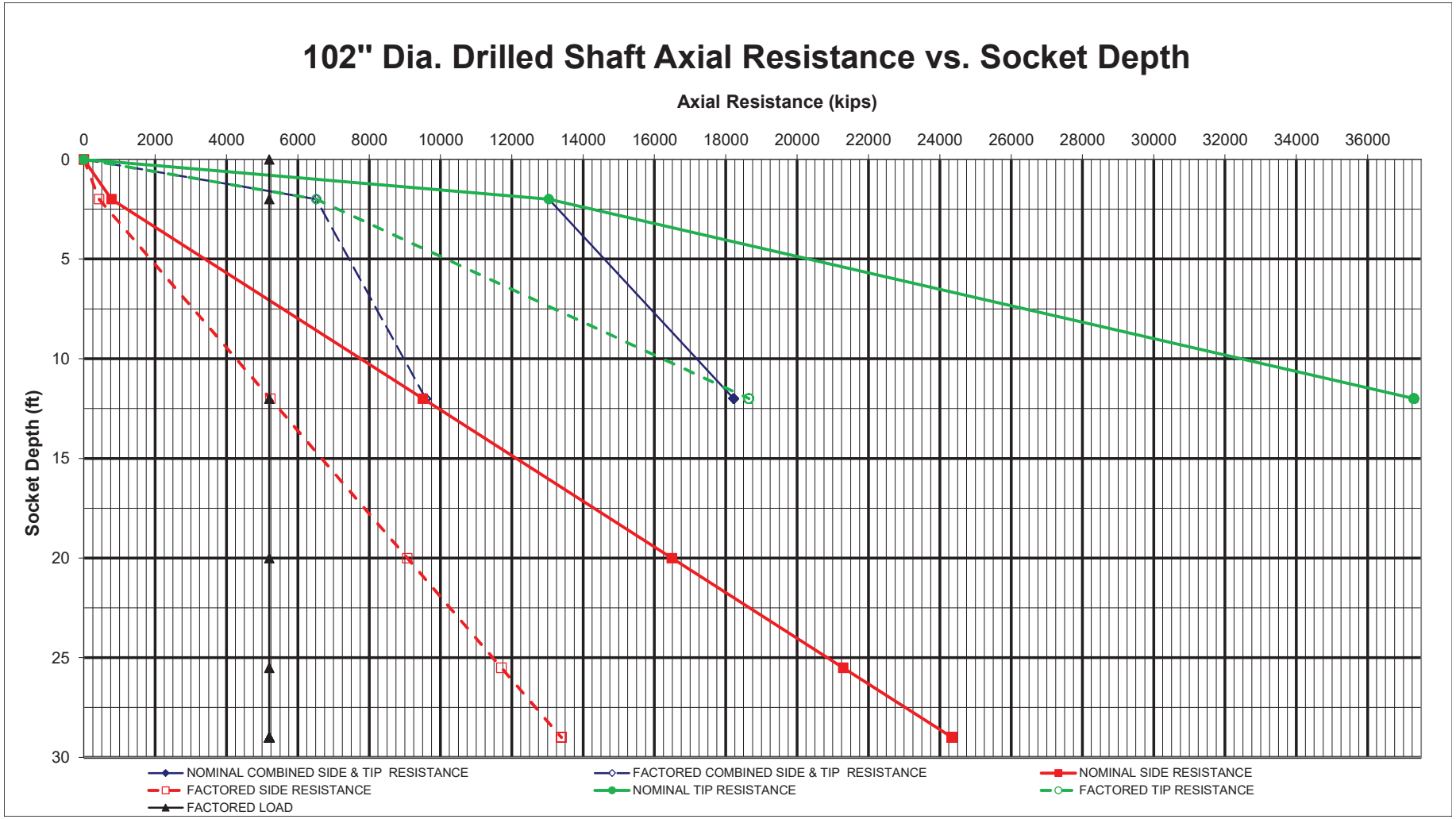
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-44
GROUND SURFACE ELEVATION ========== 416.00 FT
GROUND WATER ELEVATION ========== 412.00 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 345.00 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 5200 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
2.00	343.00	2.00	100.0	Limestone	20	Normal	0	Open	No	778	778	428	0	0.000	7.621	1714.4	13036	6518	0.712	1.00	13036	6518	0	0.000	0.736
12.00	333.00	10.00	1952.0	Limestone	45	Normal	35	Open	No	8729	9506	5229	6029	0.209	0.704	1600.0	37293	18647	2.215	0.48	18221	9586	10540	0.244	0.546
20.00	325.00	8.00	1374.9	Limestone	50	Normal	58	Open	No	6983	16489	9069	10587	0.260	0.717										
25.50	319.50	5.50	1800.0	Limestone	45	Normal	48	Open	No	4801	21290	11710	14705	0.332	0.733										
29.00	316.00	3.50	1800.0	Limestone	45	Normal	48	Open	No	3055	24345	13390	17560	0.380	0.746										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
36000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-44

Estimated Top of Rock Elevation: 345.00

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
2	343	9285	4652	SIDE + TIP	215	0.007	0.643
12	333	24757	12379	TIP	--	--	1.801
20	325	13579	7469	SIDE	9065	0.252	0.606
25.5	319.5	17533	9643	SIDE	12754	0.327	0.624
29	316	20049	11027	SIDE	15358	0.380	0.638
90 in. Diameter Drilled Shaft							
2	343	10534	5277	SIDE + TIP	194	0.004	0.674
12	333	28653	14326	TIP	--	--	1.947
20	325	14549	8002	SIDE	9570	0.254	0.643
25.5	319.5	18785	10332	SIDE	13399	0.328	0.660
29	316	21481	11815	SIDE	16084	0.379	0.674
96 in. Diameter Drilled Shaft							
2	343	11862	5942	SIDE + TIP	166	0.002	0.705
12	333	32831	16416	TIP	--	--	2.093
20	325	15519	8536	SIDE	10078	0.257	0.680
25.5	319.5	20038	11021	SIDE	14049	0.330	0.697
29	316	22913	12602	SIDE	16818	0.379	0.709
102 in. Diameter Drilled Shaft							
2	343	13036	6518	TIP	--	--	0.712
12	333	37293	18647	TIP	--	--	2.215
20	325	16489	9069	SIDE	10587	0.260	0.717
25.5	319.5	21290	11710	SIDE	14705	0.332	0.733
29	316	24345	13390	SIDE	17560	0.380	0.746
108 in. Diameter Drilled Shaft							
2	343	14507	7253	TIP	--	--	0.742
12	333	10066	5536	SIDE	6351	0.212	0.739
20	325	17459	9603	SIDE	11099	0.264	0.754
25.5	319.5	22543	12398	SIDE	15364	0.335	0.770
29	316	25777	14178	SIDE	18307	0.382	0.782
120 in. Diameter Drilled Shaft							
2	343	17983	8992	TIP	--	--	0.920
12	333	11184	6151	SIDE	6995	0.218	0.807
20	325	19399	10670	SIDE	12125	0.270	0.827
25.5	319.5	25047	13776	SIDE	16691	0.341	0.843
29	316	28641	15753	SIDE	19817	0.386	0.854

Illinois Department of Transportation

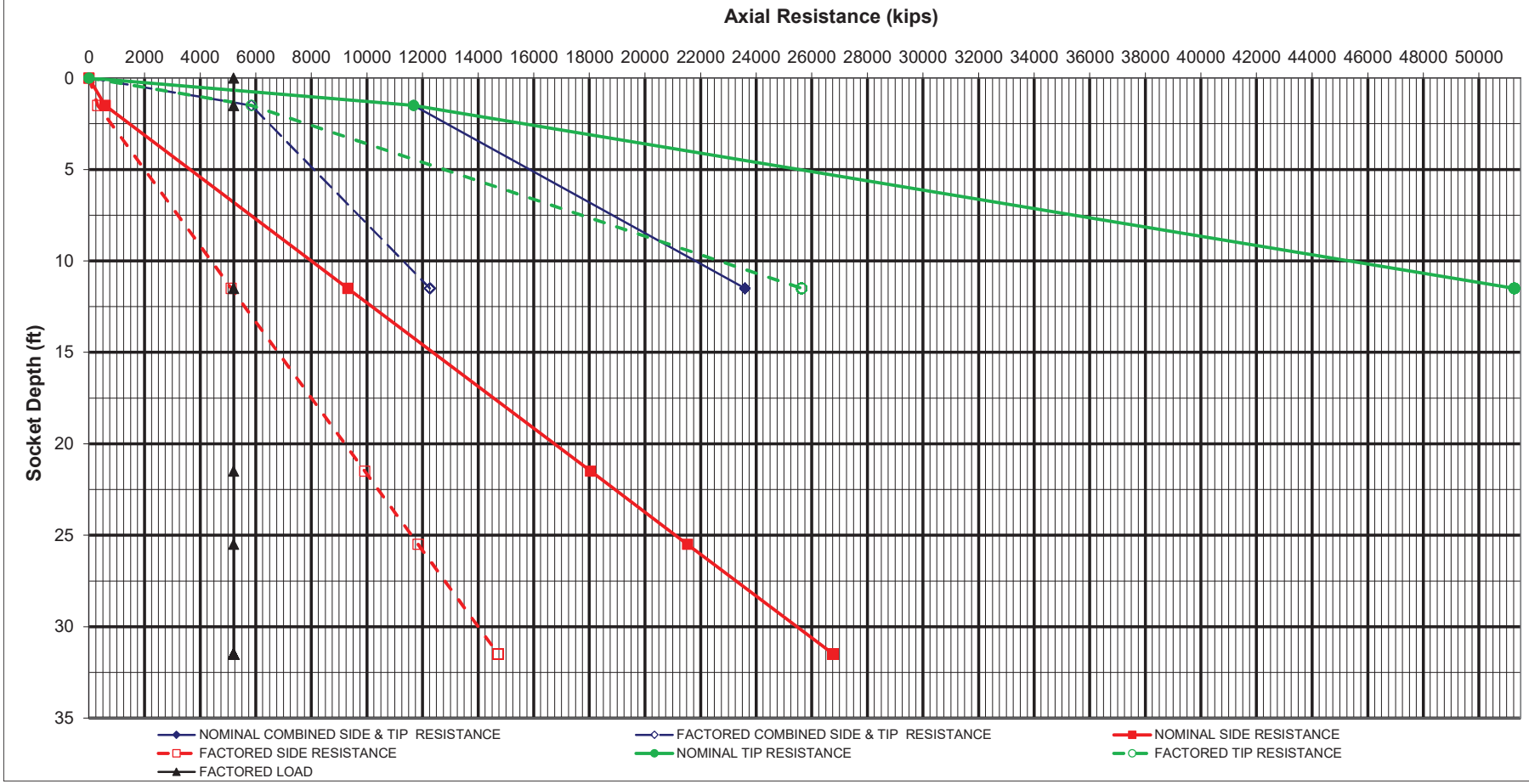
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-45
GROUND SURFACE ELEVATION ========== 417.10 FT
GROUND WATER ELEVATION ========== 413.10 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 343.60 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 5200 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)							Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
1.50	342.10	1.50	100.0	Limestone	20	Normal	0	Open	No	583	583	321	0	0.000	7.553	1449.9	11680	5840	0.523	1.00	11680	5840	0	0.000	0.523
11.50	332.10	10.00	1116.6	Limestone	50	Normal	46	Open	No	8729	9312	5122	4117	0.114	0.904	1885.9	51267	25634	2.267	0.61	23598	12265	7454	0.135	0.640
21.50	322.10	10.00	1926.1	Limestone	55	Normal	60	Open	No	8729	18041	9922	11488	0.219	0.592										
25.50	318.10	4.00	1700.0	Limestone	55	Normal	58	Open	No	3491	21532	11843	14829	0.262	0.571										
31.50	312.10	6.00	2000.0	Limestone	55	Normal	58	Open	No	5237	26769	14723	21339	0.348	0.542										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-45

Estimated Top of Rock Elevation: 343.60

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
1.5	342.1	7549	3774	TIP	--	--	0.384
11.5	332.1	34394	17197	TIP	--	--	1.852
21.5	322.1	14857	8171	SIDE	9970	0.217	0.499
25.5	318.1	17732	9753	SIDE	13056	0.265	0.485
31.5	312.1	22045	12125	SIDE	19277	0.367	0.468
90 in. Diameter Drilled Shaft							
1.5	342.1	8828	4414	TIP	--	--	0.457
11.5	332.1	39646	19823	TIP	--	--	1.953
21.5	322.1	15918	8755	SIDE	10472	0.217	0.530
25.5	318.1	18999	10449	SIDE	13638	0.263	0.513
31.5	312.1	23620	12991	SIDE	19940	0.359	0.492
96 in. Diameter Drilled Shaft							
1.5	342.1	10205	5103	TIP	--	--	0.468
11.5	332.1	45270	22635	TIP	--	--	2.097
21.5	322.1	16979	9339	SIDE	10978	0.218	0.561
25.5	318.1	20266	11146	SIDE	14230	0.262	0.542
31.5	312.1	25195	13857	SIDE	20629	0.353	0.516
102 in. Diameter Drilled Shaft							
1.5	342.1	11680	5840	TIP	--	--	0.523
11.5	332.1	51267	25634	TIP	--	--	2.267
21.5	322.1	18041	9922	SIDE	11488	0.219	0.592
25.5	318.1	21532	11843	SIDE	14829	0.262	0.571
31.5	312.1	26769	14723	SIDE	21339	0.348	0.542
108 in. Diameter Drilled Shaft							
1.5	342.1	13253	6626	TIP	--	--	0.556
11.5	332.1	57637	28818	TIP	--	--	2.392
21.5	322.1	19102	10506	SIDE	12002	0.221	0.623
25.5	318.1	22799	12539	SIDE	15434	0.262	0.601
31.5	312.1	28344	15589	SIDE	22065	0.345	0.567
120 in. Diameter Drilled Shaft							
1.5	342.1	16691	8345	TIP	--	--	0.594
11.5	332.1	71494	35747	TIP	--	--	2.585
21.5	322.1	21224	11673	SIDE	13035	0.224	0.685
25.5	318.1	25332	13933	SIDE	16660	0.263	0.659
31.5	312.1	31493	17321	SIDE	23557	0.341	0.619

Illinois Department of Transportation

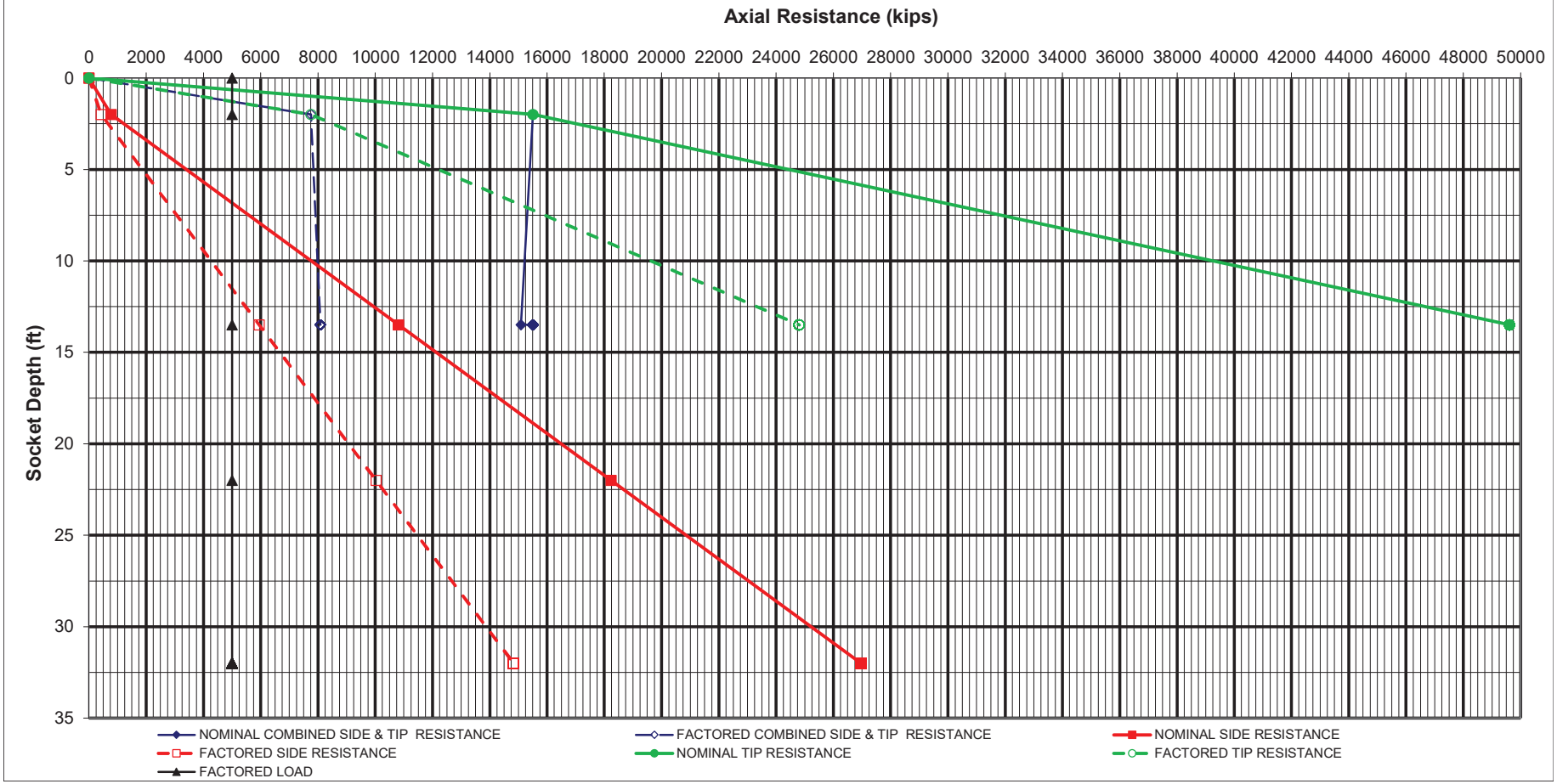
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-46
GROUND SURFACE ELEVATION ========== 414.50 FT
GROUND WATER ELEVATION ========== 410.50 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 341.00 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 5000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
2.00	339.00	2.00	100.0	Limestone	20	Normal	0	Open	No	778	778	428	0	0.000	7.621	2184.9	15508	7754	0.633	1.00	15508	7754	0	0.000	0.658
13.50	327.50	11.50	2393.2	Limestone	55	Normal	60	Open	No	10038	10816	5949	8705	0.189	0.336	1429.9	49609	24804	2.635	0.28	15089	8085	14208	0.236	0.260
22.00	319.00	8.50	1749.4	Limestone	50	Normal	53	Open	No	7419	18235	10029	15389	0.292	0.426										
32.00	309.00	10.00	1110.4	Limestone	50	Normal	44	Open	No	8729	26964	14830	22333	0.384	0.556										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-46

Estimated Top of Rock Elevation: 341.00

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
2	339	11011	5515	SIDE + TIP	254	0.007	0.541
13.5	327.5	34988	17494	TIP	--	--	2.331
22	319	15017	8259	SIDE	13584	0.294	0.363
32	309	22206	12213	SIDE	20143	0.403	0.482
90 in. Diameter Drilled Shaft							
2	339	12494	6257	SIDE + TIP	219	0.004	0.580
13.5	327.5	39583	19791	TIP	--	--	2.461
22	319	16090	8849	SIDE	14174	0.292	0.384
32	309	23792	13085	SIDE	20849	0.395	0.506
96 in. Diameter Drilled Shaft							
2	339	14069	7045	SIDE + TIP	175	0.002	0.619
13.5	327.5	44456	22228	TIP	--	--	2.617
22	319	17162	9439	SIDE	14777	0.292	0.405
32	309	25378	13958	SIDE	21580	0.389	0.531
102 in. Diameter Drilled Shaft							
2	339	15508	7754	TIP	--	--	0.633
13.5	327.5	49609	24804	TIP	--	--	2.635
22	319	18235	10029	SIDE	15389	0.292	0.426
32	309	26964	14830	SIDE	22333	0.384	0.556
108 in. Diameter Drilled Shaft							
2	339	17254	8627	TIP	--	--	0.671
13.5	327.5	55040	27520	TIP	--	--	2.794
22	319	19308	10619	SIDE	16009	0.292	0.447
32	309	28550	15702	SIDE	23103	0.381	0.582
120 in. Diameter Drilled Shaft							
2	339	21024	10512	TIP	--	--	0.830
13.5	327.5	12724	6998	SIDE	9943	0.194	0.386
22	319	21453	11799	SIDE	17268	0.294	0.489
32	309	31722	17447	SIDE	24683	0.378	0.634

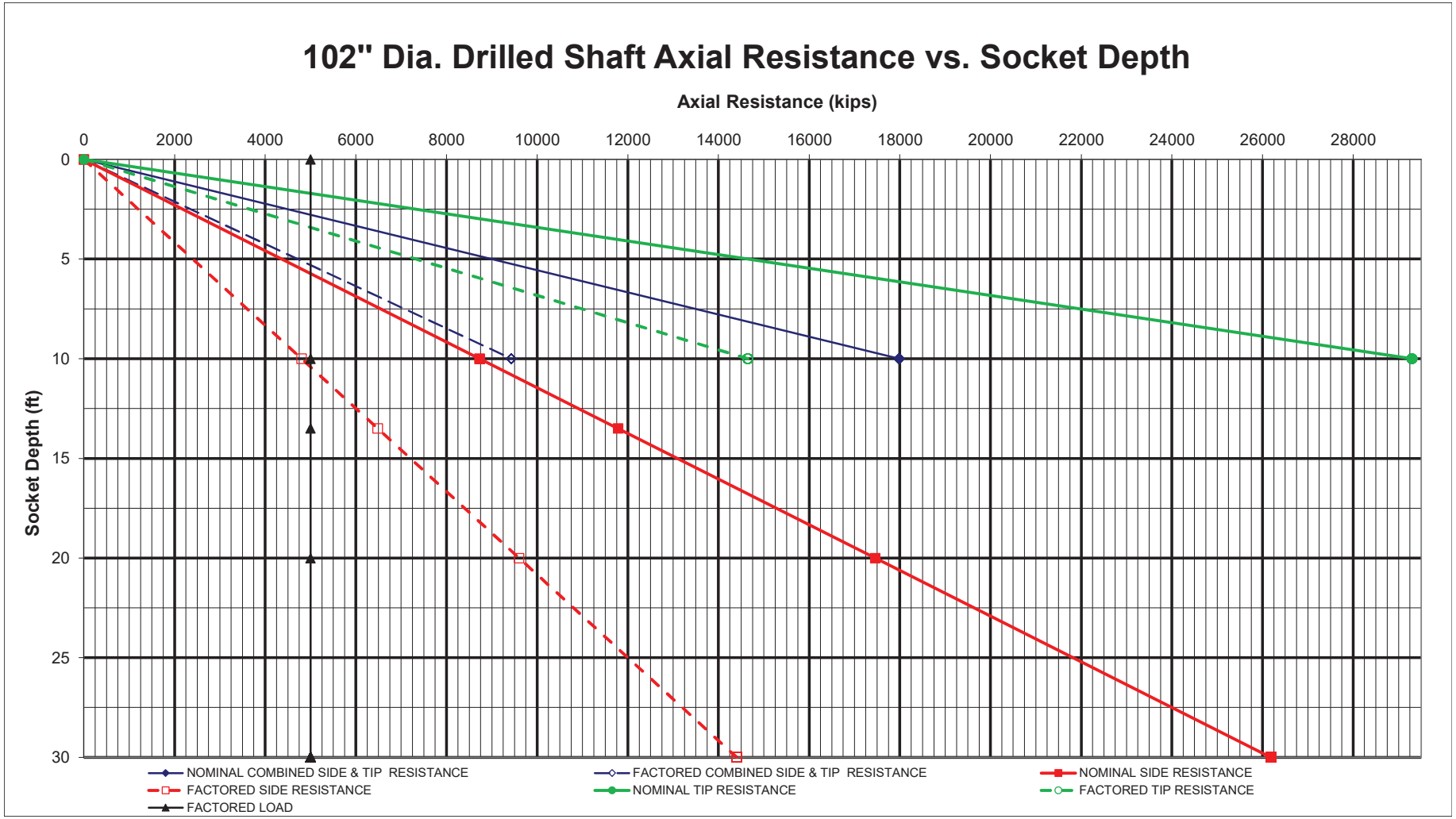
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-47
GROUND SURFACE ELEVATION ========== 416.50 FT
GROUND WATER ELEVATION ========== 412.50 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 344.00 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 5000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
10.00	334.00	10.00	1300.0	Limestone	45	Normal	40	Open	Yes	8729	8729	4801	4406	0.145	0.854	1191.2	29294	14647	2.072	0.51	17987	9430	6840	0.160	0.680
13.50	330.50	3.50	1400.0	Limestone	45	Normal	30	Open	Yes	3055	11784	6481	6200	0.183	0.869										
20.00	324.00	6.50	1500.0	Limestone	45	Normal	30	Open	Yes	5674	17457	9602	9988	0.253	0.875										
30.00	314.00	10.00	800.0	Limestone	40	Normal	18	Open	Yes	8729	26186	14402	14032	0.325	1.143										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-47

Estimated Top of Rock Elevation: 344.00

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10	334	20937	10469	TIP	--	--	1.832
13.5	330.5	108238	54119	TIP	--	--	10.003
20	324	14377	7907	SIDE	8523	0.244	0.738
30	314	21565	11861	SIDE	12079	0.319	0.970
90 in. Diameter Drilled Shaft							
10	334	23572	11786	TIP	--	--	1.894
13.5	330.5	121859	60930	TIP	--	--	10.534
20	324	15404	8472	SIDE	9010	0.247	0.784
30	314	23106	12708	SIDE	12727	0.320	1.027
96 in. Diameter Drilled Shaft							
10	334	26358	13179	TIP	--	--	1.995
13.5	330.5	136267	68133	TIP	--	--	11.091
20	324	16431	9037	SIDE	9498	0.250	0.830
30	314	24646	13555	SIDE	13378	0.322	1.085
102 in. Diameter Drilled Shaft							
10	334	29294	14647	TIP	--	--	2.072
13.5	330.5	11784	6481	SIDE	6200	0.183	0.869
20	324	17457	9602	SIDE	9988	0.253	0.875
30	314	26186	14402	SIDE	14032	0.325	1.143
108 in. Diameter Drilled Shaft							
10	334	32380	16190	TIP	--	--	2.197
13.5	330.5	12477	6862	SIDE	6526	0.186	0.914
20	324	18484	10166	SIDE	10478	0.257	0.921
30	314	27727	15250	SIDE	14688	0.328	1.201
120 in. Diameter Drilled Shaft							
10	334	39004	19502	TIP	--	--	2.453
13.5	330.5	13863	7625	SIDE	7179	0.191	1.003
20	324	20538	11296	SIDE	11463	0.264	1.011
30	314	30807	16944	SIDE	16004	0.334	1.318

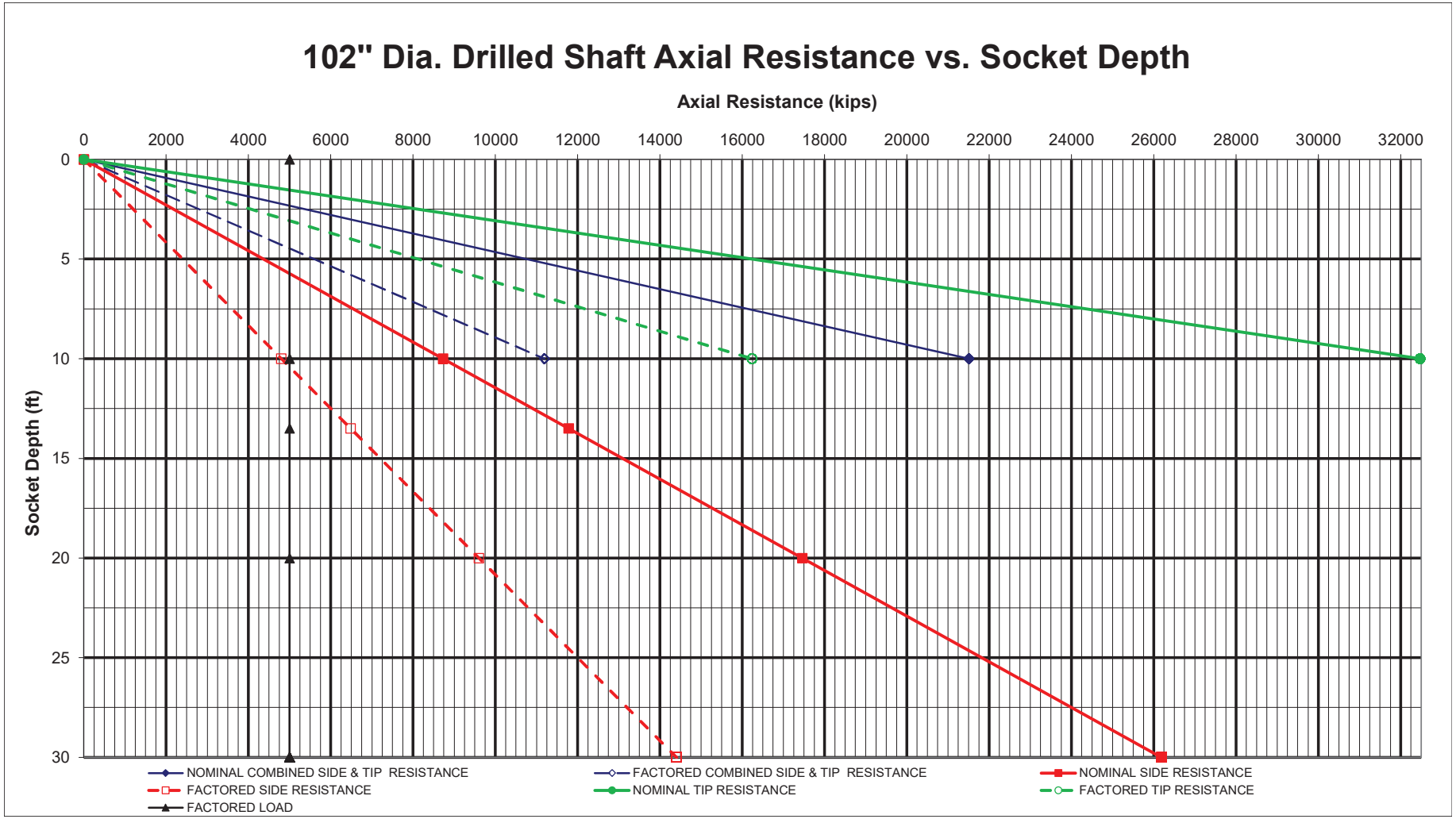
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-51
GROUND SURFACE ELEVATION ========== 415.70 FT
GROUND WATER ELEVATION ========== 411.70 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 341.70 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 5000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
10.00	331.70	10.00	1000.0	Limestone	45	Normal	50	Open	No	8729	8729	4801	3654	0.120	1.090	1355.9	32473	16236	2.089	0.59	21509	11191	5812	0.132	0.850
13.50	328.20	3.50	1600.0	Limestone	45	Normal	28	Open	No	3055	11784	6481	5573	0.165	0.993										
20.00	321.70	6.50	1500.0	Limestone	45	Normal	28	Open	No	5674	17457	9602	9287	0.236	0.952										
30.00	311.70	10.00	1100.0	Limestone	45	Normal	41	Open	No	8729	26186	14402	14527	0.317	1.036										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-51

Estimated Top of Rock Elevation: 341.70

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
10	331.7	22714	11357	TIP	--	--	1.860
13.5	328.2	21673	10837	TIP	--	--	1.765
20	321.7	14377	7907	SIDE	7906	0.226	0.801
30	311.7	21565	11861	SIDE	12559	0.314	0.880
90 in. Diameter Drilled Shaft							
10	331.7	25776	12888	TIP	--	--	1.918
13.5	328.2	24697	12348	TIP	--	--	1.885
20	321.7	15404	8472	SIDE	8365	0.229	0.851
30	311.7	23106	12708	SIDE	13212	0.314	0.932
96 in. Diameter Drilled Shaft							
10	331.7	29029	14514	TIP	--	--	2.015
13.5	328.2	27916	13958	TIP	--	--	2.031
20	321.7	16431	9037	SIDE	8826	0.232	0.901
30	311.7	24646	13555	SIDE	13868	0.315	0.984
102 in. Diameter Drilled Shaft							
10	331.7	32473	16236	TIP	--	--	2.089
13.5	328.2	11784	6481	SIDE	5573	0.165	0.993
20	321.7	17457	9602	SIDE	9287	0.236	0.952
30	311.7	26186	14402	SIDE	14527	0.317	1.036
108 in. Diameter Drilled Shaft							
10	331.7	36108	18054	TIP	--	--	2.211
13.5	328.2	12477	6862	SIDE	5869	0.167	1.045
20	321.7	18484	10166	SIDE	9750	0.239	1.002
30	311.7	27727	15250	SIDE	15188	0.319	1.089
120 in. Diameter Drilled Shaft							
10	331.7	43953	21976	TIP	--	--	2.463
13.5	328.2	13863	7625	SIDE	6463	0.172	1.149
20	321.7	20538	11296	SIDE	10677	0.246	1.101
30	311.7	30807	16944	SIDE	16519	0.325	1.194

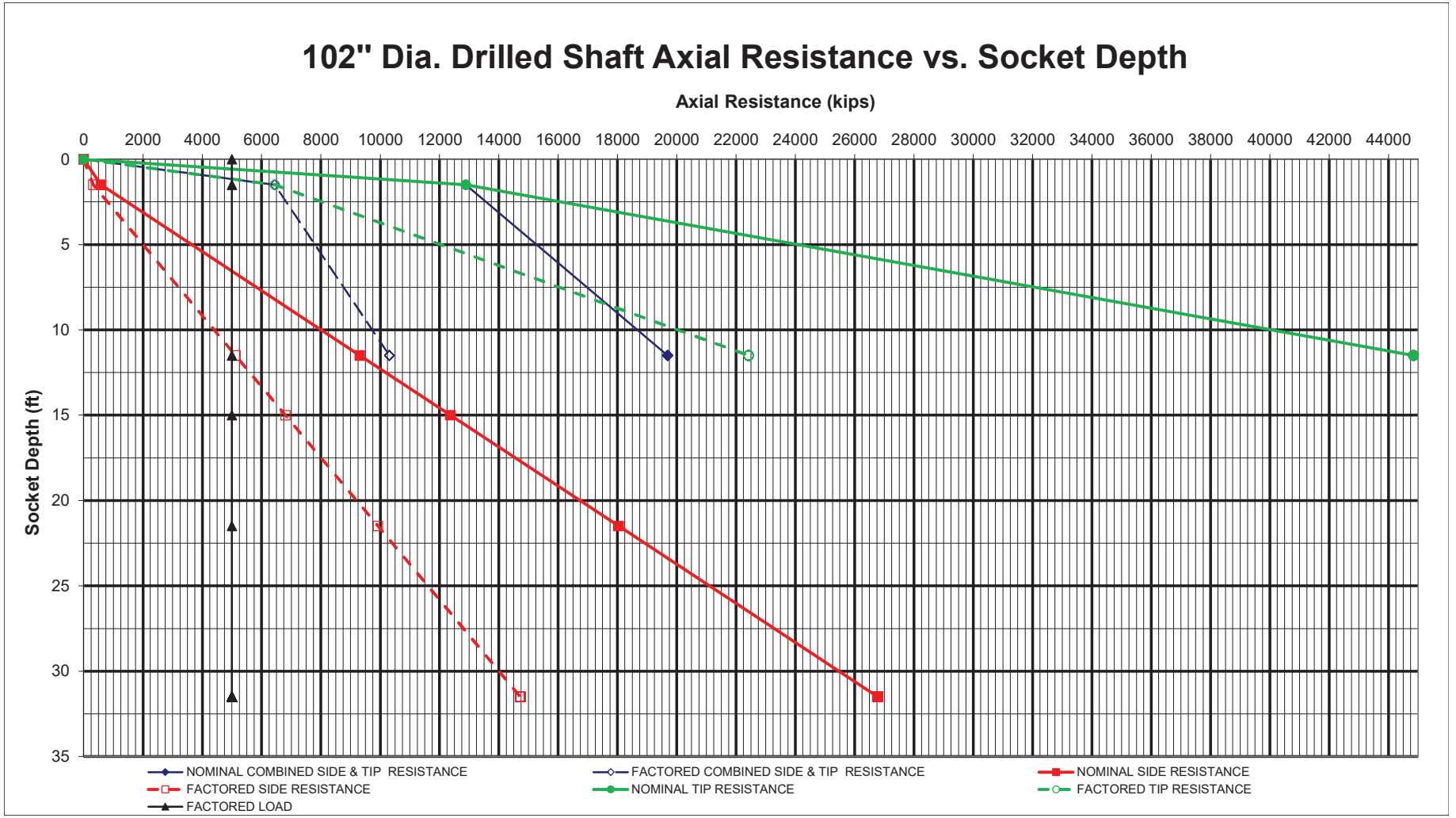
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-52
GROUND SURFACE ELEVATION ========== 415.20 FT
GROUND WATER ELEVATION ========== 411.20 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 338.70 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 5000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
1.50	337.20	1.50	100.0	Limestone	20	Normal	0	Open	No	583	583	321	0	0.000	7.553	1652.1	12886	6443	0.630	1.00	12886	6443	0	0.000	0.630
11.50	327.20	10.00	1338.5	Limestone	50	Normal	61	Open	No	8729	9312	5122	4678	0.130	0.765	1595.5	44847	22424	2.434	0.53	19690	10311	7758	0.150	0.574
15.00	323.70	3.50	2000.0	Limestone	50	Normal	41	Open	No	3055	12367	6802	7070	0.175	0.679										
21.50	317.20	6.50	2200.0	Limestone	50	Normal	41	Open	No	5674	18041	9922	12475	0.264	0.599										
31.50	307.20	10.00	831.9	Limestone	50	Normal	70	Open	No	8729	26769	14723	17570	0.324	0.744										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
34000
36000
38000
40000
42000
44000
Socket Depth (ft)
0
5
10
15
20
25
30
35
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-52

Estimated Top of Rock Elevation: 338.70

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
1.5	337.2	8321	4160	TIP	--	--	0.456
11.5	327.2	32953	16476	TIP	--	--	2.172
15	323.7	28985	14492	TIP	--	--	1.955
21.5	317.2	14857	8171	SIDE	10814	0.260	0.507
31.5	307.2	22045	12125	SIDE	15483	0.330	0.637
90 in. Diameter Drilled Shaft							
1.5	337.2	9735	4867	TIP	--	--	0.540
11.5	327.2	36730	18365	TIP	--	--	2.221
15	323.7	32503	16252	TIP	--	--	2.090
21.5	317.2	15918	8755	SIDE	11363	0.261	0.537
31.5	307.2	23620	12991	SIDE	16170	0.327	0.672
96 in. Diameter Drilled Shaft							
1.5	337.2	11257	5628	TIP	--	--	0.563
11.5	327.2	40695	20348	TIP	--	--	2.314
15	323.7	36213	18106	TIP	--	--	2.166
21.5	317.2	16979	9339	SIDE	11917	0.262	0.568
31.5	307.2	25195	13857	SIDE	16866	0.325	0.708
102 in. Diameter Drilled Shaft							
1.5	337.2	12886	6443	TIP	--	--	0.630
11.5	327.2	44847	22424	TIP	--	--	2.434
15	323.7	12367	6802	SIDE	7070	0.175	0.679
21.5	317.2	18041	9922	SIDE	12475	0.264	0.599
31.5	307.2	26769	14723	SIDE	17570	0.324	0.744
108 in. Diameter Drilled Shaft							
1.5	337.2	14624	7312	TIP	--	--	0.675
11.5	327.2	49186	24593	TIP	--	--	2.510
15	323.7	13094	7202	SIDE	7428	0.177	0.715
21.5	317.2	19102	10506	SIDE	13037	0.266	0.629
31.5	307.2	28344	15589	SIDE	18280	0.323	0.780
120 in. Diameter Drilled Shaft							
1.5	337.2	18425	9212	TIP	--	--	0.736
11.5	327.2	58423	29211	TIP	--	--	2.606
15	323.7	14549	8002	SIDE	8148	0.181	0.785
21.5	317.2	21224	11673	SIDE	14167	0.270	0.690
31.5	307.2	31493	17321	SIDE	19718	0.324	0.854

Illinois Department of Transportation

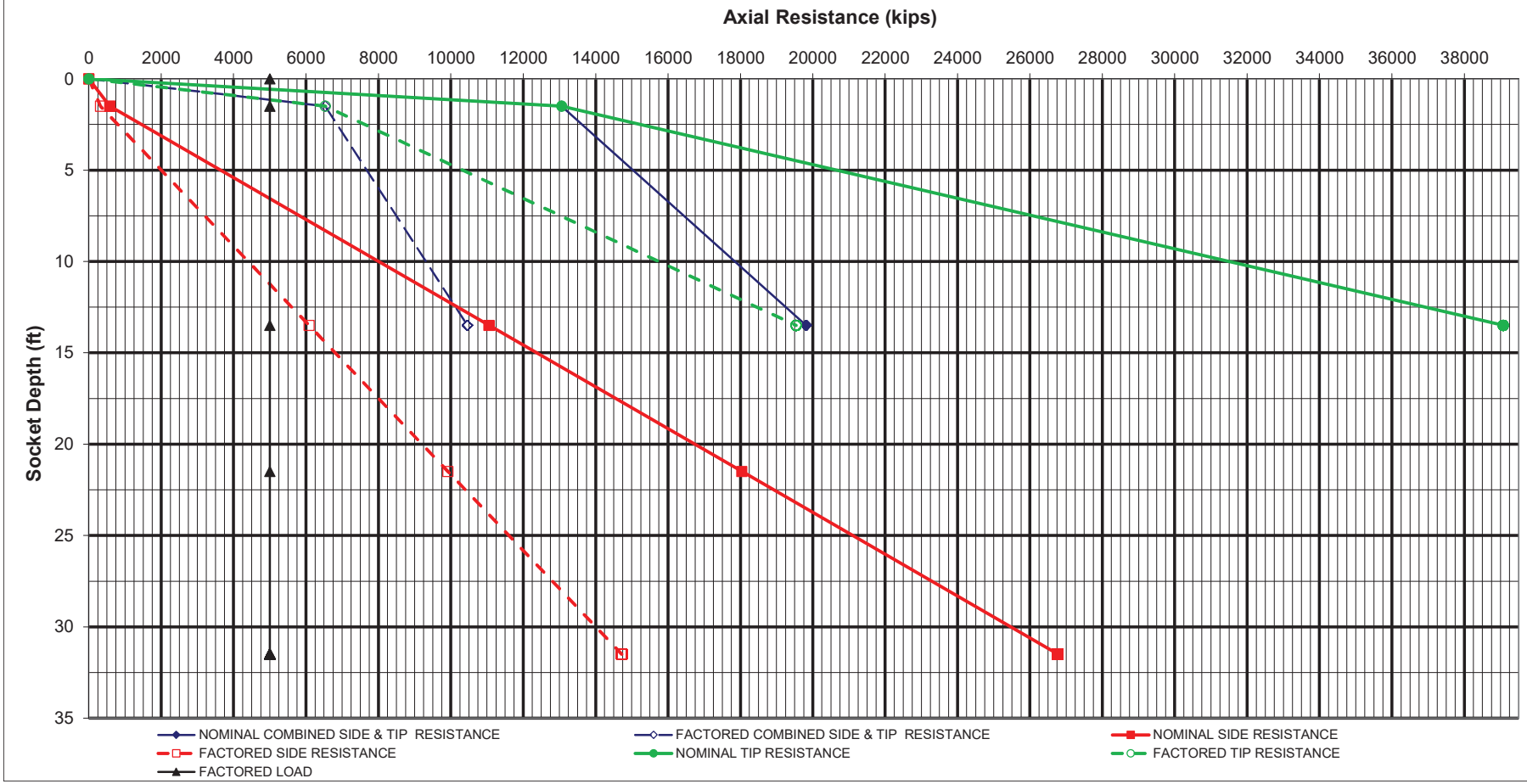
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-53
GROUND SURFACE ELEVATION ========== 414.90 FT
GROUND WATER ELEVATION ========== 410.90 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 338.90 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 5000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
1.50	337.40	1.50	100.0	Limestone	20	Normal	0	Open	No	583	583	321	0	0.000	7.553	1690.9	13064	6532	0.639	1.00	13064	6532	0	0.000	0.639
13.50	325.40	12.00	1770.4	Limestone	50	Normal	63	Open	No	10474	11058	6082	7000	0.181	0.578	1326.8	39074	19537	1.696	0.44	19815	10460	12943	0.229	0.421
21.50	317.40	8.00	1500.0	Limestone	50	Normal	35	Open	No	6983	18041	9922	12129	0.256	0.619										
31.50	307.40	10.00	1172.8	Limestone	60	Normal	89	Open	Yes	8729	26769	14723	19807	0.319	0.573										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-53

Estimated Top of Rock Elevation: 338.90

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
1.5	337.4	9003	4501	TIP	--	--	0.497
13.5	325.4	27024	13512	TIP	--	--	1.545
21.5	317.4	14857	8171	SIDE	10499	0.252	0.523
31.5	307.4	22045	12125	SIDE	17798	0.334	0.493
90 in. Diameter Drilled Shaft							
1.5	337.4	10273	5136	TIP	--	--	0.570
13.5	325.4	30795	15398	TIP	--	--	1.624
21.5	317.4	15918	8755	SIDE	11038	0.253	0.555
31.5	307.4	23620	12991	SIDE	18449	0.327	0.519
96 in. Diameter Drilled Shaft							
1.5	337.4	11627	5813	TIP	--	--	0.582
13.5	325.4	34812	17406	TIP	--	--	1.729
21.5	317.4	16979	9339	SIDE	11582	0.255	0.587
31.5	307.4	25195	13857	SIDE	19120	0.322	0.546
102 in. Diameter Drilled Shaft							
1.5	337.4	13064	6532	TIP	--	--	0.639
13.5	325.4	39074	19537	TIP	--	--	1.696
21.5	317.4	18041	9922	SIDE	12129	0.256	0.619
31.5	307.4	26769	14723	SIDE	19807	0.319	0.573
108 in. Diameter Drilled Shaft							
1.5	337.4	14584	7292	TIP	--	--	0.673
13.5	325.4	43581	21791	TIP	--	--	1.805
21.5	317.4	19102	10506	SIDE	12679	0.258	0.651
31.5	307.4	28344	15589	SIDE	20507	0.316	0.600
120 in. Diameter Drilled Shaft							
1.5	337.4	17876	8938	TIP	--	--	0.713
13.5	325.4	13009	7155	SIDE	8070	0.188	0.665
21.5	317.4	21224	11673	SIDE	13786	0.263	0.714
31.5	307.4	31493	17321	SIDE	21940	0.313	0.656

Illinois Department of Transportation

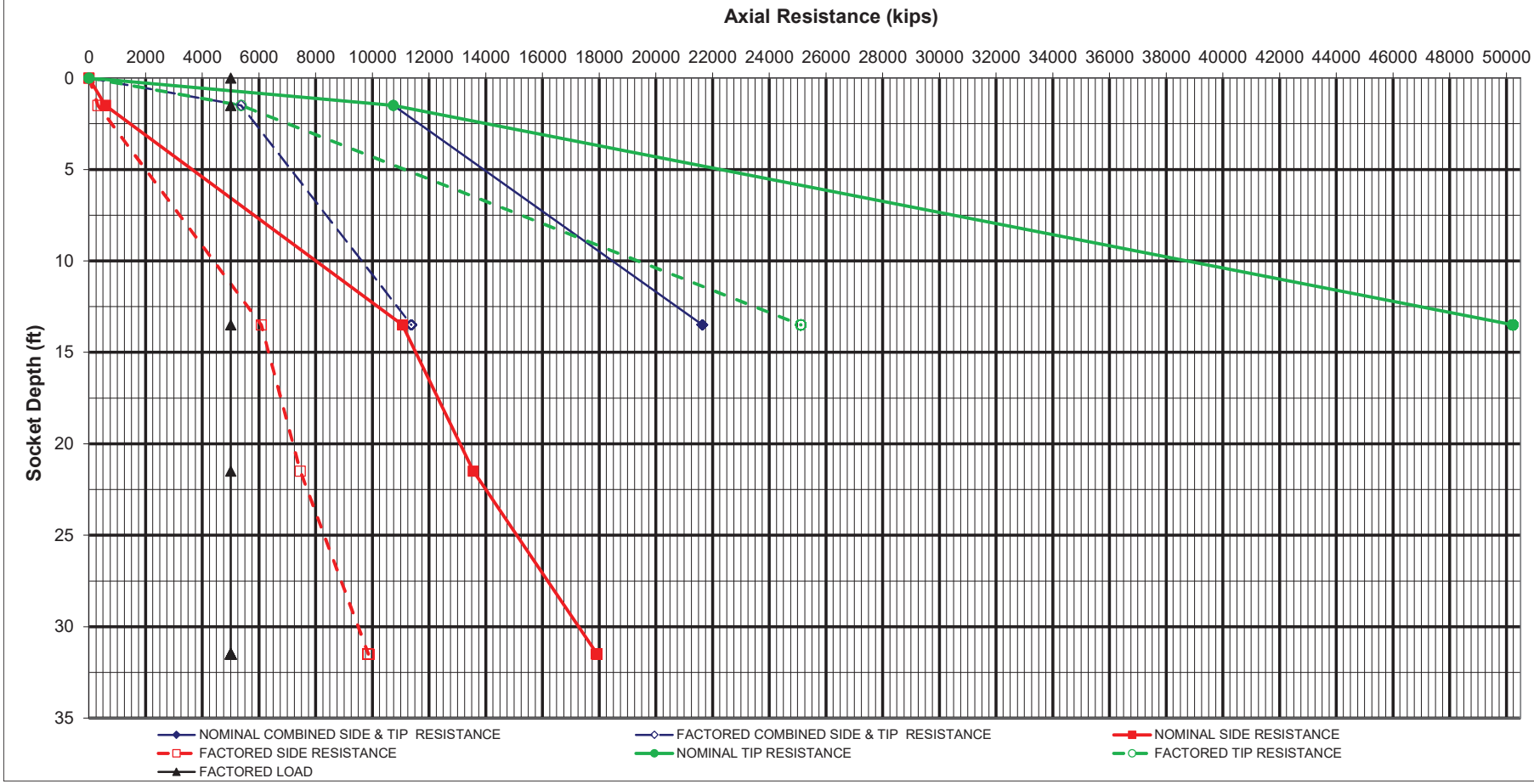
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-54
GROUND SURFACE ELEVATION ========== 413.70 FT
GROUND WATER ELEVATION ========== 409.70 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 336.70 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 5000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
1.50	335.20	1.50	100.0	Limestone	20	Normal	0	Open	No	583	583	321	0	0.000	7.553	1249.7	10737	5369	0.418	1.00	10737	5369	0	0.000	0.418
13.50	323.20	12.00	1228.8	Limestone	55	Normal	85	Open	Yes	10474	11058	6082	5496	0.116	0.643	1443.9	50228	25114	1.960	0.49	21640	11373	9520	0.143	0.453
21.50	315.20	8.00	1300.0	Limestone	55	Fractured	67	Open	No	2496	13554	7455	10168	0.177	0.367										
31.50	305.20	10.00	1571.8	Limestone	60	Fractured	92	Open	Yes	4369	17923	9858	19130	0.278	0.238										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-54

Estimated Top of Rock Elevation: 336.70

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
1.5	335.2	7241	3621	TIP	--	--	0.304
13.5	323.2	33525	16762	TIP	--	--	1.691
21.5	315.2	11162	6139	SIDE	8812	0.176	0.309
31.5	305.2	14760	8118	SIDE	17287	0.296	0.210
90 in. Diameter Drilled Shaft							
1.5	335.2	8330	4165	TIP	--	--	0.369
13.5	323.2	38719	19360	TIP	--	--	1.810
21.5	315.2	11960	6578	SIDE	9261	0.176	0.328
31.5	305.2	15814	8698	SIDE	17882	0.288	0.219
96 in. Diameter Drilled Shaft							
1.5	335.2	9496	4748	TIP	--	--	0.371
13.5	323.2	44287	22143	TIP	--	--	1.954
21.5	315.2	12757	7016	SIDE	9713	0.177	0.348
31.5	305.2	16869	9278	SIDE	18498	0.283	0.228
102 in. Diameter Drilled Shaft							
1.5	335.2	10737	5369	TIP	--	--	0.418
13.5	323.2	50228	25114	TIP	--	--	1.960
21.5	315.2	13554	7455	SIDE	10168	0.177	0.367
31.5	305.2	17923	9858	SIDE	19130	0.278	0.238
108 in. Diameter Drilled Shaft							
1.5	335.2	12055	6028	TIP	--	--	0.443
13.5	323.2	56541	28271	TIP	--	--	2.106
21.5	315.2	14351	7893	SIDE	10626	0.178	0.386
31.5	305.2	18977	10437	SIDE	19776	0.275	0.249
120 in. Diameter Drilled Shaft							
1.5	335.2	14920	7460	TIP	--	--	0.465
13.5	323.2	13009	7155	SIDE	6339	0.120	0.748
21.5	315.2	15946	8770	SIDE	11548	0.181	0.425
31.5	305.2	21086	11597	SIDE	21102	0.271	0.270

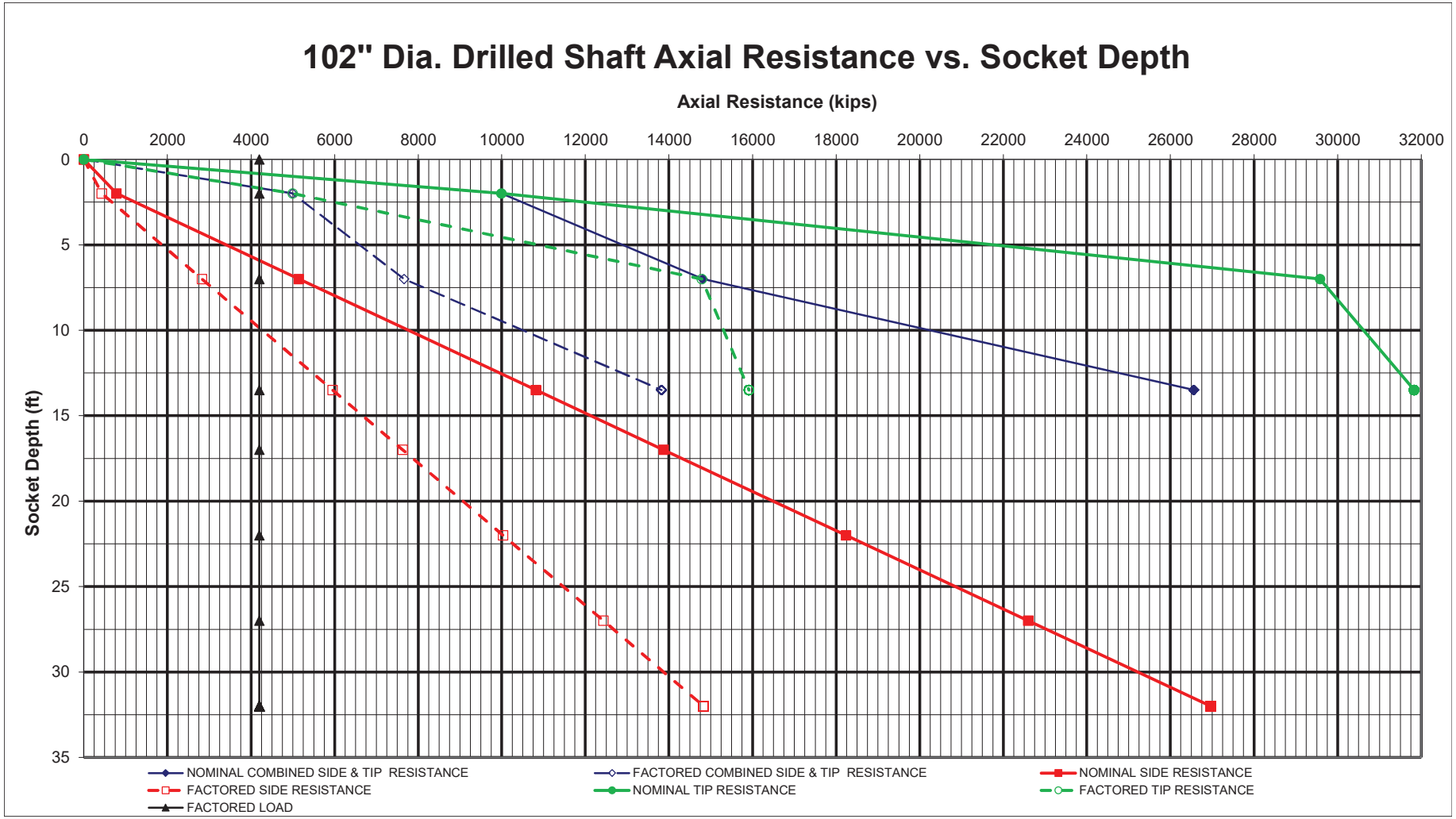
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-55
GROUND SURFACE ELEVATION ========== 410.90 FT
GROUND WATER ELEVATION ========== 406.90 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 332.90 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4200 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
2.00	330.90	2.00	100.0	Limestone	20	Normal	0	Open	No	778	778	428	0	0.000	7.621	1098.7	9990	4995	0.503	1.00	9990	4995	0	0.000	0.527
7.00	325.90	5.00	1703.2	Limestone	50	Normal	68	Open	No	4364	5142	2828	2719	0.098	0.706	981.9	29577	14789	1.571	0.65	14811	7663	4862	0.108	0.521
13.50	319.40	6.50	622.2	Limestone	45	Normal	68	Open	No	5674	10816	5949	4559	0.136	1.119	1267.4	31830	15915	1.580	0.59	26561	13821	7808	0.157	0.836
17.00	315.90	3.50	858.6	Limestone	50	Normal	91	Open	Yes	3055	13871	7629	5878	0.152	1.110										
22.00	310.90	5.00	1556.6	Limestone	55	Normal	91	Open	Yes	4364	18235	10029	8982	0.191	0.900										
27.00	305.90	5.00	930.2	Limestone	50	Normal	60	Open	No	4364	22599	12430	11351	0.223	0.929										
32.00	300.90	5.00	1745.0	Limestone	50	Normal	60	Open	No	4364	26964	14830	15301	0.283	0.869										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
26000
28000
30000
32000
Socket Depth (ft)
0
5
10
15
20
25
30
35
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-55

Estimated Top of Rock Elevation: 332.90

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
2	330.9	6753	3385	SIDE + TIP	220	0.007	0.441
7	325.9	19517	9759	TIP	--	--	1.301
13.5	319.4	20251	10125	TIP	--	--	1.253
17	315.9	28080	14040	TIP	--	--	1.828
22	310.9	15017	8259	SIDE	7673	0.186	0.755
27	305.9	18611	10236	SIDE	9778	0.220	0.783
32	300.9	22206	12213	SIDE	13357	0.286	0.741
90 in. Diameter Drilled Shaft							
2	330.9	7679	3849	SIDE + TIP	198	0.004	0.464
7	325.9	23155	11577	TIP	--	--	1.454
13.5	319.4	23829	11914	TIP	--	--	1.392
17	315.9	32673	16336	TIP	--	--	1.951
22	310.9	16090	8849	SIDE	8108	0.187	0.803
27	305.9	19941	10967	SIDE	10300	0.221	0.832
32	300.9	23792	13085	SIDE	14000	0.285	0.783
96 in. Diameter Drilled Shaft							
2	330.9	8896	4458	SIDE + TIP	167	0.002	0.496
7	325.9	26268	13134	TIP	--	--	1.491
13.5	319.4	27688	13844	TIP	--	--	1.555
17	315.9	13055	7180	SIDE	5569	0.150	1.049
22	310.9	17162	9439	SIDE	8545	0.189	0.852
27	305.9	21270	11699	SIDE	10825	0.222	0.880
32	300.9	25378	13958	SIDE	14648	0.284	0.826
102 in. Diameter Drilled Shaft							
2	330.9	9990	4995	TIP	--	--	0.503
7	325.9	29577	14789	TIP	--	--	1.571
13.5	319.4	31830	15915	TIP	--	--	1.580
17	315.9	13871	7629	SIDE	5878	0.152	1.110
22	310.9	18235	10029	SIDE	8982	0.191	0.900
27	305.9	22599	12430	SIDE	11351	0.223	0.929
32	300.9	26964	14830	SIDE	15301	0.283	0.869
108 in. Diameter Drilled Shaft							
2	330.9	11367	5683	TIP	--	--	0.532
7	325.9	33083	16541	TIP	--	--	1.652
13.5	319.4	36253	18126	TIP	--	--	1.746
17	315.9	14687	8078	SIDE	6188	0.155	1.170
22	310.9	19308	10619	SIDE	9421	0.194	0.948
27	305.9	23929	13161	SIDE	11879	0.224	0.978
32	300.9	28550	15702	SIDE	15957	0.284	0.913
120 in. Diameter Drilled Shaft							
2	330.9	14380	7190	TIP	--	--	0.675
7	325.9	40683	20341	TIP	--	--	1.868
13.5	319.4	12724	6998	SIDE	5300	0.142	1.299
17	315.9	16319	8975	SIDE	6808	0.160	1.290
22	310.9	21453	11799	SIDE	10302	0.198	1.045
27	305.9	26588	14623	SIDE	12940	0.228	1.077
32	300.9	31722	17447	SIDE	17279	0.286	1.002

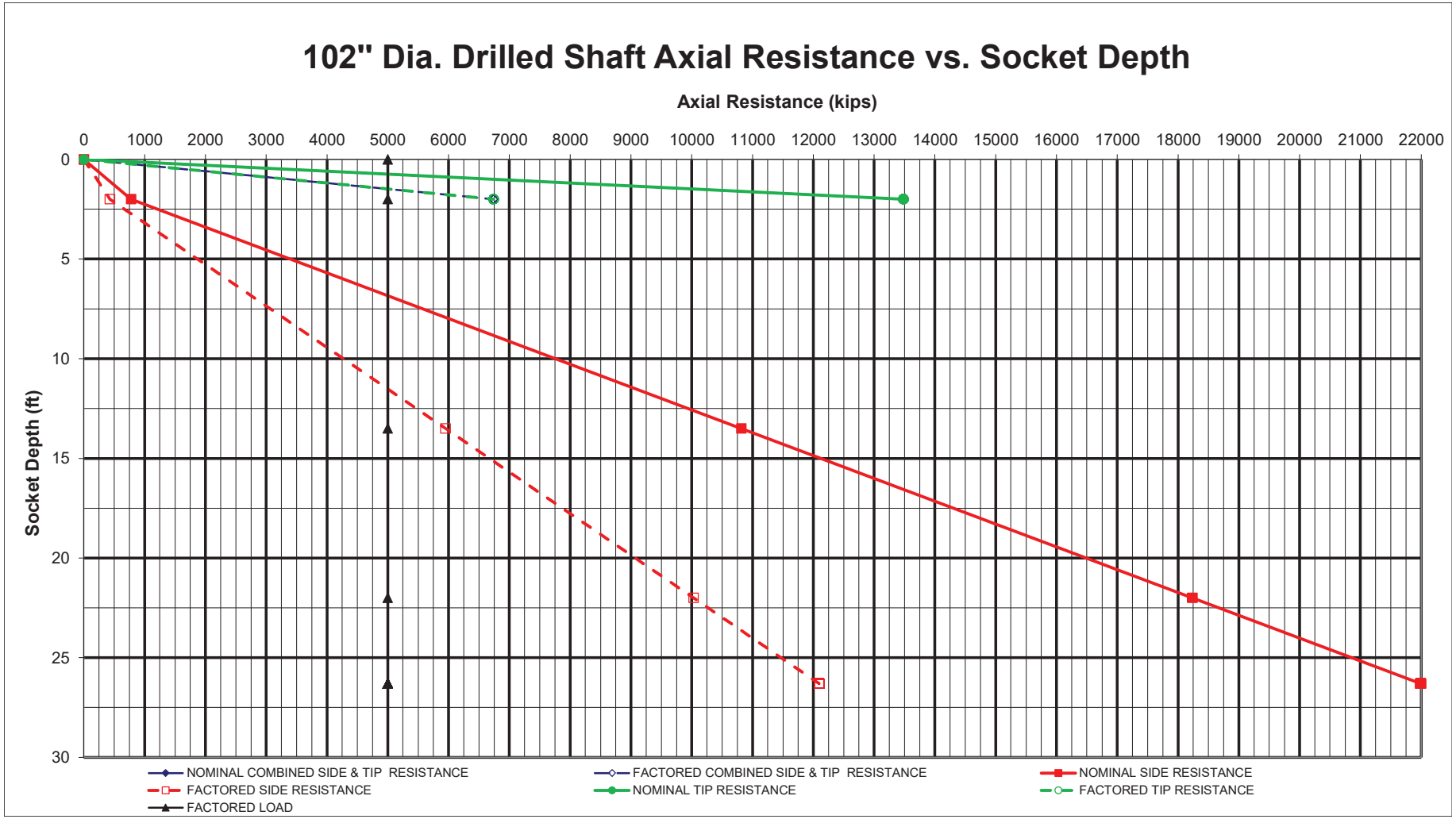
Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-56
GROUND SURFACE ELEVATION ========== 414.00 FT
GROUND WATER ELEVATION ========== 410.00 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 335.50 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 5000 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE							TIP RESISTANCE				COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
2.00	333.50	2.00	100.0	Limestone	20	Normal	0	Open	No	778	778	428	0	0.000	7.621	1729.4	13481	6741	0.595	1.00	13481	6741	0	0.000	0.619
13.50	322.00	11.50	2074.1	Limestone	50	Normal	35	Open	No	10038	10816	5949	7529	0.200	0.514										
22.00	313.50	8.50	1008.8	Limestone	55	Normal	83	Open	Yes	7419	18235	10029	11996	0.234	0.589										
26.30	309.20	4.30	1086.0	Limestone	55	Normal	78	Open	Yes	3753	21988	12094	14683	0.262	0.609										


102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth
Axial Resistance (kips)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
19000
20000
21000
22000
Socket Depth (ft)
0
5
10
15
20
25
30
NOMINAL COMBINED SIDE & TIP RESISTANCE
FACTORED COMBINED SIDE & TIP RESISTANCE
NOMINAL SIDE RESISTANCE
FACTORED SIDE RESISTANCE
NOMINAL TIP RESISTANCE
FACTORED TIP RESISTANCE
FACTORED LOAD

Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-56

Estimated Top of Rock Elevation: 335.50

SOCKET DEPTH (FT)	*TIP ELEV. (FT)*	*NOMINAL SHAFT RESIST. (KIPS)*	*FACTORED SHAFT RESIST. (KIPS)*	*RESIST. METHOD*	*SETTLEMENT DATA*		
					Q_{C1} *(KIPS)*	w_{C1} *(IN.)*	w_{Rn} *(IN.)*
84 in. Diameter Drilled Shaft							
2	333.5	9869	4944	SIDE + TIP	236	0.007	0.559
13.5	322	8907	4899	SIDE	6393	0.192	0.436
22	313.5	15017	8259	SIDE	10416	0.232	0.497
26.3	309.2	18108	9959	SIDE	12897	0.265	0.517
90 in. Diameter Drilled Shaft							
2	333.5	11081	5550	SIDE + TIP	209	0.004	0.579
13.5	322	9543	5249	SIDE	6771	0.195	0.462
22	313.5	16090	8849	SIDE	10938	0.232	0.528
26.3	309.2	19402	10671	SIDE	13484	0.264	0.547
96 in. Diameter Drilled Shaft							
2	333.5	12359	6190	SIDE + TIP	172	0.002	0.599
13.5	322	10179	5599	SIDE	7150	0.198	0.488
22	313.5	17162	9439	SIDE	11465	0.233	0.558
26.3	309.2	20695	11382	SIDE	14080	0.263	0.578
102 in. Diameter Drilled Shaft							
2	333.5	13481	6741	TIP	--	--	0.595
13.5	322	10816	5949	SIDE	7529	0.200	0.514
22	313.5	18235	10029	SIDE	11996	0.234	0.589
26.3	309.2	21988	12094	SIDE	14683	0.262	0.609
108 in. Diameter Drilled Shaft							
2	333.5	14880	7440	TIP	--	--	0.614
13.5	322	11452	6299	SIDE	7910	0.203	0.540
22	313.5	19308	10619	SIDE	12531	0.235	0.620
26.3	309.2	23282	12805	SIDE	15292	0.263	0.640
120 in. Diameter Drilled Shaft							
2	333.5	17874	8937	TIP	--	--	0.737
13.5	322	12724	6998	SIDE	8672	0.208	0.590
22	313.5	21453	11799	SIDE	13607	0.239	0.681
26.3	309.2	25869	14228	SIDE	16522	0.264	0.703

Illinois Department of Transportation

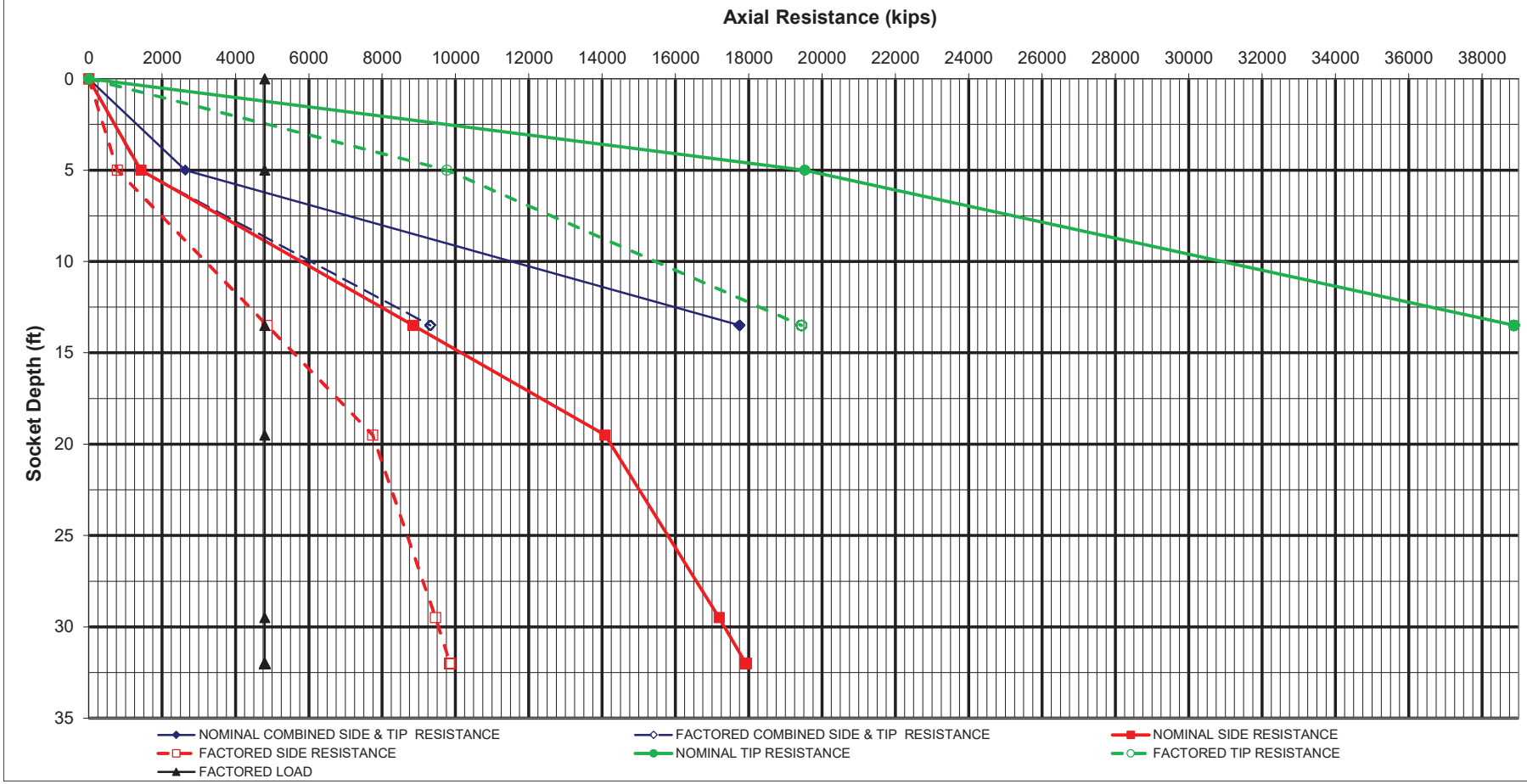
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-57
GROUND SURFACE ELEVATION ========== 412.90 FT
GROUND WATER ELEVATION ========== 408.90 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 332.40 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4800 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
5.00	327.40	5.00	900.0	Limestone	40	Fractured	30	Open	No	1418	1418	780	1637	0.074	#####	900.0	19530	9765	0.795	0.46	2634	1388	3589	0.080	0.044
13.50	318.90	8.50	800.0	Limestone	55	Normal	60	Open	Yes	7419	8838	4861	4533	0.106	0.635	1050.0	38871	19436	1.918	0.50	17748	9316	7118	0.122	0.475
19.50	312.90	6.00	1000.0	Limestone	55	Normal	91	Open	Yes	5237	14075	7741	7224	0.139	0.673										
29.50	302.90	10.00	1000.0	Limestone	50	Fractured	60	Open	Yes	3121	17196	9458	12212	0.212	0.476										
32.00	300.40	2.50	1850.0	Limestone	50	Fractured	33	Open	No	720	17915	9854	14315	0.244	0.416										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-57

Estimated Top of Rock Elevation: 332.40

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
5	327.4	13015	6507	TIP	--	--	0.607
13.5	318.9	96211	48106	TIP	--	--	5.946
19.5	312.9	11591	6375	SIDE	6159	0.135	0.562
29.5	302.9	14161	7789	SIDE	10597	0.213	0.405
32	300.4	14754	8115	SIDE	12510	0.248	0.357
90 in. Diameter Drilled Shaft							
5	327.4	15041	7520	TIP	--	--	0.679
13.5	318.9	110447	55223	TIP	--	--	6.369
19.5	312.9	12419	6831	SIDE	6513	0.136	0.599
29.5	302.9	15173	8345	SIDE	11132	0.212	0.429
32	300.4	15808	8694	SIDE	13108	0.246	0.376
96 in. Diameter Drilled Shaft							
5	327.4	17213	8606	TIP	--	--	0.760
13.5	318.9	125664	62832	TIP	--	--	6.817
19.5	312.9	13247	7286	SIDE	6868	0.138	0.636
29.5	302.9	16184	8901	SIDE	11671	0.212	0.452
32	300.4	16862	9274	SIDE	13710	0.245	0.396
102 in. Diameter Drilled Shaft							
5	327.4	19530	9765	TIP	--	--	0.795
13.5	318.9	38871	19436	TIP	--	--	1.918
19.5	312.9	14075	7741	SIDE	7224	0.139	0.673
29.5	302.9	17196	9458	SIDE	12212	0.212	0.476
32	300.4	17915	9854	SIDE	14315	0.244	0.416
108 in. Diameter Drilled Shaft							
5	327.4	21994	10997	TIP	--	--	0.878
13.5	318.9	45060	22530	TIP	--	--	2.147
19.5	312.9	14903	8197	SIDE	7580	0.141	0.709
29.5	302.9	18207	10014	SIDE	12755	0.212	0.500
32	300.4	18969	10433	SIDE	14925	0.244	0.436
120 in. Diameter Drilled Shaft							
5	327.4	27360	13680	TIP	--	--	0.969
13.5	318.9	10397	5719	SIDE	5254	0.110	0.738
19.5	312.9	16559	9107	SIDE	8296	0.144	0.783
29.5	302.9	20230	11127	SIDE	13848	0.214	0.549
32	300.4	21077	11592	SIDE	16151	0.245	0.476

Illinois Department of Transportation

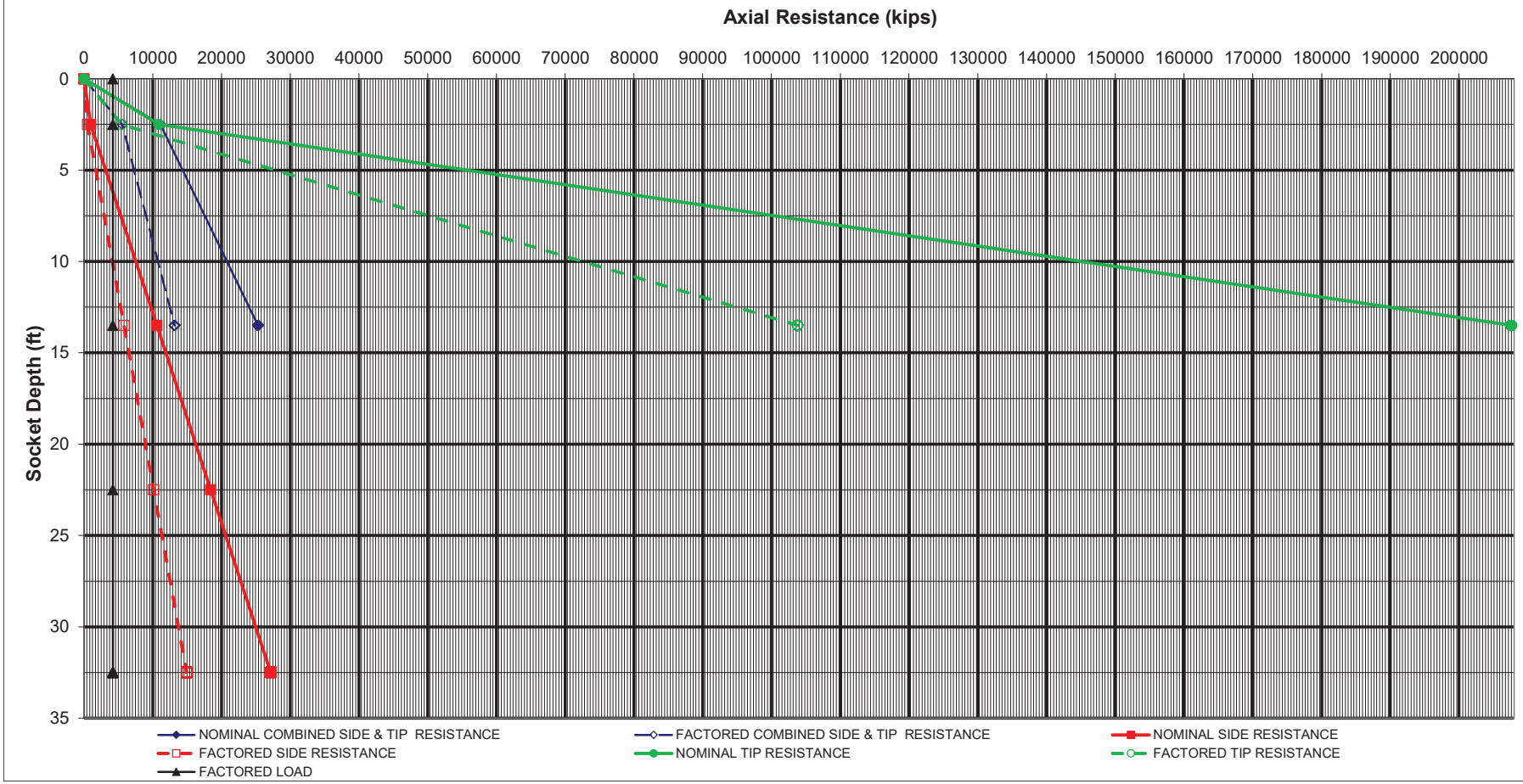
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-58
GROUND SURFACE ELEVATION ========== 413.20 FT
GROUND WATER ELEVATION ========== 409.20 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 334.70 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4200 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

										SIDE RESISTANCE						AVG. q_u	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)	W/IN 2 - SHAFT DIA. (KSF)	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT Q_{C1} (KIPS)	SETTLEMENT w_{C1} (IN.)	SETTLEMENT w_{Rn} (IN.)
2.50	332.20	2.50	100.0	Limestone	20	Normal	0	Open	No	972	972	535	185	0.009	7.673	1232.0	10861	5430	0.443	0.98	11116	5571	403	0.009	0.468
13.50	321.20	11.00	1349.0	Limestone	50	Normal	37	Open	No	9602	10574	5816	5275	0.145	0.827	1463.2	207580	103790	7.478	0.58	25302	13180	10791	0.183	0.563
22.50	312.20	9.00	1017.6	Limestone	60	Normal	95	Open	Yes	7856	18430	10136	9805	0.173	0.681										
32.50	302.20	10.00	1964.6	Limestone	60	Normal	75	Open	Yes	8729	27158	14937	20152	0.297	0.526										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-58

Estimated Top of Rock Elevation: 334.70

SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
2.5	332.2	7756	3889	SIDE + TIP	428	0.015	0.419
13.5	321.2	130445	65222	TIP	--	--	5.921
22.5	312.2	15177	8347	SIDE	8468	0.171	0.571
32.5	302.2	22366	12301	SIDE	18250	0.316	0.455
90 in. Diameter Drilled Shaft							
2.5	332.2	8810	4416	SIDE + TIP	430	0.014	0.435
13.5	321.2	154228	77114	TIP	--	--	6.473
22.5	312.2	16261	8944	SIDE	8911	0.172	0.608
32.5	302.2	23963	13180	SIDE	18863	0.308	0.478
96 in. Diameter Drilled Shaft							
2.5	332.2	9929	4977	SIDE + TIP	422	0.012	0.451
13.5	321.2	179939	89970	TIP	--	--	7.047
22.5	312.2	17345	9540	SIDE	9357	0.172	0.644
32.5	302.2	25561	14058	SIDE	19498	0.301	0.502
102 in. Diameter Drilled Shaft							
2.5	332.2	11116	5571	SIDE + TIP	403	0.009	0.468
13.5	321.2	207580	103790	TIP	--	--	7.478
22.5	312.2	18430	10136	SIDE	9805	0.173	0.681
32.5	302.2	27158	14937	SIDE	20152	0.297	0.526
108 in. Diameter Drilled Shaft							
2.5	332.2	12368	6197	SIDE + TIP	372	0.007	0.484
13.5	321.2	48272	24136	TIP	--	--	1.638
22.5	312.2	19514	10732	SIDE	10255	0.174	0.718
32.5	302.2	28756	15816	SIDE	20821	0.293	0.551
120 in. Diameter Drilled Shaft							
2.5	332.2	15073	7551	SIDE + TIP	275	0.002	0.517
13.5	321.2	12440	6842	SIDE	6115	0.151	0.958
22.5	312.2	21682	11925	SIDE	11160	0.177	0.792
32.5	302.2	31951	17573	SIDE	22196	0.288	0.603

Illinois Department of Transportation

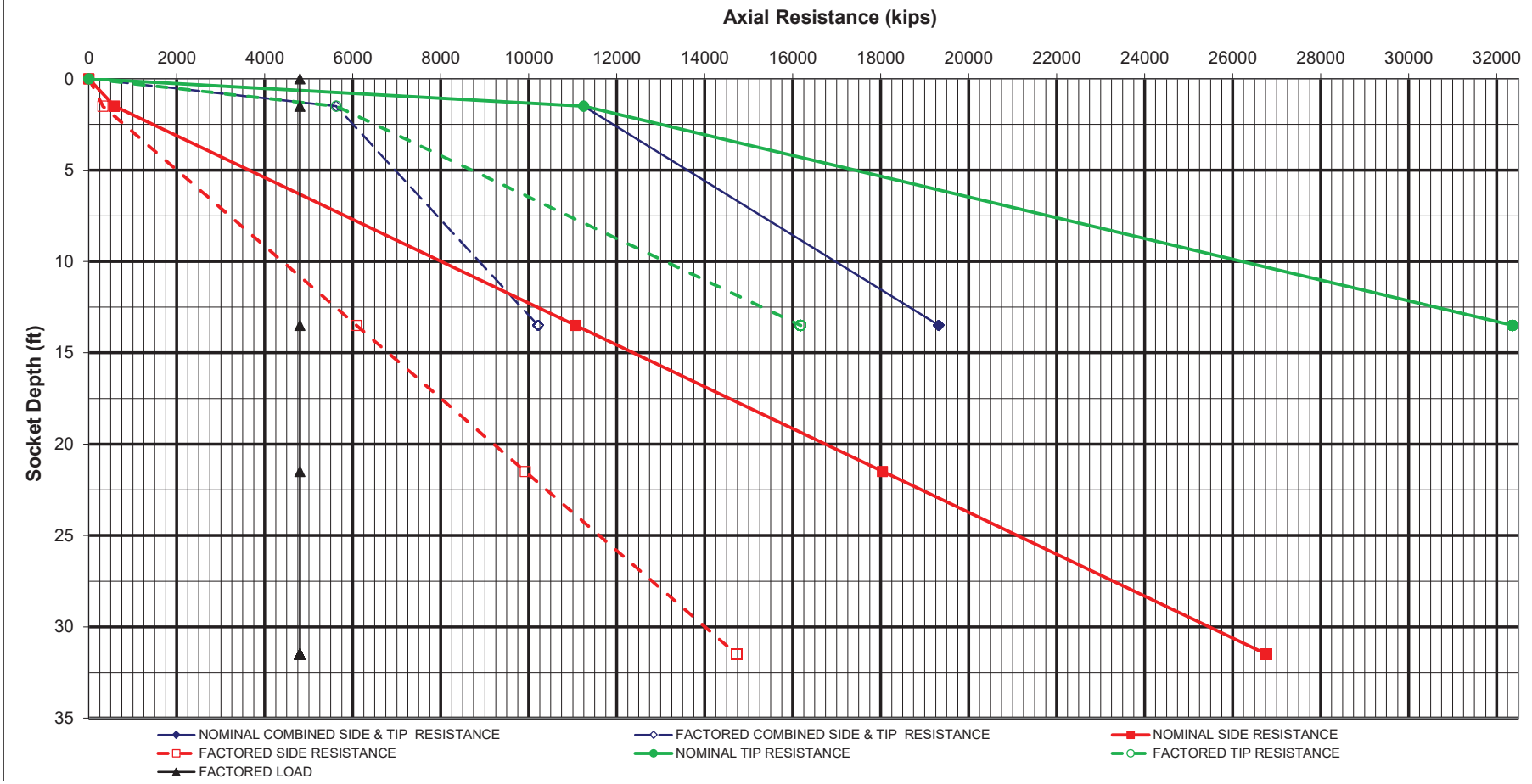
DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

STRUCTURE ========== SN 060-0350
SUBSTRUCTURE & REFERENCE BORING ======= BB-59
GROUND SURFACE ELEVATION ========== 412.30 FT
GROUND WATER ELEVATION ========== 408.30 FT
ESTIMATED TOP OF ROCK ELEVATION ========= 333.80 FT
DRILLED SHAFT DIAMETER IN ROCK ========== 102 IN.
FACTORED AXIAL LOAD ========== 4800 KIPS
DRILLED SHAFT CONCRETE STRENGTH, f'c ===== 3.5 KSI

FOUNDATION REDUNDANCY ==== REDUNDANT

SOCKET DEPTH (FT)	TIP ELEV. (FT)	LAYER THICK. (FT)	UNCONFINED COMPRESSIVE STRENGTH (q_u) (KSF)	ROCK TYPE	GSI	ROCK CONDITION	RQD (%)	JOINT TYPE	ROCK INTACT OR TIGHTLY JOINTED?	SIDE RESISTANCE						AVG. q_u W/IN 2 - SHAFT DIA. (KSF)	TIP RESISTANCE			COMBINED SIDE & TIP RESISTANCE					
										NOM. RESIST. (KIPS)	Σ NOM. RESIST. (KIPS)	Σ FACT. RESIST. (KIPS)	SETTLEMENT				NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTL. w_{Rn} (IN.)	R_P/R_n	NOM. RESIST. (KIPS)	FACT. RESIST. (KIPS)	SETTLEMENT		
													Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)							Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
1.50	332.30	1.50	100.0	Limestone	20	Normal	0	Open	No	583	583	321	0	0.000	7.553	1329.9	11248	5624	0.709	1.00	11248	5624	0	0.000	0.709
13.50	320.30	12.00	1242.6	Limestone	50	Normal	75	Open	Yes	10474	11058	6082	5401	0.140	0.813	1038.4	32359	16180	2.434	0.43	19321	10213	7622	0.155	0.665
21.50	312.30	8.00	1539.3	Limestone	35	Normal	11	Open	No	6983	18041	9922	9943	0.254	0.952										
31.50	302.30	10.00	593.2	Limestone	50	Normal	82	Open	Yes	8729	26769	14723	13605	0.280	1.083										

102" Dia. Drilled Shaft Axial Resistance vs. Socket Depth



Illinois Department of Transportation

DRILLED SHAFT AXIAL CAPACITY IN ROCK - DOLOMITE, LIMESTONE, SANDSTONE, AND HARD SHALE

Drilled Shaft Design Table for BB-59

Estimated Top of Rock Elevation: 333.80

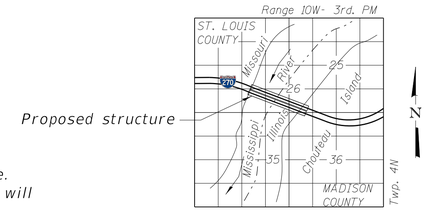
SOCKET DEPTH (FT)	TIP ELEV. (FT)	NOMINAL SHAFT RESIST. (KIPS)	FACTORED SHAFT RESIST. (KIPS)	RESIST. METHOD	SETTLEMENT DATA		
					Q_{C1} (KIPS)	w_{C1} (IN.)	w_{Rn} (IN.)
84 in. Diameter Drilled Shaft							
1.5	332.3	7459	3729	TIP	--	--	0.467
13.5	320.3	23500	11750	TIP	--	--	2.343
21.5	312.3	14857	8171	SIDE	8472	0.244	0.802
31.5	302.3	22045	12125	SIDE	11745	0.278	0.918
90 in. Diameter Drilled Shaft							
1.5	332.3	8636	4318	TIP	--	--	0.574
13.5	320.3	26305	13153	TIP	--	--	2.400
21.5	312.3	15918	8755	SIDE	8961	0.247	0.852
31.5	302.3	23620	12991	SIDE	12362	0.278	0.973
96 in. Diameter Drilled Shaft							
1.5	332.3	9899	4949	TIP	--	--	0.619
13.5	320.3	29258	14629	TIP	--	--	2.485
21.5	312.3	16979	9339	SIDE	9451	0.251	0.902
31.5	302.3	25195	13857	SIDE	12983	0.279	1.027
102 in. Diameter Drilled Shaft							
1.5	332.3	11248	5624	TIP	--	--	0.709
13.5	320.3	32359	16180	TIP	--	--	2.434
21.5	312.3	18041	9922	SIDE	9943	0.254	0.952
31.5	302.3	26769	14723	SIDE	13605	0.280	1.083
108 in. Diameter Drilled Shaft							
1.5	332.3	12682	6341	TIP	--	--	0.777
13.5	320.3	35608	17804	TIP	--	--	2.526
21.5	312.3	19102	10506	SIDE	10436	0.258	1.001
31.5	302.3	28344	15589	SIDE	14229	0.282	1.138
120 in. Diameter Drilled Shaft							
1.5	332.3	15808	7904	TIP	--	--	0.886
13.5	320.3	13009	7155	SIDE	6254	0.146	0.942
21.5	312.3	21224	11673	SIDE	11425	0.265	1.100
31.5	302.3	31493	17321	SIDE	15484	0.286	1.250

APPENDIX G
TSL

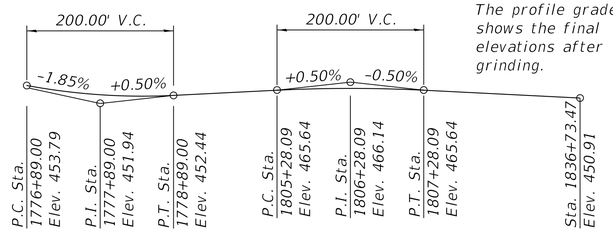
APPENDIX G
TSL

Benchmark:
BM2316-4: Cut "□" on Southwest corner of South wing wall at the West end of the Old Chain of Rocks Bridge over the Mississippi River (Missouri). Elev. 439.761'
BM2316-5: RR spike in power pole at the Northwest corner of Riverview Drive and Coal Bank Road (Missouri). Elev. 430.055'
Existing Structure: SN 060-0035 Steel girder and concrete slab superstructure bridge on piers. Approximately in line with Westbound structure. Approximately 5411.0' long by 62'-9" wide. Constructed in 1966. To be removed after proposed EB Structure No. 060-0350 is complete.
Traffic Control: none
No Salvage

Notes:
All Elevations are given in NAVD 1988 Datum unless noted.
NAVD 1988 = NGVD 1929 - 0.20'.
EWSE = Estimated Water Surface Elevation.
HWE = High Water Elevation.
For ground elevations see Sheet 8.
⊕ Denotes soil boring.
Proposed lighting unit: 50 ft. aluminum pole, 15" bolt circle diameter, mounted on bridge parapet wall.
Lighting unit is subject to refinement during the design phase.
Estimated Top of Rock Elevations shown at the substructures will be subject to refinement during final design.
Ripap shall be capped with 2" stone for drivability. Location to be determined during final design.



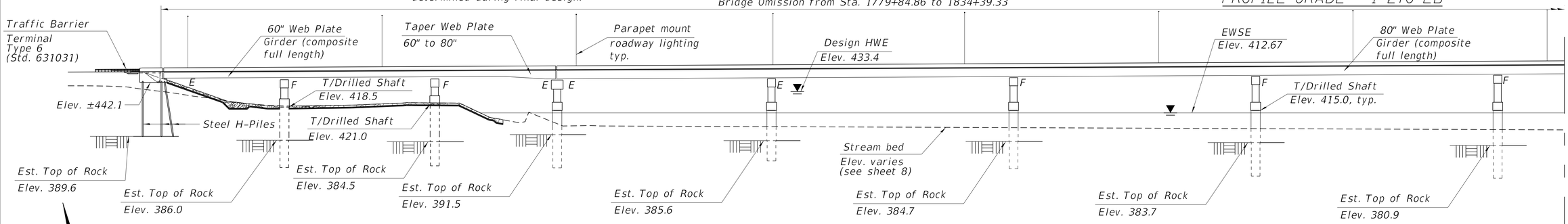
LOCATION SKETCH



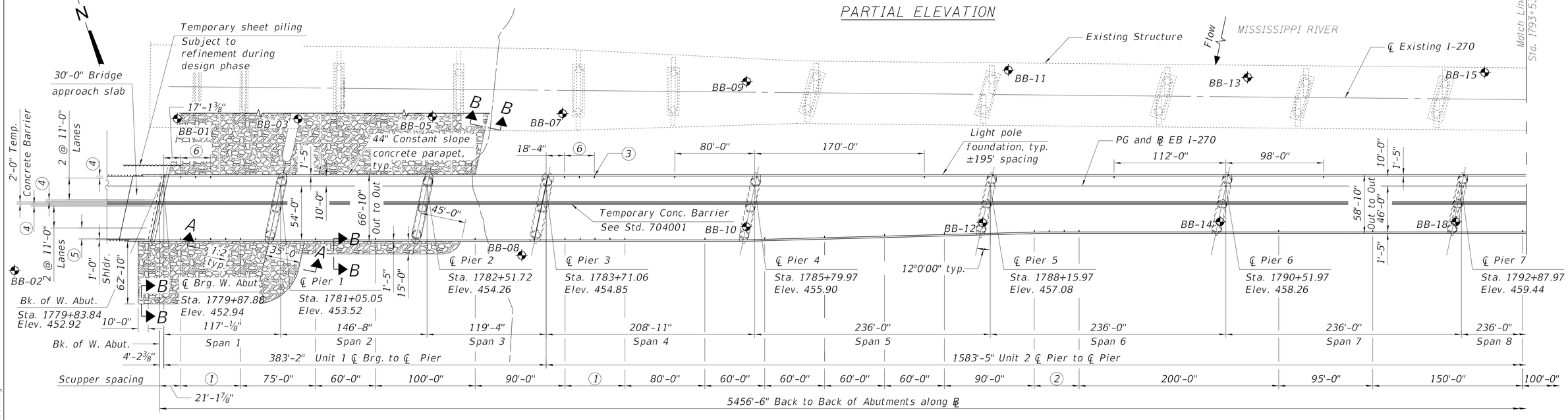
The profile grade shows the final elevations after grinding.

PROFILE GRADE - I-270 EB

Bridge Omission from Sta. 1779+84.86 to 1834+39.33



PARTIAL ELEVATION



PARTIAL PLAN

(1) 4 spaces at 15'-0" centers
(2) 3 spaces at 15'-0" centers
(3) DS-11 Scupper, typ. UNO
(4) 2'-0" Shldr.
(5) 11'-0" Ent. Ramp Lane
(6) 2 spaces at 15'-0" centers

HIGHWAY CLASSIFICATION

I-270 (FAI 270)
Functional Class: Interstate
ADT: 44,600(2019); 58,000(2045)
ADTT: 8,000(2019); 10,440(2045)
DHV: 4,080
Design Speed: 60 m.p.h.
Posted Speed: 60 m.p.h.
Two-Way Traffic
Directional Distribution: 50/50

DESIGN STRESSES

FIELD UNITS

f'c = 4,000 psi (Substructure)
f'c = 4,000 psi (Superstructure)
f'c = 5,000 psi (Drilled Shafts)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.
2,500 yr Seismic Design Earthquake
Importance Factor for Strength Load Combinations = 1.05

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

GENERAL PLAN & ELEVATION - 1
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 1806+89.23
STRUCTURE NO. 060-0350 (EB)

HORNER & SHIFRIN
Teaming with: PARSONS

USER NAME =	DESIGNED - TMB	REVISED -	
	CHECKED - RAM	REVISED -	
PLOT SCALE =	DRAWN - TMB	REVISED -	
PLOT DATE =	CHECKED - JAB	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 8 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
	ILLINOIS FED. AID PROJECT			

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Notes:
All Elevations are given in NAVD 1988 Datum unless noted.
EWSE = Estimated Water Surface Elevation.
HWE = High Water Elevation.
For ground elevations see Sheet 8.
Denotes soil boring.

Notes (continued):
Proposed lighting unit: 50 ft. aluminum pole, 15" bolt circle diameter, mounted on bridge parapet wall.
Lighting unit is subject to refinement during the design phase.
Estimated Top of Rock Elevations shown at the substructures will be subject to refinement during final design.

(1) DS-11 Scupper, typ., U.N.O.

(2) 3 Spaces at 15'-0" centers

(3) Space 6" diameter free fall floor drains at 15'-0" centers from Station 1805+70.00 to 1806+75.00. Omit drains that are within 10'-0" from the face of Pier 13. At other locations, use DS-11 scupper.

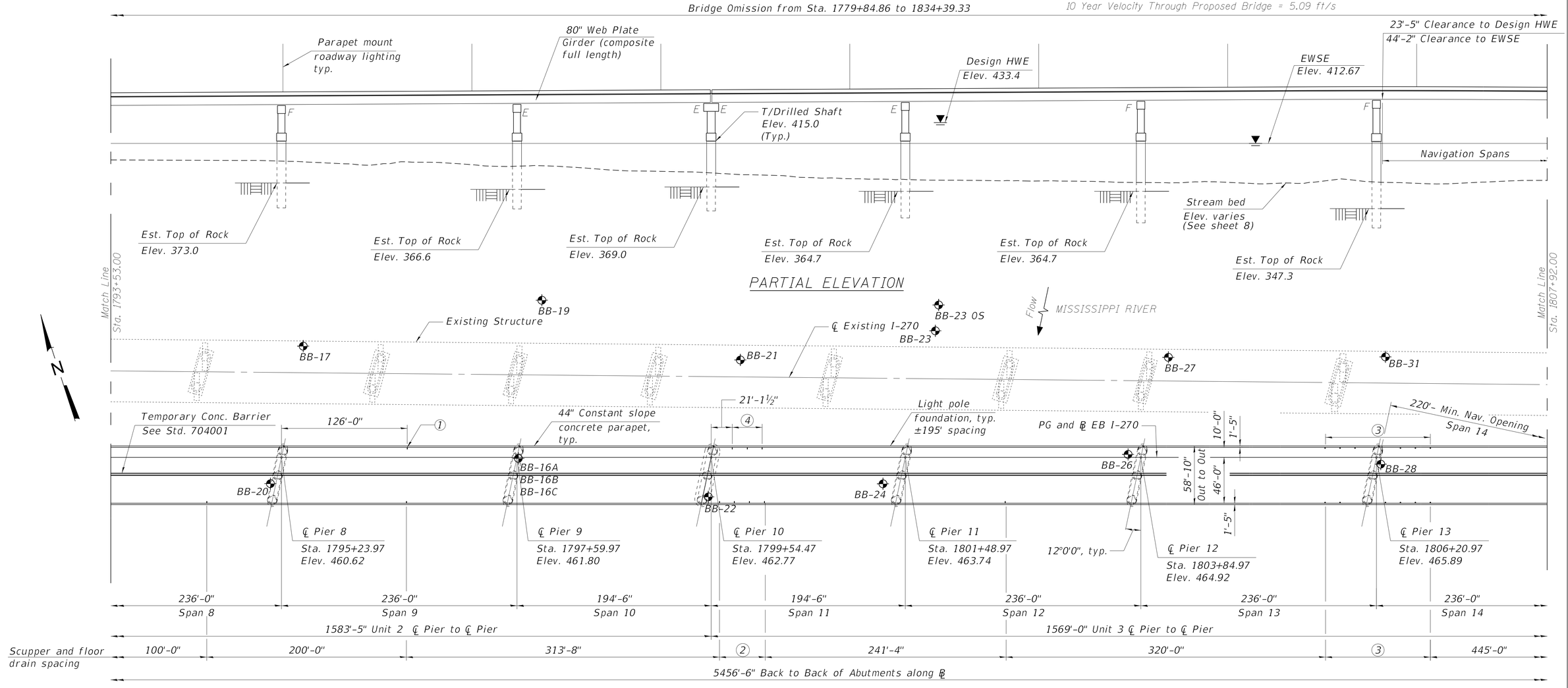
(4) 2 Spaces at 15'-0" centers

WATERWAY INFORMATION

Drainage Area = 697,000 sq. mi. Low Grade Elev. 452.24 @ Sta. 1834+07.67

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.
Ten-Year	10	777,656	144,867	152,761	426.3	0.1	0.0	426.4	426.3
Design	50	984,883	179,011	188,351	433.3	0.1	0.1	433.4	433.4
Base	100	1.067M	188,974	198,694	435.4	0.2	0.1	435.6	435.5
Scour Design Check	200	1.146M	201,158	211,492	437.8	0.2	0.2	438.0	438.0
Max. Calc.	500	1.247M	211,346	221,832	439.9	0.2	0.2	440.1	440.1

10 Year Velocity Through Existing Bridge = 5.37 ft/s
10 Year Velocity Through Proposed Bridge = 5.09 ft/s



PARTIAL PLAN

DESIGN SCOUR ELEVATION TABLE

Design Scour Elevation (ft.)	West Abut.	Pier 1	Pier 2	Pier 3	Pier 4	Pier 5	Pier 6	Pier 7	Pier 8	Pier 9	Pier 10	Pier 11	Pier 12	Pier 13
Q100	442.1	386.0	384.5	391.5	385.6	384.7	383.7	380.9	373.0	366.6	369.0	364.7	364.7	347.3
Q200	442.1	386.0	384.5	391.5	385.6	384.7	383.7	380.9	373.0	366.6	369.0	364.7	364.7	347.3

Design Scour Elevation (ft.)	Pier 14	Pier 15	Pier 16	Pier 17	Pier 18	Pier 19	Pier 20	Pier 21	Pier 22	Pier 23	Pier 24	Pier 25	East Abut.	Item 113
Q100	342.7	340.7	349.0	343.6	345.0	381.2	381.2	381.2	381.2	381.2	381.2	381.2	440.5	
Q200	342.7	340.7	349.0	343.6	345.0	371.8	371.8	371.8	371.8	371.8	371.8	371.8	440.5	5

GENERAL PLAN & ELEVATION - 2
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 1806+89.23
STRUCTURE NO. 060-0350 (EB)

HORNER & SHIFRIN
Teaming with: PARSONS

USER NAME =		DESIGNED - TMB	REVISED -
		CHECKED - RAM	REVISED -
PLOT SCALE =		DRAWN - TMB	REVISED -
PLOT DATE =		CHECKED - JAB	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 8 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
		ILLINOIS FED. AID PROJECT		

MODEL: Default
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Notes:
All Elevations are given in NAVD 1988 Datum unless noted.
EWSE = Estimated Water Surface Elevation.
HWE = High Water Elevation.
For ground elevations see Sheet 8.
Denotes soil boring.

Notes (continued):
Proposed lighting unit: 50 ft. aluminum pole, 15" bolt circle diameter, mounted on bridge parapet wall.
Lighting unit is subject to refinement during the design phase.
Estimated Top of Rock Elevations shown at the substructures will be subject to refinement during final design.

(1) DS-11 Scupper, typ., U.N.O.

(2) 2 Spaces at 15'-0" centers

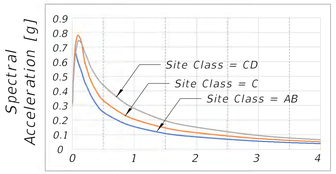
(3) 3 Spaces at 15'-0" centers

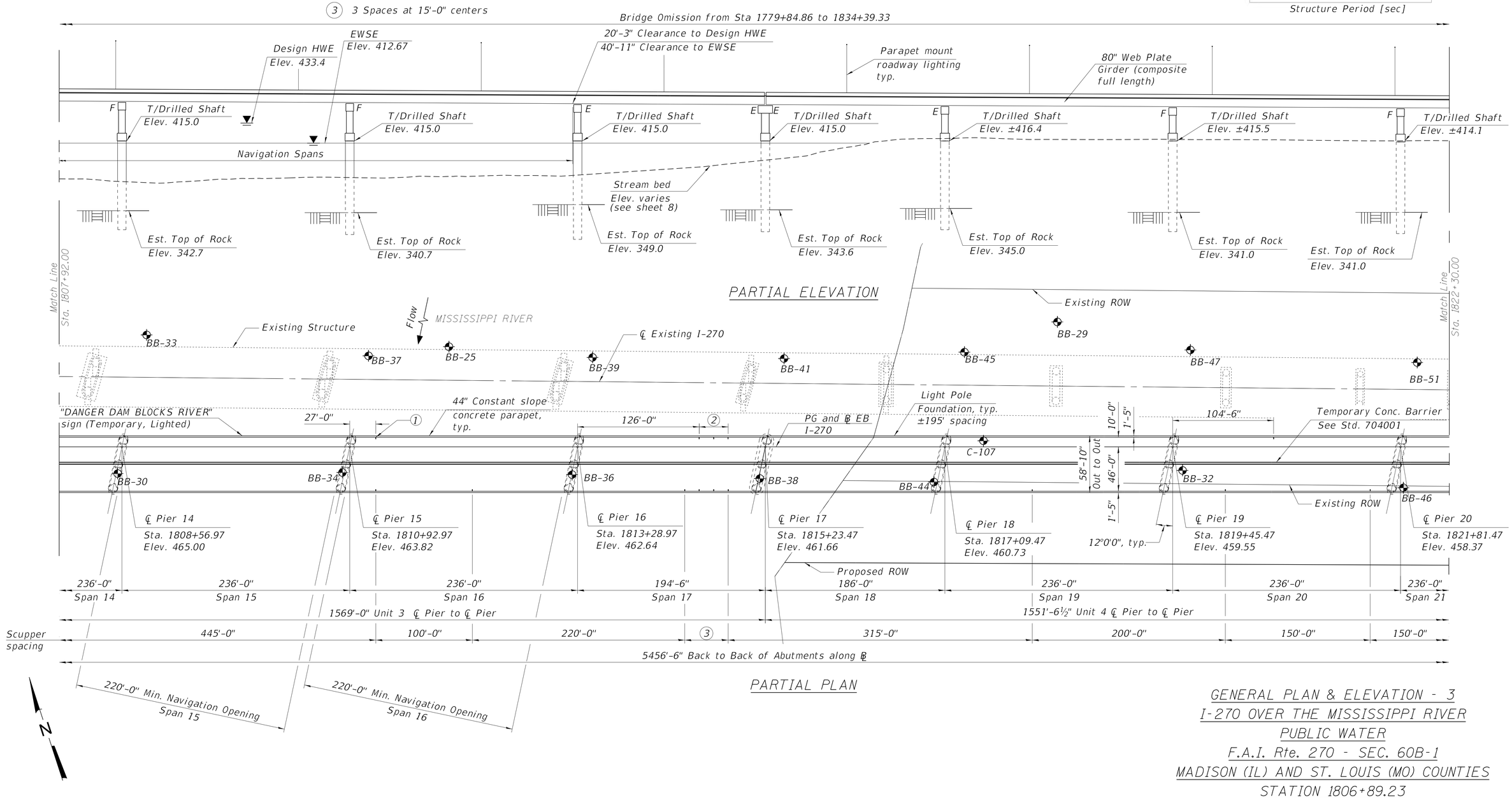
SEISMIC DATA

Seismic Performance Zone (SPZ) = 2
Operational Classification: Critical

Seismic Data based on Site-Specific Data			
	West Abut. Piers 1-3	Piers 4-16	Piers 17-25 East Abut.
Site Class	C	AB	CD
Design Spectral Acceleration at 1.0 sec, S_{D1} [g]	0.204	0.153	0.279
Design Spectral Acceleration at 0.2 sec, S_{DS} [g]	0.608	0.465	0.668

SITE - SPECIFIC UNIFORM HAZARD SPECTRA





GENERAL PLAN & ELEVATION - 3
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 1806+89.23
STRUCTURE NO. 060-0350 (EB)

HORNER & SHIFRIN
Teaming with: PARSONS

USER NAME =	DESIGNED - TMB	REVISED -
	CHECKED - RAM	REVISED -
PLOT SCALE =	DRAWN - TMB	REVISED -
PLOT DATE =	CHECKED - JAB	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 3 OF 8 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
		ILLINOIS FED. AID PROJECT		

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Notes:
All Elevations are given in NAVD 1988 Datum unless noted.
EWSE = Estimated Water Surface Elevation.
HWE = High Water Elevation.
For ground elevations see Sheet 8.
Denotes soil boring.

Notes (continued):
Proposed lighting unit: 50 ft. aluminum pole, 15" bolt circle diameter, mounted on bridge parapet wall.
Lighting unit is subject to refinement during the design phase.
Estimated Top of Rock Elevations shown at the substructures will be subject to refinement during final design.

(1) DS-11 Scupper, typ., U.N.O.

(2) 3 Spaces at 15'-0" centers

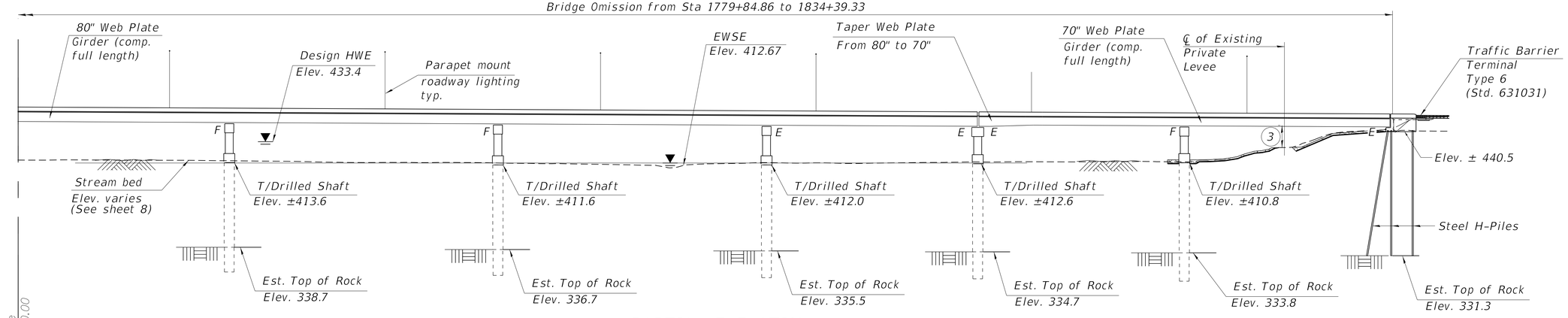
(3) Min. Clr. 18'-6"±

(4) Riprap slope varies. Max at 1V:2H at right angles

(5) Riprap placed on existing west face of levee. Approxmiate slope 1V:2H at right angles to existing levee

(6) Point of minimum vertical clear

(7) Riprap shall extend 500ft to the east of the abutment and match roadway grading.



PARTIAL PLAN

GENERAL PLAN & ELEVATION - 4
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 1806+89.23
STRUCTURE NO. 060-0350 (EB)

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HORNER & SHIFRIN
Teaming with: PARSONS

USER NAME =	DESIGNED - TMB	REVISED -	
	CHECKED - RAM	REVISED -	
PLOT SCALE =	DRAWN - TMB	REVISED -	
PLOT DATE =	CHECKED - JAB	REVISED -	

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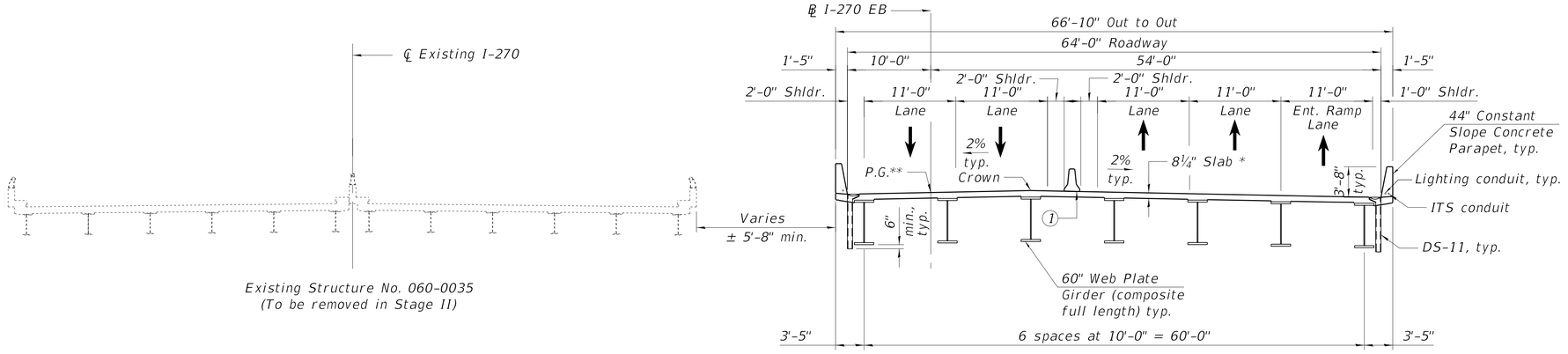
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

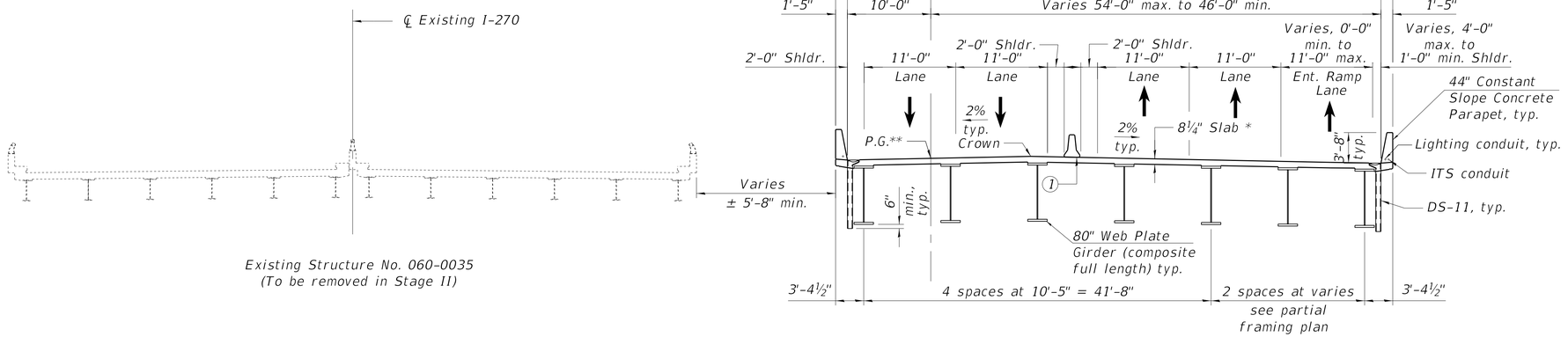
SHEET 4 OF 8 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
	ILLINOIS FED. AID PROJECT			



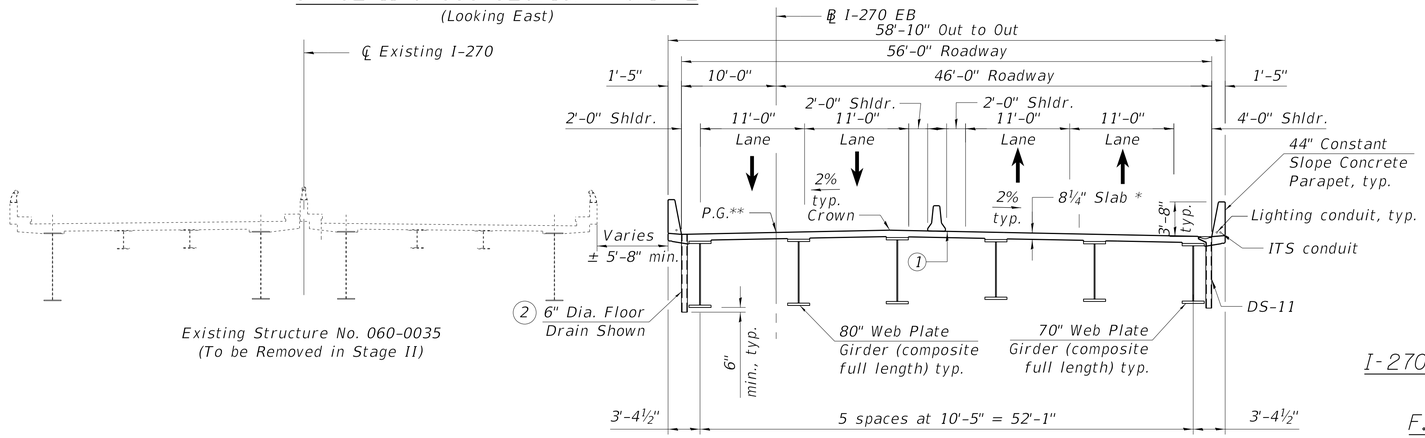
STAGE II CROSS SECTION - UNIT 1

(Looking East)



STAGE II CROSS SECTION - UNIT 2

(Looking East)



Showing Units 3 & 4

Showing Unit 5

STAGE II CROSS SECTION - UNIT 3, 4 & 5

(Looking East)

MOT Note:
Traffic is maintained in its existing configuration on existing structure during construction of SN-060-0350. Cross sections show traffic at the start of Stage II.

Note:
Up to ¼" may be ground off the bridge deck and bridge approach slabs.
** Prior to grinding*
*** After grinding*

(1) *Temporary Concrete Barrier See Std. 704001, typ.*

(2) *6" diameter floor drain from Station 1805+70.00 to 1806+75.00, DS-11 Scupper at other locations*

DETAILS - 1
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 1806+89.23
STRUCTURE NO. 060-0350 (EB)

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HORNER & SHIFRIN
Teaming with: PARSONS

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PLOT SCALE =	DRAWN - TMB	REVISED -	
PLOT DATE =	CHECKED - JAB	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 5 OF 8 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
		ILLINOIS FED. AID PROJECT		

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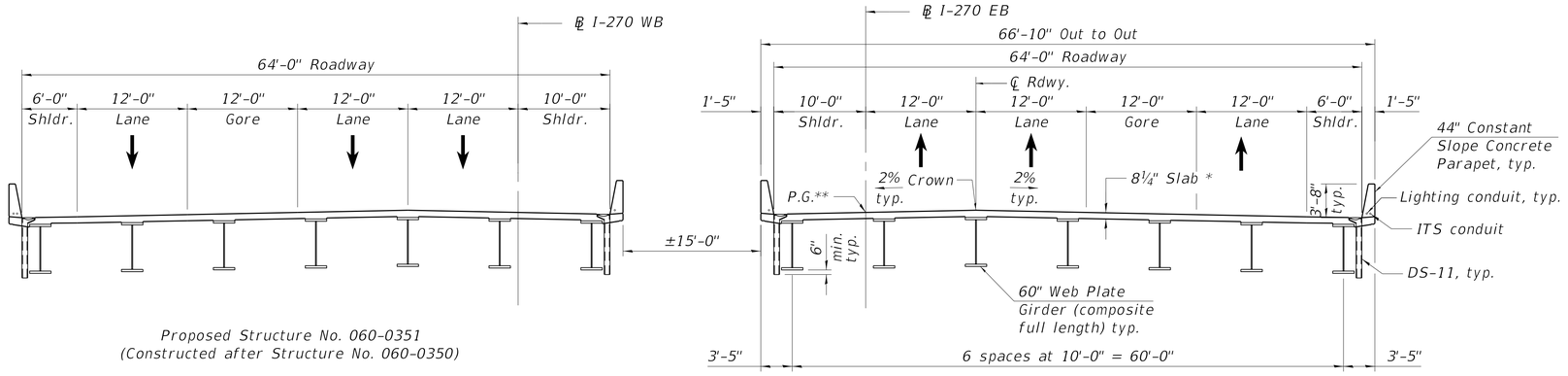
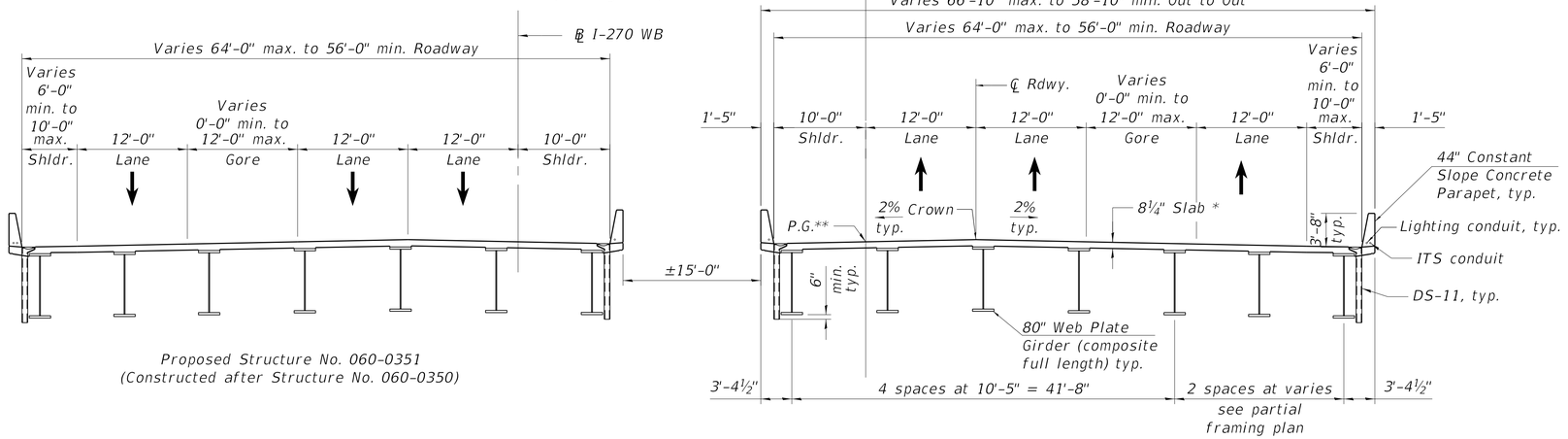


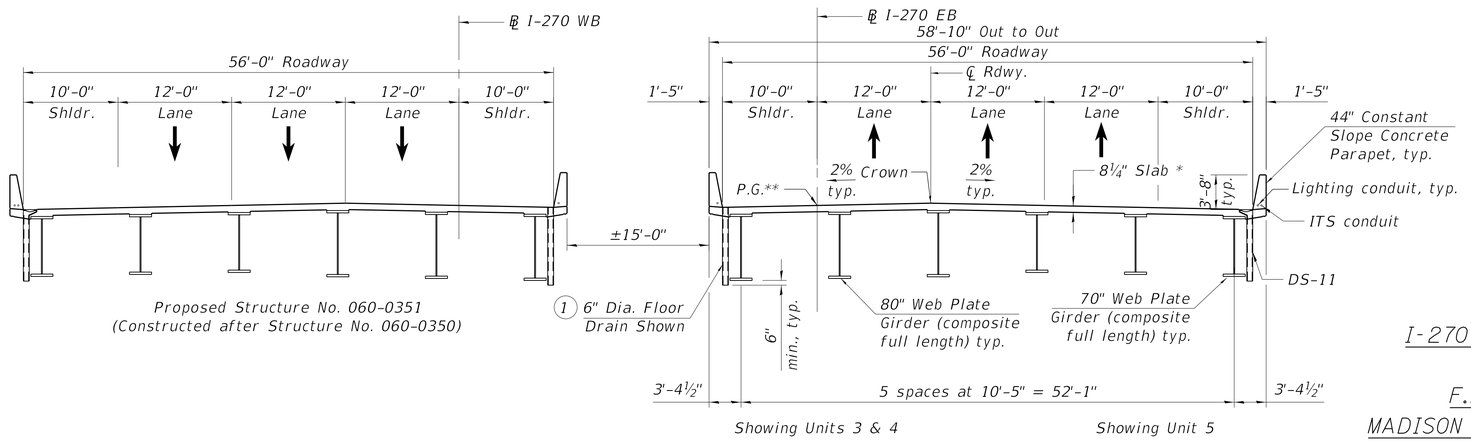
STAGE III CROSS SECTION - UNIT 1

(Looking East)



STAGE III CROSS SECTION - UNIT 2

(Looking East)



STAGE III CROSS SECTION - UNIT 3, 4 & 5

(Looking East)

Note:
Up to ¼" may be ground off the bridge deck and bridge approach slabs.
** Prior to grinding*
*** After grinding*

(1) *6" diameter floor drain from Station 1805+70.00 to 1806+75.00, DS-11 Scupper at other locations*

DETAILS - 2
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 1806+89.23
STRUCTURE NO. 060-0350 (EB)

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HORNER & SHIFRIN
Teaming with: PARSONS

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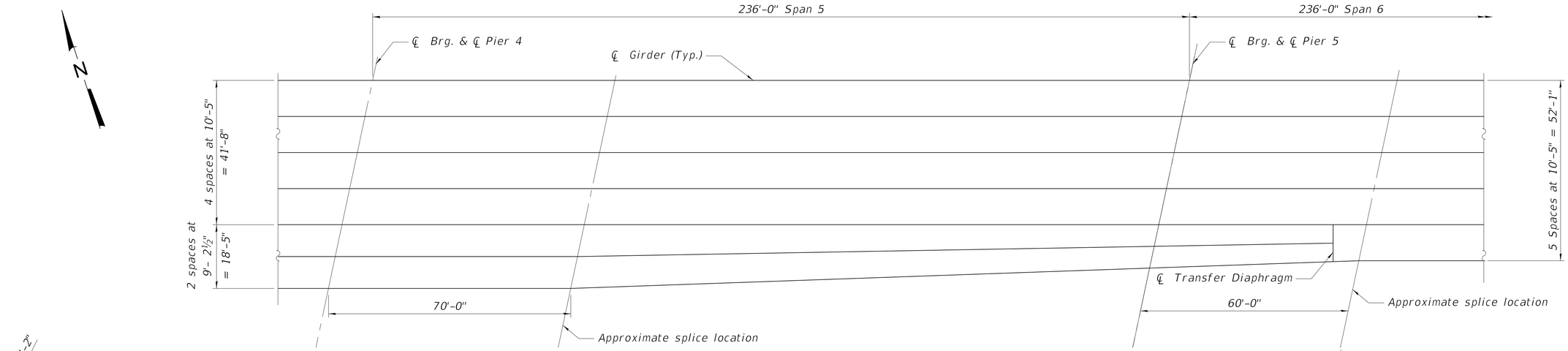
PLOT SCALE =	DRAWN - TMB	REVISED -	
PLOT DATE =	CHECKED - JAB	REVISED -	

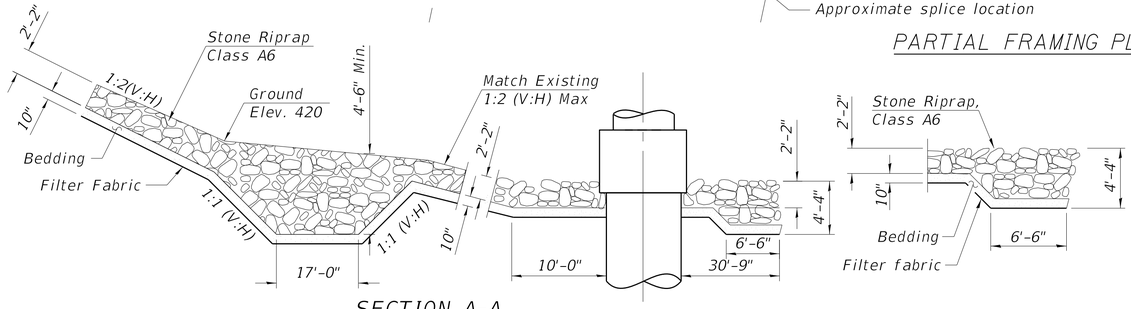
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 6 OF 8 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
		ILLINOIS FED. AID PROJECT		

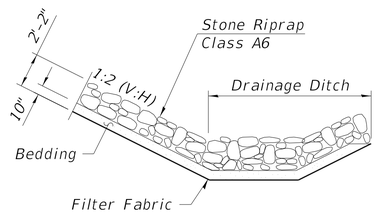


PARTIAL FRAMING PLAN - UNIT 2

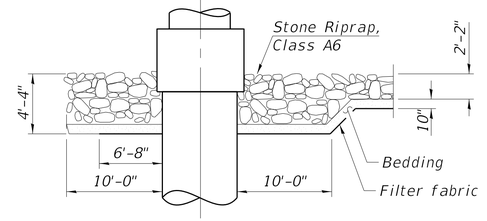


SECTION A-A

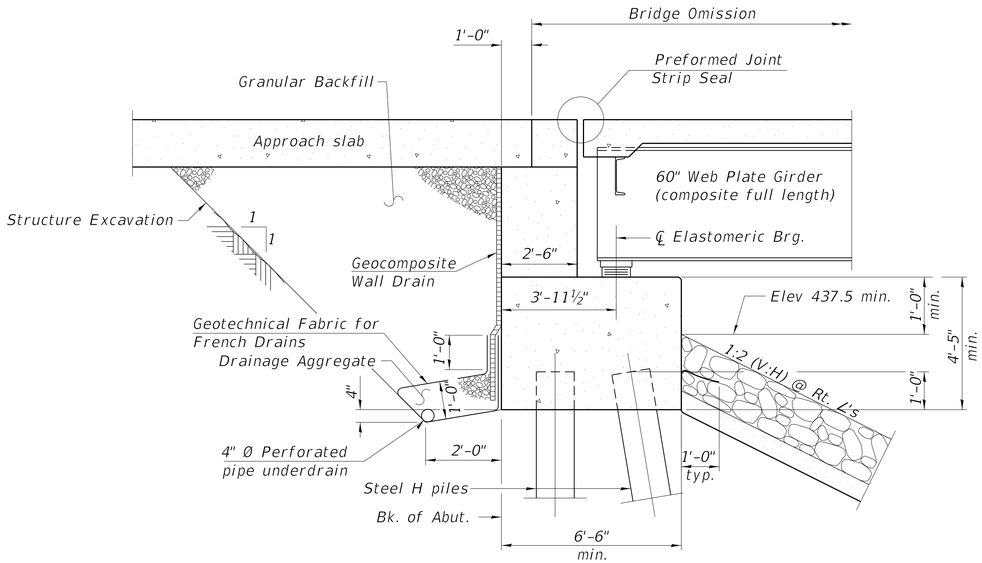
SECTION B-B



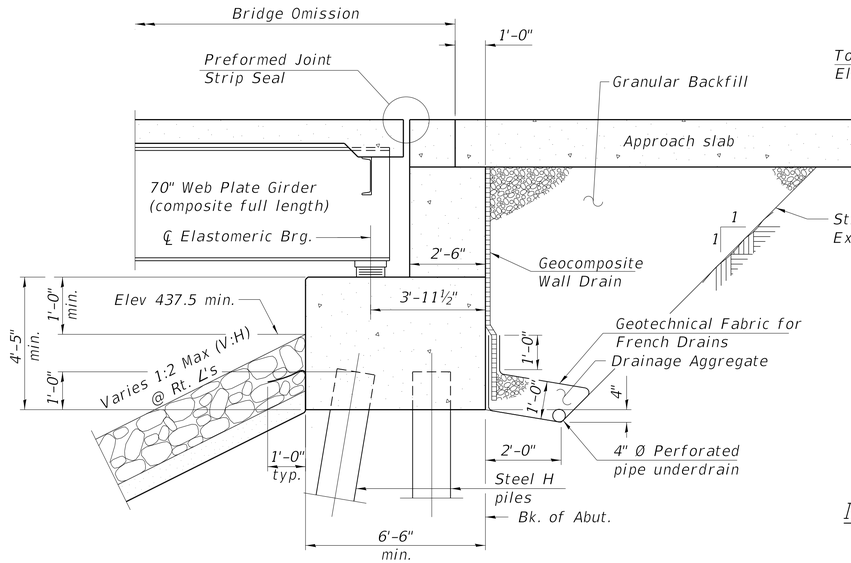
SECTION E-E



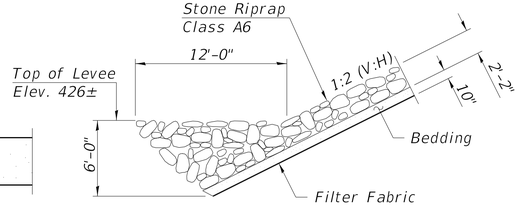
SECTION D-D



SECTION THRU PILE SUPPORTED
WEST ABUTMENT
(Horiz. dim. @ Rt. ℄'s)



SECTION THRU PILE SUPPORTED
EAST ABUTMENT
(Horiz. dim. @ Rt. ℄'s)



SECTION C-C

DETAILS - 3
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 1806+89.23
STRUCTURE NO. 060-0350 (EB)

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HORNER & SHIFRIN
Teaming with: PARSONS

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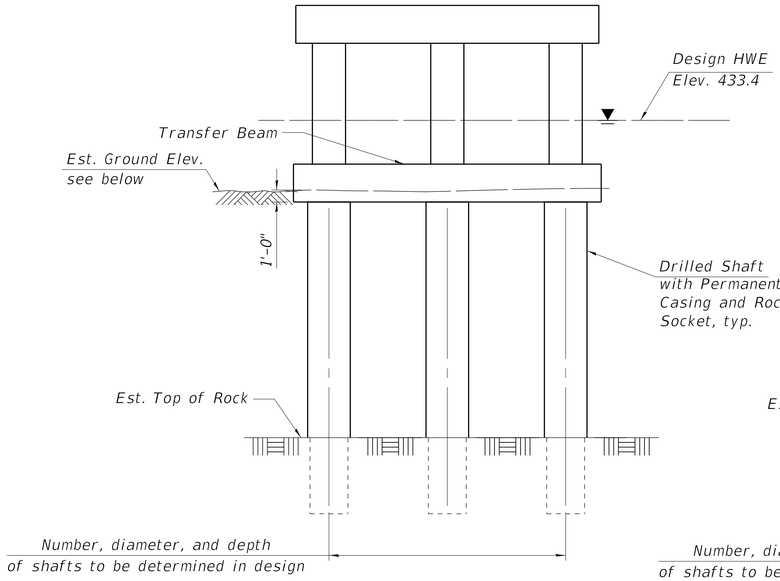
	CHECKED - RAM	REVISED -
PLOT SCALE =	DRAWN - TMB	REVISED -
PLOT DATE =	CHECKED - JAB	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 7 OF 8 SHEETS

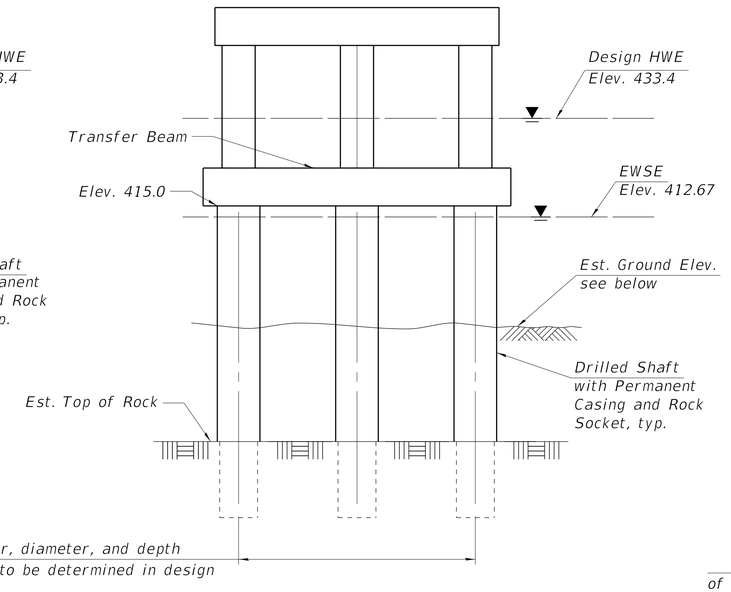
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
		ILLINOIS FED. AID PROJECT		



PIER SKETCH

(Piers 1 - 2)

Pier	Est. Ground Elev.
1	419.5
2	422.0

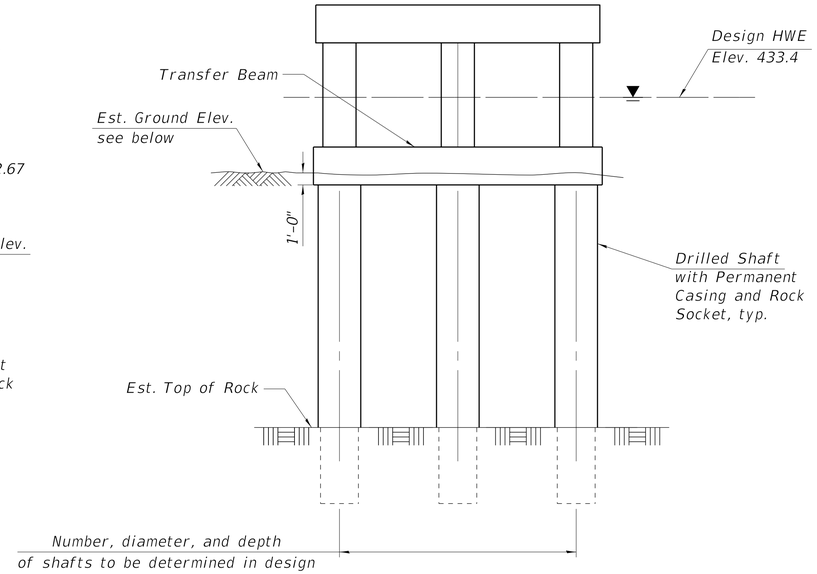


PIER SKETCH

(Piers 3 - 17)

Pier	Est. Ground Elev.
3	401.7
4	399.2
5	398.2
6	397.3
7	396.3
8	394.8
9	389.6

Pier	Est. Ground Elev.
10	383.3
11	376.3
12	373.4
13	373.6
14	372.6
15	377.0
16	379.3
17	394.6



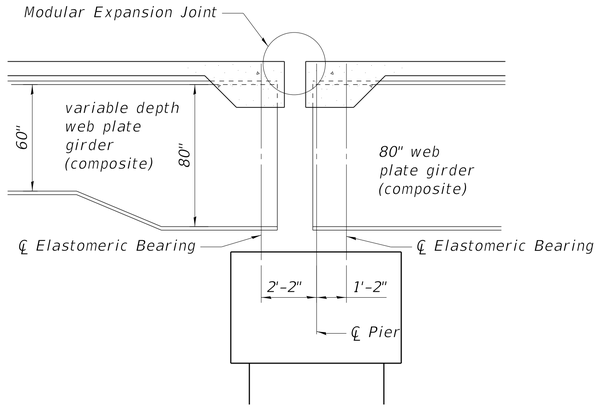
PIER SKETCH

(Piers 18 - 25)

Pier	Est. Ground Elev.
18	417.4
19	416.5
20	415.1
21	414.6
22	412.6
23	413.0
24	413.6
25	411.8

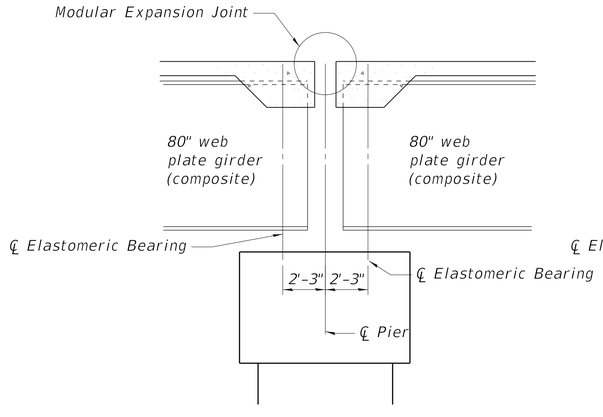
Note: Estimated ground and rock elevations subject to refinement during final design.

Estimated ground/streambed elevations vary and subject to elevations at time of survey. Elevations shown are from 10/10/2017 Survey Data.



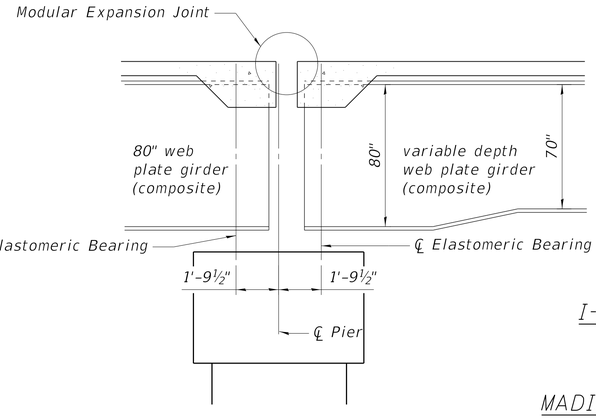
EXPANSION PIER

Pier 3
(Horiz. dim. parallel to baseline)



EXPANSION PIER

Pier 10, 17
(Horiz. dim. parallel to baseline)



EXPANSION PIER

Pier 24
(Horiz. dim. parallel to baseline)

DETAILS - 4
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 1806+89.78
STRUCTURE NO. 060-0350 (EB)

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HORNER & SHIFRIN
Teaming with: PARSONS

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PLOT SCALE =	DRAWN - TMB	REVISED -	
PLOT DATE =	CHECKED - JAB	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

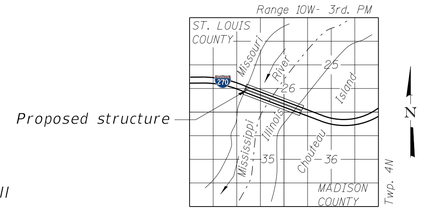
SHEET 8 OF 8 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
	ILLINOIS	FED. AID PROJECT		

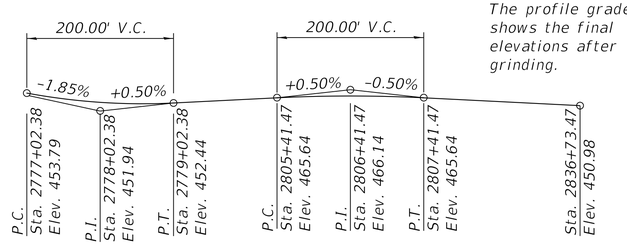
Benchmark:
BM2316-4: Cut "□" on Southwest corner of South wing wall at the West end of the Old Chain of Rocks Bridge over the Mississippi River (Missouri). Elev. 439.761'
BM2316-5: RR spike in power pole at the Northwest corner of Riverview Drive and Coal Bank Road (Missouri). Elev. 430.055'
Existing Structure: SN 060-0035 Steel girder and concrete slab superstructure bridge on piers. Approximately in line with Westbound structure. Approximately 5411.0' long by 62'-9" wide. Constructed in 1966. To be removed after proposed EB Structure No. 060-0350 is complete.
Traffic Control: none
No Salvage

(1) *4 spaces at 15'-0" centers*
(2) *3 spaces at 15'-0" centers*
(3) *DS-11 Scupper, typ. U.N.O.*
(4) *2 spaces at 15'-0" centers*

Notes:
All Elevations are given in NAVD 1988 Datum unless noted.
NAVD 1988 = NGVD 1929 - 0.20'.
EWSE = Estimated Water Surface Elevation.
HWE = High Water Elevation.
For ground elevations see Sheet 7.
Denotes soil boring.
Proposed lighting unit: 50 ft. aluminum pole, 15" bolt circle diameter, mounted on bridge parapet wall.
Lighting unit is subject to refinement during the design phase.
Estimated Top of Rock Elevations shown at the substructures will be subject to refinement during final design.
Ripap shall be capped with 2" stone for drivability. Location to be determined during final design.

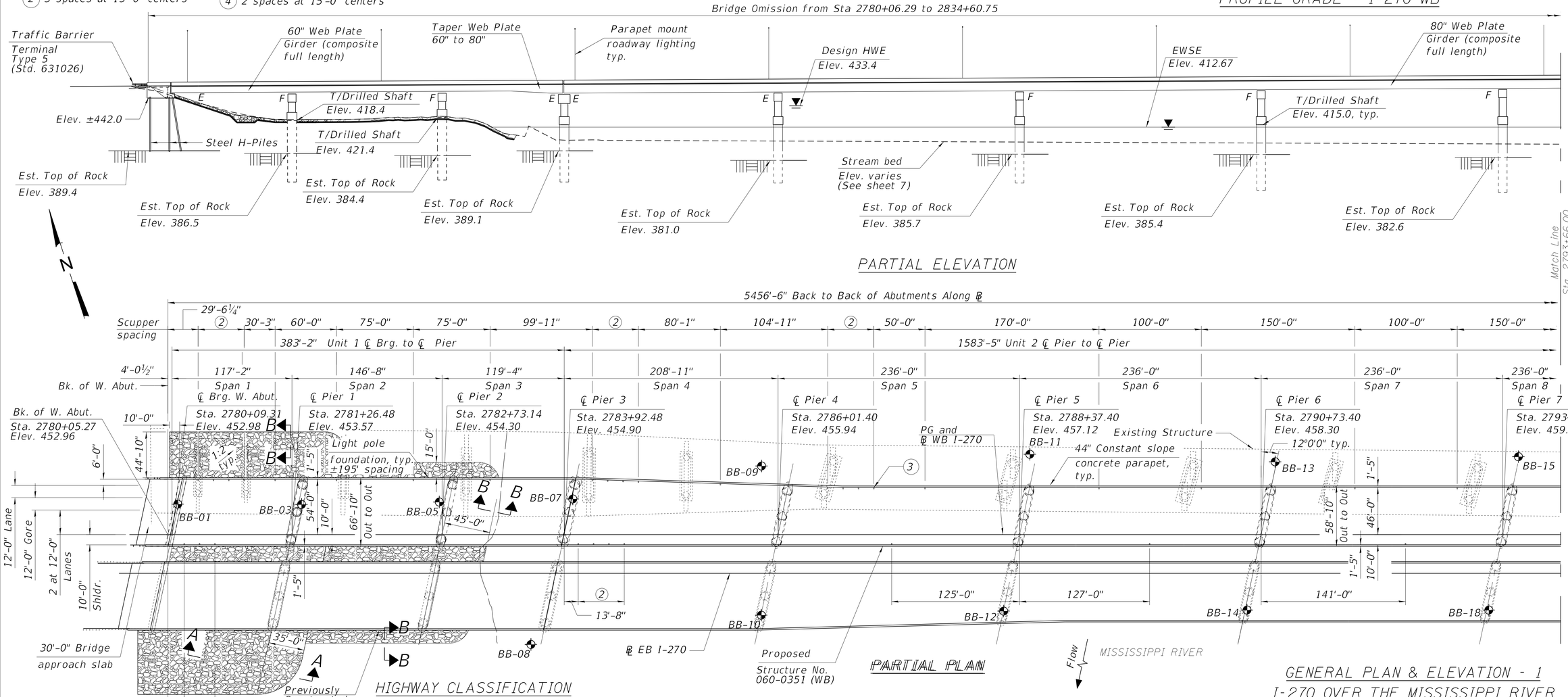


LOCATION SKETCH



The profile grade shows the final elevations after grinding.

PROFILE GRADE - I-270 WB



PARTIAL ELEVATION

PARTIAL PLAN

HIGHWAY CLASSIFICATION

I-270 (FAI 270)
Functional Class: Interstate
ADT: 44,600(2019); 58,000(2045)
ADTT: 8,000(2019); 10,440(2045)
DHV: 4,080
Design Speed: 60 m.p.h.
Posted Speed: 60 m.p.h.
Two-Way Traffic
Directional Distribution: 50/50

DESIGN STRESSES

FIELD UNITS

f'c = 4,000 psi (Substructure)
f'c = 4,000 psi (Superstructure)
f'c = 5,000 psi (Drilled Shafts)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.
2,500 yr Seismic Design Earthquake
Importance Factor for Strength Load Combinations = 1.05

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

GENERAL PLAN & ELEVATION - 1
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 2807+06.64
STRUCTURE NO. 060-0351 (WB)

HORNER & SHIFRIN
Teaming with: PARSONS

USER NAME =	DESIGNED - TMB	REVISED -	
	CHECKED - RAM	REVISED -	
PLOT SCALE =	DRAWN - TMB	REVISED -	
PLOT DATE =	CHECKED - JAB	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 7 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
	ILLINOIS FED. AID PROJECT			

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Notes:
All Elevations are given in NAVD 1988 Datum unless noted.
EWSE = Estimated Water Surface Elevation.
HWE = High Water Elevation.
For ground elevations see Sheet 7.
Denotes soil boring.

Notes (continued):
Proposed lighting unit: 50 ft. aluminum pole, 15" bolt circle diameter, mounted on bridge parapet wall.
Lighting unit is subject to refinement during the design phase.
Estimated Top of Rock Elevations shown at the substructures will be subject to refinement during final design.

(1) DS-11 Scupper, typ., U.N.O.

(2) 4 Spaces at 15'-0" centers

(3) Space 6" diameter free fall floor drains at 15'-0" centers from Station 2805+85.04 to 2806+90.04. Omit drains that are within 10'-0" from the face of Pier 13.

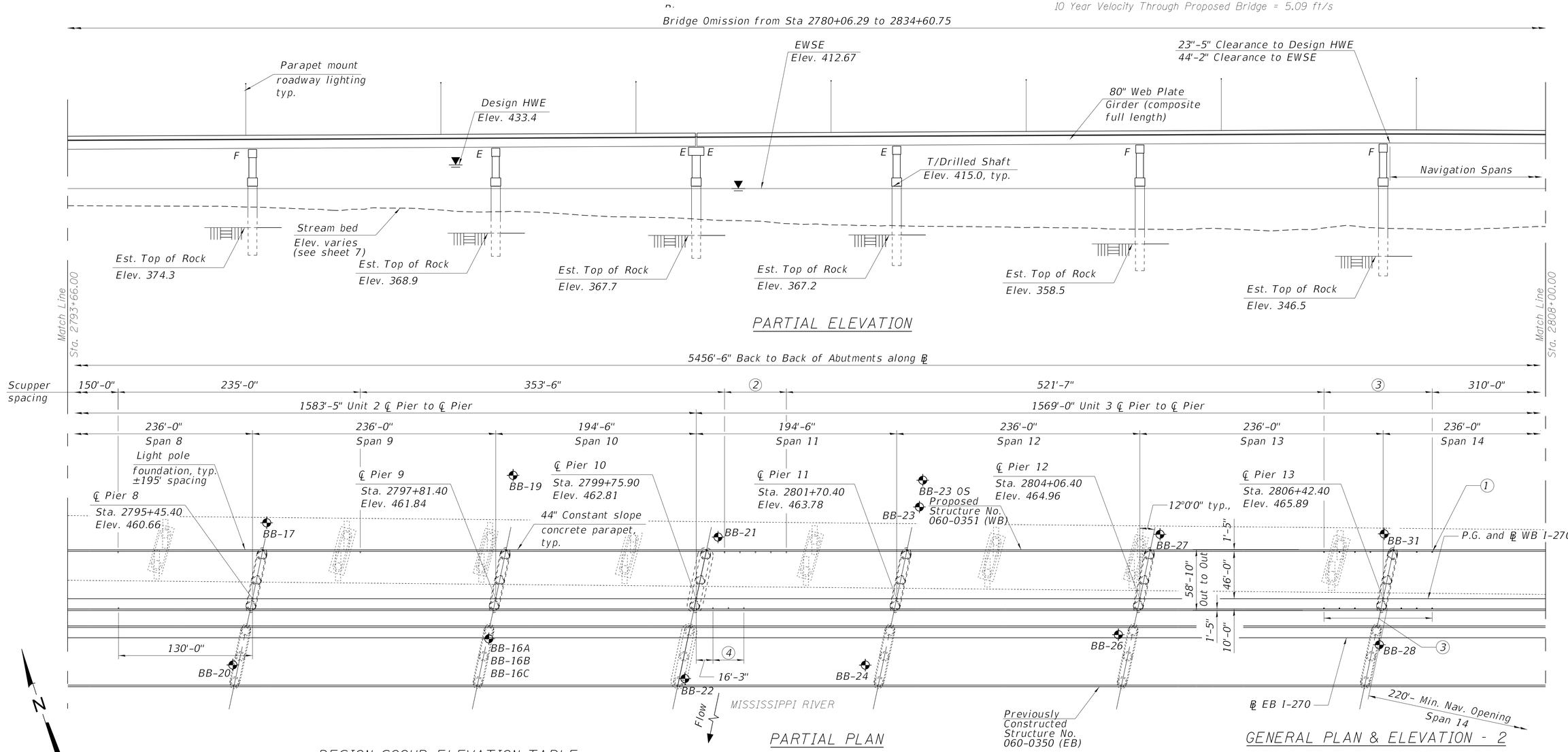
(4) 2 Spaces at 15'-0" centers

WATERWAY INFORMATION

Drainage Area = 697,000 sq. mi. Low Grade Elev. 452.24 @ Sta. 2834+07.67

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.
Ten-Year	10	777,656	144,867	152,761	426.3	0.1	0.0	426.4	426.3
Design	50	984,883	179,011	188,351	433.3	0.1	0.1	433.4	433.4
Base	100	1.067M	188,974	198,694	435.4	0.2	0.1	435.6	435.5
Scour Design Check	200	1.146M	201,158	211,492	437.8	0.2	0.2	438.0	438.0
Max. Calc.	500	1.247M	211,346	221,832	439.9	0.2	0.2	440.1	440.1

10 Year Velocity Through Existing Bridge = 5.37 ft/s
10 Year Velocity Through Proposed Bridge = 5.09 ft/s



PARTIAL PLAN

DESIGN SCOUR ELEVATION TABLE

Design Scour Elevation (ft.)	West Abut.	Pier 1	Pier 2	Pier 3	Pier 4	Pier 5	Pier 6	Pier 7	Pier 8	Pier 9	Pier 10	Pier 11	Pier 12	Pier 13
Q100	442.0	386.5	384.4	389.1	381.0	385.7	385.4	382.6	374.3	368.9	367.7	367.2	358.5	346.5
Q200	442.0	386.5	384.4	389.1	381.0	385.7	385.4	382.6	374.3	368.9	367.7	367.2	358.5	346.5

Design Scour Elevation (ft.)	Pier 14	Pier 15	Pier 16	Pier 17	Pier 18	Pier 19	Pier 20	Pier 21	Pier 22	Pier 23	Pier 24	Pier 25	East Abut.	Item 113
Q100	343.1	344.6	346.3	344.1	343.6	381.2	381.2	381.2	381.2	381.2	381.2	381.2	441.0	5
Q200	343.1	344.6	346.3	344.1	343.6	371.8	371.8	371.8	371.8	371.8	371.8	371.8	441.0	

GENERAL PLAN & ELEVATION - 2
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 2807+06.64
STRUCTURE NO. 060-0351 (WB)

Notes:
All Elevations are given in NAVD 1988 Datum unless noted.
EWSE = Estimated Water Surface Elevation.
HWE = High Water Elevation.
For ground elevations see Sheet 7.
Denotes soil boring.

Notes (continued):
Proposed lighting unit: 50 ft. aluminum pole, 15" bolt circle diameter, mounted on bridge parapet wall.
Lighting unit is subject to refinement during the design phase.
Estimated Top of Rock Elevations shown at the substructures will be subject to refinement during final design.

(1) DS-11 Scupper, typ., U.N.O.

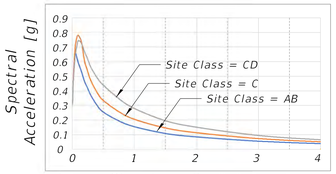
(2) 3 spaces at 15'-0" centers

SEISMIC DATA

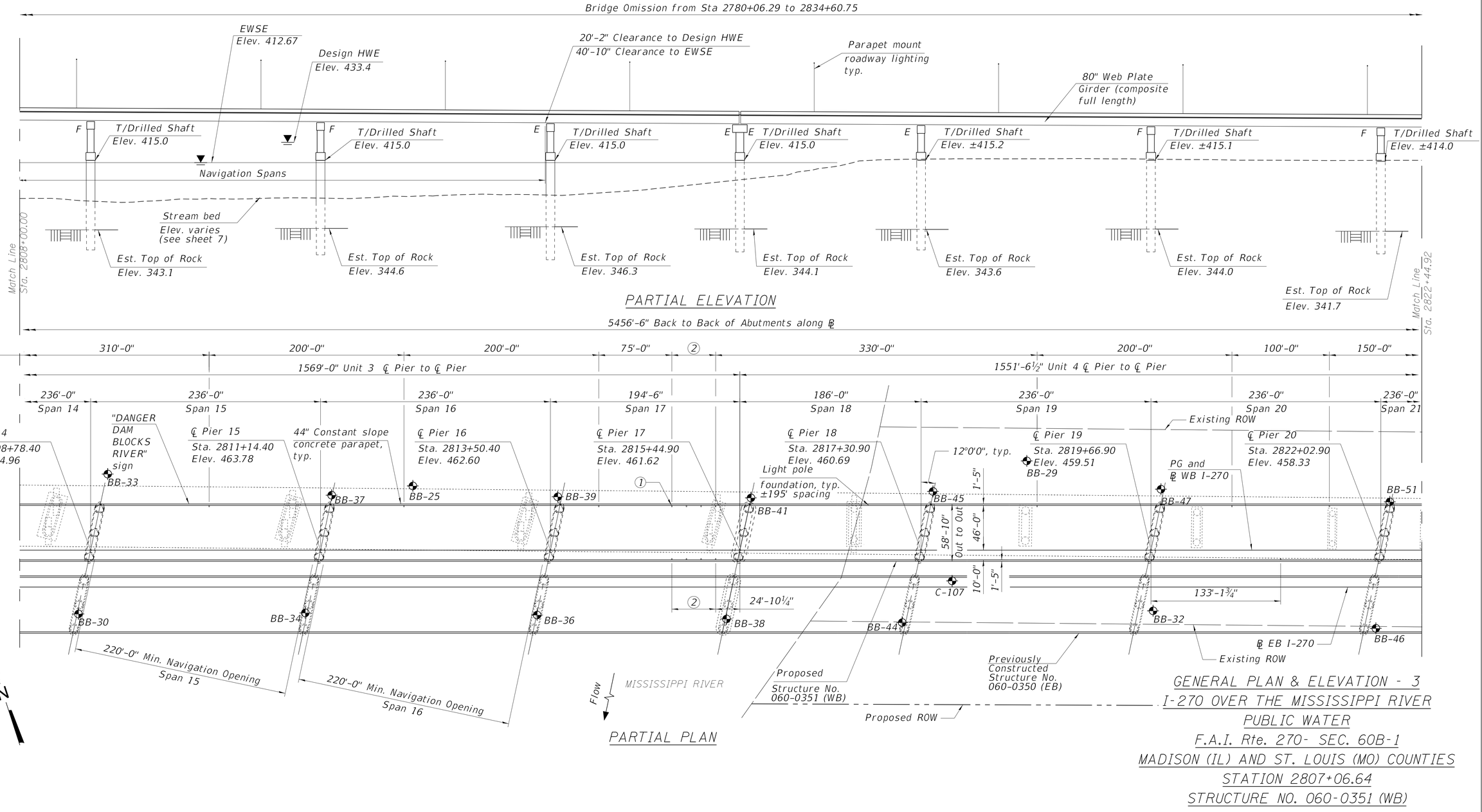
Seismic Performance Zone (SPZ) = 2
Operational Classification: Critical

Seismic Data based on Site-Specific Data			
	West Abut. Piers 1-3	Piers 4-16	Piers 17-25 East Abut.
Site Class	C	AB	CD
Design Spectral Acceleration at 1.0 sec, S_{D1} [g]	0.204	0.153	0.279
Design Spectral Acceleration at 0.2 sec, S_{DS} [g]	0.608	0.465	0.668

SITE - SPECIFIC UNIFORM HAZARD SPECTRA



Bridge Omission from Sta 2780+06.29 to 2834+60.75



PARTIAL ELEVATION

5456'-6" Back to Back of Abutments along ℄

Scupper spacing	310'-0"	200'-0"	200'-0"	75'-0"	(2)	330'-0"	200'-0"	100'-0"	150'-0"
	1569'-0" Unit 3 ℄ Pier to ℄ Pier					1551'-6½" Unit 4 ℄ Pier to ℄ Pier			
	236'-0" Span 14	236'-0" Span 15	236'-0" Span 16	194'-6" Span 17		186'-0" Span 18	236'-0" Span 19	236'-0" Span 20	236'-0" Span 21

PARTIAL PLAN

GENERAL PLAN & ELEVATION - 3
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270- SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 2807+06.64
STRUCTURE NO. 060-0351 (WB)

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HORNER & SHIFRIN
Teaming with: PARSONS

USER NAME =		DESIGNED - TMB	REVISED -
		CHECKED - RAM	REVISED -
PLOT SCALE =		DRAWN - TMB	REVISED -
PLOT DATE =		CHECKED - JAB	REVISED -

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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

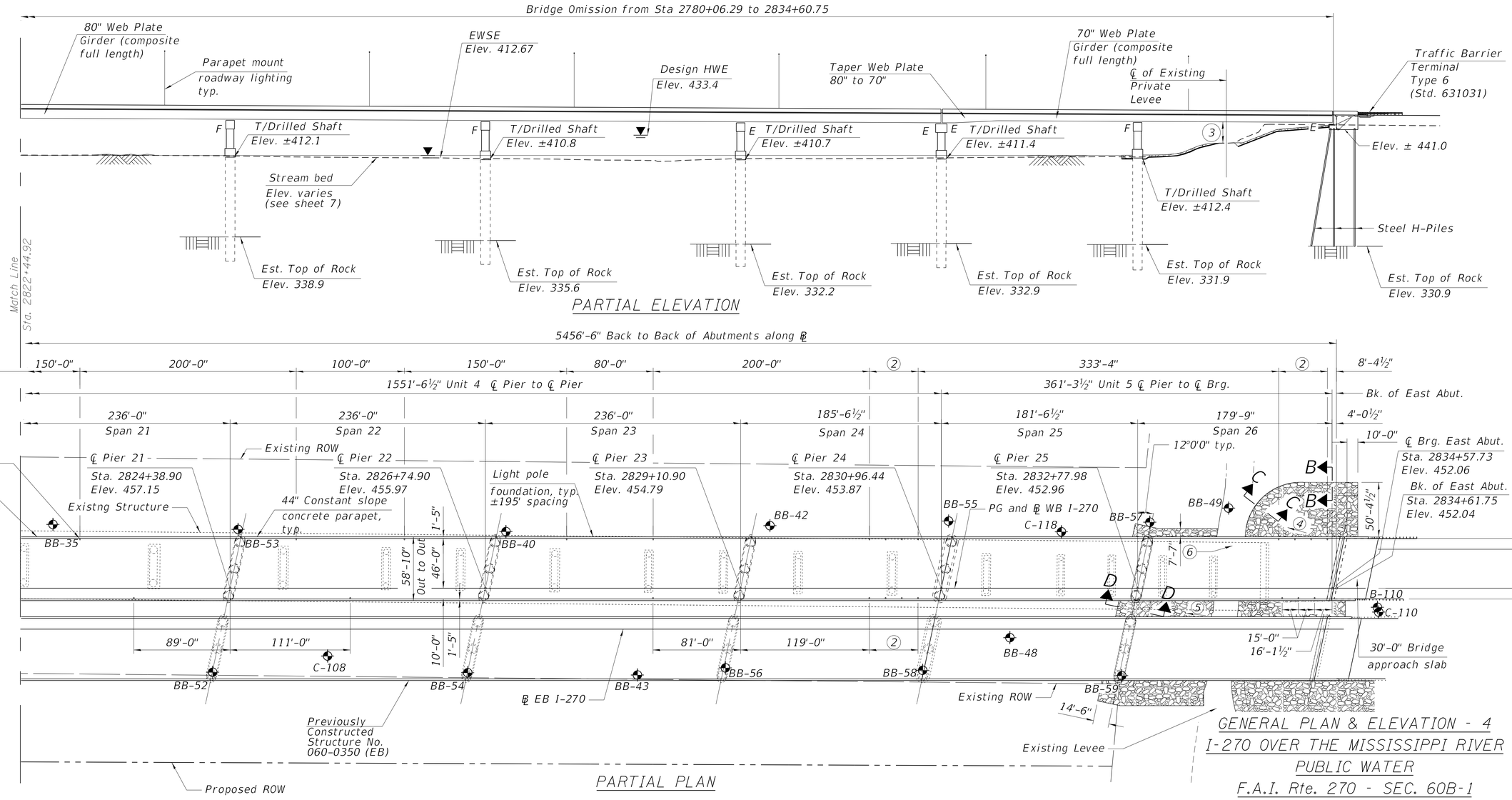
SHEET 3 OF 7 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
	ILLINOIS	FED. AID PROJECT		

Notes:
All Elevations are given in NAVD 1988 Datum unless noted.
EWSE = Estimated Water Surface Elevation.
HWE = High Water Elevation.
For ground elevations see Sheet 7.
Denotes soil boring.

Notes (continued):
Proposed lighting unit: 50 ft. aluminum pole, 15" bolt circle diameter, mounted on bridge parapet wall.
Lighting unit is subject to refinement during the design phase.
Estimated Top of Rock Elevations shown at the substructures will be subject to refinement during final design.

1. DS-11 Scupper, typ. U.N.O
2. 3 Spaces at 15'-0" centers
3. Min. Clr. 18'-6"±
4. Riprap slope varies. Max at 1V:2H at right angles
5. Riprap placed on existing west face of levee. Approxmiate slope 1V:2H at right angles to existing levee
6. Point of minimum vertical clear



GENERAL PLAN & ELEVATION - 4
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 2807+06.64
STRUCTURE NO. 060-0351 (WB)

HORNER & SHIFRIN
Teaming with: PARSONS

USER NAME =	DESIGNED - TMB	REVISED -	
	CHECKED - RAM	REVISED -	
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PLOT DATE =	CHECKED - JAB	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 4 OF 7 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
	ILLINOIS FED. AID PROJECT			

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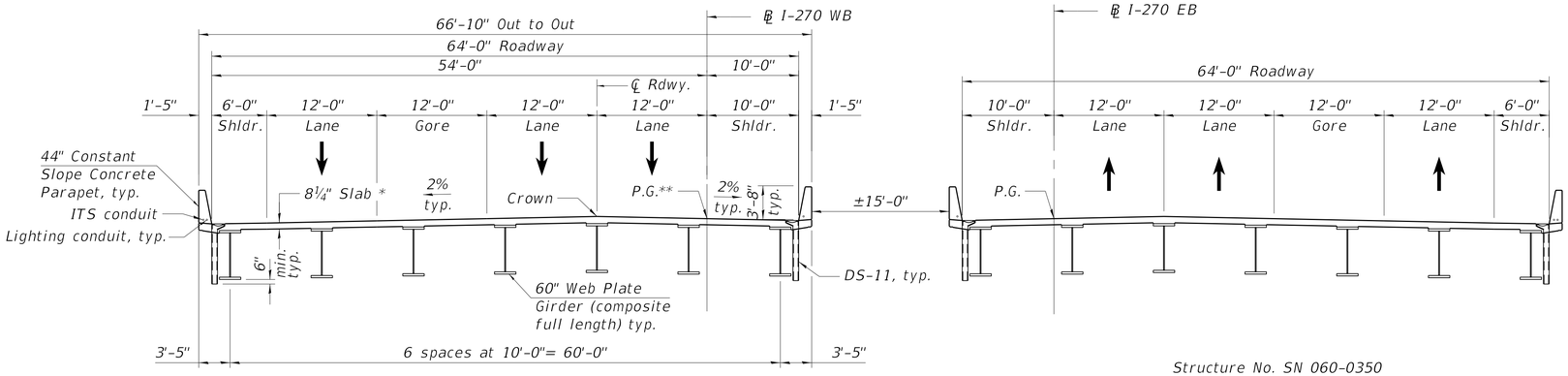
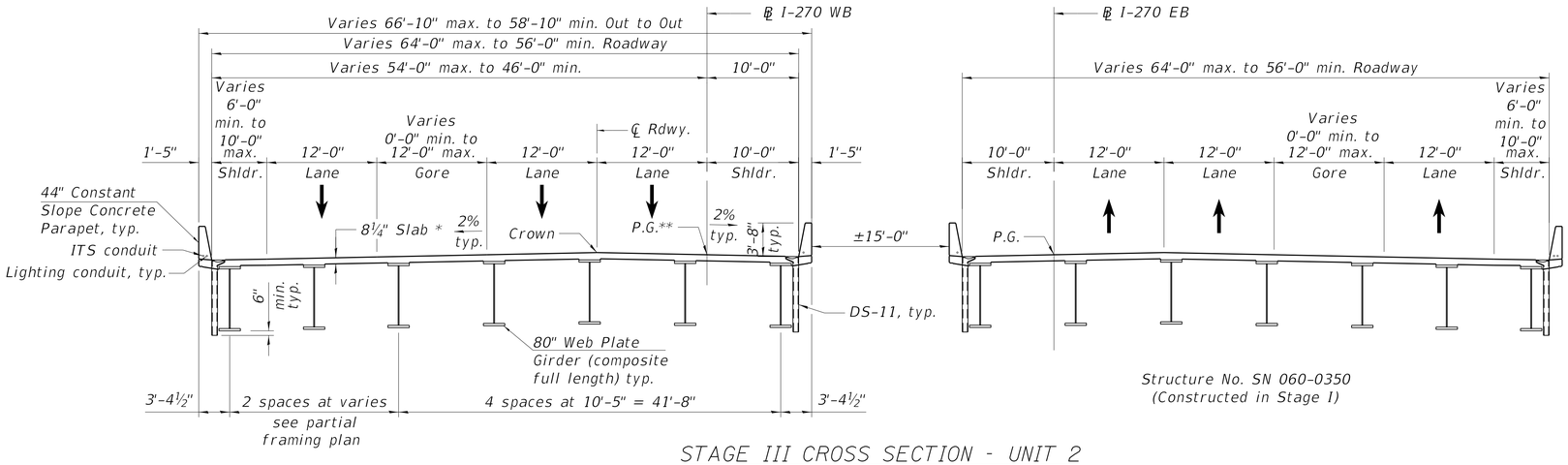


Structure No. SN 060-0350
(Consructed in Stage I)

STAGE III CROSS SECTION - UNIT 1

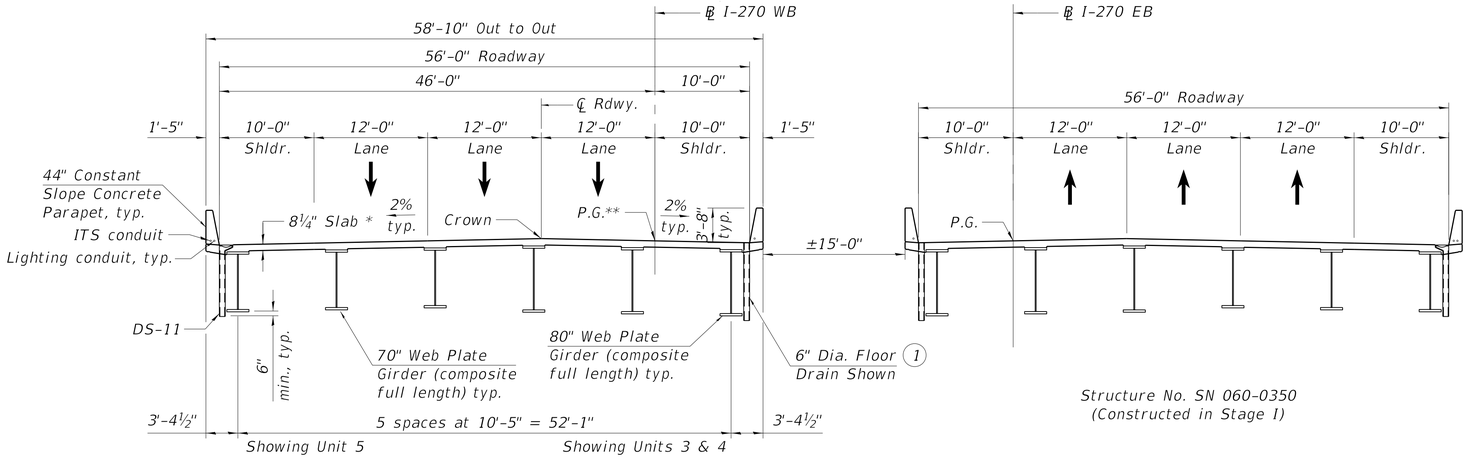
(Looking East)



Structure No. SN 060-0350
(Constructed in Stage I)

STAGE III CROSS SECTION - UNIT 2

(Looking East)



Structure No. SN 060-0350
(Constructed in Stage I)

STAGE III CROSS SECTION - UNIT 3, 4 & 5

(Looking East)

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

* Prior to grinding
** After grinding

(1) 6" diameter floor drain from Station 2805+85.04 to 2806+90.04, DS-11 Scupper at other locations

DETAILS - 1
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 2807+06.64
STRUCTURE NO. 060-0351 (WB)

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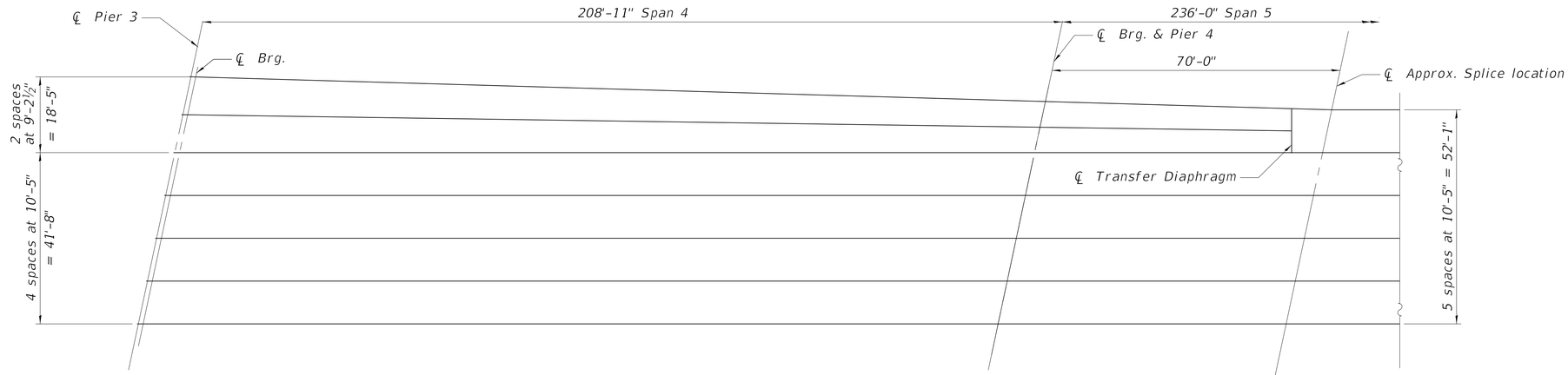
PLOT DATE =	CHECKED - JAB	REVISED -	

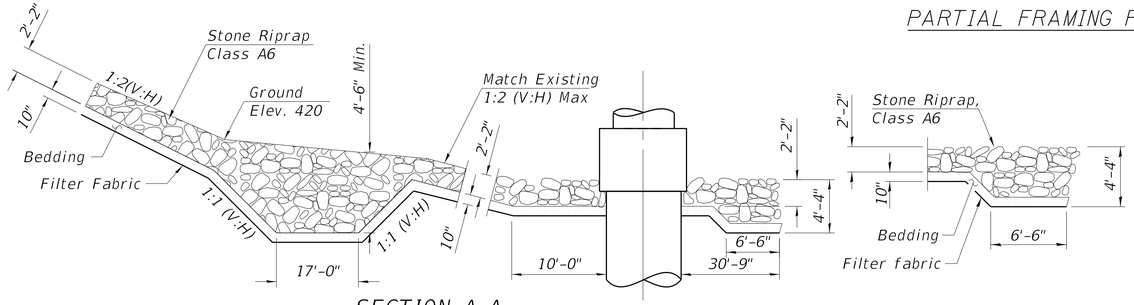
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 5 OF 7 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
	ILLINOIS FED. AID PROJECT			

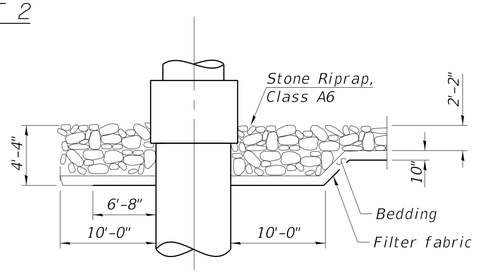


PARTIAL FRAMING PLAN - UNIT 2



SECTION A-A

SECTION B-B



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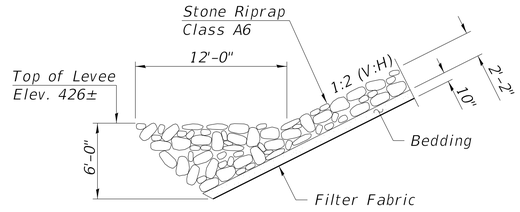

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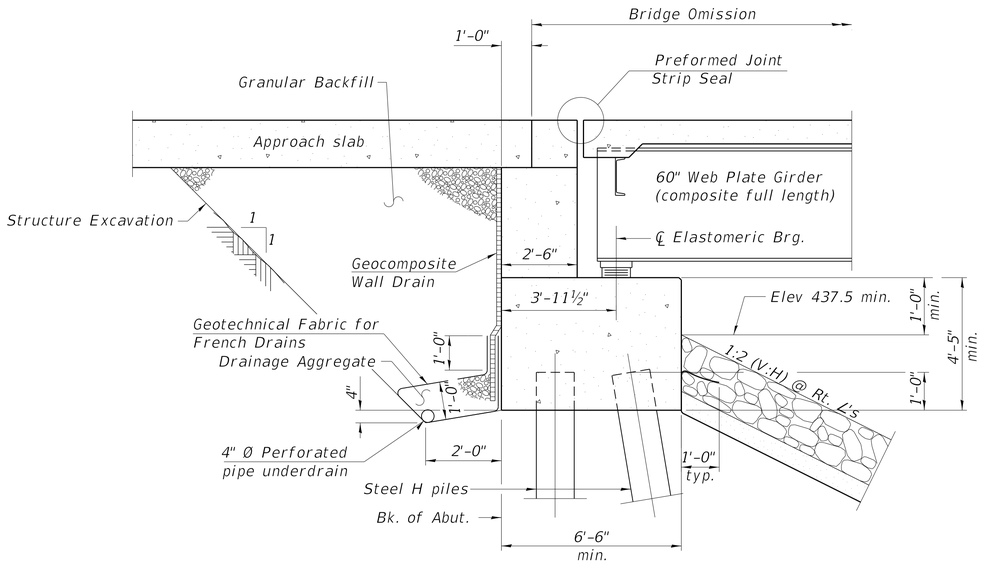
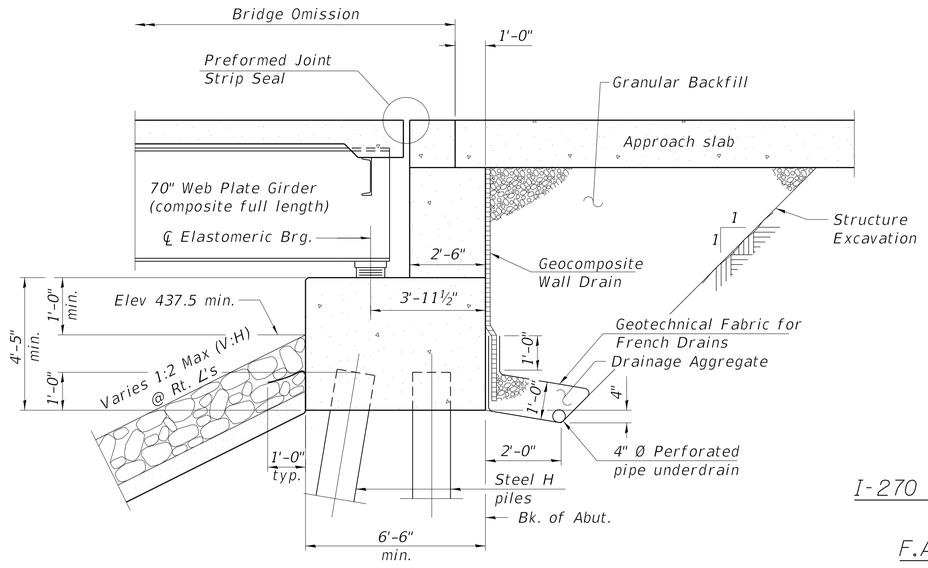


SECTION THRU PILE SUPPORTED
WEST ABUTMENT
(Horiz. dim. @ Rt. ℄'s)



SECTION THRU PILE SUPPORTED
EAST ABUTMENT
(Horiz. dim. @ Rt. ℄'s)

DETAILS - 2
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 2807+06.64
STRUCTURE NO. 060-0351 (WB)

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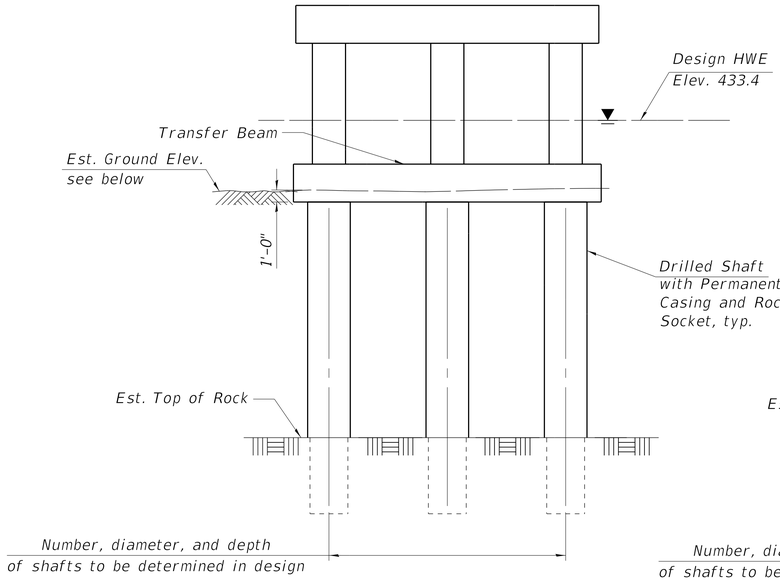
PLOT DATE =	CHECKED - JAB	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 6 OF 7 SHEETS

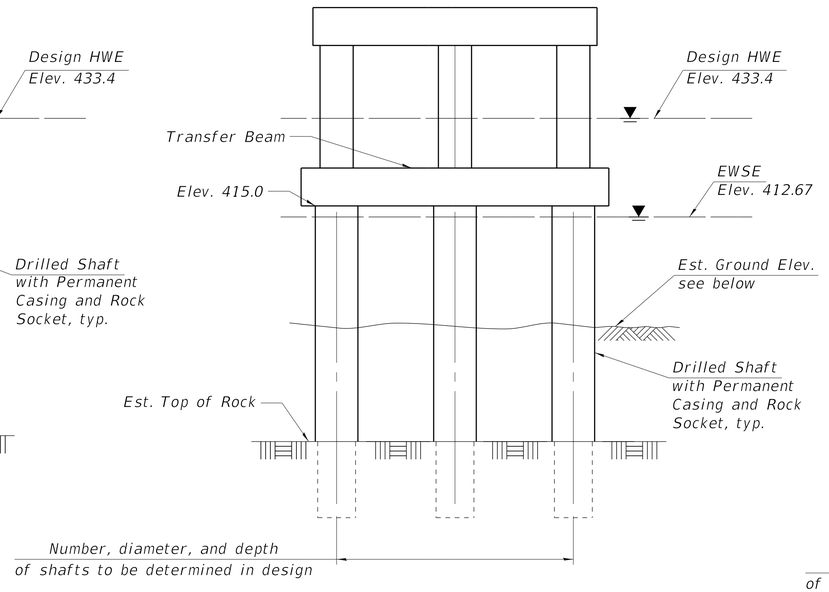
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
	ILLINOIS FED. AID PROJECT			



PIER SKETCH

(Piers 1 - 2)

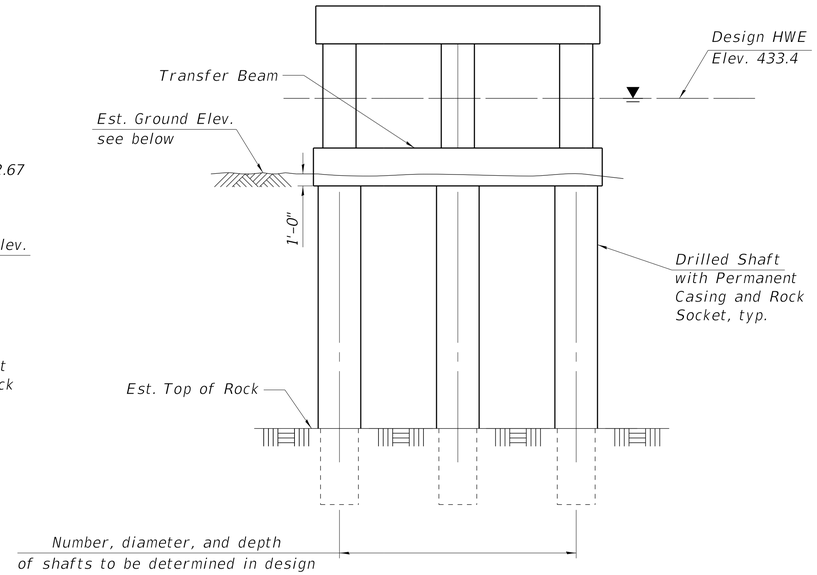
Pier	Est. Ground Elev.
1	419.4
2	422.4



PIER SKETCH

(Piers 3 - 17)

Pier	Est. Ground Elev.	Pier	Est. Ground Elev.
3	399.4	10	382.8
4	399.1	11	376.5
5	398.1	12	373.2
6	397.2	13	374.0
7	396.2	14	373.0
8	394.7	15	376.2
9	390.0	16	379.2
		17	394.6



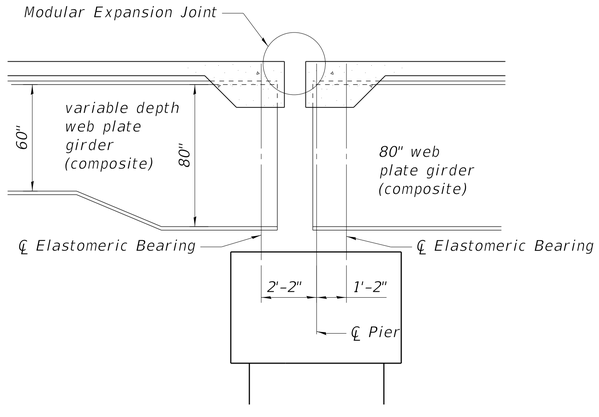
PIER SKETCH

(Piers 18 - 25)

Pier	Est. Ground Elev.
18	416.2
19	416.1
20	415.0
21	413.2
22	411.8
23	411.7
24	412.4
25	413.4

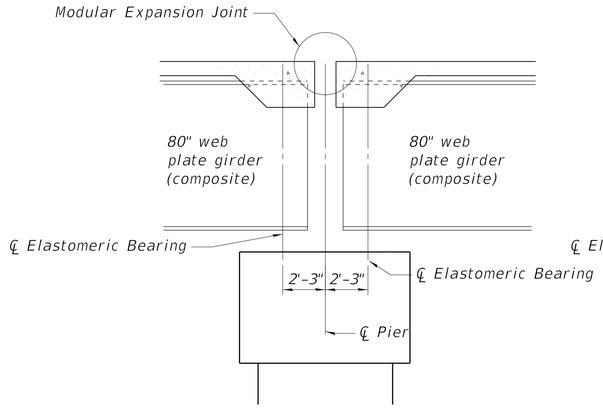
Note: Estimated ground and rock elevations subject to refinement during final design.

Estimated ground/streambed elevations vary and subject to elevations at time of survey. Elevations shown are from 10/10/2017 Survey Data.



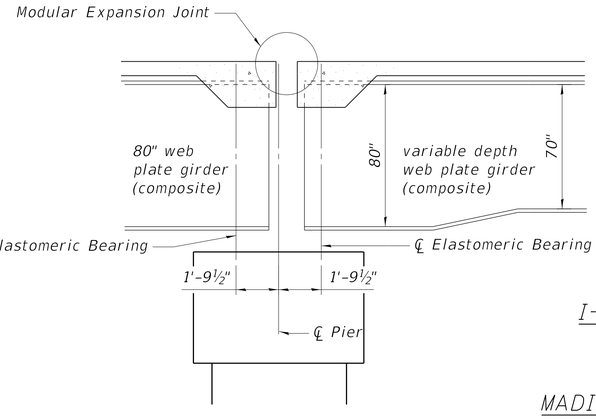
EXPANSION PIER

Pier 3
(Horiz. dim. parallel to baseline)



EXPANSION PIER

Pier 10, 17
(Horiz. dim. parallel to baseline)



EXPANSION PIER

Pier 24
(Horiz. dim. parallel to baseline)

DETAILS - 3
I-270 OVER THE MISSISSIPPI RIVER
PUBLIC WATER
F.A.I. Rte. 270 - SEC. 60B-1
MADISON (IL) AND ST. LOUIS (MO) COUNTIES
STATION 2807+06.64
STRUCTURE NO. 060-0351 (WB)

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HORNER & SHIFRIN
Teaming with: PARSONS

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PLOT SCALE =	DRAWN - TMB	REVISED -	
PLOT DATE =	CHECKED - JAB	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 7 OF 7 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
270	60B-1	MADISON		
		CONTRACT NO. 76J90		
	ILLINOIS	FED. AID PROJECT		

APPENDIX H
GIS Information for the Explored SGR Borings/ Soundings

GIS Information for the Explored SGR Borings/Soundings

Project: **I-270 over Mississippi River**
SCI No. **2017-3167.10 Task 200**

Boring/ Sounding	IL Northing	IL Easting	Project Northing	Project Easting	Latitude	Longitude	Section	Township	Range	EB Sta	EB OS FT	EB OS Side	WB Sta	WB OS FT	WB OS Side	Elevation FT
B-101	764712.3496	2292848.2170	764769.2790	293018.9093	38.7668827	-90.1797730		Land Grant 00114		1780+03.06	258.56	LT	2780+16.44	220.73	LT	419.1
B-110	762794.1838	2297990.0620	762850.9704	298161.1371	38.7615606	-90.1617394	36	4 North	10 West	1834+86.27	20.22	LT	2834+99.65	17.62	RT	442.6
B-111	762676.5341	2297935.4810	762733.3120	298106.5521	38.7612376	-90.1619308	36	4 North	10 West	1834+70.65	108.54	RT	2834+84.03	146.38	RT	419.1
B-112	762668.2385	2298378.7670	762725.0158	298549.8711	38.7612148	-90.1603762	36	4 North	10 West	1838+95.92	12.41	LT	2839+07.09	22.99	RT	442.2
B-113	762562.7597	2298336.4890	762619.5291	298507.5899	38.7609251	-90.1605245	36	4 North	10 West	1838+81.05	100.23	RT	2838+93.54	135.79	RT	425.4
B-118	762658.6444	2298162.2040	762715.4209	298333.2919	38.7611884	-90.1611357	36	4 North	10 West	1836+91.35	55.75	RT	2837+05.23	93.44	RT	425.4
BB-01	764531.1393	2292787.8220	764588.0552	292958.5098	38.7663294	-90.1799847		Land Grant 00114		1780+01.52	67.54	LT	2780+14.90	29.71	LT	441.4
BB-02	764436.5788	2292585.8480	764493.4877	292756.5208	38.7660696	-90.1806931		Land Grant 00114		1778+38.55	84.72	RT	2778+51.94	122.56	RT	420.6
BB-03	764493.5859	2292902.7430	764550.4990	293073.4394	38.7662263	-90.1795816		Land Grant 00114		1781+22.43	67.28	LT	2781+35.81	29.44	LT	420.0
BB-05	764454.3029	2293031.5100	764511.2131	293202.2160	38.7661185	-90.1791300		Land Grant 00114		1782+57.04	69.63	LT	2782+70.42	31.80	LT	420.4
BB-07	764416.8978	2293156.4670	764473.8052	293327.1823	38.7658900	-90.1786450		Land Grant 00114		1783+87.45	72.60	LT	2784+00.83	34.77	LT	410.3
BB-08	764294.4088	2293073.7740	764351.3071	293244.4831	38.7657626	-90.0178977		Land Grant 00114		1783+46.58	69.43	RT	2783+59.96	107.27	RT	410.4
BB-09	764390.6202	2293341.8380	764447.5257	293512.5671	38.7659437	-90.1780416		Land Grant 00114		1785+71.90	104.80	LT	2785+85.28	66.96	LT	400.2
BB-10	764252.1809	2293296.6280	764309.0761	293467.3537	38.7655050	-90.1781890		Land Grant 00114		1785+71.61	40.85	RT	2785+84.99	78.68	RT	409.2
BB-11	764320.6647	2293594.6870	764377.5650	293765.4349	38.7657610	-90.1771090		Land Grant 00114		1788+34.02	116.26	LT	2788+47.40	78.43	LT	406.6
BB-12	764182.9369	2293523.0980	764239.8269	293693.8406	38.7653735	-90.1774058		Land Grant 00114		1788+08.41	36.85	RT	2788+21.79	74.68	RT	393.4
BB-13	764239.7295	2293820.3710	764296.6237	293991.1357	38.7656110	-90.1763140		Land Grant 00114		1790+73.68	108.90	LT	2790+87.06	71.06	LT	405.4
BB-14	764110.5621	2293749.5600	764167.4467	293920.3194	38.7651749	-90.1766115		Land Grant 00114		1790+46.17	35.83	RT	2790+59.55	73.66	RT	394.2
BB-15	764171.1528	2294047.9850	764228.0419	294218.7666	38.7652016	-90.1757276		Land Grant 00114		1793+11.37	113.88	LT	2793+24.75	76.05	LT	406.6
BB-16C	763923.0336	2294440.5230	763979.9043	294611.3339	38.7646300	-90.1742700		Land Grant 00114		1797+61.34	1.04	RT	2797+74.72	38.87	RT	400.2
BB-17	764096.5546	2294270.1890	764153.4382	294440.9872	38.7652000	-90.1747400		Land Grant 00114		1795+45.76	111.48	LT	2795+59.15	73.64	LT	389.6
BB-18	764037.6725	2293974.2720	764094.5517	294145.0482	38.7650350	-90.1758300		Land Grant 00114		1792+82.43	35.84	RT	2792+95.81	73.67	RT	407.8
BB-19	764066.5609	2294511.7940	764123.4422	294682.6102	38.7650470	-90.1739320		Land Grant 00114		1797+84.85	157.48	LT	2797+98.24	119.65	LT	389.5
BB-20	763975.5410	2294196.4340	764032.4156	294367.2267	38.7647970	-90.1750380		Land Grant 00114		1795+12.94	26.40	RT	2795+26.32	64.23	RT	389.2
BB-21	763948.2681	2294682.4810	764005.1406	294853.3099	38.7647294	-90.1733395		Land Grant 00114		1799+83.72	97.61	LT	2799+97.11	59.78	LT	388.7
BB-22	763827.6470	2294609.5740	763884.5106	294780.3975	38.7643910	-90.1735890		Land Grant 00114		1799+51.58	39.63	RT	2799+64.97	77.46	RT	388.8
BB-23	763915.7613	2294877.3170	763972.6314	295048.1604	38.7646330	-90.1726500		Land Grant 00114		1801+79.10	126.80	LT	2801+92.48	88.97	LT	389.7
BB-23 OS	763939.4328	2294888.4390	763996.3047	295059.2832	38.7646980	-90.1726110		Land Grant 00114		1801+82.38	152.75	LT	2801+95.76	114.92	LT	389.2
BB-24	763786.1169	2294780.0790	763842.9774	294950.9151	38.7642770	-90.1729910		Land Grant 00114		1801+26.60	26.53	RT	2801+39.98	64.36	RT	388.6
BB-25	763580.2436	2295837.2220	763637.0887	296008.1368	38.7637191	-90.1692896		Land Grant 00114		1811+95.77	103.78	LT	2812+09.15	65.95	LT	400.2
BB-26	763738.3929	2295022.7230	763795.2498	295193.5772	38.7641460	-90.1721400	26	4 North	10 West	1803+72.15	2.94	LT	2803+85.53	34.90	RT	388.6
BB-27	763818.5098	2295091.1590	763875.3727	295262.0183	38.7643660	-90.1719000	26	4 North	10 West	1804+12.53	100.26	LT	2804+25.91	62.43	LT	388.5
BB-28	763650.9751	2295260.5180	763707.8255	295431.3899	38.7639060	-90.1713060	26	4 North	10 West	1806+25.33	6.86	RT	2806+38.71	44.69	RT	390.3
BB-29	763410.2406	2296444.6150	763467.0731	296615.5751	38.7632304	-90.1671699	25	4 North	10 West	1818+26.03	129.46	LT	2818+39.41	91.62	LT	418.0
BB-30	763561.1213	2295470.1980	763617.9650	295641.0855	38.7636450	-90.1705860	26	4 North	10 West	1808+52.52	27.64	RT	2808+65.90	65.48	RT	389.9
BB-31	763751.8528	2295298.1600	763808.7107	295469.0347	38.7641830	-90.1711740	26	4 North	10 West	1806+30.02	100.72	LT	2806+43.40	62.89	LT	390.0

GIS Information for the Explored SGR Borings/Soundings

Project: **I-270 over Mississippi River**
SCI No. **2017-3167.10 Task 200**

Boring/ Sounding	IL Northing	IL Easting	Project Northing	Project Easting	Latitude	Longitude	Section	Township	Range	EB Sta	EB OS FT	EB OS Side	WB Sta	WB OS FT	WB OS Side	Elevation FT
BB-32	763223.8995	2296520.4860	763280.7181	296691.4517	38.7627407	-90.1668932	25	4 North	10 West	1819+55.69	24.40	RT	2819+69.08	62.23	RT	416.0
BB-33	763688.4734	2295543.0850	763745.3266	295713.9779	38.7640090	-90.1703150	26	4 North	10 West	1808+82.57	115.99	LT	2808+95.95	78.16	LT	392.1
BB-34	763490.3202	2295691.9980	763547.1587	295862.9020	38.7634722	-90.1697989	26	4 North	10 West	1810+85.36	26.57	RT	2810+98.74	64.40	RT	391.3
BB-35	763244.7443	2296848.9210	763301.5645	297019.9112	38.7628260	-90.1657304	25	4 North	10 West	1822+61.70	96.76	LT	2822+75.08	58.93	LT	415.2
BB-36	763414.8158	2295917.6750	763471.6486	296088.5958	38.7632800	-90.1689890	26	4 North	10 West	1813+23.34	28.77	RT	2813+36.72	66.60	RT	414.0
BB-37	763596.9365	2295755.0340	763653.7829	295925.9427	38.7637649	-90.1695778	26	4 North	10 West	1811+12.43	94.31	LT	2811+25.82	56.47	LT	393.8
BB-38	763351.0022	2296101.3350	763407.8303	296272.2695	38.7631220	-90.1683630	25	4 North	10 West	1815+17.74	32.81	RT	2815+31.13	70.64	RT	406.0
BB-39	763523.7667	2295975.2630	763580.6076	296146.1881	38.7658485	-90.1688282	25	4 North	10 West	1813+44.51	92.65	LT	2813+57.89	54.81	LT	403.9
BB-40	763109.2983	2297245.2650	763166.1084	297416.2847	38.7624259	-90.1643514	25	4 North	10 West	1826+80.53	90.19	LT	2826+93.91	52.36	LT	412.6
BB-41	763461.5092	2296163.5930	763518.3455	296334.5321	38.7634038	-90.1681810	25	4 North	10 West	1815+42.88	91.53	LT	2815+56.26	53.69	LT	403.2
BB-42	763039.1741	2297479.1450	763095.9790	297650.1821	38.7622829	-90.1634747	36	4 North	10 West	1829+24.65	95.64	LT	2829+38.04	57.81	LT	410.2
BB-43	762945.7281	2297319.9830	763002.5260	297491.0082	38.7619432	-90.1641776	36	4 North	10 West	1828+02.07	42.36	RT	2828+15.46	80.19	RT	408.8
BB-44	763291.8741	2296271.7720	763348.6978	296442.7192	38.7629273	-90.1677655	25	4 North	10 West	1816+98.12	36.47	RT	2817+11.50	74.30	RT	416.0
BB-45	763410.1635	2296343.3690	763466.9960	296514.3215	38.7632521	-90.1675144	25	4 North	10 West	1817+29.74	98.15	LT	2817+43.12	30.31	LT	417.1
BB-46	763136.2300	2296732.4790	763193.0421	296903.4605	38.7624999	-90.1661498	25	4 North	10 West	1821+84.41	42.39	RT	2821+97.79	80.23	RT	414.5
BB-47	763340.1066	2296566.7110	763396.9339	296737.6802	38.7630598	-90.1667311	25	4 North	10 West	1819+62.82	100.41	LT	2819+77.20	62.58	LT	416.5
BB-48	762872.2785	2297658.1930	762929.0709	297829.2434	38.7617751	-90.1629033	36	4 North	10 West	1831+46.47	7.88	RT	2831+59.86	45.72	RT	414.3
BB-49	762923.7843	2297887.4990	762980.5806	298058.5665	38.7619165	-90.1620991	36	4 North	10 West	1833+48.72	111.86	LT	2833+62.10	74.03	LT	426.9
BB-50	762733.0511	2297813.9400	762789.8332	297985.0020	38.7613928	-90.1623571	36	4 North	10 West	1833+37.59	92.28	RT	2833+50.97	130.11	RT	426.6
BB-51	763255.2807	2296786.1690	763312.1017	296957.1545	38.7628268	-90.1659615	25	4 North	10 West	1821+98.76	87.42	LT	2822+12.14	49.59	LT	415.7
BB-52	763069.3030	2296947.2670	763126.1101	297118.2645	38.7623161	-90.1653965	25	4 North	10 West	1824+09.39	39.79	RT	2824+22.77	77.63	RT	415.2
BB-53	763187.5925	2297010.3040	763244.4084	297181.3062	38.7626409	-90.1651754	25	4 North	10 West	1824+32.86	92.18	LT	2824+46.24	54.35	LT	414.9
BB-54	762996.1503	2297171.3950	763052.9520	297342.4092	38.7621152	-90.1646105	36	4 North	10 West	1826+45.17	40.23	RT	2826+58.55	78.07	RT	413.7
BB-55	762992.2595	2297637.5490	763049.0609	297808.5979	38.7621045	-90.1629757	36	4 North	10 West	1830+89.82	99.89	LT	2831+03.20	62.05	LT	410.9
BB-56	762926.8889	2297399.4130	762983.6854	297570.4441	38.7619251	-90.1638108	36	4 North	10 West	1828+83.45	35.77	RT	2828+96.83	73.61	RT	414.0
BB-57	762933.8758	2297814.1980	762990.6728	297985.2600	38.7619442	-90.1623561	26	4 North	10 West	1832+75.88	98.85	LT	2832+89.26	61.01	LT	412.9
BB-58	762868.5222	2297572.1780	762925.3144	297743.2220	38.7617648	-90.1632049	36	4 North	10 West	1830+65.81	37.99	RT	2830+79.19	75.83	RT	413.2
BB-59	762807.0430	2297745.7220	762863.8306	297916.7789	38.7615959	-90.1625963	36	4 North	10 West	1832+49.87	42.94	RT	2832+63.25	80.77	RT	412.3
C-107	763316.7349	2296333.7620	763373.5604	296504.7138	38.7629956	-90.1675481	25	4 North	10 West	1817+49.42	6.30	LT	2817+62.81	31.53	RT	417.0
C-108	763050.7545	2297052.9760	763107.5602	297223.9814	38.7622652	-90.1650258	36	4 North	10 West	1825+15.67	24.82	RT	2825+29.05	62.66	RT	412.7
C-110	762789.6120	2297989.8530	762846.3983	298160.9281	38.7615481	-90.1617401	36	4 North	10 West	1834+87.48	15.80	LT	2835+01.04	21.90	RT	442.6
C-111	762674.8999	2297940.7860	762731.6776	298111.8574	38.7612331	-90.1619122	36	4 North	10 West	1834+76.20	108.46	RT	2834+89.58	146.29	RT	419.0
C-112	762662.5981	2298382.4930	762719.3749	298553.5973	38.7611993	-90.1603632	36	4 North	10 West	1839+00.92	7.85	LT	2839+12.08	27.51	RT	442.2
C-113	762561.3952	2298341.9430	762618.1645	298513.0443	38.7609214	-90.1605054	36	4 North	10 West	1838+86.51	100.21	RT	2838+98.95	135.71	RT	416.7
C-118	762950.6494	2297733.6780	763007.4477	297904.7340	38.7619903	-90.1626385	36	4 North	10 West	1831+94.10	89.96	LT	2832+07.48	52.13	LT	412.0

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

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