STRUCTURE GEOTECHNICAL REPORT

IL-56 Pedestrian Bridge over East Branch DuPage River

IDOT P-91-439-01, Contract No 60P75

Section 634X-N-3

Structure Number: SN 022-P069

DuPage County, Illinois

Prepared for:

Mr. Joel Ihde, P.E., S.E.
Bollinger, Lach and Associates, Inc.
333 Pierce Road, Suite 200
Itasca, IL. 60143

Prepared by:

Geo Services, Inc.
805 Amherst Court
Suite 204
Naperville, Illinois 60565
(630) 305-9186

GSI Job No. 12195
February 2016

Geo Services, Inc.
Geotechnical, Environmental and Civil Engineering

November 27, 2012
December 13, 2012
June 24, 2013
February 17, 2014
February 16, 2015
August 12, 2015
Revised February 5, 2016

Bollinger, Lach and Associates, Inc.
333 Pierce Road, Suite 200
Itasca, IL 60143

Attn: Mr. Joel Ihde, P.E., S.E.

GSI Project 12195

Re: Structure Geotechnical Report
IL-56 Pedestrian Bridge over East Branch DuPage River (SN 022-P069)
IDOT Project No. P-91-439-01, Contract No. 60P75
DuPage County, IL

Dear Mr. Ihde:

The following report presents the geotechnical analysis and recommendations for the IL-56 Pedestrian Bridge over East Branch DuPage River Project. A total of eleven (11) structural soil borings (PB-01 thru PB-04, PB-03A and PB-04A, PW-01 through PW-05) were completed at the site by Geo Services, Inc. (GSI). Copies of these boring logs, along with bridge core information, are included in this report.

If there are any questions with regard to the information submitted in this report, or if we can be of further assistance to you in any way, please do not hesitate to contact us.

Very truly yours,

GEO SERVICES, INC.

Richard Realeza
Staff Engineer
Office Phone: (847) 253-3845x202
richard@geoservicesinc.net

Andrew J. Ptak, P.E.
Office Manager
Office Phone: (847) 253-3845x204
drew@geoservicesinc.net

enc.

TABLE OF CONTENTS

SECTION 01: INTRODUCTION

The following report presents the geotechnical analysis and recommendations for the construction of the IL-56 Pedestrian Bridge over East Branch DuPage River in Downers Grove, DuPage County, IL. A total of eleven (11) structural soil borings (PB-01 thru PB-04, PB-03A and PB-04A, PW-01 through PW-05) were completed for the construction of the pedestrian bridge. Additional hand-auger borings were drilled at the east portion of the proposed bridge location to further delineate the extent of organic clay soils encountered at boring PB-03 and PB-04 borings. Copies of these boring logs, location diagram, soil profile, and lab data are included in this report.

The proposed 3-span prefabricated truss bridge will extend from approximately Station 494+68.11 to 497+23.76 (approximately 256'-8 ¾" feet back-to-back of abutments). In addition to the bridge structure, MSE walls are also proposed at the bridge abutments, which stretch approximately 229 feet long at the West Abutment, and approximately 84 feet long at the East Abutment. The estimated substructure loads and bottom of footing cap elevations and have been provided by Bollinger, Lach and Associates, Inc. (BLA), and are tabulated in Tables 3 and 4 of this report, respectively. Also, IDOT Scour report and Vibration Report (for East Abutment portion of the pedestrian bridge) were provided by BLA for analyses of the proposed pedestrian bridge.

SECTION 02: SUBSURFACE INVESTIGATION PROCEDURES

The soil boring locations were selected by Geo Services based on the criteria in the IDOT Geotechnical Manual and submitted to and approved by Bollinger, Lach and Associates, Inc. (BLA) and IDOT. Soil borings were laid out by Geo Services, Inc. field personnel. Surveyed elevations were provided by BLA and are shown on the boring logs. The as-drilled locations for the borings are shown on the Boring Location Diagram found in the Appendix section of this report.

The borings PB-01 thru PB-04 and PW-01 thru PW-05 were performed during the months of September and October, 2012 with a truck mounted drill rig and the borings were advanced by means of hollow stem augers or rotary drilling techniques. In addition, hand-augers (PB-03A and PB-04A) were conducted at the east portion of proposed bridge location during the month of December, 2012 to supplement this investigation. Representative samples from the drill rig were obtained employing split spoon sampling procedures in accordance with AASHTO T-206. Cohesive samples were tested for unconfined compressive strength using an IDOT modified RIMAC test device and/or calibrated penetrometer in the field.

In addition, rock cores were obtained at all borings PB-01 thru PB-04 using rotary drilling techniques and a NX-size double tubed core barrel with a diamond impregnated bit.

SECTION 03: GEOLOGY AND PEDOLOGY

According to the 1971 ISGS Circular #460: Summary of the Geology of the Chicago Area/ISGS Geologic Materials to a Depth of 20' – Du Page County, the project site is located in a transitional area where the surficial soils to the west are categorized as belonging to the Batavia Member of the Henry Formation and to the east, less than 20.0' of Cahokia Alluviums overly Batavia Member soils. Henry Formation deposits generally consist of sand and gravel deposited in valley trains which are typically well sorted and evenly bedded and the Cahokia Alluvium deposits are associated with flood plain and channel deposits of present rivers and streams and consist of silt and sand, some gravel and organics.

The ISGS Circular C542 15 Meter Stack Map confirms that surficial soils in the vicinity of the project site are as noted above and that they are underlain soils belonging to the Wadsworth Till Member of the Wedron Formation that extend to a depth of more than 50.0' below ground surface. It is further noted that there are areas in near vicinity to the project site where bedrock can be expected to be encountered within a depth of 20.0' to 50.0' below ground surface. Wadsworth Till soils were deposited during Woodfordian Substage of the Wisconsinan glaciation between 12,500 to 22,000 years ago and generally consist of gray clayey and silty clay tills. A review of ISGS well records reviewed on-line identified one nearby well where bedrock was encountered at a depth of 90.0' below ground surface.

According to the 1984 ISGS Berg Circular #532: "Potential for Contamination of Shallow Aquifers in Illinois, the project site is located in an AX Zone which is defined as an area with alluvium stream deposits of gravel, sand, silt and clay. These deposits are variable in composition and thickness.

The Wetland Inventory database reviewed on-line at the US Fish & Wildlife Service website indicates that where the project site crosses the East Branch of the DuPage River, there are 79.7 and 10.4 acre wetlands to the north and south, respectively, that are identified as Palustrine System-Emergent Class wetlands that are partially drained or ditched and that they are located in a Seasonally Flooded water regime. There is also a small body of water near the northwest intersection of the river and the project roadway that is identified as a 0.4 acre man-made, Palustrine System-Unconsolidated Bottom Class wetland that is located in an Intermittently Exposed water regime.

The USDA Natural Resources Conservation Service Soil Survey database indicates that surficial soils in the vicinity of the project site consist of Sawmill Silty Clay Loams (3107A). These soils are not overly organic, less than 0.5%, potential frost action is rated as high, are subject to frequent flooding and considered to be prime farmland if drained and either protected from flooding or not frequently flooded during the growing season. These soils are not considered to be Hydric, are classified as having a slight erosion hazard and a K factor of 0.28.

According to readily available ISGS sources, there are no documented coal mining operations in near vicinity to the project site and seismic activity is noted to be very low.

The available geologic information indicates that the subgrade soils within the limits of the project site should consist of granular soils associated with stream deposits and that bedrock should be in excess of 50.0' deep. The materials encountered in the borings performed for this investigation generally match these conditions except that bedrock was encountered at shallower depths than expected.

SECTION 04: LAB TESTING PROGRAM

The test procedures were performed in accordance with test procedures discussed in the IDOT Geotechnical Manual. All split-spoon samples obtained from the drilling operation were visually classified in the field.

The soil testing program included performing water content, density and either unconfined compression and/or calibrated penetrometer tests on the cohesive samples recovered. Water content tests were performed on the non-cohesive samples recovered. These tests were performed upon representative portions of the samples obtained in the field. In addition, unconfined compressive testing was performed on rock cores obtained from the field and are indicated on the rock core logs.

The results of the above testing, along with a visual classification of the material based upon both the Illinois textural classification and the AASHTO Soil Classification System, are indicated on the boring logs. Unconfined compressive testing was performed on rock cores obtained from the field and are indicated on the rock core logs. The tests were performed upon representative portions of the samples obtained in the field.

SECTION 05: SUBSURFACE CONDITIONS

Surficial soils at the West Abutment areas (borings PB-01, PW-01 thru PW-03) and Pier 1 (boring PB-02) sections of the pedestrian bridge consist of 12 inches of topsoil with gravel fill, overlying 7-foot layer of stiff to very stiff clay loam with stone fill, with the exception of boring PB-02, which had 2-foot layer of medium dense clayey gravel and stone fill to approximate elevation 671. At the East Abutment area (borings PB-03, PW-04 and PW-05) and Pier 2 (boring PB-04) sections of the proposed pedestrian bridge, surficial materials consist of consist of 2 inches of asphalt and 8 inches of crushed stone or 12 inches of topsoil/silty sand fill, overlying 4½-foot layer of stiff to very stiff clay to clay loam fill, and 3 to 6-foot layer of soft to medium stiff organic silty clay to an approximate elevation 668 feet. Note that a 2-½ foot layer of buried topsoil was also encountered at boring PB-04, PW-04 and PW-05 at elevation ranging from 669 to 675.5 feet, and a 2-½ foot layer of very loose peat encountered at approximate elevation 662 feet. Underlying the surficial soils, the stratigraphy consists mainly of medium dense to very dense sand and gravel with occasional medium dense sandy loams before it

reaches bedrock to approximate elevation 642.

Surficial soils of the hand-auger borings (borings PB-03A and PB-04A) consist of 2 to 5 feet of topsoil. At boring PB-04A, strata of stiff silty clay and soft organic silty clay were encountered beneath the topsoil layer to approximate elevation 667.9. Stratigraphy of soils continued with 2 to 3.5 feet of sand and gravel to the termination of borings at approximate elevation 662.

Moisture contents of the granular soil ranges from 5% to 14% with an average of 9%. Fill materials had moisture contents with an average of 18%. The organic silty clay soils had moisture contents from 32% to 54% with an average of 37%. Peat had moisture content of 73%.

Bedrock was cored at borings PB-01 thru PB-04 locations. The bedrock was consistently categorized as Silurian System Niagaran Series Dolomite. Table 1 contains a summary of the bedrock information obtained during our exploration.

Table 1 – Bedrock Information Summary

Boring	Station	Bedrock Elevation	RQD	Compressive Strength (psi)
PB-01 (Run 1)	Sta. 494+64	642.2	15.5%	9,324
PB-02 (Run 1)	Sta. 495+26	642.0	15.5%	12,069
PB-03 (Run 1)	Sta. 496+57	642.1	46.0%	7,176
PB-04 (Run 1)	Sta. 497+28	645.0	32.0%	5,843

The rock core logs are illustrated in Appendix D. The unconfined compressive strength results of rock cores are shown at Appendix F. Rock cores indicated high degree of sample recovery with fairly low RQD values.

SECTION 06: WATER TABLE CONDITIONS

Water level readings were obtained in the borings during the drilling operation and these readings are shown on the boring logs. Groundwater levels were noted at 6 to 16.5 feet deep below ground surface. Estimated 100-year high water surface elevation and streambed of the East Branch DuPage River are approximately elevations 676.9 and 667.0 feet, respectively. Based on the coloration change in the soils from dark brown, gray and black to gray, we estimate a depth of 6 to 12 feet for the long-term groundwater table. Fluctuations in the amount of water accumulated and in the hydrostatic water table can be anticipated depending upon variations in precipitation, and surface runoff of the East Branch DuPage River.

SECTION 07: ANALYSIS

7.1 Seismic Consideration

For LFRD design, according to the AASHTO LRFD Bridge Design Specification 2012, the project site has a horizontal Response Spectral Acceleration of 0.037 at a period of 1.0 second and 5% critical dampening (S_1). The site also has a horizontal Response Spectral Acceleration of 0.099 at a period of 0.2 seconds and 5% critical dampening (S_s). The following table shows recommended seismic design data in accordance to the AASHTO LRFD Bridge Design Specification 2012.

Table 2 – Seismic Design (Approximately 1000-Year Return Period)

Seismic Performance Zone (SPZ)	1
Spectral Acceleration at 1 second (S_{D1})	0.089
Design Spectral Acceleration at 0.2 seconds (S_{Ds})	0.158
Soil Site Class	D

The project site is considered to be in a low seismic area. Liquefiable layers are not expected to impact the design of the new bridge.

7.2 Settlement

Proposed grade changes will result in estimated maximum fill heights of 10 feet at both West and East Abutment walls along the pedestrian bridge alignment. For all of the borings at the West Abutment section and boring PB-04 at the East Abutment section, settlement was calculated to be less than 0.4 inch, and no settlement issues were identified. Downdrag is not considered to affect the design of the piles at abutment areas where piles are to be placed.

However, at worst-case borings PW-04 and PW-05 of the East Abutment wall section, which had high moisture contents organic silty clay and peat at the upper to mid stratigraphy, settlement was calculated to be 1 to 1.5 inches. We estimate that 90% consolidation of the compressible deposits will occur in the order of 3 to 5 months.

It is anticipated that ground improvements such as installation of Aggregate Column Ground Improvements (detailed in Section 8.6 of this report) will be necessary at East Abutment wall areas due to unsuitable bearing soils and unacceptable total settlement estimates.

7.3 Slope Stability (for the proposed walls)

A wall structure is proposed at the bridge abutments with a maximum wall height of 10 feet at the West Abutment and East Abutment walls. The embankment slope and slope stability at the maximum height of the MSE wall have been analyzed with the Stabl slope analysis program using both the Bishop and Janbu methods of analysis. A factor of safety greater than 1.5 was calculated for a scenario with no ground improvement and no ground acceleration with a critical slope of 2H:1V, and the slope meets the minimum factor of safety of 1.5 as designated in the IDOT Geotechnical Manual for fill slopes. The worst-case slope (at boring PB-04) was analyzed. Stabl output for the MSE wall slope stability (at boring PB-04/04A) is included in Appendix G.

7.4 Scour

The design scour elevations has been determined for each substructure based on the total scour resulting from a 100-year and 200-year event Waterway Information Tables and the results of the scour tables provided by IDOT through BLA, and provisions from IDOT Bridge Manual 2012 and ABD Memo 14.2 requirements. The following table shows the design scour elevations appropriate for bottom of substructure foundation elevations.

Table 3 - Design Scour Elevations

Event/Limit State	Design Scour Elevations (feet)				Item 113 [1]
	W. Abutment	Pier 1	Pier 2	E. Abutment	
Q100	674.6	665.9	665.0	674.0	5
Q200	674.6	666.7	664.2	674.0	
Design	674.6	665.9	665.0	674.0	
Check	674.6	666.7	664.2	674.0	

Note: 1. Refer to ABD Memo 14.2 requirements for Illinois Structure Information System (ISIS) Item 113 rating.

SECTION 08: FOUNDATION RECOMMENDATIONS

8.1 Recommended Foundation Types

Based on the existing soil conditions and the estimated factored substructure loads tabulated in Table 3, the piers and abutment foundations may be supported on a deep foundation system of driven Metal Shell or H-pile foundation systems or shallow spread footings. Drilled-in rock-socketed H-pile or drilled shafts are also considered feasible foundation support type system for the proposed pedestrian bridge. It should be noted that the shallow spread footings on piers will be undermined by scour based on the proposed bottom of footing elevations as stated in Table 3; therefore, bearing elevation of the footings should be deeper than the design scour elevations (based on Table 3) or deep foundations should be used for design. In addition, Micropiles are also feasible foundation type. However, this type has not been investigated further or may not be economical compared to the conventional foundation types; therefore, this foundation type is not considered for the proposed pedestrian bridge.

At the East Abutment of the bridge, vibration issues may affect the nearby Nicor utility gas main, which is approximately 27'-8" feet away from the proposed East Abutment. Based on the Preliminary Vibration Report prepared by EN Engineering (provided by BLA on June 26, 2013), a minimum required distance of approximately 10 feet (if installing using Vibratory Hammer) or about 9.5 feet (if using an Impact Hammer of 3 tons) away from the transmission line if driven piles are installed at the East Abutment of the bridge; the use of driven piles may be feasible in this case. However, if driven piles are not elected as foundation support at East Abutment portion of the bridge, other feasible foundation support system options may include drilled in-place, rock-socketed H-piles, or rock-socketed drilled shafts. The use of the drilled in-place, rock-socketed H-piles, and rock-socketed drilled shafts support systems will need for extended steel casing due to non-cohesive soils from caving in. We recommend that an economic analysis for each foundation option presented below be considered before choosing a deep foundation system for the design. Based on the foundation loads for abutments provided by Bollinger Lach and Associates, Inc. (BLA), the total preliminary factored reactions at the top of foundation are shown on the following Table 4- Estimated Factored Loads for the Substructures:

Table 4 – Estimated Factored Loads for the Substructures

Location	Factored Loads (kips)
West Abutment	290
Pier 1	790
Pier 2	865
East Abutment	360

8.2 Shell and H-Pile Recommendations

Driven Metal Shell or H-piles or drilled-in-place, rock-socketed H-piles with individual pile encasements may be considered for support of the proposed piers and abutments.

The majority of the pile capacity from the Shell piles will be achieved through friction, and for H-piles will be achieved through end bearing by driving piles to top of bedrock (to refusal). For the Metal Shell piles, it is recommended that the pile tip remain at least 10 feet above the top of bedrock to avoid damage to the shell piles. For this reason, the maximum Nominal Required Bearing (NRB) for the Metal Shell piles may not be achieved due to elevation of the bedrock. The selection of pile type should be determined by economic considerations because both pile types are feasible for the design of the bridge. Pile design data are included in Appendix E. Pile capacities and lengths were calculated to the piles' Nominal Required Bearing and Factored Resistance Available, based on a LRFD resistance factor of 0.55. Selection of the Metal Shell and H-piles should be based on economic and construction considerations. Driving shoes should be required to drive H-piles to refusal on bedrock according to IDOT Bridge Manual 3.10.1.8. No pile shoes will be needed for the Metal Shell piles terminated at 10 feet above bedrock.

Due to site conditions and foundation loading imposed, drilled-in-place, rock-socketed H-piles may be considered at the abutment and pier sections of the proposed bridge. The bedrock is considered good quality. The Carter and Kulhawy equation was used to compute the bearing and an $\Phi b=0.50$ was used for the factor of safety. A minimum socket depth of 3 feet into sound bedrock (minimum 24" socket diameter) will be required for the rock-socketed H-piles. For rock-socketed H-piles socketed 3-feet or more into sound bedrock, factored unit end-bearing resistance of 55 ksf and a factored unit side resistance of 8 ksf/ft are recommended for design. The design of the rock socket resistance for the H-piles may be based on end-bearing or side resistance in bedrock only, whichever is greater (and not both) and not using the resistance from the overburden above bedrock per IDOT Bridge Manual 3.10.2.1. Individual pile encasement (minimum 24" socket diameter for HP12 or HP14 sections) will be needed in the preboring process. Setting piles in rock should be performed according to the GBSP 56 provisions. To the extent rock-socketing is provided, a factored uplift resistance value of 6 ksf/ft (applying a geotechnical resistance factor of 0.40 for uplift loading per AASHTO LRFD Table 10.5.2.4-1) can be used for H-piles socketed in rock to resist uplift loads.

There is a 36" Nicor transmission gas main located west of the East Abutment. Nicor's subconsultant, EN Engineering, provided IDOT with a Vibration Report for installing piles using either vibratory or impact hammers. The report concluded that the minimum distance from the transmission main to pile installation is 9.71 feet. Drilled-in-place, rock-socketed H-piles (Setting Piles in Rock) may be considered as another option for foundation support at the East Abutment portion of the bridge to minimize vibrations compared to driving piles. However, the piles should be analyzed for lateral deflection using the lateral soil properties in Tables 9 and 10 to determine if deeper embedment is

required.

Tables and graphs for estimated pile lengths for various pile sizes and pile capacities at each substructure unit are summarized in the Appendix E. Selection of the piles should be based on economic and construction considerations.

8.3 Pile Foundation Considerations

As per the IDOT Design Guide AGMU Memo 10.2, dated August 2011, the Washington State DOT (WSDOT) formula has replaced the FHWA Gates Formula as the standard method of construction verification. A modified IDOT static method was used to develop the SGR pile design tables. Nominal Required Bearing (NRB) was calculated from LRFD skin-friction (with pile type correction factors) and end-bearing calculations. A value of 1.04 is used for Bias Factor Ratio (I_G). A geotechnical resistance factor (Φ_G) of 0.55 was used in calculations for the Factored Resistance Available (FRA). Pile lengths were selected with respect to the loadings and geometry of the proposed structures.

For the new driven piles, it is estimated settlement of ¼ inch or less excluding the elastic shortening of the pile due to loading. Piles will be used according to IDOT Standard Specification.

The pile tables, provided in Appendix E, are estimates and test piles should be used for final pile length selections. We recommend that a minimum of one test pile be performed at each substructure unit. The piles should be driven until satisfactory driving resistance is developed in accordance with an appropriate pile driving formula. The test piles shall be driven to 110 percent of the Nominal Required Bearing indicated in the pile data information. The pile size and capacity selected should be based on economic considerations and the loads imposed on the structures.

8.4 Shallow Foundation System Recommendations for the Bridge Substructures

Based on the information obtained from the structure borings and the loads to be imposed, the new bridge abutments and piers may be supported on shallow spread footing foundations situated below any loose to dense sand and gravel or stiff silty clay soils. At the piers, the shallow spread footings will be undermined by scour based on the proposed bottom of footing elevations per Table 3. We recommend that the final bearing elevation of the pier footings should at least set at the design scour elevations (based on Table 3) or deep foundations should be used for foundation design.

The estimated elevation to suitable bearing material for each boring is presented in the Table 5.

Table 5 - Elevation of Suitable Bearing Material at Bridge Substructures for Shallow Foundations

Substructure (Boring)	Proposed bottom of substructure elevation by BLA (feet)	Elevation to suitable bearing material [1]	Depth of Undercut Required (ft)	Bearing Material
West Abutment (PB-01)	674.6	673.0	1.6 [2]	Very Stiff Silty Clay
West Pier (PB-02)	668.5 [3]	669.0	--	Medium Dense to Dense Sand & Gravel
East Pier (PB-03/PB-03A)	668.5 [3]	668.5	--	Medium Dense Sand & Gravel
East Abutment (PB-04/PB-04A)	674.0	668.0	6.0 [2]	Loose to Medium Dense Sand and Gravel

Notes: 1. Verify in field.
2. May require a temporary soil retention system be designed.
3. GSI recommends that the proposed bottom of pier elevations should be lower than the 100-year Design Scour Elevation. See corresponding design scour elevations on Table 3 of this report.

We recommend that spread footings supported on the native, very stiff clay or medium dense to dense sand and gravel soils (west abutment, west pier, east pier, east abutment) be designed for a factored bearing resistance of 7,000 psf at the elevations listed in Table 5 or on a pad of compacted, structural fill that is first excavated to the elevations detailed in Table 5. Resistance factors of 0.45 for sand and 0.50 for clay were used to calculate the factored bearing resistance at strength limit according to LRFD guidelines (Article 10.5.5.2.2).

Structural fill utilized to support footings should be extended at least 6 inches beyond the proposed footing limits and then one foot horizontally for each one foot of fill placed below the base of the footing.

If materials with less than adequate bearing strength are noted at the foundation level during footing construction, the weaker soils encountered at the base of the footings should be undercut to reach suitable bearing soils, and the undercut area filled with rock fill or lean concrete.

It should be noted that for footing excavations where the sandy soils are present, it is possible that a quick or semi-quick condition may occur at the base of the excavation following the release in confining overburden pressure and from construction activity. If such a condition is encountered (possibly due to a perched water table condition), the excavation should be thoroughly dewatered and any soils loosened as a result of this quick or semi-quick condition should be removed and replaced with a compacted

crushed stone.

Undercutting should be performed in such a manner as to minimize disturbance to the undercut subgrade, and heavy equipment traffic directly on the subgrade should be minimized. The actual extent of undercut should be determined in the field and at the time of construction by the geotechnical engineer.

For overexcavations in the abutment areas where deeper undercuts are needed, it is anticipated that temporary walls may be less than 20 feet tall, and stiff clay fill and loose granular soils will be encountered within the upper stratigraphy of the soils. Temporary Sheet Piling is recommended since the temporary system can be designed using the table in IDOT Design Guide 3.13.1. Lateral soil properties in Table 9 may be used for temporary retention system design.

The estimated settlement of the proposed bridge substructures will be on the order of ½ inch.

We recommend a resistance factor against sliding of 0.8 to be used for cast in-place concrete based on LRFD Manual procedures section 10.6.3.4. Table 6 below provides recommended lateral earth pressures to resist lateral loadings for shallow spread footing against concrete for the bearing soils present at or near design footing elevations at the site.

Table 6 – Lateral Earth Pressures

	Active Pressure, K_a ($P_a = K_a * \sigma_{vo'}$)	**Passive Pressure, K_p**[1] ($P_p = K_p * \sigma_{vo'}$)	**At-Rest Pressure, K_o** ($P_o = K_p * \sigma_{vo'}$)
Sand & Gravel and/or Granular Fill	0.28	3.54	0.44
Stiff Clay	0.34	3.00	0.50

Note: 1. For passive pressure, lateral movement of 0.006 times pier foundation height required to activate (Navfac DM7.2 Chapter 3, Figure 1).

8.5 Rock-Socketed Drilled Shaft Recommendations

The use of drilled shafts is another feasible foundation support system option for the proposed pedestrian bridge, especially at the East Abutment, which can minimize vibrations to the 36" Nicor gas main near the proximity of the East Abutment. The foundations may be constructed using a foundation system of rock-socketed drilled shafts. A factored end-bearing resistance of 55 ksf and side resistance of 8 ksf/ft is recommended for design for rock-socketed drilled shaft socketed 3-feet into sound bedrock, using a geotechnical resistance factor (Φb) of 0.50. A minimum diameter of 24 inches for the rock-socket size is recommended for the straight-shaft rock-socketed

drilled shafts.

Considering the piers are located near the East Branch of the DuPage River and after review of the boring and core logs, there is potential for water infiltration though the sandy soils and bedrock (approximately 642 feet). We recommend that the contract plans alert the contractor to potential need of temporary casing and/or work using slurry during construction due to potential water infiltration. Use of slurry would also require tremie methods of concrete placement. An experienced, geotechnical engineer should be present during excavation to determine the actual allowable bearing.

Based on the soil borings, saturated silty and sandy soils are to be encountered at all piers and the bridge abutment. We recommend that the contractor be informed that construction will require construction methods, such as the use of temporary casing and/or drilling slurry, to maintain the stability of the drilled shaft side walls. As per section 516 of the IDOT Standard Specification for Road and Bridge Construction, it is the contractor's responsibility to determine the method to construct the drilled shaft to meet the requirements of the specifications and design.

Based on the estimated bearing pressures, the consistency of the rock encountered and the magnitude of the loads expected, we estimate a maximum settlement of 1/4-inch for drilled shaft foundations supported on bedrock. Differential settlements would be dependent on the adjacent loads but is typically 1/2 to 2/3 of the total settlement. It should be noted that these settlement values are for rock compression only and that elastic compression of the concrete shaft should be added to these values. A minimum shaft diameter of 2 1/2 feet is recommended.

We strongly recommend that an experienced soil engineer be present during all phases of drilled shaft construction to observe that the excavations have reached a suitable bearing stratum as recommended in the design.

8.6 Wall Foundation Recommendations at the Abutments

Retaining Walls are proposed at the abutments of the proposed bridge. Feasible wall types include MSE, Gravity or Semi-gravity walls. Approximate bottom of the leveling pad or wall footing elevations of 672 feet (at the West Abutment) and 670.5 feet (at the East Abutment) have been used, which are generally bearing on clay fill and loose to dense sand and gravel soils. The calculated factored bearing resistances for the wall (at the abutments) are summarized in the following Table 7:

Table 7 – Factored Bearing Resistance Summary for the Proposed Walls

Wall Location	Boring	Approx. Max Wall Height (feet)	Estimated Maximum Allowable Bearing Pressure Needed at Wall (ksf) [2]	Factored Bearing Resistance for MSE Wall (ksf) [1]	Factored Bearing Resistance for Gravity or Semi-Gravity Walls (ksf) [1]
West Abutment	PB-01	10.0	2.6	5.1	4.4
	PW-01	5.5	1.1	4.7	4.0
	PW-02	7.0	1.5	4.5	3.8
	PW-03	8.0	1.8	4.3	3.6
East Abutment	PB-04 [3]	9.5	2.4	4.0	3.4
	PW-04 [3]	9.0	2.1	3.0	2.6
	PW-05 [3]	5.5	1.1	2.7	2.3

Notes:
1. Factored Bearing Resistance is computed for a resistance factor of 0.65 as required for MSE walls, and a resistance factor of 0.55 for Gravity and Semi-gravity walls. The factored bearing resistance indicated in the table is prior to remedial treatments. Minimum depth of foundation for MSE and Gravity/Semi-Gravity Walls below proposed grade are approximately 3.5 and 4.0 feet, respectively. No required Factored Bearing Resistances for the walls were provided to GSI during the report preparation. Approx. factored design bearing required for the walls are estimated in this table for analysis purposes only.

2. Required wall bearing/service loads estimated from sum of vertical load divided by length of wall strips (a minimum reinforcement length of 8 feet is used regardless of the wall height, 0.7 x H > 8'-0") minus twice the eccentricity. A fill unit weight of 120 pcf is assumed in the calculations.

3. Undercutting or the use of Aggregate Column Ground Improvement (ACGI) will be required at these boring areas due to unsuitable bearing soils, unacceptable total settlements, and to increase bearing resistance needed to support the wall.

Based on our analyses of bearing resistance, the soils encountered at a majority of the wall locations are suitable for support; however, the East Abutment wall area have settlement issues due to unsuitable bearing soils at and below design footing elevations. Remedial treatments, such as installing Aggregate Column Ground Improvement (ACGI) or undercutting to elevations ranging from 662 to 669 feet should be performed at the East Abutment walls due to organic/peat soils encountered to elevation 662 feet in borings PW-04 and PW-05. If ground improvements are performed, the factored bearing resistances summarized in Tables 7 will increase to provide the required bearing resistance needed per wall location.

Aggregate Column Ground Improvement (ACGI) at the East Abutment walls may be installed to stiffen the subgrade soils for support up to 4,500 psf of factored bearing resistance. We estimate a triangular spacing range of 8 to 9 feet (center-to-center) and a diameter range of 30 to 36 inches may be appropriate for the ACGI. If East Abutment and wingwalls are supported on spread footings, we recommend ACGI to extend to a minimum of 6 feet beyond the front of footings for the East Abutment and the wingwalls

and at elevation of 657 feet deep.

In addition, a load-transfer platform (LTP) at least 3 to 4 feet thick will need to be utilized to uniformly transfer load from the MSE wall to the Aggregate Column Ground Improvement. Typically, a performance based specification is specified for this type of work.

With a sensitive 36" Nicor transmission gas main located west of the East Abutment, the effect of vibration from the Aggregate Column Ground Improvement (ACGI) installation does not pose any vibration issue since the gas main pipe distance from the ACGI installation area is more than the required distance (9.71 feet) as concluded from the Vibration Report (provided by Nicor's subconsultant, EN Engineering). Also, there is an existing gas line located north of the East Abutment wall that runs east to west direction. Per BLA, we were informed that the gas line will be relocated at the time of the construction. Therefore, no vibration concerns are anticipated from the ACGI installation.

Existing overhead utilities are shown in the TS&L, which is located within the area proposed for ACGI installation. Based on the survey information provided by BLA, the lowest high voltage wire elevation is estimated to be 738.5 feet and the estimated bottom elevation of the proposed wall is approximately 670.0 feet. The overhead clearance between the high voltage wire and bottom of the wall elevation provides enough room for the ACGI equipment to operate. Existing overhead utilities are anticipated to be non-issue; however, the Contractor and the owner of the overhead utilities will need to verify clearances during construction to ensure that the required minimum overhead clearances are met.

Undercutting to elevations ranging from 669 to 666.5 feet (below all organic and peat soils) may be also feasible as an alternative to ACGI. However, it may not be economical due to deep undercutting, and the need for a temporary retention system to construct the ground improvement. Economic, construction, and scheduling factors should be evaluated for the decision of the wall construction.

The following Table 8 shows our remedial treatment/ground improvement recommendations needed for the East Abutment wall areas of the proposed pedestrian bridge.

Table 8 – Remedial Treatment/ Ground Improvement Recommendations at the East Abutment Walls

Boring(s) (Approx. Station Limits)	Proposed Wall Footing Elevation (feet)	Subgrade Description	Unconfined Compressive Strength, tsf (moisture content, %)	Reason for Remedial Treatment	Remedial Treatment, Elevation (depth, feet) [1]	Remedial Treatment
PB-04/PB-04A (Sta 497+00 to 497+50)	670.5	Topsoil to Organic Silty Clay	0.75 (26% to 35%)	High Moisture Contents, Unsuitable Bearing Soils	666.5 [2] (4 feet)	Install Aggregate Column Ground Improvement or Remove & Replace with Approved Structural (Granular) Fill
PW-04 (Sta 497+50 to 498+00)	670.5	Clay Fill to Organic Silty Clay	0.8 to 1.9 (22% to 37%)	High Moisture Contents, Unsuitable Bearing Soils	659.0 [2] (11.5 feet)	
PW-05 (Sta. 498+00 to 498+25)	670.5	Clay Fill, Topsoil to Organic Silty Clay	0.4 to 0.7 (22% to 50%)	High Moisture Contents, Unsuitable Bearing Soils	662.0 [2] (8.5 feet)	

Notes: 1. Verify undercuts in field
2. Will require a temporary soil retention system be designed.

If undercutting option is elected, it should be performed in such a manner as to minimize disturbance to the undercut subgrade, and heavy equipment traffic directly on the subgrade should be minimized. The actual extent of undercut should be determined in the field and at the time of construction by the geotechnical engineer.

Structural fill utilized to support MSE leveling pad or wall footings should be extended at least 6 inches beyond the proposed footing limits and then one foot horizontally for each one foot of fill placed below the base of the footing.

For overexcavations in the abutment areas where deeper undercuts are needed, it is anticipated that temporary walls may be less than 20 feet tall, and stiff clay fill and loose granular soils will be encountered within the upper stratigraphy of the soils. Temporary Sheet Piling is recommended since the temporary system can be designed using the table in IDOT Design Guide 3.13.1. Lateral soil properties in Table 9 may be used for temporary retention system design.

8.7 Wingwall Recommendations

The east and west abutments will have associated wingwalls. The foundation recommendations presented for the abutments in ***Section 8.6 – Wall Foundation Recommendations for the Abutments*** are also valid for the wingwalls.

For the lateral design of yielding wingwalls, it is recommended that a lateral active earth pressure of 40 psf per foot of depth be used above the water table assuming a free-draining granular backfill is utilized. For cohesive soils, a lateral active earth pressure of 55 psf per foot should be used. For non-yielding abutment walls with granular backfill, a lateral at-rest pressure of 50 psf per foot should be used, assuming proper drainage. For cohesive soils, a lateral at-rest pressure of 65 psf per foot should be used.

Allowances should be made for any surcharge loads adjacent to the retaining structure. Drainage should be provided behind any walls.

8.8 General Wall Design

Embankment fill behind the retaining wall should be placed in compliance with Section 205 of the IDOT Standard Specifications for Road and Bridge Construction. Backfill behind the wall should consist of a compacted, free-draining granular material. A proper drainage system should be designed and provided behind the wall. The retaining wall should be designed by an IL-licensed Structural Engineer.

To provide adequate frost protection, we recommend the bottom of a reinforced concrete cantilever or gravity/semi-gravity walls be a minimum of 4 feet below final grade and 3.5 feet below grade for an MSE wall.

8.9 Approach Slab Recommendations

The new approach slab will be supported on either new or existing embankment fill. We recommend using a compacted, fill for the embankment. Shallow footing for the new approach slab should be designed for a factored bearing resistance of 2,000 pounds per square foot. The new fill should be compacted per IDOT specifications for earth embankment. A qualified geotechnical engineer should observe the subgrade prior to any base course is placed.

SECTION 09: LATERAL SOIL PROPERTIES

On the following Tables 9 and 10 are tabulation of lateral soil parameters to be used for design of piles and the bridge substructures.

Table 9 – Soil Parameters for Lateral Resistance

Material (Elevation)	Unit Weight (pcf)	Drained Friction Angle (°)	Undrained Cohesion (psf)	Lateral Modulus of Subgrade Reaction (pci)	Strain
Stiff to Very Stiff Clay Loam Fill (680 to 675)	125	30	1,700	600	0.006
Buried Topsoil (675 to 673) [1]	110	24	-	20	-
Soft to Medium Stiff Organic Silty Clay (673 to 670) [1]	110	24	400	30	0.008
Loose Sandy Clay Loam (670 to 660)	120	28	-	30	-
Loose to Medium Dense Sand (660 to 653)	125	32	-	300	-
Medium Dense to Dense Sand and Gravel (653 to 638)	132	34	-	800	-

Notes: 1. Soils encountered at PB-03 and PB-04 borings only.

Table 10 – Bedrock Parameters for Lateral Resistance

Material (Elevation)	Unit Weight (pcf)	Young's Modulus (psi)	Uniaxial Compressive Strength (psi)	RQD (%)	Strain (k_m)
Bedrock (638 to 628)	150	2×10^6	See Lab Data on Rock Core Logs	15% to 46%	0.0001

Allowances should be made for any surcharge loads adjacent to the structure.

SECTION 10: COFFERDAM RECOMMENDATIONS

Per Bridge Manual Section 2.3.6.4.2, if drilled shafts are to be used for the proposed bridge piers, cofferdam may not be needed since there is a potential need of temporary casing to maintain the stability of the drilled shaft side walls. Also, if drilled-in-place, rock-socketed H-piles with individual pile encasements are selected for support of the proposed piers, then cofferdams may not be needed. However, if piles (without encasement) are selected to support the proposed bridge piers, then cofferdams will be required for construction.

For the pile caps, excavation for the proposed bridge piers (estimated bottom of the substructure elevations at 668.5 feet at West Pier and 668.5 feet at the East Pier) are to be below the estimated water surface elevation (approximate elevation 669.7 feet) of the East Branch of the DuPage River. Based on the temporary cofferdams criteria stated in the Section 2.3.6.4.2 of the IDOT Bridge Manual 3.13.3 and GBSP No. 73 (Article 502.06b), it is determined that the use of seal coat is required to effectively dewater the cofferdam and provide a working platform for construction; therefore, we are recommending the use of Type 2 cofferdam for the proposed bridge piers. Dewatering or pump and pit procedures will also be needed to keep the site "in the dry" during construction of the piers. Tables 9 and 10 may be used for design of the temporary structures. A minimum factor of safety against buoyancy of 1.2 is required by IDOT.

SECTION 11: GENERAL CONSTRUCTION CONSIDERATIONS

All soils which become softened or loosened at the base of foundation excavation areas or subgrade areas should be carefully recompacted or removed prior to placement of foundation concrete or fill material. No foundation concrete or structural fill should be placed in areas of ponded water or frozen soil.

All excavations should be performed in accordance with the latest Occupational Safety and Health Administration (OSHA) requirements. Allowances should be made for any surcharge loads adjacent to the excavation areas. The information provided below should not be interpreted to mean that Geo Services, Inc. is assuming responsibility for construction site safety or the contractor's activities. Construction site safety is the sole responsibility of the contractor, who should also be solely responsible for the means, methods, and sequencing of construction operations.

During excavation for the proposed improvements, movement of adjacent soils into the excavation should be prevented. All excavations should be performed in accordance with the latest Occupational Safety and Health Administration (OSHA) requirements. Allowances should be made for any surcharge loads adjacent to the retaining structures.

SECTION 12: GENERAL QUALIFICATIONS

The analysis and recommendations presented in this report are based upon the data obtained from our soil borings performed at the indicated locations. This report does not reflect any variations that may occur between borings or across the site. In addition, the soil samples cannot be relied on to accurately reflect the strata variations that usually exist between sampling locations. The nature and extent of such variations may not become evident until construction. If variations appear evident, it will be necessary to reevaluate the recommendations of the report. In addition, it is recommended that Geo Services Inc. be retained to perform construction observation and thereby provide

a complete professional geotechnical engineering service through the observational method.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranties, either expressed or implied, are intended or made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by the geotechnical engineer. Also note that Geo Services Inc. is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of the report's subsurface data or engineering analyses without the express written authorization of Geo Services Inc.

APPENDIX A

GENERAL NOTES

GENERAL NOTES

CLASSIFICATION

American Association of State Highway & Transportation Officials (AASHTO) System used for soil classification.

Cohesionless Soils

Relative Density	No. of Blows per foot N
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	Over 50

TERMINOLOGY

Streaks are considered to be paper thick. **Lenses** are considered to be less than 2 inches thick. **Layers** are considered to be less than 6 inches thick. **Stratum** are considered to be greater than 6 inches thick.

Cohesive Soils

Consistency	Unconfined Compressive Strength - qu (tsf)
Very Soft	Less than 0.25
Soft	0.25 - 0.5
Medium Stiff	0.5 - 1.0
Stiff	1.0 - 2.0
Very Stiff	2.0 - 4.0
Hard	Over 4.0

DRILLING AND SAMPLING SYMBOLS

SS:	Split Spoon 1-3/8" I.D., 2" O.D.	HS:	Housel Sampler
ST:	Shelby Tube 2" O.D., except where noted	WS:	Wash Sample
AS:	Auger Sample	FT:	Fish Tail
DB:	Diamond Bit - NX: BX: AX	RB:	Rock Bit
CB:	Carboloy Bit - NX: BX: AX	WO:	Wash Out
OS:	Osterberg Sampler		

Standard "N" Penetration: Blows per foot of a 140 lb. hammer falling 30" on a 2" O.D. Split Spoon

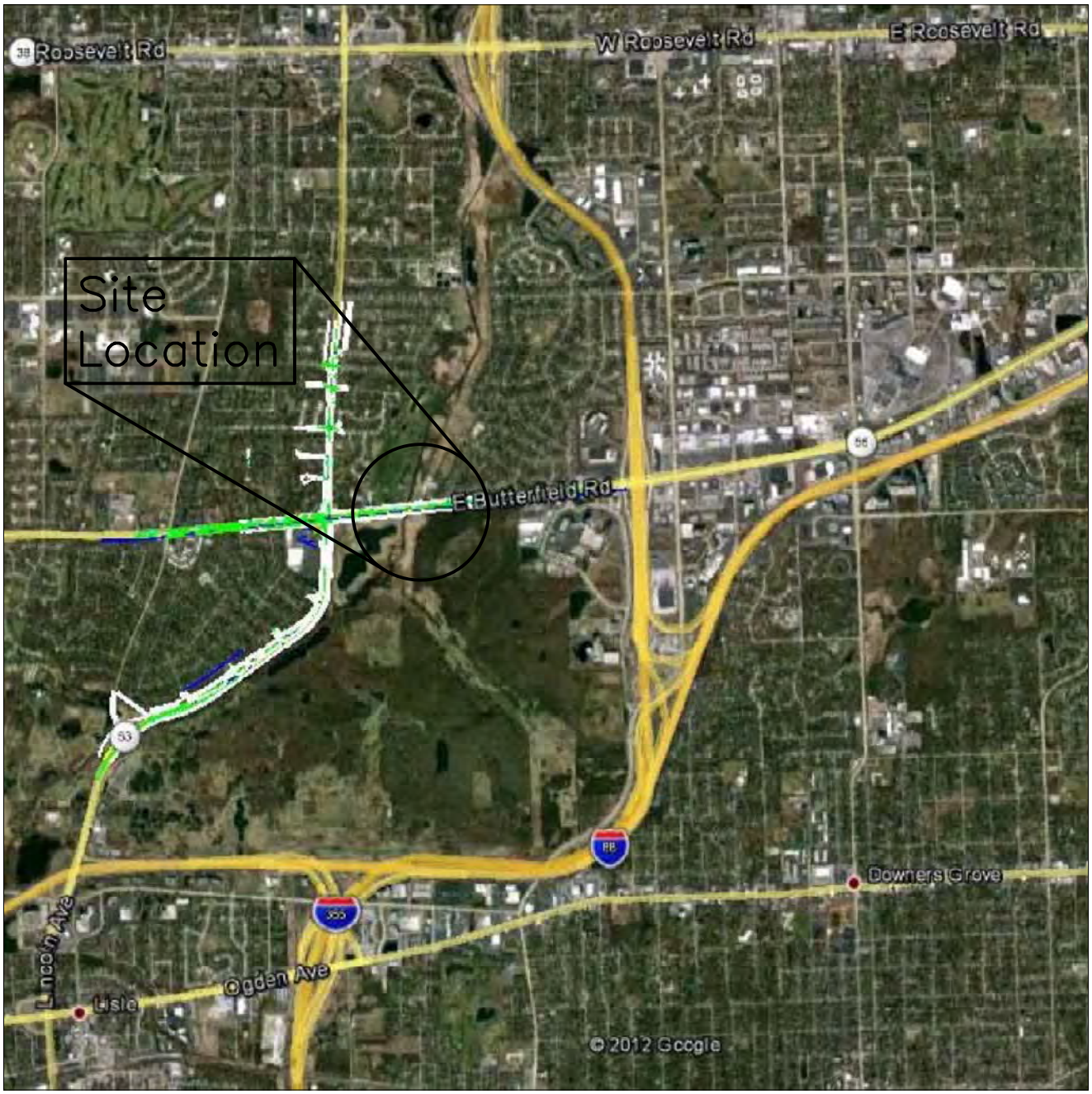
WATER LEVEL MEASUREMENT SYMBOLS

WL:	Water	WD:	While Drilling
WCI:	Wet Cave In	BCR:	Before Casing Removal
DCI:	Dry Cave In	ACR:	After Casing Removal
WS:	While sampling	AB:	After Boring

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable ground water levels. In impervious soils, the accurate determination of ground water elevations is not possible in even several days observation, and additional evidence on ground water elevations must be sought.

APPENDIX B

SITE LOCATION MAP



SITE MAP			
IL–56 Pedestrian Bridge over East Branch of DuPage River Contract No. 60P75 DuPage County, Illinois	**Geo Services, Inc.** Geotechnical, Environmental & Civil Engineering 805 Amherst Court, Suite 204 Naperville, Illinois 60565 (630) 355-2838	DRAWN BY	RR
		APPROVED BY	AJP
		DATE	November 24, 2012
		GSI JOB No.	12195
		SCALE	NTS

© Geo Services, Inc.

APPENDIX C

BORING LOCATION DIAGRAM

PLAN
SURVEYED
PLOTTED
PLOT CHECKED
RT. OF WAY CHECKED
CADD FILE NAME
NOTE BOOK
NO.
BY
DATE

PROFILE
SURVEYED
PLOTTED
PLOT CHECKED
BLM. NOTED
STRUCTURE NOTATNS CHKD
NOTE BOOK
NO.
BY
DATE

N

SCALE: 1"=20'-0"

PW-01 PW-02 PW-03 PB-01 PB-02 PB-03A PB-04A

PB-03 PB-04 PW-04 PW-05

BUTTERFIELD RD (IL RTE 56)

EX. R.O.W.

PR. R.O.W.

HMA CONC AGG FO W

Geo Services, Inc. Geotechnical, Environmental & Civil Engineering 805 Amherst Court, Suite 204 Naperville, Illinois 60565 (630) 355-2838	USER NAME =	DESIGNED - RWC	REVISED - 12/7/2012	
		DRAWN - RWC	REVISED -	
	PLOT SCALE =	CHECKED - AJP	REVISED -	
	PLOT DATE =	DATE - 11/21/2012	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IL ROUTE 56 (BUTTERFIELD ROAD)
PEDESTRIAN PATH SOIL BORING PLAN

SCALE: 1"=20' | SHEET NO. 1 OF 1 SHEETS | STA. 492+50 TO STA. 498+50

F.A.U RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
365	634X-N-3	DuPAGE	1	1
		CONTRACT NO. 60P75		
	ILLINOIS FED. AID PROJECT			

PROPOSED STRUCTURE
STA. 494+69 TO STA. 497+01

PREFABRICATED PEDESTRIAN TRUSS SUPERSTRUCTURE

EXISTING GROUND ALONG PROPOSED SHARED-USE PATH

SHARED-USE PATH PROPOSED PROFILE

100 YR HWL ELEV=676.65

10 YR HWL ELEV=675.45

PW-01 492+54 19.9' Right 675.9

PW-02 493+27 18.0' Right 675.4

PW-03 493+96 14.2' Right 676.7

PB-01 494+64 25.3' Right 681.4

PB-02 495+26 4.6' Left 674.0

PB-03 496+57 22.0' Right 681.6

PB-04 497+28 20.9' Right 681.0

PW-04 497+73 15.5' Right 679.6

PW-05 498+36 12.3' Right 678.3

PROP. PIER 1

PROP. WEST ABUTMENT

PROP. PIER 2

DUPAGE RIVER BED ELEVATION = 667.00

PROP. EAST ABUTMENT

EOB

BEDROCK

WEATHERED ROCK

LEGEND

BORING NUMBER
STATION
OFFSET
ELEVATION

N-VALUE

SOIL STRENGTH (TSF)
B-BULGE
S-SHEAR
P-POCKET PENETROMETER

MOISTURE CONTENT (%)
NR=NO RECOVERY

GROUNDWATER ELEVATION
▼ FIRST ENCOUNTER
▽ AT COMPLETION
▽ 24 HRS WATER LEVEL

EOB=END OF BORING

VERTICAL SCALE: 1"=5'-0"

HORIZONTAL SCALE: 1"=20'-0"

PLAN — SURVEYED / PLOTTED / ALIGNMENT CHECKED / R.T. OF WAY CHECKED / CADD FILE NAME / NOTE BOOK / NO. / BY / DATE

PROFILE — SURVEYED / PLOTTED / PROFILE CHECKED / BM. NOTED / STRUCTURE NO(S)/PINS CHKD

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

USER NAME =	DESIGNED - RWC	REVISED - 12/7/2012	
	DRAWN - RWC	REVISED - 12/13/2012	
PLOT SCALE =	CHECKED - AJP	REVISED -	
PLOT DATE =	DATE - 11/21/2012	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IL ROUTE 56 (BUTTERFIELD ROAD)
SHARED-USE PATH SOIL BORING PROFILE

SCALE: 1"=20'HZ 1"=5'VT | SHEET NO. 1 OF 1 SHEETS | STA. 492+50 TO STA. 498+50

F.A.U RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
365	634X-N-3	DuPAGE	1	1
		CONTRACT NO. 60P75		
		ILLINOIS FED. AID PROJECT		

PROPOSED STRUCTURE
STA. 494+69 TO STA. 497+01

PREFABRICATED PEDESTRIAN TRUSS SUPERSTRUCTURE

EXISTING GROUND ALONG PROPOSED SHARED-USE PATH

SHARED-USE PATH PROPOSED PROFILE

100 YR HWL ELEV=676.65

10 YR HWL ELEV=675.45

PROP. PIER 1

PROP. WEST ABUTMENT

PROP. PIER 2

DUPAGE RIVER BED ELEVATION = 667.00

PROP. EAST ABUTMENT

PB-03A
496+62
11.7' Left
672.4

	N	Qu	W%
TOPSOIL	AS	1.0P	36
	AS	0.5P	38
	AS	NP	15
SAND & GRAVEL (A-1)	AS	NP	15

EOB

PB-04A
497+36
12.3' Left
672.9

	N	Qu	W%
TOPSOIL	AS	-	33
SILTY CLAY (A-7)	AS	1.0P	35
ORGANIC SILTY CLAY	AS	0.25P	54
	AS	NP	17
SAND & GRAVEL (A-1)	AS	NP	17

EOB

LEGEND

BORING NUMBER
STATION
OFFSET
ELEVATION

N-VALUE

SOIL STRENGTH (TSF)
B-BULGE
S-SHEAR
P-POCKET PENETROMETER

MOISTURE CONTENT (%)
NR=NO RECOVERY

	N	Qu	W%
AS			
10		2.5P	22
9		NP	7
16		1.5B	14
27		-	12

EOB

GROUNDWATER ELEVATION
▼ FIRST ENCOUNTER
▽ AT COMPLETION
▽ 24 HRS WATER LEVEL

EOB=END OF BORING

VERTICAL SCALE: 1"=5'-0"

HORIZONTAL SCALE: 1"=20'-0"

676.37	675.41	674.62	675.59	675.87	676.15	673.13	668.63	674.33	674.75	675.26	675.18	674.70
677.67	**678.36**	**679.06**	**679.89**	**681.53**	**683.05**	**683.89**	**684.03**	**683.47**	**682.22**	**680.48**	**678.73**	**677.55**

492+50 | 493+00 | 493+50 | 494+00 | 494+50 | 495+00 | 495+50 | 496+00 | 496+50 | 497+00 | 497+50 | 498+00 | 498+50

PLAN: SURVEYED | PLOTTED | DRAWN | CHECKED | R.O.W. CHECKED | CADD FILE NAME | NOTE BOOK | NO. | BY | DATE

PROFILE: SURVEYED | PLOTTED | DRAWN | CHECKED | BAL. NOTED | STRUCTURE NO/ATH'S CHKD | NOTE BOOK | NO. | BY | DATE

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Ammer St. Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

USER NAME =		DESIGNED - RWC	REVISED - 12/7/2012		
		DRAWN - RWC	REVISED - 12/13/2012		
PLOT SCALE =		CHECKED - AJP	REVISED -		
PLOT DATE =		DATE - 11/21/2012	REVISED -		

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IL ROUTE 56 (BUTTERFIELD ROAD)
SHARED-USE PATH SOIL BORING PROFILE

SCALE: 1"=20'HZ 1"=5'VT | SHEET NO. 1 OF 1 SHEETS | STA. 492+50 TO STA. 498+50

F.A.U RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
365	634X-N-3	DuPAGE	1	1
		CONTRACT NO. 60P75		
	ILLINOIS FED. AID PROJECT			

APPENDIX D

SOIL BORING LOGS AND ROCK CORE LOGS

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 10/14/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE Diedrich Automatic

STRUCT. NO. n/a
Station 495+85.00

BORING NO. **PB-01**
Station 494+64
Offset 25.3' Right
Ground Surface Elev. *681.4*

Surface Water Elev. *n/a*
Stream Bed Elev. *n/a*
Groundwater Elevation:
First Encounter *667.9* ▼
Upon Completion *n/a* ▽
After ____ Hrs. ▽

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	AS	–	13	12.0" TOPSOIL with Gravel–black (Fill)
	7		*112*	
	6			
	6	1.9B	16	
				CLAY LOAM with Stone–dark brown, gray & black–stiff to very stiff (A–6) Fill
	4			
	3			
–5	4	1.0P	17	
	7		*116*	
	8			
	5	3.9B	16	
673.4				
	2		*104*	SILTY CLAY–dark brown, gray & black–very stiff (A–6)
	3			
–10	5	2.5B	23	
670.9				
	6			
	18			
	12	NP	8	
				SAND & GRAVEL–brown–dense (A–1) ▼
	25			
	17			
–15	17	NP	6	
665.9				
	6			
	11			
	12	NP	11	
				SAND & GRAVEL–gray– medium dense to dense (A–1)
	8			
	8			
–20	8	NP	8	
				SAND & GRAVEL–gray– medium dense to dense (A–1)
	7			
	8			
	4	NP	11	
	9			
	11			
–25	11	NP	12	
	4			
	4			
	6	NP	12	
	9			
	7			
–30	9	NP	12	
	7			
	7			
–35	11	NP	8	
642.2	23			
	50/2"			Drillers Observation: Weathered Rock
641.2 –40		NP	8	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B–Bulge, S–Shear, P–Penetrometer) ST–Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR–No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 10/14/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE Diedrich Automatic

STRUCT. NO. n/a
Station 495+85.00

BORING NO. **PB-01**
Station 494+64
Offset 25.3' Right
Ground Surface Elev. *681.4*

Surface Water Elev. *n/a*
Stream Bed Elev. *n/a*
Groundwater Elevation:
First Encounter *667.9*
Upon Completion *n/a*
After _____ Hrs.

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Silurian System, Niagaran Series Dolomite RUN 1 (−40.0' to −50.0') Light gray to gray with horizontal to wavy bedding & some varving. Numerous horizontal fractures with some chert nodules throughout. Recovery=100.0% R.Q.D.=15.5%			
−45	RUN 1		
631.4 −50			
End Of Boring @ −50.0 Hollow Stem Augers to −40.0' Rotary Drilling To Completion Diedrich Automatic Hammer			
−55			
−60			
−65			
−70			
−75			
−80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

ROCK CORE LOG

PAGE 1 of 1
DATE 10/14/2012
LOGGED BY DR
GSI JOB No. 12195

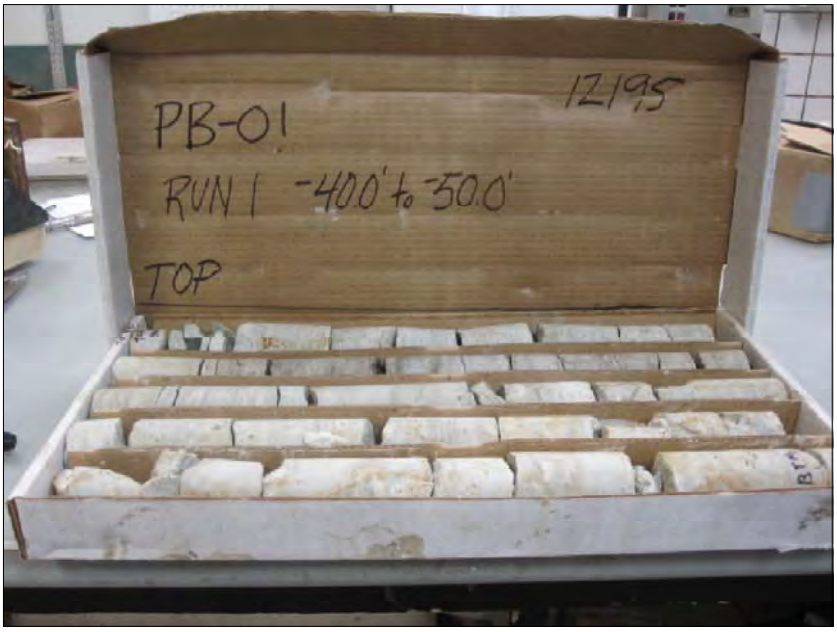
ROUTE F.A.P. RTE. 365
DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls
SECTION 634X-N-3
LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM
COUNTY DuPage County
CORING METHOD Rotary Wash
STRUCT. NO. n/a
CORING BARREL TYPE & SIZE NX Double Swivel-10 ft
Station 495+85.00
Core Diameter 2.0 in
BORING NO. **PB-01**
Top of Rock Elev. 642.2
Station 494+64
Begin Core Elev. 641.2
Offset 25.3' Right
Ground Surface Elev. 681.4

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	100.0	15.5	n/a	671 @ -44.6'

Silurian System, Niagaran Series Dolomite
RUN 1 (-40.0' to -50.0')
Light gray to gray with horizontal to wavy bedding & some varving. Numerous horizontal fractures with some chert nodules throughout.

-45

-50



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

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 10/3/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE Diedrich Automatic

STRUCT. NO. n/a
Station 495+85.00

BORING NO. **PB-02**
Station 495+26
Offset 4.6' Left
Ground Surface Elev. *674.0*

Surface Water Elev. *n/a*
Stream Bed Elev. *n/a*

Groundwater Elevation:
First Encounter *668.0* ▼
Upon Completion *n/a* ▽
After _____ Hrs. ▽

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				12.0" TOPSOIL with Gravel-black (Fill)
				673.0
	AS	–	14	
	3			
				CLAYEY GRAVEL & STONE-dark brown to black-medium dense (Fill)
	6			
	4	–	9	
				671.0
	2			
				SAND & GRAVEL-brown-loose (A-1)
–5	3			
	4	NP	5	
				▼*668.0*
	11			
	17			
	15	NP	7	
	5			
	10			
–10	9	NP	9	
				SAND & GRAVEL-gray-medium dense to dense (A-1)
	4			
	5			
	8	NP	9	
	5			
	6			
–15	6	NP	9	
	8			
	8			
	10	NP	8	
	6			
	5			
–20	4	NP	7	
–25	6			SAND & GRAVEL-gray-medium dense to dense (A-1)
	6	NP	9	
	8			
	8			
	7	NP	7	
	15			
–30	14			
	21	NP	5	
				642.0
	50/1"	NP	9	Drillers Observation: Apparent Bedrock *641.5*
				Silurian System, Niagaran Series Dolomite RUN 1 (–32.5' to –42.5') Light gray to gray with horizontal to wavy bedding. Numerous horizontal fractures with some chert nodules throughout.
–35				RUN 1
–40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 10/3/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE Diedrich Automatic

STRUCT. NO. n/a
Station 495+85.00

BORING NO. **PB-02**
Station 495+26
Offset 4.6' Left
Ground Surface Elev. *674.0*

Surface Water Elev. *n/a*
Stream Bed Elev. *n/a*

Groundwater Elevation:
First Encounter *668.0*
Upon Completion *n/a*
After _____ Hrs.

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
631.5	RUN 1		
−45			
−50			
−55			
−60			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
−65			
−70			
−75			
−80			

Recovery=98.5%
R.Q.D.=15.5%

End Of Boring @ −42.5
Hollow Stem Augers to −32.5'
Rotary Drilling To Completion
Diedrich Automatic Hammer

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

ROCK CORE LOG

DATE 10/3/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365

DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3

LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County

CORING METHOD Rotary Wash

STRUCT. NO. n/a

CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station 495+85.00

Core Diameter 2.0 in

BORING NO. **PB-02**

Top of Rock Elev. 642.0

Station 495+26

Begin Core Elev. 641.5

Offset 4.6' Left

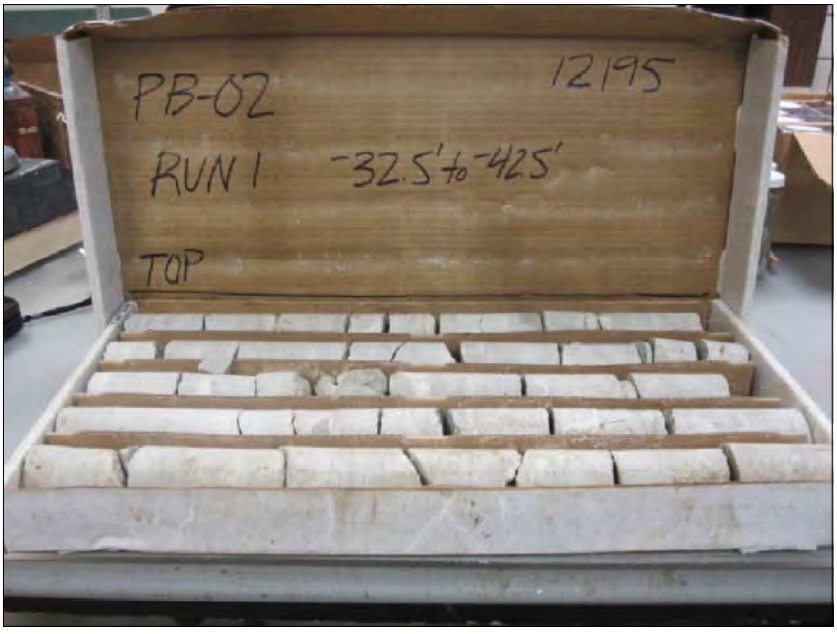
Ground Surface Elev. 674.0

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	98.5	15.5	n/a	869 @ -38.3'

Silurian System, Niagaran Series Dolomite
RUN 1 (-32.5' to -42.5')
Light gray to gray with horizontal to wavy bedding. Numerous horizontal fractures with some chert nodules throughout.

-37.5

-42.5



Color pictures of the cores Yes Cores will be stored for examination for –

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

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 10/1/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE Diedrich Automatic

STRUCT. NO. n/a
Station 495+85.00

BORING NO. **PB-03**
Station 496+57
Offset 22.0' Right
Ground Surface Elev. 681.6

Surface Water Elev. n/a
Stream Bed Elev. n/a
Groundwater Elevation:
First Encounter 665.1 ▼
Upon Completion n/a ▽
After ____ Hrs. ▽

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				2.0" ASPHALT, 8.0" CRUSHED STONE 680.8
	1		113	
	3			SILTY LOAM-gray-medium dense (A-4)
	4	1.9B	17	
				CLAY-brown-stiff (Fill)
	2		91	
	4			
-5	4	1.8B	20	
				676.1
	3			
	3			
	3	0.5P	42	
				ORGANIC SILTY CLAY-dark brown & black-soft to medium stiff (A-7)
	1		87	
	1			
-10	1	0.3B	32	
	1		82	
	2			
	3	0.6B	37	
				668.6
	1			
	3			
				SILTY CLAY-dark gray-stiff (A-6)
-15	4	1.0P	23	
▼ 665.1	3			
	5			
	6	NP	12	
				SAND & GRAVEL-gray-medium dense (A-1)
	4			
	6			
-20	8	NP	13	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SAND & GRAVEL-medium dense (A-1) 661.1
	4			
	5			SILTY LOAM-gray-medium dense (A-4)
	6	NP	11	
				658.6
	3			
	34			
-25	50/4"	NP	8	
	2			
	6			
	9	NP	11	
				SAND & GRAVEL-gray-medium dense to very dense (A-1)
	6			
	8			
-30	5	NP	14	
	9			
	11			
-35	15	NP	8	
				645.1
				Drillers Observation: Weathered Rock
				642.1
-40				Silurian System, Niagaran Series Dolomite RUN 1

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 10/1/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE Diedrich Automatic

STRUCT. NO. n/a
Station 495+85.00

BORING NO. **PB-03**
Station 496+57
Offset 22.0' Right
Ground Surface Elev. *681.6*

Surface Water Elev. *n/a*
Stream Bed Elev. *n/a*
Groundwater Elevation:
First Encounter *665.1*
Upon Completion *n/a*
After _____ Hrs.

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-45	RUN 1		
-50			
-55			
-60			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-65			
-70			
-75			
-80			

RUN 1 (-32.5' to -42.5')
Light gray with horizontal to wavy bedding. Numerous horizontal fractures with some chert nodules throughout.

Recovery=100.0%
R.Q.D.=46.0%

632.1

End Of Boring @ -49.5
Hollow Stem Augers to -39.5'
Rotary Drilling To Completion
Diedrich Automatic Hammer

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

ROCK CORE LOG

DATE 10/1/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365

DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3

LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County

CORING METHOD Rotary Wash

STRUCT. NO. n/a

CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station 495+85.00

Core Diameter 2.0 in

BORING NO. **PB-03**

Top of Rock Elev. 642.1

Station 496+57

Begin Core Elev. 641.6

Offset 22.0' Right

Ground Surface Elev. 681.6

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	100.0	46.0	n/a	517 @ -32.3'
-44.5					
-49.5					

Silurian System, Niagaran Series Dolomite
RUN 1 (-32.5' to -42.5')
Light gray with horizontal to wavy bedding. Numerous horizontal fractures with some chert nodules throughout.

Color pictures of the cores Yes Cores will be stored for examination for -

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

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 12/10/2012

LOGGED BY TZ

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD Hand Auger HAMMER TYPE Manual

STRUCT. NO. n/a
Station 495+85.00

BORING NO. **PB-03A**
Station 496+62
Offset 11.7' Left
Ground Surface Elev. *672.4*

Surface Water Elev. *n/a*
Stream Bed Elev. *n/a*

Groundwater Elevation:
First Encounter *666.9*
Upon Completion *666.9*
Wet Cave In *666.4*

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
0			
TOPSOIL-black	AS	1.0P	36
667.9	AS	0.5P	38
-5			
SAND & GRAVEL-brown (A-1)	AS	NP	15
664.4	AS	NP	15
End Of Boring @ -8.0 Hand Auger			
-10			
-15			
-20			
-25			
-30			
-35			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 10/2/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE Diedrich Automatic

STRUCT. NO. n/a
Station 495+85.00

BORING NO. **PB-04**
Station 497+28
Offset 20.9' Right
Ground Surface Elev. *681.0*

Surface Water Elev. *n/a*
Stream Bed Elev. *n/a*
Groundwater Elevation:
First Encounter *667.0* ▼
Upon Completion *n/a* ▽
After _____ Hrs. ▽

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				2.0" ASPHALT, 8.0" CRUSHED STONE
680.2				
	2		***110***	CLAYEY SAND-gray-
	3			loose to medium dense (A-2)
	5	2.4B	18	
				CLAY to CLAY LOAM-brown & gray-
				very stiff (A-6) Fill
	2		***111***	
	4			SILTY LOAM-gray-loose (A-4)
-5	4	2.4B	19	
675.5				
	2			
	3			TOPSOIL-black
	5	2.0P	26	
673.0				
	1			ORGANIC SILTY CLAY-black-
	2			medium stiff (A-7)
-10	3	0.75P	35	
670.5				
	1			
	2			SANDY LOAM-gray-loose (A-2)
	2	NP	22	
▼*667.0*	2			
	2			
-15	6	NP	12	
				SAND & GRAVEL-gray-
				loose to medium dense (A-1)
	4			
	6			
	6	NP	14	
663.0				
	3			CLAYEY SAND-gray-
	5			loose to medium dense (A-2)
661.0 -20	7	NP	17	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	3			CLAYEY SAND-gray-
	3			loose to medium dense (A-2)
	6	NP	22	
658.0				
	1			
	2			SILTY LOAM-gray-loose (A-4)
-25	4	NP	21	
655.5				
	38			
	21			
	22	NP	7	
	20			
	30			SAND & GRAVEL-gray-
-30	23	NP	5	medium dense to dense (A-1)
	13			
	18			
-35	11	NP	9	
645.0				
				Drillers Observation: Apparent Bedrock
643.0				
				Silurian System, Niagaran Series Dolomite
				RUN 1 (-32.5' to -42.5')
-40				RUN 1

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 10/2/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE Diedrich Automatic

STRUCT. NO. n/a
Station 495+85.00

BORING NO. **PB-04**
Station 497+28
Offset 20.9' Right
Ground Surface Elev. *681.0*

Surface Water Elev. *n/a*
Stream Bed Elev. *n/a*
Groundwater Elevation:
First Encounter *667.0*
Upon Completion *n/a*
After _____ Hrs.

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Light gray with horizontal to wavy bedding. Numerous horizontal fractures with some chert nodules throughout.			
Recovery=99.0% R.Q.D.=32.0%			
	RUN 1		
-45			
633.0			
End Of Boring @ -48.0 Hollow Stem Augers to -38.0' Rotary Drilling To Completion Diedrich Automatic Hammer			
-50			
-55			
-60			
-65			
-70			
-75			
-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

ROCK CORE LOG

DATE

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365

DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3

LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County

CORING METHOD Rotary Wash

STRUCT. NO. n/a

CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station 495+85.00

Core Diameter 2.0 in

BORING NO. **PB-04**

Top of Rock Elev. 645.0

Station 497+28

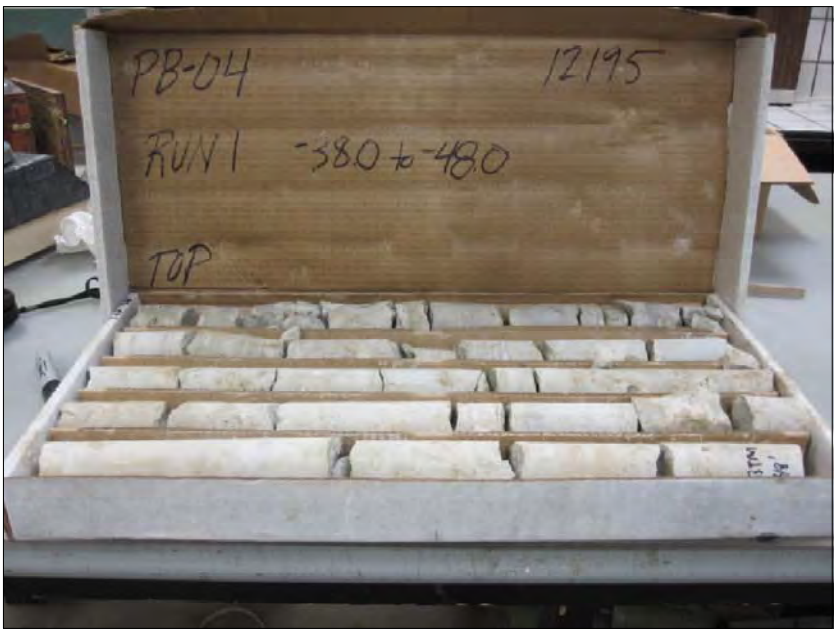
Begin Core Elev. 643.0

Offset 20.9' Right

Ground Surface Elev. 681.0

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	99.0	32.0	n/a	421 @ -43.3'
-43.0					
-48.0					

Silurian System, Niagaran Series Dolomite
RUN 1 (-32.5' to -42.5')
Light gray with horizontal to wavy bedding. Numerous horizontal fractures with some chert nodules throughout.



Color pictures of the cores Yes Cores will be stored for examination for -

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

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 12/10/2012

LOGGED BY TZ

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD Hand Auger HAMMER TYPE Manual

STRUCT. NO. n/a
Station 495+85.00

BORING NO. **PB-04A**
Station 497+36
Offset 12.3' Left
Ground Surface Elev. *672.9*

Surface Water Elev. *n/a*
Stream Bed Elev. *n/a*

Groundwater Elevation:
First Encounter *666.9*
Upon Completion *667.4*
Wet Cave In *666.9*

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
TOPSOIL-black							
670.9	AS	–	33				
SILTY CLAY-dark brown-stiff (A-7) Wet							
669.4	AS	1.0P	35				
ORGANIC SILTY CLAY-black-soft							
667.9 –5	AS	0.25P	54	–25			
SAND & GRAVEL-gray ▽ *666.9* ▼▼	AS	NP	17				
SAND & GRAVEL-brown							
664.9	AS	NP	17				
End Of Boring @ –8.0 Hand Auger							
–10				–30			
–15				–35			
–20				–40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) ST-Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR-No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 9/27/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD 3.25" Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. –
Station 495+85.00

BORING NO. **PW-01**
Station 492+52
Offset 5.0' Right
Ground Surface Elev. *675.9*

Surface Water Elev. *n/a*
Stream Bed Elev. *n/a*
Groundwater Elevation:
First Encounter *669.4*
Upon Completion *669.9*
After _____ Hrs.

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	AS	–	25	TOPSOIL with Gravel–black
	2			
	4			
	4	–	22	
672.4				
	4			SAND & GRAVEL–brown–medium dense to dense (A–1)
	8			
–5	8	NP	9	
	6			
	20			
	20	NP	13	
	15			
	22			
–10	17	NP	5	
665.4				
	9			SAND & GRAVEL–gray–medium dense (A–1)
	11			
	6	NP	12	
	10			
	10			
–15	11	NP	9	
	3			
	8			
	14	NP	14	
	9			
	10			
–20	11	NP	7	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	18			SAND & GRAVEL–gray–medium dense (A–1)
	18			
	16	NP	8	
	16			
	13			
–25	11	NP	4	
650.4				
	26			WEATHERED ROCK–gray–very dense
	44			
	47	NP	7	
	50/4"			
645.9 –30		NP	11	
				End Of Boring @ –30.0' Hollow Stem Augers CME Automatic Hammer
–35				
–40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B–Bulge, S–Shear, P–Penetrometer) ST–Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR–No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 9/27/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD 3.25" Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. –

Station 495+85.00

BORING NO. **PW-02**

Station 493+26

Offset 4.0' Right

Ground Surface Elev. *674.6*

Surface Water Elev. *n/a*

Stream Bed Elev. *n/a*

Groundwater Elevation:

First Encounter *668.1*

Upon Completion *668.6*

After _____ Hrs.

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
	AS	–	23	
	2			
	3			TOPSOIL–black
	3	1.0P	27	
671.1				
	2			
	3			SILTY CLAY LOAM–brown & gray–
–5	3	1.75P	23	medium dense to dense (A–6)
▽*668.6*				
	4			
	9			
	14	NP	5	
				SAND & GRAVEL–brown–
				medium dense (A–1)
	10			
	14			
–10	15	NP	5	
664.1				
	4			
	4			
	7	NP	11	
	2			
	6			
–15	15	NP	10	SAND & GRAVEL–gray–
				medium dense to very dense (A–1)
	2			
	5			
	9	NP	13	
	3			
	5			
–20	6	NP	17	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
	7			
	19			
	15	NP	14	
	9			
	9			SAND & GRAVEL–gray–
–25	35	NP	7	medium dense to very dense (A–1)
	50			
	7			
	7	NP	8	
	20			
	50/4"			
644.6 –30		NP	8	
				End Of Boring @ –30.0'
				Hollow Stem Augers
				CME Automatic Hammer
–35				
–40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B–Bulge, S–Shear, P–Penetrometer) ST–Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR–No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 9/28/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD 3.25" Hollow Stem Auger HAMMER TYPE Diedrich Automatic

STRUCT. NO. –
Station 495+85.00
BORING NO. **PW-03**
Station 494+02
Offset 10.0' Right
Ground Surface Elev. *676.7*

Surface Water Elev. *n/a*
Stream Bed Elev. *n/a*
Groundwater Elevation:
First Encounter *667.7* ▼
Upon Completion *670.7* ▽
After _____ Hrs. ▽

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	AS	–	16	12.0" TOPSOIL–black
	4			
	5			
	5	3.75P	16	
				CLAY LOAM–dark brown, gray & black–stiff to very stiff (Fill)
	3		***98***	
	4			
–5	4	1.2B	25	
▽				
	2			
	3			
	4	1.0P	12	
▼667.7				
	7			
	14			
–10	14	–	5	
				CLAYEY SAND & GRAVEL–brown–medium dense (A-2) Possible Fill
	9			
	12			
	16	–	9	
663.7				
	9			
	13			
–15	13	NP	3	
				SAND & GRAVEL–gray–medium dense to dense (A-1)
	8			
	6			
	6	NP	14	
	6			
	5			
–20	11	NP	6	
				SAND & GRAVEL–gray–medium dense to dense (A-1)
	6			
	20			
–25	9	NP	7	
	4			
	16			
	20	NP	9	
	19			
	9			
–30	5	NP	5	
643.2	50/1"	NP	10	
				Auger Refusal @ –33.5' Possible Bedrock End Of Boring Hollow Stem Augers Diedrich Automatic Hammer
–35				
–40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B–Bulge, S–Shear, P–Penetrometer) ST–Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR–No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 9/28/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD 3.25" Hollow Stem Auger HAMMER TYPE Diedrich Automatic

STRUCT. NO. –

Station 495+85.00

BORING NO. **PW-04**

Station 497+66

Offset 1.9' Left

Ground Surface Elev. *674.6*

Surface Water Elev. *n/a*

Stream Bed Elev. *n/a*

Groundwater Elevation:

First Encounter *657.6*

Upon Completion *657.6*

After _____ Hrs.

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
				12.0" TOPSOIL–black
673.6	AS	–	13	
	3		***107***	
	5			
	5	2.6B	20	CLAY–dark brown, gray & black–stiff to very stiff (A–6) Fill
	2		***1.9***	
	5			
–5	4	1.9B	22	
669.1				
	3			TOPSOIL–black
	4			
	6	1.5P	29	
666.6				
	1		***77***	ORGANIC SILTY CLAY–black–medium stiff (A–7)
	2			
–10	3	0.8B	37	
664.1				
	1			SILTY SAND with Gravel–dark gray–very loose (A–2)
	2			
	2	NP	16	
661.6				
	1			PEAT–dark gray to black–very loose (A–8)
	1			
–15	1	NP	73	
659.1				
	3			
▽	3			
	4	NP	13	SILTY SAND with Gravel–dark gray–loose (A–2)
	2			
	3			
–20	3	NP	11	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Soil Description
654.1				SILTY SAND with Gravel–loose (A–2)
	2			
	4			
	3	NP	24	SANDY LOAM–gray–loose (A–2)
	2			
	2			
–25	3	NP	20	
649.1				
	18			SAND & GRAVEL–gray–dense (A–1)
	18			
	20	NP	7	
	31			
	16			
–30	22	NP	7	
642.6	50/1"	NP	NR	
				Auger Refusal @ –32.0'
				Possible Bedrock
				End Of Boring
				Hollow Stem Augers
				Diedrich Automatic Hammer
–35				
–40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B–Bulge, S–Shear, P–Penetrometer) ST–Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR–No Recovery

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

DATE 9/28/2012

LOGGED BY DR

GSI JOB No. 12195

ROUTE F.A.P. RTE. 365 DESCRIPTION Pedestrian Bridge over East Branch DuPage River & Retaining Walls

SECTION 634X-N-3 LOCATION SEC 25, T39N, R10E, SW1/4, 3RD PM

COUNTY DuPage County DRILLING METHOD 3.25" Hollow Stem Auger HAMMER TYPE Diedrich Automatic

STRUCT. NO. –

Station 495+85.00

BORING NO. **PW-05**

Station 498+27

Offset 3.8' Left

Ground Surface Elev. *674.0*

Surface Water Elev. *n/a*

Stream Bed Elev. *n/a*

Groundwater Elevation:

First Encounter *662.5* ▼

Upon Completion *666.5* ▽

After _____ Hrs. ▽

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	AS	–	13	12.0" SILTY SAND–black (Fill)
673.0				
	2		***101***	
	4			
	6	2.4B	24	CLAY–brown & gray spotted black–stiff to very stiff (A–6) Fill
	3		***103***	
	4			
–5	3	1.9B	22	
668.5				
	2		***71***	TOPSOIL–black
	2			
▽*666.5*	3	0.7B	50	
	1		***84***	ORGANIC SILTY CLAY–dark gray to black–very loose (A–7)
	1			
–10	2	0.4B	37	
▼*662.5*	3			
	4			SILTY SAND with Gravel–dark gray–medium dense (A–2)
	6	NP	17	
661.0				
	3			SANDY LOAM–gray–loose (A–2)
	4			
–15	5	NP	15	
658.5				
	5			
	8			
	9	NP	14	SILTY LOAM–gray–loose to medium dense (A–4)
	4			
	4			
–20	5	NP	20	

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SILTY LOAM–gray (A–4)
653.5				
	2			
	3			SILTY CLAY LOAM–gray–loose (A–4/A–6)
	4	–	23	
651.0				
	2			
	3			SILTY LOAM to LOAM–gray–loose (A–2/A–4)
–25	5	NP	15	
648.5				
	31			
	18			
	26	NP	5	
	19			SAND & GRAVEL–gray–dense (A–1)
	24			
–30	10	NP	8	
640.0	50/1"	NP	7	
				Auger Refusal @ –34.0'
				Possible Bedrock
–35				End Of Boring
				Hollow Stem Augers
				Diedrich Automatic Hammer
–40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B–Bulge, S–Shear, P–Penetrometer) ST–Shelby Tube Sample VS=Vane Shear Test
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) The Unit Dry Weight (pcf) is noted in italics above moist (%)
NR–No Recovery

APPENDIX E

PILE ANALYSIS

Estimated Pile Lengths and Capacities for the West Section of the Proposed IL-56 Pedestrian Bridge over East Branch DuPage River

Boring PB-01 - West Abutment (Ground Surface Elevation against Pile during driving = 674.60, Pile Cutoff Elevation = 676.60)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 14x73		Metal Shell 12"		Metal Shell 14"	
	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing NRB(Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)
3	6	11	8	14	9	17	11	21	18	33	23	42
6	15	27	18	32	21	37	25	45	66	119	77	139
8	19	34	23	42	27	50	33	60	110	200	128	233
11	22	40	27	50	33	64	40	72	109	199	136	248
13	24	43	30	54	35	69	43	78	100	182	125	228
16	24	44	32	57	38	75	46	83	98	177	120	218
18	28	51	35	56	42	77	50	92	131	238	164	299
21	26	47	33	63	42	85	53	96	109	199	133	242
23	31	55	39	61	47	90	56	103	131	238	161	293
26	33	59	42	71	50	96	60	110				
28	35	63	44	76	53	103	64	117				
31	36	66	47	81	56	109	68	124				
33	38	70	50	86	60	134	73	132				
34	50	90	61	111	74	134	91	166				
35	90	163	111	202	133	242	139	252				
36	157	286	184	335	230	419	234	426				
37							318	578				

Note: All H-piles reach Max Available NRB based on Pile Driving Stresses through soil layers. Pile lengths in RED denotes pile end-bearing at bedrock.
Metal Shell piles do not reach the Max Available NRB and are limited to about 10 feet above bedrock to prevent pile damage during driving.
[1] Metal Shell Pile 12" diameter with 0.250" walls
[2] Metal Shell Pile 14" diameter with 0.312" walls

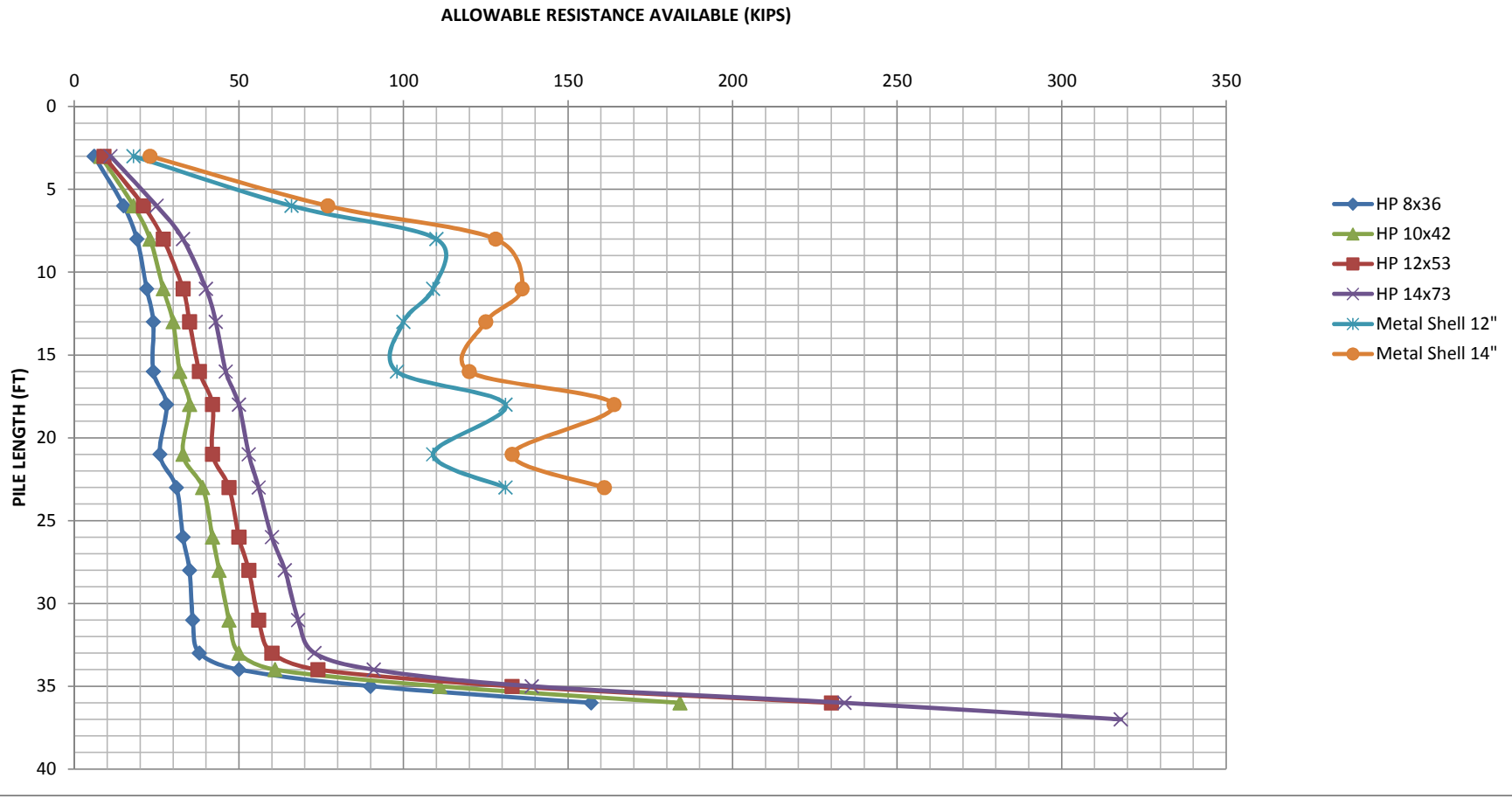
Boring PB-02, Pier-1/ West Pier (Ground Surface Elevation against Pile during driving = 668.90, Pile Cutoff Elevation = 669.90)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 14x73		Metal Shell 12"		Metal Shell 14"	
	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)
2	3	5	3	6	4	6	4	8	26	46	30	54
5	5	9	6	10	7	12	8	15	37	67	43	78
7	6	11	8	14	9	17	11	20	49	89	57	104
10	8	15	10	18	12	22	15	27	75	136	94	171
12	10	17	12	22	14	26	17	31	60	109	74	135
15	12	21	14	26	17	32	21	39	91	166	117	212
17	13	24	17	30	20	36	24	44	82	149	102	186
20	15	28	19	34	23	41	27	50				
22	19	35	23	43	28	51	35	64				
25	25	45	31	56	37	67	45	82				
26	35	63	43	77	51	94	65	117				
27	88	160	109	198	131	238	160	291				
28	157	286	184	335	230	419	256	465				
29							318	578				

Note: All H-piles reach Max Available NRB based on Pile Driving Stresses through soil layers. Pile lengths in RED denotes pile end-bearing at bedrock.
Metal Shell piles do not reach the Max Available NRB and are limited to about 10 feet above bedrock to prevent pile damage during driving.
[1] Metal Shell Pile 12" diameter with 0.250" walls
[2] Metal Shell Pile 14" diameter with 0.312" walls

PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

BORING PB-01 West Abutment

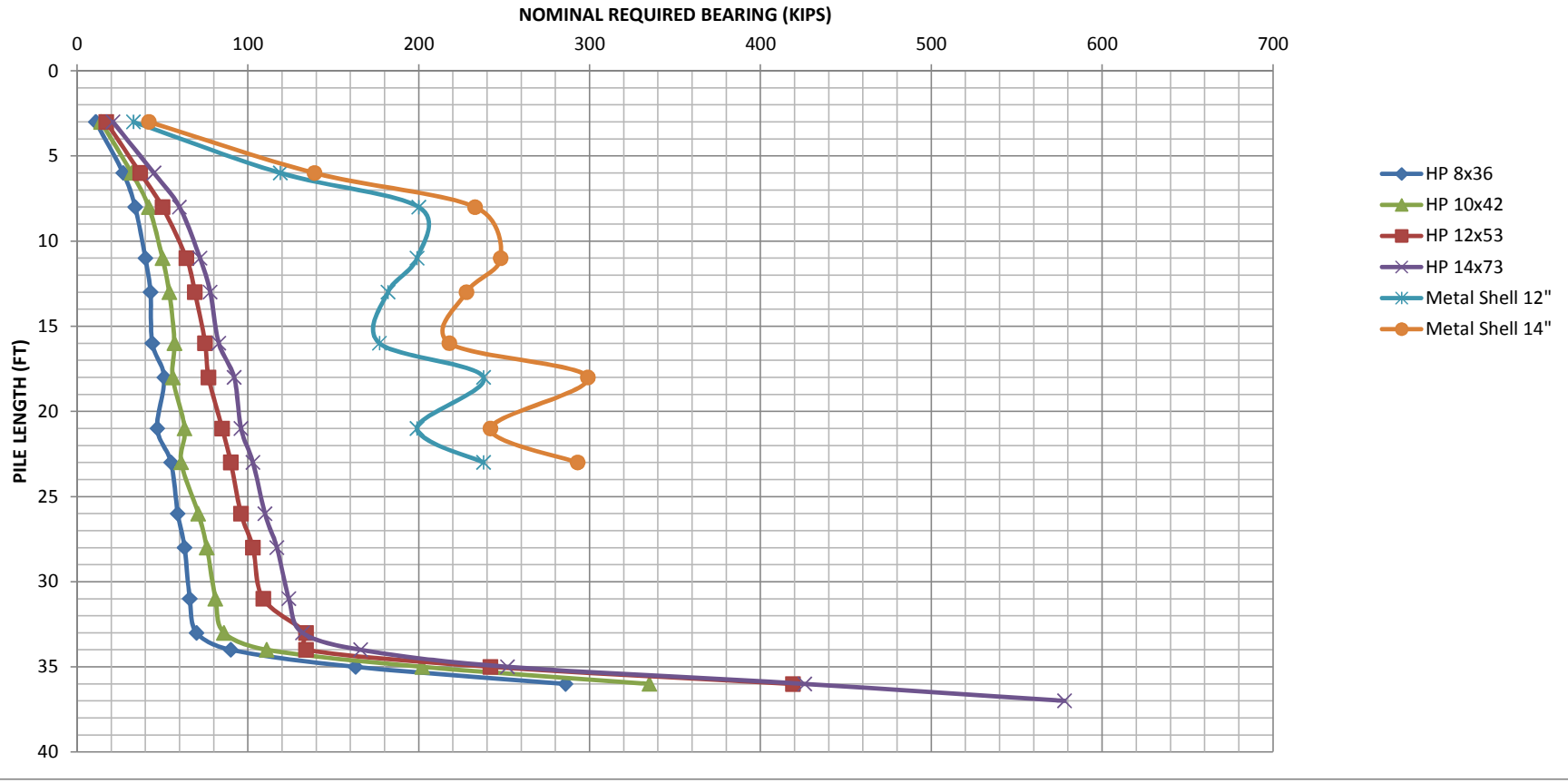
Begin Friction at Elevation 674.60, Pile Cutoff (Pile Length =0 feet) at 676.60



PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

BORING PB-01 West Abutment

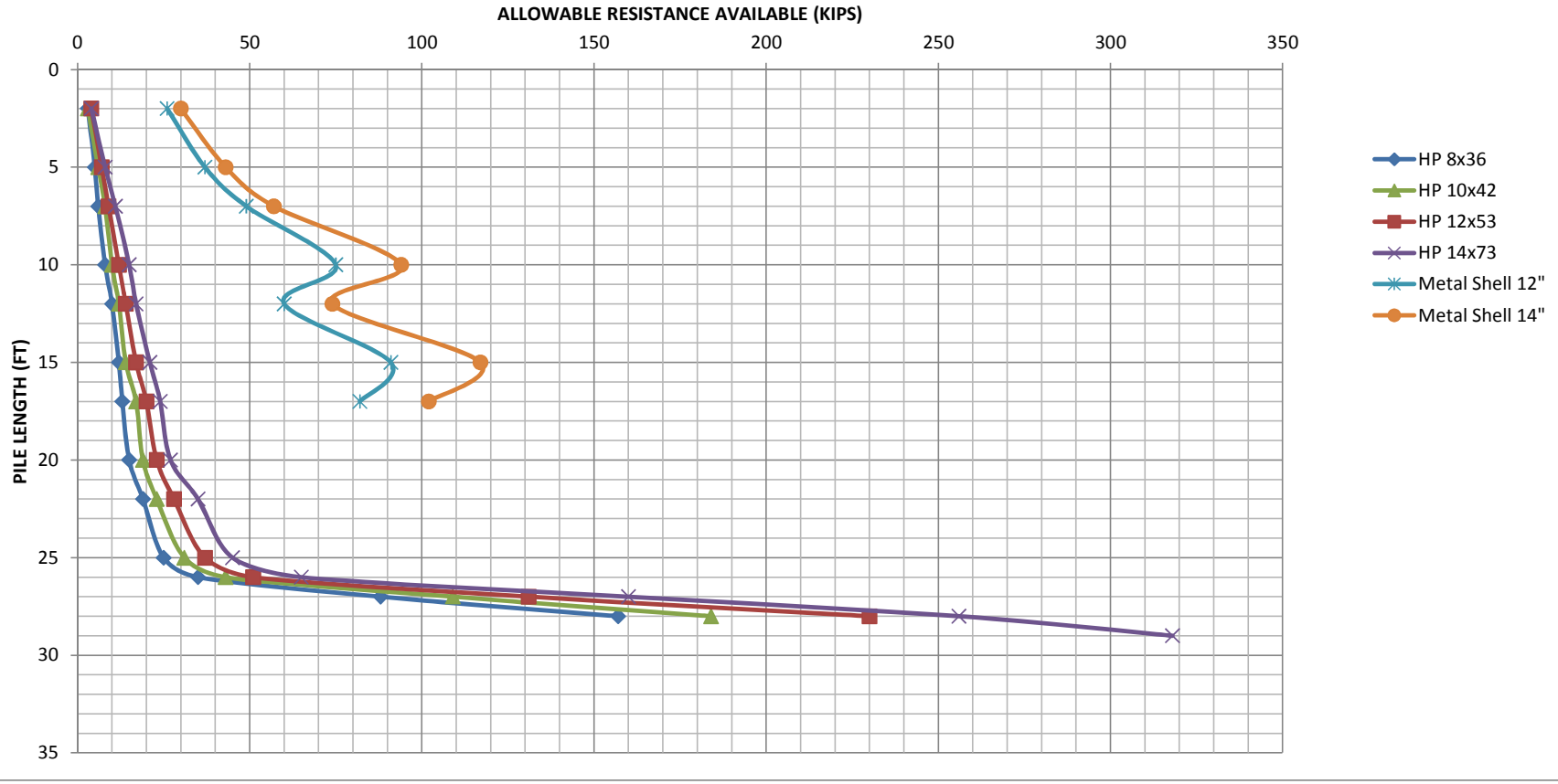
Begin Friction at Elevation 674.60, Pile Cutoff (Pile Length =0 feet) at 676.60



PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

BORING PB-02 Pier 1/West Pier

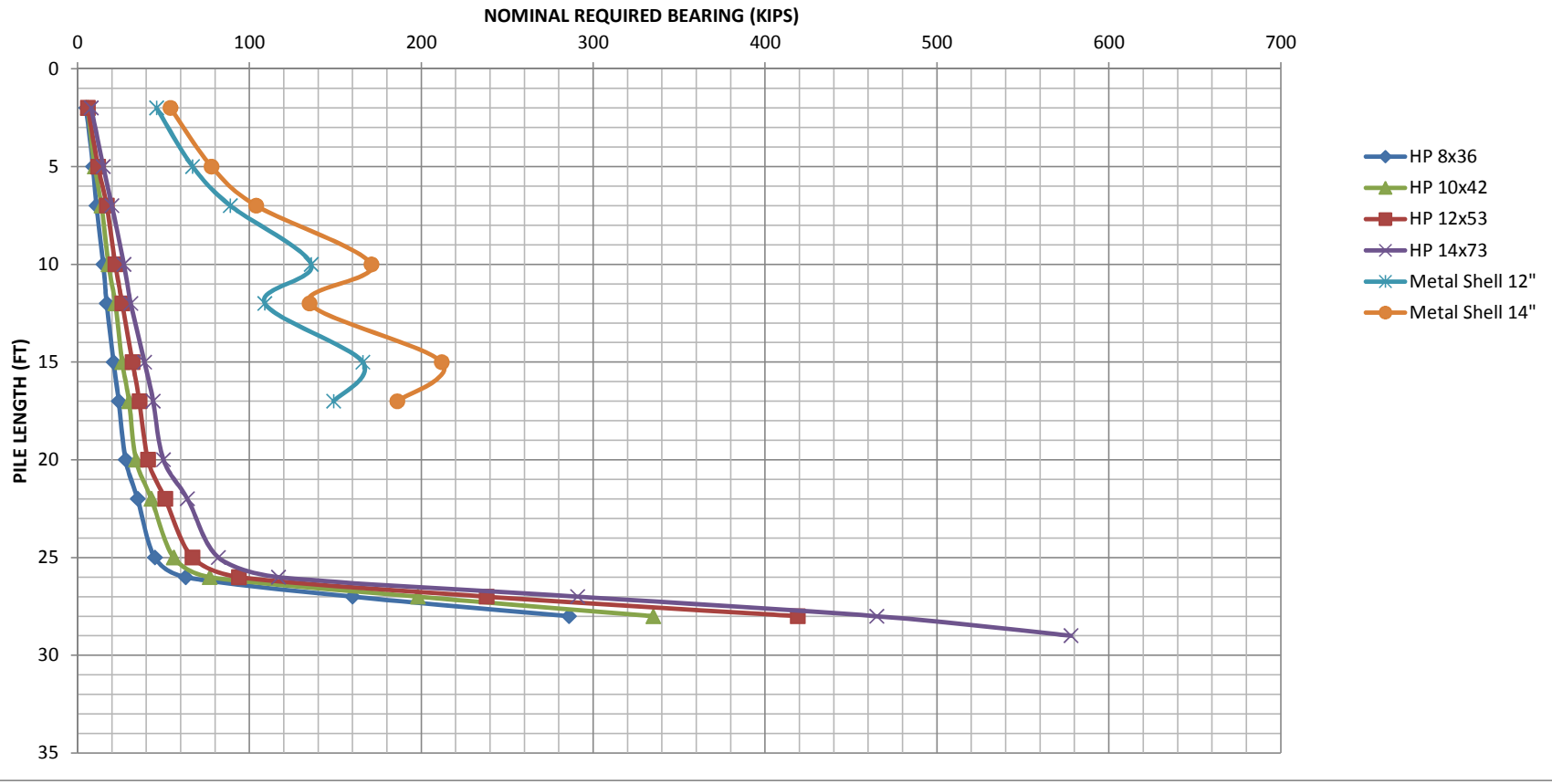
Begin Friction at Elevation 668.90 , Pile Cutoff (Pile Length = 0 feet) at 669.90



PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

BORING PB-02 Pier 1/West Pier

Begin Friction at Elevation 667.10 , Pile Cutoff (Pile Length = 0 feet) at 668.10



Estimated Pile Lengths and Capacities for the East Section of the Proposed IL-56 Pedestrian Bridge over East Branch DuPage River

Boring PB-03 - Pier 2 East Pier (Ground Surface Elevation against Pile during driving = 668.50, Pile Cutoff Elevation = 669.50)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 14x73		Metal Shell 12"		Metal Shell 14"	
	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)
2	2	4	2	4	3	5	3	6	12	23	14	26
5	4	7	5	8	5	10	6	11	30	54	34	63
7	5	10	7	12	8	14	9	17	38	69	45	81
10	7	12	8	15	10	19	12	23	58	106	73	132
12	9	16	11	20	13	24	16	29	66	120	85	154
15	10	19	13	23	15	28	19	34	68	124	86	157
17	13	23	16	29	19	34	23	42				
20	16	29	20	36	24	43	29	53				
22	19	35	24	43	29	52	35	64				
23	28	51	34	62	42	76	53	96				
24	108	197	134	244	161	292	196	356				
25	157	286	184	335	230	419	318	578				

Note: All H-piles reach Max Available NRB based on Pile Driving Stresses through soil layers. Pile lengths in RED denotes pile end-bearing at bedrock.
Metal Shell piles do not reach the Max Available NRB and are limited to about 10 feet above bedrock to prevent pile damage during driving.
[1] Metal Shell Pile 12" diameter with 0.250" walls
[2] Metal Shell Pile 14" diameter with 0.312" walls

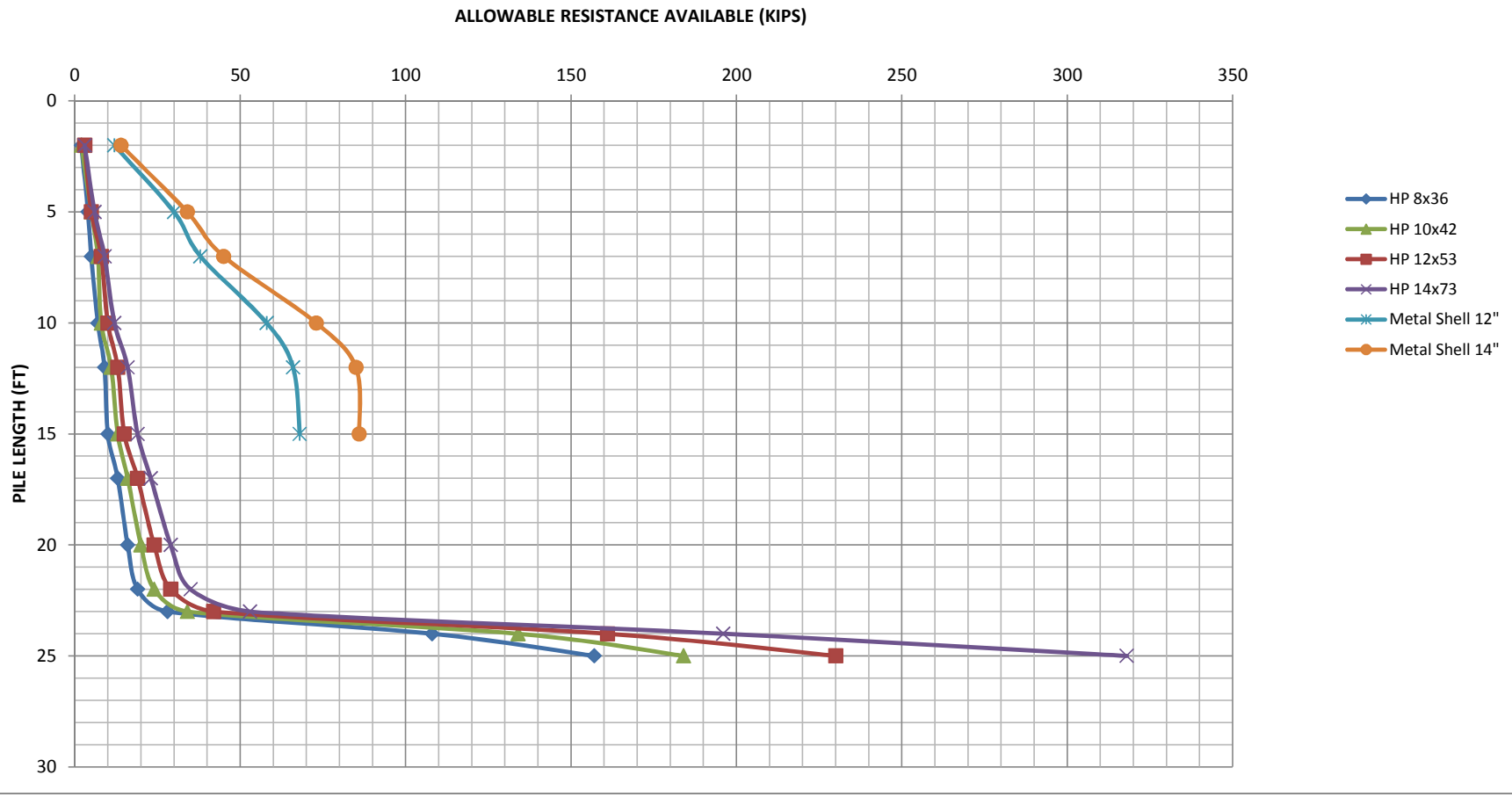
Boring PB-04, East Abutment (Ground Surface Elevation against Pile during driving = 674.00, Pile Cutoff Elevation = 676.00)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 14x73		Metal Shell 12"		Metal Shell 14"	
	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Requred Bearing, NRB (Kips)
3	3	5	4	7	4	8	5	10	7	12	9	15
6	6	11	7	13	9	15	10	19	13	24	16	29
8	7	12	8	15	10	18	12	21	27	49	31	57
11	8	14	10	18	12	21	14	26	44	80	55	100
13	9	16	11	20	13	24	16	30	49	89	63	115
16	10	18	12	22	15	27	18	32	45	83	58	105
18	10	19	13	24	15	28	19	34	41	74	51	92
21	15	27	18	33	22	40	27	50	144	261	190	346
23	25	45	30	55	37	67	45	83				
26	37	68	46	84	56	101	68	124				
28	44	80	55	100	66	120	80	145				
31	56	102	69	126	84	152	103	188				
32	110	199	136	247	163	297	199	361				
33	157	286	184	355	230	419	294	535				
34							318	578				
35												

Note: All H-piles reach Max Available NRB based on Pile Driving Stresses through soil layers. Pile lengths in RED denotes pile end-bearing at bedrock.
Metal Shell piles do not reach the Max Available NRB and are limited to about 10 feet above bedrock to prevent pile damage during driving.
[1] Metal Shell Pile 12" diameter with 0.250" walls
[2] Metal Shell Pile 14" diameter with 0.312" walls

PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

BORING PB-03 Pier-2 East Pier

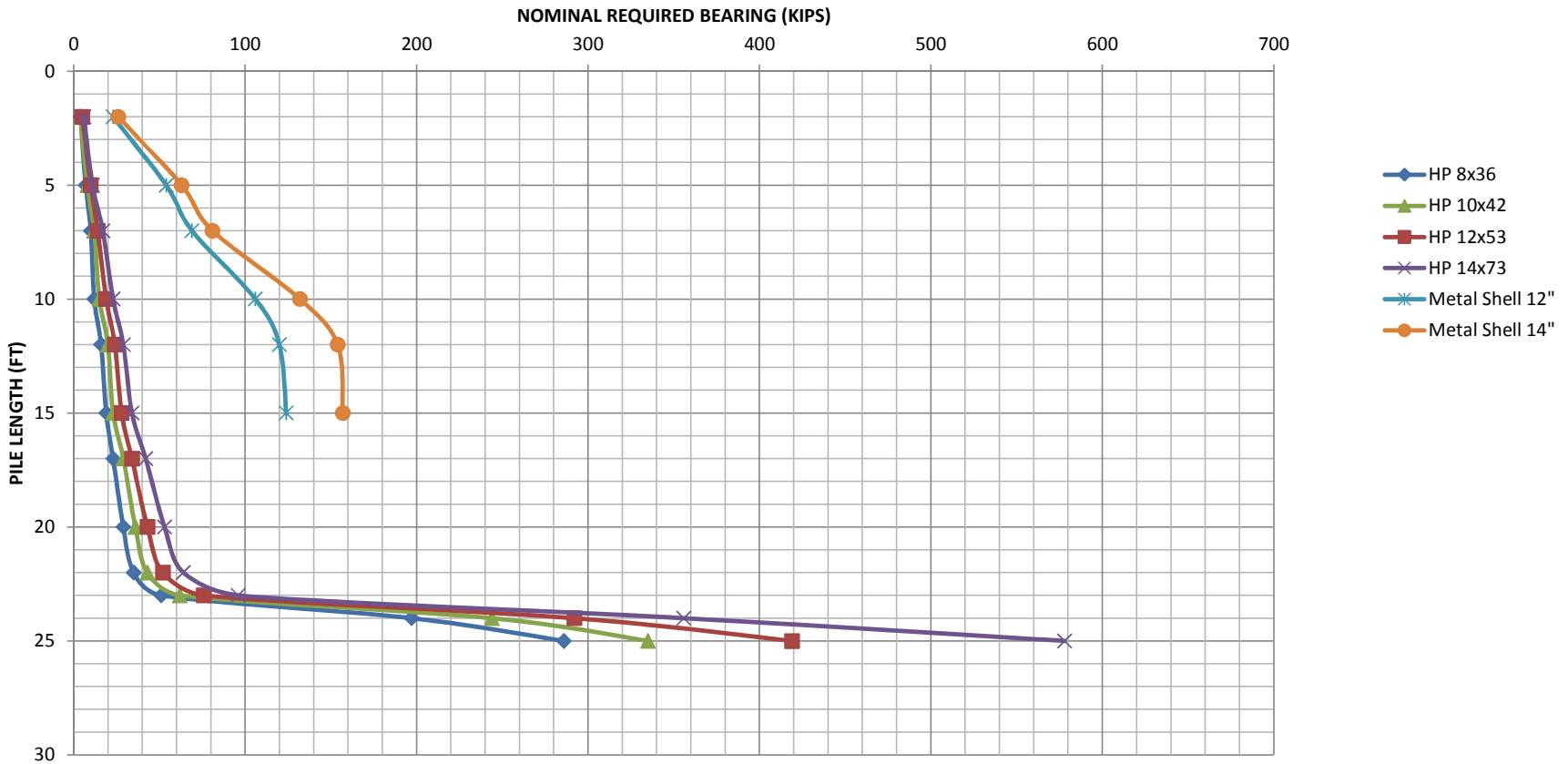
Begin Friction at Elevation 668.50, Pile Cutoff (Pile Length =0 feet) at 669.50



PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

BORING PB-03 Pier-2 East Pier

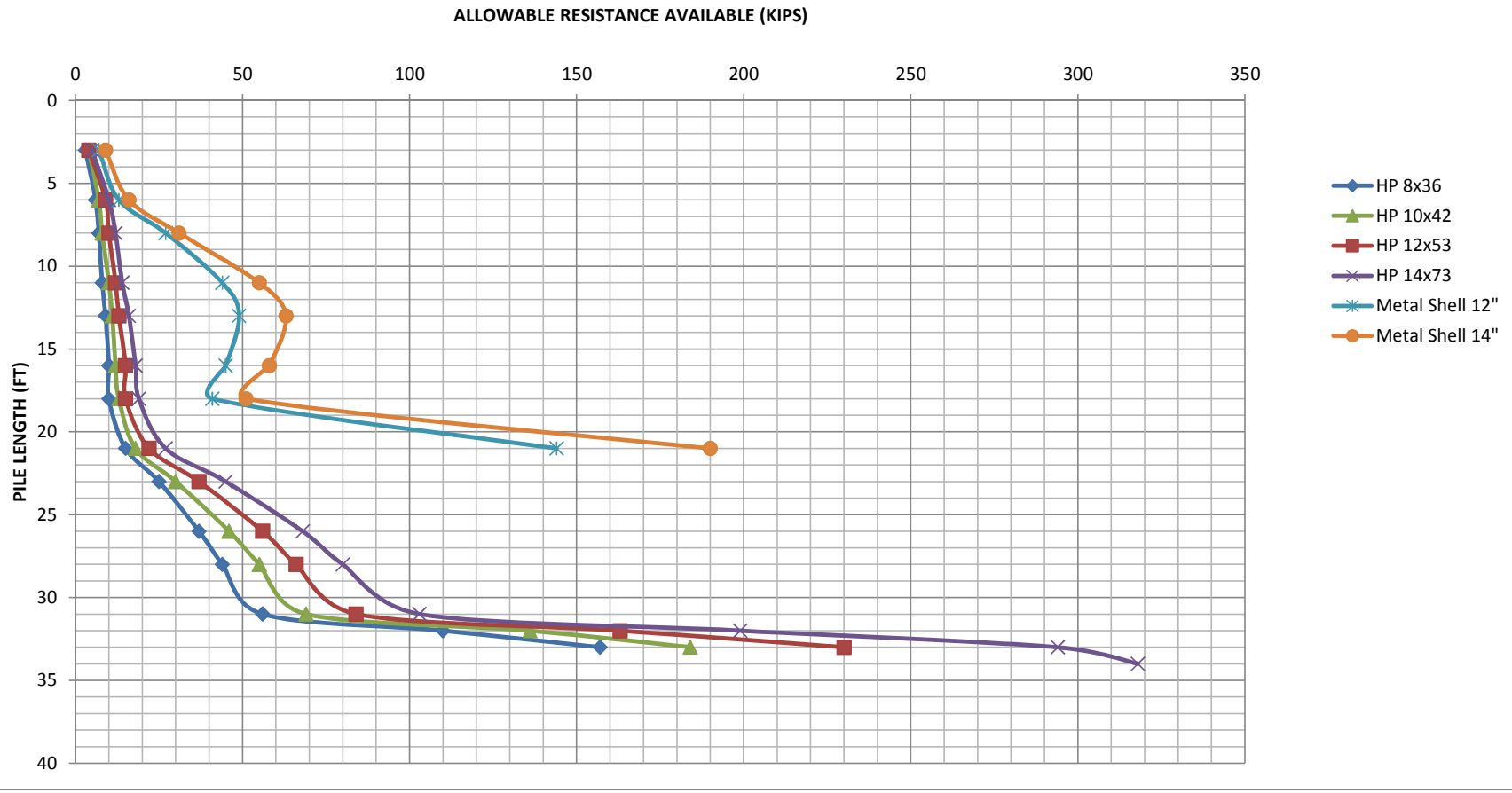
Begin Friction at Elevation 666.80, Pile Cutoff (Pile Length =0 feet) at 667.80



PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

BORING PB-04 East Abutment

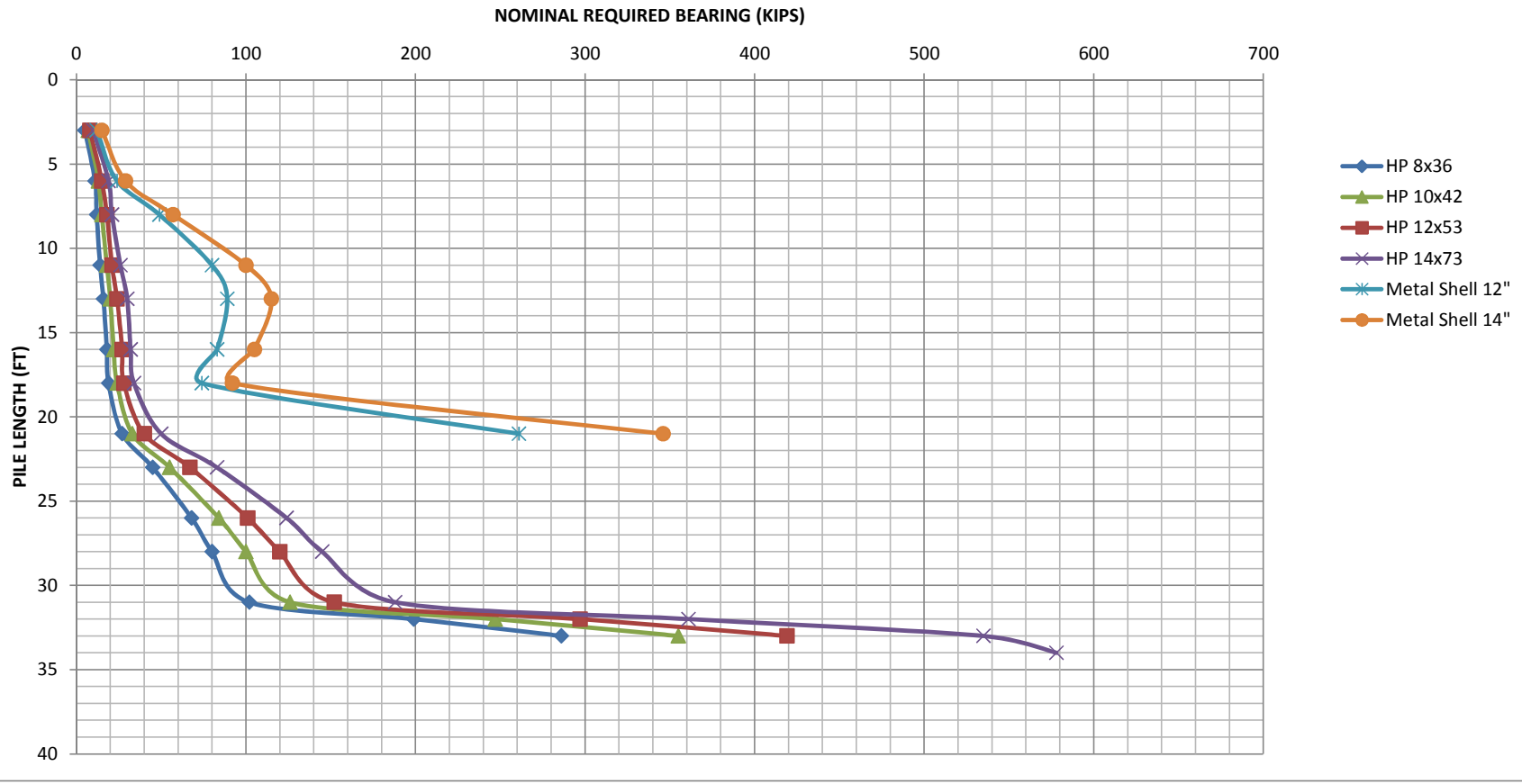
Begin Friction at Elevation 674.00 , Pile Cutoff (Pile Length = 0 feet) at 676.00



PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

BORING PB-04 East Abutment

Begin Friction at Elevation 674.00 , Pile Cutoff (Pile Length = 0 feet) at 676.00



APPENDIX F

LAB TEST RESULTS

Geo Services, Inc.
Geotechnical, Environmental and Civil Engineering
An MBE - DBE Firm
1235 E. Davis Street
Arlington Heights, Illinois 60005
Phone: (847) 253-3845 Fax: (847) 253-0482

UNCONFINED COMPRESSIVE STRENGTH of INTACT ROCK CORE SPECIMENS - ASTM D 7012

Project Name: IL-56 Pedestrian Bridge over East Branch DuPage River & Retaining Walls
Location: Illinois Route 56 & The East Branch Of The DuPage River
County: DuPage County
Sample Type: Drilled Bedrock Core Sample

Date: 10/31/12
Job No.: 12195
Tested By: RWC

Sample No.	Depth (ft)	Length (in)	Diameter (in)	Weight (g)	Load (lbs)	Area (in^2)	Unit Weight ($lbs\ ft^3$)	Compressive Strength (tsf)	Compressive Strength (psi)
PB-01 Run 1	-44.6	4.053	2.054	519.2	30880	3.31	147.3	671	9324
PB-02 Run 1	-38.3	4.014	2.055	574.3	40030	3.32	164.3	869	12069
PB-03 Run 1	-32.3	4.050	2.051	537.6	23710	3.30	153.0	517	7176
PB-04 Run 1	-43.3	4.065	2.056	533.9	19400	3.32	150.6	421	5843

Geo Services, Inc.
Geotechnical, Environmental and Civil Engineering
An MBE - DBE Firm

1235 E. DAVIS STREET
ARLINGTON HEIGHTS, IL 60005
(847) 253-3845 FAXES (847) 253-0482

Organic Matter in Soils by Wet Combustion
AASHTO T 194

Project Name IL-56 Pedestrian Bridge & Approach Retaining Walls over the East Branch of the DuPage River
Location DuPage County, Illinois
Date 11/20/12
Job No 12195

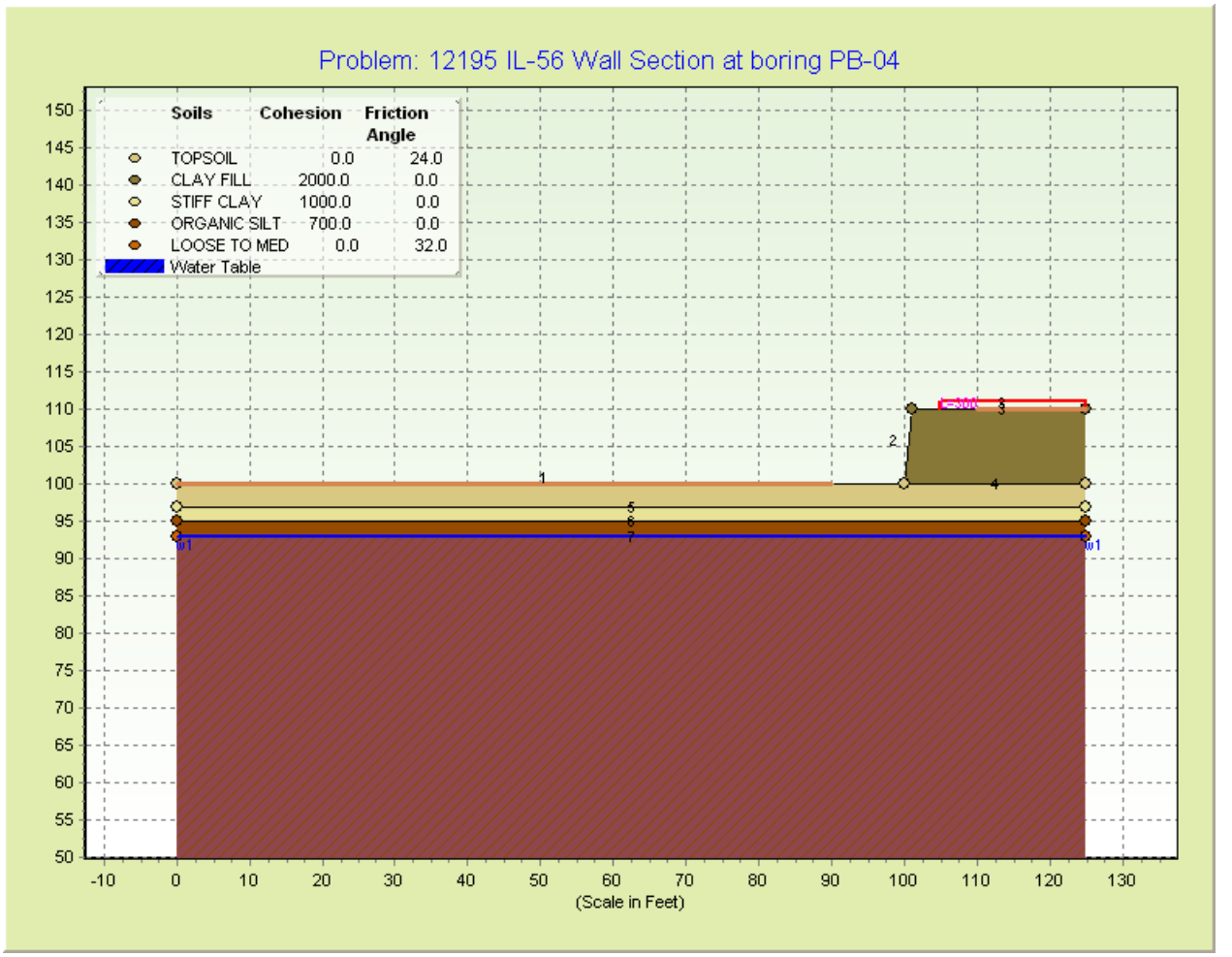
Sample Location	PB-03	PB-04						
Sample No	6	5						
Depth	11.0'-12.5'	8.5'-10.0'						
Total Organic Matter %	5.2	2.1						

Performed by: JE

APPENDIX G

SLOPE STABILITY ANALYSIS RESULTS

========== DATA SUMMARY ==========



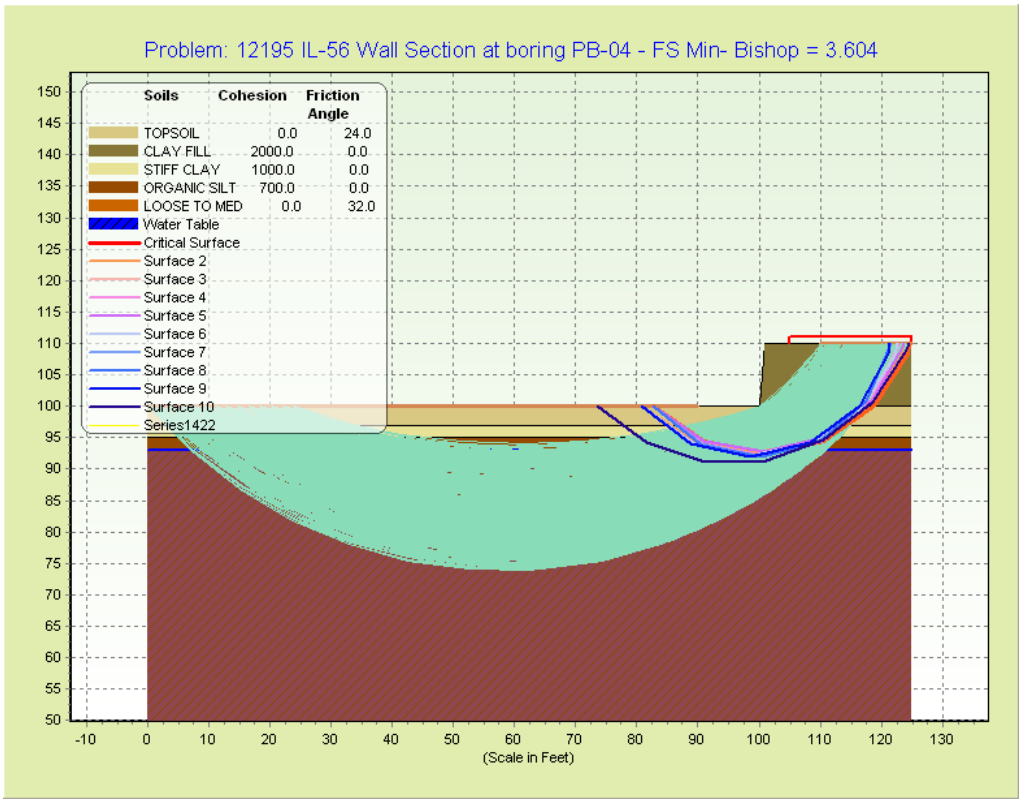
Profile Data

Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
1	0	100	100	100	2
2	100	100	101	110	1
3	101	110	125	110	1
4	100	100	125	100	2
5	0	97	125	97	3
6	0	95	125	95	4
7	0	93	125	93	5

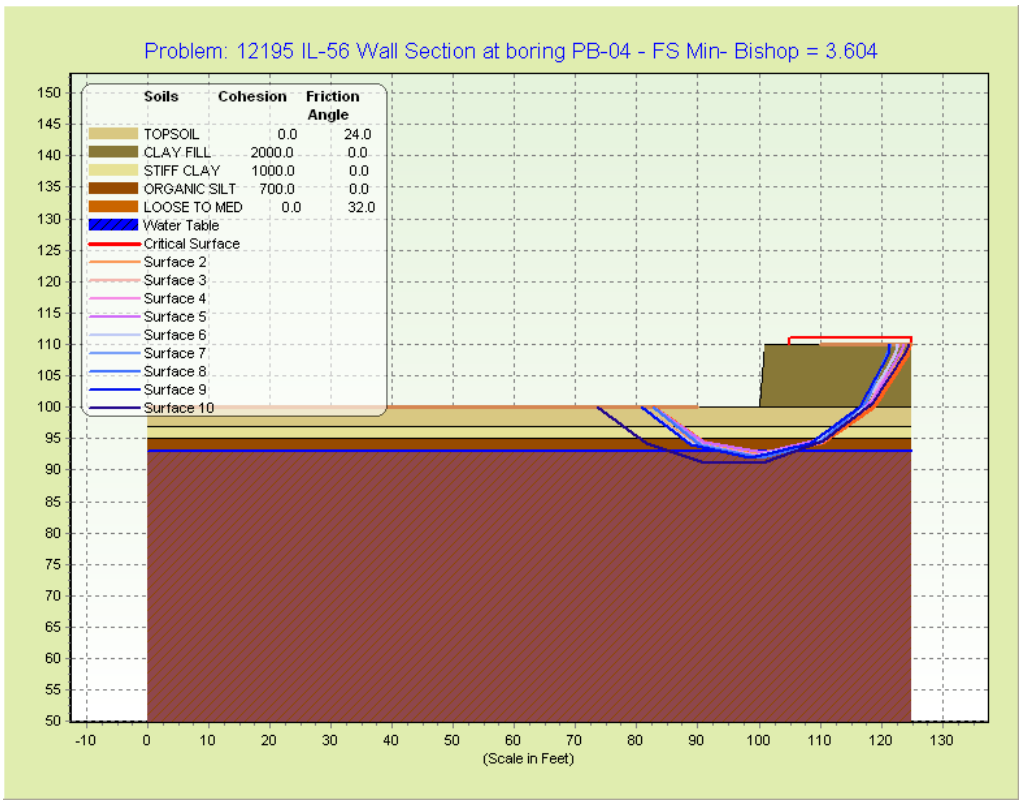
Soil Properties

Soil Number	Wet Unit Weight	Saturated Unit Weight	Cohesive Intercept	Friction Angle	Ru	Pressure Head	Water Table	Soil Name
1	120	125	2000	0	0	0	1	CLAY FILL
2	110	115	0	24	0	0	1	TOPSOIL
3	120	125	1000	0	0	0	1	STIFF CLAY
4	110	115	700	0	0	0	1	ORGANIC
5	125	130	0	32	0	0	1	LOOSE TO

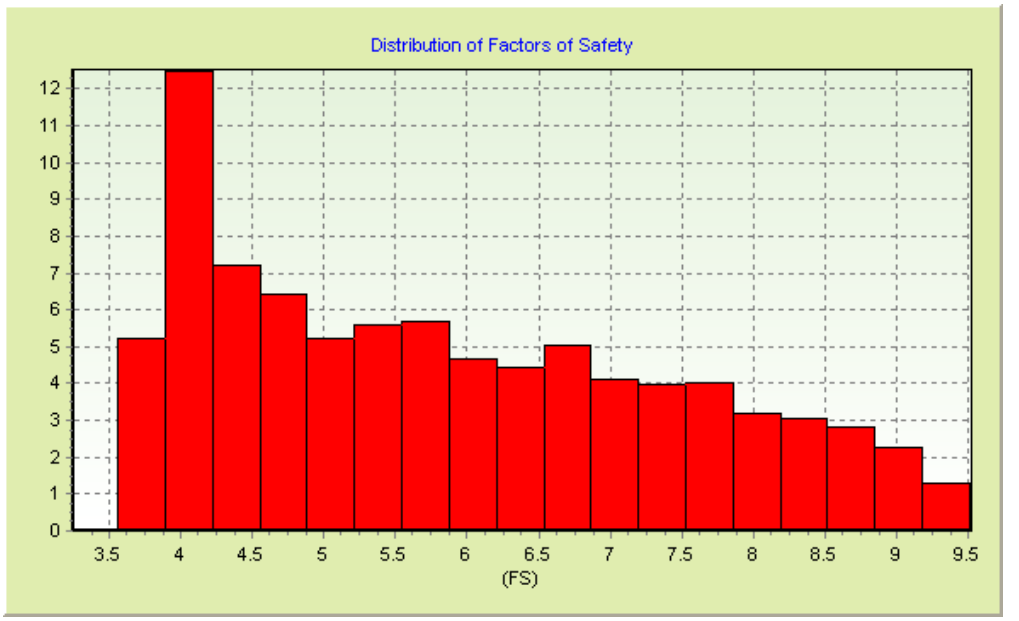
========== All Surfaces Generated ==========



========== 10 Most Critical Surfaces ==========



========== Factor of Safety Histogram ==========



======== Factors of Safety of 10 Most Critical Surfaces =======

Surface Number	Factor of Safety
1	3.604
2	3.61
3	3.616
4	3.617
5	3.625
6	3.634
7	3.638
8	3.645
9	3.657
10	3.679