SCI ENGINEERING, INC.
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618-624-6969
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Structure Geotechnical Report

PEDESTRIAN BRIDGE CONSTRUCTION
PTB 195 ITEM 57
SHARED USE PATH OVER JUDY'S BRANCH
F.A.P. ROUTE 592
MADISON COUNTY, ILLINOIS
SECTION: 51-R
STATION 11+32.26
STRUCTURE NO. SN 060-7003 (PROPOSED)

Thomas J. Casey, P.E.
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April 7, 2023

Prepared for:
FUHRMANN ENGINEERING
1022 EASTPORT PLAZA DRIVE
COLLINSVILLE, ILLINOIS 62234
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Exp: 11/30/2023

SCI No. 2020-0531.10

Thomas Casey

LICENSED PROFESSIONAL ENGINEER
THOMAS
JOSEPH CASEY
062-061853
STATE OF ILLINOIS

4/7/2023

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CONSTRUCTION SERVICES

April 7, 2023

Eric M. Lagemann, P.E., S.E.
Fuhrmann Engineering
1022 Eastport Plaza Drive
Collinsville, Illinois 62234

RE: Structure Geotechnical Report
Pedestrian Bridge Construction
PTB 195 Item 57
Shared Use Path over Judy's Branch
F.A.P Route 592
Madison County, Illinois
Section: 51-R
Station 11+32.26
Structure No. SN 060-7003 (Proposed)
SCI No.: 2020-0531.10

Dear Eric M. Lagemann:

Enclosed is our *Structure Geotechnical Report (SGR)*, dated April 2023. This report should be read in its entirety, and our recommendations considered in the design and construction of the proposed bridge. Please call if you have any questions.

Respectfully,

SCI ENGINEERING, INC.

Prakash Paudel, E.I.
Staff Engineer

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

PP/TJC/snp

Enclosure

\\sciengineering.local\shared\Projects\2020\2020-0531 PTB 195, Item 57 Realignment of IL 162 at 157\Report\SN 060-7003 (P) - Shared Use Path over Judy's Branch\Updated SGR\20-0531.10 Shared Use Path over Judy's Branch (SN060-7003) Final.docx

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Structure Geotechnical Report

PEDESTRIAN BRIDGE CONSTRUCTION
PTB 195 ITEM 57
SHARED USE PATH OVER JUDY'S BRANCH
F.A.P. ROUTE 592
MADISON COUNTY, ILLINOIS
SECTION: 51-R
STATION 11+32.26
STRUCTURE NO. SN 060-7003 (PROPOSED)

1.0 PROJECT DESCRIPTION

This overall project consists of the realignment of the offset intersection of State Route IL-162 and State Route IL-157 in Collinsville, Illinois. The west leg of Route 162 shall be realigned to the south to align with the existing east leg of Route 162, creating a traditional four-legged intersection with traffic signals. The geotechnical study summarized in this report was performed for the proposed construction of the pedestrian bridge that will carry a shared use path for bikers and pedestrians over Judy's Branch in Madison County, Illinois. This bridge will be constructed immediately west of the proposed Route 157 bridge over Judy's Branch.

Based on the latest TS&L provided by Fuhrmann Engineering (Fuhrmann) on March 24, 2023, the proposed structure will be a two-lane, single span with a back-to-back abutment length of approximately 138 feet and width of approximately 14 feet. According to the provided profiles and cross sections, a maximum fill of approximately 10 feet is planned near the south approach embankment whereas maximum fill of 8 feet is planned near the north approach embankment. The end slopes will have a maximum inclination of 2 horizontal to 1 vertical (2H:1V) and the streambed of the creek will be capped with approximately 24 inches of stone riprap used for scour protection. The location of the site is shown on the *Vicinity and Topographic Map*, Figure 1.

2.0 SUBSURFACE EXPLORATION

2.1 Area Geology

The project is located approximately 7.5 miles east of the Mississippi River in the floodplain known locally as the American Bottoms. According to *Surficial Geology of Monks Mound Quadrangle, Madison and St. Clair Counties, Illinois 2007*, the near-surface soils are of the Cahokia Formation that mainly consist of silt loam with occasional thin sand and diamicton beds; soft and weakly stratified and up to 15 feet thick. These alluviums were deposited by distributary channels in fans including redeposited loess and some mud flows.

According to *Bedrock Geologic Map, Monks Mound Quadrangle, Madison and St. Clair Counties, Illinois 2001*, the bedrock at this site belongs to Carbondale and Tradewater formations. The Carbondale formation is dominated by dark gray carbonaceous and pyritic shales with siltstone intervals while the Tradewater formation is dominated by shale or claystone and commonly shows rooting.

2.2 Exploration Procedures

Two standard penetration test (SPT) borings, designated as B-7 and B-24, and one CPTu sounding, designated as B-6 were advanced near the proposed abutment locations, as shown on the *Aerial Photograph*, Figure 2 and *Site Plan,* Figure 3. The test locations were selected and staked in the field by SCI personnel; however the elevations were estimated from publicly available LIDAR data. The stations and offsets were estimated from the TS&L plans provided and included in Appendix F. The field exploration was performed in general accordance with procedures outlined in the *2020 IDOT Geotechnical Manual*.

Personnel from SCI were with the drill rig to supervise drilling, log the borings, and perform field unconfined compressive strength tests of the borings. A CME 550X all-terrain-mounted drill rig equipped with both hollow stem augers and mud-rotary was used to advance the borings. SPTs were performed with a split-spoon sampler at 2½-foot intervals to 30 feet, and at 5-foot intervals thereafter to the termination depth of the borings. The unconfined compressive strength of the cohesive soils was determined with a Rimac test apparatus. A pocket penetrometer was used to measure the compressive strength if the soils were not conducive to Rimac testing. While auger refusal did not occur in any of the borings, split spoon sampler refusal did occur within the shale bedrock in both soil test borings to the depths of 87.5 to 89 feet, as detailed on the appended boring logs. Split-spoon sampler refusal is a designation applied to any material that results in SPT N-values in excess of 100 blows per foot (bpf) or 50 blows over the advancement depth of less than 6 inches.

The CPTu sounding was conducted in accordance with ASTM D5778 "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils." 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 1 inch per second. 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 are recorded approximately every 1 inch.

2.3 Subsurface Conditions

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 and CPTu Log with Lab Test Results in Appendix A. The generalized soil profile is included on the *Subsurface Profile*, Figure 4.

The boring B-7 encountered 6 feet of existing fill consisting of a couple feet of cinders (A-1) at the top followed by dark brown to brown silty clay loam (A-4) while boring B-24 encountered gray clay (A-7) fill down to 3 feet below the ground surface. Standard Penetration Test (SPT) N-values (the sum of the second and third blow count numbers in each sampling interval from the SPT) in the existing fill ranged from 7 to 15 bpf with an average of 18 bpf and Rimac unconfined compressive strength (Qu) of the cohesive fill samples ranged from 0.4 to 0.9 tons per square foot (tsf) with an average of 0.65 tsf. The correlated SPT N-values of the upper 6 feet (estimated existing fill depth) from the CPTu sounding B-6 ranged from 5 to 43. Overall, the strength and N-values classify the fill as medium stiff to stiff in consistency.

Underlying the fill, the natural soils generally consisted of silty to sandy loam (A-4) and silty clay (A-6) to clay (A-7), with occasional layers of sand (A-3) to a nominal depth of 32 feet (El. 406), followed by clay (A-7) to silty clay loam (A-6) all the way down to the sampler refusal depth. As an exception, a gray weathered layer of clayey shale was encountered in boring B-7 at 79.5 feet (El. 358.5) that extended all the way down to 86 feet (El. 352).

In general, the fine-grained soils are very soft to stiff in consistency and the granular soils are very loose to medium dense in relative density, with a majority of the observed and correlated N-values ranging between 0 and 31 blows per foot (bpf) with an average of approximately 10 bpf. Unconfined compressive strengths obtained from Rimac tests ranged between 0.1 to 3 tons per square foot (tsf) with an average of 1.1 tsf. Moisture contents in the native soil samples ranged from 15 to 48 percent, with an average of approximately 26 percent.

2.4 Groundwater Conditions

Groundwater levels observed at the time of drilling are summarized in Table 2.1. It should be noted that the groundwater level is subject to seasonal and climatic variations, the water level in the existing Judy's Branch, and other factors; and may be present at different depths in the future. In addition, without extended periods of observation, measurement of the true groundwater levels may not be possible.

Table 2.1 – Summary of Approximate Groundwater Levels

Boring	Ground Surface Elevation (feet)	Depth to Groundwater during Drilling (feet)	Groundwater Elevation during Drilling (feet)	Depth to Groundwater 24 hours after Completion of Drilling (feet)	Groundwater Elevation 24 hours after Completion of Drilling (feet)
B-7	438±	13.0	425.0	Not Measured	--
B-24	437±	Not Encountered	--	9.4	427.6

3.0 GEOTECHNICAL EVALUATIONS

In order to provide design recommendations for founding the structure, 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, existing plans, and communications with Fuhrmann personnel familiar with the project.

3.1 Seismic Considerations

3.1.1 Design Earthquake

Ground shaking at the foundation of structures and liquefaction of the soil under the foundation are the principle seismic hazards to be considered in design of earthquake-resistant structures. Soil liquefaction is possible within loose sand and low plastic silt deposits below the groundwater table. Liquefaction occurs when a rapid development in water pressure, caused by the ground motion, pushes sand particles apart, resulting in a loss of strength and later densification as the water pressure dissipates. This loss of strength can cause bearing capacity failure while the densification can cause excessive settlement. Potential earthquake damage can be mitigated by structural and/or geotechnical measures or procedures common to earthquake resistant design.

For the purposes of seismic design the bridge has been classified as *Regular* and *Essential*. According to the Illinois Department of Transportation Bridge Manual 2012 edition, the structure should be designed to a design earthquake with a 7 percent Probability of Exceedance (PE) over a 75-year exposure period (i.e. a 1,000-year design earthquake). The design earthquake has a Moment Magnitude (Mw) of 4.9 and a site coefficient (A_s) of 0.25g, as determined from data provided by the United States Geological Survey (USGS) National Seismic Hazard Mapping Project and procedures outlined in the All Geotechnical Manual Users (AGMU) 10.1, *Liquefaction Analysis Procedure*.

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 AGMU Memo 09.1, *Seismic Site Class Definition*, of the IDOT Bridge Manual Design Guides. The global site Class was evaluated using methods defined as B and C, which include evaluating the SPT N-values and undrained shear strength, S_u. The following results were calculated:

- Method B using N: 10 bpf (Site Class E)
- Method C using N_{ch}: 26 bpf (Site Class D)
- Method C using S_u: 1,100 psf (Site Class D)

Based on the span and overall bridge lengths and the guidelines in the AGMU, we recommend that Site Class D be used for the project. Based on Table 3.15.2-1, the Seismic Performance Zone is 2. Seismic design parameters for the site are summarized in Table 3.1.

Table 3.1 – Seismic Design Parameters

Site Class	D
PGA	0.17
Spectral Acceleration at 0.2 sec. (S_S)	0.35g
Spectral Acceleration at 1.0 sec.(S_1)	0.10g
F_{pga}	1.46
F_a	1.52
F_v	2.40
Site Coefficient (As)	0.25
Design Spectral Acceleration at 0.2 sec. (S_{DS})	0.53g
Design Spectral Acceleration at 1.0 sec.(S_{D1})	0.23g
Seismic Design Category	B
Seismic Performance Zone	2

3.1.3 Liquefaction Potential Analysis

The liquefaction potential analysis for the site was conducted using field and laboratory data and the techniques outlined in AGMU 10.1. For the seismic hazard evaluation, it is generally not prescribed to assume that earthquakes would coincide with other extreme loading events, (i.e., reoccurring flood events) unless the structure is considered critical, for which engineering judgement may be used to provide additional conservatism to the analysis, if necessary. The average seasonal groundwater elevation used in the analysis was estimated from the end of boring conditions and the seasonal weather conditions. Sands located above the water table are not susceptible to liquefaction.

Based on our analyses, a majority of the soils observed have sufficient strength and/or a plasticity index that make the threat of liquefaction minimal during the design earthquake. The detailed input parameters and results of the Liquefaction Analyses are provided in Appendix B. While the amount of 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 and Pier Settlement

Based on the maximum fill of 10 feet near the south abutment and 8 feet near the north abutment as shown on the provided cross sections, settlement of approximately 2.5 and 3.5 inches are anticipated near the south and the north approach embankment, respectively. Based on the anticipated settlement, the effects of down drag need to be considered on the determination of axial pile capacity for both of the abutments.

3.3 Bridge Approach Slabs

Based on the available information, the bridge approach slabs will likely bear on newly placed, low plastic structural fill. In evaluating the bearing resistance of the slabs, we recommend using a modulus of subgrade reaction of 100 pounds per square inch per inch of deflection (pci).

3.4 Slope Stability

The global slope stability of the end slope near both north and south approach embankment was analyzed for end-of-construction (short-term), long-term, and seismic (pseudo-static) loading conditions. 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-E.

The Bishop Method, as recommended by IDOT, 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 3.2 below. The analysis results indicate that the calculated factor of safety meets the required minimum factor of safety. Therefore, the end slopes will perform satisfactorily under short term, long term, and seismic conditions.

Table 3.2 – Summary of Estimated Global Slope Stability Factors of Safety

Analyzed End Slope	Short-Term Static Condition		Long-Term Static Condition		Seismic Condition	
	Required FOS	Estimated FOS	Required FOS	Estimated FOS	Required FOS	Estimated FOS
North Abutment	1.50	1.53	1.50	1.53	1.00	1.21
South Abutment	1.50	1.76	1.50	1.68	1.00	1.31

3.5 Scour

The pile capacity is dependent on the scour elevation and suitable protection should be provided to the foundation elements. Based on the latest TS&L, the design and check scour elevations for the abutments are shown in Table 3.3 below.

Table 3.3 – Summary of Design Scour Elevations

Event/Limit State	Design Scour Elevation (ft)		Item 113
	South Abutment	North Abutment	
Design	439.00	438.92	8
Check	439.00	438.92	

3.6 Bridge Foundations

The foundation supporting the proposed bridge must provide sufficient support to resist dead and live loads, including seismic loads. For the abutments, several potential foundation options were considered for supporting the bridge structure that included driven steel H-Piles, metal shell piles, drilled shafts, and shallow foundations. Shallow foundations are not recommended due to the relatively soft consistency of the shallow subsurface conditions encountered. Drilled shaft foundations were determined to be too costly, given the size of the proposed structure. SCI should be contacted for additional recommendations if drilled shafts will be considered. Both the driven steel H-piles and metal shell piles are feasible for the abutments. However, as per the latest TS&L provided on March 24, 2023, steel H-piles are planned for the bridge, and hence the design information for only steel H-piles is included in Driven Pile Capacity Sheets in Appendix C. No structure loads were provided at the time of writing this report. Therefore, a preliminary load of 800 kips was assumed for the abutments.

For the driven steel foundation options, we recommend a minimum of one index pile be installed near the North Abutment to help verify the pile length. Additionally, the index pile installed for the new IL-157 bridge (SN 060-0229) can also be utilized for this bridge if it is installed on the west side of the proposed IL-157 bridge and are completed under the same contract.

3.6.1 Driven Steel Piles

The structural capacity of driven piles depends on the allowable stress and cross-sectional areas of steel and concrete. The pile recommendations in this report assume that Steel H-piles will conform to ASHTO M270 Grade 50 (ASTM 709 Gr 50) or equivalent with a minimum yield stress of 50 kips per square inch (ksi) and metal shell piles will conform to ASTM A252 grade 3 (or equivalent) with a minimum yield stress of 45 ksi.

Based on the most current IDOT Bridge Manual, All Geotechnical Manual User Memorandums (AGMUs), and Guide Bridge Special Provisions (GBSP), a geotechnical resistance factor (φ_G) of 0.55 was used for the design of the driven pile foundations. Geotechnical losses due to down drag are considered for both the abutment locations as mentioned above. Geotechnical losses associated with scour were not considered as the open abutments will be protected with rip rap to prevent scour. 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 IDOT Bridge Manual, and appropriate AGMUs and GMSPs, and assume construction verification will follow the "WSDOT" formula outlined in Section 512 of the most current IDOT Standard Specifications for Road and Bridge construction. The tip elevations were calculated from the Modified IDOT Static Method spreadsheets based on the available factored resistance.

A summary of the design capacities, or factored resistance available (R_F), seismic factored resistance (R_{Fseis}), and nominal required bearing (R_N) as well as estimated pile lengths, is presented in Appendix C for each H-pile. It should be noted that H-piles driven into shale may run shorter than the IDOT spreadsheet predicts. The estimated pile lengths should be adjusted based on the index pile results. The maximum nominal required bearing and the available maximum factored resistance for typical steel H-piles for the abutments are shown in Table 3.4.

Table 3.4 – Maximum Nominal Required Bearing for Steel H-Piles

Abutment/ Pier	Pile Size	Maximum Nominal Required Bearing, R_{Nmax} (kips)	Maximum Factored Resistance Available (kips)	Maximum Factored Resistance Available Considering Downdrag (kips)	Estimated Length of Pile at Refusal (feet)
South Abutment	HP 12X74	589	324	275	92
	HP 12X84	664	365	316	93
	HP 14X89	705	388	331	91
	HP 14X117	929	511	453	95
North Abutment	HP 12X74	589	324	294	96
	HP 12X84	664	365	335	98
	HP 14X89	705	388	353	96
	HP 14X117	929	511	476	99

We recommend a minimum driven pile center to center spacing of three pile diameters, as recommended by the IDOT 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.

3.7 Lateral Pile Response

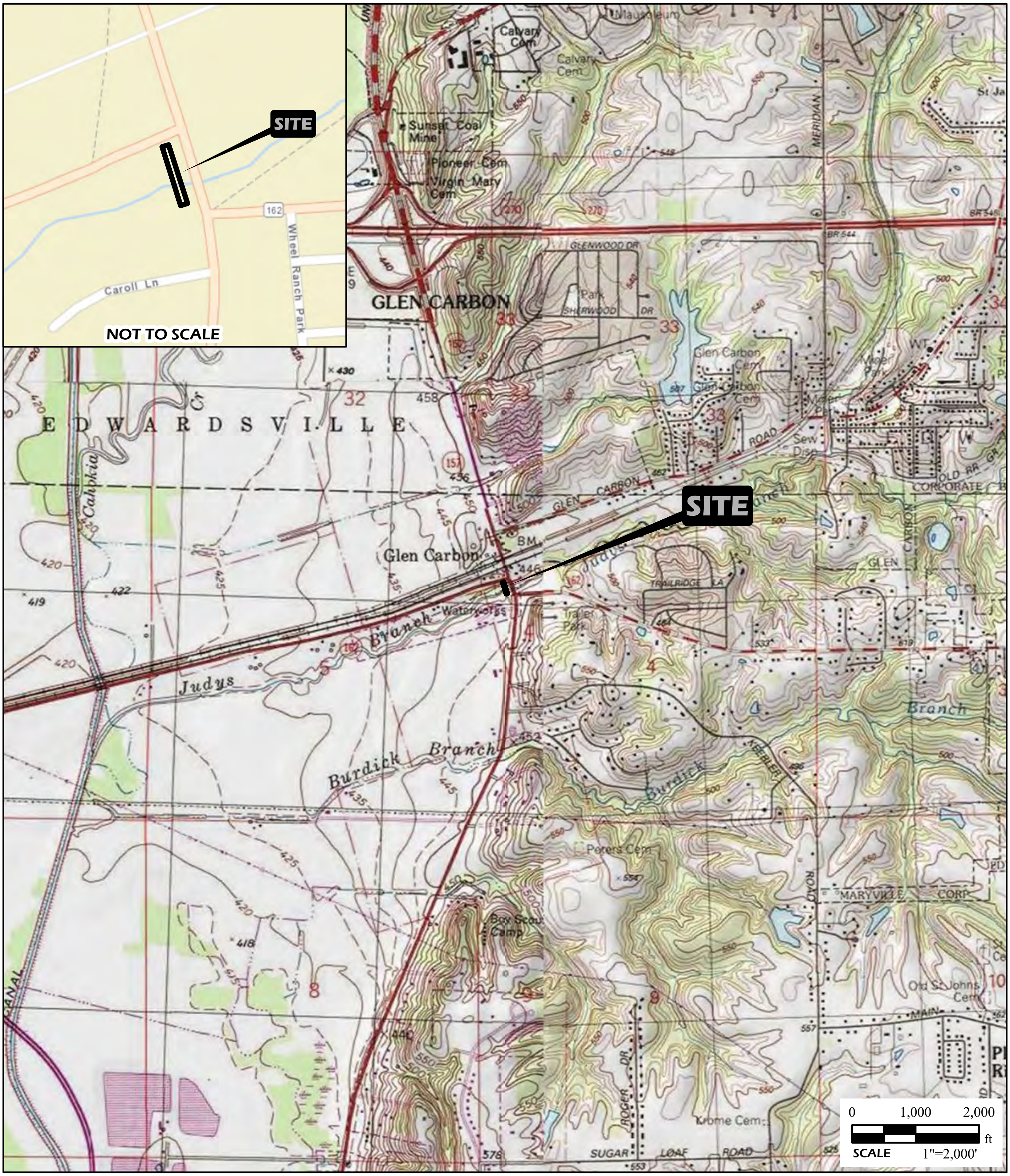
A representation of the shaft response under lateral loading exceeding 3 kips per pile is required for design of the bridge superstructure per Section 3.10.1.10 of the 2012 Bridge Manual. The lateral response can be developed by modeling the soil/shaft interaction with the computer program LPILE. Discrete 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. Tables for the abutment locations summarizing approximate soil and rock parameters for the LPILE analyses are included in Appendix D (Reference: LPILE User's Manual, Ensoft, Inc., 2019).

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.

5.0 LIMITATIONS

The recommendations provided herein are for the exclusive use of Fuhrmann Engineering and IDOT. They are specific only to the project described and are based on subsurface information obtained at two borings and one sounding location within the bridge area, 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
PTB 195, ITEM 57
SHARED USE PATH OVER JUDY'S BRANCH
MADISON COUNTY, ILLINOIS

VICINITY AND TOPOGRAPHIC MAP

DRAWN BY	JTM	DATE	JOB NUMBER
CHECKED BY	PP	04/2023	2020-0531.10

GENERAL NOTES/LEGEND

USGS TOPOGRAPHIC MAPS
WOOD RIVER, ILLINOIS QUADRANGLE
DATED 1994
10' CONTOURS
EDWARDSVILLE, ILLINOIS QUADRANGLE
DATED 1991
10' CONTOURS

MONKS MOUND, ILLINOIS QUADRANGLE
DATED 1954, REVISED 1993
10' CONTOURS
COLLINSVILLE, ILLINOIS QUADRANGLE
DATED 1991
10' CONTOURS

STREET MAP
HTTP://GOTO.ARCGISONLINE.COM/MAPS/WORLD_STREET_MAP

N
W
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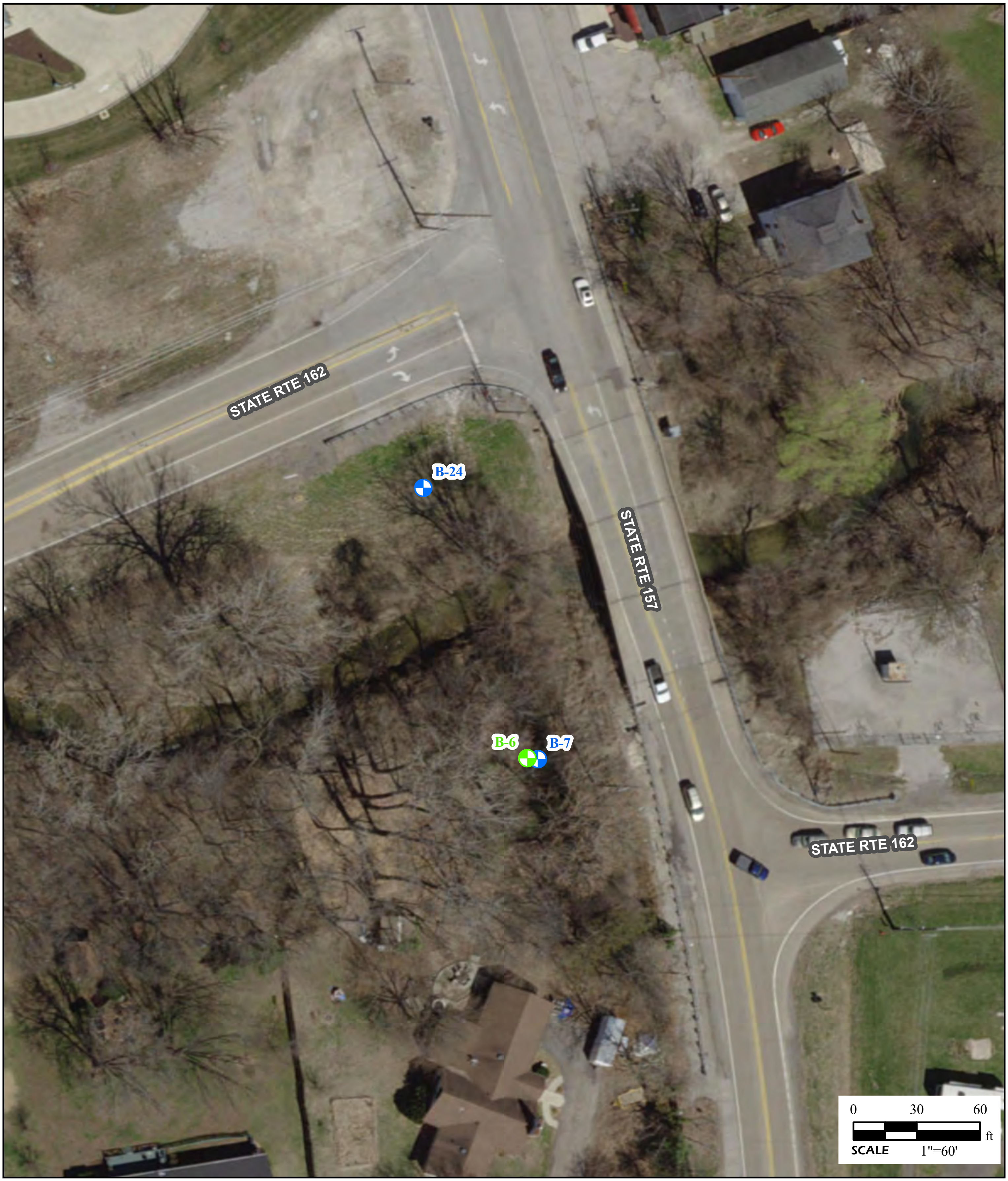
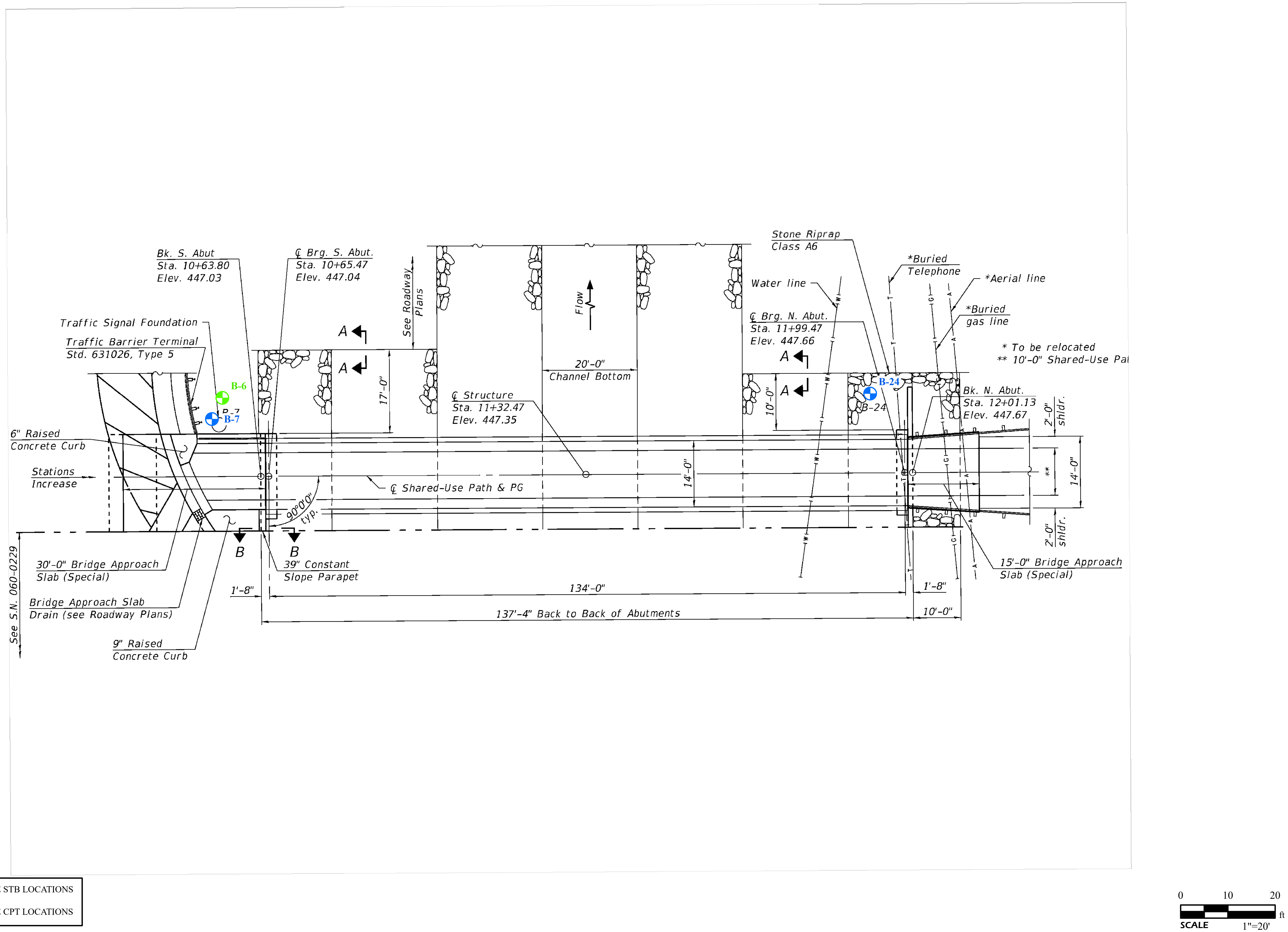
FIGURE
1



PROJECT NAME	GENERAL NOTES/LEGEND	
PTB 195, ITEM 57 SHARED USE PATH OVER JUDY'S BRANCH MADISON COUNTY, ILLINOIS	APPROXIMATE STB LOCATIONS APPROXIMATE CPT LOCATIONS	N W E S
AERIAL PHOTOGRAPH	AERIAL PHOTOGRAPH OBTAINED FROM ARCGIS ONLINE, WORLD IMAGERY.	
DRAWN BY JTM / CHECKED BY PP · DATE 04/2023 · JOB NUMBER 2020-0531.10	DIMENSIONS AND LOCATIONS ARE APPROXIMATE; ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.	FIGURE 2



APPROXIMATE STB LOCATIONS

APPROXIMATE CPT LOCATIONS

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GENERAL NOTES/LEGEND

PLAN DATED 03/28/2022 BY FUHRMANN ENGINEERING.

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

PTB 195, ITEM 57
SHARED USE PATH OVER JUDY'S BRANCH
MADISON COUNTY, ILLINOIS

SITE PLAN

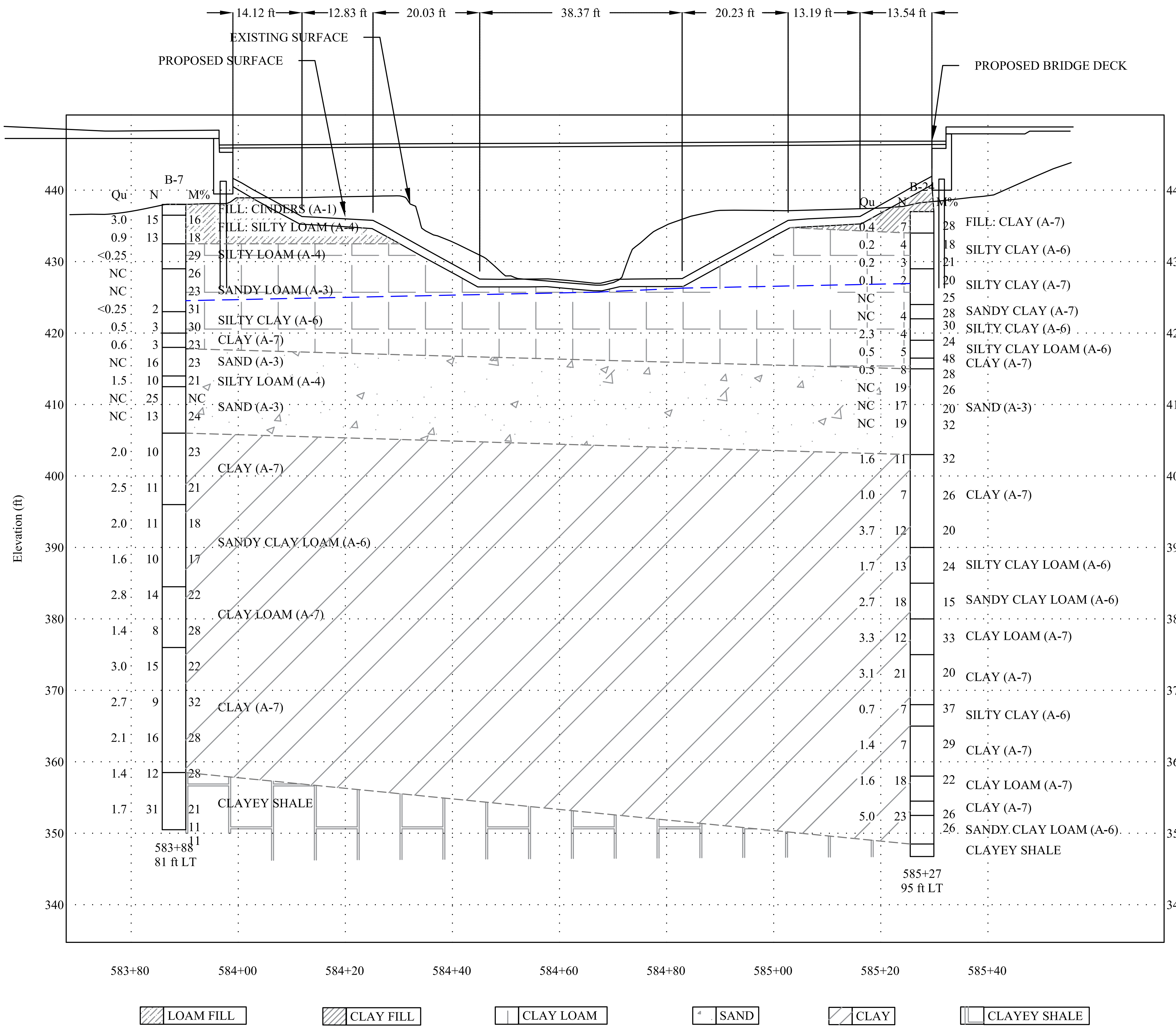
JOB NUMBER
2020-0531.10

DATE
04/2023

DRAWN BY
JTM

CHECKED BY
PP

FIGURE
3



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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

PTB 195, ITEM 57
SHARED USE PATH OVER JUDY'S BRANCH
MADISON COUNTY, ILLINOIS

SUBSURFACE PROFILE

SCALE 1" = 15' V, 1" = 20' H

JOB NUMBER 2020-0531.10

DATE 04/2023

DRAWN BY KMC

CHECKED BY PP

FIGURE 4

Appendix A

SCI ENGINEERING, INC.
130 Point West Boulevard
St. Charles, Missouri 63301
636-949-8200
www.sciengineering.com

BORING LOG LEGEND AND NOMENCLATURE

Depth is in feet below ground surface. **Elevation** is in feet mean sea level, site datum, or as otherwise noted.

Sample Type

- **SS** Split-spoon sample, disturbed, obtained by driving a 2-inch-O.D. split-spoon sampler (ASTM D 1586).
- **NX** Diamond core bit, nominal 2-inch-diameter rock sample (ASTM D 2113).
- **ST** Thin-walled (Shelby) tube sample, relatively undisturbed, obtained by pushing a 3-inch-diameter, tube (ASTM D 1587).
- **CS** Continuous sample tube system, relatively undisturbed, obtained by split-barrel sampler in conjunction with auger advancement.
- **SV** Shear vane, field test to determine strength of cohesive soil by pushing or driving a 2-inch-diameter vane, and then shearing by torquing soil in existing and remolded states (ASTM D 2573).
- **BS** Bag sample, disturbed, obtained from cuttings.

Recovery is expressed as a ratio of the length recovered to the total length pushed, driven, cored.

Blows Numbers indicate blows per 6 inches of split-spoon sampler penetration when driven with a 140-pound hammer falling freely 30 inches. The number of total blows obtained for the second and third 6-inch increments is the N value (Standard Penetration Test or SPT) in blows per foot (ASTM D 1586). Practical refusal is considered to be 50 or more blows without achieving 6 inches of penetration, and is expressed as a ratio of 50 to actual penetration, e.g., 50/2 (50 blows for 2 inches).

For analysis, the N value is used when obtained by a cathead and rope system. When obtained by an automatic hammer, the N value may be increased by a factor of 1.3.

Vane Shear Strength is expressed as the peak strength (existing state) / the residual strength (remolded state).

Description indicates soil constituents and other classification characteristics (ASTM D 2488) and the Unified Soil Classification (ASTM D 2487). Secondary soil constituents (expressed as a percentage) are described as follows:

Trace	<5
Few	5-15
With	>15-30

Stratigraphic Breaks may be observed or interpreted, and are indicated by a dashed line. Transition between described materials may be gradual.

Laboratory Test Results

- Natural moisture content (ASTM D 2216) in percent.
- Dry density in pounds per cubic foot (pcf).
- Hand penetrometer value of apparently intact cohesive sample in kips per square foot (ksf).
- Unconfined compressive strength (ASTM D 2166) in kips per square foot (ksf).
- Liquid and Plastic Limits (ASTM D 4318) in percent.

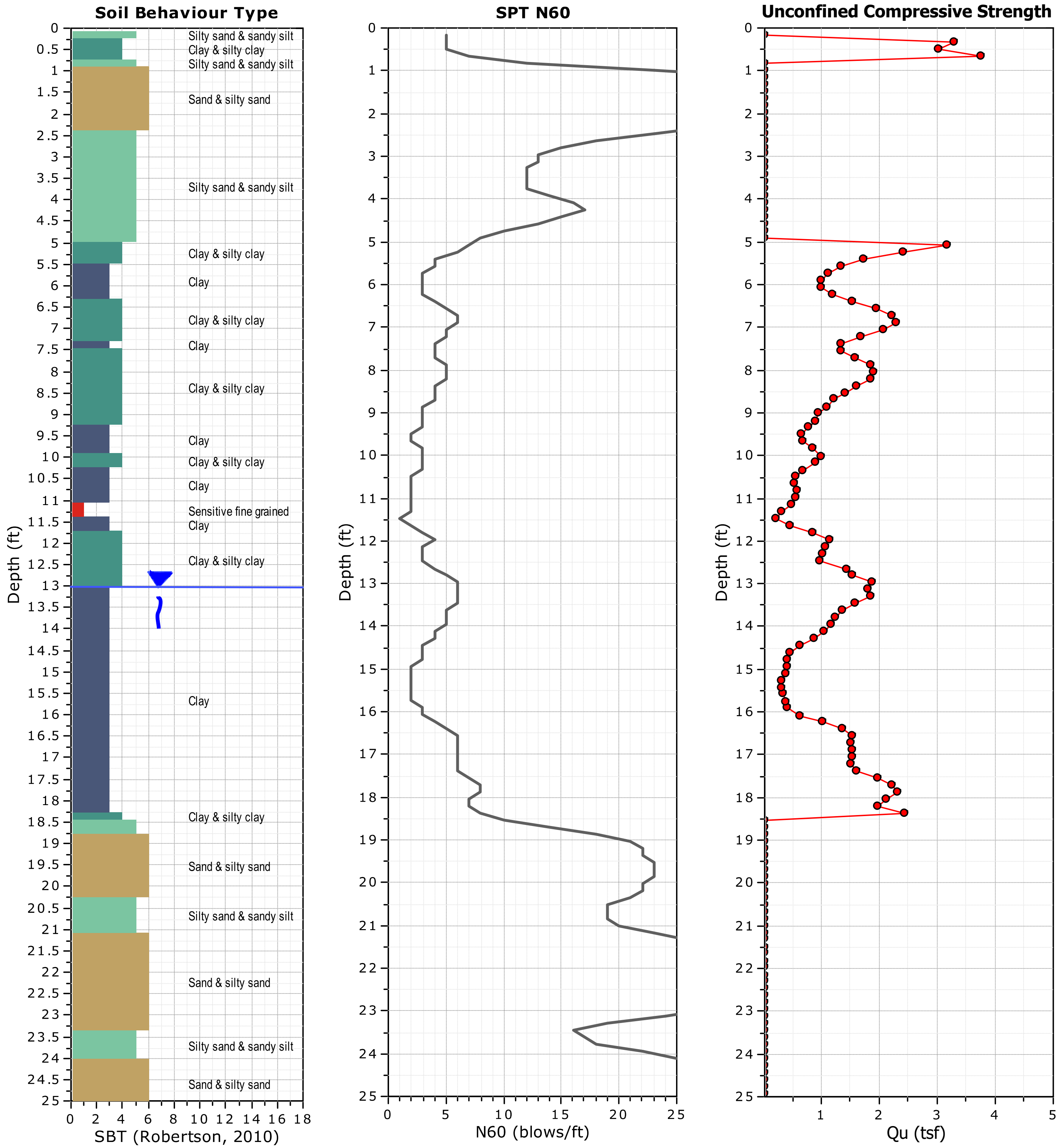
RQD (Rock Quality Designation) is the ratio between the total length of core segments 4 inches or more in length and the total length of core drilled. RQD (expressed as a percentage) indicates insitu rock quality as follows:

Excellent	90 to 100
Good	75 to 90
Fair	50 to 75
Poor	25 to 50
Very Poor	0 to 25

SCI Engineering, Inc.
650 Pierce Boulevard, O'Fallon, Illinois 62269
Geotechnical Services
www.sciengineering.com

CPT: B-6
Total depth: 25.10 ft, Date: 1/17/2022
Surface Elevation: 438.00 ft
Coords: 34.740838, -90.002131
STA: 17+81.00 Offset: 50 ft. RT
SEC: 4 TWP: 3N RNG: 8W

Project: **PTB 195 Item 57 Shared Use Path over Judy's Branch : SCI No. 2020-0531.10**
Location: **Madison County, IL**



Illinois Department of Transportation

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 3/1,2/2022

ROUTE Route 157/162 **DESCRIPTION** Shared Use Path over Judy's Branch **LOGGED BY** SCI

SECTION 51-1R **LOCATION** Madison County, Illinois, **SEC.** 4, **TWP.** 3N, **RNG.** 8W
Lat 38.740837 **Long** -90.002113

COUNTY Madison **DRILLING METHOD** CME 550 w/HSA and Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. SN 060-0229/ SN 060-7003
Station 584+70.00 and 11+32.26

BORING NO. B-7
Station 17+86
Offset 50 ft LT
Ground Surface Elev. 438.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 425.0 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
FILL: CINDERS (A-1)					
FILL: Dark brown to brown SILTY LOAM (A-4), stiff	436.5		5 6 9	3.0 P	16
		-5	4 6 7	0.9 S/10%	18
Brown SILTY LOAM (A-4), very moist, very soft *Percentage finer than #200 test performed (21.6% passing)*	432.5		WOH WOH WOH	<0.25 P	29
Percentage finer than #200 test performed (19.9% passing)	429.0				
Brown to reddish brown SANDY LOAM (A-3) w/ silt, very moist, very loose		-10	WOH WOH 1	NC	26
Percentage finer than #200 test performed (19.2% passing)			WOH WOH 1	NC	23
▼					
Percentage finer than #200 test performed (20.3% passing)		-15	1 1 1	<0.25 P	31
Gray and Brown SILTY CLAY (A-6), moist, very soft	423.0		WOH 1 2	0.5 S/15%	30
Gray CLAY (A-7), moist, soft *Atterberg Limits test performed (LL=34, PI=18)*	420.0				
	418.0	-20	1 1 2	0.6 B/20%	23

Description	Elev. (ft)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray fine SAND (A-3), wet, medium dense			4 7 9	NC	23
Gray SILTY LOAM (A-4), moist, stiff	414.0	-25	5 5 5	1.5 P	21
Gray fine SAND (A-3), wet, medium dense	412.5		8 12 13	NC	NC
		-30	6 6 7	NC	24
Gray CLAY (A-7), moist, stiff	406.0				
		-35	5 4 6	2.0 B/20%	23
		-40	4 4 7	2.5 B/20%	21

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 3/1,2/2022

ROUTE Route 157/162 **DESCRIPTION** Shared Use Path over Judy's Branch **LOGGED BY** SCI

SECTION 51-1R **LOCATION** Madison County, Illinois, **SEC.** 4, **TWP.** 3N, **RNG.** 8W
Lat 38.740837 **Long** -90.002113

COUNTY Madison **DRILLING METHOD** CME 550 w/HSA and Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. SN 060-0229/ SN 060-7003
Station 584+70.00 and 11+32.26

BORING NO. B-7
Station 17+86
Offset 50 ft LT
Ground Surface Elev. 438.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 425.0 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray CLAY (A-7), moist, stiff *(continued)*				
396.0 — Gray SANDY CLAY LOAM (A-6), moist, stiff (fill)				
	-45	3 4 7	2.0 B/20%	18
	-50	3 4 6	1.6 B/20%	17
384.5 — Gray CLAY LOAM (A-7), moist, stiff	-55	5 6 8	2.8 B/20%	22
	-60	3 4 4	1.4 B/20%	28

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray CLAY LOAM (A-7), moist, stiff *(continued)*				
376.0 — Gray CLAY (A-7), moist, very stiff	-65	6 6 9	3.0 B/20%	22
Becomes brown and stiff	-70	6 4 5	2.7 B/20%	32
Becomes very stiff	-75	4 7 9	2.1 B/20%	28
Becomes gray; 358.5	-80	4 5 7	1.4 B/20%	28

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Lat 38.740837 **Long** -90.002113

COUNTY Madison **DRILLING METHOD** CME 550 w/HSA and Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. SN 060-0229/ SN 060-7003
Station 584+70.00 and 11+32.26

BORING NO. B-7
Station 17+86
Offset 50 ft LT
Ground Surface Elev. 438.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter 425.0 ft ▼
Upon Completion N/A ft
After N/A **Hrs.** N/A ft

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray weathered CLAYEY SHALE, hard *(continued)*				
		6 11 20	1.7 S/10%	21
	-85			
		50/5.5"		11
		50/2"		
350.5		50/5"		11
Sampler Refusal at 87.5 feet. Borehole grouted upon completion.		50/1"		
	-90			
	-95			
	-100			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
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Illinois Department of Transportation

Division of Highways
SCI Engineering, Inc.

SOIL BORING LOG

Date 2/22,23/2022

ROUTE Route 157/162 **DESCRIPTION** Shared Use Path Over Judy's Branch **LOGGED BY** SCI

SECTION 51-1R **LOCATION** Madison County, Illinois, **SEC.** 4, **TWP.** 3N, **RNG.** 8W
Lat 38.741190 **Long** -90.002303

COUNTY Madison **DRILLING METHOD** CME 550 w/HSA and Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. SN 060-7003
Station 11+32.26

BORING NO. B-24
Station 585+27
Offset 95 ft LT
Ground Surface Elev. 437.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter N/A ft
Upon Completion N/A ft
After 24 **Hrs.** 427.6 ft ▽

Description	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
FILL: Gray CLAY (A-7), moist, medium stiff				
		4 3 4	0.4 S/10%	28
434.0 — Gray SILTY CLAY (A-6), moist, soft				
	-5	2 2 2	0.2 S/15%	18
		1 2 1	0.2 S/15%	21
429.0 — Gray SILTY CLAY (A-7), trace brown, moist, soft				
	▽ -10	1 1 1	0.1 S/20%	20
Becomes gray and brown		WOH WOH 2	NC	25
424.0 — Brown SANDY CLAY (A-6), wet, soft, sand is fine *Atterberg Limits Test Performed (LL=32, PI=10)*		WOH 2 2	NC	28 30
422.0 — Brown and gray SILTY CLAY (A-6), soft, moist	-15			
		1 1 3	2.3 P	24 48
419.0 — Gray SILTY CLAY LOAM (A-6) w/ clay deposits, moist, medium stiff				
	-20	3 2 3	0.5 B/20%	28
416.5 — Gray CLAY (A-7) w/ sand deposits, moist, medium stiff		WOH 2 6	0.5 P	26
415.0 — Gray fine SAND (A-3), moist, loose				
Becomes medium dense	-25	8 9 10	NC	
w/ sandy loam deposits		7 6 11	NC	20
No loam, trace coal fragments	-30	5 6 13	NC	32
403.0 — Brown CLAY (A-7), moist, stiff	-35	8 5 6	1.6 B/20%	32
Becomes medium stiff, w/ silty loam deposits	-40	3 2 5	1.0 B/20%	26

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SOIL BORING LOG

Date 2/22,23/2022

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Lat 38.741190 **Long** -90.002303

COUNTY Madison **DRILLING METHOD** CME 550 w/HSA and Mud Rotary **HAMMER TYPE** Automatic

STRUCT. NO. SN 060-7003
Station 11+32.26

BORING NO. B-24
Station 585+27
Offset 95 ft LT
Ground Surface Elev. 437.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter N/A ft
Upon Completion N/A ft
After 24 **Hrs.** 427.6 ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Brown CLAY (A-7), moist, stiff *(continued)*					
Becomes gray and stiff		-45	4 5 7	3.7 B/20%	20
Gray SILTY CLAY LOAM (A-6), moist, stiff	390.0				
		-50	5 6 7	1.7 B/20%	24
Gray and brown SANDY CLAY LOAM (A-6), trace gravel, moist, very stiff (glacial till)	385.0				
		-55	7 7 11	2.7 B/20%	15
Brown and gray CLAY LOAM (A-7), moist, stiff (till)	380.0				
		-60	6 5 7	3.3 B/20%	33

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Brown and gray CLAY LOAM (A-7), moist, stiff (till) *(continued)*					
Brown CLAY (A-7), moist, very stiff	375.0				
		-65	5 8 13	3.1 B/20%	20
Grayish brown SILTY CLAY (A-6), trace organics, moist, medium stiff	368.0	-70	3 3 4	0.7 B/20%	37
Grayish brown CLAY (A-7), trace organics, moist, medium stiff	365.0				
		-75	3 3 4	1.4 B/20%	29
Grayish brown CLAY LOAM (A-7), trace gravel, moist, very stiff	358.0	-80	4 5 13	1.6 B/20%	22

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
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STRUCT. NO. SN 060-7003
Station 11+32.26

BORING NO. B-24
Station 585+27
Offset 95 ft LT
Ground Surface Elev. 437.0 ft

Surface Water Elev. N/A ft
Stream Bed Elev. N/A ft

Groundwater Elev.:
First Encounter N/A ft
Upon Completion N/A ft
After 24 **Hrs.** 427.6 ft

Description	Elev.	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Grayish brown CLAY LOAM (A-7), trace gravel, moist, very stiff *(continued)*	354.5				
Brown CLAY (A-7), moist, very stiff	352.5		20 12 11	5.0 S/20%	26 26
Grayish brown SANDY CLAY LOAM (A-6), trace gravel, moist, very stiff	348.5	-85			
Gray CLAYEY SHALE, hard	346.8		50/2" 50/1"		
Sampler Refusal at 90.25 feet. Borehole grouted upon completion.		-90	50/2" 50/1"		
		-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)

Appendix B

Illinois Department of Transportation

LIQUEFACTION ANALYSIS

REFERENCE BORING NUMBER ===================================== B-24 N Abut
ELEVATION OF BORING GROUND SURFACE ========================= 437.00 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ====================== 9.40 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE =================== 9.40 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ===== 0.433
EARTHQUAKE MOMENT MAGNITUDE ================================ 5.1
FINISHED GRADE FILL OR CUT FROM BORING SURFACE =============== -5.33 FT. (Cut Depth)
HAMMER EFFICIENCY=== 73 %
BOREHOLE DIAMETER=== 6 IN.
SAMPLING METHOD=== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.362**

AVG. SHEAR WAVE VELOCITY (top 40')
$V_{s,40'}$ = **435** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.1
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.297**

	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
434.5	2.5	7	0.4					0.111	0.278	12.369	12.369	0.135								
432	5	4	0.2					0.104	0.538	6.381	6.381	0.083								
429.5	7.5	3	0.2					0.104	0.798	4.442	4.442	0.068	0.104	0.226	0.226	1.500	**0.241**	0.974	**0.274**	**N.L. (1)**
427	10	2		50				0.048	0.918	3.086	8.703	0.102	0.110	0.501	0.501	1.380	**0.332**	0.939	**0.264**	**N.L. (1)**
424.5	12.5	2		50				0.048	1.038	3.147	8.777	0.102	0.110	0.776	0.776	1.252	**0.303**	0.898	**0.253**	**N.L. (1)**
422	15	4		50				0.053	1.170	6.304	12.565	0.136	0.053	0.908	0.925	1.233	**0.397**	0.852	**0.244**	**1.627 (C)**
419.5	17.5	4	1		12	48	48	0.059	1.318	6.227	6.227	0.081	0.059	1.056	1.229	1.156	**0.222**	0.802	**0.263**	**N.L. (2)**
417	20	5	0.5	50	12	28	28	0.051	1.445	7.678	14.213	0.152	0.051	1.183	1.512	1.162	**0.418**	0.748	**0.269**	**N.L. (2)**
414.5	22.5	8	0.5	50	12	26	26	0.051	1.573	12.062	19.475	0.209	0.051	1.311	1.796	1.150	**0.568**	0.694	**0.267**	**N.L. (2)**
412	25	19						0.067	1.740	30.487	30.487	0.506	0.067	1.478	2.119	1.138	**1.360**	0.639	**0.258**	**N.L. (3)**
409.5	27.5	17						0.066	1.905	25.819	25.819	0.309	0.066	1.643	2.440	1.088	**0.794**	0.586	**0.245**	**N.L. (3)**
407	30	19						0.067	2.073	28.280	28.280	0.380	0.067	1.811	2.764	1.056	**0.947**	0.537	**0.231**	**N.L. (3)**
402	35	11	1.6		12	32	32	0.065	2.398	14.275	14.275	0.153	0.065	2.136	3.401	0.998	**0.360**	0.454	**0.204**	**N.L. (2)**
397	40	7	1		12	26	26	0.059	2.693	8.596	8.596	0.101	0.059	2.431	4.008	0.970	**0.231**	0.392	**0.182**	**N.L. (2)**
392	45	12	3.7		12	20	20	0.075	3.068	13.829	13.829	0.149	0.075	2.806	4.695	0.931	**0.327**	0.350	**0.165**	**N.L. (2)**
387	50	13	1.7		12	24	24	0.065	3.393	14.256	14.256	0.153	0.065	3.131	5.332	0.904	**0.326**	0.323	**0.155**	**N.L. (2)**
382	55	18	2.7		12	15	15	0.071	3.748	19.221	19.221	0.206	0.071	3.486	5.999	0.866	**0.421**	0.305	**0.148**	**N.L. (2)**
377	60	12	3.3		12	33	33	0.074	4.118	11.768	11.768	0.129	0.074	3.856	6.681	0.865	**0.264**	0.295	**0.144**	**N.L. (2)**
372	65	21	3.1		12	20	20	0.073	4.483	20.236	20.236	0.218	0.073	4.221	7.358	0.816	**0.421**	0.288	**0.141**	**N.L. (2)**
367	70	7	0.7		12	37	37	0.055	4.758	6.268	6.268	0.082	0.055	4.496	7.945	0.855	**0.165**	0.284	**0.141**	**N.L. (2)**
362	75	7	1.4		12	29	29	0.063	5.073	6.012	6.012	0.080	0.063	4.811	8.572	0.844	**0.159**	0.272	**0.136**	**N.L. (2)**
357	80	18	1.6		12	22	22	0.065	5.398	14.930	14.930	0.159	0.065	5.136	9.209	0.793	**0.298**	0.265	**0.134**	**N.L. (2)**
348.5	88.5	33	5				26	0.079	6.069	26.908	26.908	0.336	0.079	5.807	10.410	0.712	**0.565**	0.253	**0.128**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS
N.L. (1) = NOT LIQUEFIABLE, ABOVE EQ GROUND WATER ELEVATION
N.L. (2) = NOT LIQUEFIABLE, PI ≥ 12 OR w_c/LL ≤ 0.85
N.L. (3) = NOT LIQUEFIABLE, $(N_1)_{60}$ > 25
(C) = CONTRACTIVE SOIL TYPES
(D) = DILATIVE SOIL TYPES

Illinois Department of Transportation

LIQUEFACTION ANALYSIS

REFERENCE BORING NUMBER ==================================== B-7 S Abut
ELEVATION OF BORING GROUND SURFACE ========================== 438.00 FT.
DEPTH TO GROUNDWATER - DURING DRILLING ====================== 13.00 FT. (Below Boring Ground Surface)
DEPTH TO GROUNDWATER - DURING EARTHQUAKE ==================== 13.00 FT. (Below Finished Grade Cut or Fill Surface)
PEAK HORIZ. GROUND SURFACE ACCELERATION COEFFICIENT (As) ===== 0.433
EARTHQUAKE MOMENT MAGNITUDE ================================= 5.1
FINISHED GRADE FILL OR CUT FROM BORING SURFACE =============== -6.72 FT. (Cut Depth)
HAMMER EFFICIENCY== 73 %
BOREHOLE DIAMETER== 6 IN.
SAMPLING METHOD== Sampler w/out Liners

EQ MAGNITUDE SCALING FACTOR
(MSF) = **2.362**

AVG. SHEAR WAVE VELOCITY (top 40')
$V_{s,40'}$ = **379** FT./SEC.

PGA CALCULATOR
Earthquake Moment Magnitude = 5.1
Source-To-Site Distance, R (km) = 10
Ground Motion Prediction Equations = CEUS
PGA = **0.297**

	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
435.5	2.5	15	2					0.130	0.325	29.061	29.061	0.413								
433	5	13	0.9					0.120	0.625	21.839	21.839	0.240								
430.5	7.5	1		21.6				0.095	0.863	1.452	5.452	0.075	0.095	0.074	0.074	1.500	**0.267**	0.986	**0.278**	**N.L. (1)**
428	10	1		19.9		26	26	0.095	1.100	1.466	5.179	0.073	0.095	0.312	0.312	1.471	**0.255**	0.938	**0.264**	**N.L. (1)**
425.5	12.5	1		19.2		23	23	0.095	1.338	1.452	5.031	0.072	0.095	0.549	0.549	1.311	**0.224**	0.884	**0.249**	**N.L. (1)**
423	15	2		20.3				0.048	1.458	2.926	6.829	0.086	0.110	0.824	0.824	1.221	**0.249**	0.826	**0.232**	**N.L. (1)**
420.5	17.5	3	0.5	50	12	30	30	0.051	1.585	4.368	10.241	0.115	0.113	1.107	1.107	1.164	**0.317**	0.764	**0.215**	**N.L. (1)**
418	20	3	0.6		18	34	23	0.053	1.718	4.312	4.312	0.067	0.053	1.239	1.257	1.113	**0.176**	0.700	**0.200**	**N.L. (2)**
415.5	22.5	16						0.065	1.880	23.850	23.850	0.271	0.065	1.402	1.575	1.141	**0.730**	0.638	**0.202**	**3.614 (D)**
413	25	10	1		5	21	21	0.059	2.028	13.731	13.731	0.148	0.059	1.549	1.879	1.083	**0.377**	0.578	**0.197**	**1.914 (D)**
410.5	27.5	25						0.069	2.200	37.650	37.650	0.000	0.069	1.722	2.207	1.087	**0.001**	0.522	**0.188**	**N.L. (3)**
408	30	13						0.063	2.358	17.181	17.181	0.183	0.063	1.879	2.521	1.034	**0.446**	0.472	**0.178**	**2.506 (D)**
403	35	10	2		12	23	23	0.067	2.693	12.204	12.204	0.133	0.067	2.214	3.168	0.989	**0.311**	0.391	**0.157**	**N.L. (2)**
398	40	11	2.5		12	21	21	0.070	3.043	12.662	12.662	0.137	0.070	2.564	3.830	0.954	**0.309**	0.334	**0.140**	**N.L. (2)**
393	45	11	2		12	18	18	0.067	3.378	12.013	12.013	0.131	0.067	2.899	4.477	0.926	**0.287**	0.296	**0.128**	**N.L. (2)**
388	50	10	1.6		12	17	17	0.065	3.703	10.402	10.402	0.117	0.065	3.224	5.114	0.907	**0.250**	0.271	**0.121**	**N.L. (2)**
383	55	14	2.8		12	22	22	0.072	4.063	13.817	13.817	0.148	0.072	3.584	5.786	0.875	**0.306**	0.256	**0.116**	**N.L. (2)**
378	60	8	1.4		12	28	28	0.063	4.378	7.550	7.550	0.092	0.063	3.899	6.413	0.877	**0.191**	0.247	**0.114**	**N.L. (2)**
373	65	15	3		12	22	22	0.072	4.738	13.466	13.466	0.145	0.072	4.259	7.085	0.838	**0.287**	0.242	**0.113**	**N.L. (2)**
368	70	9	2.7		12	32	32	0.071	5.093	7.705	7.705	0.093	0.071	4.614	7.752	0.845	**0.186**	0.238	**0.113**	**N.L. (2)**
363	75	16	2.1		12	28	28	0.068	5.433	13.121	13.121	0.142	0.068	4.954	8.404	0.808	**0.270**	0.229	**0.109**	**N.L. (2)**
358	80	12	1.4		12	28	28	0.063	5.748	9.484	9.484	0.109	0.063	5.269	9.031	0.812	**0.208**	0.222	**0.107**	**N.L. (2)**
353	85	31	1.7					0.065	6.073	25.033	25.033	0.293	0.065	5.594	9.668	0.729	**0.504**	0.215	**0.104**	**N.L. (3)**

* FACTOR OF SAFETY DESCRIPTIONS
N.L. (1) = NOT LIQUEFIABLE, ABOVE EQ GROUND WATER ELEVATION
N.L. (2) = NOT LIQUEFIABLE, PI ≥ 12 OR w_c/LL ≤ 0.85
N.L. (3) = NOT LIQUEFIABLE, $(N_1)_{60}$ > 25
(C) = CONTRACTIVE SOIL TYPES
(D) = DILATIVE SOIL TYPES

Appendix C

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

Illinois Department of Transportation

SUBSTRUCTURE==================================== S Abutment (SN060-7003)
REFERENCE BORING ================================ B-7
LRFD or ASD or SEISMIC ============================= LRFD
PILE CUTOFF ELEV. ================================= 440.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 439.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ================= ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) =============== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ============== 800 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 14.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ============ 457.14 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ============ 171.43 KIPS

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

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
929 KIPS	**929** KIPS	**511** KIPS	**95** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)	NOMINAL 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.)
435.50	3.50	1.50	15		16.3		34.9	24.0		***27.0***	27	0	0	15	5
433.00	2.50	0.90	13		7.9	18.5	***24.2***	11.6	3.0	35.6	24	0	0	13	7
430.50	2.50		0	Very Fine Silty Sand	0.0	0.0	***27.0***	0.0	0.0	36.0	27	0	0	15	10
428.00	2.50		1	Very Fine Silty Sand	0.2	2.7	***27.2***	0.3	0.4	36.3	27	0	0	15	12
425.50	2.50		1	Very Fine Silty Sand	0.2	2.7	***30.1***	0.3	0.4	37.0	30	0	0	17	15
423.00	2.50		2	Very Fine Silty Sand	0.4	5.5	***34.9***	0.6	0.9	38.3	35	0	0	19	17
420.50	2.50	0.48	3		4.6	9.9	***37.8***	6.7	1.6	44.7	38	0	0	21	20
418.00	2.50		3	Very Fine Silty Sand	0.6	8.2	88.7	0.8	1.3	***53.7***	54	0	0	30	22
415.50	2.50		16	Fine Sand	3.3	58.6	60.9	4.9	9.5	***53.5***	54	0	0	29	25
413.00	2.50		10	Very Fine Silty Sand	1.9	27.5	126.8	2.8	4.5	***66.7***	67	0	0	37	27
410.50	2.50		25	Medium Sand	5.5	91.5	88.4	8.1	14.9	***67.7***	68	0	0	37	30
408.00	2.50		13	Medium Sand	2.9	47.6	84.7	4.2	7.7	***70.8***	71	0	0	39	32
403.00	5.00	1.99	10		28.2	41.0	122.9	41.3	6.7	***113.8***	114	0	0	63	37
398.00	5.00	2.48	11		32.5	51.1	***145.3***	47.7	8.3	159.8	145	0	0	80	42
393.00	5.00	1.99	11		28.2	41.0	***165.5***	41.3	6.7	199.8	165	0	0	91	47
388.00	5.00	1.60	10		24.4	32.9	***214.5***	35.8	5.4	239.6	215	0	0	118	52
383.00	5.00	2.80	14		35.3	57.7	***220.4***	51.8	9.4	286.6	220	0	0	121	57
378.00	5.00	1.37	8		21.9	28.2	***276.5***	32.1	4.6	324.3	277	0	0	152	62
373.00	5.00	3.03	15		37.4	62.4	***307.9***	54.8	10.1	378.2	308	0	0	169	67
368.00	5.00	2.74	9		34.8	56.4	***329.3***	51.1	9.2	427.1	329	0	0	181	72
363.00	5.00	2.09	16		29.0	43.0	***344.7***	42.6	7.0	467.4	345	0	0	190	77
357.00	6.00	1.43	12		27.1	29.4	***376.4***	39.7	4.8	507.9	376	0	0	207	83
352.00	5.00	1.65	31		24.9	34.0	***550.3***	36.5	5.5	568.7	550	0	0	303	88
351.00	1.00			Shale	60.4	183.0	***610.7***	88.7	29.8	657.3	611	0	0	336	89
350.00	1.00			Shale	60.4	183.0	***671.1***	88.7	29.8	746.0	671	0	0	369	90
349.00	1.00			Shale	60.4	183.0	***731.6***	88.7	29.8	834.6	732	0	0	402	91
348.00	1.00			Shale	60.4	183.0	***792.0***	88.7	29.8	923.3	792	0	0	436	92
347.00	1.00			Shale	60.4	183.0	***852.4***	88.7	29.8	1011.9	852	0	0	469	93
346.00	1.00			Shale	60.4	183.0	***912.8***	88.7	29.8	1100.6	913	0	0	502	94
345.00	1.00			Shale	60.4	183.0	***973.2***	88.7	29.8	1189.3	~~973~~	~~0~~	~~0~~	~~535~~	~~95~~
344.00	1.00			Shale	60.4	183.0	***1033.6***	88.7	29.8	1277.9	~~1034~~	~~0~~	~~0~~	~~569~~	~~96~~
343.00	1.00			Shale	60.4	183.0	***1094.1***	88.7	29.8	1366.6	~~1094~~	~~0~~	~~0~~	~~602~~	~~97~~
342.00	1.00			Shale	60.4	183.0	***1154.5***	88.7	29.8	1455.2	~~1154~~	~~0~~	~~0~~	~~635~~	~~98~~
341.00	1.00			Shale	60.4	183.0	***1214.9***	88.7	29.8	1543.9	~~1215~~	~~0~~	~~0~~	~~668~~	~~99~~
340.00	1.00			Shale	60.4	183.0	***1275.3***	88.7	29.8	1632.5	~~1275~~	~~0~~	~~0~~	~~701~~	~~100~~
339.00	1.00			Shale	60.4	183.0	***1335.7***	88.7	29.8	1721.2	~~1336~~	~~0~~	~~0~~	~~735~~	~~101~~
338.00	1.00			Shale		183.0			29.8						

Pile Design Table for S Abutment (SN060-7003) utilizing Boring #B-7

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36			
	261	143	88
Steel HP 10 X 42			
	249	137	83
	335	184	88
	335	184	89
Steel HP 10 X 57			
	254	140	83
	343	189	88
	454	250	91
Steel HP 12 X 53			
	303	167	83
Steel HP 12 X 63			
	305	168	83
	427	235	88
	497	273	90
Steel HP 12 X 74			
	310	170	83
	434	239	88
	589	324	92
Steel HP 12 X 84			
	288	158	77
	314	173	83
	441	243	88
	664	365	93
Steel HP 14 X 73			
	297	163	67
	318	175	72
	333	183	77
	364	200	83
	528	290	88
	578	318	89
Steel HP 14 X 89			
	300	165	67
	322	177	72
	337	185	77
	368	202	83
	535	294	88
	705	388	91
Steel HP 14 X 102			
	304	167	67
	325	179	72
	341	187	77
	372	205	83
	543	299	88
	810	445	93
Steel HP 14 X 117			
	308	169	67
	329	181	72
	345	190	77
	376	207	83
	550	303	88
	929	511	95

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

Illinois Department of Transportation

SUBSTRUCTURE===================================== S Abutment (SN060-7003)
REFERENCE BORING ================================= B-7
LRFD or ASD or SEISMIC ============================== LRFD
PILE CUTOFF ELEV. ================================== 440.00 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 439.00 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== DD
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ============== 412.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) =============== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ============== 800 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 14.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ============ 457.14 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ============ 171.43 KIPS

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

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
929 KIPS	**929** KIPS	**453** KIPS	**95** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)	NOMINAL 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.)
435.50	3.50	1.50	15		16.3		34.9	24.0		***27.0***	27	9	18	-12	5
433.00	2.50	0.90	13		7.9	18.5	***24.2***	11.6	3.0	35.6	24	13	27	-27	7
430.50	2.50		0	Very Fine Silty Sand	0.0	0.0	***27.0***	0.0	0.0	36.0	27	13	27	-25	10
428.00	2.50		1	Very Fine Silty Sand	0.2	2.7	***27.2***	0.3	0.4	36.3	27	13	27	-25	12
425.50	2.50		1	Very Fine Silty Sand	0.2	2.7	***30.1***	0.3	0.4	37.0	30	14	27	-24	15
423.00	2.50		2	Very Fine Silty Sand	0.4	5.5	***34.9***	0.6	0.9	38.3	35	14	28	-22	17
420.50	2.50	0.48	3		4.6	9.9	***37.8***	6.7	1.6	44.7	38	16	33	-28	20
418.00	2.50		3	Very Fine Silty Sand	0.6	8.2	88.7	0.8	1.3	***53.7***	54	17	33	-20	22
415.50	2.50		16	Fine Sand	3.3	58.6	60.9	4.9	9.5	***53.5***	54	18	37	-26	25
413.00	2.50		10	Very Fine Silty Sand	1.9	27.5	126.8	2.8	4.5	***66.7***	67	19	39	-22	27
410.50	2.50		25	Medium Sand	5.5	91.5	88.4	8.1	14.9	***67.7***	68	19	39	-21	30
408.00	2.50		13	Medium Sand	2.9	47.6	84.7	4.2	7.7	***70.8***	71	19	39	-19	32
403.00	5.00	1.99	10		28.2	41.0	122.9	41.3	6.7	***113.8***	114	19	39	4	37
398.00	5.00	2.48	11		32.5	51.1	***145.3***	47.7	8.3	159.8	145	19	39	22	42
393.00	5.00	1.99	11		28.2	41.0	***165.5***	41.3	6.7	199.8	165	19	39	33	47
388.00	5.00	1.60	10		24.4	32.9	***214.5***	35.8	5.4	239.6	215	19	39	60	52
383.00	5.00	2.80	14		35.3	57.7	***220.4***	51.8	9.4	286.6	220	19	39	63	57
378.00	5.00	1.37	8		21.9	28.2	***276.5***	32.1	4.6	324.3	277	19	39	94	62
373.00	5.00	3.03	15		37.4	62.4	***307.9***	54.8	10.1	378.2	308	19	39	111	67
368.00	5.00	2.74	9		34.8	56.4	***329.3***	51.1	9.2	427.1	329	19	39	123	72
363.00	5.00	2.09	16		29.0	43.0	***344.7***	42.6	7.0	467.4	345	19	39	131	77
357.00	6.00	1.43	12		27.1	29.4	***376.4***	39.7	4.8	507.9	376	19	39	149	83
352.00	5.00	1.65	31		24.9	34.0	***550.3***	36.5	5.5	568.7	550	19	39	244	88
351.00	1.00			Shale	60.4	183.0	***610.7***	88.7	29.8	657.3	611	19	39	278	89
350.00	1.00			Shale	60.4	183.0	***671.1***	88.7	29.8	746.0	671	19	39	311	90
349.00	1.00			Shale	60.4	183.0	***731.6***	88.7	29.8	834.6	732	19	39	344	91
348.00	1.00			Shale	60.4	183.0	***792.0***	88.7	29.8	923.3	792	19	39	377	92
347.00	1.00			Shale	60.4	183.0	***852.4***	88.7	29.8	1011.9	852	19	39	410	93
346.00	1.00			Shale	60.4	183.0	***912.8***	88.7	29.8	1100.6	913	19	39	444	94
345.00	1.00			Shale	60.4	183.0	***973.2***	88.7	29.8	1189.3	~~973~~	~~19~~	~~39~~	~~477~~	~~95~~
344.00	1.00			Shale	60.4	183.0	***1033.6***	88.7	29.8	1277.9	~~1034~~	~~19~~	~~39~~	~~510~~	~~96~~
343.00	1.00			Shale	60.4	183.0	***1094.1***	88.7	29.8	1366.6	~~1094~~	~~19~~	~~39~~	~~543~~	~~97~~
342.00	1.00			Shale	60.4	183.0	***1154.5***	88.7	29.8	1455.2	~~1154~~	~~19~~	~~39~~	~~577~~	~~98~~
341.00	1.00			Shale	60.4	183.0	***1214.9***	88.7	29.8	1543.9	~~1215~~	~~19~~	~~39~~	~~610~~	~~99~~
340.00	1.00			Shale	60.4	183.0	***1275.3***	88.7	29.8	1632.5	~~1275~~	~~19~~	~~39~~	~~643~~	~~100~~
339.00	1.00			Shale	60.4	183.0	***1335.7***	88.7	29.8	1721.2	~~1336~~	~~19~~	~~39~~	~~676~~	~~101~~
338.00	1.00			Shale		183.0			29.8						

Pile Design Table for S Abutment (SN060-7003) utilizing Boring #B-7

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36			
	261	111	88
Steel HP 10 X 42			
	335	144	88
Steel HP 10 X 57			
	427	194	90
Steel HP 12 X 53			
	303	119	83
Steel HP 12 X 63			
	305	120	83
	427	187	88
	497	225	90
Steel HP 12 X 74			
	310	122	83
	434	190	88
	589	275	92
Steel HP 12 X 84			
	314	123	83
	441	193	88
	664	316	93
Steel HP 14 X 73			
	364	143	83
	528	234	88
	578	261	89
Steel HP 14 X 89			
	368	145	83
	535	237	88
	705	331	91
Steel HP 14 X 102			
	372	147	83
	543	241	88
	810	388	93
Steel HP 14 X 117			
	376	149	83
	550	244	88
	929	453	95

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

Illinois Department of Transportation

SUBSTRUCTURE==================================== N Abutment (SN060-7003)
REFERENCE BORING ================================ B-24
LRFD or ASD or SEISMIC ============================== LRFD
PILE CUTOFF ELEV. ================================= 439.92 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 438.92 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ================= ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) =============== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ============== 800 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 14.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ============ 457.14 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ============ 171.43 KIPS

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

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
929 KIPS	**929** KIPS	**511** KIPS	**99** FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)	NOMINAL 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.)
434.50	4.42	0.40	7		6.8		10.9	10.0		***10.7***	11	0	0	6	5
432.00	2.50	0.20	4		2.0	4.1	***12.3***	2.9	0.7	13.5	12	0	0	7	8
429.50	2.50	0.17	3		1.7	3.5	***11.9***	2.5	0.6	15.6	12	0	0	7	10
427.00	2.50	0.07	2		0.7	1.4	***11.8***	1.0	0.2	16.5	12	0	0	7	13
424.50	2.50	0.03	2		0.3	0.6	26.2	0.5	0.1	***19.3***	19	0	0	11	15
422.00	2.50		4	Fine Sand	0.8	14.6	***17.5***	1.2	2.4	19.0	17	0	0	10	18
419.50	2.50	0.25	4		2.5	5.1	25.5	3.6	0.8	***23.5***	23	0	0	13	20
417.00	2.50	0.52	5		4.9	10.7	49.0	7.2	1.7	***33.7***	34	0	0	19	23
414.50	2.50		8	Fine Sand	1.7	29.3	73.5	2.4	4.8	***39.8***	40	0	0	22	25
412.00	2.50		19	Very Fine Silty Sand	3.6	52.2	71.6	5.3	8.5	***44.2***	44	0	0	24	28
409.50	2.50		17	Very Fine Silty Sand	3.2	46.7	80.3	4.7	7.6	***49.8***	50	0	0	27	30
407.00	2.50		19	Very Fine Silty Sand	3.6	52.2	64.7	5.3	8.5	***52.0***	52	0	0	29	33
402.00	5.00	1.60	11		24.4	32.9	***76.9***	35.8	5.4	85.8	77	0	0	42	38
397.00	5.00	1.01	7		17.4	20.8	149.3	25.5	3.4	***120.2***	120	0	0	66	43
392.00	5.00	3.68	12		43.1	75.8	***150.8***	63.3	12.3	176.7	151	0	0	83	48
387.00	5.00	1.66	13		25.0	34.2	***198.1***	36.7	5.6	217.0	198	0	0	109	53
382.00	5.00	2.74	18		34.8	56.4	***244.2***	51.1	9.2	269.9	244	0	0	134	58
377.00	5.00	3.29	12		39.7	67.7	***279.1***	58.2	11.0	327.3	279	0	0	154	63
372.00	5.00	3.06	21		37.6	63.0	***267.1***	55.2	10.2	374.5	267	0	0	147	68
367.00	5.00	0.65	7		12.0	13.4	***295.1***	17.6	2.2	394.7	295	0	0	162	73
362.00	5.00	1.43	7		22.6	29.4	***321.2***	33.1	4.8	428.3	321	0	0	177	78
357.00	5.00	1.60	18		24.4	32.9	***345.6***	35.8	5.4	464.1	346	0	0	190	83
352.00	5.00	1.60	18		24.4	32.9	***440.0***	35.8	5.4	511.3	440	0	0	242	88
347.00	5.00	5.00	23		50.4	103.0	***570.5***	74.0	16.7	598.3	570	0	0	314	93
346.00	1.00			Shale	60.4	183.0	***630.9***	88.7	29.8	686.9	631	0	0	347	93.9
345.00	1.00			Shale	60.4	183.0	***691.3***	88.7	29.8	775.6	691	0	0	380	94.9
344.00	1.00			Shale	60.4	183.0	***751.7***	88.7	29.8	864.2	752	0	0	413	95.9
343.00	1.00			Shale	60.4	183.0	***812.1***	88.7	29.8	952.9	812	0	0	447	96.9
342.00	1.00			Shale	60.4	183.0	***872.6***	88.7	29.8	1041.5	873	0	0	480	97.9
341.00	1.00			Shale	60.4	183.0	***933.0***	88.7	29.8	1130.2	~~933~~	~~0~~	~~0~~	~~513~~	~~98.9~~
340.00	1.00			Shale	60.4	183.0	***993.4***	88.7	29.8	1218.8	~~993~~	~~0~~	~~0~~	~~546~~	~~99.9~~
339.00	1.00			Shale	60.4	183.0	***1053.8***	88.7	29.8	1307.5	~~1054~~	~~0~~	~~0~~	~~580~~	~~100.9~~
338.00	1.00			Shale	60.4	183.0	***1114.2***	88.7	29.8	1396.1	~~1114~~	~~0~~	~~0~~	~~613~~	~~101.9~~
337.00	1.00			Shale	60.4	183.0	***1174.6***	88.7	29.8	1484.8	~~1175~~	~~0~~	~~0~~	~~646~~	~~102.9~~
336.00	1.00			Shale	60.4	183.0	***1235.1***	88.7	29.8	1573.4	~~1235~~	~~0~~	~~0~~	~~679~~	~~103.9~~
335.00	1.00			Shale	60.4	183.0	***1295.5***	88.7	29.8	1662.1	~~1295~~	~~0~~	~~0~~	~~713~~	~~104.9~~
334.00	1.00			Shale	60.4	183.0	***1355.9***	88.7	29.8	1750.8	~~1356~~	~~0~~	~~0~~	~~746~~	~~105.9~~
333.00	1.00			Shale		183.0			29.8						

Pile Design Table for N Abutment (SN060-7003) utilizing Boring #B-24

	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36			
	272	150	93
Steel HP 10 X 42			
	277	152	88
Steel HP 10 X 57			
	283	156	88
	357	196	93
	454	250	96
Steel HP 12 X 53			
	278	153	83
	345	189	88
	418	230	93
Steel HP 12 X 63			
	280	154	83
	348	191	88
	444	244	93
	497	273	95
Steel HP 12 X 74			
	284	156	83
	353	194	88
	451	248	93
	589	324	96
Steel HP 12 X 84			
	288	158	83
	359	197	88
	458	252	93
	664	365	98
Steel HP 14 X 73			
	310	171	78
	334	184	83
	423	233	88
	547	301	93
	578	318	94
Steel HP 14 X 89			
	288	159	73
	314	173	78
	338	186	83
	429	236	88
	555	305	93
	705	388	96
Steel HP 14 X 102			
	292	160	73
	318	175	78
	342	188	83
	434	239	88
	563	309	93
	810	445	98
Steel HP 14 X 117			
	295	162	73
	321	177	78
	346	190	83
	440	242	88
	570	314	93
	929	511	99

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE==================================== N Abutment (SN060-7003)
REFERENCE BORING ================================ B-24
LRFD or ASD or SEISMIC ============================== LRFD
PILE CUTOFF ELEV. ================================= 439.92 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 438.92 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== DD
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ============== 414.00 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) =============== ft

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	**476** KIPS	**99** FT.

TOTAL FACTORED SUBSTRUCTURE LOAD ============== 800 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 14.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1

Approx. Factored Loading Applied per pile at 8 ft. Cts ============ 457.14 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ============ 171.43 KIPS

PILE TYPE AND SIZE ============= Steel HP 14 X 117

Pile Perimeter============================== 4.850 FT. Unplugged Pile Perimeter============== 7.117 FT.
Pile End Bearing Area========================= 1.469 SQFT. Unplugged Pile End Bearing Area======== 0.239 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL SIDE RESIST. (KIPS)	NOMINAL END BRG. RESIST. (KIPS)	NOMINAL TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
434.50	4.42	0.40	7		6.8		10.9	10.0		***10.7***	11	4	8	-5	5
432.00	2.50	0.20	4		2.0	4.1	***12.3***	2.9	0.7	13.5	12	5	10	-8	8
429.50	2.50	0.17	3		1.7	3.5	***11.9***	2.5	0.6	15.6	12	6	12	-11	10
427.00	2.50	0.07	2		0.7	1.4	***11.8***	1.0	0.2	16.5	12	6	12	-12	13
424.50	2.50	0.03	2		0.3	0.6	26.2	0.5	0.1	***19.3***	19	6	13	-8	15
422.00	2.50		4	Fine Sand	0.8	14.6	***17.5***	1.2	2.4	19.0	17	7	14	-11	18
419.50	2.50	0.25	4		2.5	5.1	25.5	3.6	0.8	***23.5***	23	8	16	-12	20
417.00	2.50	0.52	5		4.9	10.7	49.0	7.2	1.7	***33.7***	34	11	22	-14	23
414.50	2.50		8	Fine Sand	1.7	29.3	73.5	2.4	4.8	***39.8***	40	12	24	-13	25
412.00	2.50		19	Very Fine Silty Sand	3.6	52.2	71.6	5.3	8.5	***44.2***	44	12	24	-11	28
409.50	2.50		17	Very Fine Silty Sand	3.2	46.7	80.3	4.7	7.6	***49.8***	50	12	24	-8	30
407.00	2.50		19	Very Fine Silty Sand	3.6	52.2	64.7	5.3	8.5	***52.0***	52	12	24	-7	33
402.00	5.00	1.60	11		24.4	32.9	***76.9***	35.8	5.4	85.8	77	12	24	7	38
397.00	5.00	1.01	7		17.4	20.8	149.3	25.5	3.4	***120.2***	120	12	24	31	43
392.00	5.00	3.68	12		43.1	75.8	***150.8***	63.3	12.3	176.7	151	12	24	48	48
387.00	5.00	1.66	13		25.0	34.2	***198.1***	36.7	5.6	217.0	198	12	24	74	53
382.00	5.00	2.74	18		34.8	56.4	***244.2***	51.1	9.2	269.9	244	12	24	99	58
377.00	5.00	3.29	12		39.7	67.7	***279.1***	58.2	11.0	327.3	279	12	24	118	63
372.00	5.00	3.06	21		37.6	63.0	***267.1***	55.2	10.2	374.5	267	12	24	112	68
367.00	5.00	0.65	7		12.0	13.4	***295.1***	17.6	2.2	394.7	295	12	24	127	73
362.00	5.00	1.43	7		22.6	29.4	***321.2***	33.1	4.8	428.3	321	12	24	141	78
357.00	5.00	1.60	18		24.4	32.9	***345.6***	35.8	5.4	464.1	346	12	24	155	83
352.00	5.00	1.60	18		24.4	32.9	***440.0***	35.8	5.4	511.3	440	12	24	207	88
347.00	5.00	5.00	23		50.4	103.0	***570.5***	74.0	16.7	598.3	570	12	24	278	93
346.00	1.00			Shale	60.4	183.0	***630.9***	88.7	29.8	686.9	631	12	24	312	93.9
345.00	1.00			Shale	60.4	183.0	***691.3***	88.7	29.8	775.6	691	12	24	345	94.9
344.00	1.00			Shale	60.4	183.0	***751.7***	88.7	29.8	864.2	752	12	24	378	95.9
343.00	1.00			Shale	60.4	183.0	***812.1***	88.7	29.8	952.9	812	12	24	411	96.9
342.00	1.00			Shale	60.4	183.0	***872.6***	88.7	29.8	1041.5	873	12	24	445	97.9
341.00	1.00			Shale	60.4	183.0	***933.0***	88.7	29.8	1130.2	~~933~~	~~12~~	~~24~~	~~478~~	~~98.9~~
340.00	1.00			Shale	60.4	183.0	***993.4***	88.7	29.8	1218.8	~~993~~	~~12~~	~~24~~	~~511~~	~~99.9~~
339.00	1.00			Shale	60.4	183.0	***1053.8***	88.7	29.8	1307.5	~~1054~~	~~12~~	~~24~~	~~544~~	~~100.9~~
338.00	1.00			Shale	60.4	183.0	***1114.2***	88.7	29.8	1396.1	~~1114~~	~~12~~	~~24~~	~~578~~	~~101.9~~
337.00	1.00			Shale	60.4	183.0	***1174.6***	88.7	29.8	1484.8	~~1175~~	~~12~~	~~24~~	~~611~~	~~102.9~~
336.00	1.00			Shale	60.4	183.0	***1235.1***	88.7	29.8	1573.4	~~1235~~	~~12~~	~~24~~	~~644~~	~~103.9~~
335.00	1.00			Shale	60.4	183.0	***1295.5***	88.7	29.8	1662.1	~~1295~~	~~12~~	~~24~~	~~677~~	~~104.9~~
334.00	1.00			Shale	60.4	183.0	***1355.9***	88.7	29.8	1750.8	~~1356~~	~~12~~	~~24~~	~~710~~	~~105.9~~
333.00	1.00			Shale		183.0			29.8						

Pile Design Table for N Abutment (SN060-7003) utilizing Boring #B-24

Pile	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36			
	272	130	93
Steel HP 10 X 42			
	277	128	88
Steel HP 10 X 57			
	283	131	88
	357	172	93
	454	225	96
Steel HP 12 X 53			
	345	161	88
Steel HP 12 X 63			
	348	162	88
	444	215	93
	497	244	95
Steel HP 12 X 74			
	353	165	88
	451	219	93
	589	294	96
Steel HP 12 X 84			
	359	167	88
	458	222	93
	664	335	98
Steel HP 14 X 73			
	334	149	83
	423	199	88
	547	267	93
	578	284	94
Steel HP 14 X 89			
	338	151	83
	429	201	88
	555	271	93
	705	353	96
Steel HP 14 X 102			
	342	153	83
	434	204	88
	563	275	93
	810	410	98
Steel HP 14 X 117			
	346	155	83
	440	207	88
	570	278	93
	929	476	99

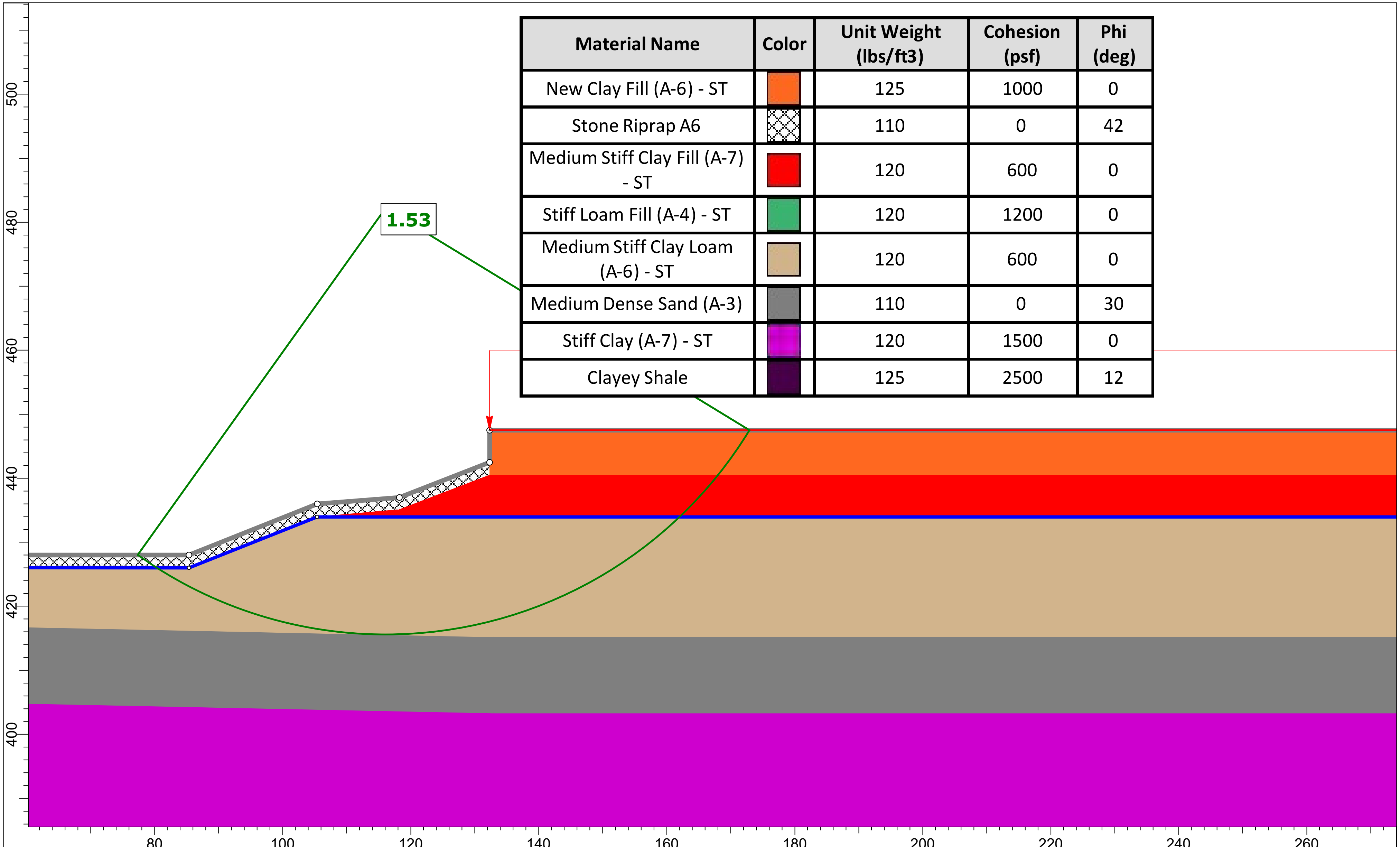
Appendix D

Appendix D - L-Pile Parameters (SN060-7003)

North Abutment	Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
B-24	0 to 21.9	436.9 to 415	Soft Clay (Matlock) with free water	50	250	--	30	0.02
	21.9 to 33.9	415 to 403	Submerged Medium Dense Sand	45	--	30	60	--
	33.9 to 51.9	403 to 385	Medium Stiff Clay (with free water)	55	1500	--	500	0.009
	51.9 to 66.9	385 to 370	Stiff Clay (with free water)	55	2500	--	1000	0.007
	66.9 to 79.9	370 to 357	Medium Stiff Clay (with free water)	55	1000	--	100	0.01
	79.9 to 88.4	357 to 348.5	Very Stiff Clay (with free water)	60	3500	--	1500	0.005
	88.4+	< 348.5	Shale	130	5000	44	2000	0.004

South Abutment	Depth (ft)	Elevation (ft)	Abbreviated Soil Description	Effective Unit Weight (pcf)	Cohesion (psf)	Phi (degrees)	Soil Modulus Parameter (pci)	E_{50}
B-7	0 to 18.9	436.9 to 418	Submerged Loose Loam	50	--	26	20	--
	18.9 to 30.9	418 to 406	Submerged Medium Dense Sand	45	--	30	60	--
	30.9 to 84.9	406 to 352	Medium Stiff Clay (with free water)	55	2000	--	700	0.007
	84.9+	< 352	Shale	130	5000	44	2000	0.004

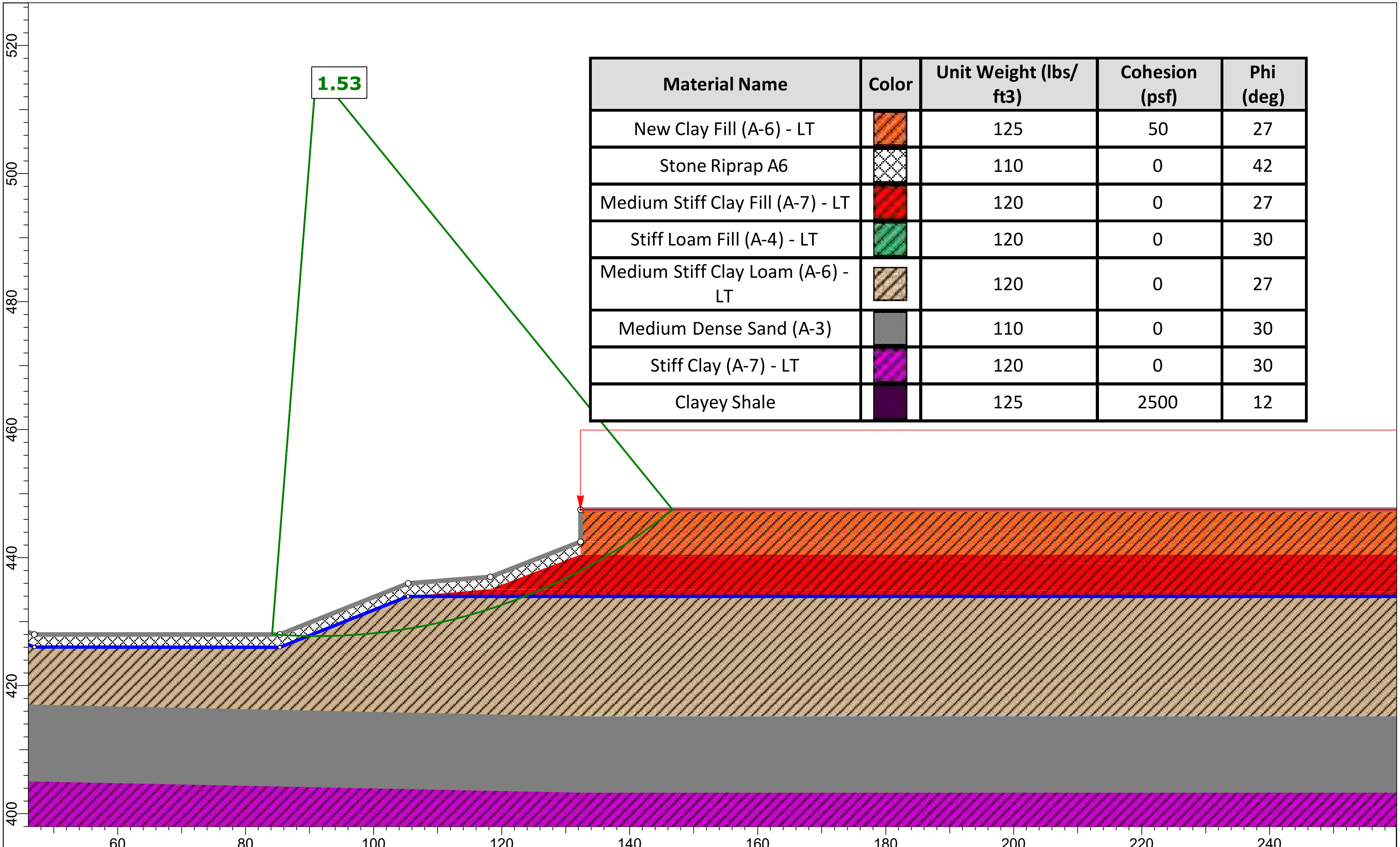
Appendix E



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
New Clay Fill (A-6) - ST		125	1000	0
Stone Riprap A6		110	0	42
Medium Stiff Clay Fill (A-7) - ST		120	600	0
Stiff Loam Fill (A-4) - ST		120	1200	0
Medium Stiff Clay Loam (A-6) - ST		120	600	0
Medium Dense Sand (A-3)		110	0	30
Stiff Clay (A-7) - ST		120	1500	0
Clayey Shale		125	2500	12

Project	PTB 195 Item 57 Shared Use Path over Judy's Branch (SN 060-7003)
Analysis Description	End Slope North Abut (Short Term)
Location	Madison County, Illinois
Drawn By	PP
Reviewed By:	TJC
Scale	1:249
Company	SCI Engineering, Inc.
Date	5/23/2022
Project #	2020-0531.10
File Name	Slope Stability Analysis.slmd

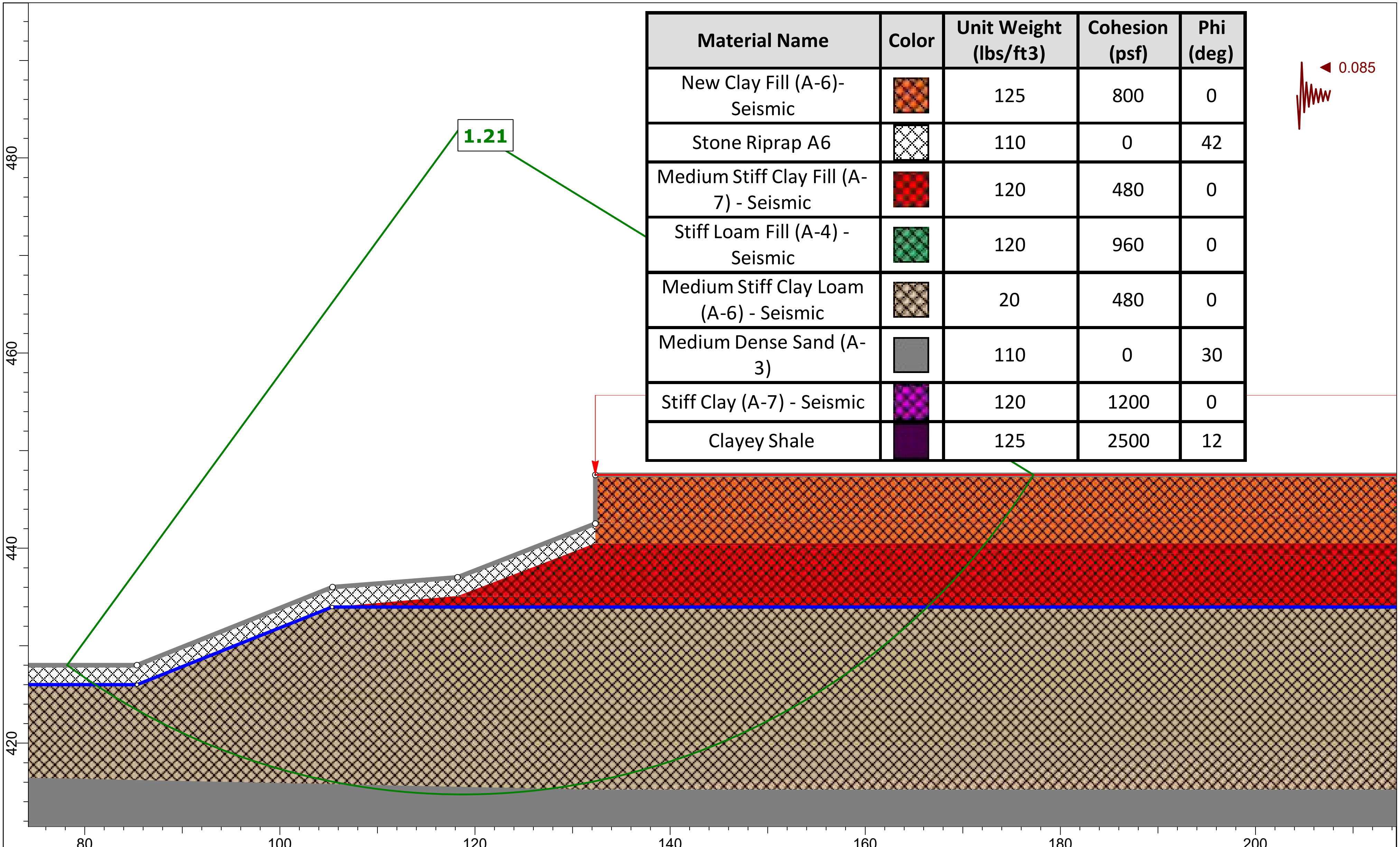
SLIDEINTERPRET 9.020



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
New Clay Fill (A-6) - LT		125	50	27
Stone Riprap A6		110	0	42
Medium Stiff Clay Fill (A-7) - LT		120	0	27
Stiff Loam Fill (A-4) - LT		120	0	30
Medium Stiff Clay Loam (A-6) - LT		120	0	27
Medium Dense Sand (A-3)		110	0	30
Stiff Clay (A-7) - LT		120	0	30
Clayey Shale		125	2500	12

SLIDEINTERPRET 9.020

Project	PTB 195 Item 57 Shared Use Path over Judy's Branch (SN 060-7003)		
Analysis Description	End Slope North Abut (Long Term)	*Location*	Madison County, Illinois
Drawn By PP	*Reviewed By:* TJC	*Scale* 1:249	*Company* SCI Engineering, Inc.
Date 5/23/2022	*Project #* 2020-0531.10	*File Name*	Slope Stability Analysis.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
New Clay Fill (A-6)-Seismic		125	800	0
Stone Riprap A6		110	0	42
Medium Stiff Clay Fill (A-7) - Seismic		120	480	0
Stiff Loam Fill (A-4) - Seismic		120	960	0
Medium Stiff Clay Loam (A-6) - Seismic		20	480	0
Medium Dense Sand (A-3)		110	0	30
Stiff Clay (A-7) - Seismic		120	1200	0
Clayey Shale		125	2500	12

SLIDEINTERPRET 9.020

Project PTB 195 Item 57 Shared Use Path over Judy's Branch (SN 060-7003)

Analysis Description End Slope North Abut (Seismic)

Location Madison County, Illinois

Drawn By PP

Reviewed By: TJC

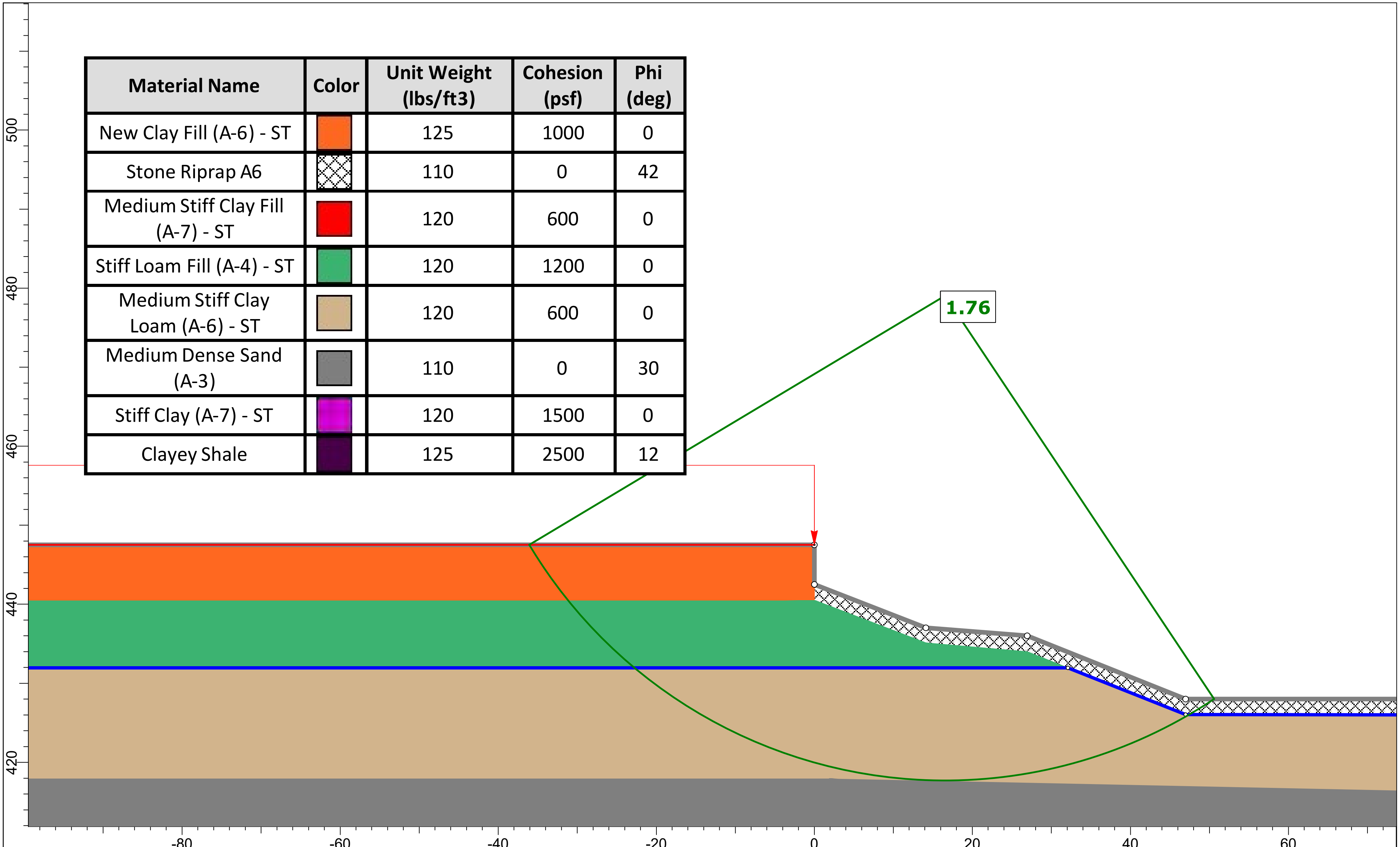
Scale 1:163

Company SCI Engineering, Inc.

Date 5/23/2022

Project # 2020-0531.10

File Name Slope Stability Analysis.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
New Clay Fill (A-6) - ST		125	1000	0
Stone Riprap A6		110	0	42
Medium Stiff Clay Fill (A-7) - ST		120	600	0
Stiff Loam Fill (A-4) - ST		120	1200	0
Medium Stiff Clay Loam (A-6) - ST		120	600	0
Medium Dense Sand (A-3)		110	0	30
Stiff Clay (A-7) - ST		120	1500	0
Clayey Shale		125	2500	12

SLIDEINTERPRET 9.020

Project PTB 195 Item 57 Shared Use Path over Judy's Branch (SN 060-7003)

Analysis Description End Slope South Abut (Short Term)

Location Madison County, Illinois

Drawn By PP

Reviewed By: TJC

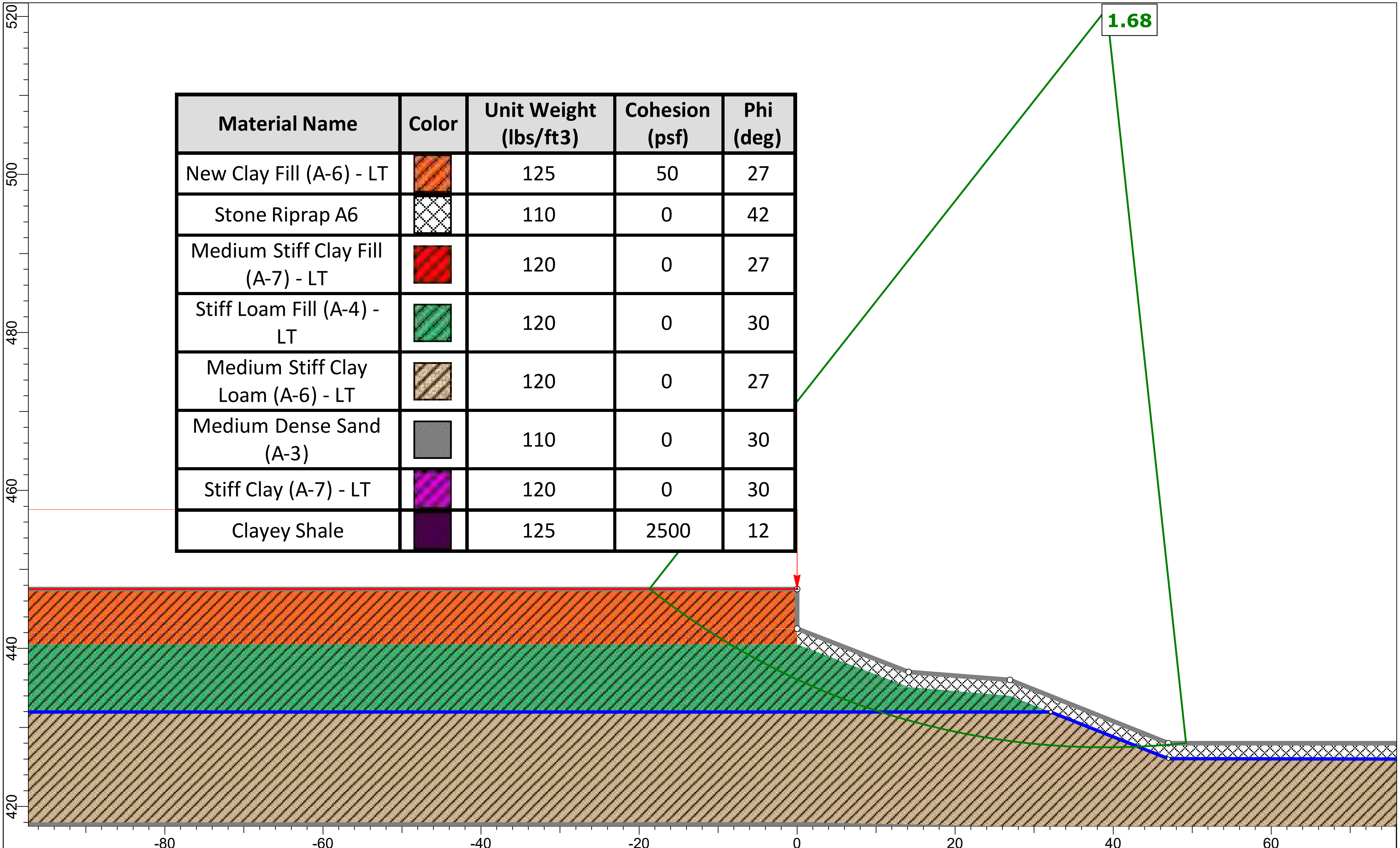
Scale 1:202

Company SCI Engineering, Inc.

Date 5/23/2022

Project # 2020-0531.10

File Name Slope Stability Analysis.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
New Clay Fill (A-6) - LT		125	50	27
Stone Riprap A6		110	0	42
Medium Stiff Clay Fill (A-7) - LT		120	0	27
Stiff Loam Fill (A-4) - LT		120	0	30
Medium Stiff Clay Loam (A-6) - LT		120	0	27
Medium Dense Sand (A-3)		110	0	30
Stiff Clay (A-7) - LT		120	0	30
Clayey Shale		125	2500	12

SLIDEINTERPRET 9.020

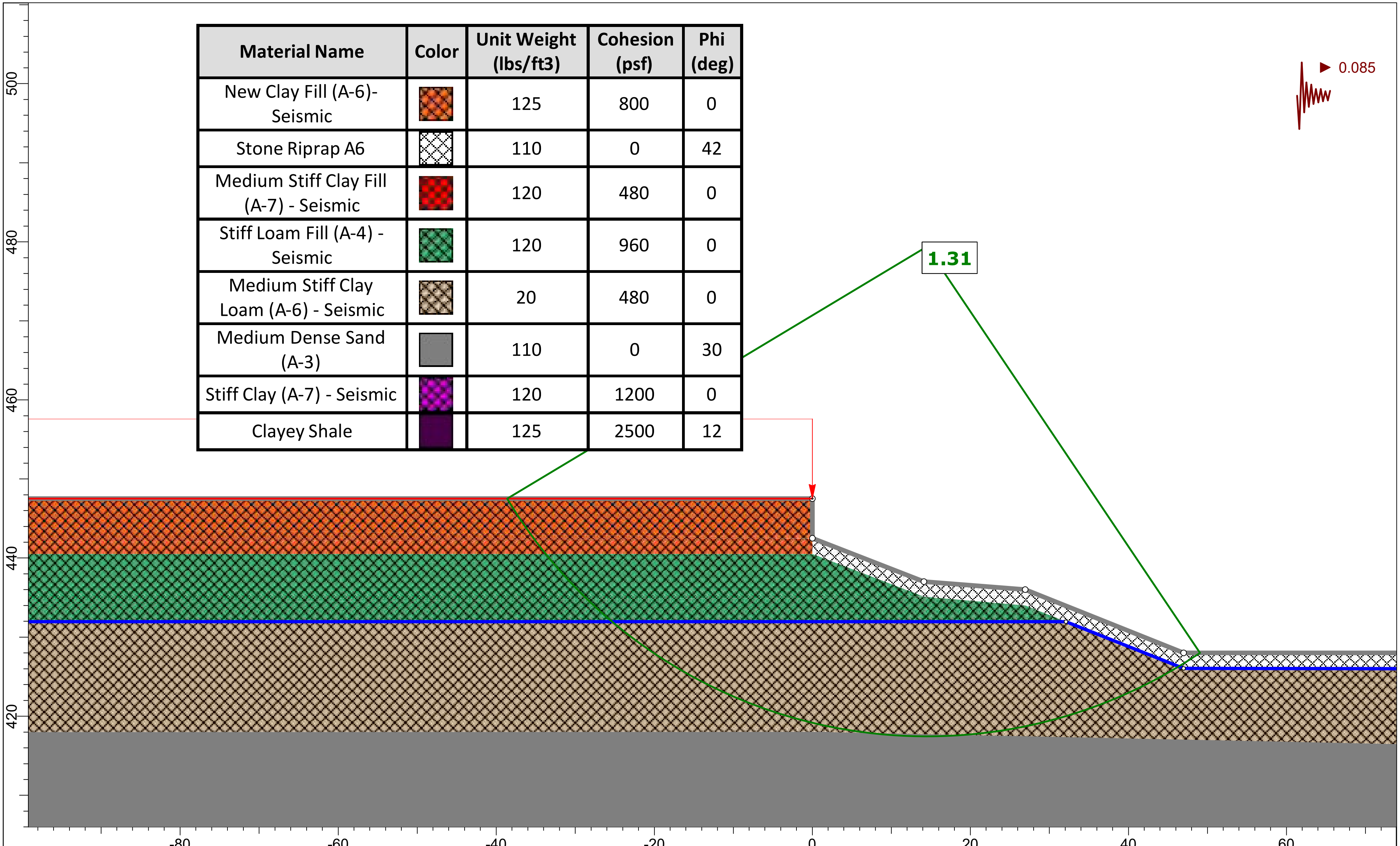
Project PTB 195 Item 57 Shared Use Path over Judy's Branch (SN 060-7003)

Analysis Description End Slope South Abut (Long Term)

Location: Madison County, Illinois

Drawn By PP | *Reviewed By:* TJC | *Scale* 1:202 | *Company* SCI Engineering, Inc.

Date 5/23/2022 | Project # 2020-0531.10 | *File Name* Slope Stability Analysis.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
New Clay Fill (A-6)-Seismic		125	800	0
Stone Riprap A6		110	0	42
Medium Stiff Clay Fill (A-7) - Seismic		120	480	0
Stiff Loam Fill (A-4) - Seismic		120	960	0
Medium Stiff Clay Loam (A-6) - Seismic		20	480	0
Medium Dense Sand (A-3)		110	0	30
Stiff Clay (A-7) - Seismic		120	1200	0
Clayey Shale		125	2500	12

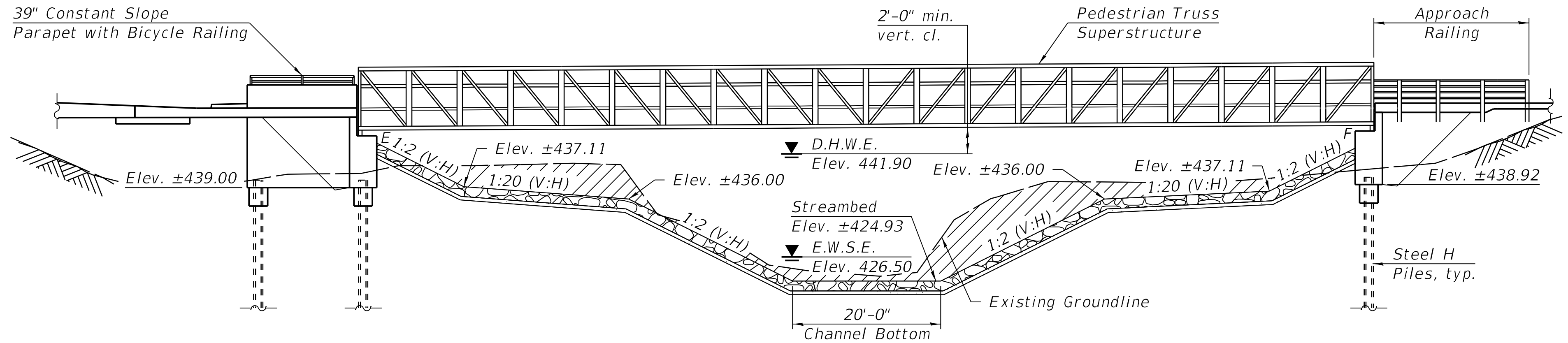
SLIDEINTERPRET 9.020

Project	PTB 195 Item 57 Shared Use Path over Judy's Branch (SN 060-7003)						
Analysis Description	End Slope South Abut (Seismic)					Location	Madison County, Illinois
Drawn By	PP	*Reviewed By:*	TJC	*Scale*	1:202	*Company*	SCI Engineering, Inc.
Date	5/23/2022	*Project #*	2020-0531.10			*File Name*	Slope Stability Analysis.slmd

Appendix F

Benchmark: Cut "□", with +, on top of parapet wall at Northwest corner of IL-157 Bridge over Judys Branch (S.N. 060-0087). Elev. 449.226.

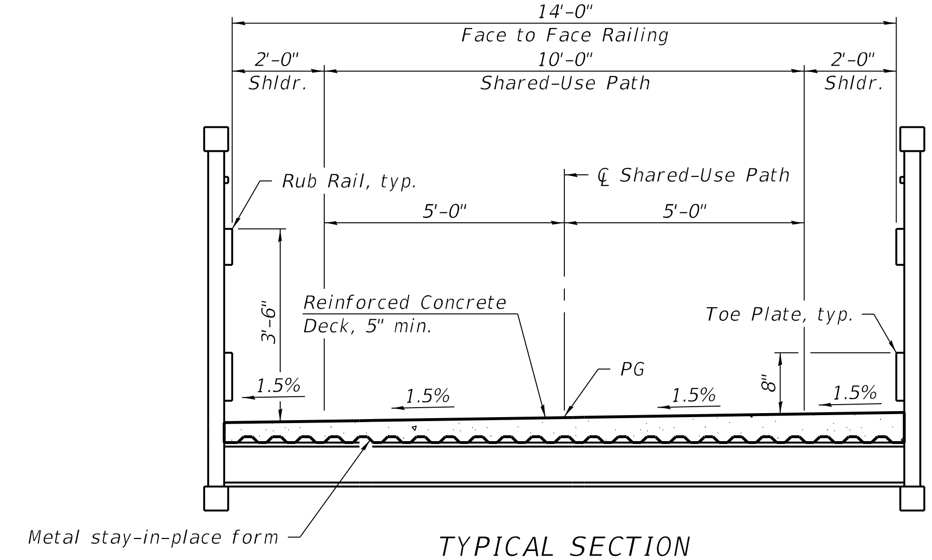
Existing Structure: None.



KEY

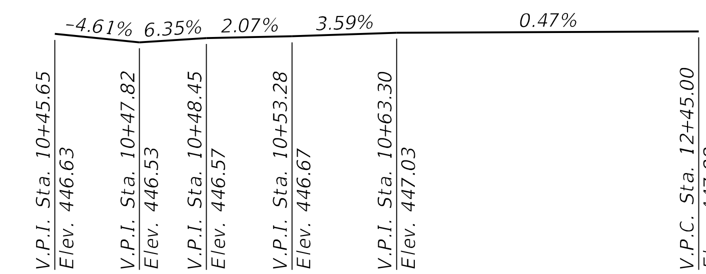
Denotes Channel Excavation

ELEVATION



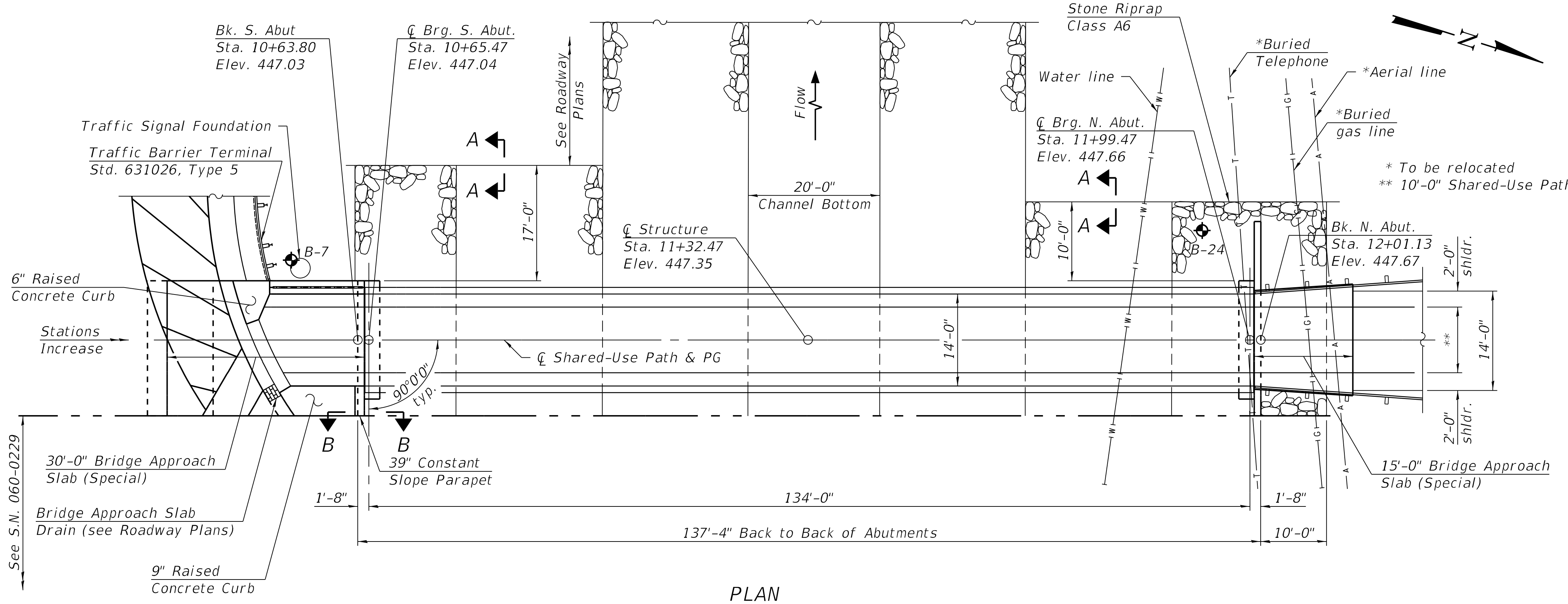
TYPICAL SECTION

(Looking North)



PROFILE GRADE

(Along ℄ Shared Use Path)



PLAN

Notes:

For details regarding Plan of 30'-0" Bridge Approach Slab (Special), see sheet 2 of 2.

For Section A-A, see sheet 2 of 2.

LOADING H-10

Live Load = 90 psf uniform load

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th. Edition.

2009 AASHTO LRFD Guide Specifications For Design of Pedestrian Bridges

DESIGN STRESSES

FIELD UNITS

f'c = 4,000 psi (Superstructure)
f'c = 3,500 psi (Substructure)
fy = 60,000 psi (Reinforcement)

PRE-ENGINEERED BRIDGE UNITS

fy = 50,000 psi (M270 Grade50W)

SEISMIC DATA

Seismic Performance Zone (SPZ) = 2
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.23g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.53g
Soil Site Class = D

WATERWAY INFORMATION

Drainage Area = 8.6 sq. mi.

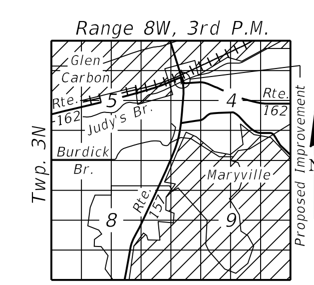
Existing Overtopping Elev. = 445.83 at Sta. 582+50.00
Proposed Overtopping Elev. = 446.42 at Sta. 581+42.36

Flood Event	Freq. Yr.	Discharge, Q C.F.S.	Waterway Opening – Ft² Existing	Waterway Opening – Ft² Proposed	Natural H.W.E. – Ft.	Head – Ft. Existing	Head – Ft. Proposed	Headwater Elevation – Ft. Existing	Headwater Elevation – Ft. Proposed
Design	50	5750	883	1146	441.9	0.5	0.3	442.4	442.2
Base	100	6590	941	1214	442.4	1.5	0.4	443.9	442.8
Scour Design Check	200	7600	987	1287	443.0	1.3	0.6	444.3	443.7
Overtop Existing	N/A	---	---	---	---	---	---	---	---
Overtop Proposed	N/A	---	---	---	---	---	---	---	---
Max. Calc.	500	8920	998	1367	443.7	1.3	1.6	445.0	445.3

10 Year Velocity Through Existing Bridge = N/A
10 Year Velocity Through Proposed Bridge = 4.46 ft/s

DESIGN SCOUR ELEVATION TABLE

Event / Limit State	Design Scour Elevations (ft.) S. Abut.	N. Abut.	Item 113
Q100	439.00	438.92	8
Q200	439.00	438.92	
Design	439.00	438.92	
Check	439.00	438.92	

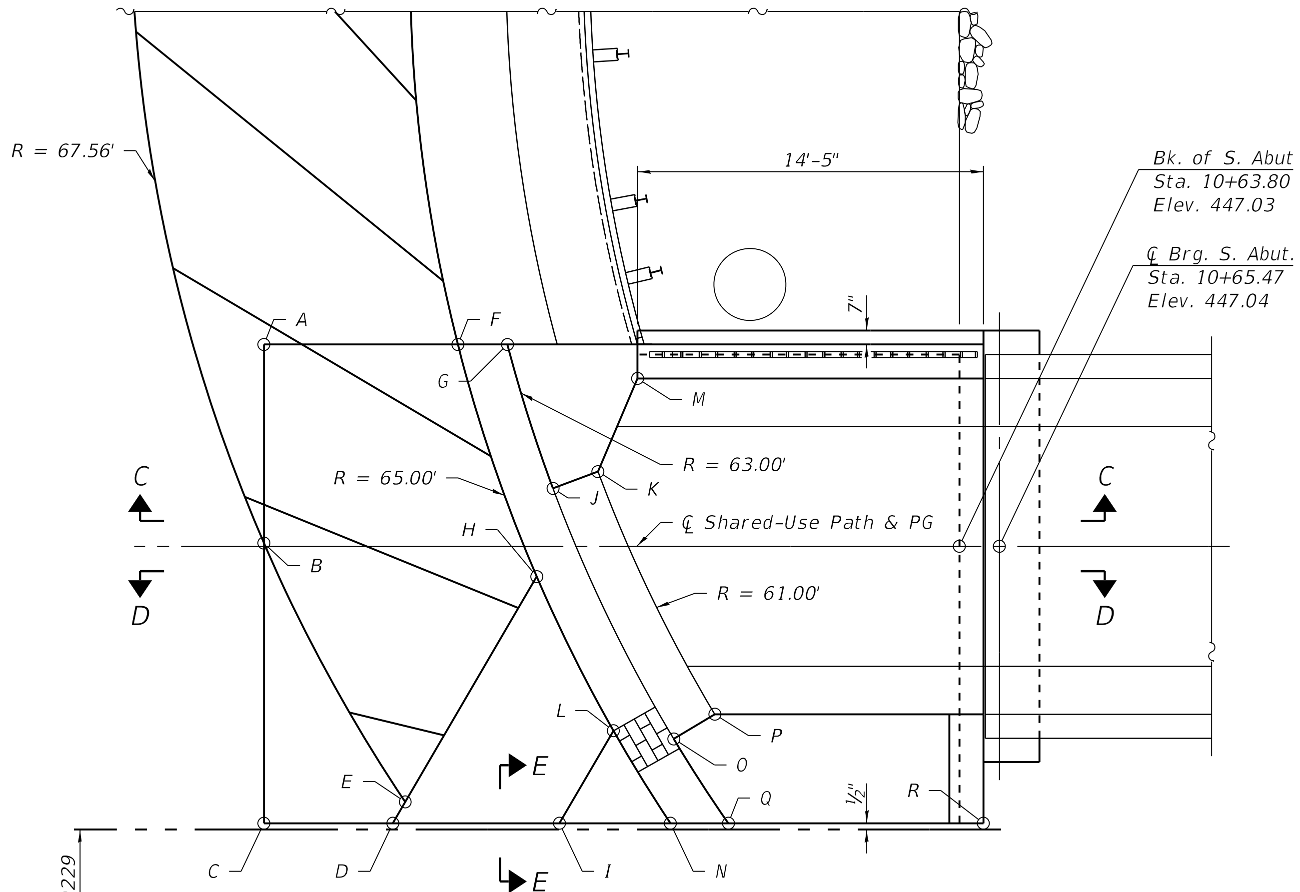


LOCATION SKETCH

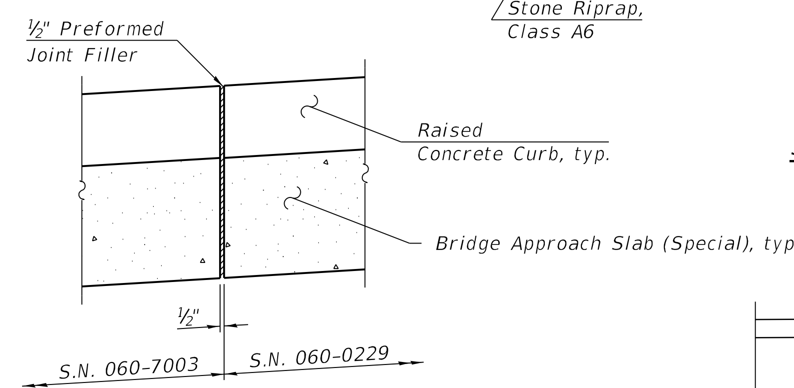
GENERAL PLAN & ELEVATION
SHARED-USE PATH OVER JUDYS BRANCH
F.A.P. ROUTE 586
SECTION 51-1R
MADISON COUNTY
STATION 11+32.47
STRUCTURE NO. 060-7003

TABLE OF ROADWAY STATIONS AND OFFSETS

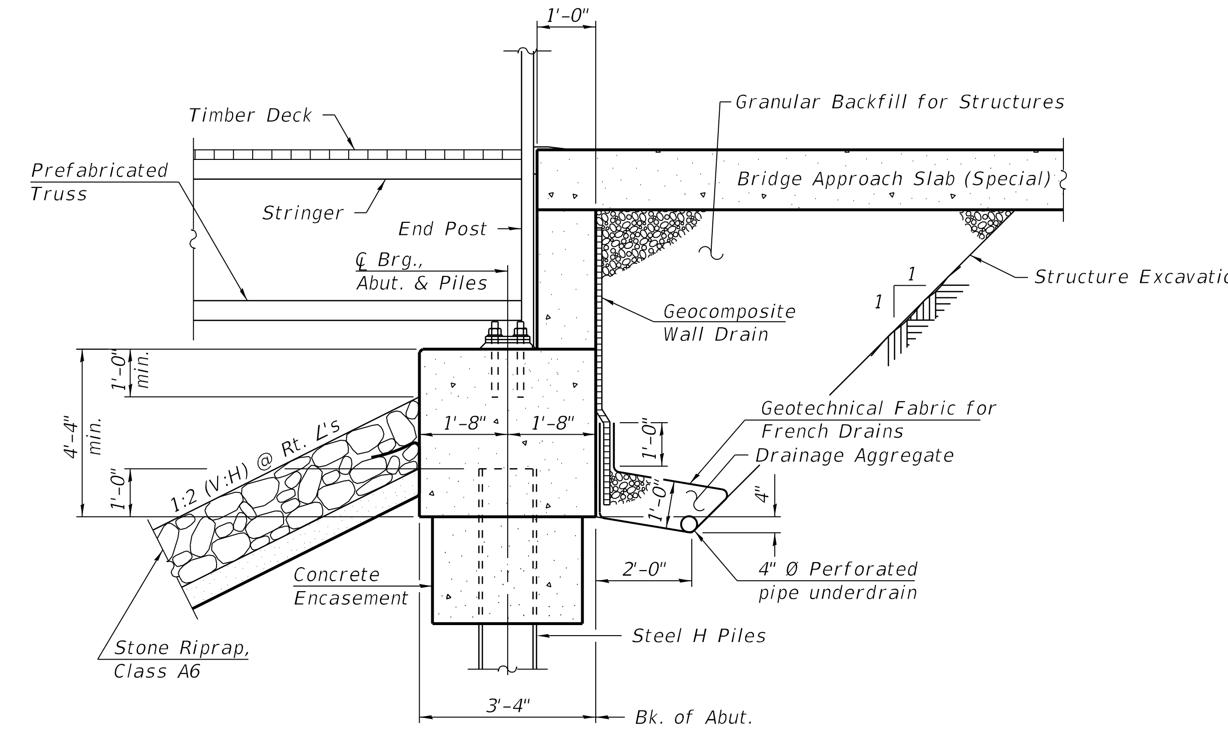
Point	Station	Offset
A	10+34.80	8.42' Lt.
B	10+34.80	0.14' Lt.
C	10+34.80	11.51' Rt.
D	10+40.20	11.51' Rt.
E	10+40.70	10.66' Rt.
F	10+42.89	8.42' Lt.
G	10+44.96	8.42' Lt.
H	10+46.18	1.26' Rt.
I	10+47.15	11.51' Rt.
J	10+46.86	2.42' Lt.
K	10+48.73	3.12' Lt.
L	10+49.37	7.69' Rt.
M	10+50.38	7.00' Lt.
N	10+51.72	11.51' Rt.
O	10+51.89	8.03' Rt.
P	10+53.60	7.00' Rt.
Q	10+54.14	11.51' Rt.
R	10+64.80	11.51' Rt.



PLAN OF 30'-0" BRIDGE APPROACH SLAB (SPECIAL)

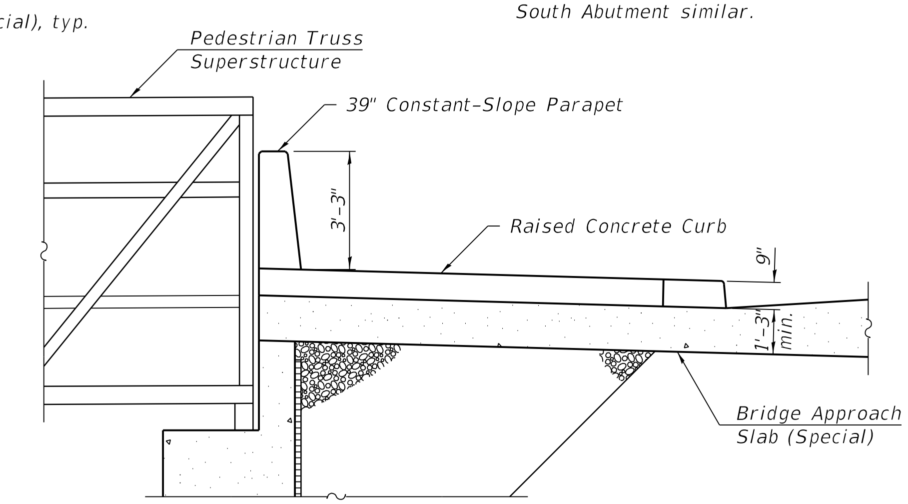


SECTION E-E

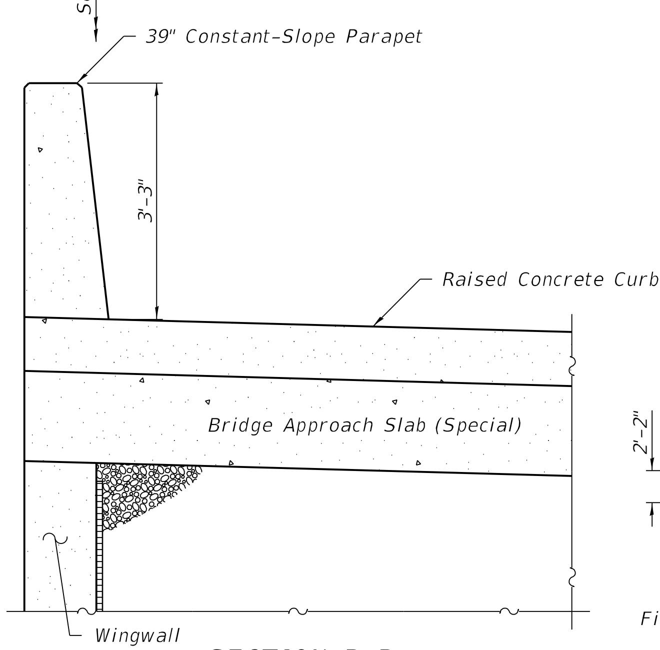


SECTION THRU ABUTMENT

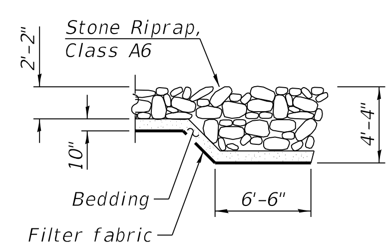
Note:
North Section Thru Abutment shown, South Abutment similar.



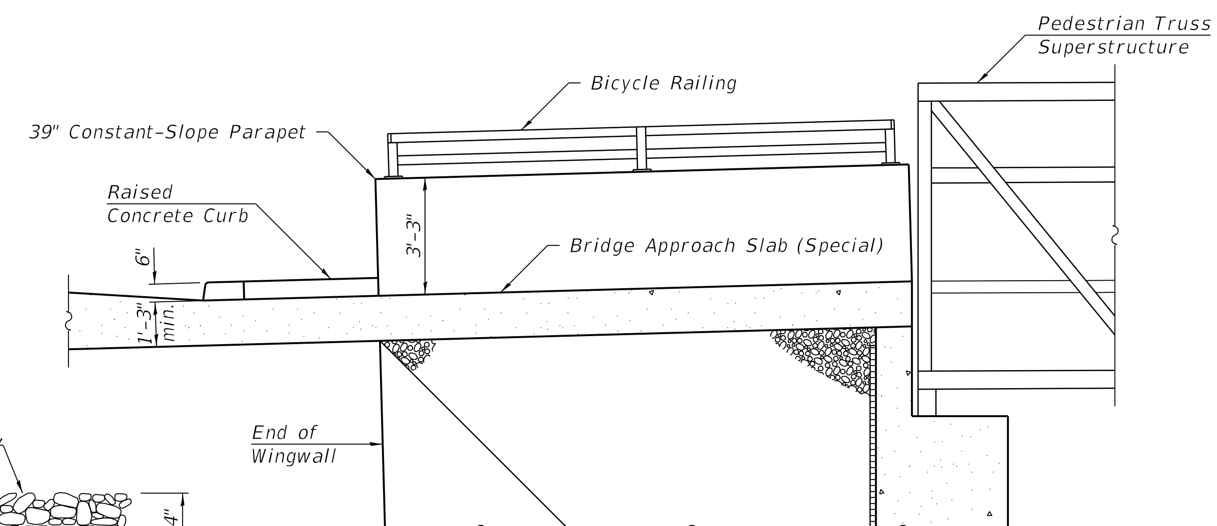
SECTION D-D



SECTION B-B



SECTION A-A



SECTION C-C

Note:
For location of section A-A, see sheet 1 of 2.

DETAILS
SHARED-USE PATH OVER JUDYS BRANCH
F.A.P. ROUTE 586
SECTION 51-1R
MADISON COUNTY
STATION 11+32.47
STRUCTURE NO. 060-7003

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FUHRMANN ENGINEERING
WWW. FUHRMANN-ENG .COM

USER NAME =	DESIGNED -	A.H. Morinaga Mansilla	REVISED -	
	CHECKED -	T.S. Friederich	REVISED -	
PLOT SCALE =	DRAWN -	A.H. Morinaga Mansilla	REVISED -	
PLOT DATE =	CHECKED -	T.S. Friederich	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2 SHEETS

F.A.P RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
586	51-1R	MADISON		

CONTRACT NO. 76A46
ILLINOIS FED. AID PROJECT

3/23/2023 2:09:01 PM

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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