Structure Geotechnical Report

US 20 Bypass over St. Charles Street

Structure No. 045-0006
IDOT Job No. D-91-453-20
Kane and Cook Counties
Elgin, Illinois

For:

Illinois Department of Transportation
District 1 / Region 1

Submitted By:

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11. Abstract

This Structure Geotechnical Report was performed as part of the State of Illinois Department of Transportation (IDOT) Phase II Study for improvements on the segment of US Route 20 from west of Randall Road to east of Shales Parkway. The overall project is 6.9 miles long including a 1.3-mile omission area near McClean Blvd interchange. The overall project scope includes roadway and bridge widening and roadway improvements. To complete this work, some bridge replacements will be required, while other bridges may require new bridge decks, repairs, superstructures, retaining walls, as well as increasing the height of existing retaining wall structures. Other work includes lighting improvements and noise abatement walls.

Gannett Fleming Inc (GF) is contracted to prepare this report that includes recommendations for the replacement of the three-span bridge that carries US-20 over St. Charles Street. The existing Structure Number for the bridge is 045-0006. Since the proposed structure will reuse portions of the existing structure, no new structure number is provided. The bridge carries US-20 over St. Charles Street and is at station 417+77.66 in the city of Elgin, Kane County, Illinois (see Location Map in Appendix A for reference). The original structure was constructed in 1960 as a three-span, non-composite steel beam bridge, supported on concrete stub abutments and concrete multiple column-bent piers, and founded on spread footings. The abutments and multiple column-bent piers were constructed in the original 1959 contract and widened in 1986. The overall structure is 160.2 feet from back-to-back abutments on a 0.33-degree skew.

The subsurface exploration consisted of six (6) structure borings designated 45-0006-BSB-01 through 45-0006-BSB-06. The borings were drilled by Wang Testing Services between October 18 and December 03, 2021. The borings were drilled at elevations between El. 732.36 and EL. 753.32 and were advanced to depths of 60 feet below ground surface elevation (bgs), and 90 feet bgs for 45-0006-BSB-04.

12. Path to archived file https://gfnet.sharepoint.com/:b:/r/sites/068096/GF/5_Working/02_Studies/SGRs/(Geo)/3_US%2020%20Bypass%20over%20St%20Charles%20St/SGR_SN045-0006.pdf?csf=1&web=1&e=ndUrKe

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1. PROJECT DESCRIPTION AND SCOPE

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This bridge has underwent widening and has had improvements in the past. In 1979, a new jersey type barrier was installed, separating the east and west bound traffic. In 1986, the structure was widened on both sides of the structure and the existing deck was resurfaced with a concrete overlay. In 2011, preformed joint seals were replaced at the abutments and deck slab repairs were performed. The abutment wingwalls are 11′-6″ in length and ± seven feet in height and are parallel reinforced concrete retaining walls, constructed as part of the 1986 widening. The spill-through slopes are protected by concrete slope walls that are four-inches thick at the abutments. They extend five feet beyond the north and south edges of the deck. See Appendix B for the Existing Plans and Appendix C for the proposed preliminary Type, Size and Location (TSL) plans. The preliminary footing elevations of the proposed structure are presented in Table 1.0-2.

Table 1.0-2 Preliminary Footing Elevations

Substructure	Bottom of Footing
West Abutment	745.04
West Pier	725.20
East Pier	725.20
East Abutment	745.22

The scope of this Structure Geotechnical Report (SGR) is for the replacement and widening of the US-20 bypass over St. Charles Street. The report follows the format presented in the Geotechnical Manual for Illinois Department of Transportation revised December 4, 2020. The report contains the geological setting, results of subsurface exploration, the geotechnical recommendations, foundation recommendations, and construction considerations for the bridge and wingwall structures for the proposed alternative replacement.

2. GEOLOGICAL SETTING

The project area is in the northeastern region of Illinois, within the city limits of Elgin, in Kane and Cook Counties. The following synopsis of geologic data is to validate the present subsurface exploration results, especially regarding the factors that may influence the design and construction of the proposed structure. In analyzing the regional geology, Gannett Fleming considered the area surrounding the project site in Ogle County (see Appendix D: Regional Geology Map).

2.1. Physiography

The surrounding area of the bridge is urban and is primarily bounded by residences and businesses. The site topography is flat with elevations ranging between 730.0 to 750.0 feet.

The bridge is in the Wheaton Morainal Country physiographic division of the Great Lake Section of the Central Lowland Province of Illinois. The Wheaton Morainal Country Natural Division consists of hilly topography, broad parallel morainic ridges, lakes, and swamps. The moraine soils are low plasticity glacial tills containing varying percentages of sand, gravel, cobbles and boulders, and zones of water-sorted sands

2.2. Surficial Cover

The project area was shaped during the Wisconsin-age glaciation, and it is underlain by less than 25 to 100 feet of overburden (Curry, 2007). The surficial cover belongs to the Henry Formation's proglacial outwash, consisting of stratified sand and gravel or sand with lenses of silt and clay or diamicton (till). Significant lateral and vertical variation are present in grain size, sorting, bedding, and structure of the deposits within the formation (ISGS).

2.3. Bedrock

The bedrock consists of upper Ordovician-age bedrock known as the Maquoketa Formation or Group. The Maquoketa Group includes the Scales Shale (0-135 ft), Fort Atkinson Limestone (0-60 ft), Brainard Shale (0-100 ft), and Neda Formation (0-15 ft) in northern Illinois (Kolata, 2005).

Bedrock was not encountered in the borings at this bridge; however, Dolostone was encountered in the nearby structure borings to the west, for the US 20 bypass over Fox River. No faults are known within a thirty miles radius of the site (Nelson, 1995).

The subsurface exploration results corroborate the documented geologic nature of the area. The material encountered in the borings was silty clay with sand and cobble lenses overlying sand and gravel.

3. FIELD EXPLORATION

3.1. Subsurface Exploration and Testing

The subsurface exploration consisted of six (6) structure borings designated 45-0006-BSB-01 through 45-0006-BSB-06. The borings were drilled by Wang Testing Services between October 18 and December 03, 2021. The borings were drilled at elevations between El. 732.36 and EL 753.32 and were advanced to depths of sixty feet below ground surface elevation (bgs), and ninety feet bgs for 45-0006-BSB-04. The as-drilled boring locations are shown in the Boring Location Plan (Appendix E) and the boring logs are presented in Appendix G.

A D-50T rig with an 80% efficiency hammer, equipped with a 2.25-inch inner diameter hollow stem auger (HSA), was used to advance boring 45-0006-BSB-03 and a 3.25-inch inner diameter HSA was used to advance borings 45-0006-BSB-01, 45-0006-BSB-02, 45-0006-BSB-04, 45-0006-BSB-05, and 45-0006-BSB-06. The borings were sampled at 2.5-foot intervals for the upper 30.0 feet bgs and at 5.0-foot intervals from greater than thirty feet to termination. No bedrock cores were taken during this exploration. The borings were advanced to depths based on the minimum depth required to gain capacity for various foundation types under consideration for the structure. Soil samples collected from each sampling interval were placed in sealed jars and transported to the laboratory for further examination and testing.

Field boring logs prepared and maintained by Wang Testing Services included lithological descriptions, visual – manual soil classifications, results of Rimac spring tests, and results of standard penetration tests (SPT), when using the automatic hammer, were recorded as blows per six inches of penetration and are on the boring logs in Appendix G.

Groundwater levels were measured while drilling and at completion of each boring. A long-term groundwater monitoring program was not within the scope of this project.

All samples were tested in the laboratory for moisture content (AASHTO T265).

3.2. Subsurface Conditions

The existing embankments are vegetated. Boring 45-0006-BSB-01 was advanced in the west-bound lane of US-20, near the north side of the existing west abutment. 45-0006-BSB-01 encountered three inches of asphalt overlying eight inches of concrete. Also in the westbound lane, but on the east side of the structure, boring 45-0006-BSB-02 encountered three inches of asphalt overlying nine inches of concrete. In the eastbound lane, to the west of the southern portion of west abutment, boring 45-0006-BSB-03 encountered two inches of asphalt, nine inches of concrete, nine inches of gravel base. Also in the eastbound lane, to the east of the

bridge, boring 45-006-BSB-06 encountered three inches of asphalt, 9.5 inches of concrete and 2.5 inches of base course. This pavement overlies damp, stiff to very stiff, brown, and gray silty clay loam with trace to little gravel (fill material), with the exception of a minor deposit of sand to sandy gravel in 45-0006-BSB-01. This silty clay fill overlies damp, medium stiff to very stiff, naturally deposited, silty clay with trace gravel followed by damp to saturated, medium dense to dense sand, sandy gravel to gravel with a minor deposit of clay loam in 45-0006-BSB-01. All borings terminated in damp, medium stiff to hard, brown silty clay loam to silty clay with trace gravel. The boring location plan is included in Appendix E. Detailed descriptions of the soil conditions encountered during the subsurface explorations are presented in the Subsurface Data Profile Plot in Appendix F and in the attached Boring Logs in Appendix G. Please note that strata contact lines represent approximate boundaries between soil types. The actual transition between soil types in the field may be gradual in horizontal and vertical directions.

The subsurface conditions can be broken into four strata. These strata are consistent across the site, with variation occurring within the fill, minor deposits, or seams, as well as buried topsoil in 45-006-BSB-06. A brief description of each major stratum are as follows:

1) *Stiff to very Stiff Silty Clay Loam to Silty Clay (Embankment Fill)*
   The fill material encountered onsite is embankment fill for US-20, consisting of damp, brown to gray, medium stiff to hard, silty clay to silty clay loam with trace to some gravel. This fill material is present between EL 755 and 737. The average moisture content of this fill is 15% and the average N-value is eleven bpf.

2) *Medium Stiff to Stiff Silty Clay*
   The fill is underlain by damp to saturated, brown, or black to brown, medium stiff to very stiff silty clay with trace gravel, between EL 741 and 730. The average moisture content is 21% and the average N-value is thirteen bpf.

3) *Dense to Very Dense Fine to Coarse Sand, Sandy Loam to Sandy Gravel*
   Fine sand to sandy gravel is consistently encountered across the site below the silty clay and silt. This dense to very dense fine sand to sandy gravel is anywhere from damp to saturated and brown. The average moisture content is 6% and the average N-value is twenty-eight bpf.

4) Stiff to Hard Silty Clay Loam

All borings terminated in damp, brown to gray, stiff to hard silty clay loam with trace gravel, below EL 715.00. The average moisture content is 14% and the average N-value is twenty bpf.

3.3. Groundwater

Groundwater was encountered while drilling between elevations of EL 698.32 and 726.28. Table 3.3-1 summarizes the water elevations during exploration. This elevation should not be inferred to indicate static groundwater as they were generally collected within a 24-hour window during drilling and abandoning the hole. The borings were taken in late fall and early winter 10/2021 to 12/2021. A groundwater monitoring program was beyond the scope of this project.

Table 3.3-1 Groundwater Readings During the Exploration

Boring	Depth (EL) While Drilling	Depth (EL) At Completion
45-0005-BSB-01	36.50 (716.82)	55.00 (698.32)
45-0005-BSB-02	38.50 (713.72)	48.50 (703.72)
45-0005-BSB-03	38.50 (714.55)	48.00 (705.05)
45-0005-BSB-04	5.50 (726.86)	NA
45-0005-BSB-05	17.50 (715.0)	NA
45-0005-BSB-06	38.00 (714.04)	55.00 (697.04)

4. GEOTECHNICAL EVALUATIONS AND RECOMMENDATIONS

4.1. Settlement

The predominant subsurface soil consists of stiff to hard silty clay fill and natural deposits, overlying dense to very dense sand to sandy gravel. The bridge will be slightly widened to the north and south of the bridge. New embankment fills in these areas are expected to be very limited. Driven Piles are anticipated to support abutments and shallow foundations, bearing on soil, will support the piers. Earthwork and new embankment are minimal, therefore, induced settlement is anticipated to be less than one inch. Settlement induced by the structure loading on the spread footing is discussed in Section 5.1.

4.2. Slope Stability

No significant new embankment is proposed. The new abutments will be constructed behind the existing abutments and, therefore, the slope will not change significantly, and no slope stability analysis was performed for this report.

4.3. Scour

The bridge does not cross a body of water. There is no potential for scour.

4.4. Seismic Considerations

The project site is evaluated using IDOT's All Geotechnical User Memos (AGMU) 09.1 *LRFD Seismic Soil Site Class Definition* (IDOT, 2009) for a seismic event with seven percent probability of exceedance in 75 years, which is the 1000-year return period (LRFD), and a seismic event with ten percent probability of exceedance in 50 years, which is an approximately 500-year return period (LFD). Four seismic design parameters are reported including: Seismic Performance Zone (SPZ), Design Spectral Acceleration at 1.0 second (SD1), Design Spectral Acceleration at 0.2 seconds (SDS), and the Soil Site Class.

Based on the encountered subsurface data, the soil within the top one hundred feet has a weighted average of SPT blow counts per foot (N) of twenty, a weighted average SPT N-value within cohesionless soil layer of 26, and a weighted average undrained shear strength (S_u) of 2.53 ksf. According to IDOT "Seismic Site Class" spreadsheet, the project site is classified as Seismic Site Class D (IDOT, 2009 and IDOT, 2010).

For 1000-year design response spectrum (LRFD), the project site has a horizontal Response Spectral Acceleration of 0.035g at a period of 1.0 second and 5% critical dampening (S_1); The site also has a horizontal Response Spectral Acceleration of 0.093g at a period of 0.2 seconds and 5% critical dampening (Ss). For 500-year design response spectrum (LRFD), the project site has a horizontal Response Spectral Acceleration of 0.023g at a period of 1.0 second and

5% critical dampening (S_1); The site also has a horizontal Response Spectral Acceleration of 0.043g at a period of 0.2 seconds and 5% critical dampening (Ss). For Site class D, site factors F_a = 1.6 and F_v = 2.4 were estimated for S_1<0.1. The following table shows recommended seismic design data in accordance with the *AASHTO LRFD Bridge Design Specifications*, (AASHTO, 2020).

Table 4.4-1: Seismic Design Parameters

Seismic Design Parameters	1000-yr (LRFD)	500-yr (LFD)
Soil Site Class	D	
Spectral Acceleration at 1 sec. (S_{D1})	0.084g	0.055g
Design Spectral Acceleration at 0.2 sec. (S_{Ds})	0.149g	0.069g
Seismic Performance Zone (SPZ)	1	1

According to IDOT's *Geotechnical Manual* (IDOT, 2020), SPZ 1 requires no special analysis or design details, beyond meeting a minimum bearing seat length requirement and a minimum 20% superstructure-to-substructure load transfer requirement.

Liquefaction is not expected, since the site is in SPZ 1, as per IDOT's *Bridge Manual* (IDOT, 2012*)* and the soils are not liquefiable.

5. FOUNDATION RECOMMENDATIONS

The preliminary TSL drawings indicate that the bridge abutments will be supported on driven piles and the bridge piers will be supported by spread footings bearing on soil. This section includes the recommendations for supporting piers on spread footings, with a footing width ranging from four to ten-foot, and the abutments supported on metal shell piles of 12-, 14-, and 16-inches in diameter.

5.1. Spread Footings

Spread footings are proposed to support both piers. The estimated elevation for each boring is presented in the Table 5.1-1.

Table 5.1-1 Elevation of Suitable Bearing Material for Spread Footing (Piers)

Sub-structure	Borings	Bottom of Footing Elevation	Subgrade Description	EL of Suitable Bearing Material	Estimated Depth of Undercut (ft.)
Pier 1	0006-BSB-04	725.20	Sandy Gravel to Gravel	723.60	±1.6
Pier 2	0006-BSB-05	725.20	Sandy Gravel to Gravel	725.80	±0.0

Based on the subsurface soil conditions, we recommend that the spread footings be supported on the natural sandy gravel soils, beneath the existing fill. This will require minor over-excavation at Pier 1. The over excavated material should be replaced with structural fill. Table 5.1-1 presents the associated borings used for the design, the proposed bottom of footing elevation, the description of the natural soil that can be used for bearing, the elevation of the natural stratum, and the estimated amount of undercut. The actual extent of undercut may vary based on the actual conditions encountered in the field, at the time of construction, by the geotechnical engineer.

The Strength Limit Bearing Resistance was calculated according to AASHTO LRFD (AASHTO, 2020) and a resistance factor of 0.45 was used to calculate the factored bearing resistance at the strength limit, according to the LRFD guidelines, based on the underlying cohesive material.

The bearing resistance at the service limit state is also calculated by limiting the primary (consolidation) settlement to one inch. The load required to induce the settlement was back calculated and used to determine the service bearing pressure. It should also be noted, since

the foundation soil is medium dense sand for both pier foundations, the bearing resistance at service state limit will not control the design.

According to the boring logs, the water table is above the proposed bottom of footing elevation and is assumed to be on the bottom of footing elevation for the bearing resistance calculation. The bearing resistance at the service limit state and strength limit state are calculated via various footing widths, ranging from four to ten feet and are summarized in Table 5.1-2 below.

Table 5.1-2 Summary of bearing resistance for Spread Footing at Piers

Footing Width ft.	Service Limit State Ksf	Strength Limit State ksf
4	66.25	7.67
5	52.50	7.70
6	43.75	7.73
7	38.13	7.76
8	33.13	7.79
9	30.00	7.82
10	26.88	7.85

Since the spread footing is designed to be embedded nine feet below grade, the sliding resistance is estimated to be high and will not control the design. This is due to the relatively high passive resistance, according to according to LRFD guidelines.

Should structural fill be utilized to support the spread footings, the fill should be extended at least six inches beyond the proposed footing limits and one foot, horizontally, for each foot of fill placed, below the base of the footing. The new fill should also consist of inorganic material, free of debris, placed in maximum nine-inch, loose, lifts, and compacted to a minimum of 98% of the maximum dry density, obtained in accordance with ASTM Standard D-1557, Modified Proctor Method. If CA-1 or CA-7 grade crushed stone materials are used, they can be compacted by tamping with a backhoe bucket. The moisture content of the fill should be controlled within two percent of the optimum moisture content.

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

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

5.2. Driven Piles

The driven pile was designed according to IDOT's *All Geotechnical Manual User* (AGMU) Memo 10.2 issued February 3, 2010 (IDOT, 2010). Based on the subsurface profile and loading of the bridge, metal shell piles and integral abutments are recommended for the foundation support of all bridge abutments. H-Piles are not recommended due to the inability to bear on bedrock, and since they may require undesirably long pile lengths (longer than fifty feet). The Integral Abutment Feasibility calculation is included in Appendix I.

Only high displacement piles (metal shell piles) are recommended for the pile foundation. Currently, the TSL does not show a pile diameter. Based on this analysis and loading, metal shell piles with 12-inch diameter with 0.25-inch-thick walls are acceptable on all structures. However, all standard sizes and their associated maximum Nominal Required Bearing resistance (R_N) are shown in the recommendations below.

The Maximum Factored Design Loads were provided by GF engineers and are presented in Table 5.2-1. The foundation elevations and associated borings used in the analysis are presented in Table 5.2-2. One foot embedment depth is assumed for all piles.

Table 5.2-1 Design Loads

Substructure	Max Factored Load per pile
West Abutment	163 kips
East Abutment	163 kips

Table 5.2-2 Foundation Elevations and Analysis Boring ID

Substructure	Bottom of Footing	Boring ID
West Abutment West Bound Lane	746.51	45-0006-BSB-01
West Abutment East Bound Lane	746.51	45-0006-BSB-03
East Abutment West Bound Lane	746.05	45-0006-BSB-02
East Abutment East Bound Lane	746.05	45-0006-BSB-06

The available Nominal Required Bearing resistance has been calculated and is presented in Table 5.2-3 as the maximum R_N. This value has been calculated using IDOT's *All Geotechnical Manual User* (AGMU) Memo 10.2 issued February 3, 2010.

Table 5.2-3 Maximum Nominal Required Bearing Resistance (R_N) for Shell Piles

Shell Pile	R_N (Kips)
Metal Shell 12"Φ w/.25" walls	392
Metal Shell 14"Φ w/.25" walls	459
Metal Shell 14"Φ w/.312" walls	570
Metal Shell 16"Φ w/.312" walls	654
Metal Shell 16"Φ w/.375" walls	782

Based on the analysis, as well as the presence of the hard till / dense sand / dense sandy gravel layer, the piles can be driven to the achieve the required structural load, and most of the piles can also be driven to achieve the R_N. The Maximum Factored Resistance Available (R_F) is the R_N multiplied by 0.55. The factored resistance for various length up to and including the Maximum Nominal Required Bearings are presented in Tables 5.2-4 and Table 5.1-5.

We recommend using conical tips on the proposed Metal Shell piles, since presence of cobbles are noted in the borings at the abutments. We recommend that a minimum of one test pile be performed at each substructure unit. At each location, 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 (R_N) indicated in the pile data information. The Pile Design Tables and Bearing Graphs are included as Appendix J.

Table 5.1-4 West Abutment Foundation Recommendations

Est. Pile Length	Metal Shell 12"Φ w/.25" walls		Metal Shell 14"Φ w/.25" walls		Metal Shell 14"Φ w/.312" walls		Metal Shell 16"Φ w/.312" walls		Metal Shell 16"Φ w/.375" walls	
	Factored Resistance Available (FRA)	Nominal Required Bearing Available (NRB)	Factored Resistance Available (FRA)	Nominal Required Bearing Available (NRB)	Factored Resistance Available (FRA)	Nominal Required Bearing Available (NRB)	Factored Resistance Available (FRA)	Nominal Required Bearing Available (NRB)	Factored Resistance Available (FRA)	Nominal Required Bearing Available (NRB)
(ft)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)
West Bound										
11	42	76	51	92	51	92	60	109	60	109
16	100	181	128	232	128	232	158	288	158	288
21	100	181	125	227	125	337	152	277	152	277
29	76	138	89	162	89	162	102	186	102	186
34	216	392	252	459	314	570	360	654	430	782
East Bound										
12	56	101	67	122	67	122	79	144	79	144
14	67	122	81	147	81	147	96	174	96	174
19	93	169	112	205	112	205	133	243	133	243
22	142	259	179	326	179	326	220	400	220	400
24	212	385	252	459	272	495	339	617	339	617
29	216	392			267	486	323	587	323	587
39					274	498	325	590	325	590
49					265	483	307	558	307	558

Note: * The estimated pile length includes one foot embedment depth within the pile cap.

Table 5.1-5 East Abutment Foundation Recommendations

Est. Pile Length	Metal Shell 12"Φ w/.25" walls		Metal Shell 14"Φ w/.25" walls		Metal Shell 14"Φ w/.312" walls		Metal Shell 16"Φ w/.312" walls		Metal Shell 16"Φ w/.375" walls	
	Factored Resistance Available (FRA)	Nominal Required Bearing Available (NRB)	Factored Resistance Available (FRA)	Nominal Required Bearing Available (NRB)	Factored Resistance Available (FRA)	Nominal Required Bearing Available (NRB)	Factored Resistance Available (FRA)	Nominal Required Bearing Available (NRB)	Factored Resistance Available (FRA)	Nominal Required Bearing Available (NRB)
(ft)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)	(kips)
West Bound										
12	33	60	40	72	40	72	47	86	47	86
17	75	137	95	172	95	172	116	212	116	212
20	216	392	252	459	280	508	346	629	346	629
21					301	548	360	654	375	684
22					314	570			406	739
29									360	655
34									430	782
East Bound										
17	60	110	72	131	72	131	85	154	85	154
19	127	230	161	293	161	293	199	362	199	362
22	169	308	217	394	217	394	270	491	270	491
24	178	324	226	411	226	411	279	507	279	507
29	200	364	252	459	250	455	304	554	304	554
31	216	392			263	478	319	581	319	581
39					223	406	258	469	258	469
44					307	557	360	654	363	660
49					267	486			309	562

Note: * The estimated pile length includes one foot embedment depth within the pile cap.

5.3. Wingwalls

The proposed wingwalls are only approximately eight feet in length, it is assumed that the abutment foundation will be extended to include this length and, therefore, no separate wingwall recommendations are necessary.

6. CONSTRUCTION CONSIDERATIONS

No new embankments are proposed as part of this project. However, limited embankment excavation and reconstruction is anticipated to install the pier extensions and abutments. In general, work should follow the current edition of IDOT's *Standard Specification for Road and Bridge Construction*. During the subsurface exploration, groundwater was encountered while drilling between elevations of EL 698.32 and 726.28. Based on the footing elevation of the piers, groundwater water may need to be controlled during excavation. However, a groundwater monitoring program was beyond the scope of this exploration and groundwater may vary significantly seasonally. The contractor should make his own assessment on effort required for dewatering the excavation.

6.1. Temporary Soil Retention System / Sheet Piling

Excavations should be performed in accordance with local, state, and federal regulations. The potential effect of ground movements upon nearby utilities should be considered during construction. Excavations for the construction of the abutments and piers should be properly shored or sloped at no steeper than 1:1.5 (V:H).

Temporary shoring is identified at each abutment between stages. Based on the depth of the footings, shallow excavations such as these are a function of the contractor's means and methods. Where shoring is required, IDOT's *Bridge Design Manual Design Guide 3.13.1* (IDOT, 2012) must be followed.

6.2. Pile Installation

Driven piles are proposed for the structure. The driven piles shall be furnished and installed according to IDOT's *Standard Specifications for Road and Bridge Construction* (IDOT, 2016) Section 512, Piling. One test pile should be performed for each substructure to verify the required capacity per the anticipated depth.

7. QUALIFICATIONS

The analyses and recommendations mentioned herein this structure report are based upon the data obtained from the borings at the specific locations shown on the Boring Location Plan in Appendix E and the Soil Boring Logs are in Appendix G. It should be noted that this site is in an urban area and fill consistencies and depth can vary significantly due to past construction. Variations between these locations and others onsite may not become evident until construction. If any such variations from the logged material is encountered, the Resident Engineer should be informed so that recommendations can be adjusted accordingly.

REFERENCES

American Association of State Highway Transportation Officials (AASHTO) (2020), LRFD Bridge Design Specifications, 9th ed.

Curry, B. B. (2007), Bedrock Topography of Elgin Quadrangle, Kane and Cook Counties, Illinois: Illinois State Geological Survey, Illinois Geologic Quadrangle Map, IGQ Elgin-BT, and IGQ Elgin-SG, 1:24,000.

Kolata, D.R. (2005), Bedrock Geology of Illinois: Illinois State Geological Survey, Illinois Map 14, 1:500,000.

IDOT (2009), "All Geotechnical Manual Users Memorandum 09.1 - Seismic Site Class Definition." Illinois Department of Transportation.

IDOT (2010), "All Geotechnical Manual Users Memorandum 10.2 - Static Method of Estimating Pile Length." Illinois Department of Transportation.

IDOT (2010), "LRFD Soil Site Class Definition." Illinois Department of Transportation.

IDOT (2012), "Bridge Manual." Illinois Department of Transportation.

IDOT (2016), "Standard Specifications for Road and Bridge Construction." Illinois Department of Transportation. 1098 pp.

IDOT (2020), "Geotechnical Manual." Illinois Department of Transportation.

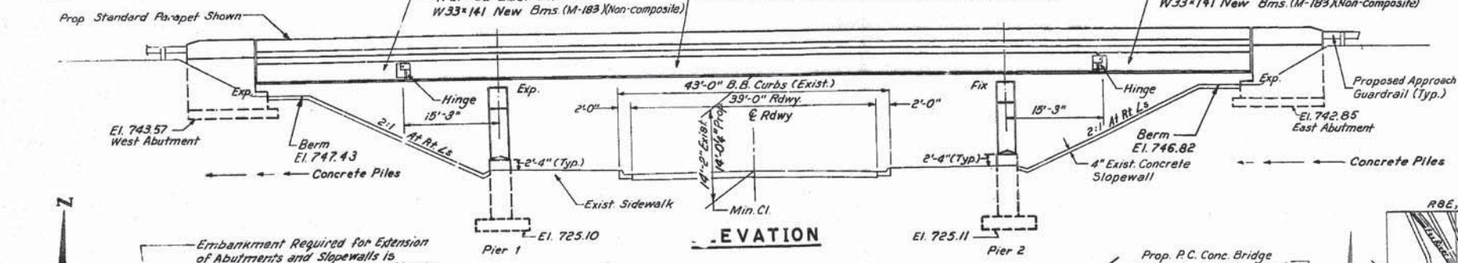
Nelson, W. J. (1995), "Structural Features in Illinois". Illinois State Geological Survey, Bulletin 100.

APPENDIX A: LOCATION MAP

US20 OVER ST. CHARLES ST. BRIDGE LOCATION MAP

APPENDIX B: EXISTING PLANS

B.M.: "□" SQUARE CUT ON TOP OF CONCRETE EASTERLY SIDE OF N.E. CORNER WINGWALL ST. CHARLES RD. BRIDGE – ELEV. 755.30



ELEVATION

EXISTING STRUCTURE DATA: THE EXISTING THREE SPAN HINGED ROLLED BEAM STRUCTURE WAS CONSTRUCTED IN 1959, CARRYING TWO LANES IN EACH DIRECTION OF U.S. ROUTE 20 TRAFFIC OVER ST. CHARLES STREET. THE STRUCTURE IS 160'-2" LONG WITH A VARIABLE ROADWAY WIDTH. THE EAST AND WESTBOUND TRAFFIC IS SEPARATED BY A NEW JERSEY TYPE CONCRETE BARRIER WALL MEDIAN WHICH WAS CONSTRUCTED IN 1979. THE DECKS AND SUBSTRUCTURES ARE REINFORCED CONCRETE. THE PIERS ARE SUPPORTED ON SPREAD FOOTINGS, AND THE ABUTMENTS ARE SUPPORTED ON PILES.

THE CONTRACTOR SHALL WIDEN THE EXISTING STRUCTURE, SCARIFY THE EXISTING DECK AND APPLY A CONCRETE OVERLAY OVER THE EXISTING DECK. TWO LANES OF TRAFFIC SHALL BE MAINTAINED AT ALL TIMES UTILIZING STATE CONSTRUCTION. NO SALVAGE.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
426	8R-HB-5 (BG)	KANE	209	115
STA.				

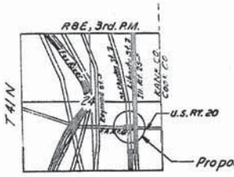
SHEET NO. 1 OF 22 SHEETS

Original Construction Boring Locations.
▲ 1983 Reconstruction Boring Locations.

NOTE
See Sheet #2 for Section A-A & B-B

STA. 218+04.95
WIDENED 15.8 BY
STATE OF ILLINOIS
F.A.R.T. 6(SB) 15 SEC. 8R-HB-5 (BG)
F.A. PROJ. [illegible]
LOADING HS20
STR. NO. 045-0006

See Standard 2113
See Plan for locations of new and existing Name Plates.



LOCATION SKETCH

PLAN

Baker Engineers
Baker Engineering, Inc.

DESIGNED	P. Wood
CHECKED	J. Owen
DRAWN	R. Spellman
CHECKED	J. Owen

JOHN H. OWEN 81-3361 REGISTERED STRUCTURAL ENGINEER OF ILLINOIS

Signed John H. Owen Date 3-4-86
John H. Owen, SE, Ill. Reg No 81-3361

APPROVED
FOR FEDERAL AID PROJECTS ONLY
James E. Kaylor
DIRECTOR OF HIGHWAYS

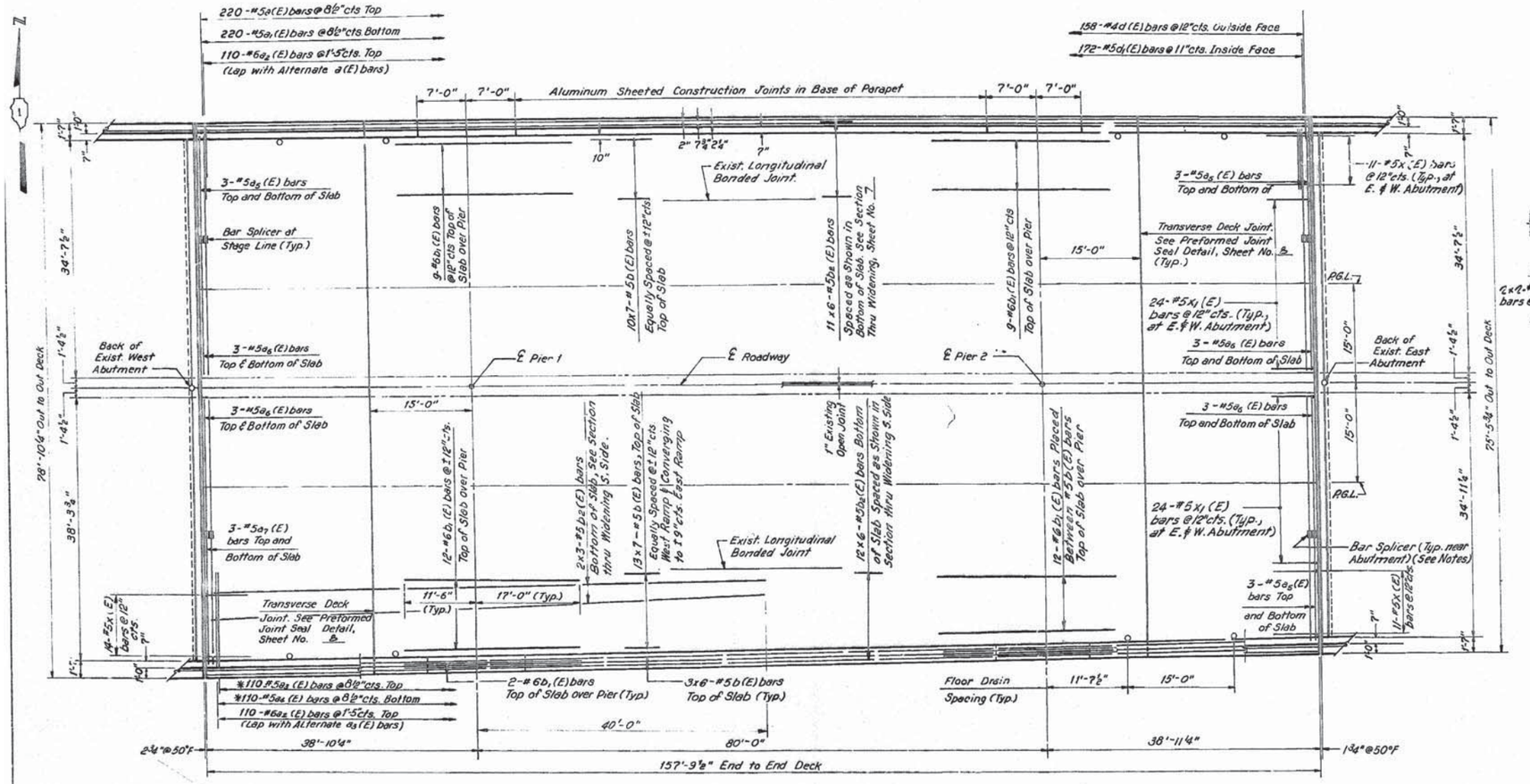
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GENERAL PLAN AND ELEVATION

REVISIONS	
NAME	DATE
Revised Profile Grade	3/31/86
Revised Profiles	2/3/86

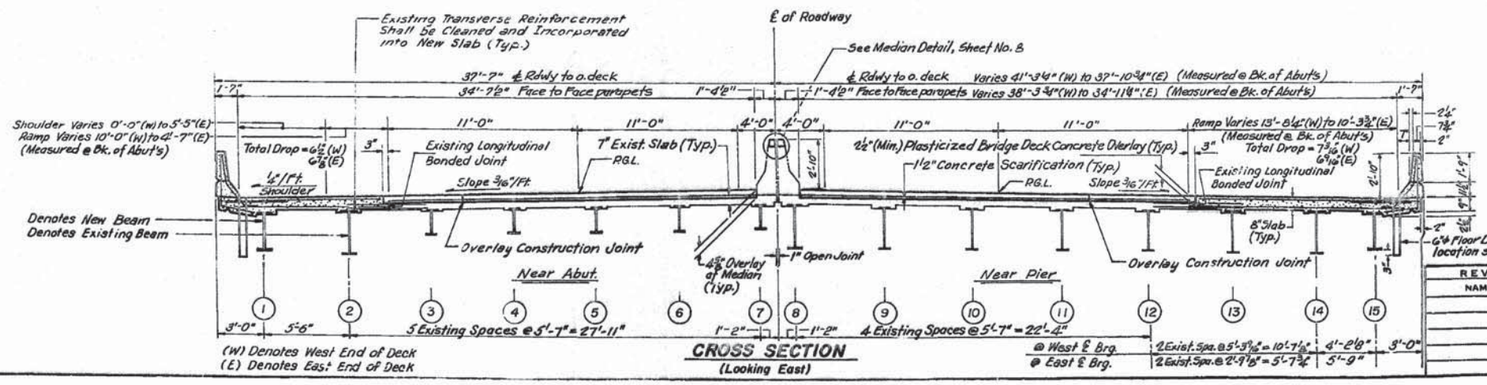
U.S. ROUTE 20 BY-PASS (F.A.P. 426) OVER
ST. CHARLES STREET
SECTION 8R-HB-5 (BG)
KANE COUNTY
STATION 218+04.95
STR. NO. 045-0006

SHEET NO. 6 OF 22 SHEETS	F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	426	8R-HB-5(84)	KANE	209	120
	STA.		TO STA.		
	F.A. ROUTE NO.		SEC. & TWP. NO.		

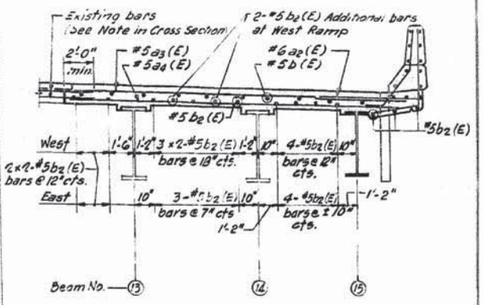


*Order a3(E) and a4(E) bars Full Length Cut to fit Taper and use Remainder of Bars in Opposite End

PLAN



CROSS SECTION
(Looking East)



SECTION THRU WIDENING
(S. Side widening is shown)

SUPERSTRUCTURE BILL OF MATERIAL

ITEM	UNIT	TOTAL
Plasticized Bridge Deck Conc. Overlay	Sq. Yd.	851
Bridge Deck Scarification	Sq. Yd.	844
Deck Slab Repair (Partial Depth)	Sq. Yd.	425
Deck Slab Repair (Full Depth)	Sq. Yd.	50
Class "X" Concrete	Cu. Yd.	158.6
Concrete Removal	Cu. Yd.	86
Preformed Joint Seal, 1 in.	Lin. Ft.	149
Preformed Joint Seal, 2 in.	Lin. Ft.	160

NOTES:

1. See Sheet No. 7 for Superstructure Details and Bill of Material for Reinforcement Bars.
2. Reinforcement Bars designated (E) shall be Epoxy coated.
3. Bars indicated thus 20 x 3 - #5 etc. indicates 20 lines of bars with 3 lengths per line.
4. For Bar Splicer Details, see Sheet #20. Cost incidental to REINFORCEMENT BARS (Epoxy Coated).
5. Minimum Bar Laps
   #5 - 1'-8"
   #6 - 2'-0"

Baker Engineers
Baker Engineering, Inc.

DESIGNED	M. Ryann
CHECKED	J. Owen
DRAWN	J. Chalikis
CHECKED	M. Ryann

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SUPERSTRUCTURE

U.S. ROUTE 20 BY-PASS (F.A.P. 426) OVER
ST. CHARLES STREET
SECTION 8R-HB-5(84)
KANE COUNTY
STATION 218+04.95
STR. NO. 045-0006

REVISIONS	
NAME	DATE

FEDERAL AID ROUTE NO.	SEC.	COUNTY	TOTAL SHEETS	SHEET NO.
6	8R-HB-5 8R-HF-5	KANE	22	1
D P R 550 NO. 4	ILLINOIS	PROJECT	U-613(3)	

STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS AND BUILDINGS
DIVISION OF HIGHWAYS

PLANS FOR PROPOSED FEDERAL AID HIGHWAY

SCALES		
	PLAN	1 INCH 50 FT.
	PROFILE, HOR.	1 INCH 50 FT.
	PROFILE, VERT.	1 INCH 10 FT.
	CROSS-SECTIONS	1 INCH 5 FT.

F.A. ROUTE 6

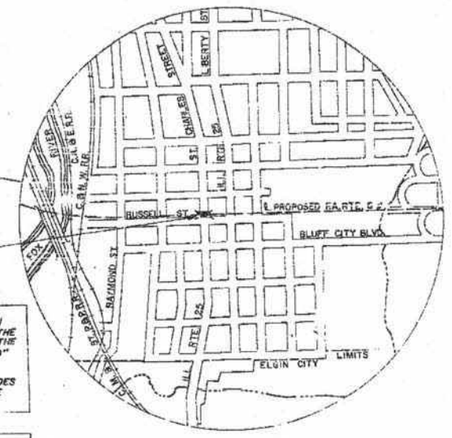
SECTION 8R-HB-5, 8R-HF-5

KANE COUNTY

PROJECT U-613(3)

LOCATION OF SECTION INDICATED THUS:—

SCALE 1" = 1 MILE



SCALE 1" = 600 FEET
NET LENGTH OF IMPROVEMENT – 160.17 FEET (0.030 MILES)

SECTION 8R-HB-5 INCLUDES THE CONSTRUCTION OF AN 4"BEAM GRADE SEPARATION BRIDGE (ON F.A. Rte. 6 OVER ST. CHARLES STREET) NEAR THE INTERSECTION OF ST. CHARLES & RUSSELL STREETS IN THE CITY OF ELGIN, SPANS, ONE @ 32'-0" & TWO @ 38'-3" AT STA. 218+04.95 WITH THE EXCEPTION OF FURNISHING, FABRICATING, SHOP PAINTING, AND DELIVERY OF THE STRUCTURAL STEEL AS SPECIFIED BELOW, ALSO INCLUDES THE CONSTRUCTION OF RETAINING WALLS AND SERVICE DRIVES, STA. 214+11 TO STA. 220+30.

SECTION 8R-HF-5 INCLUDES THE FURNISHING, FABRICATING, SHOP PAINTING, AND DELIVERY OF THE STRUCTURAL STEEL AS SPECIFIED IN THE NOTE, FOR AN 8" BEAM GRADE SEPARATION STRUCTURE (ON F.A. Rte. 6 OVER ST. CHARLES STREET) NEAR THE INTERSECTION OF ST. CHARLES & RUSSELL STREETS IN THE CITY OF ELGIN, SPANS, ONE @ 80'-0" & TWO @ 38'-3" AT STA. 218+04.95

NOTE:
STRUCTURAL STEEL SHALL BE DELIVERED F.O.B. NATIONAL STREET SIDING OF THE CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC R.R. IN THE CITY OF ELGIN, EXCEPT THAT DELIVERY MAY BE MADE F.O.B. BRIDGE SITE BY TRUCK IF SUITABLE ARRANGEMENTS ARE MADE WITH THE CONTRACTOR FOR SECTION 8R-HB-5

STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS AND BUILDINGS
DIVISION OF HIGHWAYS

SUBMITTED December 8, 1938
D.S. Mayo
DIRECTOR OF HIGHWAYS

RECOMMENDED Jan 7, 1939
C.V. Van Auskall
ENGINEER OF THESE PLANS AND CONTRACTS

PASSED Jan 7, 1939
W.H. Stratton
SECRETARY OF STATE

APPROVED Jan 7, 1939
B.B. Meidenmeyer
GOVERNOR OF ILLINOIS

APPROVED Jan 7, 1939
Edward J. Hanley
DIRECTOR

DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS

APPROVED

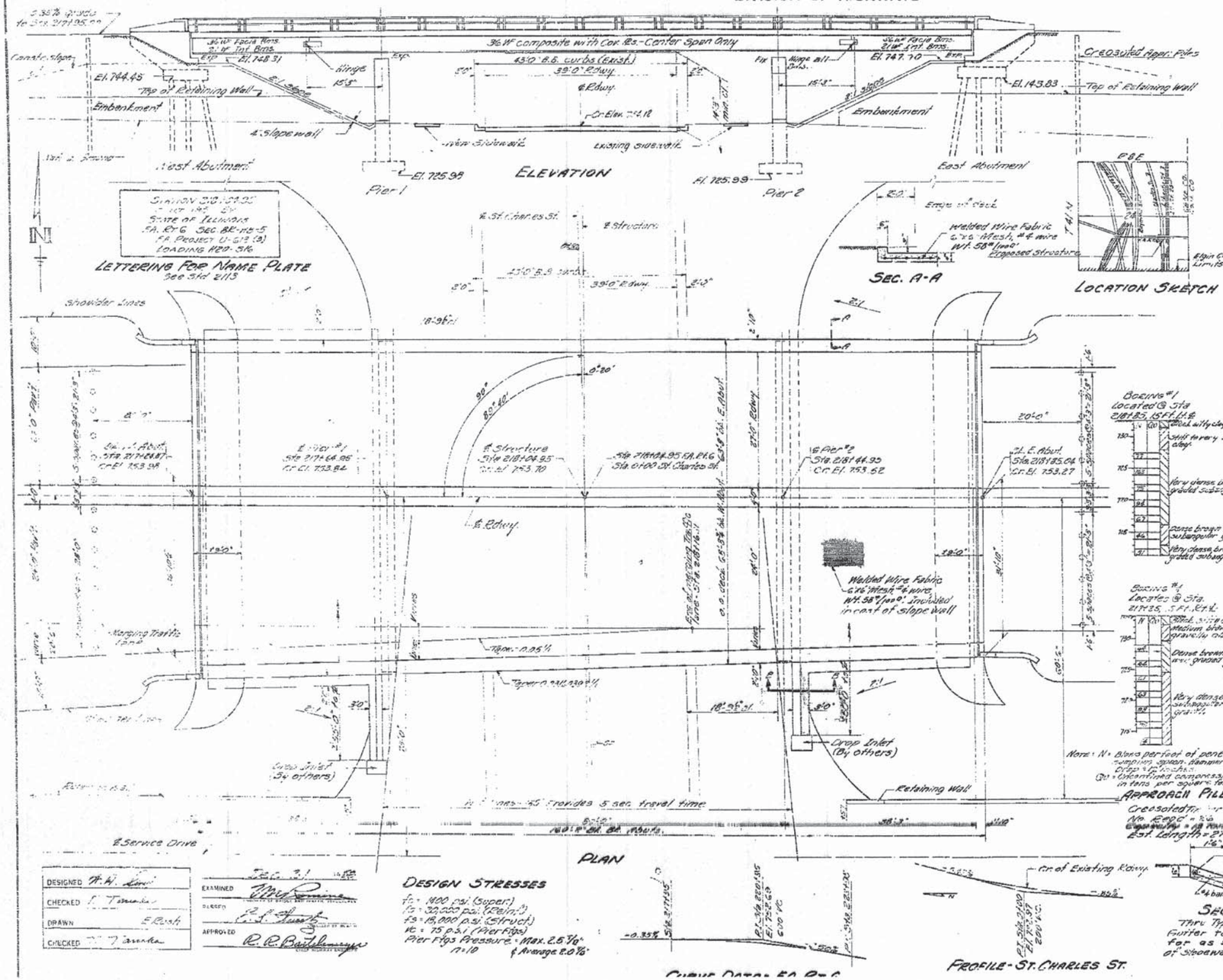
DIVISION ENGINEER — DATE

B.M. #2 - S. nut of fire hydrant N.E. corner of St. Charles & Russell Sts. - Elev. 734.67

Ht. & Loading Structure

STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS & BUILDINGS
DIVISION OF HIGHWAYS

ROUTE NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
S.B.I. Rte. 6	8-BR-5	KANE	12	11 SHEETS
FED. ROAD DIST. NO.	STATE PROJECT			



DESIGNED W. H. Lenz
CHECKED L. Tomaka
DRAWN E. Rush
CHECKED T. Tomaka
EXAMINED
DIRECTOR
APPROVED R. R. Bartlemay

DESIGN STRESSES

f_c = 1400 psi (Superstr.)
f_c = 32,000 psi (Retg. Wall)
f_s = 18,000 psi (Structural Steel)
v_c = 75 psi (Pier Fdgs.)
Pier Fdgs. Pressure = Max. 2.5 T/sq. ft. & Average 2.0 T/sq. ft.
n = 10

GENERAL NOTES

Class X Concrete shall be used throughout except in handrail and posts.
Handrail concrete shall be used in handrail and posts.
The concrete cover slab shall be finished in accordance with Article 51.19 of the Standard Specifications.
Slope wall shall be reinforced with welded wire fabric 6"x6" mesh, #4 wires, weighing 58# per 100 sq. ft.
Holes for piles in abutments shall be grouted in accordance with Article 60.9(c) of the Standard Spec.
Rivets ⅞" ϕ in holes ⅞" ϕ, unless noted.
Field connections riveted unless noted.

All bolsters, rockers, bearing plates, lead plates, pintles and anchor bolts shall be fabricated and set in accordance with the applicable sections of the Standard Specifications and as detailed in the plans of Structural Steel.
Anchor bolts shall be set before riveting diaphragms over supports.

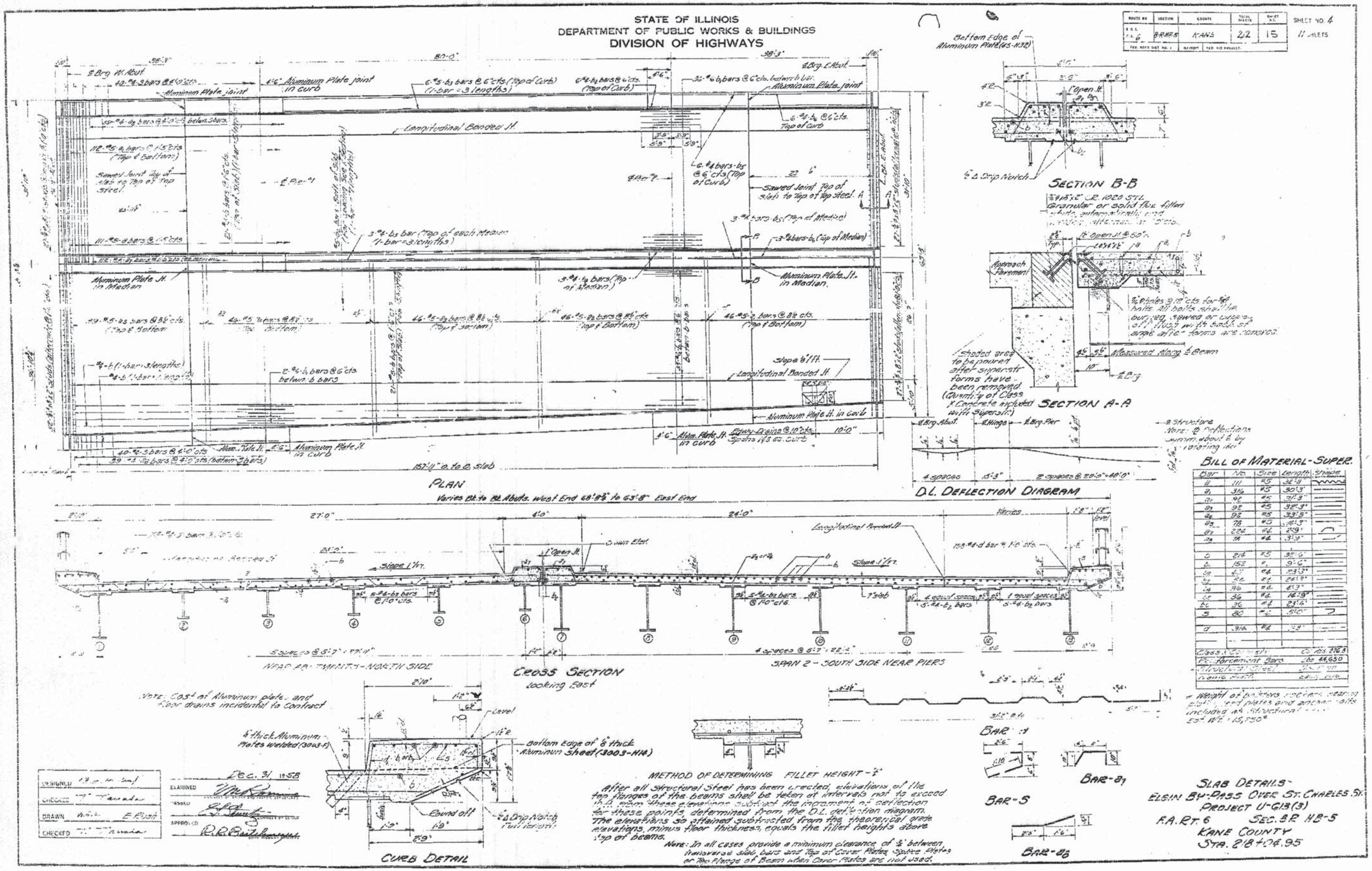
Except as otherwise provided, all structural steel shall receive one shop coat of red lead paint and two coats of aluminum paint. See Articles 561.16 & 562.5 (a) (1) (c) of the Standard Specifications.

The Contractor shall drive 2 conc. test piles (in permanent locations) as directed by the Engineer before ordering remainder of piles, one test pile at East Abutment and one test pile at West Abutment.
Expansion joints shall be furnished and installed in accordance with Article 520.18 (a) (1) of the Standard Specifications.
Expansion guards are included in quantity of Structural Steel, Est. Wt. 1860 lbs.
The following surfaces of expansion guards shall be given two shop coats of red lead paint: Outside face of vertical leg and top faces of horizontal legs of 6"x4"-6 lbs.

TOTAL BILL OF MATERIAL - SEC. 8R-HB-5

Item	Unit	Superstr.	Substr.	Total
Class X Concrete	Cu. Yds.	274.3	397.1	671.4
Handrail	Cu. Yds.	2.9		2.9
Reinforcement Bars	Lbs.	46,890	26,770	73,660
Structural Steel	Lbs.	320,650		320,650
4" Slope Wall	Sq. Yds.		633	633
Concrete Piles	Lin. Ft.		520	520
Conc. Test Piles	Each		2	2
Metal Handrail	Lin. Ft.	316		316
Class B Excav. for Str.	Cu. Yds.		497	497
Borrow Excav.	Cu. Yds.			6,580
Creosoted Piles	Lin. Ft.		790	790
Name Plates	Each	One		One

GENERAL PLAN & ELEVATION
ELGIN BY-PASS OVER ST. CHARLES STREET
PROJECT U-613(3)
F.A. RT. 6 SEC. 8R HB-5
KANE COUNTY
STA. 218+04.95


STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS & BUILDINGS
DIVISION OF HIGHWAYS
SHEET NO. 4
11 SHEETS
KANE
22
15
PLAN
Varies Bk. to Bk. Abuts. West End 68'8¾" to 65'8" East End
157'-1" c. to c. slab
Longitudinal Bonded Jt.
Aluminum Plate joint in curb
Aluminum Plate Jt. in Median
Sawed Joint Top of slab to Top of top Steel
SECTION B-B
SECTION A-A
D.L. DEFLECTION DIAGRAM
BILL OF MATERIAL-SUPER.
CROSS SECTION
Looking East
SPAN 2 - SOUTH SIDE NEAR PIERS
Note: Cost of Aluminum plate and Floor drains incidental to Contract
CURB DETAIL
METHOD OF DETERMINING FILLET HEIGHT
After all Structural Steel has been erected, elevations of the top flanges of the beams shall be taken at intervals not to exceed ... from these elevations subtract the increment of deflection for these points determined from the D.L. deflection diagram. The elevations so obtained subtracted from the theoretical grade elevations, minus floor thickness, equals the fillet heights above top of beams.
Note: In all cases provide a minimum clearance of ½" between transverse slab bars and Top of Cover Plates, Splice Plates or Top Flange of Beam when Cover Plates are not used.
BAR-S
BAR-B1
BAR-B6
DESIGNED
CHECKED
DRAWN
CHECKED
EXAMINED
APPROVED
Dec. 31, 1958
SLAB DETAILS
ELGIN BY-PASS OVER ST. CHARLES ST.
PROJECT U-G13(3)
F.A. RT. 6 SEC. 8R HB-5
KANE COUNTY
STA. 218+04.95

APPENDIX C: PRELIMINARY TSL

Benchmark: Cut "Γ" on NW corner of Pier 1 on E side of St. Charles St. & 38 feet N ℄ of US 20.
Elev. = 737.093

Existing Structure: S.N. 045-0006 was originally constructed in 1959 as F.A. Route 6, Project U-613(3). In 1986 the bridge was widened, expansion joints reconstructed, overlay placed, and bearings replaced. Various repairs were made to the structure in 1998, 2003 and 2011. The existing structure is a 3-span hinged steel WF beam bridge supported by concrete stub abutments on piles and multi-column concrete piers on spread footings. The bridge measures 160'-2" from back-to-back of abutments and has a variable out-to-out deck width of 75'-5¾" to 78'-10¼".

Traffic shall be maintained during construction utilizing staged construction.

Salvage: None

SCOPE OF WORK

1. Remove existing superstructure and abutments.
2. Widen existing piers, remove and replace pier caps.
3. Construct new integral abutments.
4. Replace hinge beam system with continuous beams and updated beam spacing.
5. Replace concrete deck.
6. Remove and replace approach slabs.
7. Repair piers with formed concrete repair and epoxy crack injection.
8. Remove and reconstruct slopewalls.

HIGHWAY CLASSIFICATION

St. Charles Street
Functional Class: Local
ADT: 3,250 (2018) / 3,965 (2046)
ADTT: 585 (2018) / 714 (2046)
DHV: 475 (2046)
Posted Speed: 30 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50

US Rte. 20 (F.A.P. Rte. 345)
Functional Class: Freeway and Expressway
ADT: 43,700 (2021); 64,000 (2040)
ADTT: 4,370 (2021); 6,400 (2040)
DHV: 6,500 (2040)
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50

LOADING HL-93

Allow 50#/sq. ft. for future wearing surface

DESIGN SPECIFICATIONS

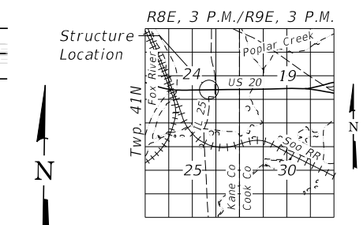
EXISTING CONSTRUCTION
2002 AASHTO Standard Specifications for Highway Bridges, 17th Edition
NEW CONSTRUCTION
2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

DESIGN STRESSES

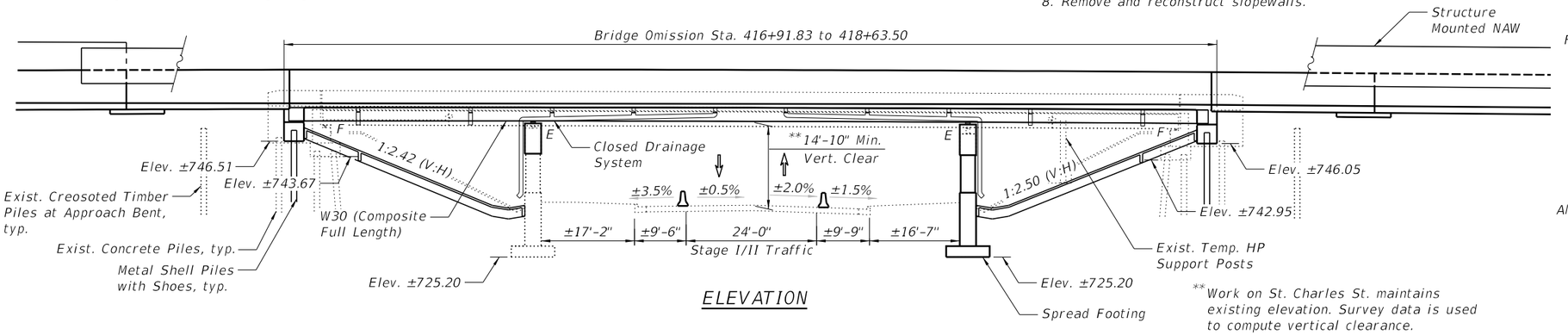
EXISTING UNITS (ORIGINAL CONST.)
fc= 1,400 psi (Concrete)
fs= 20,000 psi (Reinforcement)
EXISTING UNITS (1986 CONST.)
f'c=3,500 psi
fy= 60,000 psi (Reinforcement)
FIELD UNITS (NEW CONST.)
f'c= 4,000 psi (Superstructure)
f'c= 3,500 psi (Substructure)
fy= 50,000 psi (M270 Gr. 50)
fy= 60,000 psi (Reinforcement)

SEISMIC DATA

Seismic Performance Zone (SPC) = A
Horiz. Bedrock Acceleration Coefficient (A) = 0.036g
Site Coefficient (S) = 1.5



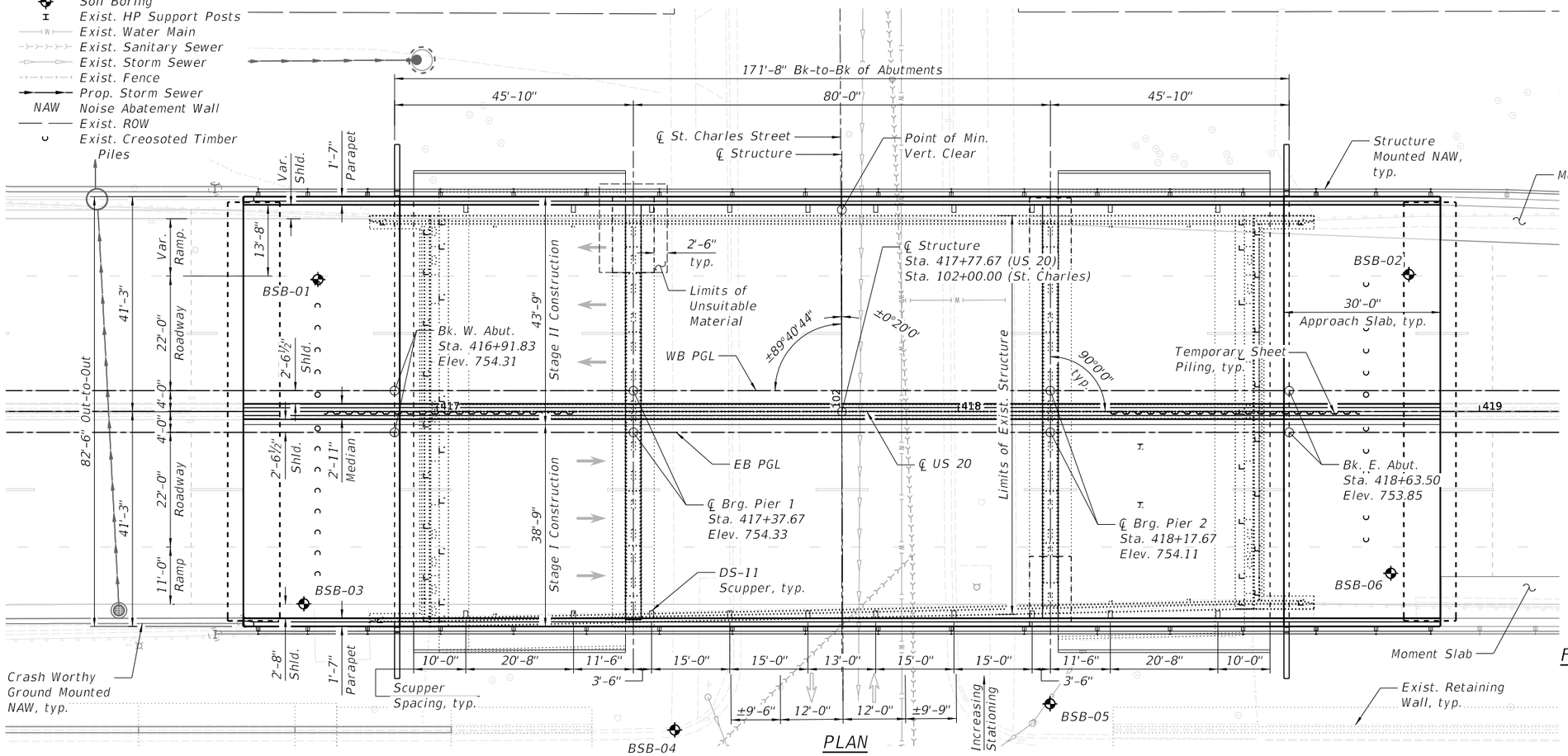
LOCATION SKETCH



ELEVATION

LEGEND

- Soil Boring
- Exist. HP Support Posts
- Exist. Water Main
- Exist. Sanitary Sewer
- Exist. Storm Sewer
- Exist. Fence
- Prop. Storm Sewer
- NAW Noise Abatement Wall
- Exist. ROW
- Exist. Creosoted Timber Piles



PLAN

GENERAL PLAN & ELEVATION
US ROUTE 20 OVER ST. CHARLES ST.
F.A.P. RTE. 345-SEC 2020-146-B-BR&NW
KANE COUNTY
STATION 417+77.67
STRUCTURE NO. 045-0006

BURNS McDONNELL

USER NAME = eckay	DESIGNED -	REVISED -	
	CHECKED -	REVISED -	
PLOT SCALE = 24.000 ' / in.	DRAWN -	REVISED -	
PLOT DATE = 3/16/2023	CHECKED -	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 3 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
345	2020-146-B-BR&NW	KANE	3	1
		CONTRACT NO. 62L34		
		ILLINOIS FED. AID PROJECT		

MODEL: Default
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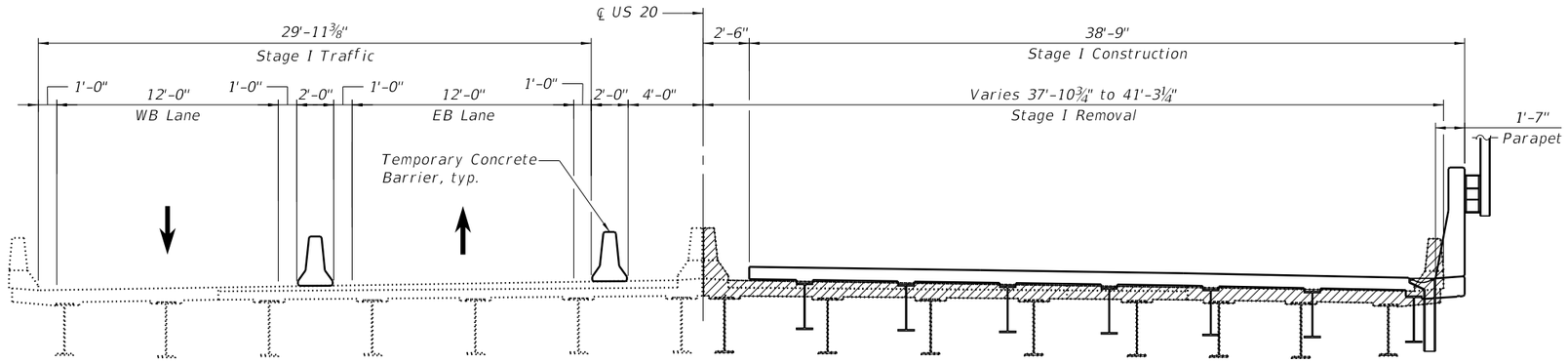
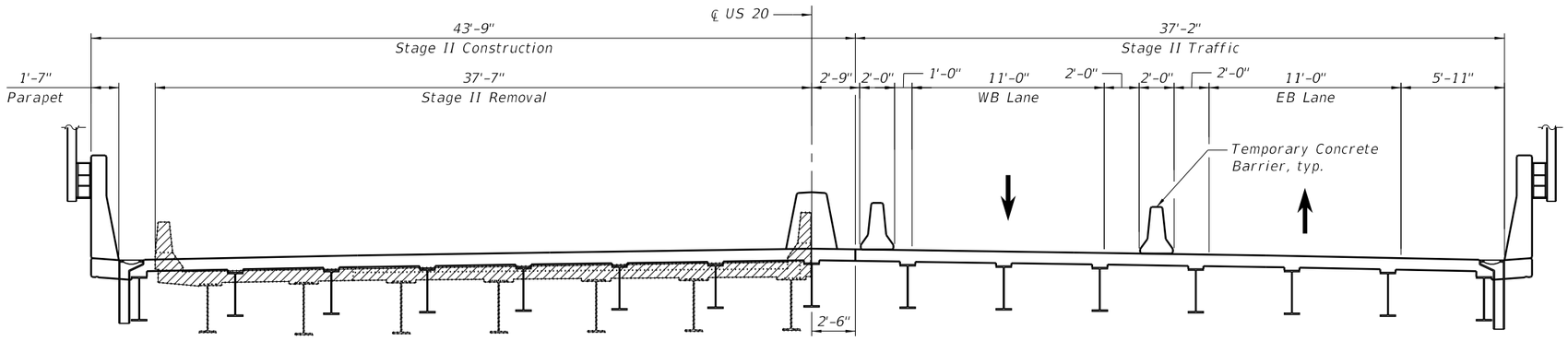


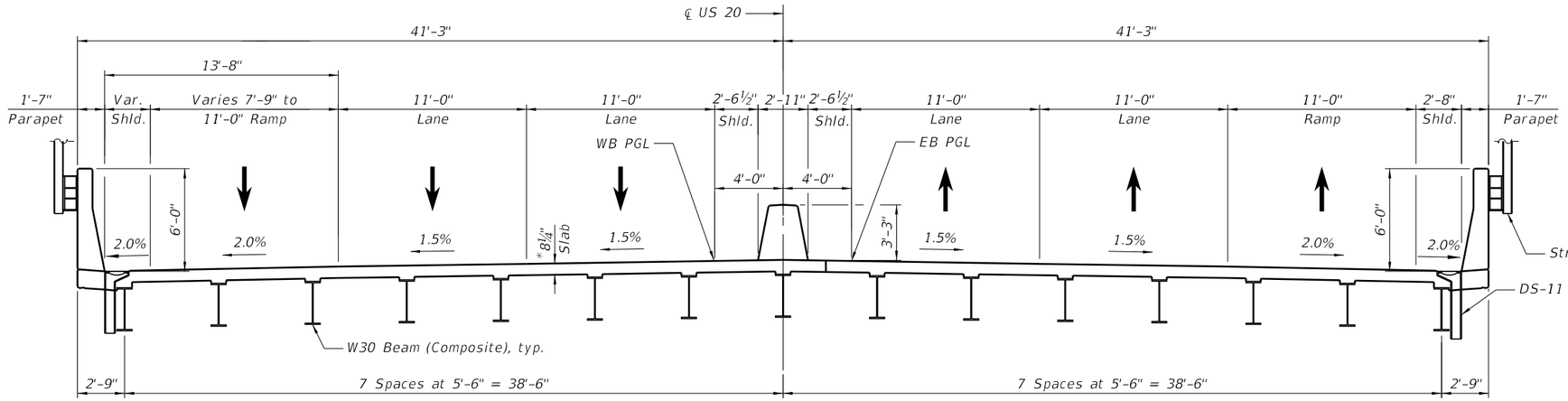
STAGE I CROSS SECTION

(Looking East)



STAGE II CROSS SECTION

(Looking East)



*Prior to Grinding. Subject to refinement during the design phase.

FINAL CROSS SECTION

(Looking East)

LEGEND

Removal of Existing Superstructure

CONSTRUCTION STAGING

US ROUTE 20 OVER ST. CHARLES ST.
F.A.P. RTE. 345-SEC 2020-146-B-BR&NW
KANE COUNTY
STATION 417+77.67
STRUCTURE NO. 045-0006

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3/16/2023 8:35:06 AM

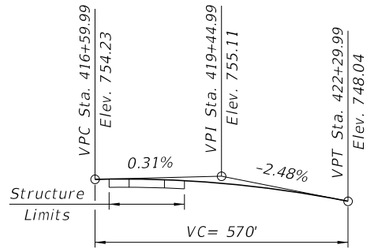
BURNS McDONNELL

USER NAME = eckay	DESIGNED -	REVISED -	
	CHECKED -	REVISED -	
PLOT SCALE = 8.000 ' / in.	DRAWN -	REVISED -	
PLOT DATE = 3/16/2023	CHECKED -	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

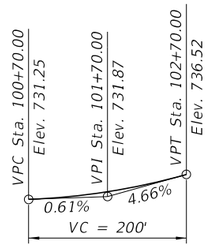
SHEET 2 OF 3 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
345	2020-146-B-BR&NW	KANE	3	2
		CONTRACT NO. 62L34		
		ILLINOIS	FED. AID PROJECT	



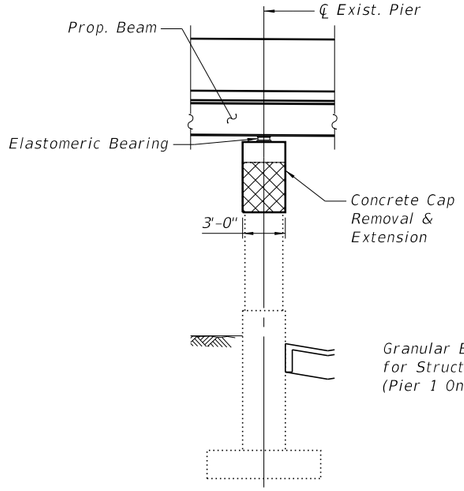
PROFILE GRADE

(Along EB & WB PGL US 20)

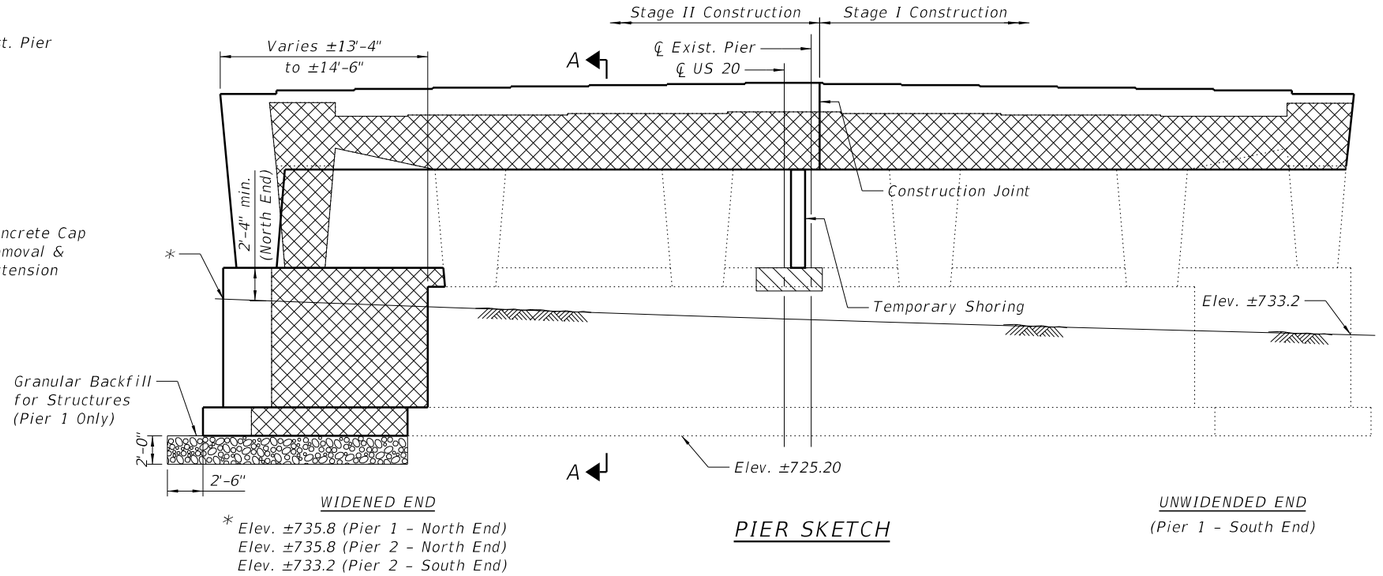


PROFILE GRADE

(Along ℄ St. Charles Street)
Approx. from survey data and existing plans



SECTION A-A



WIDENED END

* Elev. ±735.8 (Pier 1 - North End)
Elev. ±735.8 (Pier 2 - North End)
Elev. ±733.2 (Pier 2 - South End)

PIER SKETCH

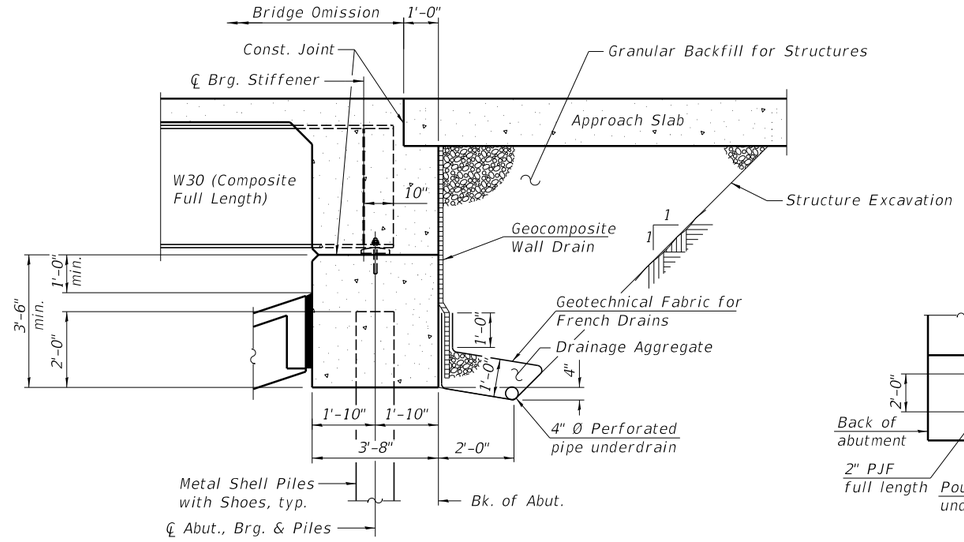
UNWIDENDED END

(Pier 1 - South End)

LEGEND

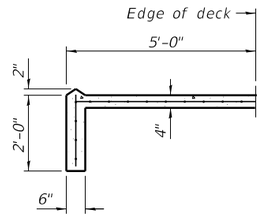
Concrete Removal

Structural Repair of Concrete

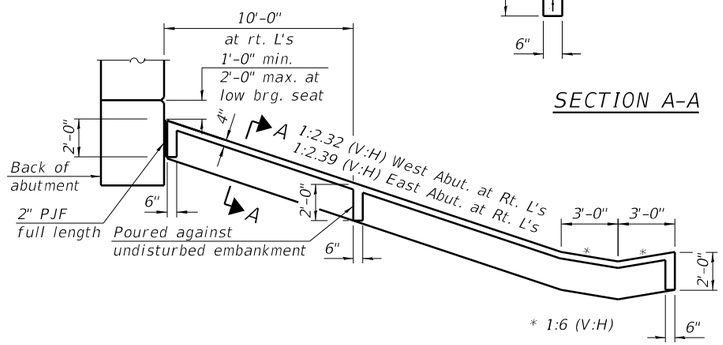


SECTION THRU INTEGRAL ABUTMENT

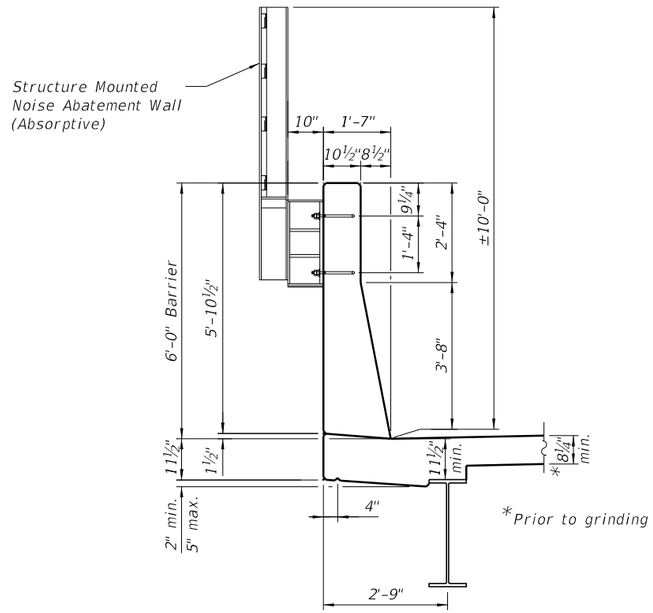
(Horiz. dim. @ Rt. ∠'s)



SECTION A-A



SECTION THRU CONCRETE SLOPEWALL



STRUCTURE MOUNTED NOISE ABATEMENT WALL

DETAILS
US ROUTE 20 OVER ST. CHARLES ST.
F.A.P. RTE. 345-SEC 2020-146-B-BR&NW
KANE COUNTY
STATION 417+77.67
STRUCTURE NO. 045-0006

MODEL: Default
FILE NAME: pw:\\gfnet-pw.bentley.com:gfnet-pw-01\Documents\Projects\68096\Project Working\A_CADD\Sheets\TSLs\0450006-62L34-TSL-003.dgn

3/16/2023 8:35:19 AM

BURNS McDONNELL

USER NAME = eckay	DESIGNED -	REVISED -	
	CHECKED -	REVISED -	
PLOT SCALE = 10.667 ' / in.	DRAWN -	REVISED -	
PLOT DATE = 3/16/2023	CHECKED -	REVISED -	

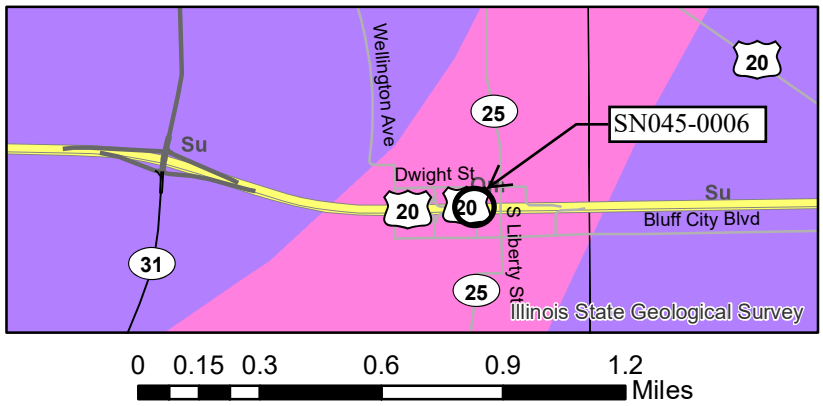
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

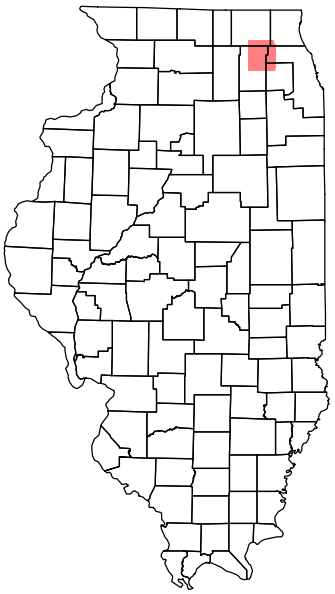
SHEET 3 OF 3 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
345	2020-146-B-BR&NW	KANE	3	3
		CONTRACT NO. 62L34		
		ILLINOIS	FED. AID PROJECT	

APPENDIX D: REGIONAL GEOLOGY MAP

BEDROCK GEOLOGY





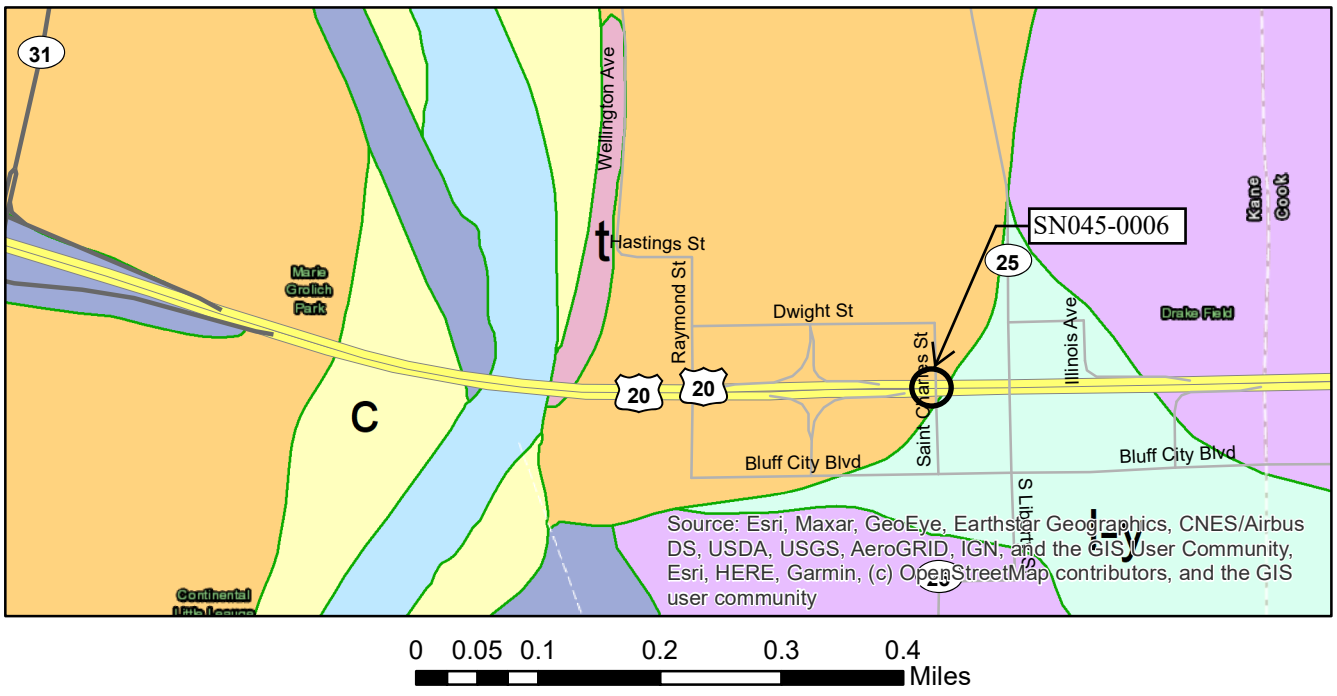
SILURIAN SYSTEM

SILURIAN UNDIVIDED: LIMESTONE AND DOLOMITE

ORDOVICIAN SYSTEM

MAQUOKETA FORMATION OR GROUP: LIMESTONES, SHALES AND SANDSTONES

SURFICIAL GEOLOGY



c	CAHOKIA FORMATION: FLOODPLAIN ALLUVIUM, SAND AND GRAVEL
dg	DISTURBED GROUND: EMBANKMENTS AND MOUNDS
e	EQUALITY FORMATION: LAKE DEPOSITS, SILT, CLAY AND FINE SAND
h	HENRY FORMATION: KAMIC DEPOSITS, SAND AND GRAVEL (SILTY TO CLEAN)
l-y	LEMONT FORMATION: TILL, DEBRIS FLOW, LAKE SEDIMENT, DIAMICTON, SILTY CLAY AND CLAY
t	TISKILWA FORMATION: TILL AND DEBRIS FLOW DEPOSITS, DIAMICTON, CLAY LOAM TO LOAM
	WATER

SITE GEOLOGY MAP - US-20 OVER ST. CHARLES ST.

SCALE: GRAPHICAL

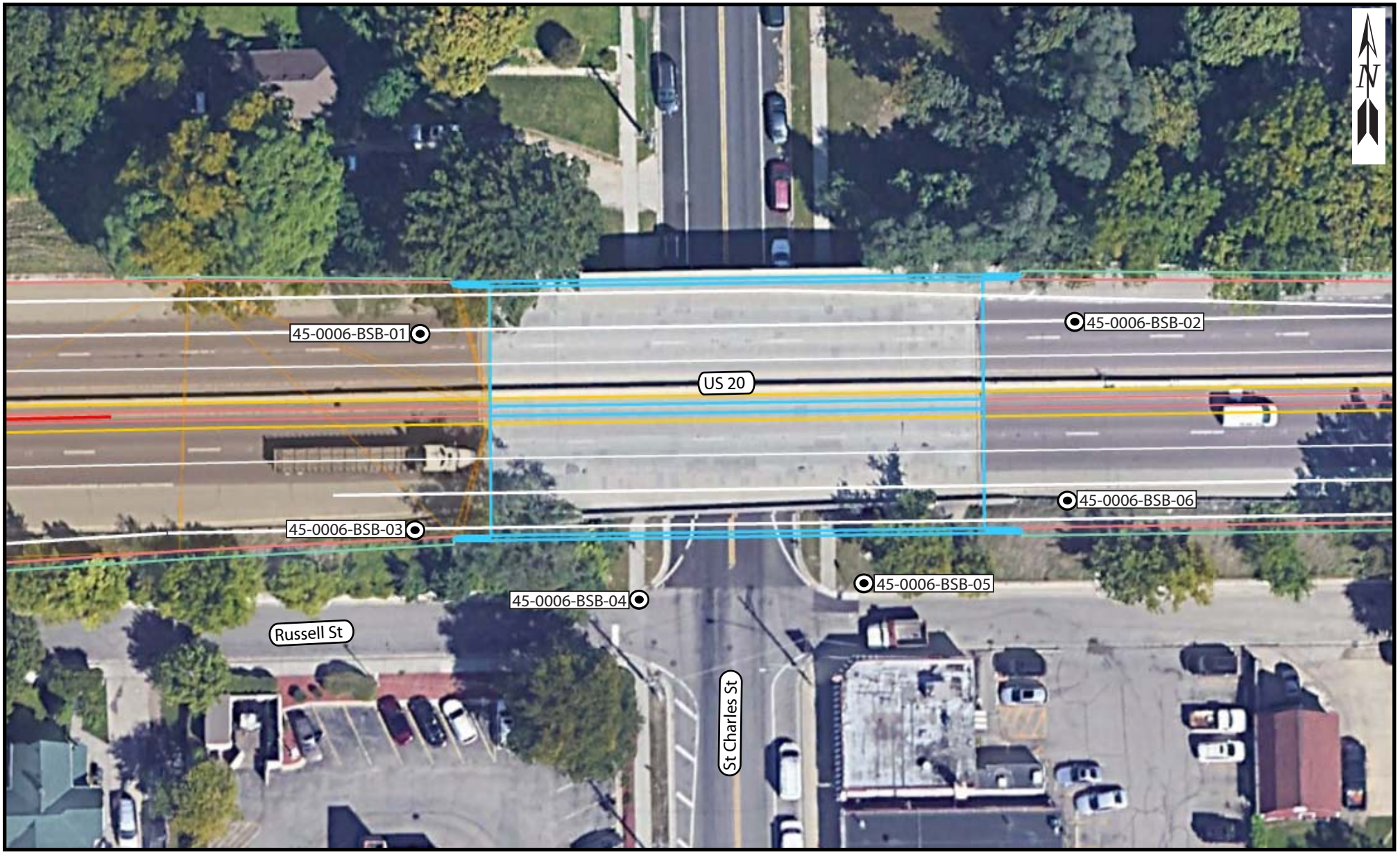
EXHIBIT D

DRAWN: JAY
CHECKED: TLM

GANNETT FLEMING

FOR BURNS & MCDONNELL

APPENDIX E: BORING LOCATION PLAN



0 100 200 Feet

Legend

Boring Location

BORING LOCATION PLAN: US 20 OVER ST. CHARLES STREET, SN045-0006; RANDALL ROAD TO SHALES PARKWAY, KANE COUNTY, ILLINOIS

SCALE: GRAPHICAL	EXHIBIT 3-3	DRAWN BY: J. Bensen CHECKED BY: M. Seyhun

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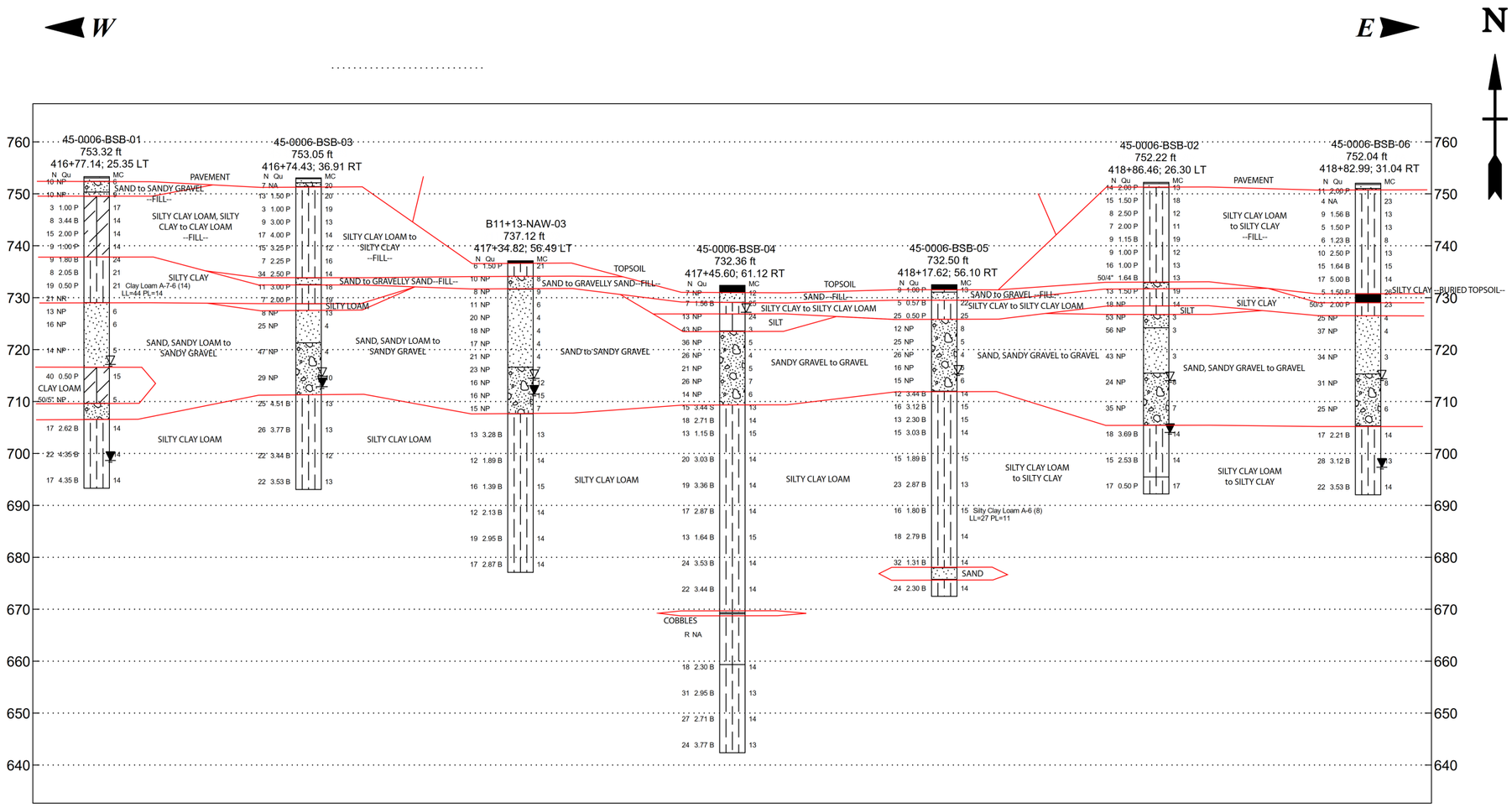
Lombard, IL 60148
www.wangeng.com

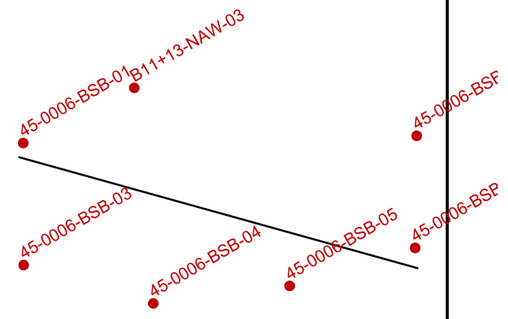
FOR GANNETT FLEMING, INC. 121-03-01

APPENDIX F: SUBSURFACE DATA PROFILE PLOT



Lithology Graphics

- Pavement
- Concrete
- Gravelly sand, sandy gravel
- IDH Sand, Sandy Loam
- IDH Clay Loam
- IDH Silty Clay, Silty Clay Loam
- IDH Silt, Silty Loam
- Topsoil
- Boulders and cobbles



Site Map Scale 1 inch equals 80 feet

Explanation:

45-0006-BSB-01
416+77.14 — Borehole Number Station

Borehole Lithology

N--N-value, (blw/12 in)
Qu--UC Strength, (tsf)
MC--Moisture Content, (%)

Water Level Reading at time of drilling.

Water Level Reading 24-hr after drilling or at end of drilling

0 — 22

Horizontal Scale (feet)

Vertical Exaggeration: 1x

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1145 N Main Street
Lombard, IL 60148

Bridge SN045-0006
US 20 Over St. Charles Street

WEI SINCE 1982

US Route 20 From Randall Rd to Shales Parkway
Elgin, Illinois

JOB NUMBER	PLATE NUMBER
121-03-01	EXHIBIT 3-3

APPENDIX G: SOIL BORING LOGS

Wang Engineering

LEGEND FOR BORING LOG

Relative Density of Non-Cohesive Soils

N-Blows/ 12 inches	Relative Density Term
0-3	Very Loose
4-9	Loose
10-29	Medium Dense
30-49	Dense
50-80+	Very Dense

Consistency of Cohesive Soils

Unconfined Compressive Strength Qu, tsf	Consistency Term
<0.25	Very Soft
0.25-0.49	Soft
0.50-0.99	Medium Stiff
1.00-1.99	Stiff
2.00-3.99	Very Stiff
>4.00	Hard

Rock Quality Designation (RQD)

0-25%	Very Poor
25-50%	Poor
50-75%	Fair
75-90%	Good
90-100%	Excelent

SS = Split Spoon
ST = Shelby Tube
SPT = Standard Penetration Test
Q_u = Unconfined Compressive Strength
NP = Non Plastic
P = Pocket Penetrometer
S = Shear failure of sample, Rimac test
B = Bulge failure of sample, Rimac test
SSA = Solid Stem Augers,
HSA = Hollow Stem Augers,

Proportional Terms

		Percent of Dry Weight
Trace	1-9	
Little	10-19	
Some	20-34	
And	35-50	

Gradation Terminology

Boulders	>200mm
Cobbles	200mm to 75mm
Gravel	75mm to 2mm
Sand	2-0mm to 0.074mm
Silt	0.074mm to 0.002mm
Clay	<0.002mm

Relative Moisture Conditions

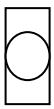
Term	Description
Dry	Dusty, No visible moisture
Damp	Cohesives hard to mold; Granulars do not flow easily
Moist	Cohesives can be molded; Granulars start to stick together
Wet	Cohesives can be very easily molded and sticky; Granulars stick together easily
Saturated	Only granular soils; Water drains freely from sample

Relative Drilling Resistance (RDR)

1	No Chatter - Very Easy Drilling
2	No Chatter - Easy Drilling
3	Some Chatter - Moderate Advancement
4	Frequent Chatter - Slow Advancement
5	Constant Chatter - Very Slow Advanement

Sample Type Symbols


Split Spoon


No Recovery


Geoprobe


Rock Core


Shelby Tube


Auger Cuttings


In-situ Vane Shear Test

SPT = Standard Penetration Test
N Value is the sum of the second and the third numbers

(Rev. 05/23/2018)

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BORING LOG 45-0006-BSB-01

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 753.32 ft
North: 1949991.93 ft
East: 1001753.49 ft
Station: 416+77.14
Offset: 25.35 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	753.1	3-inch thick ASPHALT --PAVEMENT--						
	752.4	8-inch thick CONCRETE --PAVEMENT--						
		Medium dense, brown SANDY GRAVEL; damp			1	6 3 7	NP	6
	750.3	--FILL-- --RDR 2--						
	749.5	Brown, fine to coarse SAND, little gravel; damp --FILL--	5		2	4 6 4	NP	9
		Stiff to very stiff, brown and gray SILTY CLAY LOAM to CLAY LOAM, trace gravel; damp --FILL-- --RDR 2--			3	2 2 1	1.00 P	17
			10		4	3 3 5	3.44 B	14
					5	4 7 8	2.00 P	14
			15		6	2 4 5	1.00 P	14
	737.8	Medium stiff to very stiff, black to brown SILTY CLAY, trace gravel; damp --RDR 2--			7	7 4 5	1.80 B	24
			20		8	3 3 5	2.05 B	21

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--L_L(%)=44, P_L(%)=14-- --%Gravel=8.2-- --%Sand=33.8-- --%Silt=34.2-- --%Clay=23.7-- --A-7-6 (14)--			9	4 10 9	0.50 P	21
	729.1	Medium dense, brown, fine to coarse SAND, trace gravel; damp to saturated --RDR 2--	25		10	4 7 14	NR	
					11	8 6 7	NP	6
			30		12	6 7 9	NP	6
	716.6	Medium stiff, gray CLAY LOAM, little gravel; moist --RDR 2-3--	35		13	7 6 8	NP	5
			40		14	6 20 20	0.50 P	15

GENERAL NOTES

Begin Drilling **11-22-2021** Complete Drilling **11-22-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&JD** Logger **D. You** Checked by **CLM (-Lab)**
Drilling Method **3.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **36.50 ft**
At Completion of Drilling ▼ **55.00 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 1210301.GPJ WANGENG.GDT 9/12/22

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Fax: 630-953-9928

BORING LOG 45-0006-BSB-01

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 753.32 ft
North: 1949991.93 ft
East: 1001753.49 ft
Station: 416+77.14
Offset: 25.35 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--rig chatter; possible cobbles--						
	709.7	Very dense, gray GRAVEL; saturated			15	50/5"	NP	5
		--RDR 3--	45					
	706.6	Very stiff to hard, gray SILTY CLAY LOAM, trace gravel; damp						
		--RDR 2--			16	4 7 10	2.62 B	14
			50					
					17	7 11 11	4.35 B	14
			55					
					18	6 7 10	4.35 B	14
	693.3		60					
		Boring terminated at 60.00 ft						

GENERAL NOTES

Begin Drilling **11-22-2021** Complete Drilling **11-22-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&JD** Logger **D. You** Checked by **CLM (-Lab)**
Drilling Method **3.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **36.50 ft**
At Completion of Drilling ▼ **55.00 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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Fax: 630-953-9928

BORING LOG 45-0006-BSB-02

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 752.22 ft
North: 1949995.78 ft
East: 1001962.93 ft
Station: 418+86.46
Offset: 26.30 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	752.0	3-inch thick ASPHALT --PAVEMENT--						
	751.2	9-inch thick CONCRETE --PAVEMENT--						
		Stiff to very stiff, brown SILTY CLAY LOAM to SILTY CLAY, trace to little gravel; damp --FILL-- --RDR 2--			1	4 7 7	2.00 P	13
			5		2	4 7 8	1.50 P	18
					3	2 3 5	2.50 P	12
			10		4	3 4 3	2.00 P	11
					5	2 6 3	1.15 B	19
			15		6	3 4 5	1.00 P	12
					7	5 4 12	1.00 P	13
	732.9	Tan GRAVEL; damp	20		8	5 10 50/4"	1.64 B	13
	731.7	--FILL-- --RDR 2--						
		Stiff, brown SILTY CLAY, trace gravel; damp --RDR 2--			9	6 5 8	1.50 P	19
	728.4	Medium dense, brown SILT, trace gravel; damp --RDR 2--	25		10	5 9 9	NP	14
	726.7	Very dense, brown SANDY GRAVEL; damp --RDR 2--			11	18 25 28	NP	3
	724.2	Dense to very dense, brown and gray, fine to coarse SAND, some gravel; damp --RDR 2--	30		12	25 29 27	NP	3
			35		13	14 23 20	NP	3
	715.5	--rig chatter; possible cobbles-- Medium dense to very dense, brown SANDY GRAVEL; saturated --RDR 2-3--	40		14	9 13 11	NP	8

GENERAL NOTES

Begin Drilling **11-22-2021** Complete Drilling **11-22-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&JD** Logger **D. You** Checked by **CLM (-Lab)**
Drilling Method **3.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **38.50 ft**
At Completion of Drilling ▼ **48.50 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 45-0006-BSB-02

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 752.22 ft
North: 1949995.78 ft
East: 1001962.93 ft
Station: 418+86.46
Offset: 26.30 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			45		15	8 16 19	NP	7
		--rig chatter; possible cobbles--						
	705.5	Very stiff, brown to gray SILTY CLAY LOAM, trace gravel; damp --RDR 2--	50		16	5 8 10	3.69 B	14
			55		17	5 7 8	2.53 B	14
	695.5	Medium stiff, gray SILTY CLAY, trace gravel; damp --RDR 2--						
	692.2	Boring terminated at 60.00 ft	60		18	5 8 9	0.50 P	17

GENERAL NOTES

Begin Drilling **11-22-2021** Complete Drilling **11-22-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&JD** Logger **D. You** Checked by **CLM (-Lab)**
Drilling Method **3.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **38.50 ft**
At Completion of Drilling ▼ **48.50 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 45-0006-BSB-03

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 753.05 ft
North: 1949926.96 ft
East: 1001753.70 ft
Station: 416+74.43
Offset: 36.91 RT

Elevation (ft)	Depth (ft)	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
752.9		2-inch thick ASPHALT --PAVEMENT--					
752.1		9-inch thick CONCRETE --PAVEMENT--					
751.4		9-inch thick SANDY GRAVEL --AGGREGATE BASE--					
		Stiff to hard, brown SILTY CLAY LOAM to SILTY CLAY, trace gravel; damp					
		--FILL--					
		--RDR 2--					
	5			1	4 3 4	NA	20
				2	3 6 7	1.50 P	20
				3	2 2 1	1.00 P	19
		--1-inch thick, sand seam; damp--					
	10			4	3 4 5	3.00 P	13
				5	3 8 9	4.00 P	14
	15			6	4 7 8	3.25 P	12
				7	4 3 4	2.25 P	16
733.8		Dense, black and brown, fine to					
	20			8	5 22 12	2.50 P	14

Elevation (ft)	Depth (ft)	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
732.6		coarse SAND, trace gravel; damp					
		--FILL--					
		--RDR 2--					
		Very stiff, brown SILTY CLAY, little gravel; damp to moist		9	4 7 4	3.00 P	18
		--RDR 2--					
728.8		Loose, brown SILTY LOAM; moist		10	5 4 3	2.00 P	19
	25	--RDR 2--					
727.6		Loose to medium dense, brown, fine to coarse SAND to SANDY LOAM, trace gravel; damp		11	4 3 5	NP	13
		--RDR 2--					
	30			12	6 9 16	NP	4
721.3		Medium dense to dense, brown, fine to coarse SAND, some gravel; damp to saturated					
		--RDR 2-3--		13	19 23 24	NP	4
	35	--rig chatter; possible cobbles--					
				14	11 14 15	NP	10
	40						

GENERAL NOTES

Begin Drilling **10-18-2021** Complete Drilling **10-18-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&JD** Logger **E. Yim** Checked by **CLM (-Lab)**
Drilling Method **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **38.50 ft**
At Completion of Drilling ▼ **48.00 ft**
Time After Drilling **24 hours**
Depth to Water ▼ **40.50 ft**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 1210301.GPJ WANGENG.GDT 9/12/22

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BORING LOG 45-0006-BSB-03

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 753.05 ft
North: 1949926.96 ft
East: 1001753.70 ft
Station: 416+74.43
Offset: 36.91 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	711.3	Very stiff to hard, gray SILTY CLAY LOAM, trace gravel; damp --RDR 2--	45		15	7 11 14	4.51 B	13
			50		16	7 11 15	3.77 B	13
			55		17	8 11 11	3.44 B	12
	693.1	Boring terminated at 60.00 ft	60		18	6 10 12	3.53 B	13

GENERAL NOTES

Begin Drilling **10-18-2021** Complete Drilling **10-18-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&JD** Logger **E. Yim** Checked by **CLM (-Lab)**
Drilling Method **2.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **38.50 ft**
At Completion of Drilling ▼ **48.00 ft**
Time After Drilling **24 hours**
Depth to Water ▼ **40.50 ft**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 45-0006-BSB-04

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 732.36 ft
North: 1949906.56 ft
East: 1001822.75 ft
Station: 417+45.60
Offset: 61.12 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		16-inch thick, black, medium to coarse SANDY LOAM						
	731.0	--TOPSOIL--						
		Loose, brown, fine to coarse SAND, little gravel; damp			1	2 3 4	NP	12
		--RDR 2--						
		--FILL--						
	729.1							
		Stiff, brown SILTY CLAY, trace gravel; moist			2	3 3 4	1.56 B	25
		--RDR 2--	5					
	726.9							
		Medium dense, brown SILT, trace gravel; saturated			3	2 5 8	NP	24
		--RDR 2--						
	723.6							
		Medium dense to dense, gray and brown SANDY GRAVEL to GRAVEL; damp to saturated	10		4	13 20 23	NP	3
		--RDR 2-3--						
		--possible cobbles--			5	5 15 21	NP	5
			15		6	7 10 16	NP	4
		--possible cobbles--			7	9 11 10	NP	5
			20		8	5 11 15	NP	7

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--after drilling borehole collapsed at 20 feet--						
					9	8 9 5	NP	6
	709.4							
		Stiff to very stiff, brown SILTY CLAY LOAM, trace gravel; damp			10	5 6 9	3.44 S	13
		--RDR 2--	25					
					11	5 8 10	2.71 B	14
			30		12	4 5 8	1.15 B	15
			35		13	5 8 12	3.03 B	14
			40		14	5 8 11	3.36 B	14

GENERAL NOTES

Begin Drilling **11-23-2021** Complete Drilling **11-23-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&JD** Logger **D. You** Checked by **CLM (-Lab)**
Drilling Method **3.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **5.50 ft**
At Completion of Drilling ▼ **NA**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 45-0006-BSB-04

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 732.36 ft
North: 1949906.56 ft
East: 1001822.75 ft
Station: 417+45.60
Offset: 61.12 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			45		15	5 7 10	2.87 B	14
			50		16	4 5 8	1.64 B	15
			55		17	7 11 13	3.53 B	14
			60		18	6 10 12	3.44 B	14
	669.4	--rig chatter; possible cobbles--						
	669.1	COBBLES Gravelly SILTY CLAY LOAM	65			C O R E		
			70		19			
	659.4	Very stiff, brown SILTY CLAY LOAM, trace gravel; damp						
			75		20	5 8 10	2.30 B	14
			80		21	10 12 19	2.95 B	13

GENERAL NOTES

Begin Drilling **11-23-2021** Complete Drilling **11-23-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&JD** Logger **D. You** Checked by **CLM (-Lab)**
Drilling Method **3.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **5.50 ft**
At Completion of Drilling ▼ **NA**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 45-0006-BSB-04

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 732.36 ft
North: 1949906.56 ft
East: 1001822.75 ft
Station: 417+45.60
Offset: 61.12 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			85		22	9 11 16	2.71 B	14
	642.4		90		23	6 10 14	3.77 B	13
		Boring terminated at 90.00 ft	95					
			100					

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)

GENERAL NOTES

Begin Drilling **11-23-2021** Complete Drilling **11-23-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&JD** Logger **D. You** Checked by **CLM (-Lab)**
Drilling Method **3.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **5.50 ft**
At Completion of Drilling ▼ **NA**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 45-0006-BSB-05

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 732.50 ft
North: 1949915.88 ft
East: 1001895.31 ft
Station: 418+17.62
Offset: 56.10 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	731.7	10-inch thick, black SILTY LOAM, trace gravel; damp						
		--TOPSOIL--						
	731.1	Stiff, brown SILTY CLAY LOAM, little gravel; moist			1	2 5 4	1.00 P	13
		--FILL--						
	729.5	Loose, brown, fine to coarse SAND, little gravel; damp						
		--FILL--			2	2 2 3	0.57 B	22
		Medium stiff, brown SILTY CLAY, trace to little gravel; moist	5					
		--RDR 2-3--						
		--rig chatter--			3	5 11 14	0.50 P	25
	725.8	Medium dense, brown SANDY GRAVEL to GRAVEL: damp to saturated						
		--RDR 2-3--			4	4 5 7	NP	8
			10					
					5	7 12 13	NP	5
					6	8 12 14	NP	4
			15					
					7	10 9 7	NP	6
					8	9 7 8	NP	6
			20					

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	712.0	Stiff to very stiff, brown SILTY CLAY LOAM, trace to little gravel; damp						
		--RDR 2--			9	4 5 7	3.44 B	14
			25		10	5 7 9	3.12 B	15
					11	4 5 8	2.30 B	15
			30		12	4 6 9	3.03 B	14
			35		13	5 6 9	1.89 B	15
			40		14	7 11 12	2.87 B	13

GENERAL NOTES

Begin Drilling **12-03-2021** Complete Drilling **12-03-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&AG** Logger **D. You** Checked by **CLM (-Lab)**
Drilling Method **3.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **17.50 ft**
At Completion of Drilling ▼ **DRY**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG 45-0006-BSB-05

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 732.50 ft
North: 1949915.88 ft
East: 1001895.31 ft
Station: 418+17.62
Offset: 56.10 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--L_L(%)=27, P_L(%)=11--						
		--%Gravel=3.1--						
		--%Sand=24.6--			15	5 7 9	1.80 B	15
		--%Silt=48.6--	45					
		--%Clay=23.6--						
		--A-6 (8)--						
					16	5 8 10	2.79 B	14
			50					
	678.0							
		Brown, fine to medium SAND, trace gravel; saturated			17	7 12 20	1.31 B	14
		--RDR 2--	55					
	675.8							
		Very stiff, brown SILTY CLAY LOAM, trace gravel; damp						
		--RDR 2--						
					18	6 9 15	2.30 B	14
	672.5		60					
		Boring terminated at 60.00 ft						

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)

GENERAL NOTES

Begin Drilling **12-03-2021** Complete Drilling **12-03-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&AG** Logger **D. You** Checked by **CLM (-Lab)**
Drilling Method **3.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **17.50 ft**
At Completion of Drilling ▼ **DRY**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG 45-0006-BSB-06

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 752.04 ft
North: 1949936.09 ft
East: 1001962.14 ft
Station: 418+82.99
Offset: 31.04 RT

Depth (ft)	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
0	751.8	3-inch thick ASPHALT --PAVEMENT--					
	751.0	9.5-inch thick CONCRETE --PAVEMENT--					
	750.8	2.5-inch thick SANDY GRAVEL --AGGREGATE BASE--					
		Stiff to hard, brown SILTY CLAY to SILTY CLAY LOAM, trace to some gravel; damp to moist --FILL--					
5		--RDR 2-3--		1	5 6 5	2.00 P	
				2	2 2 2	NA	23
				3	2 3 6	1.56 B	13
10				4	2 2 3	1.50 P	13
				5	4 4 2	1.23 B	8
15				6	3 5 5	2.50 P	13
				7	4 5 10	1.64 B	15
20				8	5 7 10	5.00 B	14
	730.8	Stiff, brown SILTY CLAY, trace gravel; moist --Buried TOPSOIL--		9	4 3 2	1.50 P	26
	729.0	--RDR 2-- Very stiff, brown SILTY CLAY, little gravel; damp --RDR 2-3--		10	4 13 50/3"	2.00 P	23
25		--rig chatter; possible cobbles--					
	726.5	Medium dense to dense, brown, fine to coarse SAND, trace to some gravel; damp --RDR 2-3--		11	6 10 15	NP	4
		--rig chatter; possible cobbles--		12	14 18 19	NP	4
30							
		--heaving sand in auger--		13	14 17 17	NP	3
35	715.3	Medium dense to dense, brown SANDY GRAVEL; saturated --RDR 2--					
40				14	10 17 14	NP	8

GENERAL NOTES

Begin Drilling **10-19-2021** Complete Drilling **10-19-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&JD** Logger **E. Yim** Checked by **CLM (-Lab)**
Drilling Method **3.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **38.00 ft**
At Completion of Drilling ▼ **55.00 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 45-0006-BSB-06

WEI Job No.: 121-03-01

Client **Gannett Fleming**
Project **US Route 20 From Randall Rd to Shales Parkway**
Location **Elgin, Illinois**

Datum: NAVD 88
Elevation: 752.04 ft
North: 1949936.09 ft
East: 1001962.14 ft
Station: 418+82.99
Offset: 31.04 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
			45		15	7 12 13	NP	6
	705.3	Very stiff, brown SILTY CLAY LOAM, trace gravel; damp --RDR 2--						
			50		16	5 8 9	2.21 B	14
			55		17	10 12 16	3.12 B	13
			60		18	7 9 13	3.53 B	14
	692.0	Boring terminated at 60.00 ft						

GENERAL NOTES

Begin Drilling **10-19-2021** Complete Drilling **10-19-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **RH&JD** Logger **E. Yim** Checked by **CLM (-Lab)**
Drilling Method **3.25" ID HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **38.00 ft**
At Completion of Drilling ▼ **55.00 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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APPENDIX H: LABORATORY TESTING

LABORATORY TEST RESULTS SUMMARY-BRIDGES

Project: US Route 20
Client: Gannett Fleming
WEI Job No.: 121-03-01

Sample Identification	Sample Depth	Soil Classification	Atterberg Limits			Particle Size/Hydrometer			
		IDH	D4318			D422			
			LL	PL	PI	Gravel	Sand	Silt	Clay
	ft		%	%	%	%	%	%	%
45-0004-BSB-01#9	21.0-22.5	*Gravelly Clay Loam*	*31*	*13*	*18*	*20.6*	*24*	*36.3*	*19*
45-0004-BSB-03#3	6.0-7.5	*Silty Clay Loam*	*56*	*19*	*37*	*0.2*	*19.6*	*50.4*	*29.8*
45-0004-BSB-12#15	48.5-50.0	*Clay Loam*	*25*	*10*	*15*	*4.2*	*26.2*	*46*	*23.6*
45-0005-BSB-02#7	16.0-17.5	*Silty Clay*	*34*	*15*	*19*	*3.5*	*6.6*	*54.9*	*35*
45-0005-BSB-04#16	48.5-50.0	*Clay Loam*	*25*	*11*	*14*	*3.2*	*23.8*	*48.2*	*24.9*
45-0006-BSB-01#9	21.0-22.5	*Clay Loam*	*44*	*14*	*30*	*8.2*	*33.8*	*34.2*	*23.7*
45-0006-BSB-05#15	43.5-45.0	*Silty Clay Loam*	*27*	*11*	*16*	*3.1*	*24.6*	*48.6*	*23.6*

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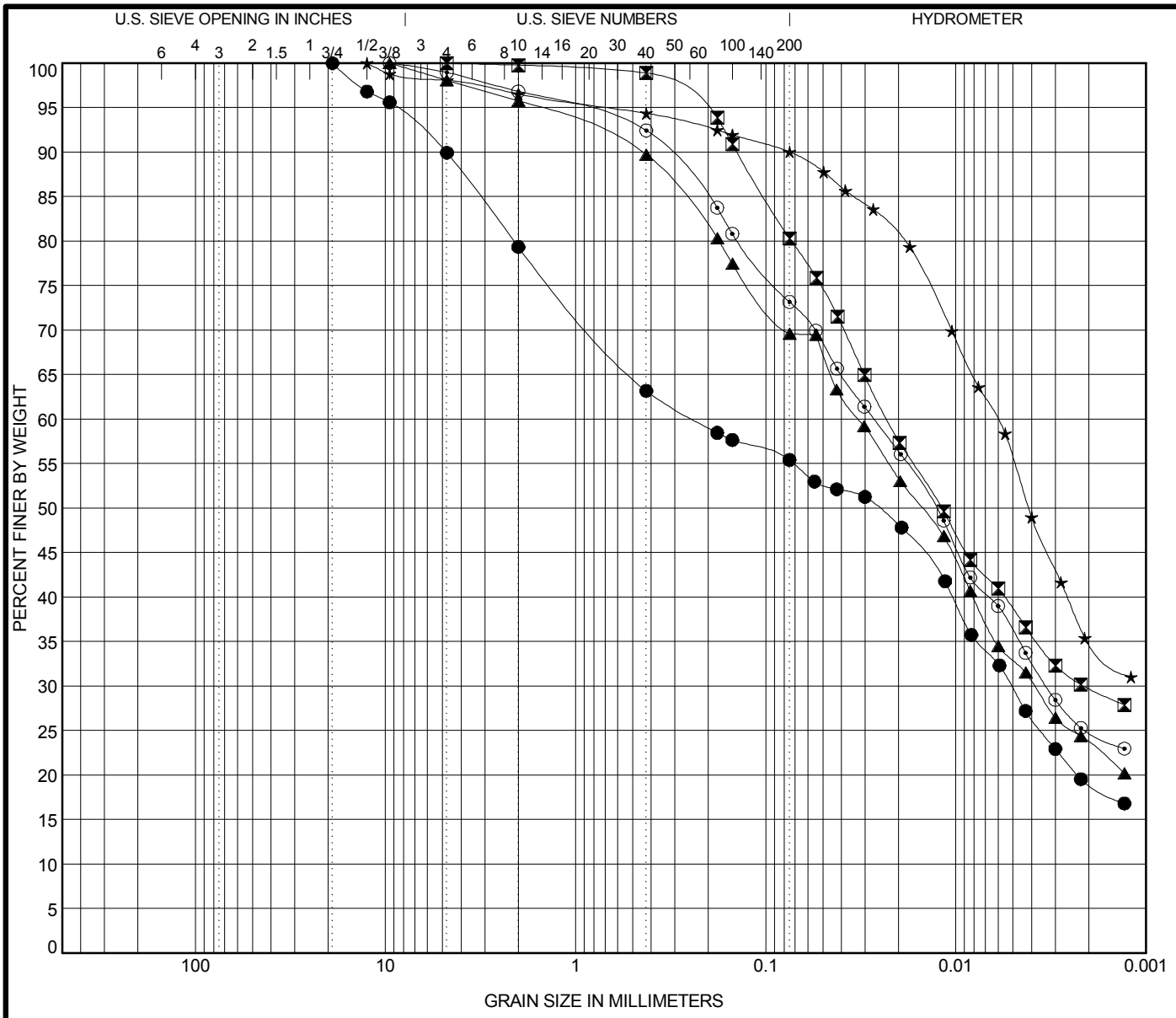

COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification	IDH Classification	LL	PL	PI	Cc	Cu
● 45-0004-BSB-01#9 21.0 ft	**Gravelly Clay Loam**	**31**	**13**	**18**		
⊠ 45-0004-BSB-03#3 6.0 ft	**Silty Clay Loam**	**56**	**19**	**37**		
▲ 45-0004-BSB-12#1548.5 ft	**Clay Loam**	**25**	**10**	**15**		
★ 45-0005-BSB-02#7 16.0 ft	**Silty Clay**	**34**	**15**	**19**		
⊙ 45-0005-BSB-04#1648.5 ft	**Clay Loam**	**25**	**11**	**14**		

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 45-0004-BSB-01#9 21.0 ft	**19**	**0.238**	**0.005**		**20.6**	**24.0**	**36.3**	**19.0**
⊠ 45-0004-BSB-03#3 6.0 ft	**4.75**	**0.023**	**0.002**		**0.2**	**19.6**	**50.4**	**29.8**
▲ 45-0004-BSB-12#1548.5 ft	**9.5**	**0.032**	**0.004**		**4.2**	**26.2**	**46.0**	**23.6**
★ 45-0005-BSB-02#7 16.0 ft	**12.5**	**0.006**			**3.5**	**6.6**	**54.9**	**35.0**
⊙ 45-0005-BSB-04#1648.5 ft	**9.5**	**0.027**	**0.003**		**3.2**	**23.8**	**48.2**	**24.9**

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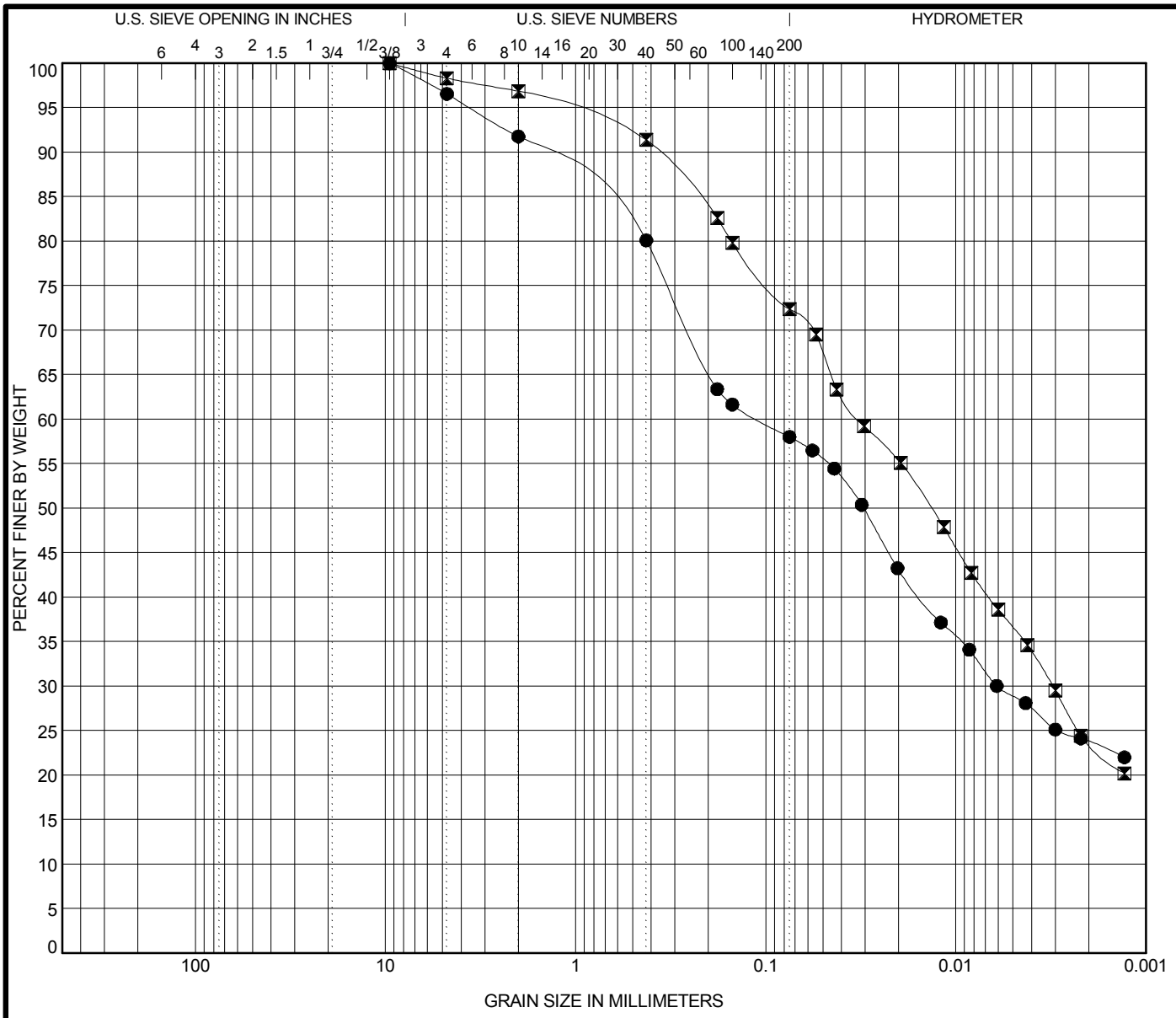
GRAIN SIZE DISTRIBUTION

Project: US Route 20 From Randall Rd to Shales Parkway

Location: Elgin, Illinois

Number: 121-03-01



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

	Specimen Identification	IDH Classification	LL	PL	PI	Cc	Cu
●	45-0006-BSB-01#9 21.0 ft	**Clay Loam**	**44**	**14**	**30**		
⊠	45-0006-BSB-05#1543.5 ft	**Silty Clay Loam**	**27**	**11**	**16**		

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	45-0006-BSB-01#9 21.0 ft	**9.5**	**0.11**	**0.006**		**8.2**	**33.8**	**34.2**	**23.7**
⊠	45-0006-BSB-05#1543.5 ft	**9.5**	**0.032**	**0.003**		**3.1**	**24.6**	**48.6**	**23.6**

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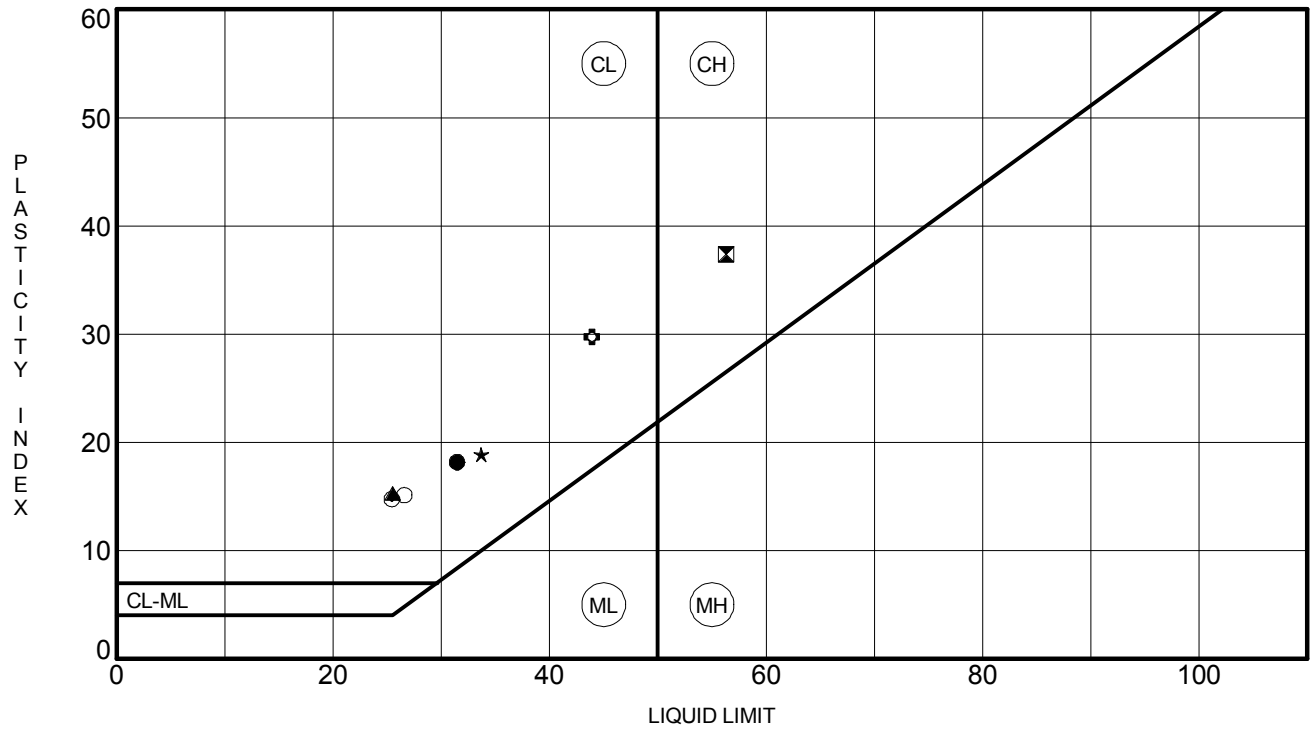
GRAIN SIZE DISTRIBUTION

Project: US Route 20 From Randall Rd to Shales Parkway

Location: Elgin, Illinois

Number: 121-03-01



Specimen Identification			LL	PL	PI	Fines	IDH Classification
●	45-0004-BSB-01#9	21.0 ft	31	13	18	55	**Gravelly Clay Loam**
⊠	45-0004-BSB-03#3	6.0 ft	56	19	37	80	**Silty Clay Loam**
▲	45-0004-BSB-12#15	48.5 ft	25	10	15	70	**Clay Loam**
★	45-0005-BSB-02#7	16.0 ft	34	15	19	90	**Silty Clay**
⊙	45-0005-BSB-04#16	48.5 ft	25	11	14	73	**Clay Loam**
✿	45-0006-BSB-01#9	21.0 ft	44	14	30	58	**Clay Loam**
○	45-0006-BSB-05#15	43.5 ft	27	11	16	72	**Silty Clay Loam**

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ATTERBERG LIMITS' RESULTS

Project: US Route 20 From Randall Rd to Shales Parkway

Location: Elgin, Illinois

Number: 121-03-01

APPENDIX I: PILE DESIGN TABLES & BEARING GRAPHS

WB - West Abutment

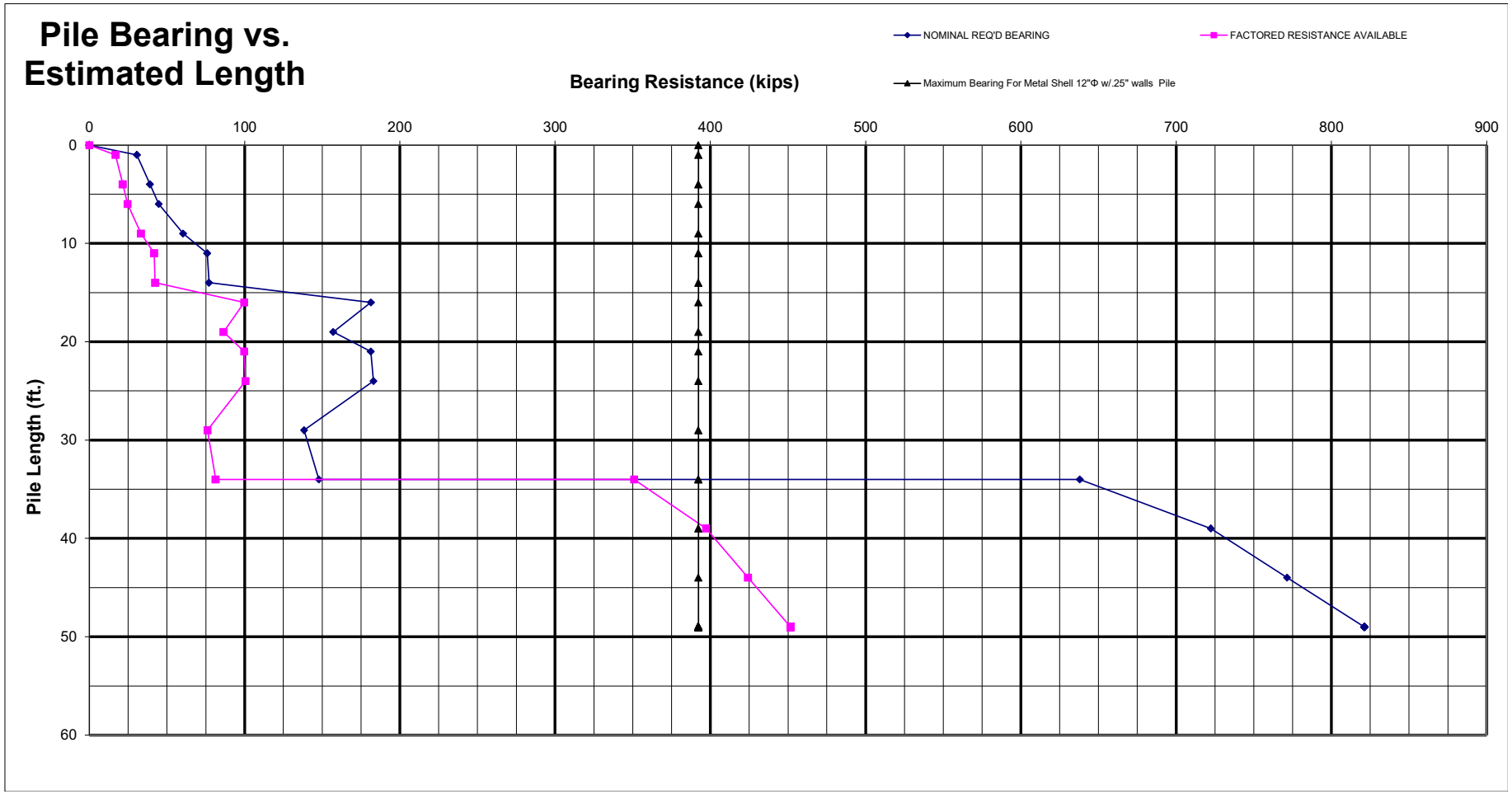
Pile Design Table for West Abutment - WB utilizing Boring #BSB-1

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls		
148	81	34
Metal Shell 14"Φ w/.25" walls		
173	95	34
Metal Shell 14"Φ w/.312" walls		
173	95	34
Metal Shell 16"Φ w/.312" walls		
199	109	34
Metal Shell 16"Φ w/.375" walls		
199	109	34
Steel HP 8 X 36		
225	124	49

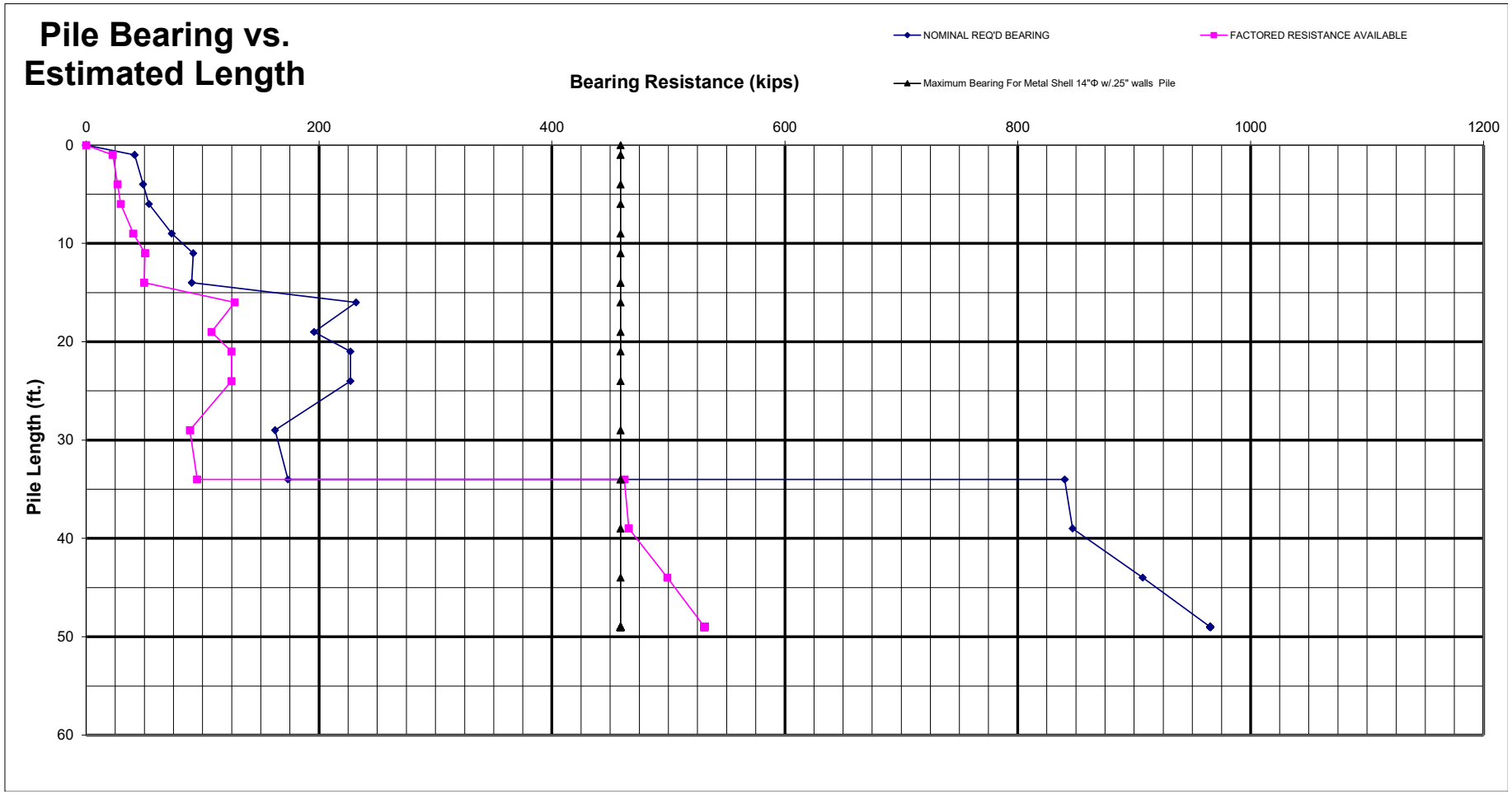
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
284	156	49
Steel HP 10 X 57		
290	160	49
Steel HP 12 X 53		
259	143	39
311	171	44
351	193	49
Steel HP 12 X 63		
262	144	39
314	173	44
355	195	49
Steel HP 12 X 74		
266	146	39
319	175	44
360	198	49

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
269	148	39
323	178	44
365	201	49
Steel HP 14 X 73		
185	102	34
315	173	39
381	210	44
429	236	49
Steel HP 14 X 89		
195	107	34
319	176	39
386	213	44
434	239	49
Steel HP 14 X 102		
202	111	34
323	178	39
391	215	44
440	242	49
Steel HP 14 X 117		
211	116	34
327	180	39
396	218	44
445	245	49
Precast 14"x 14"		
116	64	14

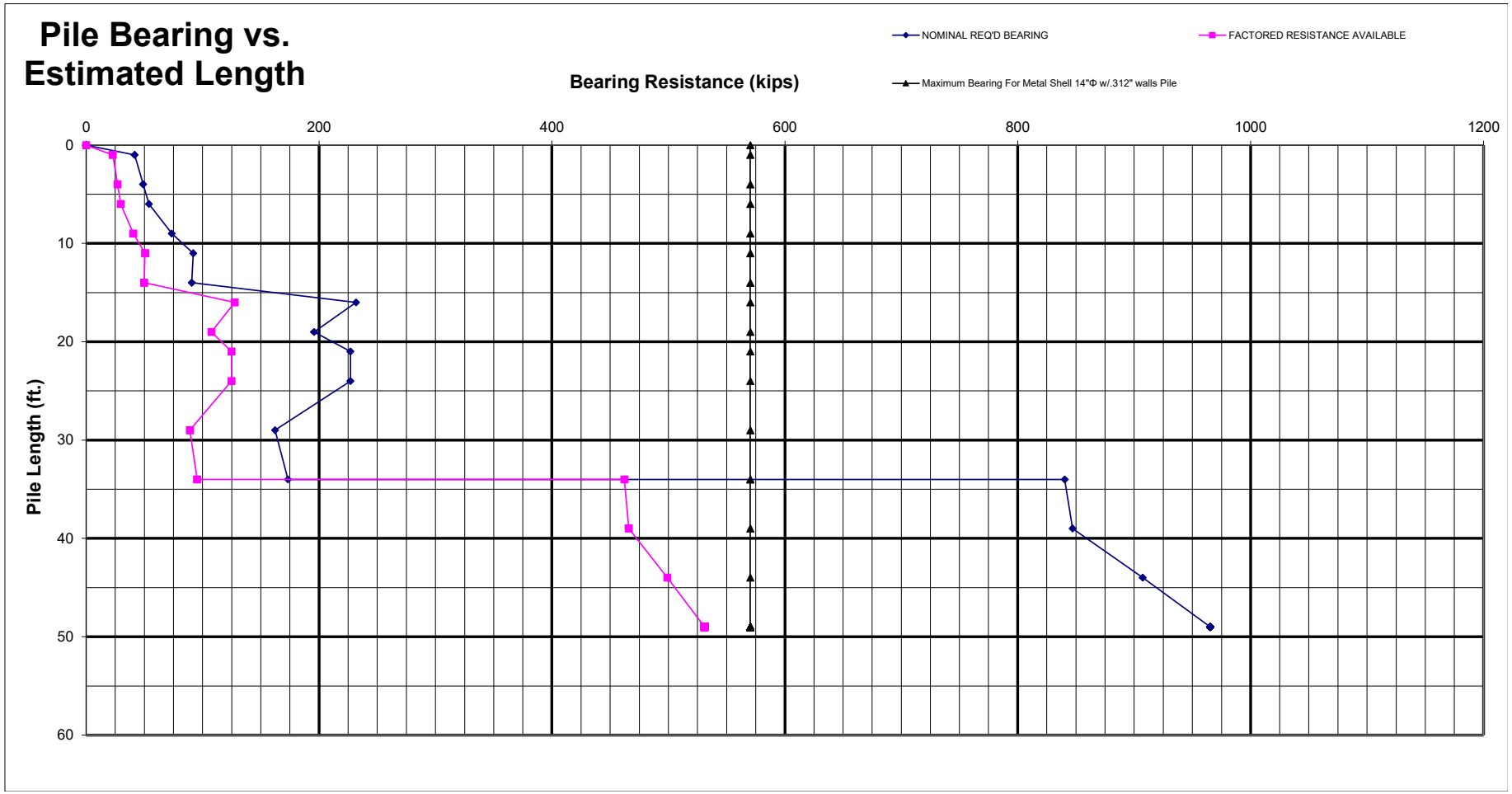
WB - West Abutment
12" w/0.25" wall



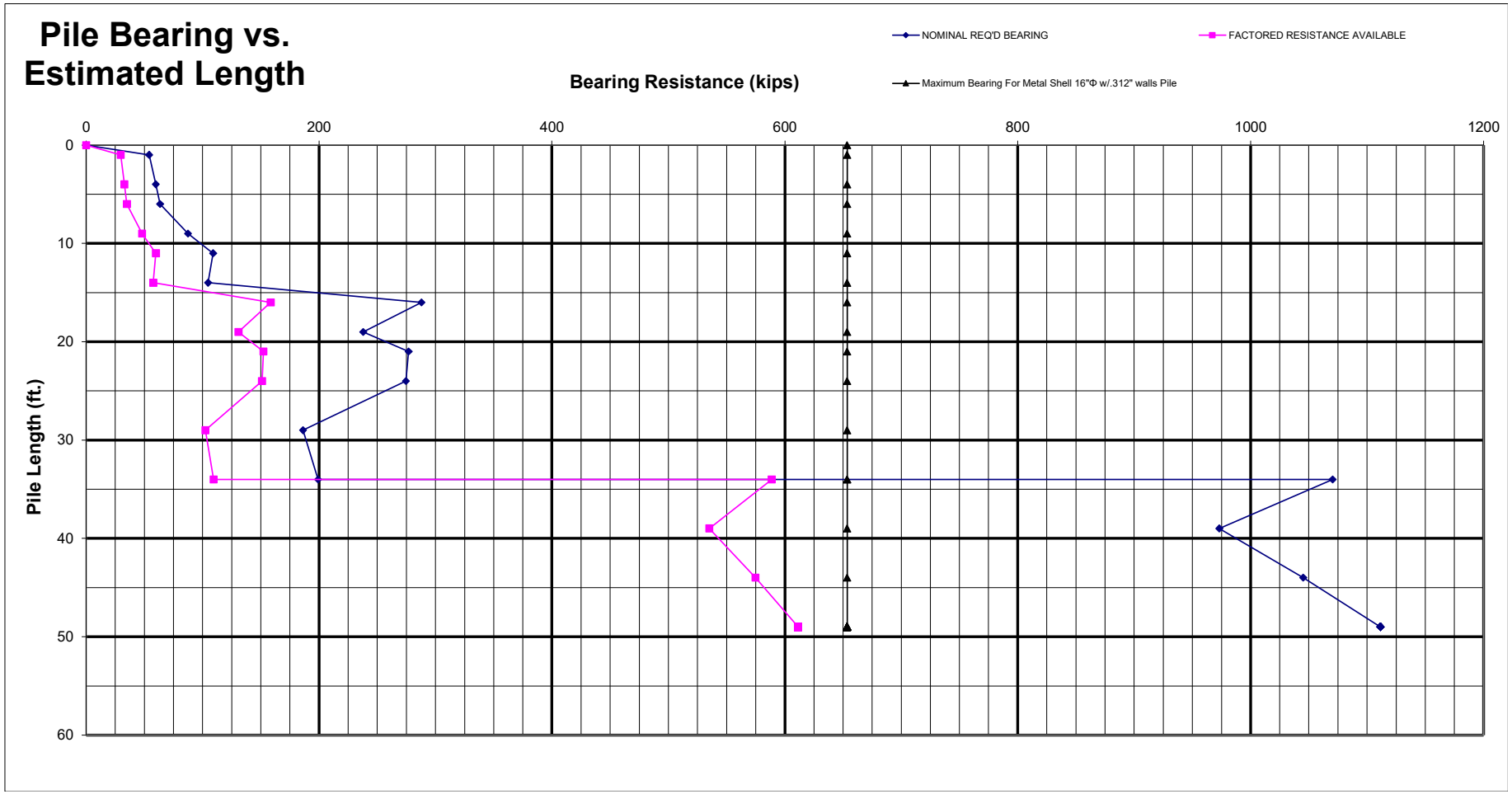
WB - West Abutment
14" w/0.25" wall



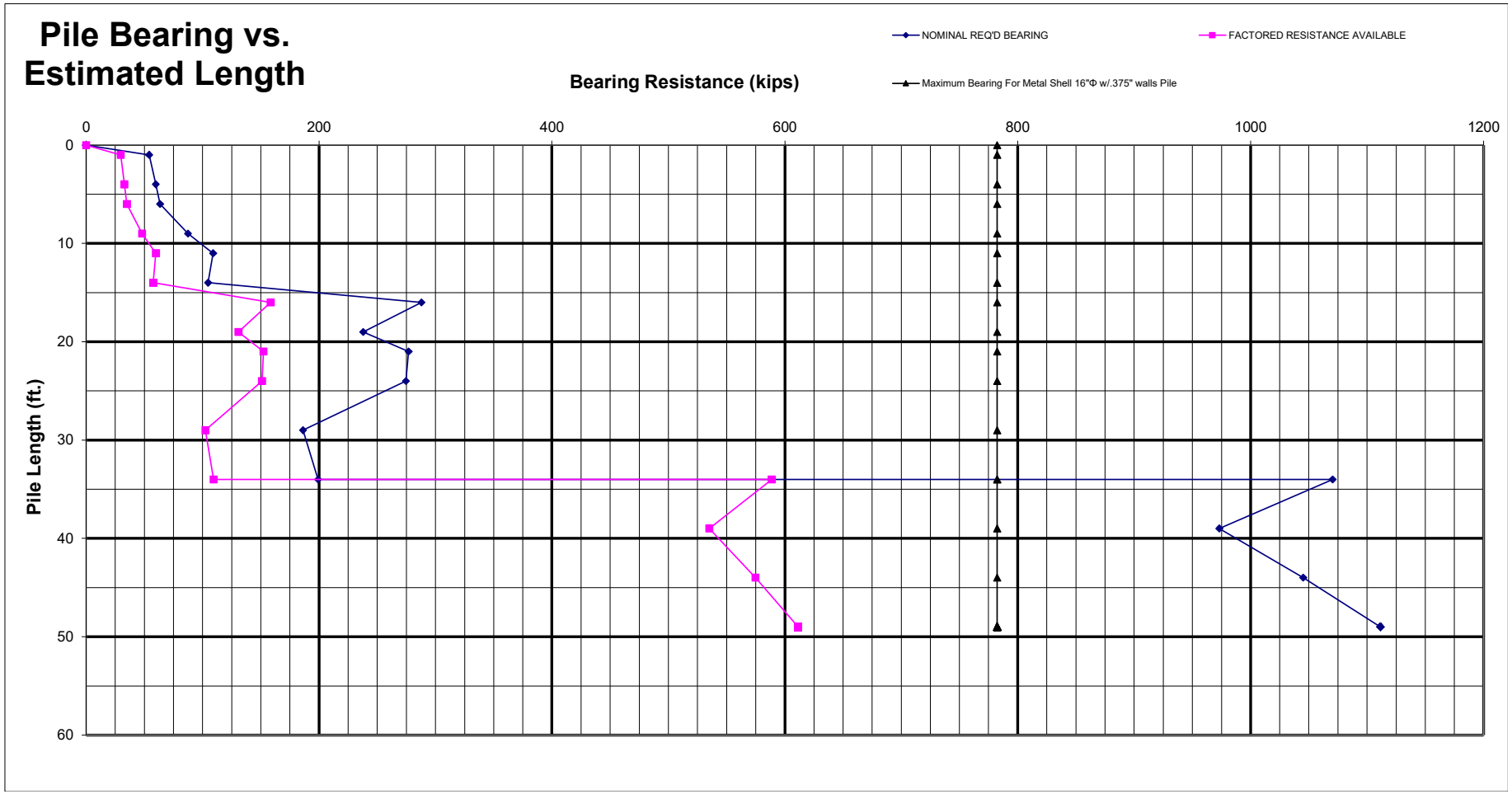
WB - West Abutment
14" w/0.312" wall



WB - West Abutment
16" w/0.312" wall



WB - West Abutment
16" w/0.375" wall



EB - West Abutment

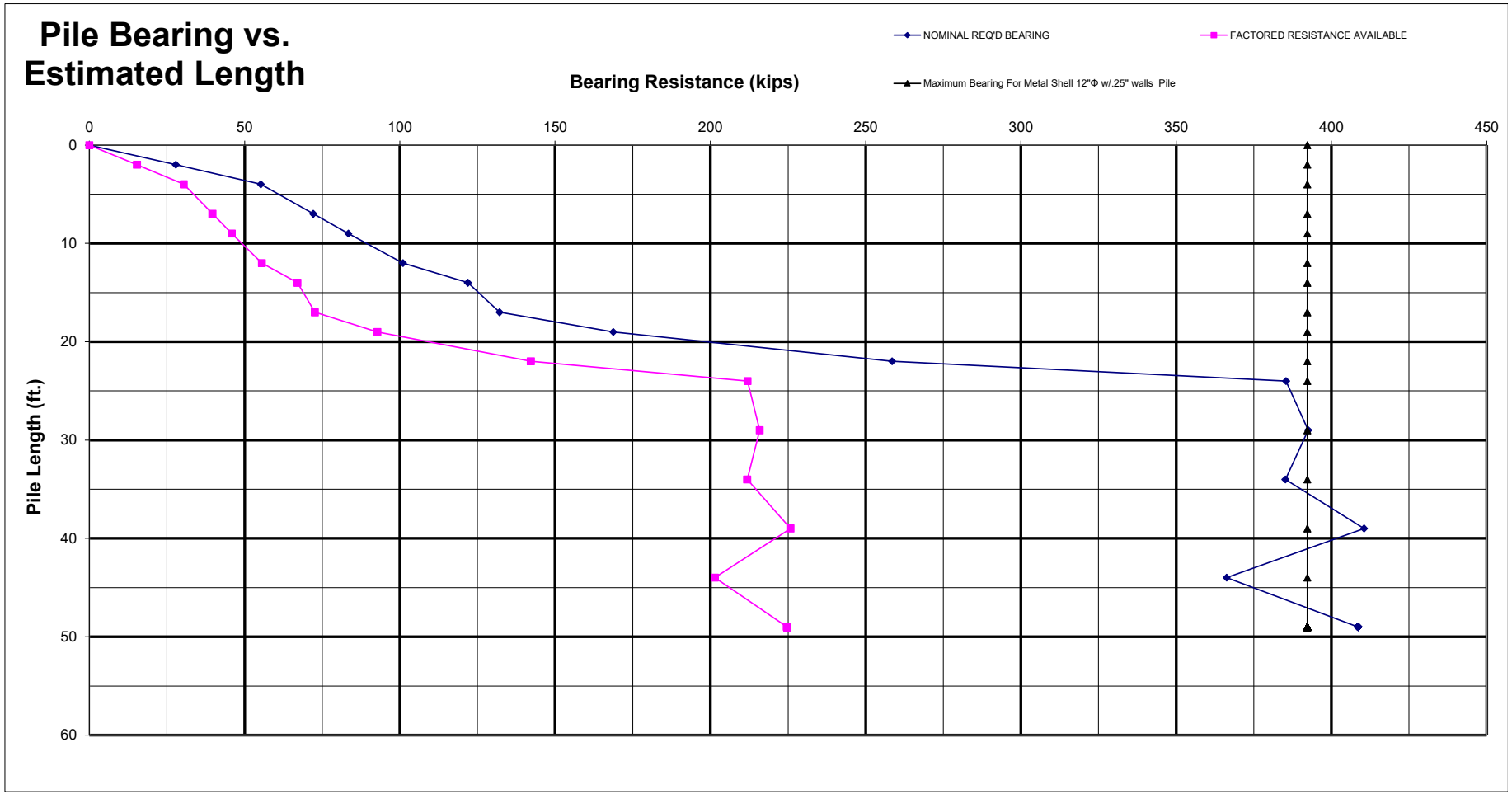
Pile Design Table for West Abutment - EB utilizing Boring #BSB-3

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls		
259	142	22
Metal Shell 14"Φ w/.25" walls		
205	112	19
326	179	22
Metal Shell 14"Φ w/.312" walls		
205	112	19
326	179	22
433	238	44
483	265	49
Metal Shell 16"Φ w/.312" walls		
243	133	19
400	220	22
502	276	44
558	307	49
Metal Shell 16"Φ w/.375" walls		
243	133	19
400	220	22
502	276	44
558	307	49
Steel HP 8 X 36		
151	83	49

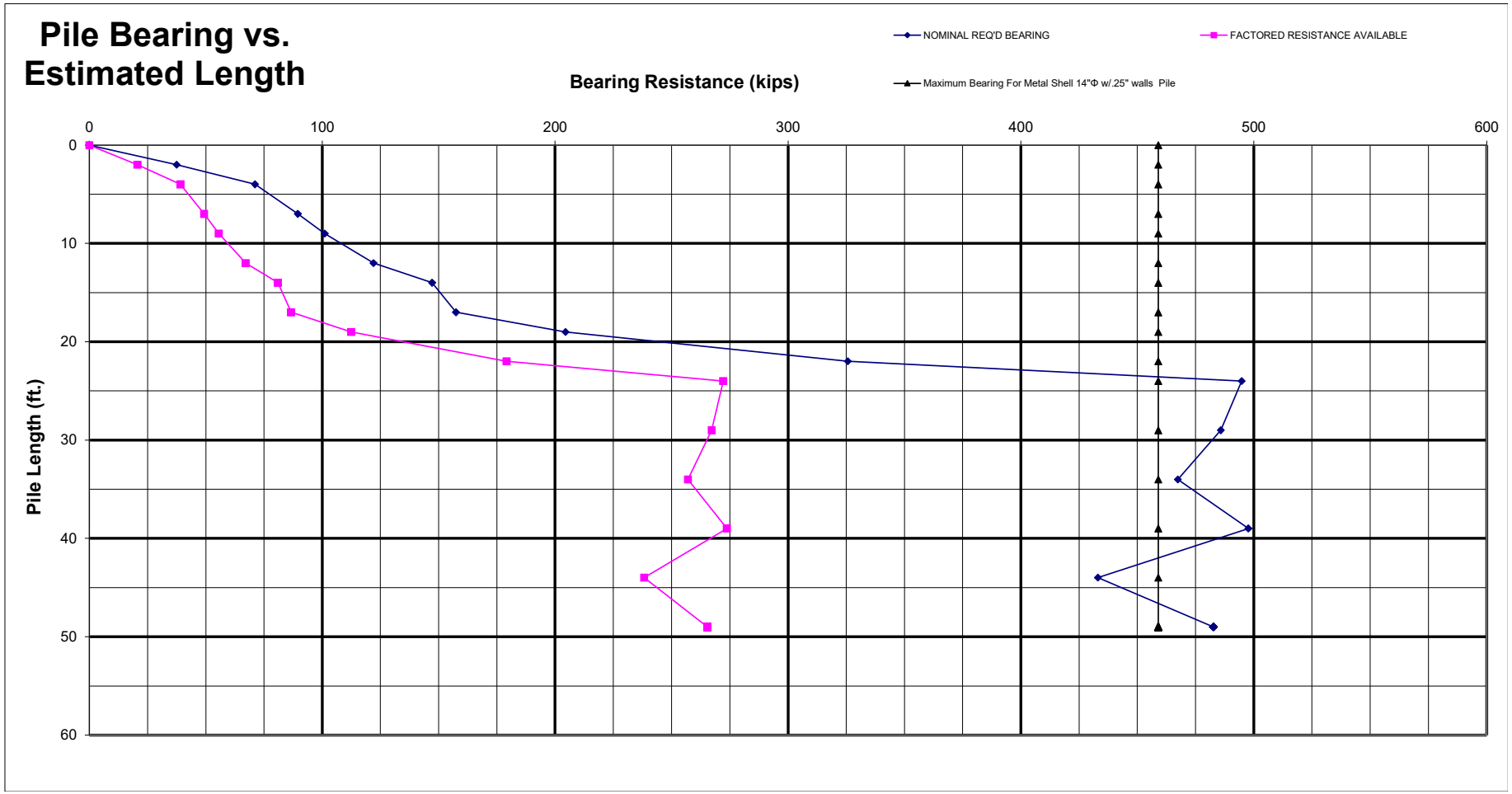
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
191	105	49
Steel HP 10 X 57		
196	108	49
Steel HP 12 X 53		
238	131	49
Steel HP 12 X 63		
241	132	49
Steel HP 12 X 74		
244	134	49

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
248	136	49
Steel HP 14 X 73		
293	161	49
Steel HP 14 X 89		
255	140	44
297	163	49
Steel HP 14 X 102		
258	142	44
301	165	49
Steel HP 14 X 117		
262	144	44
304	167	49
Precast 14"x 14"		
260	143	19

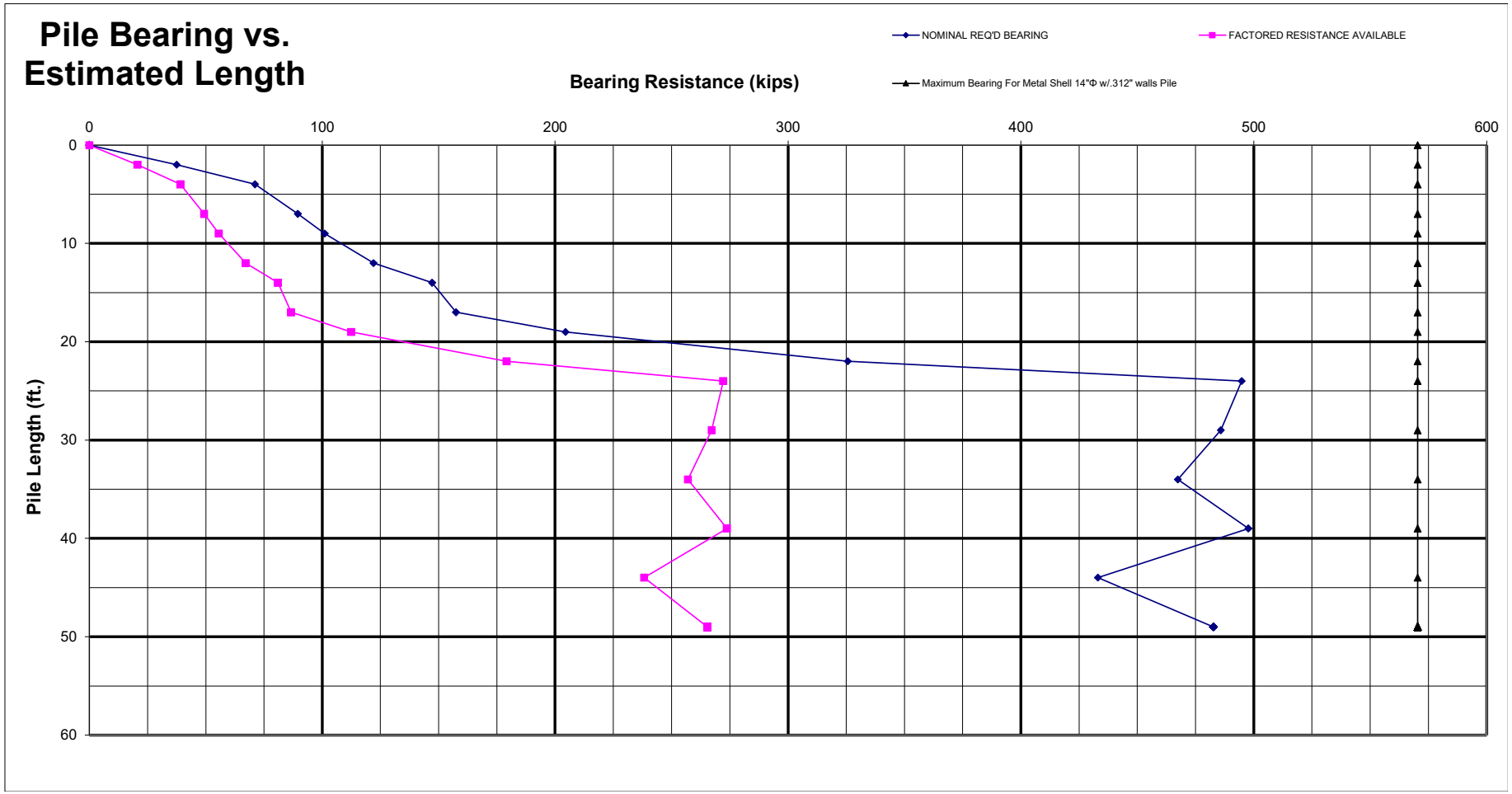
EB - West Abutment
12" w/0.25" wall



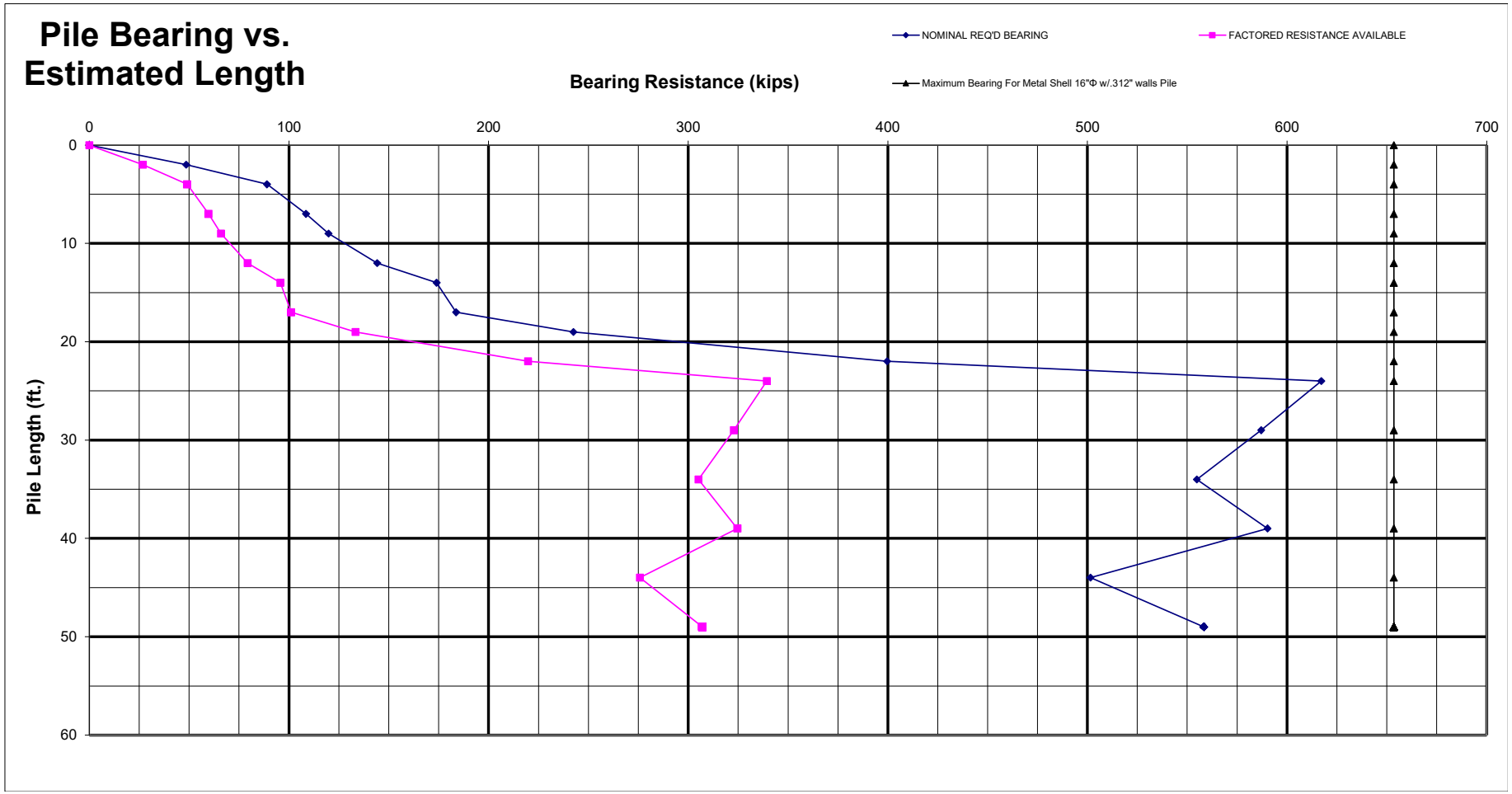
EB - West Abutment
14" w/0.25" wall



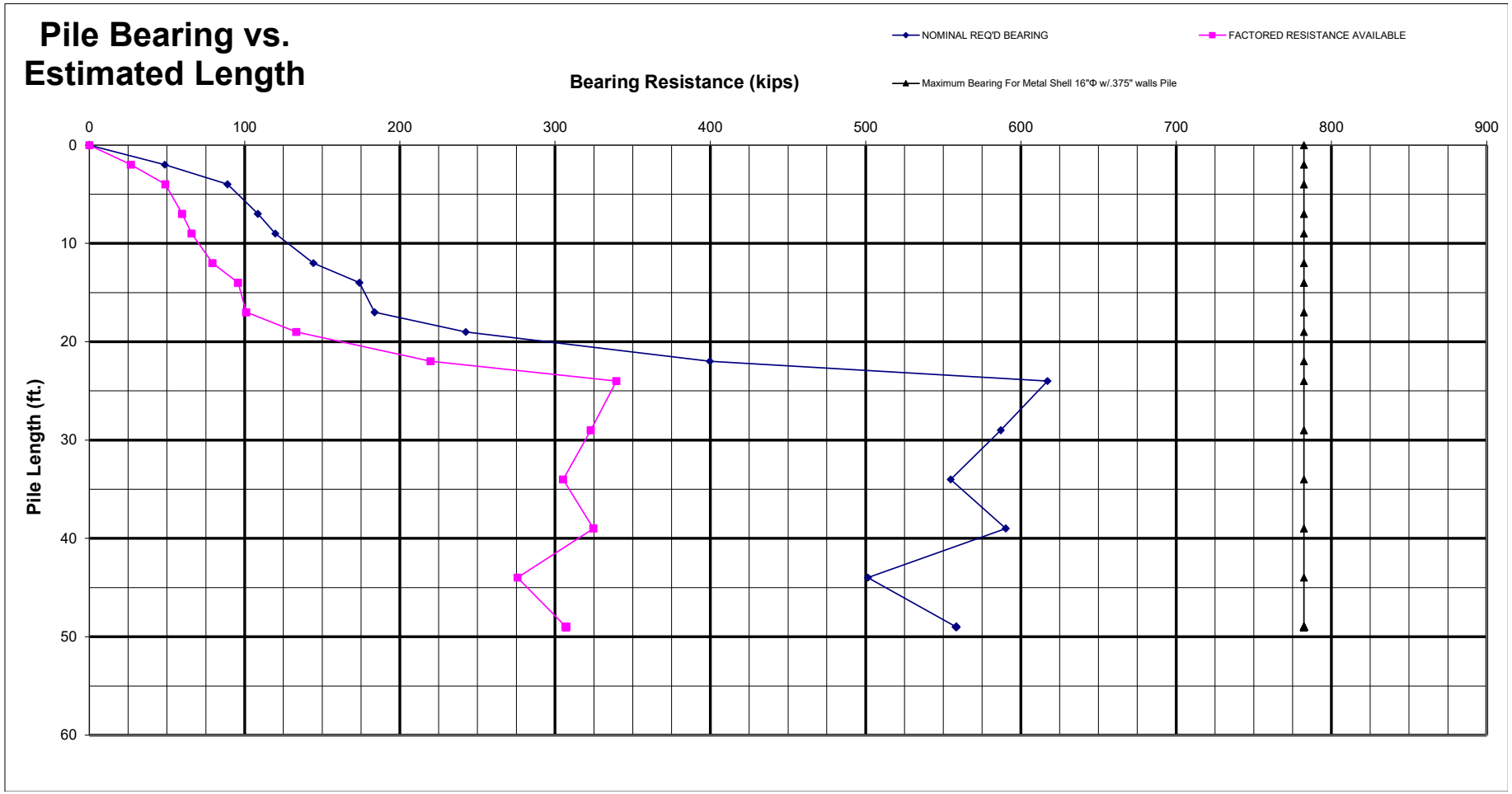
EB - West Abutment
14" w/0.312" wall



EB - West Abutment
16" w/0.312" wall



EB - West Abutment
16" w/0.375" wall



WB - East Abutment

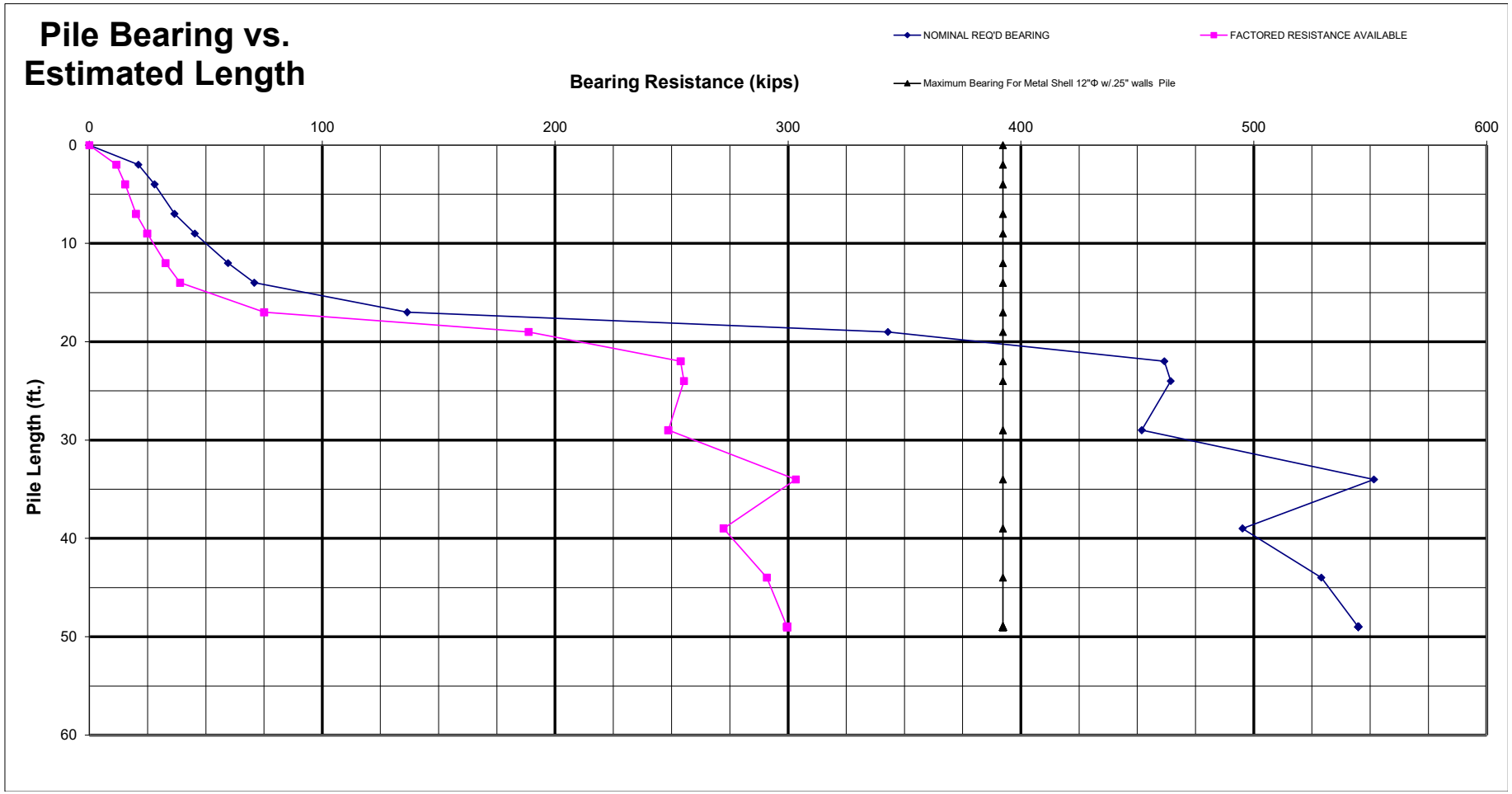
Pile Design Table for East Abutment - WB utilizing Boring #BSB-2

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls		
137	75	17
343	189	19
Metal Shell 14"Φ w/.25" walls		
172	95	17
451	248	19
Metal Shell 14"Φ w/.312" walls		
172	95	17
451	248	19
Metal Shell 16"Φ w/.312" walls		
212	116	17
574	316	19
Metal Shell 16"Φ w/.375" walls		
212	116	17
574	316	19
655	360	29
Steel HP 8 X 36		
151	83	49

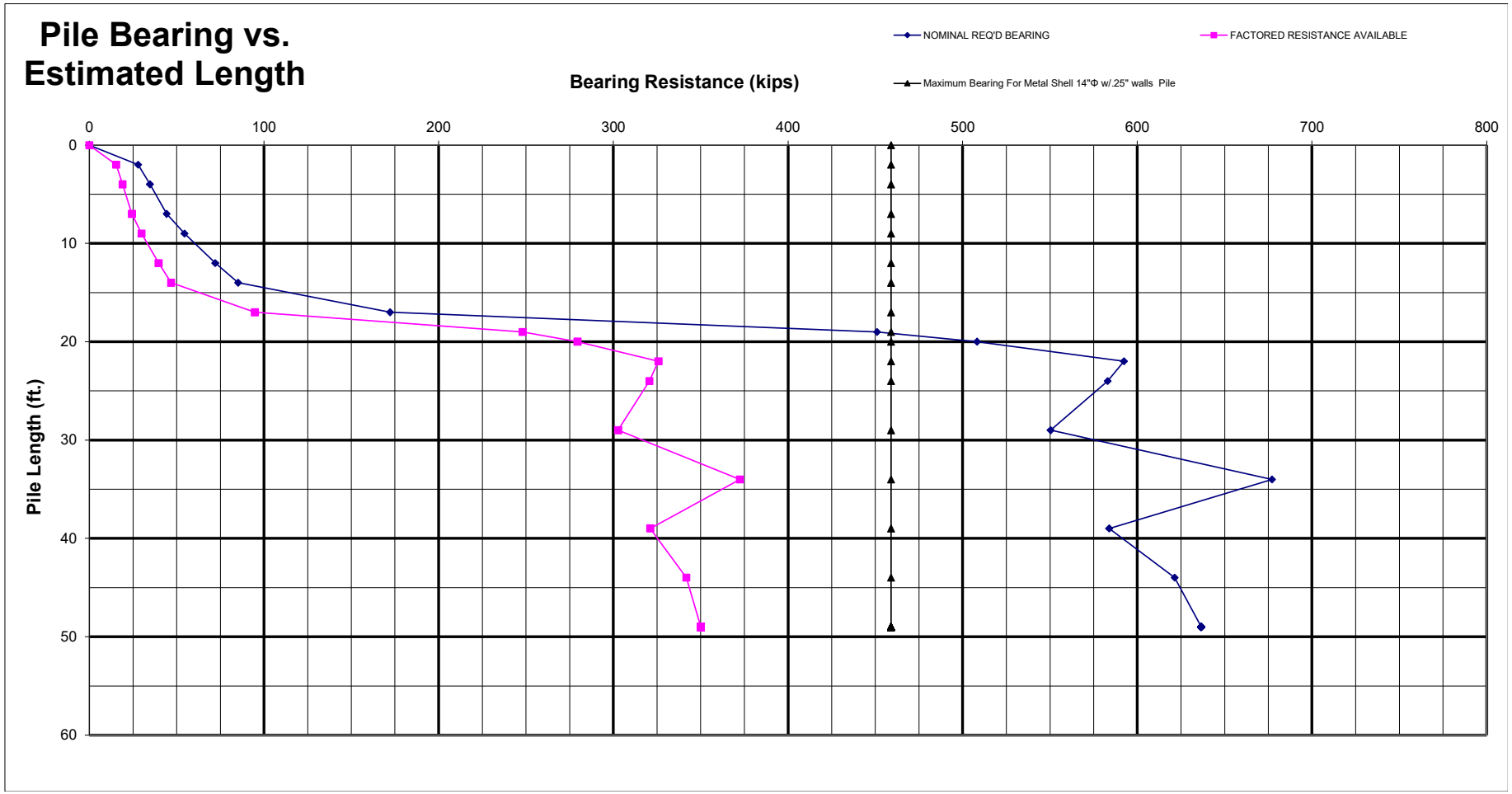
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
185	102	49
Steel HP 10 X 57		
189	104	49
Steel HP 12 X 53		
224	123	49
Steel HP 12 X 63		
226	124	49
Steel HP 12 X 74		
229	126	49

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
232	127	49
Steel HP 14 X 73		
267	147	49
Steel HP 14 X 89		
270	148	49
Steel HP 14 X 102		
273	150	49
Steel HP 14 X 117		
276	152	49
Precast 14"x 14"		
219	121	17

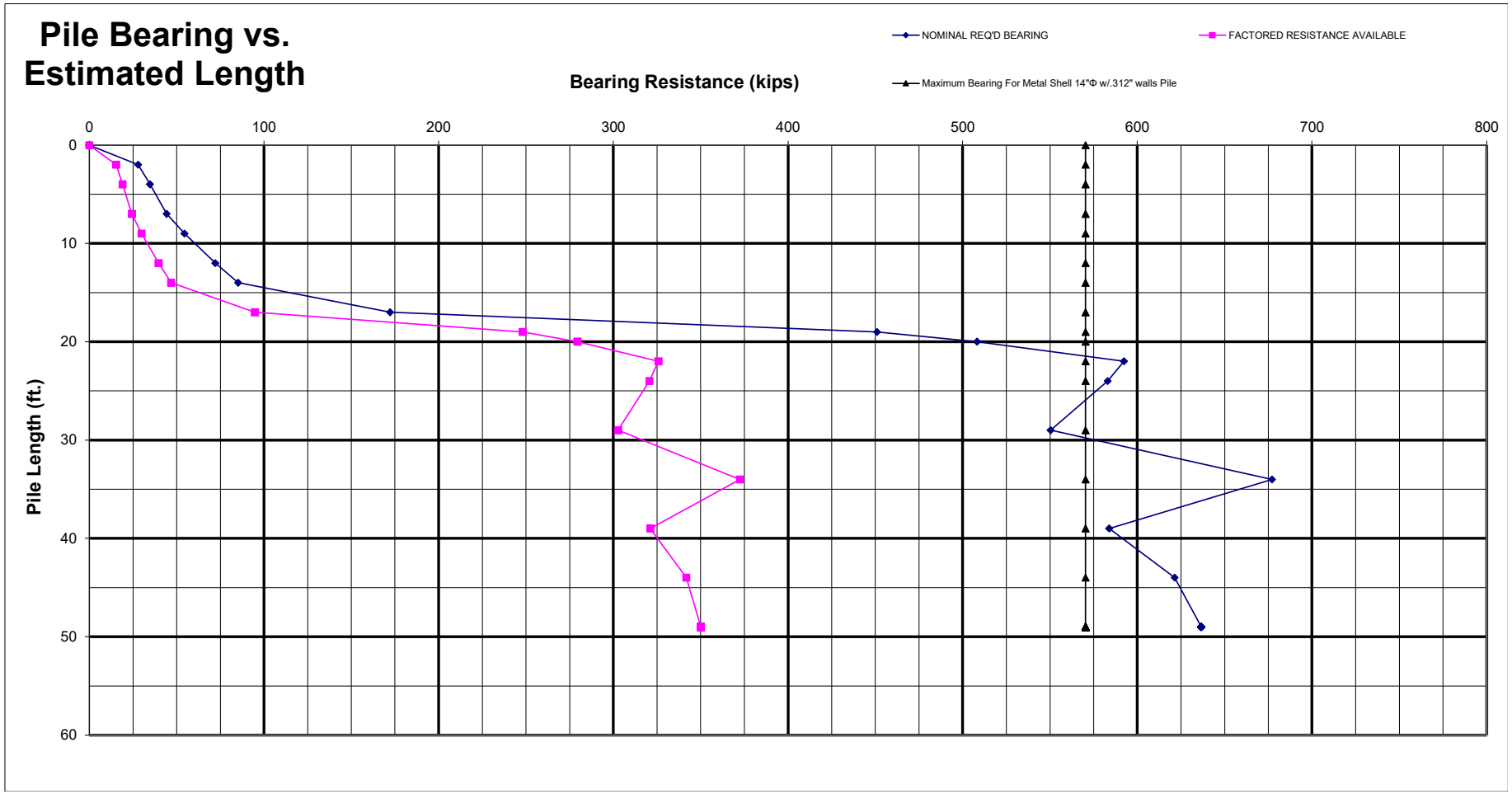
WB - East Abutment
12" w/0.25" wall



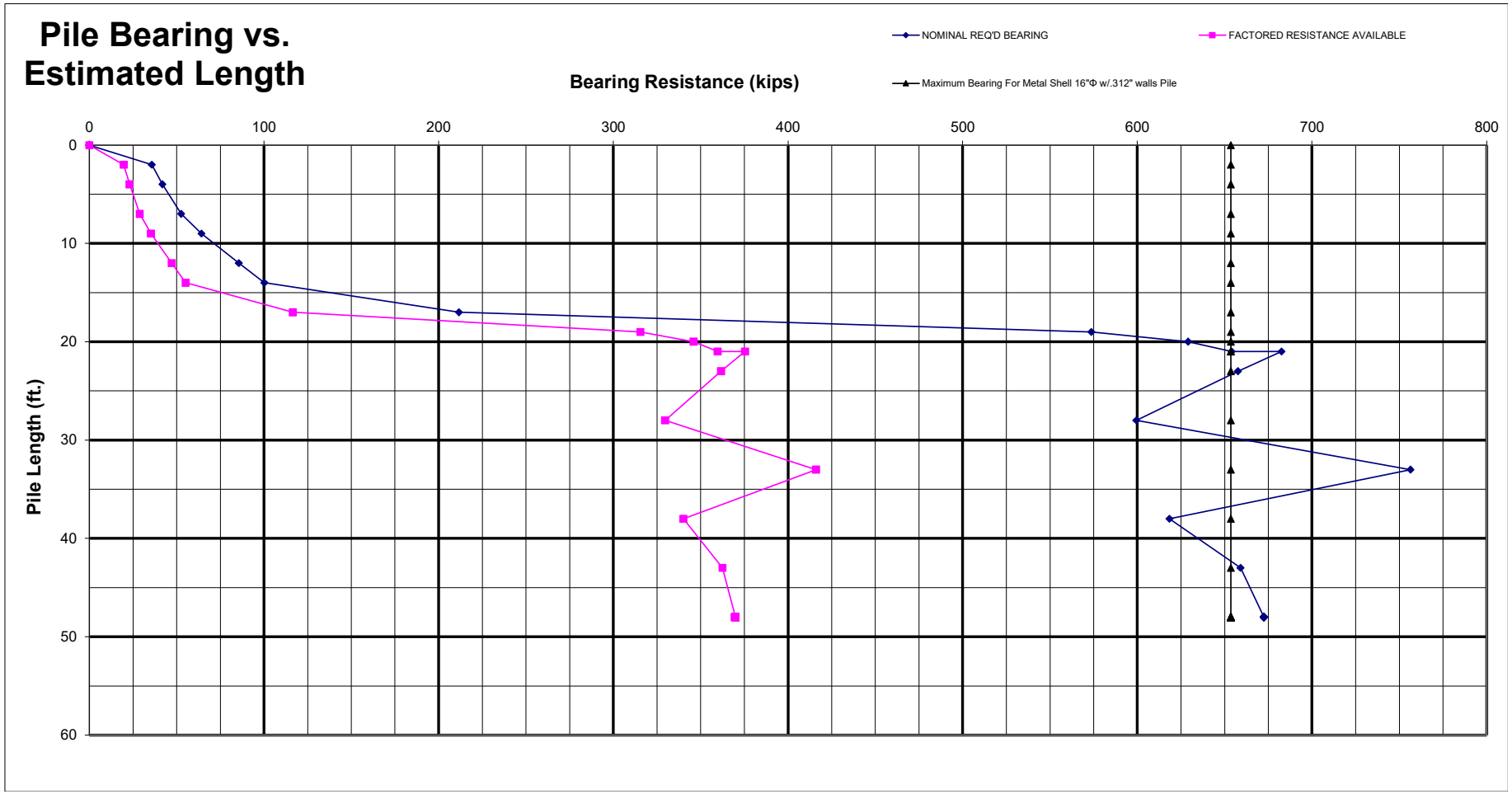
WB - East Abutment
14" w/0.25" wall



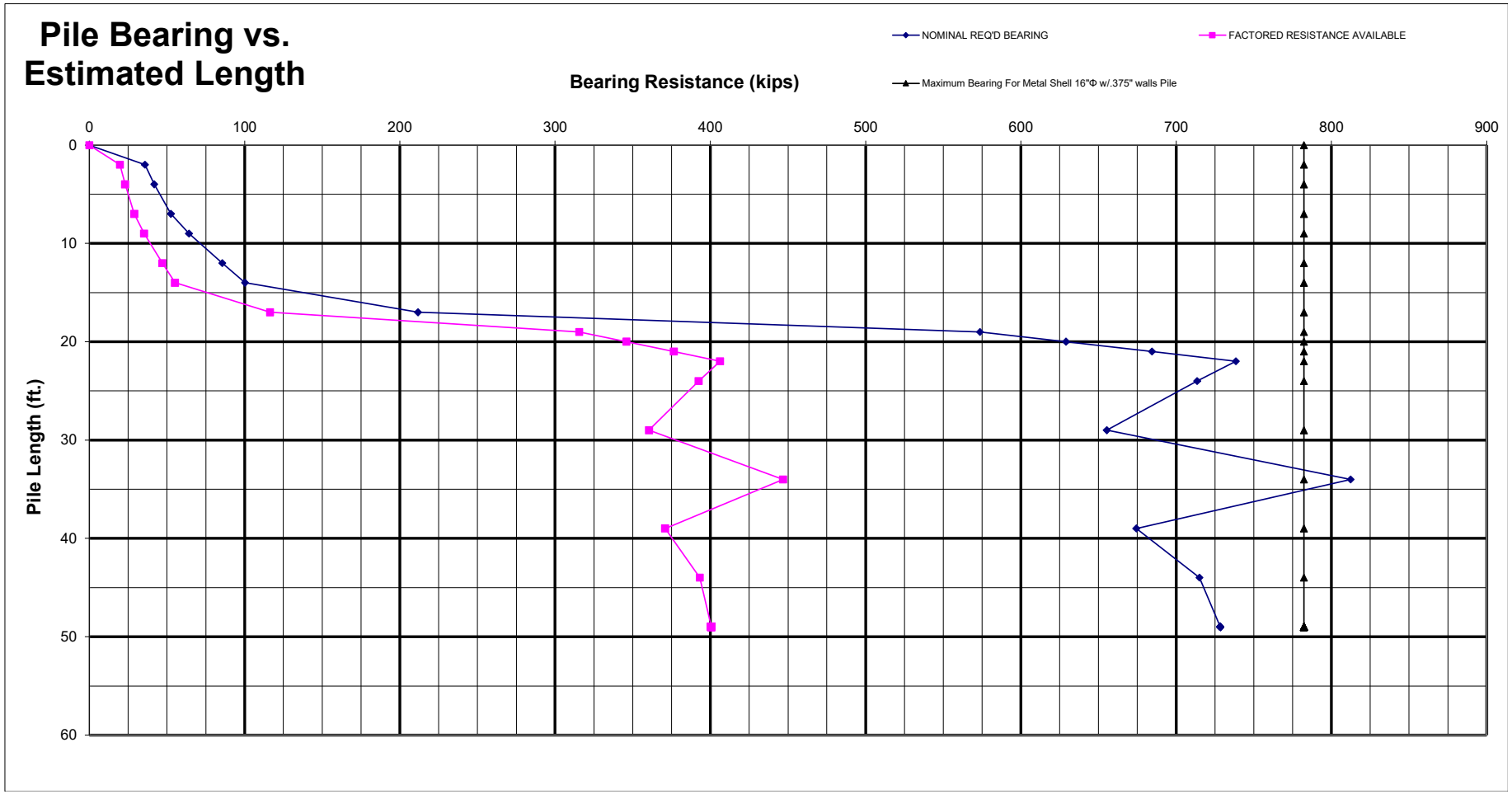
WB - East Abutment
14" w/0.312" wall



WB - East Abutment
16" w/0.312" wall



WB - East Abutment
16" w/0.375" wall



EB - East Abutment

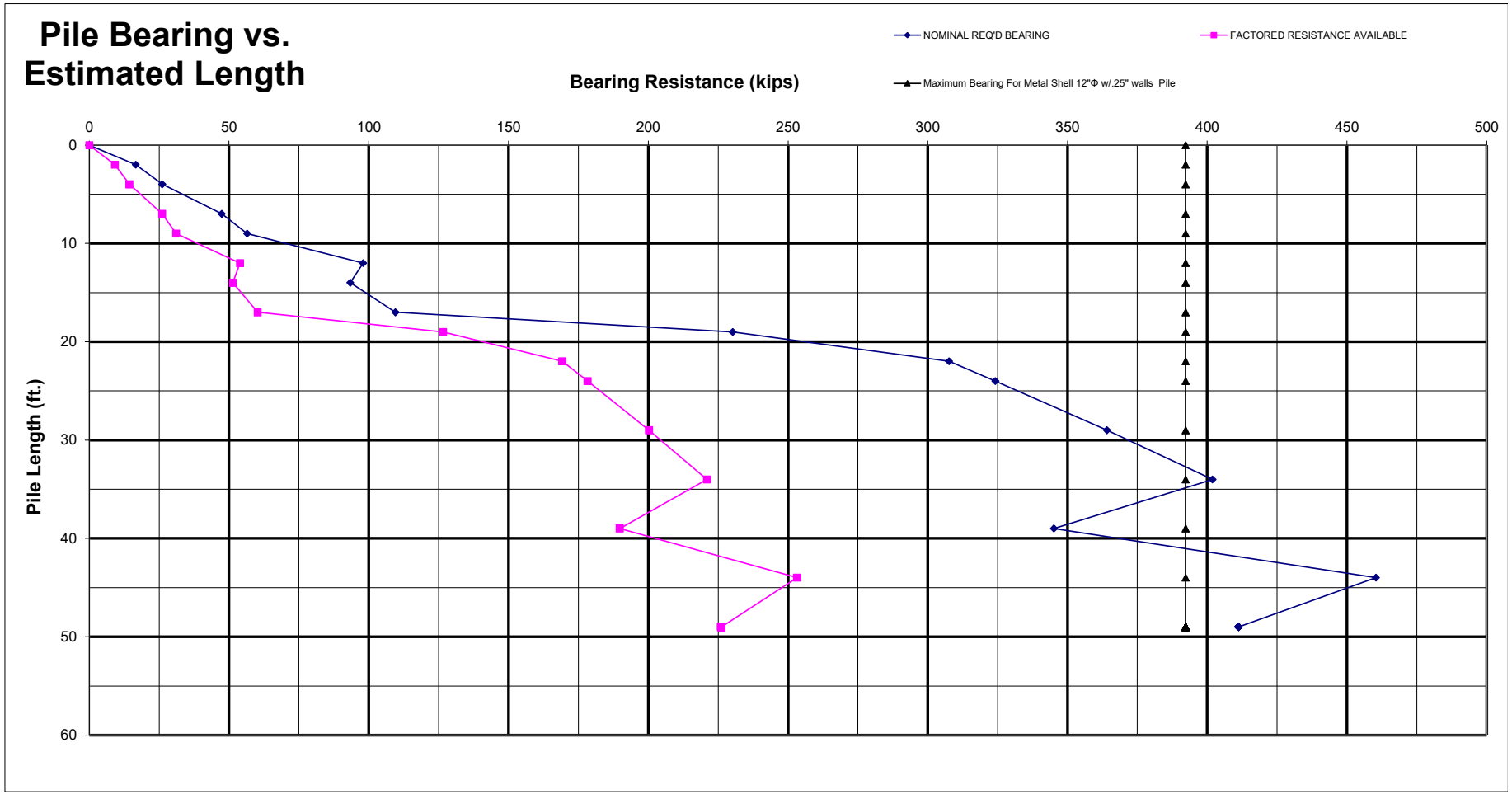
Pile Design Table for East Abutment - EB utilizing Boring #BSB-6

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls		
230	127	19
308	169	22
324	178	24
Metal Shell 14"Φ w/.25" walls		
293	161	19
394	217	22
Metal Shell 14"Φ w/.312" walls		
293	161	19
394	217	22
406	223	39
486	267	49
Metal Shell 16"Φ w/.312" walls		
154	85	17
362	199	19
469	258	39
Metal Shell 16"Φ w/.375" walls		
154	85	17
362	199	19
469	258	39
562	309	49
Steel HP 8 X 36		
139	76	49

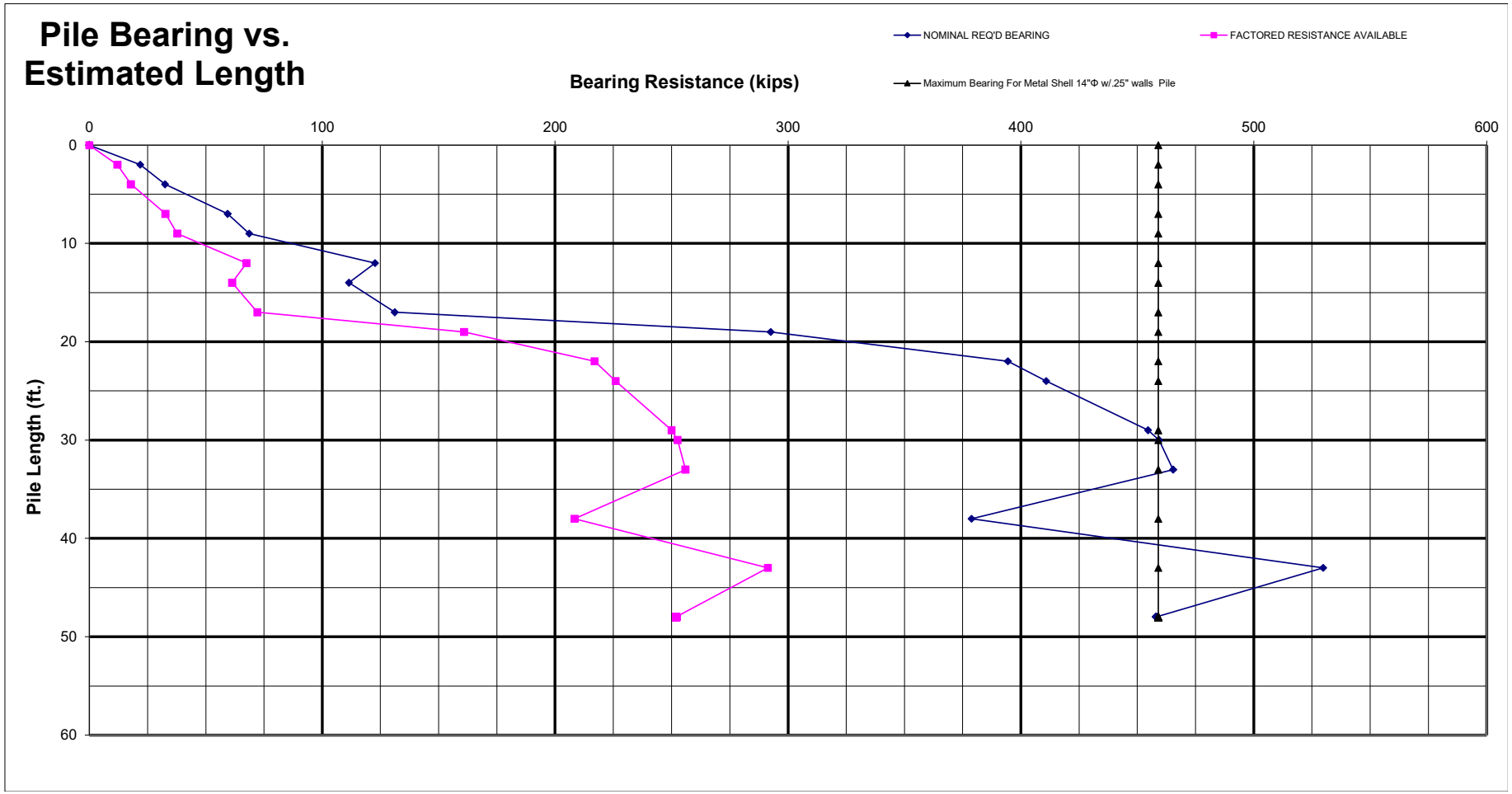
Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
176	97	49
Steel HP 10 X 57		
180	99	49
Steel HP 12 X 53		
220	121	49
Steel HP 12 X 63		
222	122	49
Steel HP 12 X 74		
226	124	49

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
229	126	49
Steel HP 14 X 73		
271	149	49
Steel HP 14 X 89		
275	151	49
Steel HP 14 X 102		
279	153	49
Steel HP 14 X 117		
282	155	49
Precast 14"x 14"		
167	92	17

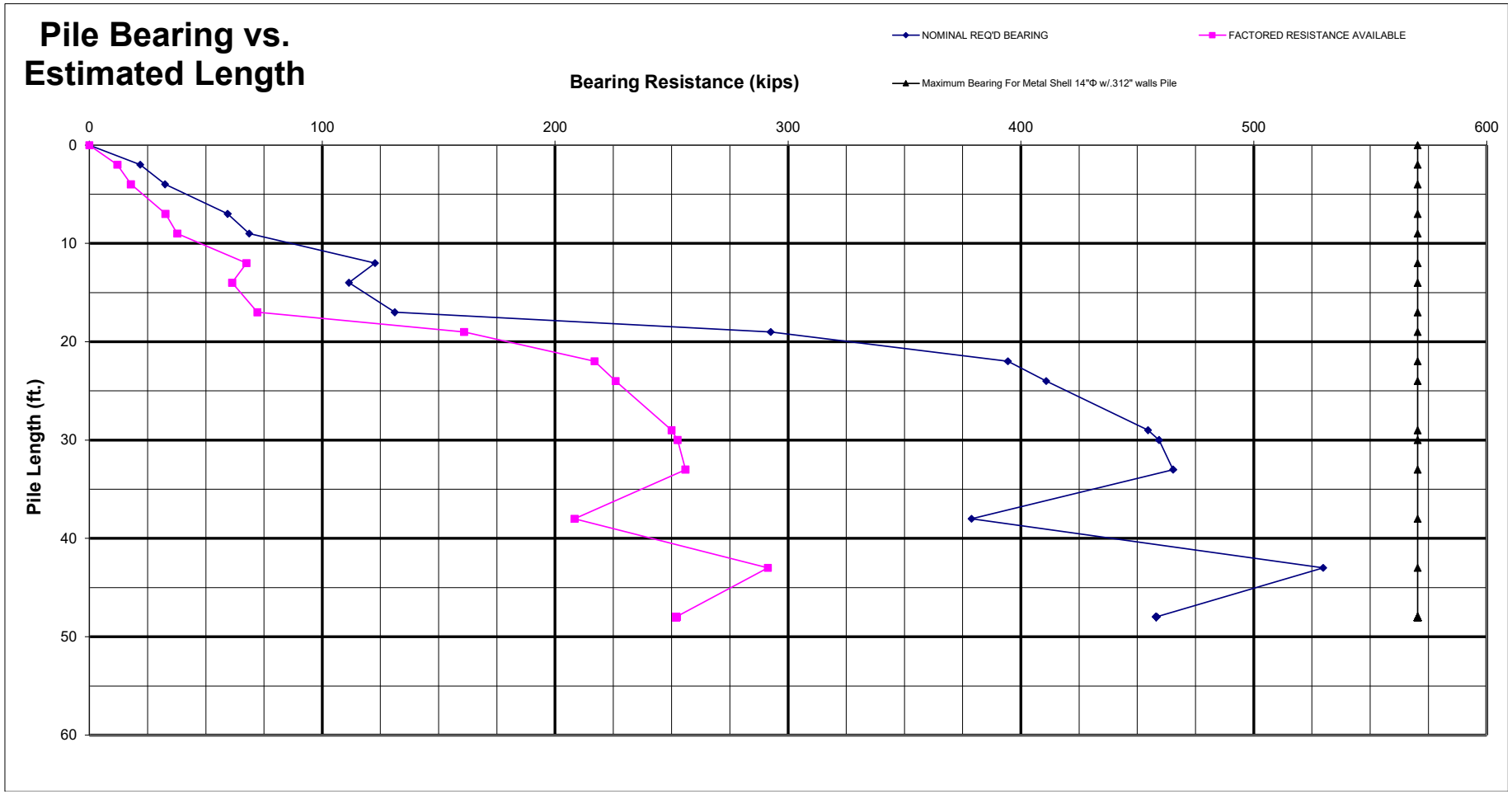
EB - East Abutment
12" w/0.25" wall



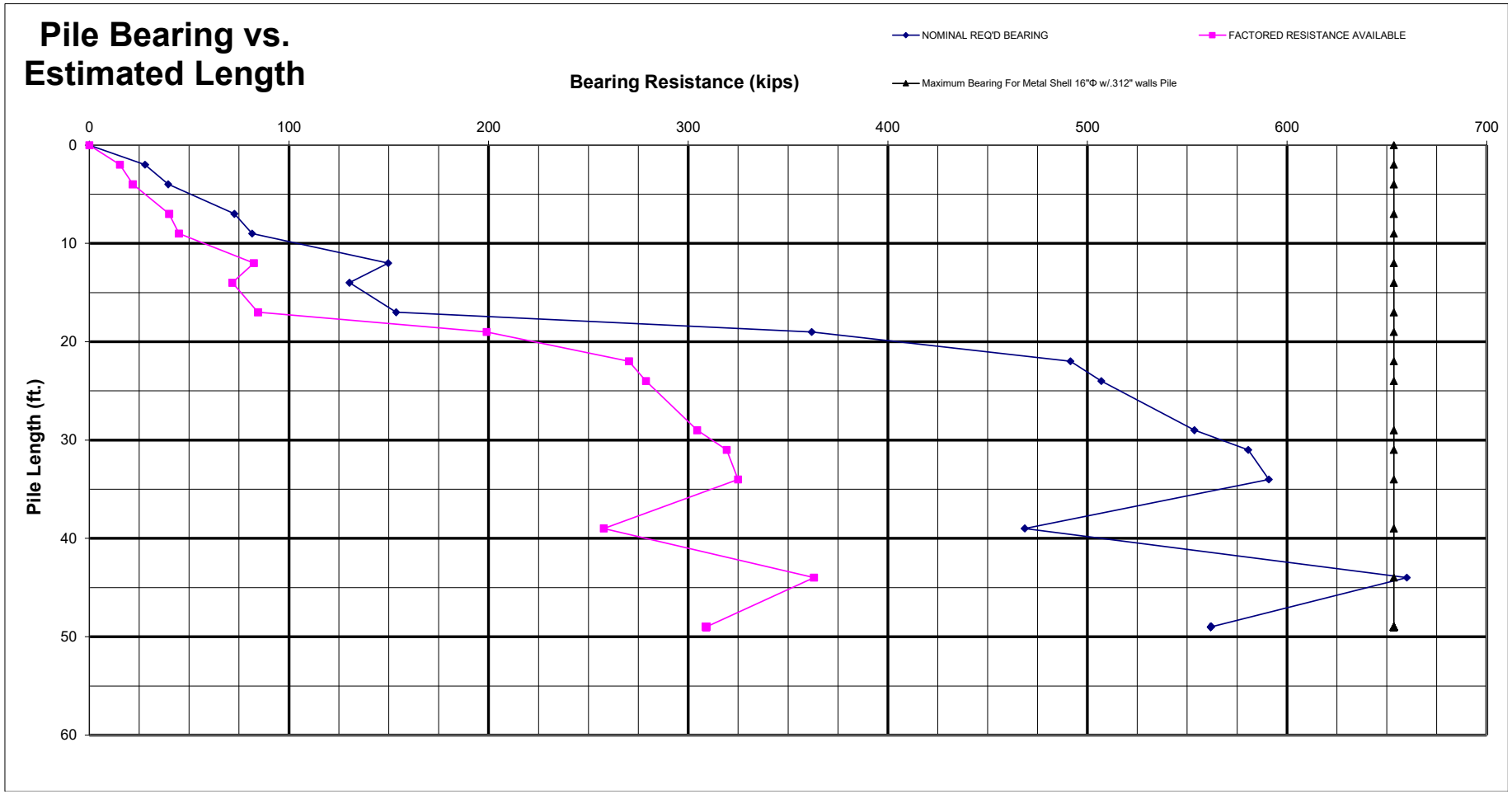
EB - East Abutment
14" w/0.25" wall



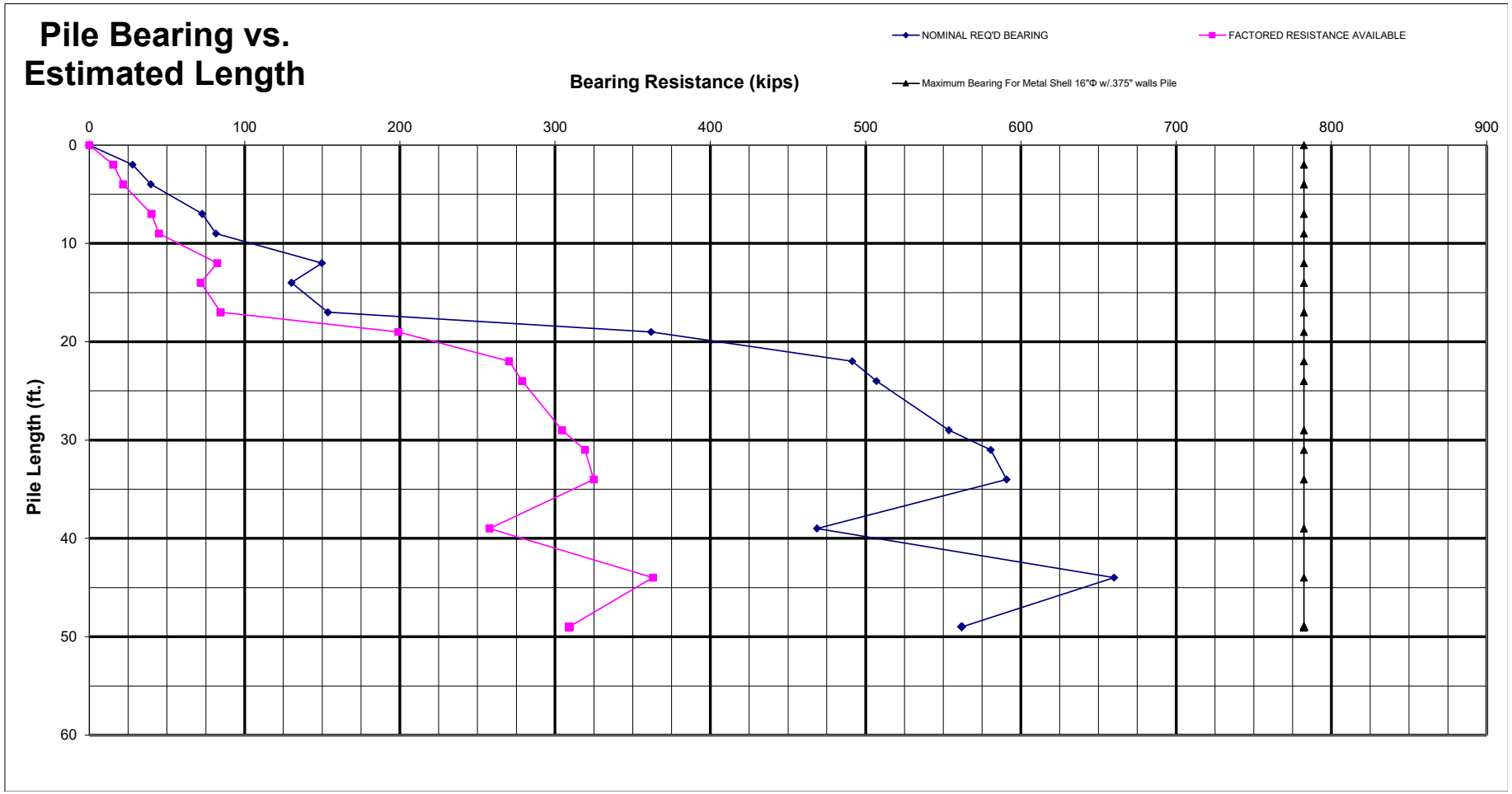
EB - East Abutment
14" w/0.312" wall



EB - East Abutment
16" w/0.312" wall



EB - East Abutment
16" w/0.375" wall



APPENDIX J: INTEGRAL ABUTMENT FEASIBILITY

East Bound Bridge

Illinois Department of Transportation

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER	045-0006 (EB)		TOTAL STRUCTURE LENGTH	188.00	FT
STRUCTURE TYPE	MULTI-SPAN		NUMBER OF SPANS	3	
STRUCTURE SKEW	0	DEGREES	END SPAN LENGTH	54.00	FT
SUPER. DATA IN REFERENCE TO SUB. DATA	ABUT 1		ADJACENT INTERIOR SPAN LENGTH	80.00	FT

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (END OR MAIN SPAN)

BEAM TYPE	WIDE FLANGE	
WIDE FLANGE	W27X161	
BEAM SPACING PERP. TO CL	5.92	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)

WIDE FLANGE	W27X161	
BEAM SPACING PERP. TO CL	5.92	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

ABUTMENT #1 DATA

ABUTMENT NAME	West Abut	
ABUTMENT REFERENCE BORING	BSB-03	
BOTTOM OF ABUTMENT ELEVATION	746.04	FT
ESTIMATED NUMBER OF PILES AT ABUT.	7	
PILE SPACING PERP. TO CL	5.92	FT

ABUTMENT #2 DATA

ABUTMENT NAME	East Abut	
ABUTMENT REFERENCE BORING	BSB-06	
BOTTOM OF ABUTMENT ELEVATION	745.22	FT
ESTIMATED NUMBER OF PILES AT ABUT.	7	
PILE SPACING PERP. TO CL	5.92	FT

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
745.54	0.50		3	1.5
743.04	2.50		9	2.3
740.54	2.50		17	2.8
738.04	2.50		15	2.7
736.04	2.00		7	2.2

10.00 FT = TOTAL DEPTH ENTERED

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
744.52	0.70		9	2.3
742.02	2.50		5	1.9
739.52	2.50		6	2.0
737.02	2.50		10	2.4
735.22	1.80		15	2.7

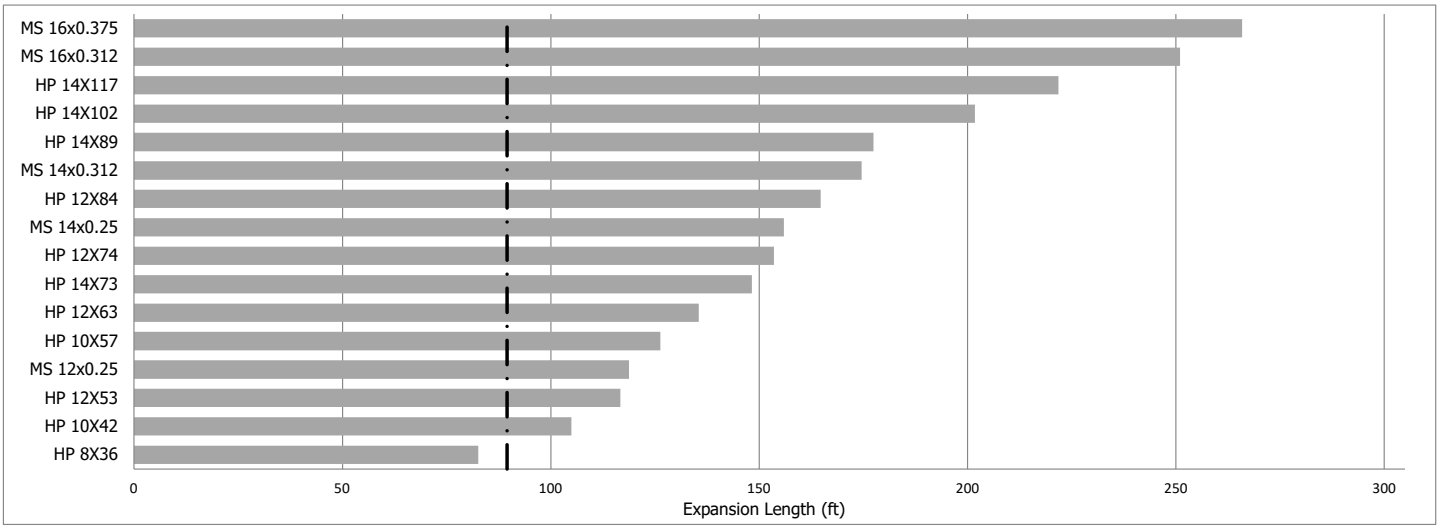
10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1	2.48	TSF	WEIGHTED AVERAGE Qu FOR ABUTMENT #2	2.25	TSF
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*2.48])	1.42		PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*2.25])	1.29	

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1.42*7*0+1.29*7*188]/[1.42*7+1.29*7] = 89.55 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1.29*7*0+1.42*7*188]/[1.29*7+1.42*7] = 98.45 FT

ABUT 1 (West Abut) - EXPANSION LENGTH LIMIT CHART - 0 DEG. SKEW



= Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration.
(Note: The same size pile should be used at both abutments.)

West Bound Bridge

Illinois Department of Transportation

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER	045-0006 (WB)		TOTAL STRUCTURE LENGTH	188.00	FT
STRUCTURE TYPE	MULTI-SPAN		NUMBER OF SPANS	3	
STRUCTURE SKEW	0	DEGREES	END SPAN LENGTH	54.00	FT
SUPER. DATA IN REFERENCE TO SUB. DATA	ABUT 1		ADJACENT INTERIOR SPAN LENGTH	80.00	FT

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (END OR MAIN SPAN)

BEAM TYPE	WIDE FLANGE	
WIDE FLANGE	W27X161	
BEAM SPACING PERP. TO CL	5.92	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)

WIDE FLANGE	W27X161	
BEAM SPACING PERP. TO CL	5.92	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

ABUTMENT #1 DATA

ABUTMENT NAME	West Abut	
ABUTMENT REFERENCE BORING	BSB-01	
BOTTOM OF ABUTMENT ELEVATION	746.04	FT
ESTIMATED NUMBER OF PILES AT ABUT.	7	
PILE SPACING PERP. TO CL	5.92	FT

ABUTMENT #2 DATA

ABUTMENT NAME	East Abut	
ABUTMENT REFERENCE BORING	BSB-02	
BOTTOM OF ABUTMENT ELEVATION	745.22	FT
ESTIMATED NUMBER OF PILES AT ABUT.	7	
PILE SPACING PERP. TO CL	5.92	FT

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
745.82	0.22		3	1.5
743.32	2.50		8	2.3
740.82	2.50		15	2.7
738.32	2.50		9	2.3
736.04	2.28		9	2.3

10.00 FT = TOTAL DEPTH ENTERED

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
744.72	0.50		8	2.3
742.22	2.50		7	2.2
739.72	2.50		9	2.3
737.22	2.50		9	2.3
735.22	2.00		16	2.8

10.00 FT = TOTAL DEPTH ENTERED

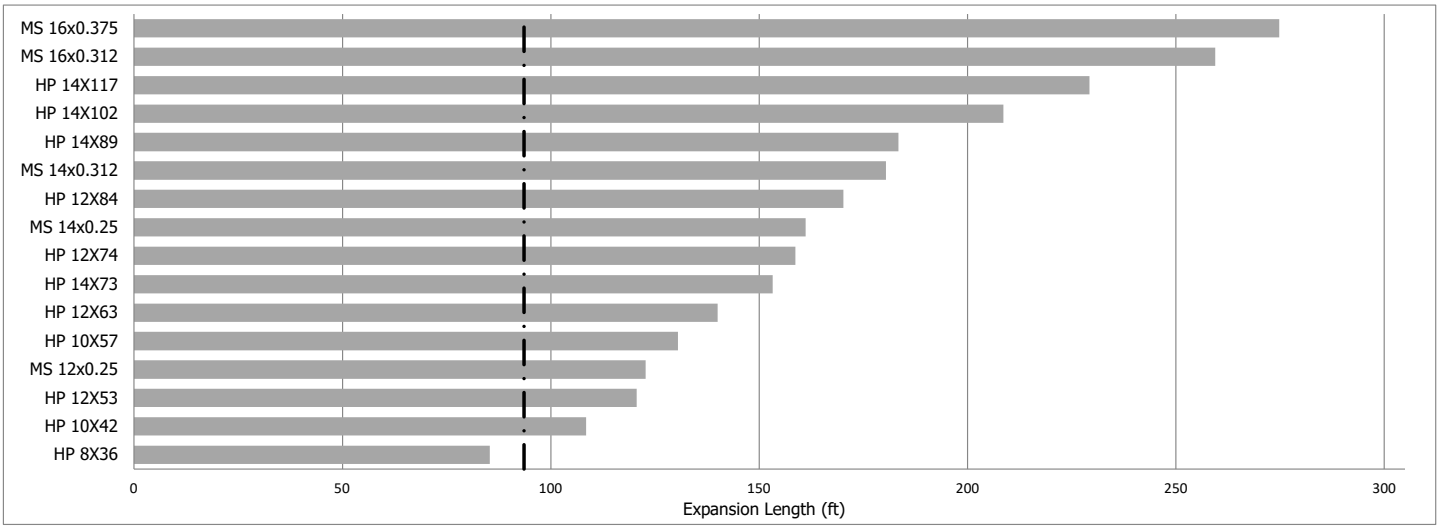
ENTER 10 FT OF SOIL DATA

WEIGHTED AVERAGE Qu FOR ABUTMENT #1	2.40	TSF	WEIGHTED AVERAGE Qu FOR ABUTMENT #2	2.38	TSF
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*2.4])	1.37		PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*2.38])	1.36	

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1.37*7*0+1.36*7*188]/[1.37*7+1.36*7] = 93.60 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1.36*7*0+1.37*7*188]/[1.36*7+1.37*7] = 94.40 FT

ABUT 1 (West Abut) - EXPANSION LENGTH LIMIT CHART - 0 DEG. SKEW



= Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration.
(Note: The same size pile should be used at both abutments.)