STRUCTURE GEOTECHNICAL REPORT
INTERSTATE 80 EB/WB AND FRONTAGE ROAD
OVER ROADWAY DITCH
CULVERT AT STATION 228+03.54
PR SN 099-0451, SECTION 2021-151-B
WILL COUNTY, ILLINOIS

For
Stantec

350 North Orleans Street, Suite 1301

Chicago, IL 60654

Submitted by

Wang Engineering, Inc.

1145 North Main Street

Lombard, IL 60148

Original Report: September 20, 2022
Revised Report: September 27, 2022

Technical Report Documentation Page

1. Title and Subtitle Structure Geotechnical Report Culvert at Station 228+03.54		**2. Original Date:** September 20, 2022 **Revised Date:** September 27, 2022 **3. Report Type** ☒ SGR ☐ RGR ☒ Draft ☐ Final ☐ Revised
4. Route / Section / County/ District/ Region FAI 80 / 2021-151-B / Will / 1 / 1		**5. IDOT Job / Contract** D-91-196-09 / 62P71
6. PTB / Item No. 194/010	**7. Existing Structure Number(s)** NA	**8. Proposed Structure Number(s)** 099-0451
9. Prepared by Wang Engineering, Inc. 1145 N Main Street Lombard, IL 60148	**Contributor(s)** Author: Azza Hamad. P.E. QA/QC: Corina T. Farez, P.G., P.E.	**Contact** (630) 480-5539 ahamad@wangeng.com
10. Prepared for Stantec 350 North Orleans Street, Suite 1301 Chicago, IL, 60654	**Design Engineer** HBM Engineering Group, LLC John Saraceno, P.E., S.E	**Contact** (312) 262-2245 Dave.Pieniazek@stantec.com (708) 236-0900 John.saraceno@hbmeng.com

11. Abstract

The existing reinforced concrete single cell box culvert that carries Interstate 80 and Frontage Road over a roadway ditch will be replaced. The proposed culvert will be a cast-in-place single-cell box culvert with an interior opening of 12-foot wide and 6-foot high. The culvert will have a length of 237.96 feet (out-to-out headwalls) with up to 11.7 feet of embankment fill on top.

The pavement structure along the I-80 shoulders consists of 15 to 18 inches of asphalt over aggregate base and the topsoil is about 3 inches thick. Beneath the surface and up to 13.0 feet of fill, the soil is made up of stiff to hard silty clay to silty clay loam. Although the groundwater was not encountered in the culvert borings, the groundwater can be encountered at elevations of 580 to 571 feet based on the water levels measured in the nearby roadway borings.

At the proposed culvert base at elevations of 572.96 to 571.94 feet, stiff to hard silty clay to silty clay loam will be encountered, which represent suitable foundation soils for construction of the culvert barrel replacement. The foundation soils will experience a total long-term settlement of 1.0 inch or less with differential settlements of 0.5 inches or less.

Horizontal cantilever wingwalls are proposed at each end. The culvert wingwalls could be constructed as horizontal cantilever walls if they are less than 16 feet in length and the wingwall locations can be adequately dewatered.

Since the groundwater is expected to be encountered near the culvert base slab elevations, the contractor should be prepared for possible dewatering measures. Any excavation that cannot be sloped at 1:2 (V:H) should be properly shored. Due to the presence of hard cohesive soils, temporary sheet piling will not be feasible and a temporary soil retention system is recommended.

12. Path to archived file

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Wang Engineering
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OVER ROADWAY DITCH
CULVERT AT STATION 228+03.54
PR SN 099-0451, SECTION 2021-151-B
WILL COUNTY, ILLINOIS
FOR
STANTEC

1.0 INTRODUCTION

This report presents the results of our subsurface investigation, laboratory testing, geotechnical evaluations, and recommendations to support the design and reconstruction of the culvert carrying Interstate 80 (I-80) and Frontage Road over the roadway ditch at Station 228+03.54 in Will County, Illinois. The project site is located about 0.3 miles east of the Shepley Road crossing at I-80 in west central Will County. On the USGS *Channahon Quadrangle 7.5 Minute Series* map, the project site is generally located at NE¼ of Section 31, Tier 35N, Range 9 E of the Third Principal Meridian (Exhibit 1).

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 culvert replacement.

1.1 Proposed Structure

Based on the *General Plan and Elevation* (GPE) drawing, provided by HBM Engineering, LLC (HBM) and dated September 16, 2022, Wang Engineering, Inc. (Wang) understands the existing single cell concrete box culvert will be removed and replaced with a cast-in-place single-cell box culvert with an interior opening of 12-foot wide and 6-foot high. The new culvert has proposed invert elevations of 572.96 and 571.94 feet at the upstream and downstream ends, respectively. The culvert will have a length of 237.97 feet out-to-out of headwalls and a total width of 13.3 feet with up to 11.7 feet of embankment fill on the top as the I-80 proposed grade will be raised by up to 5.0 feet at the culvert location. Horizontal cantilever wingwalls are proposed at each end. The culvert replacement will be done utilizing staged construction to maintain traffic on I-80.

1.2 Existing Structure

Based on historical drawings provided by HBM, we understand the existing culvert was constructed around 1959 as a single concrete box culvert with a 12-foot wide by 6-foot high interior opening. The overall length of the culvert is approximately 223 feet (out-to-out headwalls). The existing culvert will be removed and replaced.

2.0 METHODS OF INVESTIGATION

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

2.1 Field Investigation

The field investigation consisted of four structure borings, designated as I-80-CUL-3-01 through I-80-CUL-3-04, drilled by Wang in April of 2022. To supplement our analyses, we also considered Boring WB-SGB-13, drilled by Wang in March of 2021. The borings were drilled from elevations of 582.9 to 589.8 feet to depths of 9.0 to 45.0 feet below the grade (bgs). The as-drilled northings and eastings were obtained with a mapping-grade GPS unit. Elevations, stations, and offsets were provided by Stantec. The as-drilled boring location data is presented in the *Boring Logs* (Appendix A) and the locations are shown in the *Boring Location Plan* (Exhibit 2).

A combination of ATV- and truck-mounted drilling rigs, equipped with hollow stem augers, were used to advance and maintain open boreholes. 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 a depth of 30.0 feet bgs and at 5.0-foot intervals thereafter to the boring termination depths. Soil samples collected from each sampling interval were placed in sealed jars and transported to the laboratory for further examination and laboratory testing.

Field boring logs, prepared and maintained by Wang geologists, include 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 each boring. 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 analyses (AASHTO T88) were performed on selected samples. Tested samples were classified according to the IDH classification system. Field visual descriptions of the soil samples were verified in the laboratory. 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 3). 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.

3.1 Lithological Profile

Boring WB-SGB-13 and I-80-CUL-3-04 were drilled along the I-80 shoulders and revealed the pavement structure consists of 15 to 18 inches of asphalt overlying 3 to 6 inches of sandy gravel aggregate base. Borings I-80-CUL-3-01 and I-80-CUL-3-02 were drilled outside the shoulders and encountered 3 inches of silty clay topsoil. Boring I-80-CUL-3-03 was drilled within the I-80 median and revealed 6 inches of cobble fill followed by 6 inches of silty clay buried topsoil. In descending order, the general lithologic succession encountered beneath the surface includes: 1) man-made ground (fill) and 2) stiff to hard silty clay to silty clay loam.

1) Man-made ground (fill)

Beneath the topsoil or pavement structure, the borings sampled up to 13.0 feet of medium stiff to very stiff, black, brown, and gray, silty clay to silty clay loam and clay to clay loam fill with unconfined compressive strength (Q_u) values of 0.7 to 3.7 tsf and moisture content values of 14 to 29%. Laboratory index testing on samples from this layer showed liquid limit (LL) values of 45 to 50% and plastic limit (PL) values of 13 to 22%.

A 2.5-foot thick layer of granular fill consisting of loose, brown sand was sampled underneath the cohesive fill in Boring I-80-CUL-3-04. This layer has an SPT N-value of 4 blows per foot and a moisture content of 9%.

A 10-inch thick layer of buried, black silty clay topsoil was sampled beneath the fill in Boring WB-SGB-13. The presence of this layer most likely indicates the boundary between fill and natural soils.

2) Stiff to hard silty clay to silty clay loam

Beneath the fill, at elevations of 581.3 to 570.0 feet, the borings encountered stiff to hard, brown to gray, silty clay to silty clay loam extending to the boring termination depths of 40.0 to 45.0 feet bgs. This unit has Q_u values of 1.2 to 8.2 tsf and moisture content values of 14 to 21%. This soil layer represents the primary foundation soil beneath the culvert box. Laboratory index testing on a sample from this unit revealed LL and PL values of 32 and 15%, respectively.

Slow and hard drilling was noted within this layer in Boring I-80-CUL-3-03 at elevations of 571 to 561 feet (depths of 15.5 to 25.0 feet bgs) indicating the presence of hard soils and possible cobbles.

3.2 Groundwater Conditions

The borings were found dry while drilling and upon completion of drilling. Since the borings encountered mostly clayey soils, we anticipate the groundwater was deep seated. However, Borings EB-SGB-13 and CL-SGB-13, drilled for the I-80 roadway improvements and located about 400 to 750 feet east of the proposed culvert, measured the groundwater level at elevations of about to 580 to 571 feet (7.0 to 15.0 feet bgs). Therefore, the groundwater elevation could be as high as an elevation of 580 feet near the culvert location. It should be noted that groundwater levels might change with seasonal rainfall patterns and long-term climate fluctuations or may be influenced by local site conditions.

4.0 ANALYSES AND RECOMMENDATIONS

Geotechnical evaluations and recommendations for the design and construction of the proposed culvert barrel and wingwalls are included in this section. As per the GPE (Appendix C), the upstream and downstream elevations will be 572.96 and 571.94 feet, respectively, and horizontal cantilever walls are proposed at the culvert ends.

4.1 Culvert Foundations

The existing culvert will be removed and replaced with a new single-box culvert that extends about 10.0 feet beyond the existing culvert footprint on the south end. Based on the subsurface investigation and proposed invert elevations of 572.96 to 571.94 feet at the upstream and downstream ends, the

soils at the base of culvert barrel are expected to be stiff to hard silty clay to silty clay loam which represent suitable foundation soils for construction of the culvert barrel replacement. However, near the base of the proposed culvert, Boring I-80-CUL-3-02 encountered up to 2.5 feet of stiff silty clay to silty clay loam with a moisture content value of 26% and a LL value of 50%, indicating possible compressible soil conditions. If this layer is encountered during construction, it should be removed and replaced with compacted aggregate to an elevation of about 570 feet for the culvert length starting at about 40.0 feet north of the I-80 centerline feet (approximate midpoint of Borings I-80-CUL-3-02 and I-80-CUL-03-03) and ending about 100.0 feet north of the I-80 centerline (approximate midpoint of Borings I-80-CUL3-01 and I-80-CUL3-02). The removal and replacement material should extend a minimum of two foot beyond the edge of the box. The actual extent of the removal should be determined in the field by a geotechnical soil inspector at the time of construction. Based on the groundwater level measurements from the nearby Borings EB-SGB-13 and CL-SGB-13, groundwater may be encountered at elevation of about 580 to 571 feet; thus, groundwater control may be needed during construction.

Settlement analyses was performed based on the boring information and the estimated culvert and roadway fill pressures applied to the full width of the culvert. The loading applied to the culvert will come primarily from the new fill material to be placed around and over it as part of the proposed roadway widening. We estimate the foundation soils will experience a total long-term settlement of up to 1.0 inch with a differential settlement of 0.5 inches or less. Based on our geotechnical analysis, we estimate a cast-in-place culvert, as proposed, is feasible at this site.

4.2 Wingwalls

Based on the GPE (Appendix C), we understand horizontal cantilever wingwalls are proposed at each end. The culvert wingwalls could be constructed as horizontal cantilever walls if they are less than 16 feet in length and the wingwall locations can be adequately dewatered (IDOT 2017). Horizontal cantilever wingwalls are supported by the culvert box rather than the foundation soils. Horizontal cantilever wingwalls should be designed based on the guidelines provided in Section 4.2 of the IDOT *Culvert Manual* (IDOT 2017). Horizontal cantilever wingwalls should be installed at a minimum depth of 3.0 feet below the culvert invert elevations.

4.3 Global Stability

Since horizontal cantilever walls are proposed at the culvert ends, we do not anticipate global instability concerns for the wingwalls.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Site Preparation

The existing vegetation, surface topsoil, pavement, and debris should be cleared and stripped where the new culvert foundations 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 roadways and utilities should be considered during construction. Excavated material should not be stockpiled immediately adjacent to the top of slopes, nor should equipment be allowed to operate too closely to open excavations. Any excavation that cannot be graded at a slope of 1:2 (V:H) should be properly shored. Due to the presence of very hard cohesive soils with Q_u values of greater than 4.5 tsf, we estimate these excavations may not be supported with cantilever steel sheet piling, and we recommend including the pay item, *Temporary Soil Retention System.* A temporary geotextile retaining wall, as per the GPE (Appendix C), could be used for the retention of Stage I construction backfill over the new culvert.

Although the groundwater was not observed in the culvert borings, the groundwater could be encountered at elevations of 580 to 571 feet based on the groundwater levels recorded in Borings EB-SGB-13 and CL-SGB-13 near the culvert slab base and the contractor should be prepared for possible dewatering measures. Depending upon prevailing climate conditions and the time of the year when wingwalls construction taken place, control runoff and maintenance of existing flows may require temporary water diversion and control. Any water that accumulates in open excavations by seepage or runoff should be immediately removed by sump pump.

5.3 Filling and Backfilling

Fill used as embankment material and for replacement of any unstable or unsuitable soils encountered during construction should be pre-approved by the Engineer. The material used to backfill around and to a level at least 1 foot over the top of the culvert box, should be porous granular material conforming to the requirements specified in the IDOT 2022 Standard Specifications (IDOT 2022).

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.

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 2. 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. If changes are planned to the proposed improvements as described in this report, we should be timely informed so that our recommendations can be adjusted accordingly.

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

Respectfully Submitted,

WANG ENGINEERING, INC.

Azza Hamad, P.E.
Senior Geotechnical Engineer

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

REFERENCES.

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

IDOT (2017) *Culvert Manual.* Illinois Department of Transportation.

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

IDOT (2022) *Standard Specifications for Road and Bridge Construction.* Illinois Department of Transportation. 1098 pp.

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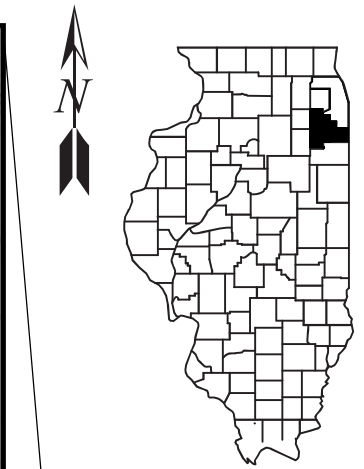
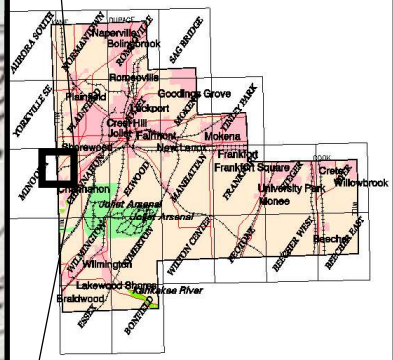
EXHIBITS





Will County

0 0.5 1.0 Mile

SITE LOCATION MAP: I-80 EB/WB CULVERT OVER ROADWAY DITCH, SN 0XX-XXXX, WILL COUNTY, ILLINOIS

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

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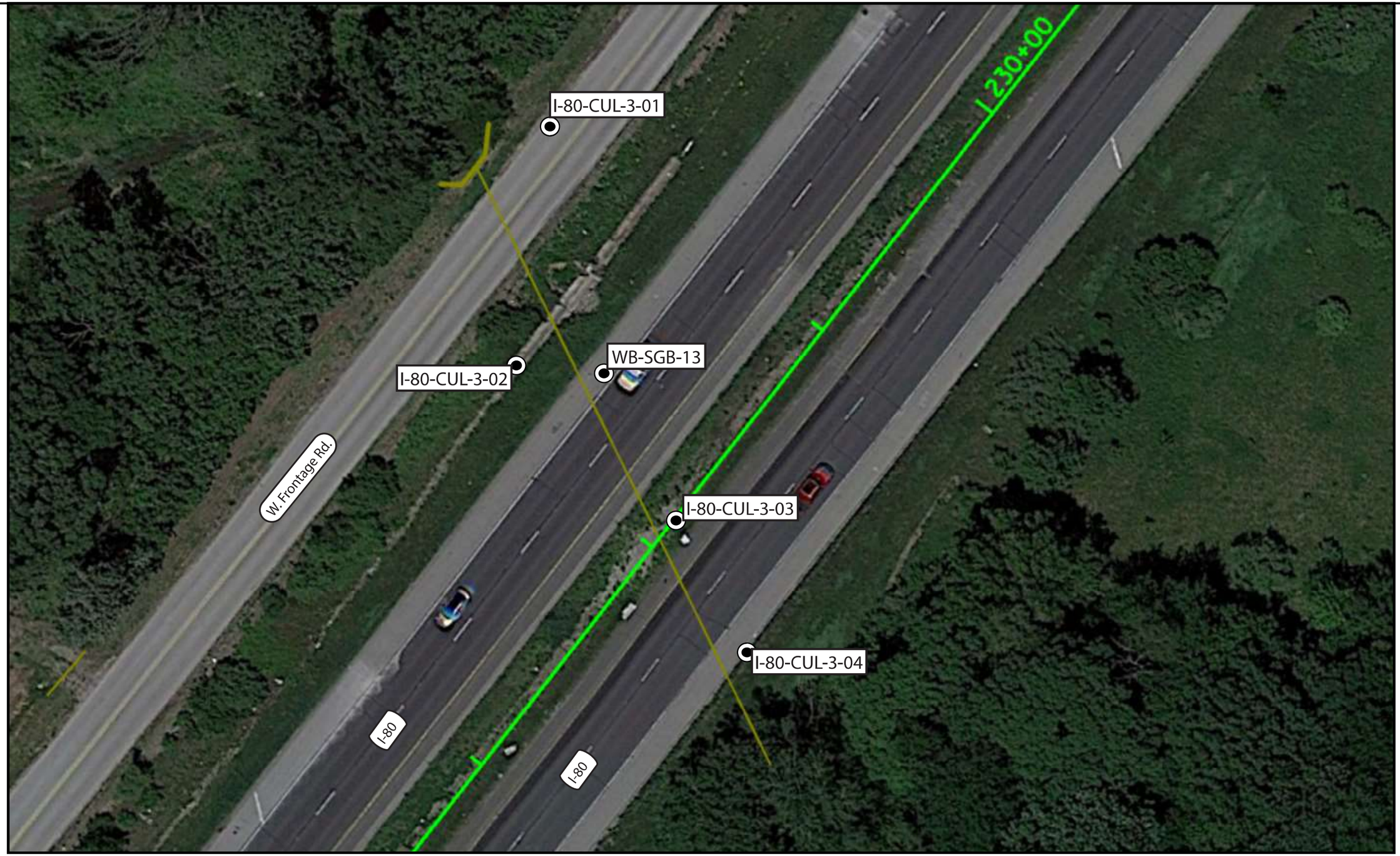
FOR STANTEC | 255-39-01



Legend

Boring Location

0 50 100 Feet

BORING LOCATION PLAN: I-80 EB/WB CULVERT OVER ROADWAY DITCH, SN 0XX-XXXX, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL	EXHIBIT 2	DRAWN BY: J. Bensen CHECKED BY: A. Hamad

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FOR STANTEC 255-39-01

◄ W

E ►

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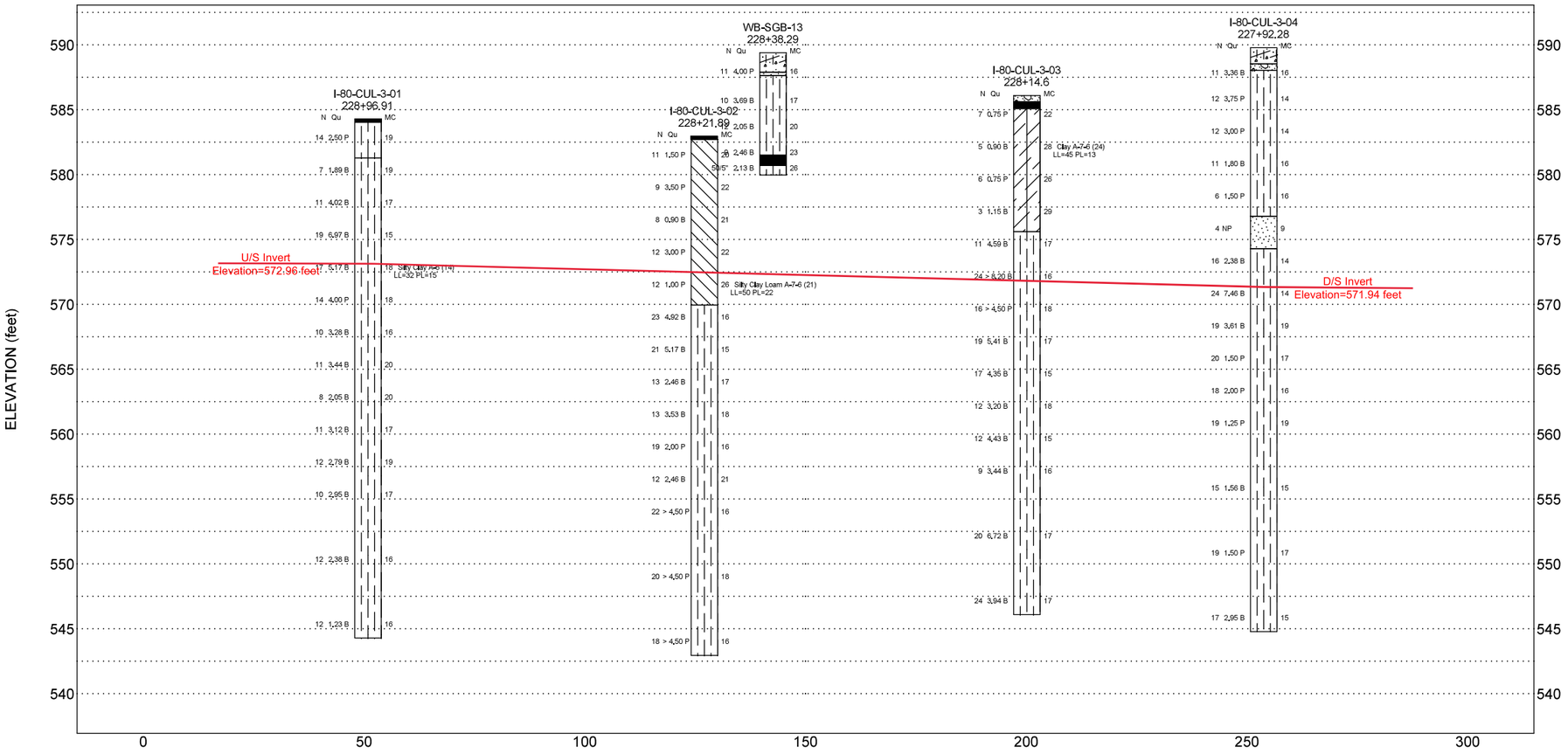
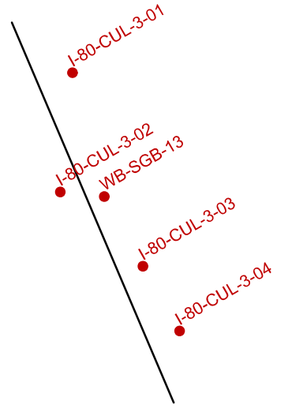


Lithology Graphics

- Topsoil
- IDH Silty Clay, Silty Clay Loam
- IDH Clay
- Gravelly sand, sandy gravel
- IDH Clay Loam
- Pavement
- IDH Sand, Sandy Loam
- Crushed stone

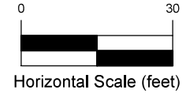


Site Map Scale 1 inch equals 110 feet

Explanation:

Water Level Reading at time of drilling.

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



Horizontal Scale (feet)

Vertical Exaggeration: 3x

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I-80 EB/WB and Frontage Road over Roadway Ditch Soil Profile

WEI SINCE 1982

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

JOB NUMBER	PLATE NUMBER
255-39-01	EXHIBIT 3

WEI 11X17 2553901.GPJ WANGENG.GDT 9/16/22

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APPENDIX A

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BORING LOG I-80-CUL-3-01

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: 584.28 ft
North: 1751043.59 ft
East: 1010467.95 ft
Station: 228+96.91
Offset: 123.53 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	584.0	3-inch thick, black SILTY CLAY --TOPSOIL--						
		Very stiff, gray, brown, and black SILTY CLAY, trace gravel; damp			1	3 6 8	2.50 P	19
	581.3	--FILL-- --RDR 2--						
		Stiff to hard, brown to gray SILTY CLAY, trace gravel; damp	5		2	3 3 4	1.89 B	19
		--RDR 2--			3	3 5 6	4.02 B	17
			10		4	5 9 10	6.97 B	15
		--L_L(%)=32, P_L(%)=15-- --%Gravel=2.5-- --%Sand=7.9-- --%Silt=58.1-- --%Clay=31.5-- --A-6 (14)--			5	4 7 10	5.17 B	18
			15		6	5 7 7	4.00 P	18
					7	4 5 5	3.28 B	16
			20		8	5 5 6	3.44 B	20
					9	4 4 4	2.05 B	20
			25		10	4 4 7	3.12 B	17
			30		11	3 5 7	2.79 B	19
					12	3 4 6	2.95 B	17
			35		13	4 5 7	2.38 B	16
	544.3	Boring terminated at 40.00 ft	40		14	5 5 7	1.23 B	16
			45					
			50					

GENERAL NOTES

Begin Drilling **04-11-2022** Complete Drilling **04-11-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **20CME55T[81%]**
Driller **R&R** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **3.25" ID HSA; 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.

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BORING LOG I-80-CUL-3-02

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: 582.95 ft
North: 1750956.99 ft
East: 1010459.08 ft
Station: 228+21.89
Offset: 79.20 LT

Elevation (ft)	Depth (ft)	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
582.7		3-inch thick, black SILTY CLAY --TOPSOIL--					
		Medium stiff to very stiff, brown, black and gray CLAY to SILTY CLAY and SILtY CLAY LOAM, trace gravel; damp to moist		1	5 5 6	1.50 P	20
		--FILL-- --RDR 2--		2	3 5 4	3.50 P	22
	5			3	4 4 4	0.90 B	21
		--black and gray--		4	4 5 7	3.00 P	22
	10			5	2 4 8	1.00 P	26
		--L_L(%)=50, P_L(%)=22-- --%Gravel=5.5-- --%Sand=19.3-- --%Silt=51.9-- --%Clay=23.2-- --A-7-6 (21)--					
570.0		Very stiff to hard, brown to gray SILTY CLAY to SILTY CLAY LOAM, trace gravel; damp to moist		6	6 10 13	4.92 B	16
	15	--RDR 2--		7	6 9 12	5.17 B	15
		--gray--		8	3 6 7	2.46 B	17
	20			9	4 6 7	3.53 B	18
	25			10	5 8 11	2.00 P	16
	30			11	2 4 8	2.46 B	21
				12	7 10 12	> 4.50 P	16
	35			13	4 10 10	> 4.50 P	18
				14	5 9 9	> 4.50 P	16
543.0	40	Boring terminated at 40.00 ft					
	45						
	50						

GENERAL NOTES

Begin Drilling **04-22-2022** Complete Drilling **04-22-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **20D25A [83%]**
Driller **KG&TC** Logger **M. Rojo** Checked by **C. Marin**
Drilling Method **2.25" ID HSA; 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.

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BORING LOG I-80-CUL-3-03

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: 586.09 ft
North: 1750903.10 ft
East: 1010519.08 ft
Station: 228+14.6
Offset: 0.99 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	585.6	6-inch thick, gray COBBLES						
	585.1	--FILL--						
		6-inch thick, black SILTY CLAY --Buried TOPSOIL--			1	3 3 4	0.75 P	22
		Medium stiff to stiff, gray and brown CLAY to CLAY LOAM, trace gravel; damp to moist --FILL--			2	2 3 2	0.90 B	28
		--RDR 2-3--	5					
		--L_L(%)=45, P_L(%)=13--						
		--%Gravel=0.7--						
		--%Sand=20.4--			3	3 3 3	0.75 P	26
		--%Silt=47.5--						
		--%Clay=31.3--						
		--A-7-6 (24)--						
		--few sand seams; moist--			4	2 1 2	1.15 B	29
			10					
	575.6							
		Very stiff to hard, brown to gray SILTY CLAY; damp --RDR 2-3--			5	2 3 8	4.59 B	17
			15		6	5 9 15	> 8.20 B	16
		--slow hard drilling--			7	5 6 10	> 4.50 P	18
		--slow hard drilling--	20		8	6 9 10	5.41 B	17
		--slow hard drilling--			9	8 8 9	4.35 B	15
		--slow hard drilling--	25		10	3 6 6	3.20 B	18

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--slow hard drilling--			11	6 5 7	4.43 B	15
			30		12	3 3 6	3.44 B	16
		--few silt seams--			13	7 8 12	6.72 B	17
			35					
			40		14	8 9 15	3.94 B	17
	546.1	--3-inch thick silt seam--						
		Boring terminated at 40.00 ft						
			45					
			50					

GENERAL NOTES

Begin Drilling **04-25-2022** Complete Drilling **04-25-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **20D25A [83%]**
Driller **P&T** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA; 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.

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BORING LOG I-80-CUL-3-04

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: 589.78 ft
North: 1750856.12 ft
East: 1010545.71 ft
Station: 227+92.28
Offset: 50.38 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	588.5	15-inch thick ASPHALT --PAVEMENT--						
	588.0	Brown SANDY GRAVEL; damp --BASE COURSE--						
		Stiff to very stiff, brown and gray SILTY CLAY to SILTY CLAY LOAM, trace to little gravel; damp			1	3 5 6	3.36 B	16
		--FILL--	5		2	6 6 6	3.75 P	14
		--RDR 2--			3	6 6 6	3.00 P	14
			10		4	4 5 6	1.80 B	16
		--hit culvert; offset 15' northeast--			5	7 3 3	1.50 P	16
	576.8							
		Loose, brown, medium SAND; damp			6	1 2 2	NP	9
		--FILL-- --RDR 2--	15					
	574.3							
		Stiff to hard, brown and gray to gray SILTY CLAY to SILTY CLAY LOAM, trace gravel; damp			7	3 7 9	2.38 B	14
		--RDR 2--						
			20		8	6 11 13	7.46 B	14
					9	5 8 11	3.61 B	19
			25		10	8 10 10	1.50 P	17
			30		11	7 10 8	2.00 P	16
					12	5 7 12	1.25 P	19
		--gray--	35		13	6 7 8	1.56 B	15
			40		14	8 8 11	1.50 P	17
	544.8		45		15	7 7 10	2.95 B	15
		Boring terminated at 45.00 ft						
			50					

GENERAL NOTES

Begin Drilling **04-26-2022** Complete Drilling **04-26-2022**
Drilling Contractor **Wang Testing Services** Drill Rig **20CME55T[81%]**
Driller **R&T** Logger **M. Sadowski** Checked by **C. Marin**
Drilling Method **2.25" ID HSA; 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.

WANGENGINC 2553901.GPJ WANGENG.GDT 9/16/22

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BORING LOG WB-SGB-13

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: 589.39 ft
North: 1750953.68 ft
East: 1010491.03 ft
Station: 228+38.29
Offset: 51.6 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	587.9	18-inch thick ASPHALT --PAVEMENT--						
	587.6	3-inch thick, brown SANDY GRAVEL --AGGREGATE BASE--			1	7 4 7	4.00 P	16
		Very stiff to hard, brown SILTY CLAY LOAM, trace gravel; damp --FILL-- --RDR 2--	5		2	5 5 5 7	3.69 B	17
					3	4 5 7 8	2.05 B	20
	581.5				4	3 4 5 9	2.46 B	23
	580.7	Very stiff, black SILTY CLAY'; damp						
	580.0	--Buried TOPSOIL--			5	50/5"	2.13 B	26
		Very stiff, gray SILTY CLAY; damp --sand seams; wet-- --RDR 2--	10					
		Boring terminated at 9.40 ft	15					
			20					
			25					

GENERAL NOTES

Begin Drilling **03-30-2021** Complete Drilling **03-30-2021**
Drilling Contractor **Wang Testing Services** Drill Rig **13CME55T [85%]**
Driller **R&J** Logger **I. Nenn** Checked by **C. Marin**
Drilling Method **2.25" ID HSA; 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.

WANGENGINC 2553901.GPJ WANGENG.GDT 9/16/22

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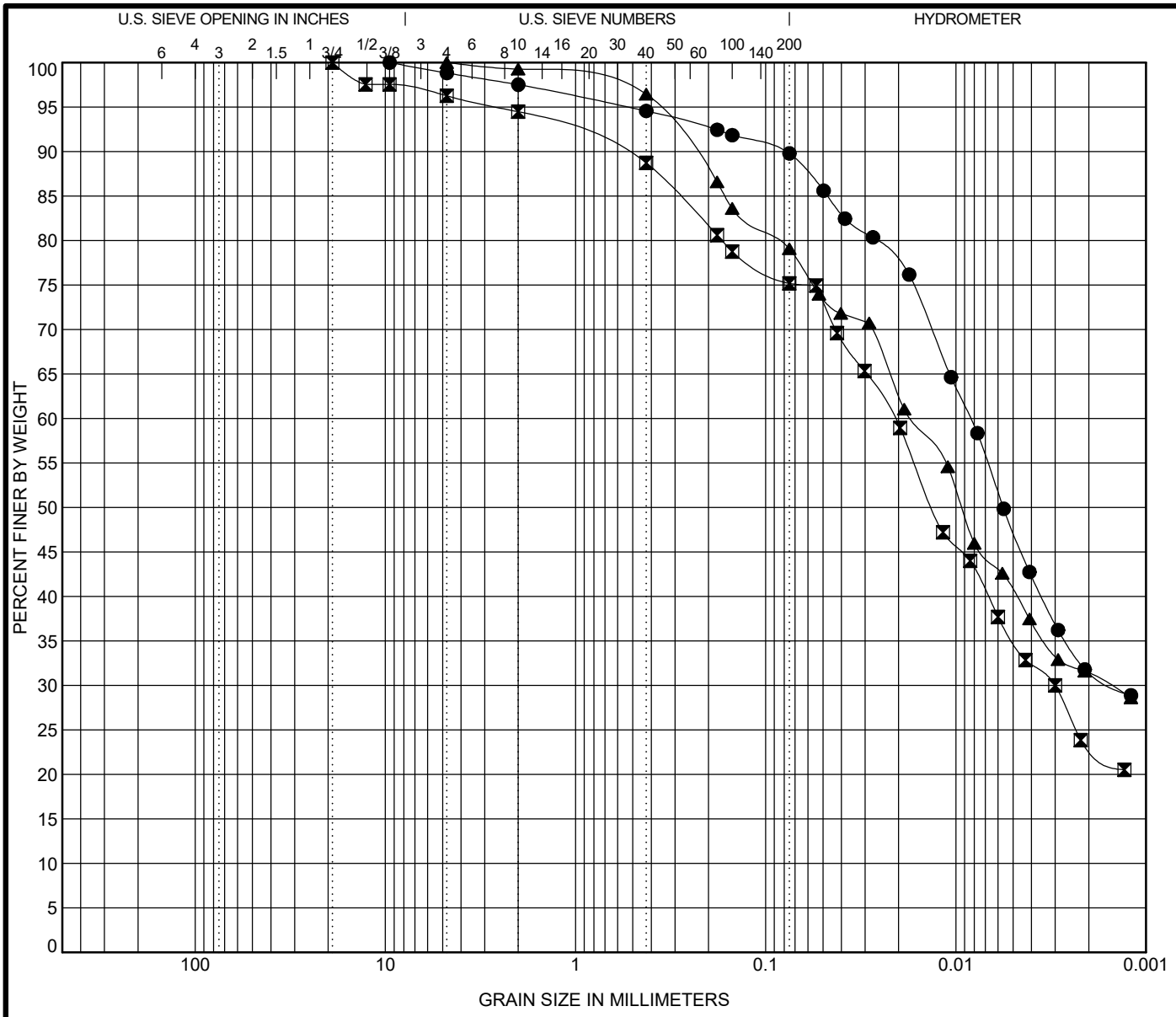
APPENDIX B



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

	Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
●	I-80-CUL-3-01#5	11.0 ft	**Silty Clay**	**32**	**15**	**17**		
⊠	I-80-CUL-3-02#5	11.0 ft	**Silty Clay Loam**	**50**	**22**	**28**		
▲	I-80-CUL-3-03#2	3.5 ft	**Clay**	**45**	**13**	**32**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	I-80-CUL-3-01#5	11.0 ft	**9.5**	**0.008**	**0.001**		**2.5**	**7.9**	**58.1**	**31.5**
⊠	I-80-CUL-3-02#5	11.0 ft	**19**	**0.021**	**0.003**		**5.5**	**19.3**	**51.9**	**23.2**
▲	I-80-CUL-3-03#2	3.5 ft	**4.75**	**0.017**	**0.002**		**0.7**	**20.4**	**47.5**	**31.3**

WEI SINCE 1982
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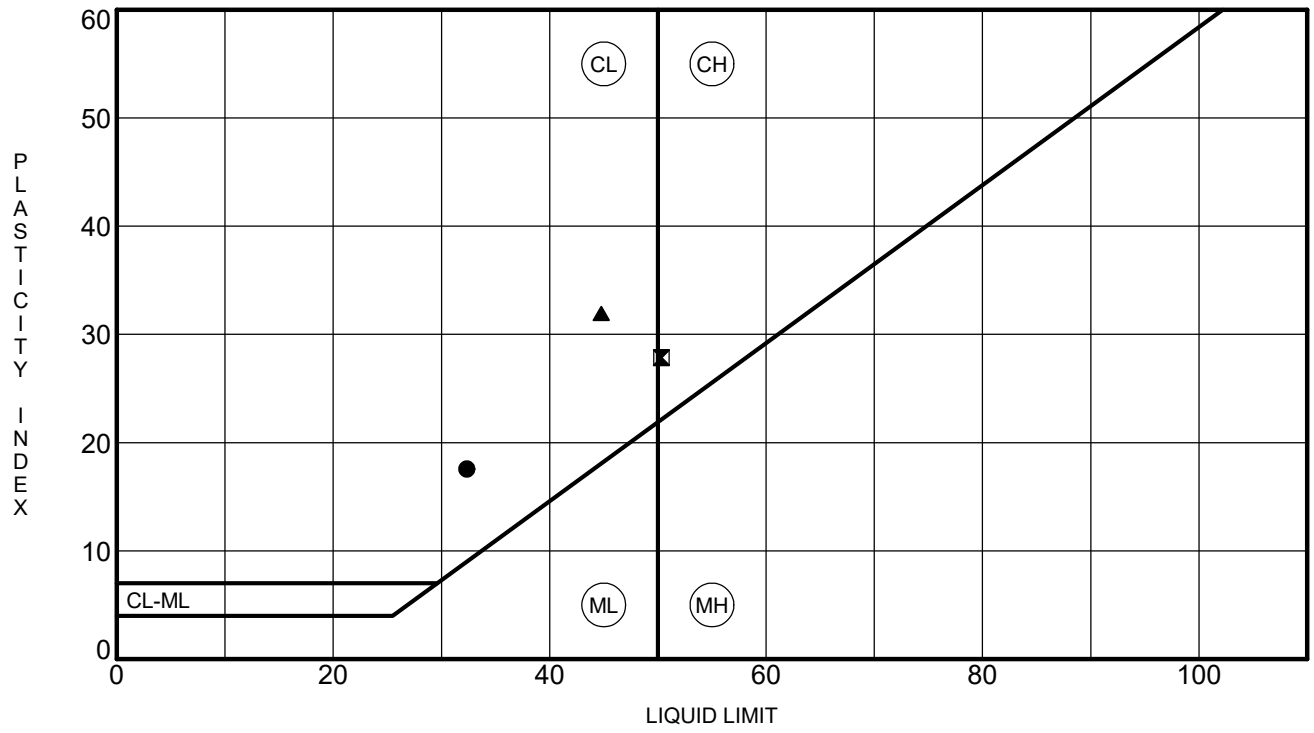
GRAIN SIZE DISTRIBUTION

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
●	I-80-CUL-3-01#5	11.0 ft	32	15	17	90	Silty Clay
⧓	I-80-CUL-3-02#5	11.0 ft	50	22	28	75	Silty Clay Loam
▲	I-80-CUL-3-03#2	3.5 ft	45	13	32	79	Clay

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ATTERBERG LIMITS' RESULTS

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

Location: Will County, Illinois

Number: 255-39-01

Wang Engineering

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ORGANIC CONTENT in SOILS by LOSS on IGNITION

ASTM D 2974, Method C

Client: Stantec
Project: I-80
WEI Job: 255-39-01/KE225039
Type/Condition: SS
Testing Furnace Temp °C.: 440

Analyst Name: LV
Date Received: Various
Date Tested: 9/13/2022

Sample No./ Depth	I80-CUL-3-03 SS#2 (3.5-5ft.)				
Sample Description					
wet soil + tare	76.08				
Dry Soil + Tare	69.00				
Tare Mass	41.69				
w (%)	26				
Dry Soil + Tare	69.00				
Ash+ Tare	67.76				
Tare Mass	41.69				
Ash Content (%)	95				
Organic Content (%)	4.5				

Prepeared By:_____

Reviwed By:_____

AASHTO ACCREDITATION PROGRAM

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APPENDIX C

Bench Mark: xxx

Existing Structure: The existing structure consists of 1-36" dia. and 2-48" dia. reinforced concrete pipes built into a 21'x5' reinforced concrete structure. The ordinal structure was constructed in 1959 as 36" diameter pipe culvert under FAI Rte. 80, Section 99-1, Project I-80-4(12)124/I-80-4(29)124. The 2-48" dia. reinforced pipes were added during the 1980 construction. The existing structure to be removed and replaced with a cast-in-place double box culvert 7'-0" wide by 6'-0" high and 231'-8" long.

Salvage: No salvage.
Precast alternative is not allowed.
Traffic to be maintained utilizing Stage Construction.

LOADING HL-93

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

DESIGN STRESSES

FIELD UNITS

f'c = 3,500 psi
fy = 60,000 psi (Reinforcement)

DESIGN SPECIFICATIONS

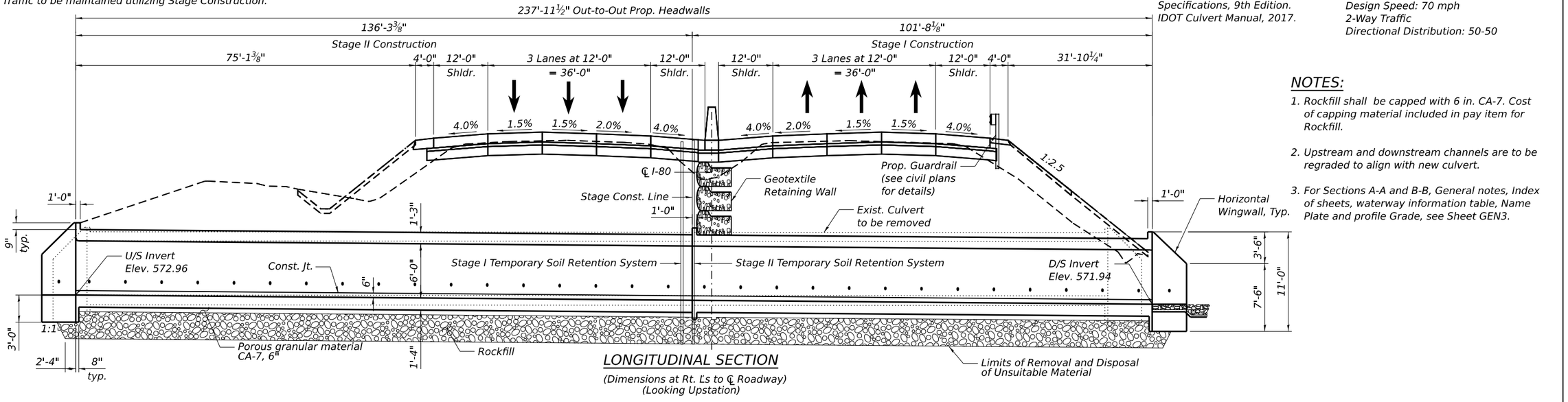
2020 AASHTO LRFD Bridge Design Specifications, 9th Edition.
IDOT Culvert Manual, 2017.

HIGHWAY CLASSIFICATION

F.A.I. Rte. I-80
Functional Class: Interstate
ADT: 57,400 (2019); 61,284 (2032)
ADTT: 10,906 (2019); 11,644 (2032)
DHV: 6,741 (2032)
Posted Speed:70 mph
Design Speed: 70 mph
2-Way Traffic
Directional Distribution: 50-50

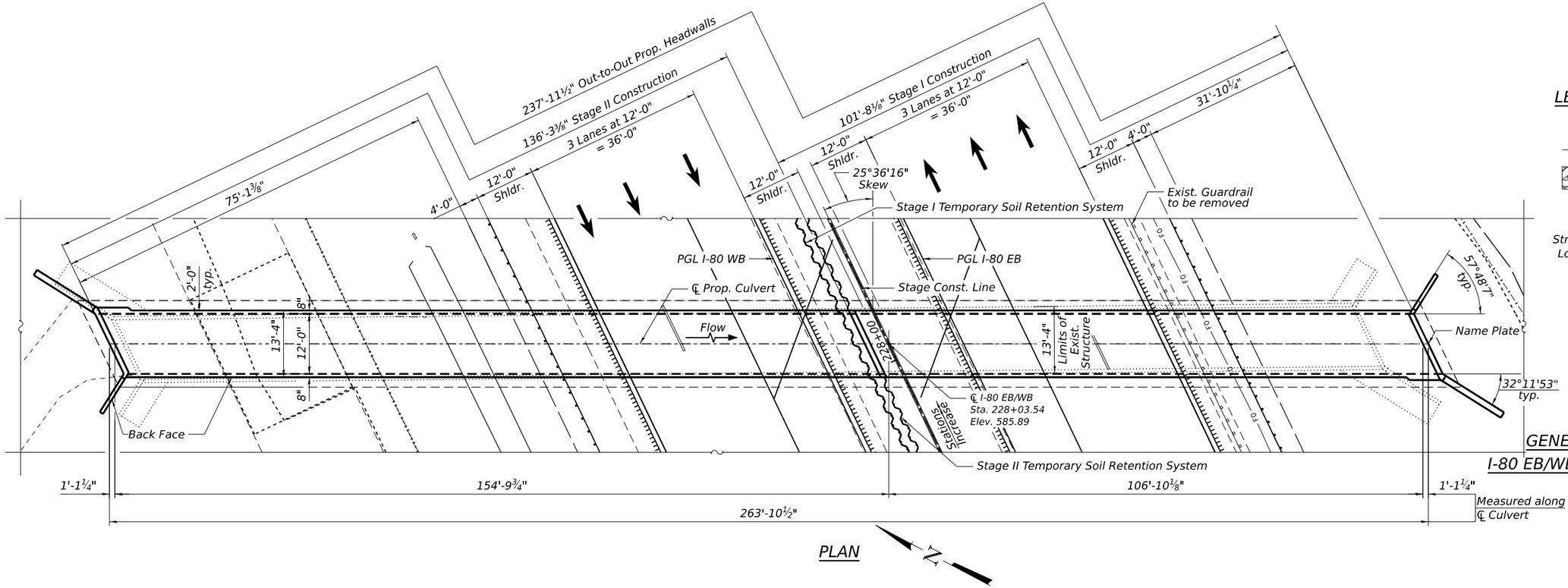
NOTES:

1. Rockfill shall be capped with 6 in. CA-7. Cost of capping material included in pay item for Rockfill.
2. Upstream and downstream channels are to be regraded to align with new culvert.
3. For Sections A-A and B-B, General notes, Index of sheets, waterway information table, Name Plate and profile Grade, see Sheet GEN3.



LONGITUDINAL SECTION

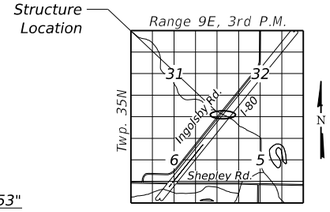
(Dimensions at Rt. L's to ℄ Roadway)
(Looking Upstation)



PLAN

LEGEND

- Soil Boring
- Limit of Rockfill
- Stone Riprap



LOCATION SKETCH

GENERAL PLAN & ELEVATION
I-80 EB/WB OVER RIVER ROAD ZONE A
F.A.I. ROUTE I-80
SEC - 2021-151-B
WILL COUNTY
STA. 228+03.54
S.N. 099-0451

HBM ENGINEERING GROUP, LLC

USER NAME =	DESIGNED - JJS, FL	REVISED -
	CHECKED - MI, MAI	REVISED -
PLOT SCALE =	DRAWN - FL	REVISED -
PLOT DATE =	CHECKED - MI, MAI	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

STRUCTURE NO. 099-0451

SHEET 01 OF S3-12 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
80	2021-151-B	WILL	396	238
		CONTRACT NO. 62P71		
	ILLINOIS FED. AID PROJECT			

MODEL: Default
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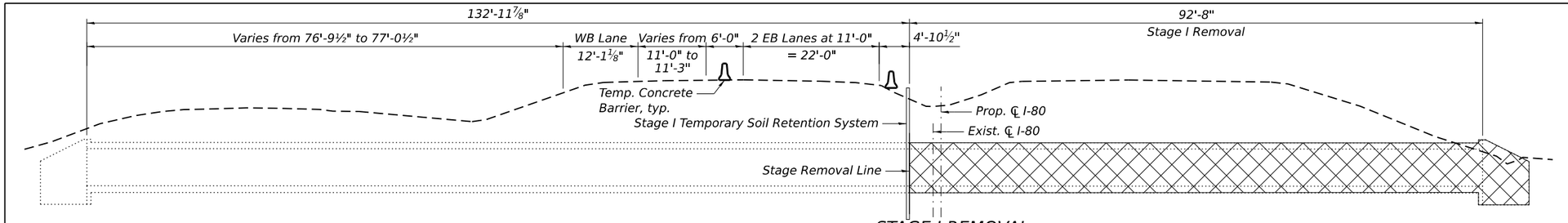
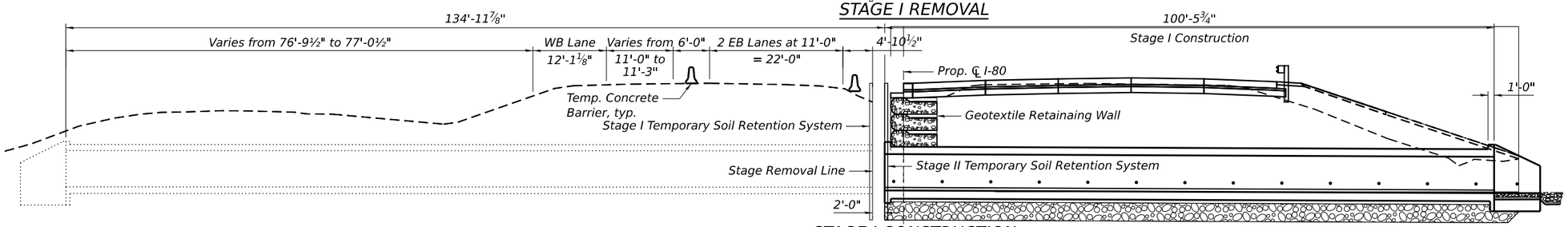
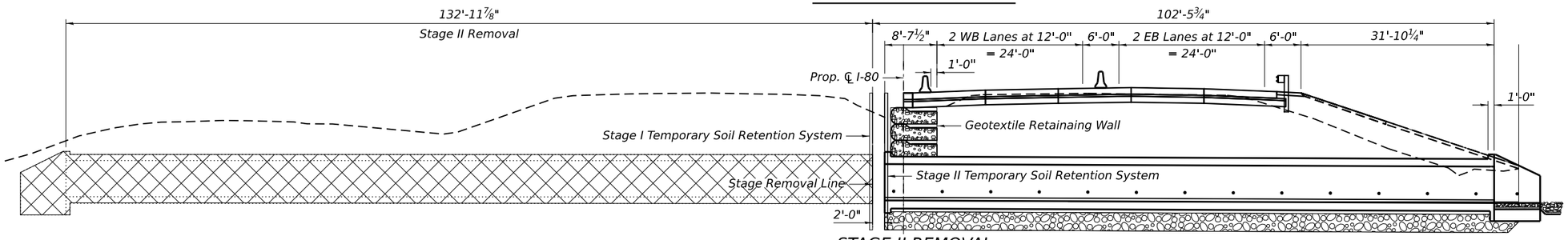


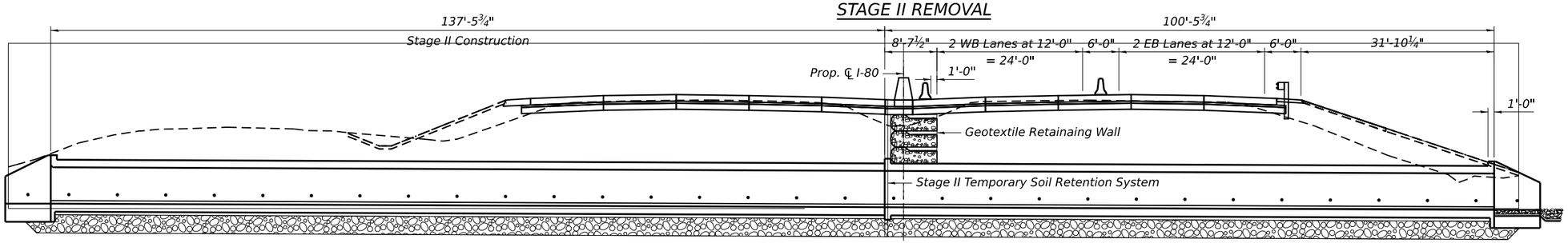
STAGE I REMOVAL



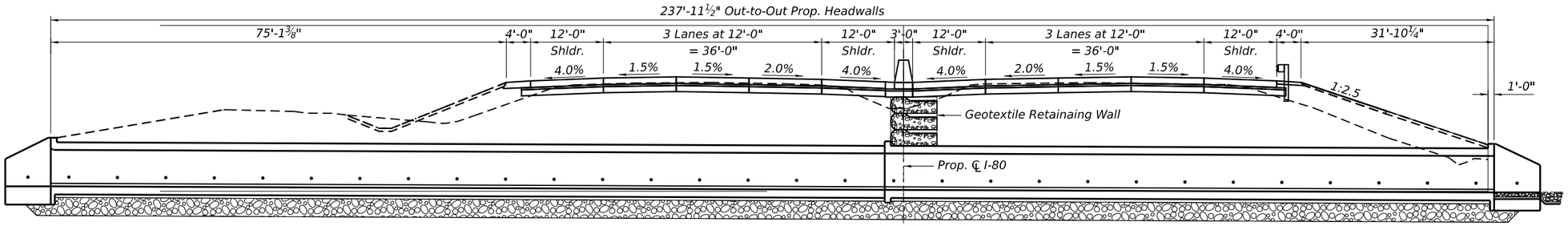
STAGE I CONSTRUCTION



STAGE II REMOVAL



STAGE II CONSTRUCTION



FINAL CROSS SECTION

STAGE I REMOVAL

1. Install temporary concrete barrier as shown to locate construction work areas on the south side of the existing structure.
2. Install Temporary sheet piling as shown.
3. Remove portions of existing pavement on south side of the roadway.
4. Remove the 92'-8" portion of the south culvert barrel, and remove the south headwall and wingwalls.

STAGE I CONSTRUCTION

1. Construct 100'-5¾" portion of the south culvert barrel and construct the south headwall and wingwalls.
2. Construct the pavement and shoulder on the south side of the roadway.

STAGE II REMOVAL

1. Install temporary concrete barrier as shown to locate construction work areas on the north side of the existing structure.
2. Install Temporary sheet piling as shown.
3. Remove portions of existing pavement on north side of the roadway.
4. Remove the 132'-11⅞" portion of the north culvert barrel, and remove the north headwall and wingwalls.

STAGE II CONSTRUCTION

1. Construct 137'-5¾" portion of the north culvert barrel and construct the north headwall and wingwalls.
2. Construct the pavement and shoulder on the north side of the roadway.

LEGEND

Removal Of Existing Structures No. 3

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HBM ENGINEERING GROUP, LLC

USER NAME =	DESIGNED - JJS, FL	REVISED -	
	CHECKED - MI, MAI	REVISED -	
PLOT SCALE =	DRAWN - FL	REVISED -	
PLOT DATE =	CHECKED - MI, MAI	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

STAGE REMOVAL AND CONSTRUCTION
STRUCTURE NO. 099-0451
SHEET S3-03 OF S3-10 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
80	2021-151-B	WILL	388	234
		CONTRACT NO. 62P71		
		ILLINOIS	FED. AID PROJECT	