STRUCTURE GEOTECHNICAL REPORT
ROADWAY DITCH CULVERT
I-80 EB AND WB AT STATION 575+27.00
PROPOSED SN 099-0759
WILL COUNTY, ILLINOIS

For

TranSystems Corporation

1475 Woodfield Road, Suite 600

Schaumburg, IL 60173-5440

Submitted by

Wang Engineering, Inc. a Terracon Company

1145 North Main Street

Lombard, IL 60148

Original Report: April 25, 2023
Revised Report: TBD

Technical Report Documentation Page

1. Title and Subtitle Structure Geotechnical Report Roadway Ditch Culvert I-80 EB and WB at Station 575+27.00		**2. Original Date:** April 25, 2023 **Revised Date:** TBD **3. Report Type** ☒ SGR ☐ RGR ☐ Draft ☒ Final ☐ Revised
4. Route / Section / County/ District/ Region F.A.I I-80/ 2021-151-B/ Will/ 1/ 1		**5. IDOT Job/ Contract No.** D-91-207-19/ 62R27
6. PTB / Item No. 194/011	**7. Existing Structure Number(s)** N.A.	**8. Proposed Structure Number(s)** 099-0759
9. Prepared by Wang Engineering, Inc. 1145 N Main Street Lombard, IL 60148	**Contributor(s)** Author: Metin W. Seyhun, PE QA/QC: Corina T. Farez, PG, PE PM: Andri A. Kurnia, PE	**Contact** (630) 785-6226 akurnia@wangeng.com
10. Prepared for TranSystems Corporation 1475 E. Woodfield Road, Suite 600 Schaumburg, IL 60173-5440	**Design Manager** Jennifer M. Golemba, P.E. Vice President	**Contact** (847) 778-4975 jmgolemba@transystems.com

11. Abstract

The existing double 36-inch pipe culvert that carries I-80 over Roadway ditch will be abandoned in place and a new cast-in-place double-cell box culvert, with an interior opening of 9-foot wide and 4-foot high, will be installed parallel about 6 feet west of the existing culvert alignment. The culvert will have a length of 181 feet out-to-out headwalls, and total width of 19.5 feet with up to 3.5 feet of embankment fill on the top. It has a proposed invert elevation of 617.87 feet at the upstream (north) and 615.01 feet at downstream (south) ends. The culvert installation will be done on staged construction to maintain traffic at I-80.

Beneath the pavement and topsoil surface, the subsurface investigation shows 5 to 7.8 feet cohesive fill overlying up to 24.5 feet of stiff to hard, brown to gray silty clay. Below the silty clay there is 0.8 to 4.5 feet of medium dense to dense, brown, and gray, wet to saturated silt extending to borings termination depth of 30 feet below ground surface.

Groundwater was observed at more than 10 feet below the proposed culvert invert elevation. Depending upon prevailing climate conditions and the time of the year the culvert construction taken place, control runoff and maintenance of existing flows may require temporary water diversion and control.

Average bottom of culvert elevation is 615.69 feet. The new culvert is anticipated to rest on stiff to hard, brown to gray silty clay which could experience settlement of ¼ inches or less. Temporary sheet piling using IDOT Design Guide 3.3.1.13 (IDOT 2012) is not feasible due to very hard soil conditions; therefore, a Temporary Soil Retention System (TSRS) pay item should be included.

Unstable or unsuitable materials exposed during excavation should be removed and replaced with compacted structural fill. The replacement material could be IDOT CA-6 or IDOT District One "*Aggregate Subgrade Improvement*" materials.

12. Path to archived file

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Wang Engineering
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STRUCTURE GEOTECHNICAL REPORT
ROADWAY DITCH CULVERT
I-80 EB AND WB AT STATION 575+27.00
PROPOSED SN 099-0759
WILL COUNTY, ILLINOIS
FOR
TRANSYSTEMS CORPORATION

1.0 INTRODUCTION

This report presents the results of our subsurface investigation, laboratory testing, geotechnical evaluations, and provides recommendations to support the design and construction of a new culvert for the Roadway Ditch along Interstate 80 (I-80) at Station 575+27.00 in Joliet, Will County, Illinois. On the USGS *Quadrangle 7.5 Minute Series* map, the project site is generally located at SE $^1/_4$ of Section 18, Township 35N, Range 10E of the Third Principal Meridian. A *Site Location Map* is presented as 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.

1.1 Proposed Structure

Based on *General Plan and Elevation Sheets (GPE)* (Appendix D) provided by TranSystems Corporation, Wang Engineering, Inc. (Wang) understands the existing double 36-inch diameter pipe culvert will be abandoned in place and a new cast-in-place (CIP) double-cell box culvert, with an interior opening of 9-foot wide and 4-foot high for each cell, will be installed parallel about 6 feet west of the existing pipe culvert. The new culvert will have a length of 181 feet out-to-out headwalls, and total width of 19.5 feet with up to 3.5 feet of embankment fill on the top. It has a proposed invert elevation of 617.87 feet at the upstream (north) and 615.01 feet at downstream (south) ends. The culvert installation will be done on staged construction to maintain traffic along I-80.

The wingwall types at upstream and downstream ends will be horizontal wingwalls.

1.2 Existing Structure and Land Use

The existing structure consists of a double 36-inch diameter pipe culvert with an overall length of 219 feet. The structure will be filled and abandoned in place. The surrounding land of culvert is greenspace with power lines on north and south sides with existing I-80 in the east-west south direction approaching a major interchange. There are residential developments in the northeast and industrial/commercial developments in the northwest, southeast and southwest sides of the project.

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 BC2-01 through BC2-04 drilled along the north-south right-of-way shoulders in both eastbound and westbound lanes of I-80. The borings were performed by Wang from February 17 to 24, 2023. The as-drilled northings and eastings were obtained with a mapping-grade GPS unit. Elevations, stations, and offsets were provided by Transystems. As-drilled boring locations are presented in the *Boring Logs* (Appendix A) and the as-completed boring locations are shown in the *Boring Location Plan* (Exhibit 2).

A geoprobe and a truck-mounted drilling rig, 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 was backfilled upon completion with soil cuttings and/or bentonite chips. The pavement surface at Boring BC2-01 was restored as close 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

Borings BC2-02, BC2-03 and BC2-04, drilled within the grassy median and along the eastbound right-of-way, encountered 3 to 6 inches of silty clay to silty clay loam topsoil. Boring BC2-01, drilled along westbound I-80, encountered 8 inches of concrete pavement over 6 inches of sandy gravel aggregate base. In descending order, the general lithologic succession encountered beneath the surface includes: 1) man-made ground (fill); 2) stiff to hard silty clay; and 3) medium dense to dense silt and medium dense gravel.

1) *Man-made ground (fill)*

Beneath the pavement and topsoil, at elevations of 620.8 to 625.2 feet, borings encountered 5 to 7.8 feet of cohesive fill. The cohesive fill consists of stiff to hard, brown and gray silty clay with unconfined compressive strength (Q_u) values of 1.3 to 6.2 tsf and moisture content values of 17 to 25%.

2) *Stiff to hard silty clay*

At elevations of 615.8 to 619.2 feet, the borings encountered up to 24.5 feet of stiff to hard, brown to gray silty clay. The unit has Q_u values of 1.5 to 10.3 tsf and moisture content values of 14 to 23%. Laboratory test results on this layer show LL values of 31 to 44% and PL values of 17 to 18%.

3) *Medium dense to dense silt and medium dense gravel*

At elevations of 592.5 and 599.9 feet, borings BC2-03 and BC2-04 revealed 0.8 and 4.5 feet of medium dense to dense, brown and gray, wet to saturated silt. The unit has SPT N-values of 21 to 35 blows per foot. Below the silt at an elevation of 591.8 feet, Boring BC2-04 encountered gray, saturated gravel to the boring's termination depth.

3.2 Groundwater Conditions

Groundwater was encountered while drilling at elevations of 592.5 and 599.9 feet (25.5 and 28.8 feet bgs) and was measured in open boreholes at elevations of 592.3 and 602.4 feet (23 and 29 feet bgs) at the end of drilling. The groundwater table is more than 10 feet below the proposed culvert base slab bearing elevation of 615.69 feet thus should not be an issue during construction.

4.0 ANALYSES AND RECOMMENDATIONS

In the following sections, we present the results of our analyses and recommendations for the proposed culvert and wingwalls.

4.1 Scour Considerations

The design scour elevation should be taken at the bottom of the cutoff wall (IDOT 2012). At the horizontal cantilever wingwalls, the cutoff walls are established at 3.0 feet below the culvert invert elevations. To prevent local erosion, we recommend placing stone riprap or a concrete apron at the ends of the culvert. This will also prevent sediments from entering and accumulating in the culvert, minimize long term maintenance, and provide protection to the stream bed at the interface.

4.2 Culvert Foundations

The new culvert footprint will be just 6 feet west of the existing culvert that will be abandoned. Settlement analysis was performed for the new culvert based on the boring information, and the estimated culvert and roadway fill pressures applied to the full width of the culvert. The additional fill of 3.5 feet added to the center of the proposed roadway and the proposed culvert base slab bearing elevation of about 615.69 feet elevation. Borings revealed over 15 feet of stiff to hard, brown to gray silty clay followed by medium dense to dense, brown, and gray, wet to saturated silt below the culvert bottom. We estimate the foundation soils will experience a total settlement of 0.25 inches at the middle portion of the culvert; the area is currently a median. We estimate the foundation soils will experience a differential settlement of ¼-inches or less.

4.3 Wingwalls

Based on General Plan and Elevation and information provided by TranSystems, we understand the preferred wingwall type is horizontal cantilever wingwalls. The 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* (2017).

4.4 Global Stability

We performed global stability of the wingwalls for the maximum wingwall height of about 6 feet. *Slide2* evaluation exhibits employing the Bishop Simplified method of analysis are shown in Appendix C. We estimate the wingwall has a minimum factor of safety (FOS) of 9.7 for undrained soil condition and a minimum FOS of 2.7 for drained soil condition. The FOSs meet the minimum FOS requirement of 1.5 (IDOT 2020).

4.5 Stage Construction Considerations

Based on the GPE, assuming an exposed height of about 9 feet (from elevation 626 to 617 feet), temporary sheet piling using IDOT Design Guide 3.3.1.13 (IDOT 2012) is not feasible due to very hard soil conditions within the proposed embedment depth with Qu values greater than 4.5 tsf. Therefore, a Temporary Soil Retention System (TSRS) pay item should be included and designed by the Contractor to be approved by IDOT prior construction of the culvert.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Site Preparation

The existing vegetation, surface topsoil, pavement, and debris should be cleared and stripped where the foundations will be placed.

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 design and at the time of construction. Therefore, Wang recommends that the impact of the proposed culvert on the existing utilities should be undertaken for safety and construction reasons.

The groundwater was observed at elevations 592 to 602 which is more than 10 feet below the proposed culvert base slab bearing elevation of about 615.69 feet, thus should not be an issue during construction. Depending upon prevailing climate conditions and the time of the year when culvert and 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.

Unstable or unsuitable materials exposed during excavation should be removed and replaced with compacted structural fill. The replacement material could be an IDOT District One "*Aggregate Subgrade Improvement*" materials. Any culvert bedding material should be taken into account. The removal and replacement material should extend a minimum of two foot beyond the edge of the box. The actual extent of the removal shall be determined in the field by a geotechnical soil inspector at the time of construction. Geotechnical and field engineer may extend or reduce the limits of excavation based on soil condition encountered during construction.

In cases where replacement below the new box culvert where dewatering and compaction is not possible, Rockfill shall be used, and the following note should be added:

The Rockfill shall be capped with 6 inches of CA7 and satisfy the Standard Specifications unless otherwise indicated in the Special Provisions. The cost of the capping material shall be included in the pay item for Rockfill.

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 Standard Specifications (IDOT 2022). The fill material should be free of organic matter and debris. Engineered fill should be placed in lifts and compacted according to Section 205, Embankment (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 TranSystems Corporation 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.

Metin W. Seyhun, P.E.
Sr. Geotechnical Engineer

Andri A. Kurnia, P.E.
Senior Engineer

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

REFERENCES

AASHTO (2020) *LRFD Bridge Design Specifications, 9th Edition*. Washington DC.

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

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

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

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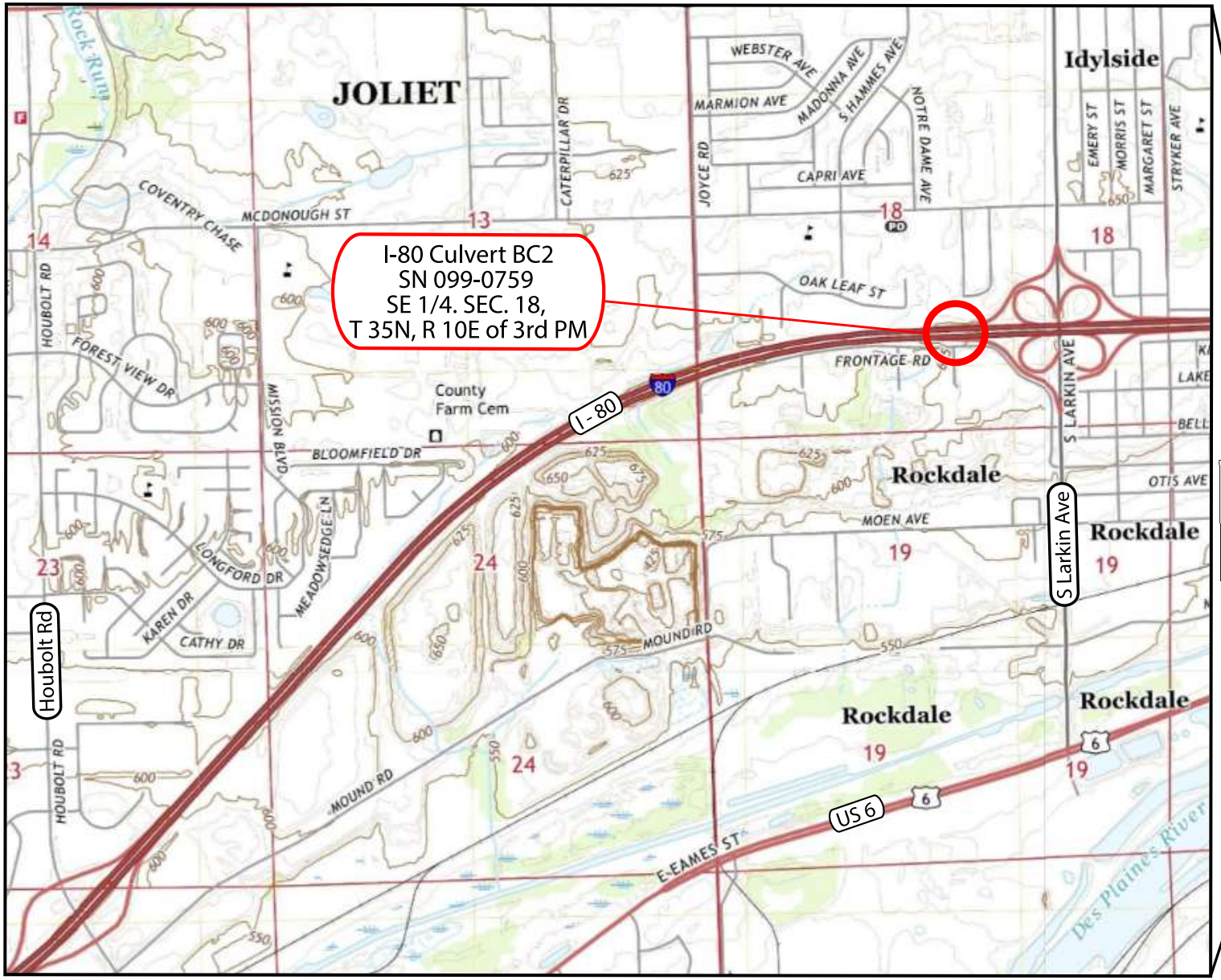
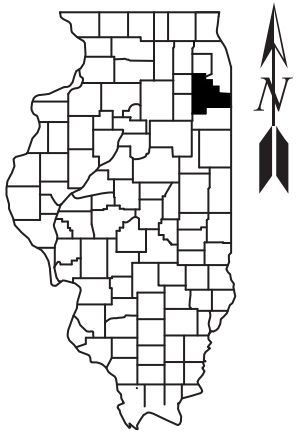
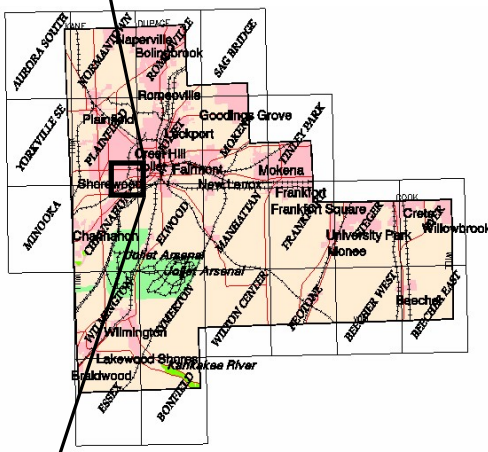
EXHIBITS







Will County

Legend

Site Locations

Scale

0 — 0.5 — 1.0 Miles

SITE LOCATION MAP: I-80 CULVERT BC2, SN: 099-0759; I-80 RECONSTRUCTION FROM HOUBOLT RD TO W CENTER ST & LARKIN AVE INTERCHAGNE, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: D. You CHECKED BY: A. Kurnia

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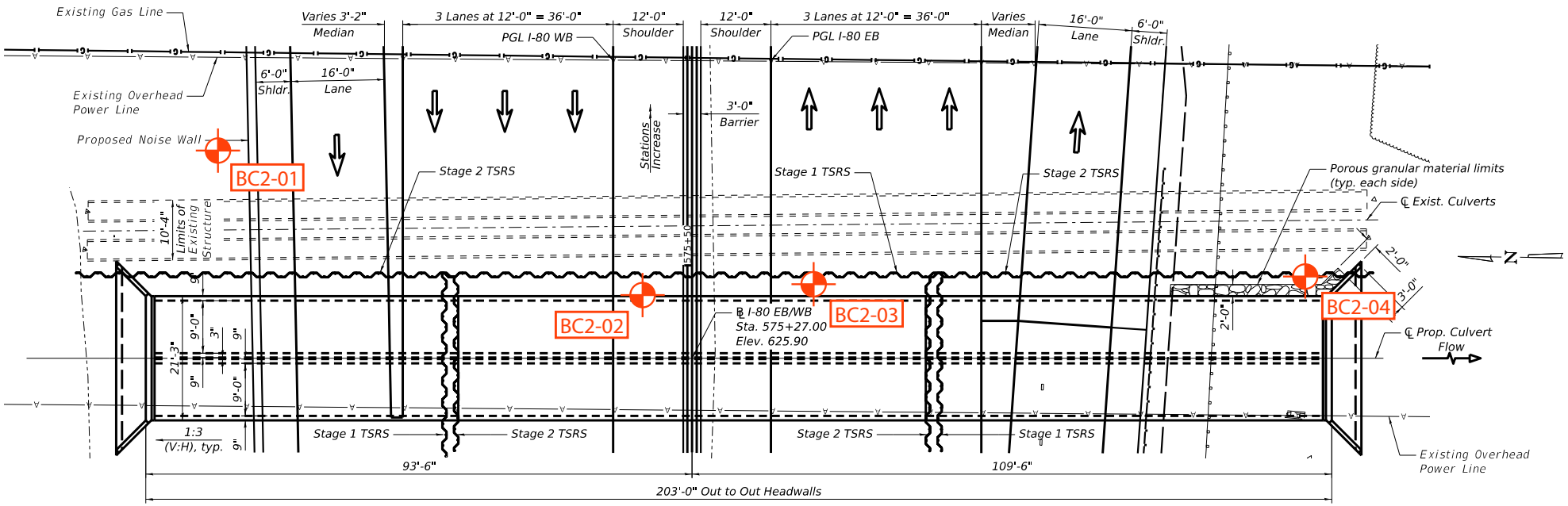
FOR TRANSYSTEMS	KE225089



Legend

Boring Location

BORING LOCATION PLAN: I-80 CULVERT BC2, SN: 099-0759; I-80 RECONSTRUCTION FROM HOUBOLT RD TO W CENTER ST & LARKIN AVE INTERCHAGNE, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL	EXHIBIT 2	DRAWN BY: D. You CHECKED BY: M. Seyhun

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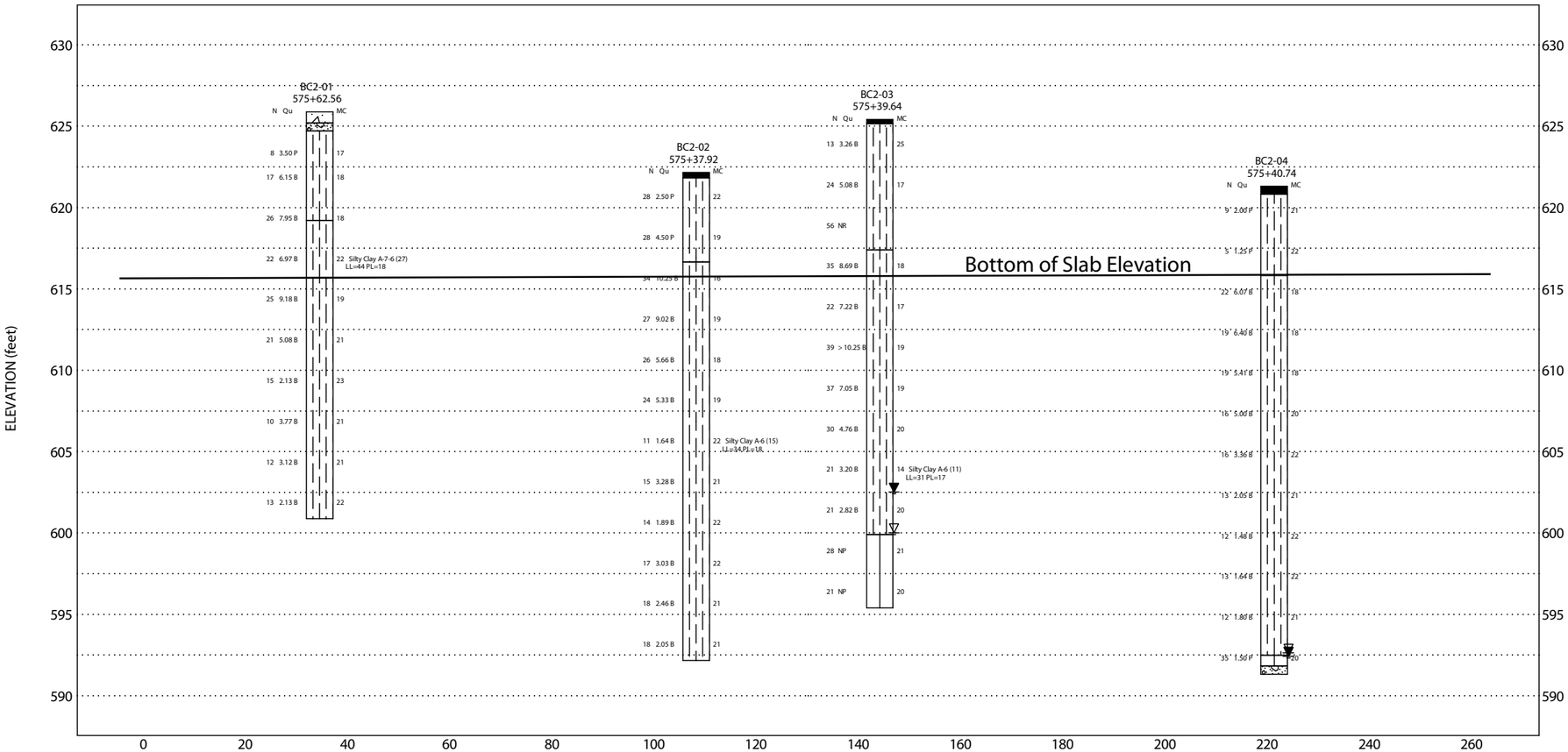
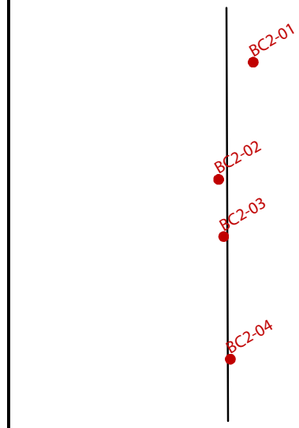


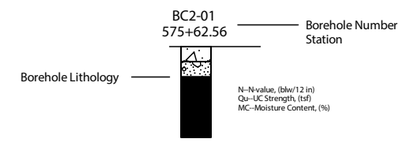
Lithology Graphics

- Concrete
- Gravelly sand, sandy gravel
- IDH Silty Clay, Silty Clay Loam
- psoil
- IDH Silt, Silty Loam



Site Map Scale 1 inch equals 95 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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Soil Profile
BC2 SN 099-0759

WEI SINCE 1982

I-80 Reconstruction (Houbolt Rd to Center St)
Will County, Illinois

JOB NUMBER	PLATE NUMBER
7901-15-01	EXHIBIT 3

WEI 11X17 7901150I.GPJ WANGENG.GDT 3/7/23

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APPENDIX A

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BORING LOG BC2-01

WEI Job No.: 7901-15-01

Client: **TranSystems Corporation**
Project: **I-80 Reconstruction (Houbolt Rd to Center St)**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 625.87 ft
North: 1764604.87 ft
East: 1040143.47 ft
Station: 575+62.56
Offset: 81.197' LT

Depth (ft)	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	625.2	8-inch thick CONCRETE --PAVEMENT--					
	624.7	6-inch thick SANDY GRAVEL --AGGREGATE BASE--					
		Very stiff to hard, brown and gray SILTY CLAY, trace to little gravel; damp --FILL-- --RDR 2--		1	5 4 4	3.50 P	17
				2	5 8 9	6.15 B	18
5							
	619.2	Very stiff to hard, brown to gray SILTY CLAY, trace gravel; damp --RDR 2--		3	11 12 14	7.95 B	18
		--L_L(%)=44, P_L(%)=18-- --%Gravel=0.2-- --%Sand=1.6-- --%Silt=51.2-- --%Clay=47.0-- --A-7-6 (27)--		4	8 9 13	6.97 B	22
10				5	9 11 14	9.18 B	19
15				6	7 9 12	5.08 B	21
				7	7 6 9	2.13 B	23
20				8	3 4 6	3.77 B	21
25	600.9	Boring terminated at 25.00 ft		9	4 5 7	3.12 B	21
				10	4 6 7	2.13 B	22
30							
35							
40							

GENERAL NOTES

Begin Drilling: **02-17-2023** Complete Drilling: **02-17-2023**
Drilling Contractor: **Wang Testing Services** Drill Rig: **20D25A [83%]**
Driller: **KS&AP** Logger: **N. Karahalios** Checked by: **J. Bensen**
Drilling Method: **2.25" IDA 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 79011501.GPJ WANGENG.GDT 3/14/23

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BORING LOG BC2-02

WEI Job No.: 7901-15-01

Client: **TranSystems Corporation**
Project: **I-80 Reconstruction (Houbolt Rd to Center St)**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 622.16 ft
North: 1764531.12 ft
East: 1040121.76 ft
Station: 575+37.92
Offset: 8.372' LT

Depth (ft)	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
0	621.8	4-inch thick, dark brown SILTY CLAY, trace gravel; damp --TOPSOIL--					
		Very stiff to hard, brown SILTY CLAY, trace gravel; damp --FILL-- --RDR 2--		1	9 13 15	2.50 P	22
				2	10 14 14	4.50 P	19
5	616.7						
		Stiff to hard, brown to gray SILTY CLAY, trace gravel; damp --RDR 2--		3	8 13 21	10.25 B	16
				4	5 11 16	9.02 B	19
10				5	8 10 16	5.66 B	18
				6	7 11 13	5.33 B	19
15		--L_L(%)=34, P_L(%)=18-- --%Gravel=1.1-- --%Sand=5.8-- --%Silt=54.5-- --%Clay=38.5-- --A-6 (15)--		7	4 5 6	1.64 B	22
				8	4 6 9	3.28 B	21
20							
25				9	6 7 7	1.89 B	22
				10	4 7 10	3.03 B	22
				11	5 7 11	2.46 B	21
30	592.2	Boring terminated at 30.00 ft		12	4 6 12	2.05 B	21
35							
40							

GENERAL NOTES

Begin Drilling: **02-23-2023** Complete Drilling: **02-24-2023**
Drilling Contractor: **Wang Testing Services** Drill Rig: **20D25A [83%]**
Driller: **RH&JD** Logger: **B. Miller** Checked by: **J. Bensen**
Drilling Method: **2.25" IDA 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 BC2-03

WEI Job No.: 7901-15-01

Client: **TranSystems Corporation**
Project: **I-80 Reconstruction (Houbolt Rd to Center St)**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 625.41 ft
North: 1764495.19 ft
East: 1040124.91 ft
Station: 575+39.64
Offset: 27.662' RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	625.2	3-inch thick, dark brown SILTY CLAY, trace gravel --TOPSOIL--						
		Very stiff to hard, brown SILTY CLAY, trace gravel; damp --FILL-- --RDR 2--			1	9 5 8	3.26 B	25
			5		2	6 9 15	5.08 B	17
					3	21 25 31	NR	
	617.4							
		Very stiff to hard, brown to gray SILTY CLAY, trace gravel; damp --RDR 2--			4	10 14 21	8.69 B	18
			10		5	7 9 13	7.22 B	17
					6	10 15 24	> 10.25 B	19
			15		7	7 16 21	7.05 B	19
					8	9 14 16	4.76 B	20
			20					

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--L_L(%)=31, P_L(%)=17-- --%Gravel=6.1-- --%Sand=9.5-- --%Silt=52.9-- --%Clay=31.5-- --A-6 (11)--			9	6 8 13	3.20 B	14
			25		10	6 10 11	2.82 B	20
	599.9							
		Medium dense, brown to gray SILT; wet --RDR 2--			11	6 11 17	NP	21
	595.4		30		12	3 10 11	NP	20
		Boring terminated at 30.00 ft						
			35					
			40					

GENERAL NOTES

Begin Drilling: **02-23-2023** Complete Drilling: **02-23-2023**
Drilling Contractor: **Wang Testing Services** Drill Rig: **20D25A [83%]**
Driller: **RH&JD** Logger: **B. Miller** Checked by: **J. Bensen**
Drilling Method: **2.25" IDA HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **25.50 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 BC2-04

WEI Job No.: 7901-15-01

Client: **TranSystems Corporation**
Project: **I-80 Reconstruction (Houbolt Rd to Center St)**
Location: **Will County, Illinois**

Datum: NAVD 88
Elevation: 621.32 ft
North: 1764418.04 ft
East: 1040129.09 ft
Station: 575+40.74
Offset: 104.913' RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type / recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	620.8	6-inch thick, black SILTY CLAY LOAM						
		--TOPSOIL--						
		Stiff to very stiff, brown SILTY CLAY, trace gravel						
		--FILL--						
		--RDR 2--						
					1	3 4 5	2.00 P	21
			5		2	2 2 3	1.25 P	22
	615.8							
		Stiff to hard, brown to gray SILTY CLAY, trace gravel						
		--RDR 2--			3	5 9 13	6.07 B	18
			10		4	3 8 11	6.40 B	18
					5	3 8 11	5.41 B	18
			15		6	6 6 10	5.00 B	20
					7	4 7 9	3.36 B	22
			20		8	4 5 8	2.05 B	21
			25		9	3 5 7	1.48 B	22
					10	4 6 7	1.64 B	22
					11	3 5 7	1.80 B	21
	592.5							
		Dense, gray SILT; saturated						
	591.8							
	591.3	Gray GRAVEL; saturated	30		12	11 20 15	1.50 P	20
		Boring terminated at 30.00 ft						
			35					
			40					

GENERAL NOTES

Begin Drilling: **02-24-2023** Complete Drilling: **02-24-2023**
Drilling Contractor: **Wang Testing Services** Drill Rig: **21GeoA[96%]**
Driller: **AG&EH** Logger: **F. Bozga** Checked by: **J. Bensen**
Drilling Method: **2.25" IDA HSA; boring backfilled upon completion**

WATER LEVEL DATA

While Drilling: **28.80 ft**
At Completion of Drilling: **29.00 ft**
Time After Drilling: **NA**
Depth to Water: **NA**

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

WANGENGINC 79011501.GPJ WANGENG.GDT 3/14/23

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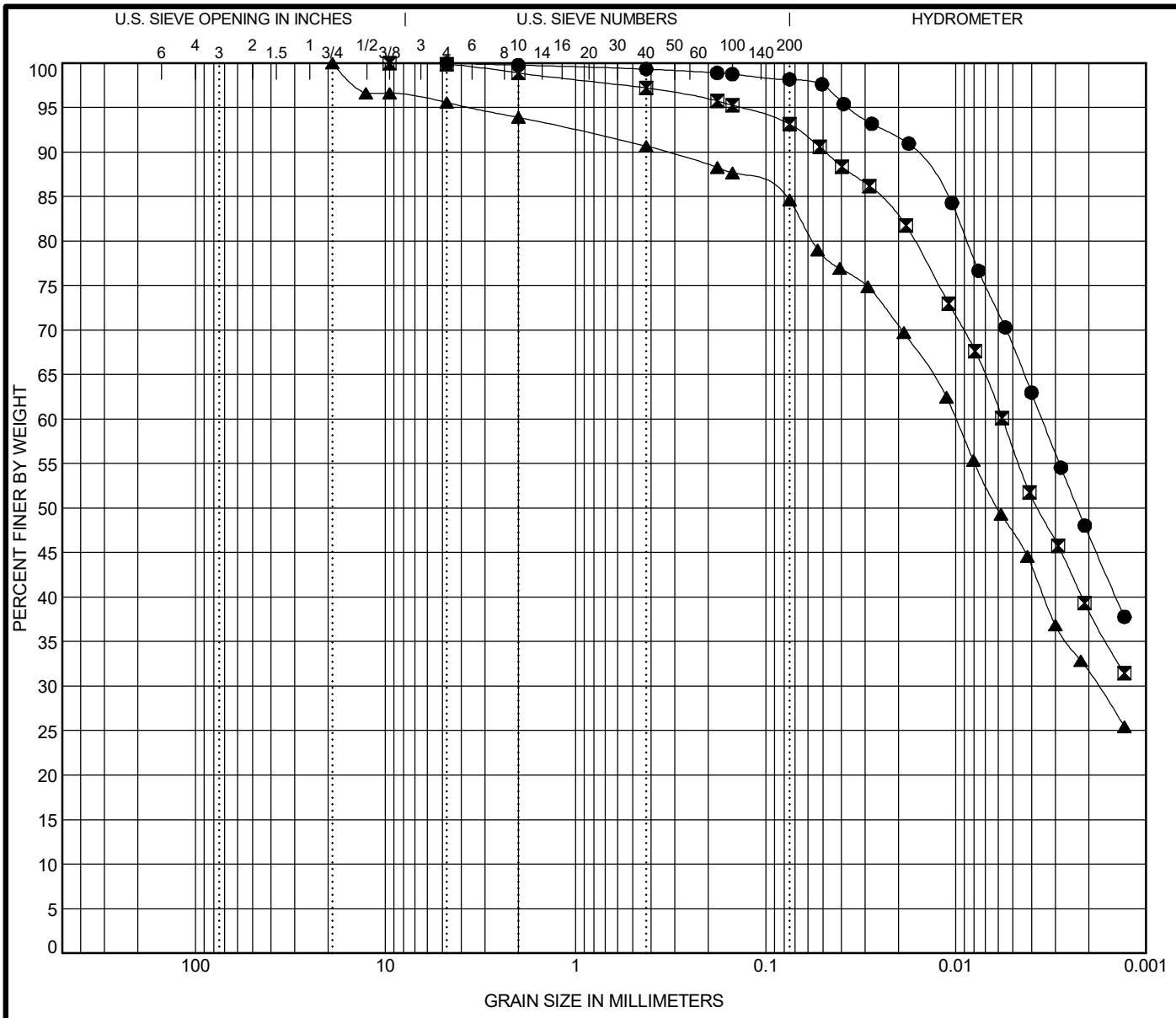
APPENDIX B



COBBLES	GRAVEL	SAND		SILT AND CLAY
		coarse	fine	

Specimen Identification		IDH Classification	LL	PL	PI	Cc	Cu
● BC2-01#4	8.5 ft	**Silty Clay**	**44**	**18**	**26**		
⊠ BC2-02#7	16.0 ft	**Silty Clay**	**34**	**18**	**16**		
▲ BC2-03#9	21.0 ft	**Silty Clay**	**31**	**17**	**14**		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BC2-01#4	8.5 ft	**4.75**	**0.004**			**0.2**	**1.6**	**51.2**	**47.0**
⊠ BC2-02#7	16.0 ft	**9.5**	**0.006**			**1.1**	**5.8**	**54.5**	**38.5**
▲ BC2-03#9	21.0 ft	**19**	**0.01**	**0.002**		**6.1**	**9.5**	**52.9**	**31.5**

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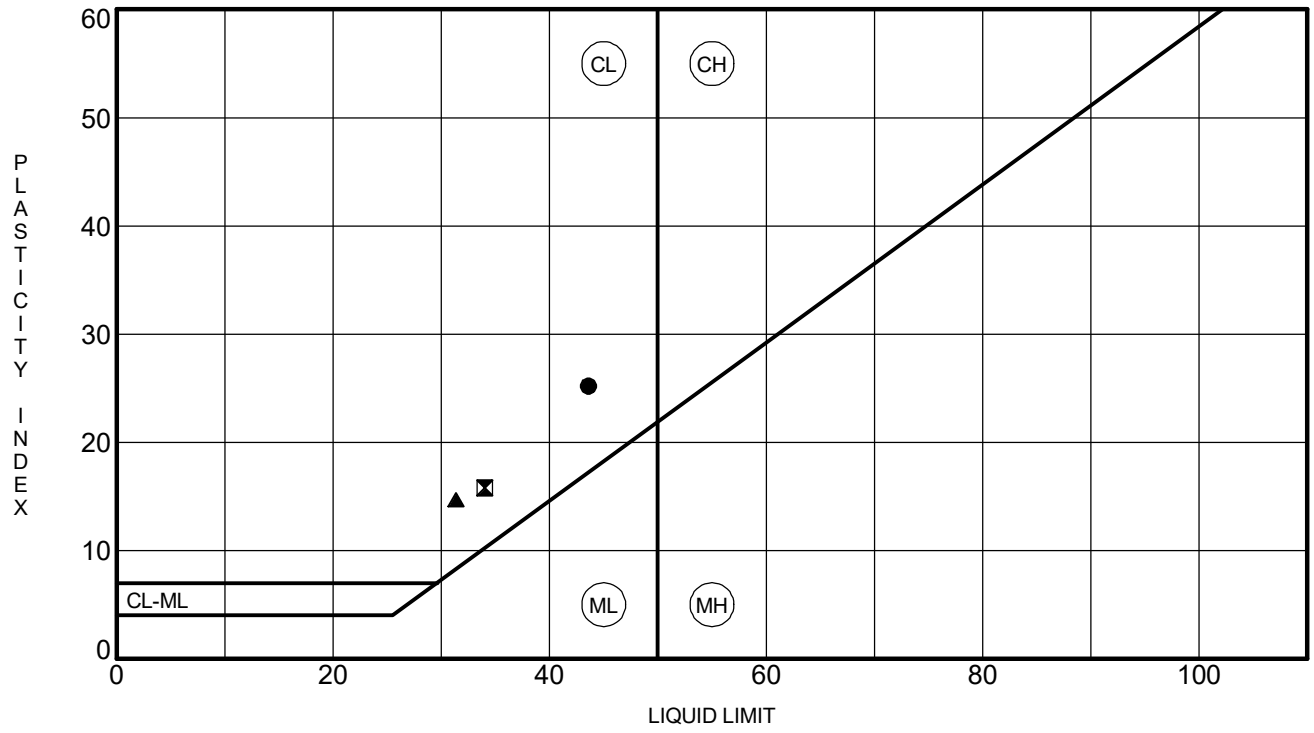
Fax: 630-953-9938

GRAIN SIZE DISTRIBUTION

Project: I-80 Reconstruction (Houbolt Rd to Center St)

Location: Will County, Illinois

Number: 7901-15-01



	Specimen Identification		LL	PL	PI	Fines	IDH Classification
●	BC2-01#4	8.5 ft	44	18	26	98	Silty Clay
⊠	BC2-02#7	16.0 ft	34	18	16	93	Silty Clay
▲	BC2-03#9	21.0 ft	31	17	14	85	Silty Clay

WEI SINCE 1982
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ATTERBERG LIMITS' RESULTS

Project: I-80 Reconstruction (Houbolt Rd to Center St)

Location: Will County, Illinois

Number: 7901-15-01

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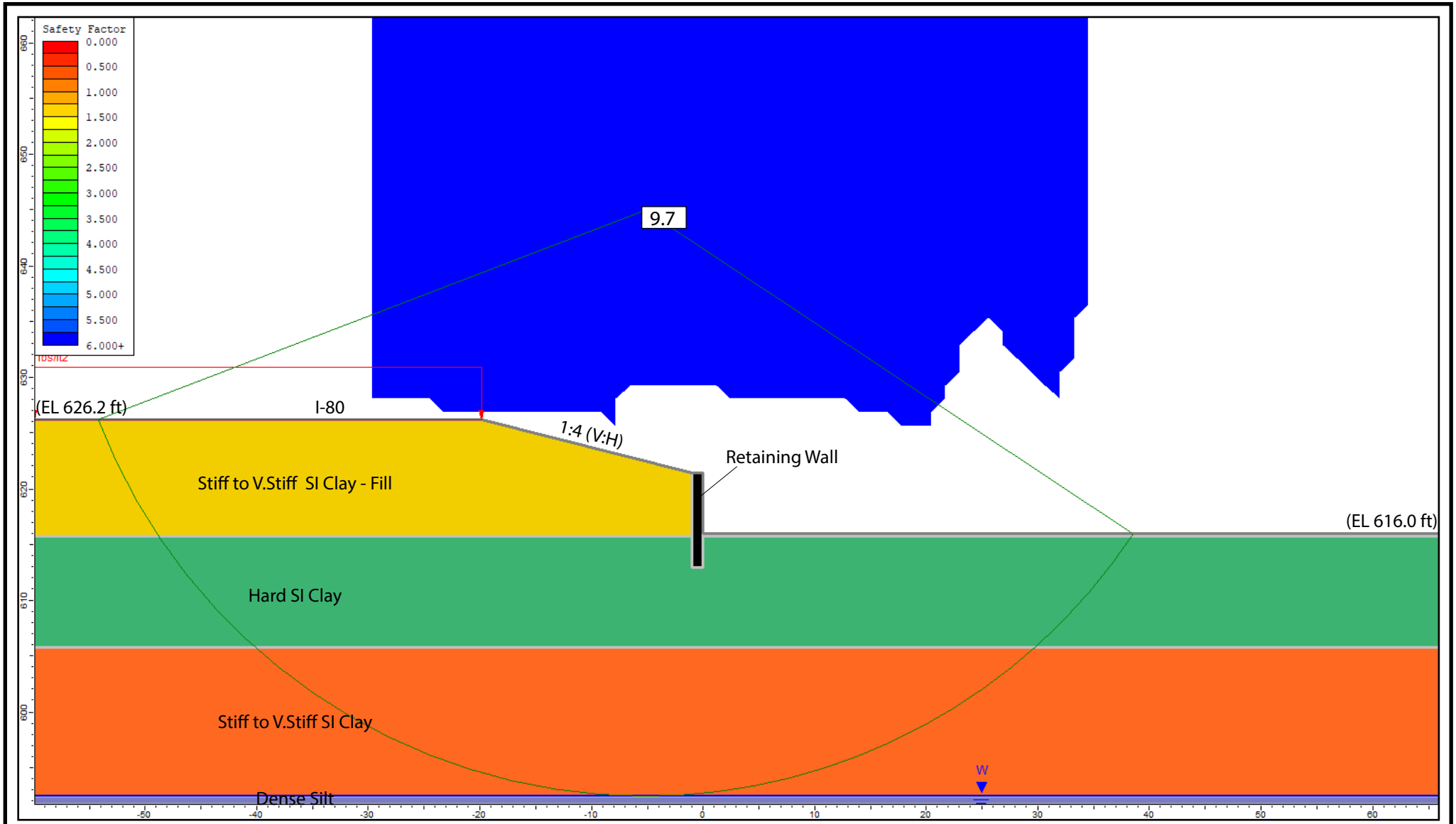
APPENDIX C



Undrained Analysis, Culvert BC2, SN:099-0759, Sta.575+25.00, Ref Boring: BC2-04

Layer ID	Description	Total Unit Weight (pcf)	Undrained Cohesion (psf)	Undrained Friction Angle (degrees)
1	Stiff to V.Stiff SI Clay - Fill	125	1600	0
2	Hard SI Clay	125	4500	0
3	Stiff to V.Stiff SI Clay	120	2000	0
4	Dense Silt	120	0	32

GLOBAL STABILITY: I-80 CULVERT BC2, SN:099-0759; I-80 RECONSTRUCTION FROM HOUBOLT RD TO W CENTER ST & LARKIN AVE INTERCHANGE, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL | APPENDIX C-1 | DRAWN BY: D. You | CHECKED BY: M. Seyhun

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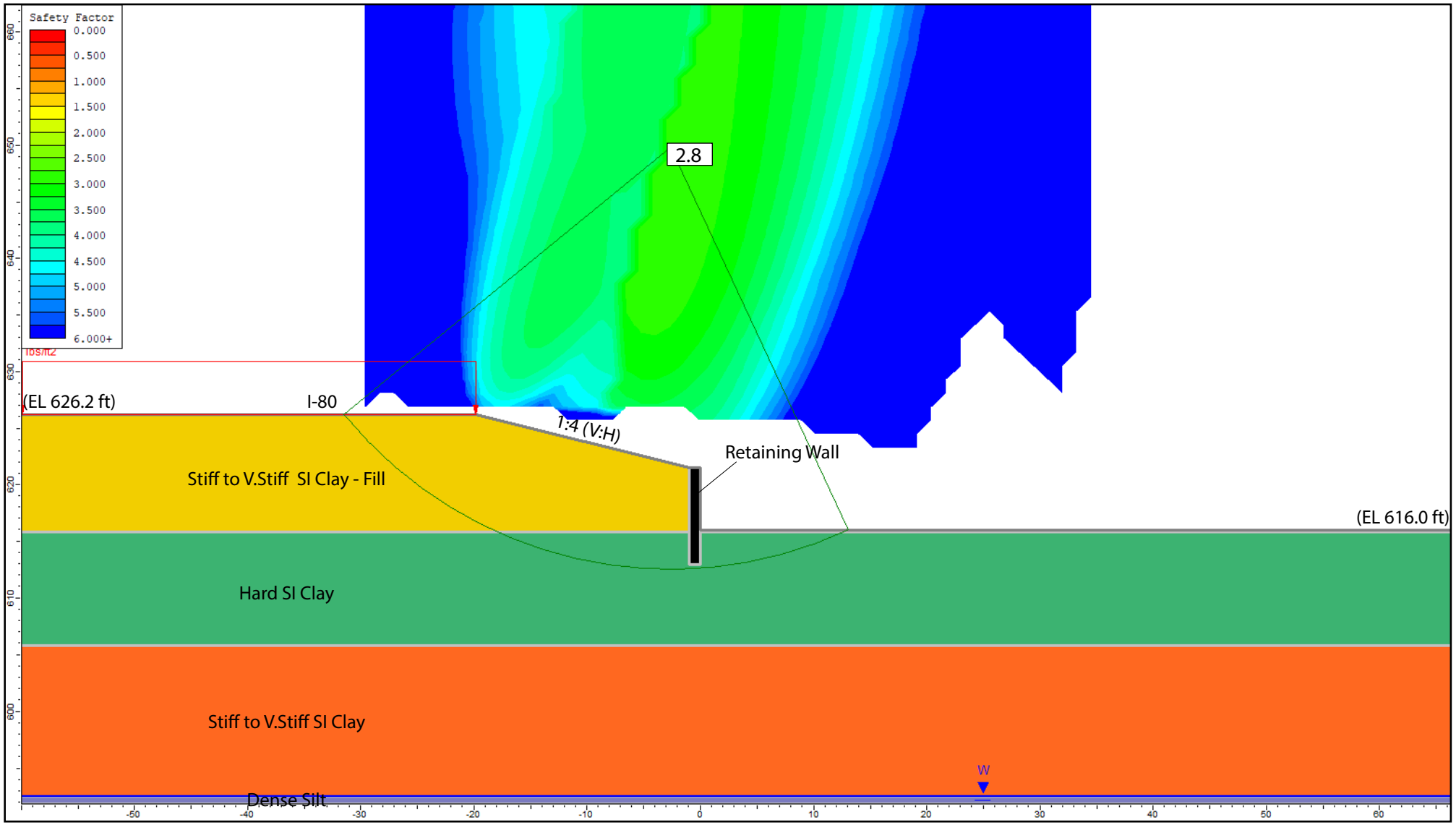
FOR TRANSYSTEMS | KE225089



Drained Analysis, Culvert BC2, SN:099-0759, Sta.575+25.00, Ref Boring: BC2-04

Layer ID	Description	Total Unit Weight (pcf)	Drained Cohesion (psf)	Drained Friction Angle (degrees)
1	Stiff to V.Stiff SI Clay - Fill	125	100	30
2	Hard SI Clay	125	100	32
3	Stiff to V.Stiff SI Clay	120	100	30
4	Dense Silt	120	0	32

GLOBAL STABILITY: I-80 CULVERT BC2, SN:099-0759; I-80 RECONSTRUCTION FROM HOUBOLT RD TO W CENTER ST & LARKIN AVE INTERCHANGE, WILL COUNTY, ILLINOIS

SCALE: GRAPHICAL | APPENDIX C-2 | DRAWN BY: D. You | CHECKED BY: M. Seyhun

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APPENDIX D

Bench Mark: BM 24 Set cut square on northwesterly corner of pier seat of most southerly Larkin Ave bridge pier on South side of Eastbound I-80. Elev. 634.804.

Existing Structure: The existing culvert was originally constructed as a 2-36" pipe culvert, with an overall length of approximately 219'-0"

Salvage: No Salvage.
Traffic will be maintained utilizing Staged Construction.

LOADING HL-93

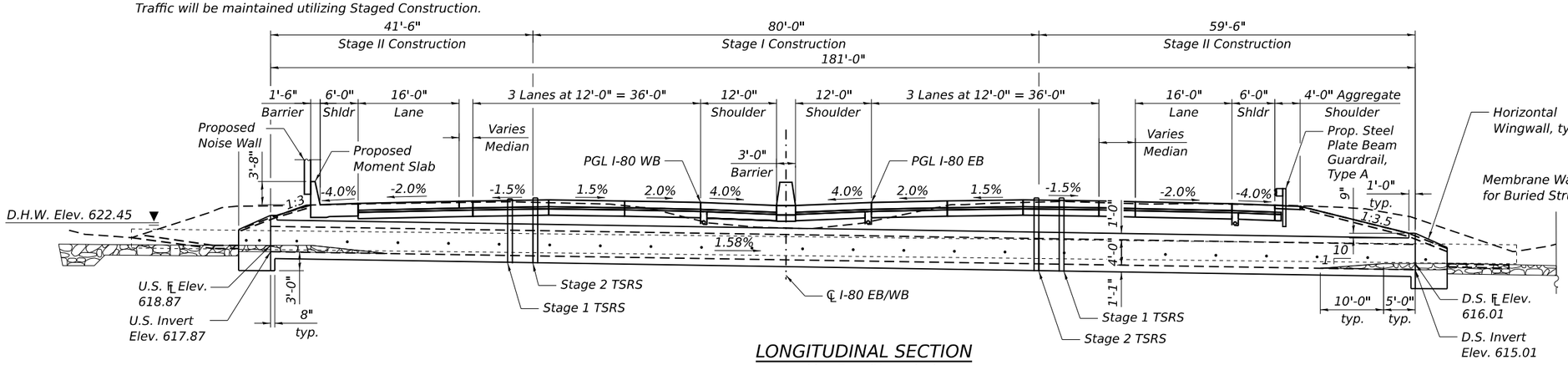
Allow 50 lb/sq.ft. for future wearing surface

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition.

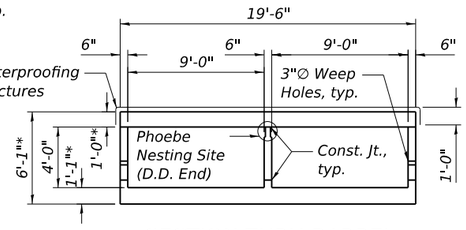
HIGHWAY CLASSIFICATION

F.A.I. Rte. 80 - I-80
Functional Class: Interstate
ADT: 67,430 (2019); 90,100 (2040)
ADTT: 16,116 (2019); 21,534 (2040)
DHV: 9,010 (2040)
Design Speed: 70 mph
Posted Speed: 65 mph
2-Way Traffic
Directional Distribution 50-50



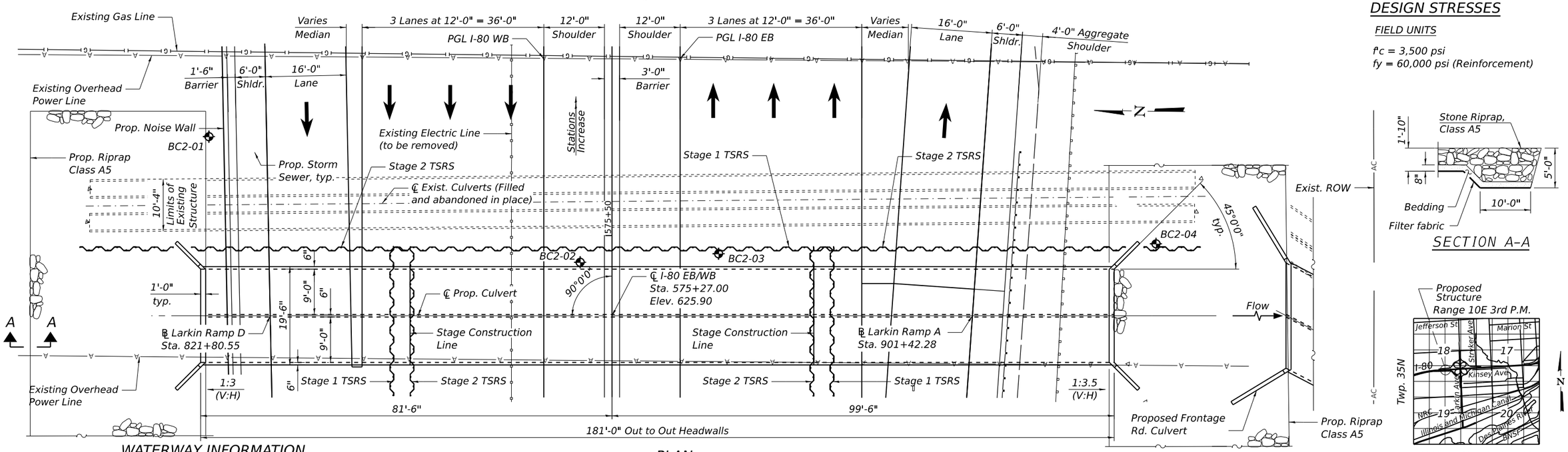
LONGITUDINAL SECTION

Looking East (Upstation)



SECTION THRU BARREL

* Subjected to refinement during final design



PLAN

SECTION A–A

LOCATION SKETCH

WATERWAY INFORMATION

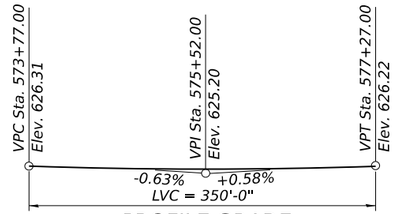
Drainage Area = 0.3 Sq. Mi.
Exist. Overtopping Elev. = 626.02 at Sta. 575+52
Prop. Overtopping Elev. = 625.75 at Sta. 575+27

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.
	2	48	5	19	620.45	0.75	0.46	621.20	620.91
	10	107	9	21	621.25	1.88	0.39	623.13	621.64
Design	50	188	13	30	621.65	4.47	0.80	626.12	622.45
Base	100	234	13	34	621.66	4.58	1.20	626.24	622.86
Overtopping	<500	161	13		621.65	4.35		626.00	
Max. Calc.	500	369	13	46	621.68	4.80	2.38	626.48	624.06

Existing 10-year outlet Velocity = 11.9 ft/s
Proposed 10-year outlet Velocity = 5.8 ft/s

LEGEND:

- Soil Boring
- Exist. Overhead Power Line
- Exist. Gas Line
- Exist. Guardrail
- Prop. Guardrail
- Exist. Electric Line
- Prop. Storm Sewer
- Stone Riparap



PROFILE GRADE

(Along EB I-80 and WB I-80, Inside Edge of Pavement)

DESIGN STRESSES

FIELD UNITS

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

GENERAL PLAN & ELEVATION

I-80 EB/WB OVER ROADWAY DITCH

F.A.I. RTE. I-80
SEC. FAI 80 22 BR
WILL COUNTY
STATION 575+27.00
STRUCTURE NO. 099-0759

MODEL: Default
FILE NAME: pw://transystems-pw.bentley.com:transystcorp-pw1-hosted/Documents/Projects_2018/CH401/401180022/02-TranSystems/CAD/62R89/Sheets/23-Structural/099-0759/099075962R89-TSL 1

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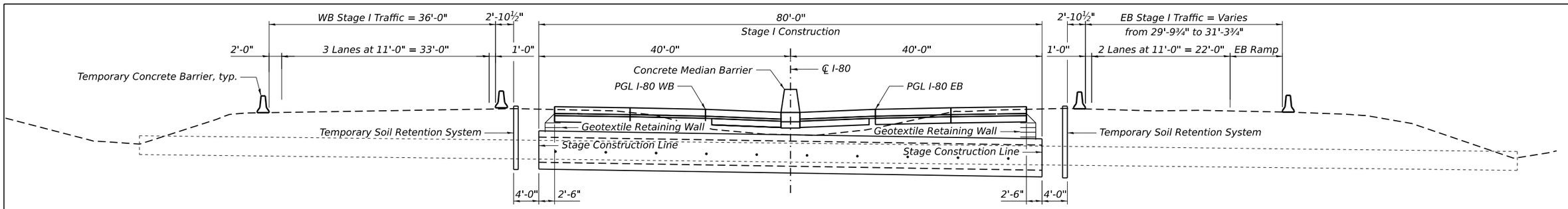
	CHECKED - MDS	REVISED -	
PLOT SCALE = 20.0000 ' / in.	DRAWN - IIP	REVISED -	
PLOT DATE = 4/19/2023	CHECKED - MDS	REVISED -	

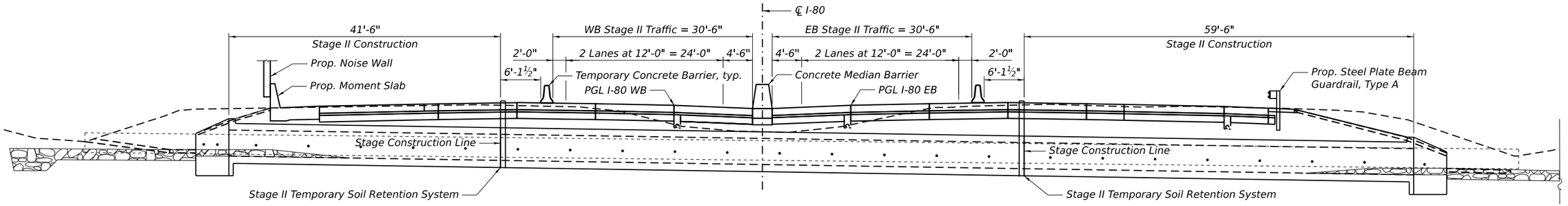
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET S3-01 OF S3-02 SHEETS

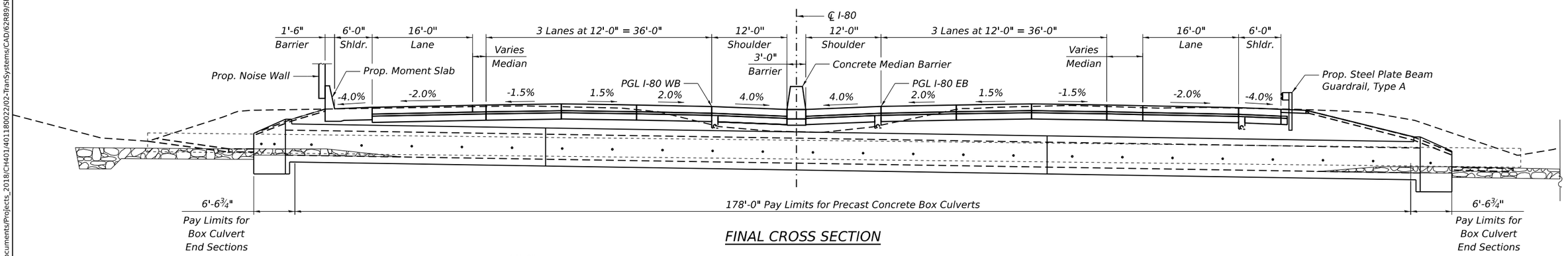
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
I-80	FAI 80 22 BR	WILL	1102	683
		CONTRACT NO. 62R89		
	ILLINOIS	FED. AID PROJECT		



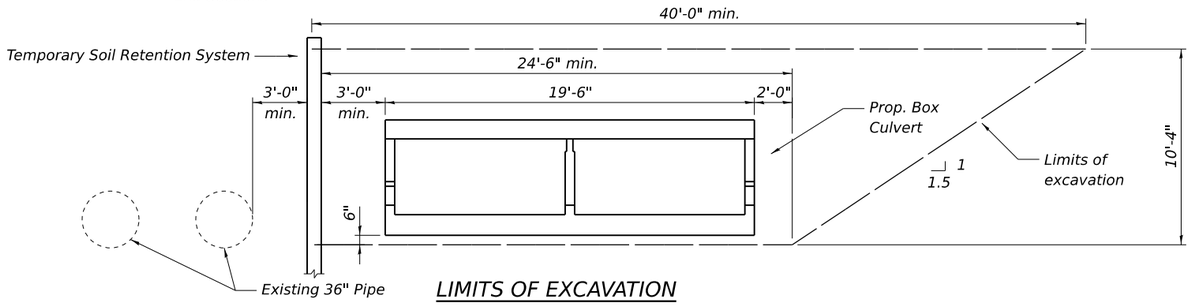
STAGE I CONSTRUCTION



STAGE II CONSTRUCTION



FINAL CROSS SECTION



LIMITS OF EXCAVATION

DETAILS
I-80 EB/WB OVER ROADWAY DITCH
F.A.I. RTE. I-80
SEC. FAI 80 22 BR
WILL COUNTY
STATION 575+27.00
STRUCTURE NO. 099-0759

MODEL: Default
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TRANSYSTEMS

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		CHECKED - MDS	REVISED -		
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PLOT DATE = 4/19/2023		CHECKED - MDS	REVISED -		

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET S3-02 OF S3-02 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
I-80	FAI 80 22 BR	WILL	1102	684
		CONTRACT NO. 62R89		
		ILLINOIS	FED. AID PROJECT	