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**STRUCTURE GEOTECHNICAL REPORT**  
**Interstate 80 Bridge over BNSF R.R., UP R.R. and Gardner St.**  
**Section 2013-008B & 2013-009B**  
**IDOT Job Number D-91-244-13 (PTB 152, Item 004)**  
**Existing SN 099-0060 (EB) & 099-0061 (WB)**  
**Proposed SN 099-0902 (EB) & 099-0903 (WB)**  
**Joliet, Will County, Illinois**

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**Submitted to:**

**HBP Illinois Partners, JV**  
**c/o HNTB**  
**One South Wacker Drive**  
**Suite 900**  
**Chicago, Illinois 60606**

**Prepared by:**

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



**GSI Job No. 13125**

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September 11, 2015  
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HBP Illinois Partners, JV  
One South Wacker Drive, Suite 900  
Chicago, Illinois 60606

Attn: Ms. Amy Foster, P.E.  
HNTB Corporation

Job No. 13125

Re: Structure Geotechnical Report  
Interstate 80 Bridge over BNSF R.R., UP R.R. and Gardner St.  
Section 2013-008B & 2013-009B  
Proposed SN 099-0902 (EB) and 099-0903 (WB)  
Existing SN 099-0060 (EB) and 099-0061 (WB)  
IDOT Job Number: D-91-244-13 (PTB 152, Item 004)  
Joliet, Will County, Illinois

Dear Ms. Foster:


The following report presents the geotechnical analysis and recommendations for the replacement and widening of the bridge structures carrying Interstate 80 over the BNSF R.R., UP R.R. and Gardner St. A total of seventeen (17) structural soil borings (BSB-01 thru BSB-16 and BSB-01A) were completed. In addition, two (2) survey borings (BSB-52 and BSB-53) were also completed to supplement the boring information of the geotechnical investigation. Copies of these boring logs, along with plan and profiles are included in this report.

If there are any questions regarding the information submitted herein, please do not hesitate to contact us.

Very truly yours,

GEO SERVICES, Inc.

  
Richard Realeza  
Staff Engineer  
richard@geoservicesinc.net

  
Stephen A. Bucher, P.E.  
Senior Geotechnical Engineer  
stephenbucher@geoservicesinc.net



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## **SECTION 01: INTRODUCTION**

This report presents the results of the geotechnical investigation for the bridge replacement and widening of the Interstate 80 over the BNSF R.R., UP R.R. and Gardner St. Project, IDOT Job Number: D-91-196-09 (PTB 152, Item 004). The results of the seventeen (17) structure borings (BSB-01 thru BSB-16 and BSB-01A), and two (2) survey borings (BSB-52 and BSB-53) completed by Geo Services, along with plan and profile drawings, are included with this report.

Boring locations were selected by Geo Services, Inc. and were reviewed and approved by HBP Illinois Partners, JV (HBP), and the Illinois Department of Transportation (IDOT). Boring locations were marked in the field by Geo Services, Inc. (GSI) personnel after review of accessibility and utility locations. Estimated ground surface elevations at the as-drilled boring locations were taken from the topographic and cross-section drawings provided by HBP. The as-drilled locations for the borings are shown on the Boring Location Diagram found in Appendix C section of the report.

This report includes a description of subsurface conditions, location diagram, profiles and boring logs, as well as recommendations pertaining to the design and construction of the new bridge foundations, earth embankment, retaining walls and general construction considerations for the site.

## **SECTION 02: PROJECT DESCRIPTION**

The existing bridges (SN 099-0060 EB and SN 099-0061 WB) were constructed in 1964 and were repaired in 1990, 1998, 2001, and 2011. The existing dual structures consist of a seven span structure composed of a three-span unit, single span and a three-span unit. The existing bridge structures are composed of reinforced concrete deck, which is carried by W36 rolled steel beams supported by pile bent abutments, and multi-column concrete piers founded on steel piles. The EB bridge measures 483'-5" back to back abutments, and the WB bridge measures 477'-1" back to back abutments. Out to out deck width of the existing bridges is approximately 48'-0" feet and skews of approximately 13° and 9° per the existing drawings.

It is intended to remove and replace the bridge structure. The bridges are proposed to be widened at each side of the median lanes/shoulders to approximately ± 63 feet for the eastbound structure and ± 65 feet for the westbound structure.

The new bridges (SN 099-0902 EB and SN 099-0903 WB) will be 3-span bridge superstructures that have an overall width of approximately 128 feet, out to out with an approximate length of 394 feet, back-to-back abutments. The new bridges are proposed to be supported on semi-integral abutments, and a deep foundation system. In addition, the proposed bridge superstructure will have an MSE retaining wall that sets parallel to the abutment with dog-ear configuration wingwalls. Per TS&L, the estimated

substructure pile cap and foundation footing elevations were provided by HBP. The estimated substructure elevations at the bridge and walls are shown on the following Tables 1 and 2.

**Table 1 – Estimated Bridge Substructure Elevations**

Substructure	Approximate Station	Estimated Bottom of substructure elevation (feet) <sup>1</sup>
West Abutment	Sta. 711+38	570.10
Pier 1	Sta. 712+72	539.50
Pier 2	Sta. 714+23	529.10
East Abutment	Sta. 715+34	567.70

Notes: 1. Piles assumed to be embedded 1.0-ft into the pile cap.

**Table 2 – Estimated Retaining Wall Elevations**

Wall Location	Estimated bottom of footing/leveling pad elevation (feet) <sup>1</sup>
West Abutment (WB & EB)	546.53
East Abutment (WB & EB)	540.36

Based on the foundation loads provided by HBP, the total service loads at the top of foundation are shown on the following Table 3 - Preliminary Factored Loads for the Substructures:

**Table 3 – Preliminary Factored Loads for the Bridge Substructures**

Location	Total Dead Load (kips)	Total Live Load (kips)	Estimated Total Factored Loads (kips)
West Abutment	1,650	710	2,360
Pier 1	4,050	1,550	5,600
Pier 2	3,550	1,450	5,000
East Abutment	1,450	670	2,120

## **SECTION 03: SUBSURFACE INVESTIGATION PROCEDURES**

The borings were performed during the months of October, 2013, March to May, 2014, and June, 2015 with a truck-mounted drilling rig. Borings were performed at the top of the bridge deck (BSB-01, BSB-01A, BSB-02 thru BSB-04, BSB-15, and BSB-16), below the bridge structure outside Gardner Street, BNSF and UP R.R. (BSB-05 thru BSB-14), and in the median portion of the existing East Abutment (BSB-52 and BSB-53). All of the borings were advanced by means of hollow stem augers and continued with rotary drilling techniques. Representative soil samples were obtained employing split spoon sampling procedures in accordance with AASHTO Method T-206. Bedrock cores were obtained in all of bridge structure borings using an NX-size double tube core barrel with a diamond impregnated bit. Samples obtained in the field were returned to our laboratory for further examination and testing.

Split spoon sampling involves driving a 2.0-inch outside diameter split-barrel sampler into the soil with a 140-pound weight falling freely through a distance of 30 inches. Blow counts are recorded at 6" intervals and the blow counts are shown on the boring logs. The number of blows required to advance the sampler the last 12 inches is termed the Standard Penetration Resistance (N). The N value is an indication of the relative density of the soil.

## **SECTION 04: LAB TESTING PROGRAM**

The test procedures were performed in accordance with test procedures discussed in the IDOT Geotechnical Manual. All split-spoon samples obtained from the drilling operation were visually classified in the field. Cohesive samples were tested for unconfined compressive strength using an IDOT modified RIMAC test device and/or calibrated penetrometer 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 to the regular lab testing program, Organic Content (AASHTO T-194) test was performed on select samples from borings, and unconfined compressive testing was performed on rock cores obtained from the field as 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.

## **SECTION 05: SUBSURFACE CONDITIONS**

Boring logs can be found in Appendix C. The stratification lines shown on the boring logs represent the approximate boundary between soil types, and the actual transition may be gradual.

Surface conditions at the boring locations taken along the roadway or shoulder areas of Interstate 80 consisted of existing asphalt and concrete pavement over crushed stone base and then stiff to hard clay to clay loam fill materials that extended to elevations ranging from approximately 530 to 577 feet for borings performed at the existing abutments. Below the Interstate 80 Bridge near Gardner Street, BNSF and UP railroads where borings BSB-05 to BSB-14 were drilled, surface conditions varied from concrete pavement, sand, gravel and/or topsoil to underlying crushed stone, sand, cinders and stone fill to an approximate elevation of 525 feet. Beneath the surficial materials, interstratified layers of fill materials including medium dense sand and gravel, medium stiff to stiff clay, and clay loam were encountered to elevations varying from approximately 507 to 512 feet. A 5-foot thick layer of organic silty loam was noted below the fill at boring BSB-15 beginning at approximate elevation 528 feet. Also, a 3-foot thick layer of buried topsoil (organic content = 6.7%) was encountered below the fill at boring BSB-53 beginning at approximate elevation 526 feet.

The fill soils had moisture contents within the range of 12% to 23% with an average of 19%. Moisture contents of the cohesive soils are within the range of 26% to 44% with an average of 35%. The granular soils had moisture contents within the range of 6% to 18% with an average of 7%. Buried topsoil had a moisture content of 35%. Organic soil had moisture contents within the range of 31% to 67% with an average of 49%.

Below the native overburden soils, bedrock was encountered at elevations varying from approximately 479 to 509 feet. The rock cores obtained indicated Silurian System, Niagaran Dolomite. A summary of the bedrock information obtained during our exploration is tabulated in Table 4.

**Table 4 – Bedrock Information Summary**

Boring (Run)	Station	Offset	RQD	Approximate Top of Bedrock Elevation (feet)	Approximate Elevation of Qu Test (feet)	Unconfined Compressive Strength, $Q_u$ (tsf)
BSB-01A (Run 1)	Sta. 710+93	55.2' Left	40.0%	513.1	509.0	950
BSB-01A (Run 2)	Sta. 710+93	55.2' Left	0.0%		n/a	n/a
BSB-01A (Run 3)	Sta. 710+93	55.2' Left	18.0%		488.1	845
BSB-02 (Run 1)	Sta. 710+92	10.6' Right	21.0%	511.4	510.2	439
BSB-03 (Run 1)	Sta. 711+69	23.0' Left	52.0%	505.7	502.6	843
BSB-04 (Run 1)	Sta. 711+50	52.6' Right	45.5%	510.4	509.7	618
BSB-04 (Run 2)	Sta. 711+50	52.6' Right	10.6%		493.7	594
BSB-04 (Run 3)	Sta. 711+50	52.6' Right	14.0%		491.6	382
BSB-05 (Run 1)	Sta. 712+72	65.3' Left	58.0%	512.8	511.8	1,038
BSB-06 (Run 1)	Sta. 712+70	9.2' Right	41.0%	511.0	506.8	938
BSB-07 (Run 1)	Sta. 713+13	11.2' Left	21.0%	513.7	512.9	1,088
BSB-08 (Run 1)	Sta. 713+00	67.1' Right	23.0%	514.4	507.6	1,209
BSB-09 (Run 1)	Sta. 713+77	66.2' Left	43.0%	512.2	509.3	280
BSB-10 (Run 1)	Sta. 713+67	7.7' Right	0.0%	514.4	n/a	n/a
BSB-10 (Run 2)	Sta. 713+67	7.7' Right	45.0%		507.4	337
BSB-10 (Run 3)	Sta. 713+67	7.7' Right	0.0%		n/a	n/a
BSB-11 (Run 1)	Sta. 714+35	6.9' Left	33.0%	509.1	508.1	434
BSB-12 (Run 1)	Sta. 714+21	67.5' Right	32.0%	512.4	509.9	561
BSB-13 (Run 1)	Sta. 715+06	67.3' Left	50.0%	509.1	508.0	663
BSB-14 (Run 1)	Sta. 714+93	11.0' Right	39.0%	512.2	503.5	1,452
BSB-15 (Run 1)	Sta. 715+97	23.2' Left	64.0%	512.2	510.2	1,332
BSB-16 (Run 1)	Sta. 715+78	50.7' Right	81.0%	517.8	513.2	876

## **SECTION 06: WATER TABLE CONDITIONS**

Groundwater was encountered before switching to rotary drilling techniques in 7 of the borings at elevations ranging from approximately 561 feet to 572 feet for the abutment borings (BSB-01 and BSB-16), and elevations ranging from approximately 517 feet to 529 feet for the borings drilled below the bridge (BSB-05A, BSB-10, BSB-12, BSB-13, and BSB-14). Due to the nature of rotary-wash drilling, it was not possible to obtain accurate water levels after drilling. Perched water levels may occur within granular layers above the rock. Fluctuations in the amount of water accumulated and in the hydrostatic water table can be anticipated depending on variations in precipitation and surface runoff.

## **SECTION 07: ANALYSIS**

### **Mining Activity**

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

### **Site Seismic Parameters**

For LRFD design, according to the AASHTO LRFD Bridge Design Specification 2012 (with 2013 Interims), the project site has a Horizontal Response Spectral Acceleration ( $S_1$ ) of 0.040 at a period of 1.0 second and 5% critical dampening. The site also has a Horizontal Response Spectral Acceleration ( $S_s$ ) of 0.104 at a period of 0.2 seconds and 5% critical dampening. The following table shows recommended seismic design data in accordance with the AASHTO LRFD Bridge Design Specification 2012 (with 2013 Interims).

**Table 5 – Seismic Design (Approximately 1000-Year Return Period)**

Seismic Performance Zone (SPZ)	1
Design Spectral Acceleration at 1 second ( $S_{D1}$ )	0.068
Design Spectral Acceleration at 0.2 seconds ( $S_{Ds}$ )	0.125
Soil Site Class	C

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 and wall structures.

### **Settlement, Bearing Capacity, and Slope Stability**

The proposed bridge structure will have an MSE wall structure at the abutments and widening areas at the shoulders and median portions of the bridge. Approximate maximum exposed heights (top of leveling pad to top of approach slab) of 32'-10" at the West Abutment and 35'-9" at the East Abutment have been evaluated for settlement, bearing capacity, and slope stability. The leveling pads for the MSE walls are proposed at elevation 546.5 feet at the West Abutment and 540.4 feet at the East Abutment.

For bearing resistance, widening fill areas with maximum fill heights of 32'-10" feet at the West Abutment and 35'-9" feet at the East Abutment have been analyzed. A resistance factor of 0.65 has been used for the LRFD soil bearing resistance calculations per AASTHO Table 11.5.7-1. The factored bearing resistances of the soils, as shown in the following Table 6, are insufficient to support the high embankment loads due to the low unconfined compressive strengths of the clay to clay loam fills and organic silty loam at the abutment areas. Aggregate Column Ground Improvement (ACGI) at the abutment areas will be needed to support the new embankment loads. The width of aggregate column ground improvement zone will be about 25 feet and will span along the length of the abutment walls until wall height is less than 10 feet. Recommended limits of the ACGI will be about 100 feet offset at left and right from the I-80 centerline.

For estimated settlements, borings BSB-03, which had strata of medium stiff clay loam fill, and BSB-15 which had strata of clay to clay loam fill to organic silty loam were used as "worst-case scenario" for analysis. Settlement at the West Abutment was calculated to be approximately 1 to 1.5 inches. Settlement at the East Abutment was calculated to be approximately 3 to 3.5 inches. An estimated 50% and 90% consolidation of the compressible deposits will occur in 2 and 6 months, respectively. Consequently, downdrag will affect the design of the piles at both the West and East Abutment since the phased construction schedule will not allow time for 90% consolidation to occur prior to pile driving. Feasible alternatives such as designing piles to carry the additional downdrag loadings or precoring to reduce downdrag stresses may be considered. See subsection **Pile Foundation Considerations** for more discussion.

A slope stability program (STABL v3.0) was utilized to calculate factors of safety (FOS) at the walls using wall heights of 32'-10" feet at the West Abutment and 35'-9" feet at the East Abutment, and a vertical geometry with a slope of 1.5H:1V. At boring BSB-15 location, which has been used as "worst-case scenario" for slope stability analysis, we calculate factor of safety of less than 1.5 for drained conditions. In order to satisfy the Factor of Safety requirement ( $FOS \geq 1.5$ ) per IDOT requirements, ground improvements in the area of boring BSB-15 at the East Abutment WB portion of the proposed bridge and walls will be required to increase the FOS. No slope stability issues were identified at the West Abutment.

The following Table 6 shows the summary of the estimated bearing resistances, settlements, and slope stability factor of safety calculated at abutment/footing locations:

**Table 6 – Factored Bearing Resistance, Settlement, and Slope Stability Summary for the Retaining Walls**

Analyses	West Abutment			East Abutment		
	Estimated Equivalent Uniform Bearing Pressure	Without Ground Improvements	With Ground Improvement	Estimated Equivalent Uniform Bearing Pressure	Without Ground Improvements	With Ground Improvements
Factored Bearing Resistance (psf) <sup>1</sup>	8,500	5,800	8,500+	9,000	6,100	9,000+
Estimated Settlement (inches)	n/a	1.0 to 1.5	<1	n/a	3 to 3.5	<1
Slope Stability (FOS)	n/a	1.53 (Undrained) 1.52 (Drained)	n/a	n/a	2.0 (Undrained) 1.37 (Drained)	2.01 (Undrained) 2.01 (Drained)

Note: 1. Factored Bearing Resistance is computed for a resistance factor of 0.65 as required for MSE walls. The factored bearing resistance indicated in the table is prior to remedial treatments. Minimum depth of foundation is approximately 3.5 feet below proposed grade.

To increase bearing resistances and decrease settlement for support of the new embankment fill of the MSE walls at the West and East Abutment portions of the bridge, ground improvements, such as the use of Aggregate Column Ground Improvements (ACGI) will be needed. Settlement is estimated to be less than 1 inch after ground improvements. By incorporating ground improvements in the slope stability analysis, the FOS was increased to  $\geq 1.5$ .

Other means of remedial treatments such as undercutting/replacement or preloading may be feasible; however, these are not recommended. Undercutting is not recommended due to deep undercutting to about 20 feet below the MSE wall footing foundation, and the need for a temporary earth retention system to construct the ground improvement. Preloading due to the construction of the proposed MSE wall on the early phase of stage construction may be able to reduce the excessive and/or differential settlements at the abutments; however, inadequate bearing at the abutments remains an issue, and ground improvements (i.e. aggregate columns) will be necessary to improve bearing capacity and reduce settlements at the abutments.

### **Overturning, Sliding, and Eccentricity**

The contractor should provide a design for the MSE wall's internal stability by a qualified and approved vendor. Per AASHTO, the wall block, which extends a distance of  $0.7H$  ( $H$ = exposed wall height) from the outside face of the wall, is to be considered a solid reinforced soil mass. The reinforced mass minimum dimensions needed to provide the external stability (based on overturning and sliding analyses) of the proposed MSE wall are satisfied. In addition, the  $0.7H$  width of the reinforced mass is adequate based on the global and external stability analyses for the proposed MSE wall.

Overturning, sliding, and eccentricity have been checked using the reinforced block. At worst-case scenario, the borings BSB-03 at the West Abutment and BSB-15 at the East Abutment were selected for analyses. Maximum wall heights of 32'-10" feet at the West Abutment and 35'-9" feet at the East Abutment were also used in the calculations. The point of pivot was considered at the toe and the adjacent embankment and traffic pressures were applied. Table 7 is a summary of the factors of safety for overturning, sliding, and calculated eccentricities. The computed factors of safety (FS) satisfy the requirements set for overturning and sliding friction.

**Table 7 – Factors of Safety for MSE Wall Soil Block Overturning,  
Sliding and Eccentricity**

Location	Factor of Safety for MSE Wall Soil Block Overturning at Toe <sup>1</sup>	Factor of Safety for MSE Wall Soil Block Sliding <sup>2</sup>	Calculated Eccentricity (feet) <sup>3</sup>
West Abutment	3.4	3.6	3.3
East Abutment	3.5	3.6	3.5

Notes: 1. Required FS=2.0  
2. Required FS=1.5  
3. Eccentricity must be no greater than  $B/6$  (where B is estimated as  $0.7H$ )

## **SECTION 08: BRIDGE FOUNDATION RECOMMENDATIONS**

### **Foundation Recommendations**

Based on the results of the borings, type of structure, and estimated loading, feasible foundations for support include deep foundation systems consisting of driven Metal H-piles at both abutments and at the pier sections of the bridges. Driven Metal H-piles are preferred over drilled shafts due to anticipated shaft drilling difficulties through very dense granular materials, and the need for extended steel casing due to non-cohesive soils.

We recommend that an economic analysis for each foundation option presented below be considered before choosing a foundation system for the design.

### **Pile Recommendations**

Based on the results of the borings and proposed foundation loadings, H-piles (driven to refusal) may be used for the support of the proposed substructures. Based on IDOT Pile Calculation spreadsheets for the pier and abutments sections of the bridge, the maximum allowable stress while driving Metal Shell piles occurred at shallow depth (less than about 10 to 12 feet); therefore, Metal Shell piles are not recommended at the bridge substructures.

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 the 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. We anticipate hard driving to occur starting at elevation ranges of 523 to 533 feet, and driving shoes are required to penetrate H-piles through the dense sand and gravel, and fractured rock.

For the new driven piles at the abutment areas, it is estimated settlement of ¼ 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 section of the report.

### **Pile Foundations 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 ( $\Phi_G$ ) 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.

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

Due to the magnitude of settlements estimated for the MSE wall fill at the abutments, downdrag is anticipated to affect the design of the piles. For design of piles accounting for downdrag, a downdrag stress occurring throughout the embankment fill soils to elevation ranges at approximately 522 to 535 feet has been applied. Pile capacity tables have been included in Appendix E for both abutments with downdrag. Installation of corrugated steel pipe sleeves from the bottom of the abutment to the bottom of the leveling pad within the MSE wall mass is recommended prior to constructing the MSE wall and driving piles. The annular space within the pile sleeves will be backfilled with dry, loose sand.

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 (especially at the north end of WB West Abutment) due to variability of the top of bedrock elevation (i.e. top of rock elevation between borings B-1 and B-1A). Variation in pile lengths should be expected. 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.

### **Approach Slab Recommendations**

The new approach slab will be supported on either new or existing embankment fill. Shallow footings for the "sleeper" below the slab should be designed for a maximum applied service bearing pressure of 2,000 psf situated on new embankment fill. 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. Settlement of the approach slab is calculated on the order of less than 0.4 inches.

## **SECTION 09: RETAINING WALL RECOMMENDATIONS**

### **Recommended Wall Types**

It is proposed that an MSE type retaining wall be considered for the new fill required at the abutments. The maximum retaining wall height is to be approximately 36 feet. Based on the soil conditions shown on the boring logs, and wall/site geometry, the proposed wall structures are feasible and recommended for use. Other wall systems such as T-type cantilever wall can also be considered for embankment support.

Economic, construction and scheduling factors should be evaluated for the decision of retaining wall design. The following provides a general discussion of soil conditions as they relate to the retaining wall construction.

### **Shallow Foundation Recommendations**

The proposed walls around the bridge abutments are proposed to be an MSE retaining wall system bearing on shallow foundations, which is considered a viable option for design of the retaining wall. Based on our analyses of soil bearing resistance and estimated settlements, aggregate column ground improvements are recommended for support of the retaining walls at both abutments. Per our preliminary analysis, we estimate a triangular spacing of 7 feet (center-to-center) and a diameter of 30 inches may be appropriate for the aggregate column ground improvements. The aggregate columns are anticipated to extend to top of bedrock at approximate elevation 503 feet at the West Abutment, and 513 feet at the East Abutment. In addition, the width of aggregate column ground improvement zone will be about 25 feet and will span along the length of the abutment walls until wall height is less than 10 feet (about 100 feet offset left and right from the I-80 centerline). If ground improvements are performed, the factored bearing resistances summarized in Table 6 will increase to provide the required bearing capacity needed per wall location. As noted at the bottom of each table, it will be important to observe the soils exposed during construction to determine the actual extent of undercutting that will be needed. Also, two (2) survey borings (BSB-52 and BSB-53) were completed to delineate the extent of the soft soils encountered in boring BSB-15 area. The results of the survey borings show that BSB-53 had noted about 3-foot of buried topsoil below the existing fill at approximate elevation 526 feet, which is near the elevation where the organic silt was encountered at boring BSB-15. Overexcavation may not be an economical solution since the soft soils encountered at borings BSB-15 and BSB-53 are about 14 to 20 feet below the MSE wall footing foundation. Consequently, it is recommended that aggregate column ground improvements be used at the MSE walls at both abutments.

Soil should be verified in the field at the time of construction by an experienced Geotechnical Engineer or representative. Actual extents of any remedial treatments will be determined at this time. If soils with less than adequate bearing strength are noted

at the foundation level during footing construction, the weaker soils encountered at the base of the footings should be undercut to reach suitable bearing soils, and the undercut area filled with lean concrete or an approved compacted structural (granular) fill material. All placement of structural fill for footing support should be in accordance with the IDOT Standard Specifications and the Guide Bridge Special Provisions (GBSP).

Ground improvements, such as aggregate columns will be required to increase bearing resistances and reduce settlement for support of the new embankment fill in the area of the MSE walls at both the West and East Abutment portions of the bridge. At the East Abutment area, bulging of the aggregate column elements in the organic silt layer may be a concern when the ACGI are constructed. In order to prevent the bulging issue of the constructed aggregate columns, we recommend installing either grouted or sleeved type aggregate columns to maintain the integrity of the aggregate column. Without a grouted or a sleeved aggregate column, the aggregate columns could laterally bulge into the high moisture organic soils and prevent the aggregate column from being properly densified or compacted.

For excavations extending into the higher portions of the embankments and at the piers (if needed), a Temporary Soil Retention System (TSRS), or an option to use a temporary MSE wall, to be designed by the Contractor (or as directed by the Engineer, as specified in IDOT GBSP 44) will likely also be required to support the embankment during excavation and wall construction. The retention system should be designed by an IL-licensed Structural Engineer.

To provide adequate frost protection, we recommend the bottom of the retaining wall be a minimum of 3.5 feet below final grade.

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

## **SECTION 10: LATERAL SOIL PARAMETERS**

On the following table is a summary of lateral soil parameters to be used for design of the deep foundation system, retaining walls at the abutments, and temporary soil retention system.

**Table 8 – Soil Parameters for Lateral Resistance**

<b>Material (elevation, feet)</b>	<b>Unit Weight (pcf)</b>	<b>Drained Friction Angle (°)</b>	<b>Undrained Cohesion (psf)</b>	<b>Lateral Modulus of Subgrade Reaction (pci)</b>	<b>Strain</b>
Stiff to Very Stiff Clay to Clay Loam Fill (577 to 530)	125	28	1,800	700	0.007
Organic Silty Loam/Buried Topsoil (528 to 522) <sup>2</sup>	100	20	-	30	0.020
Medium Dense to Dense Loams, Sand & Gravel (530 to 520)	125	32	-	100	-
Dense to Very Dense Loams, Sand, Gravel & Fractured Rock (520 to 509)	132	34	-	250	-

Notes: 1. Values recommended for use in design from L-pile Software Manual.  
 2. Organic Silty Loam and Buried Topsoil encountered at borings BSB-15 and BSB-53, respectively.

**Table 9 – Bedrock Parameters for Lateral Resistance**

<b>Material</b>	<b>Unit Weight (pcf)</b>	<b>Young's Modulus (psi)</b>	<b>Uniaxial Compressive Strength (psi)</b>	<b>RQD (%)</b>	<b>Strain (k<sub>m</sub>)</b>
Sound Bedrock	150	2 x 10 <sup>6</sup>	See Lab Data on Rock Core Logs	21% to 84%	0.0001

Allowances should be made for any surcharge loads adjacent to the retaining structure. According to the NAVFAC Design Manual 7.02, for a concrete base on natural loams, sands and gravels or approved granular structural fill beneath the proposed gravity wall leveling pad area (or at other applicable areas of the proposed wall), 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).

At the abutments, it is recommended that a lateral active earth pressure of 40 psf per foot of depth be used above the water table assuming a free-draining granular backfill is utilized. For non-yielding walls with granular backfill, a lateral at-rest pressure of 50 psf per foot should be used, assuming proper drainage. Allowances should be made for any surcharge loads adjacent to the retaining structure. Drainage should be provided behind the walls at the abutments.

## **SECTION 11: GENERAL CONSTRUCTION CONSIDERATIONS**

Traffic will be maintained utilizing staged construction. Since the proposed wall construction is considered a fill situation, the use of IDOT Temporary Sheet Piling (TSP) Design Charts may not be feasible at the proposed abutment areas per IDOT Design Guide 3.13.1. Also, due to high blow count loams, sands, gravels, and stone, and the limitation of the usage of TSP system, the IDOT Temporary Sheet Piling Design Charts may not be feasible at the proposed pier areas. The contractor will likely need to design and install a Temporary Soil Retention System (TSRS) or temporary MSE wall. The soil and bedrock parameters for lateral resistance shown in Tables 8 and 9 (see Section 10) may be used for design of temporary retention system.

All soils which become softened or loosened at the base of foundation excavation areas or subgrade areas should be carefully recompact 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 12: GENERAL QUALIFICATIONS**

The analysis and recommendations presented in this report are based upon the data obtained from the soil borings performed at the indicated locations and from any other information discussed in this report. 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 - <math>q_u</math> (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:	Carboloy Bit - NX: BX: AX	WO:	Wash Out
OS:	Osterberg Sampler		

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

### WATER LEVEL MEASUREMENT SYMBOLS

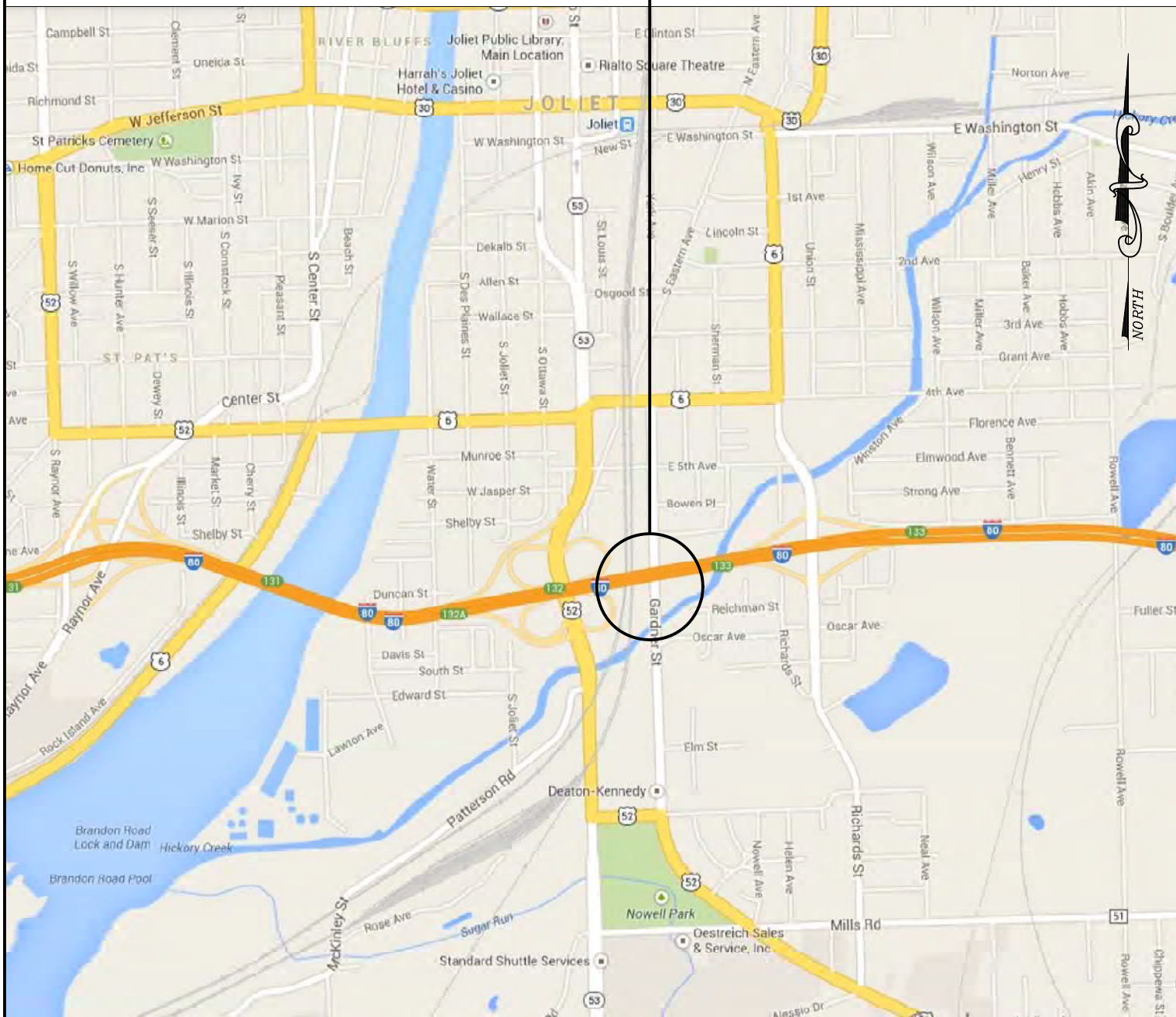
WL:	Water	WD:	While Drilling
WCI:	Wet Cave In	BCR:	Before Casing Removal
DCI:	Dry Cave In	ACR:	After Casing Removal
WS:	While sampling	AB:	After Boring

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

**APPENDIX B**

**SITE LOCATION MAP**

# PROJECT SITE LOCATION



## SITE LOCATION MAP

STRUCTURE GEOTECHNICAL REPORT  
Interstate 80 Bridge over BNSF R.R., UP R.R. and Gardner St.  
Section 2013-008B & 2013-009B  
Proposed SN 099-0902 (EB) and 099-0903 (WB)  
Existing SN 099-0060 (EB) and 099-0061 (WB)  
Joliet, Will County, Illinois  
IDOT Job Number: D-91-196-09 (PTB 152, Item 004)

**Geo Services, Inc.**

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

DRAWN BY

RR

APPROVED BY

AJP

DATE

June 13, 2014

GSJ JOB No.

13125

SCALE

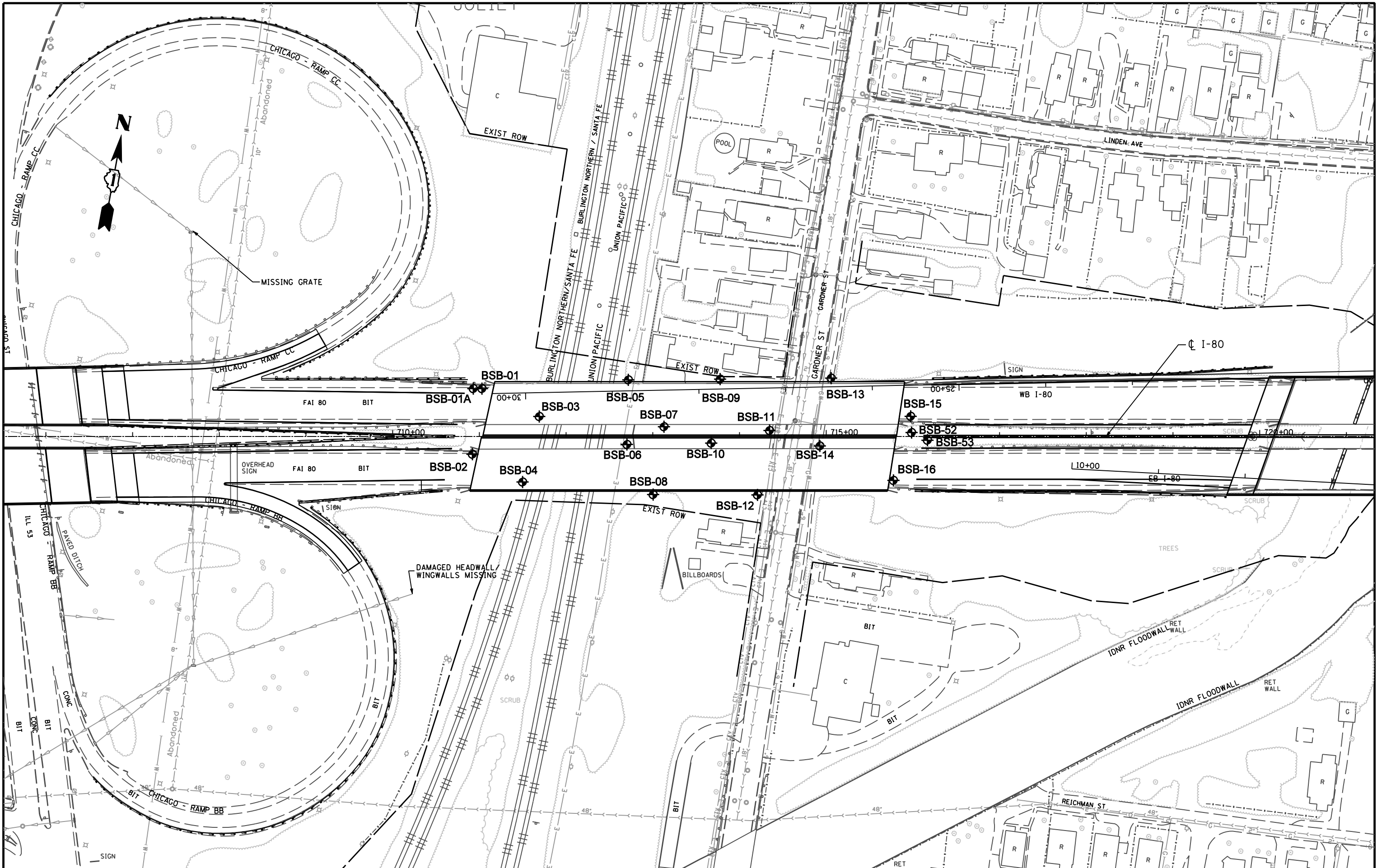
NTS

**APPENDIX C**

**BORING LOCATION PLAN & PROFILE**

PLAN	SURVEYED	BY	DATE
NOTE BOOK NO.	PLOTTED		
	GRADES CHECKED		
	STRUCTURE NOTATIONS CHKD		

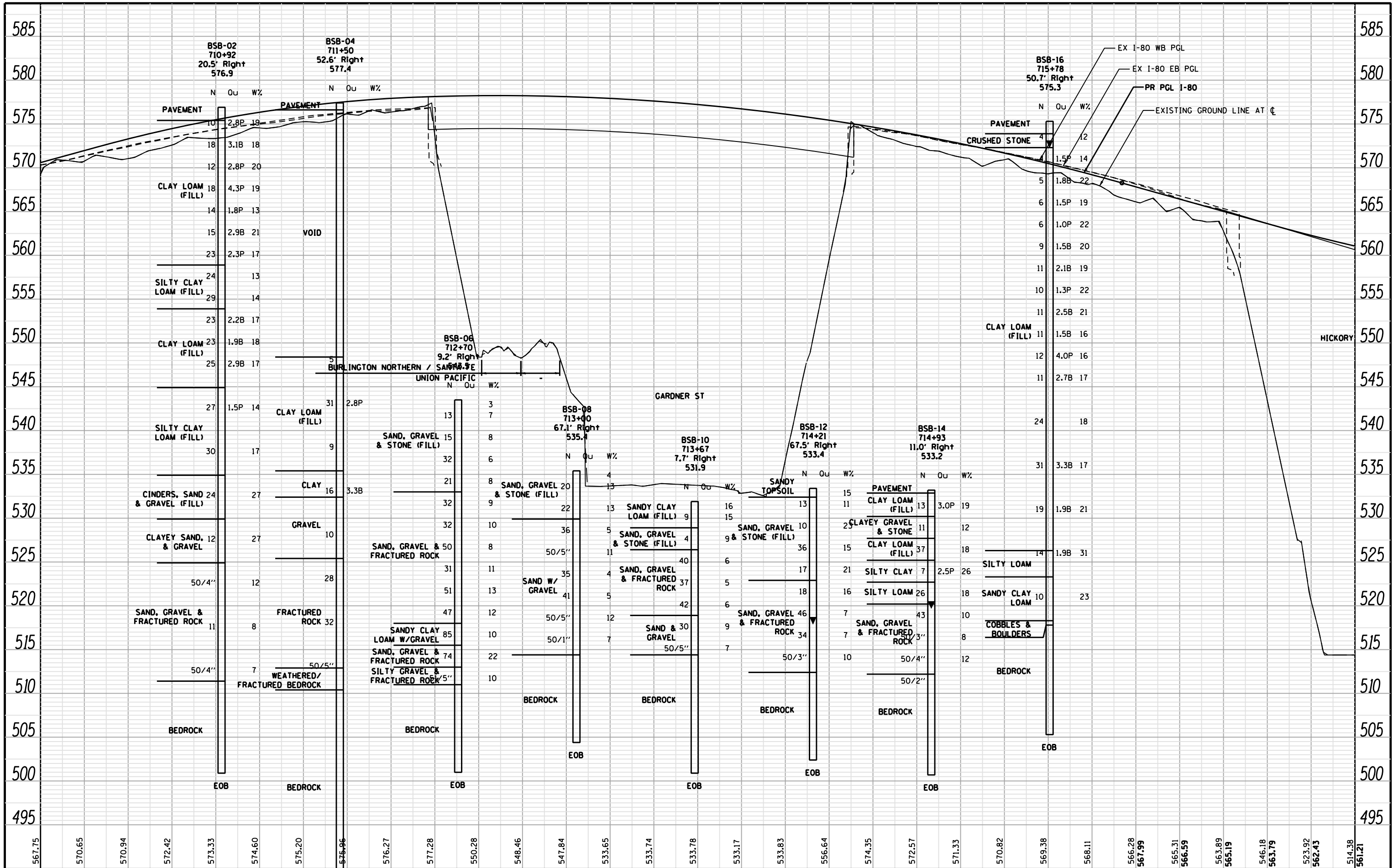
PROFILE	SURVEYED	BY	DATE
NOTE BOOK NO.	PLOTTED		
	GRADES CHECKED		
	STRUCTURE NOTATIONS CHKD		





<div><b>Geo Services, Inc.</b> Geotechnical, Environmental &amp; Civil Engineering 805 Amherst Court, Suite 204 Naperville, Illinois 60565 (630) 355-2938</div>	USER NAME =	DESIGNED - RWC	REVISED - 6/26/2014	<div><b>STATE OF ILLINOIS</b> <b>DEPARTMENT OF TRANSPORTATION</b></div>	I-80 OVER BNSF R.R. AND UP R.R. AND GARDNER STREET PROPOSED STRUCTURE NO. 099-0902 (EB) AND 099-0903 (WB) SOIL BORING PLAN				F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		DRAWN - RWC	REVISED - 6/12/2015		80	2013-008B & 2013-009B	WILL	1	3				
	PLOT SCALE =	CHECKED - AJP	REVISED -		CONTRACT NO. 60W34								
	PLOT DATE =	DATE - 6/11/2014	REVISED -		ILLINOIS FED. AID PROJECT								
					SCALE: 1"=50'	SHEET NO. 1 OF 1 SHEETS		STA. 714+69.01					

PLAN	SURVEYED	BY	DATE
NOTE BOOK NO.	PLANNED		
	DESIGNED		
	CHECKED		
	APPROVED		
	FILE NAME		

PROFILE	SURVEYED	BY	DATE
NOTE BOOK NO.	PLANNED		
	DESIGNED		
	CHECKED		
	APPROVED		
	FILE NAME		



707+00		708+00		709+00		710+00		711+00		712+00		713+00		714+00		715+00		716+00		717+00		718+00		719+00		720+00		721+00					
<div><p><b>Geo Services, Inc.</b> Geotechnical, Environmental &amp; Civil Engineering 805 Amherst Court, Suite 204 Naperville, Illinois 60565 (630) 355-2936</p></div>		USER NAME :		DESIGNED - RWC		REVISED - 6/26/2014		<div><p><b>STATE OF ILLINOIS</b> <b>DEPARTMENT OF TRANSPORTATION</b></p></div>										EB 1-80 OVER BNSF R.R. AND UP R.R. AND GARDNER STREET										F.A.I. RTE.	SECTION		COUNTY	TOTAL SHEETS	SHEET NO.
		DRAWN - RWC		REVISED -		80	2013-008B & 2013-009B											WILL	2	3													
		PLOT SCALE :		CHECKED - AJP		REVISED -												PROPOSED STRUCTURE NO. 099-0902 (EB)															
		PLOT DATE :		DATE - 6/11/2014		REVISED -												SOIL BORING PROFILE															
																		SCALE: 1"=50'H 1"=5'V		SHEET NO. 1 OF 1 SHEETS		STA. 714+69.01				CONTRACT NO.							
																								ILLINOIS FED. AID PROJECT									

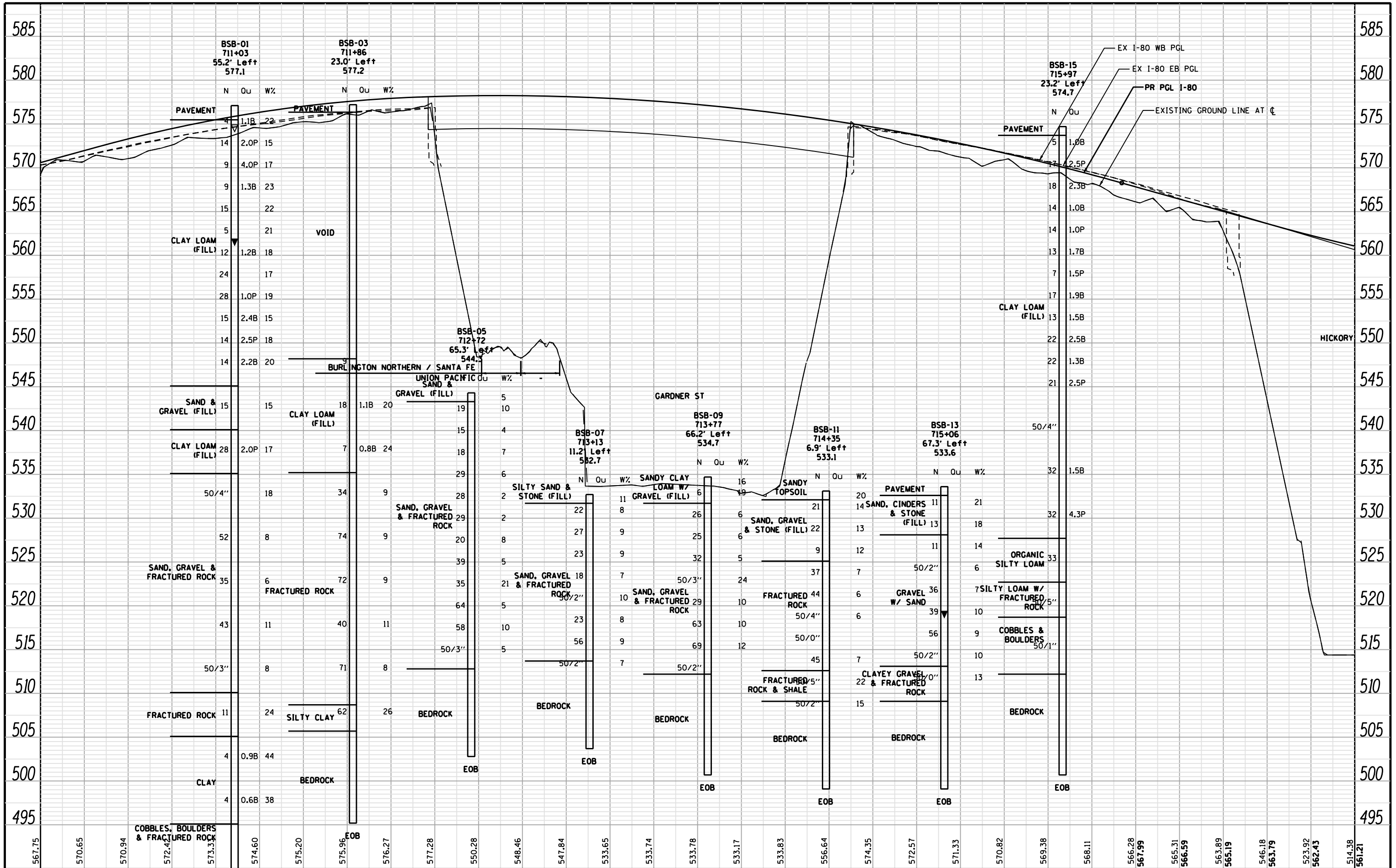
Geo Services, Inc.  
Geotechnical Engineering  
805 Amherst Court, Suite 204  
Naperville, Illinois 60565  
(630) 355-2938


STATE OF ILLINOIS  
DEPARTMENT OF TRANSPORTATION

EB I-80 OVER BNSF R.R. AND UP R.R. AND GARDNER STREET  
PROPOSED STRUCTURE NO. 099-0902 (EB)  
SOIL BORING PROFILE

PLAN	SURVEYED	BY	DATE
NOTE BOOK NO.	GRADES CHECKED		
	STRUCTURE NOTATIONS OK'D		

PROFILE	SURVEYED	BY	DATE
NOTE BOOK NO.	GRADES CHECKED		
	STRUCTURE NOTATIONS OK'D		



707+00		708+00		709+00		710+00		711+00		712+00		713+00		714+00		715+00		716+00		717+00		718+00		719+00		720+00		721+00				
 <b>Geo Services, Inc.</b> Geotechnical, Environmental & Civil Engineering 805 Amherst Court, Suite 204 Naperville, Illinois 60565 (630) 355-2936	USER NAME :		DESIGNED - RWC		REVISED - 6/26/2014		<div>STATE OF ILLINOIS</div> <div>DEPARTMENT OF TRANSPORTATION</div>										WB I-80 OVER BNSF R.R. AND UP R.R. AND GARDNER STREET PROPOSED STRUCTURE NO. 099-0903 (WB) SOIL BORING PROFILE										F.A.I. RTE.	SECTION		COUNTY	TOTAL SHEETS	SHEET NO.
	PLOT SCALE :		DRAWN - RWC		REVISED -																						80	2013-008B & 2013-009B		WILL	3	3
	PLOT DATE :		CHECKED - AJP		REVISED -																						CONTRACT NO.					
	DATE - 6/11/2014		REVISED -		SCALE: 1"=50'H 1"=5'V																						SHEET NO. 1 OF 1 SHEETS		STA. 714+69.01		ILLINOIS/FED. AID PROJECT	

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Geotechnical Engineering  
805 Amherst Court, Suite 204  
Naperville, Illinois 60565  
(630) 355-2938

**APPENDIX D**

**BORING & ROCK CORE LOGS**

# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY NW

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO. \_\_\_\_\_  
Station \_\_\_\_\_

BORING NO. BSB-01  
Station 711+03  
Offset 55.20ft Left  
Ground Surface Elev. 577.10 ft

D E P T H  (ft)	B L O W S  (/6")	U C S  (tsf)	M O I S T  (%)
-----------------------------------	------------------------------------	--------------------------	----------------------------------

Surface Water Elev.	n/a	ft
Stream Bed Elev.	n/a	ft
Groundwater Elev.:		
First Encounter	561.1	ft ▼
Upon Completion	574.1	ft ▼
After _____ Hrs.		ft

D E P T H  (ft)	B L O W S  (/6")	U C S  (tsf)	M O I S T  (%)
-----------------------------------	------------------------------------	--------------------------	----------------------------------

7.5" ASPHALT, 12.0" CONCRETE

575.48

CLAY LOAM-brown & gray-stiff to hard (Fill)

▽

CLAY LOAM-brown & gray-stiff to hard (Fill) (continued)

9

14

1.0

19

14

P

8

6

2.4

15

9

B

4

5

2.5

18

9

P

3

7

2.2

20

7

B

545.10

SAND & GRAVEL-brown-medium dense (Fill)

6

7

15

8

540.10

CLAY LOAM-brown & gray-very stiff (Fill)

8

11

2.0

17

17

P

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

BBS, from 137 (Rev. 8-99)

Z:\PROJECTS\2013\13125 HNTB, I-80 PHASE II (NEAR TERM)\13125 BORING LOGS\13125\_LOG.GPJ 4/20/15



BBS, from 137 (Rev. 8-99)

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

# ROCK CORE LOG

PAGE 1 of 1

DATE 3/11/2014

LOGGED BY JK

GSI JOB No. 13125

ROUTE	DESCRIPTION
--	I-80 Reconstruction (Near Term Phase 2)

SECTION   --   LOCATION   SEC 15, T35N, R10E, SW 1/4, 3rd PM  

COUNTY	Will	CORING METHOD	Rotary Wash
--------	------	---------------	-------------

STRUCT. NO.	--	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	D	C	R	R	C	S
				E	O	E	.	O	T

Station	--	Core Diameter	2.0 in	P	R	C	Q	R	R
---------	----	---------------	--------	---	---	---	---	---	---

Top of Rock Elev.	n/a	T	E	O	D.	ET	E
-------------------	-----	---	---	---	----	----	---

Begin Core Elev.	$n/a$	H	R	V	D	I	N
				E		M	G

BORING NO. **BSB-01**

Station 711+03

Offset 55.2' Left

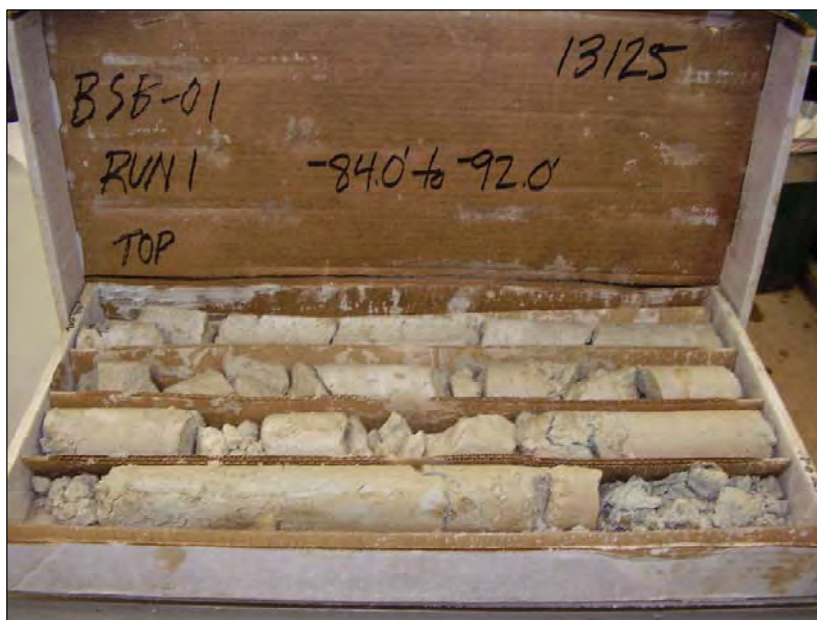
Ground Surface Elev.	577.1
----------------------	-------

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R. Q. D. (%)	CORE TIME (min /ft)	STRENGTH (tsf)
---------------	--------------------	-----------------	-----------------	---------------------------	-------------------

RUN 1 (-84.0' to -92.0')

- (-84.0' to -89.3') Cobbles, boulders & fractured rock.
- (-89.3' to -91.0') Silty Clay with fractured rock.
- (-91.0' to -92.0') Clayey sand, gravel & fractured rock.

1	95.0	n/a	n/a	n/a
---	------	-----	-----	-----



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






GSI Job No. 13125

# ROCK CORE LOG

Page 1 of 2

Date 4/4/14

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY NW

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. Station	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft		D E P T H (ft)	C O R E (#)	R E C O V E R Y (%)	R Q D (%)	C O R E T I M E (min/ft)	S T R E N G T H (tsf)
		Core Diameter							
BORING NO. <u>BSB-01A</u>		<u>2</u>	<u>in</u>						
Station <u>710+93</u>		Top of Rock Elev. <u>513.10</u>	<u>ft</u>						
Offset <u>55.20ft Left</u>		Begin Core Elev. <u>510.40</u>	<u>ft</u>						
Ground Surface Elev. <u>577.10</u>									
SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE - Run 1				509.10	1	100	40		950.0
Light gray & porous with horizontal bedding. Highly fractured & weathered from -71.2' to -78.0' with numerous intersecting horizontal & vertical fractures.									
				-70					
				-75					
				499.10					
SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE - Run 2					2	22	0		
Light gray & porous with horizontal bedding. Highly fractured & weathered throughout with numerous intersecting horizontal & vertical fractures. Numerous clay seams throughout.									
				-80					
				-85					
				490.10					
					3	97	18		

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

BBS, form 138 (Rev. 8-99)

# ROCK CORE LOG

PAGE 1 of 3

DATE 4/5/2014

LOGGED BY JK

GSJ JOB No. 13125

ROUTE -- DESCRIPTION I-80 Reconstruction (Near Term Phase 2)

SECTION -- LOCATION SEC 15, T35N, R10E, SW 1/4, 3rd PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. -- CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station -- Core Diameter 2.0 in

BORING NO. BSB-01A Top of Rock Elev. 513.1

Station 710+93 Begin Core Elev. 509.1

Offset 55.2' Left

Ground Surface Elev. 577.1

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	100.0	40.0	n/a	950 @ -68.1'
-73					
-78					

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-68.0' to -78.0')

Light gray & porous with horizontal bedding. Highly fractured & weathered from -71.2' to -78.0' with numerous intersecting horizontal & vertical fractures.



# ROCK CORE LOG

PAGE 2 of 3

DATE 4/5/2014

LOGGED BY JK

GSJ JOB No. 13125

ROUTE -- DESCRIPTION I-80 Reconstruction (Near Term Phase 2)

SECTION -- LOCATION SEC 15, T35N, R10E, SW 1/4, 3rd PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. -- CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station -- Core Diameter 2.0 in

BORING NO. **BSB-01A** Top of Rock Elev. 513.1

Station 710+93 Begin Core Elev. 509.1

Offset 55.2' Left

Ground Surface Elev. 577.1

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	2	44.0	0.0	n/a	n/a
-83					
-87					

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 2 (-78.0' to -87.0')

Light gray & porous with horizontal bedding. Highly fractured & weathered throughout with numerous intersecting horizontal & vertical fractures. Numerous clay seams throughout. Poor core recovery due to loss of drilling fluid.



# ROCK CORE LOG

PAGE 3 of 3

DATE 4/5/2014

LOGGED BY JK

GSI JOB No. 13125

ROUTE	DESCRIPTION
--	I-80 Reconstruction (Near Term Phase 2)

SECTION   --   LOCATION   SEC 15, T35N, R10E, SW 1/4, 3rd PM  

COUNTY	Will	CORING METHOD	Rotary Wash
--------	------	---------------	-------------

STRUCT. NO.	--	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	D	C	R	R	C	S
				E	O	E	.	O	T

Station	--	Core Diameter	2.0 in	P	R	C	Q	R	R
---------	----	---------------	--------	---	---	---	---	---	---

Top of Rock Elev.	513.1	T	E	O	.	ET	E
-------------------	-------	---	---	---	---	----	---

Begin Core Elev.	509.1	H	R	V	D	I	N
				E		M	G

BORING NO. **BSB-01A** Top of Rock Elev. 513.1 H E U : E I E  
 Basic Core Elev. 500.4 B R V D I N

Station	710+93	Begin Core Elev.	<u>509.1</u>	R	E	.	M	G
---------	--------	------------------	--------------	---	---	---	---	---

Offset	55.2' Left
--------	------------

Ground Surface Elev.	577.1	(ft)	(ft)	(ft)	(ft)	(min)	(ft)
----------------------	-------	------	------	------	------	-------	------

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 3 (-87.0' to -95.0')

Light gray & porous with horizontal bedding. Weathered & fractured throughout becoming highly weathered & fractured with clay seams from -93.5' to -95.0'.

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R. Q. D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	3	97.0	18.0	n/a	845 @ -89.0'
-92					
-95					
	4	100.0	0.0	n/a	n/a

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 4 (-95.0' to -98.0')

Light gray & porous. Highly weathered & fractured throughout with some thin clay partings & chert nodules.



# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY NW

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO. \_\_\_\_\_  
Station \_\_\_\_\_

BORING NO. BSB-02  
Station 710+92  
Offset 20.50ft Right  
Ground Surface Elev. 576.90 ft

D E P T H  (ft)	B L O W S  (/6")	U C S  Qu (tsf)	M O I S T  (%)	Surface Water Elev. n/a ft	Stream Bed Elev. n/a ft	D E P T H  (ft)	B L O W S  (/6")	U C S  Qu (tsf)	M O I S T  (%)
6.0" ASPHALT, 12.0" CONCRETE									
575.40							11		
CLAY LOAM-brown & gray-stiff to hard (Fill)	5	2.8	19				16		14
	5	P					13		
				553.90					
	5						8		
	7	3.1	18				10	2.2	17
-5	11	B				-25	13	B	
	4						6		
	5	2.8	20				9	1.9	18
	7	P					14	B	
	7						8		
-10	11	4.3	19			-30	11	2.9	17
		P					14	B	
	5								
	6	1.8	13						
	8	P		544.90					
	3						9		
-15	6	2.9	21			-35	13	1.5	14
	9	B					14	P	
	7								
	9	2.3	17						
	14	P							
558.90									
SILTY CLAY LOAM-brown & gray-medium dense (Fill)	7						10		
	10		13				13		17
-20	14					-40	17		

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

# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY NW

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO. \_\_\_\_\_  
 Station \_\_\_\_\_

BORING NO. BSB-02  
 Station 710+92  
 Offset 20.50ft Right  
 Ground Surface Elev. 576.90 ft

D E P T H  (ft)	B L O W S  (/6")	U C S  (tsf)	M O I S T  (%)	Surface Water Elev. n/a ft	D E P T H  (ft)	B L O W S  (/6")	U C S  (tsf)	M O I S T  (%)
				Stream Bed Elev. n/a ft				
				Groundwater Elev.: First Encounter Dry to 10.0' ft				
				Upon Completion n/a ft				
				After _____ Hrs. _____ ft				
SILTY CLAY LOAM-brown & gray-medium dense (Fill) (continued)								
534.90								
CINDERS, SAND & GRAVEL-brown & black-medium dense (Fill)								
	6					27		
	9		27			50/4"		7
-45	15				-65			
				511.40				
529.90				Drillers Observation: Apparent bedrock 510.90				
CLAYEY SAND & GRAVEL-brown-medium dense (Apparent Fill)				Borehole continued with rock coring.				
	5							
	5		27					
-50	7				-70			
524.90								
SAND, GRAVEL & FRACTURED ROCK-brown & gray-medium dense to very dense								
	26							
	50/4"		12					
-55					-75			
	11							
	5		8					
-60	6				-80			

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



GSI Job No. 13125

## ROCK CORE LOG

Page 1 of 1

Date 3/26/14

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY NW

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. Station

CORING BARREL TYPE &amp; SIZE NX Double Swivel-10 ft

Core Diameter 2 in  
Top of Rock Elev. 511.40 ft  
Begin Core Elev. 510.90 ftBORING NO. BSB-02  
Station 710+92  
Offset 20.50ft Right  
Ground Surface Elev. 576.90 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
510.90	1	100	21		439.0
-70					
-75					
500.90					
-80					
-85					

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE  
Light gray to gray with horizontal bedding. Porous & weathered rust staining throughout.  
Highly fractured throughout with numerous intersecting horizontal & vertical fractures.

End Of Boring @ -76.0'. Boring backfilled with cuttings.

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

BBS, form 138 (Rev. 8-99)

# ROCK CORE LOG

PAGE 1 of 1

DATE 3/26/2014

LOGGED BY JK

GSJ JOB No. 13125

ROUTE -- DESCRIPTION I-80 Reconstruction (Near Term Phase 2)

SECTION -- LOCATION SEC 15, T35N, R10E, SW 1/4, 3rd PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. -- CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station -- Core Diameter 2.0 in

BORING NO. **BSB-02** Top of Rock Elev. 511.4

Station 710+92 Begin Core Elev. 510.9

Offset 10.6' Right

Ground Surface Elev. 576.9

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	100.0	21.0	n/a	439 @ -66.7'

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-66.0' to -76.0')

Light gray to gray with horizontal bedding. Porous & weathered rust staining throughout.  
Highly fractured throughout with numerous intersecting horizontal & vertical fractures.





BBS, from 137 (Rev. 8-99)



# ROCK CORE LOG

PAGE 1 of 1

DATE 5/15/2014

LOGGED BY JK

GSJ JOB No. 13125

ROUTE -- DESCRIPTION I-80 Reconstruction (Near Term Phase 2)

SECTION -- LOCATION --

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. -- CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station -- Core Diameter 2.0 in

BORING NO. BSB-03 Top of Rock Elev. 505.7

Station 711+69 Begin Core Elev. 505.2

Offset 23.0' Left

Ground Surface Elev. 577.2

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	100.0	52.0	n/a	839 @ -74.6'
-77					
-82					

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-72.0' to -82.0')

Light gray & porous with rust staining. Weathered with horizontal bedding. Vertical fractures from -72.0' to -73.9', -75.2' to -75.5' & from -76.6' to -77.5'. Some horizontal fractures throughout.



Z:\PROJECTS\2013\13125 HNTB, I-80 PHASE II (NEAR TERM)\13125 BORING LOGS\13125 LOG.GPJ 4/20/15





GSI Job No. 13125

## ROCK CORE LOG

Page 1 of 2

Date 5/21/14

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY MD

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO.	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Station	Core Diameter 2 in							
BORING NO. BSB-04	Top of Rock Elev. 510.40 ft							
Station 711+50	Begin Core Elev. 509.90 ft							
Offset 52.60ft Right								
Ground Surface Elev. 577.40 ft								
SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE			509.90	1	100	28		618.0
Light gray with horizontal to wavy bedding. Highly fractured & weathered with clay seams throughout.								
			-70					
			-75					
			501.90	2	100	11		
SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE								
Light gray & porous with horizontal to wavy bedding. Highly fractured & weathered with clay seams throughout.								
			-80					
			493.40	3	100	14		594.0
SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE								
Light gray & porous with horizontal to wavy bedding. Highly fractured & weathered with clay seams throughout.			-85					
								382.0

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

BBS, form 138 (Rev. 8-99)



GSI Job No. 13125

## ROCK CORE LOG

Page 2 of 2

Date 5/21/14

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY MD

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO.	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Station	Core Diameter 2 in							
BORING NO. BSB-04	Top of Rock Elev. 510.40 ft							
Station 711+50	Begin Core Elev. 509.90 ft							
Offset 52.60ft Right								
Ground Surface Elev. 577.40 ft								

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

Light gray &amp; porous with horizontal to wavy bedding. Highly fractured &amp; weathered with clay seams throughout. (continued)

488.40

End Of Boring @ -89.0'. Boring backfilled with cuttings.

-90

-95

-100

-105

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

BBS, form 138 (Rev. 8-99)

# ROCK CORE LOG

PAGE 1 of 3

DATE 5/21/2014

LOGGED BY JK

GSI JOB No. 13125

ROUTE	DESCRIPTION
--	I-80 Reconstruction (Near Term Phase 2)

SECTION      LOCATION     

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO.	--	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	D	C	R	R	C	S
				E	O	E	.	O	T

Station	--	Core Diameter	2.0 in	P	R	C	Q	R	R
---------	----	---------------	--------	---	---	---	---	---	---

Top of Rock Elev.	510.4	T	E	O	.	ET	E
-------------------	-------	---	---	---	---	----	---

BORING NO. **BSB-04** Top of Rock Elev. 510.4 H E U : E I E  
 Basic Core Elev. 500.0 B R V D I N

Station	711+50	Begin Core Elev.	<u>509.9</u>	R	E	.	M	G
---------	--------	------------------	--------------	---	---	---	---	---

Offset	52.6' Right
--------	-------------

Ground Surface Elev. 577.4

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-67.5' to -75.5')

Light gray with horizontal to wavy bedding. Highly fractured & weathered with clay seams throughout.

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R . Q . D . (%)	CORE TIME (min /ft)	STRENGTH (tsf)
	1	100.0	45.5	n/a	618 @ -67.7
-72.5					
-75.5					



# ROCK CORE LOG

PAGE 2 of 3

DATE 5/21/2014

LOGGED BY JK

GSJ JOB No. 13125

ROUTE -- DESCRIPTION I-80 Reconstruction (Near Term Phase 2)

SECTION -- LOCATION --

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. -- CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station -- Core Diameter 2.0 in

BORING NO. **BSB-04** Top of Rock Elev. 510.4

Station 711+50 Begin Core Elev. 509.9

Offset 52.6' Right

Ground Surface Elev. 577.4

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
---------------	--------------------	-----------------	---------------	--------------------------	-------------------

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

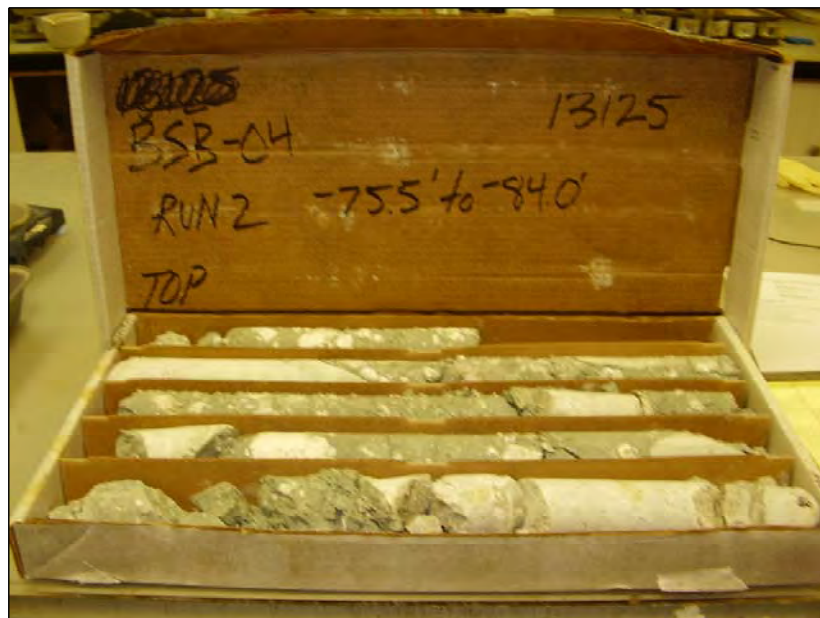
RUN 2 (-75.5' to -84.0')

Light gray & porous with horizontal to wavy bedding. Highly fractured & weathered with clay seams throughout.

	2	100.0	10.6	n/a	594 @ -83.7'
--	---	-------	------	-----	-----------------

-80.5

-84.0



# ROCK CORE LOG

PAGE 3 of 3

DATE 5/21/2014

LOGGED BY JK

GSJ JOB No. 13125

ROUTE -- DESCRIPTION I-80 Reconstruction (Near Term Phase 2)

SECTION -- LOCATION --

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. -- CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station -- Core Diameter 2.0 in

BORING NO. **BSB-04** Top of Rock Elev. 510.4

Station 711+50 Begin Core Elev. 509.9

Offset 52.6' Right

Ground Surface Elev. 577.4

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
---------------	--------------------	-----------------	---------------	--------------------------	-------------------

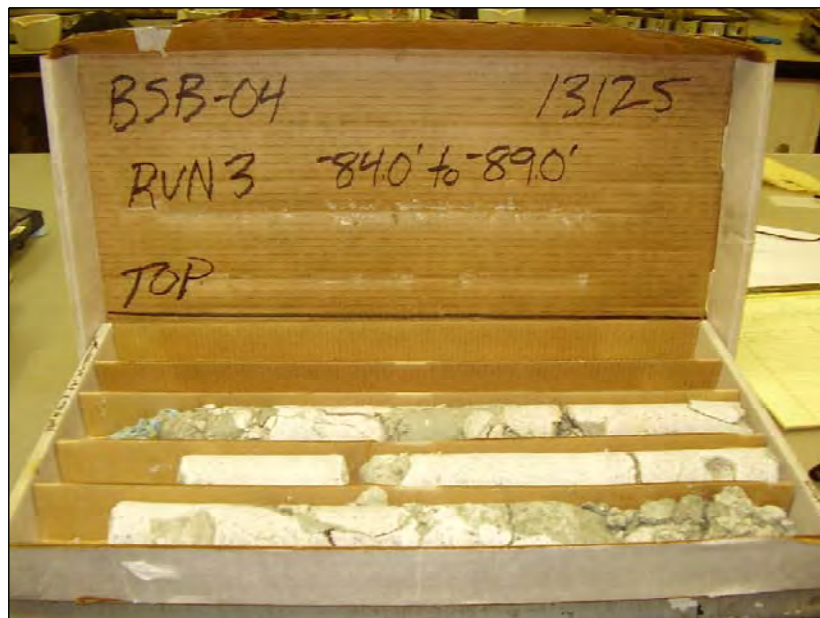
SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 3 (-84.0' to -89.0')

Light gray & porous with horizontal to wavy bedding. Highly fractured & weathered with clay seams throughout.

3	100.0	14.0	n/a	382 @ -85.8'
---	-------	------	-----	-----------------

-89



# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO. Station	DEPTH H (ft)	BLOW S (/6")	UCS Qu (tsf)	MOIST T (%)	Surface Water Elev. Stream Bed Elev.	Groundwater Elev.: First Encounter Upon Completion After Hrs.	DEPTH H (ft)	BLOW S (/6")	UCS Qu (tsf)	MOIST T (%)
					n/a ft n/a ft					
BORING NO. BSB-05 Station 712+72 Offset 65.30ft Left Ground Surface Elev. 544.30 ft						525.8 ft ▼ Dry ft				
SAND & GRAVEL-dark dray (Fill) 543.30					SAND, GRAVEL & FRACTURED ROCK-brown & gray-medium dense to very dense (continued)					
	9						11			
	9			10			16			21
	10						19			
	5						15			
	7			4			43			5
	8						21			
	-5						-25			
	7						25			
	9			7			27			10
	11						31			
	6						50/3"			
	17			6						5
	12									
	-10						-30			
	15					512.80				
	17			2	Borehole continued with rock coring.					
	11									
	11									
	14			2						
	15									
	-15						-35			
	7									
	8			8						
	12									
	13									
	15			5						
	24									
	-20						-40			

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



GSI Job No. 13125

## ROCK CORE LOG

Page 1 of 1

Date 10/24/13

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. Station

CORING BARREL TYPE &amp; SIZE NX Double Swivel-10 ft

Core Diameter 2 in  
Top of Rock Elev. 512.80 ft  
Begin Core Elev. 512.80 ftBORING NO. BSB-05  
Station 712+72  
Offset 65.30ft Left  
Ground Surface Elev. 544.30 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
---------------	-------------	-----------------	---------------	--------------------------	-------------------

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

512.80

1

100

58

Light gray &amp; fine grained with horizontal bedding. Numerous horizontal fractures to -39.5'. Vertical fractures with intersecting horizontal fractures from -34.9' to -36.1' &amp; from -38.7' to -39.5'.

1038.0

-35

-40

502.80

End Of Boring @ -41.5'. Boring backfilled with cuttings.

-45

-50

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

BBS, form 138 (Rev. 8-99)

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

# ROCK CORE LOG

PAGE 1 of 1

DATE 10/24/2013

LOGGED BY JK

GSI JOB No. 13125

ROUTE	DESCRIPTION
--	I-80 Reconstruction (Near Term Phase 2)

SECTION   --   LOCATION   SEC 15, T35N, R10E, SW 1/4, 3rd PM  

COUNTY	Will	CORING METHOD	Rotary Wash
--------	------	---------------	-------------

STRUCT. NO.	--	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	D	C	R	R	C	S
				E	O	E	.	O	T

Station	--	Core Diameter	2.0 in	P	R	C	Q	R	R
---------	----	---------------	--------	---	---	---	---	---	---

Top of Rock Elev.	512.8	T	E	O	.	ET	E
-------------------	-------	---	---	---	---	----	---

BORING NO. **BSB-05** Top of Rock Elev. 512.8 H E O . E E  
 Basic Core Elev. 512.8 B P V D I N

Station	712+72	Begin Core Elev.	<u>512.8</u>	R	E	.	M	G
---------	--------	------------------	--------------	---	---	---	---	---

Offset	<u>65.3' Left</u>		C N	R Y	E L	H I
--------	-------------------	--	--------	--------	--------	--------

Ground Surface Elev. 544.3

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-31.5' to -41.5')

Light gray & fine grained with horizontal bedding. Numerous horizontal fractures to -39.5'. Vertical fractures with intersecting horizontal fractures from -34.9' to -36.1' & from -38.7' to -39.5'.

DEPTH (ft)	CORE RUN (#)	RECOVER Y (%)	R · Q · D · (%)	CORE TIME (min /ft)	STRENGTH (tsf)
	1	100.0	58.0	n/a	1038 @ -32.5'
-36.5					
-41.5					



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

BBS, from 137 (Rev. 8-99)



GSI Job No. 13125

## ROCK CORE LOG

Page 1 of 1

Date 10/25/13

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. Station

CORING BARREL TYPE &amp; SIZE NX Double Swivel-10 ft

Core Diameter 2 in  
Top of Rock Elev. 511.00 ft  
Begin Core Elev. 511.00 ftBORING NO. BSB-06  
Station 712+70  
Offset 9.20ft Right  
Ground Surface Elev. 543.50 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
511.00	1	86	71		
-35					
-40					
501.00					938.0
End Of Boring @ -42.5'. Boring backfilled with cuttings.					
-45					
-50					

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

BBS, form 138 (Rev. 8-99)

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

# ROCK CORE LOG

PAGE 1 of 1

DATE 10/25/2013

LOGGED BY JK

GSI JOB No. 13125

ROUTE	DESCRIPTION
--	I-80 Reconstruction (Near Term Phase 2)

SECTION   --   LOCATION   SEC 15, T35N, R10E, SW 1/4, 3rd PM  

COUNTY	Will	CORING METHOD	Rotary Wash
--------	------	---------------	-------------

STRUCT. NO.	--	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	D	C	R	R	C	S
				E	O	E	.	O	T

Station	--	Core Diameter	2.0 in	P	R	C	Q	R	R
---------	----	---------------	--------	---	---	---	---	---	---

Top of Rock Elev.	511.0	T	E	O	D.	ET	E
-------------------	-------	---	---	---	----	----	---

Begin Core Elev.	511.0	H	R	V	D	I	N
				E		M	G

BORING NO. **BSB-06**

Station	712+70	Begin Core Elev.	<u>511.0</u>	R	E	.	M	G
---------	--------	------------------	--------------	---	---	---	---	---

Offset	9.2' Right
--------	------------

Ground Surface Elev. 543.5

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-32.5' to -42.5')

Light gray with horizontal bedding. Highly fractured & weathered with clay seams from -32.5' to -36.5' & from -41.4' to -42.5'.

DEPTH (ft)	CORE RUN (#)	RECOVER Y (%)	R · Q · D · (%)	CORE TIME (min /ft)	STRENGTH (tsf)
	1	86.0	41.0	n/a	938 @ -36.7'
-37.5					
-42.5					



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

# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO. \_\_\_\_\_  
 Station \_\_\_\_\_

BORING NO. BSB-07  
 Station 713+13  
 Offset 11.20ft Left  
 Ground Surface Elev. 532.70 ft

D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)
-------------------------------	--------------------------------	----------------------------	------------------------------

Surface Water Elev. n/a ft  
 Stream Bed Elev. n/a ft  
 Groundwater Elev.:  
 First Encounter Dry to 10.0' ft  
 Upon Completion n/a ft  
 After \_\_\_\_\_ Hrs. \_\_\_\_\_ ft

SILTY SAND & STONE-black (FILL)	531.70			
SAND, GRAVEL & FRACTURE ROCK-brown & gray-medium dense to very dense	12			8
	16			
	6			
	11			9
	11			
	16			
	-5			
	13			9
	11			
	12			
	12			7
	9			
	9			
	-10			
	20			10
	50/2"			
	23			8
	11			
	12			
	-15			
	23			9
	30			
	26			
	50/2"			7
513.70				
Borehole continued with rock coring.				
	-20			

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



GSI Job No. 13125

## ROCK CORE LOG

Page 1 of 1

Date 10/22/13

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. Station

CORING BARREL TYPE &amp; SIZE NX Double Swivel-10 ft

Core Diameter 2 in  
Top of Rock Elev. 513.70 ft  
Begin Core Elev. 513.70 ftBORING NO. BSB-07  
Station 713+13  
Offset 11.20ft Left  
Ground Surface Elev. 532.70 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
513.70	1	100	21		1088.0
-20					
-25					
503.70					
-30					
-35					

End Of Boring @ -29.0'. Boring backfilled with cuttings.

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

BBS, form 138 (Rev. 8-99)

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

# ROCK CORE LOG

PAGE 1 of 1

DATE 10/22/2013

LOGGED BY JK

GSI JOB No. 13125

ROUTE	DESCRIPTION
--	I-80 Reconstruction (Near Term Phase 2)

SECTION   --   LOCATION   SEC 15, T35N, R10E, SW 1/4, 3rd PM  

COUNTY	Will	CORING METHOD	Rotary Wash
--------	------	---------------	-------------

STRUCT. NO.	--	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	D	C	R	R	C	S
				E	O	E	.	O	T

Station	--	Core Diameter	2.0 in	P	R	C	Q	R	R
---------	----	---------------	--------	---	---	---	---	---	---

BORING NO.	<b>BSB-07</b>	Top of Rock Elev.	<u>513.7</u>	H	E	O	.	E	E
		Basic Core Elev.	<u>513.5</u>	B	B	V	D	I	N

Station	713+13	Begin Core Elev.	<u>513.7</u>	R	E	.	M	G
---------	--------	------------------	--------------	---	---	---	---	---

Offset	11.2' Left
--------	------------

Ground Surface Elev. 532.7

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-19.0' to -29.0')

Light gray to gray & cherty with horizontal bedding. Highly fractured & weathered throughout with clay seams from -23.5' to -23.8' & from -24.8' to -26.5'.

D E P T H	C O R E R U N	R E C O V E R Y	R . Q . D .	C O R E T I M E  (min /ft)	S T R E N G T H  (tsf)
(ft)	(#)	(%)	(%)		
	1	100.0	21.0	n/a	1088 @ -19.8'
-24					
-29					



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

# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO. \_\_\_\_\_  
Station \_\_\_\_\_

BORING NO. BSB-08  
Station 713+00  
Offset 67.10ft Right  
Ground Surface Elev. 535.40 ft

D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)	Surface Water Elev. n/a ft	Stream Bed Elev. n/a ft	D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)
	5								
	6		13						
	14								
	9								
	10		13						
	12								
-5						-25			
529.90									
	13								
	15		5						
	21								
	50/5"								
			11						
-10						-30			
	15								
	16		4						
	19								
	9								
	14		5						
-15	27					-35			
	30								
	36		12						
	50/5"								
	50/1"								
			7						
-20						-40			

SAND, GRAVEL, ASPHALT & STONE-medium dense (Fill)

GRAVEL with SAND-brown-dense to very stiff (continued)

514.40

Borehole continued with rock coring.

GRAVEL with SAND-brown-dense to very stiff

Z:\PROJECTS\2013\13125 HNTB, I-80 PHASE II (NEAR TERM)\13125 BORING LOGS\13125 LOG.GPJ 4/20/15

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


GSI Job No. 13125

# ROCK CORE LOG

Page 1 of 1

Date 10/28/13

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO.                      CORING BARREL TYPE & SIZE NX Double Swivel-10 ft  
Station                     

BORING NO. BSB-08 Core Diameter 2 in  
Station 713+00 Top of Rock Elev. 514.40 ft  
Offset 67.10ft Right Begin Core Elev. 514.40 ft  
Ground Surface Elev. 535.40 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
514.40	1	100	23		
-25					
-30					
504.40					1209.0
-35					
-40					

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE  
 Light gray to gray with rust staining. Numerous horizontal fractures throughout with some clay seams. Vertical fractures from -22.7' to -23.3', -23.9' to -25.2', -26.0' to -27.2' & from -29.4' to -30.1'.

End Of Boring @ -31.0'. Boring backfilled with cuttings.

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

# ROCK CORE LOG

PAGE 1 of 1

DATE 10/28/2013

LOGGED BY JK

GSJ JOB No. 13125

ROUTE -- DESCRIPTION I-80 Reconstruction (Near Term Phase 2)

SECTION -- LOCATION SEC 15, T35N, R10E, SW 1/4, 3rd PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. -- CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station -- Core Diameter 2.0 in

BORING NO. **BSB-08** Top of Rock Elev. 514.4

Station 713+00 Begin Core Elev. 514.4

Offset 67.1' Right

Ground Surface Elev. 535.4

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min /ft)	STRENGTH (tsf)
	1	100.0	23.0	n/a	1209 @ -27.8'
-26					
-31					

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-21.0' to -31.0')

Light gray to gray with rust staining. Numerous horizontal fractures throughout with some clay seams. Vertical fractures from -22.7' to -23.3', -23.9' to -25.2', -26.0' to -27.2' & from -29.4' to -30.1'.



# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO.	D	B	U	M	Surface Water Elev.	n/a	ft	D	B	U	M
Station	E	L	C	O	Stream Bed Elev.	n/a	ft	E	L	C	O
BORING NO.	P	W	S	I	Groundwater Elev.:			P	W	S	I
Station	T	S	Qu	S	First Encounter	Dry to 24.0'	ft	H	S	Qu	T
Offset	H				Upon Completion	n/a	ft				
Ground Surface Elev.	(ft)	(/6")	(tsf)	(%)	After	Hrs.	ft	(ft)	(/6")	(tsf)	(%)
534.70											
SANDY CLAY LOAM with GRAVEL-brown & black-loose (Fill)					SAND, GRAVEL & FRACTURED ROCK-brown & gray-medium dense to very dense (continued)						
	2							50/2"			
	3			19							
	3						512.20				
531.70					Drillers Observation: Apparent bedrock						
SAND, GRAVEL & FRACTURED ROCK-brown & gray-medium dense to very dense	6						510.70				
	12			6	Borehole continued with rock coring.						
	-5	14					-25				
	9										
	10			6							
	15										
	10										
	14			5							
-10	18						-30				
	23										
	50/3"			24							
	11										
	11			10							
-15	18						-35				
	17										
	27			10							
	36										
	25										
	32			12							
-20	37						-40				

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



GSI Job No. 13125

## ROCK CORE LOG

Page 1 of 1

Date 10/23/13

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO.	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Station	Core Diameter 2 in							
BORING NO. BSB-09	Top of Rock Elev. 512.20 ft							
Station 713+77	Begin Core Elev. 510.70 ft							
Offset 66.20ft Left								
Ground Surface Elev. 534.70 ft								

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE	510.70	1	100	43		
Light gray with horizontal to wavy bedding & some chert inclusions. Horizontal fractures at -31.1', -31.2', -31.75' & -32.5'. Highly fractured & weathered from -24.0' to -24.8' & from -28.9' to -30.0'.	-25					280.0
	-30					
	-35					
	-40					
	-45					
	-50					
	-55					
	-60					
	-65					
	-70					
	-75					
	-80					
	-85					
	-90					
	-95					
	-100					
	-105					
	-110					
	-115					
	-120					
	-125					
	-130					
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	-145					
	-150					
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	-215					
	-220					
	-225					
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	-755					
	-760					
	-765					
	-770					
	-775					
	-780					
	-785					
	-790					
	-795					
	-800					
	-805					
	-810					
	-815					
	-820					
	-825					
	-830					
	-835					
	-840					
	-845					
	-850					
	-855					
	-860					
	-865					
	-870					
	-875					
	-880					
	-885					
	-890					
	-895					
	-900					
	-905					
	-910					
	-915					
	-920					
	-925					
	-930					
	-935					
	-940					
	-945					
	-950					
	-955					
	-960					
	-965					
	-970					
	-975					
	-980					
	-985					
	-990					
	-995					
	-1000					

End Of Boring @ -34.0'. Boring backfilled with cuttings.

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

BBS, form 138 (Rev. 8-99)

# ROCK CORE LOG

PAGE 1 of 1

DATE 10/23/2013

LOGGED BY JK

GSJ JOB No. 13125

ROUTE -- DESCRIPTION I-80 Reconstruction (Near Term Phase 2)

SECTION -- LOCATION SEC 15, T35N, R10E, SW 1/4, 3rd PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. -- CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station -- Core Diameter 2.0 in

BORING NO. BSB-09 Top of Rock Elev. 512.2

Station 713+77 Begin Core Elev. 510.7

Offset 66.2' Left

Ground Surface Elev. 534.7

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
	1	100.0	43.0	n/a	280 @ -25.4'
-29					
-34					

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-24.0' to -34.0')

Light gray with horizontal to wavy bedding & some chert inclusions. Horizontal fractures at -31.1', -31.2', -31.75' & -32.5'. Highly fractured & weathered from -24.0' to -24.8' & from -28.9' to -30.0'.



# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO. \_\_\_\_\_  
 Station \_\_\_\_\_

BORING NO. BSB-10  
 Station 713+67  
 Offset 7.70ft Right  
 Ground Surface Elev. 531.90 ft

D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)
-------------------------------	--------------------------------	----------------------------	------------------------------

Surface Water Elev. n/a ft  
 Stream Bed Elev. n/a ft  
 Groundwater Elev.:  
 First Encounter 518.4 ft ▼  
 Upon Completion n/a ft  
 After \_\_\_\_\_ Hrs. \_\_\_\_\_ ft

SANDY CLAY LOAM-dark brown to black (Fill)			
	3		
	4		15
	5		
528.90			
SAND, GRAVEL & COBBLES-black-very loose (Fill)	2		
	2		9
	2		
	-5		
526.40			
SAND, GRAVEL & FRACTURED ROCK-brown	6		
	14		6
	26		
	6		
	16		5
	21		
-10			
	18		
	19		6
	23		
518.90			
SAND & GRAVEL-brown ▼	13		
	17		9
	13		
	-15		
	50/5"		
			7
514.40			
Borehole continued with rock coring.			
-20			

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



GSI Job No. 13125

# ROCK CORE LOG

Page 1 of 1

Date 10/22/13

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. Station

CORING BARREL TYPE &amp; SIZE NX Double Swivel-10 ft

Core Diameter 2 in  
Top of Rock Elev. 510.90 ft  
Begin Core Elev. 514.40 ft

BORING NO. BSB-10  
Station 713+67  
Offset 7.70ft Right  
Ground Surface Elev. 531.90 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
------------	----------	--------------	------------	--------------------	----------------

Rock Core - Run 1, SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE  
Light gray, cherty, & highly weathered & fractured throughout. 514.40

512.40

Roller Bit  
Drillers Observation: Weathered & fractured rock.

510.90

Rock Core - Run 2, SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE  
Light gray to gray with horizontal to wavy bedding & chert nodules throughout. Highly weathered & fractured from -21.0' to -23.0' & from -27.0' to -29.0'. Clay seams from -27.0' to -29.0'.

2 94

-25

337.0

502.90

Rock Core - Run 3, SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE  
Light gray & highly weathered. Highly fractured with clay seams throughout.

3 100 0

-30

500.90

End Of Boring @ -31.0'. Boring backfilled with cuttings.

-35

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

# ROCK CORE LOG

PAGE 1 of 2

DATE 10/22/2013

LOGGED BY JK

GSJ JOB No. 13125

ROUTE -- DESCRIPTION I-80 Reconstruction (Near Term Phase 2)

SECTION -- LOCATION SEC 15, T35N, R10E, SW 1/4, 3rd PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. -- CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station -- Core Diameter 2.0 in

BORING NO. BSB-10 Top of Rock Elev. 514.4

Station 713+67 Begin Core Elev. 514.4

Offset 7.7' Right

Ground Surface Elev. 531.9

DEPTH (ft)	CORE RUN (#)	RECOVER (%)	R.Q.D. (%)	CORRECTION (min/ft)	STRENGTH (tsf)
---------------	--------------------	----------------	---------------	------------------------	-------------------

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE  
RUN 1 (-17.5' to -19.5')  
Light gray, cherty, & highly weathered & fractured throughout.

(19.5' to -21.0') Roller Bit  
Drillers Observation: Weathered & fractured rock.

RUN 2 (-21.0' to -29.0')  
Light gray to gray with horizontal to wavy bedding & chert nodules throughout. Highly weathered & fractured from -21.0' to -23.0' & from -27.0' to -29.0'. Clay seams from -27.0' to -29.0'.



# ROCK CORE LOG

PAGE 2 of 2

DATE 10/22/2013

LOGGED BY JK

GSJ JOB No. 13125

ROUTE -- DESCRIPTION I-80 Reconstruction (Near Term Phase 2)

SECTION -- LOCATION SEC 15, T35N, R10E, SW 1/4, 3rd PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. -- CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Station -- Core Diameter 2.0 in

BORING NO. **BSB-10** Top of Rock Elev. 514.4

Station 713+67 Begin Core Elev. 514.4

Offset 7.7' Right

Ground Surface Elev. 531.9

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R.Q.D. (%)	CORRECTION (min/ft)	STRENGTH (tsf)
---------------	--------------------	-----------------	---------------	------------------------	-------------------

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 3 (-29.0' to -31.0')

Light gray & highly weathered. Highly fractured with clay seams throughout.

3	100.0	0.0	n/a	n/a
---	-------	-----	-----	-----



# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO.	D	B	U	M	Surface Water Elev.	n/a	ft	D	B	U	M
Station	E	L	C	O	Stream Bed Elev.	n/a	ft	E	L	C	O
BORING NO.	P	W	S	I	Groundwater Elev.:			P	W	S	I
Station	T	S	Qu	T	First Encounter	Dry to 13.5'	ft	H	S	Qu	T
Offset	H				Upon Completion	n/a	ft				
Ground Surface Elev.	(ft)	(/6")	(tsf)	(%)	After	Hrs.	ft	(ft)	(/6")	(tsf)	(%)
12.0" SANDY TOPSOIL-black					512.60						
532.10				20	FRACTURED ROCK & SHALE-very dense			50/5"			22
CRUSHED STONE, GRAVEL & SAND-dark brown-loose to medium dense (Fill)		10		14							
		12									
		9									
		8			509.10			50/2"			15
		10		13	Borehole continued with rock coring.						
	-5	12					-25				
		3									
		4		12							
		5									
525.10											
FRACTURED ROCK-gray-dense to very dense		8									
		18		7							
	-10	19					-30				
		19									
		24		6							
		20									
		50/4"									
				6							
	-15						-35				
		50/0"									
		37									
		21		7							
		24									
	-20						-40				

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



# ROCK CORE LOG

PAGE 1 of 1

DATE 10/30/2013

LOGGED BY JK

GSI JOB No. 13125

ROUTE	DESCRIPTION
--	I-80 Reconstruction (Near Term Phase 2)

SECTION   --   LOCATION   SEC 15, T35N, R10E, SW 1/4, 3rd PM  

COUNTY	Will	CORING METHOD	Rotary Wash
--------	------	---------------	-------------

STRUCT. NO.	--	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	D	C	R	R	C	S
				E	O	E	.	O	T

Station	--	Core Diameter	2.0 in	P	R	C	Q	R	R
---------	----	---------------	--------	---	---	---	---	---	---

Top of Rock Elev.	509.1	T	E	O	.	ET	E
-------------------	-------	---	---	---	---	----	---

BORING NO. **BSB-11** Top of Rock Elev. 509.1 H E U : E I E  
 Basic Core Elev. 508.4 B R V D I N

Station	714+35	Begin Core Elev.	<u>509.1</u>	R	E	.	M	G
---------	--------	------------------	--------------	---	---	---	---	---

Offset     6.9' Left

Ground Surface Elev. 533.1

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-24.0' to -34.0')

Light gray to gray with horizontal to wavy bedding. Highly weathered & fractured with clay partings & some chert nodules from -24.0' to -29.7'.

[illegible]

# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO.	DEPTH	BLOW	UCS	MOIST	Surface Water Elev.	Stream Bed Elev.	Groundwater Elev.:	First Encounter	Upon Completion	After	Hrs.	DEPTH	BLOW	UCS	MOIST
Station	(ft)	(/6")	(tsf)	(%)	n/a	n/a	ft	ft	ft	ft		(ft)	(/6")	(tsf)	(%)
BSB-12															
Station	714+21														
Offset	67.50ft Right														
Ground Surface Elev.	533.40														
12.0" SANDY TOPSOIL	532.40			15			512.40								
CRUSHED STONE, GRAVEL, SAND & CINDERS-black-medium dense to dense (Fill)		4		11			Borehole continued with rock coring.								
		6													
		7													
		3													
		5		23											
	-5	5										-25			
		12													
		16		15											
		20													
		5													
		7		21											
	-10	10										-30			
SAND, GRAVEL & FRACTURED ROCK-brown-medium dense to very dense	522.90														
		7		16											
		8													
		10													
		15													
		22		7											
	-15	24										-35			
		13													
		15		7											
		19													
		19													
		50/3"		10											
	-20											-40			

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



GSI Job No. 13125

## ROCK CORE LOG

Page 1 of 1

Date 10/30/13

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. CORING BARREL TYPE & SIZE NX Double Swivel-10 ft  
StationBORING NO. BSB-12  
Station 714+21  
Offset 67.50ft Right  
Ground Surface Elev. 533.40 ft  
Core Diameter 2 in  
Top of Rock Elev. 512.40 ft  
Begin Core Elev. 512.40 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
512.40	1	97	32		561.0
-25					
-30					
502.40					
-35					
-40					

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE  
Light gray with rust staining & horizontal fractures throughout, becoming highly weathered & fractured with intersecting vertical fractures & clay seams from -26.2' to -31.0'.

End Of Boring @ -31.0'. Boring backfilled with cuttings.

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

BBS, form 138 (Rev. 8-99)

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

# ROCK CORE LOG

PAGE 1 of 1

DATE 10/30/2013

LOGGED BY JK

GSI JOB No. 13125

ROUTE	DESCRIPTION
--	I-80 Reconstruction (Near Term Phase 2)

SECTION   --   LOCATION   SEC 15, T35N, R10E, SW 1/4, 3rd PM  

COUNTY	Will	CORING METHOD	Rotary Wash
--------	------	---------------	-------------

STRUCT. NO.	--	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	D	C	R	R	C	S
				E	O	E	.	O	T

Station	--	Core Diameter	2.0 in	P	R	C	Q	R	R
---------	----	---------------	--------	---	---	---	---	---	---

Top of Rock Elev.	512.4	T	E	O	.	ET	E
-------------------	-------	---	---	---	---	----	---

BORING NO. **BSB-12** Top of Rock Elev. 512.4 H E U : E I E  
 Basic Core Elev. 512.4 B R V D I N

Station	714+21	Begin Core Elev.	<u>512.4</u>	R	E	.	M	G
---------	--------	------------------	--------------	---	---	---	---	---

Offset	67.5' Right
--------	-------------

Ground Surface Elev. 533.4

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-21.0' to -31.0')

Light gray with rust staining & horizontal fractures throughout, becoming highly weathered & fractured with intersecting vertical fractures & clay seams from -26.2' to -31.0'.

D E P T H	C O R E R U N	R E C O V E R Y	R . Q . D .	C O R E T I M E	S T R E N G T H
(ft)	(#)	(%)	(%)	(min /ft)	(tsf)
	1	97.0	32	n/a	561 @ -23.5'
-26					
-31					



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

# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO. \_\_\_\_\_  
 Station \_\_\_\_\_

BORING NO. BSB-13  
 Station 715+06  
 Offset 67.30ft Left  
 Ground Surface Elev. 533.60 ft

D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)	Surface Water Elev. n/a ft	Stream Bed Elev. n/a ft	D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)
4.0" CONCRETE	533.27					513.10			
8.0" CRUSHED STONE	532.60								
SAND, CINDERS & STONE-medium dense (Fill)	4						31		
	5		21				35		13
	6						50/0"		
	5								
	6		18						
	7					509.10			
	-5								
GRAVEL with SAND-brown-medium dense to very dense	528.10								
	3								
	4		14						
	7								
	10								
	50/2"		6						
	-10								
	24								
	17		7						
	19								
	17								
	18		10						
	21								
	14								
	26		9						
	30								
	50/2"								
			10						
	-20								

Groundwater Elev.:  
 First Encounter 518.6 ft ▼  
 Upon Completion n/a ft  
 After \_\_\_\_\_ Hrs. \_\_\_\_\_ ft

CLAYEY GRAVEL & FRACTURED ROCK-gray-very dense

Borehole continued with rock coring.

Z:\PROJECTS\2013\13125 HNTB, I-80 PHASE II (NEAR TERM)\13125 BORING LOGS\13125\_LOG.GPJ 4/20/15

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



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

# ROCK CORE LOG

PAGE 1 of 1

DATE 10/20/2013

LOGGED BY JK

GSI JOB No. 13125

ROUTE	DESCRIPTION
--	I-80 Reconstruction (Near Term Phase 2)

SECTION   --   LOCATION   SEC 15, T35N, R10E, SW 1/4, 3rd PM  

COUNTY	Will	CORING METHOD	Rotary Wash
--------	------	---------------	-------------

STRUCT. NO.	--	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	D	C	R	R	C	S
				E	O	E	.	O	T

Station	--	Core Diameter	2.0 in	P	R	C	Q	R	R
---------	----	---------------	--------	---	---	---	---	---	---

BORING NO. **BSB-13** Top of Rock Elev. 509.1 H E O . E E  
 Basic Core Elev. 508.4 B P V D I N

Station	715+06	Begin Core Elev.	<u>509.1</u>	R	E	.	M	G
---------	--------	------------------	--------------	---	---	---	---	---

Offset	67.3' Left
--------	------------

Ground Surface Elev. 533.6

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-24.5' to -34.5')

Light gray mottled gray with horizontal to wavy bedding. Fine grained with some horizontal fractures becoming highly fractured & weathered with clay seams from -30.6' to -34.5'.

	D E P T H	C O R E  R U N	R E C O V E R Y	R . Q . D .	C O R E T I M E (min /ft)	S T R E N G T H (tsf)
	(ft)	(#)	(%)	(%)		
		1	89.0	50.0	n/a	663 @ -25.6'



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

# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO. Station	DEPTH H	BLOW S	UCS Qu	MOIST T	Surface Water Elev. Stream Bed Elev.	Groundwater Elev.: First Encounter Upon Completion After Hrs.	DEPTH H	BLOW S	UCS Qu	MOIST T
	(ft)	(/6")	(tsf)	(%)	n/a ft n/a ft	519.7 ft n/a ft	(ft)	(/6")	(tsf)	(%)
4.0" CONCRETE	532.87				SAND, GRAVEL & FRACTURE					
CLAY LOAM-dark brown & black-very stiff (Fill)		5			ROCK-brown & gray-very dense	512.20	50/2"			
		6	3.0	19	(continued)					
		7	P		Drillers Observation: Apparent bedrock	510.70				
	530.20				Borehole continued with rock coring.					
CLAYEY GRAVEL & STONE-dark brown & black-medium dense (Fill)		4								
		5		12						
		-5	6				-25			
	527.70									
CLAY LOAM-dark brown & black-dense (Fill)		15								
		17		18						
		20								
	525.20									
SILTY CLAY-dark brown to black-very stiff		2								
		3	2.5	26						
		4	P				-30			
		-10								
	522.70									
SILTY LOAM-brown-medium dense		7								
		11		18						
		15								
	520.20									
SAND, GRAVEL & FRACTURE ROCK-brown & gray-very dense		19								
		20		10						
		23					-35			
		-15								
		26								
		50/3"		8						
		21		12						
		50/4"								
	-20						-40			

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


GSI Job No. 13125

# ROCK CORE LOG

Page 1 of 1

Date 10/21/13

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY TZ

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO.                       
Station                     

CORING BARREL TYPE & SIZE NX Double Swivel-10 ft

Core Diameter 2 in  
Top of Rock Elev. 512.20 ft  
Begin Core Elev. 510.70 ft

BORING NO. BSB-14  
Station 714+93  
Offset 11.00ft Right  
Ground Surface Elev. 533.20 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
510.70	1	99	39		
-25					
-30					1452.0
500.70					
-35					
-40					

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE  
Light gray & fine grained with horizontal bedding. Weathered with numerous horizontal fractures throughout. Clay seams from -22.9' to -23.7', -25.0' to -25.4', -26.4' to -28.1' & from -28.4' to -28.6'.

End Of Boring @ -32.5'. Boring backfilled with cuttings.

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

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

# ROCK CORE LOG

PAGE 1 of 1

DATE 10/21/2013

LOGGED BY JK

GSI JOB No. 13125

ROUTE	DESCRIPTION
--	I-80 Reconstruction (Near Term Phase 2)

SECTION   --   LOCATION   SEC 15, T35N, R10E, SW 1/4, 3rd PM  

COUNTY	Will	CORING METHOD	Rotary Wash
--------	------	---------------	-------------

STRUCT. NO.	--	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	D E	C O	R E	R .	C O	S T
-------------	----	---------------------------	------------------------	--------	--------	--------	--------	--------	--------

Station	--	Core Diameter	2.0 in	P	R	C	Q	R	R
---------	----	---------------	--------	---	---	---	---	---	---

BORING NO.	<b>BSB-14</b>	Top of Rock Elev.	<u>512.2</u>	H	E	U	.	E	E
		Basic Core Elev.	<u>512.0</u>	B	B	V	D	I	N

Station	714+93	Begin Core Elev.	<u>510.7</u>	R	E	.	M	G
---------	--------	------------------	--------------	---	---	---	---	---

Offset	11.0' Right
--------	-------------

Ground Surface Elev. 533.2

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-22.5' to -32.5')

Light gray & fine grained with horizontal bedding. Weathered with numerous horizontal fractures throughout. Clay seams from -22.9' to -23.7', -25.0' to -25.4', -26.4' to -28.1' & from -28.4' to -28.6'.

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min /ft)	STRENGTH (tsf)
—	1	99.8	39.0	n/a	1452 @ -29.7'
—					
—					
—					
—					
—					
—27.5					
—					
—					
—					
—					
—					
—					
—32.5					



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

# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY NW

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO. \_\_\_\_\_  
Station \_\_\_\_\_

BORING NO. BSB-15  
Station 715+97  
Offset 23.20ft Left  
Ground Surface Elev. 574.70 ft

D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)
-------------------------------	--------------------------------	----------------------------	------------------------------

Surface Water Elev. n/a ft  
Stream Bed Elev. n/a ft  
Groundwater Elev.:  
First Encounter Dry to 10.0' ft  
Upon Completion n/a ft  
After \_\_\_\_\_ Hrs. \_\_\_\_\_ ft

D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)
-------------------------------	--------------------------------	----------------------------	------------------------------

6.0" ASPHALT, 6.0" CRUSHED STONE	573.70				CLAY to CLAY LOAM-brown & gray-stiff to hard (Fill) (continued)				
		1				6			
		2	1.0	18		7	1.5	17	
		3	B			6	B		
		9				8			
		13	2.5	21		9	2.5	15	
	-5	4	P			13	B		
		10				8			
		9	2.3	19		10	1.3	16	
		9	B			12	B		
		6				7			
		7	1.0	22		8	2.5	15	
	-10	7	B			13	P		
		4							
		7	1.0	25					
		7	P						
		4				50/4"			
		5	1.7	21				15	
	-15	8	B						
		3							
		3	1.5	22					
		4	P						
		5				8			
		7	1.9	17		13	1.5	20	
	-20	10	B			19	B		

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

BBS, from 137 (Rev. 8-99)



GSI Job No. 13125

## ROCK CORE LOG

Page 1 of 1

Date 3/17/14

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY NW

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO.	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Station	Core Diameter 2 in							
BORING NO. BSB-15	Top of Rock Elev. 512.20 ft							
Station 715+97	Begin Core Elev. 510.70 ft							
Offset 23.20ft Left								
Ground Surface Elev. 574.70 ft								

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE	510.70	1	100	64		1332.0
Light gray with horizontal bedding. Highly fractured & weathered with clay partings from -65.5' to -68.7'. Some horizontal fractures.	-65					

End Of Boring @ -74.0'. Boring backfilled with cuttings.	500.70					
	-75					
	-80					

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

BBS, form 138 (Rev. 8-99)

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

# ROCK CORE LOG

PAGE 1 of 1

DATE 3/17/2014

LOGGED BY JK

GSI JOB No. 13125

ROUTE	DESCRIPTION
--	I-80 Reconstruction (Near Term Phase 2)

SECTION   --   LOCATION   SEC 15, T35N, R10E, SW 1/4, 3rd PM  

COUNTY	Will	CORING METHOD	Rotary Wash
--------	------	---------------	-------------

STRUCT. NO.	--	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	D	C	R	R	C	S
				E	O	E	.	O	T

Station	--	Core Diameter	2.0 in	P	R	C	Q	R	R
---------	----	---------------	--------	---	---	---	---	---	---

Top of Rock Elev.	512.2	T	E	O	.	ET	E
-------------------	-------	---	---	---	---	----	---

Begin Core Elev.	510.7	H	R	V	D	I	N
				E		M	G

BORING NO. **BSB-15**

Station	715+97	Begin Core Elev.	<u>510.7</u>	R	E	.	M	G
---------	--------	------------------	--------------	---	---	---	---	---

Offset	23.2' Left
--------	------------

Ground Surface Elev. 574.7

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-64.0' to -74.0')

Light gray with horizontal bedding. Highly fractured & weathered with clay partings from -65.5' to -68.7'. Some horizontal fractures.

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R . Q . D . (%)	CORE TIME (min /ft)	STRENGTH (tsf)
	1	100.0	64.0	n/a	1332 @ -64.5'
-69					
-74					



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

# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY JH

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO.	DEPTH	BLOW	UCS	MOIST	Surface Water Elev.	Stream Bed Elev.	Groundwater Elev.:	First Encounter	Upon Completion	After	Hrs.	DEPTH	BLOW	UCS	MOIST
Station	(ft)	(/6")	(tsf)	(%)	n/a	n/a	ft	ft	ft	ft		(ft)	(/6")	(tsf)	(%)
BSB-16															
Station	715+78														
Offset	50.70ft Right														
Ground Surface Elev.	575.30														
5.0" ASPHALT, 12.0" CONCRETE															
	573.88	1											3		
CRUSHED STONE-very loose		2		12									4	2.5	21
		2											7	B	
	571.30	1											3		
CLAY to CLAY LOAM-brown & gray-stiff to hard (Fill)		2	1.5	14									5	1.5	16
	-5	2	P										6	B	
		3											4		
		2	1.8	22									5	4.0	16
		3	B										7	P	
		1											5		
		3	1.5	19									5	2.7	17
	-10	3	P										6	B	
		2													
		3	1.0	22											
		3	P												
		3											8		
		3	1.5	20									10		18
	-15	6	B										14		
		3													
		5	2.1	19											
		6	B												
		2											8		
		4	1.3	22									14	3.3	17
	-20	6	P										17	B	

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

# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY JH

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO. \_\_\_\_\_  
 Station \_\_\_\_\_

BORING NO. BSB-16  
 Station 715+78  
 Offset 50.70ft Right  
 Ground Surface Elev. 575.30 ft

D E P T H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)
-------------------------------	--------------------------------	----------------------------	------------------------------

Surface Water Elev. n/a ft  
 Stream Bed Elev. n/a ft  
 Groundwater Elev.:  
 First Encounter 572.3 ft ▼  
 Upon Completion n/a ft  
 After \_\_\_\_\_ Hrs. \_\_\_\_\_ ft

CLAY to CLAY LOAM-brown & gray-stiff to hard (Fill) (continued)			
	7		
	8	1.9	21
	11	B	
	-45		
526.30	18		
SILTY LOAM-dark brown-stiff (A-6)	6	1.9	31
	8	B	
	-50		
523.30			
SANDY CLAY LOAM-brown-medium dense			
	5		
	4		23
	6		
	-55		
518.30			
Drillers Observation: Cobbles & Boulders	517.80		
Drillers Observation: Apparent Bedrock			
515.30	-60		

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



GSI Job No. 13125

## ROCK CORE LOG

Page 1 of 1

Date 3/19/14

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY JH

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

COUNTY Will CORING METHOD Rotary Wash

STRUCT. NO. Station

CORING BARREL TYPE &amp; SIZE NX Double Swivel-10 ft

Core Diameter 2 in  
Top of Rock Elev. 517.80 ft  
Begin Core Elev. 515.30 ftBORING NO. BSB-16  
Station 715+78  
Offset 50.70ft Right  
Ground Surface Elev. 575.30 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
515.30	1	98	81		876.0
-65					
505.30	-70				
-75					
-80					

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE  
Light gray & porous with horizontal bedding. Some horizontal fractures.

End Of Boring @ -70.0'. Boring backfilled with cuttings.

Color pictures of the cores Yes

Cores will be stored for examination until 5 yrs after const.

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

BBS, form 138 (Rev. 8-99)

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

# ROCK CORE LOG

PAGE 1 of 1

DATE 3/20/2014

LOGGED BY MD

GSI JOB No. 13125

ROUTE	DESCRIPTION
--	I-80 Reconstruction (Near Term Phase 2)

SECTION   --   LOCATION   SEC 15, T35N, R10E, SW 1/4, 3rd PM  

COUNTY	Will	CORING METHOD	Rotary Wash
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STRUCT. NO.	--	CORING BARREL TYPE & SIZE	NX Double Swivel-10 ft	D	C	R	R	C	S
				E	O	E	.	O	T

Station	--	Core Diameter	2.0 in	P	R	C	Q	R	R
---------	----	---------------	--------	---	---	---	---	---	---

BORING NO.	<b>BSB-16</b>	Top of Rock Elev.	<u>517.8</u>	H	E	O	.	E	E
		Basic Core Elev.	<u>515.8</u>	B	B	V	D	I	N

Station	715+78	Begin Core Elev.	<u>515.3</u>	R	E	.	M	G
---------	--------	------------------	--------------	---	---	---	---	---

Offset	50.7' Right
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Ground Surface Elev. 575.3

SILURIAN SYSTEM, NIAGARAN SERIES DOLOMITE

RUN 1 (-60.0' to -70.0')

Light gray & porous with horizontal bedding. Some horizontal fractures.

DEPTH (ft)	CORE RUN (#)	RECOVERY (%)	R . Q . D . (%)	CORE TIME (min /ft)	STRENGTH (tsf)
	1	98.0	81.0	n/a	876 @ -62.1'
-65					
-70					



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



# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY NW

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO.	D	B	U	M	Surface Water Elev.	n/a	ft	D	B	U	M
Station	E	L	C	O	Stream Bed Elev.	n/a	ft	E	L	C	O
BORING NO.	P	W	S	I	Groundwater Elev.:			P	W	S	I
Station	T	S	Qu	T	First Encounter	Dry to 10.0'	ft	H	S	Qu	T
Offset	H				Upon Completion	n/a	ft				
Ground Surface Elev.	(ft)	(/6")	(tsf)	(%)	After	Hrs.	ft	(ft)	(/6")	(tsf)	(%)
Blind drill to -41.0'. (continued)					514.00						
533.50					SILTY LOAM & FRACTURED						
CLAY LOAM-brown & gray-stiff (Fill)	10				ROCK-gray-very dense			24			
	12	1.3	14					50/5"		18	
	17	P									
531.50					511.50						
CLAYEY CINDERS & STONE-dark brown & black-dense (Fill)	42				Drillers Observation: Possible	511.00					
	19		11		Bedrock						
	13				End Of Boring @ -63.5'. Boring						
	-45				backfilled with cuttings.			-65			
529.00											
CLAY LOAM-dark brown & black-dense (Fill)	18										
	21		15								
	25										
526.50											
CLAYEY GRAVEL & STONE-dark brown & gray-medium dense to dense (Fill)	9										
	17		18								
	15							-70			
	6										
	9		25								
	13										
521.50											
CLAYEY SAND & GRAVEL-brown & gray-dense	24										
	22		17								
	19							-75			
519.00											
GRAVEL with Sand-brown-very dense	50/5"										
			9								
516.50											
SILTY SAND & GRAVEL-brown-very dense	50/5"										
			11								
	-60							-80			

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

**BBS, from 137 (Rev. 8-99)**

# SOIL BORING LOG

ROUTE F.A.I.R.T.E. 80 DESCRIPTION I-80 Phase II (Near Term) LOGGED BY NW

SECTION 2013-008B & 2013-009B LOCATION SW 1/4, SEC. 15, TWP. T35N, RNG. R10E, 3<sup>rd</sup> PM

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

STRUCT. NO. Station	DEPTH H	BLOW S	UCS Qu	MOIST T	Surface Water Elev. Stream Bed Elev.	Groundwater Elev.: First Encounter Upon Completion After Hrs.	DEPTH H	BLOW S	UCS Qu	MOIST T
	(ft)	(/6")	(tsf)	(%)	n/a ft n/a ft	Dry to 10.0' ft n/a ft	(ft)	(/6")	(tsf)	(%)
Blind drill to -41.0'. (continued)	532.70				513.20					
CLAY LOAM-dark brown & gray-hard (Fill)	10				FRACTURED ROCK-gray-very dense		50/5"			
	11	4.2	18		511.70				8	
	16	B			Drillers Observation: Possible Bedrock	510.70				
530.70					End Of Boring @ -63.0' . Boring backfilled with cuttings.					
SAND, GRAVEL, CINDERS & STONE-black-dense (Fill)	28									
529.20	13		12							
& GRAVEL-dark brown & gray-medium dense (Fill)	-45	22					-65			
	12									
	13		8							
	14									
525.70										
TOPSOIL-black	5									
Organic Content = 6.7%	6	1.4	35							
	12	B					-70			
523.20										
SILTY CLAY LOAM with Gravel-dark brown & gray spotted black-medium stiff	6									
	6		26							
	9									
520.70										
SAND, GRAVEL & FRACTURED ROCK-brown-very dense	25									
	22		10							
	-55	39					-75			
	35									
	34		10							
	28									
515.70										
SANDY LOAM with Fractured Rock-gray-very dense	33									
	27		13							
	-60	21					-80			

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

**APPENDIX E**

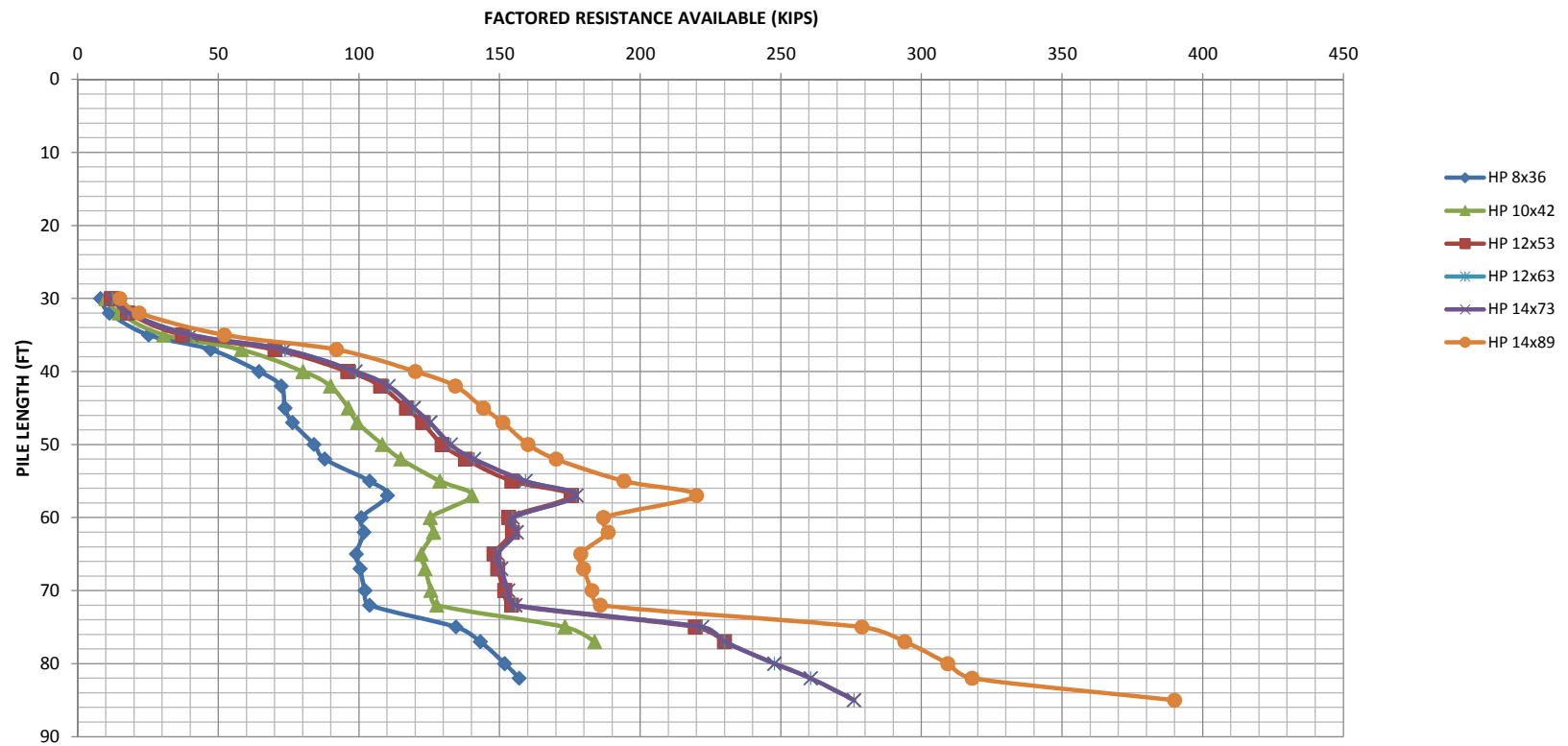
**PILE LENGTH AND CAPACITY TABLES**

**Estimated Pile Lengths and Capacities for the West Abutments of the Proposed I-80 over Gardner St. and BNSF RR**

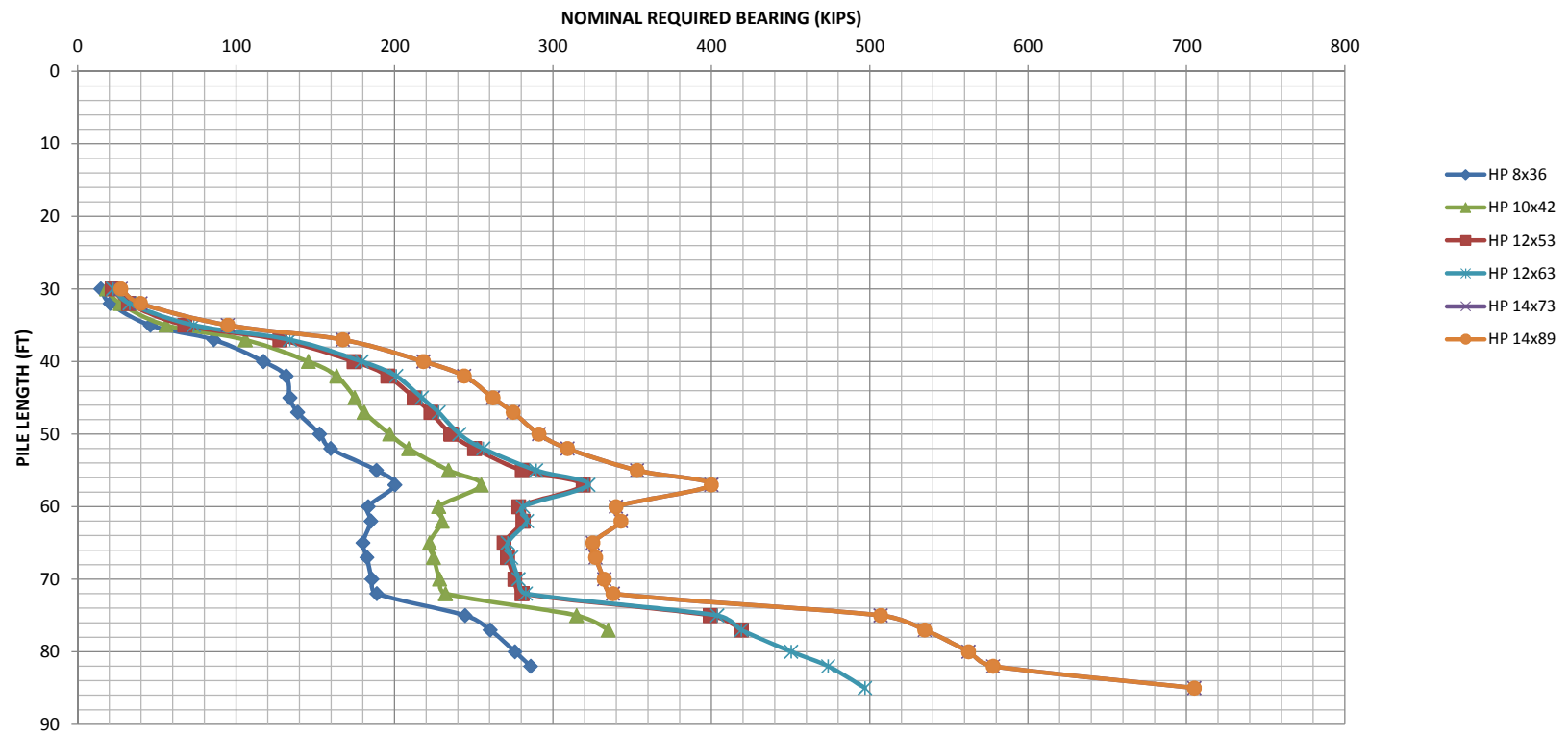
Boring BSB-01 and BSB-03 - West Abutment WB (Ground Surface Elevation against Pile during driving = 546.53, Pile Cutoff Elevation = 571.10)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 12x63		HP 14x73		HP 14x89	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, 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)
30	8	15	10	18	12	22	12	22	15	27	15	27
32	11	21	15	27	18	32	18	33	21	39	22	40
35	25	46	31	56	37	68	40	73	47	86	52	95
37	47	86	58	106	70	128	74	134	87	158	92	167
40	65	117	80	146	96	175	99	179	117	212	120	218
42	72	132	90	164	108	196	111	201	131	238	134	244
45	74	134	96	175	117	213	119	217	142	257	144	262
47	76	139	99	181	123	223	125	228	148	270	151	275
50	84	153	108	197	130	236	133	241	157	285	160	291
52	88	160	115	209	138	251	141	256	167	303	170	309
55	104	189	129	234	154	281	159	289	188	342	194	353
57	110	200	140	255	176	319	177	322	217	395	220	400
60	101	183	125	228	153	279	155	281	185	336	187	340
62	102	185	127	230	155	281	156	284	186	339	189	343
65	99	180	122	222	148	269	149	271	177	322	179	325
67	100	183	124	225	149	271	151	274	178	323	180	327
70	102	186	126	228	152	276	153	278	181	329	183	332
72	104	189	128	232	154	281	156	283	184	334	186	338
75	135	245	173	315	220	399	222	404	275	500	279	507
77	143	260	184	335	230	419	230	419	290	527	294	535
80	152	276					248	450	305	555	309	562
82	157	286					261	474	318	578	318	578
85							276	497			390	705

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

**PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH**  
**BORING BSB-01 and BSB-03 West Abutment WB**  
**Begin Friction at Elevation 546.53, Pile Cutoff (Pile Length =0 feet) at 571.1**



**PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH**  
**BORING BSB-01 and BSB-03 West Abutment WB**  
**Begin Friction at Elevation 546.53, Pile Cutoff (Pile Length =0 feet) at 571.1**



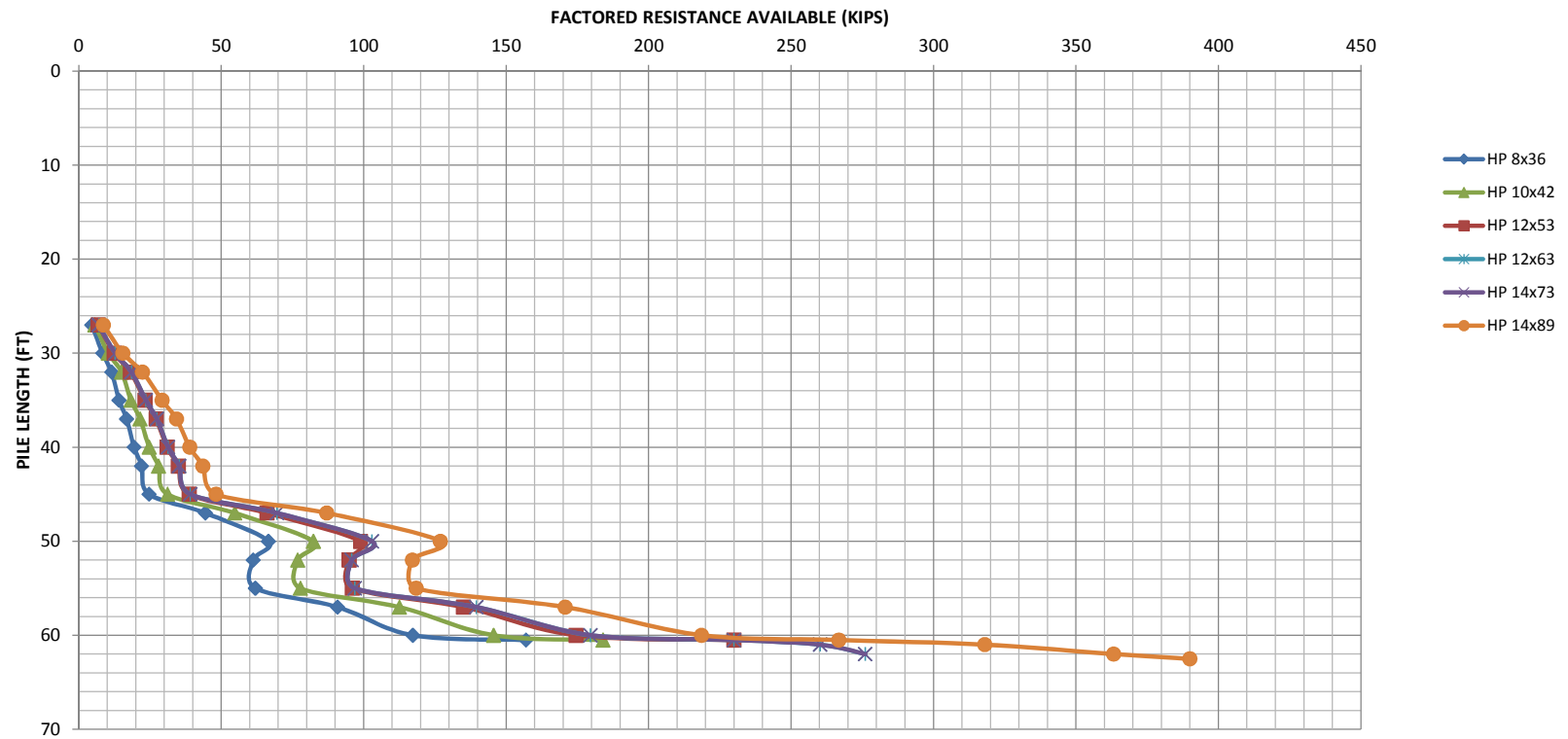
**Estimated Pile Lengths and Capacities for the West Abutments of the Proposed I-80 over Gardner St. and BNSF RR**

Boring BSB-02 and BSB-04, West Abutment EB (Ground Surface Elevation against Pile during driving = 546.53, Pile Cutoff Elevation = 571.10)

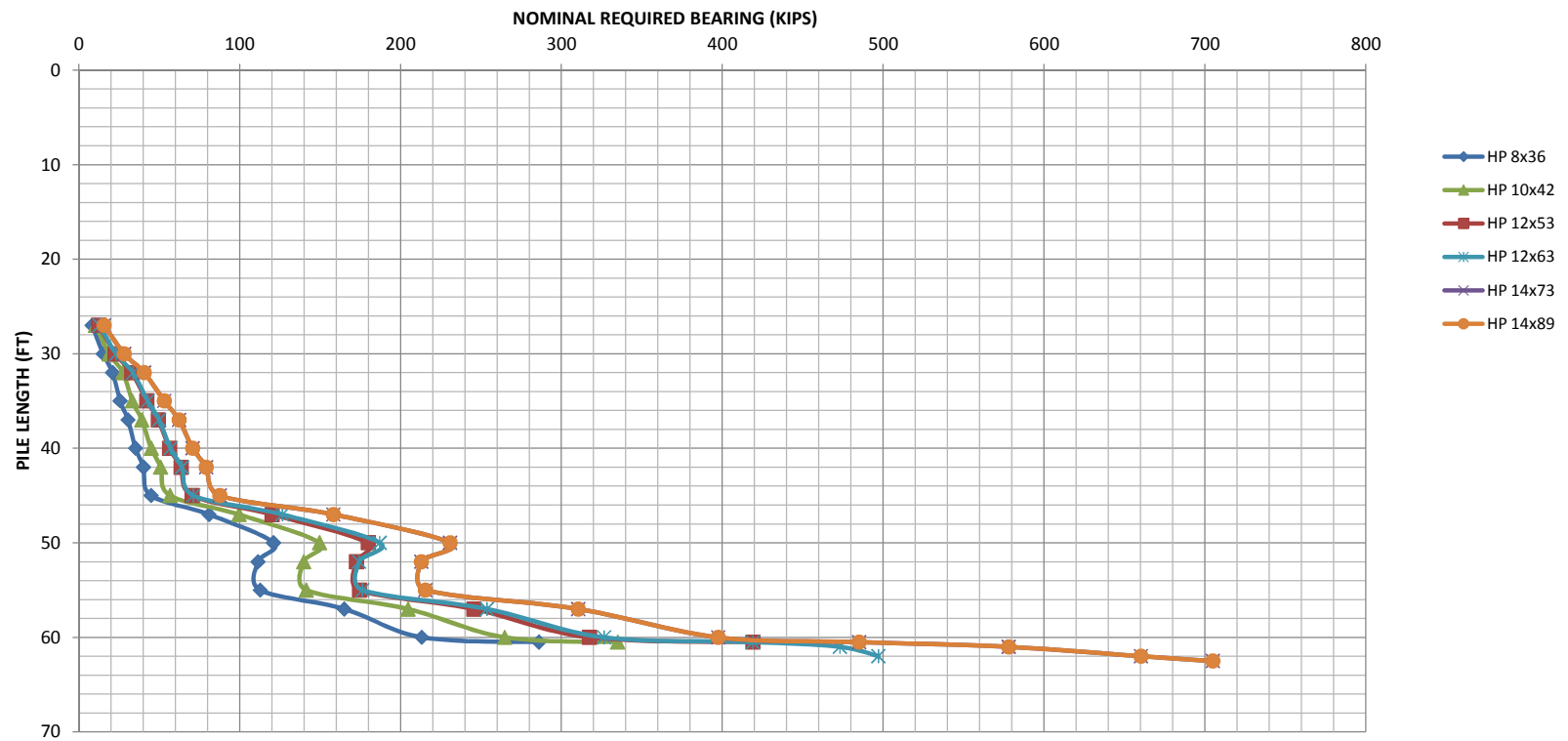
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 12x63		HP 14x73		HP 14x89	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required 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)
27	5	8	6	10	7	12	7	13	8	15	9	16
30	8	15	10	19	12	23	13	23	15	28	15	28
32	12	21	15	27	18	33	19	34	22	40	22	41
35	14	26	18	33	23	42	24	43	29	52	29	53
37	17	31	22	39	27	49	27	50	34	62	34	62
40	19	35	25	45	31	56	31	57	38	70	39	71
42	22	40	28	51	35	63	35	64	43	78	44	79
45	25	45	31	57	39	71	39	71	48	87	48	88
47	45	81	55	100	66	120	70	126	82	149	87	158
50	67	121	82	150	99	180	103	187	122	221	127	231
52	61	111	77	140	95	173	96	174	116	210	117	213
55	62	113	78	141	96	175	97	176	117	213	118	215
57	91	165	113	205	135	246	140	254	165	300	171	310
60	117	213	146	265	175	317	180	327	213	386	219	397
60.5	157	286	184	335	230	419	230	419	260	473	267	485
61							260	473	318	578	318	578
62							276	497			363	660
63											390	705

Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. RED denotes pile length in bedrock.

**PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH**  
**BORING BSB-02 and BSB-04 West Abutment EB**  
**Begin Friction at Elevation 546.53, Pile Cutoff (Pile Length = 0 feet) at 571.1**



**PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH**  
**BORING BSB-02 and BSB-04 West Abutment EB**  
**Begin Friction at Elevation 546.53, Pile Cutoff (Pile Length = 0 feet) at 571.1**

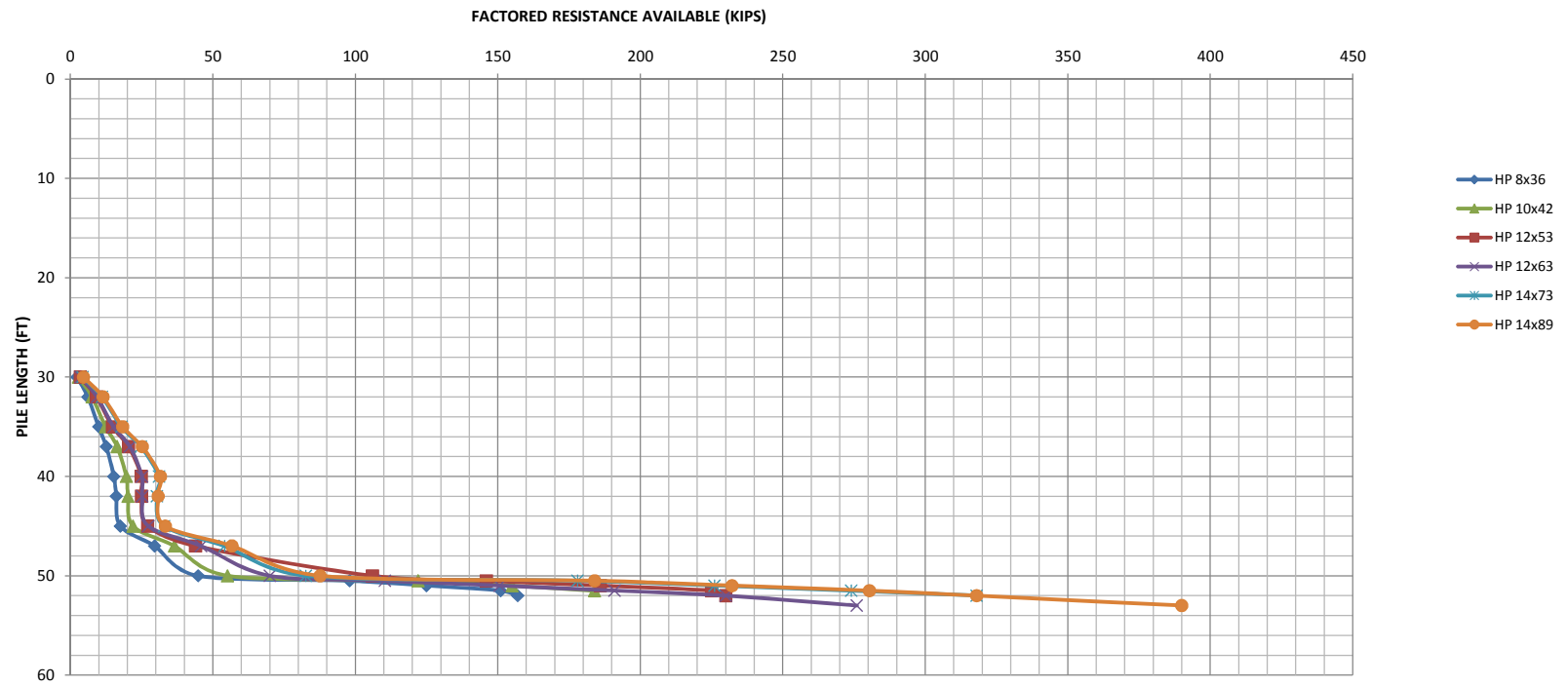


**Estimated Pile Lengths and Capacities for the East Abutments of the Proposed I-80 over Gardner St. and BNSF RR**

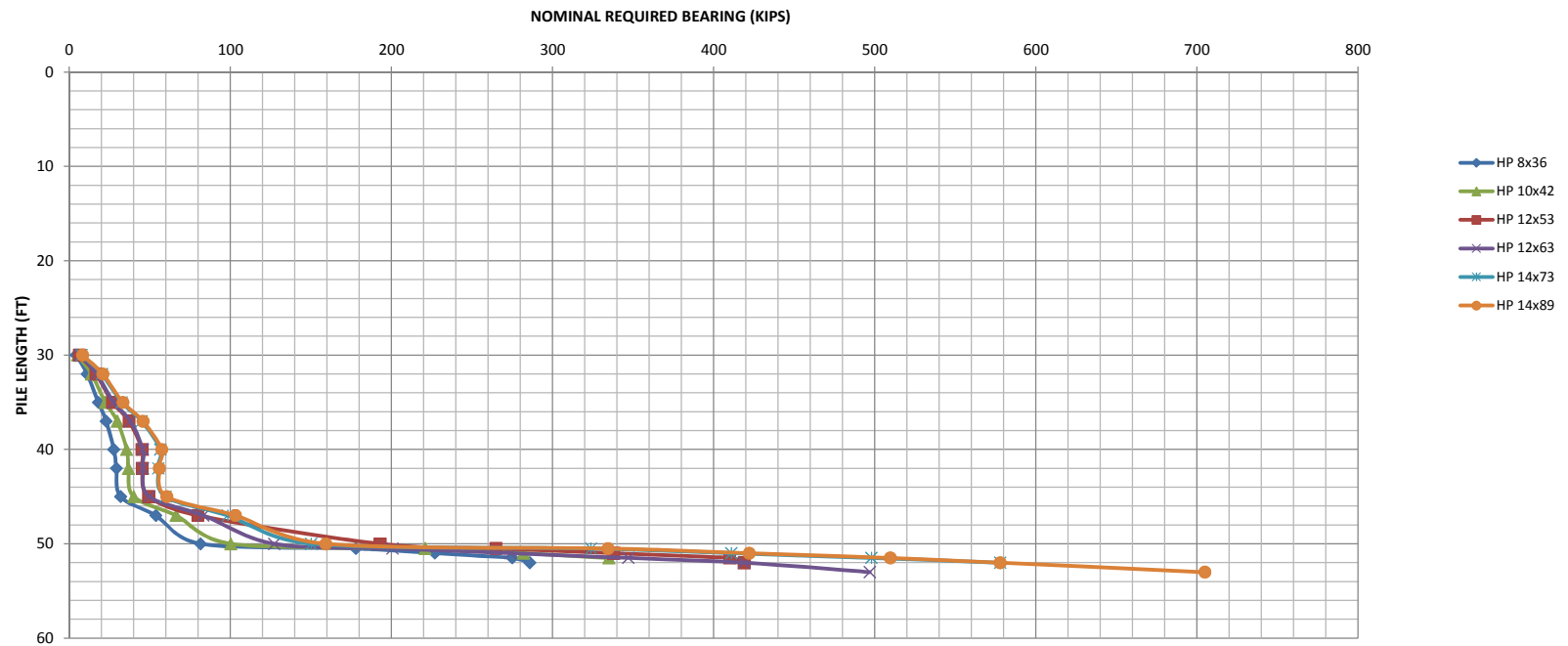
Boring BSB-13 and BSB-15 East Abutment WB (Ground Surface Elevation against Pile during driving = 540.36 Pile Cutoff Elevation = 568.7)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 12x63		HP 14x73		HP 14x89	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, 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)
30	2	4	3	5	3	6	4	7	4	8	5	8
32	6	11	8	14	9	17	9	17	11	20	11	21
35	10	18	12	22	15	27	15	28	18	33	18	33
37	13	23	16	30	20	37	21	38	25	45	25	46
40	15	28	20	36	25	45	25	46	31	57	32	57
42	16	29	20	37	25	45	25	46	30	55	31	56
45	18	32	22	40	27	49	27	50	33	60	33	61
47	30	54	37	66	44	80	46	83	54	98	57	103
50	45	81	55	100	106	193	70	127	83	150	88	159
50.5	98	178	122	221	146	265	110	201	178	324	184	335
51	125	227	155	282	186	338	151	274	226	411	232	422
51.5	151	275	184	335	225	410	191	347	274	498	280	510
52	157	286			230	419	230	419	318	578	318	578
53							276	497			390	705

Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. RED denotes pile length in bedrock.

**PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH**  
**BORING BSB-13 and BSB-15 East Abutment WB**  
**Begin Friction at Elevation 540.36, Pile Cutoff (Pile Length =0 feet) at 568.7**



**PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH**  
**BORING BSB-13 and BSB-15 East Abutment WB**  
Begin Friction at Elevation 540.36, Pile Cutoff (Pile Length =0 feet) at 568.7



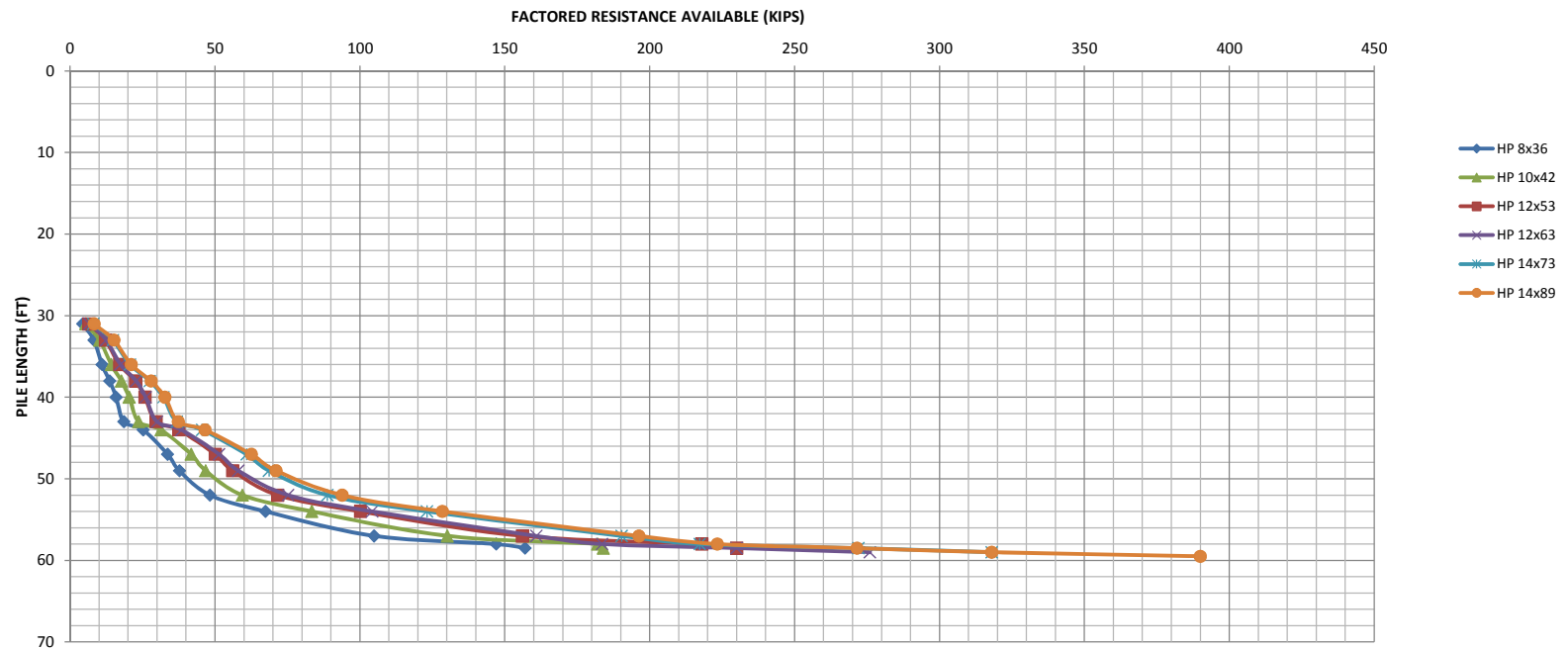
**Estimated Pile Lengths and Capacities for the East Abutments of the Proposed I-80 over Gardner St. and BNSF RR**

Boring BSB-14 and BSB-16, East Abutment EB (Ground Surface Elevation against Pile during driving = 540.36 Pile Cutoff Elevation = 568.7)

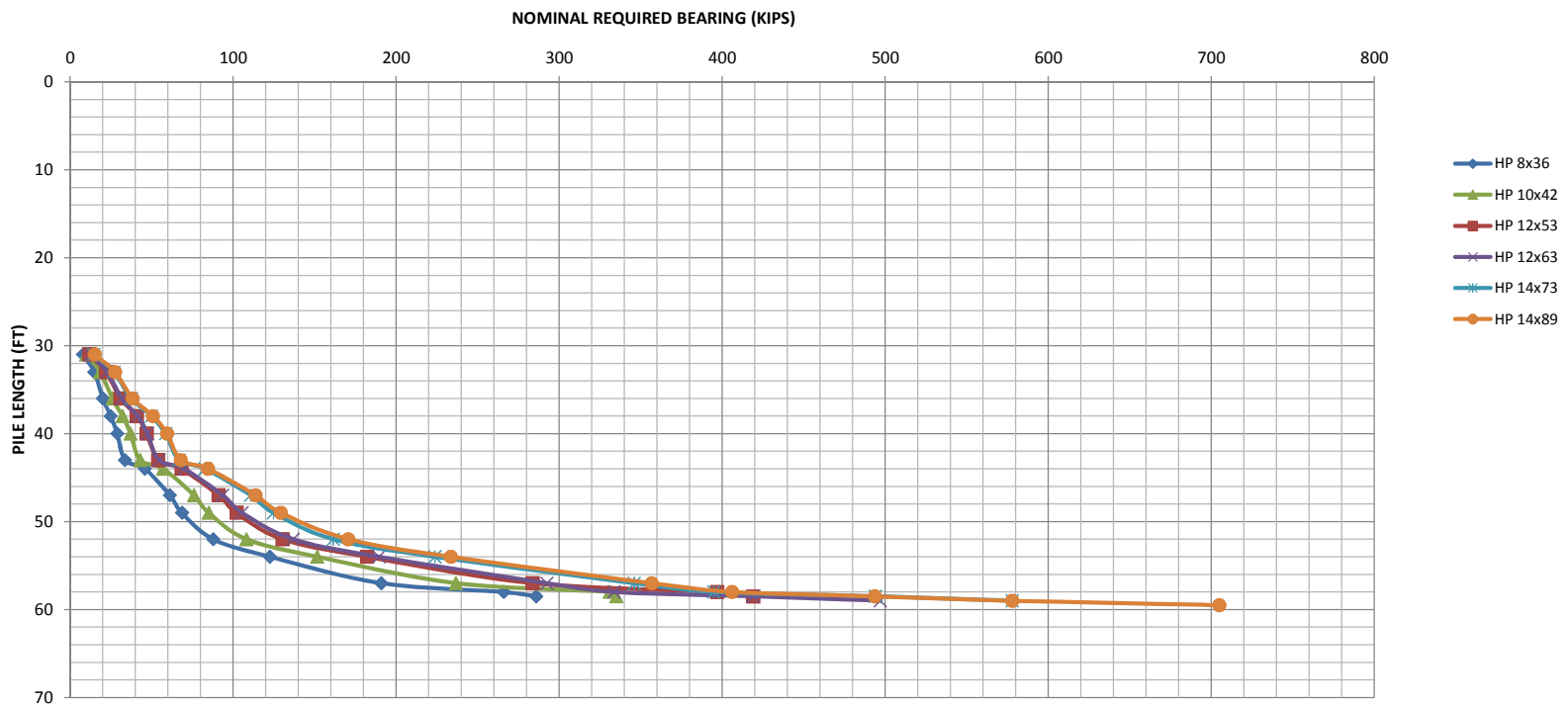
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 12x63		HP 14x73		HP 14x89	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required 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)
31	4	8	5	10	6	12	7	12	8	14	8	15
33	8	15	10	18	12	22	12	23	15	27	15	28
36	11	20	14	26	17	31	17	32	21	38	21	38
38	14	25	18	32	23	41	23	41	27	50	28	51
40	16	29	20	37	26	47	26	47	32	59	33	59
43	19	34	24	43	30	54	30	55	37	67	37	68
44	25	46	31	57	38	68	38	70	46	83	47	85
47	34	61	42	76	50	91	51	94	61	111	63	114
49	38	69	47	85	56	102	58	106	69	125	71	129
52	48	88	59	108	72	130	75	137	89	161	94	171
54	67	123	83	152	100	182	104	189	123	224	128	234
57	105	191	130	237	156	284	161	292	190	346	196	357
58	147	266	182	331	218	397	184	334	217	395	223	406
58.5	157	286	184	335	230	419	230	419	272	494	272	494
59							276	497	318	578	318	578
59.5											390	705

Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. RED denotes pile length in bedrock.

**PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH**  
**BORING BSB-14 and BSB-16 East Abutment EB**  
Begin Friction at Elevation 540.36, Pile Cutoff (Pile Length = 0 feet) at 568.7



**PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH**  
**BORING BSB-14 and BSB-16 East Abutment EB**  
Begin Friction at Elevation 540.36, Pile Cutoff (Pile Length = 0 feet) at 568.7



**Estimated Pile Lengths and Capacities for the West Abutments of the Proposed I-80 over Gardner St. and BNSF RR**

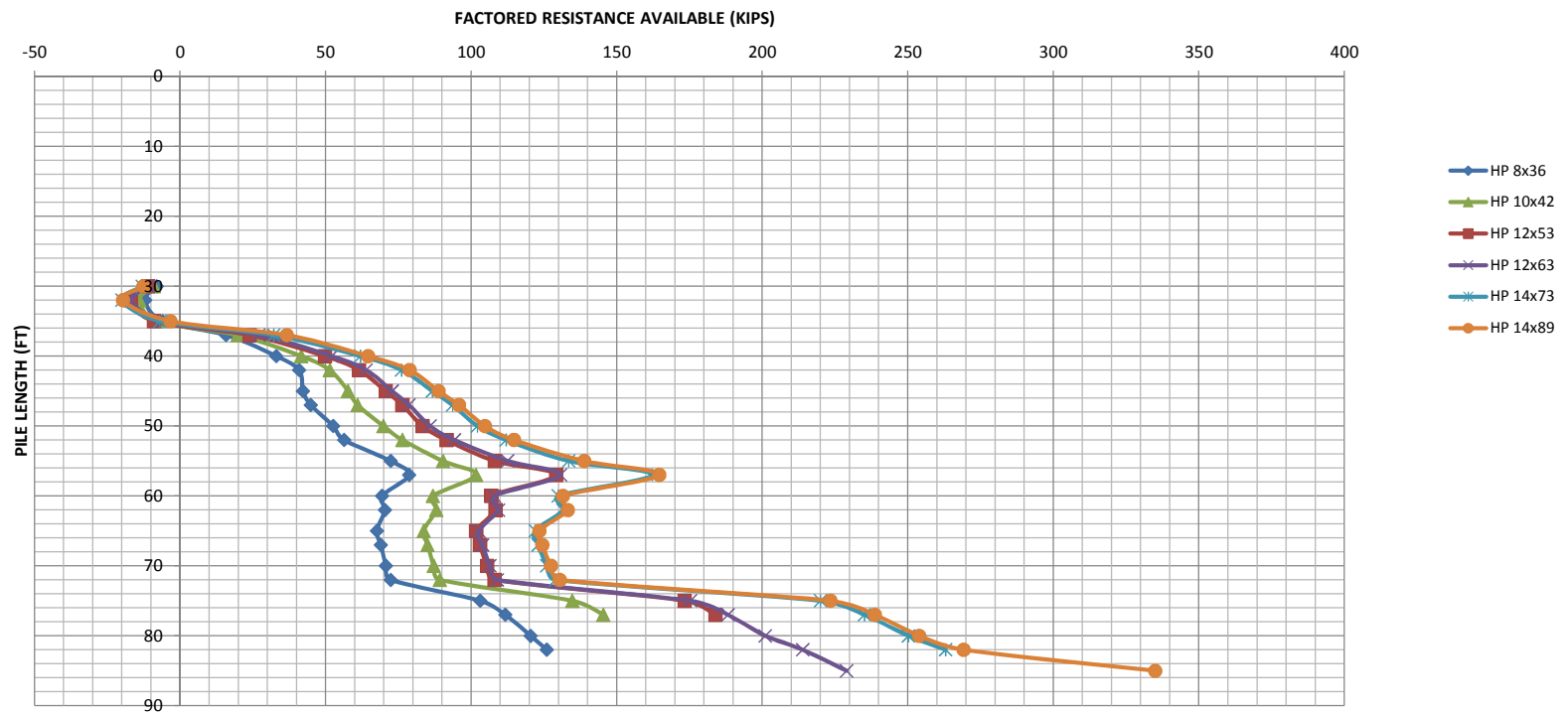
Boring BSB-01 & BSB-03 - West Abutment WB (Ground Surface Elev. against Pile during driving = 546.53, Pile Cutoff Elevation = 571.10, Downdrag Elevation = 535.0)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 12x63		HP 14x73		HP 14x89	
	Factored Resistance Available, FRA (Kips)	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)
30	-8	15	-9	18	-11	22	-11	22	-13	27	-13	27
32	-12	21	-14	27	-17	32	-17	33	-20	39	-20	40
35	-6	46	-8	56	-9	68	-6	73	-7	86	-3	95
37	16	86	20	106	24	128	27	134	32	158	37	167
40	33	117	42	146	50	175	52	179	62	212	65	218
42	41	132	51	164	61	196	64	201	76	238	79	244
45	42	134	58	175	71	213	73	217	87	257	89	262
47	45	139	61	181	76	223	79	228	94	270	96	275
50	53	153	70	197	83	236	86	241	102	285	105	291
52	56	160	76	209	92	251	94	256	112	303	115	309
55	72	189	90	234	108	281	113	289	134	342	139	353
57	79	200	102	255	129	319	131	322	162	395	165	400
60	69	183	87	228	107	279	108	281	130	336	132	340
62	70	185	88	230	108	281	109	284	132	339	133	343
65	68	180	84	222	102	269	103	271	122	322	123	325
67	69	183	85	225	103	271	104	274	123	323	124	327
70	71	186	87	228	106	276	106	278	126	329	127	332
72	72	189	89	232	108	281	109	283	129	334	130	338
75	103	245	135	315	173	399	175	404	220	500	223	507
77	112	260	145	335	184	419	188	427	235	527	239	535
80	120	276					201	450	250	555	254	562
82	126	286					214	474	263	578	269	590
85							229	497			335	705

Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers.  
Downdrag elevation taken at the approximated bottom elevation of the existing fill.

## PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

BORING BSB-01 and BSB-03 West Abutment WB

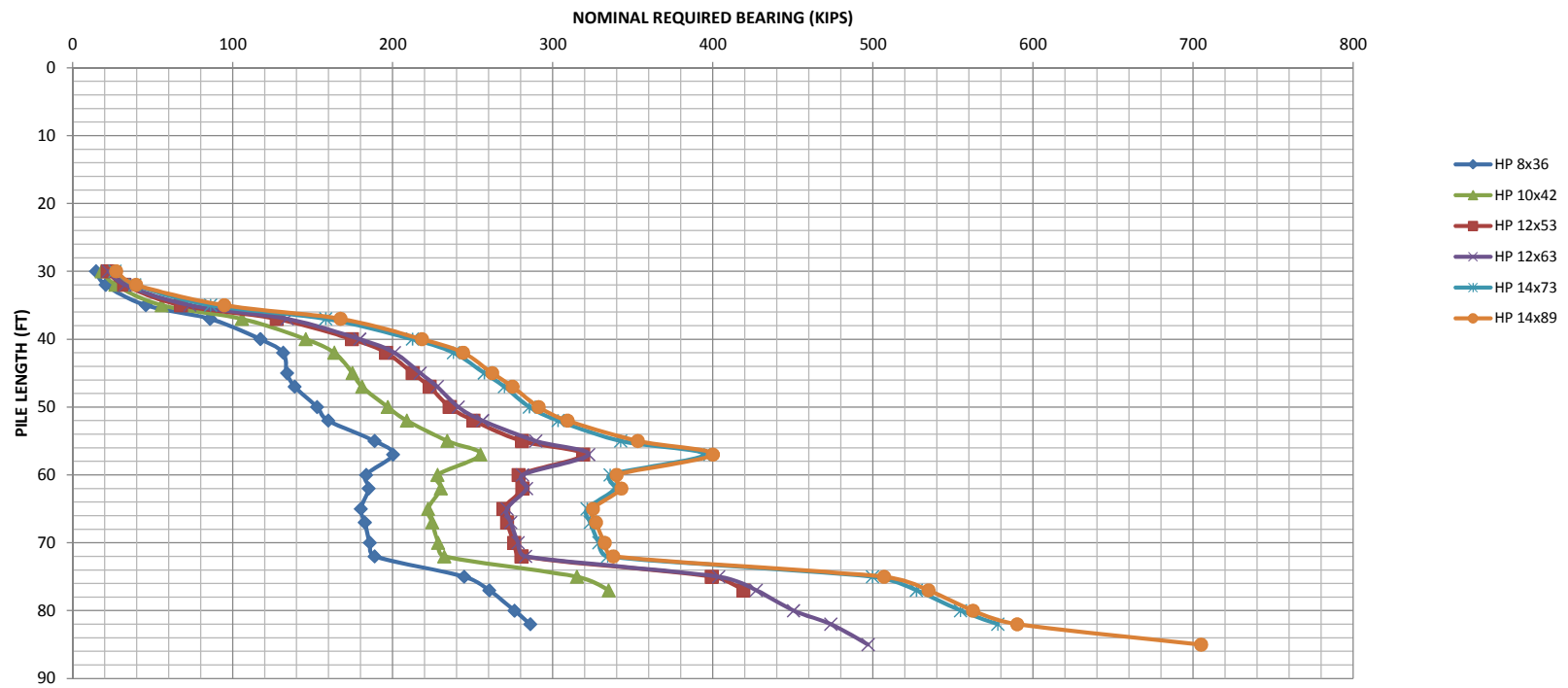
Begin Friction at Elevation 546.53, Pile Cutoff (Pile Length =0 feet) at 571.1, Downdrag Elevation = 535.0



## PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

BORING BSB-01 and BSB-03 West Abutment WB

Begin Friction at Elevation 546.53, Pile Cutoff (Pile Length =0 feet) at 571.1, Downdrag Elevation = 535.0



**Estimated Pile Lengths and Capacities for the West Abutments of the Proposed I-80 over Gardner St. and BNSF RR**

Boring BSB-02 & BSB-04, West Abutment EB (Ground Surface Elev. against Pile during driving = 546.53, Pile Cutoff Elevation = 571.10, Downdrag Elev. = 525.0)

Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 12x63		HP 14x73		HP 14x89	
	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)
27	-4	8	-5	10	-5	12	-5	13	-6	15	-6	16
30	-8	15	-9	19	-11	23	-11	23	-13	28	-13	28
32	-13	21	-14	27	-17	33	-17	34	-20	40	-20	41
35	-18	26	-21	33	-24	42	-24	43	-27	52	-27	53
37	-23	31	-27	39	-32	49	-32	50	-36	62	-36	62
40	-28	35	-34	45	-39	56	-40	57	-45	70	-45	71
42	-34	40	-40	51	-47	63	-48	64	-54	78	-55	79
45	-39	45	-47	57	-55	71	-55	71	-63	87	-64	88
47	-19	81	-23	100	-28	120	-25	126	-29	149	-25	158
50	3	121	4	150	5	180	8	187	11	221	15	231
52	-2	111	-1	140	1	173	1	174	5	210	5	213
55	-2	113	0	141	2	175	2	176	6	213	6	215
57	27	165	35	205	41	246	45	254	54	300	58	310
60	54	213	68	265	81	317	85	327	101	386	106	397
61	94	286	106	335	136	419	166	473	197	560	203	573
62							182	497	207	578	251	660
62.5											278	705

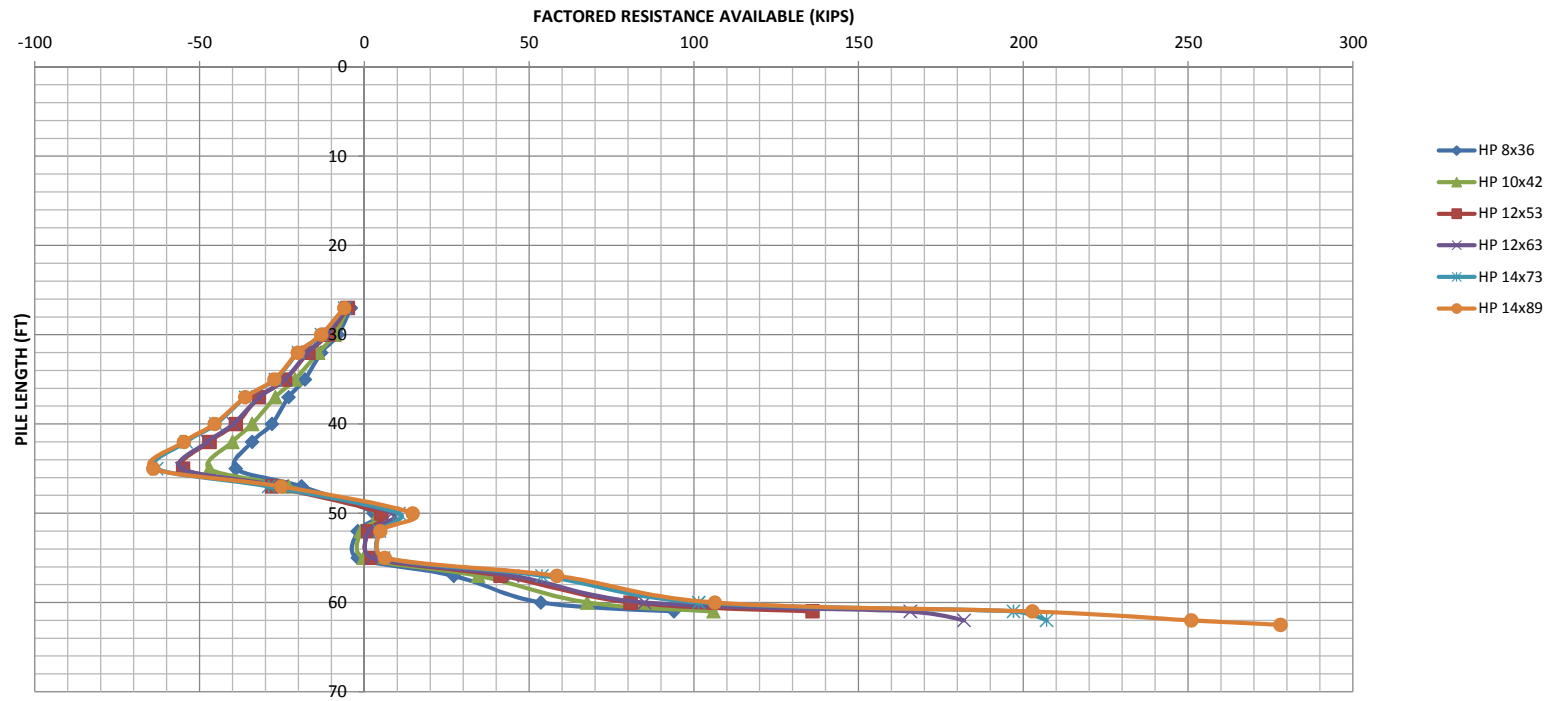
Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. RED denotes pile length in bedrock.

Downdrag elevation taken at the approximated bottom elevation of the existing fill.

## PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

BORING BSB-02 and BSB-04 West Abutment EB

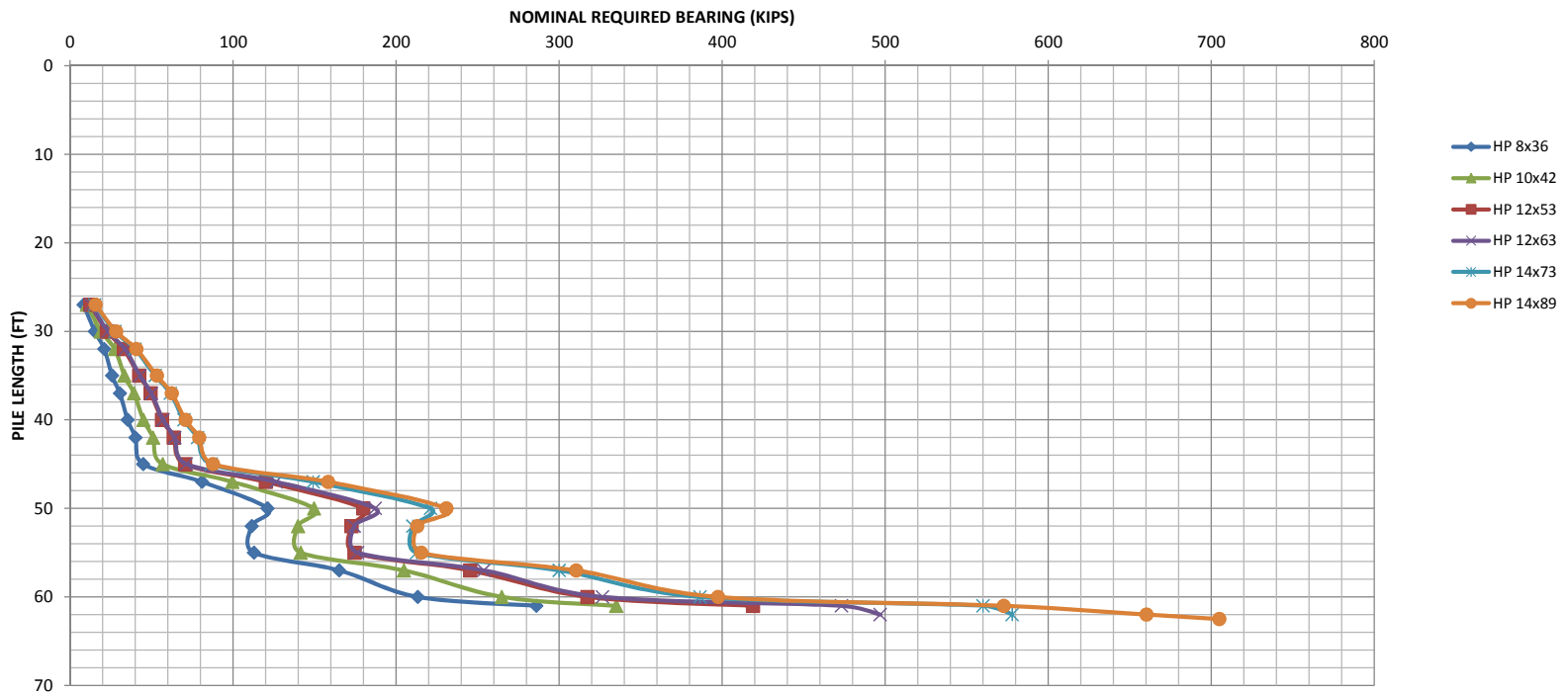
Begin Friction at Elevation 546.53, Pile Cutoff (Pile Length = 0 feet) at 571.1, Downdrag Elevation = 525.0



## PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

BORING BSB-02 and BSB-04 West Abutment EB

Begin Friction at Elevation 546.53, Pile Cutoff (Pile Length = 0 feet) at 571.1, Downdrag Elevation = 525.0



**Estimated Pile Lengths and Capacities for the East Abutments of the Proposed I-80 over Gardner St. and BNSF RR**

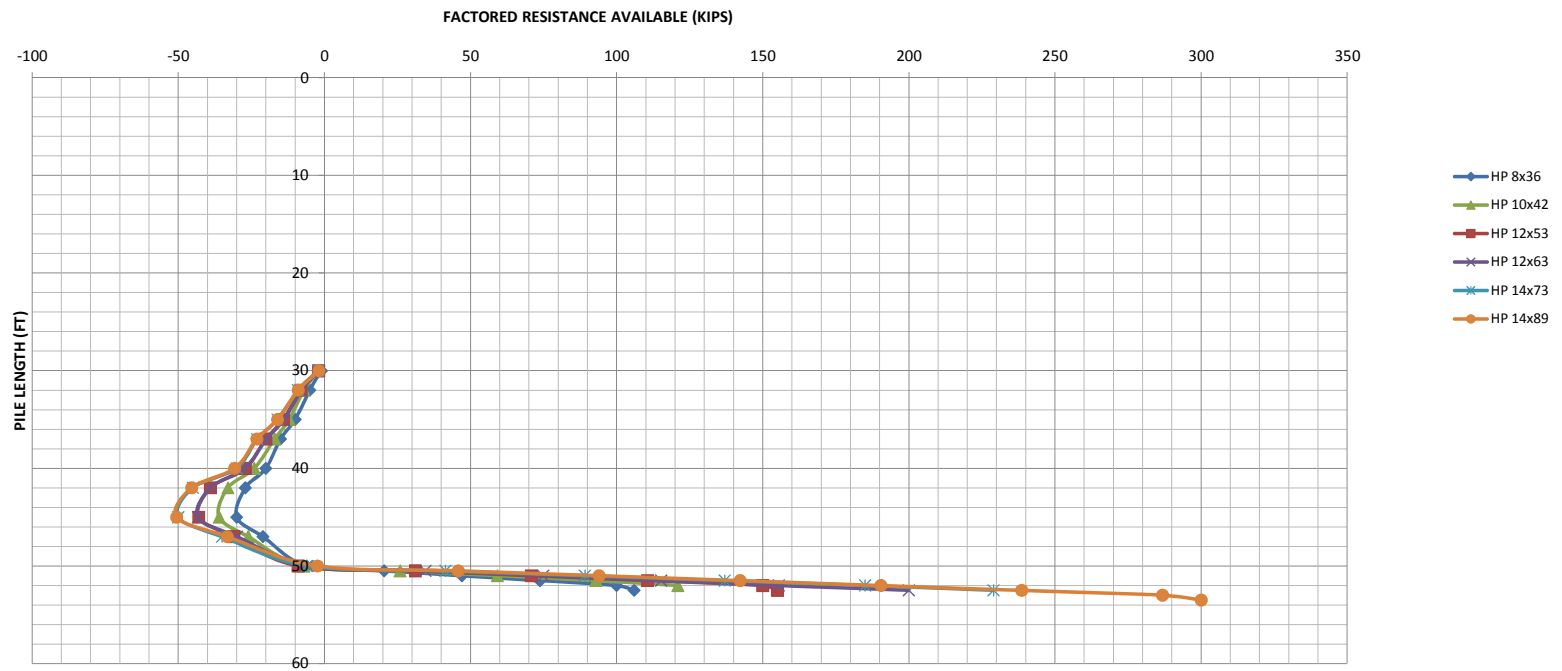
Boring BSB-13 & BSB-15 East Abutment WB (Ground Surface Elev. against Pile during driving = 540.36 Pile Cutoff Elevation = 568.7, Downdrag Elevation = 522.0)												
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 12x63		HP 14x73		HP 14x89	
	Factored Resistance Available, FRA (Kips)	Nominal 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)
30	-1	4	-2	5	-2	6	-2	7	-2	8	-2	8
32	-5	11	-7	14	-8	17	-8	17	-9	20	-9	21
35	-10	18	-12	22	-14	27	-14	28	-16	33	-16	33
37	-15	23	-17	30	-20	37	-20	38	-23	45	-23	46
40	-20	28	-24	36	-27	45	-27	46	-30	57	-31	57
42	-27	29	-33	37	-39	45	-39	46	-45	55	-45	56
45	-30	32	-36	40	-43	49	-43	50	-50	60	-51	61
47	-21	54	-26	66	-31	80	-30	83	-35	98	-33	103
50	-6	81	-7	100	-9	121	-6	127	-6	150	-2	159
50.5	20	130	26	161	31	193	35	201	41	237	46	247
51	47	178	59	221	71	265	75	274	89	324	94	335
51.5	74	227	93	282	111	338	115	347	137	411	142	422
52	100	275	121	335	150	410	156	420	185	498	190	510
52.5	106	286			155	419	200	497	229	578	239	597
53											287	685
53.5											300	705

Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. **RED** denotes pile length in bedrock.  
Downdrag elevation taken at the approximated bottom elevation of the existing fill.

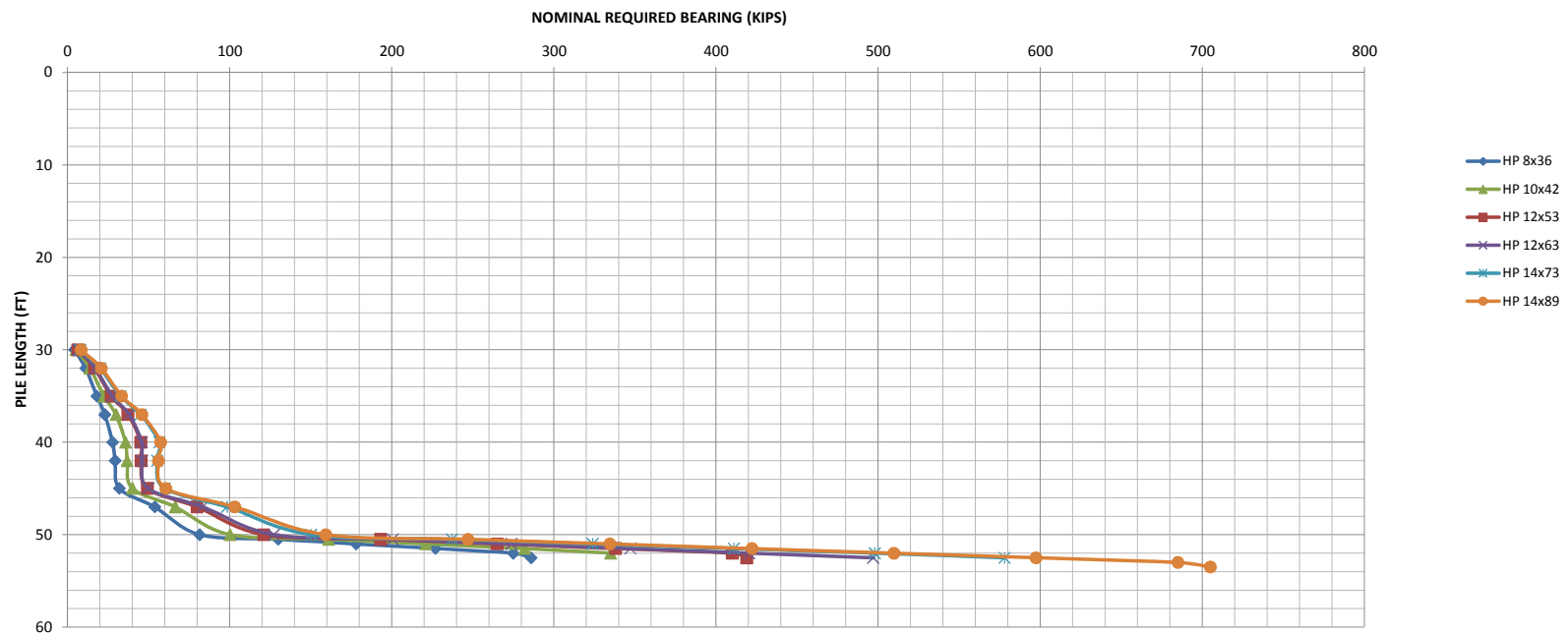
## PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

BORING BSB-13 and BSB-15 East Abutment WB

Begin Friction at Elevation 540.36, Pile Cutoff (Pile Length =0 feet) at 568.7, Downdrag Elevation = 522.0



**PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH**  
**BORING BSB-13 and BSB-15 East Abutment WB**  
Begin Friction at Elevation 540.36, Pile Cutoff (Pile Length =0 feet) at 568.7, Downdrag Elevation = 522.0



**Estimated Pile Lengths and Capacities for the East Abutments of the Proposed I-80 over Gardner St. and BNSF RR**

Boring BSB-14 & BSB-16, East Abutment EB (Ground Surface Elev. against Pile during driving = 540.36 Pile Cutoff Elevation = 568.7, Downdrag Elevation = 526.0)

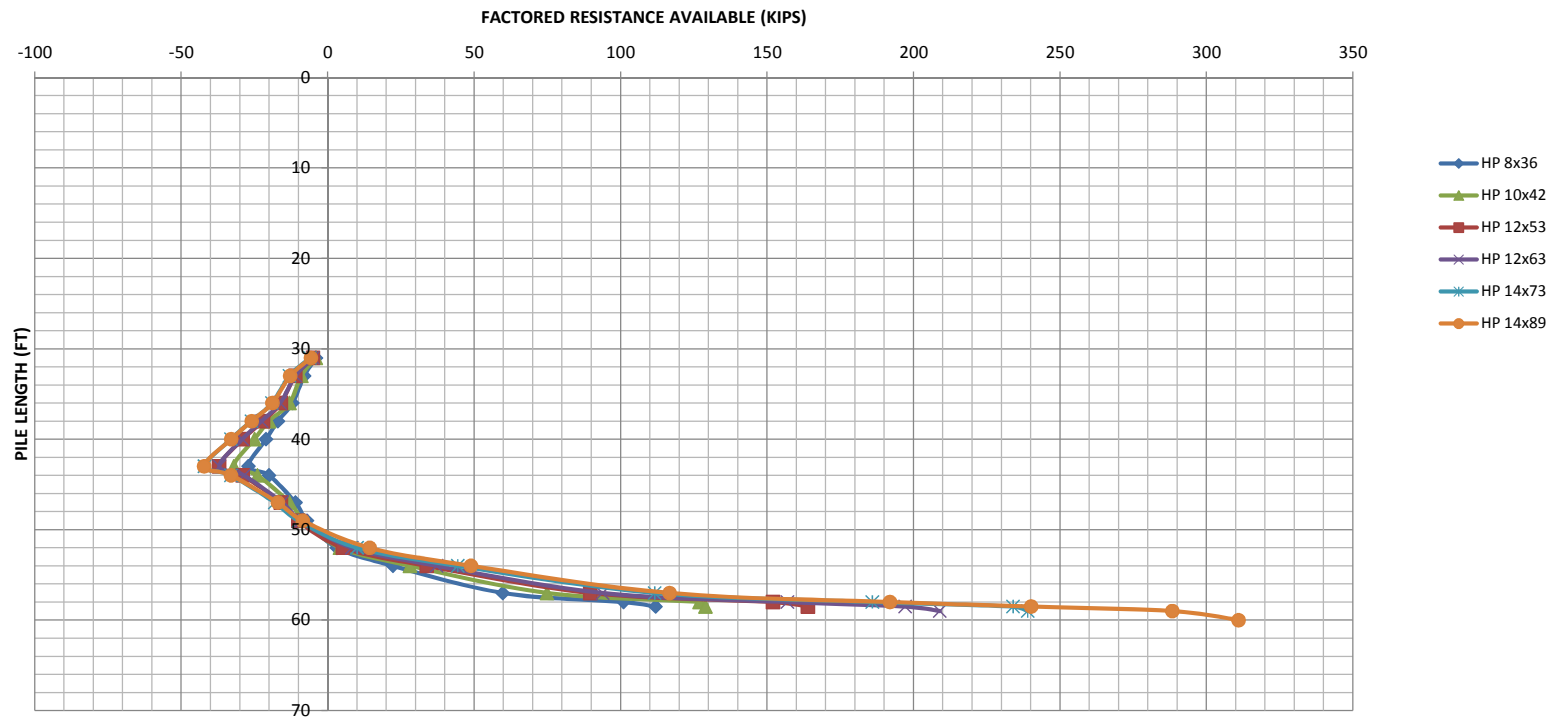
Estimated Pile Length (ft.)	HP 8x36		HP 10x42		HP 12x53		HP 12x63		HP 14x73		HP 14x89	
	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required Bearing, NRB (Kips)	Factored Resistance Available, FRA (Kips)	Nominal Required 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)
31	-4	8	-4	10	-5	12	-5	12	-6	14	-6	15
33	-8	15	-9	18	-11	22	-11	23	-13	27	-13	28
36	-12	20	-13	26	-16	31	-16	32	-19	38	-19	38
38	-17	25	-20	32	-22	41	-23	41	-26	50	-26	51
40	-21	29	-25	37	-29	47	-29	47	-33	59	-33	59
43	-27	34	-32	43	-37	54	-37	55	-42	67	-42	68
44	-20	46	-24	57	-29	68	-29	70	-33	83	-33	85
47	-11	61	-13	76	-16	91	-16	94	-18	111	-17	114
49	-7	69	-8	85	-10	102	-9	106	-10	125	-8	129
52	3	88	4	108	5	130	8	137	10	161	14	171
54	22	123	28	152	34	182	37	189	44	224	49	234
57	60	191	75	237	90	284	94	292	112	346	117	357
58	101	266	127	331	152	397	157	407	186	482	192	494
58.5	112	286	129	335	164	419	197	480	234	569	240	581
59							209	497	239	578	288	669
60											311	705

Note: All piles reach Max Available NRB based on Pile Driving Stresses through soil layers. **RED** denotes pile length in bedrock.  
Downdrag elevation taken at the approximated bottom elevation of the existing fill.

## PILE BEARING (FRA) VS. ESTIMATED PILE LENGTH

BORING BSB-14 and BSB-16 East Abutment EB

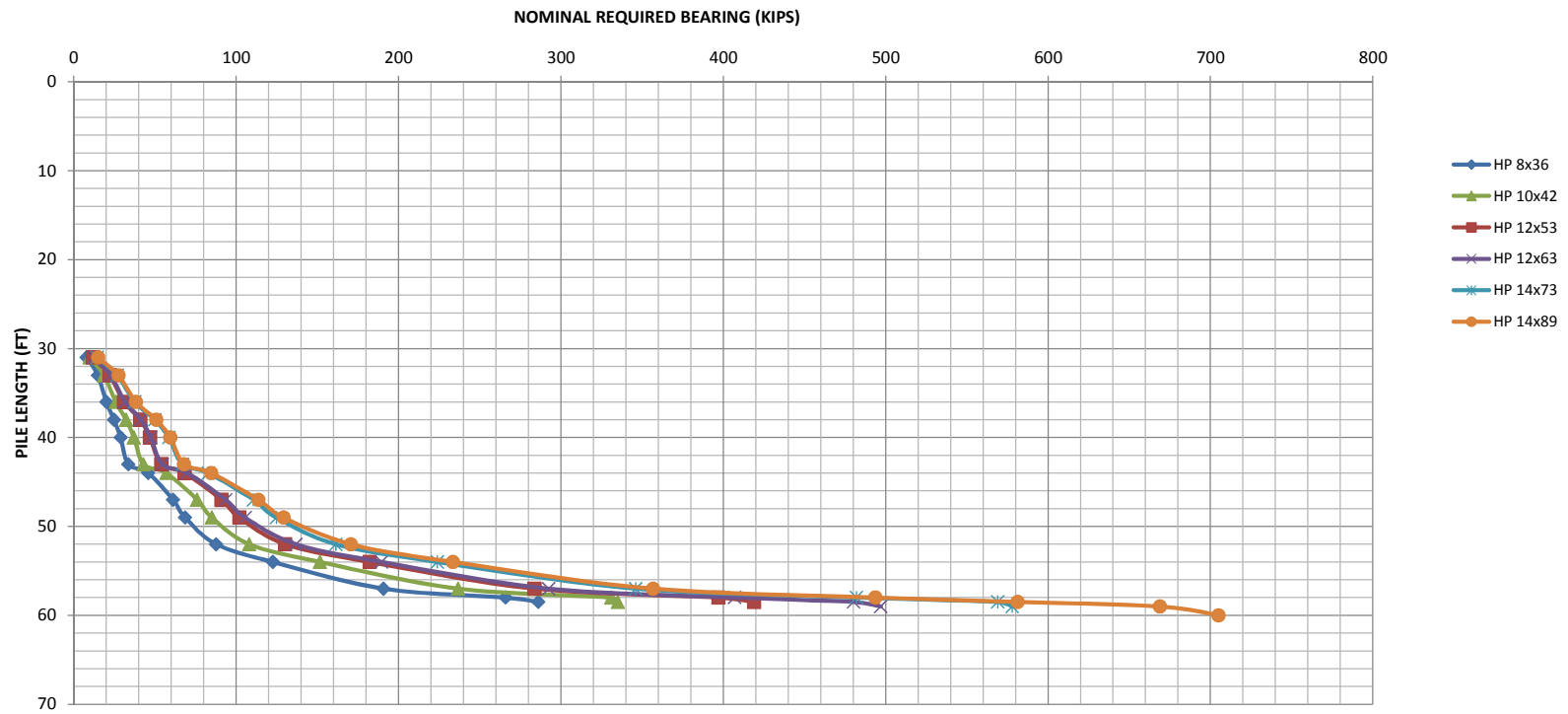
Begin Friction at Elevation 540.36, Pile Cutoff (Pile Length = 0 feet) at 568.7, Downdrag Elevation = 526.0



## PILE BEARING (NRB) VS. ESTIMATED PILE LENGTH

### BORING BSB-14 and BSB-16 East Abutment EB

Begin Friction at Elevation 540.36, Pile Cutoff (Pile Length = 0 feet) at 568.7, Downdrag Elevation = 526.0



**APPENDIX F**

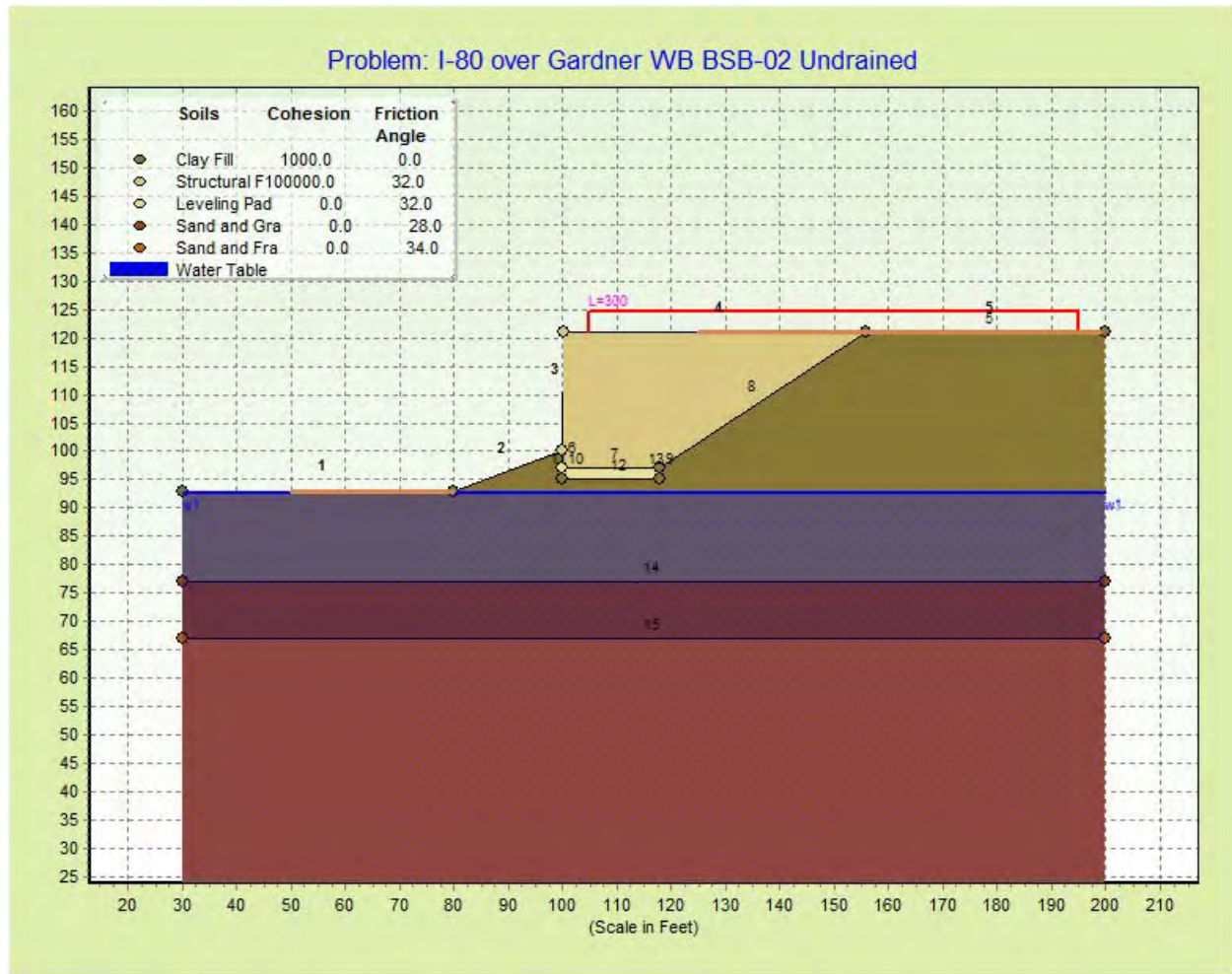
**SLOPE STABILITY RESULTS**



# STABL for Windows 3.0 - Results

## Name: I-80 over Gardner WB BSB-02 Undrained

### ===== DATA SUMMARY =====



#### Profile Data

Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
1	30	93	80	93	1
2	80	93	100	100	1
3	100	100	100.1	121	2
4	100.1	121	156	121	2
5	156	121	200	121	1
6	100	100	100	97	2
7	100	97	118	97	3
8	118	97	156	121	1
9	118	97	118	95	1
10	100	97	100	95	3

## STABL for Windows 3.0 - Results

Name: I-80 over Gardner WB BSB-02 Undrained

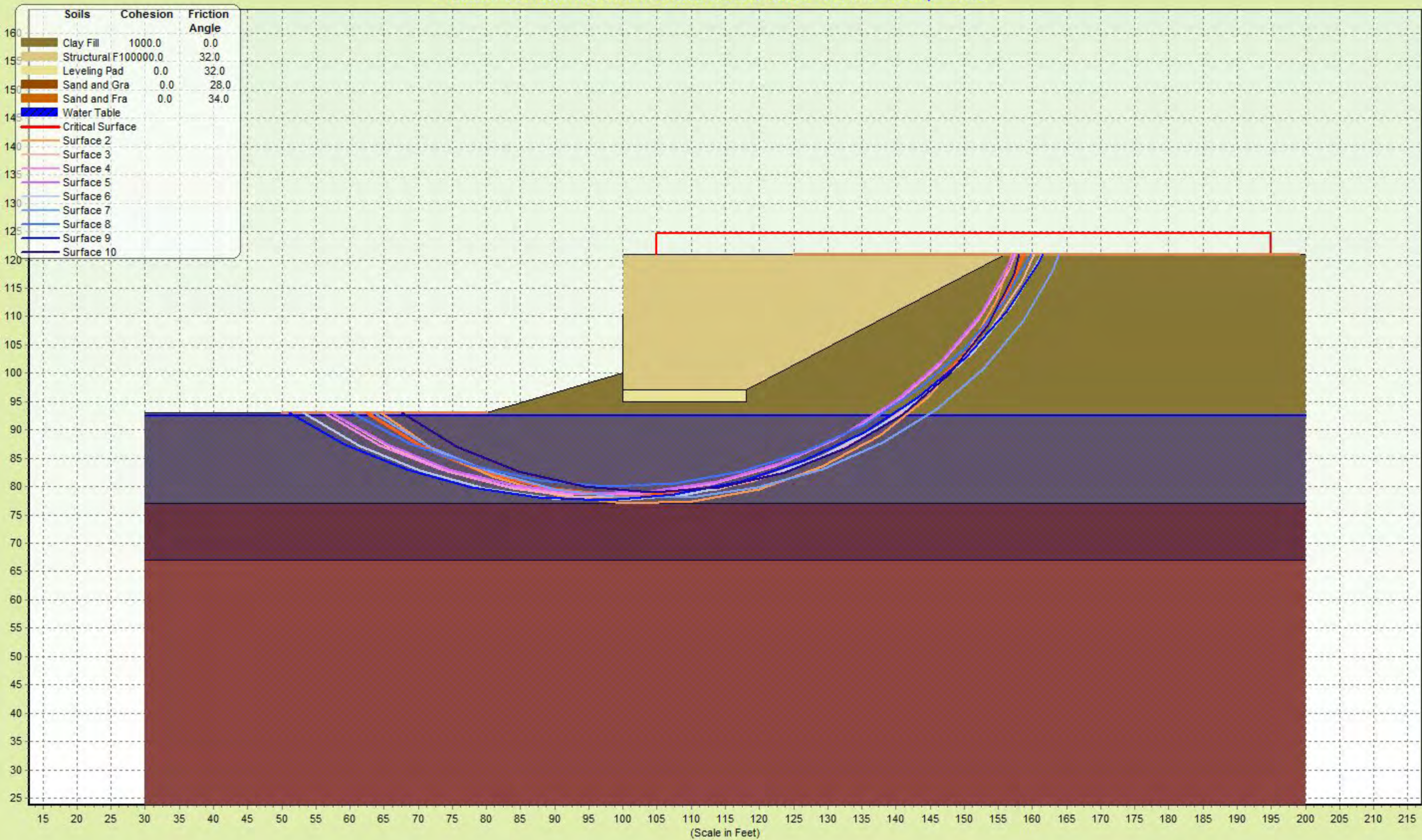
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Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
11	100	95	100	97	3
12	100	95	118	95	1
13	118	95	118	97	1
14	30	77	200	77	4
15	30	67	200	67	5

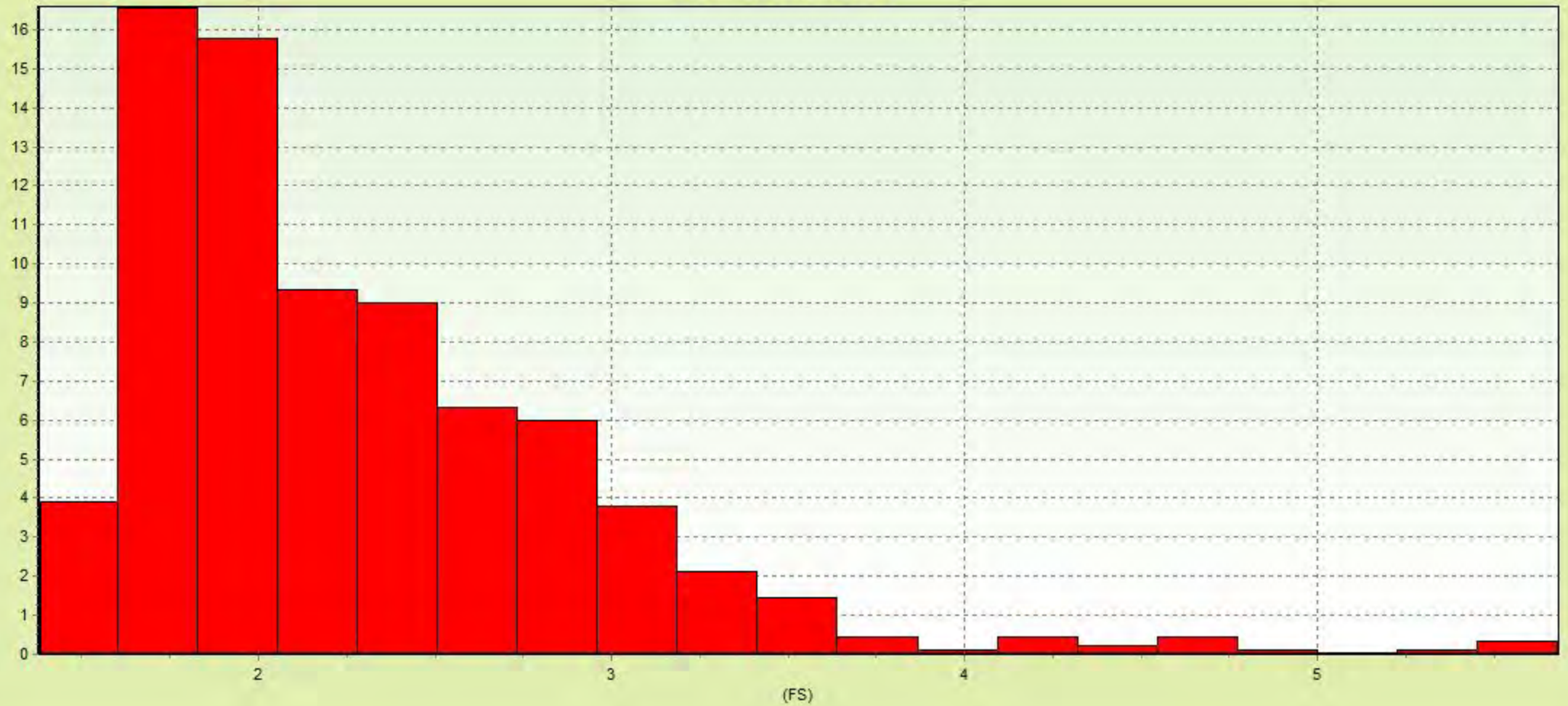
### Soil Properties

Soil Number	Wet Unit Weight	Saturated Unit Weight	Cohesive Intercept	Friction Angle	Ru	Pressure Head	Water Table	Soil Name
1	120	125	1000	0	0	0	1	Clay Fill
2	120	125	100000	32	0	0	1	Structural Fill
3	120	125	0	32	0	0	1	Leveling Pad
4	120	125	0	28	0	0	1	Sand and
5	130	132	0	34	0	0	1	Sand and Frac

Problem: I-80 over Gardner WB BSB-02 Undrained - FS Min- Bishop = 1.53



### Distribution of Factors of Safety

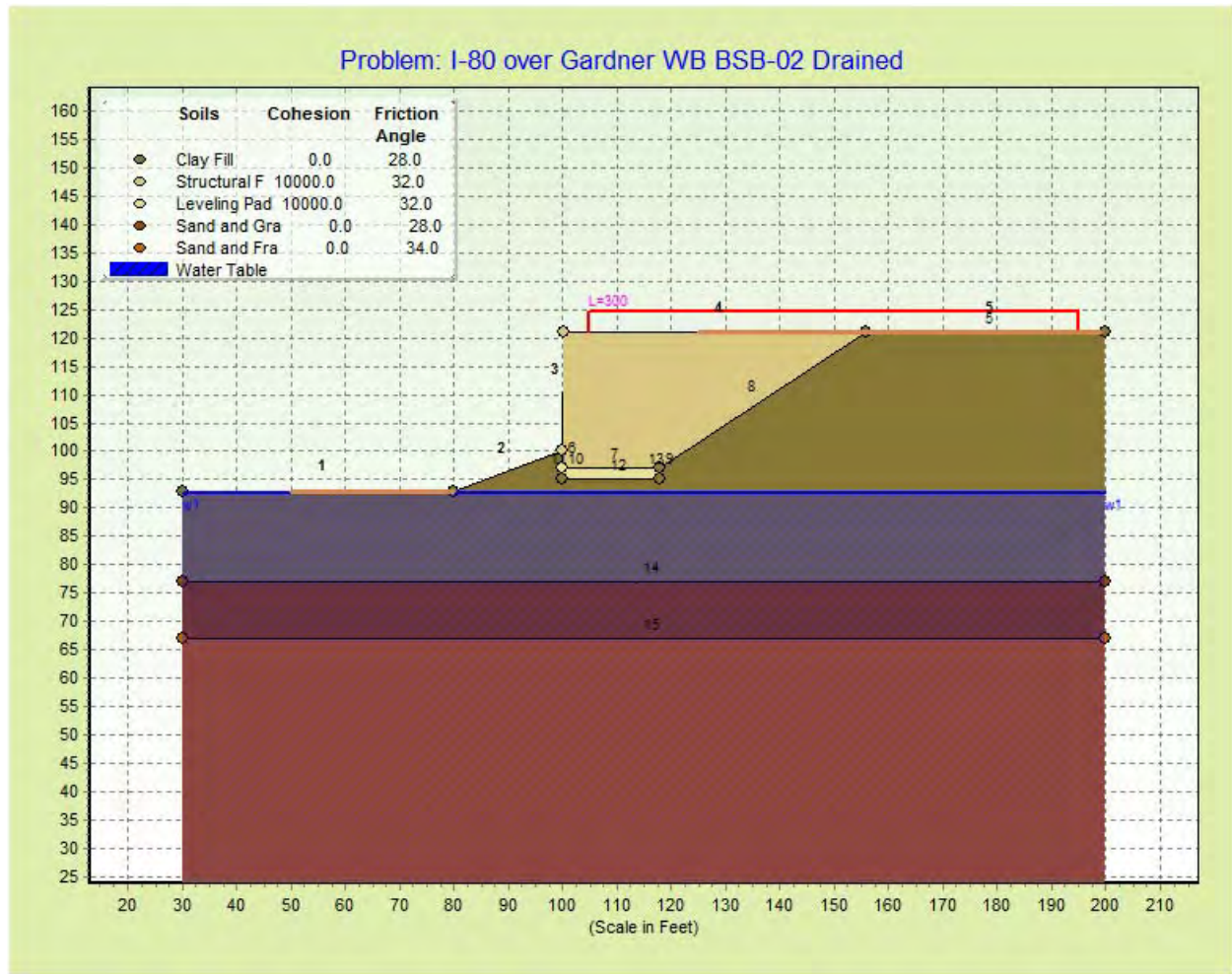
[illegible]



# STABL for Windows 3.0 - Results

## Name: I-80 over Gardner WB BSB-02 Drained

### ===== DATA SUMMARY =====



#### Profile Data

Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
1	30	93	80	93	1
2	80	93	100	100	1
3	100	100	100.1	121	2
4	100.1	121	156	121	2
5	156	121	200	121	1
6	100	100	100	97	2
7	100	97	118	97	3
8	118	97	156	121	1
9	118	97	118	95	1
10	100	97	100	95	3

## STABL for Windows 3.0 - Results

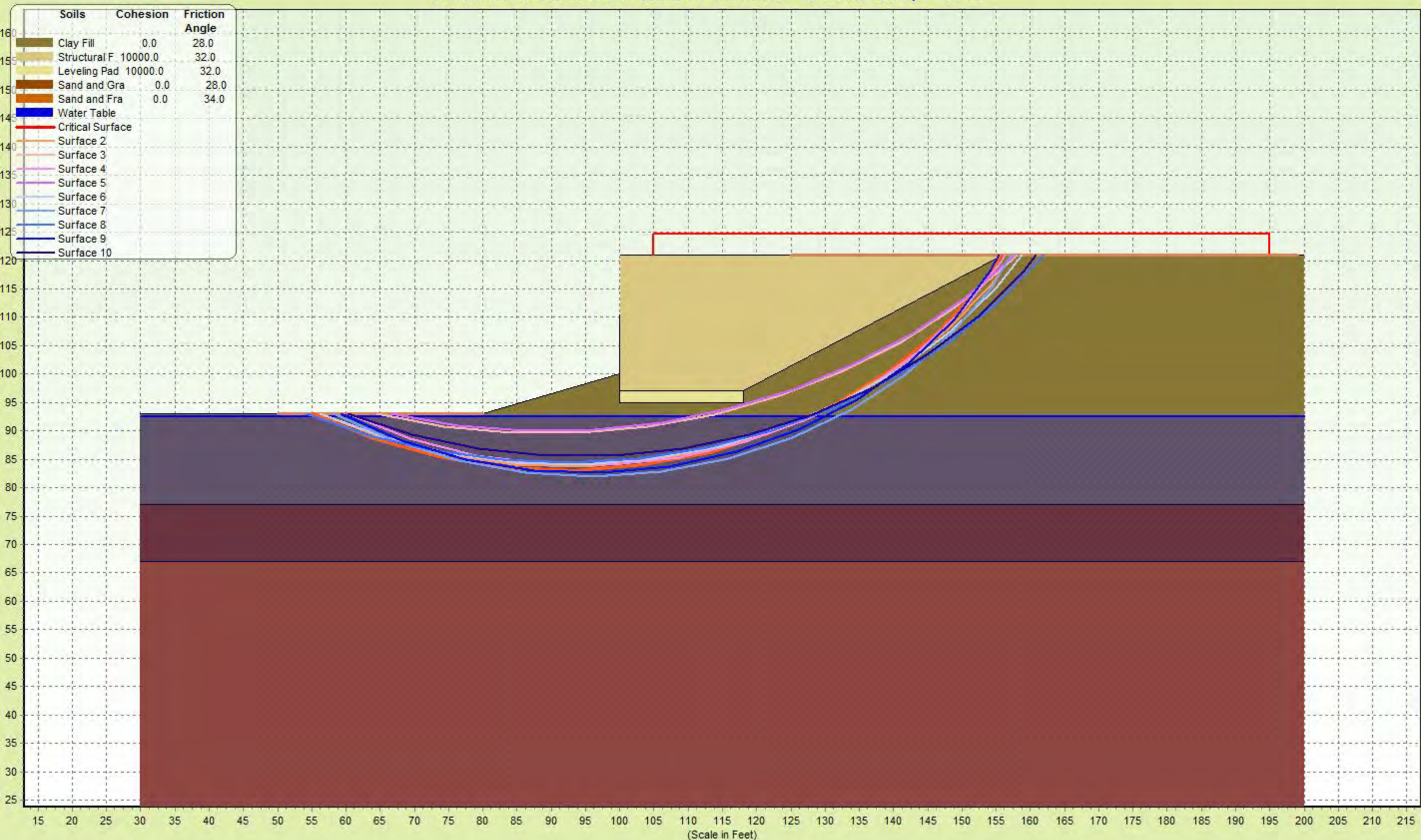
Name: I-80 over Gardner WB BSB-02 Drained

Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
11	100	95	100	97	3
12	100	95	118	95	1
13	118	95	118	97	1
14	30	77	200	77	4
15	30	67	200	67	5

### Soil Properties

Soil Number	Wet Unit Weight	Saturated Unit Weight	Cohesive Intercept	Friction Angle	Ru	Pressure Head	Water Table	Soil Name
1	120	125	0	28	0	0	1	Clay Fill
2	120	125	10000	32	0	0	1	Structural Fill
3	125	130	10000	32	0	0	1	Leveling Pad
4	120	125	0	28	0	0	1	Sand and
5	130	132	0	34	0	0	1	Sand and Frac

Problem: I-80 over Gardner WB BSB-02 Drained - FS Min- Bishop = 1.518



### Distribution of Factors of Safety

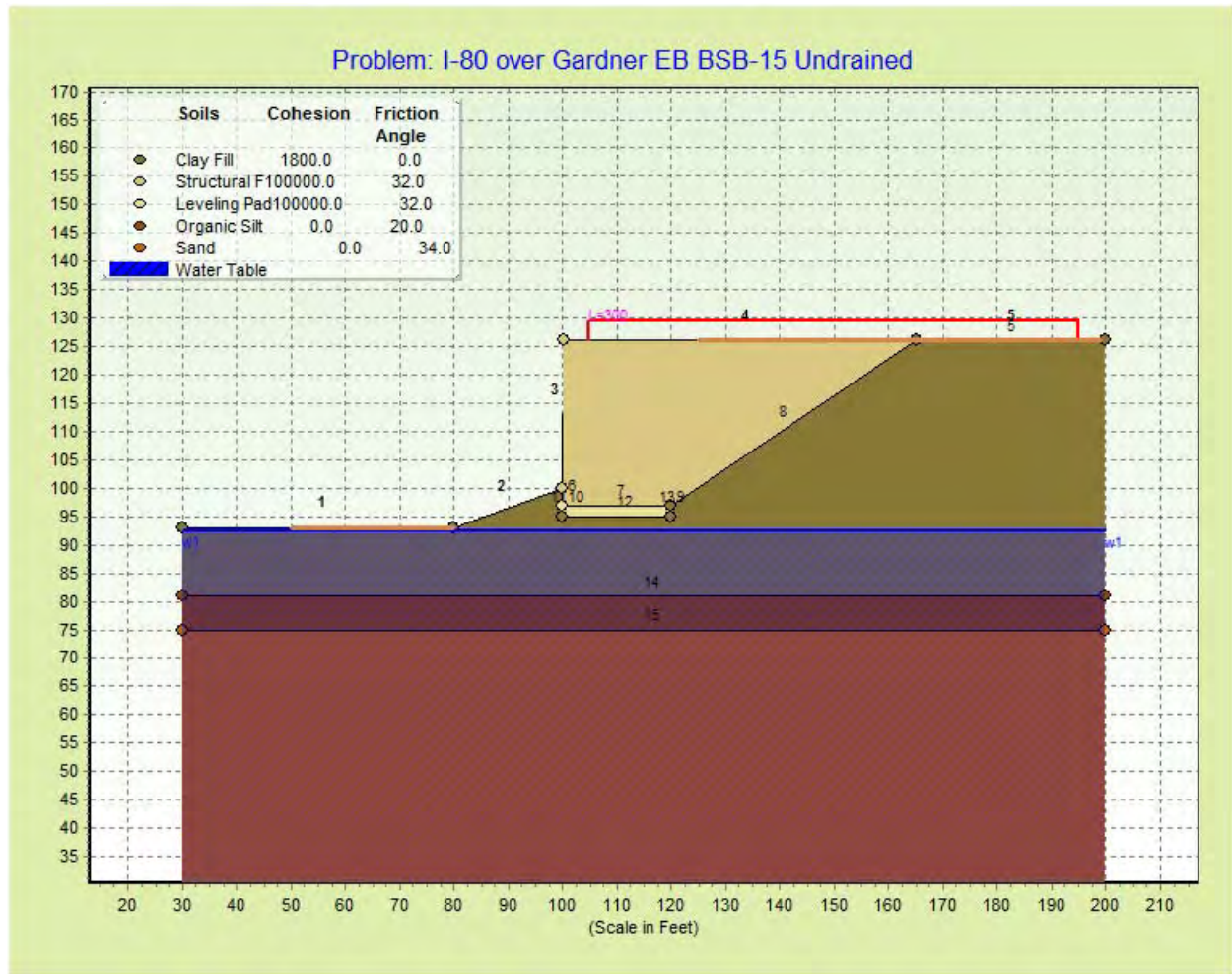
[illegible]



# STABL for Windows 3.0 - Results

## Name: I-80 over Gardner EB BSB-15 Undrained

### ===== DATA SUMMARY =====



#### Profile Data

Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
1	30	93	80	93	1
2	80	93	100	100	1
3	100	100	100.1	126	2
4	100.1	126	165	126	2
5	165	126	200	126	1
6	100	100	100	97	2
7	100	97	120	97	3
8	120	97	165	126	1
9	120	97	120	95	1
10	100	97	100	95	3

## STABL for Windows 3.0 - Results

Name: I-80 over Gardner EB BSB-15 Undrained

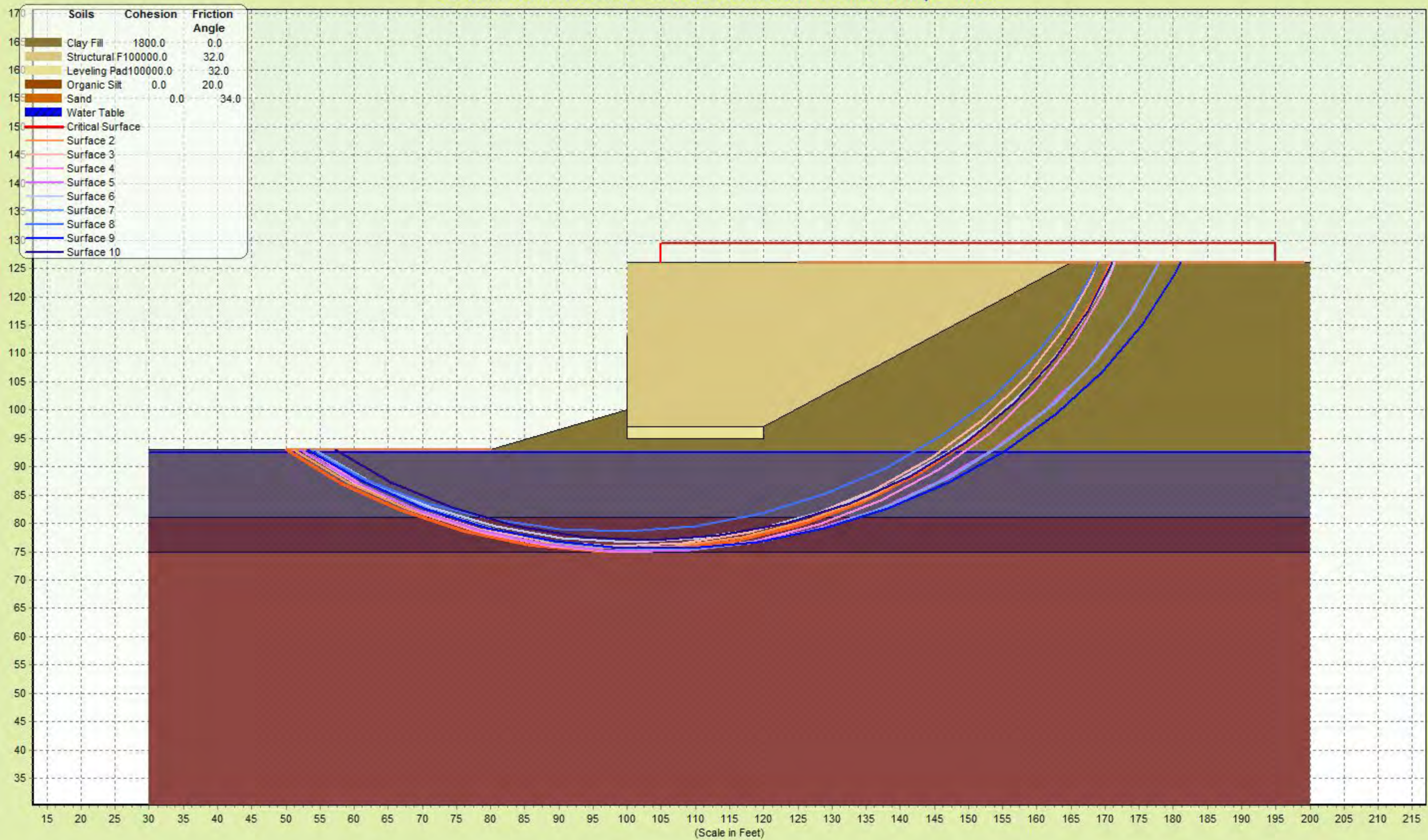
---

Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
11	100	95	100	97	3
12	100	95	120	95	1
13	120	95	120	97	1
14	30	81	200	81	4
15	30	75	200	75	5

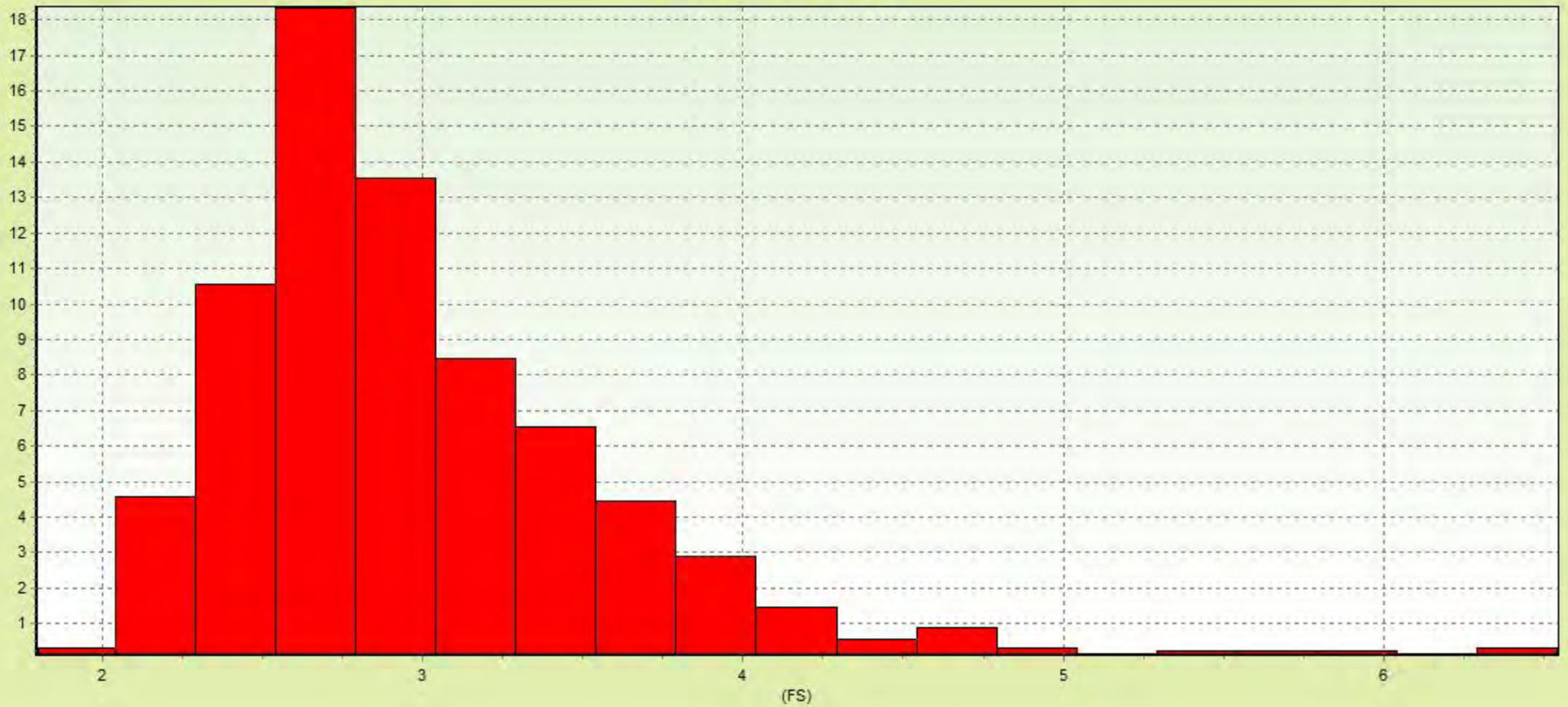
### Soil Properties

Soil Number	Wet Unit Weight	Saturated Unit Weight	Cohesive Intercept	Friction Angle	Ru	Pressure Head	Water Table	Soil Name
1	120	125	1800	0	0	0	1	Clay Fill
2	120	125	100000	32	0	0	1	Structural Fill
3	120	125	100000	32	0	0	1	Leveling Pad
4	100	110	0	20	0	0	1	Organic Silty
5	130	132	0	34	0	0	1	Sand

Problem: I-80 over Gardner EB BSB-15 Undrained - FS Min- Bishop = 1.995



### Distribution of Factors of Safety

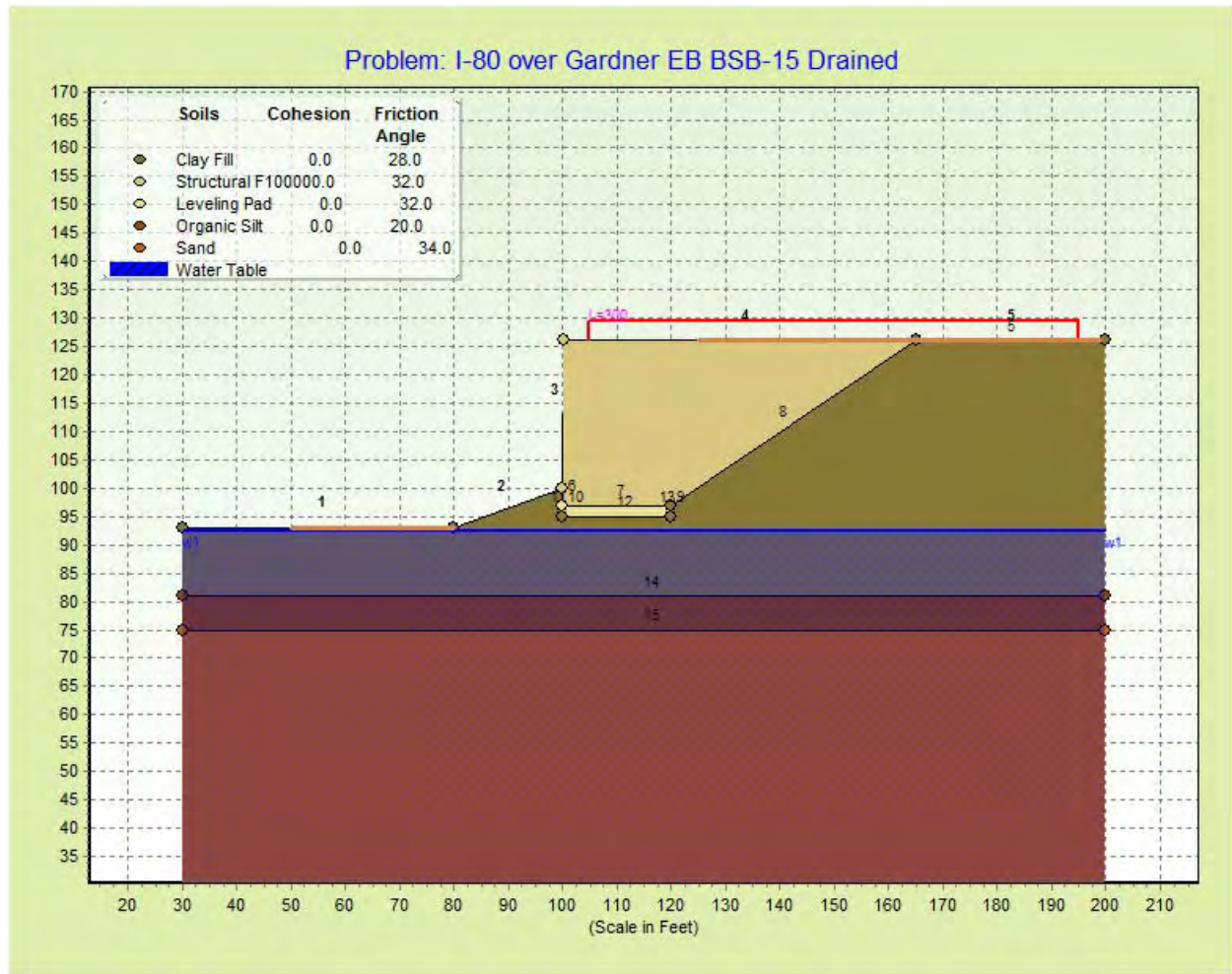
[illegible]



# STABL for Windows 3.0 - Results

## Name: I-80 over Gardner EB BSB-15 Drained

### ===== DATA SUMMARY =====



#### Profile Data

Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
1	30	93	80	93	1
2	80	93	100	100	1
3	100	100	100.1	126	2
4	100.1	126	165	126	2
5	165	126	200	126	1
6	100	100	100	97	2
7	100	97	120	97	3
8	120	97	165	126	1
9	120	97	120	95	1
10	100	97	100	95	3

## STABL for Windows 3.0 - Results

Name: I-80 over Gardner EB BSB-15 Drained

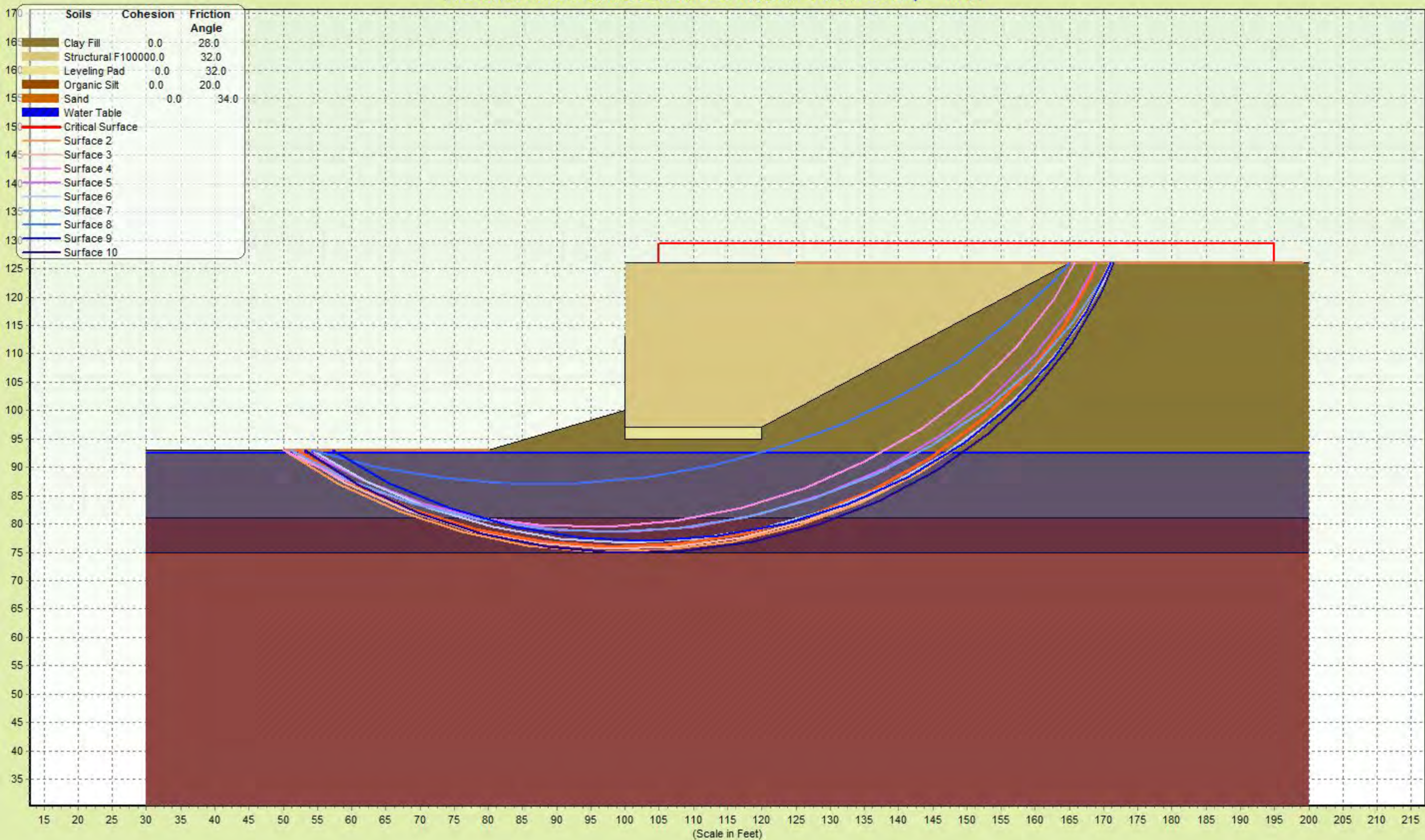
---

Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
11	100	95	100	97	3
12	100	95	120	95	1
13	120	95	120	97	1
14	30	81	200	81	4
15	30	75	200	75	5

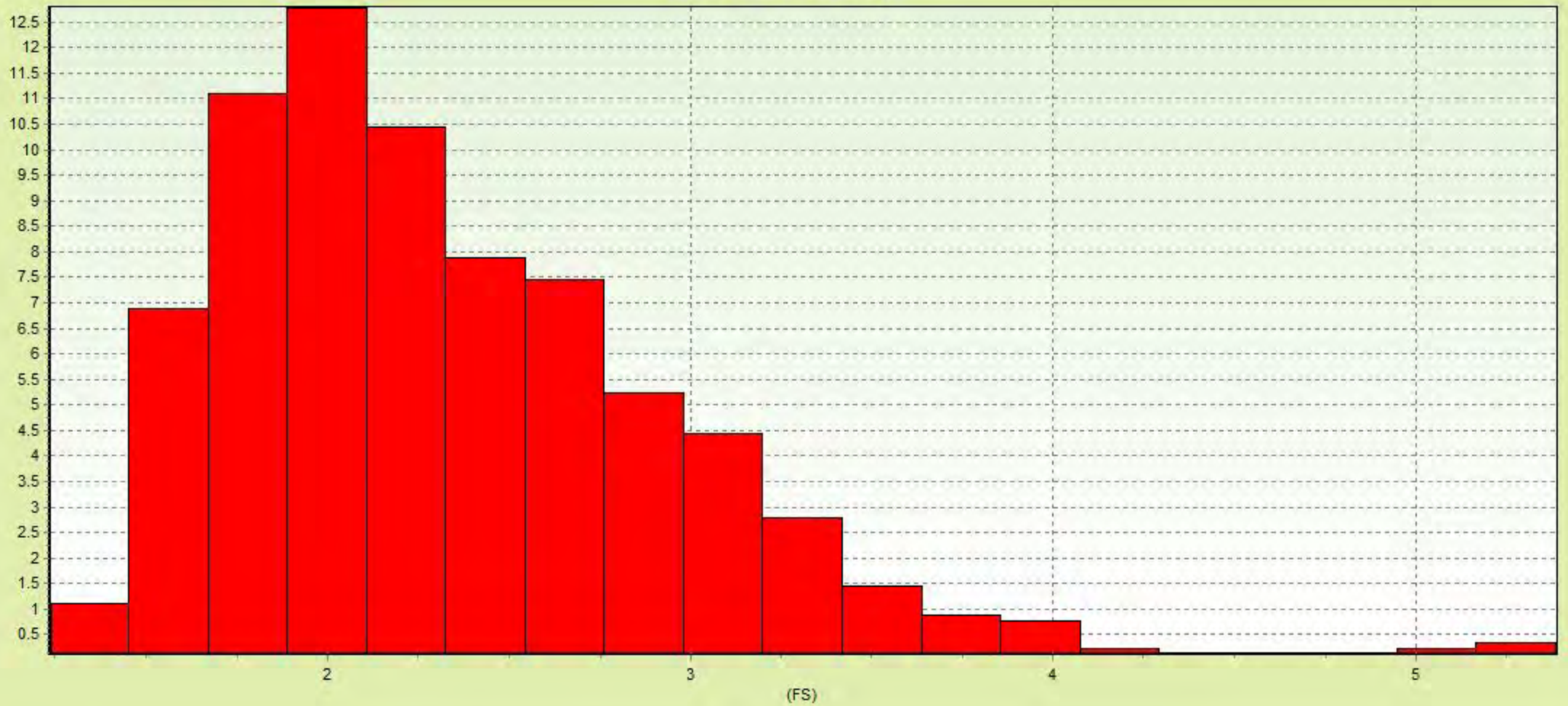
### Soil Properties

Soil Number	Wet Unit Weight	Saturated Unit Weight	Cohesive Intercept	Friction Angle	Ru	Pressure Head	Water Table	Soil Name
1	120	125	0	28	0	0	1	Clay Fill
2	120	125	100000	32	0	0	1	Structural Fill
3	120	125	0	32	0	0	1	Leveling Pad
4	100	110	0	20	0	0	1	Organic Silty
5	130	132	0	34	0	0	1	Sand

Problem: I-80 over Gardner EB BSB-15 Drained - FS Min- Bishop = 1.371



### Distribution of Factors of Safety

[illegible]

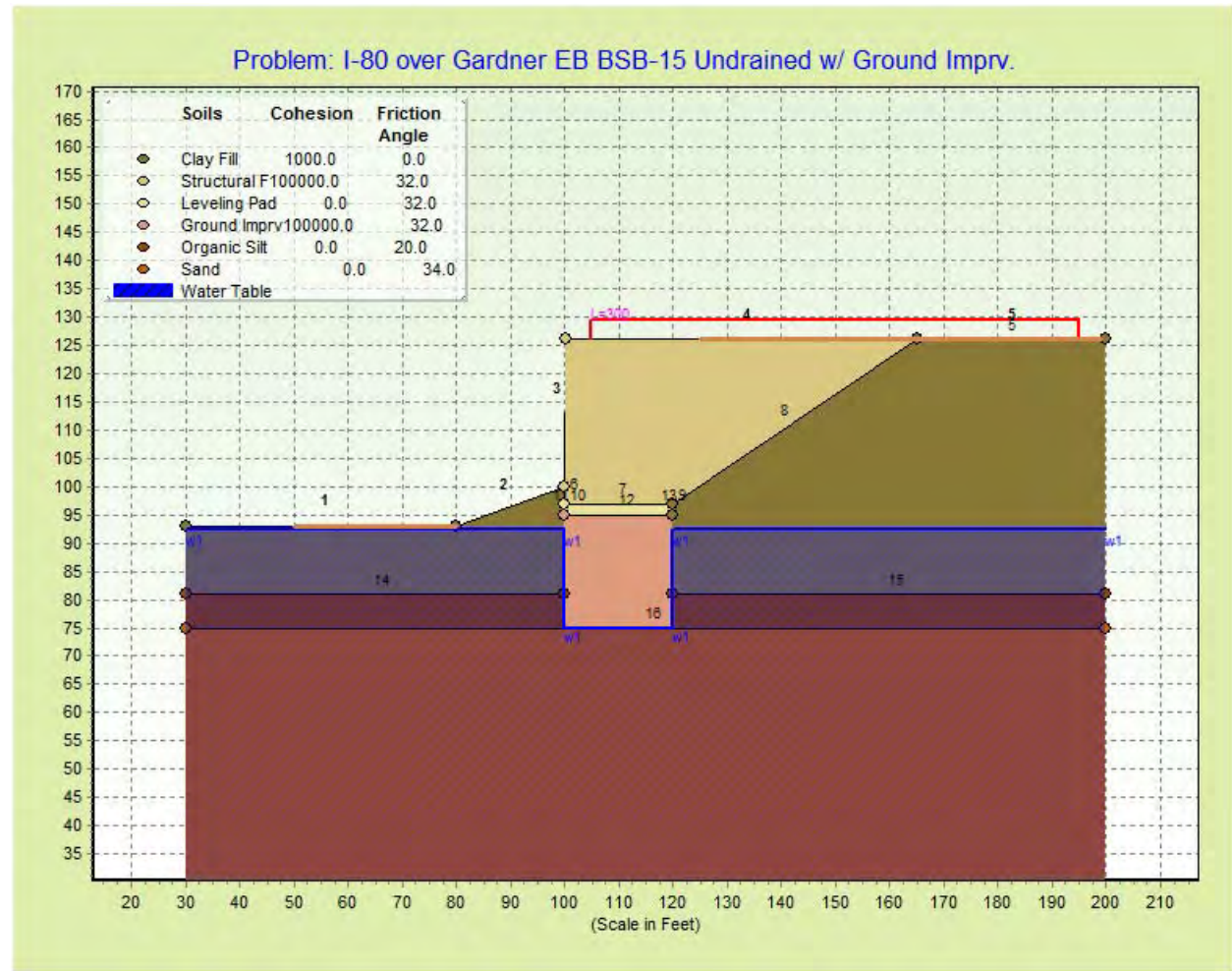


# STABL for Windows 3.0 - Results

Name: I-80 over Gardner EB BSB-15 Undrained w/

Ground Imprv.

## ===== DATA SUMMARY =====



### Profile Data

Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
1	30	93	80	93	1
2	80	93	100	100	1
3	100	100	100.1	126	2
4	100.1	126	165	126	2
5	165	126	200	126	1
6	100	100	100	97	2
7	100	97	120	97	3
8	120	97	165	126	1
9	120	97	120	95	1
10	100	97	100	95	3

**STABL for Windows 3.0 - Results****Name: I-80 over Gardner EB BSB-15 Undrained w/****Ground Imprv.**

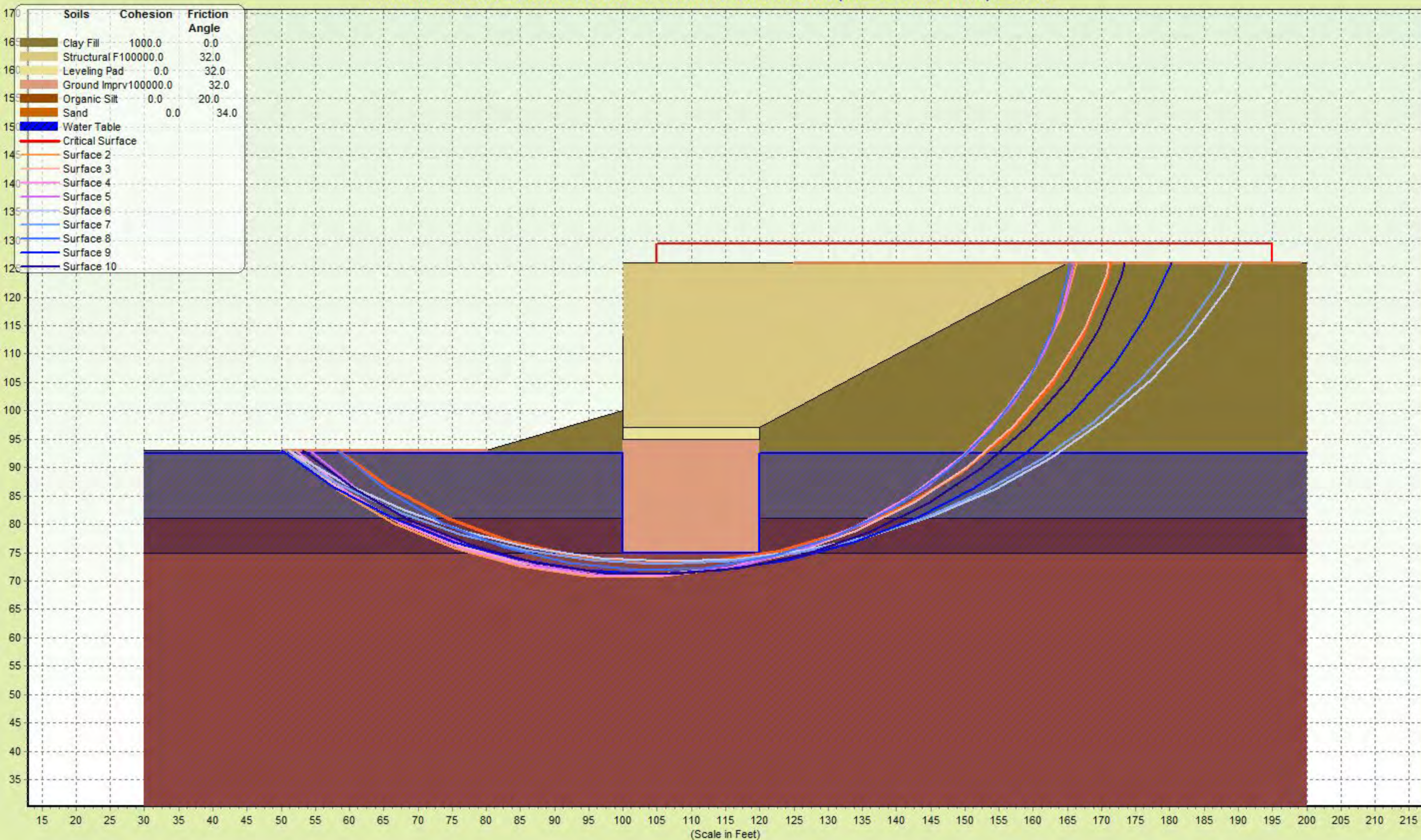
---

Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
11	100	95	100	97	3
12	100	95	120	95	6
13	120	95	120	97	1
14	30	81	100	81	4
15	120	81	200	81	4
16	30	75	200	75	5

**Soil Properties**

Soil Number	Wet Unit Weight	Saturated Unit Weight	Cohesive Intercept	Friction Angle	Ru	Pressure Head	Water Table	Soil Name
1	120	125	1000	0	0	0	1	Clay Fill
2	120	125	100000	32	0	0	1	Structural Fill
3	120	125	0	32	0	0	1	Leveling Pad
4	100	110	0	20	0	0	1	Organic Silty
5	130	132	0	34	0	0	1	Sand
6	125	130	100000	32	0	0	1	Ground Imprv.

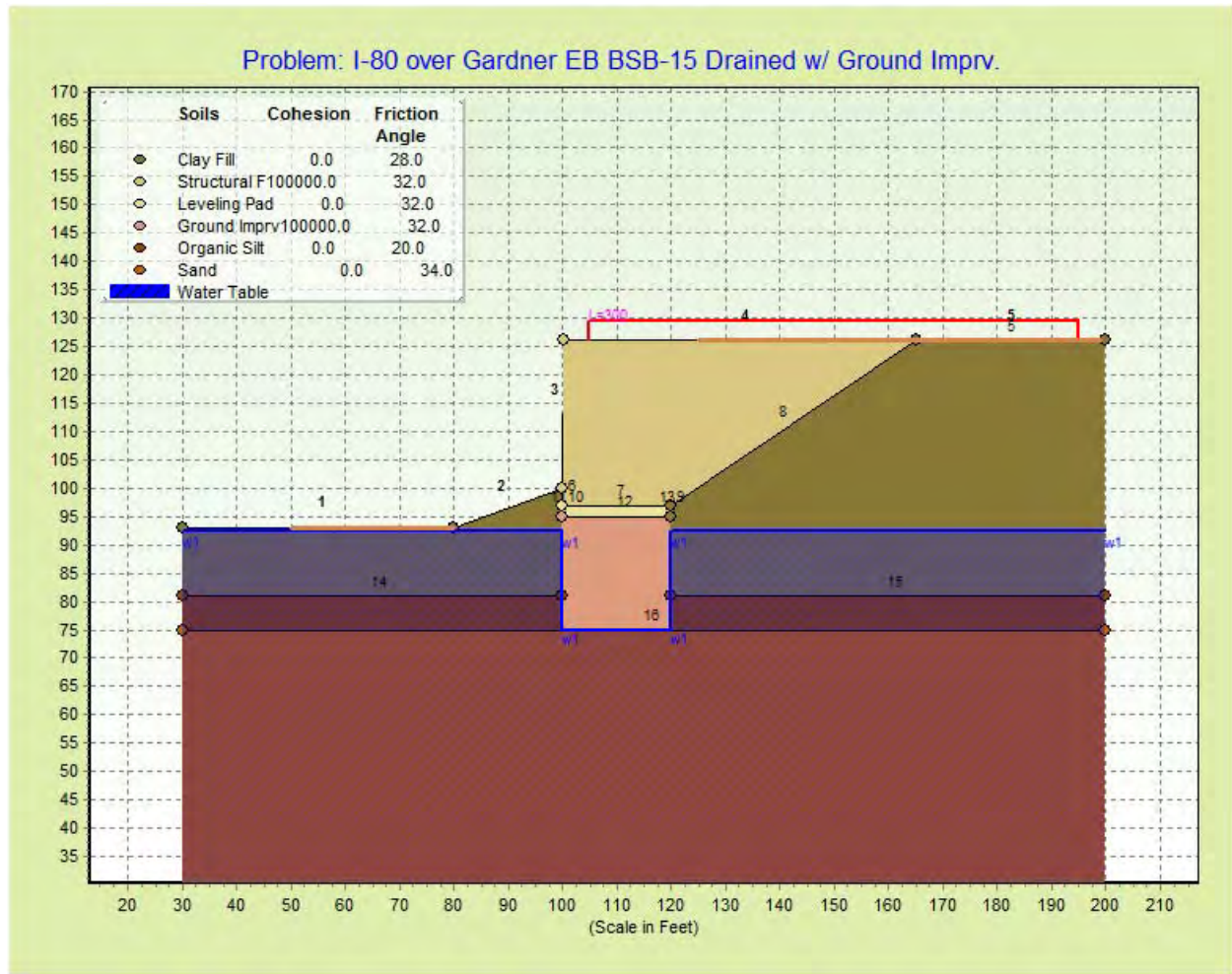
# Problem: I-80 over Gardner EB BSB-15 Undrained w/ Ground Imprv. - FS Min- Bishop = 2.007



## Distribution of Factors of Safety

[illegible]

===== **DATA SUMMARY** =====



**Profile Data**

Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
1	30	93	80	93	1
2	80	93	100	100	1
3	100	100	100.1	126	2
4	100.1	126	165	126	2
5	165	126	200	126	1
6	100	100	100	97	2
7	100	97	120	97	3
8	120	97	165	126	1
9	120	97	120	95	1
10	100	97	100	95	3

**STABL for Windows 3.0 - Results****Name: I-80 over Gardner EB BSB-15 Drained w/****Ground Imprv.**

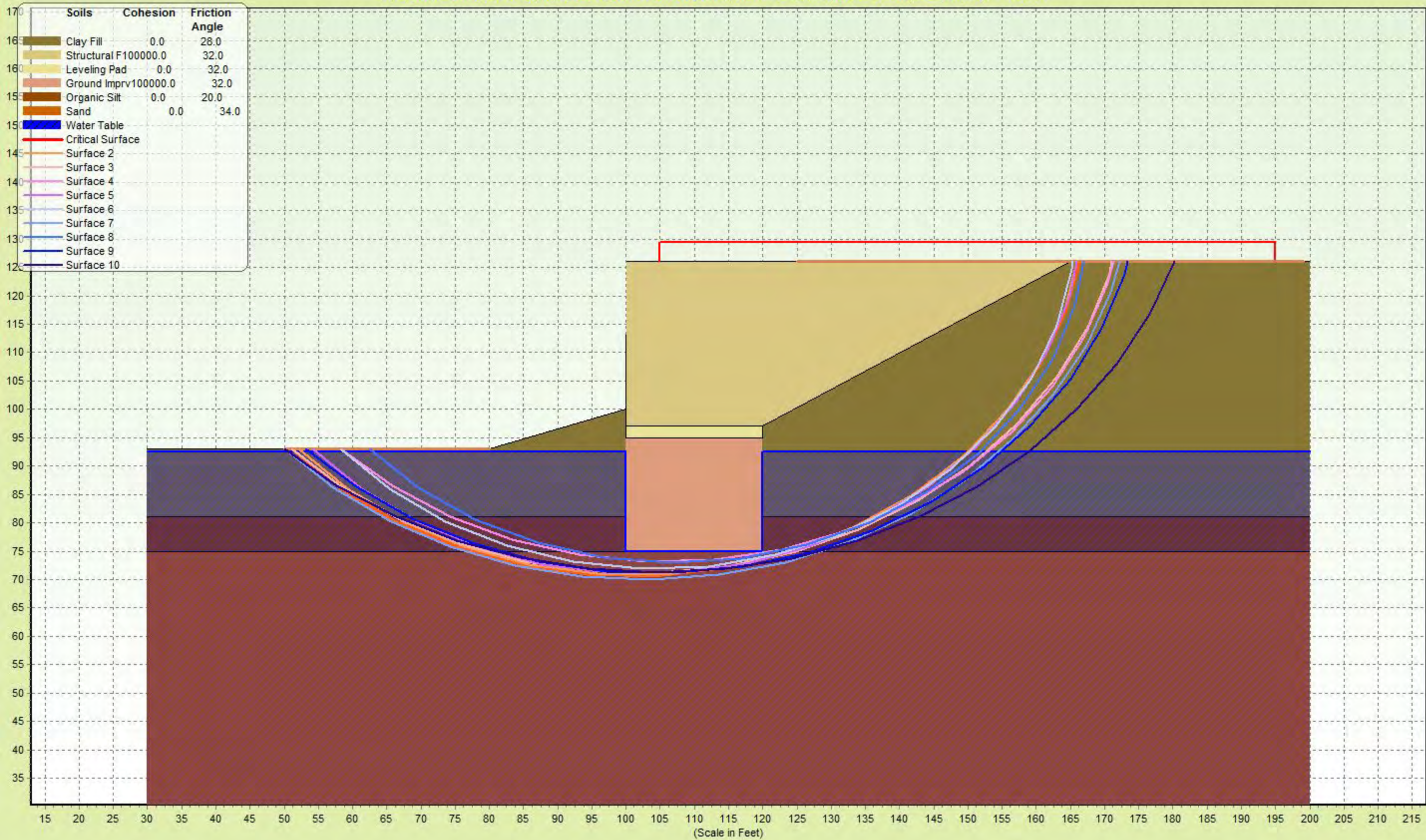
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Segment Number	Left Extreme X	Left Extreme Y	Right Extreme X	Right Extreme Y	Soil Under Segment
11	100	95	100	97	3
12	100	95	120	95	6
13	120	95	120	97	1
14	30	81	100	81	4
15	120	81	200	81	4
16	30	75	200	75	5

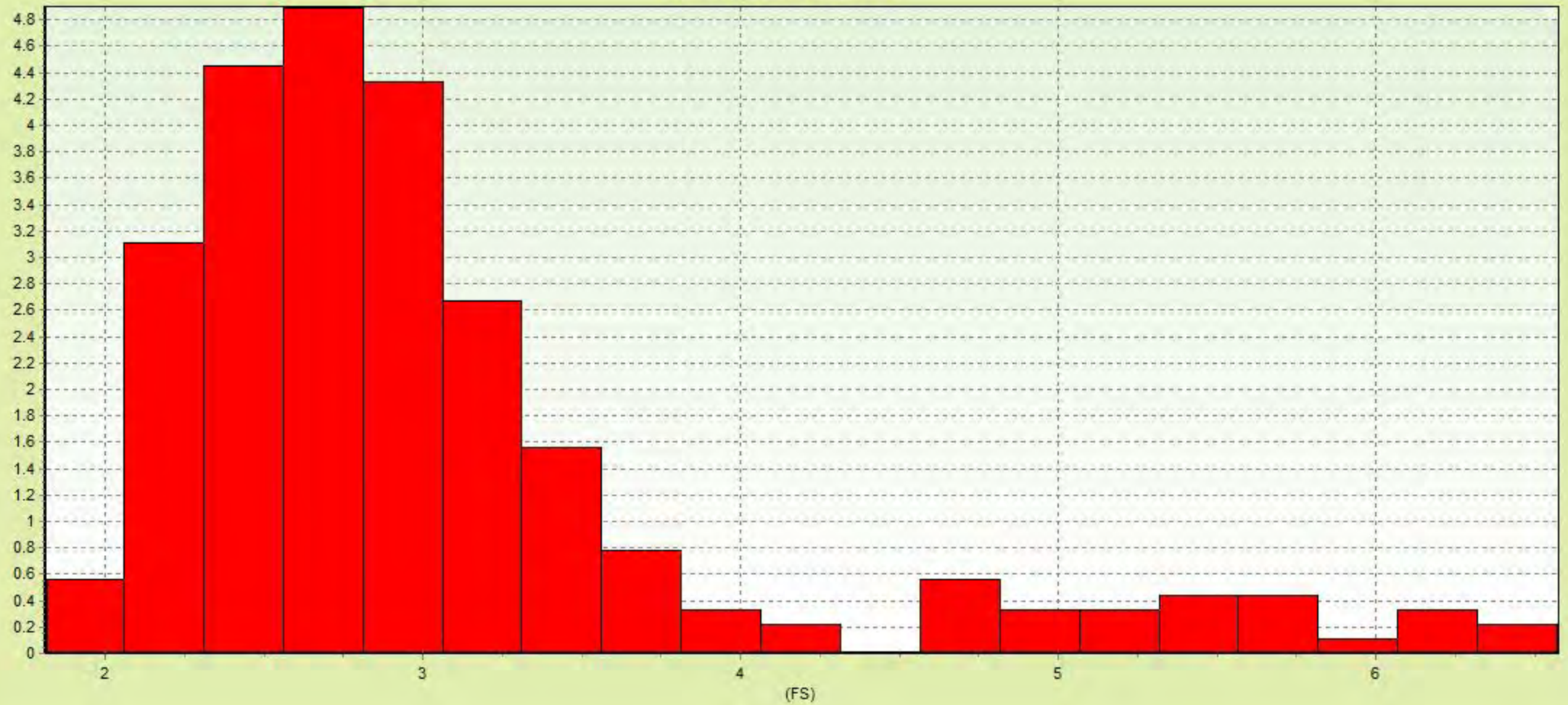
**Soil Properties**

Soil Number	Wet Unit Weight	Saturated Unit Weight	Cohesive Intercept	Friction Angle	Ru	Pressure Head	Water Table	Soil Name
1	120	125	0	28	0	0	1	Clay Fill
2	120	125	100000	32	0	0	1	Structural Fill
3	120	125	0	32	0	0	1	Leveling Pad
4	100	110	0	20	0	0	1	Organic Silty
5	130	132	0	34	0	0	1	Sand
6	125	130	100000	32	0	0	1	Ground Imprv.

Problem: I-80 over Gardner EB BSB-15 Drained w/ Ground Imprv. - FS Min- Bishop = 2.011

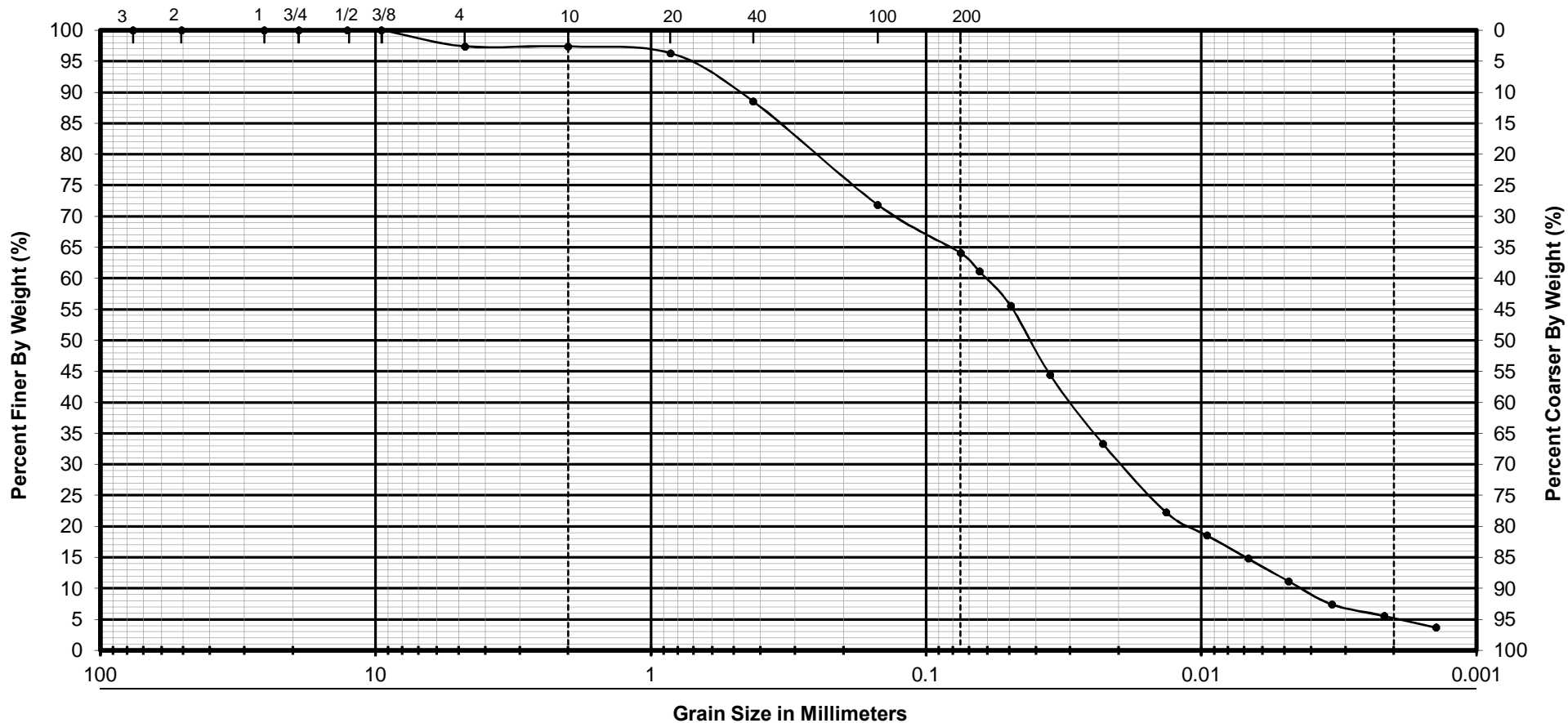


### Distribution of Factors of Safety


[illegible]

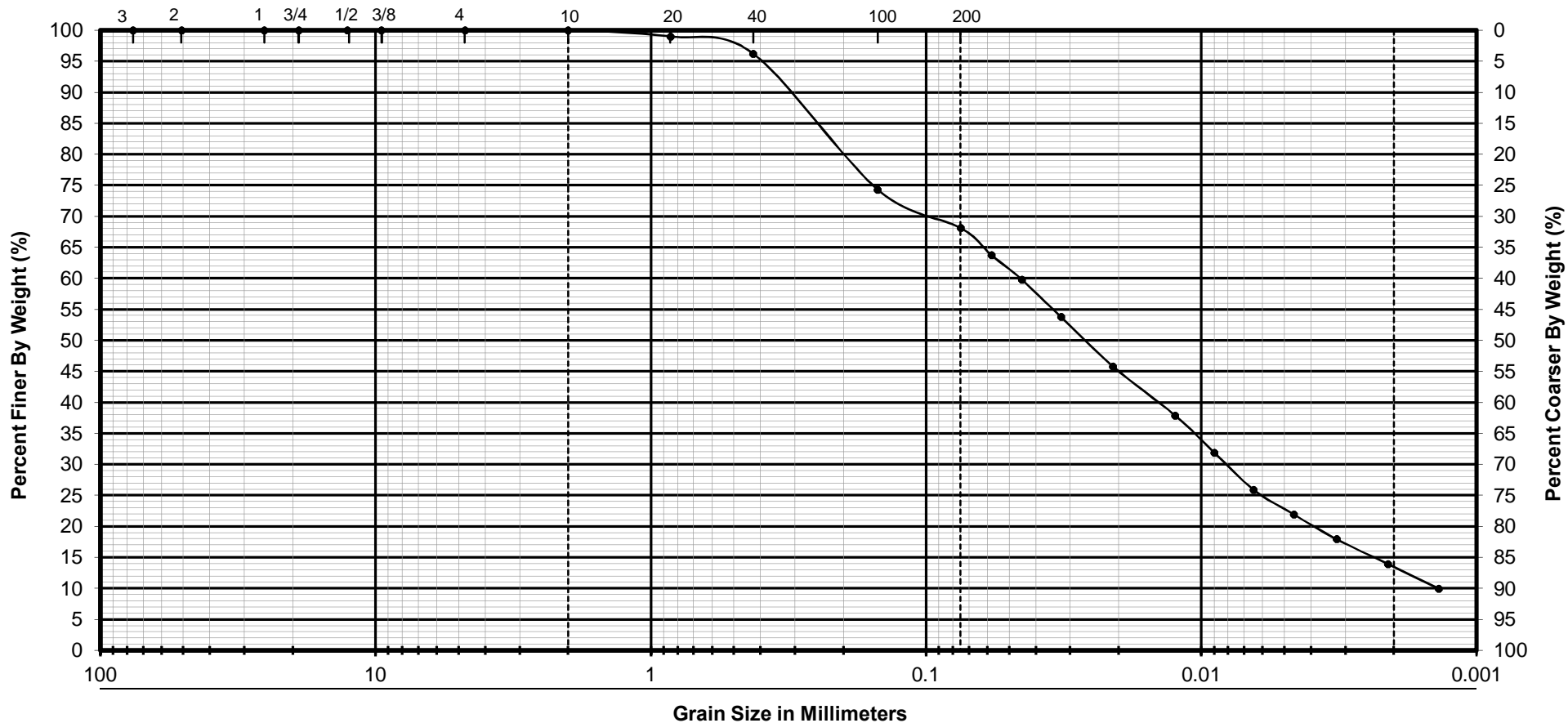
**APPENDIX G**

**LAB TEST RESULTS**




GRAVEL	SAND		SILT	CLAY
	COARSE	FINE		

Boring No.	BSB-15	CLASSIFICATION	PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	17	<b>ORGANIC SILTY LOAM</b> <b>A-7</b> <b>black</b> Group Index      9 % Gravel        2.6 % Sand            33.3 % Silt             58.5 % Clay            5.6	<b>I-80 Phase II</b> <b>Will County, Illinois</b>   <b>Geo Services, Inc.</b> 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
Depth	48.5'-50.0'		
Liquid Limit	62		
Plastic Limit	51		
Plasticity Index	11		
Test By	MT		
Date	6/9/14		
Reviewed By	RR		
Job No	13125		



GRAVEL	SAND		SILT	CLAY
	COARSE	FINE		

Boring No.	BSB-16	CLASSIFICATION	PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	17	<b>SILTY LOAM</b> <b>A-6</b> <b>dark brown</b> Group Index      8 % Gravel        0.0 % Sand           31.9 % Silt            54.2 % Clay           13.9	<b>I-80 Phase II</b> <b>Will County, Illinois</b>   <b>Geo Services, Inc.</b> 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
Depth	48.5'-50.0'		
Liquid Limit	37		
Plastic Limit	23		
Plasticity Index	14		
Test By	MT		
Date	6/10/14		
Reviewed By	RR		
Job No	13125		



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 I-80 Reconstruction (Near Term Phase 2)  
Location Various  
County Will  
Sample Type Drilled Bedrock Core Sample

Date 11/7/13  
Job No. 13125  
Tested By: RWC

Sample No.	Depth (ft)	Length (in)	Diameter (in)	Weight (g)	Load (lbs)	Area (in <sup>2</sup> )	Unit Weight (lbs ft <sup>3</sup> )	Compressive Strength (tsf) (psi)	
BSB-01A Run 1	68.1	4.079	2.049	592.2	43490	3.30	167.7	950	13189
BSB-01A Run 3	89.0	4.074	2.047	575.8	38610	3.29	163.6	845	11738
BSB-02 Run 1	66.7	4.167	2.050	601.0	20140	3.30	166.4	439	6102
BSB-03 Run 1	74.6	4.099	2.056	594.2	38840	3.32	166.3	843	11705
BSB-04 Run 1	67.7	4.091	2.054	586.9	28600	3.31	164.9	622	8635
BSB-04 Run 2	83.7	4.088	2.057	587.2	27530	3.32	164.6	596	8284
BSB-04 Run 3	85.8	3.994	2.061	564.6	17710	3.33	161.4	382	5311
BSB-05 Run 1	32.5	4.099	2.052	570.0	47700	3.31	160.1	1038	14424
BSB-06 Run 1	36.7	4.079	2.056	564.8	43260	3.32	158.8	938	13030
BSB-07 Run 1	19.8	4.121	2.050	592.2	49870	3.30	165.8	1088	15109
BSB-08 Run 1	27.8	4.129	2.070	588.5	56520	3.37	161.3	1209	16795
BSB-09 Run 1	25.4	4.077	2.047	499.7	12810	3.29	141.8	280	3892
BSB-10 Run 2	24.5	4.097	2.052	549.6	15470	3.31	154.5	337	4678
BSB-11 Run 1	25.0	4.094	2.074	539.0	20360	3.38	148.4	434	6027
BSB-12 Run 1	23.5	4.166	2.059	600.5	25930	3.33	164.8	561	7788
BSB-13 Run 1	25.6	4.099	2.066	561.2	30860	3.35	155.5	663	9205
BSB-14 Run 1	29.7	4.111	2.051	588.7	66650	3.30	165.0	1452	20173
BSB-15 Run 1	64.5	4.085	2.051	571.5	61120	3.30	161.2	1332	18500
BSB-16 Run 1	62.1	4.107	2.055	607.8	40360	3.32	169.9	876	12168



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

Organic Matter in Soils by Wet Combustion  
AASHTO T 194

Project Name I-80 Phase II

Date 6/11/15

Location Will County, Illinois

Job No 13125

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Sample Location	BSB-53							
Sample No	4							
Depth	42.5'-50.0'							
Total Organic Matter %	6.7							

Comments: -

Performed by: JE