STRUCTURE GEOTECHNICAL REPORT

ILLINOIS ROUTE 141 OVER
UNMARKED STREAM
FAP ROUTE 877, SECTION 101B-4
EXISTING STRUCTURE 097-0029
PROPOSED STRUCTURE 097-2017
WHITE COUNTY, ILLINOIS
JOB NO. D-99-041-11
PTB 154-056

Prepared For:
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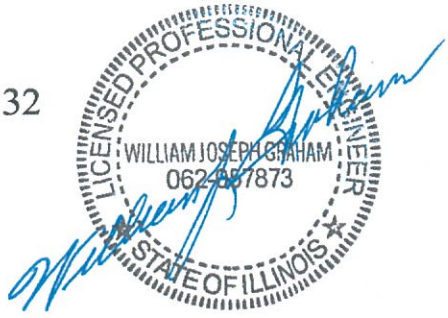

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STRUCTURE GEOTECHNICAL REPORT
(FAP 877) ILLINOIS ROUTE 141 OVER UNMARKED STREAM
WHITE COUNTY, ILLINOIS

1.0 PROJECT DESCRIPTION AND PROPOSED STRUCTURE INFORMATION

1.1 INTRODUCTION

This report summarizes the results of a geotechnical investigation performed for the design of a replacement structure for an existing bridge on Illinois Route 141 over an unnamed stream 2 miles west of New Haven, White County, Illinois. The purpose of this study was to provide a geotechnical assessment of the planned replacement structure, based on subsurface conditions encountered at two borings performed by the Illinois Department of Transportation (IDOT) at the existing structure. This report describes the exploration procedures used, presents the field and laboratory data, includes an assessment of the subsurface conditions in the area, and provides geotechnical recommendations for the construction.

1.2 PROJECT DESCRIPTION

The project consists of the removal and replacement of the existing bridge on Illinois Route 141 over an unmarked stream in White County, Illinois. Route 141 is located essentially along the boundary between White and Gallatin Counties. The existing bridge is a 28-foot long, single span concrete slab bridge supported by spread footings on timber piles. It is to be replaced with a new double box culvert with new guardrails and terminals, along with minor earthwork and some resurfacing of existing pavements near the structure. The existing bridge will be removed in two stages, with one lane being open to traffic at all times. The bridge is located about 2 miles west of New Haven, at Station 384+52. The general site area is shown on the attached Vicinity Map, Figure 1 in Appendix A. A plan that shows the locations of the borings performed for this study is presented as the Site and Boring Location Plan, Figure 2 in Appendix A.

1.3 PROPOSED STRUCTURE INFORMATION

The proposed structure will be a double box culvert. The new culvert will be approximately 35 feet long, providing 12-foot driving lanes and 4-foot shoulders on each side. It will be approximately 30.5 feet wide. The proposed culvert centerline station will be 384+52. The culvert will have two barrels that measure 14 feet in width and 8 feet in height, with 10-inch thick vertical walls, a 19-inch thick base slab, and a 12-inch thick deck slab. Wing walls at 45 degrees to the bridge alignment will be approximately 16 feet in length, and will be cantilevered off the culvert. The dead loads imposed on the base of the slab are understood to total approximately 1,450 kips. A copy of the TS&L sheet is included in Appendix D. Present plans are to leave the existing pile-supported bridge abutment footings in place, where they will underlie the new box culvert. The footing segments supporting the existing wing walls will be removed.

2.0 SUBSURFACE EXPLORATION

The field exploration for this project was conducted by IDOT. The exploration consisted of completing two soil borings within the roadway pavement, with one boring on the east side and one on the west side of the existing bridge. The borings were designated as Borings 1-S and 2-S. The approximate locations of the borings are shown on the Site and Boring Location Plan, Figure 2 in Appendix A.

The two borings for this study were completed on August 17 and 22, 2011. Boring 1-S was located just east of the existing bridge at Station 384+77 and offset 10 feet right of the roadway centerline. Boring 2-S was located just west of the existing bridge at Station 384+27 and offset 10 feet left of the centerline. Each boring was augered through the pavement section and base rock, and then advanced into intact bedrock at depths ranging from 59.4 to 59.6 feet. Split-spoon (SPT) samples were obtained on 2.5-foot centers in the overburden soils. Boring 1-S was advanced into the underlying bedrock using rock coring equipment, extending to a termination depth of 69.4 feet. The sampling sequence for each boring is summarized on the Boring Logs in Appendix B of this report. A Subsurface Profile is provided as Figure 3 in Appendix A.

3.0 SUBSURFACE CONDITIONS

Details of the subsurface conditions encountered at the borings are shown on the Boring Logs provided in Appendix B. The general subsurface conditions encountered and their pertinent engineering characteristics are described in the following paragraphs. Conditions represented by the borings should be considered applicable only at the boring locations on the dates shown; the reported conditions may be different at other locations at other times.

3.1 GEOLOGY

The site lies in the Saline Watershed, within the Mt. Vernon Hill Country portion of the Till Plains Section of the Central Lowland Physiographic Province. The watershed encompasses the Saline River which flows in a southeastern direction toward the Wabash River. The general geology at the project site appears to be Quaternary sand, silt, loam, and clay till and outwash deposits left by the glaciers from the Illinois Glacial Episode, underlain by Pennsylvanian and Permian sedimentary bedrock including shale, sandstone, and limestone. Thin coal deposits are also possible across Gallatin and White Counties. Geologic mapping by Illinois State Geologic Survey (ISGS) indicates the site is underlain by lakebed deposits of silt and clay laid down in glacial and early post-glacial time. These deposits would have formed an essentially level surface that has been subsequently crossed with erosion channels.

3.2 GENERALIZED SUBSURFACE PROFILE

The soils in the area are mainly lean and fat clays with occasional silt layers (A-6, A-7-6, and A-4 as defined by the AASHTO Classification System) that are typically soft to stiff throughout the soil profile. Standard penetration test values (N) in the soil range from 2 to 12 blows per foot (bpf). Unconfined compression tests were performed with a Rimac machine on the soils at each boring. The Rimac tests resulted in values ranging from 0.3 to 1.9 tons per square foot (tsf). Moisture contents in the soils vary from 17 to 33%.

Shale bedrock was encountered beneath the soils at a depth of approximately 57.5 feet in Boring 1-S. The shale is gray, dry, and hard. The shale is underlain by gray, very dense sandstone with traces of clay seams. This sandstone bedrock was encountered below the shale in Boring 1-S at a depth of 59.5 feet, and below the clay at 58.5 feet in Boring 2-S. Core recoveries in the sandstone range from 93 to 100% with Rock Quality Designation (RQD) values of 8 to 27%. Compressive strength tests on the sandstone resulted in values between 485 and 6,963 pounds per square inch (psi).

3.3 GROUNDWATER

Groundwater was encountered at 17.0 feet in Boring 1-S and 19.5 feet in Boring 2-S. The presence or absence of groundwater at a particular location does not necessarily mean that groundwater will be present or absent at that location at other times. Seasonal variations, the water level in the adjacent stream, and other unknown considerations could cause fluctuations in water levels and the presence of water in the soils. The elevation of the surface water in the stream was recorded at 381.1 on the boring logs during the time of drilling.

4.0 GEOTECHNICAL EVALUATIONS

4.1 SETTLEMENT

The clay soils at subgrade level and below appear to be compressible. A settlement analysis was made in general accordance with the IDOT January 1999 Geotechnical Manual, for the 1,500 kip loading imposed by the completed box culvert, the backfill over the culvert, and the pavement. Accounting for the original ground surface level in the site area, the calculated settlement was less than 2 inches. Initially it was considered that since the existing pile-supported abutment footings will be left in place beneath the culvert, any significant settlement of the foundation soils would result in the partial transfer of the load from the subgrade to the existing footings, reducing but not eliminating the settlement. This settlement would result in the need for the floor slab to be designed to span between the footings. However, the increase in weight of the redesigned structure could substantially overload the pile-supported footings, causing calculated settlement of the same magnitude as the settlement that does not account for the presence of the footings. In either case, the settlement analyses indicate that most of the settlement is the result of recompression rather than virgin consolidation. This should occur relatively rapidly. It is recommended that the placement of the final pavement should be delayed for at least 30 days after completion of construction. Benchmarks could be installed on the completed floor slab during the first stage of construction, to permit monitoring of settlement during construction of the first stage. The data from this monitoring could enable this delay period to be verified or modified.

The results of the borings indicate that the existing soil below the base of the box culvert should be suitable for support of the structure, so that a working mat of granular soil should not be required, provided that care is exercised by the contractor not to disrupt these soils.

4.2 SLOPE STABILITY

A slope stability analysis was performed for the new wing walls and the 2 Horizontal to 1 Vertical (2H:1V) side slopes of the roadway utilizing the SLOPE/W 2007 program. In accordance with the IDOT Geotechnical Manual, Section 3.2.3.2, the minimum factor of safety (FOS) required is 1.5 for end-of-construction (undrained strength) and long term (drained strength) stability. Analyses of these conditions indicate the slopes and wing walls as designed are within the required minimums, as shown in Table 4.1 below. The output sheets for these analyses are given in Appendix C. Note that the geometry of the wing wall analysis is taken perpendicular to the wall, not down the slope.

TABLE 4.1
CALCULATED CRITICAL FACTOR OF SAFETY

	SLOPE/W Calculated Factor of Safety	
	End-of-Construction	Long Term
Wing Walls	2.3	1.6
Roadway Side Slopes	2.4	1.6

4.3 Mining Activity

A review of undermining was made using the Illinois State Geological Survey (ISGS) website for mapped coal mines in White and Gallatin Counties, Illinois. Based on this information, the project site is unlikely to be undermined. The nearest coal mines are more than 7 miles away near Maunie, Norris City, and Ridgeway, Illinois.

5.0 Foundation Evaluations and Design Recommendations

5.1 Box Culvert Design

In accordance with the 2016 IDOT Culvert Manual, either a cast-in-place or a precast box culvert are viable options for the structure replacement. However, due to the stage construction of the culvert and the configuration of the culvert over a portion of the existing foundations, a precast alternate will not be allowed. TSi understands that the existing pile-supported bridge abutment footings will remain in place beneath the planned box culvert, but that the portion of the footings beneath the existing wing walls will be removed. As described in Section 4.1, the settlement of the foundation soils beneath the culvert could result in the structure being supported by the existing pile-supported footings. Consequently, it will be necessary to design the base slab to span between the two footings, and the completed culvert to be at least partially supported by the footings, spanning across the existing substructures. Because the portion of the footings beneath the existing bridge wing walls will be demolished, while the culvert itself will be supported at least partially on the footings, the new wing walls should be cantilevered from the culvert structure to avoid likely differential settlement.

Surface water flow and groundwater seepage into the footing excavation from the stream bed must be controlled so that the integrity of the footing bearing surface is maintained. The soils at the site appear to be moisture sensitive and will deteriorate rapidly when saturated. Surface flow control will require the installation of a diversion system, such as a temporary dam at each end of the construction area, with adequate pumping capacity or other means to transfer stream flow across the area.

5.2 Lateral Earth Pressures

According to the current drawings, the wing walls are approximately 16 feet in length and up to 14.8 feet in height. As noted in Section 5.1, the wing walls will be horizontally cantilevered from the box culvert structure. The following design parameters are recommended for walls retaining cohesive backfill materials.

TABLE 5.1
LATERAL EARTH PRESSURE PARAMETERS
FOR WALLS WITH SURFACES INCLINED NO STEEPER THAN 2H:1V
(2.8H:1V AS MEASURED PERPENDICULAR TO THE WALL FACE)

Parameter		Cohesive Soil
At-Rest Equivalent Fluid Pressure	Drained	90 pcf
	Submerged	105 pcf
Active Equivalent Fluid Pressure	Drained	65 pcf
	Submerged	95 pcf
Passive Equivalent Fluid Pressure	Drained	155 pcf
	Submerged	75 pcf
Soil Unit Weight		120 pcf
Angle of Internal Friction		25°
Assumed Surcharge Condition		None

No factor of safety has been applied to the values above.
pcf = pounds per cubic foot

Submerged values should be used for the calculation of lateral earth pressures for those portions of the walls that extend below the highest level of anticipated groundwater. The values for submerged fluid pressure for active and at-rest conditions include hydrostatic pressures. The effects of vertical surcharge loads behind the walls are not included for the stated fluid pressures. Vertical surcharge effects can be accounted for by assuming an additional horizontal pressure equal to one-half the vertical surcharge pressure.

6.0 Construction Considerations

6.1 Temporary Sheeting and Soil Retention

The construction activities should be performed in accordance with the current IDOT Standard Specifications for Road and Bridge Construction. Trenching, excavating, and bracing should be performed in accordance with OSHA (Occupational Safety and Health Administration) regulations, and other applicable regulatory agencies. In accordance with the OSHA excavation standards, the soil at the site is considered to be Type C, which requires a side slope for excavations no steeper than 1.5H:1.0V. However, worker safety and classification of the excavation soil is the responsibility of the contractor. Because one lane of the roadway is to remain in service during construction, sloping back the sides of the excavation will likely not be feasible. This will require a temporary retention system such as a cantilever sheet pile wall. A cantilever sheet pile system appears feasible for the subsurface conditions encountered, and may be designed using IDOT Design Guide 3.13.1 – Temporary Sheet Piling Design.

6.2 Subgrade Water Protection

The need to provide a dry excavation for the box culvert is covered in Section 5.1 of this report. Additional shallow trenching and pumping from sumps may be needed to control local groundwater seepage within the construction area.

7.0 REPORT LIMITATIONS

This geotechnical report has been prepared for the exclusive use of **MODJESKI AND MASTERS, INC.** and **THE ILLINOIS DEPARTMENT OF TRANSPORTATION** for the specific application to the subject project. The information and recommendations contained in this report have been made in accordance with generally accepted geotechnical and foundation engineering practices; no other warranties are implied or expressed.

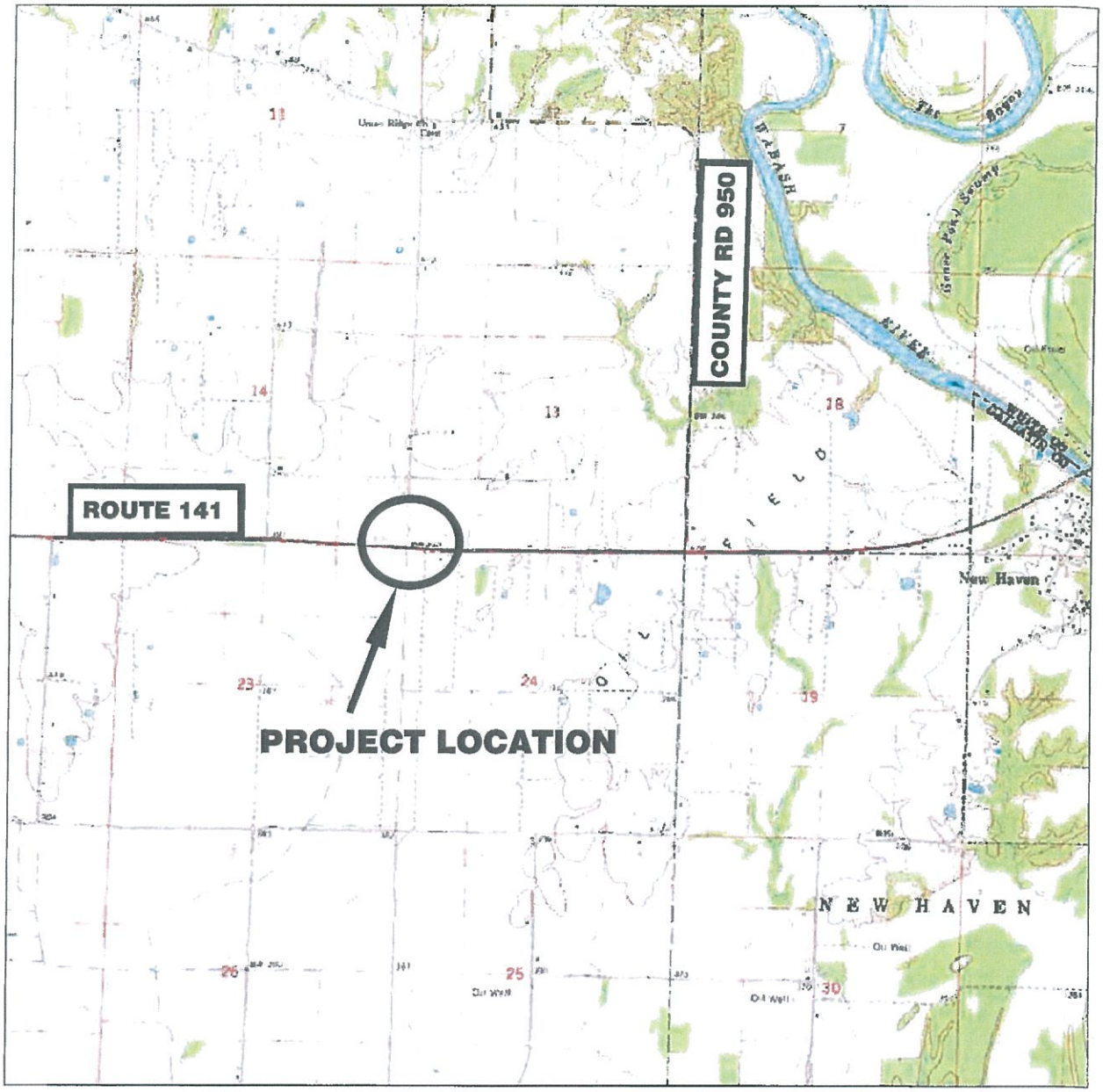
The assessments and recommendations submitted in this report are based in part upon the data obtained from the borings. The nature and extent of variations between the borings may not be evident at this time. If variations appear evident at a later date, it may be necessary to re-evaluate the recommendations of this report.

We emphasize that this report was prepared for design purposes only and may not be sufficient to prepare an accurate construction bid. Contractors reviewing this report should acknowledge that the information and recommendations contained herein are for design purposes.

If conditions at the site have changed due to natural causes or other operations, this report should be reviewed by TSi to determine the applicability of the analysis and recommendations considering the changed conditions. The report should also be reviewed by TSi if changes occur in the structure location, size, and type, in the planned loads, elevations, grading and site development plans or the project concepts.

TSi requests the opportunity to review the final plans and specifications for the project prior to construction to verify that the recommendations in this report are properly interpreted and incorporated in the design and construction documents. If TSi is not accorded the opportunity to make this recommended review, we can assume no responsibility for the misinterpretation of our recommendations.

Appendix A



NOT TO SCALE

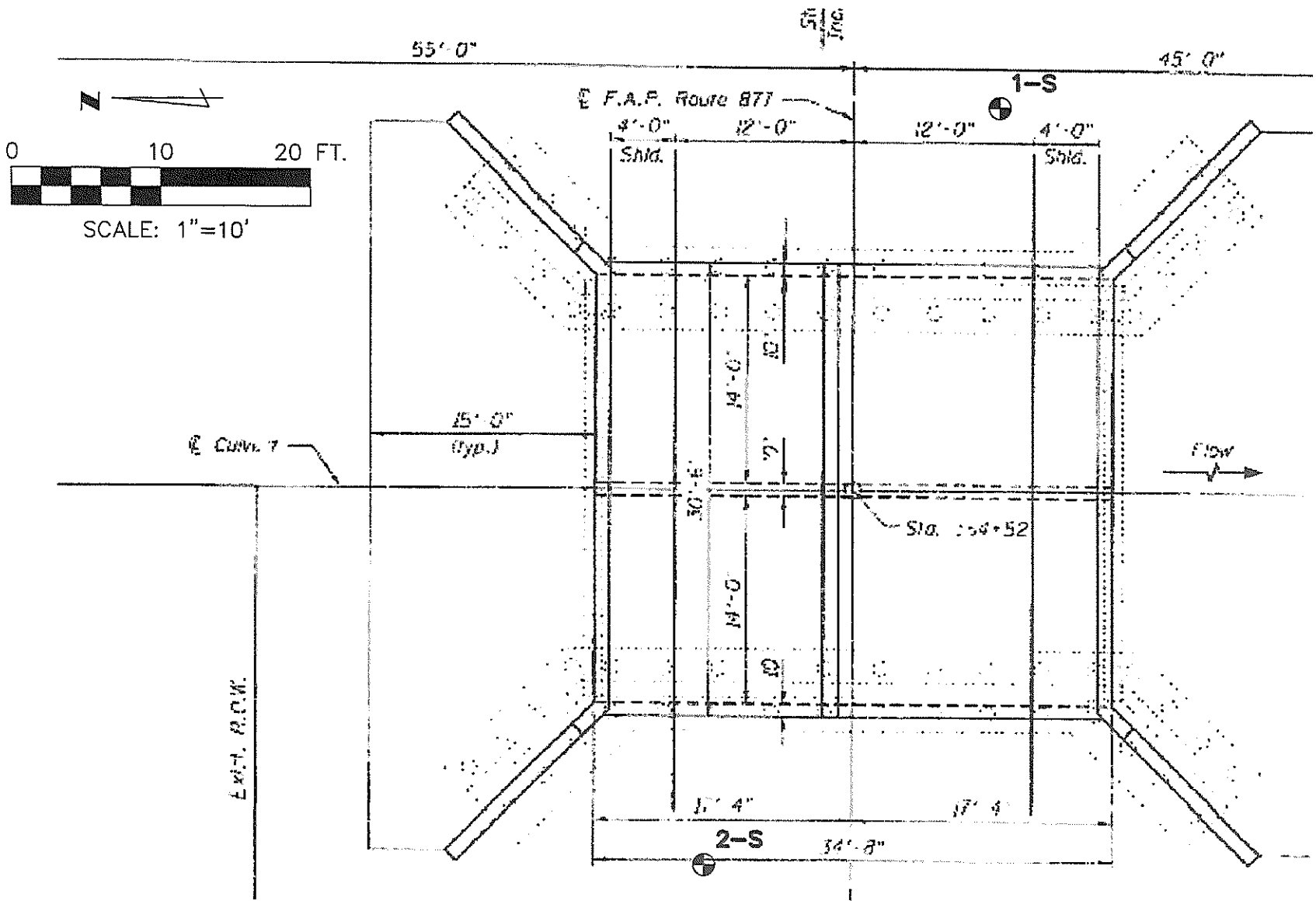
N

NOTE:
DRAWING PREPARED FROM AN IMAGE OBTAINED FROM TOPOQUEST.COM ON 7/11/2012

TSI engineering, inc.
5850 ARSENAL STREET
ST. LOUIS, MISSOURI 63139

VICINITY MAP
FAP (877) ILLINOIS ROUTE 141
OVER UNMARKED STREAM
WHITE COUNTY, IL

Drawn By: JAS	Checked By: WJG	
Project No. 20111018.06	Date: 7/11/12	Figure 1



LEGEND

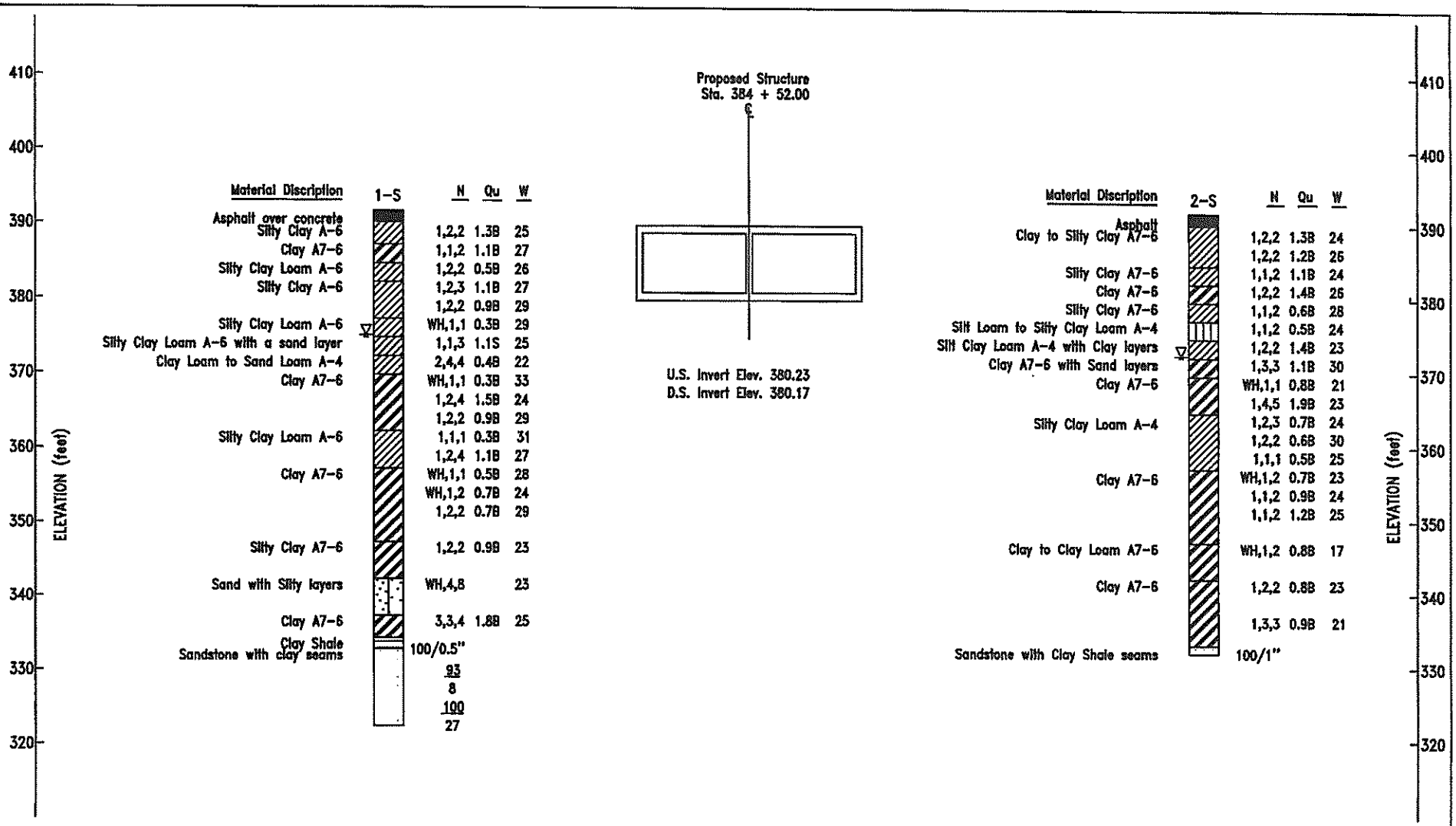
1-S ⊕ APPROXIMATE BORING LOCATION AND NUMBER

NOTE: THIS PLAN WAS PREPARED FROM A PDF RECEIVED FROM MODJESKI AND MASTERS ON 3-26-12.

TSi engineering, inc.
5850 ARSENAL STREET
ST. LOUIS, MISSOURI 63139

SITE AND BORING LOCATION PLAN
ILLINOIS ROUTE 141 OVER UNMARKED STREAM
FAP ROUTE 877 SECTION 101B-4
WHITE COUNTY, ILLINOIS

Drawn By: JAS	Checked By: WJG	
Project No. 20111018.06	Date: 7/20/12	Figure 2



PROFILE KEY:

BORING N Qu w%

SPT BLOW-COUNT — RIMAC/PP VALUE (TSF) — MOISTURE CONTENT

VERTICAL SCALE: 1" = 20'

NOTE: THIS PLAN WAS PREPARED FROM DRAWINGS RECEIVED FROM MODJESKI AND MASTERS ON 3-22-13. BORING LOCATIONS SHOWN ON PROFILE ARE APPROXIMATE.

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SOIL PROFILE

ILLINOIS ROUTE 141 OVER UNMARKED STREAM
FAP 877 SECTION 101B-4
WHITE COUNTY, IL

Drawn By: JAS	Checked By: WJG
Project No. 20111018.06	Date: 10/26/16 Figure 3

Appendix B

M+M

Illinois Department of Transportation

Memorandum

To:	Carrie Nelsen	Attn: Dave Piche
From:	Bruce Peebles BP	By: Rob Graeff
Subject:	*Boring Logs	
Date:	September 12, 2011	

FAP 877 (IL 141) over Stream
Structure 097-0029 (Existing)
White County

Foundation boring logs have been obtained for the above listed structure and are attached.

Supplemental compressive strength tests of the rock cores are included in the boring logs.

Liquefaction Analysis
Liquefaction calculations indicate no liquefiable soils at this structure location.

Slope Stability
At the time of this report, a preliminary TSL is not available. Therefore, we are unable to provide any slope stability calculations for the proposed endslope configuration. This office should be contacted to complete the slope stability calculations when a proposed endslope configuration is determined.

Structure Geotechnical Report
Due to a current shortage of staffing, the District Nine Geotechnical Unit is unable to complete the required Structure Geotechnical Report. Any additional foundation recommendations should be evaluated by a competent consultant.

Attachments
RG:rg

cc: Soils File

ILLINOIS DEPARTMENT OF TRANSPORTATION
District Nine Materials

Bridge Foundation Boring Log

FAP 877 (IL 141) Over stream — Sheet 1 of 2

Route: FAP 877 (IL 141) Structure Number: 097-0029 Date: 8/17/2011

Section 101 Bored By: R Moberly

County: White Location: 2 mi W of New Haven Checked By: R Graeff

Boring No 1-S
Station 384+77
Offset 10' Rt CL
Ground Surface 391.6 Ft

Surf Wat Elev: 381.1
Ground Water Elevation
when Drilling 374.6
At Completion
At: Hrs:

DEPTH	BLOWS	Qu tsf	W%	DEPTH	BLOWS	Qu tsf	W%
Asphalt over concrete				Stiff, moist, grey, Clay A7-6	2	1.6B	24
390.1					4		
Stiff, moist, grey, Silty Clay A-6				384.6			
	1			Medium, very moist to moist,	1		
	2	1.3B	25	grey, Clay A7-6	2	0.9B	29
	2				2		
387.1				362.1			
5.0 Stiff, moist, grey mottled brown,	1			30.0 Soft, very moist, grey, Silty Clay	1		
Clay A7-6	1	1.1B	27	Loam A-6	1	0.3B	31
	2				1		
384.6				359.6			
Medium to soft, very moist, brown	1			Stiff, moist to very moist, grey,	1		
mottled grey, Silty Clay Loam A-6	2	0.5B	26	Silty Clay Loam A-6	2	1.1B	27
	2				4		
382.1				357.1			
10.0 Stiff, moist, grey mottled brown,	1			35.0 Medium to soft, very moist, grey,	WH		
Silty Clay A-6	2	1.1B	27	Clay A7-6	1	0.5B	28
	3				1		
379.6				354.6			
Medium, very moist, grey mottled	1			Medium, very moist, grey, Clay	WH		
brown, Silty Clay A-6	2	0.9B	29	A7-6	1	0.7B	24
	2				2		
377.1							
15.0 Soft, very moist, grey mottled	WH			40.0	1		
brown, Silty Clay Loam A-6	1	0.3B	29		2	0.7B	29
	1				2		
374.6							
Stiff, very moist, brown and tan,	1						
Silty Clay Loam A-6 with	1	1.1S	25				
a sand layer	3						
372.1				347.1			
20.0 Soft, very moist, brown, Sandy	2			45.0 Medium, very moist, grey, Silty	1		
Clay Loam to Sand Loam A-4	4	0.4B	22	Clay A7-6	2	0.9B	23
	4				2		
369.6							
Soft, very moist, grey, Clay A7-6	WH						
	1	0.3B	33				
	1						
367.1				342.1			
25.0 Stiff, moist, grey, Clay A7-6	1			50.0	WH		

N-Std Pentr Test: 2" OD Sampler,140# Hammer, 30" Fall (Type Fail. B-Bulge S-Shear E-Estimated P-Penetrometer)

Route: FAP 877 (IL 141)
Section: 101
County: White
Date: 8/17/2011

Boring No: 1-S
Station: 384+77
Offset: 10' Rt CL
Ground Surface: 391.6 Ft

	DEPTH	BLOWS	Qu tsf	W%
Loose to medium, very moist, grey and brown, Sand with Silty layers 83% Silt 10% Sand 7% Clay		4 8		23
337.1		Washed 5'		
Stiff, moist, grey, Clay A7-6	55.0	3		
		3 4	1.8B	25
334.1				
Hard, dry, grey, Clay Shale				
332.6				
Very dense, dry, grey, Sand: 332.1		100/0.5"		
Test @ 6,963 psi	60.0			
Cored 59.4 to 64.4 feet 93% Recovery; 8% RQD Very dense, dry, grey and brown, Sandstone with clay seams				
327.1				
	65.0			
Cored 64.4 to 69.4 feet 100% Recovery; 27% RQD Very dense, dry, grey, Sandstone with clay seams				
Test @ 485 psi 322.1				
	70.0			
Bottom of hole = 69.4 feet Free water observed at 17.0 feet Elevation referenced to BM 109 at SW corner; Elev.= 391.4 feet				
	75.0			

	DEPTH	BLOWS	Qu tsf	W%
Wash-out procedures used from 51.0 to 54.5 feet Borehole advanced with hollow stem auger (8" O.D, 3.25" I.D.) To convert "N" values to "N60" multiply by 1.25	80.0			
	85.0			
	90.0			
	95.0			
	100.0			

N-Std Pentr Test: 2" OD Sampler,140# Hammer, 30" Fall (Type Fail. B-Bulge S-Shear E-Estimated P-Penetrometer)

ILLINOIS DEPARTMENT OF TRANSPORTATION
District Nine Materials

Bridge Foundation Boring Log

FAP 877 (IL 141) Over stream

Sheet 1 of 2

Route: FAP 877 (IL 141 Structure Number: 097-0029 Date: 8/22/2011

Section 101 Bored By: R Moberly

County: White Location: 2 mi W of New Haven Checked By: R Graeff

Boring No 2-S
Station 384+27
Offset 10' Lt CL
Ground Surface 391.6Ft

Surf Wat Elev: 381.1
Ground Water Elevation
when Drilling 372.1
At Completion
At: Hrs:

DEPTH	BLOWS	Qu tsf	W%	DEPTH	BLOWS	Qu tsf	W%
Asphalt				Stiff, moist, grey, Clay A7-6	4	1.9B	23
390.1					5		
Stiff, moist, grey, Clay to Silty Clay A7-6	1			364.6			
	2	1.3B	24	Medium, very moist, grey, Silty Clay Loam A-4	1		
	2				2	0.7B	24
					3		
5.0	1			362.1			
	2	1.2B	26	Medium, very moist, grey, Silty Clay Loam A-6 30.0	1		
	2				2	0.6B	30
384.6					2		
Stiff, moist to very moist, grey mottled brown, Silty Clay A7-6	1				1		
	1	1.1B	24		1	0.5B	25
	2				1		
382.1				357.1			
Stiff, moist, grey mottled brown, 10.0 Clay A7-6	1			Medium, very moist, grey, Clay 35.0 A7-6	WH		
	2	1.4B	26		1	0.7B	23
	2				2		
379.6							
Medium, very moist, brown mottled grey, Silty Clay A7-6	1				1		
	1	0.6B	28		1	0.9B	24
	2				2		
377.1				352.1			
Medium to soft, very moist, brown 15.0 mottled grey, Silt Loam to Silty Clay Loam A-4	1			Stiff, moist, grey, Clay A7-6 40.0	1		
	1	0.5B	24		1	1.2B	25
	2				2		
374.6							
Stiff, moist, brown mottled grey, Silty Clay Loam A-4 with Clay layers	1						
	2	1.4B	23				
	2						
372.1				347.1			
Stiff, moist, grey, Clay A7-6 20.0 with Sand layers	1			Medium, very moist, grey, Clay 45.0 to Clay Loam A7-6	WH		
	3	1.1B	30		1	0.8B	17
	3				2		
369.6							
Medium, very moist, grey, Clay A7-6	WH						
	1	0.8B	21				
	1						
367.1				342.1			
Stiff, moist, grey, Clay A7-6 25.0	1			Medium, very moist, grey, Clay 50.0	1		

N-Std Pentr Test: 2" OD Sampler,140# Hammer, 30" Fall (Type Fail, B-Bulge S-Shear E-Estimated P-Penetrometer)

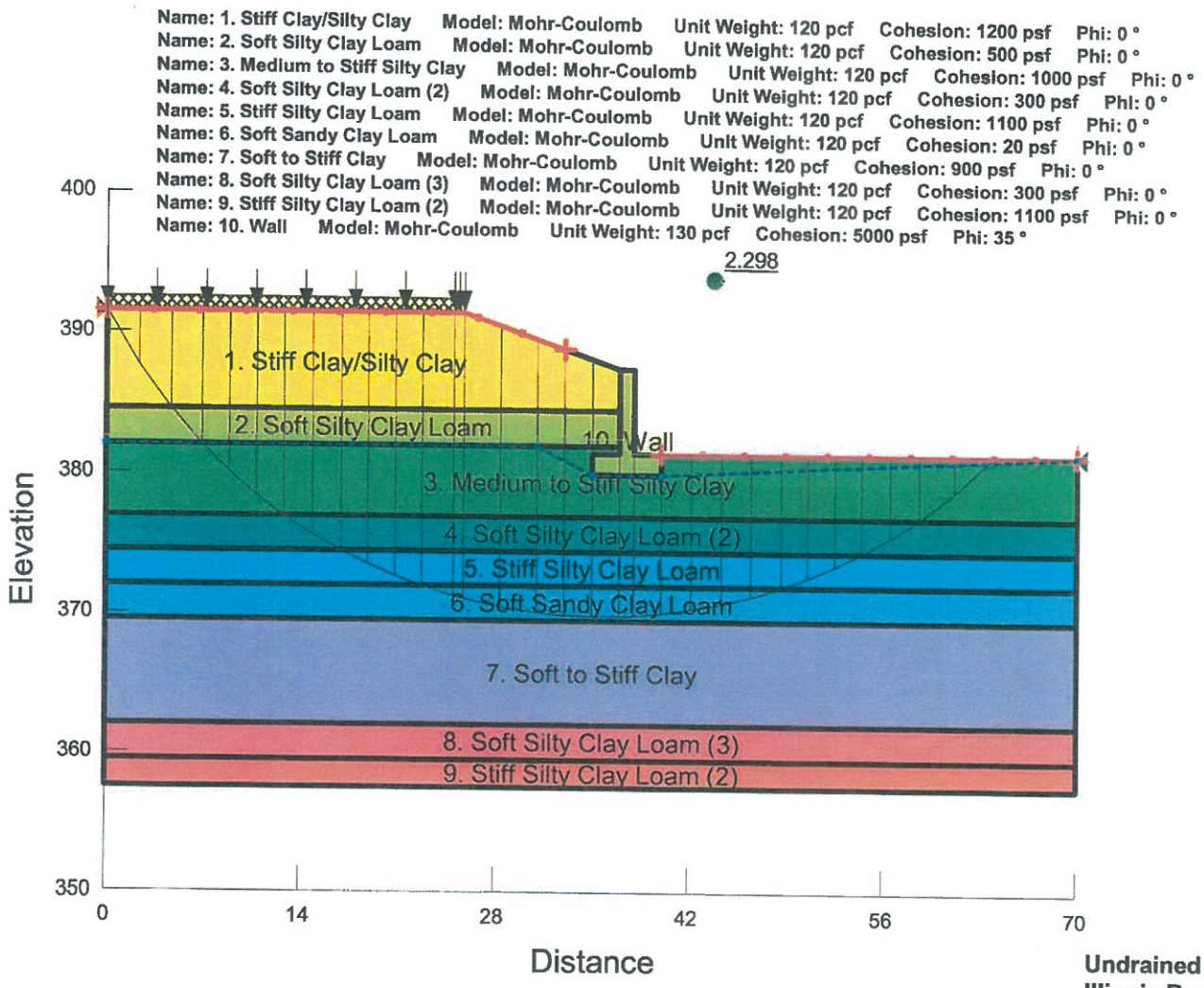
Route: FAP 877 (IL 141)
Section: 101
County: White
Date: 8/22/2011

Boring No: 2-S
Station: 384+27
Offset: 10' Lt CL
Ground Surface: 391.6 Ft

DEPTH	BLOWS	Qu tsf	W%
A7-6	2 2	0.8B	23
55.0	1		
	3 3	0.9B	21
333.1			
Very dense, dry, grey, Sandstone with Clay Shale seams			
331.6 60.0	100/1"		
Bottom of hole = 59.6 feet			
Free water observed at 19.5 feet			
Elevation referenced to BM 109 at SW corner; Elev.= 391.4 feet			
Borehole advanced with hollow stem auger (8" O.D, 3.25" I.D.)			
To convert "N" values to "N60" multiply by 1.25			
70.0			
75.0			
80.0			
85.0			
90.0			
95.0			
100.0			

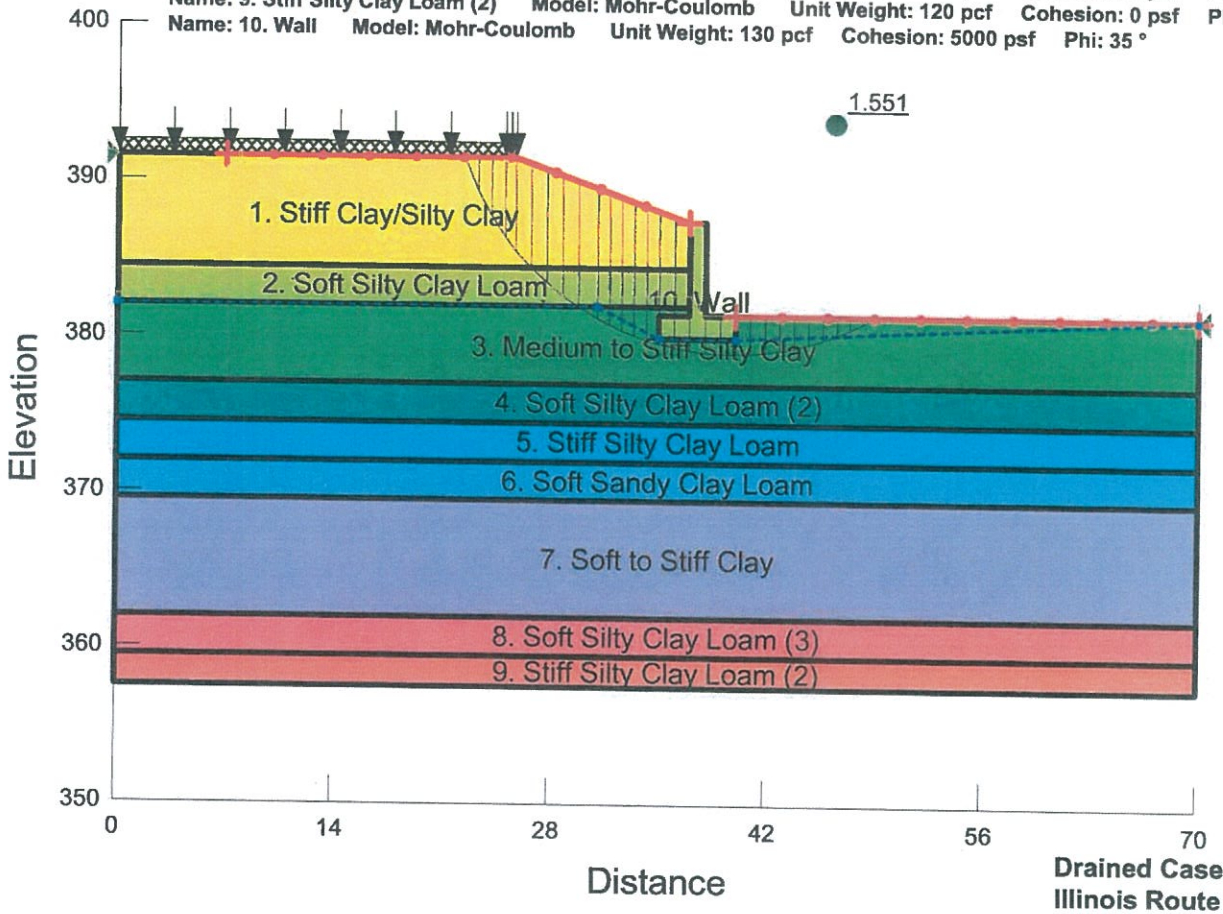
N-Std Pentr Test: 2" OD Sampler,140# Hammer, 30" Fall (Type Fail. B-Bulge S-Shear E-Estimated P-Penetrometer)

Appendix C



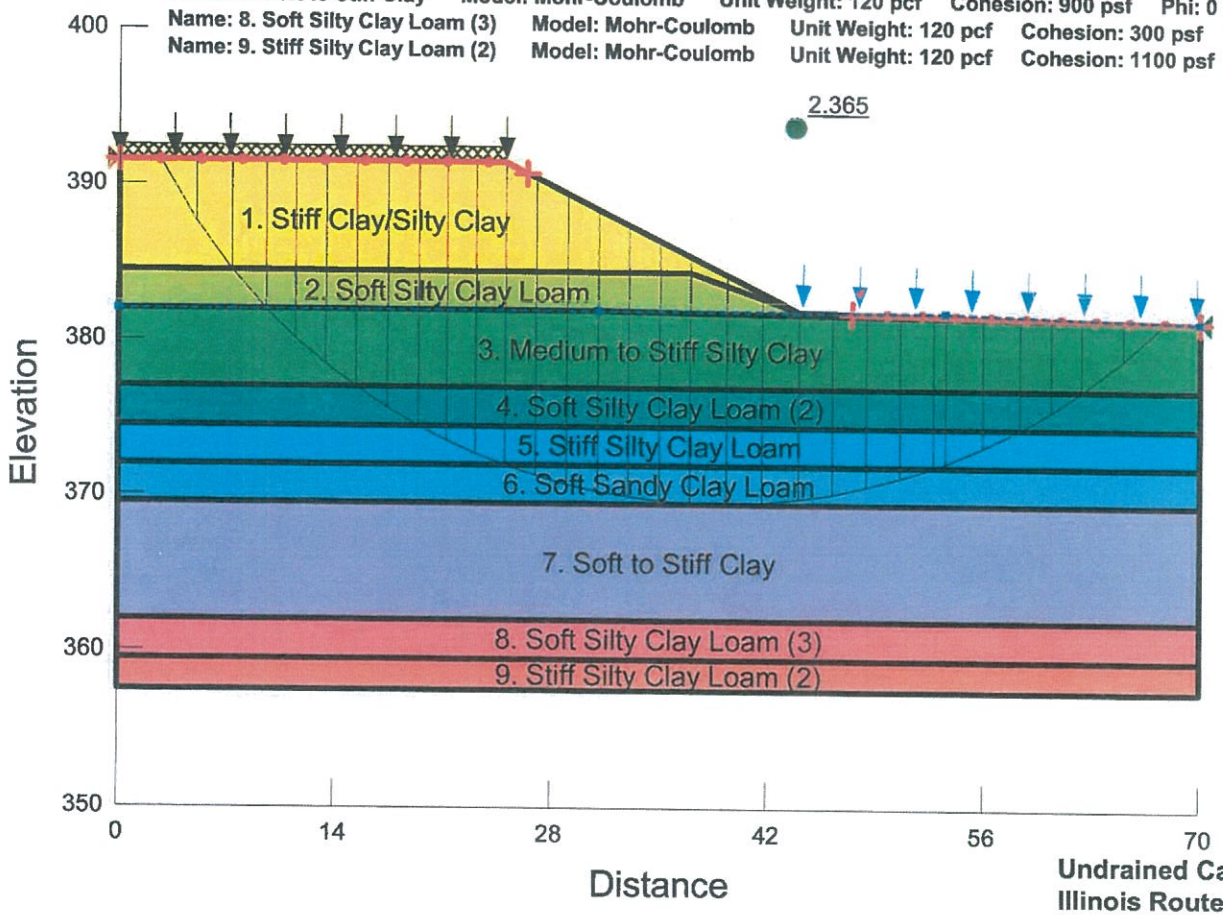
Undrained Case:
Illinois Route 141 Over Unmarked Stream
FAP Route 877, Section 101B-4
Existing Structure 097-0029
White County, Illinois
Job No. D-99-041-11
PTB 154-056

Name: 1. Stiff Clay/Silty Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 50 psf Phi: 27 °
Name: 2. Soft Silty Clay Loam Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 50 psf Phi: 29 °
Name: 3. Medium to Stiff Silty Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 50 psf Phi: 28 °
Name: 4. Soft Silty Clay Loam (2) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 28 °
Name: 5. Stiff Silty Clay Loam Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 28 °
Name: 6. Soft Sandy Clay Loam Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 28 °
Name: 7. Soft to Stiff Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 32 °
Name: 8. Soft Silty Clay Loam (3) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 25 °
Name: 9. Stiff Silty Clay Loam (2) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 0 psf Phi: 28 °
Name: 10. Wall Model: Mohr-Coulomb Unit Weight: 130 pcf Cohesion: 5000 psf Phi: 35 °

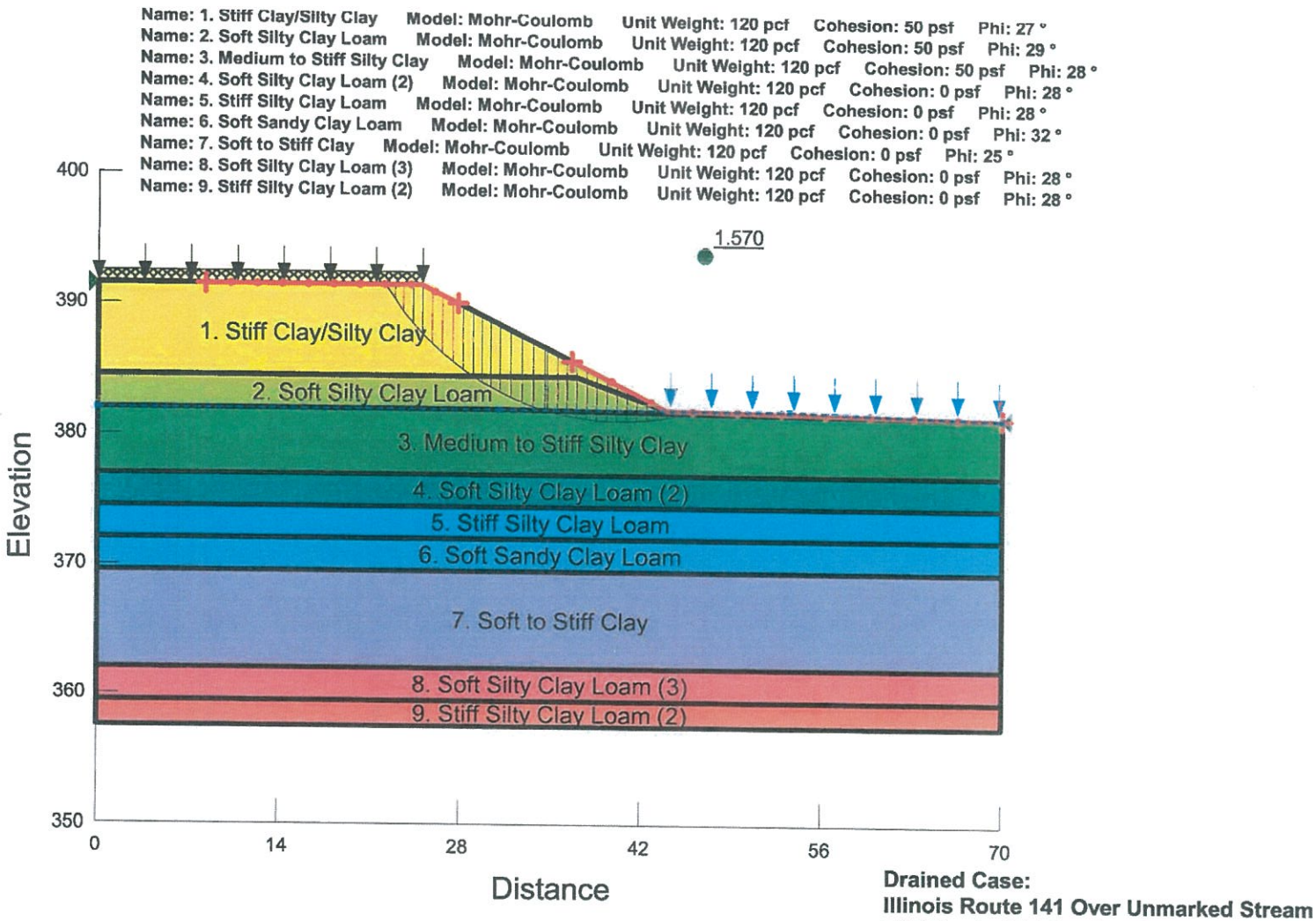


Drained Case:
Illinois Route 141 Over Unmarked Stream
FAP Route 877, Section 101B-4
Existing Structure 097-0029
White County, Illinois
Job No. D-99-041-11
PTB 154-056

Name: 1. Stiff Clay/Silty Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 1200 psf Phi: 0 °
Name: 2. Soft Silty Clay Loam Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 500 psf Phi: 0 °
Name: 3. Medium to Stiff Silty Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 1000 psf Phi: 0 °
Name: 4. Soft Silty Clay Loam (2) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 300 psf Phi: 0 °
Name: 5. Stiff Silty Clay Loam Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 1100 psf Phi: 0 °
Name: 6. Soft Sandy Clay Loam Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 20 psf Phi: 0 °
Name: 7. Soft to Stiff Clay Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 900 psf Phi: 0 °
Name: 8. Soft Silty Clay Loam (3) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 300 psf Phi: 0 °
Name: 9. Stiff Silty Clay Loam (2) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion: 1100 psf Phi: 0 °



Undrained Case:
Illinois Route 141 Over Unmarked Stream
FAP Route 877, Section 101B-4
Existing Structure 097-0029
White County, Illinois
Job No. D-99-041-11
PTB 154-056



Drained Case:
Illinois Route 141 Over Unmarked Stream
FAP Route 877, Section 101B-4
Existing Structure 097-0029
White County, Illinois
Job No. D-99-041-11
PTB 154-056

Appendix D

Bench Mark: BM 109 - Chiseled square in southwest wingwall of SN 097-0029. Elev. 391.40.

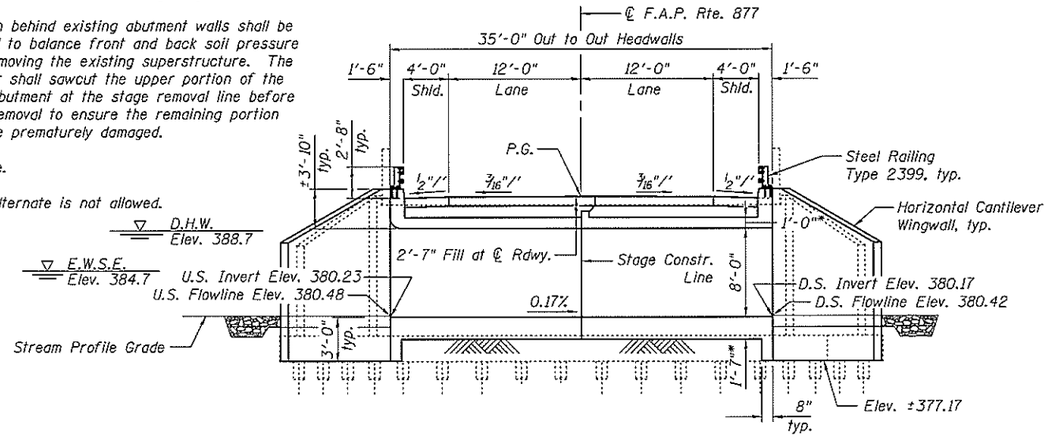
Existing Structure: SN 097-0029 was originally built in 1933 as SBI Route 141 (Section A-101) and resurfaced in 1970 as SBI Route 141 (Section 101W, RS). The existing structure is a 28 foot (back to back abutments) single span reinforced concrete slab bridge. The substructure consists of closed abutments founded on footings on timber piles. The deck measures 32'-8" between curbs and the overall out to out width of the bridge is 36'-2". The existing superstructure and abutment walls are to be removed and replaced. The existing foundation is to remain in place except as noted.

Traffic to be maintained utilizing stage construction.

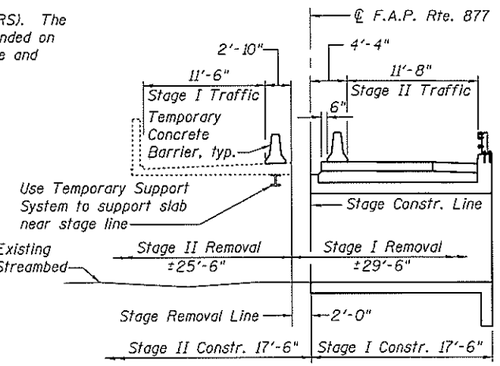
Excavation behind existing abutment walls shall be performed to balance front and back soil pressure before removing the existing superstructure. The Contractor shall sawcut the upper portion of the existing abutment at the stage removal line before Stage I removal to ensure the remaining portion will not be prematurely damaged.

No salvage.

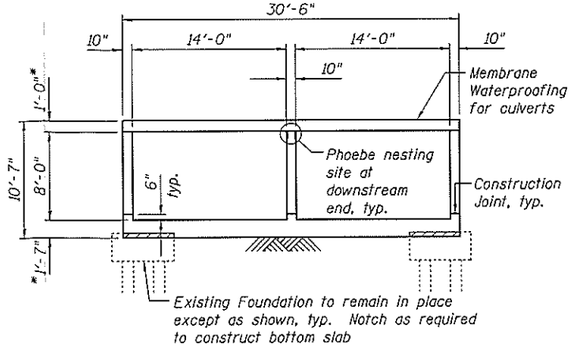
Precast alternate is not allowed.



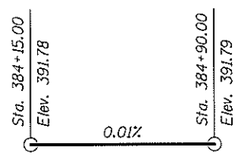
LONGITUDINAL SECTION
(Looking Upstation)



STAGE CONSTRUCTION SKETCH
(Looking Upstation)



SECTION THRU BARREL
*Slab thickness is subject to refinement during Final Design.



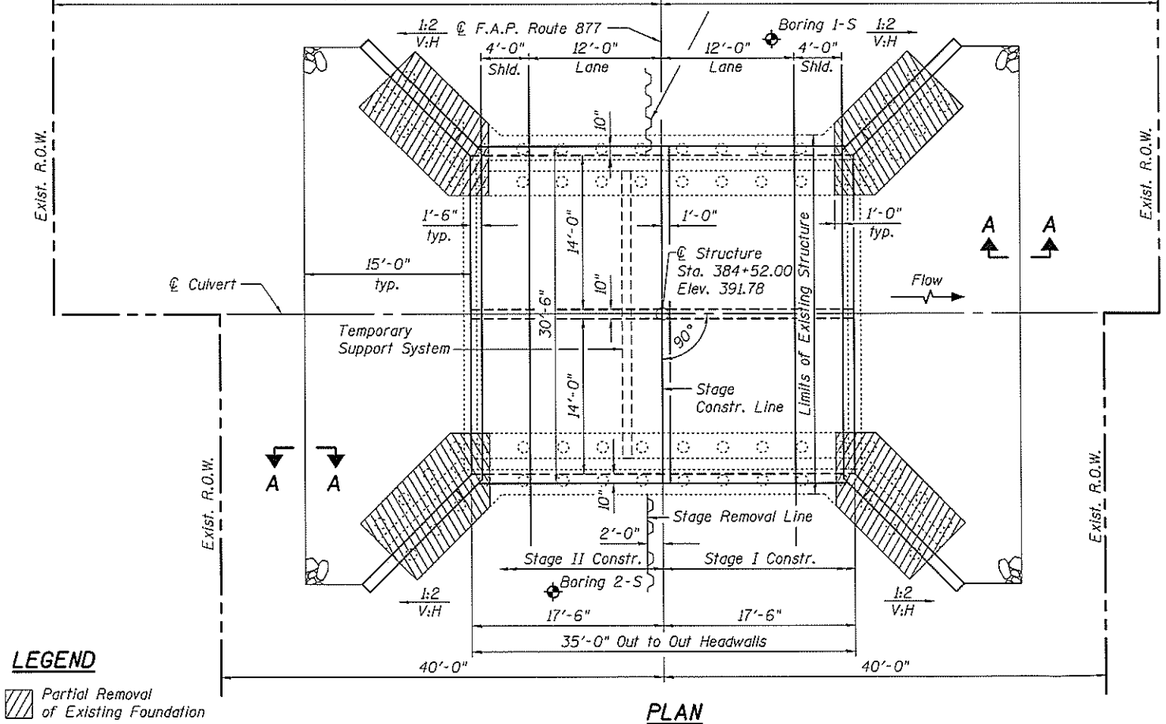
PROFILE GRADE
(Along ℄ Roadway)

HIGHWAY CLASSIFICATION
F.A.P. Rte. 877 (IL Rte. 141)
Functional Class: Minor Arterial (Non-Urban)
ADT: 2050 (2009); 2630 (2034)
DHV: 265
ADTT: SU = 3.4% MU = 9.8%
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50/50

LOADING HL-93
Allow 50#/sq. ft. for future wearing surface.

DESIGN SPECIFICATIONS
2014 AASHTO LRFD Bridge Design Specifications, 7th Edition with 2015 and 2016 Interims

DESIGN STRESSES
FIELD UNITS
f'c = 3,500 psi
fy = 60,000 psi (Reinforcement)



PLAN

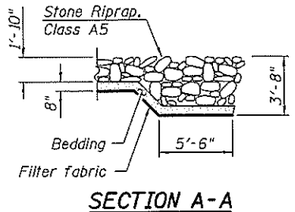
LEGEND
Partial Removal of Existing Foundation

WATERWAY INFORMATION

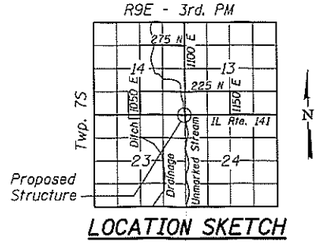
Drainage Area = 4.2 sq. mi. — Low Grade Elev. 391.63 @ Sta. 380+98

Flood		Discharge (cfs)		Waterway Opening (sq. ft.)		Natural H.W.E.	Head (ft.)		Headwater Elevation	
		Existing	Proposed	Existing	Proposed		Existing	Proposed	Existing	Proposed
10	Main Channel	1119	1145	136	217	388.3	2.1	1.7	390.4	390.0
	Relief Structure	779	753	110	141					
	Total	1898	1898	246	358					
OVT (E)	Main Channel	1221	1480	142	217	388.5	2.8	2.8	391.3	391.3
	Relief Structure	862	1100	115	147					
	Total	2083	2580	257	364					
OVT (P)	Main Channel	1146	1480	143	217	388.6	2.8	2.7	391.4	391.2
	Relief Structure	808	1096	116	148					
	Total	1954	2576	259	365					
50	Main Channel	955	1260	146	217	388.7	2.8	2.7	391.4	391.4
	Relief Structure	674	950	118	151					
	Total	1629	2210	264	368					
100	Main Channel	631	918	150	217	388.8	2.8	2.7	391.6	391.5
	Relief Structure	434	672	121	154					
	Total	1065	1590	271	371					

Note: SN 097-2017 is the main channel structure.



SECTION A-A



LOCATION SKETCH

GENERAL PLAN AND ELEVATION
ILLINOIS ROUTE 141 OVER UNMARKED STREAM
F.A.P. ROUTE 877 - SEC. 101B-4
WHITE COUNTY
STATION 384+52.00
STRUCTURE NO. 097-2017

MODJESKI and MASTERS Experience great bridges.	USER NAME =	DESIGNED - ZJB	REVISED
		CHECKED - RLM	REVISED
	PLOT SCALE =	DRAWN - PRC	REVISED
	PLOT DATE = 10/28/2016	CHECKED - JMH	REVISED

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

GENERAL PLAN AND ELEVATION
STRUCTURE NO. 097-2017
SHEET NO. 1 OF 1 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
877	101B-4	WHITE	1	1
		CONTRACT NO. 78264		
	ILLINOIS FED. AID PROJECT			

EX S.N. 097-0029
℄ STA. 384+52.00
28'-0" BK TO BK ABUTS
36'-2" OUT TO OUT DECK
SINGLE SPAN RC SLAB
BRIDGE TO BE REPLACED
WITH NEW DOUBLE BOX
CULVERT.

EXIST. CURVE 141-2
PI STA. = 389+85.40
Δ = 4° 02' 43" (LT)
D = 0° 23' 58"
R = 14,340.95'
T = 506.46'
L = 1,012.50'
E = 8.94'
e = -----
T.R. = -----
S.E. RUN = -----
P.C. STA. = 384+78.94
P.T. STA. = 394+91.44

CROPS
EX ROW
WATER SURFACE ELEVATION: 381.9'
WATER SURFACE ELEVATION: 381.7'
PC STA 384+78.94
PR SPBGR
12" WINGWALL
12" HEADWALL
GRAV.
BRIDGE CURB
385+00
PROPOSED S.N. 097-2017
℄ STA. 384+52.00
40.00'
55.00'
IL ROUTE 141
ASPHALT
WATER SURFACE ELEVATION: 381.2'
40.00'
45.00'
25' W. EARTH ENTRANCE
UNMARKED STREAM
10W. GRAVEL

CENTERLINE TIE

CONC. NAIL IN CENTERLINE ℄ STA. 378+00
STATION STAMP 379+00
IL ROUTE 141
20.3'
104.3'
233.8'
GALLATIN CO. MILE 10.00
IRON PIPE W/CAP
83.2'
UTILITY POLE W/MAG NAIL
N
#15
STA 378+00

BENCH MARK:
BM 109 - CHISELED SQUARE IN SOUTHWEST WINGWALL OF SN 097-0029, ELEV. 391.40.

SEC 13, T7S, R9E, 3RD PM

CENTERLINE TIE

STATION STAMP 394+00
MAG NAIL IN CENTERLINE ℄ PT STA. 394+91.44
IL ROUTE 141
38.5'
45.8'
21.8'
IRON PIPE W/CAP
UTILITY POLE W/MAG NAIL
GRAVEL
N
#18
STA 394+91.44

N
20 0 20 40
SCALE IN FEET

PROFILE
SURVEYED
PLOTTED
CROSS CHECKED
B.M. NOTED
STRUCTURE NO.(TYP.) CHKD
NOTE BOOK
NO. _____
BY DATE

PLAN
SURVEYED
PLOTTED
ALIGNMENT CHECKED
R.T. OF WAY CHECKED
CADD FILE NAME
NOTE BOOK
NO. _____
BY DATE

400
395
390
385
380
375
370

0.01%
STA. 384+15.00
ELEV. 391.78'
STA. 384+90.00
ELEV. 391.79'
PROPOSED DOUBLE 7' WIDE X 8' HIGH CONCRETE BOX CULVERT

391.71 391.70 391.72 391.78 391.78 391.79 391.78 391.79 391.85 391.87 391.79 391.81 391.78

382+00 382+50 383+00 383+50 384+00 384+50 385+00 385+50 386+00 386+50 387+00 387+50

MODJESKI and MASTERS
Experience great bridges.

USER NAME =	DESIGNED - RLM	REVISED -
	DRAWN - PRC	REVISED -
PLOT SCALE =	CHECKED - JMH	REVISED -
PLOT DATE =	DATE - 10/28/2016	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

FAP ROUTE 877 (IL RTE. 141) PLAN AND PROFILE

SCALE: 1"=20' | SHEET OF SHEETS | STA. 382+00 TO STA. 387+50

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
877	101B-4	WHITE		
		CONTRACT NO. 78264		
	ILLINOIS FED. AID PROJECT			