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**STRUCTURE GEOTECHNICAL REPORT  
INTERSTATE 80 EB/WB AND FRONTAGE ROAD  
OVER ROADWAY DITCH  
CULVERT AT STATION 215+35.55  
PR SN 099-8343, SECTION 2021-151-B  
WILL COUNTY, ILLINOIS**

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**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 27, 2022  
Revised Report: October 10, 2022**

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**Technical Report Documentation Page**

<b>1. Title and Subtitle</b> Structure Geotechnical Report Culvert at Station 215+35.55		<b>2. Original Date:</b> September 27, 2022 <b>Revised Date:</b> October 10, 2022	
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<b>6. PTB / Item No.</b> 194 / 010	<b>7. Existing Structure Number(s)</b> NA	<b>8. Proposed Structure Number(s)</b> 099-8343	
<b>9. Prepared by</b> Wang Engineering, Inc. 1145 N Main Street Lombard, IL 60148		<b>Contributor(s)</b> Author: Azza Hamad, P.E. QA/QC: Corina T. Farez, P.G., P.E.	<b>Contact</b> (630) 480-5539 <a href="mailto:ahamad@wangeng.com">ahamad@wangeng.com</a>
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<b>11. Abstract</b> <p>The existing reinforced concrete single cell box culvert with a 4-foot wide and 3-high opening that carries Interstate 80 and Frontage Road over a roadway ditch near Station 215+35.55 will be replaced. The proposed culvert will be a cast-in-place single-cell box culvert with an interior opening of 8-foot wide and 4-foot high. The culvert will have a length of 222.8 feet (out-to-out of headwalls) with up to 5.0 feet of embankment fill on top.</p> <p>At the surface, the topsoil is about 3 to 36 inches thick. Beneath the surface and up to 2.8 feet of fill, the soil is made up of stiff to hard clay to silty clay followed by 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 an elevation of 589 feet based on the 24-hour water level reading in a nearby structure boring.</p> <p>At the proposed culvert base at estimated elevations of 587.03 to 585.95 feet, stiff to hard clay to silty clay is expected to be primarily encountered, which represent suitable foundation soils for construction of the culvert barrel replacements. However, at the base of the proposed culvert, up to 2.5 feet of hard silty clay with a moisture content value of 30% and a LL value of 41%, indicating possible compressible soil conditions, is expected to be encountered. If this layer is encountered during construction, it should be removed and replaced with compacted aggregate to an elevation of about 584.0 feet for the culvert length starting at about 30.0 feet east of the I-80 centerline (approximate midpoint of Borings I-80-CUL-2-03 and I-80-CUL-2-04) and ending about 30.0 feet west of the I-80 centerline (approximate midpoint of Borings I-80-CUL-2-02 and I-80-CUL-2-03). The foundation soils will experience long-term settlement of 1.0 inch or less with differential settlement of 0.5 inches or less.</p> <p>Horizontal cantilever wingwalls are proposed at the downstream 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.</p> <p>Since the groundwater is expected to be encountered about 1.0 feet above 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.</p>			
<b>12. Path to archived file</b> \\PKEWFS01\Data_WANGLegacy\SHARED\Netprojects\2553901\Reports\SGRs\Culverts\Culvert2_SN099-8343\RPT_Wang_AZH_2553901_Culvert2_SN099-8343_V02_20221010.doc			

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**STRUCTURE GEOTECHNICAL REPORT  
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PR SN 099-8343, 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 215+35.55 in Will County, Illinois. The project site is located about 350 feet north of the Shepley Road crossing at I-80. On the USGS *Channahon Quadrangle 7.5 Minute Series* map, the project site is generally located at NE  $\frac{1}{4}$  of Section 31, Township 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 dated September 16, 2022, and prepared by HBM Engineering, LLC (HBM), Wang Engineering, Inc. (Wang) understands the existing single cell concrete box culvert will be removed and replaced with one cast-in-place single-cell box culvert with an interior opening of 8-foot wide and 4-foot high. The culvert will carry I-80 and Frontage Road over a roadway ditch. Based on information provided by HBM, we understand the culvert is currently proposed as one single structure with a thickened portion acting as a junction chamber between I-80 WB and Frontage Road. The sidewalls and bottom slab will be continuous throughout the full-length of the culvert. As shown on the GPE, the junction chamber, used for maintenance purposes as well as ditch drainage between westbound I-80 and Frontage Road, will connect the two new culvert portions between westbound I-80 and Frontage Road to allow for continuous flow under both roadways. The

area between the roadways will be graded. The new culvert has proposed invert elevations of 587.95 and 586.87 feet at the upstream and downstream ends, respectively. The culvert will have a length of 222.8 feet (out-to-out headwalls) with up to 5.0 feet of embankment fill on the top as the I-80 proposed grade will be raised by up to 3.5 feet at the culvert location. The existing grade along Frontage Road will remain unchanged. Horizontal cantilever wingwalls are proposed at the downstream end whereas an 8.75-foot wide by 10-foot long drop box will be constructed at the upstream end for hydraulic purposes. The culvert replacement will be done utilizing staged construction to maintain traffic on I-80 and Frontage Road.

## 1.2 Existing Structure

Based on the GPE and historical drawings provided by HBM, we understand the existing culverts were constructed around 1959 as single 4-foot wide and 3-foot high concrete box culverts. The overall culvert lengths are approximately 133.9 and 38.5 feet (out-to-out headwalls) at I-80 and Frontage Road, respectively. Existing culverts 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-2-01 through I-80-CUL-2-04 drilled by Wang from April 11 to April 27, 2022. The borings were drilled from elevations of 596.9 to 592.2 feet to depths of 30.0 feet below the ground surface (bgs). The as-drilled northings and eastings were obtained with a mapping-grade GPS unit. Elevation, station, and offsets were provided by Stantec. As-drilled boring locations are presented in the *Boring Logs* (Appendix A) and 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 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.

## **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**

At the surface, the borings encountered 3 to 36 inches of silty clay topsoil. In descending order, the general lithologic succession encountered beneath the surface includes: 1) man-made ground (fill); 2) stiff to hard clay to silty clay; and 3) stiff to hard silty clay to silty clay loam.

#### *1) Man-made ground (fill)*

Beneath the topsoil, Borings I-80-CUL-2-01 and I-80-CUL-2-04 encountered up to 2.8 feet of very stiff, black, brown, and gray, silty clay fill with unconfined compressive strength ( $Q_u$ ) values of 2.0 to 2.5 tsf and moisture content values of 23%.

A 2.5-foot thick layer of granular fill consisting of medium dense, gray damp gravel was sampled underneath the topsoil in Boring I-80-CUL-2-02. This layer has an SPT N-value of 18 blows per foot and a moisture content of 4%.

A 30-inch thick layer of black silty clay buried topsoil with a moisture content of 35% was sampled beneath the fill in Boring I-80-CUL-2-01. The presence of this layer most likely indicates the boundary between fill and natural soils.

2) *Stiff to hard clay to silty clay*

Beneath the fill, at elevations of 592 to 591 feet and immediately below the buried topsoil, the borings sampled up to 7.5 feet of stiff to hard, brown, and gray, clay to silty clay. This soil layer has  $Q_u$  values of 1.2 to 5.6 tsf and moisture content value of 22 to 30%. Laboratory index testing on samples from this layer showed liquid limit (LL) and plastic limit (PL) values of 41 and 17%.

3) *Stiff to hard silty clay to silty clay loam*

At elevations of 589 to 584 feet, the borings encountered stiff to hard, brown to gray, silty clay to silty clay loam extending to the boring termination depths of 30.0 feet bgs with intermittent layers of sand and/or gravel. The unit has  $Q_u$  values of 1.0 to 10.2 tsf and moisture content values of 15 to 26%. Laboratory index testing on a sample from this unit revealed LL and PL values of 32 to 33% and 18 to 19%, respectively.

Weathered shale bedrock was noted at the boring termination depth of 30.0 feet bgs in Boring I-80-CUL-2-02.

### **3.2 Groundwater Conditions**

The culvert 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, Boring SHP-BSB-02B drilled for the Shepley Road Bridge and located about 300 feet west of the culvert was blind-drilled to a depth of 30.0 feet bgs and kept open to measure 24-hour water level. At Boring SHP-BSB-02B, the 24-hour water level was recorded at an elevation of about 589 feet (12.1 feet bgs). The design groundwater elevation may be considered at elevation of 589 feet. 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 barrels, wingwalls, drop box, and junction chamber are included in this section. As per the GPE (Appendix C), the upstream and downstream invert elevations will be 587.95 and 586.87 feet, respectively. Horizontal cantilever walls are proposed at the downstream culvert end whereas a drop box is proposed at the upstream culvert end. A junction chamber is proposed to connect the culverts at the roadway ditch between I-80 and Frontage Road to maintain a continuous flow.

### 4.1 Culvert Foundations

The existing culverts will be removed and replaced with two new single-box culverts that extend about 19.0 and 18.5 feet beyond the existing culvert footprints on the north and south ends, respectively. Based on the subsurface investigation and proposed invert elevations of 587.95 to 586.87 feet at the upstream and downstream ends, the soils at the base of culvert barrels are expected to be stiff to hard clay to silty clay which represent suitable foundation soils for construction of the new culvert barrels. However, at the base of the proposed culvert, Boring I-80-CUL-2-03 encountered up to 2.5 feet of hard silty clay with a moisture content value of 30% and a LL value of 41%, 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 584.0 feet for the culvert length starting at about 30.0 feet east of the I-80 centerline (approximate midpoint of Borings I-80-CUL-2-03 and I-80-CUL-2-04) and ending about 30.0 feet west of the I-80 centerline (approximate midpoint of Borings I-80-CUL-2-02 and I-80-CUL-2-03). 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 24-hour water level reading nearby Shepley Road Bridge site, the groundwater may be encountered at elevation of 589 feet; thus, water control may be needed during construction.

The junction chamber located at the roadway ditch between I-80 and Frontage Road and drop box at the upstream end will likely be installed in the presence of groundwater at or higher than the culvert slab elevations. The design groundwater elevation is estimated to be 589 feet based on nearby borings. We estimate FOS in uplift greater than the required minimum FOS of 1.4.



Settlement analyses were 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. We estimate cast-in-place culverts are feasible at this site.

## **4.2 Wingwalls**

Based on the GPE (Appendix C), we understand horizontal cantilever wingwalls are proposed at the downstream 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 downstream end, there are no global stability issues for these walls as they are structurally connected to the culvert barrel. The stability of the roadway embankment slopes will be analyzed and discussed in the Contract ML-4 Roadway Geotechnical Report.

## **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 sloped 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 can be encountered at an elevation of 589 feet based on the Shepley Road Bridge boring 24-hour water level reading. Therefore, groundwater should be expected at an elevation of 589 feet, about 1.0 feet above the proposed culvert base slab 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

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## ***REFERENCES***

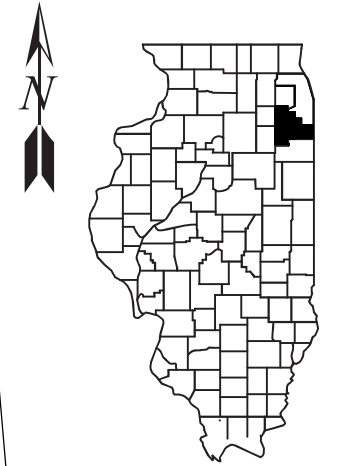
IDOT (2012) *Bridge Manual*. Illinois Department of Transportation.

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

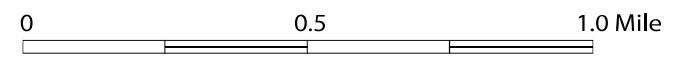
IDOT (2020) *Geotechnical Manual*. Illinois Department of Transportation.

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

## **EXHIBITS**



Will County



SITE LOCATION MAP: I-80 EB/WB CULVERT OVER ROADWAY DITCH, SN 099-8343,  
WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL	<b>EXHIBIT 1</b>	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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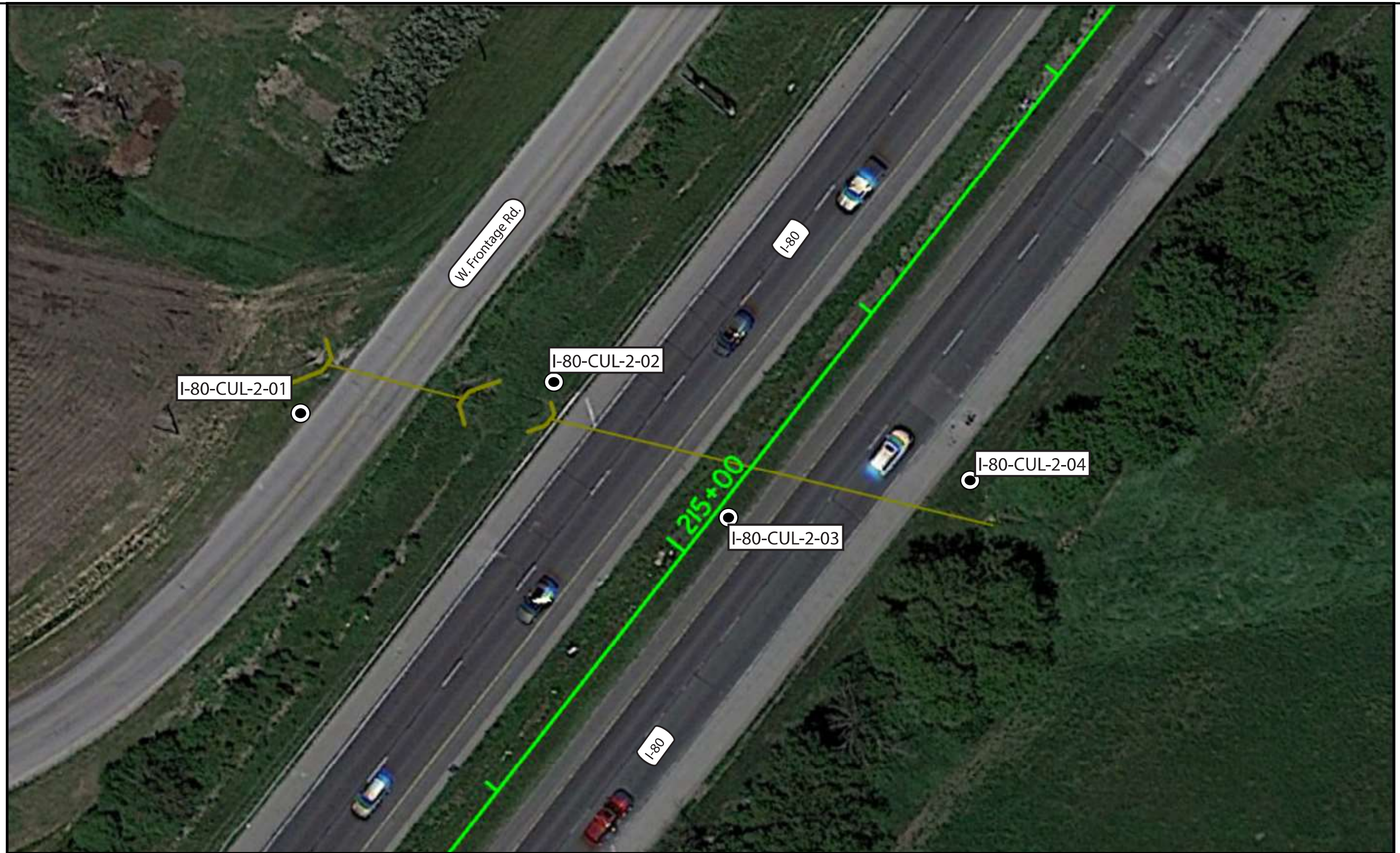
**Wang Engineering**

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FOR STANTEC

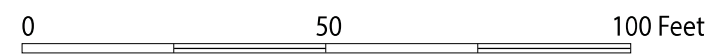
255-39-01






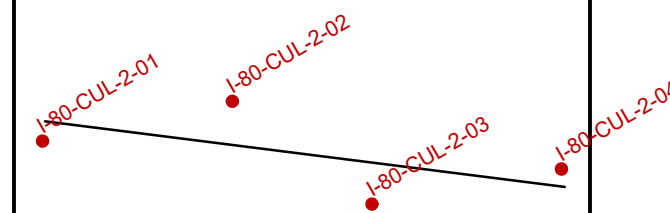
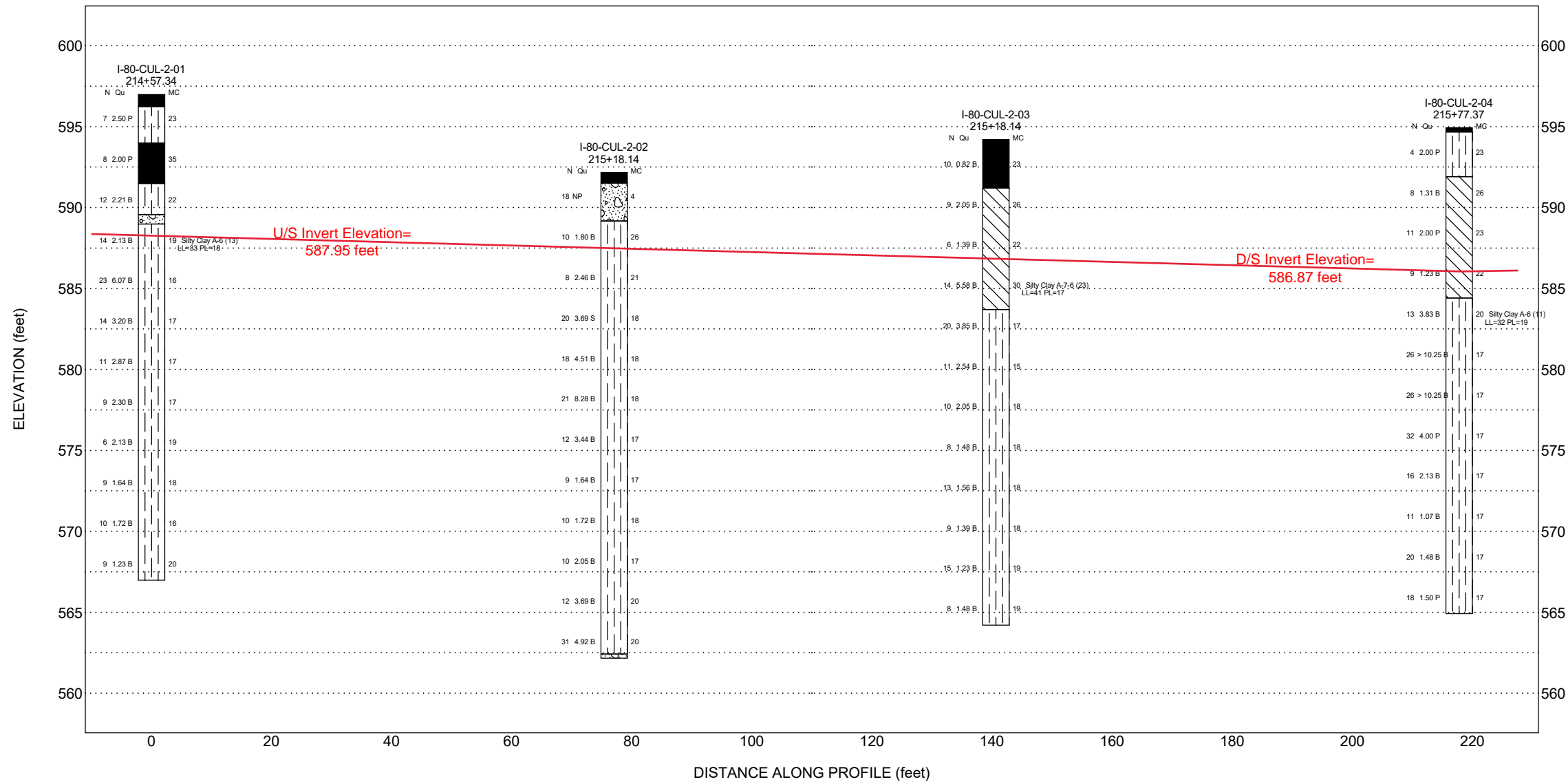
**Legend**

● Boring Location



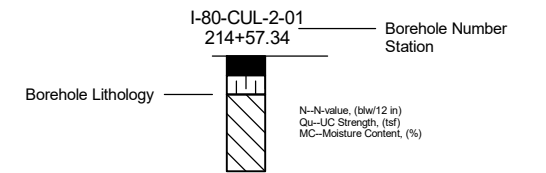
BORING LOCATION PLAN: I-80 EB/WB CULVERT OVER ROADWAY DITCH, SN 099-8343, WILL COUNTY, ILLINOIS		
SCALE: GRAPHICAL	<b>EXHIBIT 2</b>	DRAWN BY: J. Bensen CHECKED BY: A. Hamad
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FOR STANTEC		255-39-01



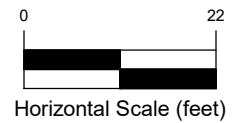


Site Map Scale 1 inch equals 80 feet

**Explanation:**



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



Vertical Exaggeration: 2.5x

**Wang Engineering, Inc.**  
 1145 N Main Street  
 Lombard, IL 60148

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



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

JOB NUMBER	PLATE NUMBER
255-39-01	EXHIBIT 3



## APPENDIX A



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 Lombard, IL 60148  
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# BORING LOG I-80-CUL-2-01

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: 596.98 ft  
 North: 1749885.11 ft  
 East: 1009613.38 ft  
 Station: 214+57.34  
 Offset: 122.95 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	596.2	9-inch thick, black SILTY CLAY --TOPSOIL-- Very stiff, brown, gray and black SILTY CLAY; damp			1	3 3 4	2.50 P	23						11	3 5 5	1.72 B	16
	594.0	--FILL-- --RDR 2-- Very stiff, black SILTY CLAY; damp			2	3 4 4	2.00 P	35						12	3 4 5	1.23 B	20
	591.5	--Buried TOPSOIL-- Very stiff, brown and gray CLAY to SILTY CLAY; damp			3	3 4 8	2.21 B	22		567.0	Boring terminated at 30.00 ft						
	589.6	Gray and tan GRAVEL; moist			4	6 6 8	2.13 B	19									
	589.0	Stiff to hard, brown to gray SILTY CLAY, trace gravel; damp			5	5 10 13	6.07 B	16									
		--RDR 2-- --L <sub>L</sub> (%)=33, P <sub>L</sub> (%)=18-- --%Gravel=1.2-- --%Sand=8.1-- --%Silt=59.1-- --%Clay=31.6-- --A-6 (13)--			6	4 6 8	3.20 B	17									
			15		7	3 5 6	2.87 B	17									
			20		8	3 4 5	2.30 B	17									
					9	3 3 3	2.13 B	19									
			25		10	3 4 5	1.64 B	18									

## 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.



# BORING LOG I-80-CUL-2-02

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 Telephone: 630 953-9928  
 Fax: 630 953-9938

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: 592.17 ft  
 North: 1749901.80 ft  
 East: 1009693.13 ft  
 Station: 215+18.14  
 Offset: 68.71 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	
	591.5	8-inch thick, dark brown SILTY CLAY																
		--TOPSOIL--																
		Medium dense, gray GRAVEL; damp			1	9 10 8	NP	4						11	5 6 6	3.69 B	20	
	589.2	--FILL-- --RDR 2--			2	3 4 6	1.80 B	26						12	6 10 21	4.92 B	20	
		Stiff to hard, brown to gray SILTY CLAY, trace gravel; damp	5		3	3 4 4	2.46 B	21		562.4 562.2	Gray GRAVEL; damp --WEATHERED SHALE-- Boring terminated at 30.00 ft	30						
		--RDR 2--			4	6 9 11	3.69 S	18										
			10		5	4 7 11	4.51 B	18										
			15		6	5 9 12	8.28 B	18										
			20		7	4 5 7	3.44 B	17										
			25		8	3 4 5	1.64 B	17										
					9	3 4 6	1.72 B	18										
					10	3 4 6	2.05 B	17										

### GENERAL NOTES

Begin Drilling **04-27-2022** Complete Drilling **04-27-2022**  
 Drilling Contractor **Wang Testing Services** Drill Rig **20D25A [83%]**  
 Driller **KG&JD** 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.

WANGENGINC 2553901.GPJ WANGENG.GDT 9/21/22



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 Lombard, IL 60148  
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# BORING LOG I-80-CUL-2-03

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: 594.20 ft  
 North: 1749858.64 ft  
 East: 1009751.76 ft  
 Station: 215+18.14  
 Offset: 4.09 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	
		Medium stiff, black SILTY CLAY, trace gravel; moist --TOPSOIL-- --RDR 2--			1	4 4 6	0.82 B	23						11	12 8 7	1.23 B	19	
	591.2	Stiff to hard, brown and gray to gray CLAY to SILTY CLAY, trace gravel; moist --RDR 2--	5		2	3 3 6	2.05 B	26		564.2		30		12	2 3 5	1.48 B	19	
					3	3 3 3	1.39 B	22			Boring terminated at 30.00 ft							
		--L <sub>L</sub> (%)=41, P <sub>L</sub> (%)=17-- --%Gravel=1.2-- --%Sand=5.0--10 --%Silt=49.8-- --%Clay=44.0-- --A-7-6 (23)--			4	2 4 10	5.58 B	30				35						
	583.7	Stiff to very stiff, brown to gray SILTY CLAY, trace gravel; moist --RDR 2--			5	8 9 11	3.85 B	17										
			15		6	3 4 7	2.54 B	15				40						
					7	3 4 6	2.05 B	18										
			20		8	2 3 5	1.48 B	18				45						
					9	4 5 8	1.56 B	18										
			25		10	3 4 5	1.39 B	18				50						

### GENERAL NOTES

Begin Drilling **04-24-2022** Complete Drilling **04-24-2022**  
 Drilling Contractor **Wang Testing Services** Drill Rig **21D50A [84%]**  
 Driller **PA&TC** Logger **A. Scifers** 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-2-04

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: 594.91 ft  
 North: 1749873.36 ft  
 East: 1009831.38 ft  
 Station: 215+77.37  
 Offset: 59.41 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	594.73	3-inch thick, black SILTY CLAY --TOPSOIL-- Very stiff, brown SILTY CLAY, trace gravel; damp			1	2 2 2	2.00 P	23									
	591.9	--FILL-- --RDR 2-- Stiff to very stiff, dark brown and brown CLAY to SILTY CLAY, trace gravel; damp			2	1 3 5	1.31 B	26							5 9 11	1.48 B	17
		--RDR 2--	5							564.9		30			5 8 10	1.50 P	17
					3	3 6 5	2.00 P	23			Boring terminated at 30.00 ft						
					4	3 3 6	1.23 B	22									
	584.4	Stiff to hard, brown SILTY CLAY to SILTY CLAY LOAM, trace gravel; damp			5	3 6 7	3.83 B	20									
		--RDR 2-- --L <sub>L</sub> (%)=32, P <sub>L</sub> (%)=19-- --%Gravel=1.1-- --%Sand=7.9-- --%Silt=59.2-- --%Clay=31.8-- --A-6 (11)--	10														
					6	6 10 16	10.25 B	17									
					7	9 12 14	10.25 B	17									
					8	18 16 16	4.00 P	17									
					9	5 7 9	2.13 B	17									
					10	4 4 7	1.07 B	17									

## GENERAL NOTES

## WATER LEVEL DATA

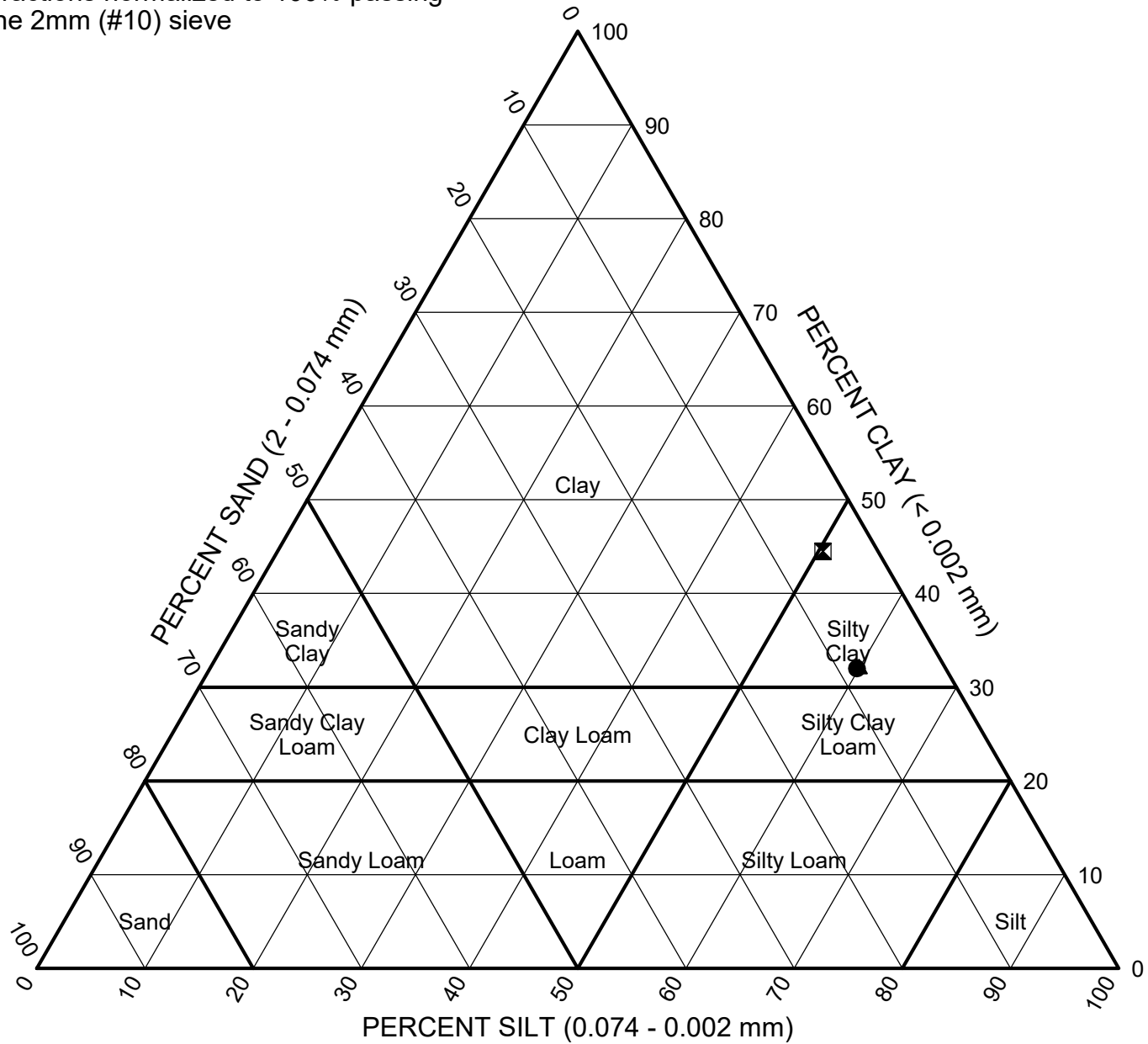
Begin Drilling **04-25-2022** Complete Drilling **04-25-2022**  
 Drilling Contractor **Wang Testing Services** Drill Rig **20D25A [83%]**  
 Driller **KG&G** Logger **M. Rojo** Checked by **C. Marin**  
 Drilling Method **2.25" ID HSA; boring backfilled upon completion**

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.

## **APPENDIX B**

Fractions normalized to 100% passing the 2mm (#10) sieve



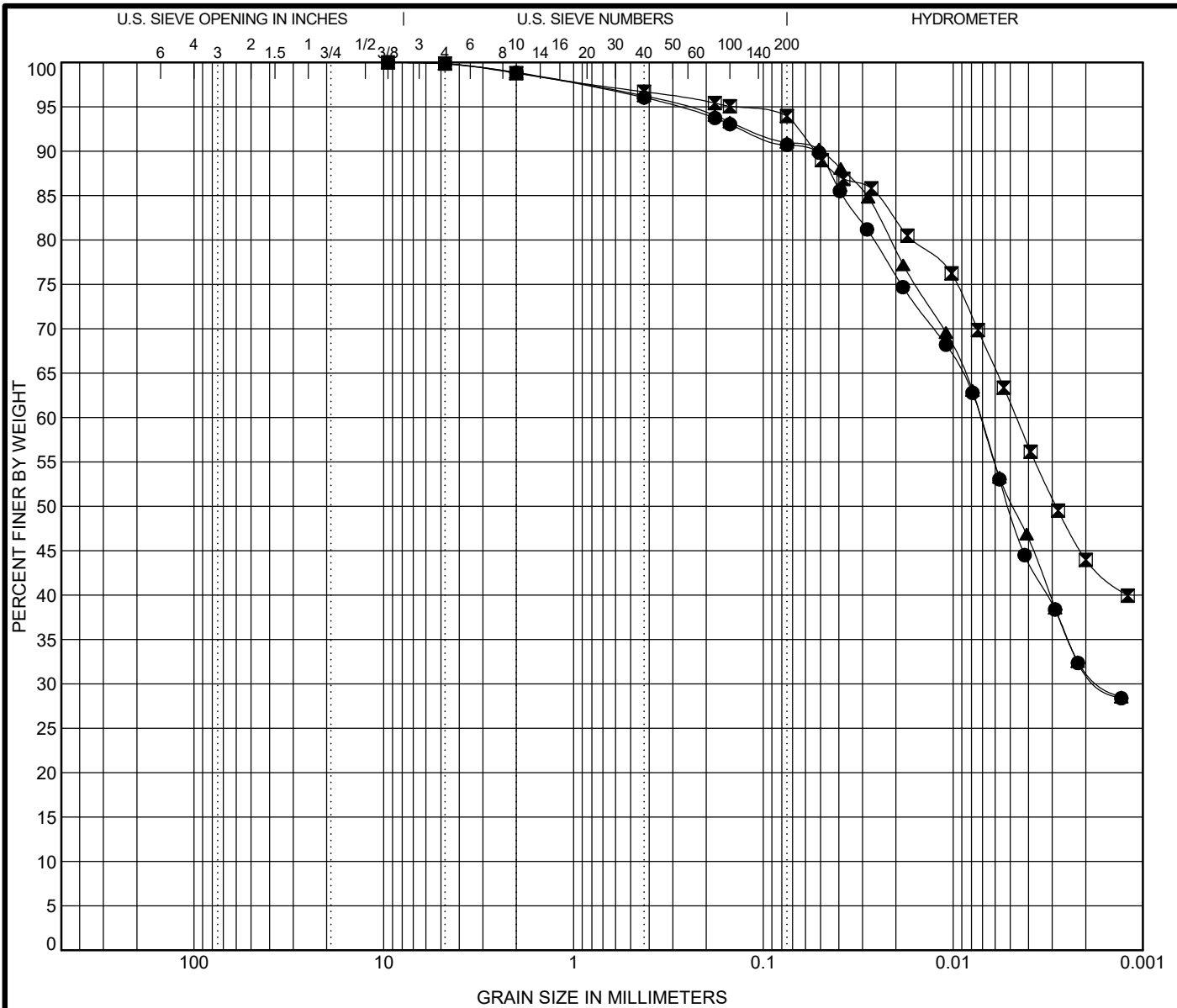
	Sample	Depth (ft)	Sand (%)	Silt (%)	Clay (%)	Classification		
						IL DOT	AASHTO	ASTM
●	80-CUL-2-01#4	8.5	8.2	59.8	32.0	Silty Clay	A-6 (13)	CL
■	80-CUL-2-03#4	8.5	5.1	50.4	44.5	Silty Clay	A-7-6 (23)	CL
▲	80-CUL-2-04#5	11.0	8.0	59.9	32.2	Silty Clay	A-6 (11)	CL

WEI IDH 2553901.GPJ WANGENG.GDT 9/21/22



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**IDH Textural Classification Chart**  
 Project: I-80 Reconstruction, Ridge Road to Houbolt Road  
 Location: Will County, Illinois  
 Number: 255-39-01



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification	IDH Classification	LL	PL	PI	Cc	Cu
● I-80-CUL-2-01#4 8.5 ft	<b>Silty Clay</b>	<b>33</b>	<b>18</b>	<b>15</b>		
☒ I-80-CUL-2-03#4 8.5 ft	<b>Silty Clay</b>	<b>41</b>	<b>17</b>	<b>24</b>		
▲ I-80-CUL-2-04#5 11.0 ft	<b>Silty Clay</b>	<b>32</b>	<b>19</b>	<b>13</b>		

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● I-80-CUL-2-01#4 8.5 ft	<b>9.5</b>	<b>0.007</b>	<b>0.002</b>		<b>1.2</b>	<b>8.1</b>	<b>59.1</b>	<b>31.6</b>
☒ I-80-CUL-2-03#4 8.5 ft	<b>9.5</b>	<b>0.005</b>			<b>1.2</b>	<b>5.0</b>	<b>49.8</b>	<b>44.0</b>
▲ I-80-CUL-2-04#5 11.0 ft	<b>9.5</b>	<b>0.007</b>	<b>0.002</b>		<b>1.1</b>	<b>7.9</b>	<b>59.2</b>	<b>31.8</b>



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 Lombard, IL 60148  
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**GRAIN SIZE DISTRIBUTION**  
 Project: I-80 Reconstruction, Ridge Road to Houbolt Road  
 Location: Will County, Illinois  
 Number: 255-39-01

WEI GRAIN SIZE IDH 2553901.GPJ US LAB.GDT 9/21/22



**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

<b>Sample No./ Depth</b>	<b>180-CUL-2-03 SS#4 (8.5-10ft.)</b>				
<b>Sample Description</b>					
<b>wet soil + tare</b>	76.83				
<b>Dry Soil + Tare</b>	71.08				
<b>Tare Mass</b>	42.63				
<b>w (%)</b>	20				
<b>Dry Soil + Tare</b>	71.08				
<b>Ash+ Tare</b>	70.18				
<b>Tare Mass</b>	42.63				
<b>Ash Content (%)</b>	97				
<b>Organic Content (%)</b>	3.2				

Prepared By: \_\_\_\_\_

Revised By: \_\_\_\_\_

## APPENDIX C

Bench Mark: xxx

Existing Structure: The existing structure consists of a 36" dia. reinforced concrete pipe culvert and a 4'x3' reinforced concrete box culvert. The original 4'x3' structure was constructed in 1959 under FAI Rte. 80, Section 99-1, Project I-80-4(12)124/I-80-4(29)124. The 48" dia. reinforced pipe was added during the 1980 construction. The existing structure to be removed and replaced with a cast-in-place double box culvert 8'-0" wide by 4'-0" high and 229'-3 7/8" long.

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

**DESIGN STRESSES**

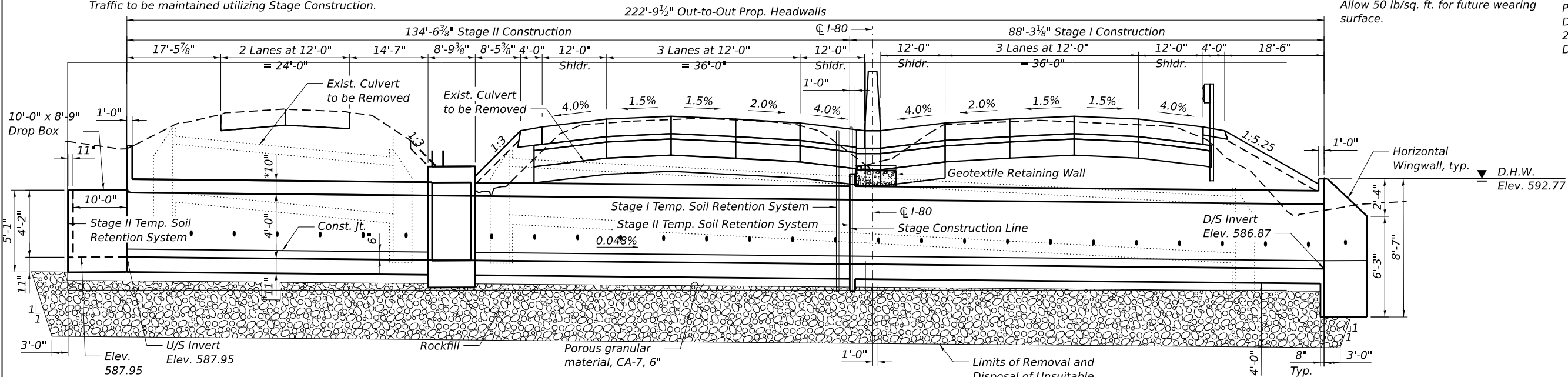
FIELD UNITS  
f<sub>c</sub> = 3,500 psi  
f<sub>y</sub> = 60,000 psi (Reinforcement)

**DESIGN SPECIFICATIONS**

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition.  
IDOT Culvert Manual, 2017.  
**LOADING HL-93**  
Allow 50 lb/sq. ft. for future wearing surface.

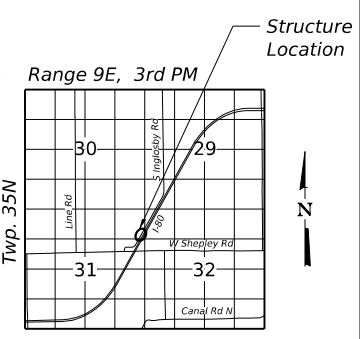
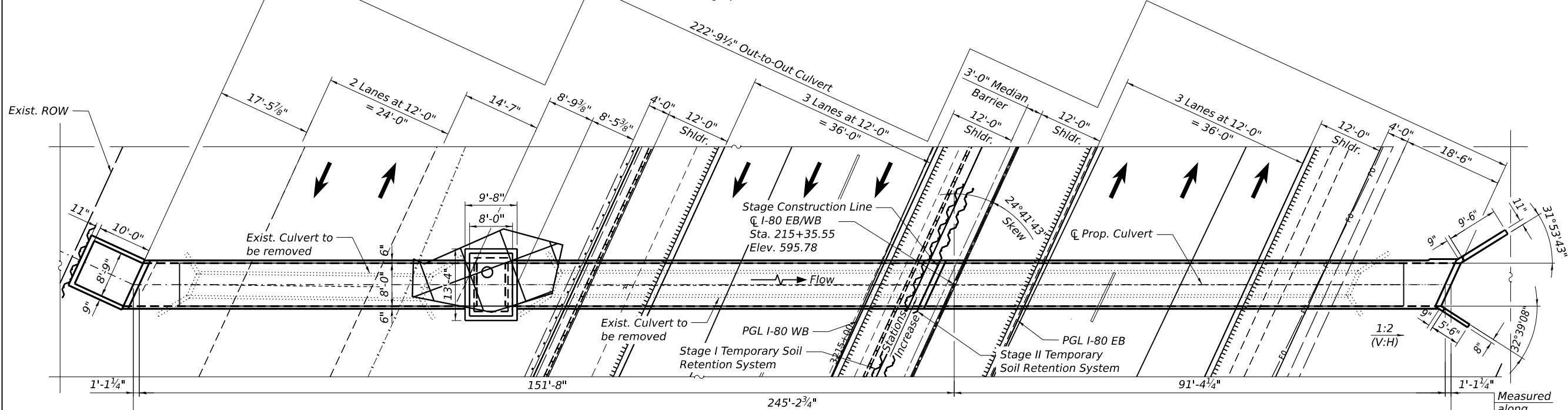
**HIGHWAY CLASSIFICATION**

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



**LONGITUDINAL SECTION**

(Dimensions at Rt. Ls to C Roadway) (Looking Upstation)



**WATERWAY INFORMATION - INGOLSBY CULVERT**

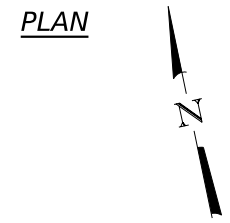
Flood	Freq. Yr.	Q C.F.S.	Opening Ft <sup>2</sup>		Nat. H.W.E.	Head - Ft.		Headwater El.	
			Exist.	Prop.		Exist.	Prop.	Exist.	Prop.
Design	10	82	2.0	24.0	592.95	2.88	0.0	595.83	592.95
Design	50	167	4.0	24.0	593.27	3.40	0.2	596.67	593.47
Base	100	218	4.0	24.0	593.41	3.40	2.88	596.81	596.29
Overtopping	>500								
Max. Calc.	500	302	5.0	24.0	593.64	3.35	3.12	596.99	596.76

10-Year Velocity through Exist. Culvert = 6.8 ft/s  
10-Year Velocity through Prop. Culvert = 4.8 ft/s

**WATERWAY INFORMATION - I-80 CULVERT**

Flood	Freq. Yr.	Q C.F.S.	Opening Ft <sup>2</sup>		Nat. H.W.E.	Head - Ft.		Headwater El.	
			Exist.	Prop.		Exist.	Prop.	Exist.	Prop.
Design	10	86	12.0	24.0	N/A			594.76	590.76
Design	50	167	12.0	24.0	N/A			595.67	592.77
Base	100	218	12.0	24.0	N/A			595.67	594.58
Overtopping	>500								
Max. Calc.	500	302	12.0	24.0	N/A			596.10	595.67

10-Year Velocity through Exist. Culvert = 14.0 ft/s  
10-Year Velocity through Prop. Culvert = 7.0 ft/s



**GENERAL PLAN & ELEVATION**

**EB&WB I-80 OVER RIVER ROAD ZONE A**

**F.A.I. ROUTE 180**  
**SEC - 2021-151-B**  
**WILL COUNTY**  
**STA. 215+35.55**  
**S.N. 099-8343**



USER NAME	DESIGNED	REVISION
JJS, HI	JJS, HI	-
MI, MAI	MI, MAI	-
HI	HI	-
MI, MAI	MI, MAI	-

**STATE OF ILLINOIS**  
**DEPARTMENT OF TRANSPORTATION**

STRUCTURE NO. 099-8343

SHEET S2-01 OF S2-17 SHEETS

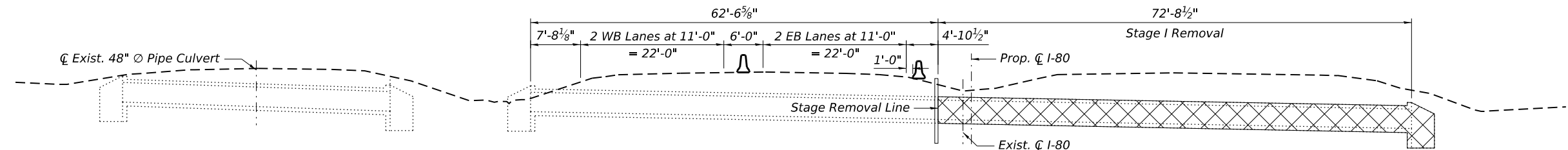
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
80	2021-151-B	WILL	396	221

CONTRACT NO. 62P71

ILLINOIS FED. AID PROJECT

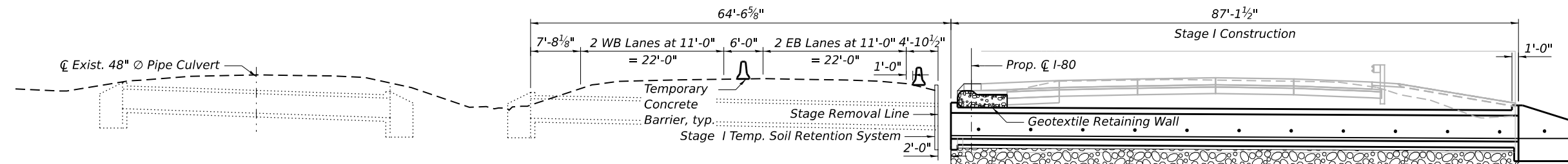
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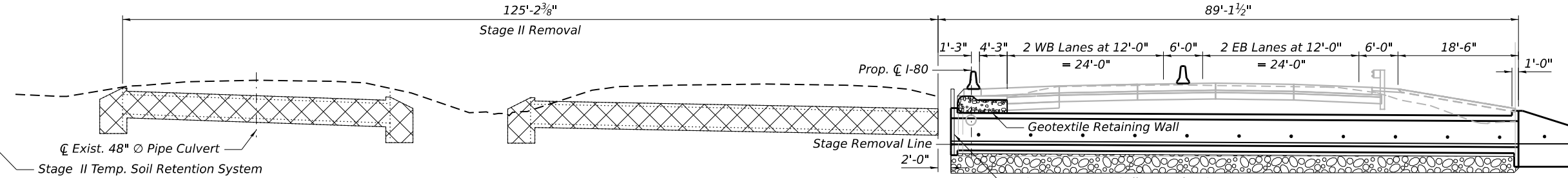
**STAGE I REMOVAL**

- STAGE I REMOVAL**
1. Install temporary concrete barrier as shown to locate construction work areas on the east side of the existing structure.
  2. Install Temporary sheet piling as shown.
  3. Remove portions of existing pavement on east side of the roadway.
  4. Remove the 69'-7" portion of the east culvert barrel, and remove the east headwall and wingwalls.



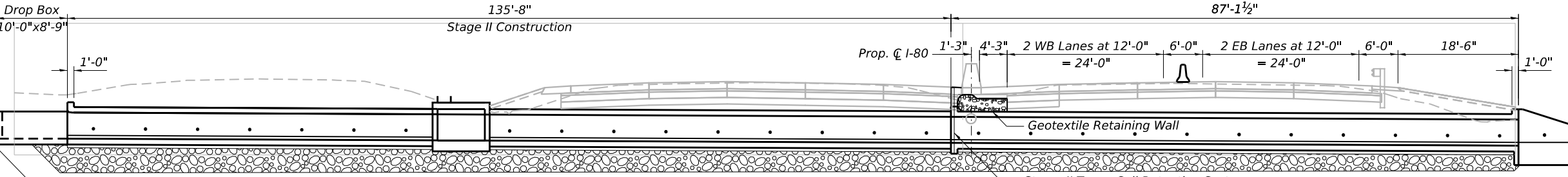
**STAGE I CONSTRUCTION**

- STAGE I CONSTRUCTION**
1. Construct 74'-2" portion of the east culvert barrel and construct the east headwall and wingwalls.
  2. Construct the pavement and shoulder on the east side of the roadway.



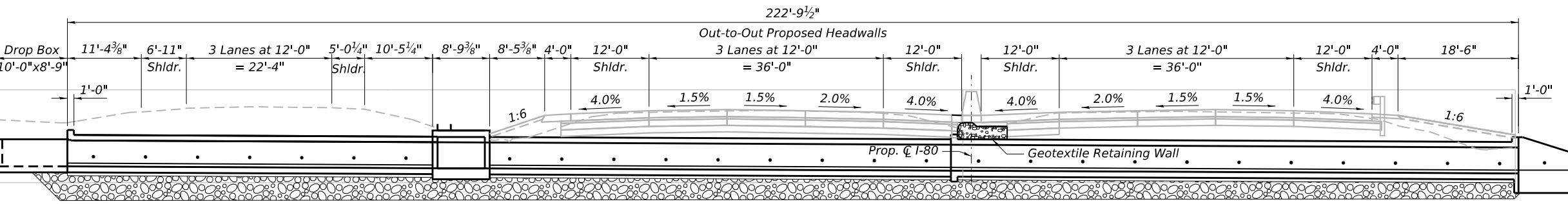
**STAGE II REMOVAL**

- STAGE II REMOVAL**
1. Install temporary concrete barrier as shown to locate construction work areas on the west side of the existing structure.
  2. Install Temporary sheet piling as shown.
  3. Remove portions of existing pavement on west side of the roadway.
  4. Remove the 128'-3<sup>7</sup>/<sub>8</sub>" portion of the west culvert barrel, and remove the west headwall and wingwalls.



**STAGE II CONSTRUCTION**

- STAGE II CONSTRUCTION**
1. Construct 135'-5" portion of the west culvert barrel and construct the north headwall and wingwalls.
  2. Construct the pavement and shoulder on the west side of the roadway.



**FINAL CROSS SECTION**

**LEGEND**

Removal Of Existing Structures No. 2



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

**STATE OF ILLINOIS**  
**DEPARTMENT OF TRANSPORTATION**

**STAGE REMOVAL AND CONSTRUCTION**  
**STRUCTURE NO. 099-8343**

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
80	2021-151-B	WILL	388	221
CONTRACT NO. 62P71				
		ILLINOIS	FED. AID PROJECT	

SHEET S2-03 OF S2-13 SHEETS