STRUCTURE GEOTECHNICAL REPORT
CULVERT REPLACEMENT
FAP 308/IL 84 OVER UNNAMED TRIBUTARY
SN. 043-1024 (EXISTING), SN. 043-1117(PROPOSED)
SECTION (103, 104)CR, IDOT JOB P-92-009-15
JO DAVIESS COUNTY, ILLINOIS

For

Baxter & Woodman

8678 Ridgefield Road

Crystal Lake, IL 60012

(815) 459-1260

Submitted by

Wang Engineering, Inc.

1145 North Main Street

Lombard, IL 60148

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Original: May 14, 2020
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Technical Report Documentation Page

1. Title and Subtitle Structure Geotechnical Report, Culvert Replacement FAP 308/IL 84 over Unnamed Tributary		**2. Revised Report Date** March 04, 2021 **3. Report Type** ☒ SGR ☐ RGR ☐ Draft ☐ Final ☒ Revised
4. Route / Section / County FAP 308 (IL 84)/ (103, 104)CR / Jo Daviess		**5. Job No. / Contract No.** P-92-009-15/64K62
6. PTB / Item No. 190/ 024	**7. Existing Structure Number(s)** 043-1024	**8. Proposed Structure Number(s)** 043-1117
9. Prepared by Wang Engineering, Inc. 1145 N Main Street Lombard, IL 60148	**Contributor(s)** Author: Metin W. Seyhun, P.E. QC/QA: Corina T. Farez, P.E., P.G. PM: Metin W. Seyhun, P.E.	**Contact** (630) 953-9928 ext. 1018 mseyhun@wangeng.com
10. Prepared for Baxter & Woodman 8678 Ridgefield Road Crystal Lake, IL 60012	**Design / Structural Engineer** Denis T. Hogan, P.E. Transportation Project Director	**Contact** (815) 459-1260 dhogan@baxterwoodman.com

11. Abstract

The existing 10 feet by 8 feet box culvert carrying Illinois 84 will be replaced by a new 8 feet by 8 feet double barrel cast-in-place concrete box culvert. It will be about 78-foot long with 6° skew. Horizontal cantilever wingwalls will support the widened roadway embankment at the both ends.

In general, the lithologic profile includes very soft to very stiff silty clay to silty clay loam followed by very loose to loose silty loam to loam. Underneath the silty loam lies soft to stiff silty clay or very loose to loose silty loam to sandy loam. All granular and cohesive soils have high moisture contents. Groundwater was encountered while drilling within silty loam at elevations of 584.9 to 591.3 feet (14.5 and 19.5 bgs). At the completion of drilling, groundwater was measured at an elevation of 567.3 to 578.4 feet (21 to 43.5 feet bgs).

This investigation revealed up to 30-foot thick unstable very loose to loose granular soil and soft to stiff cohesive soil. This cohesive had moisture content as high as 36% and unconfined compressive strength as low as 0.2 tsf. We estimate this soil carrying the proposed culvert will undergo settlement of about 1.5 inches, which is excessive.

To reduce settlement and provide a working platform, we recommend treatment by removing 4 feet of the unstable loam to silty loam layer along the footprint of culvert and replacing it with Rockfill capped with CA 6 or CA 10 to reduce differential settlement and create a working platform. After treatment, settlement is estimated to be ½-inch or less. The extent of removal and replacement will be based on actual conditions encountered during construction.

A temporary cantilever sheet piling system was found not feasible, thus a Temporary Soil Retention System (TSRS) is recommended. A temporary geotextile retaining wall may also be used for the retention of Stage I construction backfill over the new culvert.

12. Path to archived file

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Wang Engineering

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JO DAVIESS COUNTY, ILLINOIS
FOR
BAXTER & WOODMAN

1.0 INTRODUCTION

This report presents the results of our subsurface investigation, laboratory testing, geotechnical evaluations, and recommendations to support the removal and replacement of the existing culvert carrying Illinois Route 84 (IL 84) over Unnamed Tributary in Jo Daviess County, Illinois. A *Site Location Map* is presented as Exhibit 1.

1.1 Proposed Structure

Based on *Preliminary Design Drawings* (Appendix B) provided by Baxter and Woodman (B&W), Wang Engineering, Inc. (Wang) understands the existing culvert (SN043-1024) is located 0.90 mile northwest of Whitton Road, at Station 144+10, along IL 84 will be removed and replaced.

Wang understands the proposed structure (SN 043-1117) will be a double barrel 8 feet by 8 feet-Cast-in-place Concrete Box Culvert with horizontal cantilever wingwalls. The structure length will measure about 78.0 feet, and the out-to-out width estimated to measure about 18 feet (8 inches wall thickness) with 6 degree skew to the IL 84 centerline. The upstream invert elevation will be 595.52 feet and the downstream invert elevation will be at 595.17 feet.

1.2 Existing Structure

The existing structure (SN 043-1024) is a single barrel 8 feet wide by 10 feet high and 58 feet long box culvert. It carries an unnamed tributary to Apple River flowing from northeast to southwest under IL 84. It has a length of approximately 58 feet from face to face and has 0 degree skew to IL 84 the centerline.

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 and wingwalls.

2.0 METHODS OF INVESTIGATION

2.1 Subsurface Investigation

The subsurface investigation was performed by IDOT in 2014. Logs of Borings B-1 and B-2, drilled on December 10 and 11, 2014, were used for our culvert evaluation. Northing, Easting, Elevations, and Stations and offsets were provided on the logs. Boring locations data are presented in the *Boring Logs* (Appendix A), and the as-drilled boring locations are shown in the *Boring Location Plan* (Exhibit 2).

2.2 Laboratory Testing

No laboratory testing information was provided except for the moisture contents shown on the boring logs.

3.0 INVESTIGATION RESULTS

Detailed descriptions of the soil conditions encountered during the subsurface investigation by IDOT are presented in the attached *Boring Logs* (Appendix A) and in the *Soil Profile* (Exhibit 3).

3.1 Lithological Profile

In descending order, the general lithologic succession encountered includes 1) very soft to very stiff silty clay to silty clay loam, 2) very loose to loose silty loam to loam, 3) soft to stiff silty clay, 4) very loose to loose silty loam, 5) soft to stiff silty clay, and 6) loose silt, silty loam to sandy loam

1) Very soft to very stiff silty clay to silty clay loam

The borings encountered up to 11.5 feet below ground surface (bgs) of very soft to very stiff, brown, dark brown to gray silty clay to silty clay loam. The clayey soils had unconfined compressive strength (Qu) values of 0.2 to 2.5 tsf with moisture content values ranging from 19 to 35%. Borings encountered interbedded layer of very loose to loose, gray and tan silty loam with SPT-N values of 3 and 7 and moisture contents of 25 and 28%.

2) Very loose to loose silty loam to loam

At elevations of about 590.4 to 599.3 feet, borings encountered up to 10-foot thick layer of very loose to loose, light brown and gray silty loam to loam. This layer had SPT N-values of 1 and 5 blows/foot with moisture contents of 24 to 30%.

3) Soft to stiff silty clay

At elevations of about 584.9 to 589.3 feet, borings encountered up to 5-foot thick layer of soft to stiff, gray silty clay with Qu values of 0.3 to 1 tsf and moisture content values of 27 to 33%.

4) Very loose to loose silty loam

At elevations of about 580.4 to 584.3 feet, borings encountered up to 10-foot thick layer of very loose to loose, gray silty loam with SPT-N values of 3 to 7 and moisture content values of 25 to 34%

5) Soft to stiff silty clay

At elevations of about 572.9 to 574.3 feet, borings encountered up to 5-foot thick layer of soft to stiff gray silty clay with Qu values of 0.3 to 1.1 tsf and moisture content values of 28 to 29%.

6) Loose silt, silty loam to sandy loam

At elevations of about 567.9 to 571.8 feet to boring termination depths, borings encountered loose, gray silt, silty loam to sandy loam with SPT-N values of 4 to 5 and moisture content values of 28 to 36%. Below sandy loam, Boring B-2 encountered soft, gray clay loam with Qu value of 0.3 tsf and moisture content of 36%.

3.2 Groundwater Conditions

While drilling, groundwater encountered at 584.9 and 591.36 feet elevation (14.5 to 19.5 feet bgs) within the silty loam. At the completion of drilling, groundwater encountered at 567.3 to 578.4 feet (21.0 to 43.5 bgs) within silty loam.

4.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

Geotechnical evaluations and recommendations for the design and construction of culvert and wingwalls are included in this section. The upstream invert elevation will be 595.73 feet and the downstream invert elevation will be at 595.42 feet based on preliminary drawings provided by B&W.

Horizontal cantilever wingwalls will be used to support the roadway embankment. These walls are structurally designed as part of the culvert and are supported through cantilever action without footings.

4.1 Bearing Capacity and Settlement

Existing culvert will be completely removed and replaced with a double barrel box culvert. The new culvert footprint will extend beyond the existing culvert. The concern would be the differential settlement between existing consolidated culvert footprint and the new culvert sections bearing upon the virgin soils. Bearing capacity is not a concern since the culvert weighs less than the adjacent soil.

Settlement analyses was performed for the culvert barrels based on the boring information, and the estimated culvert and roadway fill pressures applied to the full width of the culvert at the proposed foundation bearing estimated at about 595 feet elevation.

Culvert Foundation

Boring B-1and B-2 revealed up to 30 feet of very loose to loose sandy loam, loam to silty loam layer or soft to stiff silty clay below the base of the proposed culvert. This layer had a high moisture content of 36% and a low unconfined compressive strength of 0.2 tsf indicative of unstable soils. Our analyses showed settlement of about 1.5 inches, which is excessive. Since the culvert channel will extend southwest into the Apple River, soft stream deposits might be present below the culvert.

Therefore, we recommend removing 4 feet of the unstable loam to silty loam layer throughout the length of culvert to an elevation of 590.6 feet and replacing it with Rockfill capped with 6 inches of CA-6 or CA-10 as per IDOT Special Provision (IDOT 2016a) to reduce differential settlement and create a working platform. The replacement material should extend a minimum of 4 feet beyond each side of the box (IDOT 2016). The settlement after treatment will be less than ½-inch. Precast sections shall be designed to be able to tolerate the differential settlement. Settlements collars may be used as necessary to further reduce minimize the differential settlement. Horizontal wingwalls with cutoff walls should be placed 3 feet below bottom the invert elevation.

Culvert barrel should be designed as per Section 542.0 (IDOT 2016). Wingwalls should be designed based on the information and typical sections shown in Sections 4.2 of IDOT *Culvert Manual* (IDOT 2017). For a precast culvert, a minimum of 6 inches of porous granular bedding is required as per article 540.06 of standard specifications (IDOT 2016).

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Site Preparation

Existing culvert, vegetation, surface topsoil, and debris should be cleared and stripped where the new culvert and wingwalls 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 the roadway and nearby 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.

The groundwater elevation along the culvert alignment is expected to be as high as 591.3 feet which is about 4 feet below the proposed culvert bearing elevation. Seasonal water table fluctuations may occur. Fluctuations in water table occur based on seasonal variation. Temporary dewatering of the foundation excavations may be required via sump or similar dewatering methods. Any water that accumulates in open excavations by seepage or runoff should be immediately removed by sump pump. Unstable or unsuitable materials exposed during excavation should be removed and replaced with compacted structural fill as described in Section 6.3. The following note should be included:

The limits and quantities of removal and replacement recommended are based on boring data and may be modified by the District Geotechnical and Field Engineers for variable surface conditions encountered in the field.

In cases where replacement below the 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 CA 6 or CA 10 as per IDOT Special Provisions. The cost of the capping material shall be included in the pay item for Rockfill.

5.3 Filling and Backfilling

Coarse aggregate of IDOT gradation CA-7, CA-11, or CA-18 or pre-approved, compacted, on-site excavated soil conforming to IDOT Specifications for Road and Bridge Construction Section 204 would be acceptable as engineered fill (IDOT 2016). 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 2016).

The materials used to backfill around culvert, and to a level at least 1 foot over the top of the culvert barrel, should be porous granular material conforming to the requirements specified in the IDOT Recurring Special Provision, *Granular Backfill for Structures* (IDOT 2021). From the line 1 foot above the top of the culvert the fill materials used to attain the final design grade could be *Granular Backfill for Structures* (IDOT 2016). Trench backfill shall be compacted to minimum of 95% of standard laboratory density.

5.4 Stage Construction Considerations

Stage construction will be used for construction of the new culvert. A temporary cantilever sheet piling system is not feasible based on IDOT methods, thus a Temporary Soil Retention System (TSRS) is recommended. A temporary geotextile retaining wall may also be used for the retention of Stage I construction backfill over the new culvert.

5.5 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. In the event that any changes in the design and/or location of the structure are planned, we should be timely informed so that our recommendations can be adjusted accordingly.

It has been a pleasure to assist Baxter & Woodman and the Illinois Department of Transportation District 2 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.
Project Manager

Ramesh KC, P.E.
Geotechnical Engineer

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

REFERENCES

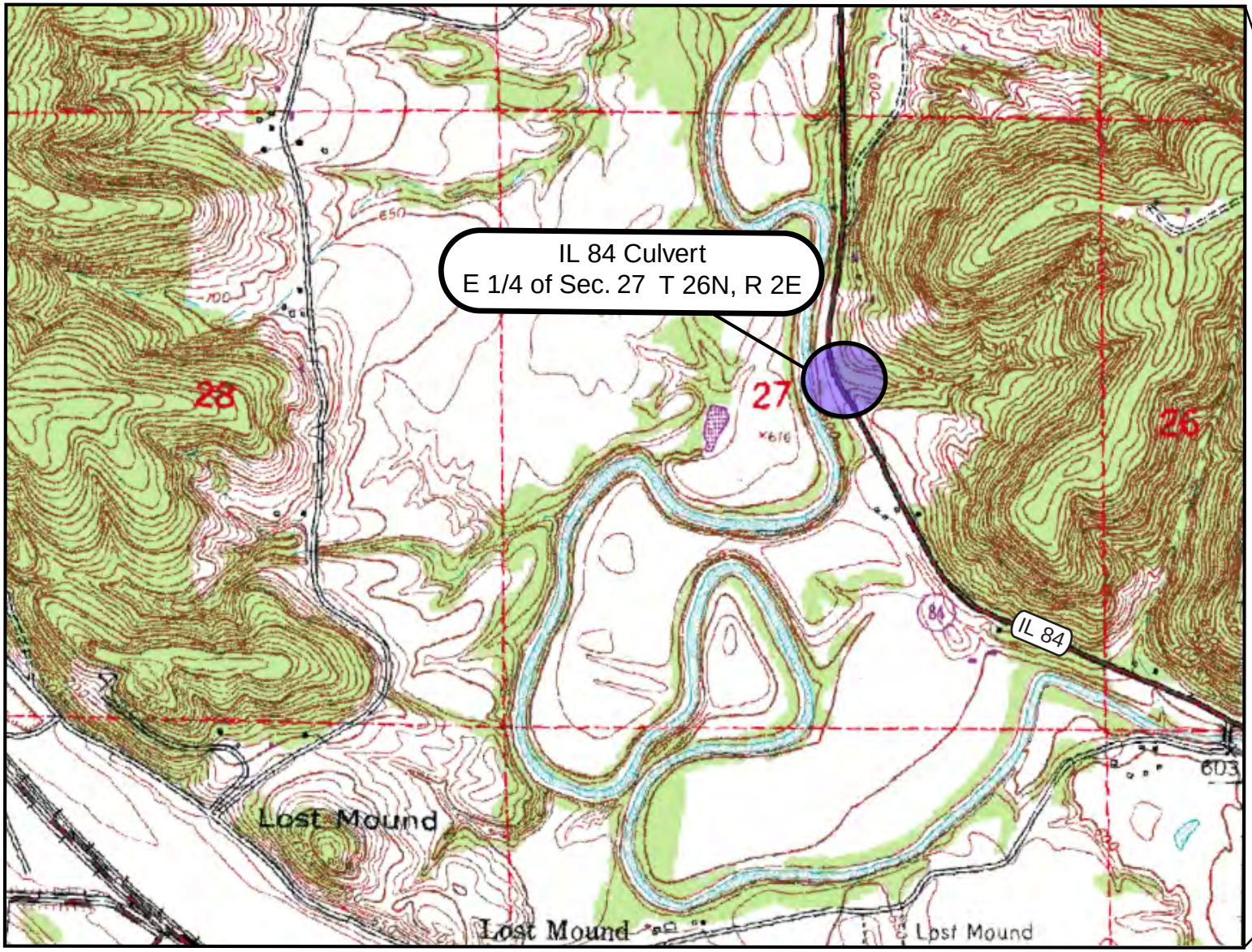
ILLINOIS DEPARTMENT OF TRANSPORTATION (2016) *Standard Specifications for Road and Bridge Construction*, Springfield, IL.

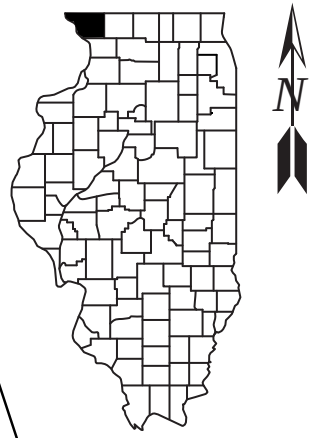
ILLINOIS DEPARTMENT OF TRANSPORTATION (2016a) *Special Provisions for Aggregate Subgrade Improvement*, Springfield, IL.

ILLINOIS DEPARTMENT OF TRANSPORTATION (2017) *Culvert Manual,* Springfield, IL.

ILLINOIS DEPARTMENT OF TRANSPORTATION (2021) *Supplemental Specifications and Recurring Special Provisions,* Springfield, IL.

EXHIBITS





Jo Daviess County

Scale

0 0.5 1.0 Mile

SITE LOCATION MAP: FAP ROUTE 308 (IL 84), IL 84 CULVERT, SN. 043-1117, JO DAVIESS, COUNTY, IL

SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: RKC CHECKED BY: M. Seyhun

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FOR BAXTER AND WOODMAN

132-11-01

Legend

IDOT Boring Location

Scale

0 150 300 Feet

BORING LOCATION PLAN: FAP ROUTE 308 (IL 84), IL 84 CULVERT, SN. 043-1117, JO DAVIESS, COUNTY, IL

SCALE: GRAPHICAL	EXHIBIT 2	DRAWN BY: RKC CHECKED BY: M. Seyhun

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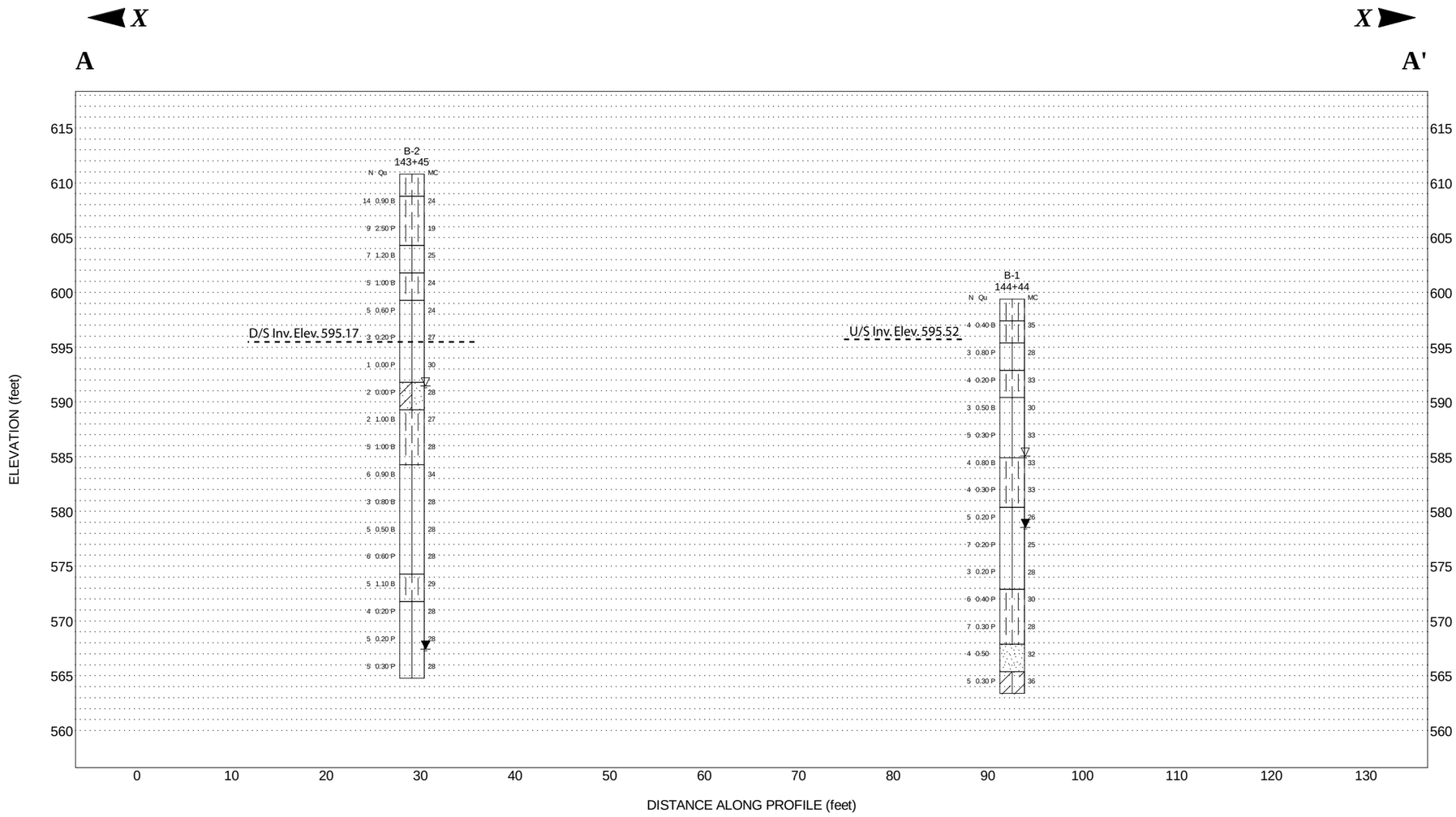
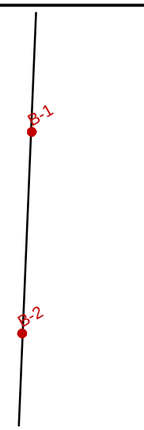


Lithology Graphics

- IDH Silty Clay, Silty Clay Loam
- IDH Silt, Silty Loam
- IDH Sand, Sandy Loam
- IDH Clay Loam
- IDH Loam



Site Map Scale 1 inch equals 50 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: 1x

Wang Engineering, Inc.
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Lombard, IL 60148

Subsurfce Data Profile
IL 84 Box Culvert, 2 1/4 miles south of Hanover

IL 84 Box Culvert, 2 1/4 miles south of Hanover
Hanover Twp, Jo Davies County, IL

JOB NUMBER	PLATE NUMBER
132-11-01	EXHIBIT 3

WEI 11X17 1321101.GPJ WANGENG.GDT 4/14/20

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APPENDIX A

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 12/10/14

ROUTE FAP 308 (IL 84) DESCRIPTION P92-009-15 64K62 Box Culvert, 2 1/4 miles south of Hanover LOGGED BY W. Garza

SECTION (103,104)CR LOCATION Hanover Twp. - 27NE, SEC. , TWP. 26N, RNG. 2E

COUNTY Jo Daviess DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME-45 Automatic

STRUCT. NO. 043-1024
Station 144+10

Latitude
Longitude

Northing
Easting

BORING NO. B-1
Station 144+44
Offset 43.00ft Rt CL
Ground Surface Elev. 599.40 ft

Surface Water Elev. ft
Stream Bed Elev. 597.90 ft

Groundwater Elev.:
First Encounter 584.9 ft ▼
Upon Completion 578.4 ft ▽
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-90.263259 42.217741 VERY SOFT dark brown SILTY CLAY LOAM with 10% ORGANICS	597.40		0.2 P	55.0
SOFT dark gray SILTY CLAY LOAM	595.90	1 1 3	0.4 B	35.0
MEDIUM gray SILTY LOAM	-5 593.40	2 1 2	0.8 P	28.0
VERY SOFT gray SILTY CLAY with ORGANICS	590.90	0 1 3	0.2 P	33.0
MEDIUM gray SILTY LOAM	-10 588.40	1 1 2	0.5 B	30.0
SOFT gray SILTY LOAM	585.90	0 2 3	0.3 P	33.0
MEDIUM gray SILTY CLAY	-15 583.40	1 2 2	0.8 B	33.0
SOFT gray SILTY CLAY	580.90	1 1 3	0.3 P	33.0
VERY SOFT gray SILTY LOAM	-20	1		
VERY SOFT gray SILTY LOAM *(continued)*	578.40▽	2 3	0.2 P	26.0
VERY SOFT gray SILTY LOAM	575.90	0 3 4	0.2 P	25.0
VERY SOFT gray SILTY LOAM	-25 573.40	0 0 3	0.2 P	28.0
SOFT gray SILTY CLAY	570.90	1 2 4	0.4 P	30.0
SOFT gray SILTY CLAY	-30 568.40	2 2 5	0.3 P	28.0
VERY LOOSE gray SANDY LOAM	565.90	0 1 3	0.5 E	32.0
SOFT gray CLAY LOAM	-35 563.40	1 2 3	0.3 P	36.0
End of Boring	-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 12/11/14

ROUTE FAP 308 (IL 84) **DESCRIPTION** P92-009-15 64K62 Box Culvert, 2 1/4 miles south of Hanover **LOGGED BY** W. Garza

SECTION (103,104)CR **LOCATION** Hanover Twp. - 27NE, **SEC.** , **TWP.** 26N, **RNG.** 2E

COUNTY Jo Daviess **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME-45 Automatic

STRUCT. NO. 043-1024
Station 144+10

Latitude _____ **Northing** _____
Longitude _____ **Easting** _____

BORING NO. B-2
Station 143+45
Offset 22.00ft Lt CL
Ground Surface Elev. 610.80 ft

Surface Water Elev. _____ ft
Stream Bed Elev. 597.90 ft

Groundwater Elev.:
First Encounter 591.3 ft ▼
Upon Completion 567.3 ft ▽
After _____ **Hrs.** _____ ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
-90.263270 42.217567 SOFT brown SILTY CLAY LOAM			0.3 P	22.0
	608.80			
MEDIUM brown SILTY CLAY LOAM		3 3 11	0.9 B	24.0
	607.30			
VERY STIFF tan/gray SILTY CLAY LOAM	-5	5 4 5	2.5 P	19.0
	604.80			
STIFF tan SILTY LOAM		1 3 4	1.2 B	25.0
	602.30			
STIFF brown SILTY CLAY LOAM	-10	1 2 3	1.0 B	24.0
	599.80			
MEDIUM light brown SILTY LOAM		1 2 3	0.6 P	24.0
	597.30			
VERY SOFT light brown SILTY LOAM	-15	0 1 2	0.2 P	27.0
	594.80			
VERY SOFT light brown SILTY LOAM		0 0 1	0.0 P	30.0
	592.30			
	▼ -20	0		

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
VERY SOFT gray LOAM with SAND lens *(continued)*		1 1	0.0 P	28.0
	589.80			
STIFF gray SILTY CLAY		0 0 2	1.0 B	27.0
	587.30			
STIFF gray SILTY CLAY with ORGANICS (shells)	-25	1 2 3	1.0 B	28.0
	584.80			
MEDIUM gray SILTY LOAM		1 2 4	0.9 B	34.0
	582.30			
MEDIUM gray SILTY LOAM	-30	0 1 2	0.8 B	28.0
	579.80			
MEDIUM gray SILTY LOAM		0 2 3	0.5 B	28.0
	577.30			
MEDIUM gray SILTY LOAM	-35	0 2 4	0.6 P	28.0
	574.80			
STIFF gray SILTY CLAY		0 1 4	1.1 B	29.0
	572.30			
VERY SOFT gray SILT	-40	0		

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 12/11/14

ROUTE FAP 308 (IL 84) DESCRIPTION P92-009-15 64K62 Box Culvert, 2 1/4 miles south of Hanover LOGGED BY W. Garza

SECTION (103,104)CR LOCATION Hanover Twp. - 27NE, SEC. , TWP. 26N, RNG. 2E

COUNTY Jo Daviess DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME-45 Automatic

STRUCT. NO. 043-1024
Station 144+10

Latitude
Longitude

Northing
Easting

BORING NO. B-2
Station 143+45
Offset 22.00ft Lt CL
Ground Surface Elev. 610.80 ft

Surface Water Elev. ft
Stream Bed Elev. 597.90 ft

Groundwater Elev.:
First Encounter 591.3 ft
Upon Completion 567.3 ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
VERY SOFT gray SILT *(continued)*	569.80	1 3	0.2 P	28.0
VERY SOFT gray SILTY LOAM with CLAY lens	567.30 ▽	0 2 3	0.2 P	28.0
SOFT gray SILTY LOAM with SAND lens	564.80	0 2 3	0.3 B	28.0
End of Boring				

-45
-50
-55
-60

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

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APPENDIX B

Bench Mark: J0D84-1A Horiz/Vert Monument GPS Base Location N 2030419.88 E 2269958.64 Elevation 633.28.

Existing Structures: S.N. 043-1024 was originally constructed in 1927 as cast-in-place single box culvert 8'-0" wide and 10'-0" high and 58'-0" long. The existing structure to be removed and replaced with a cast-in-place double box culvert 8'-0" wide by 8'-0" high and 88'-0" long.

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

DESIGN STRESSES

FIELD UNITS

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

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

LOADING HL-93

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

HIGHWAY CLASSIFICATION

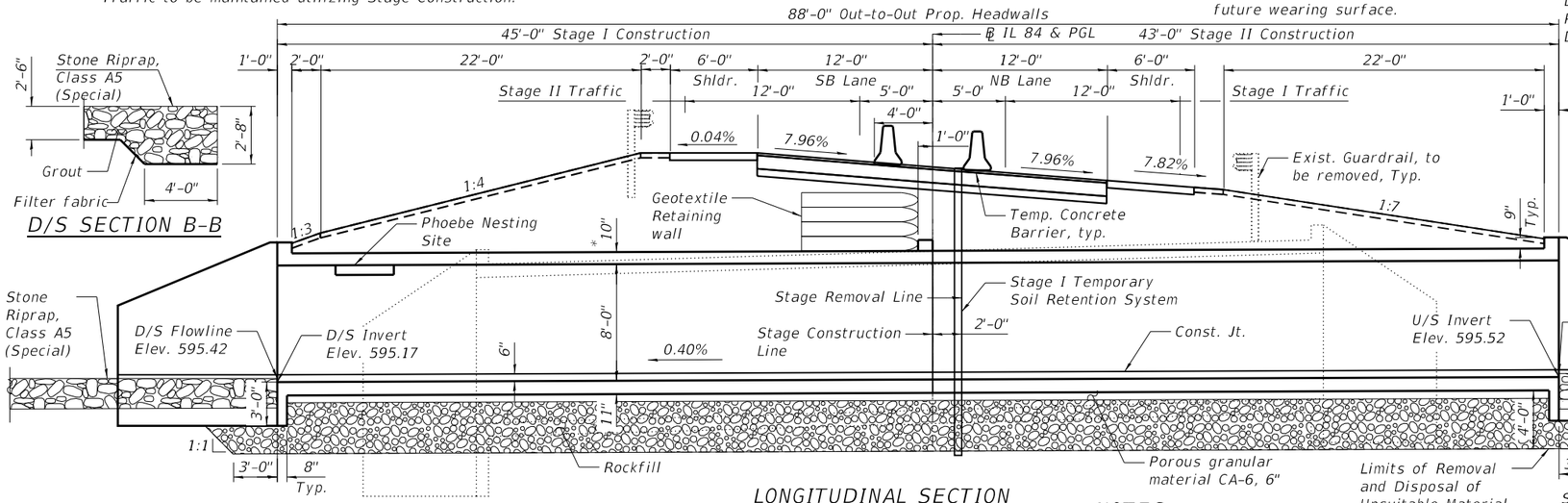
F.A.P. Rte. 308- IL 84
Function Class: Other Principal Arterial
ADT: 1550 (2019); 650 (2039)
ADTT: 264 (2019); 111 (2039)
DHV:210
Posted Speed: 50 mph
Design Speed: 50 mph

WATERWAY INFORMATION

Drainage Area = 130.8 acres
Existing Low Grade Elev. 607.72 ft at Sta. 146+06
Proposed Low Grade Elev. 607.72 ft at Sta. 146+06

Flood Event	Frequency Year	Discharge CFS	Headwater Elev. (ft) Exist.	Prop.
Ten-Year	10	154	598.98	597.94
Design	50	228	599.19	598.59
Base	100	268	599.35	598.91
Max Calc	500	391	600.32	599.82

10-Year Velocity through Existing Culvert = 2.6 ft/s
10-Year Velocity through Proposed Culvert = 7.5 ft/s



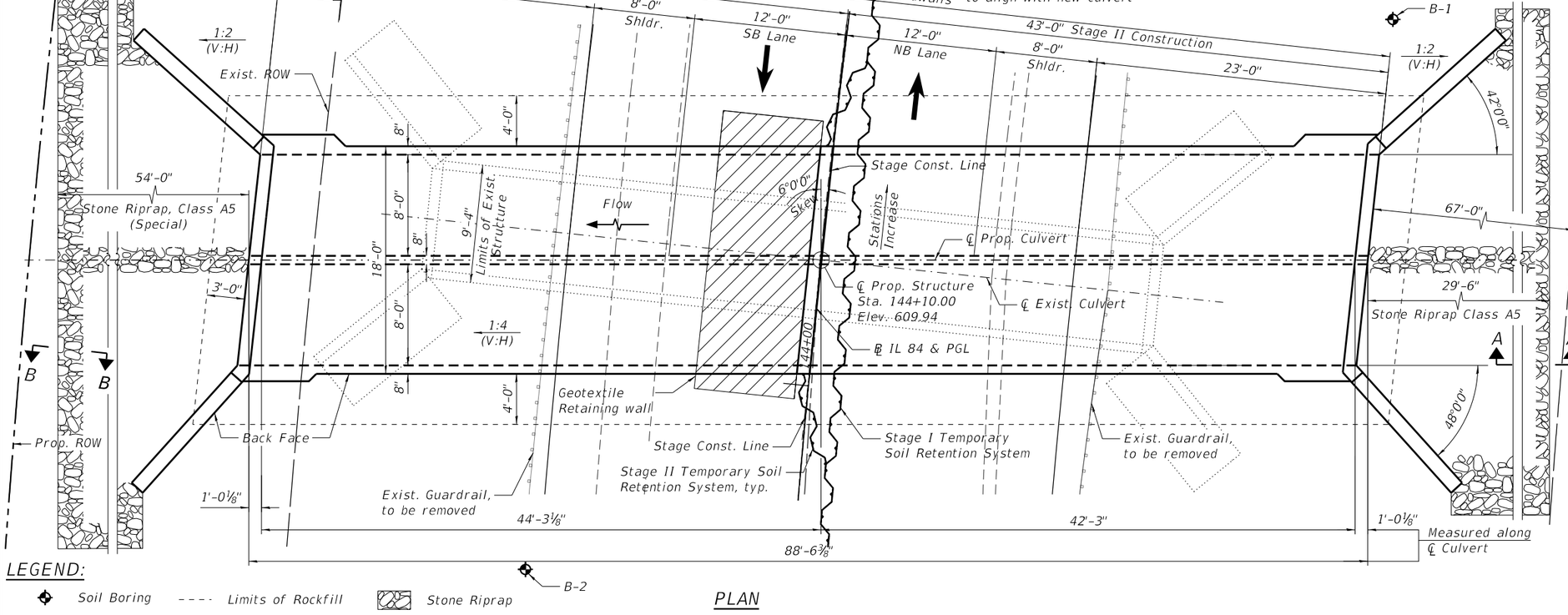
LONGITUDINAL SECTION

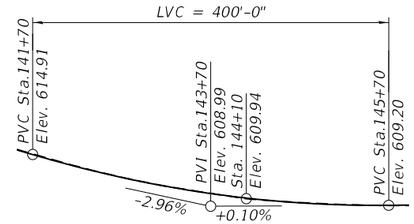
(dimension at Rt. L's to ℄ Roadway)
(Looking Upstation)

NOTES:

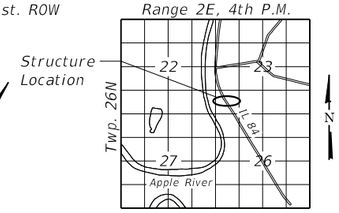
1. Rockfill shall be capped with 6 in. of CA-6. Cost of capping material included in the pay item for Rockfill.

2. Upstream and downstream channels are to be regraded to align with new culvert





PROFILE GRADE
(Along ℄ IL 84)



LOCATION SKETCH

LEGEND:
Soil Boring ---- Limits of Rockfill Stone Riprap

PLAN

GENERAL PLAN AND ELEVATION
IL 84 OVER CREEK
FAP RTE 308 - SEC (103,104)CR
JO DAVIESS COUNTY
STATION 144+10.00
S.N. 043-1117

HBM ENGINEERING GROUP, LLC

USER NAME =	DESIGNED - MAA, EBK	REVISED -	
	CHECKED - MI, RTB	REVISED -	
PLOT SCALE =	DRAWN - MAA, EBK	REVISED -	
PLOT DATE = 3/4/2021	DATE - 03/04/2021	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
308	(103,104) CR	JO DAVIESS	2	1
		CONTRACT NO. 64K62		
	ILLINOIS	FED. AID PROJECT		

MODEL: Default
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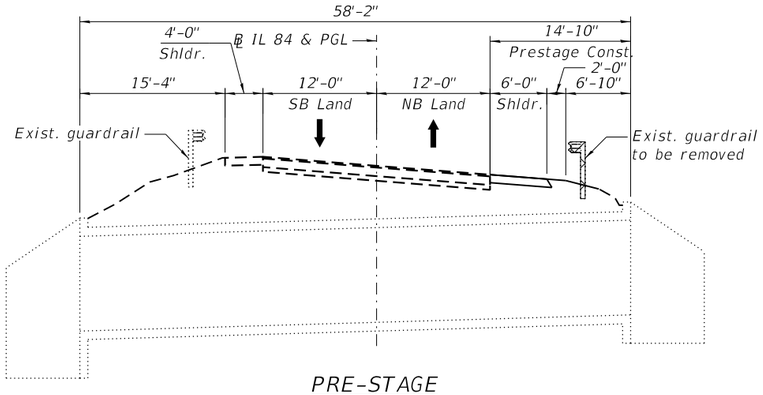
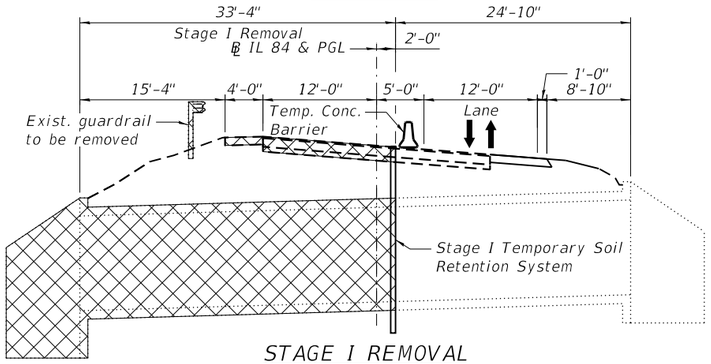
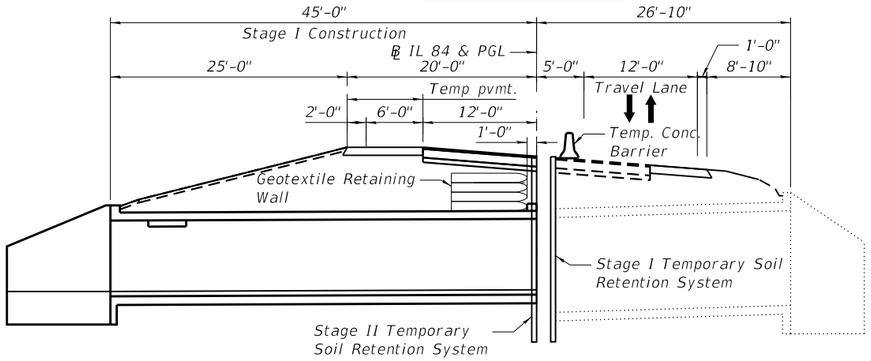


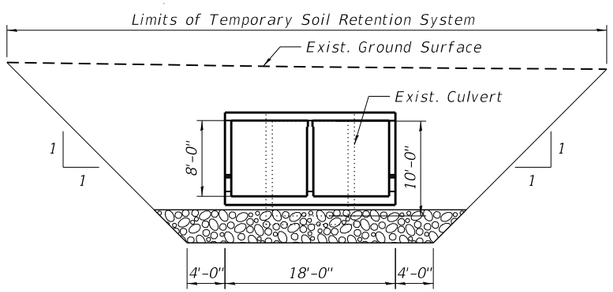
PRE-STAGE



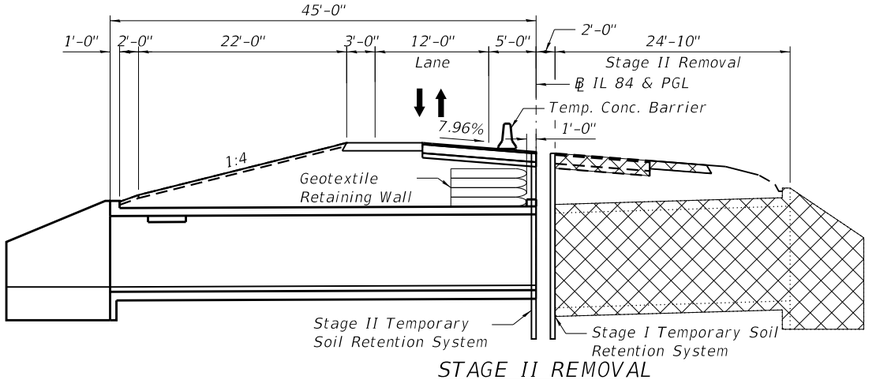
STAGE I REMOVAL



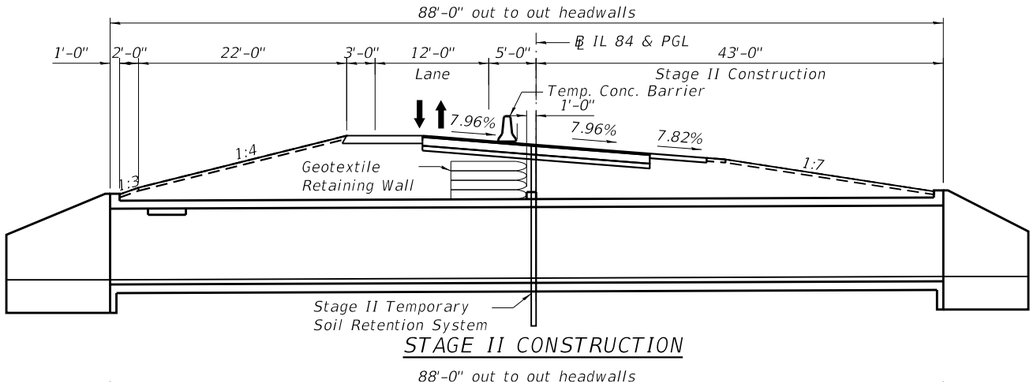
STAGE I CONSTRUCTION



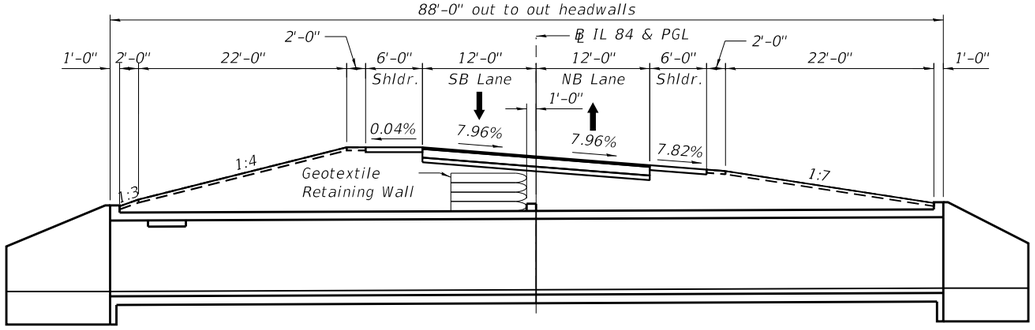
STAGE I- TEMPORARY SOIL RETENTION SYSTEM



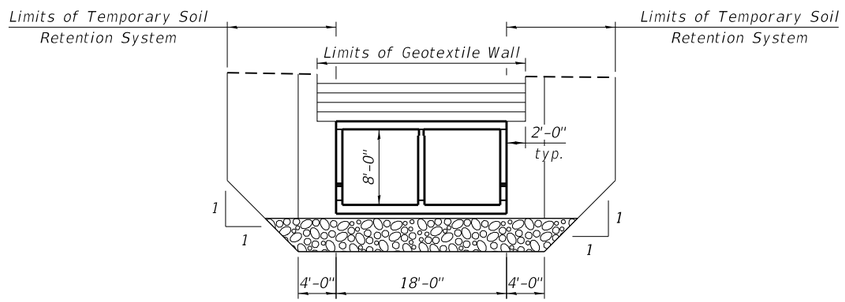
STAGE II REMOVAL



STAGE II CONSTRUCTION



FINAL CROSS SECTION



STAGE II- TEMPORARY SOIL RETENTION SYSTEM

NOTE

A cantilever sheet piling design does not appear feasible and additional members or other retention systems may be necessary. The Contractor shall submit a temporary soil retention system design including plan details and calculations for review and acceptance by the Engineer

DETAILS
IL 84 OVER CREEK
FAP RTE 308 - SEC (103,104)CR
JO DAVIESS COUNTY
STATION 144+10.00
S.N. 043-1117

MODEL: Default
FILE NAME: P:\1902-791 PTB190-24_Var_District 2\WO#4 IL 84 Culverts\Sheets\043-1117 South\D2009150431117-S02- Stagng.dgn
3/4/2021 2:39:07 PM

HBM ENGINEERING GROUP, LLC

USER NAME =	DESIGNED - MAA, EBK	REVISED -	
	CHECKED - MI, RTB	REVISED -	
PLOT SCALE =	DRAWN - MAA, EBK	REVISED -	
PLOT DATE = 3/4/2021	DATE - 03/04/2021	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
308	(103,104) CR	JO DAVIESS	2	2
		CONTRACT NO. 64K62		
	ILLINOIS	FED. AID PROJECT		