
STRUCTURE GEOTECHNICAL REPORT
IL 83/ US Route 6 Bridge over Little Calumet River

Proposed SN: 016-1302
IDOT Job No.: D-91-596-10
Thornton Township
Cook County, Illinois

Prepared for:

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JOB NO. 10147

Revised: December 2012



May 24, 2012
September 5, 2012
Revised: December 13, 2012

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Attention: Mr. Peter M. Johnston, P.E., LEED AP

Job No. 10147

Re: IL 83/ US Route 6 (Torrence Avenue) over Little Calumet River SGR
Proposed Structure Number 016-1302
IDOT Job D-91-596-10
Section 0909.1-B, Thornton Township
Cook County, IL.

Dear Mr. Johnston:

The following report presents the geotechnical analysis and recommendations for the IL 83/ US Route 6 Bridge over Little Calumet River Project. A total of three (3) structural soil borings (SB-01 thru SB-03) 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.

Soil boring B-10 (by others) was also used to formulate our analyses for this report. The boring log information is also attached in the Appendix G of 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



Andrew J. Ptak, P.E.
Office Manager

enc.

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SECTION 01: INTRODUCTION

The following report presents the geotechnical analysis and recommendations for the reconstruction of the IL 83/ US Route 6 over Little Calumet River at Thornton Township, Cook County, IL. A total of three (3) soil borings (SB-01 thru SB-03) were completed for the reconstruction of the bridge. Copies of these boring logs, location diagram, soil profile, and lab data are included in this report.

Soil boring B-10 (by others) was also utilized to formulate our analyses for this report. The boring log information is also attached in the Appendix G of this report.

The existing bridge (SN 016-0936) is a 3-span bridge, extending to approximately 159 feet long (back to back abutments) and 64 feet wide, accommodating 2 shoulders and 2 lanes of traffic in each direction crossing the Little Calumet River.

It is intended to fully replace the bridge. The proposed 3-span bridge will have integral abutments and will use steel girders, which will extend from approximately Station 174+69 to 177+42 (approximately 273 feet, including approach slabs). Estimated bottom of footing elevations have been provided by GRAEF, and are tabulated in Table 5 of this report, which are at approximately 592.5 feet at the abutments, and approximately 576.5 feet at the piers.

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 GRAEF and IDOT. Soil borings were laid out by Geo Services, Inc. field personnel. Elevations were approximated from topographic information provided by GRAEF and are shown on the boring logs. The as-drilled locations for the borings are shown on the Boring Location Diagram found in Appendix C.

The borings were performed during the month of April, 2012 with a truck mounted drill rig and the borings were advanced by means of hollow stem augers or rotary drilling techniques. 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 borings SB-01, SB-02, and SB-03 using rotary drilling techniques and a NX-size double tubed core barrel with a diamond impregnated bit.

SECTION 03: 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. In addition to the regular lab testing program, Atterberg Limits (AASHTO T-89/90), Particle Size Analysis (AASHTO T-88) or Grain Size Analysis (AASHTO T-311) were performed on select samples from the borings. 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 04: SUBSURFACE CONDITIONS

The soil borings were completed in the month of April, 2012. Specific soil conditions are indicated on the boring logs and profile. Borings SB-01 thru SB-03 were performed near the existing bridge abutments.

Surficial soils at all borings consist of 4 inches of asphalt, and 10 to 12 inches of concrete. Underlying the surficial soils consisted of stiff to very stiff clay/ clay loam fill at SB-01 and SB-03, and very dense slag fill at SB-02 to approximate elevation 592. Layers of topsoil, loose silty sand, and very loose silty clay fill were also noted in the bottom part layer of the fill soils. Beneath the fill layers, loose to medium dense silt, and medium dense silty clay loam at SB-01 and SB-02 were encountered to approximate elevation 583, and loose organic silty clay at SB-03 were extended to approximate elevation 575. The stratigraphy continues with medium stiff to hard clay and clay loam material to near-end of borings at approximate elevation of 535. A stratum of very dense silty sand and fractured rock was also encountered at borings SB-01 and SB-03 at the end of borings ranging from approximate elevation 535 to 535.

Moisture contents for the clay soils (including the organic clays) ranged of 13% to 59% with an average of 22%. Non-cohesive soils had moisture contents within the range of 10% to 26% with an average of 23%. Fill materials had moisture contents with an average of 32%

Bedrock was cored at borings SB-01 thru SB-03 locations. The bedrock was consistently categorized as Silurian System Niagaran Series Dolomite. Table 2 contains a summary of the bedrock information obtained during our exploration.

Table 1 – Bedrock Information Summary

Boring	Station	Bedrock Elevation	RQD	Compressive Strength (psi)
SB-01	Sta. 176+10	534.6	77.5%	15,833
SB-02	Sta. 177+29	535.5	69.5%	15,364
SB-03	Sta. 175+10	534.3	91.0%	15,831

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 a high degree of sample recovery with fairly high RQD values.

SECTION 05: 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 encountered at 4 to 9 feet below ground surface (approximate elevations 591 to 596) at all borings. High water elevation (at 50-year) and stream bed were estimated at approximate elevation 594 and 580 feet, respectively. Based on the coloration change in the soils from brown and gray or brown to gray, we estimate a depth of 15 to 25 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 Little Calumet River.

SECTION 06: ANALYSIS

6.1 Seismic Consideration

For LFRD design, according to the AASHTO LRFD Bridge Design Specification 2010, the project site has a horizontal Response Spectral Acceleration of 0.038 at a period of 1.0 second and 5% critical dampening (S_1). The site also has a horizontal Response Spectral Acceleration of 0.091 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 2010.

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

Seismic Performance Zone (SPZ)	1
Spectral Acceleration at 1 second (S_{D1})	0.091
Design Spectral Acceleration at 0.2 seconds (S_{Ds})	0.146
Soil Site Class	D

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

6.2 Settlement

Proposed grade is proposed to be raised at an estimated maximum fill height of 3 feet along the mainline alignment. No settlement concerns are anticipated. However, the proposed bridge will also be widened at the east section of the bridge, and a maximum fill height of 18 feet is estimated at the widening areas at the east side of the bridge. Based on the nearest boring B-10 (by others), where high moisture content fill soil layers were encountered beneath the existing embankment at the east side portion of the South Abutment of the bridge, the estimated settlement is calculated to be approximately 1.0 to 1.5 inches for maximum fill height of 18 feet. Downdrag is considered to affect the design of the piles at the east side (South Abutment) for the new bridge.

Placement of new fill early in the construction sequencing is recommended to induce as much settlement as possible prior to pile driving and abutment construction. At the SB-01, SB-02 and SB-03 boring areas, we estimate that 90% consolidation of the compressible deposits will occur on the order of 50 days. However, at the B-10 boring area (east side, South Abutment portion of the proposed bridge), we estimate that 50% and 90% consolidation of the compressible deposits will occur on the order of 265 days. Downdrag is not anticipated to affect the design of the piles at the B-10 boring areas at 90% consolidation since the settlement should be reduced to less than 0.4 inches prior to pile driving.

If time constraint is an issue during the construction scheduling, precoring will be another feasible option to relieve downdrag forces of the piles caused by settlement at the embankment at the B-10 area (east side, South Abutment of the new bridge). Precoring recommendation will be further explained in the **7.3 Pile Foundation Considerations** of the **Foundation Recommendation** section of this report.

6.3 Slope Stability

The embankment slopes 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.

6.4 Scour

The design scour elevations has been determined for each substructure based on the total scour resulting from a Phase I Hydraulic Report (dated May 2011) and bridge profile drawings provided by GRAEF, and provisions from IDOT Bridge Manual 2012. The 100-yr. scour depths for this bridge control the final design scour elevations along with any reductions due to cohesive soils or rock. According to the hydraulic report, the following Tables 3 and 4 have been formulated to represent the 100-year and 500-year event design scour elevations computed in each area:

Table 3- Scour Design Table

Location	Estimated Ground Level Elevation (feet) ²	Hydraulic Report Scour (ft)		Design Scour Elev. (ft) ³	
		100-year Event	500-year Event ¹	100-year Event	500-year Event
North Abutment	595.0	4.3	8.7	592.5	592.5
North Pier/ Pier 2	586.0	3.9	6.6	583.0	582.5
South Pier/ Pier 1	585.0	3.9	6.6	582.0	581.5
South Abutment	595.0	8.8	14.1	592.5	592.5

Note: 50-year High Water Elevation (HWE) is approximately 594.13

¹ Contraction Scour was also added into the Proposed Scour for 100 & 500-year events.

² Estimated ground level elevations at the substructures were taken from the profile drawings provided by GRAEF.

³ The Design Scour Elevations are based on the estimated ground level elevation at the substructures and reduction in scour depth (from Section 2, page 2-93 of the IDOT Bridge Manual 2012) minus the proposed scour provided by GRAEF.

The abutments of the bridge are not protected from scour; as a result, scour (based on 100-yr event) is incorporated into the pile calculations (See tables in the Appendix E for Pile Analyses). The use of riprap for the slopes along the river may be considered for protection for the structures from scour.

SECTION 07: FOUNDATION RECOMMENDATIONS

7.1 Recommended Foundation Types

Based on the proposed foundation loads and high moisture content, loose fill soils encountered at the upper stratum of the embankment (including the organic soils at boring SB-03), a shallow foundation system is not recommended. We recommend a deep foundation system to be used for design. Based on the results of the borings and type of structure and loading, Shell piles, H-piles and Drilled Piers foundation types are recommended for design. We recommend that an economic analysis for each foundation option presented below be considered before choosing a deep foundation system for the design.

7.2 Shell and H-Pile Recommendations

Based on the results of the borings and proposed foundation loadings, friction or end-bearing Shell or H-piles may be used for the support of the proposed piers and abutments.

Scour analysis was also accounted in our analysis. The footing elevations, as well as the preliminary factored loads for each substructure were provided by GRAEF, and are tabulated in Table 4.

Table 4– Preliminary Footing Elevations and Preliminary Factored Loads at Substructures

Substructure	Factored Substructure Load (kips/ft.)	Preliminary Bottom of Footing Cap Elevation (feet) ¹
North Abutment	22.0	592.5
North Pier/ Pier 2	40.0	576.5
South Pier/ Pier 1	40.0	576.5
South Abutment	22.0	592.5

Note: ¹ Piles assumed to be embedded 2-ft into the pile cap at the abutments and 18 feet at piers.

H-piles or shell piles may be used for design of the deep foundation system. The majority of the pile capacity from the Shell and H-piles will be achieved through skin and end friction (bearing on the top of bedrock), respectively. According to the IDOT Bridge Manual (2012), H-piles are usually recommended for integral abutments. The selection of pile type should be determined by economic considerations if either pile types are feasible for the design of the bridge. Pile data for Shell Piles as well as H-piles is included in Appendix E. Pile capacities and lengths were calculated to the piles' Maximum Nominal Required Bearing and Factored Resistance Available, based on a LRFD resistance factor of 0.55. Selection of the Shell and H-piles should be based on

economic and construction considerations. Based on boring SB-02 (Northeast portion of proposed bridge) and B-10 (Southeast portion of the proposed bridge), driving H-pile piles with the use of pile shoes may be possible but not probable to penetrate the very dense fill (possibly slag) material present at this project site. We recommend designing the piles with a precore through the very dense slag soils to penetrate the slag material prior to continuing with pile driving. If precoring is used, pile shoes should not be necessary for design.

We estimate that the new driven piles will settle $\frac{1}{4}$ inch or less excluding the elastic shortening of the pile due to loading.

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 H-pile should be based on economic and construction considerations.

7.3 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 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 picked with respect to the loadings and geometry of the proposed structures.

Due to unacceptable settlement levels at the B-10 boring (by others), precoring will be a viable option to relieve downdrag forces of the piles caused by settlement at the embankment at the B-10 area of the site, which is located at the east side portion (South Abutment) of the new bridge. In addition, precoring will be the most feasible option at the boring B-10 and SB-02 areas due to the presence of slag fill. Loose sand fill is typically used to fill the annulus space between the pile and the soil. Another potential option for fill is the use of bentonite chips (typically used in soil boring applications). Bentonite is a relatively soft material that might allow the piles to deflect laterally within the precored holes.

A downdrag force of 40 kips is estimated at the boring B-10 area. At the east section (South Abutment) of the embankment area, where the piles are to be set, should be precored at elevation 575 feet, and the piles will be encased with bituminous coating to relieve downdrag stresses caused by the new widened embankment.

When Steel H-piles are used, the Steel H-piles shall be according to AASHTO M270 Grade 50.

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.

To provide adequate frost protection, we recommend that footing foundations be situated at a minimum depth of 4 feet below final grade.

7.4 Drilled Shafts Recommendation

The foundations may be constructed using a foundation system of drilled shafts based at approximate elevations of 545 to 550 CCD in the very stiff to hard, clay stratum encountered at this elevation, or may be extended at the top of bedrock elevation. A factored end-bearing resistance of 9.5 ksf is recommended for design. For the unit skin friction, the following factored resistances per soil type are estimated as summarized from the boring strata:

- Medium Dense Silt – 600 psf / ft.
- Loose Organic Silty Clay – 200 psf/ ft.
- Medium Stiff to Very Stiff Clay – 500 psf/ ft.
- Very Stiff to Hard Clay Loam – 700 psf/ ft.

Note that these factored skin friction values will need to be reduced if temporary casing or drilling is used for caisson installation. Also, the lower portion (within the base) of the bottom of the shaft should be ignored for friction resistance.

An experienced, geotechnical engineer should be present during excavation to determine the actual allowable bearing. The use of temporary casing may be extended beneath the granular fill and silt strata at approximate elevation of 580 feet.

Drilled shafts may be an economical foundation selection over driven piles if a construction platform or “causeway” can be constructed to allow for access of a drilled shaft rig into the working area without the need to construct a temporary cofferdam.

The bases of the foundations should be enlarged by bellling to achieve the required bearing area. Bellling should be feasible in the hard clay soils that overlie the recommended soil bearing layer. We recommend to keep the caisson bottom depth as high as possible while still achieving bearing to minimize the risk of encountering sand and loam soils at deeper elevations at approximate elevation 538.

Based on the estimated bearing pressures, the consistency of the soils encountered and the magnitude of the loads expected, we estimate a maximum settlement of 0.40 inches for belled caisson foundations supported on the very stiff to hard clay stratum as

described above. 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 soil compression only and that elastic compression of the caisson concrete should be added to these values.

To prevent the surficial sediment soils into the caisson shaft and water inflow from Little Calumet River, we recommend that a temporary steel casing be employed at the surface during construction. The temporary casing should be extended to approximate elevations 575 and 580 at the pier and abutment locations, respectively.

A minimum caisson shaft diameter of 2 1/2 feet is recommended. The caisson bell should have a base angle of at least 60 degrees (from horizontal) and the bell diameter should not exceed 3 times the shaft diameter. Caisson concrete may be placed by the free fall method into the clean and dry shaft excavations as long as concrete does not hit the sides of the shaft or the rebar cage during placement. Concrete slump should be in the range of 5 to 7 inches.

Because the caisson technician will likely not be lowered into the excavation to observe the base of the caisson excavation directly due to safety concerns, it will be necessary to oversize the bell area by 15% or 1 foot, whichever is smaller.

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

The caisson design and construction procedures should be reviewed with the contractor selected for this work prior to the start of construction. If you wish, we would be pleased to review the plans and specifications for the foundation work once they are prepared so that we may have the opportunity to comment on the effects of the soil and groundwater conditions on the site.

7.5 Approach Slab Recommendations

The new approach slab will be supported on either new or existing embankment fill. We recommend using an assumed CBR of 2.0 for the 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. Any organics or soft, yielding subgrade (if any) should be removed prior to new fill placement. A qualified geotechnical engineer should observe the subgrade prior to any base course is placed. We estimate settlement of 1/2 inch or less for the approach slab.

SECTION 08: COFFERDAMS/ LATERAL SOIL PROPERTIES

On the following Table 5 is a tabulation of lateral soil parameters to be used for design of piles and the bridge substructures.

Table 5 – 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/ Silty Clay Fill	125	30	2,000	700	0.006
Buried Topsoil Fill	110	24	-	20	-
Very Dense Slag Fill	125	32	-	70	-
Very Loose to Loose Silty Sand	120	28	-	30	-
Medium Dense Silt	120	28	-	50	-
Medium Stiff Clay	120	26	800	200	0.008
Very Stiff to Hard Clay/ Clay Loam	130	32	3,000	1,000	0.005
Very Dense Silty Sand and Fractured Rock	132	32	-	300	-

Allowances should be made for any surcharge loads adjacent to the retaining structure. The footings are anticipated to be situated on the very stiff to hard native clay/ clay loam fill soils at the abutments and very soft clay soils at the piers. According to the NAVFAQ Design Manual 7.02, for a concrete base on natural loams, sands and gravels or approved granular structural fill, a friction angle of 28 degrees may be used, leading to a coefficient value of 0.53. A value of 0.34 may be used for the coefficient of friction between the concrete base and drained cohesive soils (this assumes a concrete base on the stiff cohesive soils). Drainage should be provided behind the wall.

Excavation for the bridge piers (approximate bottom of the footing elevation at 576.5 feet) are to be below the estimated water surface elevation (approximate elevation 579.3 feet) of the Little Calumet River. Based on the temporary cofferdams criteria stated in the Section 2.3.6.4.2 of the IDOT Bridge Manual (2012) and GBSP No. 73 (Article 502.06b), locations with six feet or less of water surface elevation above the bottom of footing excavation will typically require Type 1 Cofferdam, and locations with greater than six feet of water will require a Type 2 Cofferdam. We recommend the use of Type 1 Cofferdam at the pile supported piers. However, if the water surface elevation above from the bottom of footing excavation is greater than 6 feet as determined at the

time of construction, the use of Type 2 cofferdam may be necessary. In addition, pump and pit procedures will also be needed to keep the site “in the dry” during construction at the pile supported piers. Table 6 may be used for design of the temporary structures. A seal coat will be needed to provide a working platform for construction as well. A minimum factor of safety of buoyancy of 1.2 is required by IDOT.

SECTION 09: GENERAL CONSTRUCTION CONSIDERATIONS

It is proposed that the IL 83/ US Route 6 Bridge over Little Calumet River will be open during stage construction. Traffic will be open at the southbound lane during construction, and the northbound lane will be widened to provide traffic, while the center area of the bridge is constructed. The northbound side of the bridge will then be constructed after the southbound side of the bridge is widened to accommodate north and southbound traffic. Since the proposed retained height of approximately 15 to 20 feet is within the limits of the IDOT Temporary Sheet Piling Design charts, cantilevered sheet piling may be feasible for temporary soil retention. A tie-back wall system may also be feasible for temporary soil retention.

Also, a “slag zone” area is encountered at boring B-10 (by others) from approximate elevations 575 to 599 feet. Overexcavation with the use of temporary sheet piling of the “slag zone” area may be feasible, but not recommended due to likely costly operation. Rock excavation costs will likely need to be incorporated to excavate the very dense slag material to approximate elevation 575.

The soil parameters for lateral resistance shown in Table 5 of this report may be used for design of the selected temporary retention system.

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.

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 10: 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

<u>Relative Density</u>	<u>No. of Blows per foot N</u>
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

<u>Consistency</u>	<u>Unconfined Compressive Strength - qu (tsf)</u>
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: Carboly 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

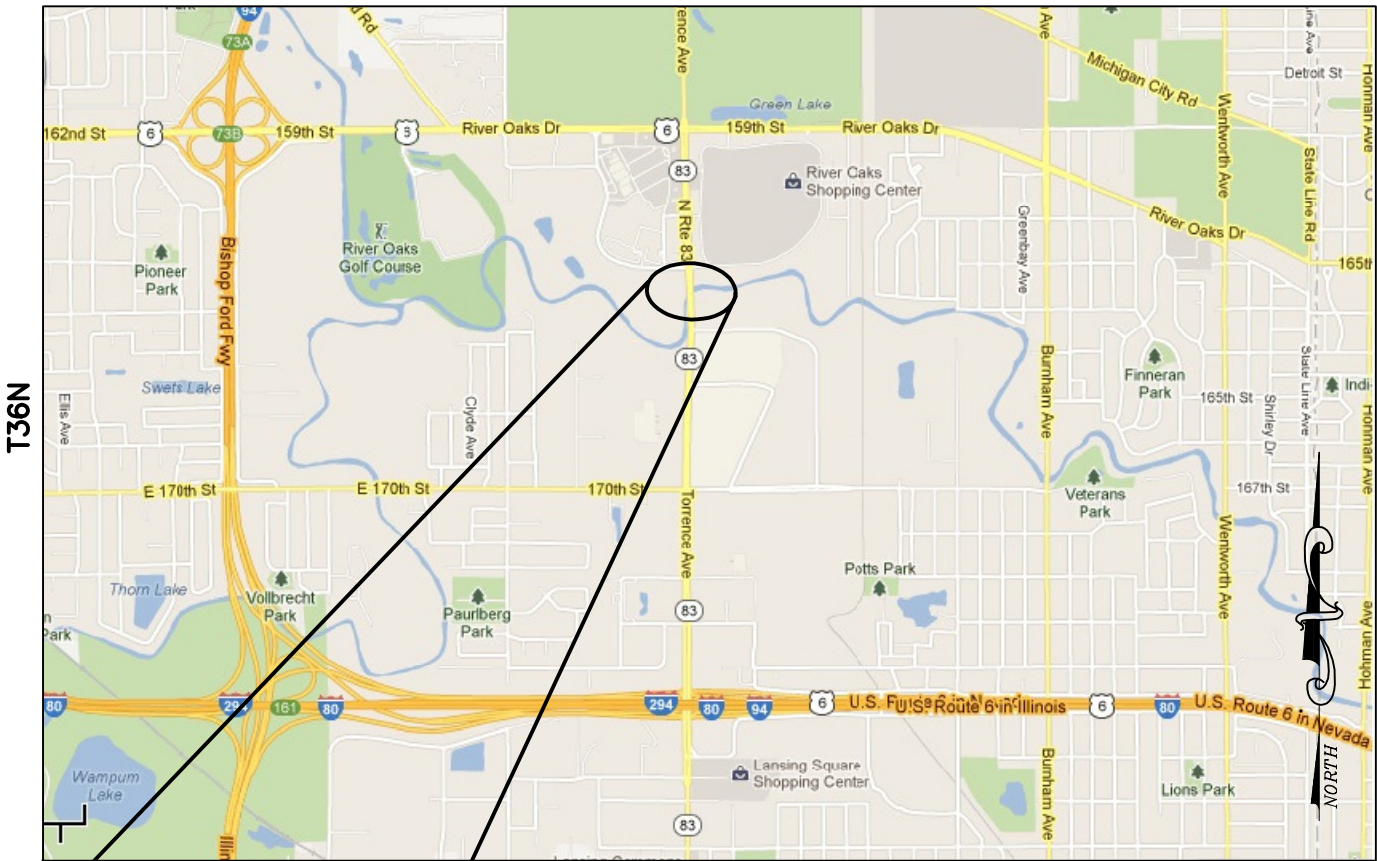
WATER LEVEL MEASUREMENT SYMBOLS

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

R14E



T36N

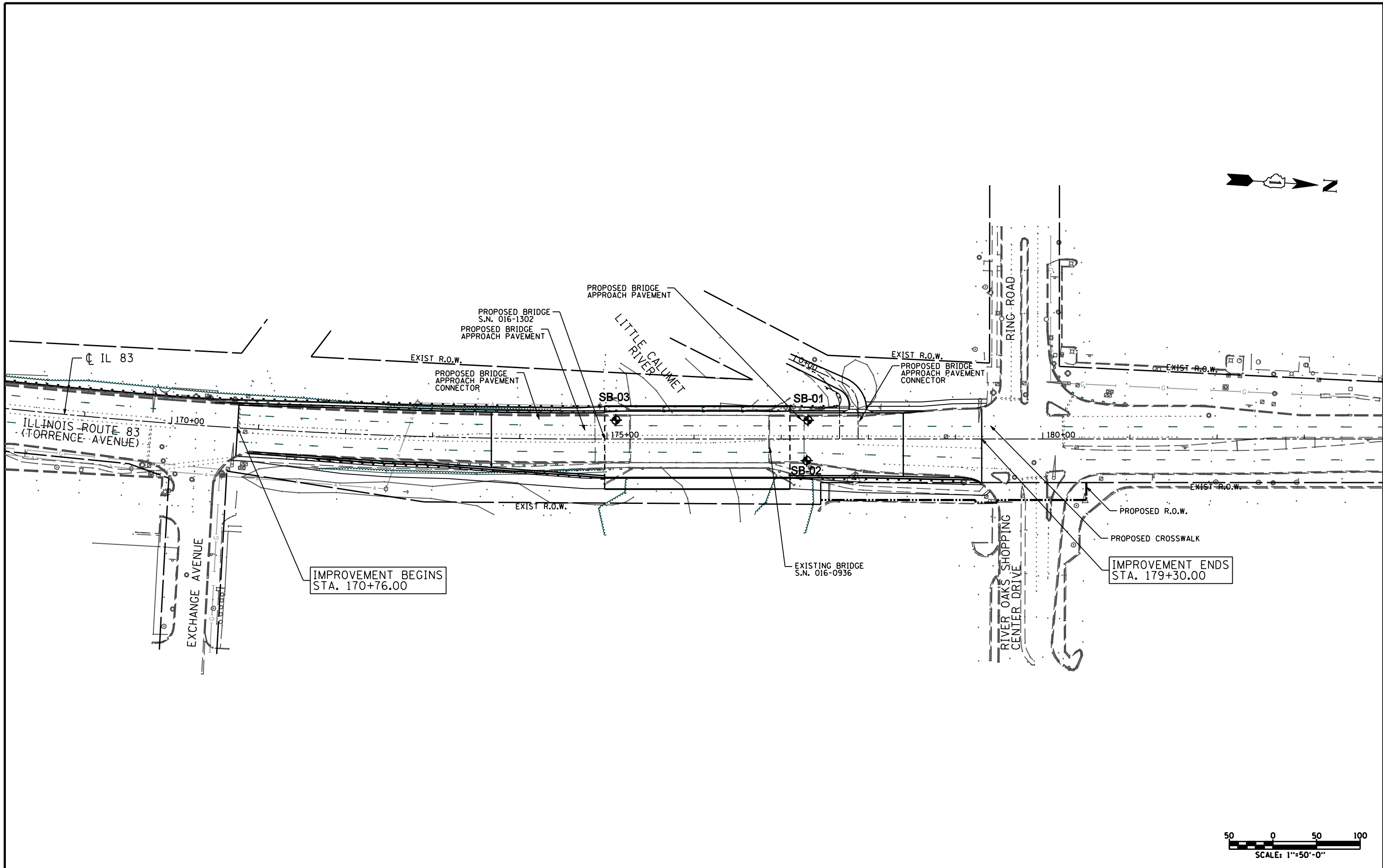
SN 016-1302
 IL 83/ US Route 6 over
 Little Calumet River

SITE LOCATION MAP		 Geo Services, Inc. Geotechnical, Environmental & Civil Engineering 805 Amherst Court, Suite 204 Naperville, Illinois 60565 (630) 355-2838	DRAWN BY	RRR
STRUCTURE GEOTECHNICAL REPORT			APPROVED BY	AJP
IL 83/ US Route 6 (Torrence Avenue) over Little Calumet River			DATE	May 22, 2012
IDOT Job D-91-596-10, Section 0909.1-B Thornton Township, Cook County, IL.			GSI JOB No.	10147
			SCALE	NTS

APPENDIX C
BORING LOCATION DIAGRAM

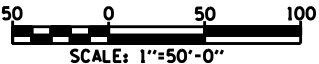
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	PLOTTED	BY
	GRADES CHECKED	
	STRUCTURE NOTATIONS CHECKED	
	NOTE BOOK NO.	
	FILE NAME	

PROFILE	SURVEYED	DATE
	PLOTTED	BY
	GRADES CHECKED	
	STRUCTURE NOTATIONS CHECKED	
	NOTE BOOK NO.	
	FILE NAME	



IMPROVEMENT BEGINS
STA. 170+76.00

IMPROVEMENT ENDS
STA. 179+30.00



Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2836

USER NAME =	DESIGNED - RWC	REVISED -
	DRAWN - RWC	REVISED -
PLOT SCALE =	CHECKED - AJP	REVISED -
PLOT DATE =	DATE - 5/15/2012	REVISED -

**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**IL 83 / US 6 (TORRENCE AVENUE) OVER LITTLE CALUMET RIVER
SOIL BORING PLAN**
SCALE: 1" = 50' SHEET NO. 1 OF 1 SHEETS STA. 170+76 TO STA. 179+30

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
358	0909.1-B	COOK	1	1
FED. ROAD DIST. NO.			ILLINOIS FED. AID PROJECT	
			CONTRACT NO. 60K78	

APPENDIX D

SOIL BORING LOGS AND ROCK CORE LOGS



SOIL BORING LOG

ROUTE US Route 6/FAP 0358 DESCRIPTION IL. 83/US Route 6/Torrence Ave. Over The Little Calumet River

SECTION 0909.1-B LOCATION T36N, R14E, SEC24 & T36N, R15E, SEC19 3rd PM

COUNTY Cook DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE CME Automatic

STRUCT. NO. Existing SN 016-0936
Proposed SN 016-1302
 Station 176+10.00

BORING NO. **SB-01**
 Northing 177+31
 Easting 21.5' Left
 Ground Surface Elev. 600.6

DEPTH H (ft)	BLOW S (/6")	UCS Qu (tsf)	MOIST S (%)	Surface Water Elev.	DEPTH H (ft)	BLOW S (/6")	UCS Qu (tsf)	MOIST S (%)
				<u>n/a</u>				
				Groundwater Elevation:				
				First Encounter <u>591.6</u> ▼				
				Upon Completion <u>n/a</u> ▼				
				After _____ Hrs. _____ ▼				
4.0" ASPHALT, 10.0" CONCRETE								
599.4								
	2		104			4		112
	3					4		
	5	3.4B	21			8	1.7B	19
CLAY-dark brown & gray-stiff to very stiff (A-6) Fill								
	1		93			3		111
	2					4		
	-5	3	1.1B	27	-25	7	3.25B	19
595.1								
	3		108	CLAY-gray-medium stiff to very stiff (A-6)		3		109
	6					3		
CLAY-brown & gray-hard (A-6)	7	5.4B	19			6	2.4B	20
	3			▼591.6		3		108
	10					4		
SILT-brown-medium dense (A-4)	-10	10	NP	23	-30	7	1.8B	21
590.1								
	11							
	11							
SILT-gray-medium dense (A-4)	11	NP	26					
	8					2		105
	10					4		
	-15	9	NP	20	-35	5	0.6B	22
585.1								
	2		100					
SILTY CLAY LOAM-gray-loose (A-4/A-6)	4							
	5	0.3B	26					
582.6								
	3		109			3		109
CLAY-gray-medium stiff to very stiff (A-6)	3					5		
	6	1.5B	20			7	1.9B	20
	-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

ROCK CORE LOG

ROUTE US Route 6/FAP 0358 DESCRIPTION Il. 83/US Route 6/Torrence Ave. Over The Little Calumet River

SECTION 0909.1-B LOCATION T36N, R14E, SEC24 & T36N, R15E, SEC19 3rd PM

COUNTY Cook CORING METHOD Rotary Wash

STRUCT. NO. Existing SN 016-0936 CORING BARREL TYPE & SIZE NX Double Swivel-10 ft
Proposed SN 016-1302

Station 176+10.00 Core Diameter 2.0 in

BORING NO. **SB-01** Top of Rock Elev. 535.6

Northing 177+31 Begin Core Elev. 534.6

Easting 21.5' Left

Ground Surface Elev. 600.6

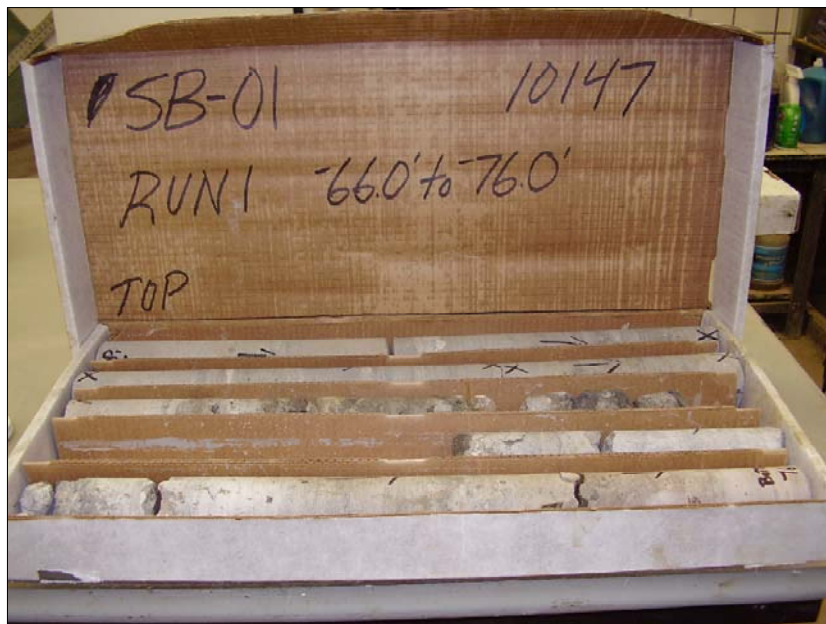
DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORRECTION (min/ft)	STRENGTH (tsf)
	1	88.0	77.5	n/a	1140 -66.0'

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-66.0' to -76.0')

Light gray to gray, fine grained with horizontal bedding. Becoming porous, vuggy & fossiliferous with some pyrite & quartz replacement & some clay partings from -70.4' to -73.4'.

Drillers Note: Void from -71.8' to -73.4'.





SOIL BORING LOG

PAGE 1 of 2

DATE 4/11/2012

LOGGED BY JK

GSI JOB No. 10147

ROUTE US Route 6/FAP 0358 DESCRIPTION II. 83/US Route 6/Torrence Ave. Over The Little Calumet River

SECTION 0909.1-B LOCATION T36N, R14E, SEC24 & T36N, R15E, SEC19 3rd PM

COUNTY Cook DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE CME Automatic

STRUCT. NO. Existing SN 016-0936
Proposed SN 016-1302
 Station 176+10.00

BORING NO. **SB-02**
 Northing 177+29
 Easting 25.0' Right
 Ground Surface Elev. 600.5

DEPTH H S	BL O W S	UC S Qu	MO I S T	Surface Water Elev. <u>n/a</u>	DEPTH H S	BL O W S	UC S Qu	MO I S T
				Stream Bed Elev. <u>n/a</u>				
				Groundwater Elevation:				
				First Encounter <u>586.0</u> ▼				
				Upon Completion <u>n/a</u> ▼				
				After _____ Hrs. _____ ▼				
(ft)	(/6")	(tsf)	(%)		(ft)	(/6")	(tsf)	(%)

4.0" ASPHALT, 10.0" CONCRETE	599.3																			
		15									7									116
		50/2"									12									
			NP				31				14	4.4B								16
		35									5									112
		50/3"									12									
SLAG-very dense (Fill)		-5		NP			33				-25	13	3.25B							19
		32									5									112
		50/4"									10									
			NP				36				15	3.1B								19
		70/2"									5									112
		-10		NP			29				7									
		590.0									-30	12	2.7B							19
		12																		
SILT-brown-medium dense (A-4)		14																		
		15		NP			26													
		587.5																		
		3									3									111
SILT-gray-medium dense (A-4)		7									8									
		-15		NP			20				-35	11	2.8B							19
		585.0																		
		3																		105
SILTY CLAY LOAM-gray-medium dense (A-4/A-6)		6																		
		9		1.9B			23													
		582.5																		
		4									4									116
CLAY-gray-very stiff to hard (A-6)		8									7									
		-20		11		2.5B	17				-40	10	2.3B							20

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



SOIL BORING LOG

PAGE 2 of 2

DATE 4/11/2012

LOGGED BY JK

GSI JOB No. 10147

ROUTE US Route 6/FAP 0358 DESCRIPTION II. 83/US Route 6/Torrence Ave. Over The Little Calumet River

SECTION 0909.1-B LOCATION T36N, R14E, SEC24 & T36N, R15E, SEC19 3rd PM

COUNTY Cook DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE CME Automatic

STRUCT. NO. Existing SN 016-0936
Proposed SN 016-1302
 Station 176+10.00

BORING NO. **SB-02**
 Northing 177+29
 Easting 25.0' Right
 Ground Surface Elev. 600.5

DEPTH H S	BL OW S	UC S Qu	MO IS T	Surface Water Elev. <u>n/a</u>	DEPTH H S	BL OW S	UC S Qu	MO IS T
				Stream Bed Elev. <u>n/a</u>				
				Groundwater Elevation:				
				First Encounter <u>586.0</u> ▼				
				Upon Completion <u>n/a</u> ▼				
(ft)	(/6")	(tsf)	(%)	After _____ Hrs. _____ ▼	(ft)	(/6")	(tsf)	(%)

DEPTH H S	BL OW S	UC S Qu	MO IS T	CLAY LOAM-gray- very stiff to hard (A-6)	DEPTH H S	BL OW S	UC S Qu	MO IS T
				CLAY-gray- very stiff to hard (A-6)				
				536.5				
	6		116					
	11			50/2"				

Drillers Observation: Apparent Bedrock
 535.5 -65 NR

DEPTH H S	BL OW S	UC S Qu	MO IS T	Silurian System, Niagaran Series Dolomite	DEPTH H S	BL OW S	UC S Qu	MO IS T
				RUN 1 (-65.0' to -75.0')				
				Gray mottled light gray with horizontal bedding. Fine grained becoming porous & fossiliferous with below -70.8'. Recovery=100.0% R.Q.D.=69.5%				
				548.5				
	6		118					
	11			RUN 1				
	17	3.6B	16					

DEPTH H S	BL OW S	UC S Qu	MO IS T	CLAY LOAM-gray- very stiff to hard (A-6)	DEPTH H S	BL OW S	UC S Qu	MO IS T
				CLAY LOAM-gray- very stiff to hard (A-6)				
				525.5 -75				
	6		114					
	11							
	19	3.3B	15					

End Of Boring @ -75.0'
 Hollow Stem Augers To -15.0'
 Rotary Drilling To Completion
 15.0' Of 4.0"Ø Casing Used
 67.0' Of 3.0"Ø Casing Used
 CME 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

ROCK CORE LOG

ROUTE US Route 6/FAP 0358 DESCRIPTION Il. 83/US Route 6/Torrence Ave. Over The Little Calumet River

SECTION 0909.1-B LOCATION T36N, R14E, SEC24 & T36N, R15E, SEC19 3rd PM

COUNTY Cook CORING METHOD Rotary Wash

STRUCT. NO. Existing SN 016-0936
Proposed SN 016-1302 CORING BARREL TYPE & SIZE NX Double Swivel-10 ft
 Station 176+10.00 Core Diameter 2.0 in

BORING NO. **SB-02** Top of Rock Elev. 536.5
 Northing 177+29 Begin Core Elev. 535.5

Easting 25.0' Right
 Ground Surface Elev. 600.5

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORRECTION (min/ft)	STRENGTH (tsf)
	1	100.0	69.5	n/a	1106 -67.0'
-70					
-75					

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE
 RUN 1 (-65.0' to -75.0')
 Gray mottled light gray with horizontal bedding. Fine grained becoming porous & fossiliferous with below -70.8'.





SOIL BORING LOG

PAGE 1 of 2

DATE 10/12/2012

LOGGED BY JK

GSI JOB No. 10147

ROUTE US Route 6/FAP 0358 DESCRIPTION II. 83/US Route 6/Torrence Ave. Over The Little Calumet River

SECTION 0909.1-B LOCATION T36N, R14E, SEC24 & T36N, R15E, SEC19 3rd PM

COUNTY Cook DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE CME Automatic

STRUCT. NO. Existing SN 016-0936
Proposed SN 016-1302
 Station 176+10.00

BORING NO. **SB-03**
 Northing 175+10
 Easting 21.5' Left
 Ground Surface Elev. 600.3

DEPTH H (ft)	BLOW S (/6")	UCS Qu (tsf)	MOIST S (%)	Surface Water Elev.		DEPTH H (ft)	BLOW S (/6")	UCS Qu (tsf)	MOIST S (%)
				<u>n/a</u>	<u>n/a</u>				
				Stream Bed Elev.	<u>n/a</u>				
				Groundwater Elevation:					
				First Encounter	<u>Dry To -10.0'</u>				
				Upon Completion	<u>n/a</u>				
				After _____ Hrs.	<u> </u>				

4.0" ASPHALT, 12.0" CONCRETE
 599.1

CLAY LOAM-black-
 loose to medium dense (Fill)
 592.3

TOPSOIL-black (Fill)
 589.8

Silty SAND-gray-loose (Fill)
 587.3

SILTY CLAY-dark brown & gray-
 very loose (Fill)
 584.8

Organic SILTY CLAY-dark brown &
 black-loose

Organic SILTY CLAY-dark brown &
 black-loose

CLAY-gray-
 medium stiff to stiff (A-6)

874.8

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

SOIL BORING LOG

ROUTE US Route 6/FAP 0358 DESCRIPTION IL. 83/US Route 6/Torrence Ave. Over The Little Calumet River

SECTION 0909.1-B LOCATION T36N, R14E, SEC24 & T36N, R15E, SEC19 3rd PM

COUNTY Cook DRILLING METHOD Hollow Stem Auger/Rotary HAMMER TYPE CME Automatic

STRUCT. NO. Existing SN 016-0936
Proposed SN 016-1302
 Station 176+10.00

BORING NO. **SB-03**

Northing 175+10

Easting 21.5' Left

Ground Surface Elev. 600.3

DEPTH H (ft)	BLOW S (/6")	UCS Qu (tsf)	MOIST T (%)	Surface Water Elev.	DEPTH H (ft)	BLOW S (/6")	UCS Qu (tsf)	MOIST T (%)
				<u>n/a</u>				
				Groundwater Elevation:				
				First Encounter				
				Upon Completion				
				After _____ Hrs.				
				CLAY LOAM—gray— very stiff to hard (A-6)				
				538.3				
				Silty SAND & FRACTURED ROCK—gray— very dense (A-2)				
	5		111				29	
	11						51	
	-45	13	1.6B	19			-65	90 NP 11
				534.3				
				Silurian System, Niagaran Series Dolomite				
				RUN 1 (-66.0' to -76.0')				
				Light gray to gray, fine grained with horizontal bedding. Becoming slightly porous & vuggy from -70.4' to -74.1'.				
	8		115					
	12			Recovery=94.0%				
	-50	17	3.25P	17			-70	
				548.3				
				CLAY LOAM—gray— very stiff to hard (A-6)				
	7		116					
	15							
	-55	32	3.0B	15			-75	
				524.3				
				End Of Boring @ -76.0'				
				Hollow Stem Augers To -10.0'				
				Rotary Drilling To Completion				
				CME Automatic Hammer				
	24							
	61							
	-60	100	3"5+P	12			-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

ROCK CORE LOG

ROUTE US Route 6/FAP 0358 DESCRIPTION Il. 83/US Route 6/Torrence Ave. Over The Little Calumet River

SECTION 0909.1-B LOCATION T36N, R14E, SEC24 & T36N, R15E, SEC19 3rd PM

COUNTY Cook CORING METHOD Rotary Wash

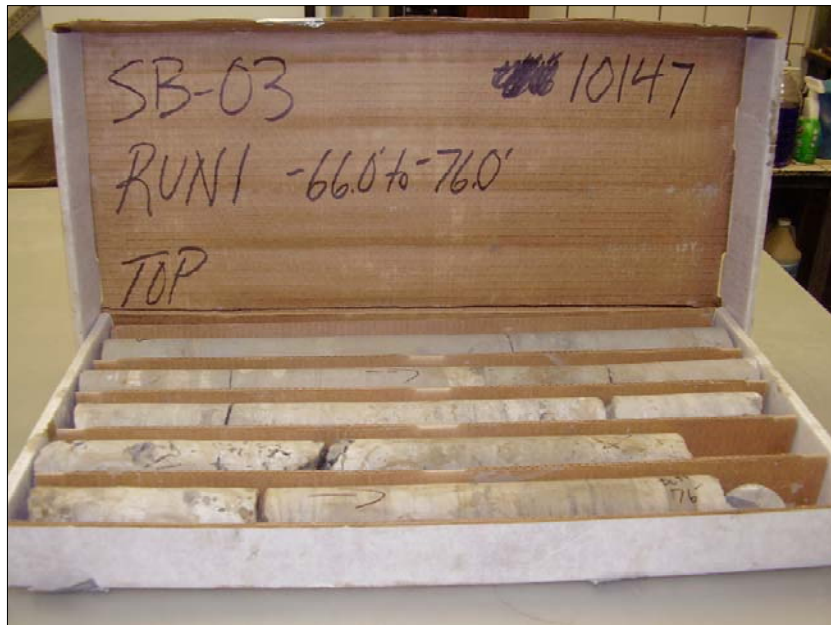
STRUCT. NO. Existing SN 016-0936
Proposed SN 016-1302 CORING BARREL TYPE & SIZE NX Double Swivel-10 ft
 Station 176+10.00 Core Diameter 2.0 in

BORING NO. **SB-03** Top of Rock Elev. 534.3
 Northing 175+10 Begin Core Elev. 534.3

Easting 21.5' Left
 Ground Surface Elev. 600.3

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORRECTION (min/ft)	STRENGTH (tsf)
	1	94.0	91.0	n/a	1140 -66.0'

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE
 RUN 1 (-66.0' to -76.0')
 Light gray to gray, fine grained with horizontal bedding. Becoming slightly porous & vuggy from -70.4' to -74.1'.



APPENDIX E
PILE ANALYSIS

Estimated Pile Lengths and Capacities for North Abutment

Boring SB-01 Southbound (Ground Surface Elevation against Pile during driving = 592.50, Pile Cutoff Elevation = 594.50)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 14x73		Metal Shell 12" ¹		Metal Shell 14" ²	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)
10	8	14	10	18	12	23	15	28	21	38	24	45
12	12	22	15	27	18	33	22	40	28	51	34	62
15	17	31	22	39	26	47	31	57	36	65	43	78
17	24	43	30	54	35	65	43	78	50	91	61	111
20	30	54	39	70	48	87	58	105	57	103	69	125
22	32	59	41	75	52	95	65	118	63	114	75	136
25	36	66	46	84	58	105	72	130	70	128	84	152
27	36	66	45	82	55	100	66	120	72	131	84	154
30	38	69	47	86	57	104	75	135	75	136	88	160
32	44	80	56	102	70	127	86	156	84	153	100	182
35	48	88	61	111	76	138	93	169	92	167	109	198
37	57	104	73	133	92	168	115	208	106	193	127	230
40	63	115	81	147	101	184	125	227	117	213	139	253
42	70	127	89	161	111	202	137	249	129	234	153	278
45	76	138	96	175	120	219	148	269	140	254	166	302
47	80	145	101	183	124	226	152	276			175	319
50	85	155	107	195	132	240	161	293			187	413
52	103	188	133	241	168	305	209	381				
55	106	192	135	246	171	311	213	388				
57	131	238	163	296	195	354	236	430				
59	143	259	177	322	212	386	258	469				
60	155	283	184	335	230	418	318	578				

Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. Pile lengths in **RED** denotes pile end-bearing at bedrock.

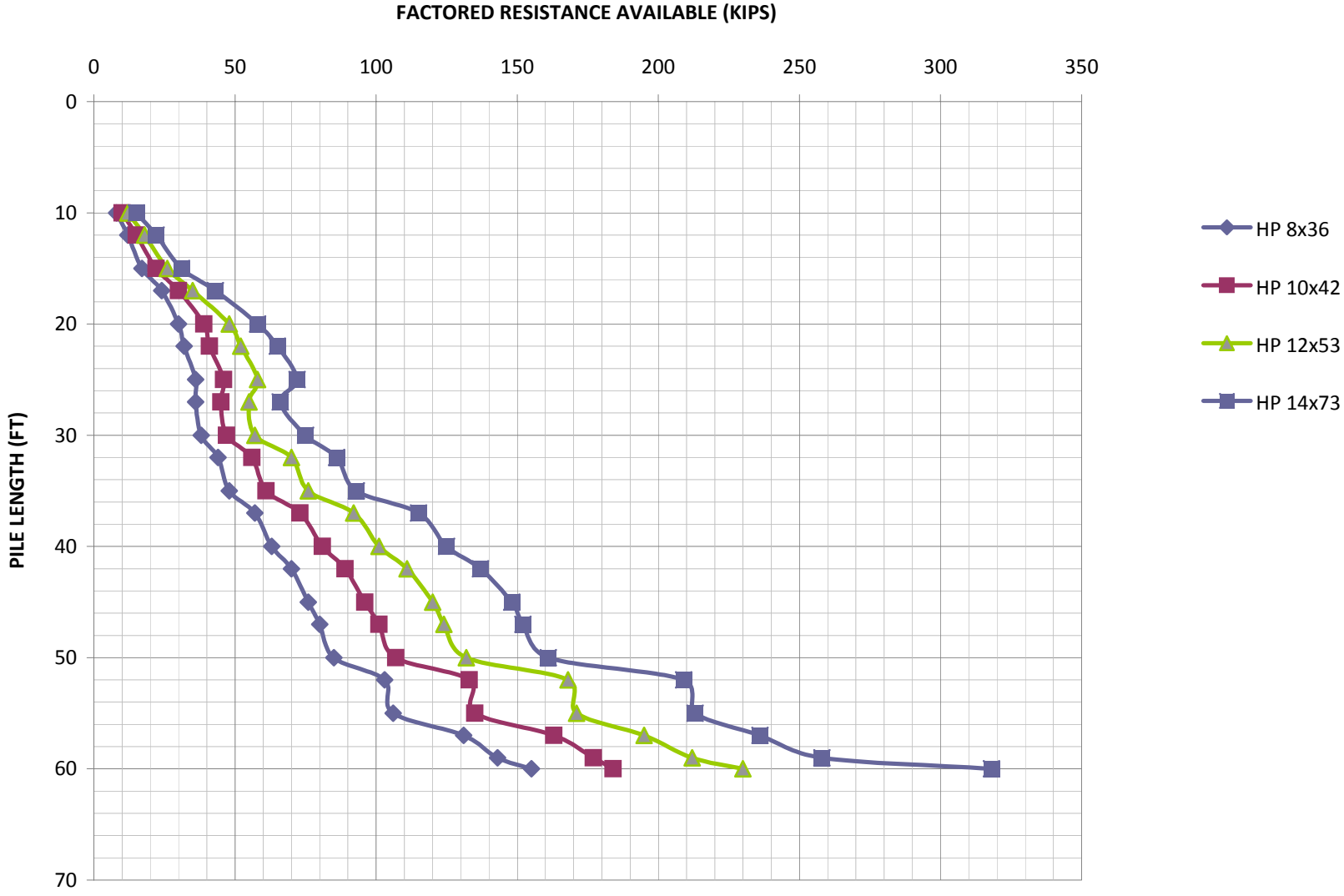
Scour elevations based on 100-year event (approximate elevation 591.2) are also incorporated in the pile calculations.

¹ Metal Shell Pile 12" diameter with 0.179" walls

² Metal Shell Pile 14" diameter with 0.250" walls

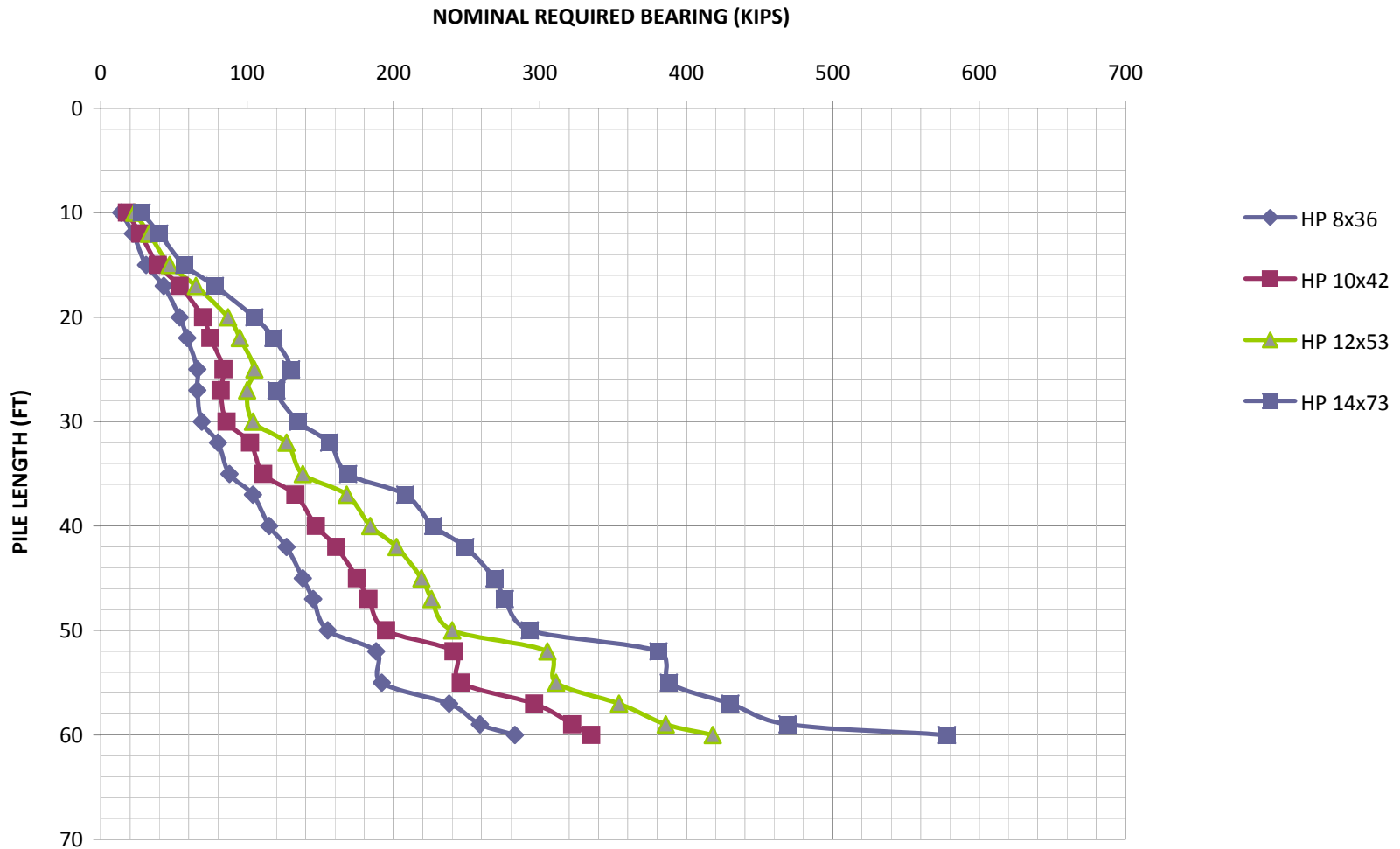
PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

SB-01 South Bound North Abutment



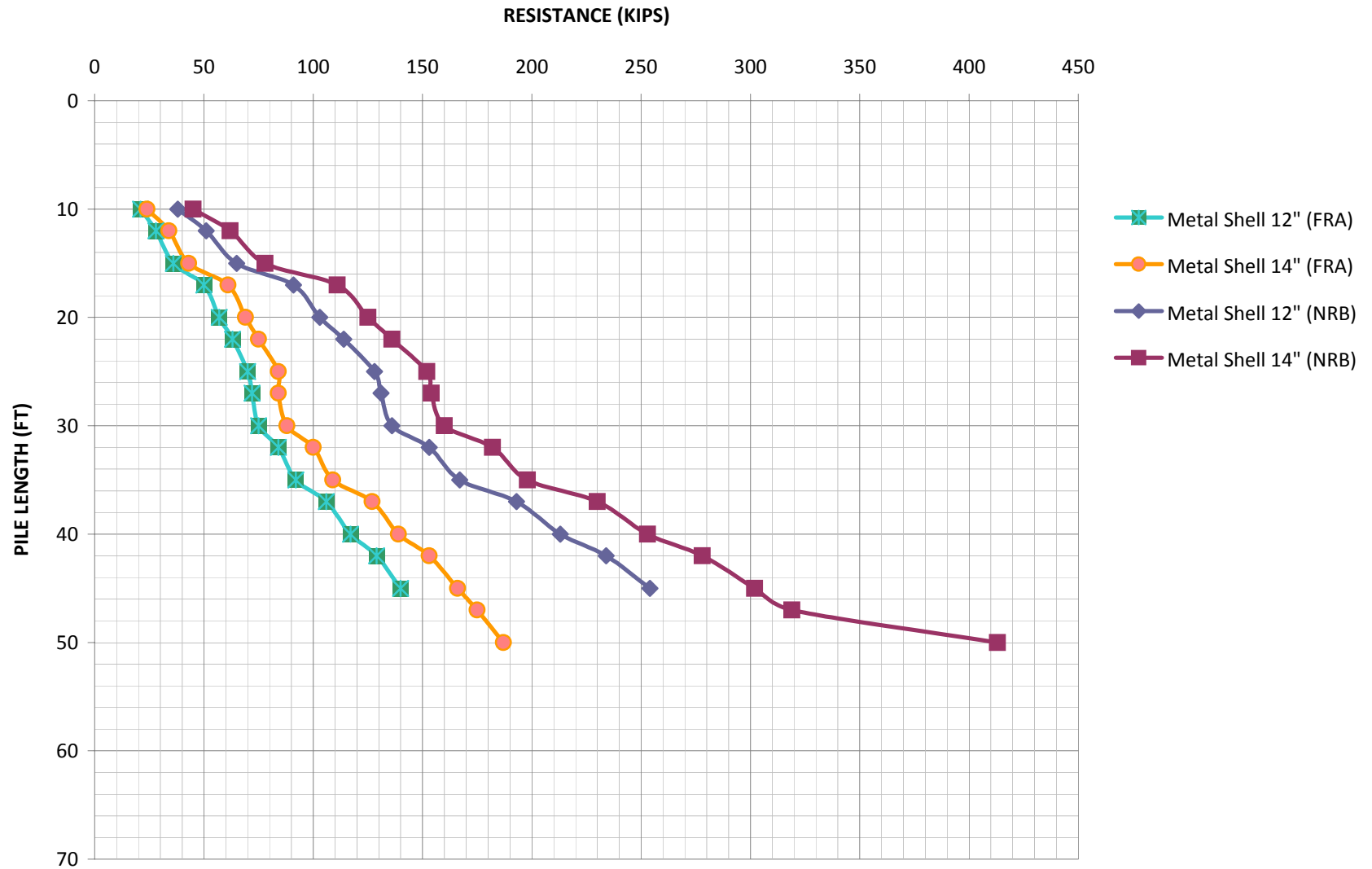
PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

SB-01 South Bound North Abutment



PILE BEARING VS. ESTIMATED PILE LENGTH

SB-01 South Bound North Abutment



Estimated Pile Lengths and Capacities for North Abutment

Boring SB-02 Northbound (Ground Surface Elevation against Pile during driving = 592.50 , Pile Cutoff Elevation =594.50)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 14x73		Metal Shell 12" ¹		Metal Shell 14" ²	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)
10	8	14	10	17	12	21	14	26	25	46	31	57
12	14	26	18	32	21	38	26	47	36	65	44	80
15	22	41	28	51	33	61	41	74	54	98	67	121
17	33	59	41	74	49	89	59	107	62	113	75	137
20	38	69	50	91	61	112	74	135	72	132	87	159
22	43	78	55	100	69	126	87	157	81	147	97	176
25	48	87	61	111	77	140	96	174	91	165	108	197
27	54	97	68	124	86	156	106	193	101	183	120	218
30	59	107	75	136	93	170	115	210	111	201	132	239
32	63	114	79	143	98	178	119	217	118	215	140	254
35	67	122	85	154	105	190	128	232	127	230	150	273
37	77	139	97	177	121	221	150	272	141	254	168	306
40	83	151	105	191	131	238	161	293			182	331
42	90	163	113	206	140	255	172	313			196	356
45	97	176	122	222	152	276	186	338			211	384
47	102	185	128	232	158	287	192	350			229	413
50	108	196	135	246	167	303	203	369				
52	141	257	184	335	232	418	278	505				
55	147	268					292	532				
57	158	286					310	563				
59							321	578				

Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers

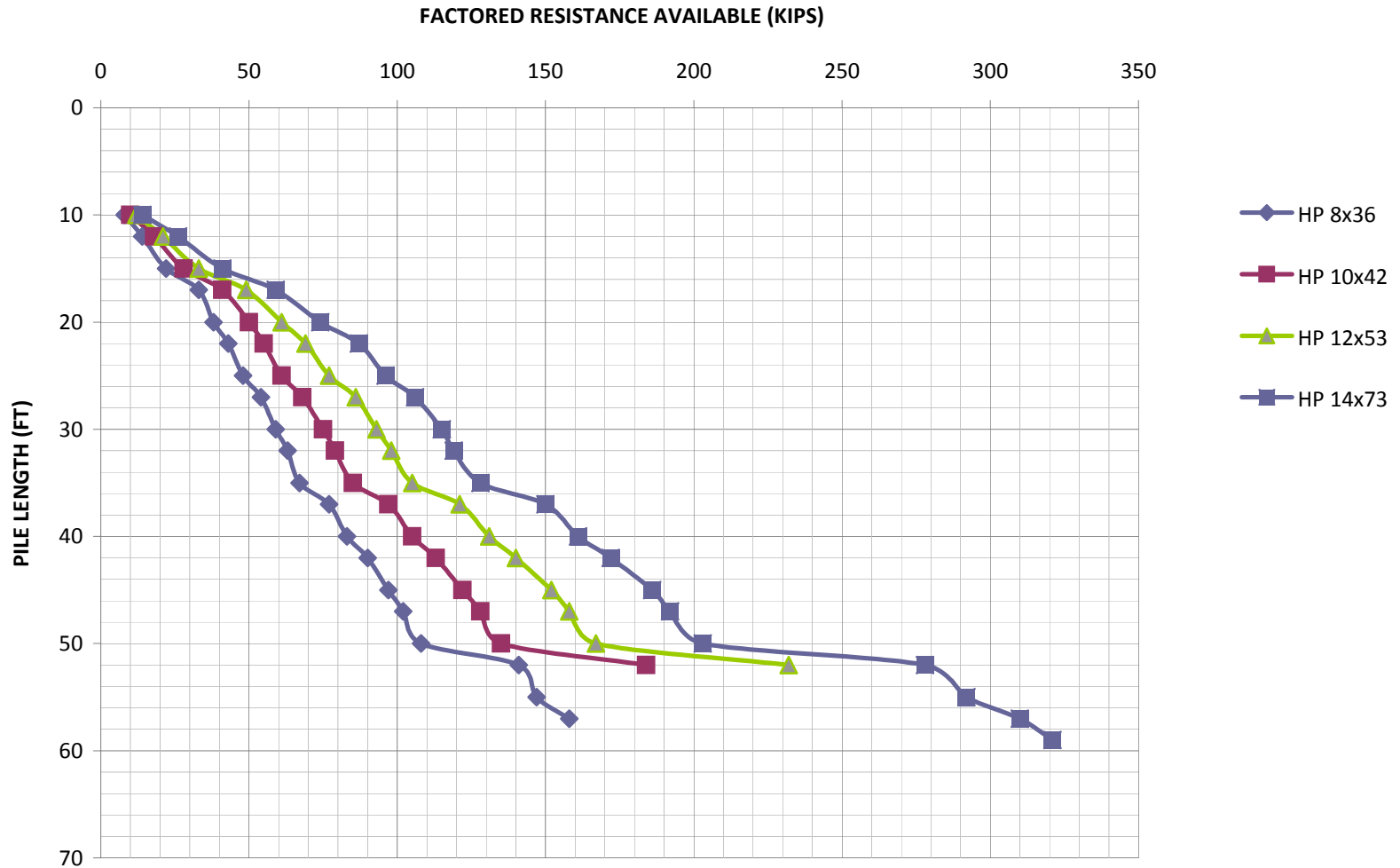
Scour elevations based on 100-year event (approximate elevation 591.2) are also incorporated in the pile calculations.

¹ Metal Shell Pile 12" diameter with 0.179" walls

² Metal Shell Pile 14" diameter with 0.250" walls

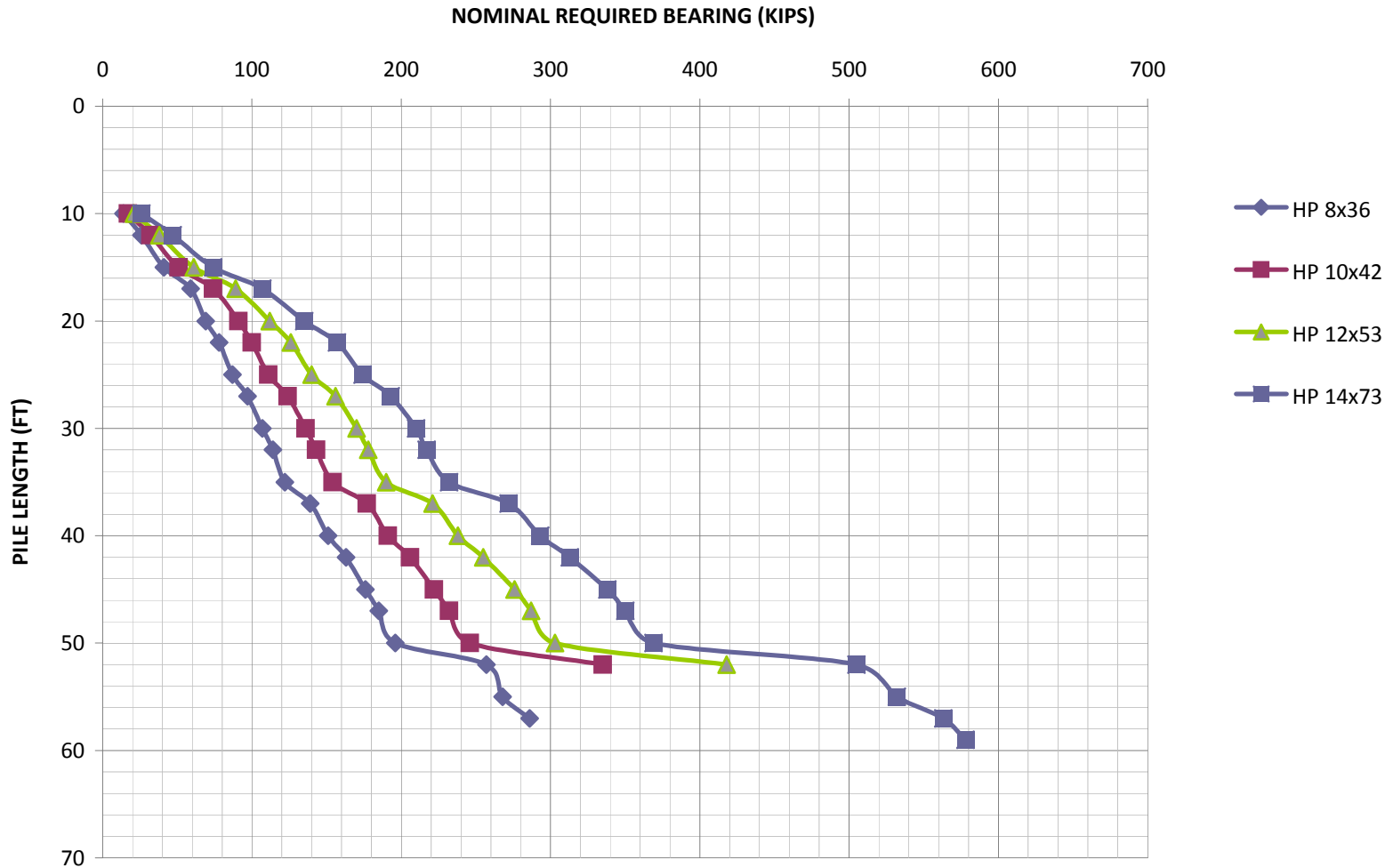
PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

SB-02 North Bound North Abutment



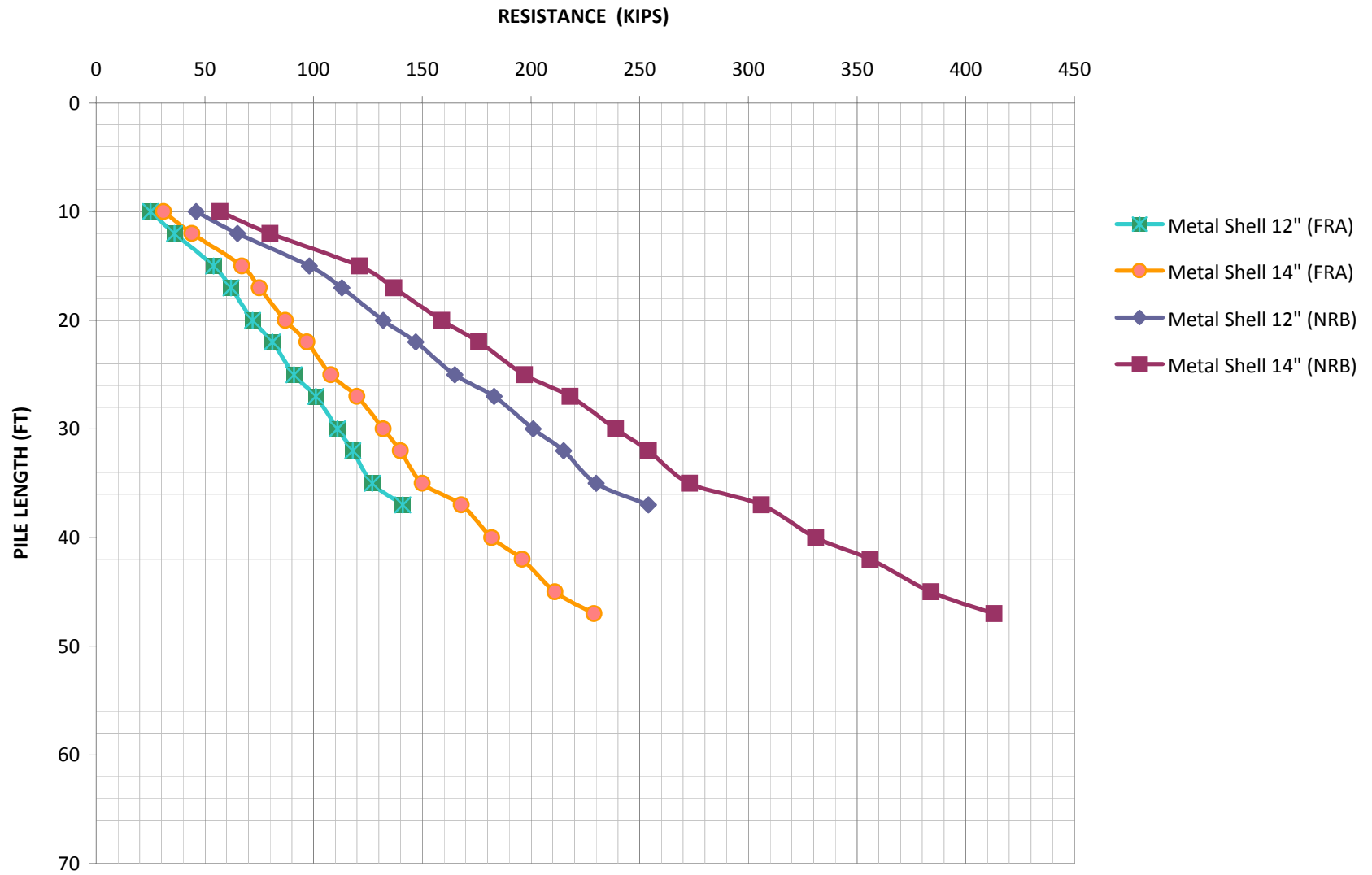
PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

SB-02 North Bound North Abutment



PILE BEARING VS. ESTIMATED PILE LENGTH

SB-02 North Bound North Abutment



Estimated Pile Lengths and Capacities for South Abutment

Boring SB-03 Southbound (Ground Surface Elevation against Pile during driving = 592.50, Pile Cutoff Elevation = 594.50)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 14x73		Metal Shell 12" ¹		Metal Shell 14" ²	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)
10	6	10	7	13	9	16	10	19	20	36	25	45
12	6	11	8	14	9	16	11	20	14	26	17	32
15	9	16	11	21	14	25	16	30	18	33	22	40
17	10	19	13	24	17	30	21	38	21	39	25	46
20	15	27	19	34	22	41	27	49	28	51	34	62
22	16	29	20	37	26	47	32	58	32	57	38	68
25	18	33	23	42	29	52	35	65	36	65	42	77
27	23	41	29	53	37	67	46	83	42	77	51	92
30	26	47	33	60	42	76	52	94	49	88	58	105
32	29	53	37	67	46	83	56	103	54	99	65	117
35	32	59	41	74	51	92	62	113	60	109	71	130
37	37	66	46	84	58	105	71	129	68	123	80	146
40	40	73	51	92	63	115	77	141	74	135	88	160
42	45	82	57	104	71	129	87	158	83	150	98	178
45	49	89	62	113	77	140	94	172	90	164	107	194
47	57	104	73	133	91	166	113	206	103	187	123	223
50	63	114	80	145	100	182	123	224	113	206	135	245
52	91	166	113	206	136	247	165	301				
55	103	187	128	233	153	278	186	338				
57	117	213	145	264	174	316	212	385				
60	136	248	169	308	203	368	246	448				
61	158	286	186	335	232	418	321	578				

Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. Pile lengths in **RED** denotes pile end-bearing at bedrock.

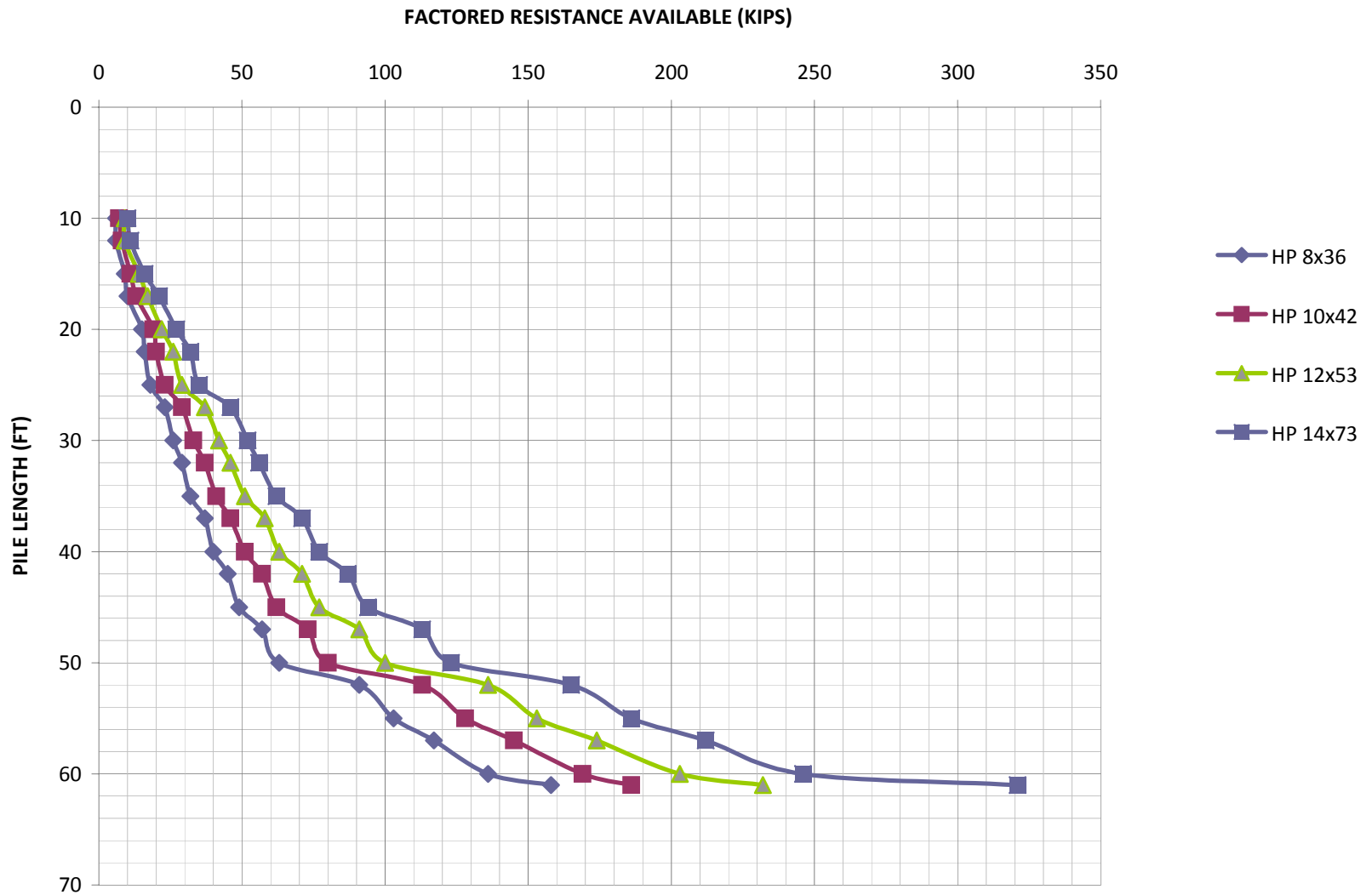
Scour elevations based on 100-year event (approximate elevation 587.9) are also incorporated in the pile calculations.

¹ Metal Shell Pile 12" diameter with 0.179" walls

² Metal Shell Pile 14" diameter with 0.250" walls

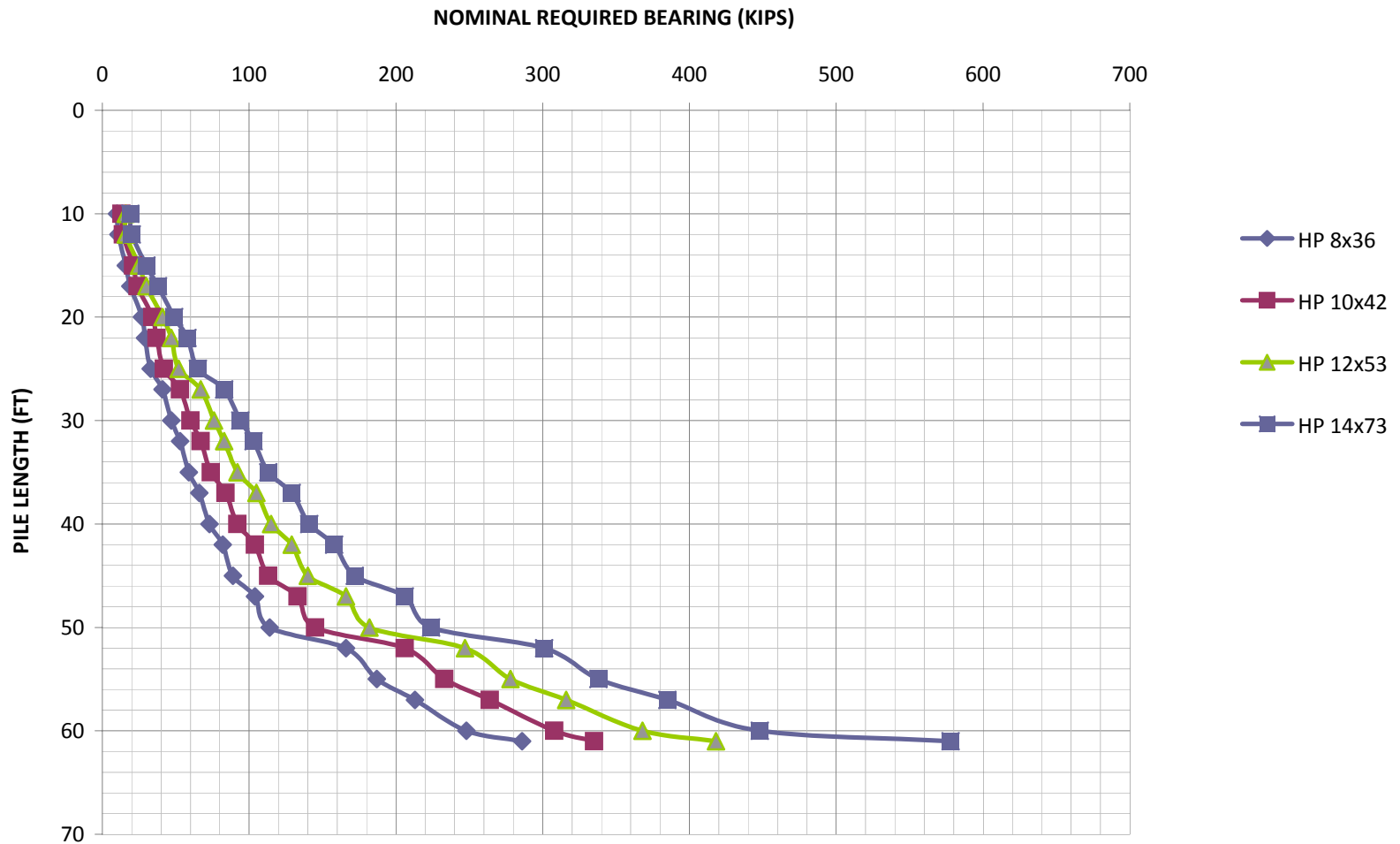
PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

SB-03 South Bound South Abutment



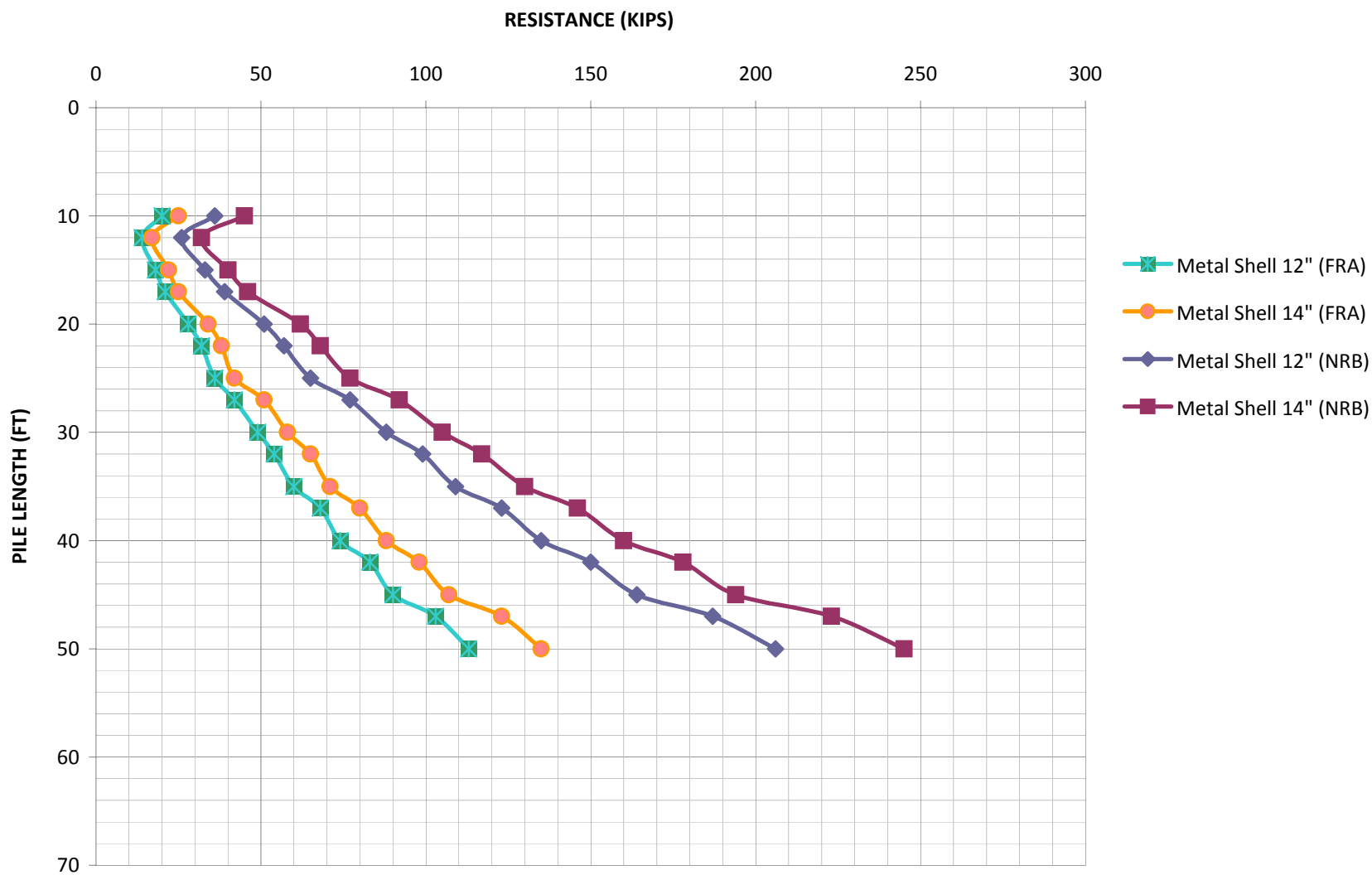
PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

SB-03 South Bound South Abutment



PILE BEARING VS. ESTIMATED PILE LENGTH

SB-03 South Bound South Abutment



Estimated Pile Lengths and Capacities for South Abutment

Boring B-10 Northbound (Ground Surface Elevation against Pile during driving = 592.50, Pile Cutoff Elevation = 594.50)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 14x73		Metal Shell 12" ¹		Metal Shell 14" ²	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)
10	7	12	8	15	10	18	13	23	71	129	93	169
13	9	16	11	20	13	24	16	30	94	171	123	223
15	11	20	14	25	17	30	21	37	103	188	134	243
18	10	19	13	24	17	31	20	37	48	88	57	103
20	15	27	19	34	22	40	27	49	56	103	67	123
23	19	35	25	45	30	55	37	67	63	115	75	136
25	23	41	29	53	37	67	46	84	69	126	82	150
28	27	50	35	64	45	82	56	102	78	141	93	168
30	31	56	40	72	50	90	62	112	84	154	100	182
33	37	68	48	87	61	110	76	138	95	172	113	205
35	44	79	56	102	71	129	89	161	106	192	126	229
38	48	87	61	111	77	139	95	172	114	207	135	246
40	53	97	68	123	85	154	105	190	124	225	147	267
43	58	106	74	134	92	168	114	206	133	242	158	286
45	65	117	82	149	102	185	126	228	141	254	170	310
48	70	127	89	161	110	200	135	246			182	331
50	73	133	92	167	113	205	138	250			189	344
53	78	141	97	177	120	218	145	265			199	362
55	118	214	146	266	175	319	213	388				
58	137	249	170	309	204	371	248	451				
58	141	254	175	318	210	381	255	463				
59	158	286	186	335	232	418	321	578				

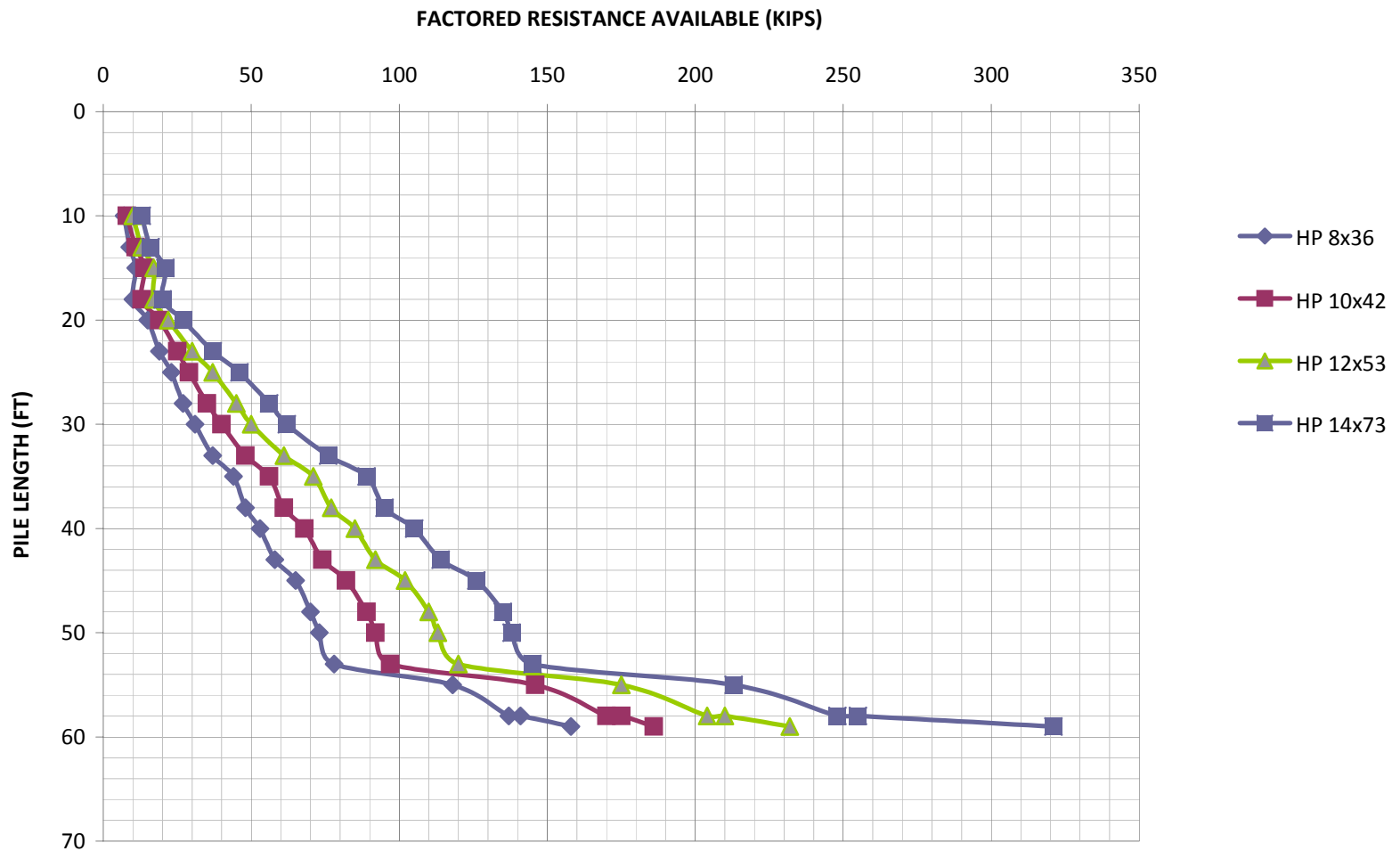
Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. Pile lengths in **RED** denotes pile end-bearing at bedrock.

Scour elevations based on 100-year event (approximate elevation 587.9) are also incorporated in the pile calculations.

¹ Metal Shell Pile 12" diameter with 0.179" walls

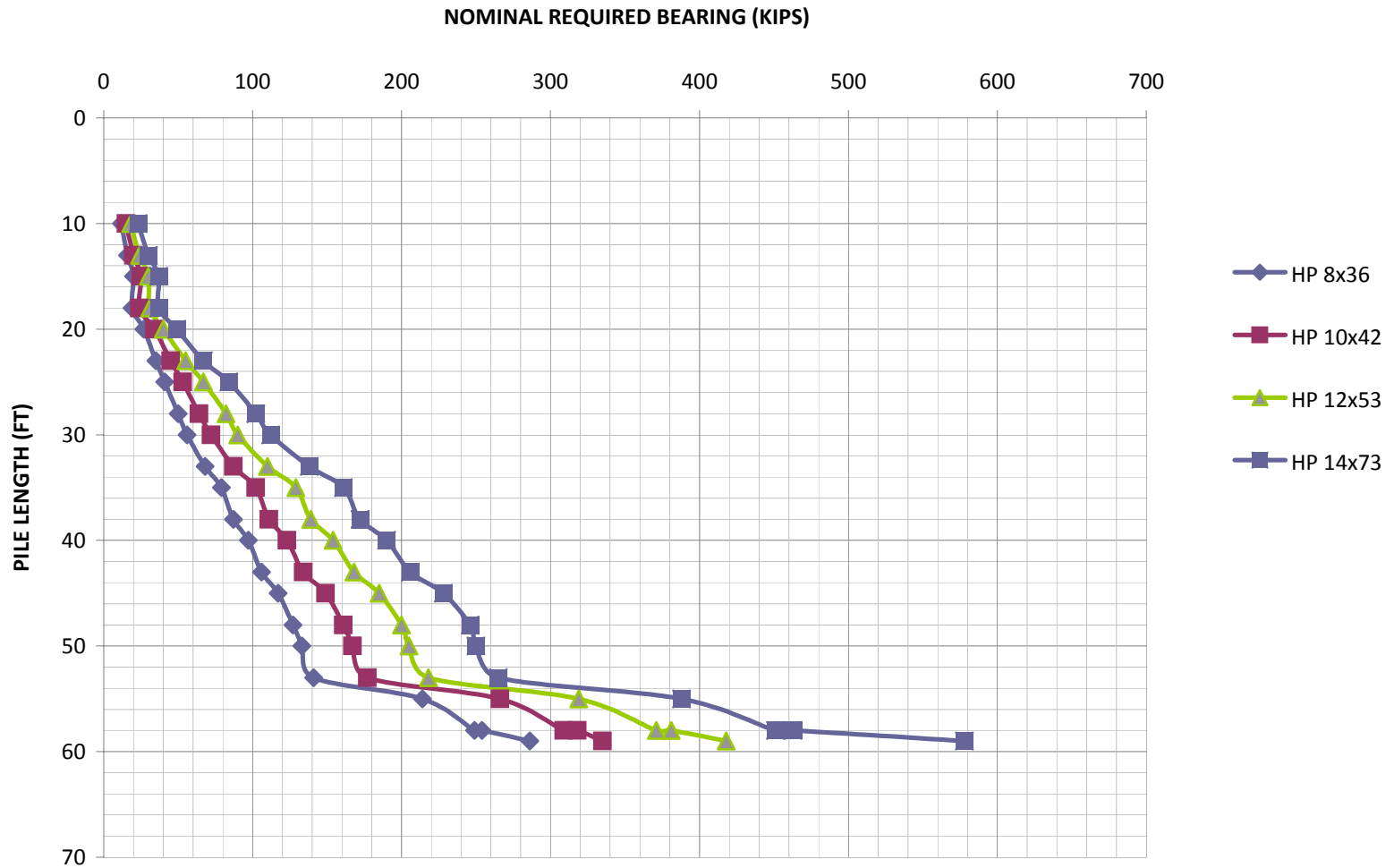
² Metal Shell Pile 14" diameter with 0.250" walls

PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH B-10 North Bound South Abutment



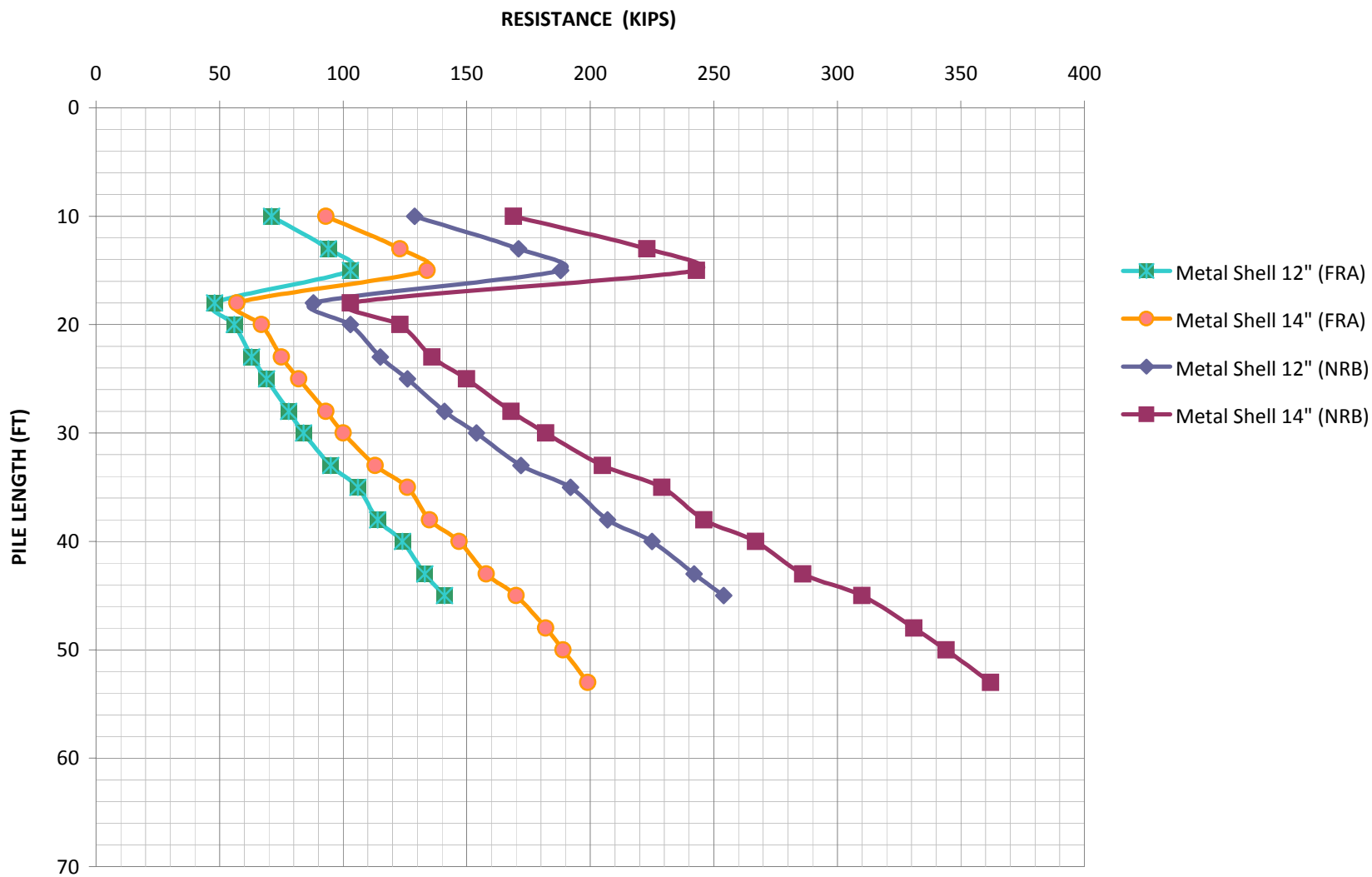
PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

B-10 North Bound South Abutment



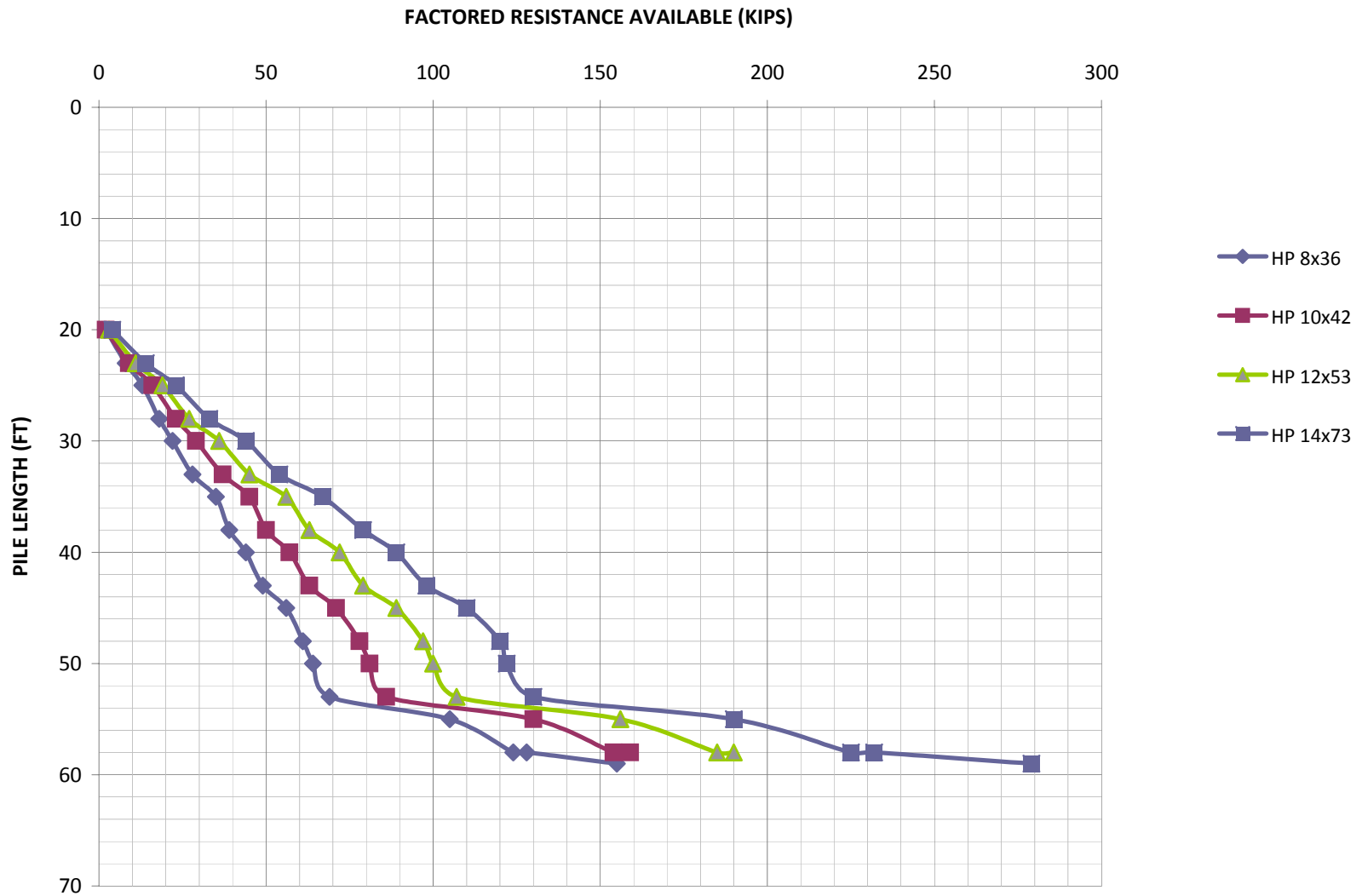
PILE BEARING VS. ESTIMATED PILE LENGTH

B-10 North Bound South Abutment



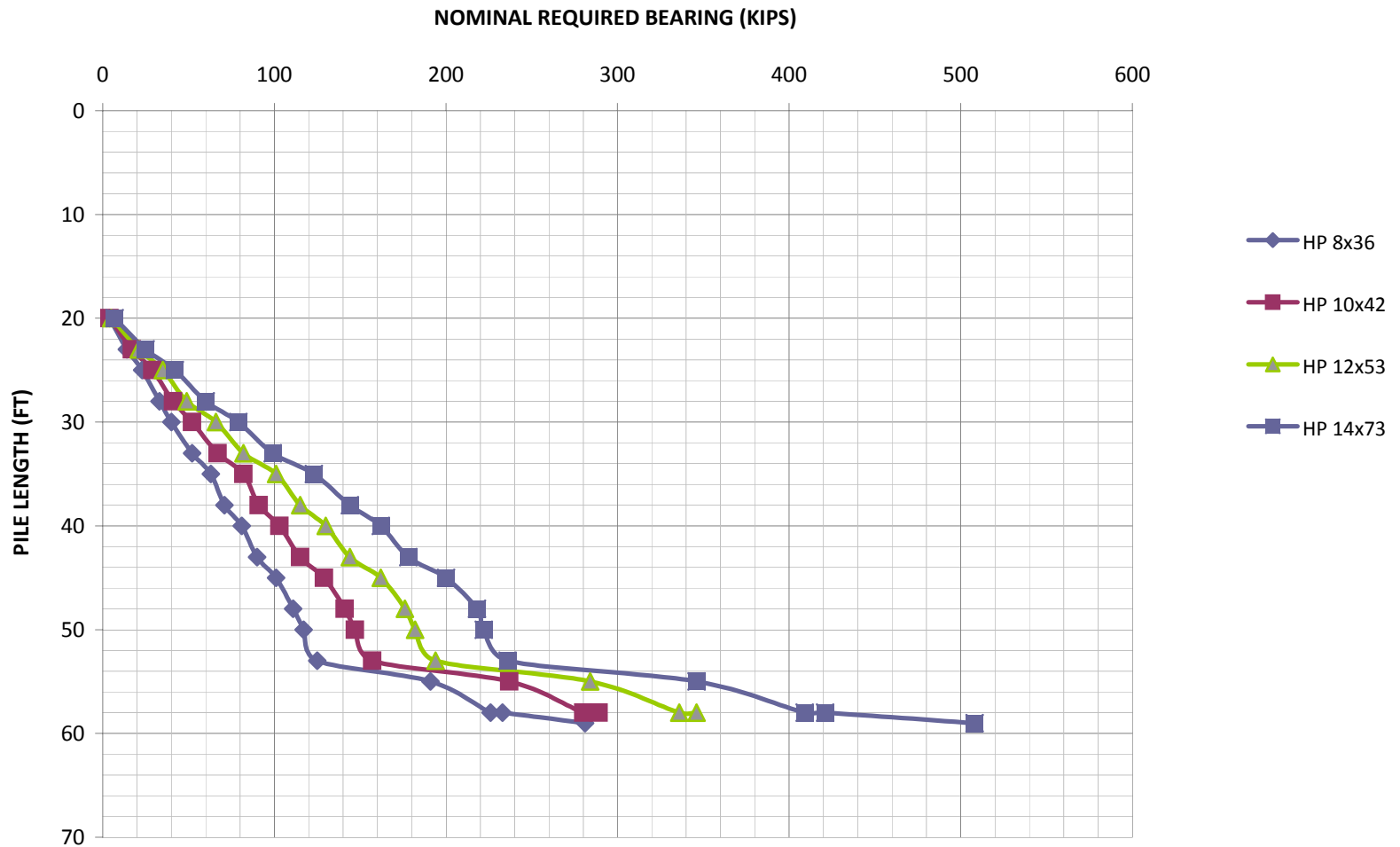
PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

B-10 South Abutment East Side



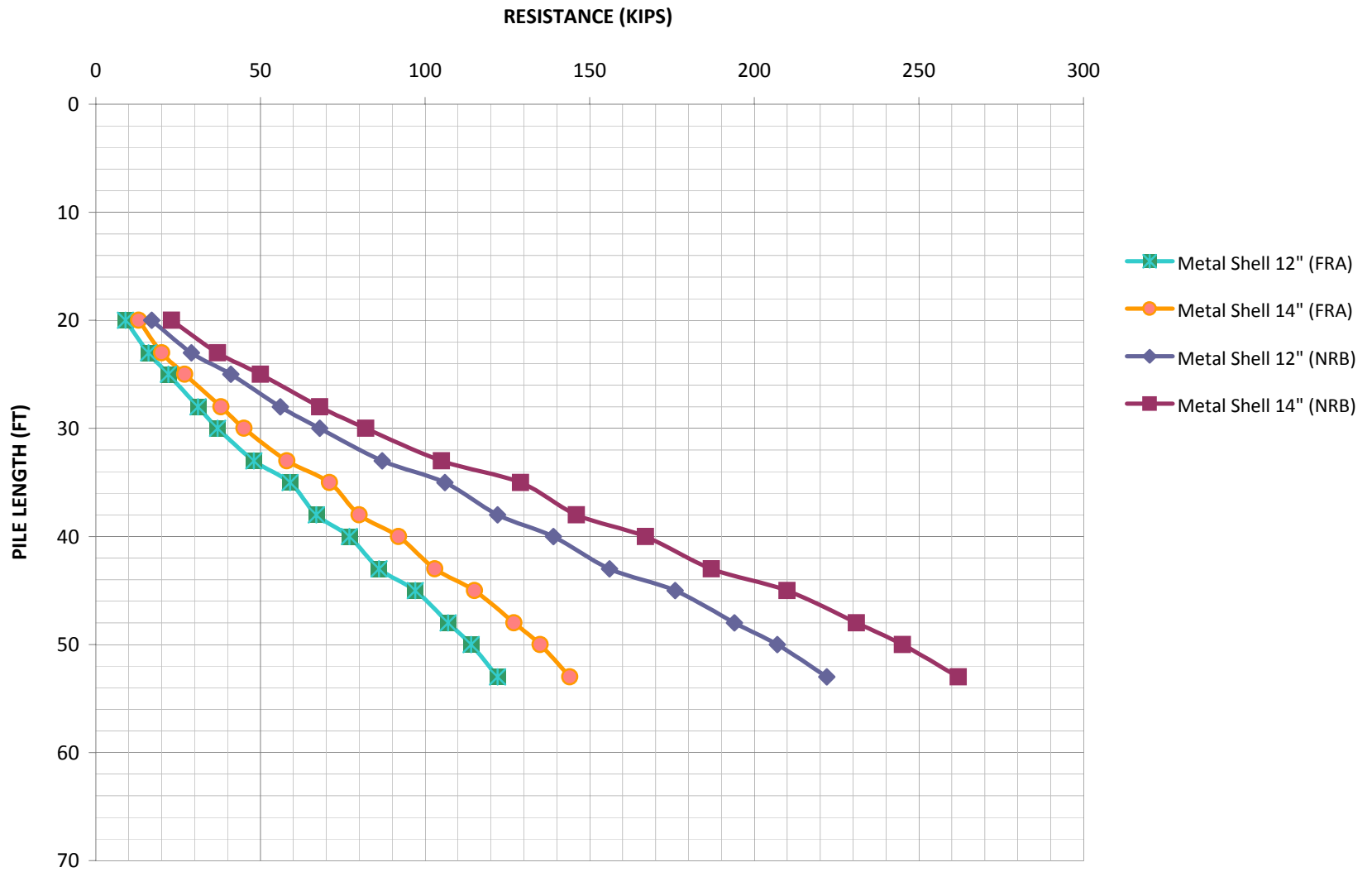
PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

B-10 South Abutment East Side



PILE BEARING VS. ESTIMATED PILE LENGTH

B-10 South Abutment East Side



Estimated Pile Lengths and Capacities for South Pier/Pier 1

Boring SB-03 (Ground Surface Elevation against Pile during driving = 576.50, Pile Cutoff Elevation = 593.40)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 14x73		Metal Shell 12" ¹		Metal Shell 14" ²	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)
19	2	4	3	5	4	7	5	8	9	16	11	21
21	7	13	9	16	10	19	13	23	12	22	15	27
24	10	17	12	23	15	28	18	33	16	29	20	35
26	14	25	17	31	20	37	25	45	23	42	28	51
29	17	31	22	41	28	50	34	61	29	53	35	64
31	20	37	26	47	33	60	41	75	35	63	42	76
34	24	43	30	55	38	69	47	85	41	74	49	89
36	28	50	36	65	45	81	56	101	48	87	58	105
39	31	57	40	73	50	91	62	113	55	100	65	119
41	36	66	46	84	58	105	72	131	63	115	75	137
44	40	74	51	93	64	117	79	144	71	129	84	153
46	48	88	62	113	79	143	98	178	84	152	100	182
49	54	98	69	126	87	158	108	196	141	256	229	416
51	79	143	98	178	117	213	143	260				
54	90	164	112	204	134	244	164	297				
56	104	190	129	235	155	282	189	344				
59	127	232	158	288	190	345	231	419				
60	158	286	184	335	229	419	318	578				

Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. Pile lengths in RED denotes pile end-bearing at bedrock.

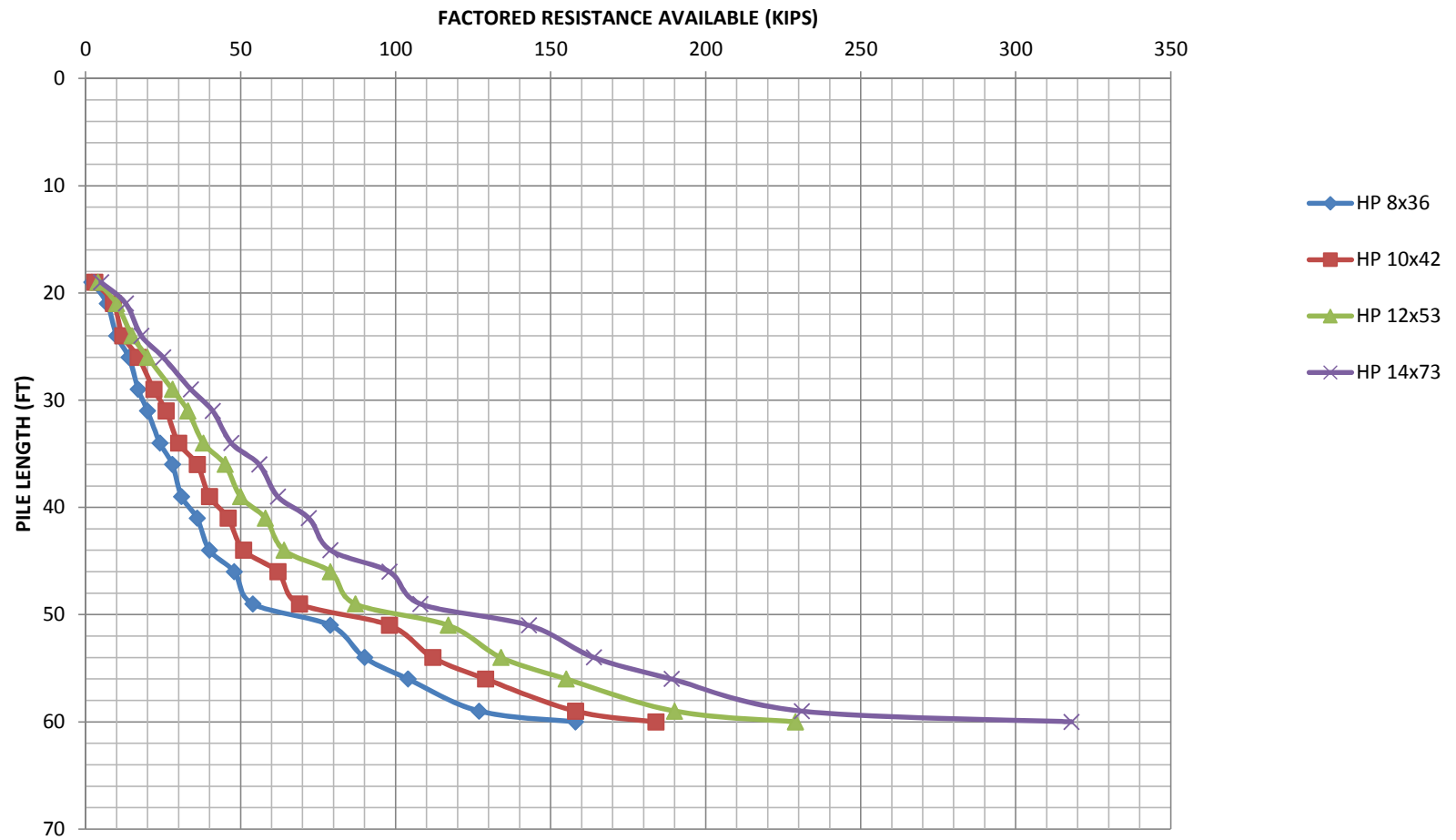
Scour elevations based on 100-year event (approximate elevation 591.2) are also incorporated in the pile calculations.

¹ Metal Shell Pile 12" diameter with 0.179" walls

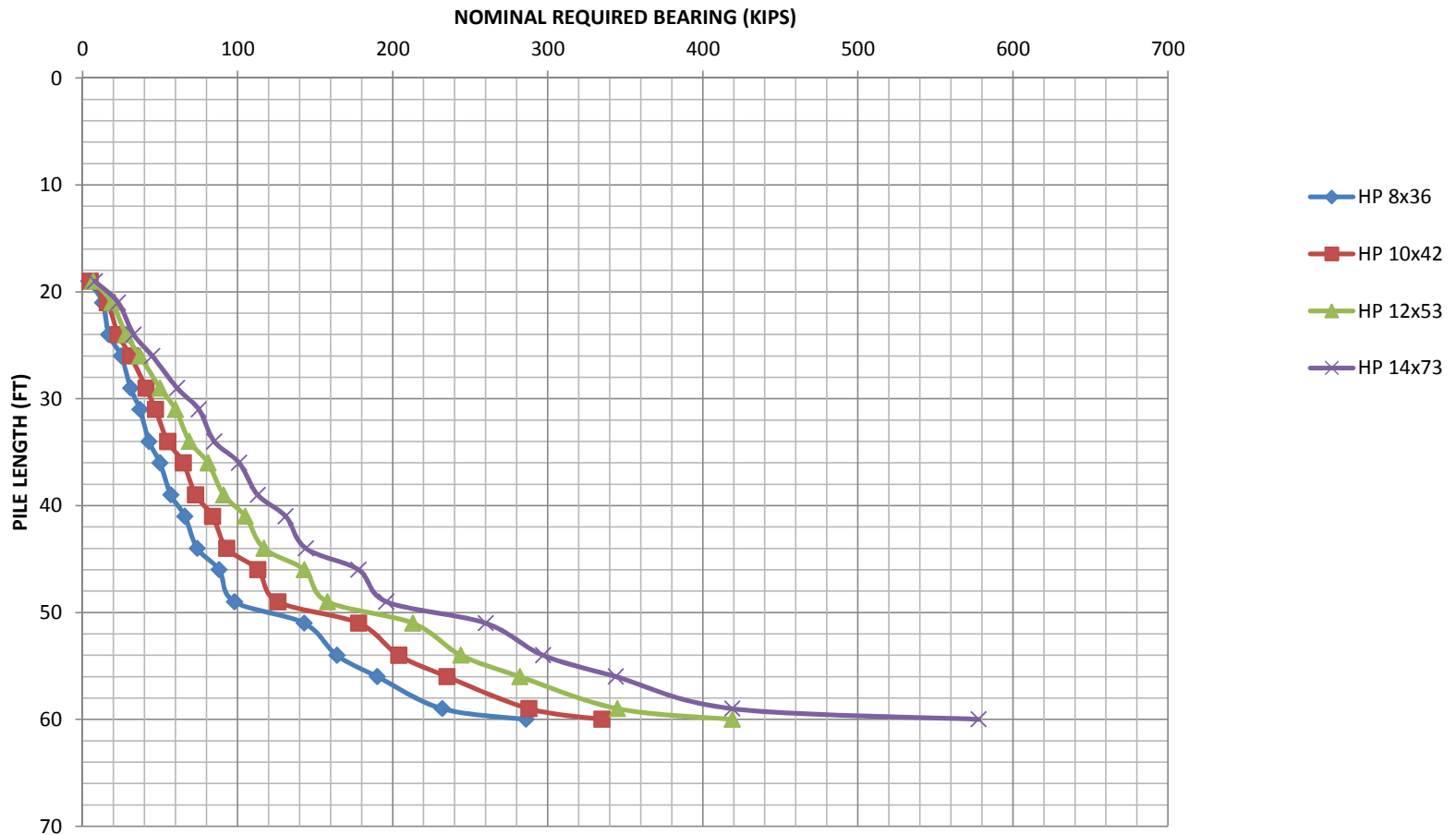
² Metal Shell Pile 14" diameter with 0.250" walls

PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

Boring SB-03 at Pier 1

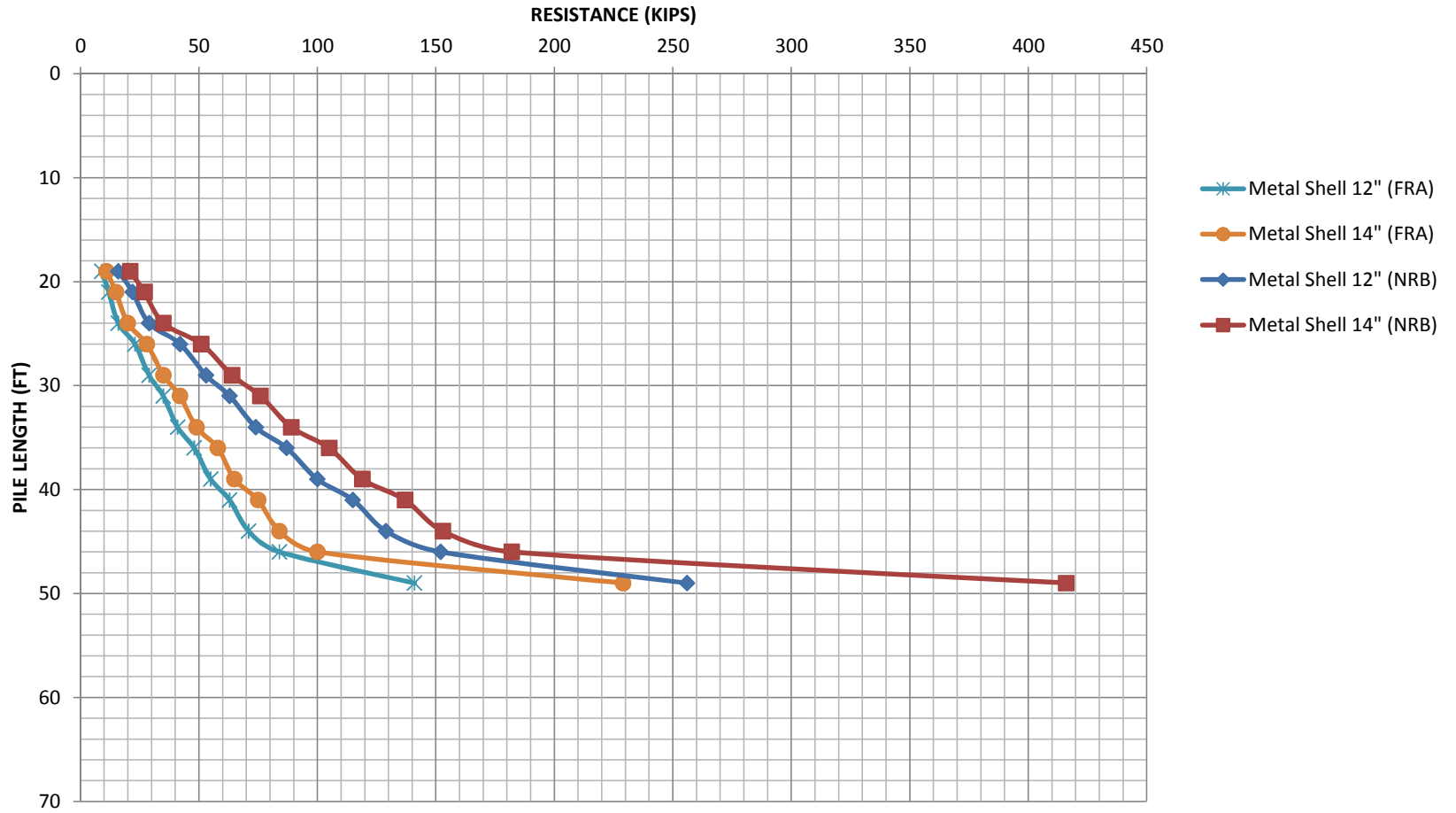


PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH Boring SB-03 at Pier 1



PILE BEARING VS. ESTIMATED PILE LENGTH

Boring SB-03 at Pier 1



Estimated Pile Lengths and Capacities for South Pier/Pier 1

Boring B-10 (Ground Surface Elevation against Pile during driving = 576.5, Pile Cutoff Elevation = 593.40)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 14x73		Metal Shell 12" ¹		Metal Shell 14" ²	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)
20	5	9	6	11	7	14	9	17	13	24	17	31
23	11	19	13	24	16	29	19	35	20	36	25	45
25	16	28	20	36	24	43	29	52	26	47	32	58
28	21	38	26	48	32	58	38	70	35	63	42	76
30	24	44	31	57	40	72	49	89	41	75	50	90
33	30	55	40	72	49	90	60	109	52	94	62	113
35	37	67	48	87	60	109	73	132	62	113	75	137
38	41	75	53	96	66	121	83	151	71	129	85	154
40	46	84	59	108	75	136	93	168	80	146	96	175
43	52	94	66	119	82	149	102	185	90	163	107	195
45	58	105	73	133	92	167	114	207	100	183	120	218
48	63	115	80	146	100	182	123	224	111	201	132	239
50	66	121	83	151	103	187	126	228	117	213	139	253
53	71	129	89	162	110	199	134	243	141	256	229	416
55	108	196	134	244	161	292	196	356				
58	129	235	161	292	192	349	234	425				
59	158	287	184	335	231	419	318	578				

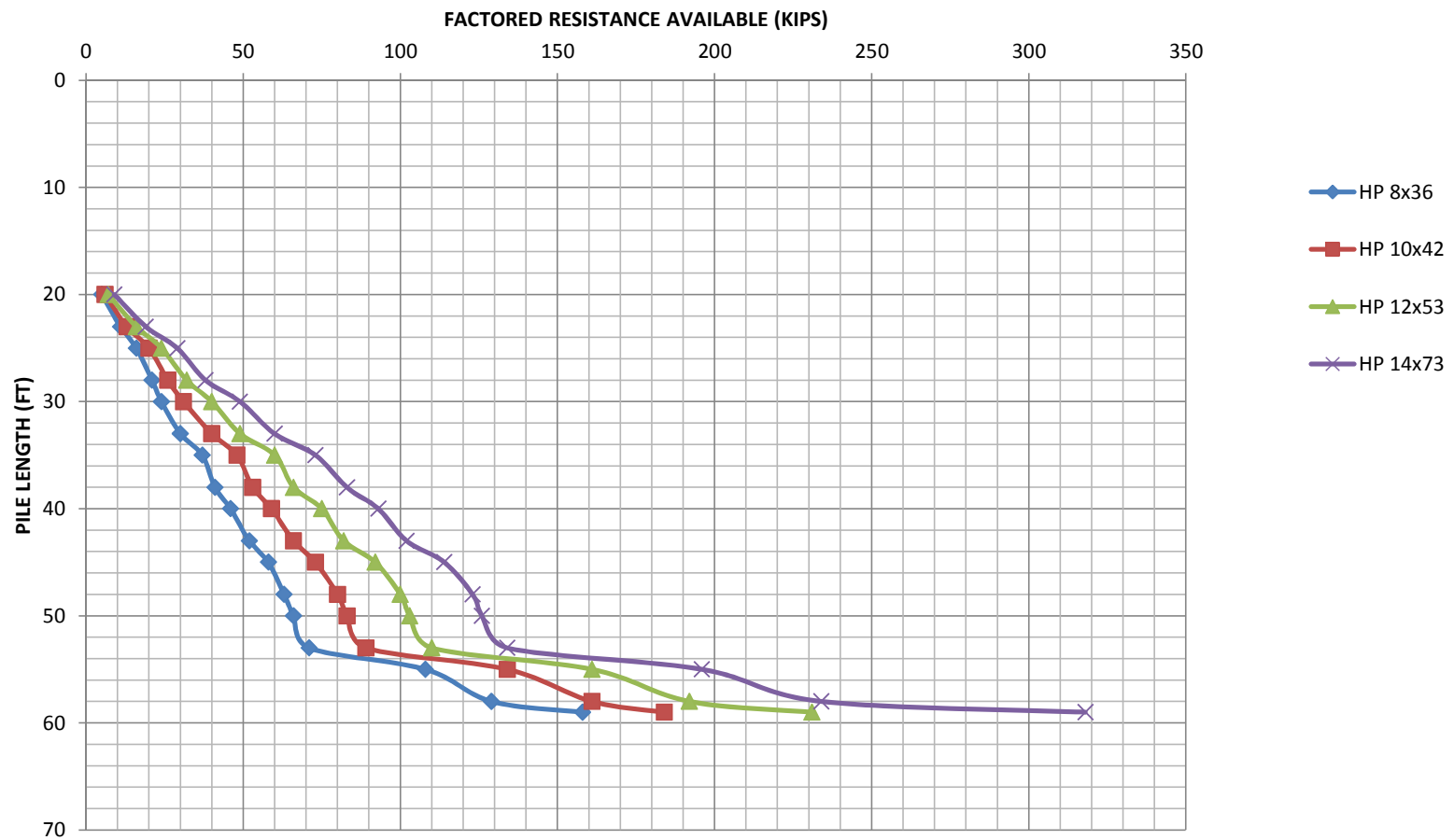
Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. Pile lengths in **RED** denotes pile end-bearing at bedrock.

Scour elevations based on 100-year event (approximate elevation 591.2) are also incorporated in the pile calculations.

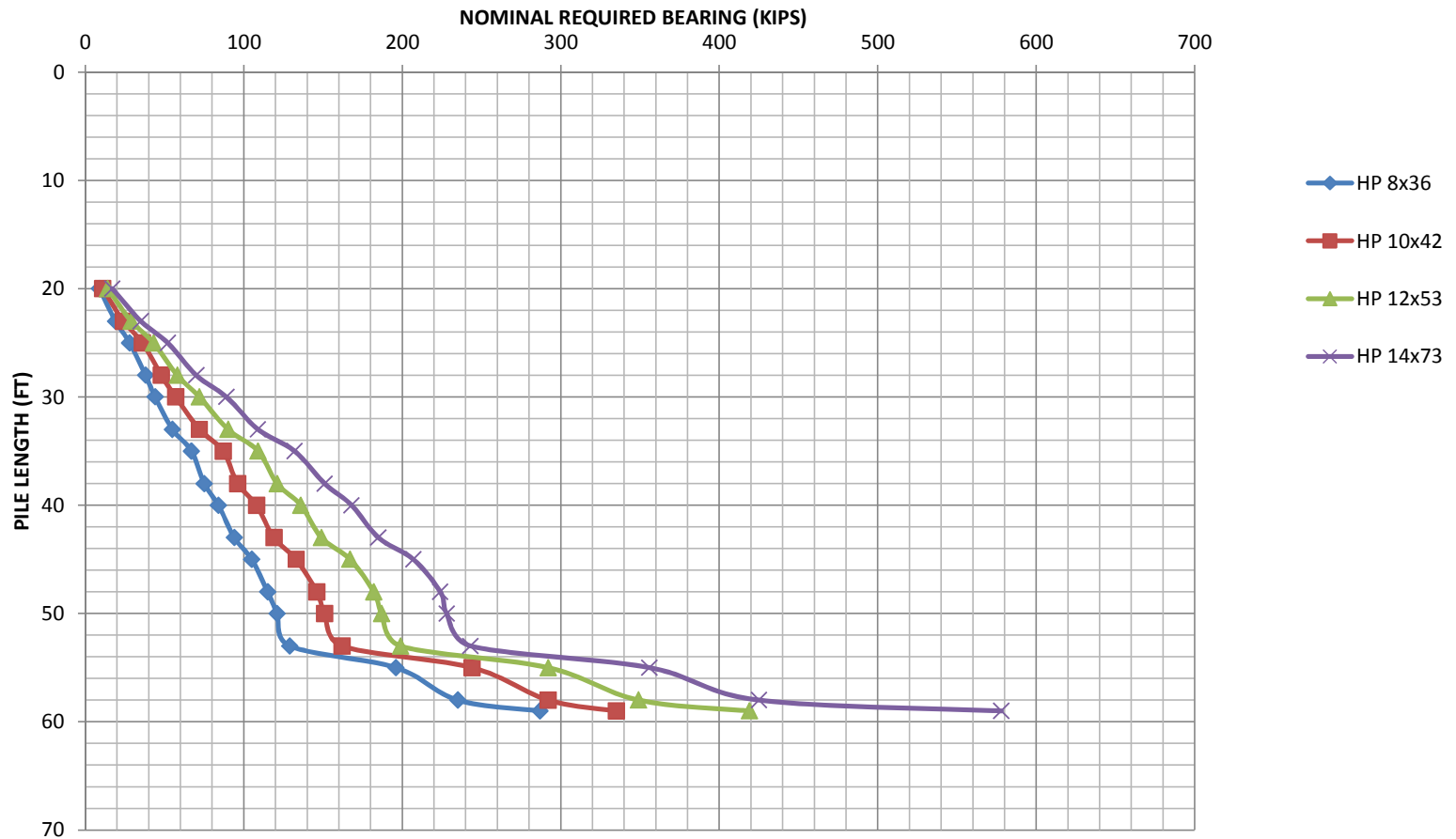
¹ Metal Shell Pile 12" diameter with 0.179" walls

² Metal Shell Pile 14" diameter with 0.250" walls

PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH Boring B-10 at Pier 1

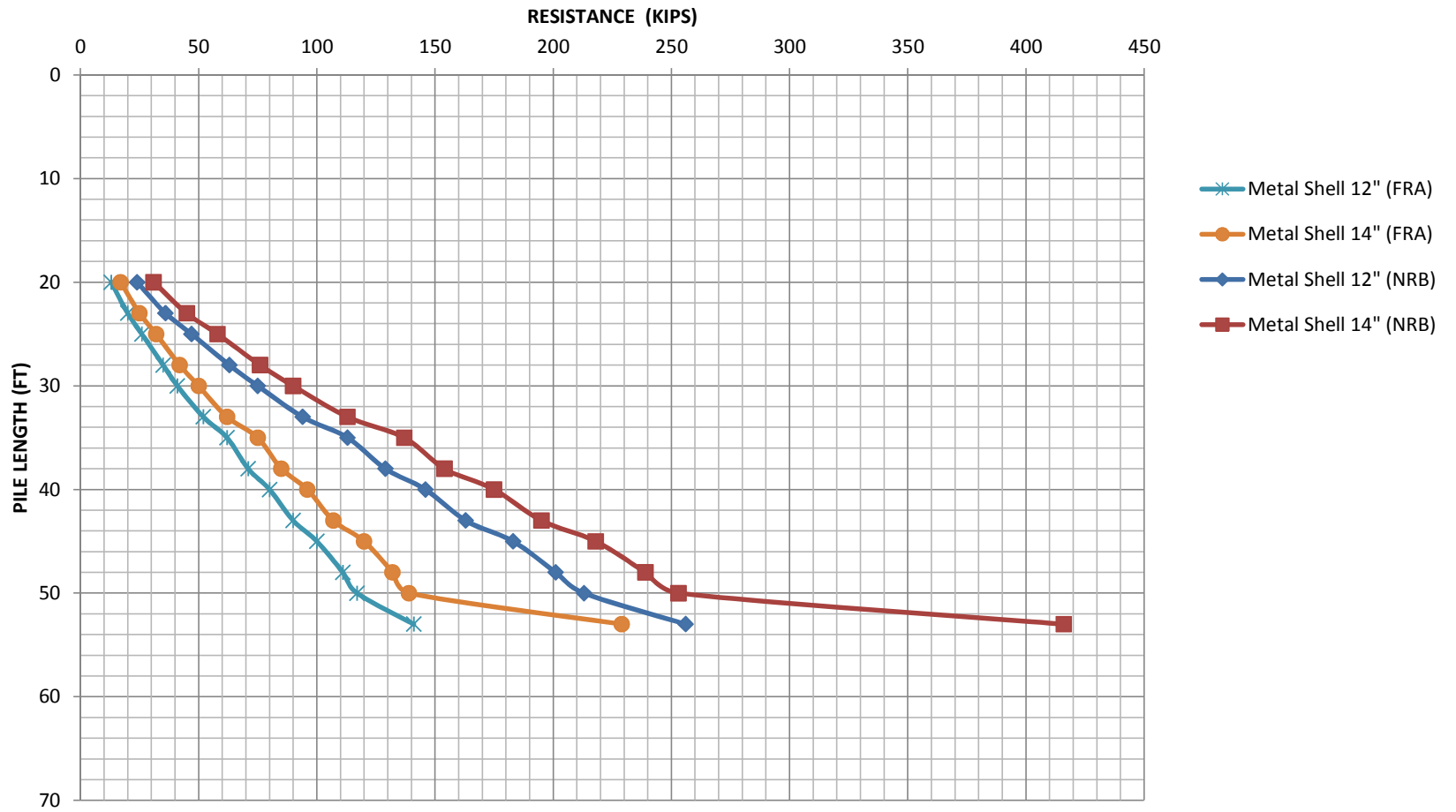


PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH Boring B-10 at Pier 1



PILE BEARING VS. ESTIMATED PILE LENGTH

Boring B-10 at Pier 1



Estimated Pile Lengths and Capacities for North Pier/Pier 2

Boring SB-01 (Ground Surface Elevation against Pile during driving = 576.50, Pile Cutoff Elevation = 593.40)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 14x73		Metal Shell 12" ¹		Metal Shell 14" ²	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)
19	8	14	10	18	12	21	15	26	20	36	25	46
21	15	27	18	33	22	40	26	48	26	47	32	58
24	20	36	25	46	30	55	37	67	33	60	40	73
26	20	36	25	45	30	55	37	67	35	63	41	75
29	21	39	27	48	33	60	40	72	38	69	45	81
31	28	50	36	65	45	82	56	102	47	86	57	103
34	32	58	41	74	51	93	64	116	55	100	66	119
36	41	74	53	96	66	119	79	144	69	125	83	151
39	47	85	60	109	77	139	95	173	80	145	96	175
41	53	97	68	124	86	157	108	197	91	166	110	200
44	59	108	76	138	96	174	119	216	103	187	123	224
46	63	115	80	146	100	182	123	223	111	202	132	240
49	69	125	87	158	108	196	132	240	141	256	230	416
51	87	158	112	204	143	260	174	316				
54	89	162	115	209	146	266	180	326				
56	107	194	133	241	159	289	193	351				
59	121	220	150	273	180	327	219	398				
60	158	286	184	335	230	419	318	578				

Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. Pile lengths in **RED** denotes pile end-bearing at bedrock.

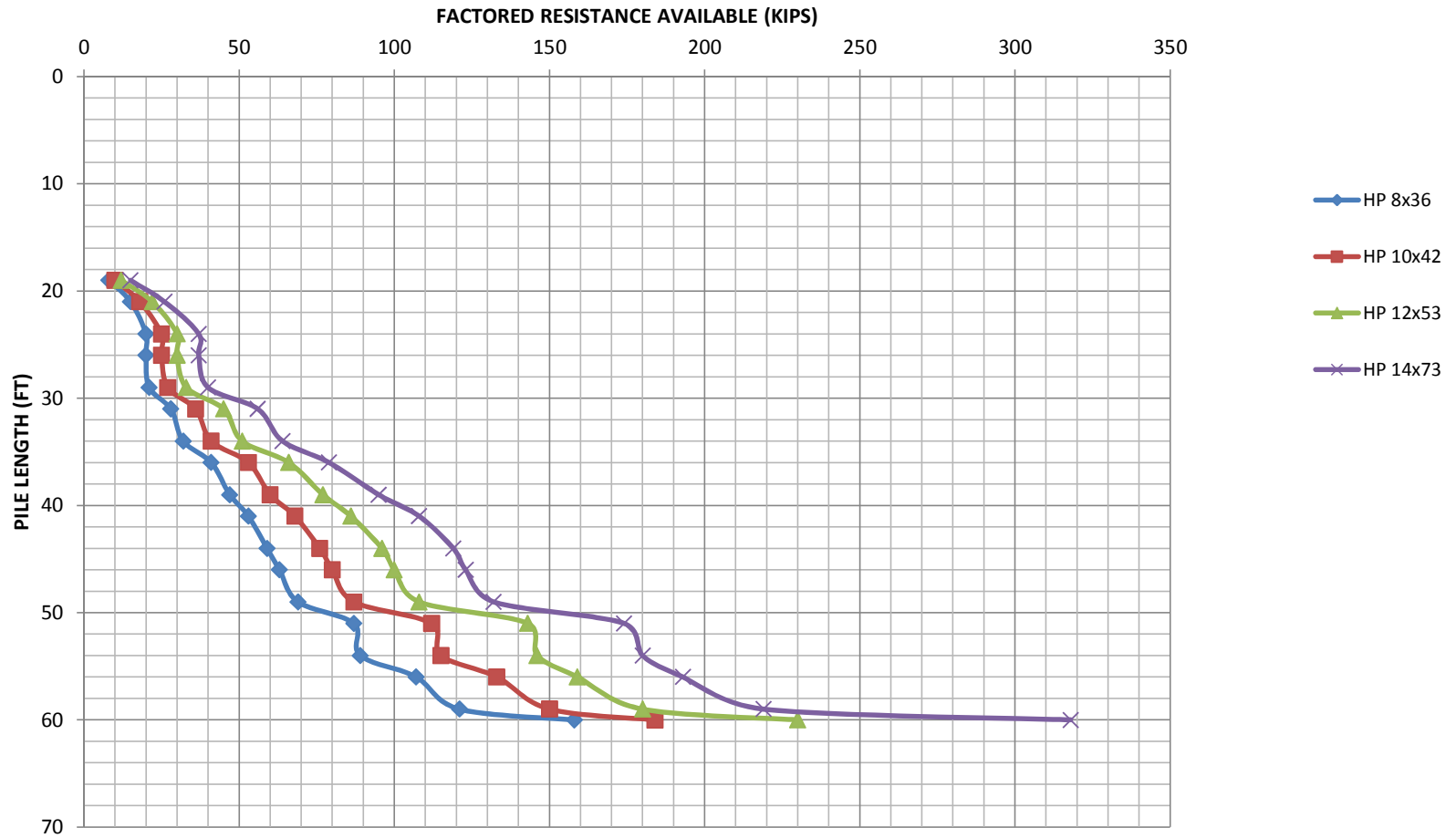
Scour elevations based on 100-year event (approximate elevation 591.2) are also incorporated in the pile calculations.

¹ Metal Shell Pile 12" diameter with 0.179" walls

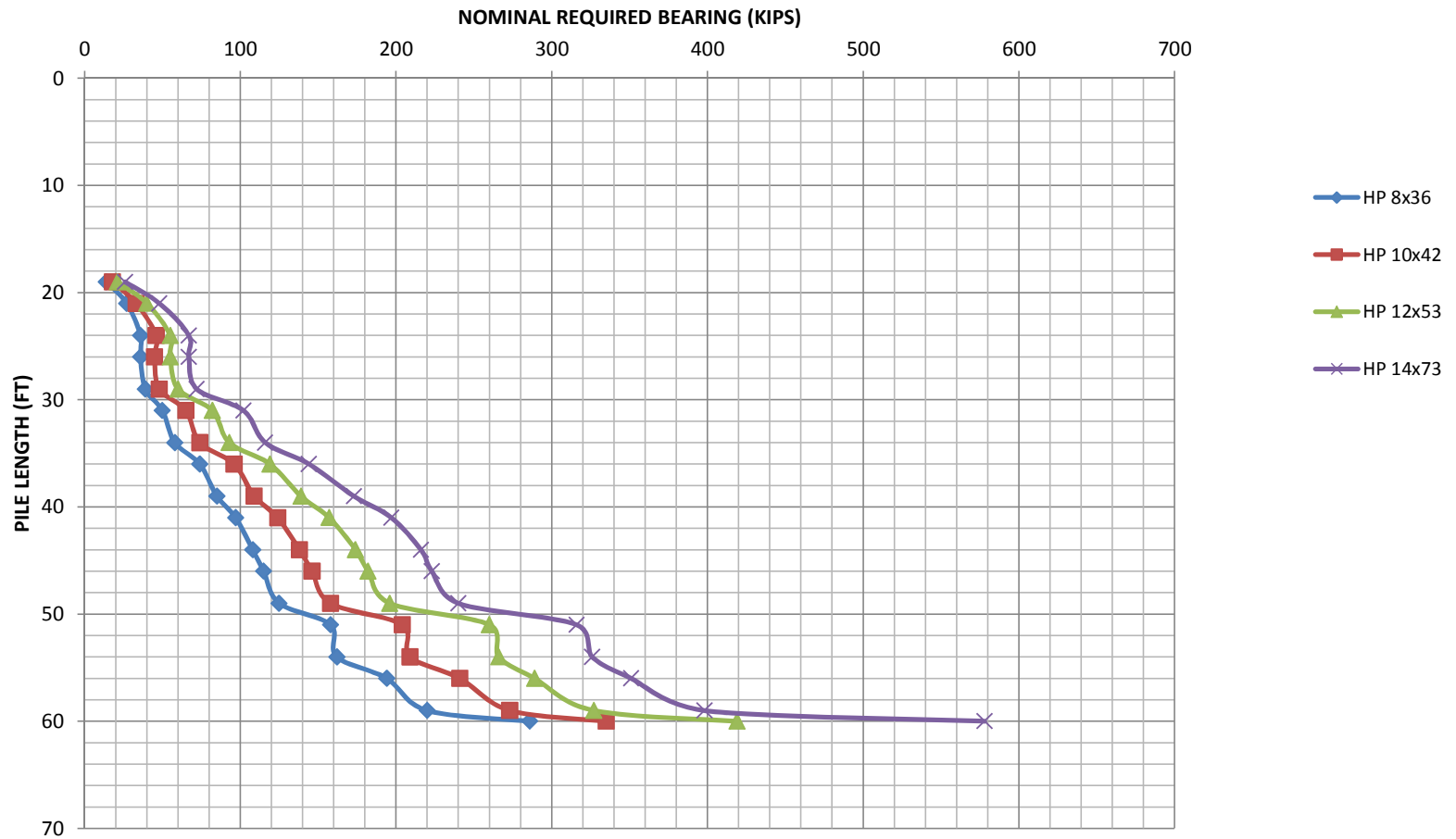
² Metal Shell Pile 14" diameter with 0.250" walls

PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

Boring SB-01 at Pier 2

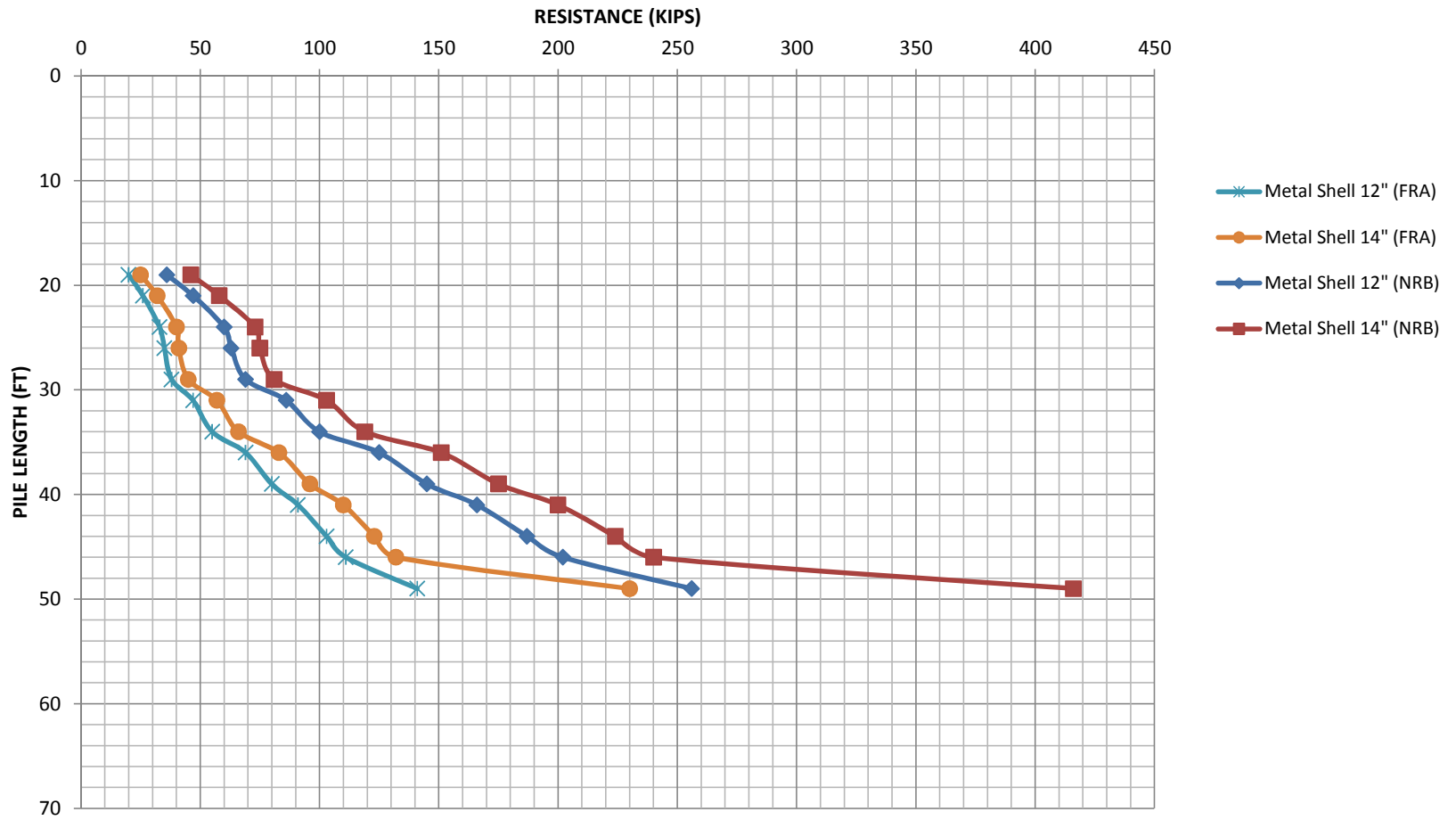


PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH Boring SB-01 at Pier 2



PILE BEARING VS. ESTIMATED PILE LENGTH

Boring SB-01 at Pier 2



Estimated Pile Lengths and Capacities for North Pier/Pier 2

Boring SB-02(Ground Surface Elevation against Pile during driving = 576.5, Pile Cutoff Elevation = 593.40)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 14x73		Metal Shell 12" ¹		Metal Shell 14" ²	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)
19	10	19	13	23	16	28	19	35	26	47	33	60
22	19	34	23	42	28	50	34	61	34	62	43	77
24	26	48	33	59	39	71	47	86	44	80	54	98
27	32	58	42	76	50	92	61	111	54	98	66	119
29	38	68	49	88	62	113	75	136	64	116	77	140
32	41	75	53	96	66	120	82	150	71	130	85	155
34	46	83	58	106	73	133	90	164	80	145	95	173
37	55	100	71	129	90	164	113	205	95	172	114	207
39	62	112	79	144	99	181	124	225	107	194	128	232
42	68	124	87	158	109	198	135	246	118	215	141	257
44	75	137	96	174	120	218	149	270	131	239	157	285
47	80	146	102	185	126	230	155	282	141	256	168	305
49	86	157	109	198	135	246	166	301			229	416
52	120	218	153	279	183	334	222	404				
54	126	229	164	298	196	356	237	431				
57	139	253	176	319	210	382	255	463				
58	157	286	184	335	230	419	268	487				
59							318	578				

Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. Pile lengths in **RED** denotes pile end-bearing at bedrock.

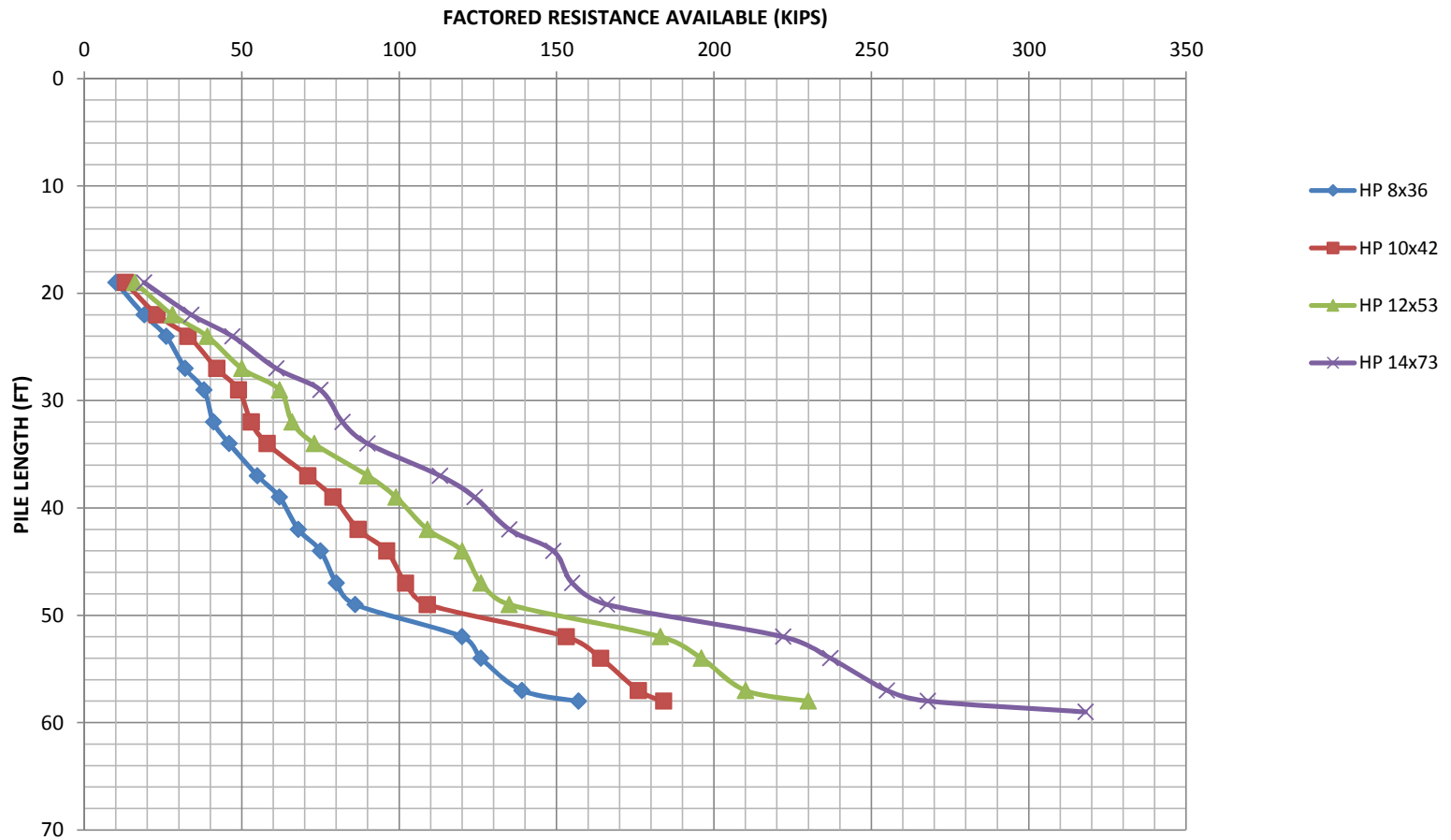
Scour elevations based on 100-year event (approximate elevation 591.2) are also incorporated in the pile calculations.

¹ Metal Shell Pile 12" diameter with 0.179" walls

² Metal Shell Pile 14" diameter with 0.250" walls

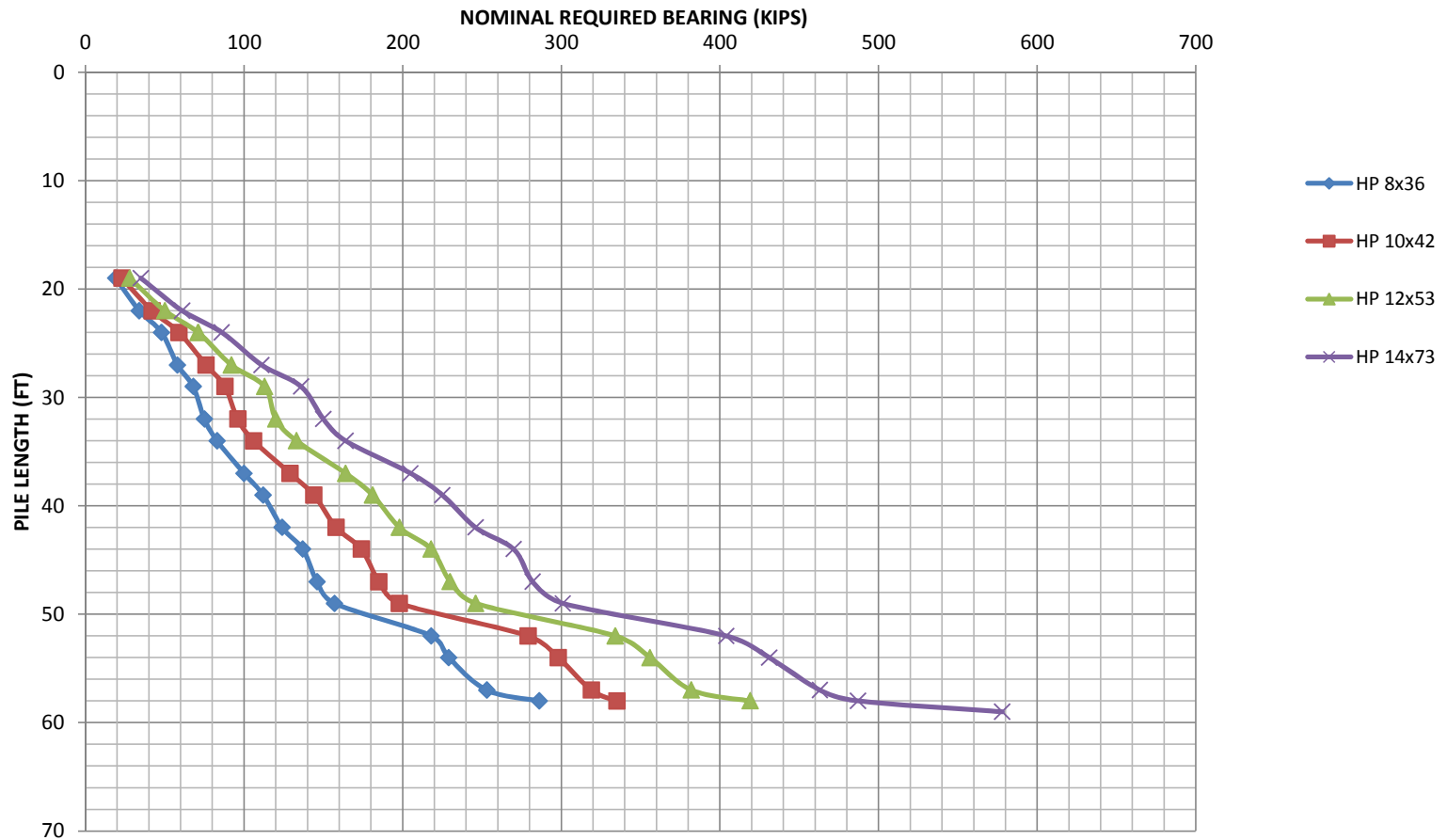
PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

Boring SB-02 at Pier 2



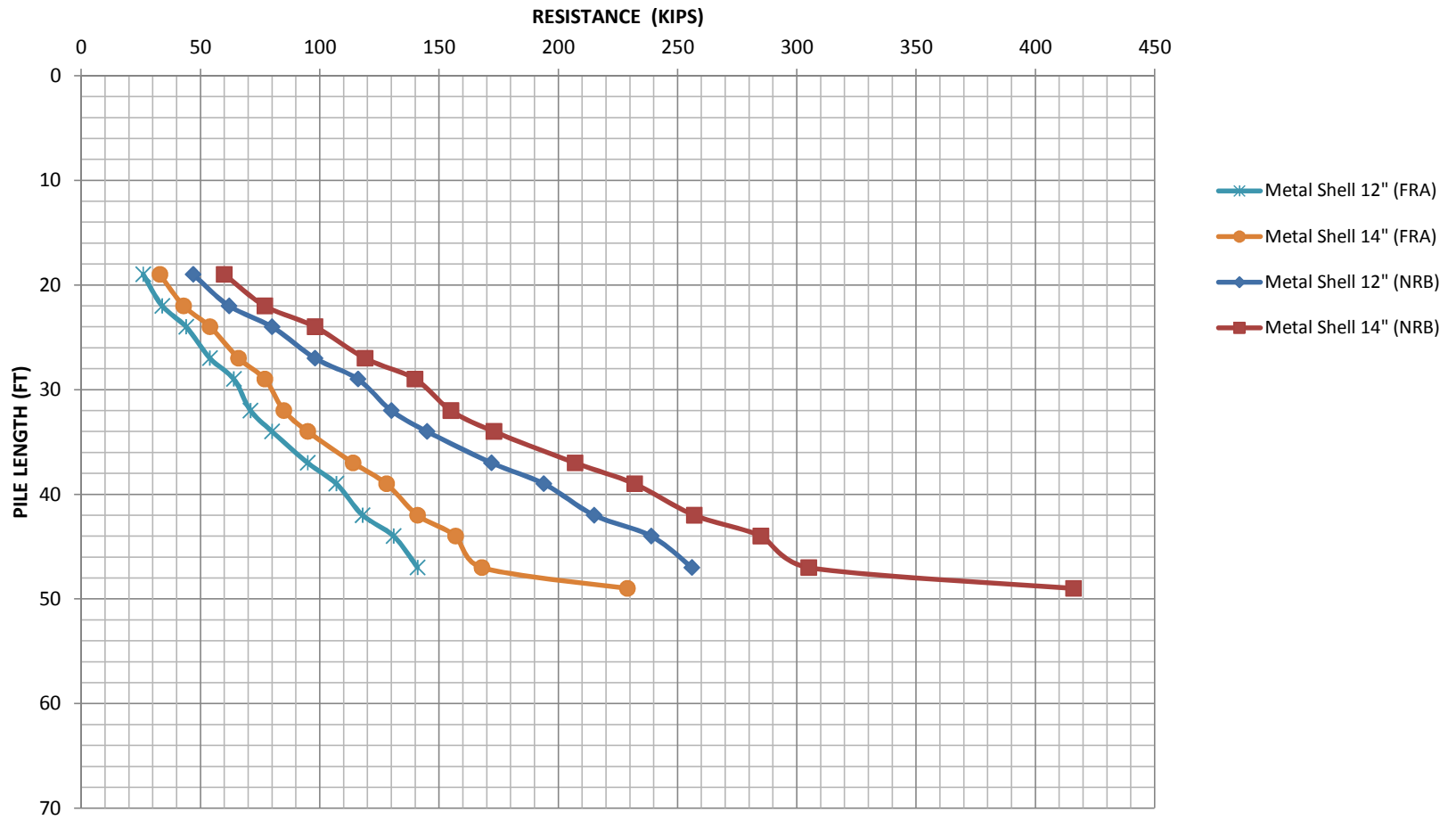
PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

Boring SB-02 at Pier 2



PILE BEARING VS. ESTIMATED PILE LENGTH

Boring SB-02 at Pier 2



IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====North Abutment- West Side

REFERENCE BORING =====SB-01

LRFD or ASD or SEISMIC =====LRFD

PILE CUTOFF ELEV. =====594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)=====ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE =====Steel HP 8 X 36

Plugged Pile Perimeter===== 2.695 FT. Unplugged Pile Perimeter===== 3.892 FT.

Plugged Pile End Bearing Area===== 0.454 SQFT. Unplugged Pile End Bearing Area===== 0.074 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
286 KIPS	286 KIPS	157 KIPS	60 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
589.80	2.70	2.40	20		9.5		28.2	13.8		16.8	17	0	0	9	5
587.30	2.50		22		1.6	18.7	27.3	2.3	3.0	18.7	19	0	0	10	7
584.80	2.50		19	Hard Till	1.4	16.1	14.5	2.0	2.6	18.4	14	0	0	8	10
582.30	2.50	0.30	9		1.6	1.9	23.7	2.4	0.3	22.0	22	0	0	12	12
579.80	2.50	1.50	9		6.5	9.5	31.5	9.4	1.5	31.6	31	0	0	17	15
577.30	2.50	1.70	12		7.1	10.8	48.4	10.2	1.8	43.4	43	0	0	24	17
574.80	2.50	3.25	11		10.9	20.7	53.9	15.8	3.4	58.3	54	0	0	30	20
572.30	2.50	2.40	9		8.8	15.3	58.9	12.7	2.5	70.4	59	0	0	32	22
569.80	2.50	1.80	11		7.3	11.5	66.2	10.6	1.9	81.0	66	0	0	36	25
567.30	2.50	1.80	11		7.3	11.5	65.9	10.6	1.9	90.3	66	0	0	36	27
564.80	2.50	0.60	9		3.1	3.8	69.0	4.5	0.6	94.8	69	0	0	38	30
562.30	2.50	0.60	9		3.1	3.8	80.4	4.5	0.6	100.6	80	0	0	44	32
559.80	2.50	1.90	12		7.6	12.1	88.0	11.0	2.0	111.6	88	0	0	48	35
557.30	2.50	1.90	12		7.6	12.1	104.2	11.0	2.0	123.9	104	0	0	57	37
554.80	2.50	3.25	18		10.9	20.7	115.1	15.8	3.4	139.7	115	0	0	63	40
552.30	2.50	3.25	18		10.9	20.7	127.0	15.8	3.4	155.6	127	0	0	70	42
549.80	2.50	3.40	19		11.3	21.6	138.3	16.3	3.5	171.9	138	0	0	76	45
547.30	2.50	3.40	19		11.3	21.6	145.4	16.3	3.5	187.6	145	0	0	80	47
544.80	2.50	2.75	18		9.7	17.5	155.1	14.0	2.8	201.6	155	0	0	85	50
542.30	2.50	2.75	18		9.7	17.5	188.0	14.0	2.8	219.3	188	0	0	103	52
539.80	2.50		48	Hard Till	4.0	40.7	192.0	5.8	6.6	225.1	192	0	0	106	55
537.30	2.50		48	Hard Till	4.0	40.7	240.2	5.8	6.6	238.1	238	0	0	131	57
535.30	2.00		100	Hard Till	11.6	84.8	280.1	16.8	13.8	259.5	259	0	0	143	59
534.80	0.50			Limestone	33.6	113.1	313.6	48.5	18.3	307.9	308	0	0	169	59.7
534.30	0.50			Limestone	33.6	113.1	347.2	48.5	18.3	356.4	347	0	0	194	60.2
533.80	0.50			Limestone	33.6	113.1	380.8	48.5	18.3	404.9	384	0	0	209	60.7
533.30	0.50			Limestone		113.1			18.3						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====North Abutment- West Side

REFERENCE BORING =====SB-01

LRFD or ASD or SEISMIC =====LRFD

PILE CUTOFF ELEV. =====594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)=====ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE =====Steel HP 10 X 42

Plugged Pile Perimeter===== 3.300 FT. Unplugged Pile Perimeter===== 4.858 FT.

Plugged Pile End Bearing Area===== 0.680 SQFT. Unplugged Pile End Bearing Area===== 0.086 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	335 KIPS	184 KIPS	60 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
589.80	2.70	2.40	20		11.7		34.9	17.2		20.1	20	0	0	11	5
587.30	2.50		22	Hard Till	2.0	23.3	37.8	2.9	2.9	23.2	23	0	0	13	7
584.80	2.50		19	Hard Till	1.7	24.2	18.2	2.5	3.1	23.0	18	0	0	10	10
582.30	2.50	0.30	9		2.0	2.9	31.7	2.9	0.4	27.4	27	0	0	15	12
579.80	2.50	1.50	9		7.9	14.3	41.5	11.7	1.8	39.3	39	0	0	22	15
577.30	2.50	1.70	12		8.6	16.2	64.9	12.7	2.1	53.9	54	0	0	30	17
574.80	2.50	3.25	11		13.4	31.0	70.2	19.7	3.9	72.5	70	0	0	39	20
572.30	2.50	2.40	9		10.8	22.9	75.3	15.9	2.9	87.7	75	0	0	41	22
569.80	2.50	1.80	11		9.0	17.2	84.3	13.2	2.2	100.9	84	0	0	46	25
567.30	2.50	1.80	11		9.0	17.2	81.8	13.2	2.2	112.7	82	0	0	45	27
564.80	2.50	0.60	9		3.8	5.7	85.6	5.6	0.7	118.3	86	0	0	47	30
562.30	2.50	0.60	9		3.8	5.7	101.8	5.6	0.7	125.4	102	0	0	56	32
559.80	2.50	1.90	12		9.3	18.1	111.1	13.7	2.3	139.1	111	0	0	61	35
557.30	2.50	1.90	12		9.3	18.1	133.2	13.7	2.3	154.4	133	0	0	73	37
554.80	2.50	3.25	18		13.4	31.0	146.6	19.7	3.9	174.1	147	0	0	81	40
552.30	2.50	3.25	18		13.4	31.0	161.4	19.7	3.9	194.0	161	0	0	89	42
549.80	2.50	3.40	19		13.8	32.4	175.2	20.4	4.1	214.4	175	0	0	96	45
547.30	2.50	3.40	19		13.8	32.4	182.9	20.4	4.1	233.9	183	0	0	101	47
544.80	2.50	2.75	18		11.9	26.2	194.7	17.5	3.3	251.4	195	0	0	107	50
542.30	2.50	2.75	18		11.9	26.2	241.4	17.5	3.3	273.3	241	0	0	133	52
539.80	2.50		48	Hard Till	4.9	61.0	246.3	7.3	7.7	280.5	246	0	0	135	55
537.30	2.50		48	Hard Till	4.9	61.0	317.4	7.3	7.7	296.2	296	0	0	163	57
535.30	2.00		100	Hard Till	14.2	127.1	374.0	20.9	16.1	322.5	322	0	0	177	59
534.80	0.50			Limestone	41.1	169.5	415.1	60.5	21.5	383.0	383	0	0	211	59.7
534.30	0.50			Limestone	41.1	169.5	456.2	60.5	21.5	443.5	444	0	0	244	60.2
533.80	0.50			Limestone	41.1	169.5	497.3	60.5	21.5	504.0	497	0	0	274	60.7
533.30	0.50			Limestone		169.5			21.5						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====North Abutment- West Side

REFERENCE BORING =====SB-01

LRFD or ASD or SEISMIC =====LRFD

PILE CUTOFF ELEV. =====594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)=====ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE =====Steel HP 12 X 53

Plugged Pile Perimeter===== 3.967 FT. Unplugged Pile Perimeter===== 5.800 FT.

Plugged Pile End Bearing Area===== 0.983 SQFT. Unplugged Pile End Bearing Area===== 0.108 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	418 KIPS	230 KIPS	60 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
589.80	2.70	2.40	20		14.0		42.1	20.5		23.6	24	0	0	13	5
587.30	2.50		22	Hard Till	2.4	28.0	51.3	3.5	3.1	27.8	28	0	0	15	7
584.80	2.50		19	Hard Till	2.1	34.9	22.6	3.0	3.8	27.5	23	0	0	12	10
582.30	2.50	0.30	9		2.4	4.1	41.5	3.5	0.5	32.8	33	0	0	18	12
579.80	2.50	1.50	9		9.5	20.7	53.8	13.9	2.3	47.0	47	0	0	26	15
577.30	2.50	1.70	12		10.4	23.4	85.6	15.2	2.6	64.5	65	0	0	35	17
574.80	2.50	3.25	11		16.1	44.8	89.9	23.5	4.9	86.8	87	0	0	48	20
572.30	2.50	2.40	9		13.0	33.1	94.7	19.0	3.6	104.9	95	0	0	52	22
569.80	2.50	1.80	11		10.8	24.8	105.5	15.8	2.7	120.6	105	0	0	58	25
567.30	2.50	1.80	11		10.8	24.8	99.7	15.8	2.7	134.6	100	0	0	55	27
564.80	2.50	0.60	9		4.6	8.3	104.3	6.7	0.9	141.3	104	0	0	57	30
562.30	2.50	0.60	9		4.6	8.3	126.7	6.7	0.9	149.9	127	0	0	70	32
559.80	2.50	1.90	12		11.2	26.2	137.9	16.3	2.9	166.2	138	0	0	76	35
557.30	2.50	1.90	12		11.2	26.2	167.7	16.3	2.9	184.6	168	0	0	92	37
554.80	2.50	3.25	18		16.1	44.8	183.8	23.5	4.9	208.1	184	0	0	101	40
552.30	2.50	3.25	18		16.1	44.8	201.9	23.5	4.9	231.8	202	0	0	111	42
549.80	2.50	3.40	19		16.6	46.9	218.5	24.3	5.1	256.1	219	0	0	120	45
547.30	2.50	3.40	19		16.6	46.9	226.2	24.3	5.1	279.5	226	0	0	124	47
544.80	2.50	2.75	18		14.3	37.9	240.5	20.9	4.1	300.3	240	0	0	132	50
542.30	2.50	2.75	18		14.3	37.9	305.0	20.9	4.1	326.7	305	0	0	168	52
539.80	2.50		48	Hard Till	5.9	88.2	310.9	8.7	9.7	335.3	311	0	0	171	55
537.30	2.50		48	Hard Till	5.9	88.2	412.4	8.7	9.7	354.5	354	0	0	195	57
535.30	2.00		100	Hard Till	17.1	183.7	490.8	25.0	20.1	386.2	386	0	0	212	59
534.80	0.50			Limestone	49.4	245.0	540.2	72.3	26.8	458.4	458	0	0	262	60.7
534.30	0.50			Limestone	49.4	245.0	589.6	72.3	26.8	530.7	534	0	0	292	60.2
533.80	0.50			Limestone	49.4	245.0	639.0	72.3	26.8	602.9	603	0	0	332	60.7
533.30	0.50			Limestone		245.0			26.8						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====North Abutment- West Side

REFERENCE BORING =====SB-01

LRFD or ASD or SEISMIC =====LRFD

PILE CUTOFF ELEV. =====594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)=====ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE =====Steel HP 14 X 73

Plugged Pile Perimeter===== 4.700 FT. Unplugged Pile Perimeter===== 6.975 FT.

Plugged Pile End Bearing Area===== 1.379 SQFT. Unplugged Pile End Bearing Area===== 0.149 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	578 KIPS	318 KIPS	60 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
589.80	2.70	2.40	20		16.6		50.3	24.7		28.3	28	0	0	16	5
587.30	2.50		22	Hard Till	2.8	33.7	62.5	4.2	3.6	33.5	34	0	0	18	7
584.80	2.50		19	Hard Till	2.4	43.1	27.7	3.6	4.6	33.1	28	0	0	15	10
582.30	2.50	0.30	9		2.8	5.8	53.7	4.2	0.6	39.8	40	0	0	22	12
579.80	2.50	1.50	9		11.3	29.0	68.9	16.8	3.1	57.0	57	0	0	31	15
577.30	2.50	1.70	12		12.3	32.9	111.1	18.3	3.5	78.5	78	0	0	43	17
574.80	2.50	3.25	11		19.1	62.8	113.8	28.3	6.8	105.0	105	0	0	58	20
572.30	2.50	2.40	9		15.4	46.4	117.6	22.8	5.0	126.6	118	0	0	65	22
569.80	2.50	1.80	11		12.8	34.8	130.3	19.0	3.7	145.6	130	0	0	72	25
567.30	2.50	1.80	11		12.8	34.8	119.9	19.0	3.7	162.0	120	0	0	66	27
564.80	2.50	0.60	9		5.4	11.6	125.3	8.0	1.2	170.0	125	0	0	69	30
562.30	2.50	0.60	9		5.4	11.6	155.8	8.0	1.2	180.8	156	0	0	86	32
559.80	2.50	1.90	12		13.2	36.7	169.1	19.6	4.0	200.4	169	0	0	93	35
557.30	2.50	1.90	12		13.2	36.7	208.4	19.6	4.0	222.9	208	0	0	115	37
554.80	2.50	3.25	18		19.1	62.8	227.5	28.3	6.8	251.1	227	0	0	125	40
552.30	2.50	3.25	18		19.1	62.8	249.4	28.3	6.8	279.7	249	0	0	137	42
549.80	2.50	3.40	19		19.7	65.7	269.1	29.2	7.1	308.9	269	0	0	148	45
547.30	2.50	3.40	19		19.7	65.7	276.2	29.2	7.1	336.8	276	0	0	152	47
544.80	2.50	2.75	18		16.9	53.1	293.1	25.1	5.7	361.9	293	0	0	161	50
542.30	2.50	2.75	18		16.9	53.1	380.6	25.1	5.7	394.6	381	0	0	209	52
539.80	2.50		48	Hard Till	7.0	123.7	387.6	10.4	13.3	405.0	388	0	0	213	55
537.30	2.50		48	Hard Till	7.0	123.7	528.6	10.4	13.3	429.9	430	0	0	236	57
535.30	2.00		100	Hard Till	20.3	257.7	634.7	30.1	27.8	469.2	469	0	0	258	59
534.80	0.50			Limestone	58.5	343.5	693.3	86.9	37.0	556.1	556	0	0	306	59.7
534.30	0.50			Limestone	58.5	343.5	751.8	86.9	37.0	643.0	643	0	0	354	60.2
533.80	0.50			Limestone	58.5	343.5	810.4	86.9	37.0	729.9	730	0	0	404	60.7
533.30	0.50			Limestone		343.5			37.0						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====North Abutment- West Side
 REFERENCE BORING =====SB-01
 LRFD or ASD or SEISMIC =====LRFD
 PILE CUTOFF ELEV. =====594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
254 KIPS	254 KIPS	140 KIPS	45 FT.

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

PILE TYPE AND SIZE =====Metal Shell 12"Φ w/.179" walls
 Pile Perimeter===== 3.142 FT.
 Pile End Bearing Area===== 0.785 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
589.80	2.70	2.40	20		17.4		74.0	74	0	0	41	5
587.30	2.50		22	Hard Till	9.5	56.6	97.4	97	0	0	54	7
584.80	2.50		19	Hard Till	8.2	70.5	37.7	38	0	0	21	10
582.30	2.50	0.30	9		3.0	2.6	51.0	51	0	0	28	12
579.80	2.50	1.50	9		11.8	12.9	64.6	65	0	0	36	15
577.30	2.50	1.70	12		12.9	14.6	90.8	91	0	0	50	17
574.80	2.50	3.25	11		19.9	28.0	103.4	103	0	0	57	20
572.30	2.50	2.40	9		16.1	20.7	114.4	114	0	0	63	22
569.80	2.50	1.80	11		13.4	15.5	127.7	128	0	0	70	25
567.30	2.50	1.80	11		13.4	15.5	130.8	131	0	0	72	27
564.80	2.50	0.60	9		5.6	5.2	136.4	136	0	0	75	30
562.30	2.50	0.60	9		5.6	5.2	153.3	153	0	0	84	32
559.80	2.50	1.90	12		13.9	16.4	167.1	167	0	0	92	35
557.30	2.50	1.90	12		13.9	16.4	192.6	193	0	0	106	37
554.80	2.50	3.25	18		19.9	28.0	212.5	213	0	0	117	40
552.30	2.50	3.25	18		19.9	28.0	233.8	234	0	0	129	42
549.80	2.50	3.40	19		20.6	29.3	254.4	254	0	0	140	45
547.30	2.50	3.40	19		20.6	29.3	269.4	269	0	0	148	47
544.80	2.50	2.75	18		17.7	23.7	287.1	287	0	0	158	50
542.30	2.50	2.75	18		17.7	23.7	459.0	459	0	0	252	52
539.80	2.50		48	Hard Till	23.7	178.0	482.7	483	0	0	266	55
537.30	2.50		48	Hard Till	23.7	178.0	699.3	699	0	0	385	57
535.30	2.00		100	Hard Till	68.4	370.8	891.3	891	0	0	490	59
534.80	0.50			Limestone	197.8	494.4	1089.1	1089	0	0	599	59.7
534.30	0.50			Limestone	197.8	494.4	1286.8	1287	0	0	708	60.2
533.80	0.50			Limestone	197.8	494.4	1484.6	1485	0	0	817	60.7
533.30	0.50			Limestone		494.4						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====North Abutment- West Side

REFERENCE BORING =====SB-01

LRFD or ASD or SEISMIC =====LRFD

PILE CUTOFF ELEV. =====594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	339 KIPS	187 KIPS	50 FT.

TOTAL FACTORED SUBSTRUCTURE LOAD =====kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)=====ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE =====Metal Shell 14"Φ w/.25" walls

Pile Perimeter===== 3.665 FT.

Pile End Bearing Area===== 1.069 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
589.80	2.70	2.40	20		20.3		86.3	86	0	0	47	5
587.30	2.50		22		11.1	66.0	115.8	116	0	0	64	7
584.80	2.50		19	Hard Till	9.6	84.4	44.5	45	0	0	24	10
582.30	2.50	0.30	9		3.5	3.5	62.1	62	0	0	34	12
579.80	2.50	1.50	9		13.8	17.6	78.2	78	0	0	43	15
577.30	2.50	1.70	12		15.0	19.9	111.4	111	0	0	61	17
574.80	2.50	3.25	11		23.3	38.1	124.7	125	0	0	69	20
572.30	2.50	2.40	9		18.8	28.1	136.4	136	0	0	75	22
569.80	2.50	1.80	11		15.6	21.1	152.0	152	0	0	84	25
567.30	2.50	1.80	11		15.6	21.1	153.6	154	0	0	84	27
564.80	2.50	0.60	9		6.6	7.0	160.2	160	0	0	88	30
562.30	2.50	0.60	9		6.6	7.0	182.0	182	0	0	100	32
559.80	2.50	1.90	12		16.2	22.3	198.1	198	0	0	109	35
557.30	2.50	1.90	12		16.2	22.3	230.1	230	0	0	127	37
554.80	2.50	3.25	18		23.3	38.1	253.4	253	0	0	139	40
552.30	2.50	3.25	18		23.3	38.1	278.4	278	0	0	153	42
549.80	2.50	3.40	19		24.0	39.9	302.4	302	0	0	166	45
547.30	2.50	3.40	19		24.0	39.9	318.9	319	0	0	175	47
544.80	2.50	2.75	18		20.6	32.2	339.5	339	0	0	187	50
542.30	2.50	2.75	18		20.6	32.2	570.1	570	0	0	314	52
539.80	2.50		48	Hard Till	27.7	242.3	597.8	598	0	0	329	55
537.30	2.50		48	Hard Till	27.7	242.3	887.9	888	0	0	488	57
535.30	2.00		100	Hard Till	79.8	504.7	1136.0	1136	0	0	625	59
534.80	0.50			Limestone	230.7	672.9	1366.7	1367	0	0	762	60.7
534.30	0.50			Limestone	230.7	672.9	1597.4	1597	0	0	879	60.2
533.80	0.50			Limestone	230.7	672.9	1828.2	1828	0	0	1005	60.7
533.30	0.50			Limestone		672.9						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====North Abutment- East Side

REFERENCE BORING =====SB-02

LRFD or ASD or SEISMIC =====LRFD

PILE CUTOFF ELEV. =====594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)=====ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE =====Steel HP 8 X 36

Plugged Pile Perimeter===== 2.695 FT. Unplugged Pile Perimeter===== 3.892 FT.

Plugged Pile End Bearing Area===== 0.454 SQFT. Unplugged Pile End Bearing Area===== 0.074 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
286 KIPS	268 KIPS	147 KIPS	55 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
589.90	2.60	1.00			5.0		29.6	7.2		11.2	11	0	0	6	5
587.40	2.50		29	Hard Till	2.1	24.6	22.4	3.1	4.0	12.7	13	0	0	7	7
584.90	2.50		18	Hard Till	1.3	15.3	20.5	1.9	2.5	14.1	14	0	0	8	10
582.40	2.50	1.90	15		7.6	12.1	31.9	11.0	2.0	25.7	26	0	0	14	12
579.90	2.50	2.50	19		9.1	15.9	53.1	13.1	2.6	40.8	41	0	0	22	15
577.40	2.50	4.40	26		13.8	28.0	59.5	19.9	4.5	59.5	59	0	0	33	17
574.90	2.50	3.25	25		10.9	20.7	69.5	15.8	3.4	75.1	69	0	0	38	20
572.40	2.50	3.10	25		10.6	19.7	77.5	15.2	3.2	89.9	78	0	0	43	22
569.90	2.50	2.70	19		9.6	17.2	87.1	13.8	2.8	103.7	87	0	0	48	25
567.40	2.50	2.70	19		9.6	17.2	97.3	13.8	2.8	117.6	97	0	0	54	27
564.90	2.50	2.80	19		9.8	17.8	107.1	14.2	2.9	131.8	107	0	0	59	30
562.40	2.50	2.80	19		9.8	17.8	113.7	14.2	2.9	145.5	114	0	0	63	32
559.90	2.50	2.30	17		8.6	14.6	122.3	12.4	2.4	157.9	122	0	0	67	35
557.40	2.50	2.30	17		8.6	14.6	139.2	12.4	2.4	171.6	139	0	0	77	37
554.90	2.50	3.60	25		11.8	22.9	150.9	17.0	3.7	188.6	151	0	0	83	40
552.40	2.50	3.60	25		11.8	22.9	162.7	17.0	3.7	205.6	163	0	0	90	42
549.90	2.50	3.60	28		11.8	22.9	175.8	17.0	3.7	222.9	176	0	0	97	45
547.40	2.50	3.80	28		12.3	24.2	184.9	17.7	3.9	240.1	185	0	0	102	47
544.90	2.50	3.30	30		11.0	21.0	195.9	16.0	3.4	256.0	196	0	0	108	50
542.40	2.50	3.30	30		11.0	21.0	257.2	16.0	3.4	280.1	257	0	0	141	52
539.90	2.50		84	Hard Till	10.5	71.2	267.7	15.1	11.6	295.3	268	0	0	147	55
537.40	2.50		84	Hard Till	10.5	71.2	291.8	15.1	11.6	312.6	292	0	0	160	57
535.40	2.00		100	Hard Till	11.6	84.8	331.6	16.8	13.8	333.9	332	0	0	182	59
534.90	0.50			Limestone	33.6	113.1	365.2	48.5	18.3	382.4	365	0	0	204	59.6
534.40	0.50			Limestone		113.1			18.3						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====North Abutment- East Side

REFERENCE BORING =====SB-02

LRFD or ASD or SEISMIC =====LRFD

PILE CUTOFF ELEV. =====594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)=====ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE ===== Steel HP 10 X 42

Plugged Pile Perimeter===== 3.300 FT. Unplugged Pile Perimeter===== 4.858 FT.

Plugged Pile End Bearing Area===== 0.680 SQFT. Unplugged Pile End Bearing Area===== 0.086 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	335 KIPS	184 KIPS	52 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED LOSS FROM SCOUR or DD (KIPS)	FACTORED LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
589.90	2.60	1.00			6.1		36.2	9.0		12.8	13	0	0	7	5
587.40	2.50		29	Hard Till	2.6	30.1	31.6	3.8	3.8	15.7	16	0	0	9	7
584.90	2.50		18	Hard Till	1.6	22.9	28.4	2.4	2.9	17.5	17	0	0	10	10
582.40	2.50	1.90	15		9.3	18.1	43.5	13.7	2.3	31.9	32	0	0	18	12
579.90	2.50	2.50	19		11.1	23.8	72.7	16.4	3.0	50.6	51	0	0	28	15
577.40	2.50	4.40	26		16.8	42.0	78.6	24.8	5.3	74.0	74	0	0	41	17
574.90	2.50	3.25	25		13.4	31.0	90.5	19.7	3.9	93.5	91	0	0	50	20
572.40	2.50	3.10	25		12.9	29.6	99.6	19.0	3.7	112.0	100	0	0	55	22
569.90	2.50	2.70	19		11.7	25.7	111.3	17.2	3.3	129.3	111	0	0	61	25
567.40	2.50	2.70	19		11.7	25.7	124.0	17.2	3.3	146.6	124	0	0	68	27
564.90	2.50	2.80	19		12.0	26.7	136.0	17.7	3.4	164.3	136	0	0	75	30
562.40	2.50	2.80	19		12.0	26.7	143.3	17.7	3.4	181.4	143	0	0	79	32
559.90	2.50	2.30	17		10.5	21.9	153.8	15.5	2.8	196.9	154	0	0	85	35
557.40	2.50	2.30	17		10.5	21.9	176.7	15.5	2.8	213.9	177	0	0	97	37
554.90	2.50	3.60	25		14.4	34.3	191.1	21.2	4.3	235.2	191	0	0	105	40
552.40	2.50	3.60	25		14.4	34.3	205.6	21.2	4.3	256.4	206	0	0	113	42
549.90	2.50	3.60	28		14.4	34.3	221.9	21.2	4.3	277.9	222	0	0	122	45
547.40	2.50	3.80	28		15.0	36.2	232.2	22.1	4.6	299.5	232	0	0	128	47
544.90	2.50	3.30	30		13.5	31.5	245.7	19.9	4.0	319.4	246	0	0	135	50
542.40	2.50	3.30	30		13.5	31.5	334.5	19.9	4.0	348.8	335	0	0	184	52
539.90	2.50		84	Hard Till	12.8	106.8	347.4	18.9	13.5	367.7	347	0	0	191	55
537.40	2.50		84	Hard Till	12.8	106.8	380.5	18.9	13.5	389.1	381	0	0	209	57
535.40	2.00		100	Hard Till	14.2	127.1	437.1	20.9	16.1	415.4	445	0	0	228	59
534.90	0.50			Limestone	41.1	169.5	478.2	60.5	21.5	476.0	476	0	0	262	59.6
534.40	0.50			Limestone		169.5			21.5						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====North Abutment- East Side

REFERENCE BORING =====SB-02

LRFD or ASD or SEISMIC ===== LRFD

PILE CUTOFF ELEV. ===== 594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)=====ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE ===== Steel HP 12 X 53

Plugged Pile Perimeter===== 3.967 FT. Unplugged Pile Perimeter===== 5.800 FT.

Plugged Pile End Bearing Area===== 0.983 SQFT. Unplugged Pile End Bearing Area===== 0.108 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	417 KIPS	229 KIPS	52 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED LOSS FROM SCOUR or DD (KIPS)	FACTORED LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
589.90	2.60	1.00			7.3		43.6	10.7		14.7	15	0	0	8	5
587.40	2.50		29	Hard Till	3.1	36.2	43.5	4.6	4.0	18.9	19	0	0	10	7
584.90	2.50		18	Hard Till	1.9	33.1	38.6	2.8	3.6	21.0	21	0	0	12	10
582.40	2.50	1.90	15		11.2	26.2	58.0	16.3	2.9	38.2	38	0	0	21	12
579.90	2.50	2.50	19		13.4	34.5	97.6	19.5	3.8	60.6	61	0	0	33	15
577.40	2.50	4.40	26		20.3	60.6	102.0	29.6	6.6	88.5	89	0	0	49	17
574.90	2.50	3.25	25		16.1	44.8	116.0	23.5	4.9	111.8	112	0	0	61	20
572.40	2.50	3.10	25		15.5	42.7	126.0	22.7	4.7	133.9	126	0	0	69	22
569.90	2.50	2.70	19		14.1	37.2	140.1	20.6	4.1	154.5	140	0	0	77	25
567.40	2.50	2.70	19		14.1	37.2	155.6	20.6	4.1	175.3	156	0	0	86	27
564.90	2.50	2.80	19		14.4	38.6	170.0	21.1	4.2	196.4	170	0	0	93	30
562.40	2.50	2.80	19		14.4	38.6	177.6	21.1	4.2	216.7	178	0	0	98	32
559.90	2.50	2.30	17		12.6	31.7	190.2	18.5	3.5	235.2	190	0	0	105	35
557.40	2.50	2.30	17		12.6	31.7	220.7	18.5	3.5	255.6	221	0	0	121	37
554.90	2.50	3.60	25		17.3	49.6	238.1	25.4	5.4	281.0	238	0	0	131	40
552.40	2.50	3.60	25		17.3	49.6	255.4	25.4	5.4	306.4	255	0	0	140	42
549.90	2.50	3.60	28		17.3	49.6	275.5	25.4	5.4	332.0	276	0	0	152	45
547.40	2.50	3.80	28		18.1	52.4	286.7	26.4	5.7	357.7	287	0	0	158	47
544.90	2.50	3.30	30		16.3	45.5	303.0	23.8	5.0	381.5	303	0	0	167	50
542.40	2.50	3.30	30		16.3	45.5	428.1	23.8	5.0	417.2	417	0	0	229	52
539.90	2.50		84	Hard Till	15.4	154.3	443.5	22.5	16.9	439.7	449	0	0	242	55
537.40	2.50		84	Hard Till	15.4	154.3	488.3	22.5	16.9	465.5	465	0	0	256	57
535.40	2.00		100	Hard Till	17.1	183.7	566.7	25.0	20.1	497.2	497	0	0	273	59
534.90	0.50			Limestone	49.4	245.0	616.1	72.3	26.8	569.4	569	0	0	313	59.6
534.40	0.50			Limestone		245.0			26.8						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====North Abutment- East Side

REFERENCE BORING =====SB-02

LRFD or ASD or SEISMIC =====LRFD

PILE CUTOFF ELEV. =====594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)=====ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE =====Steel HP 14 X 73

Plugged Pile Perimeter===== 4.700 FT. Unplugged Pile Perimeter===== 6.975 FT.

Plugged Pile End Bearing Area===== 1.379 SQFT. Unplugged Pile End Bearing Area===== 0.149 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	578 KIPS	318 KIPS	59 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
589.90	2.60	1.00			8.7		52.2	12.9		17.6	18	0	0	10	5
587.40	2.50		29	Hard Till	3.7	43.6	52.7	5.5	4.7	22.7	23	0	0	13	7
584.90	2.50		18	Hard Till	2.3	40.3	51.4	3.4	4.3	25.8	26	0	0	14	10
582.40	2.50	1.90	15		13.2	36.7	76.3	19.6	4.0	46.7	47	0	0	26	12
579.90	2.50	2.50	19		15.8	48.3	128.8	23.5	5.2	74.1	74	0	0	41	15
577.40	2.50	4.40	26		24.0	85.0	130.6	35.6	9.2	107.3	107	0	0	59	17
574.90	2.50	3.25	25		19.1	62.8	146.7	28.3	6.8	135.3	135	0	0	74	20
572.40	2.50	3.10	25		18.4	59.9	157.4	27.3	6.5	161.8	157	0	0	87	22
569.90	2.50	2.70	19		16.7	52.2	174.1	24.8	5.6	186.5	174	0	0	96	25
567.40	2.50	2.70	19		16.7	52.2	192.7	24.8	5.6	211.5	193	0	0	106	27
564.90	2.50	2.80	19		17.1	54.1	209.8	25.4	5.8	236.9	210	0	0	115	30
562.40	2.50	2.80	19		17.1	54.1	217.3	25.4	5.8	261.3	217	0	0	119	32
559.90	2.50	2.30	17		15.0	44.4	232.2	22.2	4.8	283.5	232	0	0	128	35
557.40	2.50	2.30	17		15.0	44.4	272.3	22.2	4.8	308.4	272	0	0	150	37
554.90	2.50	3.60	25		20.6	69.6	292.9	30.5	7.5	338.9	293	0	0	161	40
552.40	2.50	3.60	25		20.6	69.6	313.4	30.5	7.5	369.4	313	0	0	172	42
549.90	2.50	3.60	28		20.6	69.6	337.9	30.5	7.5	400.3	338	0	0	186	45
547.40	2.50	3.80	28		21.4	73.4	349.6	31.8	7.9	431.1	350	0	0	192	47
544.90	2.50	3.30	30		19.3	63.8	368.9	28.6	6.9	459.7	369	0	0	203	50
542.40	2.50	3.30	30		19.3	63.8	540.8	28.6	6.9	504.7	505	0	0	278	52
539.90	2.50		84	Hard Till	18.3	216.4	559.1	27.1	23.3	531.8	532	0	0	292	55
537.40	2.50		84	Hard Till	18.3	216.4	618.6	27.1	23.3	563.4	563	0	0	310	57
535.40	2.00		100	Hard Till	20.3	257.7	724.7	30.1	27.8	602.7	603	0	0	334	59
534.90	0.50			Limestone	58.5	343.5	783.2	86.9	37.0	689.6	690	0	0	379	59.6
534.40	0.50			Limestone		343.5			37.0						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====North Abutment- East Side
 REFERENCE BORING =====SB-02
 LRFD or ASD or SEISMIC =====LRFD
 PILE CUTOFF ELEV. =====594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
254 KIPS	230 KIPS	127 KIPS	35 FT.

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

PILE TYPE AND SIZE =====Metal Shell 12"Φ w/.179" walls
 Pile Perimeter===== 3.142 FT.
 Pile End Bearing Area===== 0.785 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
589.90	2.80	1.00			9.1		82.2	82	0	0	45	5
587.40	2.50		29	Hard Till	12.5	73.1	88.4	88	0	0	49	7
584.90	2.50		18	Hard Till	7.8	66.7	45.8	46	0	0	25	10
582.40	2.50	1.90	15		13.9	16.4	64.8	65	0	0	36	12
579.90	2.50	2.50	19		16.6	21.5	97.7	98	0	0	54	15
577.40	2.50	4.40	26		25.1	37.9	112.9	113	0	0	62	17
574.90	2.50	3.25	25		19.9	28.0	131.6	132	0	0	72	20
572.40	2.50	3.10	25		19.3	26.7	147.4	147	0	0	81	22
569.90	2.50	2.70	19		17.5	23.3	164.8	165	0	0	91	25
567.40	2.50	2.70	19		17.5	23.3	183.2	183	0	0	101	27
564.90	2.50	2.80	19		17.9	24.1	201.1	201	0	0	111	30
562.40	2.50	2.80	19		17.9	24.1	214.7	215	0	0	118	32
559.90	2.50	2.30	17		15.7	19.8	230.3	230	0	0	127	35
557.40	2.50	2.30	17		15.7	19.8	257.2	257	0	0	144	37
554.90	2.50	3.60	25		21.5	31.0	278.7	279	0	0	153	40
552.40	2.50	3.60	25		21.5	31.0	300.2	300	0	0	165	42
549.90	2.50	3.60	28		21.5	31.0	323.4	323	0	0	178	45
547.40	2.50	3.80	28		22.4	32.7	341.5	342	0	0	188	47
544.90	2.50	3.30	30		20.2	28.4	361.7	362	0	0	199	50
542.40	2.50	3.30	30		20.2	28.4	664.9	665	0	0	366	52
539.90	2.50		84	Hard Till	61.7	311.5	726.6	727	0	0	400	55
537.40	2.50		84	Hard Till	61.7	311.5	847.6	848	0	0	466	57
535.40	2.00		100	Hard Till	68.4	370.8	1039.6	1040	0	0	572	59
534.90	0.50			Limestone	197.8	494.4	1237.4	1237	0	0	684	59.6
534.40	0.50			Limestone		494.4						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====North Abutment- East Side
 REFERENCE BORING =====SB-02
 LRFD or ASD or SEISMIC =====LRFD
 PILE CUTOFF ELEV. =====594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	404 KIPS	222 KIPS	47 FT.

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

PILE TYPE AND SIZE ===== Metal Shell 14"Φ w/.25" walls
 Pile Perimeter===== 3.665 FT.
 Pile End Bearing Area===== 1.069 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
589.90	2.80	1.00			10.6		95.9	96	0	0	53	5
587.40	2.50		29	Hard Till	14.6	85.3	104.1	104	0	0	57	7
584.90	2.50		18	Hard Till	9.1	78.9	56.6	57	0	0	31	10
582.40	2.50	1.90	15		16.2	22.3	79.8	80	0	0	44	12
579.90	2.50	2.50	19		19.3	29.3	121.4	121	0	0	67	15
577.40	2.50	4.40	26		29.3	51.6	137.2	137	0	0	75	17
574.90	2.50	3.25	25		23.3	38.1	158.7	159	0	0	87	20
572.40	2.50	3.10	25		22.5	36.3	176.5	176	0	0	97	22
569.90	2.50	2.70	19		20.4	31.7	196.8	197	0	0	108	25
567.40	2.50	2.70	19		20.4	31.7	218.4	218	0	0	120	27
564.90	2.50	2.80	19		20.9	32.8	239.3	239	0	0	132	30
562.40	2.50	2.80	19		20.9	32.8	254.3	254	0	0	140	32
559.90	2.50	2.30	17		18.3	27.0	272.6	273	0	0	150	35
557.40	2.50	2.30	17		18.3	27.0	306.1	306	0	0	168	37
554.90	2.50	3.60	25		25.1	42.2	331.2	331	0	0	182	40
552.40	2.50	3.60	25		25.1	42.2	356.3	356	0	0	196	42
549.90	2.50	3.60	28		25.1	42.2	383.7	384	0	0	211	45
547.40	2.50	3.80	28		26.1	44.6	404.0	404	0	0	222	47
544.90	2.50	3.30	30		23.5	38.7	427.5	428	0	0	235	50
542.40	2.50	3.30	30		23.5	38.7	836.3	836	0	0	460	52
539.90	2.50		84	Hard Till	72.0	424.0	908.2	908	0	0	500	55
537.40	2.50		84	Hard Till	72.0	424.0	1061.0	1061	0	0	584	57
535.40	2.00		100	Hard Till	79.8	504.7	1309.0	1309	0	0	720	59
534.90	0.50			Limestone	230.7	672.9	1539.8	1540	0	0	847	59.6
534.40	0.50			Limestone		672.9						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====South Abutment- West Side

REFERENCE BORING =====SB-03

LRFD or ASD or SEISMIC =====LRFD

PILE CUTOFF ELEV. =====594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)=====ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE =====Steel HP 8 X 36

Plugged Pile Perimeter===== 2.695 FT. Unplugged Pile Perimeter===== 3.892 FT.

Plugged Pile End Bearing Area===== 0.454 SQFT. Unplugged Pile End Bearing Area===== 0.074 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
286 KIPS	286 KIPS	157 KIPS	61 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
592.10	0.40	1.00			0.8		7.1	1.1		2.1	2	0	0	1	2
589.60	2.50	1.00			4.8	6.4	12.9	6.9	1.0	9.2	9	0	0	5	5
587.10	2.50		8	Fine Sand	0.9	7.3	9.9	1.3	1.2	9.9	10	0	0	5	7
584.60	2.50		4	Hard Till	0.3	3.4	11.0	0.4	0.6	10.5	10	0	0	6	10
582.10	2.50		5	Hard Till	0.4	4.2	11.9	0.5	0.7	11.1	11	0	0	6	12
579.60	2.50	0.75	8		3.8	4.8	16.0	5.4	0.8	16.6	16	0	0	9	15
577.10	2.50	0.80	5		4.0	5.1	18.7	5.7	0.8	22.1	19	0	0	10	17
574.60	2.50	0.60	7		3.1	3.8	26.9	4.5	0.6	27.4	27	0	0	15	20
572.10	2.50	1.40	18		6.2	8.9	29.2	8.9	1.4	35.7	29	0	0	16	22
569.60	2.50	0.80	16		4.0	5.1	33.2	5.7	0.8	41.5	33	0	0	18	25
567.10	2.50	0.80	16		4.0	5.1	41.0	5.7	0.8	47.8	41	0	0	23	27
564.60	2.50	1.40	16		6.2	8.9	47.2	8.9	1.4	56.7	47	0	0	26	30
562.10	2.50	1.40	16		6.2	8.9	52.7	8.9	1.4	65.6	53	0	0	29	32
559.60	2.50	1.30	19		5.9	8.3	58.6	8.5	1.3	74.0	59	0	0	32	35
557.10	2.50	1.30	19		5.9	8.3	66.4	8.5	1.3	82.8	66	0	0	37	37
554.60	2.50	1.60	24		6.8	10.2	73.1	9.8	1.7	92.6	73	0	0	40	40
552.10	2.50	1.60	24		6.8	10.2	81.8	9.8	1.7	102.7	82	0	0	45	42
549.60	2.50	1.90	29		7.6	12.1	89.4	11.0	2.0	113.6	89	0	0	49	45
547.10	2.50	1.90	29		7.6	12.1	104.0	11.0	2.0	125.7	104	0	0	57	47
544.60	2.50	3.00	47		10.3	19.1	114.3	14.9	3.1	140.6	114	0	0	63	50
542.10	2.50	3.00	47		10.3	19.1	190.4	14.9	3.1	166.1	166	0	0	91	52
539.60	2.50		100	Hard Till	14.5	84.8	204.9	21.0	13.8	187.1	187	0	0	103	55
537.10	2.50		100	Hard Till	14.5	84.8	247.7	21.0	13.8	212.7	213	0	0	117	57
534.60	2.50		100	Fine Sand	24.1	113.1	271.8	34.8	18.3	247.5	248	0	0	136	60
533.60	1.00			Limestone	67.1	113.1	338.9	97.0	18.3	344.5	339	0	0	186	60-9
533.10	0.50			Limestone	33.6	113.1	372.5	48.5	18.3	392.9	373	0	0	205	64-4
532.60	0.50			Limestone	33.6	113.1	406.1	48.5	18.3	441.4	406	0	0	223	64-9
532.10	0.50			Limestone		113.1			18.3						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====South Abutment- West Side
 REFERENCE BORING =====SB-03
 LRFD or ASD or SEISMIC =====LRFD
 PILE CUTOFF ELEV. =====594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	335 KIPS	184 KIPS	61 FT.

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

PILE TYPE AND SIZE ===== Steel HP 10 X 42
 Plugged Pile Perimeter===== 3.300 FT. Unplugged Pile Perimeter===== 4.858 FT.
 Plugged Pile End Bearing Area===== 0.680 SQFT. Unplugged Pile End Bearing Area===== 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
592.10	0.40	1.00			0.9		10.5	1.4		2.6	3	0	0	1	2
589.60	2.50	1.00			5.9	9.5	15.6	8.6	1.2	11.1	11	0	0	6	5
587.10	2.50		8	Fine Sand	1.1	8.8	13.0	1.7	1.1	12.3	12	0	0	7	7
584.60	2.50		4	Hard Till	0.4	5.1	14.6	0.5	0.6	13.0	13	0	0	7	10
582.10	2.50		5	Hard Till	0.4	6.4	15.9	0.7	0.8	13.8	14	0	0	8	12
579.60	2.50	0.75	8		4.6	7.2	21.0	6.8	0.9	20.6	21	0	0	11	15
577.10	2.50	0.80	5		4.9	7.6	23.9	7.2	1.0	27.6	24	0	0	13	17
574.60	2.50	0.60	7		3.8	5.7	35.4	5.6	0.7	34.1	34	0	0	19	20
572.10	2.50	1.40	18		7.6	13.3	37.2	11.1	1.7	44.5	37	0	0	20	22
569.60	2.50	0.80	16		4.9	7.6	42.1	7.2	1.0	51.7	42	0	0	23	25
567.10	2.50	0.80	16		4.9	7.6	52.7	7.2	1.0	59.6	53	0	0	29	27
564.60	2.50	1.40	16		7.6	13.3	60.2	11.1	1.7	70.7	60	0	0	33	30
562.10	2.50	1.40	16		7.6	13.3	66.9	11.1	1.7	81.7	67	0	0	37	32
559.60	2.50	1.30	19		7.2	12.4	74.0	10.6	1.6	92.3	74	0	0	41	35
557.10	2.50	1.30	19		7.2	12.4	84.1	10.6	1.6	103.2	84	0	0	46	37
554.60	2.50	1.60	24		8.3	15.3	92.4	12.2	1.9	115.4	92	0	0	51	40
552.10	2.50	1.60	24		8.3	15.3	103.5	12.2	1.9	128.0	104	0	0	57	42
549.60	2.50	1.90	29		9.3	18.1	112.8	13.7	2.3	141.7	113	0	0	62	45
547.10	2.50	1.90	29		9.3	18.1	132.6	13.7	2.3	156.7	133	0	0	73	47
544.60	2.50	3.00	47		12.6	28.6	145.2	18.6	3.6	175.3	145	0	0	80	50
542.10	2.50	3.00	47		12.6	28.6	256.4	18.6	3.6	206.3	206	0	0	113	52
539.60	2.50		100	Hard Till	17.8	127.1	274.1	26.2	16.1	232.5	233	0	0	128	55
537.10	2.50		100	Hard Till	17.8	127.1	334.3	26.2	16.1	264.1	264	0	0	145	57
534.60	2.50		100	Fine Sand	29.5	169.5	363.8	43.5	21.5	307.5	308	0	0	169	60
533.60	1.00			Limestone	82.2	169.5	446.0	121.0	21.5	428.6	429	0	0	236	60-9
533.10	0.50			Limestone	41.1	169.5	487.2	60.5	21.5	489.1	487	0	0	268	61-4
532.60	0.50			Limestone	41.1	169.5	528.3	60.5	21.5	549.6	528	0	0	294	61-9
532.10	0.50			Limestone		169.5			21.5						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== **South Abutment- West Side**

REFERENCE BORING ===== **SB-03**

LRFD or ASD or SEISMIC ===== **LRFD**

PILE CUTOFF ELEV. ===== **594.50** ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR **592.50** ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) **None**

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)===== ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE ===== **Steel HP 12 X 53**

Plugged Pile Perimeter===== 3.967 FT. Unplugged Pile Perimeter===== 5.800 FT.

Plugged Pile End Bearing Area===== 0.983 SQFT. Unplugged Pile End Bearing Area===== 0.108 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	418 KIPS	230 KIPS	61 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
592.10	0.40	1.00			1.1		14.9	1.6		3.2	3	0	0	2	2
589.60	2.50	1.00			7.0	13.8	18.8	10.3		13.1	13	0	0	7	5
587.10	2.50		8	Fine Sand	1.4	10.6	16.9	2.0	1.2	14.7	15	0	0	8	7
584.60	2.50		4	Hard Till	0.4	7.3	19.2	0.6	0.8	15.6	16	0	0	9	10
582.10	2.50		5	Hard Till	0.5	9.2	20.8	0.8	1.0	16.5	16	0	0	9	12
579.60	2.50	0.75	8		5.5	10.3	27.1	8.1	1.1	24.7	25	0	0	14	15
577.10	2.50	0.80	5		5.9	11.0	30.2	8.6	1.2	32.9	30	0	0	17	17
574.60	2.50	0.60	7		4.6	8.3	45.8	6.7	0.9	40.8	41	0	0	22	20
572.10	2.50	1.40	18		9.1	19.3	46.6	13.3	2.1	53.2	47	0	0	26	22
569.60	2.50	0.80	16		5.9	11.0	52.4	8.6	1.2	61.8	52	0	0	29	25
567.10	2.50	0.80	16		5.9	11.0	66.6	8.6	1.2	71.2	67	0	0	37	27
564.60	2.50	1.40	16		9.1	19.3	75.7	13.3	2.1	84.5	76	0	0	42	30
562.10	2.50	1.40	16		9.1	19.3	83.4	13.3	2.1	97.7	83	0	0	46	32
559.60	2.50	1.30	19		8.6	17.9	92.0	12.6	2.0	110.3	92	0	0	51	35
557.10	2.50	1.30	19		8.6	17.9	104.8	12.6	2.0	123.3	105	0	0	58	37
554.60	2.50	1.60	24		10.0	22.0	114.7	14.6	2.4	137.9	115	0	0	63	40
552.10	2.50	1.60	24		10.0	22.0	128.8	14.6	2.4	153.0	129	0	0	71	42
549.60	2.50	1.90	29		11.2	26.2	140.0	16.3	2.9	169.3	140	0	0	77	45
547.10	2.50	1.90	29		11.2	26.2	166.3	16.3	2.9	187.3	166	0	0	91	47
544.60	2.50	3.00	47		15.2	41.3	181.5	22.2	4.5	209.5	182	0	0	100	50
542.10	2.50	3.00	47		15.2	41.3	339.1	22.2	4.5	247.2	247	0	0	136	52
539.60	2.50		100	Hard Till	21.4	183.7	360.4	31.3	20.1	278.5	278	0	0	153	55
537.10	2.50		100	Hard Till	21.4	183.7	443.1	31.3	20.1	316.4	316	0	0	174	57
534.60	2.50		100	Fine Sand	35.5	245.0	478.6	51.9	26.8	368.3	368	0	0	203	60
533.60	1.00			Limestone	98.8	245.0	577.4	144.5	26.8	512.9	543	0	0	282	60-9
533.10	0.50			Limestone	49.4	245.0	626.8	72.3	26.8	585.1	585	0	0	322	64-4
532.60	0.50			Limestone	49.4	245.0	676.2	72.3	26.8	657.4	657	0	0	362	64-9
532.10	0.50			Limestone		245.0			26.8						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====South Abutment- West Side

REFERENCE BORING =====SB-03

LRFD or ASD or SEISMIC =====LRFD

PILE CUTOFF ELEV. =====594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)=====ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE =====Steel HP 14 X 73

Plugged Pile Perimeter===== 4.700 FT. Unplugged Pile Perimeter===== 6.975 FT.

Plugged Pile End Bearing Area===== 1.379 SQFT. Unplugged Pile End Bearing Area===== 0.149 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	578 KIPS	318 KIPS	61 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
592.10	0.40	1.00			1.3		20.7	2.0		4.1	4	0	0	2	2
589.60	2.50	1.00			8.3	19.3	22.4	12.4		15.7	16	0	0	9	5
587.10	2.50		8	Fine Sand	1.6	12.7	20.6	2.4	1.4	17.8	18	0	0	10	7
584.60	2.50		4	Hard Till	0.5	9.3	24.7	0.8	1.0	18.9	19	0	0	10	10
582.10	2.50		5	Hard Till	0.6	12.9	26.9	1.0	1.4	20.0	20	0	0	11	12
579.60	2.50	0.75	8		6.6	14.5	34.5	9.7	1.6	29.9	30	0	0	16	15
577.10	2.50	0.80	5		6.9	15.5	37.5	10.3	1.7	39.8	38	0	0	21	17
574.60	2.50	0.60	7		5.4	11.6	58.4	8.0	1.2	49.4	49	0	0	27	20
572.10	2.50	1.40	18		10.8	27.1	57.6	16.0	2.9	64.2	58	0	0	32	22
569.60	2.50	0.80	16		6.9	15.5	64.5	10.3	1.7	74.5	65	0	0	35	25
567.10	2.50	0.80	16		6.9	15.5	83.1	10.3	1.7	86.0	83	0	0	46	27
564.60	2.50	1.40	16		10.8	27.1	93.8	16.0	2.9	102.0	94	0	0	52	30
562.10	2.50	1.40	16		10.8	27.1	102.7	16.0	2.9	117.8	103	0	0	56	32
559.60	2.50	1.30	19		10.2	25.1	112.9	15.2	2.7	133.0	113	0	0	62	35
557.10	2.50	1.30	19		10.2	25.1	128.9	15.2	2.7	148.8	129	0	0	71	37
554.60	2.50	1.60	24		11.8	30.9	140.7	17.5	3.3	166.3	141	0	0	77	40
552.10	2.50	1.60	24		11.8	30.9	158.3	17.5	3.3	184.4	158	0	0	87	42
549.60	2.50	1.90	29		13.2	36.7	171.6	19.6	4.0	204.1	172	0	0	94	45
547.10	2.50	1.90	29		13.2	36.7	206.1	19.6	4.0	226.0	206	0	0	113	47
544.60	2.50	3.00	47		18.0	58.0	224.0	26.7	6.2	252.7	224	0	0	123	50
542.10	2.50	3.00	47		18.0	58.0	441.7	26.7	6.2	300.9	301	0	0	165	52
539.60	2.50		100	Hard Till	25.3	257.7	467.0	37.6	27.8	338.5	338	0	0	186	55
537.10	2.50		100	Hard Till	25.3	257.7	578.2	37.6	27.8	385.3	385	0	0	212	57
534.60	2.50		100	Fine Sand	42.1	343.5	620.3	62.4	37.0	447.8	448	0	0	246	60
533.60	1.00			Limestone	117.1	343.5	737.4	173.8	37.0	621.5	622	0	0	342	60-9
533.10	0.50			Limestone	58.5	343.5	796.0	86.9	37.0	708.4	708	0	0	390	61-4
532.60	0.50			Limestone	58.5	343.5	854.5	86.9	37.0	795.3	795	0	0	437	61-9
532.10	0.50			Limestone		343.5			37.0						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== **South Abutment- West Side**
 REFERENCE BORING ===== **SB-03**
 LRFD or ASD or SEISMIC ===== **LRFD**
 PILE CUTOFF ELEV. ===== **594.50** ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR **592.50** ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) **None**
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
254 KIPS	206 KIPS	113 KIPS	50 FT.

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

PILE TYPE AND SIZE ===== **Metal Shell 12"Φ w/.179" walls**
 Pile Perimeter===== 3.142 FT.
 Pile End Bearing Area===== 0.785 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
592.10	0.40	1.00			1.4		10.0	10	0	0	6	2
589.60	2.50	1.00			8.7	8.6	31.5	31	0	0	17	5
587.10	2.50		8	Fine Sand	5.4	21.4	30.4	30	0	0	17	7
584.60	2.50		4	Hard Till	1.7	14.8	35.8	36	0	0	20	10
582.10	2.50		5	Hard Till	2.2	18.5	25.9	26	0	0	14	12
579.60	2.50	0.75	8		6.9	6.5	33.2	33	0	0	18	15
577.10	2.50	0.80	5		7.3	6.9	38.8	39	0	0	21	17
574.60	2.50	0.60	7		5.6	5.2	51.3	51	0	0	28	20
572.10	2.50	1.40	18		11.3	12.1	57.4	57	0	0	32	22
569.60	2.50	0.80	16		7.3	6.9	64.7	65	0	0	36	25
567.10	2.50	0.80	16		7.3	6.9	77.1	77	0	0	42	27
564.60	2.50	1.40	16		11.3	12.1	88.4	88	0	0	49	30
562.10	2.50	1.40	16		11.3	12.1	98.8	99	0	0	54	32
559.60	2.50	1.30	19		10.7	11.2	109.5	109	0	0	60	35
557.10	2.50	1.30	19		10.7	11.2	122.8	123	0	0	68	37
554.60	2.50	1.60	24		12.4	13.8	135.1	135	0	0	74	40
552.10	2.50	1.60	24		12.4	13.8	150.1	150	0	0	83	42
549.60	2.50	1.90	29		13.9	16.4	163.9	164	0	0	90	45
547.10	2.50	1.90	29		13.9	16.4	187.2	187	0	0	103	47
544.60	2.50	3.00	47		18.8	25.8	206.0	206	0	0	113	50
542.10	2.50	3.00	47		18.8	25.8	569.8	570	0	0	343	52
539.60	2.50		100	Hard Till	85.5	370.8	655.4	655	0	0	360	55
537.10	2.50		100	Hard Till	85.5	370.8	864.5	865	0	0	475	57
534.60	2.50		100	Fine Sand	142.1	494.4	1006.6	1007	0	0	554	60
533.60	1.00			Limestone	395.5	494.4	1402.1	1402	0	0	774	60-9
533.10	0.50			Limestone	197.8	494.4	1599.9	1600	0	0	880	64-4
532.60	0.50			Limestone	197.8	494.4	1797.6	1798	0	0	989	64-9
532.10	0.50			Limestone		494.4						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====South Abutment- West Side

REFERENCE BORING =====SB-03

LRFD or ASD or SEISMIC =====LRFD

PILE CUTOFF ELEV. =====594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	245 KIPS	135 KIPS	50 FT.

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)=====ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE ===== Metal Shell 14"Φ w/.25" walls

Pile Perimeter===== 3.665 FT.

Pile End Bearing Area===== 1.069 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
592.10	0.40	1.00			1.6		13.4	13	0	0	7	2
589.60	2.50	1.00			10.2	11.7	36.7	37	0	0	20	5
587.10	2.50		8	Fine Sand	6.3	24.9	36.4	36	0	0	20	7
584.60	2.50		4	Hard Till	2.0	18.2	45.4	45	0	0	25	10
582.10	2.50		5	Hard Till	2.5	25.2	31.5	32	0	0	17	12
579.60	2.50	0.75	8		8.0	8.8	40.1	40	0	0	22	15
577.10	2.50	0.80	5		8.5	9.4	46.2	46	0	0	25	17
574.60	2.50	0.60	7		6.6	7.0	62.2	62	0	0	34	20
572.10	2.50	1.40	18		13.2	16.4	68.3	68	0	0	38	22
569.60	2.50	0.80	16		8.5	9.4	76.8	77	0	0	42	25
567.10	2.50	0.80	16		8.5	9.4	92.3	92	0	0	51	27
564.60	2.50	1.40	16		13.2	16.4	105.5	105	0	0	58	30
562.10	2.50	1.40	16		13.2	16.4	117.4	117	0	0	65	32
559.60	2.50	1.30	19		12.5	15.2	129.9	130	0	0	71	35
557.10	2.50	1.30	19		12.5	15.2	145.9	146	0	0	80	37
554.60	2.50	1.60	24		14.4	18.8	160.3	160	0	0	88	40
552.10	2.50	1.60	24		14.4	18.8	178.3	178	0	0	98	42
549.60	2.50	1.90	29		16.2	22.3	194.4	194	0	0	107	45
547.10	2.50	1.90	29		16.2	22.3	223.5	223	0	0	123	47
544.60	2.50	3.00	47		21.9	35.2	245.4	245	0	0	135	50
542.10	2.50	3.00	47		21.9	35.2	736.9	737	0	0	405	52
539.60	2.50		100	Hard Till	99.8	504.7	836.7	837	0	0	460	55
537.10	2.50		100	Hard Till	99.8	504.7	1104.7	1105	0	0	608	57
534.60	2.50		100	Fine Sand	165.8	672.9	1270.5	1270	0	0	699	60
533.60	1.00			Limestone	461.4	672.9	1731.9	1732	0	0	953	60-9
533.10	0.50			Limestone	230.7	672.9	1962.7	1963	0	0	1079	61-4
532.60	0.50			Limestone	230.7	672.9	2193.4	2193	0	0	1206	61-9
532.10	0.50			Limestone		672.9			0	0		

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====South Abutment- East Side

REFERENCE BORING =====B-10

LRFD or ASD or SEISMIC ===== LRFD

PILE CUTOFF ELEV. ===== 594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)===== ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE ===== Steel HP 8 X 36

Plugged Pile Perimeter===== 2.695 FT. Unplugged Pile Perimeter===== 3.892 FT.

Plugged Pile End Bearing Area===== 0.454 SQFT. Unplugged Pile End Bearing Area===== 0.074 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
286 KIPS	286 KIPS	157 KIPS	59 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
591.60	0.90		25	Hard Till	0.7		15.1	1.0		3.3	3	0	0	2	3
589.10	2.50		25	Hard Till	1.8	14.4	23.7	2.7	2.3	7.0	7	0	0	4	5
586.60	2.50		25	Hard Till	1.8	21.2	25.5	2.7	3.4	9.7	10	0	0	5	8
584.10	2.50		25	Hard Till	1.8	21.2	27.4	2.7	3.4	12.3	12	0	0	7	10
581.60	2.50		25	Hard Till	1.8	21.2	36.3	2.7	3.4	16.1	16	0	0	9	13
579.10	2.50		25	Fine Sand	2.9	28.3	39.2	4.2	4.6	20.3	20	0	0	11	15
576.60	2.50		25	Fine Sand	2.9	28.3	18.5	4.2	4.6	20.7	19	0	0	10	18
574.10	2.50	0.75	4		3.8	4.8	28.4	5.4	0.8	27.1	27	0	0	15	20
571.60	2.50	1.70	9		7.1	10.8	34.8	10.2	1.8	37.2	35	0	0	19	23
569.10	2.50	1.60	11		6.8	10.2	40.9	9.8	1.7	46.8	41	0	0	23	25
566.60	2.50	1.50	13		6.5	9.5	49.9	9.4	1.5	56.6	50	0	0	27	28
564.10	2.50	1.90	12		7.6	12.1	56.3	11.0	2.0	67.4	56	0	0	31	30
561.60	2.50	1.70	17		7.1	10.8	67.8	10.2	1.8	78.3	68	0	0	37	33
559.10	2.50	2.40	17		8.8	15.3	79.1	12.7	2.5	91.4	79	0	0	44	35
556.60	2.50	2.80	19		9.8	17.8	87.0	14.2	2.9	105.3	87	0	0	48	38
554.10	2.50	2.50	21		9.1	15.9	96.8	13.1	2.6	118.5	97	0	0	53	40
551.60	2.50	2.60	18		9.3	16.5	106.1	13.5	2.7	132.0	106	0	0	58	43
549.10	2.50	2.60	18		9.3	16.5	117.3	13.5	2.7	145.7	117	0	0	65	45
546.60	2.50	2.90	22		10.1	18.4	127.4	14.5	3.0	160.3	127	0	0	70	48
544.10	2.50	2.90	22		10.1	18.4	133.0	14.5	3.0	174.1	133	0	0	73	50
541.60	2.50	2.20	73		8.3	14.0	141.3	12.0	2.3	186.1	141	0	0	78	53
539.10	2.50	2.20	73		8.3	14.0	248.7	12.0	2.3	214.2	214	0	0	118	55
536.60	2.50		100	Fine Sand	24.1	113.1	272.9	34.8	18.3	249.0	249	0	0	137	58
536.10	0.50		100	Fine Sand	4.8	113.1	277.7	7.0	18.3	256.0	256	0	0	141	58
535.60	0.50			Limestone	33.6	113.1	311.3	48.5	18.3	304.5	304	0	0	167	58.9
535.10	0.50			Limestone	33.6	113.1	344.8	48.5	18.3	353.0	345	0	0	190	59.4
534.60	0.50			Limestone		113.1			18.3						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====South Abutment- East Side

REFERENCE BORING =====B-10

LRFD or ASD or SEISMIC ===== LRFD

PILE CUTOFF ELEV. ===== 594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)===== ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE ===== Steel HP 10 X 42

Plugged Pile Perimeter===== 3.300 FT. Unplugged Pile Perimeter===== 4.858 FT.

Plugged Pile End Bearing Area===== 0.680 SQFT. Unplugged Pile End Bearing Area===== 0.086 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	335 KIPS	184 KIPS	59 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED LOSS FROM SCOUR or DD (KIPS)	FACTORED LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
591.60	0.90		25	Hard Till	0.8		18.1	1.2		3.4	3	0	0	2	3
589.10	2.50		25	Hard Till	2.2	17.3	33.1	3.3	2.2	8.3	8	0	0	5	5
586.60	2.50		25	Hard Till	2.2	30.0	37.1	3.3	3.8	11.8	12	0	0	7	8
584.10	2.50		25	Hard Till	2.2	31.8	39.3	3.3	4.0	15.1	15	0	0	8	10
581.60	2.50		25	Hard Till	2.2	31.8	52.2	3.3	4.0	19.8	20	0	0	11	13
579.10	2.50		25	Fine Sand	3.5	42.4	55.7	5.2	5.4	25.0	25	0	0	14	15
576.60	2.50		25	Fine Sand	3.5	42.4	24.0	5.2	5.4	25.7	24	0	0	13	18
574.10	2.50	0.75	4		4.6	7.2	37.7	6.8	0.9	33.7	34	0	0	19	20
571.60	2.50	1.70	9		8.6	16.2	45.4	12.7	2.1	46.3	45	0	0	25	23
569.10	2.50	1.60	11		8.3	15.3	52.7	12.2	1.9	58.4	53	0	0	29	25
566.60	2.50	1.50	13		7.9	14.3	64.5	11.7	1.8	70.5	64	0	0	35	28
564.10	2.50	1.90	12		9.3	18.1	71.8	13.7	2.3	84.0	72	0	0	40	30
561.60	2.50	1.70	17		8.6	16.2	87.2	12.7	2.1	97.5	87	0	0	48	33
559.10	2.50	2.40	17		10.8	22.9	101.8	15.9	2.9	113.9	102	0	0	56	35
556.60	2.50	2.80	19		12.0	26.7	110.9	17.7	3.4	131.3	111	0	0	61	38
554.10	2.50	2.50	21		11.1	23.8	123.0	16.4	3.0	147.7	123	0	0	68	40
551.60	2.50	2.60	18		11.4	24.8	134.4	16.8	3.1	164.5	134	0	0	74	43
549.10	2.50	2.60	18		11.4	24.8	148.7	16.8	3.1	181.7	149	0	0	82	45
546.60	2.50	2.90	22		12.3	27.7	161.0	18.1	3.5	199.8	161	0	0	89	48
544.10	2.50	2.90	22		12.3	27.7	166.7	18.1	3.5	217.1	167	0	0	92	50
541.60	2.50	2.20	73		10.2	21.0	176.9	15.0	2.7	232.2	177	0	0	97	53
539.10	2.50	2.20	73		10.2	21.0	335.6	15.0	2.7	266.0	266	0	0	146	55
536.60	2.50		100	Fine Sand	29.5	169.5	365.1	43.5	21.5	309.5	309	0	0	170	58
536.10	0.50		100	Fine Sand	5.9	169.5	371.0	8.7	21.5	318.2	318	0	0	175	58
535.60	0.50			Limestone	41.1	169.5	412.2	60.5	21.5	378.7	379	0	0	208	58.9
535.10	0.50			Limestone	41.1	169.5	453.3	60.5	21.5	439.2	439	0	0	242	59.4
534.60	0.50			Limestone		169.5			21.5						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====South Abutment- East Side

REFERENCE BORING =====B-10

LRFD or ASD or SEISMIC ===== LRFD

PILE CUTOFF ELEV. ===== 594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)===== ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE ===== Steel HP 12 X 53

Plugged Pile Perimeter===== 3.967 FT. Unplugged Pile Perimeter===== 5.800 FT.

Plugged Pile End Bearing Area===== 0.983 SQFT. Unplugged Pile End Bearing Area===== 0.108 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	418 KIPS	230 KIPS	59 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
591.60	0.90		25	Hard Till	1.0		21.8	1.4		3.7	4	0	0	2	3
589.10	2.50		25	Hard Till	2.7	20.8	39.8	4.0	2.3	9.3	9	0	0	5	5
586.60	2.50		25	Hard Till	2.7	36.1	52.3	4.0	4.0	14.4	14	0	0	8	8
584.10	2.50		25	Hard Till	2.7	45.9	55.0	4.0	5.0	18.3	18	0	0	10	10
581.60	2.50		25	Hard Till	2.7	45.9	73.0	4.0	5.0	23.9	24	0	0	13	13
579.10	2.50		25	Fine Sand	4.2	61.2	77.3	6.2	6.7	30.1	30	0	0	17	15
576.60	2.50		25	Fine Sand	4.2	61.2	30.6	6.2	6.7	30.8	31	0	0	17	18
574.10	2.50	0.75	4		5.5	10.3	49.2	8.1	1.1	40.3	40	0	0	22	20
571.60	2.50	1.70	9		10.4	23.4	58.3	15.2	2.6	55.3	55	0	0	30	23
569.10	2.50	1.60	11		10.0	22.0	66.8	14.6	2.4	69.8	67	0	0	37	25
566.60	2.50	1.50	13		9.5	20.7	81.9	13.9	2.3	84.3	82	0	0	45	28
564.10	2.50	1.90	12		11.2	26.2	90.3	16.3	2.9	100.4	90	0	0	50	30
561.60	2.50	1.70	17		10.4	23.4	110.3	15.2	2.6	116.6	110	0	0	61	33
559.10	2.50	2.40	17		13.0	33.1	128.8	19.0	3.6	136.2	129	0	0	71	35
556.60	2.50	2.80	19		14.4	38.6	139.2	21.1	4.2	156.9	139	0	0	77	38
554.10	2.50	2.50	21		13.4	34.5	153.9	19.5	3.8	176.5	154	0	0	85	40
551.60	2.50	2.60	18		13.7	35.8	167.6	20.1	3.9	196.6	168	0	0	92	43
549.10	2.50	2.60	18		13.7	35.8	185.5	20.1	3.9	217.1	185	0	0	102	45
546.60	2.50	2.90	22		14.8	40.0	200.3	21.7	4.4	238.8	200	0	0	110	48
544.10	2.50	2.90	22		14.8	40.0	205.4	21.7	4.4	259.4	205	0	0	113	50
541.60	2.50	2.20	73		12.3	30.3	217.7	17.9	3.3	277.3	218	0	0	120	53
539.10	2.50	2.20	73		12.3	30.3	444.6	17.9	3.3	318.7	319	0	0	175	55
536.60	2.50		100	Fine Sand	35.5	245.0	480.1	51.9	26.8	370.6	371	0	0	204	58
536.10	0.50		100	Fine Sand	7.1	245.0	487.2	10.4	26.8	381.0	381	0	0	210	58
535.60	0.50			Limestone	49.4	245.0	536.7	72.3	26.8	453.3	453	0	0	249	58.9
535.10	0.50			Limestone	49.4	245.0	586.1	72.3	26.8	525.5	526	0	0	289	59.4
534.60	0.50			Limestone		245.0			26.8						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====South Abutment- East Side

REFERENCE BORING =====B-10

LRFD or ASD or SEISMIC ===== LRFD

PILE CUTOFF ELEV. ===== 594.50 ft

GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 592.50 ft

GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None

BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft

TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips

TOTAL LENGTH OF SUBSTRUCTURE (along skew)===== ft

NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====

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

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

PILE TYPE AND SIZE ===== Steel HP 14 X 73

Plugged Pile Perimeter===== 4.700 FT. Unplugged Pile Perimeter===== 6.975 FT.

Plugged Pile End Bearing Area===== 1.379 SQFT. Unplugged Pile End Bearing Area===== 0.149 SQFT.

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	578 KIPS	318 KIPS	59 FT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
591.60	0.90		25	Hard Till	1.2		26.2	1.7		4.4	4	0	0	2	3
589.10	2.50		25	Hard Till	3.2	25.0	47.8	4.8	2.7	11.1	11	0	0	6	5
586.60	2.50		25	Hard Till	3.2	43.4	69.4	4.8	4.7	17.9	18	0	0	10	8
584.10	2.50		25	Hard Till	3.2	61.8	75.2	4.8	6.7	22.9	23	0	0	13	10
581.60	2.50		25	Hard Till	3.2	64.4	99.8	4.8	6.9	30.0	30	0	0	16	13
579.10	2.50		25	Fine Sand	5.0	85.9	104.9	7.5	9.3	37.4	37	0	0	21	15
576.60	2.50		25	Fine Sand	5.0	85.9	38.5	7.5	9.3	37.2	37	0	0	20	18
574.10	2.50	0.75	4		6.6	14.5	63.4	9.7	1.6	48.9	49	0	0	27	20
571.60	2.50	1.70	9		12.3	32.9	73.8	18.3	3.5	67.0	67	0	0	37	23
569.10	2.50	1.60	11		11.8	30.9	83.7	17.5	3.3	84.3	84	0	0	46	25
566.60	2.50	1.50	13		11.3	29.0	102.7	16.8	3.1	101.9	102	0	0	56	28
564.10	2.50	1.90	12		13.2	36.7	112.1	19.6	4.0	121.1	112	0	0	62	30
561.60	2.50	1.70	17		12.3	32.9	137.9	18.3	3.5	140.9	138	0	0	76	33
559.10	2.50	2.40	17		15.4	46.4	161.1	22.8	5.0	164.5	161	0	0	89	35
556.60	2.50	2.80	19		17.1	54.1	172.4	25.4	5.8	189.3	172	0	0	95	38
554.10	2.50	2.50	21		15.8	48.3	190.1	23.5	5.2	213.0	190	0	0	105	40
551.60	2.50	2.60	18		16.3	50.2	206.4	24.1	5.4	237.1	206	0	0	114	43
549.10	2.50	2.60	18		16.3	50.2	228.4	24.1	5.4	261.9	228	0	0	126	45
546.60	2.50	2.90	22		17.5	56.0	246.0	26.0	6.0	287.9	246	0	0	135	48
544.10	2.50	2.90	22		17.5	56.0	250.0	26.0	6.0	312.5	250	0	0	138	50
541.60	2.50	2.20	73		14.5	42.5	264.5	21.6	4.6	334.1	265	0	0	145	53
539.10	2.50	2.20	73		14.5	42.5	580.1	21.6	4.6	388.1	388	0	0	213	55
536.60	2.50		100	Fine Sand	42.1	343.5	622.2	62.4	37.0	450.5	451	0	0	248	58
536.10	0.50		100	Fine Sand	8.4	343.5	630.6	12.5	37.0	463.0	463	0	0	255	58
535.60	0.50			Limestone	58.5	343.5	689.1	86.9	37.0	549.9	550	0	0	302	58.9
535.10	0.50			Limestone	58.5	343.5	747.7	86.9	37.0	636.8	637	0	0	350	59.4
534.60	0.50			Limestone		343.5			37.0						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====South Abutment- East Side
 REFERENCE BORING =====B-10
 LRFD or ASD or SEISMIC =====LRFD
 PILE CUTOFF ELEV. =====594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR =====592.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) =====None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
254 KIPS	242 KIPS	133 KIPS	43 FT.

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

PILE TYPE AND SIZE =====Metal Shell 12"Φ w/.179" walls
 Pile Perimeter===== 3.142 FT.
 Pile End Bearing Area===== 0.785 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
591.60	0.90		25	Hard Till	3.9		45.9	46	0	0	25	3
589.10	2.50		25	Hard Till	10.8	42.0	87.6	88	0	0	48	5
586.60	2.50		25	Hard Till	10.8	72.9	118.2	118	0	0	65	8
584.10	2.50		25	Hard Till	10.8	92.7	129.0	129	0	0	71	10
581.60	2.50		25	Hard Till	10.8	92.7	170.8	171	0	0	94	13
579.10	2.50		25	Fine Sand	17.0	123.6	187.8	188	0	0	103	15
576.60	2.50		25	Fine Sand	17.0	123.6	87.6	88	0	0	48	18
574.10	2.50	0.75	4		6.9	6.5	102.7	103	0	0	56	20
571.60	2.50	1.70	9		12.9	14.6	114.7	115	0	0	63	23
569.10	2.50	1.60	11		12.4	13.8	126.2	126	0	0	69	25
566.60	2.50	1.50	13		11.8	12.9	141.4	141	0	0	78	28
564.10	2.50	1.90	12		13.9	16.4	153.6	154	0	0	84	30
561.60	2.50	1.70	17		12.9	14.6	172.5	172	0	0	95	33
559.10	2.50	2.40	17		16.1	20.7	192.0	192	0	0	106	35
556.60	2.50	2.80	19		17.9	24.1	207.4	207	0	0	114	38
554.10	2.50	2.50	21		16.6	21.5	224.8	225	0	0	124	40
551.60	2.50	2.60	18		17.0	22.4	241.8	242	0	0	133	43
549.10	2.50	2.60	18		17.0	22.4	261.4	261	0	0	144	46
546.60	2.50	2.90	22		18.4	25.0	279.7	280	0	0	154	48
544.10	2.50	2.90	22		18.4	25.0	292.1	292	0	0	161	50
541.60	2.50	2.20	73		15.2	19.0	307.3	307	0	0	169	53
539.10	2.50	2.20	73		15.2	19.0	797.9	798	0	0	439	55
536.60	2.50		100	Fine Sand	142.1	494.4	940.0	940	0	0	517	58
536.10	0.50		100	Fine Sand	28.4	494.4	968.4	968	0	0	533	58
535.60	0.50			Limestone	197.8	494.4	1166.2	1166	0	0	641	58.0
535.10	0.50			Limestone	197.8	494.4	1364.0	1364	0	0	750	59.4
534.60	0.50			Limestone		494.4			0	0		

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE=====South Abutment- East Side
 REFERENCE BORING =====B-10

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

LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 592.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD =====ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) =====ft

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	362 KIPS	199 KIPS	53 FT.

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

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

PILE TYPE AND SIZE ===== Metal Shell 14"Φ w/.25" walls
 Pile Perimeter===== 3.665 FT.
 Pile End Bearing Area===== 1.069 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
591.60	0.90		25	Hard Till	4.5		53.6	54	0	0	29	3
589.10	2.50		25	Hard Till	12.6	49.0	102.2	102	0	0	56	5
586.60	2.50		25	Hard Till	12.6	85.1	150.9	151	0	0	83	8
584.10	2.50		25	Hard Till	12.6	121.1	168.6	169	0	0	93	10
581.60	2.50		25	Hard Till	12.6	126.2	223.2	223	0	0	123	13
579.10	2.50		25	Fine Sand	19.8	168.2	243.1	243	0	0	134	15
576.60	2.50		25	Fine Sand	19.8	168.2	103.5	103	0	0	57	18
574.10	2.50	0.75	4		8.0	8.8	122.6	123	0	0	67	20
571.60	2.50	1.70	9		15.0	19.9	136.5	136	0	0	75	23
569.10	2.50	1.60	11		14.4	18.8	149.7	150	0	0	82	25
566.60	2.50	1.50	13		13.8	17.6	168.2	168	0	0	93	28
564.10	2.50	1.90	12		16.2	22.3	182.0	182	0	0	100	30
561.60	2.50	1.70	17		15.0	19.9	205.2	205	0	0	113	33
559.10	2.50	2.40	17		18.8	28.1	228.7	229	0	0	126	35
556.60	2.50	2.80	19		20.9	32.8	246.1	246	0	0	135	38
554.10	2.50	2.50	21		19.3	29.3	266.6	267	0	0	147	40
551.60	2.50	2.60	18		19.8	30.5	286.4	286	0	0	158	43
549.10	2.50	2.60	18		19.8	30.5	309.8	310	0	0	170	45
546.60	2.50	2.90	22		21.4	34.0	331.2	331	0	0	182	48
544.10	2.50	2.90	22		21.4	34.0	344.4	344	0	0	189	50
541.60	2.50	2.20	73		17.7	25.8	362.2	362	0	0	199	53
539.10	2.50	2.20	73		17.7	25.8	1027.1	1027	0	0	565	55
536.60	2.50		100	Fine Sand	165.8	672.9	1192.8	1193	0	0	656	58
536.10	0.50		100	Fine Sand	33.2	672.9	1226.0	1226	0	0	674	58
535.60	0.50			Limestone	230.7	672.9	1456.7	1457	0	0	804	58.0
535.10	0.50			Limestone	230.7	672.9	1687.4	1687	0	0	928	59.4
534.60	0.50			Limestone		672.9						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== S.Abut- East Side (PRECORE)
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 575.00 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
286 KIPS	286 KIPS	157 KIPS	59 FT.

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

PILE TYPE AND SIZE ===== Steel HP 8 X 36
 Plugged Pile Perimeter===== 2.695 FT. Unplugged Pile Perimeter===== 3.892 FT.
 Plugged Pile End Bearing Area===== 0.454 SQFT. Unplugged Pile End Bearing Area===== 0.074 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)	
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)						
574.10	0.90	0.75	4		1.4		12.2	2.0		3.7	4	0	0	2	20	
571.60	2.50	1.70	9		7.1	10.8	18.6	10.2	1.8	13.8	14	0	0	8	23	
569.10	2.50	1.60	11		6.8	10.2	24.7	9.8	1.7	23.5	23	0	0	13	25	
566.60	2.50	1.50	13		6.5	9.5	33.8	9.4	1.5	33.2	33	0	0	18	28	
564.10	2.50	1.90	12		7.6	12.1	40.1	11.0	2.0	44.0	40	0	0	22	30	
561.60	2.50	1.70	17		7.1	10.8	51.6	10.2	1.8	54.9	52	0	0	28	33	
559.10	2.50	2.40	17		8.8	15.3	63.0	12.7	2.5	68.1	63	0	0	35	35	
556.60	2.50	2.80	19		9.8	17.8	70.9	14.2	2.9	81.9	71	0	0	39	38	
554.10	2.50	2.50	21		9.1	15.9	80.6	13.1	2.6	95.1	81	0	0	44	40	
551.60	2.50	2.60	18		9.3	16.5	89.9	13.5	2.7	108.6	90	0	0	49	43	
549.10	2.50	2.60	18		9.3	16.5	101.1	13.5	2.7	122.4	101	0	0	56	45	
546.60	2.50	2.90	22		10.1	18.4	111.2	14.5	3.0	136.9	111	0	0	61	48	
544.10	2.50	2.90	22		10.1	18.4	116.8	14.5	3.0	150.7	117	0	0	64	50	
541.60	2.50	2.20	73		8.3	14.0	125.1	12.0	2.3	162.7	125	0	0	69	53	
539.10	2.50	2.20	73		8.3	14.0	232.6	12.0	2.3	190.8	191	0	0	105	55	
536.60	2.50		100	Fine Sand	24.1	113.1	256.7	34.8	18.3	225.7	226	0	0	124	58	
536.10	0.50		100	Fine Sand	4.8	113.1	261.5	7.0	18.3	232.6	233	0	0	128	58	
535.60	0.50			Limestone	33.6	113.1	295.1	48.5	18.3	281.1	281	0	0	155	58.9	
535.10	0.50			Limestone	33.6	113.1	328.6	48.5	18.3	329.6	329	0	0	181	59.4	
534.60	0.50			Limestone		113.1			18.3							

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== **S.Abut- East Side (PRECORE)**
 REFERENCE BORING ===== **B-10**
 LRFD or ASD or SEISMIC ===== **LRFD**
 PILE CUTOFF ELEV. ===== **594.50** ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== **575.00** ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== **None**
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	335 KIPS	184 KIPS	59 FT.

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

PILE TYPE AND SIZE ===== **Steel HP 10 X 42**
 Plugged Pile Perimeter===== 3.300 FT. Unplugged Pile Perimeter===== 4.858 FT.
 Plugged Pile End Bearing Area===== 0.680 SQFT. Unplugged Pile End Bearing Area===== 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)	
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)						
574.10	0.90	0.75	4		1.7		17.9	2.4		4.5	4	0	0	2	20	
571.60	2.50	1.70	9		8.6	16.2	25.6	12.7	2.1	17.1	17	0	0	9	23	
569.10	2.50	1.60	11		8.3	15.3	32.9	12.2	1.9	29.2	29	0	0	16	25	
566.60	2.50	1.50	13		7.9	14.3	44.6	11.7	1.8	41.3	41	0	0	23	28	
564.10	2.50	1.90	12		9.3	18.1	52.0	13.7	2.3	54.8	52	0	0	29	30	
561.60	2.50	1.70	17		8.6	16.2	67.3	12.7	2.1	68.4	67	0	0	37	33	
559.10	2.50	2.40	17		10.8	22.9	82.0	15.9	2.9	84.8	82	0	0	45	35	
556.60	2.50	2.80	19		12.0	26.7	91.1	17.7	3.4	102.1	91	0	0	50	38	
554.10	2.50	2.50	21		11.1	23.8	103.2	16.4	3.0	118.6	103	0	0	57	40	
551.60	2.50	2.60	18		11.4	24.8	114.6	16.8	3.1	135.4	115	0	0	63	43	
549.10	2.50	2.60	18		11.4	24.8	128.9	16.8	3.1	152.5	129	0	0	71	45	
546.60	2.50	2.90	22		12.3	27.7	141.2	18.1	3.5	170.7	141	0	0	78	48	
544.10	2.50	2.90	22		12.3	27.7	146.8	18.1	3.5	188.0	147	0	0	81	50	
541.60	2.50	2.20	73		10.2	21.0	157.1	15.0	2.7	203.0	157	0	0	86	53	
539.10	2.50	2.20	73		10.2	21.0	315.8	15.0	2.7	236.8	237	0	0	130	55	
536.60	2.50		100	Fine Sand	29.5	169.5	345.3	43.5	21.5	280.3	280	0	0	154	58	
536.10	0.50		100	Fine Sand	5.9	169.5	351.2	8.7	21.5	289.0	289	0	0	159	58	
535.60	0.50			Limestone	41.1	169.5	392.3	60.5	21.5	349.5	369	0	0	192	68.9	
535.10	0.50			Limestone	41.1	169.5	433.4	60.5	21.5	410.0	449	0	0	226	69.4	
534.60	0.50			Limestone		169.5			21.5							

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== **S.Abut- East Side (PRECORE)**
 REFERENCE BORING ===== **B-10**
 LRFD or ASD or SEISMIC ===== **LRFD**
 PILE CUTOFF ELEV. ===== **594.50** ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== **575.00** ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== **None**
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	418 KIPS	230 KIPS	59 FT.

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

PILE TYPE AND SIZE ===== **Steel HP 12 X 53**

Plugged Pile Perimeter===== 3.967 FT. Unplugged Pile Perimeter===== 5.800 FT.
 Plugged Pile End Bearing Area===== 0.983 SQFT. Unplugged Pile End Bearing Area===== 0.108 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.10	0.90	0.75	4		2.0		25.4	2.9		5.5	5	0	0	3	20
571.60	2.50	1.70	9		10.4	23.4	34.4	15.2	2.6	20.5	21	0	0	11	23
569.10	2.50	1.60	11		10.0	22.0	43.0	14.6	2.4	34.9	35	0	0	19	25
566.60	2.50	1.50	13		9.5	20.7	58.1	13.9	2.3	49.5	49	0	0	27	28
564.10	2.50	1.90	12		11.2	26.2	66.5	16.3	2.9	65.5	66	0	0	36	30
561.60	2.50	1.70	17		10.4	23.4	86.5	15.2	2.6	81.8	82	0	0	45	33
559.10	2.50	2.40	17		13.0	33.1	105.0	19.0	3.6	101.4	101	0	0	56	35
556.60	2.50	2.80	19		14.4	38.6	115.3	21.1	4.2	122.0	115	0	0	63	38
554.10	2.50	2.50	21		13.4	34.5	130.1	19.5	3.8	141.7	130	0	0	72	40
551.60	2.50	2.60	18		13.7	35.8	143.8	20.1	3.9	161.8	144	0	0	79	43
549.10	2.50	2.60	18		13.7	35.8	161.6	20.1	3.9	182.3	162	0	0	89	45
546.60	2.50	2.90	22		14.8	40.0	176.5	21.7	4.4	203.9	176	0	0	97	48
544.10	2.50	2.90	22		14.8	40.0	181.6	21.7	4.4	224.5	182	0	0	100	50
541.60	2.50	2.20	73		12.3	30.3	193.9	17.9	3.3	242.5	194	0	0	107	53
539.10	2.50	2.20	73		12.3	30.3	420.8	17.9	3.3	283.9	284	0	0	156	55
536.60	2.50		100	Fine Sand	35.5	245.0	456.3	51.9	26.8	335.8	336	0	0	185	58
536.10	0.50		100	Fine Sand	7.1	245.0	463.4	10.4	26.8	346.2	346	0	0	190	58
535.60	0.50			Limestone	49.4	245.0	512.8	72.3	26.8	418.5	418	0	0	230	58.9
535.10	0.50			Limestone	49.4	245.0	562.3	72.3	26.8	490.7	491	0	0	270	59.4
534.60	0.50			Limestone		245.0			26.8						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== S.Abut- East Side (PRECORE)
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 575.00 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	578 KIPS	318 KIPS	59 FT.

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

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.10	0.90	0.75	4		2.4		35.2	3.5		7.0	7	0	0	4	20
571.60	2.50	1.70	9		12.3	32.9	45.6	18.3	3.5	25.1	25	0	0	14	23
569.10	2.50	1.60	11		11.8	30.9	55.5	17.5	3.3	42.4	42	0	0	23	25
566.60	2.50	1.50	13		11.3	29.0	74.5	16.8	3.1	60.0	60	0	0	33	28
564.10	2.50	1.90	12		13.2	36.7	83.9	19.6	4.0	79.3	79	0	0	44	30
561.60	2.50	1.70	17		12.3	32.9	109.7	18.3	3.5	99.0	99	0	0	54	33
559.10	2.50	2.40	17		15.4	46.4	132.8	22.8	5.0	122.7	123	0	0	67	35
556.60	2.50	2.80	19		17.1	54.1	144.1	25.4	5.8	147.4	144	0	0	79	38
554.10	2.50	2.50	21		15.8	48.3	161.9	23.5	5.2	171.1	162	0	0	89	40
551.60	2.50	2.60	18		16.3	50.2	178.2	24.1	5.4	195.3	178	0	0	98	43
549.10	2.50	2.60	18		16.3	50.2	200.2	24.1	5.4	220.0	200	0	0	110	45
546.60	2.50	2.90	22		17.5	56.0	217.8	26.0	6.0	246.0	218	0	0	120	48
544.10	2.50	2.90	22		17.5	56.0	221.8	26.0	6.0	270.6	222	0	0	122	50
541.60	2.50	2.20	73		14.5	42.5	236.3	21.6	4.6	292.2	236	0	0	130	53
539.10	2.50	2.20	73		14.5	42.5	551.9	21.6	4.6	346.2	346	0	0	190	55
536.60	2.50		100	Fine Sand	42.1	343.5	593.9	62.4	37.0	408.6	409	0	0	225	58
536.10	0.50		100	Fine Sand	8.4	343.5	602.4	12.5	37.0	421.1	421	0	0	232	58
535.60	0.50			Limestone	58.5	343.5	660.9	86.9	37.0	508.0	508	0	0	279	58.9
535.10	0.50			Limestone	58.5	343.5	719.5	86.9	37.0	594.9	595	0	0	327	59.4
534.60	0.50			Limestone		343.5			37.0						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== S.Abut- East Side (PRECORE)
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 575.00 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
254 KIPS	222 KIPS	122 KIPS	53 FT.

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

PILE TYPE AND SIZE ===== Metal Shell 12"Φ w/.179" walls
 Pile Perimeter===== 3.142 FT.
 Pile End Bearing Area===== 0.785 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.10	0.90	0.75	4		2.5		17.1	17	0	0	9	20
571.60	2.50	1.70	9		12.9	14.6	29.1	29	0	0	16	23
569.10	2.50	1.60	11		12.4	13.8	40.6	41	0	0	22	25
566.60	2.50	1.50	13		11.8	12.9	55.9	56	0	0	31	28
564.10	2.50	1.90	12		13.9	16.4	68.0	68	0	0	37	30
561.60	2.50	1.70	17		12.9	14.6	86.9	87	0	0	48	33
559.10	2.50	2.40	17		16.1	20.7	106.5	106	0	0	59	35
556.60	2.50	2.80	19		17.9	24.1	121.8	122	0	0	67	38
554.10	2.50	2.50	21		16.6	21.5	139.2	139	0	0	77	40
551.60	2.50	2.60	18		17.0	22.4	156.2	156	0	0	86	43
549.10	2.50	2.60	18		17.0	22.4	175.8	176	0	0	97	45
546.60	2.50	2.90	22		18.4	25.0	194.2	194	0	0	107	48
544.10	2.50	2.90	22		18.4	25.0	206.5	207	0	0	114	50
541.60	2.50	2.20	73		15.2	19.0	221.7	222	0	0	122	53
539.10	2.50	2.20	73		15.2	19.0	712.4	712	0	0	392	55
536.60	2.50		100	Fine Sand	142.1	494.4	854.5	854	0	0	470	58
536.10	0.50		100	Fine Sand	28.4	494.4	882.9	883	0	0	486	58
535.60	0.50			Limestone	197.8	494.4	1080.7	1081	0	0	594	58-9
535.10	0.50			Limestone	197.8	494.4	1278.4	1278	0	0	703	59-4
534.60	0.50			Limestone		494.4			0	0		

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== S.Abut- East Side (PRECORE)
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 575.00 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	262 KIPS	144 KIPS	53 FT.

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

PILE TYPE AND SIZE ===== Metal Shell 14"Φ w/.25" walls
 Pile Perimeter===== 3.665 FT.
 Pile End Bearing Area===== 1.069 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL						NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)								
574.10	0.90	0.75	4		2.9		22.8				23	0	0	13	20
571.60	2.50	1.70	9		15.0	19.9	36.7				37	0	0	20	23
569.10	2.50	1.60	11		14.4	18.8	49.9				50	0	0	27	25
566.60	2.50	1.50	13		13.8	17.6	68.4				68	0	0	38	28
564.10	2.50	1.90	12		16.2	22.3	82.2				82	0	0	45	30
561.60	2.50	1.70	17		15.0	19.9	105.4				105	0	0	58	33
559.10	2.50	2.40	17		18.8	28.1	128.9				129	0	0	71	35
556.60	2.50	2.80	19		20.9	32.8	146.3				146	0	0	80	38
554.10	2.50	2.50	21		19.3	29.3	166.8				167	0	0	92	40
551.60	2.50	2.60	18		19.8	30.5	186.6				187	0	0	103	43
549.10	2.50	2.60	18		19.8	30.5	210.0				210	0	0	115	45
546.60	2.50	2.90	22		21.4	34.0	231.4				231	0	0	127	48
544.10	2.50	2.90	22		21.4	34.0	244.6				245	0	0	135	50
541.60	2.50	2.20	73		17.7	25.8	262.4				262	0	0	144	53
539.10	2.50	2.20	73		17.7	25.8	927.3				927	0	0	540	55
536.60	2.50		100	Fine Sand	165.8	672.9	1093.0				1093	0	0	604	58
536.10	0.50		100	Fine Sand	33.2	672.9	1126.2				1126	0	0	649	58
535.60	0.50			Limestone	230.7	672.9	1356.9				1357	0	0	746	58-9
535.10	0.50			Limestone	230.7	672.9	1587.6				1588	0	0	873	59-4
534.60	0.50			Limestone		672.9									

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== S. Abut.t- East Side (DD)
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 592.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== DD
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== 575.00 ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
286 KIPS	286 KIPS	135 KIPS	59 FT.

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

PILE TYPE AND SIZE ===== Steel HP 8 X 36

Plugged Pile Perimeter===== 2.695 FT. Unplugged Pile Perimeter===== 3.892 FT.
 Plugged Pile End Bearing Area===== 0.454 SQFT. Unplugged Pile End Bearing Area===== 0.074 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
591.60	0.90		25	Hard Till	0.7		15.1	1.0		3.3	3	0	1	3	
589.10	2.50		25	Hard Till	1.8	14.4	23.7	2.7	2.3	7.0	7	1	3	5	
586.60	2.50		25	Hard Till	1.8	21.2	25.5	2.7	3.4	9.7	10	2	5	8	
584.10	2.50		25	Hard Till	1.8	21.2	27.4	2.7	3.4	12.3	12	3	7	10	
581.60	2.50		25	Hard Till	1.8	21.2	36.3	2.7	3.4	16.1	16	4	9	13	
579.10	2.50		25	Fine Sand	2.9	28.3	39.2	4.2	4.6	20.3	20	6	12	15	
576.60	2.50		25	Fine Sand	2.9	28.3	18.5	4.2	4.6	20.7	19	8	15	18	
574.10	2.50	0.75	4		3.8	4.8	28.4	5.4	0.8	27.1	27	8	15	20	
571.60	2.50	1.70	9		7.1	10.8	34.8	10.2	1.8	37.2	35	8	15	23	
569.10	2.50	1.60	11		6.8	10.2	40.9	9.8	1.7	46.8	41	8	15	25	
566.60	2.50	1.50	13		6.5	9.5	49.9	9.4	1.5	56.6	50	8	15	28	
564.10	2.50	1.90	12		7.6	12.1	56.3	11.0	2.0	67.4	56	8	15	30	
561.60	2.50	1.70	17		7.1	10.8	67.8	10.2	1.8	78.3	68	8	15	33	
559.10	2.50	2.40	17		8.8	15.3	79.1	12.7	2.5	91.4	79	8	15	35	
556.60	2.50	2.80	19		9.8	17.8	87.0	14.2	2.9	105.3	87	8	15	38	
554.10	2.50	2.50	21		9.1	15.9	96.8	13.1	2.6	118.5	97	8	15	40	
551.60	2.50	2.60	18		9.3	16.5	106.1	13.5	2.7	132.0	106	8	15	43	
549.10	2.50	2.60	18		9.3	16.5	117.3	13.5	2.7	145.7	117	8	15	45	
546.60	2.50	2.90	22		10.1	18.4	127.4	14.5	3.0	160.3	127	8	15	48	
544.10	2.50	2.90	22		10.1	18.4	133.0	14.5	3.0	174.1	133	8	15	50	
541.60	2.50	2.20	73		8.3	14.0	141.3	12.0	2.3	186.1	141	8	15	53	
539.10	2.50	2.20	73		8.3	14.0	248.7	12.0	2.3	214.2	214	8	15	55	
536.60	2.50		100	Fine Sand	24.1	113.1	272.9	34.8	18.3	249.0	249	8	15	58	
536.10	0.50		100	Fine Sand	4.8	113.1	277.7	7.0	18.3	256.0	256	8	15	58	
535.60	0.50			Limestone	33.6	113.1	311.3	48.5	18.3	304.5	304	8	15	58.9	
535.10	0.50			Limestone	33.6	113.1	344.8	48.5	18.3	353.0	345	8	15	59.4	
534.60	0.50			Limestone		113.1			18.3						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== S. Abut.- East Side (DD)
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 592.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== DD
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== 575.00 ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	335 KIPS	156 KIPS	59 FT.

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

PILE TYPE AND SIZE ===== Steel HP 10 X 42
 Plugged Pile Perimeter===== 3.300 FT. Unplugged Pile Perimeter===== 4.858 FT.
 Plugged Pile End Bearing Area===== 0.680 SQFT. Unplugged Pile End Bearing Area===== 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
591.60	0.90		25	Hard Till	0.8		18.1	1.2		3.4	3	0	1	1	3
589.10	2.50		25	Hard Till	2.2	17.3	33.1	3.3	2.2	8.3	8	2	3	0	5
586.60	2.50		25	Hard Till	2.2	30.0	37.1	3.3	3.8	11.8	12	3	6	-2	8
584.10	2.50		25	Hard Till	2.2	31.8	39.3	3.3	4.0	15.1	15	4	8	-4	10
581.60	2.50		25	Hard Till	2.2	31.8	52.2	3.3	4.0	19.8	20	5	11	-5	13
579.10	2.50		25	Fine Sand	3.5	42.4	55.7	5.2	5.4	25.0	25	7	15	-8	15
576.60	2.50		25	Fine Sand	3.5	42.4	24.0	5.2	5.4	25.7	24	9	19	-15	18
574.10	2.50	0.75	4		4.6	7.2	37.7	6.8	0.9	33.7	34	9	19	-9	20
571.60	2.50	1.70	9		8.6	16.2	45.4	12.7	2.1	46.3	45	9	19	-3	23
569.10	2.50	1.60	11		8.3	15.3	52.7	12.2	1.9	58.4	53	9	19	1	25
566.60	2.50	1.50	13		7.9	14.3	64.5	11.7	1.8	70.5	64	9	19	8	28
564.10	2.50	1.90	12		9.3	18.1	71.8	13.7	2.3	84.0	72	9	19	12	30
561.60	2.50	1.70	17		8.6	16.2	87.2	12.7	2.1	97.5	87	9	19	20	33
559.10	2.50	2.40	17		10.8	22.9	101.8	15.9	2.9	113.9	102	9	19	28	35
556.60	2.50	2.80	19		12.0	26.7	110.9	17.7	3.4	131.3	111	9	19	33	38
554.10	2.50	2.50	21		11.1	23.8	123.0	16.4	3.0	147.7	123	9	19	40	40
551.60	2.50	2.60	18		11.4	24.8	134.4	16.8	3.1	164.5	134	9	19	46	43
549.10	2.50	2.60	18		11.4	24.8	148.7	16.8	3.1	181.7	149	9	19	54	45
546.60	2.50	2.90	22		12.3	27.7	161.0	18.1	3.5	199.8	161	9	19	61	48
544.10	2.50	2.90	22		12.3	27.7	166.7	18.1	3.5	217.1	167	9	19	64	50
541.60	2.50	2.20	73		10.2	21.0	176.9	15.0	2.7	232.2	177	9	19	69	53
539.10	2.50	2.20	73		10.2	21.0	335.6	15.0	2.7	266.0	266	9	19	118	55
536.60	2.50		100	Fine Sand	29.5	169.5	365.1	43.5	21.5	309.5	309	9	19	142	58
536.10	0.50		100	Fine Sand	5.9	169.5	371.0	8.7	21.5	318.2	318	9	19	147	58
535.60	0.50			Limestone	41.1	169.5	412.2	60.5	21.5	378.7	379	9	49	489	58.9
535.10	0.50			Limestone	41.1	169.5	453.3	60.5	21.5	439.2	439	9	49	214	59.4
534.60	0.50			Limestone		169.5			21.5						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== S. Abut.- East Side (DD)
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 592.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== DD
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== 575.00 ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	418 KIPS	197 KIPS	59 FT.

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

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
591.60	0.90		25	Hard Till	1.0		21.8	1.4		3.7	4	1	1	0	3
589.10	2.50		25	Hard Till	2.7	20.8	39.8	4.0	2.3	9.3	9	2	4	-1	5
586.60	2.50		25	Hard Till	2.7	36.1	52.3	4.0	4.0	14.4	14	4	7	-3	8
584.10	2.50		25	Hard Till	2.7	45.9	55.0	4.0	5.0	18.3	18	5	10	-5	10
581.60	2.50		25	Hard Till	2.7	45.9	73.0	4.0	5.0	23.9	24	6	13	-6	13
579.10	2.50		25	Fine Sand	4.2	61.2	77.3	6.2	6.7	30.1	30	9	18	-10	15
576.60	2.50		25	Fine Sand	4.2	61.2	30.6	6.2	6.7	30.8	31	11	22	-17	18
574.10	2.50	0.75	4		5.5	10.3	49.2	8.1	1.1	40.3	40	11	22	-11	20
571.60	2.50	1.70	9		10.4	23.4	58.3	15.2	2.6	55.3	55	11	22	-3	23
569.10	2.50	1.60	11		10.0	22.0	66.8	14.6	2.4	69.8	67	11	22	3	25
566.60	2.50	1.50	13		9.5	20.7	81.9	13.9	2.3	84.3	82	11	22	12	28
564.10	2.50	1.90	12		11.2	26.2	90.3	16.3	2.9	100.4	90	11	22	16	30
561.60	2.50	1.70	17		10.4	23.4	110.3	15.2	2.6	116.6	110	11	22	27	33
559.10	2.50	2.40	17		13.0	33.1	128.8	19.0	3.6	136.2	129	11	22	37	35
556.60	2.50	2.80	19		14.4	38.6	139.2	21.1	4.2	156.9	139	11	22	43	38
554.10	2.50	2.50	21		13.4	34.5	153.9	19.5	3.8	176.5	154	11	22	51	40
551.60	2.50	2.60	18		13.7	35.8	167.6	20.1	3.9	196.6	168	11	22	59	43
549.10	2.50	2.60	18		13.7	35.8	185.5	20.1	3.9	217.1	185	11	22	69	45
546.60	2.50	2.90	22		14.8	40.0	200.3	21.7	4.4	238.8	200	11	22	77	48
544.10	2.50	2.90	22		14.8	40.0	205.4	21.7	4.4	259.4	205	11	22	79	50
541.60	2.50	2.20	73		12.3	30.3	217.7	17.9	3.3	277.3	218	11	22	86	53
539.10	2.50	2.20	73		12.3	30.3	444.6	17.9	3.3	318.7	319	11	22	142	55
536.60	2.50		100	Fine Sand	35.5	245.0	480.1	51.9	26.8	370.6	371	11	22	170	58
536.10	0.50		100	Fine Sand	7.1	245.0	487.2	10.4	26.8	381.0	381	11	22	176	58
535.60	0.50			Limestone	49.4	245.0	536.7	72.3	26.8	453.3	453	44	22	246	58.9
535.10	0.50			Limestone	49.4	245.0	586.1	72.3	26.8	525.5	526	44	22	256	59.4
534.60	0.50			Limestone		245.0			26.8						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== S. Abut.- East Side (DD)
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 592.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== DD
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== 575.00 ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	578 KIPS	278 KIPS	59 FT.

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

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
591.60	0.90		25	Hard Till	1.2		26.2	1.7		4.4	4	1	1	3	
589.10	2.50		25	Hard Till	3.2	25.0	47.8	4.8	2.7	11.1	11	2	5	5	
586.60	2.50		25	Hard Till	3.2	43.4	69.4	4.8	4.7	17.9	18	4	8	8	
584.10	2.50		25	Hard Till	3.2	61.8	75.2	4.8	6.7	22.9	23	6	12	10	
581.60	2.50		25	Hard Till	3.2	64.4	99.8	4.8	6.9	30.0	30	8	15	13	
579.10	2.50		25	Fine Sand	5.0	85.9	104.9	7.5	9.3	37.4	37	10	21	15	
576.60	2.50		25	Fine Sand	5.0	85.9	38.5	7.5	9.3	37.2	37	13	26	18	
574.10	2.50	0.75	4		6.6	14.5	63.4	9.7	1.6	48.9	49	13	26	20	
571.60	2.50	1.70	9		12.3	32.9	73.8	18.3	3.5	67.0	67	13	26	23	
569.10	2.50	1.60	11		11.8	30.9	83.7	17.5	3.3	84.3	84	13	26	25	
566.60	2.50	1.50	13		11.3	29.0	102.7	16.8	3.1	101.9	102	13	26	28	
564.10	2.50	1.90	12		13.2	36.7	112.1	19.6	4.0	121.1	112	13	26	30	
561.60	2.50	1.70	17		12.3	32.9	137.9	18.3	3.5	140.9	138	13	26	33	
559.10	2.50	2.40	17		15.4	46.4	161.1	22.8	5.0	164.5	161	13	26	35	
556.60	2.50	2.80	19		17.1	54.1	172.4	25.4	5.8	189.3	172	13	26	38	
554.10	2.50	2.50	21		15.8	48.3	190.1	23.5	5.2	213.0	190	13	26	40	
551.60	2.50	2.60	18		16.3	50.2	206.4	24.1	5.4	237.1	206	13	26	43	
549.10	2.50	2.60	18		16.3	50.2	228.4	24.1	5.4	261.9	228	13	26	45	
546.60	2.50	2.90	22		17.5	56.0	246.0	26.0	6.0	287.9	246	13	26	48	
544.10	2.50	2.90	22		17.5	56.0	250.0	26.0	6.0	312.5	250	13	26	50	
541.60	2.50	2.20	73		14.5	42.5	264.5	21.6	4.6	334.1	265	13	26	53	
539.10	2.50	2.20	73		14.5	42.5	580.1	21.6	4.6	388.1	388	13	26	55	
536.60	2.50		100	Fine Sand	42.1	343.5	622.2	62.4	37.0	450.5	451	13	26	58	
536.10	0.50		100	Fine Sand	8.4	343.5	630.6	12.5	37.0	463.0	463	13	26	58	
535.60	0.50			Limestone	58.5	343.5	689.1	86.9	37.0	549.9	550	13	26	58.9	
535.10	0.50			Limestone	58.5	343.5	747.7	86.9	37.0	636.8	637	43	26	59.4	
534.60	0.50			Limestone		343.5			37.0						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== S. Abut.- East Side (DD)
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 592.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== DD
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== 575.00 ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req.d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
254 KIPS	242 KIPS	#VALUE! KIPS	#VALUE! FT.

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

PILE TYPE AND SIZE ===== Metal Shell 12"Φ w/.179" walls
 Pile Perimeter===== 3.142 FT.
 Pile End Bearing Area===== 0.785 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
591.60	0.90		25	Hard Till	3.9		45.9	46	2	4	19	3
589.10	2.50		25	Hard Till	10.8	42.0	87.6	88	8	16	24	5
586.60	2.50		25	Hard Till	10.8	72.9	118.2	118	14	28	23	8
584.10	2.50		25	Hard Till	10.8	92.7	129.0	129	20	40	11	10
581.60	2.50		25	Hard Till	10.8	92.7	170.8	171	26	52	16	13
579.10	2.50		25	Fine Sand	17.0	123.6	187.8	188	35	71	-3	15
576.60	2.50		25	Fine Sand	17.0	123.6	87.6	88	45	89	-86	18
574.10	2.50	0.75	4		6.9	6.5	102.7	103	45	89	-78	20
571.60	2.50	1.70	9		12.9	14.6	114.7	115	45	89	-71	23
569.10	2.50	1.60	11		12.4	13.8	126.2	126	45	89	-65	25
566.60	2.50	1.50	13		11.8	12.9	141.4	141	45	89	-56	28
564.10	2.50	1.90	12		13.9	16.4	153.6	154	45	89	-50	30
561.60	2.50	1.70	17		12.9	14.6	172.5	172	45	89	-39	33
559.10	2.50	2.40	17		16.1	20.7	192.0	192	45	89	-28	35
556.60	2.50	2.80	19		17.9	24.1	207.4	207	45	89	-20	38
554.10	2.50	2.50	21		16.6	21.5	224.8	225	45	89	-10	40
551.60	2.50	2.60	18		17.0	22.4	241.8	242	45	89	-1	43
549.10	2.50	2.60	18		17.0	22.4	261.4	261	45	89	-10	45
546.60	2.50	2.90	22		18.4	25.0	279.7	280	45	89	20	48
544.10	2.50	2.90	22		18.4	25.0	292.1	292	45	89	27	50
541.60	2.50	2.20	73		15.2	19.0	307.3	307	45	89	36	53
539.10	2.50	2.20	73		15.2	19.0	797.9	798	45	89	305	55
536.60	2.50		100	Fine Sand	142.1	494.4	940.0	940	45	89	383	58
536.10	0.50		100	Fine Sand	28.4	494.4	968.4	968	45	89	399	58
535.60	0.50			Limestone	197.8	494.4	1166.2	1166	45	89	507	58.0
535.10	0.50			Limestone	197.8	494.4	1364.0	1364	45	89	616	59.4
534.60	0.50			Limestone		494.4						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== S. Abut.- East Side (DD)
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 594.50 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 592.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== DD
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== 575.00 ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	362 KIPS	43 KIPS	53 FT.

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

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

PILE TYPE AND SIZE ===== Metal Shell 14"Φ w/.25" walls
 Pile Perimeter===== 3.665 FT.
 Pile End Bearing Area===== 1.069 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
591.60	0.90		25	Hard Till	4.5		53.6	54	2	5	22	3
589.10	2.50		25	Hard Till	12.6	49.0	102.2	102	9	19	28	5
586.60	2.50		25	Hard Till	12.6	85.1	150.9	151	16	33	34	8
584.10	2.50		25	Hard Till	12.6	121.1	168.6	169	23	47	23	10
581.60	2.50		25	Hard Till	12.6	126.2	223.2	223	30	61	32	13
579.10	2.50		25	Fine Sand	19.8	168.2	243.1	243	41	83	10	15
576.60	2.50		25	Fine Sand	19.8	168.2	103.5	103	52	104	-100	18
574.10	2.50	0.75	4		8.0	8.8	122.6	123	52	104	-89	20
571.60	2.50	1.70	9		15.0	19.9	136.5	136	52	104	-81	23
569.10	2.50	1.60	11		14.4	18.8	149.7	150	52	104	-74	25
566.60	2.50	1.50	13		13.8	17.6	168.2	168	52	104	-64	28
564.10	2.50	1.90	12		16.2	22.3	182.0	182	52	104	-56	30
561.60	2.50	1.70	17		15.0	19.9	205.2	205	52	104	-44	33
559.10	2.50	2.40	17		18.8	28.1	228.7	229	52	104	-31	35
556.60	2.50	2.80	19		20.9	32.8	246.1	246	52	104	-21	38
554.10	2.50	2.50	21		19.3	29.3	266.6	267	52	104	-10	40
551.60	2.50	2.60	18		19.8	30.5	286.4	286	52	104	1	43
549.10	2.50	2.60	18		19.8	30.5	309.8	310	52	104	14	45
546.60	2.50	2.90	22		21.4	34.0	331.2	331	52	104	26	48
544.10	2.50	2.90	22		21.4	34.0	344.4	344	52	104	33	50
541.60	2.50	2.20	73		17.7	25.8	362.2	362	52	104	43	53
539.10	2.50	2.20	73		17.7	25.8	1027.1	1027	52	-104	408	55
536.60	2.50		100	Fine Sand	165.8	672.9	1192.8	1193	52	-104	500	58
536.10	0.50		100	Fine Sand	33.2	672.9	1226.0	1226	52	-104	518	58
535.60	0.50			Limestone	230.7	672.9	1456.7	1457	52	-104	645	58.9
535.10	0.50			Limestone	230.7	672.9	1687.4	1687	52	-104	772	59.4
534.60	0.50			Limestone		672.9						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== South Pier/ Pier 1
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft
 TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips
 TOTAL LENGTH OF SUBSTRUCTURE (along skew)===== ft
 NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====
 Approx. Factored Loading Applied per pile at 8 ft. Cts ===== KIPS
 Approx. Factored Loading Applied per pile at 3 ft. Cts ===== KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
286 KIPS	286 KIPS	157 KIPS	59 FT.

PILE TYPE AND SIZE ===== Steel HP 8 X 36
 Plugged Pile Perimeter===== 2.695 FT. Unplugged Pile Perimeter===== 3.892 FT.
 Plugged Pile End Bearing Area===== 0.454 SQFT. Unplugged Pile End Bearing Area===== 0.074 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
573.10	3.40	0.75	4		5.1		15.9	7.4		9.1	9	0	0	5	20
570.60	2.50	1.70	9		7.1	10.8	22.4	10.2	1.8	19.2	19	0	0	11	23
568.10	2.50	1.60	11		6.8	10.2	28.5	9.8	1.7	28.9	28	0	0	16	25
565.60	2.50	1.50	13		6.5	9.5	37.5	9.4	1.5	38.7	38	0	0	21	28
563.10	2.50	1.90	12		7.6	12.1	43.8	11.0	2.0	49.4	44	0	0	24	30
560.60	2.50	1.70	17		7.1	10.8	55.3	10.2	1.8	60.3	55	0	0	30	33
558.10	2.50	2.40	17		8.8	15.3	66.7	12.7	2.5	73.5	67	0	0	37	35
555.60	2.50	2.90	19		9.8	17.8	74.6	14.2	2.9	87.4	75	0	0	41	38
553.10	2.50	2.90	21		9.1	15.9	84.3	13.1	2.6	100.6	84	0	0	46	40
550.60	2.50	2.60	18		9.3	16.5	93.7	13.5	2.7	114.0	94	0	0	52	43
548.10	2.50	2.60	18		9.3	16.5	104.9	13.5	2.7	127.8	105	0	0	58	45
545.60	2.50	2.90	22		10.1	18.4	114.9	14.5	3.0	142.3	115	0	0	63	48
543.10	2.50	2.90	22		10.1	18.4	120.6	14.5	3.0	156.1	121	0	0	66	50
540.60	2.50	2.20	73		8.3	14.0	128.9	12.0	2.3	168.2	129	0	0	71	53
538.10	2.50	2.20	73		8.3	14.0	236.3	12.0	2.3	196.3	196	0	0	108	55
535.60	2.50		100	Fine Sand	24.1	113.1	260.4	34.8	18.3	231.1	231	0	0	127	58
535.10	0.50		100	Fine Sand	4.8	113.1	265.3	7.0	18.3	238.1	238	0	0	131	58
534.60	0.50			Limestone	33.6	113.1	298.8	48.5	18.3	286.6	287	0	0	158	58.8
534.10	0.50			Limestone	33.6	113.1	332.4	48.5	18.3	335.0	332	0	0	183	58.3
533.60	0.50			Limestone		113.1			18.3						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== South Pier/ Pier 1
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	335 KIPS	184 KIPS	59 FT.

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

PILE TYPE AND SIZE ===== Steel HP 10 X 42
 Plugged Pile Perimeter===== 3.300 FT. Unplugged Pile Perimeter===== 4.858 FT.
 Plugged Pile End Bearing Area===== 0.680 SQFT. Unplugged Pile End Bearing Area===== 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
573.10	3.40	0.75	4		6.3		22.5	9.2		11.3	11	0	0	6	20
570.60	2.50	1.70	9		8.6	16.2	30.2	12.7	2.1	23.9	24	0	0	13	23
568.10	2.50	1.90	11		8.3	15.3	37.5	12.2	1.9	36.0	36	0	0	20	25
565.60	2.50	1.50	13		7.9	14.3	49.3	11.7	1.8	48.1	48	0	0	26	28
563.10	2.50	1.90	12		9.3	18.1	56.6	13.7	2.3	61.6	57	0	0	31	30
560.60	2.50	1.70	17		8.6	16.2	72.0	12.7	2.1	75.1	72	0	0	40	33
558.10	2.50	2.40	17		10.8	22.9	86.6	15.9	2.9	91.5	87	0	0	48	35
555.60	2.50	2.80	19		12.0	25.7	95.7	17.7	3.4	108.9	96	0	0	53	38
553.10	2.50	2.50	21		11.1	23.8	107.8	16.4	3.0	125.3	108	0	0	59	40
550.60	2.50	2.60	18		11.4	24.8	119.2	16.8	3.1	142.2	119	0	0	66	43
548.10	2.50	2.60	16		11.4	24.8	133.5	16.8	3.1	159.3	133	0	0	73	45
545.60	2.50	2.90	22		12.3	27.7	145.8	18.1	3.5	177.5	146	0	0	80	48
543.10	2.50	2.90	22		12.3	27.7	151.5	18.1	3.5	194.7	151	0	0	83	50
540.60	2.50	2.20	73		10.2	21.0	161.7	15.0	2.7	209.8	162	0	0	89	53
538.10	2.50	2.20	73		10.2	21.0	320.4	15.0	2.7	243.6	244	0	0	134	55
535.60	2.50		100	Fine Sand	29.5	169.5	349.9	43.5	21.5	287.1	287	0	0	158	58
535.10	0.50		100	Fine Sand	5.9	169.5	355.8	8.7	21.5	295.8	296	0	0	163	58
534.60	0.50			Limestone	41.1	169.5	396.9	60.5	21.5	356.3	356	0	0	496	58.9
534.10	0.50			Limestone	41.1	169.5	438.1	60.5	21.5	416.8	447	0	0	229	59.3
533.60	0.50			Limestone		169.5			21.5						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== South Pier/ Pier 1
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft
 TOTAL FACTORED SUBSTRUCTURE LOAD ===== kips
 TOTAL LENGTH OF SUBSTRUCTURE (along skew)===== ft
 NUMBER OF ROWS OF PILES PER SUBSTRUCTURE =====
 Approx. Factored Loading Applied per pile at 8 ft. Cts ===== KIPS
 Approx. Factored Loading Applied per pile at 3 ft. Cts ===== KIPS

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	418 KIPS	230 KIPS	59 FT.

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
573.10	3.40	0.75	4		7.5		31.0	11.0		13.6	14	0	0	7	20
570.60	2.50	1.70	9		10.4	23.4	40.0	15.2	2.6	28.6	29	0	0	16	23
568.10	2.50	1.60	11		10.0	22.0	48.6	14.6	2.4	43.0	43	0	0	24	25
565.60	2.50	1.50	13		9.5	20.7	63.6	13.9	2.3	57.6	58	0	0	32	28
563.10	2.50	1.90	12		11.2	26.2	72.0	16.3	2.9	73.6	72	0	0	40	30
560.60	2.50	1.70	17		10.4	23.4	92.1	15.2	2.6	89.9	90	0	0	49	33
558.10	2.50	2.40	17		13.0	33.1	110.6	19.0	3.6	109.5	109	0	0	60	35
555.60	2.50	2.80	19		14.4	38.6	120.9	21.1	4.2	130.1	121	0	0	66	38
553.10	2.50	2.50	21		13.4	34.5	135.6	19.5	3.8	149.8	136	0	0	75	40
550.60	2.50	2.60	18		13.7	35.8	149.3	20.1	3.9	169.9	149	0	0	82	43
548.10	2.50	2.60	18		13.7	35.8	167.2	20.1	3.9	190.4	167	0	0	92	45
545.60	2.50	2.90	22		14.8	40.0	182.0	21.7	4.4	212.0	182	0	0	100	48
543.10	2.50	2.60	22		14.8	40.0	187.2	21.7	4.4	232.6	187	0	0	103	50
540.60	2.50	2.20	73		12.3	30.3	199.4	17.9	3.3	250.6	199	0	0	110	53
538.10	2.50	2.20	73		12.3	30.3	426.4	17.9	3.3	292.0	292	0	0	161	55
535.60	2.50		100	Fine Sand	35.5	245.0	461.9	51.9	26.8	343.9	344	0	0	189	58
535.10	0.50		100	Fine Sand	7.1	245.0	469.0	10.4	26.8	354.3	354	0	0	195	58
534.60	0.50			Limestone	49.4	245.0	518.4	72.3	26.8	426.6	427	0	0	235	58.8
534.10	0.50			Limestone	49.4	245.0	567.8	72.3	26.8	498.8	499	0	0	274	59.3
533.60	0.50			Limestone		245.0			26.8						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== South Pier/ Pier 1
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req. d Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	578 KIPS	318 KIPS	59 FT.

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

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
573.10	3.40	0.75	4		8.9		41.8	13.3		16.8	17	0	0	9	20
570.60	2.50	1.70	9		12.3	32.9	52.2	18.3	3.5	34.8	35	0	0	19	23
568.10	2.50	1.60	11		11.8	30.9	62.0	17.5	3.3	52.2	52	0	0	29	25
565.60	2.50	1.50	13		11.3	29.0	81.1	16.8	3.1	69.8	70	0	0	38	28
563.10	2.50	1.90	12		13.2	36.7	90.4	19.6	4.0	89.0	89	0	0	49	30
560.60	2.50	1.70	17		12.3	32.9	116.3	18.3	3.5	108.7	109	0	0	60	33
558.10	2.50	2.40	17		15.4	46.4	139.4	22.8	5.0	132.4	132	0	0	73	35
555.60	2.50	2.80	19		17.1	54.1	150.7	25.4	5.8	157.2	151	0	0	83	38
553.10	2.50	2.50	21		15.8	48.3	168.5	23.5	5.2	180.9	168	0	0	93	40
550.60	2.50	2.60	18		16.3	50.2	184.7	24.1	5.4	205.0	185	0	0	102	43
548.10	2.50	2.60	18		16.3	50.2	206.8	24.1	5.4	229.7	207	0	0	114	45
545.60	2.50	2.90	22		17.5	56.0	224.3	26.0	6.0	255.8	224	0	0	123	48
543.10	2.50	2.90	22		17.5	56.0	228.3	26.0	6.0	280.4	228	0	0	126	50
540.60	2.50	2.20	73		14.5	42.5	242.9	21.6	4.6	301.9	243	0	0	134	53
538.10	2.50	2.20	73		14.5	42.5	558.4	21.6	4.6	356.0	356	0	0	196	55
535.60	2.50		100	Fine Sand	42.1	343.5	600.5	62.4	37.0	418.4	418	0	0	230	58
535.10	0.50		100	Fine Sand	8.4	343.5	608.9	12.5	37.0	430.9	431	0	0	237	58
534.60	0.50			Limestone	58.5	343.5	667.5	86.9	37.0	517.8	518	0	0	285	58.8
534.10	0.50			Limestone	58.5	343.5	726.0	86.9	37.0	604.6	606	0	0	333	60.3
533.60	0.50			Limestone		343.5			37.0						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== South Pier/ Pier 1
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
254 KIPS	229 KIPS	126 KIPS	53 FT.

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

PILE TYPE AND SIZE ===== Metal Shell 12"Φ w/ .179" walls
 Pile Perimeter===== 3.142 FT.
 Pile End Bearing Area===== 0.785 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
573.10	3.40	0.75	4		9.3		24.0	24	0	0	13	20
570.60	2.50	1.70	9		12.9	14.6	36.0	36	0	0	20	23
568.10	2.50	1.60	11		12.4	13.8	47.5	47	0	0	26	25
565.60	2.50	1.50	13		11.8	12.9	62.8	63	0	0	35	28
563.10	2.50	1.90	12		13.9	16.4	74.9	75	0	0	41	30
560.60	2.50	1.70	17		12.9	14.6	93.8	94	0	0	52	33
558.10	2.50	2.40	17		16.1	20.7	113.4	113	0	0	62	35
555.60	2.50	2.80	19		17.9	24.1	128.7	129	0	0	71	38
553.10	2.50	2.50	21		16.6	21.5	146.1	146	0	0	80	40
550.60	2.50	2.60	18		17.0	22.4	163.1	163	0	0	90	43
548.10	2.50	2.90	18		17.0	22.4	182.7	183	0	0	100	45
545.60	2.50	2.90	22		18.4	25.0	201.1	201	0	0	111	48
543.10	2.50	2.90	22		18.4	25.0	213.4	213	0	0	117	50
540.60	2.50	2.20	73		15.2	19.0	228.6	229	0	0	126	53
538.10	2.50	2.20	73		15.2	19.0	719.3	749	0	0	396	55
535.60	2.50		100	Fine Sand	142.1	494.4	861.4	861	0	0	474	58
535.10	0.50		100	Fine Sand	28.4	494.4	889.8	890	0	0	489	58
534.60	0.50			Limestone	197.8	494.4	1087.5	1088	0	0	598	58.8
534.10	0.50			Limestone	197.8	494.4	1285.3	1285	0	0	707	59.3
533.60	0.50			Limestone		494.4						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== South Pier/ Pier 1
 REFERENCE BORING ===== B-10
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	270 KIPS	149 KIPS	53 FT.

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

PILE TYPE AND SIZE ===== Metal Shell 14"Φ w/ .25" walls
 Pile Perimeter===== 3.665 FT.
 Pile End Bearing Area===== 1.069 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
573.10	3.40	0.75	4		10.9		30.8	31	0	0	17	20
570.60	2.50	1.70	9		15.0	19.9	44.7	45	0	0	25	23
568.10	2.50	1.60	11		14.4	18.8	57.9	58	0	0	32	25
565.60	2.50	1.50	13		13.8	17.6	76.4	76	0	0	42	28
563.10	2.50	1.90	12		16.2	22.3	90.2	90	0	0	50	30
560.60	2.50	1.70	17		15.0	19.9	113.5	113	0	0	62	33
558.10	2.50	2.40	17		18.8	28.1	136.9	137	0	0	75	35
555.60	2.50	2.80	19		20.9	32.8	154.3	154	0	0	85	38
553.10	2.50	2.50	21		19.3	29.3	174.8	175	0	0	96	40
550.60	2.50	2.60	18		19.8	30.5	194.7	195	0	0	107	43
548.10	2.50	2.60	18		19.8	30.5	218.0	218	0	0	120	45
545.60	2.50	2.90	22		21.4	34.0	239.4	239	0	0	132	48
543.10	2.50	2.90	22		21.4	34.0	252.6	253	0	0	139	50
540.60	2.50	2.20	73		17.7	25.8	270.4	270	0	0	149	53
538.10	2.50	2.20	73		17.7	25.8	935.3	935	0	0	544	55
535.60	2.50		100	Fine Sand	165.8	672.9	1101.0	1101	0	0	606	58
535.10	0.50		100	Fine Sand	33.2	672.9	1134.2	1134	0	0	624	58
534.60	0.50			Limestone	230.7	672.9	1364.9	1365	0	0	757	58.8
534.10	0.50			Limestone	230.7	672.9	1595.6	1596	0	0	878	59.3
533.60	0.50			Limestone		672.9						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== North Pier/ Pier 2
 REFERENCE BORING ===== SB-01
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
286 KIPS	286 KIPS	157 KIPS	60 FT.

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

PILE TYPE AND SIZE ===== Steel HP 8 X 36
 Plugged Pile Perimeter===== 2.695 FT. Unplugged Pile Perimeter===== 3.892 FT.
 Plugged Pile End Bearing Area===== 0.454 SQFT. Unplugged Pile End Bearing Area===== 0.074 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)	
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)						
574.60	1.90	3.25	11		8.3		23.6	12.0		14.5	14	0	0	8	19	
572.10	2.50	2.40	9		8.8	15.3	28.6	12.7	2.5	26.6	27	0	0	15	21	
569.60	2.50	1.90	11		7.3	11.5	35.9	10.6	1.9	37.2	36	0	0	20	24	
567.10	2.50	1.90	11		7.3	11.5	35.6	10.6	1.9	46.5	36	0	0	20	26	
564.60	2.50	0.60	9		3.1	3.8	38.7	4.5	0.6	51.0	39	0	0	21	29	
562.10	2.50	0.60	9		3.1	3.8	50.1	4.5	0.6	56.8	50	0	0	28	31	
559.60	2.50	1.90	12		7.6	12.1	57.7	11.0	2.0	67.8	58	0	0	32	34	
557.10	2.50	1.90	12		7.6	12.1	73.8	11.0	2.0	80.1	74	0	0	41	36	
554.60	2.50	3.25	18		10.9	20.7	84.8	15.8	3.4	95.9	85	0	0	47	39	
552.10	2.50	3.25	18		10.9	20.7	96.6	15.8	3.4	111.8	97	0	0	53	41	
549.60	2.50	3.40	19		11.3	21.6	107.9	16.3	3.5	128.1	108	0	0	59	44	
547.10	2.50	3.40	19		11.3	21.6	115.1	16.3	3.5	143.8	115	0	0	63	46	
544.60	2.50	2.75	18		9.7	17.5	124.8	14.0	2.8	157.8	125	0	0	69	49	
542.10	2.50	2.75	18		9.7	17.5	157.7	14.0	2.8	175.5	158	0	0	87	51	
539.60	2.50		48	Hard Till	4.0	40.7	161.7	5.8	6.6	181.3	162	0	0	89	54	
537.10	2.50		48	Hard Till	4.0	40.7	209.8	5.8	6.6	194.3	194	0	0	107	56	
534.60	2.50		100	Hard Till	14.5	84.8	252.6	21.0	13.8	219.9	220	0	0	121	59	
534.10	0.50			Limestone	33.6	113.1	286.2	48.5	18.3	268.3	268	0	0	148	59.3	
533.60	0.50			Limestone	33.6	113.1	319.8	48.5	18.3	316.8	347	0	0	174	59.8	
533.10	0.50			Limestone	33.6	113.1	353.4	48.5	18.3	365.3	369	0	0	194	60.3	
532.60	0.50			Limestone		113.1			18.3							

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== North Pier/ Pier 2
 REFERENCE BORING ===== SB-01
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	335 KIPS	184 KIPS	60 FT.

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

PILE TYPE AND SIZE ===== Steel HP 10 X 42
 Plugged Pile Perimeter===== 3.300 FT. Unplugged Pile Perimeter===== 4.858 FT.
 Plugged Pile End Bearing Area===== 0.680 SQFT. Unplugged Pile End Bearing Area===== 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.60	1.90	3.25	11		10.2		33.0	15.0		17.9	18	0	0	10	19
572.10	2.50	2.40	9		10.8	22.9	38.1	15.9	2.9	33.1	33	0	0	18	21
569.60	2.50	1.80	11		9.0	17.2	47.1	13.2	2.2	46.3	46	0	0	25	24
567.10	2.50	1.80	11		9.0	17.2	44.6	13.2	2.2	58.0	45	0	0	25	26
564.60	2.50	0.60	9		3.8	5.7	48.4	5.6	0.7	63.6	48	0	0	27	29
562.10	2.50	0.60	9		3.8	5.7	64.6	5.6	0.7	70.8	65	0	0	36	31
559.60	2.50	1.90	12		9.3	18.1	73.9	13.7	2.3	84.4	74	0	0	41	34
557.10	2.50	1.90	12		9.3	18.1	96.1	13.7	2.3	99.8	96	0	0	53	36
554.60	2.50	3.25	16		13.4	31.0	109.5	19.7	3.9	119.4	109	0	0	60	39
552.10	2.50	3.25	18		13.4	31.0	124.3	19.7	3.9	139.3	124	0	0	68	41
549.60	2.50	3.40	19		13.8	32.4	138.1	20.4	4.1	159.7	138	0	0	76	44
547.10	2.50	3.40	19		13.8	32.4	145.7	20.4	4.1	179.3	146	0	0	80	46
544.60	2.50	2.75	18		11.9	26.2	157.6	17.5	3.3	196.7	158	0	0	87	49
542.10	2.50	2.75	18		11.9	26.2	204.3	17.5	3.3	218.6	204	0	0	112	51
539.60	2.50		48	Hard Till	4.9	61.0	209.2	7.3	7.7	225.9	209	0	0	115	54
537.10	2.50		48	Hard Till	4.9	61.0	280.2	7.3	7.7	241.5	241	0	0	133	56
534.60	2.50		100	Hard Till	17.8	127.1	340.4	26.2	16.1	273.0	273	0	0	150	59
534.10	0.50			Limestone	41.1	169.5	381.5	60.5	21.5	333.5	334	0	0	183	59.3
533.60	0.50			Limestone	41.1	169.5	422.6	60.5	21.5	394.1	394	0	0	247	59.8
533.10	0.50			Limestone	41.1	169.5	463.7	60.5	21.5	454.6	456	0	0	290	60.3
532.60	0.50			Limestone		169.5			21.5						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== North Pier/ Pier 2
 REFERENCE BORING ===== SB-01
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	418 KIPS	230 KIPS	60 FT.

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

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)	
					SIDE	END BRG.	TOTAL	SIDE	END BRG.	TOTAL						
					RESIST. (KIPS)	RESIST. (KIPS)	RESIST. (KIPS)	RESIST. (KIPS)	RESIST. (KIPS)	RESIST. (KIPS)						
574.60	1.80	3.25	11		12.2		45.3	17.9		21.5	21	0	0	12	19	
572.10	2.50	2.40	9		13.0	33.1	50.0	19.0	3.6	39.6	40	0	0	22	21	
569.60	2.50	1.80	11		10.8	24.8	60.8	15.8	2.7	55.4	55	0	0	30	24	
567.10	2.50	1.80	11		10.8	24.8	55.1	15.8	2.7	69.3	55	0	0	30	26	
564.60	2.50	0.60	9		4.6	8.3	59.6	6.7	0.9	76.0	60	0	0	33	29	
562.10	2.50	0.60	9		4.6	8.3	82.1	6.7	0.9	84.6	82	0	0	45	31	
559.60	2.50	1.90	12		11.2	26.2	93.3	16.3	2.9	100.9	93	0	0	51	34	
557.10	2.50	1.90	12		11.2	26.2	123.0	16.3	2.9	119.3	119	0	0	66	36	
554.60	2.50	3.25	18		16.1	44.8	139.1	23.5	4.9	142.8	139	0	0	77	39	
552.10	2.50	3.25	18		16.1	44.8	157.3	23.5	4.9	166.6	157	0	0	86	41	
549.60	2.50	3.40	19		16.6	46.9	173.9	24.3	5.1	190.9	174	0	0	96	44	
547.10	2.50	3.40	19		16.6	46.9	181.5	24.3	5.1	214.2	182	0	0	100	46	
544.60	2.50	2.75	18		14.3	37.9	195.8	20.9	4.1	235.0	196	0	0	108	49	
542.10	2.50	2.75	18		14.3	37.9	260.4	20.9	4.1	261.4	260	0	0	143	51	
539.60	2.50		48	Hard Till	5.9	88.2	266.3	8.7	9.7	270.1	266	0	0	146	54	
537.10	2.50		48	Hard Till	5.9	88.2	367.8	8.7	9.7	289.2	289	0	0	159	56	
534.60	2.50		100	Hard Till	21.4	183.7	450.4	31.3	20.1	327.1	327	0	0	180	59	
534.10	0.50			Limestone	49.4	245.0	499.8	72.3	26.8	399.4	399	0	0	220	59.3	
533.60	0.50			Limestone	49.4	245.0	549.2	72.3	26.8	471.6	472	0	0	259	59.8	
533.10	0.50			Limestone	49.4	245.0	598.6	72.3	26.8	543.9	544	0	0	299	60.3	
532.60	0.50			Limestone		245.0			26.8							

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== North Pier/ Pier 2
 REFERENCE BORING ===== SB-01
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	578 KIPS	318 KIPS	60 FT.

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

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.60	1.90	3.25	11		14.5		60.9	21.5		26.5	26	0	0	15	19
572.10	2.50	2.40	9		15.4	46.4	64.7	22.8	5.0	48.1	48	0	0	26	21
569.60	2.50	1.80	11		12.8	34.8	77.4	19.0	3.7	67.0	67	0	0	37	24
567.10	2.50	1.80	11		12.8	34.8	67.0	19.0	3.7	83.5	67	0	0	37	26
564.60	2.50	0.60	9		5.4	11.6	72.4	8.0	1.2	91.5	72	0	0	40	29
562.10	2.50	0.60	9		5.4	11.6	102.9	8.0	1.2	102.2	102	0	0	56	31
559.60	2.50	1.90	12		13.2	36.7	116.2	19.6	4.0	121.9	116	0	0	64	34
557.10	2.50	1.90	12		13.2	36.7	155.5	19.6	4.0	144.3	144	0	0	79	36
554.60	2.50	3.25	18		19.1	62.8	174.6	28.3	6.8	172.6	173	0	0	95	39
552.10	2.50	3.25	18		19.1	62.8	196.5	28.3	6.8	201.2	197	0	0	108	41
549.60	2.50	3.40	19		19.7	65.7	216.2	29.2	7.1	230.4	216	0	0	119	44
547.10	2.50	3.40	19		19.7	65.7	223.3	29.2	7.1	258.3	223	0	0	123	46
544.60	2.50	2.75	18		16.9	53.1	240.2	25.1	5.7	283.4	240	0	0	132	49
542.10	2.50	2.75	18		16.9	53.1	327.7	25.1	5.7	316.1	316	0	0	174	51
539.60	2.50		48	Hard Till	7.0	123.7	334.7	10.4	13.3	326.5	326	0	0	180	54
537.10	2.50		48	Hard Till	7.0	123.7	475.7	10.4	13.3	351.4	351	0	0	193	56
534.60	2.50		100	Hard Till	25.3	257.7	586.9	37.6	27.8	398.2	398	0	0	219	59
534.10	0.50			Limestone	58.5	343.5	645.5	86.9	37.0	485.1	485	0	0	267	59.3
533.60	0.50			Limestone	58.5	343.5	704.0	86.9	37.0	572.0	572	0	0	315	59.8
533.10	0.50			Limestone	58.5	343.5	762.6	86.9	37.0	658.9	659	0	0	362	60.3
532.60	0.50			Limestone		343.5			37.0						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== North Pier/ Pier 2
 REFERENCE BORING ===== SB-01
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
254 KIPS	219 KIPS	121 KIPS	49 FT.

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

PILE TYPE AND SIZE ===== Metal Shell 12"Φ w/ 179" walls
 Pile Perimeter===== 3.142 FT.
 Pile End Bearing Area===== 0.785 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.60	1.90	3.25	11		15.1		35.8	36	0	0	20	19
572.10	2.50	2.40	9		16.1	20.7	46.8	47	0	0	26	21
569.60	2.50	1.80	11		13.4	15.5	60.1	60	0	0	33	24
567.10	2.50	1.80	11		13.4	15.5	63.2	63	0	0	35	26
564.60	2.50	0.60	9		5.6	5.2	68.8	69	0	0	38	29
562.10	2.50	0.60	9		5.6	5.2	85.7	86	0	0	47	31
559.60	2.50	1.90	12		13.9	16.4	99.5	100	0	0	55	34
557.10	2.50	1.90	12		13.9	16.4	125.0	125	0	0	69	36
554.60	2.50	3.25	18		19.9	28.0	144.9	145	0	0	80	39
552.10	2.50	3.25	18		19.9	28.0	166.2	166	0	0	91	41
549.60	2.50	3.40	19		20.6	29.3	186.8	187	0	0	103	44
547.10	2.50	3.40	19		20.6	29.3	201.8	202	0	0	111	46
544.60	2.50	2.75	18		17.7	23.7	219.5	219	0	0	121	49
542.10	2.50	2.75	18		17.7	23.7	391.4	391	0	0	245	54
539.60	2.50		48	Hard Till	23.7	178.0	415.2	415	0	0	228	54
537.10	2.50		48	Hard Till	23.7	178.0	631.7	632	0	0	347	56
534.60	2.50		100	Hard Till	85.5	370.8	840.8	841	0	0	462	59
534.10	0.50			Limestone	197.8	494.4	1038.6	1039	0	0	574	60-3
533.60	0.50			Limestone	197.8	494.4	1236.4	1236	0	0	680	60-8
533.10	0.50			Limestone	197.8	494.4	1434.1	1434	0	0	789	60-3
532.60	0.50			Limestone		494.4			0	0		

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== North Pier/ Pier 2
 REFERENCE BORING ===== SB-01
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	261 KIPS	143 KIPS	49 FT.

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

PILE TYPE AND SIZE ===== Metal Shell 14"Φ w/.25" walls
 Pile Perimeter===== 3.665 FT.
 Pile End Bearing Area===== 1.069 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.60	1.90	3.25	11		17.7		45.8	46	0	0	25	19
572.10	2.50	2.40	9		18.8	28.1	57.6	58	0	0	32	21
569.60	2.50	1.80	11		15.6	21.1	73.2	73	0	0	40	24
567.10	2.50	1.80	11		15.6	21.1	74.7	75	0	0	41	26
564.60	2.50	0.60	9		6.6	7.0	81.3	81	0	0	45	29
562.10	2.50	0.60	9		6.6	7.0	103.1	103	0	0	57	31
559.60	2.50	1.90	12		16.2	22.3	119.3	119	0	0	66	34
557.10	2.50	1.90	12		16.2	22.3	151.3	151	0	0	83	36
554.60	2.50	3.25	18		23.3	38.1	174.5	175	0	0	96	39
552.10	2.50	3.25	18		23.3	38.1	199.5	200	0	0	110	41
549.60	2.50	3.40	19		24.0	39.9	223.6	224	0	0	123	44
547.10	2.50	3.40	19		24.0	39.9	240.0	240	0	0	132	46
544.60	2.50	2.75	18		20.6	32.2	260.6	261	0	0	143	49
542.10	2.50	2.75	18		20.6	32.2	491.3	491	0	0	270	57
539.60	2.50		48	Hard Till	27.7	242.3	518.9	519	0	0	286	54
537.10	2.50		48	Hard Till	27.7	242.3	809.1	809	0	0	445	56
534.60	2.50		100	Hard Till	99.8	504.7	1077.1	1077	0	0	592	59
534.10	0.50			Limestone	230.7	672.9	1307.8	1308	0	0	749	59.3
533.60	0.50			Limestone	230.7	672.9	1538.5	1539	0	0	846	59.8
533.10	0.50			Limestone	230.7	672.9	1769.3	1769	0	0	973	60.3
532.60	0.50			Limestone		672.9						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== North Pier/ Pier 2
 REFERENCE BORING ===== SB-02
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
286 KIPS	286 KIPS	157 KIPS	58 FT.

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

PILE TYPE AND SIZE ===== Steel HP 8 X 36
 Plugged Pile Perimeter===== 2.695 FT. Unplugged Pile Perimeter===== 3.892 FT.
 Plugged Pile End Bearing Area===== 0.454 SQFT. Unplugged Pile End Bearing Area===== 0.074 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.00	2.50	3.25	25		10.9		30.6	15.8		19.0	19	0	0	10	19
571.50	2.50	3.10	25		10.6	19.7	38.7	15.2	3.2	33.8	34	0	0	19	22
569.00	2.50	2.70	19		9.6	17.2	48.2	13.8	2.8	47.6	48	0	0	26	24
566.50	2.50	2.70	19		9.6	17.2	58.4	13.8	2.8	61.5	58	0	0	32	27
564.00	2.50	2.80	19		9.8	17.8	68.2	14.2	2.9	75.7	68	0	0	38	29
561.50	2.50	2.80	19		9.8	17.8	74.9	14.2	2.9	89.4	75	0	0	41	32
559.00	2.50	2.90	17		8.6	14.6	83.5	12.4	2.4	101.8	83	0	0	46	34
556.50	2.50	2.90	17		8.6	14.6	100.3	12.4	2.4	115.5	100	0	0	55	37
554.00	2.50	3.60	25		11.8	22.9	112.1	17.0	3.7	132.5	112	0	0	62	39
551.50	2.50	3.60	25		11.8	22.9	123.9	17.0	3.7	149.5	124	0	0	68	42
549.00	2.50	3.60	28		11.8	22.9	136.9	17.0	3.7	166.8	137	0	0	75	44
546.50	2.50	3.80	28		12.3	24.2	146.0	17.7	3.9	184.0	146	0	0	80	47
544.00	2.50	3.90	30		11.0	21.0	157.1	16.0	3.4	199.9	157	0	0	86	49
541.50	2.50	3.90	30		11.0	21.0	218.4	16.0	3.4	224.0	218	0	0	120	52
539.00	2.50		84	Hard Till	10.5	71.2	228.9	15.1	11.6	239.2	229	0	0	126	54
536.50	2.50		84	Hard Till	10.5	71.2	252.9	15.1	11.6	256.5	253	0	0	139	57
535.50	1.00		100	Hard Till	5.8	84.8	287.0	8.4	13.8	269.4	269	0	0	148	58
535.00	0.50			Limestone	33.6	113.1	320.6	48.5	18.3	317.9	318	0	0	175	58.4
534.50	0.50			Limestone	33.6	113.1	354.1	48.5	18.3	366.4	354	0	0	195	58.0
534.00	0.50			Limestone		113.1			18.3						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== North Pier/ Pier 2
 REFERENCE BORING ===== SB-02
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

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

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	335 KIPS	184 KIPS	58 FT.

PILE TYPE AND SIZE ===== Steel HP 10 X 42
 Plugged Pile Perimeter===== 3.300 FT. Unplugged Pile Perimeter===== 4.858 FT.
 Plugged Pile End Bearing Area===== 0.680 SQFT. Unplugged Pile End Bearing Area===== 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.00	2.50	3.25	25		13.4		42.9	19.7		23.4	23	0	0	13	19
571.50	2.50	3.10	25		12.9	29.6	52.0	19.0	3.7	42.0	42	0	0	23	22
569.00	2.50	2.70	19		11.7	25.7	63.8	17.2	3.3	59.2	59	0	0	33	24
566.50	2.50	2.70	19		11.7	25.7	76.4	17.2	3.3	76.6	76	0	0	42	27
564.00	2.50	2.80	19		12.0	26.7	88.4	17.7	3.4	94.3	88	0	0	49	29
561.50	2.50	2.80	19		12.0	26.7	95.7	17.7	3.4	111.4	96	0	0	53	32
559.00	2.50	2.90	17		10.5	21.9	106.2	15.5	2.8	126.8	106	0	0	58	34
556.50	2.50	2.90	17		10.5	21.9	129.1	15.5	2.8	143.9	129	0	0	71	37
554.00	2.50	3.60	25		14.4	34.3	143.5	21.2	4.3	165.1	144	0	0	79	39
551.50	2.50	3.60	25		14.4	34.3	158.0	21.2	4.3	186.4	158	0	0	87	42
549.00	2.50	3.60	28		14.4	34.3	174.3	21.2	4.3	207.9	174	0	0	96	44
546.50	2.80	3.80	28		15.0	36.2	184.6	22.1	4.6	229.4	185	0	0	102	47
544.00	2.50	3.30	30		13.5	31.5	198.1	19.9	4.0	249.3	198	0	0	109	49
541.50	2.50	3.30	30		13.5	31.5	287.0	19.9	4.0	278.8	279	0	0	153	52
539.00	2.50		84	Hard Till	12.8	106.8	299.8	18.9	13.5	297.6	298	0	0	164	54
536.50	2.50		84	Hard Till	12.8	106.8	332.9	18.9	13.5	319.1	319	0	0	176	57
535.50	1.00		100	Hard Till	7.1	127.1	382.4	10.5	16.1	334.9	335	0	0	184	58
535.00	0.50			Limestone	41.1	169.5	423.5	60.5	21.5	395.5	395	0	0	217	58.4
534.50	0.50			Limestone	41.1	169.5	464.7	60.5	21.5	456.0	456	0	0	254	58.9
534.00	0.50			Limestone		169.5			21.5						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== North Pier/ Pier 2
 REFERENCE BORING ===== SB-02
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	418 KIPS	230 KIPS	58 FT.

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

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.00	2.50	3.25	25		16.1		58.8	23.5		28.2	28	0	0	16	19
571.50	2.50	3.10	25		15.5	42.7	68.8	22.7	4.7	50.3	50	0	0	28	22
569.00	2.50	2.70	19		14.1	37.2	82.9	20.6	4.1	70.9	71	0	0	39	24
566.50	2.50	2.70	19		14.1	37.2	98.4	20.6	4.1	91.6	92	0	0	50	27
564.00	2.50	2.80	19		14.4	38.6	112.8	21.1	4.2	112.8	113	0	0	62	29
561.50	2.50	2.80	19		14.4	38.6	120.4	21.1	4.2	133.1	120	0	0	66	32
559.00	2.50	2.30	17		12.6	31.7	133.0	18.5	3.5	151.6	133	0	0	73	34
556.50	2.50	2.30	17		12.6	31.7	163.5	18.5	3.5	172.0	164	0	0	90	37
554.00	2.50	3.60	25		17.3	49.6	180.9	25.4	5.4	197.4	181	0	0	99	39
551.50	2.50	3.60	25		17.3	49.6	198.2	25.4	5.4	222.8	198	0	0	109	42
549.00	2.50	3.60	28		17.3	49.6	218.3	25.4	5.4	248.4	218	0	0	120	44
546.50	2.50	3.60	28		18.1	52.4	229.5	26.4	5.7	274.1	230	0	0	126	47
544.00	2.50	3.30	30		16.3	45.5	245.8	23.8	5.0	297.9	246	0	0	135	49
541.50	2.50	3.30	30		16.3	45.5	370.9	23.8	5.0	333.6	334	0	0	183	52
539.00	2.50		84	Hard Till	15.4	154.3	386.3	22.5	16.9	356.1	356	0	0	196	54
536.50	2.50		84	Hard Till	15.4	154.3	431.1	22.5	16.9	381.8	382	0	0	210	57
535.50	1.00		100	Hard Till	8.5	183.7	500.9	12.5	20.1	401.0	401	0	0	221	58
535.00	0.50			Limestone	49.4	245.0	550.3	72.3	26.8	473.3	473	0	0	260	58.4
534.50	0.50			Limestone	49.4	245.0	599.8	72.3	26.8	545.5	546	0	0	300	58.0
534.00	0.50			Limestone		245.0			26.8						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== North Pier/ Pier 2
 REFERENCE BORING ===== SB-02
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	578 KIPS	318 KIPS	59 FT.

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

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.00	2.50	3.25	25		19.1		79.0	28.3		34.7	35	0	0	19	19
571.50	2.50	3.10	25		18.4	59.9	89.6	27.3	6.5	61.2	61	0	0	34	22
569.00	2.50	2.70	19		16.7	52.2	106.3	24.8	5.6	86.0	86	0	0	47	24
566.50	2.50	2.70	19		16.7	52.2	124.9	24.8	5.6	110.9	111	0	0	61	27
564.00	2.50	2.80	19		17.1	54.1	142.1	25.4	5.8	136.3	136	0	0	75	29
561.50	2.50	2.80	19		17.1	54.1	149.5	25.4	5.8	160.7	150	0	0	82	32
559.00	2.50	2.30	17		15.0	44.4	164.5	22.2	4.8	182.9	164	0	0	90	34
556.50	2.50	2.30	17		15.0	44.4	204.6	22.2	4.8	207.8	205	0	0	113	37
554.00	2.50	3.60	25		20.6	69.6	225.1	30.5	7.5	238.3	225	0	0	124	39
551.50	2.50	3.60	25		20.6	69.6	245.7	30.5	7.5	268.8	246	0	0	135	42
549.00	2.50	3.60	28		20.6	69.6	270.1	30.5	7.5	299.8	270	0	0	149	44
546.50	2.50	3.80	28		21.4	73.4	281.8	31.8	7.9	330.5	282	0	0	155	47
544.00	2.50	3.30	30		19.3	63.8	301.1	28.6	6.9	359.1	301	0	0	166	49
541.50	2.50	3.30	30		19.3	63.8	473.0	28.6	6.9	404.1	404	0	0	222	52
539.00	2.50		84	Hard Till	18.3	216.4	491.3	27.1	23.3	431.2	431	0	0	237	54
536.50	2.50		84	Hard Till	18.3	216.4	550.8	27.1	23.3	462.8	463	0	0	255	57
535.50	1.00		100	Hard Till	10.1	257.7	646.8	15.0	27.8	487.1	487	0	0	268	58
535.00	0.50			Limestone	58.5	343.5	705.4	86.9	37.0	574.0	574	0	0	316	58.4
534.50	0.50			Limestone	58.5	343.5	763.9	86.9	37.0	660.9	664	0	0	363	58.9
534.00	0.50			Limestone		343.5			37.0						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE ===== North Pier/ Pier 2
 REFERENCE BORING ===== SB-02
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
254 KIPS	239 KIPS	131 KIPS	44 FT.

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

PILE TYPE AND SIZE ===== Metal Shell 12"Φ w/ 179" walls
 Pile Perimeter===== 3.142 FT.
 Pile End Bearing Area===== 0.785 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.00	2.50	3.25	25		19.9		46.6	47	0	0	26	19
571.50	2.50	3.10	25		19.3	26.7	62.5	62	0	0	34	22
569.00	2.50	2.70	19		17.5	23.3	79.9	80	0	0	44	24
566.50	2.50	2.70	19		17.5	23.3	98.2	98	0	0	54	27
564.00	2.50	2.80	19		17.9	24.1	116.1	116	0	0	64	29
561.50	2.50	2.80	19		17.9	24.1	129.7	130	0	0	71	32
559.00	2.50	2.30	17		15.7	19.8	145.4	145	0	0	80	34
556.50	2.50	2.30	17		15.7	19.8	172.3	172	0	0	95	37
554.00	2.50	3.60	25		21.5	31.0	193.8	194	0	0	107	39
551.50	2.50	3.60	25		21.5	31.0	215.3	215	0	0	118	42
549.00	2.50	3.60	28		21.5	31.0	238.5	239	0	0	131	44
546.50	2.50	3.80	28		22.4	32.7	256.6	257	0	0	144	47
544.00	2.50	3.30	30		20.2	28.4	276.8	277	0	0	152	49
541.50	2.50	3.30	30		20.2	28.4	580.0	580	0	0	349	52
539.00	2.50		84	Hard Till	61.7	311.5	641.7	642	0	0	353	54
536.50	2.50		84	Hard Till	61.7	311.5	762.7	763	0	0	419	57
535.50	1.00		100	Hard Till	34.2	370.8	920.5	920	0	0	506	58
535.00	0.50			Limestone	197.8	494.4	1118.2	1118	0	0	615	58-4
534.50	0.50			Limestone	197.8	494.4	1316.0	1316	0	0	724	58-9
534.00	0.50			Limestone		494.4						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== North Pier/ Pier 2
 REFERENCE BORING ===== SB-02
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	328 KIPS	181 KIPS	49 FT.

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

PILE TYPE AND SIZE ===== Metal Shell 14"Φ w/ .25" walls
 Pile Perimeter===== 3.665 FT.
 Pile End Bearing Area===== 1.069 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.00	2.50	3.25	25		23.3		59.6	60	0	0	33	19
571.50	2.50	3.10	25		22.5	36.3	77.4	77	0	0	43	22
569.00	2.50	2.70	19		20.4	31.7	97.8	98	0	0	54	24
566.50	2.50	2.70	19		20.4	31.7	119.3	119	0	0	66	27
564.00	2.50	2.80	19		20.9	32.8	140.2	140	0	0	77	29
561.50	2.50	2.80	19		20.9	32.8	155.2	155	0	0	85	32
559.00	2.50	2.30	17		18.3	27.0	173.5	173	0	0	95	34
556.50	2.50	2.30	17		18.3	27.0	207.0	207	0	0	114	37
554.00	2.50	3.60	25		25.1	42.2	232.1	232	0	0	128	39
551.50	2.50	3.60	25		25.1	42.2	257.2	257	0	0	141	42
549.00	2.50	3.60	28		25.1	42.2	284.6	285	0	0	157	44
546.50	2.50	3.80	28		26.1	44.6	304.9	305	0	0	168	47
544.00	2.50	3.30	30		23.5	38.7	328.4	328	0	0	181	49
541.50	2.50	3.30	30		23.5	38.7	737.2	737	0	0	406	52
539.00	2.50		84	Hard Till	72.0	424.0	809.2	809	0	0	446	54
536.50	2.50		84	Hard Till	72.0	424.0	961.9	962	0	0	529	57
535.50	1.00		100	Hard Till	39.9	504.7	1170.0	1170	0	0	644	58
535.00	0.50			Limestone	230.7	672.9	1400.7	1404	0	0	770	58.4
534.50	0.50			Limestone	230.7	672.9	1631.5	1634	0	0	897	58.9
534.00	0.50			Limestone		672.9						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== South Pier/ Pier 1
 REFERENCE BORING ===== SB-03
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
286 KIPS	286 KIPS	157 KIPS	60 FT.

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

PILE TYPE AND SIZE ===== Steel HP 8 X 36
 Plugged Pile Perimeter===== 2.695 FT. Unplugged Pile Perimeter===== 3.892 FT.
 Plugged Pile End Bearing Area===== 0.454 SQFT. Unplugged Pile End Bearing Area===== 0.074 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)	
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)						
574.80	1.70	0.60	7		2.1		11.0	3.0		4.5	4	0	0	2	19	
572.30	2.50	1.40	18		6.2	8.9	13.4	8.9	1.4	12.8	13	0	0	7	21	
569.80	2.50	0.90	16		4.0	5.1	17.4	5.7	0.8	18.5	17	0	0	10	24	
567.30	2.50	0.90	16		4.0	5.1	25.1	5.7	0.8	24.9	25	0	0	14	26	
564.80	2.50	1.40	16		6.2	8.9	31.3	8.9	1.4	33.8	31	0	0	17	29	
562.30	2.50	1.40	16		6.2	8.9	36.9	8.9	1.4	42.6	37	0	0	20	31	
559.80	2.50	1.30	19		5.9	8.3	42.7	8.5	1.3	51.1	43	0	0	24	34	
557.30	2.50	1.30	19		5.9	8.3	50.5	8.5	1.3	59.9	50	0	0	28	36	
554.80	2.50	1.60	24		6.8	10.2	57.3	9.8	1.7	69.7	57	0	0	31	39	
552.30	2.50	1.60	24		6.8	10.2	66.0	9.8	1.7	79.7	66	0	0	36	41	
549.80	2.50	1.90	29		7.6	12.1	73.5	11.0	2.0	90.7	74	0	0	40	44	
547.30	2.50	1.90	29		7.6	12.1	88.1	11.0	2.0	102.8	88	0	0	48	46	
544.80	2.50	3.00	47		10.3	19.1	98.4	14.9	3.1	117.7	98	0	0	54	49	
542.30	2.50	3.00	47		10.3	19.1	174.5	14.9	3.1	143.2	143	0	0	79	51	
539.80	2.50		100	Hard Till	14.5	84.8	189.0	21.0	13.8	164.2	164	0	0	90	54	
537.30	2.50		100	Hard Till	14.5	84.8	231.8	21.0	13.8	189.8	190	0	0	104	56	
534.30	3.00			Fine Sand	28.9	113.1	260.7	41.8	18.3	231.5	232	0	0	127	59	
533.80	0.50			Limestone	33.6	113.1	294.3	48.5	18.3	280.0	280	0	0	154	59.6	
533.30	0.50			Limestone	33.6	113.1	327.9	48.5	18.3	328.5	328	0	0	180	60.1	
532.80	0.50			Limestone	33.6	113.1	361.5	48.5	18.3	377.0	364	0	0	199	60.6	
532.30	0.50			Limestone		113.1			18.3							

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== South Pier/ Pier 1
 REFERENCE BORING ===== SB-03
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
335 KIPS	335 KIPS	184 KIPS	60 FT.

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

PILE TYPE AND SIZE ===== Steel HP 10 X 42
 Plugged Pile Perimeter===== 3.300 FT. Unplugged Pile Perimeter===== 4.858 FT.
 Plugged Pile End Bearing Area===== 0.680 SQFT. Unplugged Pile End Bearing Area===== 0.086 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.80	1.70	0.60	7		2.6		15.9	3.8		5.5	5	0	0	3	19
572.30	2.50	1.40	18		7.6	13.3	17.8	11.1	1.7	15.9	16	0	0	9	21
569.80	2.50	0.80	16		4.9	7.6	22.6	7.2	1.0	23.1	23	0	0	12	24
567.30	2.50	0.80	16		4.9	7.6	33.2	7.2	1.0	31.0	31	0	0	17	26
564.80	2.50	1.40	16		7.6	13.3	40.8	11.1	1.7	42.1	41	0	0	22	29
562.30	2.50	1.40	16		7.6	13.3	47.4	11.1	1.7	53.1	47	0	0	26	31
559.80	2.50	1.30	19		7.2	12.4	54.6	10.6	1.6	63.7	55	0	0	30	34
557.30	2.50	1.30	19		7.2	12.4	64.6	10.6	1.6	74.6	65	0	0	36	38
554.80	2.50	1.60	24		8.3	15.3	72.9	12.2	1.9	86.8	73	0	0	40	39
552.30	2.50	1.60	24		8.3	15.3	84.1	12.2	1.9	99.4	84	0	0	46	41
549.80	2.50	1.90	29		9.3	18.1	93.4	13.7	2.3	113.1	93	0	0	51	44
547.30	2.50	1.90	29		9.3	18.1	113.2	13.7	2.3	128.1	113	0	0	62	46
544.80	2.50	3.00	47		12.6	28.6	125.8	18.6	3.6	146.7	126	0	0	69	49
542.30	2.50	3.00	47		12.6	28.6	236.9	18.6	3.6	177.7	178	0	0	98	51
539.80	2.50		100	Hard Till	17.8	127.1	254.7	26.2	16.1	203.9	204	0	0	112	54
537.30	2.50		100	Hard Till	17.8	127.1	314.9	26.2	16.1	235.4	235	0	0	129	56
534.30	3.00		100	Fine Sand	35.4	169.5	350.3	52.2	21.5	287.6	288	0	0	158	59
533.80	0.50			Limestone	41.1	169.5	391.4	60.5	21.5	348.1	348	0	0	191	59.6
533.30	0.50			Limestone	41.1	169.5	432.5	60.5	21.5	408.7	409	0	0	225	60.1
532.80	0.50			Limestone	41.1	169.5	473.6	60.5	21.5	469.2	469	0	0	258	60.6
532.30	0.50			Limestone		169.5			21.5						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== South Pier/ Pier 1
 REFERENCE BORING ===== SB-03
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRI ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
418 KIPS	418 KIPS	230 KIPS	60 FT.

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

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

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE	END BRG.	TOTAL	SIDE	END BRG.	TOTAL					
					RESIST. (KIPS)	RESIST. (KIPS)	RESIST. (KIPS)	RESIST. (KIPS)	RESIST. (KIPS)	RESIST. (KIPS)					
574.80	1.70	0.90	7		3.1		22.4	4.5		6.6	7	0	4	19	
572.30	2.50	1.40	18		9.1	19.3	23.2	13.3	2.1	19.0	19	0	10	21	
569.80	2.50	0.80	16		5.9	11.0	29.1	8.6	1.2	27.6	28	0	15	24	
567.30	2.50	0.80	16		5.9	11.0	43.2	8.6	1.2	37.1	37	0	20	26	
564.80	2.50	1.40	16		9.1	19.3	52.3	13.3	2.1	50.4	50	0	28	29	
562.30	2.50	1.40	16		9.1	19.3	60.0	13.3	2.1	63.5	60	0	33	31	
559.80	2.50	1.30	19		8.6	17.9	68.6	12.6	2.0	76.1	69	0	38	34	
557.30	2.50	1.30	19		8.6	17.9	81.4	12.6	2.0	89.2	81	0	45	36	
554.80	2.50	1.60	24		10.0	22.0	91.4	14.6	2.4	103.8	91	0	50	39	
552.30	2.50	1.60	24		10.0	22.0	105.5	14.6	2.4	118.8	105	0	58	41	
549.80	2.50	1.90	29		11.2	26.2	116.6	16.3	2.9	135.1	117	0	64	44	
547.30	2.50	1.90	29		11.2	26.2	143.0	16.3	2.9	153.1	143	0	79	46	
544.80	2.50	3.00	47		15.2	41.3	158.1	22.2	4.5	175.3	158	0	87	49	
542.30	2.50	3.00	47		15.2	41.3	315.7	22.2	4.5	213.1	213	0	117	51	
539.80	2.50		100	Hard Till	21.4	183.7	337.1	31.3	20.1	244.3	244	0	134	54	
537.30	2.50		100	Hard Till	21.4	183.7	419.7	31.3	20.1	282.3	282	0	155	56	
534.30	3.00		100	Fine Sand	42.6	245.0	462.3	62.3	26.8	344.6	345	0	190	59	
533.80	0.50			Limestone	49.4	245.0	511.7	72.3	26.8	416.6	417	0	229	59.6	
533.30	0.50			Limestone	49.4	245.0	561.1	72.3	26.8	489.1	489	0	269	60.1	
532.80	0.50			Limestone	49.4	245.0	610.6	72.3	26.8	561.3	561	0	309	60.6	
532.30	0.50			Limestone		245.0			26.8						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== South Pier/ Pier 1
 REFERENCE BORING ===== SB-03
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	578 KIPS	318 KIPS	60 FT.

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

PILE TYPE AND SIZE ===== Steel HP 14 X 73
 Plugged Pile Perimeter===== 4,700 FT. Unplugged Pile Perimeter===== 6,975 FT.
 Plugged Pile End Bearing Area===== 1.379 SQFT. Unplugged Pile End Bearing Area===== 0.149 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.80	1.70	0.80	7		3.7		30.7	5.4		8.4	8	0	0	5	19
572.30	2.50	1.40	18		10.8	27.1	29.9	16.0	2.9	23.1	23	0	0	13	21
569.80	2.50	0.80	16		6.9	15.5	36.8	10.3	1.7	33.4	33	0	0	18	24
567.30	2.50	0.80	18		6.9	15.5	55.4	10.3	1.7	45.0	45	0	0	25	26
564.80	2.50	1.40	16		10.8	27.1	66.2	16.0	2.9	60.9	61	0	0	34	29
562.30	2.50	1.40	16		10.8	27.1	75.0	16.0	2.9	76.7	75	0	0	41	31
559.80	2.50	1.30	19		10.2	25.1	85.2	15.2	2.7	91.9	85	0	0	47	34
557.30	2.50	1.30	19		10.2	25.1	101.2	15.2	2.7	107.7	101	0	0	56	36
554.80	2.50	1.60	24		11.8	30.9	113.0	17.5	3.3	125.2	113	0	0	62	39
552.30	2.50	1.60	24		11.8	30.9	130.7	17.5	3.3	143.4	131	0	0	72	41
549.80	2.50	1.90	29		13.2	36.7	143.9	19.6	4.0	163.0	144	0	0	79	44
547.30	2.50	1.90	29		13.2	36.7	178.4	19.6	4.0	185.0	178	0	0	98	46
544.80	2.50	3.00	47		18.0	58.0	196.4	26.7	6.2	211.6	196	0	0	108	49
542.30	2.50	3.00	47		18.0	58.0	414.0	26.7	6.2	259.8	260	0	0	143	51
539.80	2.50		100	Hard Till	25.3	257.7	439.4	37.6	27.8	297.4	297	0	0	164	54
537.30	2.50		100	Hard Till	25.3	257.7	550.6	37.6	27.8	344.3	344	0	0	189	56
534.30	3.00		100	Fine Sand	50.5	343.5	601.0	74.9	37.0	419.2	419	0	0	231	59
533.80	0.50			Limestone	58.5	343.5	659.6	86.9	37.0	506.0	506	0	0	278	59.6
533.30	0.50			Limestone	58.5	343.5	718.1	86.9	37.0	592.9	593	0	0	326	60.1
532.80	0.50			Limestone	58.5	343.5	776.7	86.9	37.0	679.8	680	0	0	374	60.6
532.30	0.50			Limestone		343.5			37.0						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== South Pier/ Pier 1
 REFERENCE BORING ===== SB-03
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR ===== 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
254 KIPS	171 KIPS	94 KIPS	49 FT.

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

PILE TYPE AND SIZE ===== Metal Shell 12"Φ w/ 179" walls
 Pile Perimeter===== 3.142 FT.
 Pile End Bearing Area===== 0.785 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.80	1.70	0.60	7		3.8		15.9	16	0	0	9	19
572.30	2.50	1.40	18		11.3	12.1	22.0	22	0	0	12	21
569.80	2.50	0.80	16		7.3	6.9	29.3	29	0	0	16	24
567.30	2.50	0.80	16		7.3	6.9	41.7	42	0	0	23	26
564.80	2.50	1.40	16		11.3	12.1	53.0	53	0	0	29	29
562.30	2.50	1.40	16		11.3	12.1	63.4	63	0	0	35	31
559.80	2.50	1.30	19		10.7	11.2	74.1	74	0	0	41	34
557.30	2.50	1.30	19		10.7	11.2	87.4	87	0	0	48	36
554.80	2.50	1.60	24		12.4	13.8	99.7	100	0	0	55	39
552.30	2.50	1.60	24		12.4	13.8	114.7	115	0	0	63	41
549.80	2.50	1.90	29		13.9	16.4	128.5	129	0	0	71	44
547.30	2.50	1.90	29		13.9	16.4	151.8	152	0	0	84	46
544.80	2.50	3.00	47		18.8	25.8	170.6	171	0	0	94	49
542.30	2.50	3.00	47		18.8	25.8	534.4	534	0	0	294	51
539.80	2.50		100	Hard Till	85.5	370.8	620.0	620	0	0	341	54
537.30	2.50		100	Hard Till	85.5	370.8	829.1	829	0	0	456	56
534.30	3.00		100	Fine Sand	170.5	494.4	999.6	1000	0	0	550	59
533.80	0.50			Limestone	197.8	494.4	1197.4	1197	0	0	659	59.6
533.30	0.50			Limestone	197.8	494.4	1395.1	1395	0	0	767	60.1
532.80	0.50			Limestone	197.8	494.4	1592.9	1693	0	0	876	60.6
532.30	0.50			Limestone		494.4						

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified 10/18/2011

SUBSTRUCTURE===== South Pier/ Pier 1
 REFERENCE BORING ===== SB-03
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 593.40 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DR 576.50 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== ft

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

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
413 KIPS	204 KIPS	112 KIPS	49 FT.

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

PILE TYPE AND SIZE ===== Metal Shell 14"Φ w/.25" walls
 Pile Perimeter===== 3.665 FT.
 Pile End Bearing Area===== 1.069 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
574.80	1.70	0.60	7		4.5		20.9	21	0	0	11	19
572.30	2.50	1.40	18		13.2	16.4	27.0	27	0	0	15	21
569.80	2.50	0.80	16		8.5	9.4	35.5	35	0	0	20	24
567.30	2.50	0.80	16		8.5	9.4	51.0	51	0	0	28	26
564.80	2.50	1.40	16		13.2	16.4	64.1	64	0	0	35	29
562.30	2.50	1.40	16		13.2	16.4	76.1	76	0	0	42	31
559.80	2.50	1.30	19		12.5	15.2	88.6	89	0	0	49	34
557.30	2.50	1.30	19		12.5	15.2	104.6	105	0	0	58	36
554.80	2.50	1.60	24		14.4	18.8	119.0	119	0	0	65	39
552.30	2.50	1.60	24		14.4	18.8	137.0	137	0	0	75	41
549.80	2.50	1.90	29		16.2	22.3	153.1	153	0	0	84	44
547.30	2.50	1.90	29		16.2	22.3	182.2	182	0	0	100	46
544.80	2.80	3.00	47		21.9	35.2	204.1	204	0	0	112	49
542.30	2.50	3.00	47		21.9	35.2	695.6	696	0	0	383	57
539.80	2.50		100	Hard Till	99.8	504.7	795.4	795	0	0	437	54
537.30	2.50		100	Hard Till	99.8	504.7	1063.4	1063	0	0	585	56
534.30	3.00		100	Fine Sand	198.9	672.9	1262.3	1262	0	0	694	59
533.80	0.50			Limestone	230.7	672.9	1493.1	1493	0	0	824	59.6
533.30	0.50			Limestone	230.7	672.9	1723.8	1724	0	0	948	60.1
532.80	0.50			Limestone	230.7	672.9	1954.5	1955	0	0	1075	60.6
532.30	0.50			Limestone		672.9						

APPENDIX F
LAB TEST RESULTS

Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 AASHTO T89/T90

Project Name IDOT Route 83 US Route 6, Over Little Calumet River

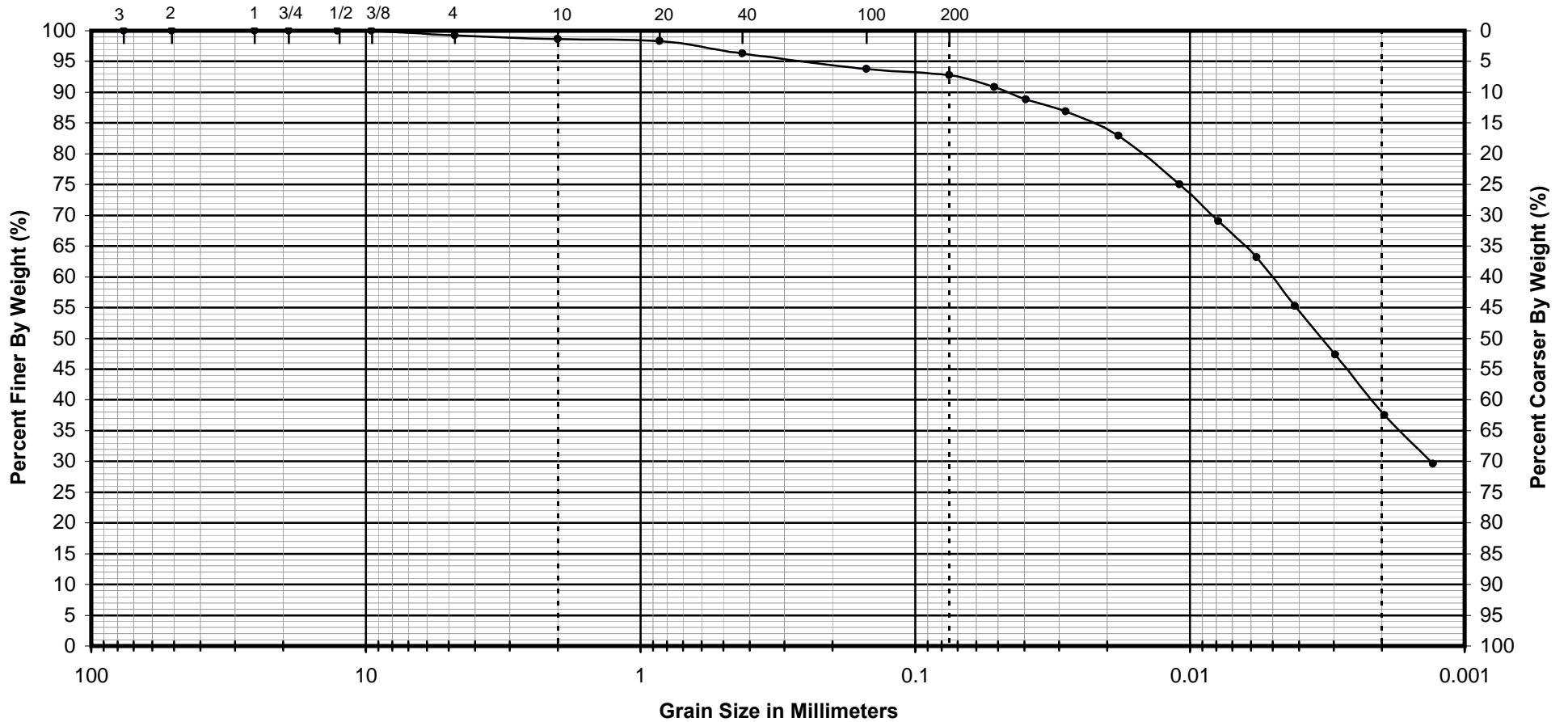
Job No 10147

Location Cook County, Illinois


Date 5/1/12

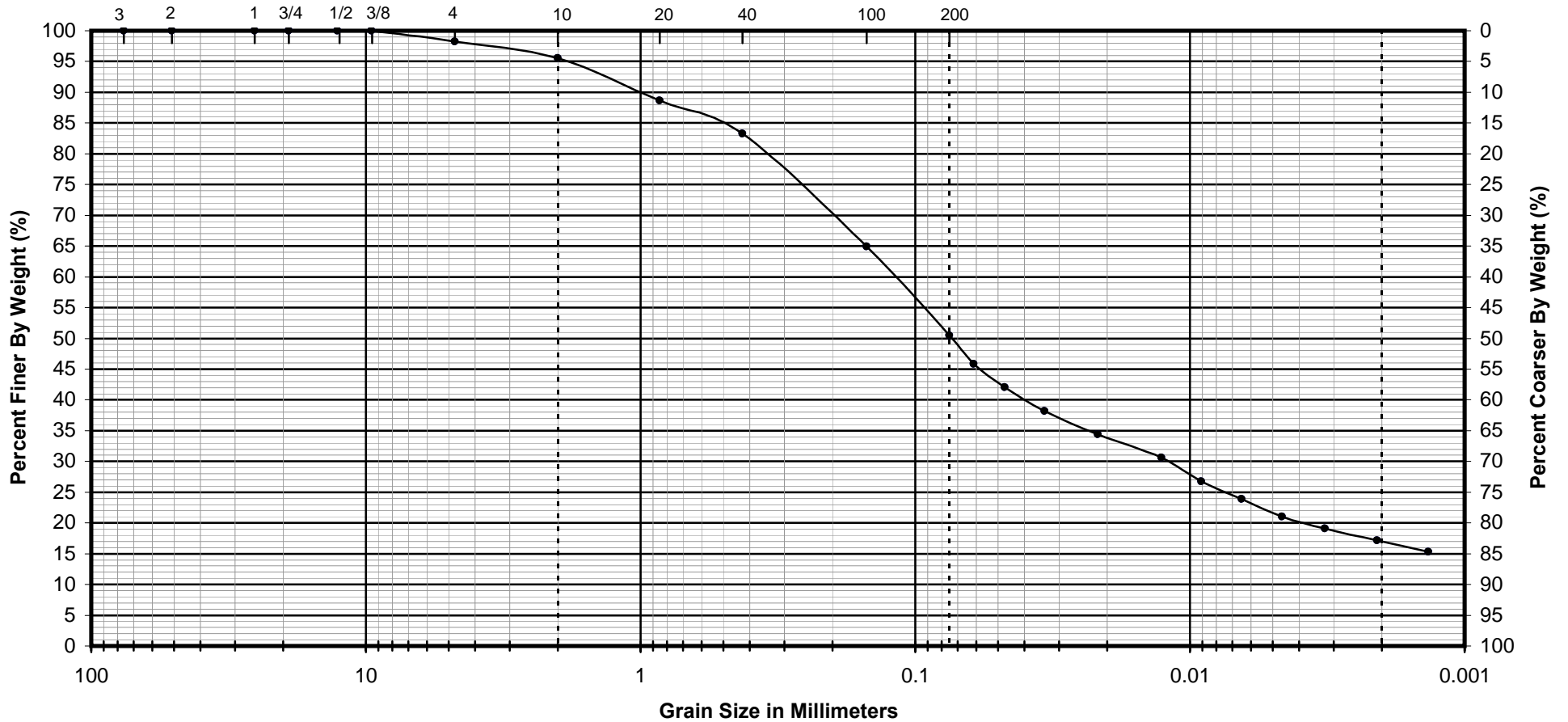
Boring No.	SB-01	SB-03						
Sample No.	2	3						
Depth	1.0'-2.5'	1.0'-2.5'						
LIQUID LIMIT (LL)	30	26						
PLASTIC LIMIT (PL)	16	16						
PLASTICITY INDEX (PI)	14	10						

Tested by MT




GRAVEL	SAND		SILT	CLAY
	COARSE	FINE		

Boring No.	SB-01	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88	
Sample No.	2	SILTY CLAY A-6 gray Group Index 12 % Gravel 1.3 % Sand 5.9 % Silt 55.3 % Clay 37.5		IDOT Route 83 & US Route 6 Over Little Calumet River Contract No. 60K78 Cook County, Illinois	
Depth	1.0'-2.5'				
Liquid Limit	30				
Plastic Limit	16				
Plasticity Index	14				
Test By	MT				
Date	4/27/12				
Reviewed By	RR				
Job No	10147				
				 Geo Services, Inc. Geotechnical, Environmental and Civil Engineering An MBE - DBE Firm 1235 E. Davis St., Arlington Heights, IL 60005 Phone 847-253-3845 • Fax 847-253-0482	



GRAVEL	SAND		SILT	CLAY
	COARSE	FINE		

Boring No.	SB-03	CLASSIFICATION	PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	3	LOAM A-4 dark brown Group Index 2 % Gravel 4.5 % Sand 45.1 % Silt 33.2 % Clay 17.2	IDOT Route 83 & US Route 6 Over Little Calumet River Contract No. 60K78 Cook County, Illinois  Geo Services, Inc. <small>Geotechnical, Environmental and Civil Engineering An MBE - DBE Firm</small> 1235 E. Davis St., Arlington Heights, IL 60005 Phone 847-253-3845 • Fax 847-253-0482
Depth	3.5'-5.0'		
Liquid Limit	26		
Plastic Limit	16		
Plasticity Index	10		
Test By	MT		
Date	4/27/12		
Reviewed By	RR		
Job No	10147		



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

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

**DETERMINATION of ORGANIC CONTENT in SOILS by LOSS on IGNITION
AASHTO T267**

Project Name IDOT Route 83 & US Route 6

Date 5/3/12

Location Cook County, Illinois

Job No 10147

Boring No	SB-03	SB-03
Sample No.	9	11
Depth	18.5'-20.0'	23.5'-25.0'
% Organic Content	11.3	11.2

Tested By JE



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. 83/U.S. Rte. 6/Torrence Av. Over The Little Calumet River
 Location T36N, R14E, SEC 24 & T36N, R15E, SEC19 3rd PM
 County Cook
 Sample Type Drilled Bedrock Core Sample

Date 4/2/12
 Job No. 10147
 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)	(psi)
SB-01 Run 1	66.0	4.090	1.867	480.4	43330	2.74	163.4	1140	15833
SB-02 Run 1	67.0	4.060	2.052	568.0	50810	3.31	161.1	1106	15364
SB-03 Run 1	66.0	4.083	2.041	569.3	51770	3.27	162.4	1140	15831

APPENDIX G

BORING LOG B-10 (by others)



ELEVATIONS
 GROUND SURFACE 600.6
 END OF BORING 535.1

WATER TABLE
 WHILE DRILLING 8.5'
 AT END OF BORING Rotary Wash Drill
 24 HOURS Grouted

IL-83 (Torrence Ave.) over Little Calumet River
 Structure No. 016-0936

DISTANCE BELOW SURFACE IN FEET	LENGTH RECOVERY	SAMPLE		N	WC	Q _u	Ø DRY	DEPTH	ELEV.	SOIL DESCRIPTIONS
		NO.	TYPE							
0		1	CORE					1.0	599.6	12" P.C. Concrete
		2	SS	12-16-20				1.5	599.1	6" Crushed Stone
		3	SS	16-21-15						FILL - Brown fine to coarse SAND, some gravel, occasional cobbles, damp A-1-b
5		4	SS	17-20-23						
		5	SS	28-33-39				10.5	590.1	(saturated below 8.5 feet)
		6	SS	37-39-50/2"	48.2					FILL - Bluish gray SAND, partially cemented, little gravel, septic or chemical-like odor noted, wet (saturated) A-1-b
15		7	SS	35-40-42	50.2					
		8	SS	25-29-33	47.7			18.0	582.6	
		9	SS	27-19-19	58.9					FILL - Dark bluish gray and black SAND, partially cemented, strong septic or chemical-like odor, wet (saturated) A-1-b
20		10	SS	46-50/3"	53.1					
		11	SS	19-18-11	63.3			25.5	575.1	
25		12	SS	1-2-2	22.6	0.75*		28.0	572.6	Stiff gray CLAY LOAM, trace organic, trace shells, very moist A-6
		13	SS	4-4-5	20.4	1.7 B 1.5*				
30		14	SS	3-4-7	21.2	1.6 B 1.5*				Tough gray CLAY, trace gravel, moist A-6
		15	SS	4-6-7	19.4	1.5 B 1.5*				
35		16	SS	4-4-8	19.7	1.9 B 1.75*				
		17	SS	4-6-11	21.1	1.7 B 1.75*				
40										

Cook County
 Thornton Township (T36N, R14E & R15E)
 Section Line 24/19
 Bridge Centerline @ Sta. 176+06.23
 Boring 10 @ Sta. 175+13, 22' RT

Division lines between deposits represent approximate boundaries between soil types; in-situ, the transition may be gradual.

PROJECT Streambed Scour Study, 11 Bridge Locations, District 1, Illinois



CLIENT Illinois Department of Transportation, Schaumburg, Illinois

BORING 10 DATE STARTED 8-1-96 DATE COMPLETED 8-1-96 JOB L-39,864

ELEVATIONS
 GROUND SURFACE 600.6
 END OF BORING 535.1

WATER TABLE
 WHILE DRILLING 8.5'
 AT END OF BORING Rotary Wash Drill
 24 HOURS Grouted

IL-83 (Torrence Ave.) over Little Calumet River
 Structure No. 016-0936

DISTANCE BELOW SURFACE IN FEET	LENGTH RECOVERY	SAMPLE		N	WC	Q _u	Ø DRY	DEPTH	ELEV.	SOIL DESCRIPTIONS
		NO.	TYPE							
40		18	SS	5-6-11	20.9	2.4 B 2.5*		40.0	560.6	Very tough gray CLAY, trace gravel, moist A-6
45		19	SS	4-7-12	24.7	2.8 B 2.5*				
		20	SS	6-9-12	19.9	2.5 B 2.5*				
50		21	SS	5-7-11	19.2	2.6 B 2.25*				
55		22	SS	6-10-12	14.9	2.9 B 3.0*		52.0	548.6	Very tough to hard gray CLAY LOAM, trace gravel, moist to damp A-4/A-6
60		23	SS	22-31-42	13.3	2.2 S@10% 4.5*				
65		24	SS	46-50/2"	13.3	0.9 S@5%		62.0 64.5	538.6 536.1	Very dense gray SILTY LOAM, trace gravel, damp A-4 Possible weathered DOLOMITE Rock Surface - Hard Drilling
70										
75										End of Boring at 65.5' * Approximate unconfined compressive strength based on measurements with a calibrated pocket penetrometer. B = Bulge failure at 15% strain S = Shear failure
80										

Cook County
 Thornton Township (T36N, R14E & R15E)
 Section Line 24/19
 Bridge Centerline @ Sta. 176+06.23
 Boring 10 @ Sta. 175+13, 22' RT

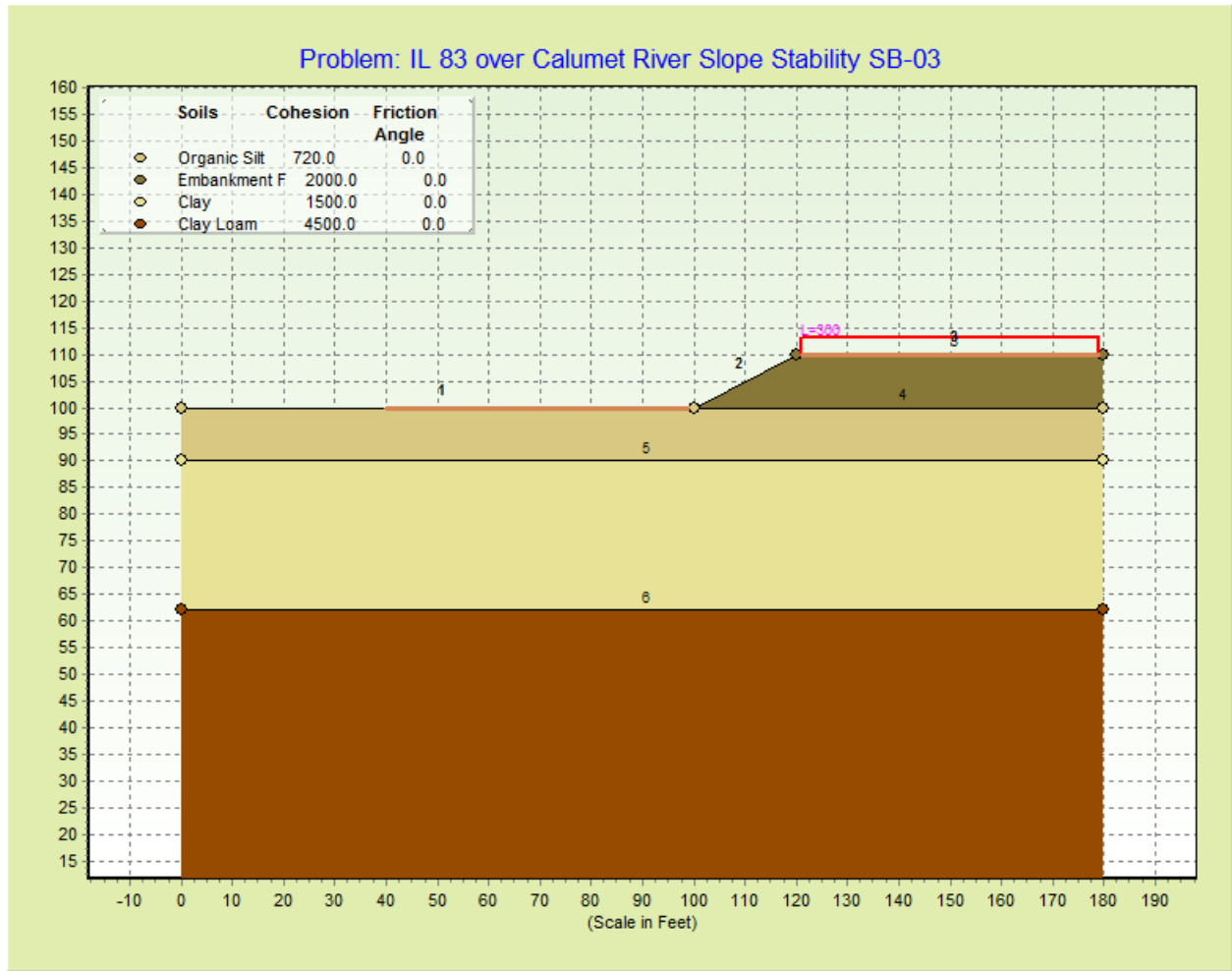
APPENDIX H
SLOPE STABILITY ANALYSIS



STABL for Windows 3.0 - Results

Name: IL 83 over Calumet River Slope Stability SB-03

===== 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	120	110	1
3	120	110	180	110	1
4	100	100	180	100	2
5	0	90	180	90	3
6	0	62	180	62	4

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	0	Embankment

STABL for Windows 3.0 - Results

Name: IL 83 over Calumet River Slope Stability SB-03

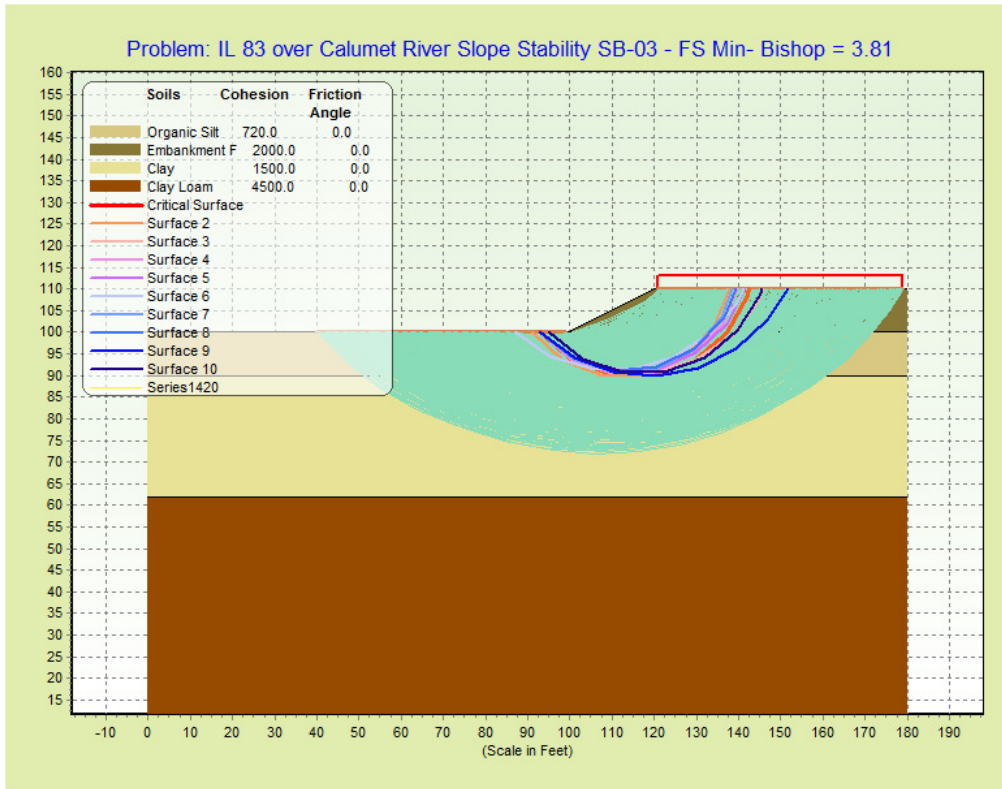
Soil Number	Wet Unit Weight	Saturated Unit Weight	Cohesive Intercept	Friction Angle	Ru	Pressure Head	Water Table	Soil Name
2	110	115	720	0	0	0	0	Organic Silty
3	120	125	1500	0	0	0	0	Clay
4	125	130	4500	0	0	0	0	Clay Loam



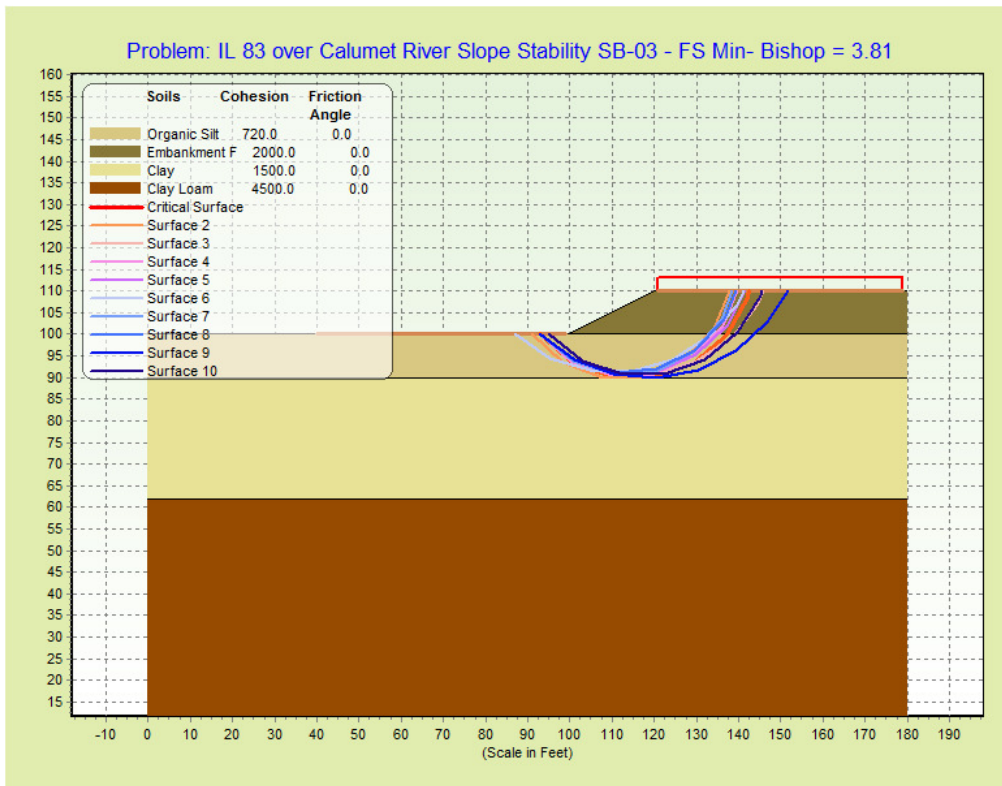
STABL for Windows 3.0 - Results

Name: IL 83 over Calumet River Slope Stability SB-03

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



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

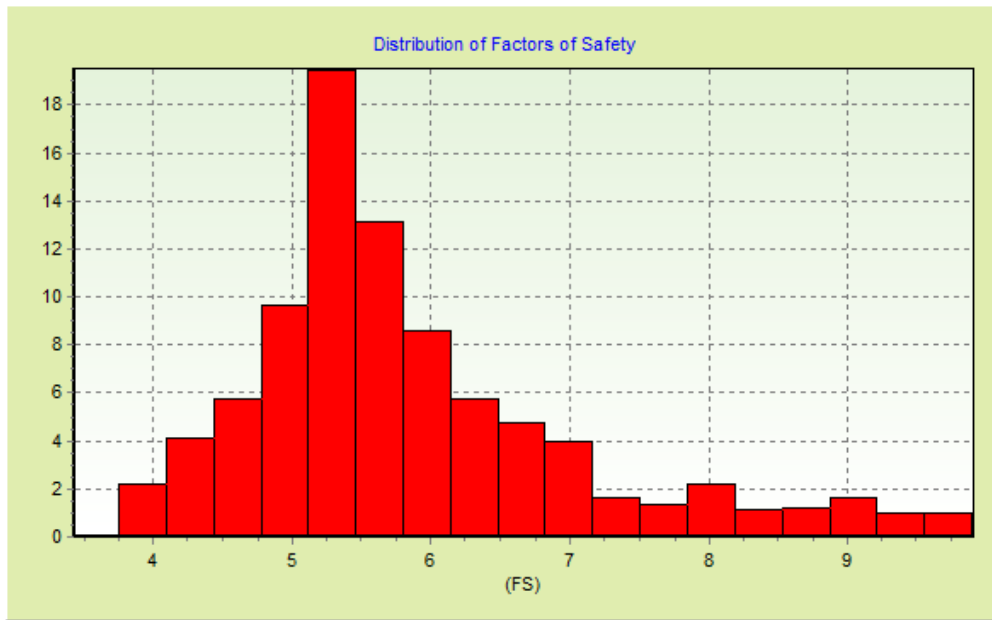




STABL for Windows 3.0 - Results

Name: IL 83 over Calumet River Slope Stability SB-03

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



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

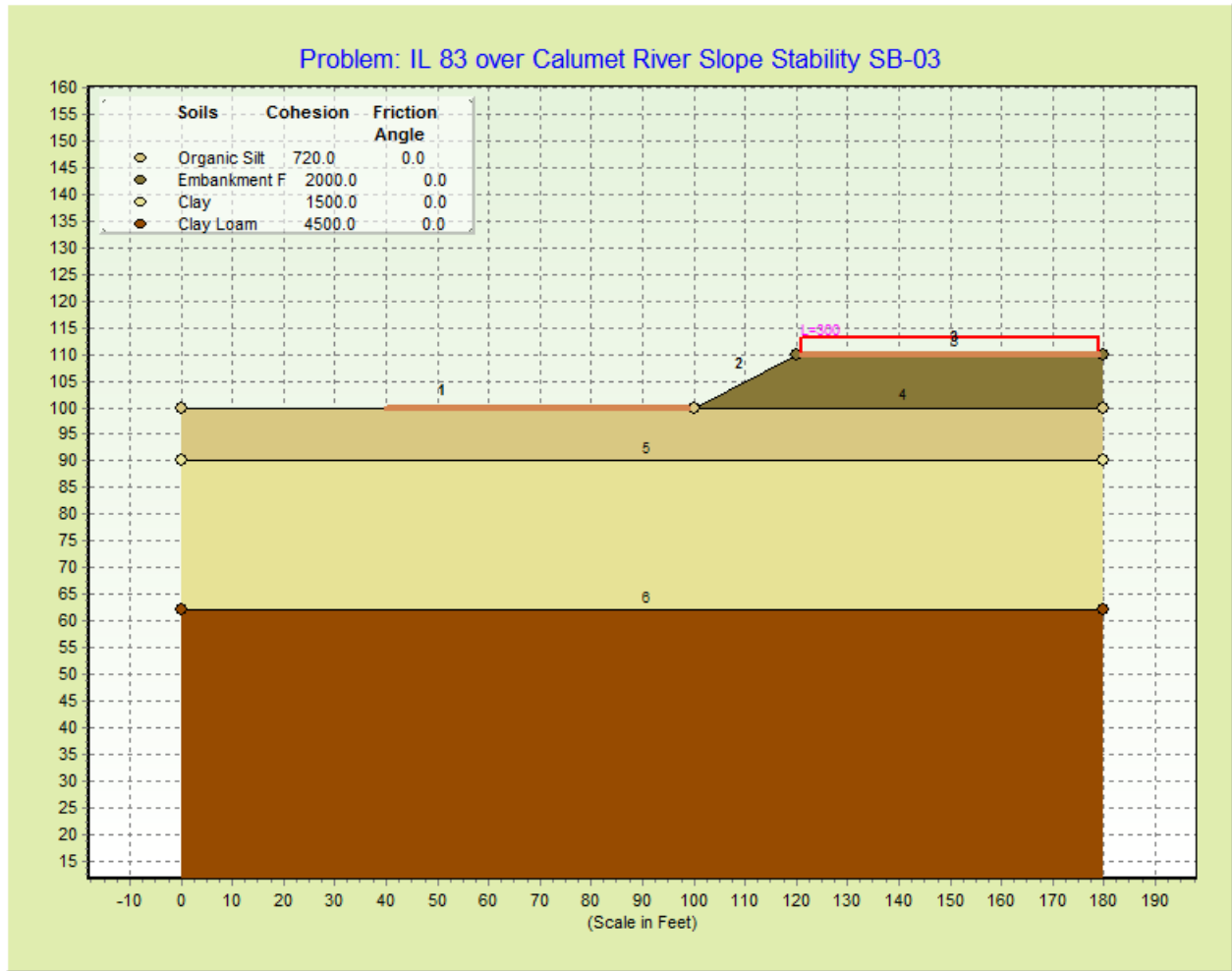
Surface Number	Factor of Safety
1	3.81
2	3.879
3	3.886
4	3.887
5	3.901
6	3.924
7	3.938
8	3.948
9	3.957
10	3.959



STABL for Windows 3.0 - Results

Name: IL 83 over Calumet River Slope Stability SB-03

===== 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	120	110	1
3	120	110	180	110	1
4	100	100	180	100	2
5	0	90	180	90	3
6	0	62	180	62	4

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	0	Embankment

STABL for Windows 3.0 - Results

Name: IL 83 over Calumet River Slope Stability SB-03

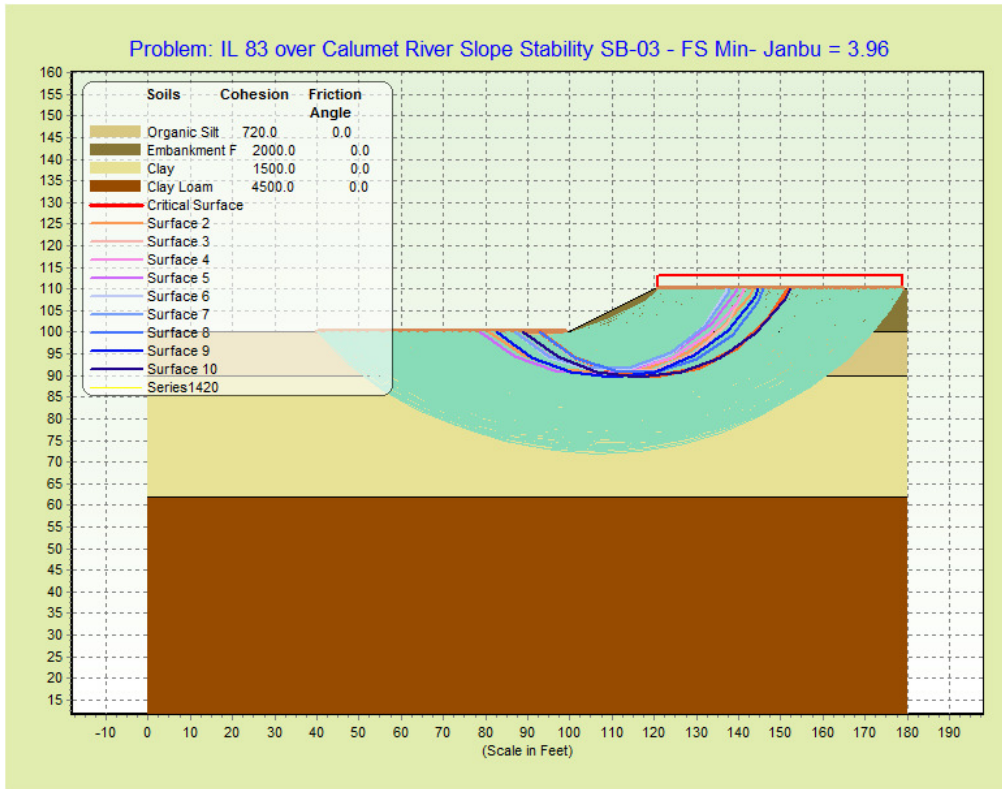
Soil Number	Wet Unit Weight	Saturated Unit Weight	Cohesive Intercept	Friction Angle	Ru	Pressure Head	Water Table	Soil Name
2	110	115	720	0	0	0	0	Organic Silty
3	120	125	1500	0	0	0	0	Clay
4	125	130	4500	0	0	0	0	Clay Loam



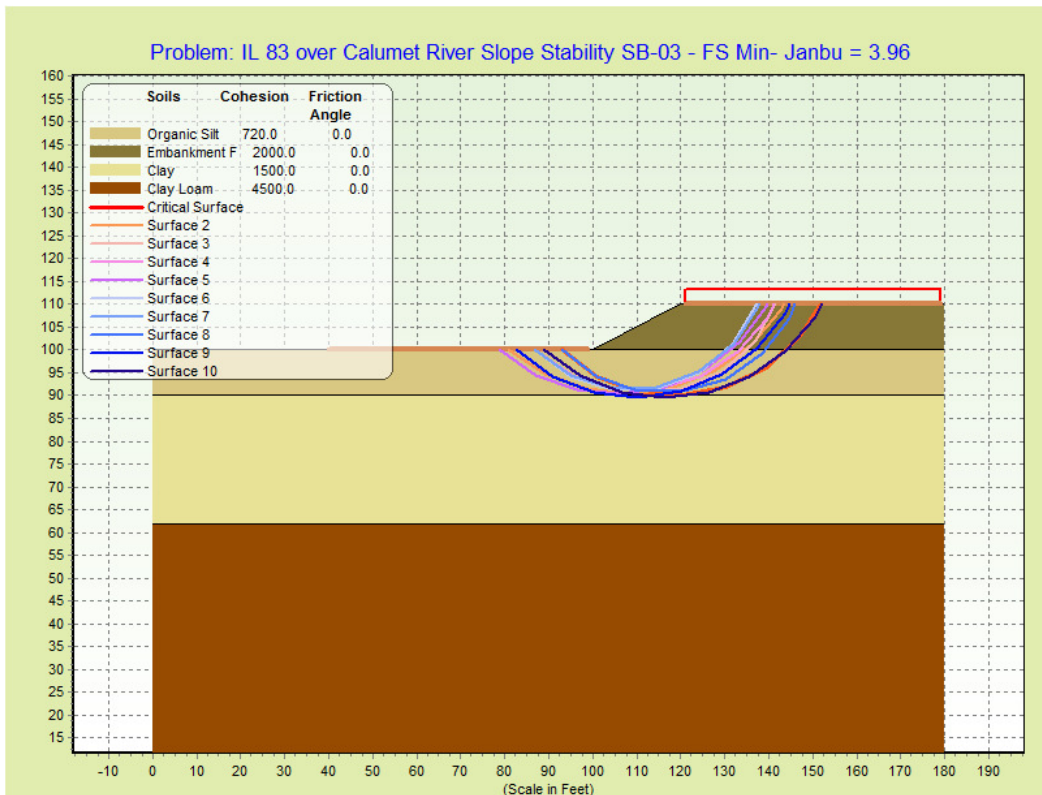
STABL for Windows 3.0 - Results

Name: IL 83 over Calumet River Slope Stability SB-03

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



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

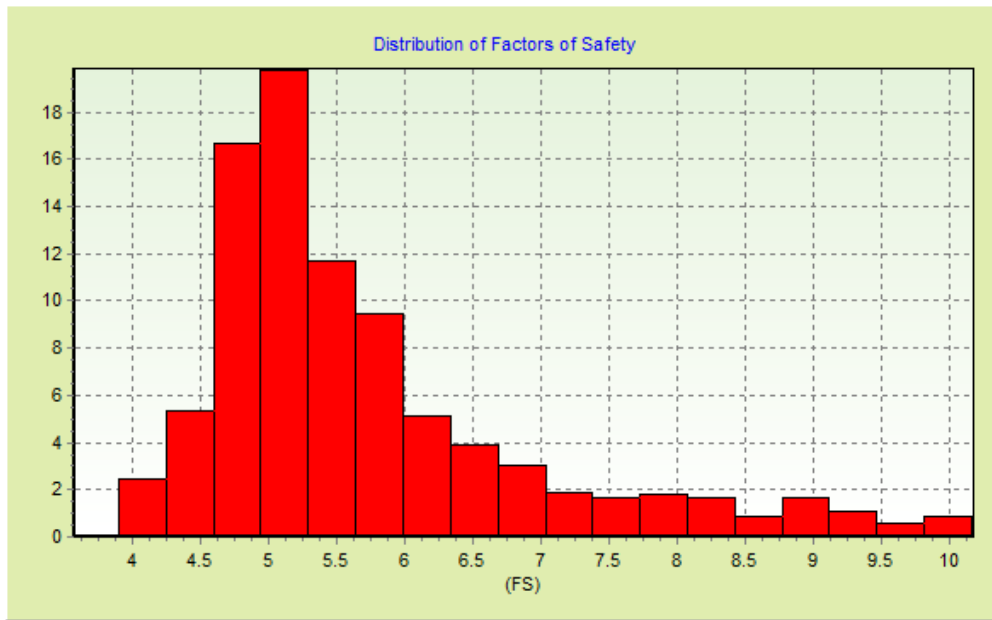




STABL for Windows 3.0 - Results

Name: IL 83 over Calumet River Slope Stability SB-03

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



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

Surface Number	Factor of Safety
1	3.96
2	3.985
3	4.021
4	4.041
5	4.047
6	4.055
7	4.068
8	4.069
9	4.071
10	4.103