STRUCTURE GEOTECHNICAL REPORT
INTERSTATE 80 BRIDGES
OVER DUPAGE RIVER
EX SNS 099-0040 (EB) AND 099-0041 (WB)
PR SNS 099-8312 (EB) AND 099-8313 (WB)
WILL COUNTY, ILLINOIS

For
Stantec

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11. Abstract

Two new, three-span bridges will replace the existing five-span bridges carrying Interstate 80 over DuPage River in Will County, Illinois. The proposed structures will have back-to-back of abutments length of 314.9 feet and out-to-out widths of 62.8 feet (EB) and 68.8 feet (WB). The proposed east and west abutment cap base elevations are 557.09 and 558.48 feet, respectively, whereas the cap base elevations at the new piers are both estimated at the bottom of the encasement walls at elevation 541.24 feet. This report provides geotechnical recommendations for the design and construction of the proposed approach embankments, approach slabs, and bridge foundations.

The pavement structure along I-80 consists of 13 to 18 inches of asphalt over aggregate base. The bridge deck consists of 9 inches of concrete pavement. Beneath the I-80 pavement structure, the general lithologic profile includes up to 19.0 feet of embankment materials consisting of stiff to hard silty clay to silty clay loam and silty loam fill overlying loose to very dense gravel to gravelly sandy loam and silt. At the east abutment, the highly weathered bedrock was encountered at elevations of 550 to 561 feet. In general, slightly weathered to fresh shale/mudstone bedrock was encountered below 540 feet elevation and slightly weathered to fresh dolostone bedrock was encountered below 535 feet elevation. The bedrock is encountered at about 546 to 551 feet near the east abutment and at about 535 to 540 feet elevation at the piers and west abutment. The groundwater level was measured at elevations ranging from 546 to 563 feet.

The approach embankments behind the east and west abutments will undergo an estimated 0.4 inches of total long-term settlement under the new embankment loads. Global stability analyses at the embankments show FOS meeting the IDOT minimum requirement of 1.5. The maximum factored soil bearing resistance for the approach footings is 2,500 psf.

The bridge abutments could be supported on driven piles. To support the abutments, driven HP12x53, HP 12x74, HP 14x73, and HP14x89 steel piles will provide 230 to 388 kips of factored resistance at total lengths of 11 to 26 feet. We do not anticipate the need for downdrag allowances on the piles. The pier could be supported on either rock-socketed drilled shafts or spread footings. Rock-socketed shafts have factored resistances of about 530 to 1,668 kips for 3.0- to 5.0-foot diameter sockets. Spread footings at the pier can be designed based on a maximum factored bearing resistance of 20 ksf.

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STANTEC

1.0 INTRODUCTION

This report presents the results of our subsurface investigation, laboratory testing, geotechnical evaluations, and recommendations in support of the design and reconstruction of the existing bridges carrying eastbound (EX SN 099-0040) and westbound (EX SN 099-0041) Interstate 80 (I-80) over the DuPage River in Troy Township, Will County, Illinois. The project area is located in west central Will County, along I-80, just south of the Village of Shorewood. On the USGS *Channahon Quadrangle 7.5 Minute Series* map, the project is located at Section 28, Tier 35 N, Range 9 E of the Third Principal Meridian. A *Site Location Map* is presented as Exhibit 1. The bridge replacements are part of the proposed widening and reconstruction of I-80 from east of Ridge Road to west of Houbolt Road in Will County, Illinois. These bridges will be reconstructed as part of Contract ML-4.

The purpose of this investigation was to characterize the site soil and groundwater conditions, perform geotechnical analyses, and provide recommendations for the design and construction of the proposed bridge foundations, approach embankments, and approach slabs.

1.1 Existing Structures and Ground Conditions

Based on the *Bridge Condition Report (BCRs)*, dated October 2011 and provided by Stantec, Wang Engineering, Inc. (Wang) understands the existing bridges were originally built in 1960 as five-span structures supported by cast-in-place reinforced concrete stub abutments and wall piers. The piers are supported on spread footings on rock, whereas the abutments are supported on 12BP53 (HP12x53) steel piles. The approach slabs and wingwalls are supported on creosoted timber piles driven to refusal. The existing bridges have lengths of 292.8 feet from back-to-back of abutments and out-to-out widths of 36.0 feet. In 1982, the bridges were widened to have out-to-out deck widths of 45.2 feet. There are also reinforced concrete wingwalls and concrete slope walls at the ends of the structures. The structures were repaired in 2001 and 2009.

In general, the relief within the project area is flat. At the bridge crossing, the DuPage River runs through a 215-foot wide channel. The surface elevation at the I-80 roadway level is about 567 feet and the elevation below deck at the DuPage River level is about 547 feet.

In the project area (see Exhibit 2), an about 15-foot thick overburden covers the shallow bedrock. The surficial cover within the project area consists of about 15-foot thick sand and gravel outwash deposits of the Henry Formation resting unconformably over the bedrock (Bauer et al. 1991, Hansel and Johnson 1996, Leighton et al. 1948 Willman et al. 1971). The bedrock is made up of shale, mudstone, and dolostone. Within the project area, the top of bedrock is mapped at 540 to 560 feet elevation. The site is located on the northern, downthrown block of the inactive Sandwich Fault Zone that may be traced 100 feet south of the proposed improvements (Kolata 2005). No underground mines are known in the area. Neither the overburden nor the upper bedrock is known to include significant sources of water supply (Woller and Sanderson 1983).

1.2 Proposed Structures

Based on the *General Plan and Elevation Drawings* (Appendix E), prepared by HBM Engineering Group, LLC (HBM) and dated March 16, 2023, Wang understands the existing five-span bridges will be removed and replaced with two new, three-span bridges with semi-integral abutments and two piers. The new bridges will have back-to-back of abutments length of 314.9 feet and out-to-out widths of 62.8 feet (EB) and 68.8 feet (WB) to accommodate two 12-foot wide travel lanes, two 12-foot wide inside shoulders, two 12-foot wide future lanes, a 12-foot wide auxiliary lane (WB only), a 6-foot wide outside shoulder (WB only), a 12-foot wide outside shoulder (EB only), and 1.4-foot wide parapets.

Based on the provided *Cross-sections* (Appendix F), the existing grade along I-80 is approximately 568 to 566 feet and the grade will be raised by up to 12 inches along each centerline at the west and east approaches, respectively. From the design drawings, we estimate the east and west abutments will be constructed about 11 feet behind the existing abutments, whereas the piers will be constructed at new locations, about 26 to 32 feet away from the existing piers. About 2.5 and 1.0 feet of new fill will be placed along the existing median at the west and east approaches, respectively, to facilitate the inward widening of the bridges by about 25.0 feet at the north and south sides of the eastbound and westbound bridges.

We understand the side slopes along the east approach would be graded at slopes similar to the existing approach embankment side slopes. As per the *Cross-Sections* (Appendix F), the side slope on the west approach will be graded at a slope of 1:4 (V: H), and up to 10.0 feet of new fill will be placed along the existing embankment's slopes. The *GPE* (Appendix E) shows end slopes armored with riprap and graded at 1:2 (V: H) with an 18-foot wide bench for the animal crossing on the east and west ends.

2.0 METHODS OF INVESTIGATION

The following sections outline the subsurface and laboratory investigations performed by Wang.

2.1 Field Investigation

The subsurface investigation consisted of eight bridge borings, designated as DpR-BSB-01 to DpR-BSB-08, drilled by Wang in August 2021. The borings were drilled from elevations of 565.8 to 567.3 feet and were advanced to depths of 28.0 to 48.0 feet bgs. The as-drilled northings and eastings were acquired with a mapping-grade GPS unit. Stations, offsets, and elevations were provided by Stantec. Boring location data are presented in the *Boring Logs* (Appendix A) and the as-drilled boring locations are shown in the *Boring Location Plan* (Exhibit 3).

To supplement our subsurface investigation, we considered original bridge design Borings H-1 to H-12 drilled in 1959. These borings are also included in the *Boring Logs* (Appendix A) and shown in the *Boring Location Plan* (Exhibit 3).

Truck-mounted drilling rigs, equipped with hollow stem augers, were used to advance and maintain open boreholes. Mud rotary drilling techniques were used from 10.0 to 31.0 feet bgs. Soil sampling was performed according to AASHTO T206, *"Penetration Test and Split Barrel Sampling of Soils."* The soil was sampled at 2.5-foot intervals to 30.0 feet bgs and at 5.0-foot intervals thereafter to the boring termination depth. Bedrock cores were collected from all the borings in 5- to 10-foot runs with an NWD4-sized core barrel. Soil samples collected from each sampling interval were placed in sealed jars and rock cores were placed into marked core boxes and transported to the laboratory for further examination and testing.

Field boring logs, prepared and maintained by Wang field engineers, included lithological descriptions, visual-manual soil (IDH Textural) classifications, results of Rimac and pocket penetrometer unconfined compressive strength tests, and results of Standard Penetration Tests (SPT) recorded as blows per 6 inches of penetration.

Groundwater levels were measured while drilling and at completion of drilling the borings. Prior to being backfilled, Boring DpR-BSB-02 drilled from I-80 was flushed at the end of drilling and left open to record 24-hour water level readings. Each borehole location was backfilled upon completion with lean grout, soil cuttings, and/or bentonite chips and, where necessary, the pavement surface was restored as much as possible to its original condition.

2.2 Laboratory Testing

The soil samples were tested in the laboratory for moisture content (AASHTO T265). Atterberg limits (AASHTO T89 and T90) and particle size analysis (AASHTO T88) tests were performed on selected samples. Unconfined compressive strength tests were performed on selected bedrock cores. Field visual descriptions of the soil samples were verified in the laboratory and index tested soils were classified according to the IDH soil Classification System. The laboratory test results are shown in the *Boring Logs* (Appendix A) and in the *Laboratory Test Results* (Appendix B).

3.0 INVESTIGATION RESULTS

Detailed descriptions of the soil conditions encountered during the subsurface investigation are presented in the attached *Boring Logs* (Appendix A) and in the *Soil Profile* (Exhibit 4). 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.

Our subsurface investigation results fit into the local geologic context. The borings drilled in the project area encountered native sediments consisting of gravel and sand outwash of the Henry Formation unconformably resting over highly to slightly weathered dolostone, shale, and mudstone bedrock. Borings DpR-BSB-07 and DpR-BSB-08 drilled at the east abutment encountered highly weathered bedrock at elevation of 550 to 561 feet. In general, slightly weathered to fresh shale/mudstone bedrock was encountered below 540 feet elevation and slightly weathered to fresh dolostone bedrock was encountered below 535 feet elevation. The bedrock is encountered at about 546 to 551 feet near the east abutment and at about 535 to 540 feet elevation at the piers and west abutment.

3.1 Lithological Profile

Borings DpR-BSB-01, DpR-BSB-02, DpR-BSB-07, and DpR-BSB-08 were drilled along the I-80 shoulders and revealed the pavement structure consists of 12.5 to 18 inches of asphalt overlying sandy gravel aggregate base. Borings DpR-BSB-03 to DpR-BSB-06 were drilled through 9-inches of bridge deck. In descending order, the general lithologic succession encountered beneath the pavement includes: 1) man-made ground (fill); 2) loose to medium dense silt to silty loam and gravelly sandy loam to sandy gravel; 3) dense to very dense gravel to sandy gravel and silt; 4) very dense weathered bedrock; 5) medium strong to strong, very poor to good quality dolomitic shale and mudstone bedrock; and 6) strong, very poor to fair dolostone bedrock.

1) Man-made ground (fill)

Beneath the pavement structure, the borings drilled along I-80 encountered up to 19.0 feet of mostly cohesive fill. The cohesive fill consists of stiff to hard, brown, and gray silty clay to silty clay loam, clay loam, and silt to silty loam with unconfined compressive strength (Q_u) values of 1.8 to 4.7 tsf and moisture content values of 13 to 32%. Laboratory index testing on a sample from this layer showed liquid limit (L_L) value of 38% and a plastic limit (P_L) value of 15%.

2) Loose to medium dense silty loam to sandy gravel

Beneath the fill or river water, at elevations of 548 to 549 feet, the borings advanced through up to 8.0 feet of loose to medium dense silty loam and gravelly sandy loam to sandy gravel interbedded with soft to medium stiff silty clay. The unit has N values of 2 to 21 blows per foot and moisture content values of 10 to 16%.

3) Dense to very dense gravel to sandy gravel and silt

At elevations of 542 to 544 feet, Borings DpR-BSB-02 and DpR-BSB-06 advanced through 2.5 feet of dense to very dense, gray, damp to saturated gravel to sandy gravel and silt. This soil unit has N-values of 30 to 54 blows per foot and moisture content values of 9 to 14%.

4) Very dense weathered bedrock

At elevations of 539 to 561 feet, the borings advanced through 2.0 to 8.0 feet of mainly very dense, dark gray, highly weathered shale bedrock. The weathered shale bedrock shows spoon refusal and moisture content values of 4 to 13%. Hard drilling and rig chatter was noted within this unit.

5) Medium strong to strong, very poor to good quality dolomitic shale/mudstone bedrock

At elevations of 538 to 553 feet (depths of 13.0 to 29.0 feet bgs), the borings encountered and cored medium strong to strong, very poor to good quality, slightly to moderately weathered dolomitic shale/mudstone bedrock.

At the proposed west abutment and piers, the dolomitic shale/ mudstone bedrock thicknesses ranged from 1.5 to 5.0 feet, with Rock Quality Designation (RQD) of 7 to 50%, and uniaxial compressive strength (rock Q_u) of 3,417 to 4,147 psi.

At the proposed east abutment this unit is as thick as 15 feet, strong and good rock quality rock with RQD of 62 to 74%, and rock Q_u values of 7,947 to 8,721 psi.

6) Strong, very poor to fair dolostone bedrock

Beneath the dolomitic shale/bedrock, at elevations of 532.5 to 536.2 feet, 30 to 34 feet bgs, the borings encountered strong, light gray and brownish gray, thinly bedded, fragmented, vuggy dolostone bedrock with greenish silty and clayey infill. The dolostone bedrock RQD ranges from 0 to 52% with rock Q_u values of 3,528 to 4,591 psi. The bedrock core data is shown in the *Bedrock Core Photographs* (Appendix C).

Original bridge design borings (H-01 to H-12) encountered and cored shale bedrock at elevations ranging from 536 to 542 feet and consistent with current borings except at proposed east abutment borings where the bedrock encountered as high as 561 feet elevation.

3.2 Groundwater Conditions

Borings DpR-BSB-01 and DpR-BSB-08 were drilled with hollow stem augers to 29 and 31 feet and while drilling the groundwater was measured at an elevation of 546 feet (20 and 21 feet bgs) and at completion of drilling at an elevation of 544 feet (23 feet bgs). In Boring DpR-BSB-01, the groundwater was observed at elevation of 564 feet (3.3 feet bgs) while drilling before the drilling technique was changed to mud rotary. Boring DpR-BSB-02 was flushed out of mud and left open to measure the 24-hour groundwater level. The groundwater level was recorded after 24 hours, and was recorded at an elevation of 556 feet (11 feet bgs). The DuPage river water level was observed at elevations of 546 to 549 feet (18 to 21 feet below the bridge level) during and upon completion of drilling. The Estimated Water Surface Elevation (EWSE) as shown in TSL is 549.39 feet. It should be noted that groundwater levels might change with seasonal rainfall patterns and long-term climate fluctuations.

4.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

The *Cross-Section* drawings (Appendix F) indicate the grade along I-80 will be raised by up to 12 inches along west and east approach centerlines. We understand the east and west semi-integral abutments will be constructed about 11 feet behind the existing abutments, whereas the piers will be constructed on the new locations, about 26 to 32 feet away from the existing piers. About 2.5 and 1.0 feet of new fill will be placed along the existing median at the west and east bridge approaches, respectively, to facilitate the inward widening of the bridges by about 25.0 feet.

We understand the side slopes along the east approach embankment would be graded at slopes similar to the existing approach embankment side slopes. As per the *Cross-Sections* (Appendix F), the side slope of the west approach will be graded at a slope of 1:4 (V: H), and up to 10.0 feet of new fill will be placed along the existing embankment's slopes. The *GPE* (Appendix E) shows riprap end slopes graded at 1:2 (V: H) with an18-foot wide bench for the proposed animal crossing on the east and west ends.

Wang recommends supporting the semi-integral abutments on driven H-pile foundations and supporting the pier on either rock-socketed drilled shafts or shallow foundations on bedrock. Supporting the abutment substructures on shallow foundations is not feasible due to the large loads anticipated from the abutments and encountered soil conditions (IDOT 2020a). Due to the shallow bedrock encountered at the east abutment, the use of the semi-integral abutment is considered. Geotechnical evaluations and recommendations for the approach embankments, approach slabs, and substructure foundations are included in the following sections.

4.1 Seismic Design Considerations

The seismic site class was determined in accordance with the IDOT *Geotechnical Manual* (IDOT 2020a). The soils within the top 100 feet have a weighted average N value of 88 blows per foot (Method C controlling) and the results classify the site in the Seismic Site Class C. The project location belongs to the Seismic Performance Zone 1 (IDOT 2020a). The seismic spectral acceleration parameters recommended for design in accordance with the AASHTO *LRFD Bridge Design Specifications* (AASHTO 2020) are summarized in Table 1. According to the IDOT *Bridge Manual* (IDOT 2012), liquefaction analysis is not required for sites located in Seismic Performance Zone 1.

Table 1: Recommended Seismic Design Parameters

Spectral Acceleration Period (sec)	Spectral Acceleration Coefficient[1)] (% g)	Site Factors	Design Spectrum for Site Class C[2)] (% g)
0.0	PGA= 4.9	F_{pga}= 1.2	**A_s= 5.9**
0.2	S_s= 10.6	F_a= 1.2	**S_{DS}= 12.7**
1.0	S_1= 4.0	F_v=1.7	**S_{D1}= 6.8**

1) Spectral acceleration coefficients based on Site Class C

2) Site Class C Spectrum to be included on plans; A_s = PGA*F_{pga}; S_{DS}= S_s*F_a; S_{D1}= S_1*F_v

4.2 Scour Considerations

A hydraulic report was prepared by HBP Partners Illinois and revised by 2IM Group, LLC in February 2021. The hydraulic report provides 100-year and 500-year scour depths at the proposed Pier 1 where maximum scour occurs for the proposed structure. The estimated 100 and 500 year scour depths are 6.06 and 7.70 feet, respectively; these results place the Q100 and Q500 scour elevations at about 538.42 to 537.97 and 538.25 to 537.80 feet at Piers 1 and 2, respectively. The scour data provided in the hydraulic report are summarized in Table 2, while the Q100, Q200, Design and Check scour elevations, as required in accordance with IDOT *All Bridge Designers Memo 14.2*, are provided in Table 3. Since the Q200 scour data was not available in the hydraulic Report, we have considered Q500 data. The D_{50} value of the gravelly sandy loam shown along the streambed in the borings is 0.64 and 1.06. Due to the dolomitic shale/mudstone encountered within the scour depth at piers, the scour elevations may be established at 10% of the predicted value that extended into the rock. The top of bedrock is at elevations of 538.5 to 539.2 feet at Pier 1 and at elevations 538.0 to 538.1 feet at Pier 2. The abutment end slopes will be armored with riprap along with the proposed 18-foot wide animal crossing; therefore, the scour elevations are placed at the proposed abutment base elevations. The Design High Water Elevation (DHWE) is 553.97 feet and the Estimated Water Surface Elevation (EWSE) within the channel is 549.39 feet. The streambed elevation is 543.74 feet.

Table 2: Project Scour Data

	West Abutment	Pier 1	Pier 2	East Abutment
Streambed Elevation (feet)	NA	543.74	543.74	NA
Foundation Base Elevation (feet)	558.48	541.24(1)	541.24(1)	557.09
100-year Combined Scour Estimate (feet)	NA	6.06	6.06	NA
500-year Combined Scour Estimate (feet)	NA	7.70	7.70	NA

(1) Cap base elevations are assumed to be at the bottom of the encasement wall.

Table 3: Project Design Scour Elevations

	West Abutment	Pier 1	Pier 2	East Abutment	Item 113
Q100 Elevation (feet)	NA	538.42	537.97	NA	
Q500 Elevation (feet)	NA	538.25	537.80	NA	
Design Elevation (feet)	558.48	538.42	537.97	557.09	8
Check Elevation (feet)	558.48	538.25	537.80	557.09	

4.3 Approach Embankment and Slabs

Wang has performed evaluations of the settlement and global stability of the approach embankments. The drawings indicate the grade along the I-80 approach embankments near the bridge will be raised by up to 12 inches along each centerline. About 2.5 and 1.0 feet of new fill will be placed along the existing median at the west and east approaches, to facilitate the inward widening of the bridges by about 25 feet. We understand the side slopes along the east approach embankment would be graded at slopes similar to the existing approach embankment side slopes. The side slope on the south side of the west approach will be graded at a slope of 1:4 (V: H), and up to 10.0 feet of new fill will be placed along the existing embankment's slopes.

4.3.1 Settlement

To facilitate the bridge widenings, up to 2.5 feet of new fill will be placed along the existing medians and up to 10.0 feet of new fill will be placed along the existing west approach embankment slopes. Settlement estimates have been made based on correlations to measured index properties obtained from the laboratory tests (Appendix B). Based on the soil conditions, we estimate the foundation soils at the approaches will undergo up to 0.4 inch of long-term consolidation settlement under the applied load of the new approach embankment fill material. These settlements are appropriate for the construction of the approach slabs and we do not anticipate downdrag allowances for the proposed abutment piles.

4.3.2 Global Stability

The global stability of the approach embankment side slopes was analyzed at the critical sections based on the soil profile described in Section 3.1 and the information provided in the *General Plan and Elevation* and *Cross-sections* (Appendixes E and F). We also analyzed the stability of the west abutment end slope with an18-foot wide animal crossing. The analysis discounts the beneficial effect of the abutment piles. The minimum required FOS for both short (undrained) and long-term (drained) conditions is 1.5 (IDOT 2012). *Slide v6.0* evaluation exhibits employing the Bishop Simplified method of analysis are shown in Appendix D. The FOS values meet the minimum requirement.

4.3.3 Approach Slabs

We assume the approach slabs will be supported on spread footing foundations (IDOT 2012). Based on the design drawings and soil conditions revealed in Borings DpR-BSB-01, DpR-BSB-02, DpR-BSB-07, and DpR-BSB-08, the approach footings will be supported mainly on the new fill to be placed along the approaches. We estimate the fill has a maximum factored soil bearing resistance of 2,500 psf for a new fill with unconfined compressive strength of 1 tsf and calculated for a geotechnical resistance factor (Φ_b) of 0.45 (AASHTO 2020). The settlement of approach footings estimated to be less than 1.0 inch.

4.3.4 Abutment End Slopes

As per the GPE drawing and information provided by HBM, we understand that both abutment slopes will have riprap armored end slopes with an 18-foot wide animal crossing at an elevation of 548.39 feet. Based on the encountered soil conditions in Borings DpR-BSB-01, DpR-BSB-02, DpR-BSB-07, and DpR-BSB-08, the proposed animal crossing will be supported on the loose silt followed by the medium dense to very dense gravel at the west abutment end slope and on the medium dense to dense sandy gravel or weathered bedrock at the east abutment end slope. To prevent potential washout or erosion along and beneath the animal crossing path, a slope protection system will be required. Due to the shallow bedrock present along the proposed animal crossing path, driven sheet pile wall is not feasible. The riprap system can be considered.

We recommend considering supporting the animal crossing on two 6-inch thick layers of aggregate base with IDOT gradation CA-7 or CA-18 that are each wrapped with a layer of geogrid i.e. the first layer of geogrid and 6 inches of aggregate should be placed at the base followed by the next 6 inches of aggregate and the second geogrid layer. The geogrid should be wrapped around the aggregate with an overlap of 12 to 24 inches. We estimate the base layer geogrid will be placed at an approximate elevation of 545.1 feet. The geogrid could be Tensar BX1200 or equivalent. The riprap protection system in front of the animal crossing consists of a minimum 6-inches of bedding stone RR-1 or RR-2 and riprap stone of RR-4 to RR-7. The riprap should be placed as per Section 281 of IDOT Standard Specifications (IDOT 2022). Following the recommended treatment, the animal crossing could be designed based on soil bearing resistance of 2,500 psf.

4.4 Structure Foundations

The soil conditions along the structures show stiff to hard clayey soils embankment fill followed by medium dense to very dense silt to gravelly sandy loam overlying shale, mudstone, and dolostone bedrock. Wang recommends supporting the semi-integral abutments on steel H-piles. We do not recommend metal shell piles due to the shallow bedrock encountered at the east abutment. Additionally, based on original bridge design borings (H-03 and H-04) and current borings (DpR-BSB-07 and DpR-BSB-08) along the proposed east abutment, the bedrock surface is interpreted to be at elevations of 543 and 546 feet at the eastbound and westbound bridges, respectively. However, the bedrock surface could be encountered as high as 553 feet elevation (DpR-BSB-07) at the westbound bridge east abutment. In these instances, some of the east abutment piles will be required to be drilled and set into the bedrock.

Considering the presence of shallow bedrock as shown by the pier borings DpR-BSB-03, DpR-BSB-04, DpR-BSB-05, and DpR-BSB-06, the piers could be supported on either rock-socketed drilled shafts or shallow foundations. The preliminary factored loading information provided by HBM on October 13, 2022 and proposed abutment cap base elevations as shown in the *GPE* are summarized in Table 4.

Table 4: Preliminary Factored Loads and Proposed Pile Cap Elevations

Direction	Substructure	Pile Cap Elevations (feet)	Total Factored Load (kips)
Eastbound	West Abutment	558.48	2070
	Pier 1	543.74(1)	5590
	Pier 2	543.74(1)	5590
	East Abutment	557.09	2070
Westbound	West Abutment	558.48	2221
	Pier 1	543.74(1)	6032
	Pier 2	543.74(1)	6032
	East Abutment	557.09	2221

(1) Cap base elevations are assumed to be at the streambed elevation.

4.4.1 Driven Piles

IDOT specifies the maximum nominal required bearing (R_{NMAX}) for each pile and states the factored resistance available (R_F) for steel H-piles should be based on a geotechnical resistance factor (Φ_G) of 0.55 (IDOT 2012). Nominal tip and side resistance were estimated using the methods and empirical equations presented in the latest *IDOT Geotechnical Pile Design Guide* (IDOT 2020a). Based on the loads provided by HBM and the proposed width of the substructures, the load per pile at the abutments will range between about 48 and 132 kips for two rows of piles spaced at 3- to 8-feet.

Based on IDOT standards, piles with greater than 0.4-inch of relative settlement along the sides require allowances for downdrag loads. We estimate that downdrag allowances will not be required for the abutment piles.

The R_F, R_N, estimated pile tip elevations, and pile lengths for HP12x53, HP 12x74, HP 14x73, and HP 14x89 steel H-piles for the abutments are summarized in Table 5. The pile lengths shown in Table 5 include a 1-foot pile embedment into the abutment pile cap elevations as shown on the *GPE* (Appendix E). IDOT generally recommends that H-piles be driven to their maximum nominal required bearing. Table 5 provides estimated pile tip elevations and pile lengths for HP 12x53, HP12x74, HP 14x73, and HP14x89 steel H-piles driven to maximum nominal bearing.

Pile shoes should be used to avoid damage to the piles. The bedrock surface along the west abutment is interpreted to be at elevations of 537 and 539 feet along the eastbound and westbound bridges respectively. As indicated in Section 4.4, the bedrock surface along the east abutment is interpreted to be at elevations of 543 and 546 feet at the eastbound and westbound bridges, respectively. Additionally, to achieve the maximum nominal required bearing at the abutments, the analysis shows the H-piles would need to be driven about 2.0 to 3.0 feet into shale/mudstone bedrock.

Table 5: Estimated Pile Lengths and Tip Elevations for Steel H-Piles Driven to R_{NMAX}

Structure Unit (Reference Boring)	Pile Cap Base Elevations (feet)	Pile Size	Maximum Nominal Bearing, R_N (kips)	Factored Geotechnical Loss (kips)	Factored Geotechnical Load Loss (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
Westbound West Abutments DpR-BSB-01 and H-1	558.48	HP 12x53	418	0	0	230	25	535
		HP 12x74	589	0	0	324	26	534
		HP 14x73	578	0	0	318	26	534
		HP 14x89	705	0	0	388	26	534
Eastbound, West Abutment DpR-BSB-02 and H-2	558.48	HP 12x53	418	0	0	230	25	535
		HP 12x74	589	0	0	324	26	534
		HP 14x73	578	0	0	318	26	534
		HP 14x89	705	0	0	388	26	534
Westbound East Abutment DpR-BSB-07 and H-3	557.09	HP 12x53	418	0	0	230	11	548
		HP 12x74	589	0	0	324	15	544

Structure Unit (Reference Boring)	Pile Cap Base Elevations (feet)	Pile Size	Maximum Nominal Bearing, R_N (kips)	Factored Geotechnical Loss (kips)	Factored Geotechnical Load Loss (kips)	Factored Resistance Available, R_F (kips)	Total Estimated Pile Length (feet)	Estimated Pile Tip Elevation (feet)
		HP 14x73	578	0	0	318	15	544
		HP 14x89	705	0	0	388	15	544
Eastbound East Abutment DpR-BSB-08 and H-4	557.09	HP 12x53	418	0	0	230	18	541
		HP 12x74	589	0	0	324	21	538
		HP 14x73	578	0	0	318	21	538
		HP 14x89	705	0	0	388	21	538

4.4.2 Drilled Shafts

The piers could be supported on drilled shafts socketed 5.0- to 10.0-feet into the bedrock with the base of shaft established in the dolostone bedrock. As per the 2012 IDOT *Bridge Manual*, drilled shafts extending into rock, in most cases, should be designed utilizing only end bearing or side resistance in rock, whichever is larger. For shafts socketed into the bedrock less than 10-foot long, we estimate the end bearing will give more capacity than the side resistance. Therefore, we recommend considering only the end bearing resistance. The shafts should be designed for end bearing with a tip resistance factor (ϕ_{stat}) of 0.50 (AASHTO 2020). Above the bedrock, the shafts should have diameters 6 inches larger than the sockets.

The bedrock resistance was evaluated in accordance with the Geologic Strength Index (GSI) method provided by AASHTO (2020). The R_F, R_N, and estimated base elevations for rock-socketed shafts are summarized in Table 6. The shaft lengths were estimated assuming the shafts start from the streambed elevation at the pier locations shown on the GPE (Appendix E). For the anticipated loads (Table 2), we estimate shaft settlements of less than 0.5 inch.

Due to the presence of groundwater and granular soils above the bedrock, the recommended construction method for shafts socketed into bedrock is to install casing to the top of the rock to maintain clean, open shafts during excavation. The quality of bedrock at the piers should be verified during construction.

Table 6: Estimated Drilled Shaft Resistances and Base Elevations (Rock-Socketed Shafts)

Structure Unit (Reference Boring)	Approximate Shaft Cap Base Elevation[1] (feet)	Top of Bedrock Elevation (feet)	Socket Diameter (feet)	Nominal Unit Resistance (ksf)	Nominal Resistance, R_N (kips)	Factored Resistance Available, R_F (kips)	Total Socket Length (feet)	Estimated Total Shaft Length[2] (feet)
Westbound and Eastbound Pier 1 and Pier 2 (DpR-BSB-03 to DpR-BSB-06)	543.7	538.0 to 539.2	3.0	150	1060	530	5.0	11.0
			3.5		1440	720		
			4.0		1880	940		
			4.5		2390	1190		
			5.0		2940	1470		
Westbound and Eastbound Pier 1 and Pier 2 (DpR-BSB-03 to DpR-BSB-06)	543.7	538.0 to 539.2	3.0	170	1200	600	10.0	16.0
			3.5		1640	820		
			4.0		2140	1070		
			4.5		2700	1350		
			5.0		3340	1670		

(1) For analysis purposes, shaft cap base elevations were assumed to be the streambed elevation

(2) Total shaft lengths were measured from streambed at pier locations.

4.4.3 Spread Footings

A spread footing supported on dolomitic shale and mudstone bedrock could be considered at the pier locations. The top of the bedrock elevation ranges from 538.5 to 539.2 feet (Borings DpR-BSB-03 and DpR-BSB-04) at Pier 1 and 538.0 to 538.1 feet (Borings DpR-BSB-05 and DpR-BSB-06) at Pier 2. The bottom of the pier spread footing should be placed a minimum of 6 inches below the top of the bedrock (IDOT 2012). However, as recommended in hydraulic report and considering the scour, the pier spread footings should be placed a minimum of 12 inches below the top of the bedrock which is 537.5 feet at Pier 1 and 537.0 feet at Pier 2. The quality of bedrock at the piers should be verified during construction.

Construction of spread footings supported on bedrock at the pier locations will require excavations of up to 11.0 feet under the river water. Therefore, cofferdams will be needed for the excavation and construction of the piers.

According to Section 10.6.3.2.2 of the AASTHO LRFD *Bridge Design Specifications* (AASHTO 2020), the recommended bearing resistance for spread footings should be determined using empirical correlations with the Geomechanics RMR system. Based on our analysis, we estimate a factored bearing resistance of 20 ksf, considering a resistance factor of 0.45 (AASHTO 2020). The factored bearing resistance shall not be taken to be greater than either the unconfined compressive strength of rock or the factored compressive resistance of the footing concrete (AASHTO 2020). The laboratory rock unconfined compressive strength results ranged from 3,528 to 8,721 psi (508 to1256 ksf) and the factored nominal resistance of the concrete is 151 ksf based on the nominal concrete resistance as provided on the GPE of 3.5 ksi (504 ksf). Thus, the recommended bearing resistance of 20 ksf should be used for the design.

As per Section 10.6.2.4.4, for footings bearing on fair to very good rock, elastic settlements may be assumed to be less than 0.5 inches (AASHTO 2020). However, since the RQD value at the pier location is about 7 to 52% and the rock within the top 5.0 feet does not meet the fair to very good criteria, a settlement analysis was conducted. For our settlement evaluations, we assumed a footing width of 6.5 feet similar to the existing bridge, a length of 68.8 feet, and no eccentric loads. Based on the proposed factored load and assumed dimensions, we estimate a settlement of less than 0.5 inches. The recommended friction coefficient between concrete and bedrock materials is 0.7 (AASHTO 2020).

4.4.4 Lateral Loading

Lateral loads on the piles should be analyzed for maximum moments and lateral deflections. Recommended lateral soil modulus and strain parameters required for analysis via the p-y curve method are included in Tables 7 to 11.

Table 7: Recommended Soil Parameters for Lateral Load Analysis at West Abutments
Reference Borings DpR-BSB-01, DpR-BSB-02, H-1, and H-2

Elevation Range (feet) Soil Type (Layer)	Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, Φ (°)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
558.48(1) to 550.0 V Stiff to Hard SILTY CLAY to SILTY CLAY LOAM FILL	120	3000	0	1000	0.4
550.0 to 542.0 Loose to Medium Dense SILT to SILTY LOAM and GRAVELLY SANDY LOAM	58(2)	0	30	60	--

Elevation Range (feet) Soil Type (Layer)	Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, Φ (°)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
542.0 to 539.0 V Dense SILTY LOAM	58(2)	0	34	90	--
539.0 to 537.0(3) WEATHERED BEDROCK	63(2)	0	36	125	--

(1) Pile cap base elevation

(2) Submerged unit weight

(3) Approximate top of bedrock

Table 8: Recommended Soil Parameters for Lateral Load Analysis at Pier 1

Reference Borings DpR-BSB-03 and DpR-BSB-04

Elevation Range (feet) Soil Type (Layer)	Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, Φ (°)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
541.24(1) to 538.0(2) Very Dense WEATHERED BEDROCK	63(3)	0	36	125	--

(1) Estimated bottom of web wall elevations at proposed Pier 1 location

(2) Approximate top of bedrock

(3) Submerged unit weight

Table 9: Recommended Soil Parameters for Lateral Load Analysis at Pier 2

Reference Borings DpR-BSB-05 and DpR-BSB-06

Elevation Range (feet) Soil Type (Layer)	Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, Φ (°)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
541.24(1) to 541.0 M Dense to Very Dense GRAVELLY SANDY LOAM to SANDY GRAVEL	58(2)	0	30	30	--
541.0 to 538.0(3) Very Dense WEATHERED BEDROCK	63(2)	0	36	125	--

(1) Estimated bottom of web wall elevations at proposed Pier 2 location

(2) Submerged unit weight

(3) Approximate top of bedrock

Table 10: Recommended Soil Parameters for Lateral Load Analysis at East Abutments
Reference Borings DpR-BSB-07, DpR-BSB-08, H-3, and H-4

Elevation Range (feet) Soil Type (Layer)	Unit Weight, γ (pcf)	Undrained Shear Strength, c_u (psf)	Estimated Friction Angle, Φ (°)	Estimated Lateral Soil Modulus Parameter, k (pci)	Estimated Soil Strain Parameter, ε_{50} (%)
557.09(1) to 555.0 Soft to Stiff CLAY LOAM to SILTY CLAY LOAM, SILTY LOAM	120	800	0	100	0.7
555.0 to 546.0(3) WEATHERED BEDROCK	63(2)	0	36	125	--

(1) Pile cap base elevation

(2) Submerged unit weight

(3) Approximate top of bedrock

Table 11: Bedrock Parameters for Lateral Load Analysis
Reference Borings DpR-BSB-01 to DpR-BSB-08

Bedrock	Total Unit Weight, γ (pcf)	Modulus of Rock Mass (ksi)	Uniaxial Compressive Strength (psi)	RQD (%)	Strain Factor
Dolomitic Shale/Mudstone	140	110	3,517 to 8,721	7 to 62	0.0005
Dolostone	140	140	3,528 to 4,591	0 to 33	0.0005

4.5 Stage Construction

Stage construction is identified in the *GPE* (Appendix E). Wang understands that the bridge replacements will be performed utilizing two main stages of construction to maintain traffic on each bridge. During Stage I, two lanes of traffic would be moved to the outside lanes and shoulders of the existing bridges so that the widening can advance within the existing median area. During Stage II, the two lanes of traffic would utilize the roadway constructed during Stage I so that the existing bridges can be removed and the outside portion of the bridges can be replaced.

The construction activities will likely involve excavations of up to 9.0 feet along the sides of the existing east and west abutments, respectively. Temporary support systems will be required if the ground cannot be sloped at 1:2 (V: H). We estimate temporary steel sheet piling, designed using the charts included in the *IDOT Design Guide-Simplified Temporary Sheet Piling Design Charts* is feasible at the west abutment. However, a pay item "*Temporary soil retention system*" will be required due the high N-values and shallow bedrock.

For the proposed installation of spread footings supported on bedrock, temporary support of up to 11.0 feet of excavation will be required under river water. The cofferdams will be required.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Site Preparation

Vegetation, surface topsoil, pavements, and debris should be cleared and stripped where the structures will be placed. If unstable or unsuitable materials are exposed during excavation, they should be removed and replaced with compacted structural fill as described in Section 5.3.

5.2 Excavation, Dewatering, and Utilities

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. Any slope that cannot be graded at 1:2 (V: H) for cohesive soils and at 1:2.5 (V:H) for saturated granular soils should be properly shored.

During the subsurface investigation, the groundwater was encountered at elevations ranging from 546 to 564 feet, as discussed in Section 3.2. At the abutments, perched groundwater may be encountered above the proposed pile cap base elevations at the west abutment and below the pile cap base elevations at the east abutment. The Contractor should be prepared for dewatering. The pier excavation to bedrock will be performed in the river water. We estimate Type II cofferdam with seal coat will be required for pier footings construction. Additionally, perched or temporary water may be encountered during times of heavy precipitation while excavating within the upper fill soils and will require dewatering efforts. Water that does accumulate in open excavations by seepage or runoff should be immediately removed by sump pump.

5.3 Filling and Backfilling

Fill material used to attain final design elevations should be pre-approved, cohesive or granular soil conforming to Section 204, *Borrow and Furnished Excavation* (IDOT 2016). The fill material should be free of organic matter and debris and should be placed in lifts and compacted according to Section 205, *Embankment* (IDOT 2016). In accordance with IDOT Section 205, *Embankment*, any embankments proposed for widening should be properly benched or deeply plowed prior to placement of new fill along the slopes (IDOT 2016).

Backfill materials for the abutments must be pre-approved by the Resident Engineer. To backfill the abutments, we recommend porous granular material conforming to the requirements specified in the IDOT Supplemental Special and Recurring Special Provisions, *Granular Backfill for Structures* (IDOT 2020b).

5.4 Earthwork Operations

The required earthwork can be accomplished with conventional construction equipment. Moisture and traffic will cause deterioration of exposed subgrade soils. Precautions should be taken by the Contractor to prevent water erosion of the exposed subgrade. A compacted subgrade will minimize water runoff erosion.

Earth moving operations should be scheduled to not coincide with excessive cold or wet weather (early spring, late fall or winter). Any soil allowed to freeze or soften due to the standing water should be removed. Wet weather can cause problems with subgrade compaction.

It is recommended that an experienced geotechnical engineer be retained to inspect the exposed subgrade, monitor earthwork operations, and provide material inspection services during the construction phase of this project.

5.5 Pile Installation

The driven piles shall be furnished and installed according to the requirements of IDOT Section 512, *Piling* (IDOT 2016). Wang recommends performing one test pile at each substructure location. Since the piles driven to bedrock, pile shoes are required as indicated in Section 4.4.1.

5.6 Drilled Shafts

Due to the presence of river water and granular soils above the bedrock, the recommended construction method for shafts socketed into bedrock is to install casing to the top of the rock to maintain clean, open shafts during excavation. The quality of bedrock at the proposed pier locations should be verified during construction.

6.0 QUALIFICATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the borings drilled at the locations shown on the boring logs and in Exhibit 3. This report does not reflect any variations that may occur between the borings or elsewhere on the site, variations whose nature and extent may not become evident until the course of construction. In the event that any changes in the design and/or location of the structure are planned, we should be timely informed so that our recommendations can be adjusted accordingly.

It has been a pleasure to assist Stantec, HBM Engineering Group, LLC, and the Illinois Department of Transportation on this project. Please call if there are any questions, or if we can be of further service.

Respectfully Submitted,

WANG ENGINEERING, INC.

Nesam S. Balakumaran, P.Eng. Project Geotechnical Engineer	Azza Hamad, P.E. Project Manager

Corina Farez, P.E., P.G.
QC/QA Reviewer

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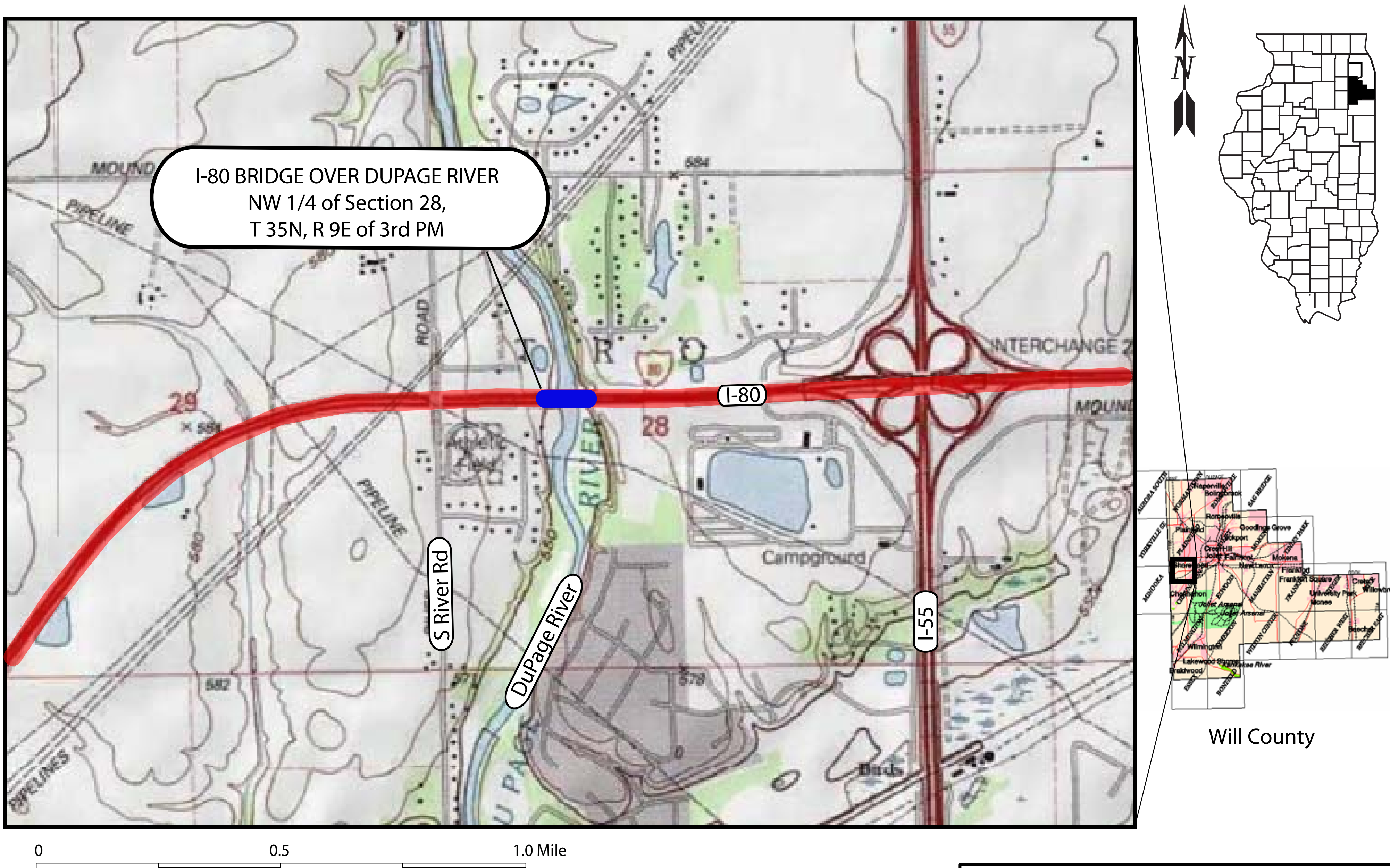
EXHIBITS



SITE LOCATION MAP: I-80 BRIDGE OVER DUPAGE RIVER; I-80 RECONSTRUCTION FROM EAST OF RIDGE RD TO HOUBOLT RD, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: J. Bensen CHECKED BY: A. Hamad

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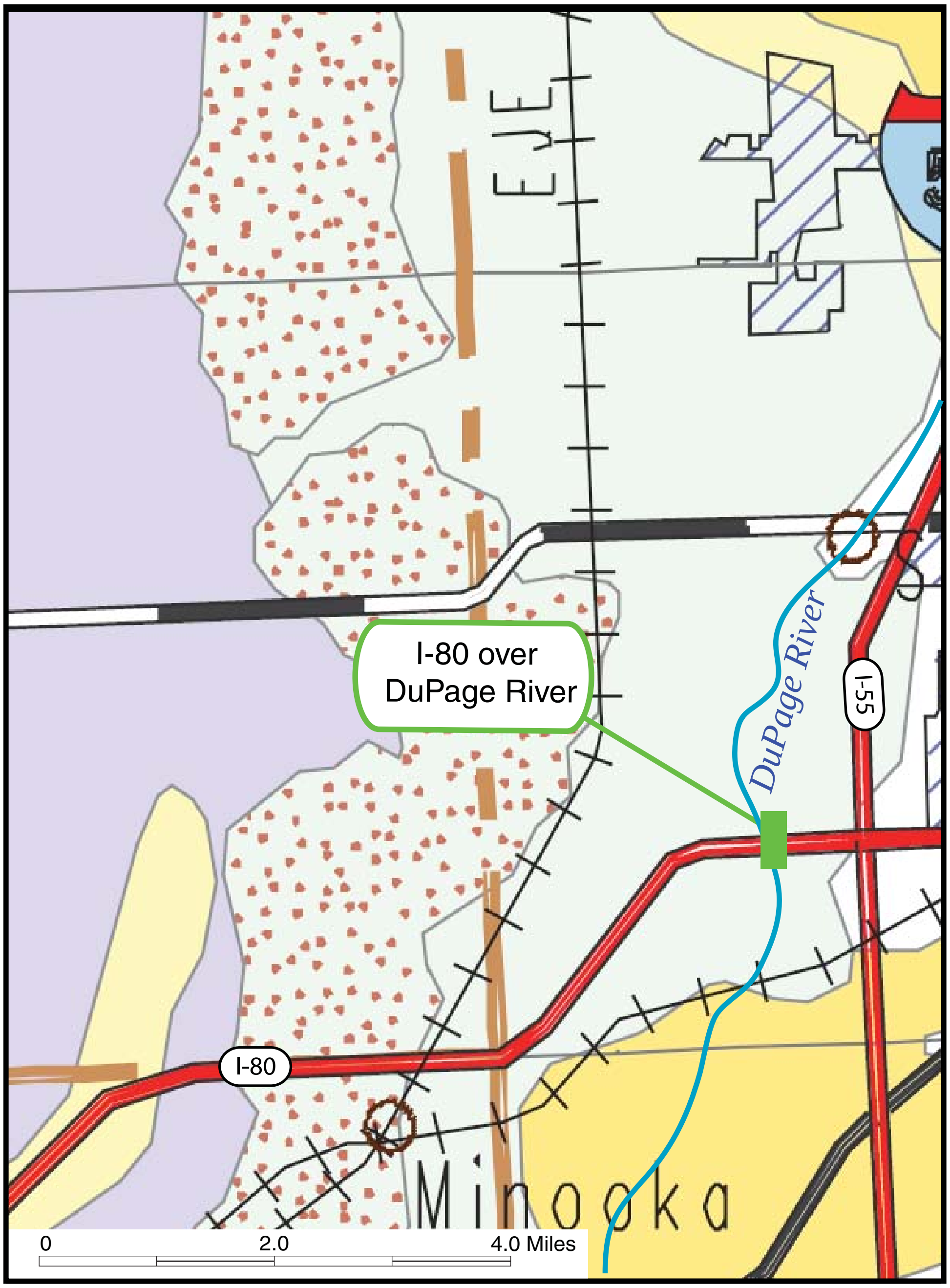
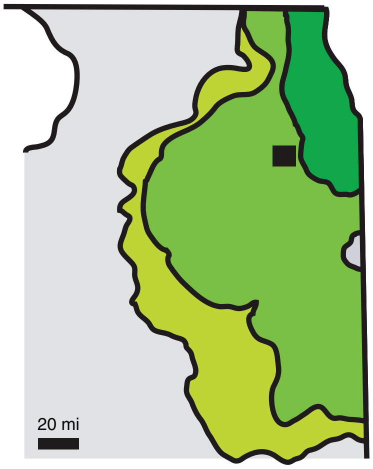


Modified after William W. Shilts (2000)

REGIONAL GEOLOGY



Wedron Group

- Wadsworth Formation
- Lemont Formation
- Tiskilwa Formation

Modified after Hansel and Johnson (1996)

Legend

Cahokia Formation
Bedded silts, clays and sand and gravel deposited in floodplains and channels of modern rivers and streams

Equality Formation
Laminated silt, clay, or fine sand deposited in slackwater, glacial, and postglacial lakes; massive to bedded, calcareous

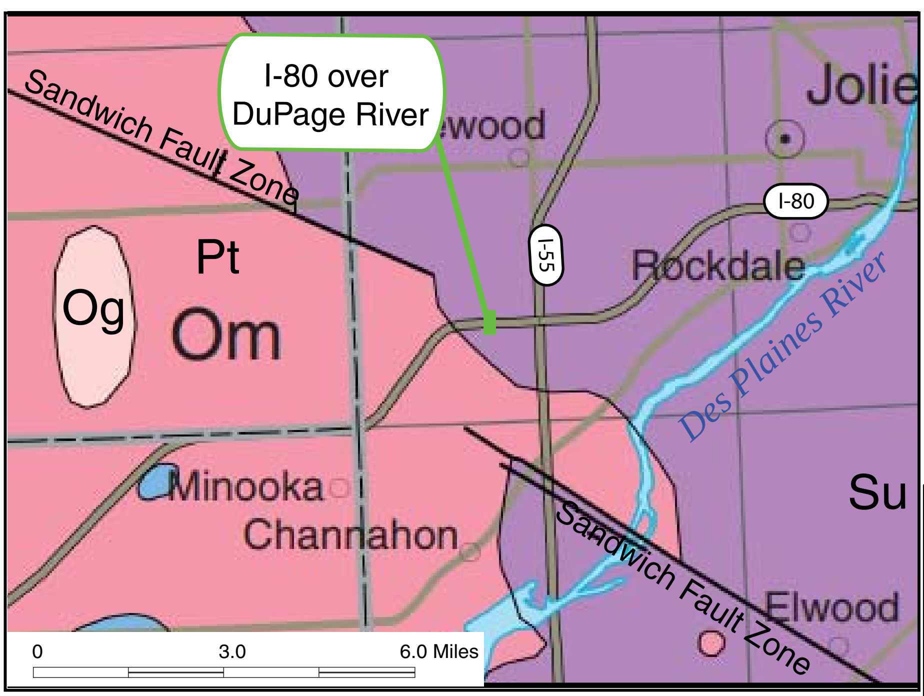
Henry Formation
Predominantly stratified sand and gravel; locally occurring silt, clay, organic debris, wood, shell lenses; outwash on floodplains

Lemont Formation
Diamicton; silty clay loam to silty clay; fine grained matrix; unsorted, unstratified mixture of gravel, sand, silt, and clay; containing lenses of sand, gravel and/or silt.

Bedrock near or at the surface

Major metropolitan area

Modified after William W. Shilts (2000)



Modified after Dennis R. Kolata (2005)

Legend

- Pt — **Pennsylvanian Shale** Tadewater Formation
- Su — **Silurian Dolomitic Limestone**
- Om — **Ordovician Formation** Maquoketa Group
- Og — **Ordovician Formation** Galena Group

SITE AND REGIONAL GEOLOGY: I-80 RECONSTRUCTION, I-80 BRIDGE over DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	EXHIBIT 2	DRAWN BY: C. Marin CHECKED BY: L. Iordache
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FOR STANTEC		255-39-01

0 100 200 Feet

Legend

Boring Location

Historical Boring Location

BORING LOCATION PLAN: I-80 BRIDGE OVER DUPAGE RIVER; I-80 RECONSTRUCTION FROM EAST OF RIDGE RD TO HOUBOLT RD, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL	EXHIBIT 3	DRAWN BY: J. Bensen CHECKED BY: A. Hamad

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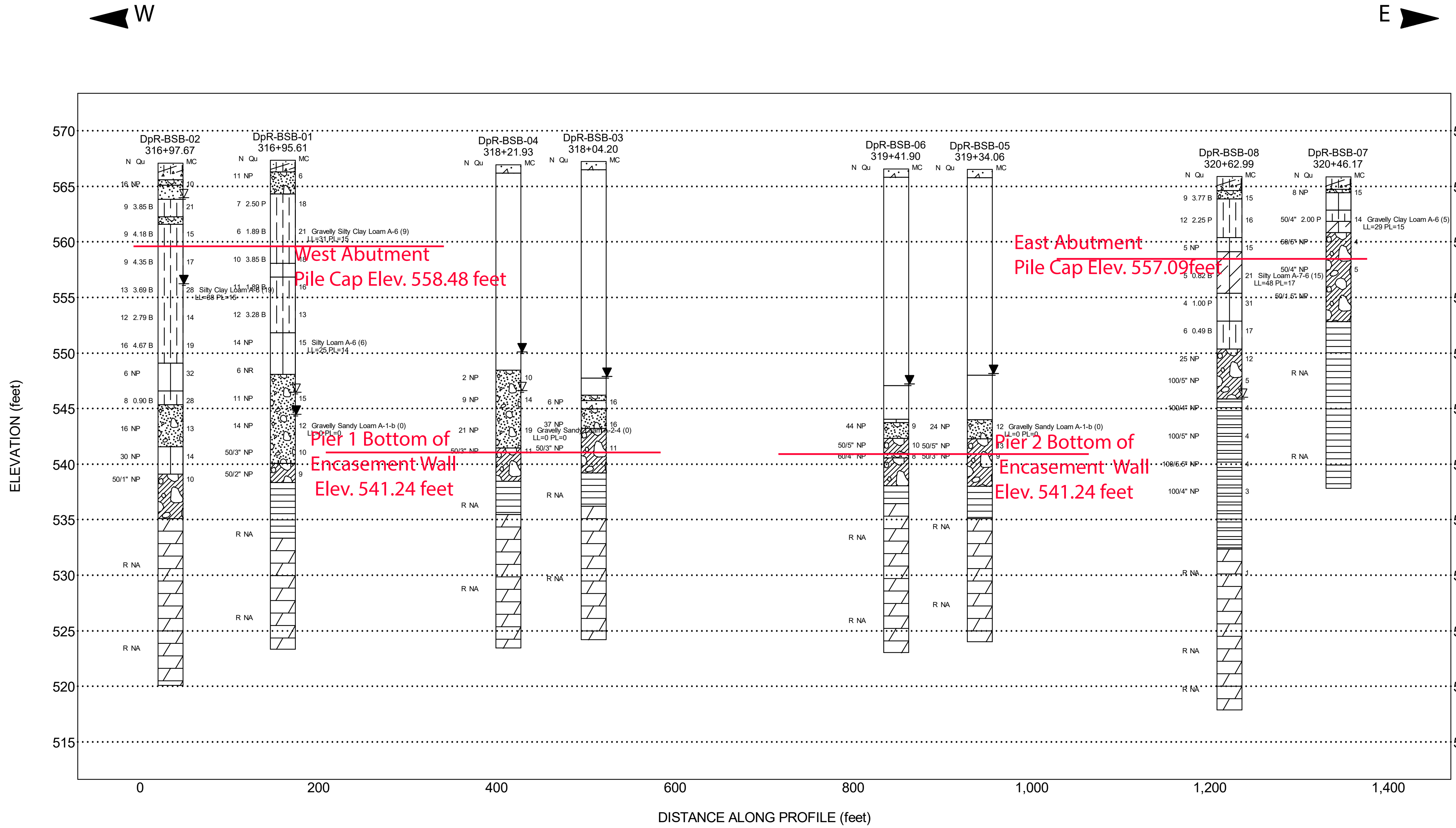
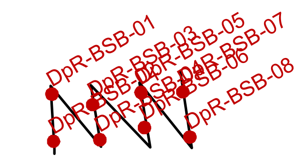


Lithology Graphics

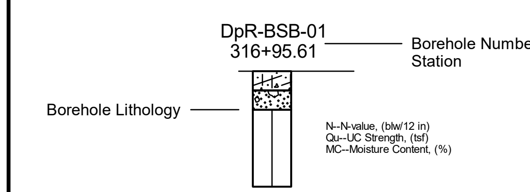
- Pavement
- Weathered bedrock
- Concrete
- Gravelly sand, sandy gravel
- Mudstone
- IDH Clay Loam
- IDH Silty Clay, Silty Clay Loam
- Dolomite or Dolomitic Limestone
- Shale
- IDH Silt, Silty Loam
- IDH Sand, Sandy Loam

N



Site Map Scale 1 inch equals 515 feet

Explanation:



Water Level Reading at time of drilling.

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

0 140

Horizontal Scale (feet)

Vertical Exaggeration: 12.5x

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Soil Profile
I-80 over DuPage River

WEI SINCE 1982

I-80 Reconstruction, Ridge Road to Houbolt Road
Will County, Illinois

JOB NUMBER	PLATE NUMBER
255-39-01	EXHIBIT 4

WEI 11X17 2553901.GPJ WANGENG.GDT 3/28/22

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APPENDIX A

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BORING LOG DpR-BSB-01

WEI Job No.: 255-39-01

Client: **Stantec**
Project: **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 567.33 ft
North: 1755313.68 ft
East: 1017504.81 ft
Station: 316+95.61
Offset: 57.9 LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	12.5-inch thick ASPHALT --PAVEMENT--					
566.3	Medium dense, brown SANDY GRAVEL; damp --AGGREGATE BASE--		1	6 8 3	NP	6
564.3	Stiff to very stiff, gray SILTY CLAY to SILTY CLAY LOAM, trace to some gravel; damp --FILL-- --RDR 2--	5	2	7 4 3	2.50 P	18
	--L_L(%)=31, P_L(%)=15-- --%Gravel=16.3-- --%Sand=11.1-- --%Silt=49.1-- --%Clay=23.5-- --A-6 (9)--		3	3 3 3	1.89 B	21
			4	3 5 5	3.85 B	18
558.1	Brown SILTY LOAM, trace gravel; damp --FILL--	10				
556.8	Stiff to very stiff, brown and gray SILTY CLAY LOAM, trace gravel; damp --FILL--		5	3 4 7	1.89 B	16
		15	6	3 6 6	3.28 B	13
551.8	Medium dense, brown and gray SILTY LOAM, trace gravel; damp --FILL-- --L_L(%)=25, P_L(%)=14-- --%Gravel=4.3-- --%Sand=18.2-- --%Silt=59.0-- --%Clay=18.6-- --A-6 (6)--		7	4 7 7	NP	15
548.1		20	8	2 3 3	NR	
	Loose to very dense, brown Gravelly SANDY LOAM; saturated --RDR 2-3--		9	4 4 7	NP	15
	--L_L(%)=NP, P_L(%)=NP-- --%Gravel=49.7-- --%Sand=32.3-- --%Silt=16.8-- --%Clay=1.2-- --A-1-b (0)--	25	10	6 7 7	NP	12
	--3-inch thick silty loam lens--		11	8 8 50/3"	NP	10
540.1	Very dense, dark brownish gray Weathered SHALE --Weathered BEDROCK--		12	50/2"	NP	9
538.3	Medium strong, dark brownish gray, poor quality, MUDSTONE & DOLOSTONE; Closely spaced, slightly weathered, horizontal and vertical joints, with 0 inch opening, slicken to slightly rough walls, and >0.2 inch thick clay infill. --RUN 1: 29.0 to 39.0 feet-- --Recovery: 100%-- --RQD: 29%--	30		CORE		
533.3	Strong, light greenish gray, very poor quality, DOLOSTONE; Closely spaced, slightly weathered, horizontal, oblique, and vertical joints, with >0.2 inch opening, rough walls, and >0.2 inch thick sand and silt infill.	35	13			
	--RUN 2: 39.0 to 44.0 feet-- --Recovery: 100%--	40		CO		

GENERAL NOTES

Begin Drilling **08-04-2021** Complete Drilling **08-04-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **17B57T [91%]**
Driller **NC&AG** Logger **E. Yim** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 29 ft; mud rotary thereafter; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **21.00 ft**
At Completion of Drilling **23.00 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.

BORING LOG DpR-BSB-01

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WEI Job No.: 255-39-01

Client **Stantec**
Project **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location **Will County, Illinois**

Datum: NAVD 88
Elevation: 567.33 ft
North: 1755313.68 ft
East: 1017504.81 ft
Station: 316+95.61
Offset: 57.9 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--RQD: 0%--			14	RE		
	523.3	Boring terminated at 44.00 ft						
			45					
			50					
			55					
			60					

GENERAL NOTES

Begin Drilling **08-04-2021** Complete Drilling **08-04-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **17B57T [91%]**
Driller **NC&AG** Logger **E. Yim** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 29 ft; mud rotary thereafter; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **21.00 ft**
At Completion of Drilling ▼ **23.00 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 DpR-BSB-02

WEI Job No.: 255-39-01

Client: **Stantec**
Project: **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 567.08 ft
North: 1755187.36 ft
East: 1017508.96 ft
Station: 316+97.67
Offset: 68.4 RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	18-inch thick ASPHALT --PAVEMENT--					
565.6	Brown SANDY GRAVEL; damp --AGGREGATE BASE--					
565.1	Medium dense, brown, gravelly SANDY LOAM; damp --FILL--		1	7 8 8	NP	10
563.8	--wet spoon recovery-- Very stiff, brown and gray SILTY CLAY, little gravel; damp --FILL--	5	2	3 4 5	3.85 B	21
562.3	Brown and gray SANDY GRAVEL; saturated --FILL--					
561.6	Very stiff to hard, brown and gray SILTY CLAY to SILTY CLAY LOAM, trace to little gravel; damp --FILL--		3	2 3 6	4.18 B	15
	--RDR 2--	10	4	4 4 5	4.35 B	17
	--L_L(%)=38, P_L(%)=15-- --%Gravel=2.0-- --%Sand=13.2-- --%Silt=55.5-- --%Clay=29.3-- --A-6 (19)--		5	4 5 8	3.69 B	28
		15	6	3 4 8	2.79 B	14
	--gray, black and brown--		7	5 7 9	4.67 B	19
549.1	Loose, gray SILTY LOAM; damp --RDR 2--	20	8	3 3 3	NP	32
546.6	Medium stiff, gray SILTY CLAY LOAM; moist		9	2 3 5	0.90 B	28
545.3	Loose to medium dense, gray and brown SANDY GRAVEL; saturated --RDR 2-3--	25	10	13 9 7	NP	13
	--rig chatter--					
541.6	Dense, gray SILTY LOAM, trace gravel; damp to moist --RDR 3--		11	11 14 16	NP	14
539.1	Very dense, greenish gray, highly weathered SHALE; damp --Weathered BEDROCK-- --RDR 2-3--	30	12	22 50/1"	NP	10
535.1	Strong, light brown and gray, poor quality, vuggy DOLOSTONE with occasional shale partings; Closely spaced, highly weathered, horizontal and oblique joints, with 0.05 - > 0.2 inch opening, rough walls, and <0.2 inch thick greenish gray clayey and silty infill. --RUN 1: 32.0 to 41.0 feet-- --Recovery: 100%-- --RQD: 40%--	35, 40	13	CORE		

GENERAL NOTES

Begin Drilling **08-01-2021** Complete Drilling **08-01-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **R&R** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 10 ft; mud rotary thereafter; boring flushed and left open for 24-hr WL reading; backfilled upon reading**

WATER LEVEL DATA

While Drilling ∇ **3.25 ft**
At Completion of Drilling ▼ **mud at 8 feet**
Time After Drilling **24 hours**
Depth to Water ▼ **11.00 ft**

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

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BORING LOG DpR-BSB-02

WEI Job No.: 255-39-01

Client **Stantec**
Project **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location **Will County, Illinois**

Datum: NAVD 88
Elevation: 567.08 ft
North: 1755187.36 ft
East: 1017508.96 ft
Station: 316+97.67
Offset: 68.4 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--RUN 2: 41.0 to 47.0 feet-- --Recovery: 100%-- --RQD: 25%--			14	CORE		
			45					
	520.1	Boring terminated at 47.00 ft						
			50					
			55					
			60					

GENERAL NOTES

Begin Drilling **08-01-2021** Complete Drilling **08-01-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **R&R** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 10 ft; mud rotary thereafter; boring flushed and left open for 24-hr WL reading; backfilled upon reading**

WATER LEVEL DATA

While Drilling ▽ **3.25 ft**
At Completion of Drilling ▼ **mud at 8 feet**
Time After Drilling **24 hours**
Depth to Water ▼ **11.00 ft**

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

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BORING LOG DpR-BSB-03

WEI Job No.: 255-39-01

Client **Stantec**
Project **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location **Will County, Illinois**

Datum: NAVD 88
Elevation: 567.22 ft
North: 1755285.12 ft
East: 1017613.89 ft
Station: 318+04.20
Offset: 27.6 LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
566.5	9-inch thick CONCRETE --bridge deck pavement--						
	--Drilled from the bridge deck--	5, 10, 15					
547.7	--River water surface--	20					
546.2							
545.7	Gray SANDY GRAVEL; saturated			1	3 3 3 19	NP	16
545.0	Gray CRUSHED CONCRETE --FILL--						
	Loose to dense, gray SANDY GRAVEL; saturated --RDR 2-3--			2	21 26 11 13	NP	16
543.2	Dense to very dense, gray weathered SHALE bedrock; wet to saturated --RDR 2-3--	25		3	50/3"	NP	11
539.2	Strong, dark gray and black, very poor quality dolomitic SHALE and MUDSTONE;Very closely to closely spaced, moderately to slightly weathered, horizontal, oblique, and vertical joints, with <0.05 inch opening, slightly rough walls, and <0.2 inch thick clay infill. --RUN 1: 28.0 to 32.75 feet-- --Recovery: 95%-- --RQD: 7%-- --Q_u at 30.0 feet= 4,147 psi	30		4	CORE		
536.2	Strong, light gray, very poor quality, DOLOSTONE; Very closely to closely spaced, moderately to slightly weathered, horizontal, oblique, and vertical joints, with <0.05 inch opening, slightly rough walls, and <0.2 inch thick light greenish clayey and silty infill. --RUN 2: 32.75 to 43.0 feet-- --Recovery: 100%-- --RQD: 12%--	35, 40		5	CORE		

GENERAL NOTES

Begin Drilling **08-17-2021** Complete Drilling **08-17-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **R&N** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 25 ft; mud rotary thereafter; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **19.50 ft**
At Completion of Drilling ▼ **19.50 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**
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BORING LOG DpR-BSB-03

WEI Job No.: 255-39-01

Client **Stantec**
Project **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location **Will County, Illinois**

Datum: NAVD 88
Elevation: 567.22 ft
North: 1755285.12 ft
East: 1017613.89 ft
Station: 318+04.20
Offset: 27.6 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	524.2							
		Boring terminated at 43.00 ft						
			45					
			50					
			55					
			60					

GENERAL NOTES

Begin Drilling **08-17-2021** Complete Drilling **08-17-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **R&N** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 25 ft; mud rotary thereafter; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **19.50 ft**
At Completion of Drilling ▼ **19.50 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG DpR-BSB-04

WEI Job No.: 255-39-01

Client **Stantec**
Project **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location **Will County, Illinois**

Datum: NAVD 88
Elevation: 566.95 ft
North: 1755191.58 ft
East: 1017633.17 ft
Station: 318+21.93
Offset: 66.3 RT

Elevation (ft)	Soil and Rock Description	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	9-inch thick CONCRETE --bridge deck pavement--					
566.2	--Drilled from the bridge deck--					
548.5	Very loose to medium dense, gray and brown SANDY GRAVEL to Gravelly SANDY LOAM; moist to saturated --RDR 2-3--	18.5	1	1, 0, 2	NP	10
			2	3, 3, 3, 6, 32	NP	14
	--L_L(%)=NP, P_L(%)=NP-- --%Gravel=32.1-- --%Sand=40.0-- --%Silt=24.4-- --%Clay=3.5-- --A-2-4 (0)--		3	17, 14, 7	NP	19
541.5	Very dense, gray, weathered SHALE --Weathered BEDROCK--	25.5	4	50/3"	NP	11
538.5	Strong, dark gray, very poor quality, MUDSTONE; Closely spaced, moderately weathered, horizontal and oblique joints, with <0.05 inch opening, slicken walls, and no infill. --RUN 1: 28.5 to 33.5 feet-- --Recovery: 100%-- --RQD: 20%-- --Q_u at 30.0 feet= 4,859 psi	28.5	5	CORE		
535.5	Strong, light bluish gray, very poor quality, DOLOSTONE; Closely spaced, highly weathered, horizontal, oblique, and vertical joints, with <0.05 - 0.2 inch opening, slicken to slightly rough walls, and >0.2 inch thick light greenish sand and silt infill. --RUN 2: 33.5 to 43.5 feet-- --Recovery: 96%-- --RQD: 18%-- --Q_u at 34.0 feet= 3,528 psi	31.5	6	CORE		

GENERAL NOTES

Begin Drilling **08-02-2021** Complete Drilling **08-02-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **R&R** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 22.5 ft; mud rotary thereafter; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **20.50 ft**
At Completion of Drilling **17.00 ft**
Time After Drilling **NA**
Depth to Water **NA**

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BORING LOG DpR-BSB-04

WEI Job No.: 255-39-01

Client **Stantec**
Project **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location **Will County, Illinois**

Datum: NAVD 88
Elevation: 566.95 ft
North: 1755191.58 ft
East: 1017633.17 ft
Station: 318+21.93
Offset: 66.3 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	523.5							
		Boring terminated at 43.50 ft						
			45					
			50					
			55					
			60					

GENERAL NOTES

Begin Drilling **08-02-2021** Complete Drilling **08-02-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **R&R** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 22.5 ft; mud rotary thereafter; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **20.50 ft**
At Completion of Drilling ▼ **17.00 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG DpR-BSB-05

WEI Job No.: 255-39-01

Client **Stantec**
Project **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location **Will County, Illinois**

Datum: NAVD 88
Elevation: 566.51 ft
North: 1755318.09 ft
East: 1017743.22 ft
Station: 319+34.06
Offset: 58.4 LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	9-inch thick CONCRETE --bridge deck pavement--					
565.8	--Drilled from the bridge deck--					
548.0	--River water surface--	18.5				
544.0	Medium dense, gray and brown Gravelly SANDY LOAM; saturated --RDR 3-- --L_L(%)=NP, P_L(%)=NP-- --%Gravel=39.8-- --%Sand=37.8-- --%Silt=19.5-- --%Clay=2.8-- --A-1-b (0)--		1	22 15 9 3	NP	12
542.3	Very dense, gray, weathered SHALE; damp to moist --Weathered BEDROCK-- --RDR 3-4-- --slow drilling--	25	2	7 7 50/5"	NP	13
			3	50/3"	NP	9
538.0	Strong, dark gray, poor quality, dolomitic SAHALE and MUDSTONE; moderately weathered, horizontal joints, with <0.05 inch opening, slightly rough walls, and no infill. --RUN 1: 28.5 to 36.5 feet-- --Recovery: 100%-- --RQD: 29%-- --Q_u at 31.0 feet= 8,721 psi	30	4	CORE		
535.1	Strong, light gray, very poor to poor quality, vuggy DOLOSTONE; Closely spaced, moderately to highly weathered, horizontal, oblique, and vertical joints, with 0.05 - 0.2 inch opening, slightly rough walls, and >0.2 inch thick light greenish clayey and silty infill. --RUN 2: 36.5 to 42.5 feet-- --Recovery: 92%-- --RQD: 22%--	35	5	CORE		
		40				

GENERAL NOTES

Begin Drilling **08-04-2021** Complete Drilling **08-04-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **R&R** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 23.5 ft; mud rotary thereafter; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **18.50 ft**
At Completion of Drilling ▼ **18.50 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG DpR-BSB-05

WEI Job No.: 255-39-01

Client **Stantec**
Project **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location **Will County, Illinois**

Datum: NAVD 88
Elevation: 566.51 ft
North: 1755318.09 ft
East: 1017743.22 ft
Station: 319+34.06
Offset: 58.4 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type *recovery*	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	524.0							
		Boring terminated at 42.50 ft						
			45					
			50					
			55					
			60					

GENERAL NOTES

Begin Drilling **08-04-2021** Complete Drilling **08-04-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **R&R** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 23.5 ft; mud rotary thereafter; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ▽ **18.50 ft**
At Completion of Drilling ▼ **18.50 ft**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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BORING LOG DpR-BSB-06

WEI Job No.: 255-39-01

Client **Stantec**
Project **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location **Will County, Illinois**

Datum: NAVD 88
Elevation: 566.55 ft
North: 1755224.17 ft
East: 1017752.61 ft
Station: 319+41.90
Offset: 35.7 RT

Elevation (ft)	Soil and Rock Description	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
565.8	9-inch thick CONCRETE --bridge deck pavement--					
547.1	River water surface					
544.1						
543.7	Stiff (1.0P), gray SILTY CLAY LOAM, little gravel					
542.3	Very dense, gray, fine to coarse GRAVEL; saturated		1	10, 26, 18, 12	NP	9
541.0	Gray weathered SHALE fragments --RDR 3--	25	2	6, 5, 50/5"	NP	10
540.6	Very dense, gray SANDY GRAVEL; saturated		3	60/4"	NP	8
538.1	Very dense, gray, weathered SHALE bedrock; moist					
536.5	Strong, dark gray, fair quality, dolomitic SHALE and MUDSTONE; Closely spaced, moderately weathered, horizontal joints, with 0-0.2 inch opening, slightly rough walls, and no infill. --RUN 1: 28.5 to 38.5 feet-- --Recovery: 100%-- --RQD: 52%-- --Q_u at 29.0 feet= 3,417 psi	30	4	CORE		
	Strong, light bluish gray, poor to fair quality, vuggy DOLOSTONE, with occasional shale partings; Closely spaced, moderately weathered, horizontal and oblique joints, with 0.05 - > 0.2 inch opening, slightly rough walls, and >0.2 inch thick light greenish clayey and silty infill. --Q_u at 32.5 feet= 4,591 psi	35				
	--RUN 2: 38.5 to 43.5 feet-- --Recovery: 100%-- --RQD: 33%--	40		COR		

Depth scale (left column): 5, 10, 15, 20; water level symbol at 547.1.

GENERAL NOTES

Begin Drilling **08-03-2021** Complete Drilling **08-03-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **R&R** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 26 ft; mud rotary thereafter; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **19.50 ft**
At Completion of Drilling **19.50 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 DpR-BSB-06

WEI Job No.: 255-39-01

Client **Stantec**
Project **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location **Will County, Illinois**

Datum: NAVD 88
Elevation: 566.55 ft
North: 1755224.17 ft
East: 1017752.61 ft
Station: 319+41.90
Offset: 35.7 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
					5	E		
	523.1	Boring terminated at 43.50 ft						
			45					
			50					
			55					
			60					

GENERAL NOTES

Begin Drilling **08-03-2021** Complete Drilling **08-03-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **20D50T [80%]**
Driller **R&R** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 26 ft; mud rotary thereafter; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **19.50 ft**
At Completion of Drilling **19.50 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 DpR-BSB-07

WEI Job No.: 255-39-01

Client: **Stantec**
Project: **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 565.84 ft
North: 1755319.46 ft
East: 1017855.32 ft
Station: 320+46.17
Offset: 57.9 LT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	13.5-inch thick ASPHALT --PAVEMENT--					
564.7						
564.4	Brown SANDY GRAVEL; damp --AGGREGATE BASE--		1	5 4 4	NP	15
	Loose, brown SILTY LOAM, trace gravel; damp --FILL--					
562.8	Very stiff, brown and black SILTY CLAY LOAM, trace gravel; damp		2	11 6 50/4"	2.00 P	14
561.8						
560.8	Very stiff, brown Gravelly CLAY LOAM; moist to wet --RDR 4-- --L_L(%)=29, P_L(%)=15-- --%Gravel=17.9-- --%Sand=25.7-- --%Silt=38.6-- --%Clay=17.7-- --A-6 (5)-- --hard drilling from 5.0 feet--	5	3	50/5"	NP	4
			4	50/4"	NP	5
	Very dense, brown and gray, weathered SHALE; damp --Weathered BEDROCK-- --RDR 4--	10	5	50/1.5"	NP	
552.8	Medium strong, dark gray, fair to good quality, dolomitic SHALE and MUDSTONE; massive, slightly weathered, horizontal and vertical joints, top 3 feet with brownish, slightly weathered joints, with 0 inch opening, slicken to slightly rough walls, and no infill. --RUN 1: 13.0 to 23.0 feet-- --Recovery: 100%-- --RQD: 62%-- --Q_u at 14.0 feet= 7,947 psi --Q_u at 14.5 feet= 8,058 psi	15	6	CORE		
		20				
	--RUN 2: 23.0 to 28.0 feet-- --Recovery: 100%-- --RQD: 84%--	25	7	CORE		
537.8	Boring terminated at 28.00 ft					
		30				
		35				
		40				

GENERAL NOTES

Begin Drilling **08-04-2021** Complete Drilling **08-04-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **17B57T [91%]**
Driller **NC&AG** Logger **E. Yim** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 13 ft; mud rotary thereafter; boring backfilled upon completion**

WATER LEVEL DATA

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

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

Wang Engineering
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Telephone: (630) 953-9928
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BORING LOG DpR-BSB-08

WEI Job No.: 255-39-01

Client: **Stantec**
Project: **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 565.87 ft
North: 1755198.67 ft
East: 1017874.15 ft
Station: 320+62.99
Offset: 63.2 RT

Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	15-inch thick ASPHALT --PAVEMENT--					
564.6	Brown, silty SANDY GRAVEL; damp --AGGREGATE BASE--					
563.9	Very stiff, brown and gray SILTY CLAY LOAM to SILTY CLAY, trace to little gravel; damp --FILL--		1	4 3 6	3.77 B	15
		5	2	8 4 8	2.25 P	16
560.4	Gray SILTY LOAM, trace gravel; damp		3	4 2 3	NP	15
559.1	--Qu: 1.00 P-- Medium stiff to stiff, brown and gray CLAY LOAM to SILTY LOAM, trace gravel; moist --RDR 2-- --L_L(%)=48, P_L(%)=17-- --%Gravel=13.2-- --%Sand=26.8-- --%Silt=43.6-- --%Clay=16.4-- --A-7-6 (30)--	10	4	2 2 3	0.82 B	21
555.4	Stiff, dark gray SILTY LOAM; moist --RDR 2--		5	2 2 2	1.00 P	31
552.9	Soft, brown and gray SILTY CLAY, some gravel; wet --RDR 2--	15	6	2 3 3	0.49 B	17
550.4	--rig chatter; moderate advancement-- Medium dense to very dense, gray, highly weathered SHALE --Weathered BEDROCK-- --RDR 3-4--		7	3 7 18	NP	12
			8	100/5"	NP	5
545.9		20				
	--rig chatter; slow advancement-- Very dense, gray, moderately weathered SHALE --BEDROCK-- --RDR 4--		9	100/4"	NP	4
	--slow advancement--	25	10	100/5"	NP	4
			11	100/5.5"	NP	4
		30	12	100/4"	NP	3
	--rig chatter; slow advancement-- Medium strong, dark gray, fair to good quality, dolomitic SHALE and MUDSTONE; slightly weathered, horizontal joints, with 0 inch opening, slicken to slightly rough walls, and no infill.			CORE		
532.4	Strong, light bluish gray, very poor quality, highly fractured, vuggy DOLOSTONE; Very closely to closely spaced, slightly weathered, horizontal, oblique, and vertical joints, with > 0.5 inch opening, slightly rough to rough walls, and >0.5 inch thick klight greenish clayey and silty infill. --RUN 1: 31.0 to 41.0 feet-- --Recovery: 69%-- --RQD: 8%--	35	13			1
		40				

GENERAL NOTES

Begin Drilling **08-02-2021** Complete Drilling **08-02-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **17B57T [91%]**
Driller **NC&AG** Logger **E. Yim** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 31 ft; mud rotary thereafter; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **20.00 ft**
At Completion of Drilling **DRY**
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 DpR-BSB-08

WEI Job No.: 255-39-01

Client **Stantec**
Project **I-80 Reconstruction, Ridge Road to Houbolt Road**
Location **Will County, Illinois**

Datum: NAVD 88
Elevation: 565.87 ft
North: 1755198.67 ft
East: 1017874.15 ft
Station: 320+62.99
Offset: 63.2 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--RUN 2: 41.0 to 45.0 feet-- --Recovery: 75%-- --RQD: 10%--			14	CORE		
		--RUN 3: 45.0 to 48.0 feet-- --Recovery: 100%-- --RQD: 11%--	45		15	CORE		
	517.9	Boring terminated at 48.00 ft						
			50					
			55					
			60					

GENERAL NOTES

Begin Drilling **08-02-2021** Complete Drilling **08-02-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **17B57T [91%]**
Driller **NC&AG** Logger **E. Yim** Checked by **C. Marin**
Drilling Method **2.25" ID HSA to 31 ft; mud rotary thereafter; boring backfilled upon completion**

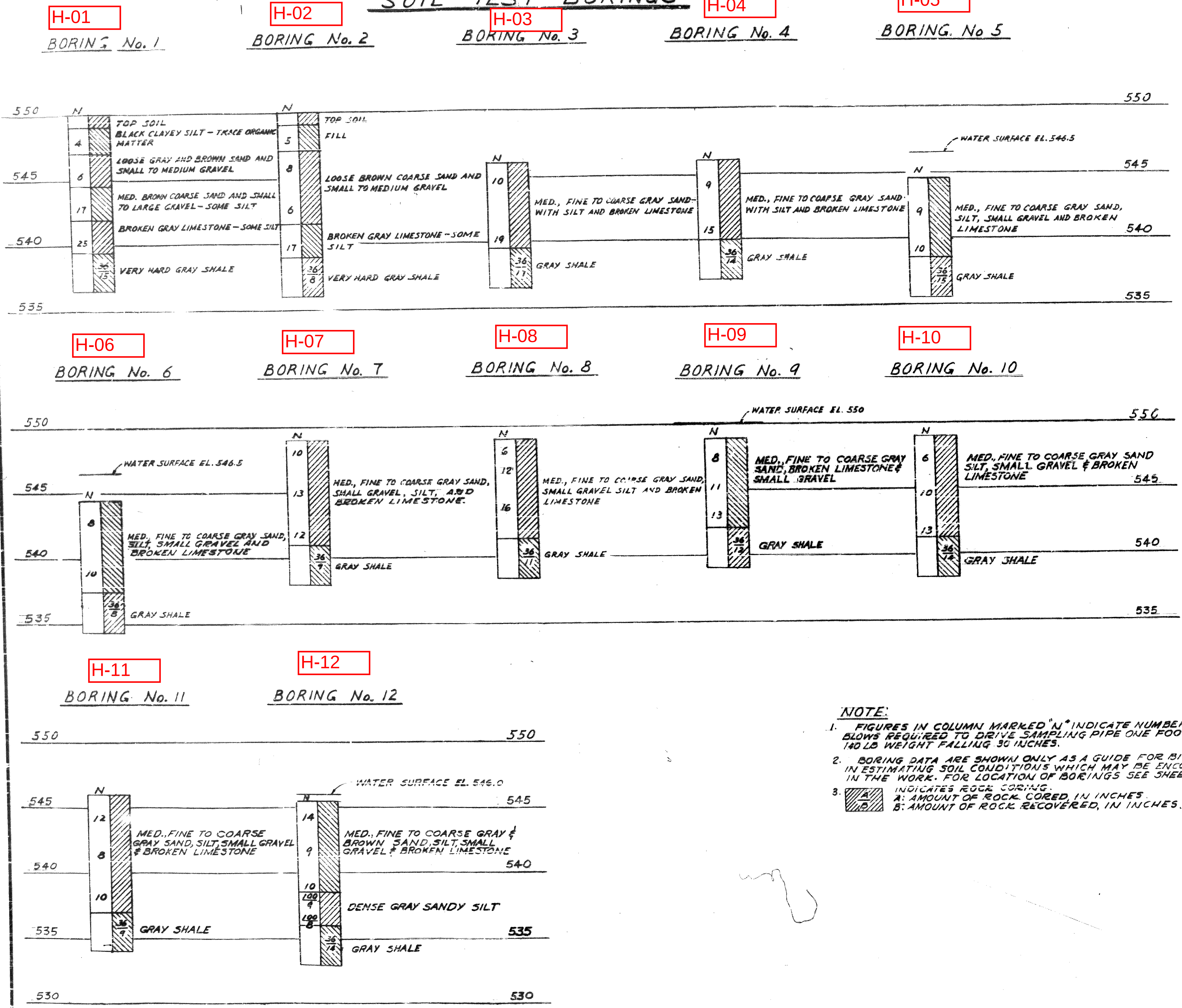
WATER LEVEL DATA

While Drilling ▽ **20.00 ft**
At Completion of Drilling ▼ **DRY**
Time After Drilling **NA**
Depth to Water ▼ **NA**

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

SOIL TEST BORINGS

F.A.I.80	99-18	WILL	16	4



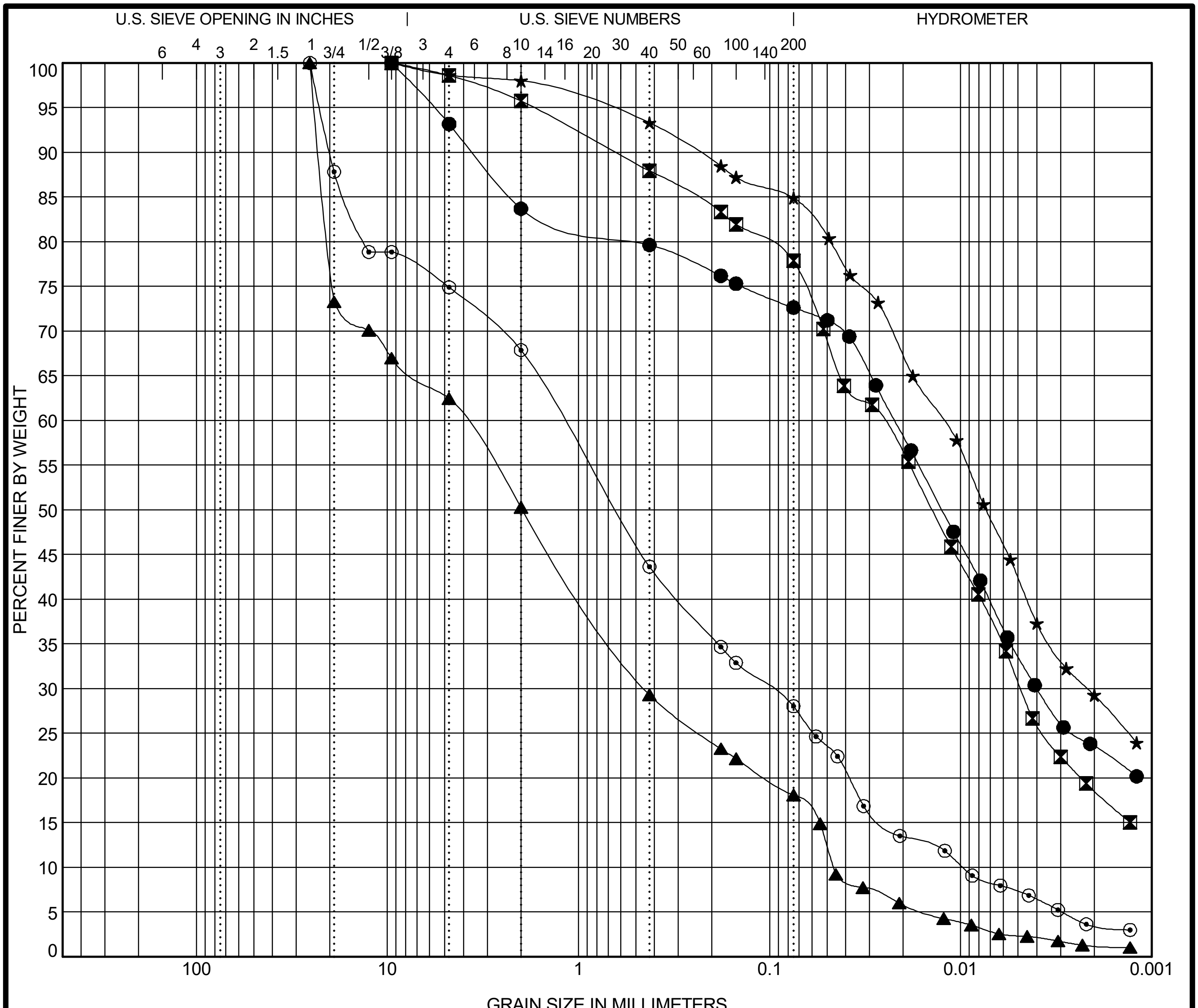
NOTE:

1. FIGURES IN COLUMN MARKED "N" INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE SAMPLING PIPE ONE FOOT USING 140 LB WEIGHT FALLING 30 INCHES.
2. BORING DATA ARE SHOWN ONLY AS A GUIDE FOR BIDDERS IN ESTIMATING SOIL CONDITIONS WHICH MAY BE ENCOUNTERED IN THE WORK. FOR LOCATION OF BORINGS SEE SHEET 2
3. A/B INDICATES ROCK CORING. A: AMOUNT OF ROCK CORED, IN INCHES. B: AMOUNT OF ROCK RECOVERED, IN INCHES.

ALFRED BENESCH & ASSOCIATES CONSULTING ENGINEERS
10 SOUTH WABASH AVENUE CHICAGO, ILLINOIS

BORINGS
F.A.I. ROUTE 80
OVER
DU PAGE RIVER
F.A. PROJECT
F.A.I. ROUTE 80 SECTION 99-18
WILL COUNTY
STATION 1911+09.33

APPENDIX B



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
● DpR-BSB-01#3	6.0 ft	**Gravelly Silty Clay Loam**	31	15	16		
⧗ DpR-BSB-01#7	16.0 ft	**Silty Loam**	25	14	11		
▲ DpR-BSB-01#10	23.5 ft	**Gravelly Sandy Loam**	NP	NP	NP	1.09	86.50
★ DpR-BSB-02#5	11.0 ft	**Silty Clay Loam**	38	15	23		
⊙ DpR-BSB-04#3	23.5 ft	**Gravelly Sandy Loam**	NP	NP	NP	0.84	124.46

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● DpR-BSB-01#3	6.0 ft	9.5	0.022	0.004		16.3	11.1	49.1	23.5
⧗ DpR-BSB-01#7	16.0 ft	9.5	0.026	0.005		4.3	18.2	59.0	18.6
▲ DpR-BSB-01#10	23.5 ft	25.4	3.988	0.447	0.046	49.7	32.3	16.8	1.2
★ DpR-BSB-02#5	11.0 ft	9.5	0.012	0.002		2.0	13.2	55.5	29.3
⊙ DpR-BSB-04#3	23.5 ft	25.4	1.209	0.099	0.01	32.1	40.0	24.4	3.5

WEI
SINCE 1982

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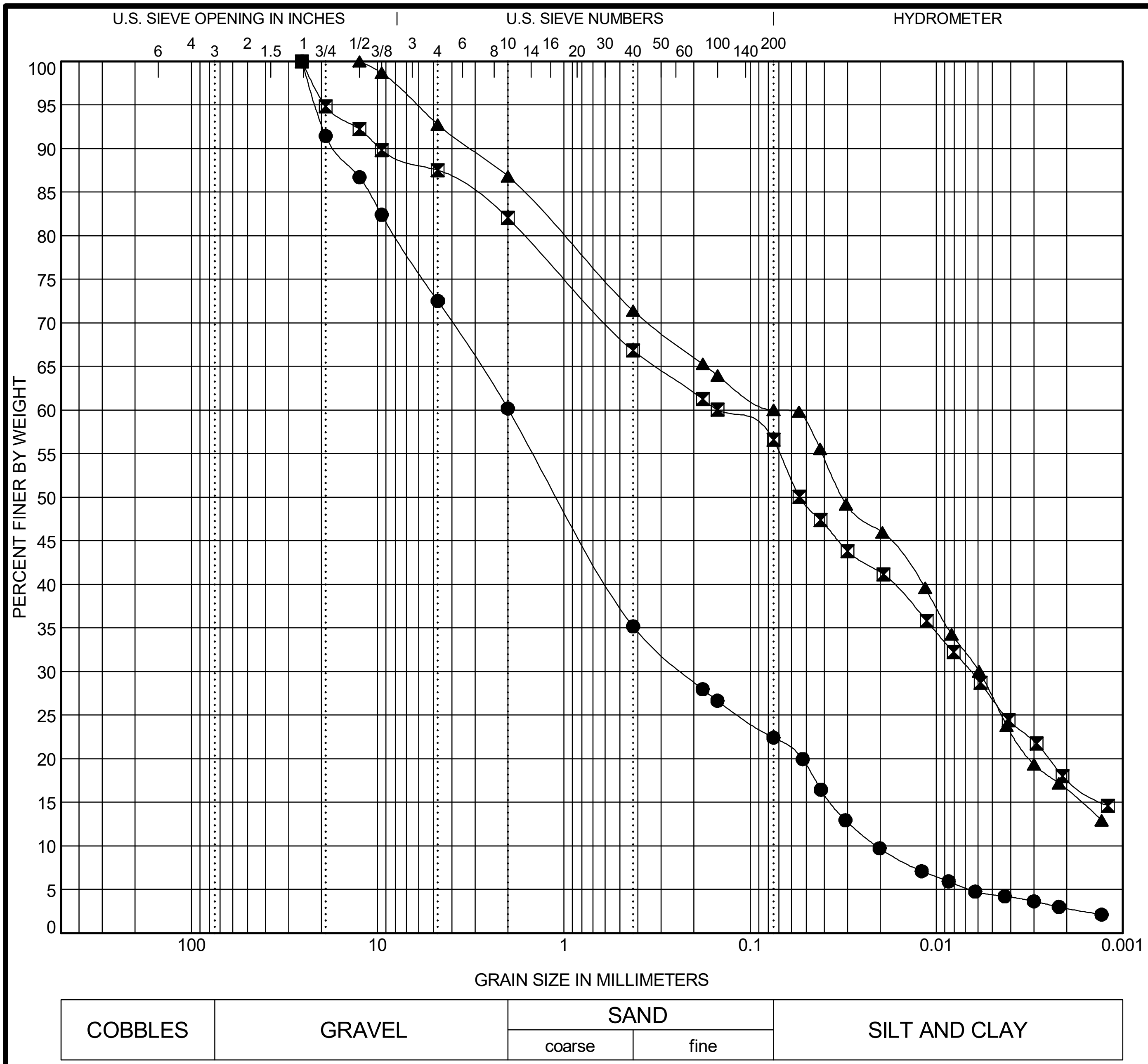
Fax: 6309539938

GRAIN SIZE DISTRIBUTION

Project: I-80 Reconstruction, Ridge Road to Houbolt Road

Location: Will County, Illinois

Number: 255-39-01



Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
● DpR-BSB-05#1	22.5 ft	**Gravelly Sandy Loam**	NP	NP	NP	1.27	94.53
⧗ DpR-BSB-07#2	3.5 ft	**Gravelly Clay Loam**	29	15	14		
▲ DpR-BSB-08#4	8.5 ft	**Silty Loam**	48	17	31		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● DpR-BSB-05#1	22.5 ft	25.4	1.978	0.229	0.021	39.8	37.8	19.5	2.8
⧗ DpR-BSB-07#2	3.5 ft	25.4	0.149	0.007		17.9	25.7	38.6	17.7
▲ DpR-BSB-08#4	8.5 ft	12.5	0.072	0.006		13.2	26.8	43.6	16.4

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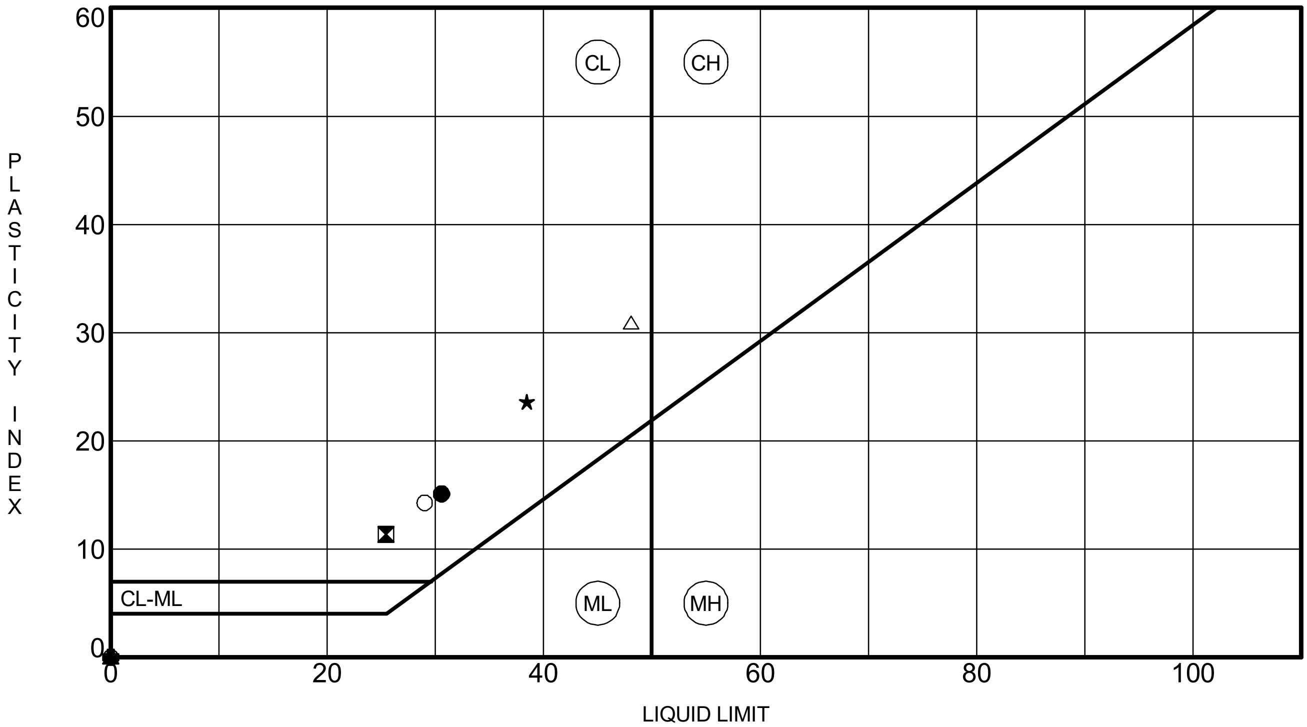
Project: I-80 Reconstruction, Ridge Road to Houbolt Road

Location: Will County, Illinois

Number: 255-39-01



	Specimen Identification		LL	PL	PI	Fines	IDH Classification
●	DpR-BSB-01#3	6.0 ft	31	15	16	73	Gravelly Silty Clay Loam
⧗	DpR-BSB-01#7	16.0 ft	25	14	11	78	Silty Loam
▲	DpR-BSB-01#10	23.5 ft	NP	NP	NP	18	Gravelly Sandy Loam
★	DpR-BSB-02#5	11.0 ft	38	15	23	85	Silty Clay Loam
⊙	DpR-BSB-04#3	23.5 ft	NP	NP	NP	28	Gravelly Sandy Loam
✿	DpR-BSB-05#1	22.5 ft	NP	NP	NP	22	Gravelly Sandy Loam
○	DpR-BSB-07#2	3.5 ft	29	15	14	57	Gravelly Clay Loam
△	DpR-BSB-08#4	8.5 ft	48	17	31	60	Silty Loam

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ATTERBERG LIMITS' RESULTS

Project: I-80 Reconstruction, Ridge Road to Houbolt Road

Location: Will County, Illinois

Number: 255-39-01

WEI ATTERBERG LIMITS IDH 2553901.GPJ US LAB.GDT 3/15/22

Wang Engineering

Unconfined Compressive Strength of Intact Rock Core Specimens

Project: I-80 Reconstruction

Client: Stantec

WEI Job No.: 255-39-01

Field Sample ID	Run #	Depth (ft)	Location	Sample Description	Length (in) Before Capping	Length (in) After Capping	Diameter (in)	Total Load (lbs)	Total Pressure (psi)	Fracture Type*	Break Date	Tested By	Area (in^2)
DpR-BSB-03	1	30.0	WB Bridge, Pier 1	Mudstone	4.21	NA	2.06	13820	4147	3	8/19/21	MAC	3.33
DpR-BSB-04	1	30.0	EB Bridge, Pier 1	Mudstone	4.10	NA	2.06	16130	4859	3	8/31/21	MAC	3.32
DpR-BSB-04	2	34.0	EB Bridge, Pier 1	Dolostone	4.04	NA	2.06	11760	3528	3	8/31/21	MAC	3.32
DpR-BSB-05	1	31.0	WB Bridge, Pier 2	Mudstone	4.18	NA	2.06	29010	8721	3	8/31/21	MAC	3.32
DpR-BSB-06	1	29.0	EB Bridge, Pier 2	Mudstone	4.05	NA	2.06	11410	3417	3	8/4/21	MAC	3.34
DpR-BSB-06	1	32.5	EB Bridge, Pier 2	Dolostone	4.06	NA	2.06	15300	4591	3	8/4/21	MAC	3.34

*** Fracture Types:**

Type 1 - Reasonably well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps;
Type 2 - Well-formed cone on one end, vertical cracks running through caps, no well defined cone on other end;
Type 3 - Columnar vertical cracking through both ends, no well-formed cones;
Type 4 - Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1;
Type 5 - Side fractures at top or bottom (occur commonly with unbonded caps);
Type 6 - Similar to Type 5 but end of cylinder is pointed.

Prepared by: 3/17/2022

Checked by: 03/17/2022

WANG ENGINEERING, INC.
1145 N. Main Street, Lombard. IL 60148

Wang Engineering

Unconfined Compressive Strength of Intact Rock Core Specimens

Project: I-80 Reconstruction

Client: Stantec

WEI Job No.: 255-39-01

Field Sample ID	Run #	Depth (ft)	Location	Sample Description	Length (in) Before Capping	Length (in) After Capping	Diameter (in)	Total Load (lbs)	Total Pressure (psi)	Fracture Type*	Break Date	Tested By	Area (in^2)
DpR-BSB-07	1	14.0	WB Bridge, East Abutment	Mudstone	4.14	NA	2.03	25720	7947	3	8/18/21	MAC	3.23
DpR-BSB-07	1	14.5	WB Bridge, East Abutment	Mudstone	4.20	NA	2.03	26080	8058	3	8/18/21	MAC	3.23

*** Fracture Types:**

Type 1 - Reasonably well-formed cones on both ends, less than 1 in. [25 mm] of cracking through caps;
Type 2 - Well-formed cone on one end, vertical cracks running through caps, no well defined cone on other end;
Type 3 - Columnar vertical cracking through both ends, no well-formed cones;
Type 4 - Diagonal fracture with no cracking through ends; tap with hammer to distinguish from Type 1;
Type 5 - Side fractures at top or bottom (occur commonly with unbonded caps);
Type 6 - Similar to Type 5 but end of cylinder is pointed.

Prepared by: M C 3/17/2022

Checked by: [signature] 03/17/2022

WANG ENGINEERING, INC.
1145 N. Main Street, Lombard. IL 60148

1145 North Main Street
Lombard, Illinois 60148
Phone (630) 953-9928
www.wangeng.com

APPENDIX C

Run #1

Boring DpR-BSB-01:
Run #1, 29.0 to 39.0 feet, RECOVERY=100%, RQD=29%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL

APPENDIX C-1

DRAWN BY: J. Bensen
CHECKED BY: A. Hamad

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FOR STANTEC

255-39-01

Run #2

0 6 inches

Boring DpR-BSB-01:
Run #2, 39.0 to 44.0 feet, RECOVERY=100%, RQD=0%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL	APPENDIX C-2	DRAWN BY: J. Bensen CHECKED BY: A. Hamad

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FOR STANTEC | 255-39-01

Run #1

0 6 inches

Boring DpR-BSB-02:
Run #1, 32.0 to 41.0 feet, RECOVERY=100%, RQD=40%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-3	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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FOR STANTEC		255-39-01

Run #2

0 6 inches

Boring DpR-BSB-02:
Run #2, 41.0 to 47.0 feet, RECOVERY=100%, RQD=25%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-4	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
Wang Engineering		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR STANTEC		255-39-01

Run #1

0 6 inches

Boring DpR-BSB-03:
Run #1, 28.0 to 32.75 feet, RECOVERY=95%, RQD=7%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-5	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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FOR STANTEC		255-39-01

Run #2

0 6 inches

Boring DpR-BSB-03:
Run #2, 32.75 to 43.0 feet, RECOVERY=100%, RQD=12%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-6	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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FOR STANTEC		255-39-01

Run #1

0 6 inches

Boring DpR-BSB-04:
Run #1, 28.5 to 33.5 feet, RECOVERY=100%, RQD=20%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-7	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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FOR STANTEC		255-39-01

Run #2

0 6 inches

Boring DpR-BSB-04:
Run #2, 33.5 to 43.5 feet, RECOVERY=96%, RQD=18%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-8	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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FOR STANTEC		255-39-01

Run #1

0 6 inches

Boring DpR-BSB-05:
Run #1, 28.5 to 36.5 feet, RECOVERY=100%, RQD=29%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-9	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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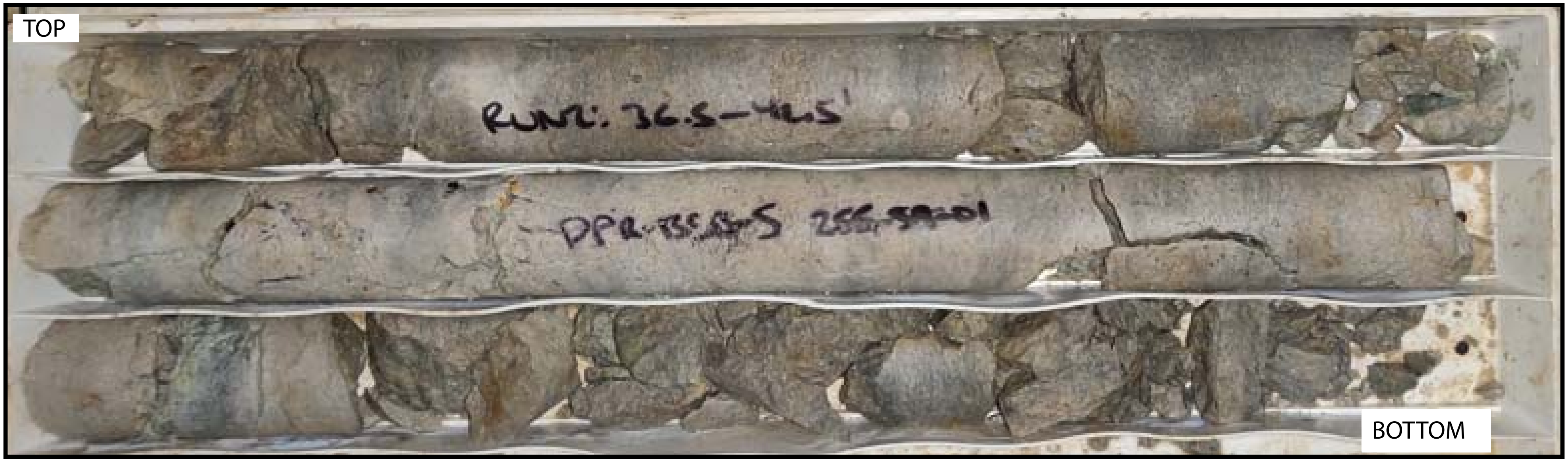
FOR STANTEC		255-39-01

Run #2



0 6 inches

Boring DpR-BSB-05:
Run #2, 36.5 to 42.5 feet, RECOVERY=92%, RQD=22%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-10	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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FOR STANTEC		255-39-01

Run #1

0 6 inches

Boring DpR-BSB-06:
Run #1, 28.5 to 38.5 feet, RECOVERY=96%, RQD=52%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-11	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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FOR STANTEC		255-39-01

Run #2

0 6 inches

Boring DpR-BSB-06:
Run #2, 38.5 to 43.5 feet, RECOVERY=100%, RQD=33%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-12	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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FOR STANTEC		255-39-01

Run #1

0 6 inches

Boring DpR-BSB-07:
Run #1, 13.0 to 23.0 feet, RECOVERY=100%, RQD=62%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-13	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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FOR STANTEC		255-39-01

Run #2

0 6 inches

Boring DpR-BSB-07:
Run #2, 23.0 to 28.0 feet, RECOVERY=100%, RQD=84%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-14	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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FOR STANTEC		255-39-01

Run #1

0 6 inches

Boring DpR-BSB-08:
Run #1, 31.0 to 41.0 feet, RECOVERY=69%, RQD=8%
Run #2, 41.0 to 45.0 feet, RECOVERY=75%, RQD=10%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-15	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
Wang Engineering		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR STANTEC		255-39-01

Run #3

Boring DpR-BSB-08:
Run #3, 45.0 to 48.0 feet, RECOVERY=100%, RQD=11%

BEDROCK CORE: I-80 RECONSTRUCTION, I-80 BRIDGE OVER DuPAGE RIVER, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	APPENDIX C-16	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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FOR STANTEC		255-39-01

Wang Engineering

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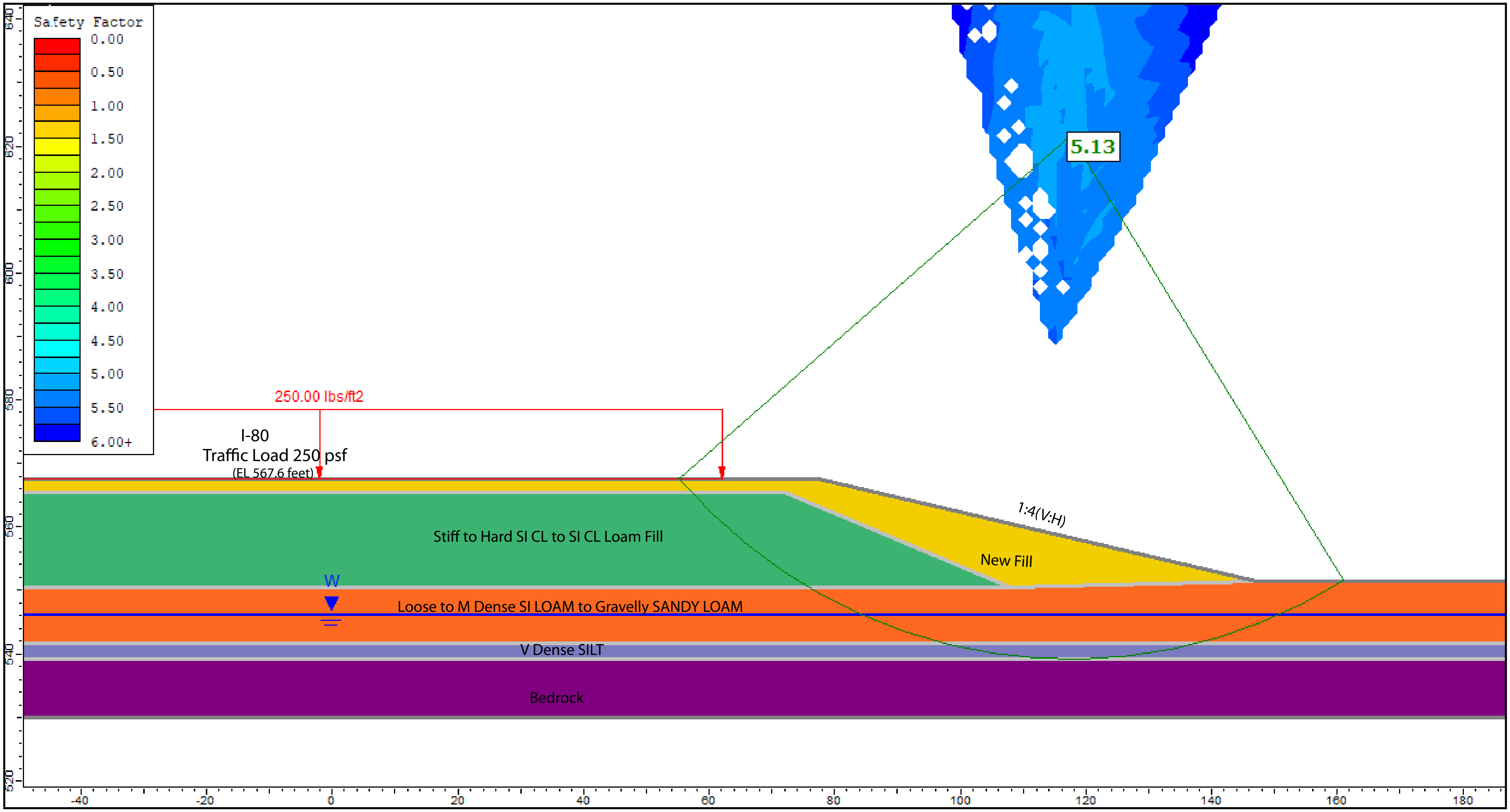
APPENDIX D



Undrained Analysis, West Approach Side Slope, Ref Borings: DpR-BSB-01 and DpR-BSB-02

Layer ID	Description	Total Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	New Fill	125	1000	0
2	Stiff to Hard SI CL to SI CL Loam Fill	120	2600	0
3	Loose to M Dense SI LOAM to GR SA LOAM	120	0	30
4	V Dense SILT	125	0	35

GLOBAL STABILITY: I-80 OVER DUPAGE RIVER BRIDGE; I-80 RECONSTRUCTION FROM EAST OF RIDGE RD TO HOUBOLT ROAD, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL

APPENDIX D-1

DRAWN BY: D. You
CHECKED BY: N. Balakumaran

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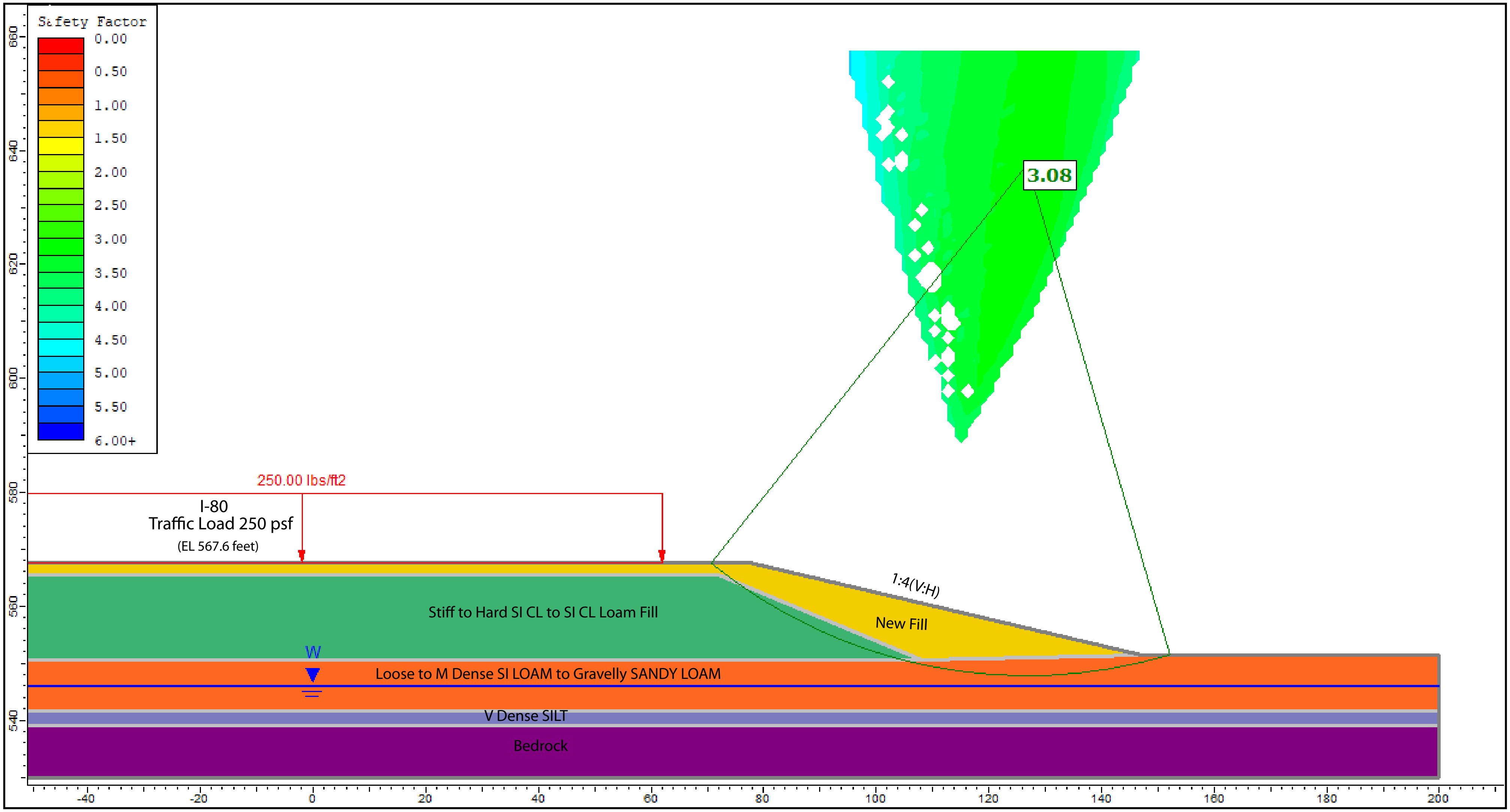
255-39-01



Drained Analysis, West Approach Side Slope, Ref Borings: DpR-BSB-01 and DpR-BSB-02

Layer ID	Description	Total Unit Weight (pcf)	Drained Cohesion (psf)	Drained Friction Angle (degrees)
1	New Fill	125	100	30
2	Stiff to Hard SI CL to SI CL Loam Fill	120	100	30
3	Loose to M Dense SI LOAM to GR SA LOAM	120	0	30
4	V Dense SILT	125	0	35

GLOBAL STABILITY: I-80 OVER DUPAGE RIVER BRIDGE; I-80 RECONSTRUCTION FROM EAST OF RIDGE RD TO HOUBOLT ROAD, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL

APPENDIX D-2

DRAWN BY: D. You
CHECKED BY: N. Balakumaran

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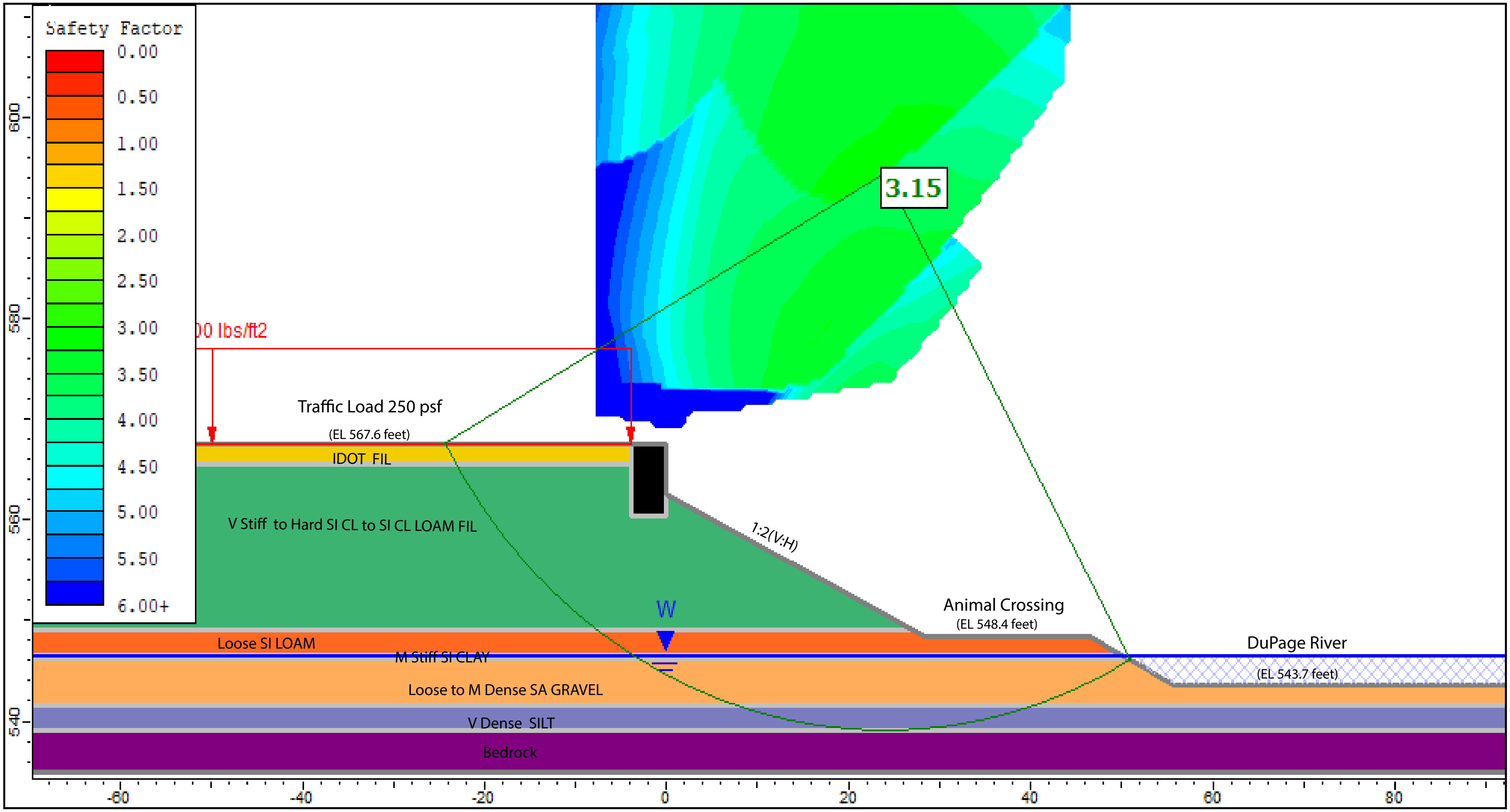

Undrained Analysis, West Abutment End Slope, Ref Boring: DpR-BSB-02

Layer ID	Description	Total Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	IDOT Fill	120	1000	0
2	V Stiff to Hard SI CL LOAM to SI CLAY Fill	120	2500	0
3	Loose SI LOAM	120	0	30
4	M Stiff SI CLAY	115	900	0
5	Loose to M Dense SA GRAVEL	120	0	32
6	V Dense SILT	125	0	35

GLOBAL STABILITY: I-80 OVER DUPAGE RIVER BRIDGE; I-80 RECONSTRUCTION FROM EAST OF RIDGE RD TO HOUBOLT ROAD, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL

APPENDIX D-3

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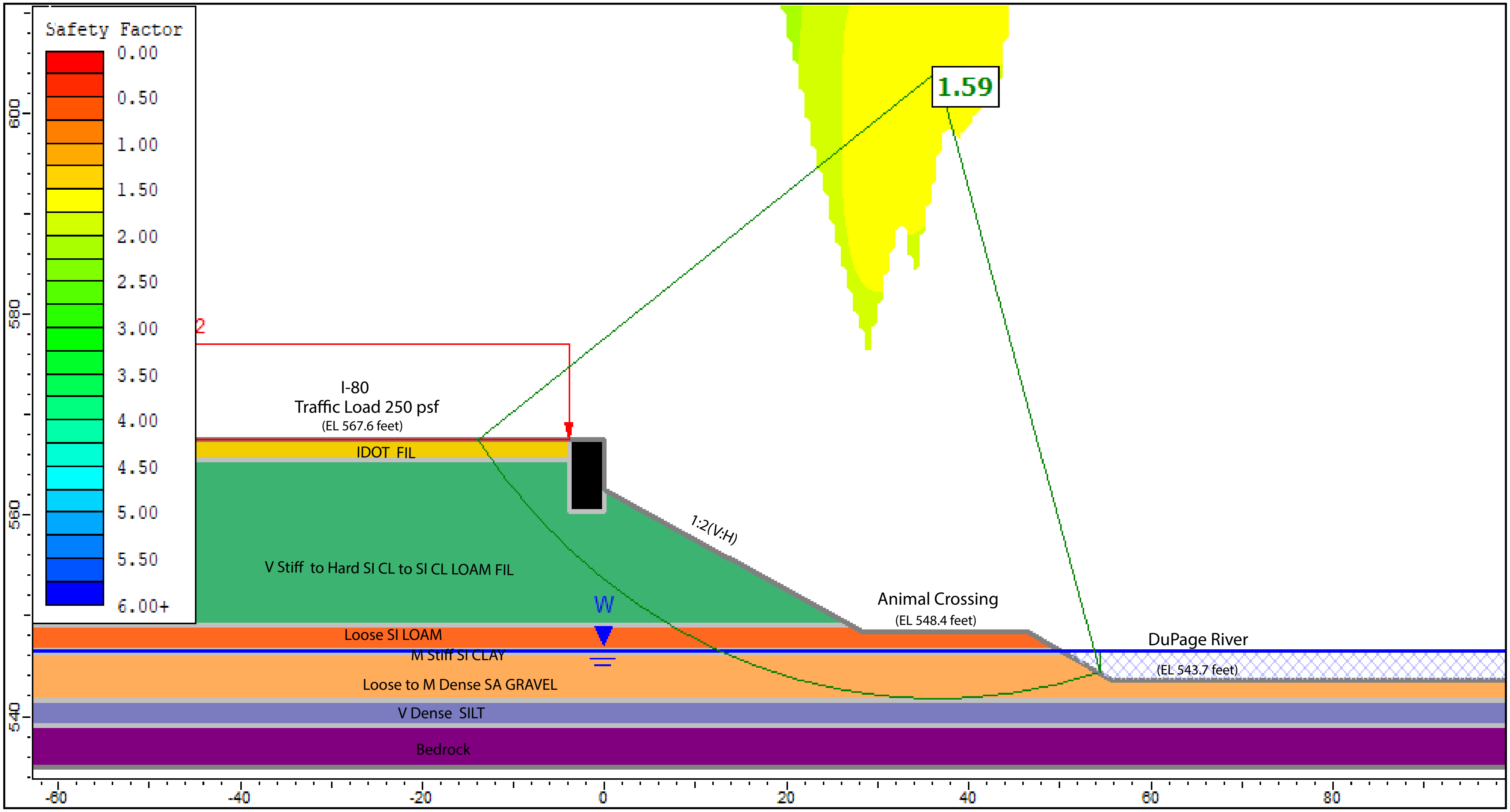

Drained Analysis, West Abutment End Slope, Ref Boring: DpR-BSB-02

Layer ID	Description	Total Unit Weight (pcf)	Drained Cohesion (psf)	Drained Friction Angle (degrees)
1	IDOT Fill	120	100	30
2	V Stiff to Hard SI CL LOAM to SI CLAY Fill	120	100	30
3	Loose SI LOAM	120	0	30
4	M Stiff SI CLAY	115	50	29
5	Loose to M Dense SA GRAVEL	120	0	32
6	V Dense SILT	125	0	35

GLOBAL STABILITY: I-80 OVER DUPAGE RIVER BRIDGE; I-80 RECONSTRUCTION FROM EAST OF RIDGE RD TO HOUBOLT ROAD, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL

APPENDIX D-4

DRAWN BY: D. You
CHECKED BY: N. Balakumaran

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255-39-01

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APPENDIX E

Benchmark: Set 2" CWA aluminum disc at top of concrete parapet wall at SE corner of eastbound I-80 Bridge over DuPage River. Elevation 568.745.

Existing Structure: S.N.s 099-0040 (EB) and 099-0041 (WB) were originally constructed in 1960 as 5-Span dual bridges with no skew carrying two lanes of eastbound, and two lanes of westbound, I-80 traffic over the DuPage River (F.A.I. Route I-80; FA Project I-80-4 (9); Section 99-1B). In 1982, the structures were widened by adding an additional beam line along the outside edges of existing roadway (F.A.I. Route 80, Proj. I-IR-80-4 (140) 123; Section 99-1B-BR-79) and in 2008, typical repairs including expansion joint replacement, deck slab repairs, bridge deck scarification and overlay placement, and substructure repairs were performed (F.A.I. Route 80; C-91-084-08; Section 99-1-B-I-2). The bridges have an overall length of approximately 292'-9" (Back-to-Back Abutments), an overall width of approximately 45'-2" (Out-to-Out deck) and consist of a 7"- thick reinforced concrete deck with 2¼" latex concrete overlay. The existing deck is supported by seven (7) - 42" PPC I-Beams at 6'-4" to 6'-6" center-to-center spacing. The substructures consist of reinforced concrete stub abutments on battered and straight steel piles on bedrock and reinforced concrete solid wall piers with spread footings on rock. The structures will be removed and replaced. Traffic will be maintained utilizing staged construction.

Salvage: No Salvage.

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.068g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.127g
Soil Site Class = C

LOADING HL-93

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

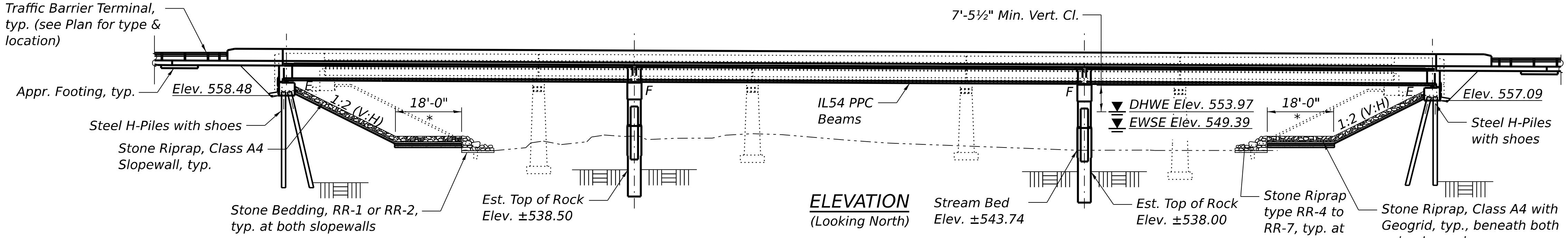
DESIGN STRESSES

FIELD UNITS
f'c = 4,000 psi (Superstructure)
f'c = 3,500 psi (Substructure)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

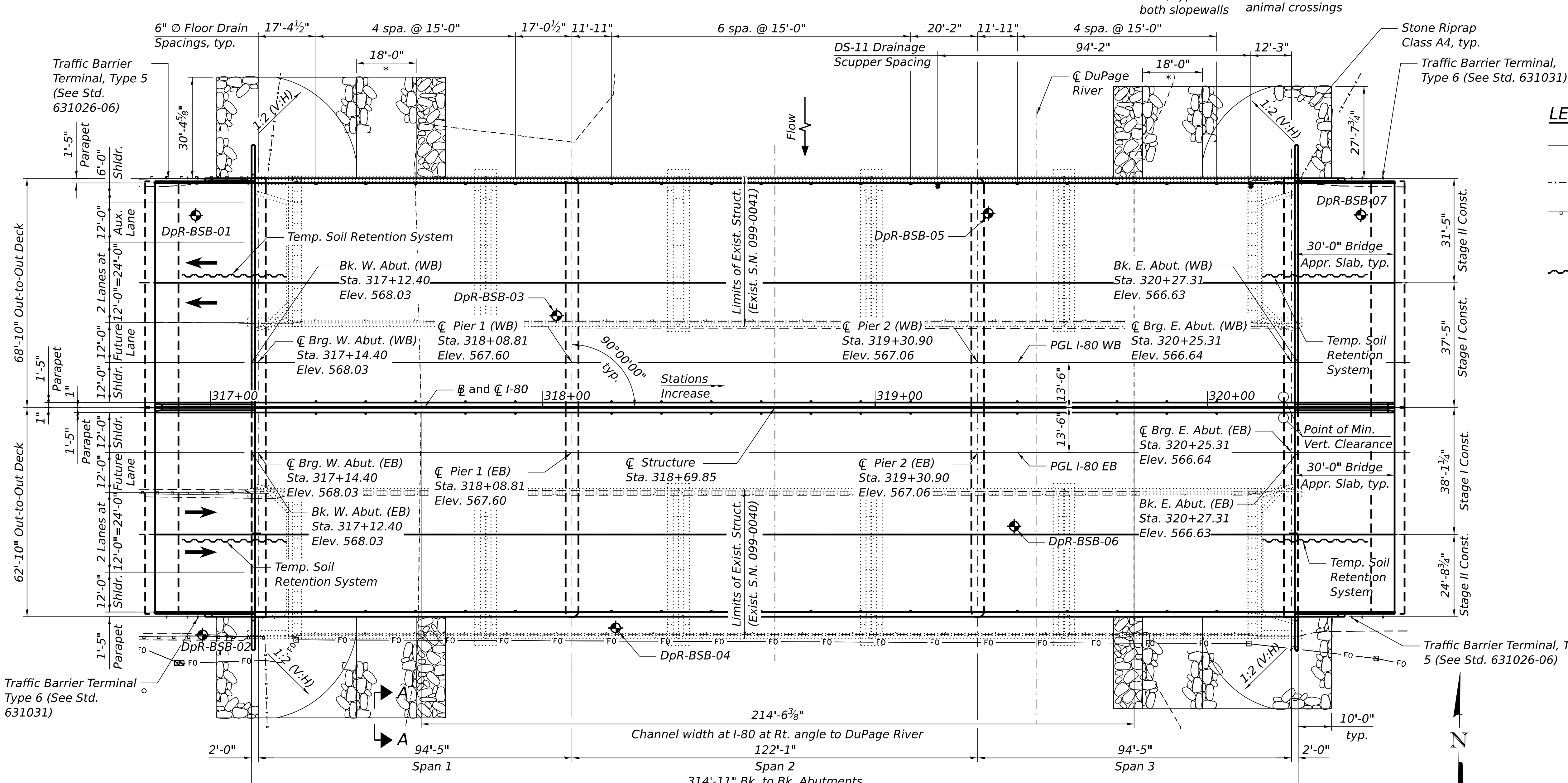
PRECAST PRESTRESSED UNITS
f'c = 8,500 psi
f'ci = 6,500 psi
fpu = 270,000 psi (0.6" ∅ low lax. strands)
fpbt = 202,300 psi (0.6" ∅ low lax. strands)

HIGHWAY CLASSIFICATION

F.A.I. Rte. 80 - I-80
Functional Class: Interstate
ADT: 49,400 (2019); 69,600 (2040)
ADTT: 15,800 (2019); 22,270 (2040)
DHV: 8,350 (2040)
Design Speed: 70 mph
Posted Speed: 70 mph
2-Way Traffic
Directional Distribution: 50-50



ELEVATION
(Looking North)



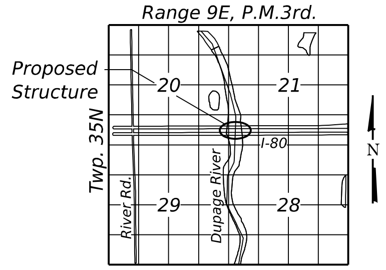
PLAN

LEGEND:

- FO — Exist. Fiber Optic Line, to be relocated
- Exist. Fence
- Exist. Guardrail, to be removed
- Soil Boring
- Temp. Soil Retention System

NOTES:

1. Up to ¼ inch may be ground off the bridge deck and the bridge approach slabs.
2. For Waterway Information Table, Section A-A and Design Scour Elevation Table, see Sheet 2.



LOCATION SKETCH

GENERAL PLAN AND ELEVATION
I-80 EB/WB OVER DUPAGE RIVER
F.A.I. RTE. I-80
SECTION 2021-154-R
WILL COUNTY
STA. 318+69.85
STRUCTURE NO. 099-8312 (EB)
STRUCTURE NO. 099-8313 (WB)

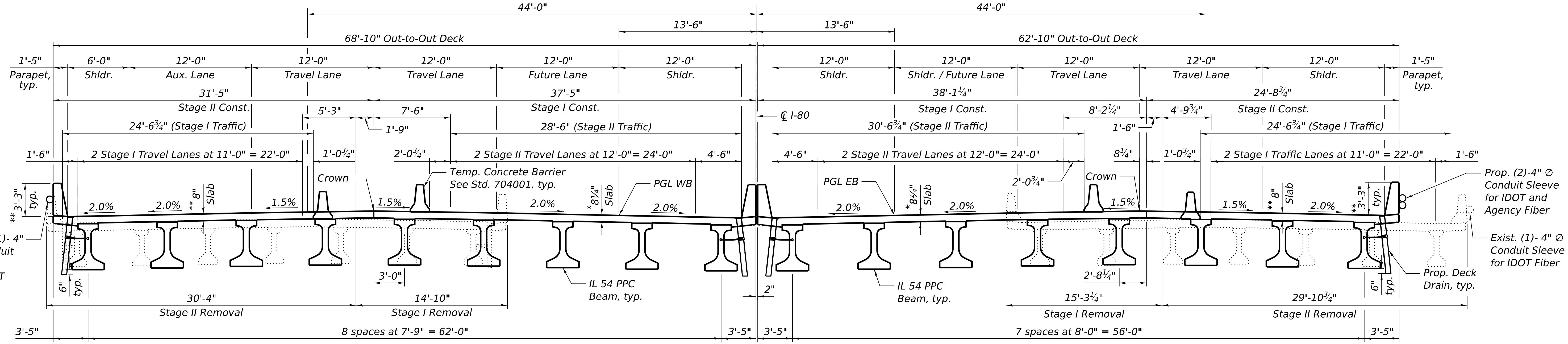
HBM ENGINEERING GROUP, LLC	USER NAME =	DESIGNED - JJS, SK	REVISED -
		CHECKED - MI	REVISED -
	PLOT SCALE =	DRAWN - PG	REVISED -
	PLOT DATE =	CHECKED - MI	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

STRUCTURE NOS. 099-8312 (EB) & 099-8313 (WB)

SHEET 1 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
I-80	FAI 80 21 STRUCTURE 7	WILL	2	1
		CONTRACT NO. 62R28		
		ILLINOIS FED. AID PROJECT		

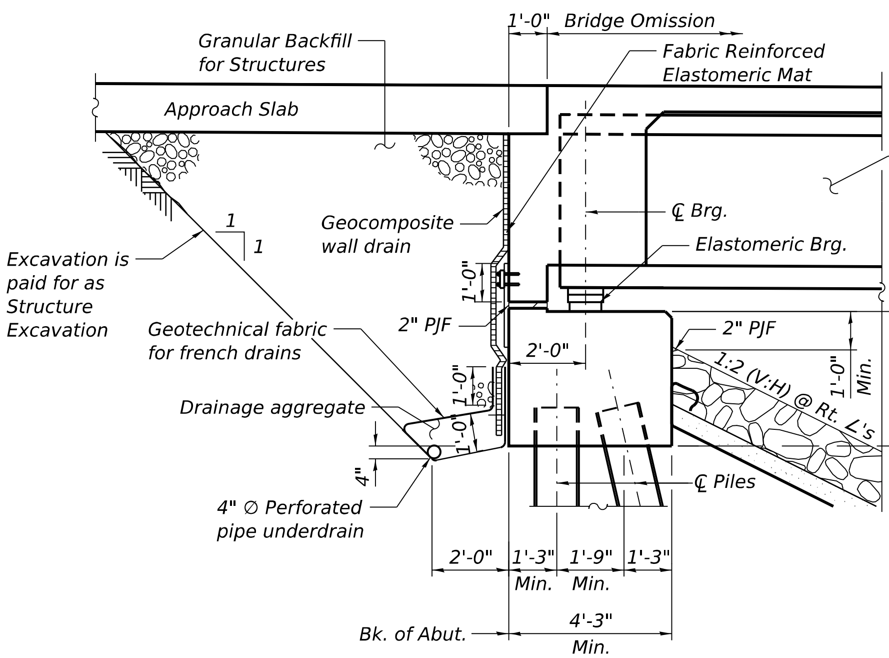


S.N. 099-8313 (WB)

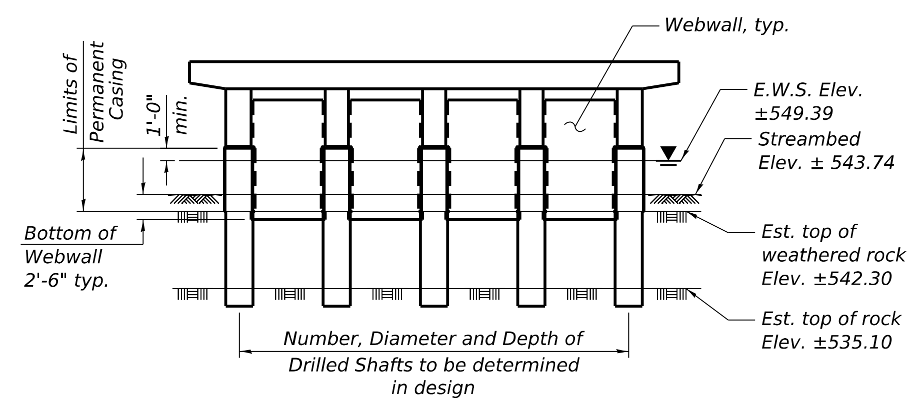
S.N. 099-8312 (EB)

CROSS SECTION
(Looking East)

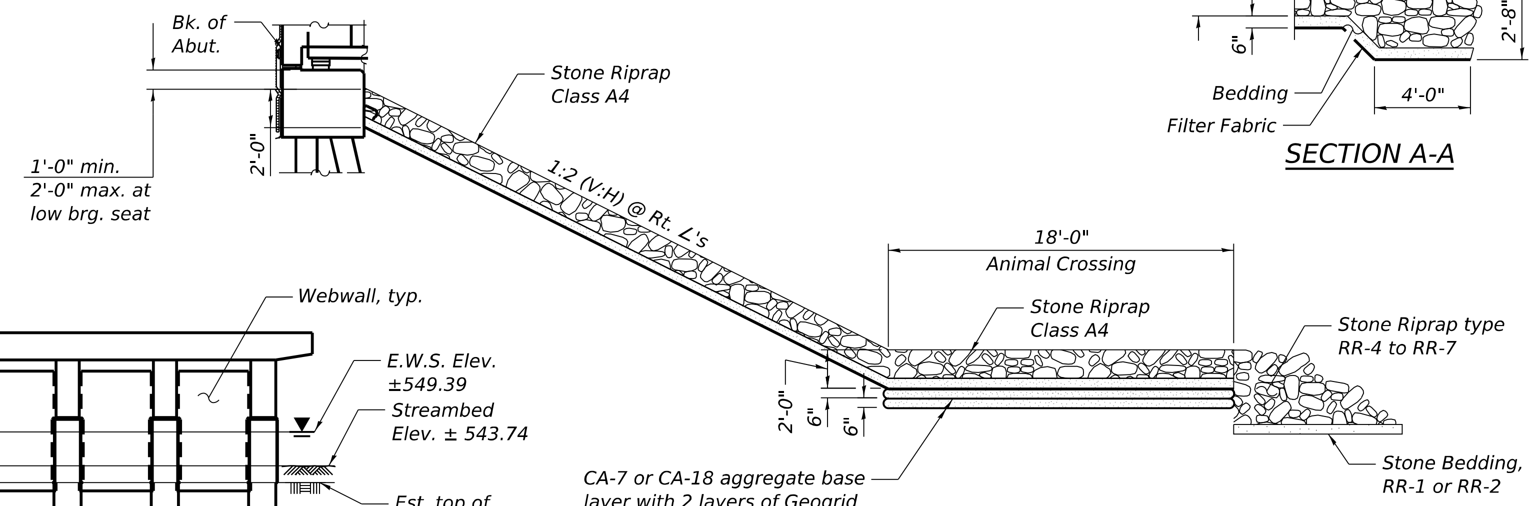
*Prior to grinding
**After grinding



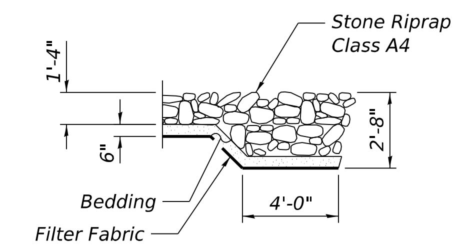
SECTION THRU SEMI-INTEGRAL ABUTMENT



PIER SKETCH



SECTION THRU RIPRAP SLOPEWALL



SECTION A-A

DESIGN SCOUR ELEVATION TABLE

Event / Limit State	Design Scour Elevations (ft.)				Item 113
	W. Abut.	Pier 1	Pier 2	E. Abut.	
Q100	N/A	538.42	537.97	N/A	8
Q500	N/A	538.25	537.80	N/A	
Design	558.48	538.42	537.97	557.09	
Check	558.48	538.25	537.80	557.09	

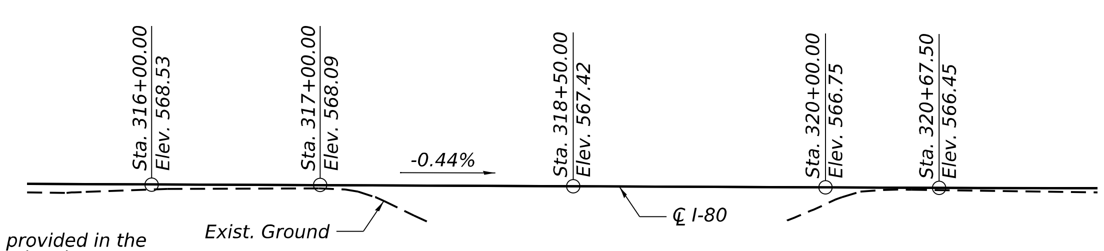
WATERWAY INFORMATION

Drainage Area = 340.0 Square miles
Exist. Overtopping Elev. = 565.91 at Sta. 320+74
Prop. Overtopping Elev. = 566.69 at Sta. 321+48

Flood	Freq. Yr.	Q C.F.S.	Opening Ft² Exist.	Opening Ft² Prop.	Nat. H.W.E.	Head – Ft. Exist.	Head – Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
Ten-Year	10	8,682	1,436	1,516	552.45	0.32	0.20	552.77	552.65
Design	50	12,250	1,720	1,837	553.72	0.42	0.25	554.14	553.97
Base	100	13,997	1,847	1,979	554.27	0.48	0.30	554.75	554.57
Max. Calc.	500	18,000	2,114	2,279	555.41	0.62	0.40	556.03	555.81

All-Time H.W.E. & Date: October 1954, 554 ft.

10 Year Velocity Thru Exist. Structure = 5 ft/s
10 Year Velocity Thru Prop. Structure = 5 ft/s



*** The stations provided in the Profile Grade sketch are measured along the ℄ I-80; however, the elevations provided are identical along the WB PGL, EB PGL and ℄ I-80.

*** PROFILE GRADE
(Along ℄ I-80)
(The profile grade shows the final elevations after grinding)

GENERAL DETAILS
I-80 EB/WB OVER DUPAGE RIVER
F.A.I. RTE. I-80
SECTION 2021-154-R
WILL COUNTY
STA. 318+69.85
STRUCTURE NO. 099-8312 (EB)
STRUCTURE NO. 099-8313 (WB)

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HBM ENGINEERING GROUP, LLC

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	CHECKED - MI	REVISED -	
PLOT SCALE =	DRAWN - PG	REVISED -	
PLOT DATE =	CHECKED - MI	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

STRUCTURE NOS. 099-8312 (EB) & 099-8313 (WB)

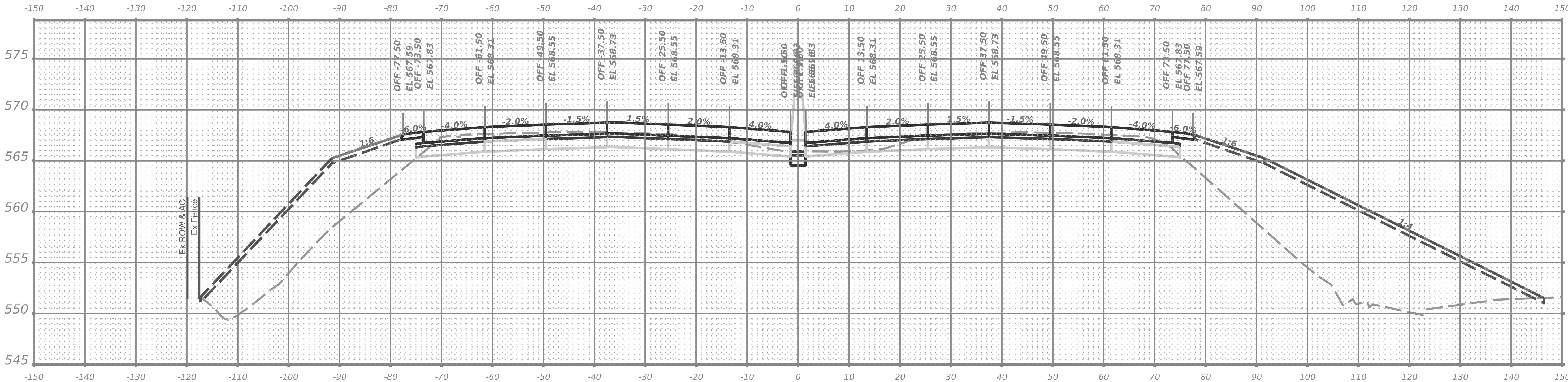
SHEET 2 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
I-80	FAI 80 21 STRUCTURE 7	WILL	2	2

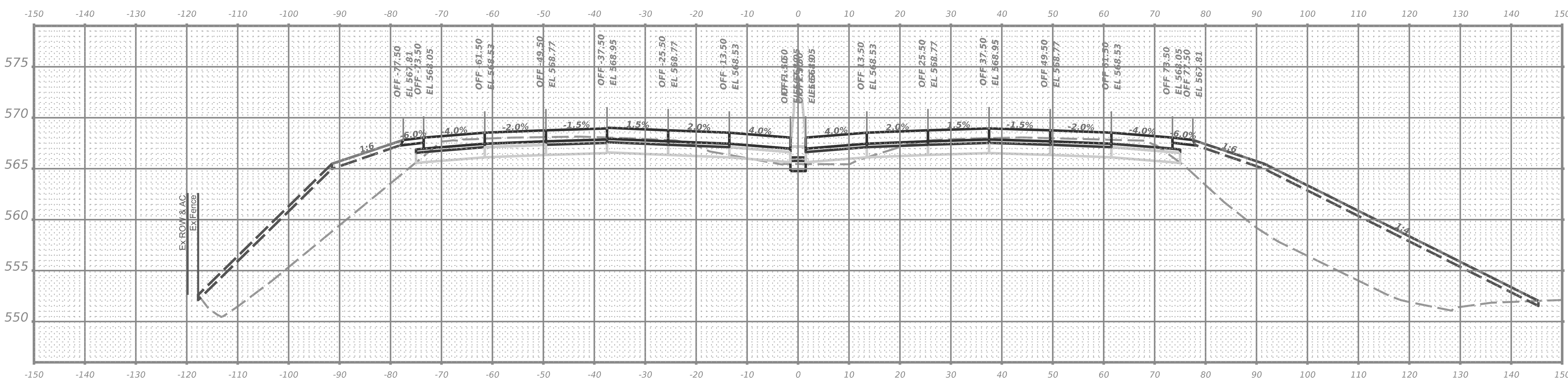
CONTRACT NO. 62R28
ILLINOIS FED. AID PROJECT

3/16/2023 11:31:57 AM

APPENDIX F



STA 316+50.00



STA 316+00.00

Stantec

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PLOT DATE = 3/25/2022	DATE -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

CROSS SECTIONS

SCALE: SHEET OF SHEETS STA.

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.

CONTRACT NO. 62P71

ILLINOIS FED. AID PROJECT

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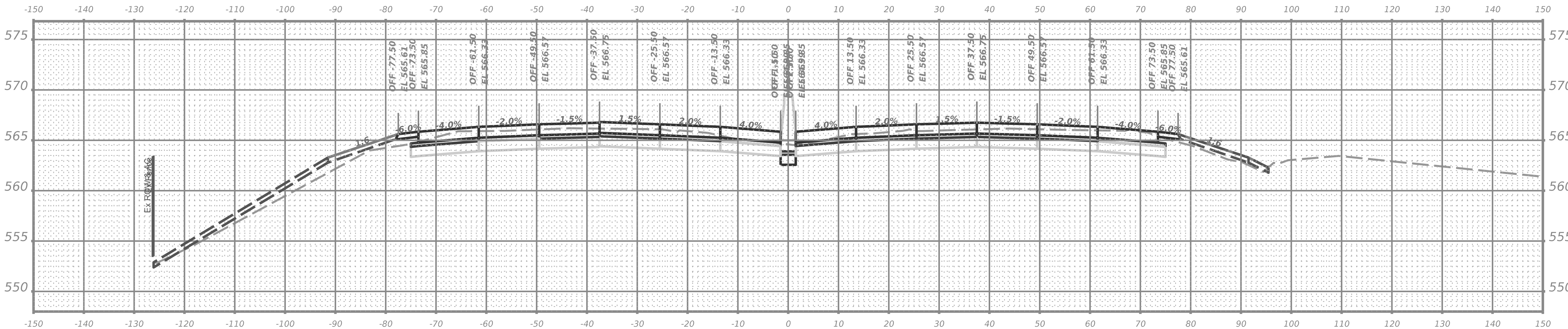
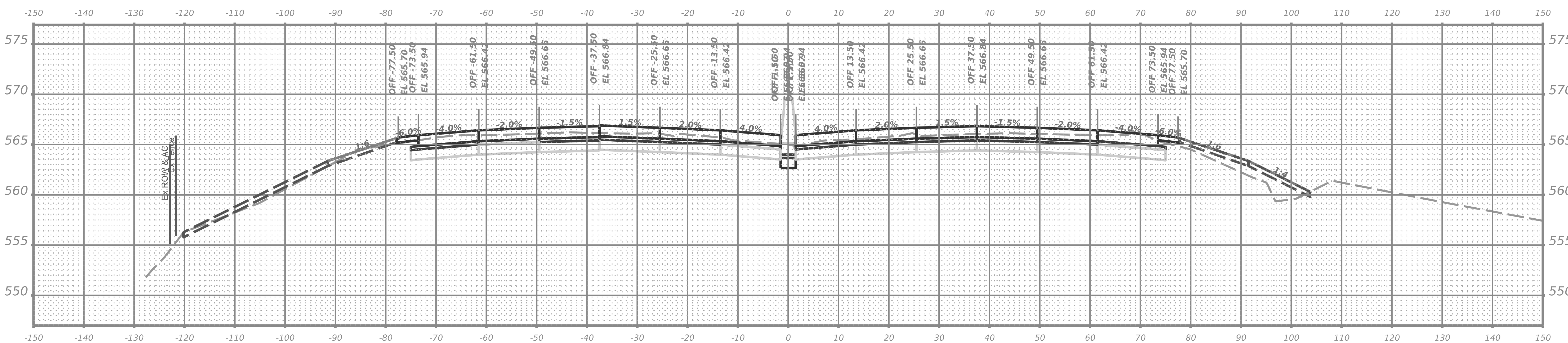


STA 321+00.00



STA 320+75.00

Stantec	USER NAME = skuchta	DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	CROSS SECTIONS
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F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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		ILLINOIS FED. AID PROJECT		

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