Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: 05/14/2021 **Proposed SN:** SN 006-0190 **Route:** CH 15 - FAI 80 (I-80)
Revised Date: **Existing SN:** SN 006-0117 **Section:** (06-2HB)ES
Geotechnical Engineer: Rubino Engineering, Inc. (G21.020) **County:** Bureau County
Structural Engineer: HR Green **Contract:** No. 66K73

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The proposed bridge configuration consists of a two-span steel plate girder bridge structure with 115-foot spans and a pier in the median. The new bridge will utilize 40-inch web plate girders on integral abutments and spread footing pier supported by piles. A preliminary TSL drawing is attached.

Discuss the existing boring data, existing plans foundation information, new subsurface exploration and need for any additional exploration to be provided with SGR Technical Memo (attach all data and subsurface profile plot): The existing plans indicate that the abutments are supported on concrete piles and the three piers are supported on Creosoted wood piles. In August of 2020, two soil borings were taken at the abutments and one soil boring was taken at the center pier. Copies of these logs are attached.

Provide the location and maximum height of any new soil fill or magnitude of footing bearing pressure. Estimate the amount and time of the expected settlement. Indicate if further testing, analysis, and/or ground improvement/treatment is necessary: The new profile of the bridge will change minimally. There are no cuts or fill proposed for this profile and, therefore, minimal settlement is anticipated under the existing embankments. No additional testing or treatment for settlement is anticipated.

Identify any new cuts or fill slope angles and heights. Estimate the factor of safety against slope failure. Indicate if further testing, analysis or ground improvement/treatment is necessary: The proposed embankment slope below the bridge will be 1:2. In slope stability analyses, the drained (long-term construction) conditions control over the undrained (short-term construction) conditions. Rubino used the slope stability program Stedwin Version 2.88 to run the Modified Bishop Method. A factor of safety of 1.6 against slope failure was achieved in the drained condition. No additional analysis or treatment is recommended.

Indicate at each substructure, the 100-year and 200-year total scour depths in the Hydraulics report, the non-granular scour depth reduction, the proposed ground surface, and the recommended foundation design scour elevations: Scour is not applicable because this is a grade separation structure.

Determining the seismic soil site class, the seismic performance zone, the 0.2 and 1.0 second design spectral accelerations and indicate if that the soils are liquefiable: The seismic data is as follows: Seismic Soil Site Class = C; Seismic Performance Zone = SPZ 1; Design Spectral Accelaration at 0.2 sec. (SDS) = 0.1173; Design Sprectral Acceleration at 1.0 sec. (SD1) = 0.0609. Liquefaction is not applicable because the SPZ = 1.

Confirm feasibility of the proposed foundation or wall type and provide design parameters. Attach a pile design table indicating feasible pile types, various nominal required bearings, factored resistances available and corresponding estimated lengths at locations where piles will be used. Provide factored bearing resistance and unit sliding resistance at various elevations and confirm no ground improvement/treatment is necessary where spread footings are proposed. Estimated top of rock elevations as well as preliminary factored unit side and tip resistance values shall be indicated when drilled shafts are proposed: See the attached supplemental information.

Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: Water suface elevations and cofferdams/seal coat are not applicable because this is a grade separation structure.

Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: If the structure will be closed to all traffic during construction, then temporary sheet pilling will not be needed to construct the abutments.

Source Benchmark:
Cross cut in north end of concrete bridge wall at northeast quadrant of 645 E. Street (TR 82-C) bridgeover I-80, at station 17+98, 17.3' left Elevation: 700.324 (NAVD 88)

Existing Structure:
S.N. 006-0117 was originally built in 1963. The exisitng structure is 4 spans measuring 220'-0" Bk to Bk abutments, 31'-8" out to out deck with a 4°31'00" left forward skew concrete deck on steel beams with concrete hammerhead piers and concrete stub abutments. Traffic will be detoured during construction.

Salvage: None

HIGHWAY CLASSIFICATION

TR 82-C - 645 E. Street
Functional Class: Local Road
ADT: 275 (2017); 492 (2032)
ADTT: 10 (2017); 18 (2032)
DHV: 50
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
2-Way Traffic
Directional Distribution: 50-50

HIGHWAY CLASSIFICATION

F.A.I. Rte 80 - I-80
Functional Class: Interstate
ADT: 17200 (2019);17925 (2032)
ADTT: 8950 (2019); 9330 (2032)
DHV: 1800
Design Speed: 70 m.p.h.
Posted Speed: 70 m.p.h.
2-Way Traffic

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

DESIGN STRESSES

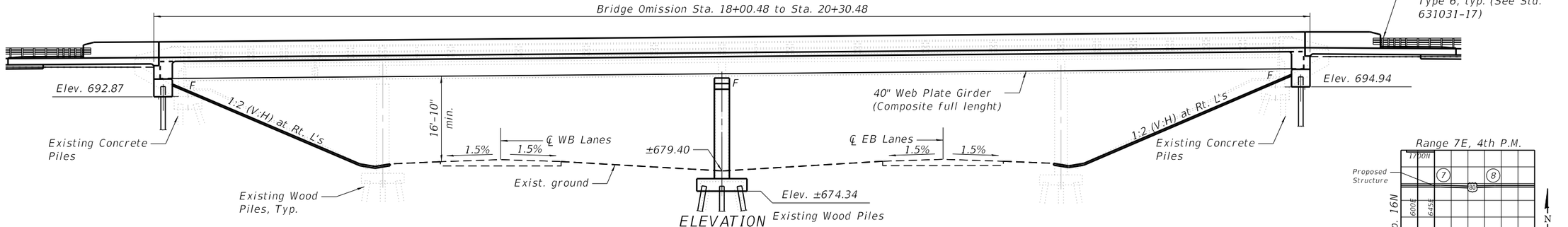
FIELD UNITS
f'c = 4,000 psi (Superstructure)
f'c = 3,500 psi (Substructure)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

LOADING HL-93

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

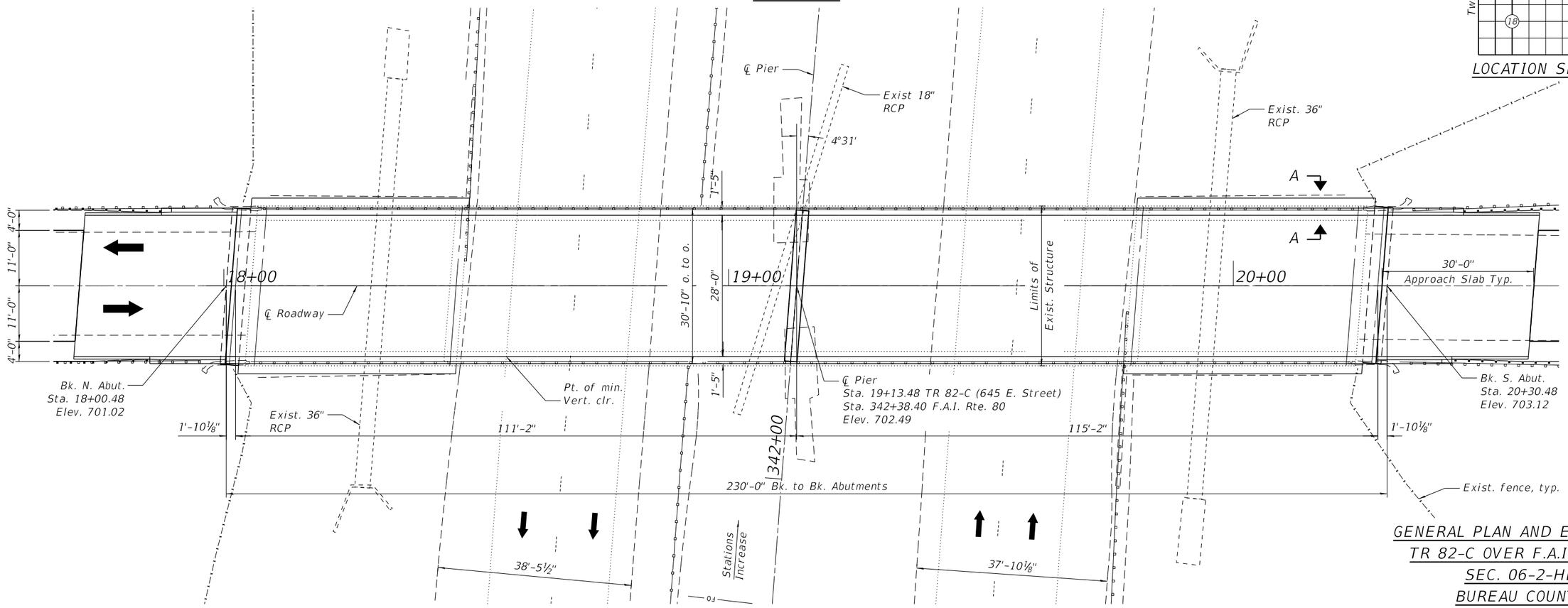
SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.084
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.136
Soil Site Class = D



ELEVATION

LOCATION SKETCH



PLAN

GENERAL PLAN AND ELEVATION
TR 82-C OVER F.A.I. RT. 80
SEC. 06-2-HB
BUREAU COUNTY
STA. 19+13.48
STRUCTURE NO. 006-0190

HRG PROJECT NO.: 2020#
HRG PROJ. CONTACT:
FILE NAME: 2020\07_Str_SN 006-0190_TSL.dgn
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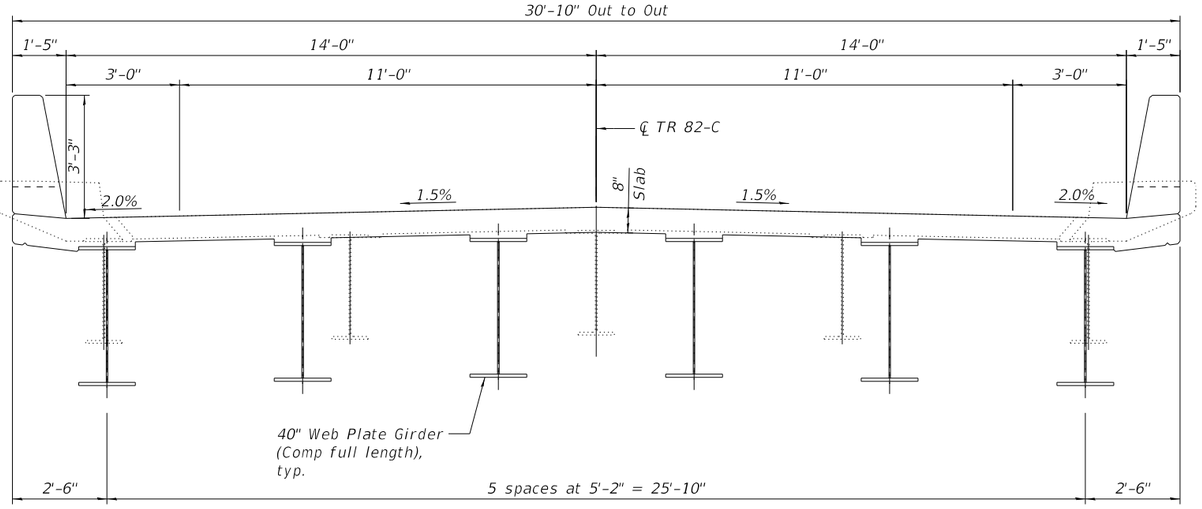
HRGreen.com
Illinois Professional Design Firm # 184-001322

USER NAME = whood	DESIGNED - OM/SLS	REVISED -
	CHECKED - WJH	REVISED -
PLOT SCALE =	DRAWN - WJH	REVISED -
PLOT DATE = 3/22/2021	CHECKED - AEU	REVISED -

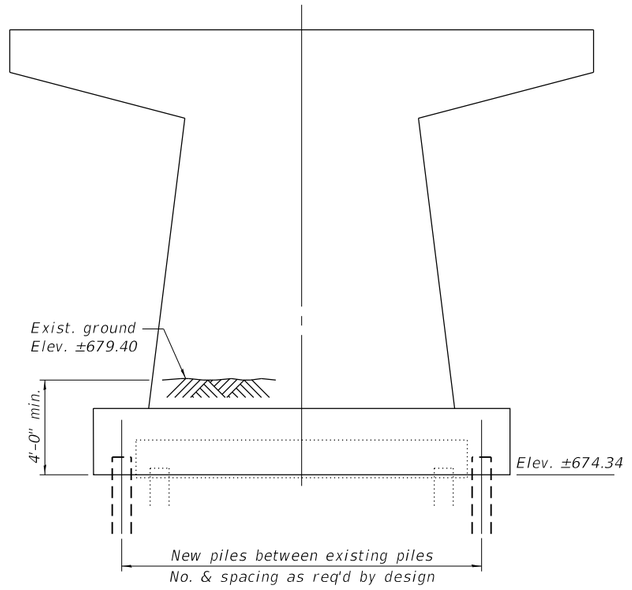
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 1 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
TR 82-C	06-2-HB	BUREAU	2	1
		CONTRACT NO.		
		ILLINOIS FED. AID PROJECT		



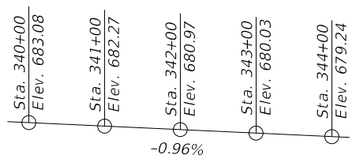
CROSS SECTION
(Looking North)



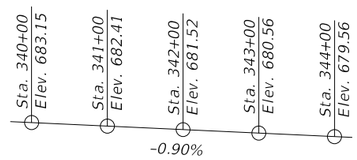
PIER SKETCH

EXISTING CURVE DATA
F.A.I. RT 80

EXIST. CURVE EXCL I-80 10
PI STA. = 347+18.00
Δ = 18° 06' 20" (RT)
D = 0° 26' 00"
R = 13,222.10'
T = 2,106.66'
L = 4,178.20'
E = 166.77'
e =
T.R. =
S.E. RUN =
P.C. STA. = 326+11.34
P.T. STA. = 367+89.54



EXISTING PROFILE GRADE
WESTBOUND F.A.I. RT 80
(Stations run East)
(Along ℄ Roadway)



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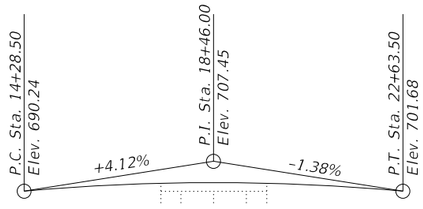
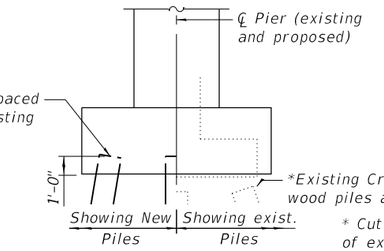
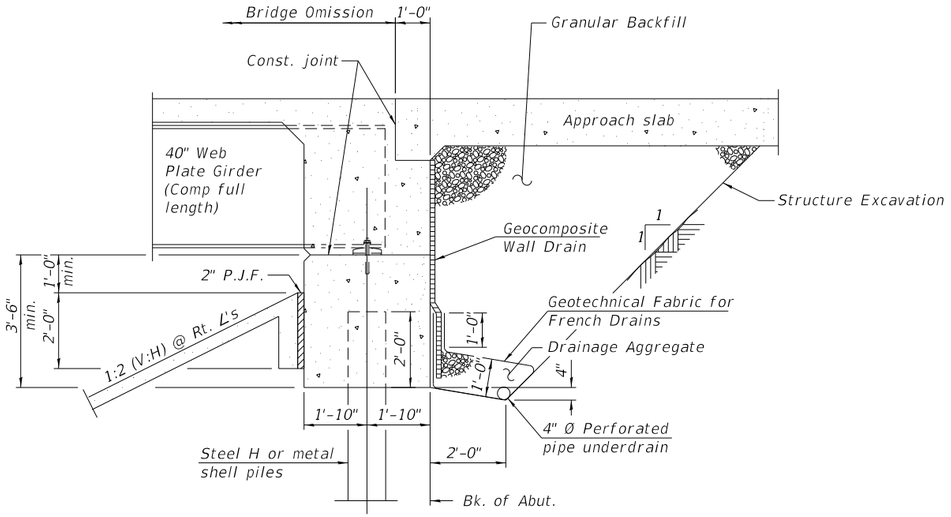
(Stations run East)
(Along ℄ Roadway)



PROPOSED PROFILE GRADE TR 82-C
(Along ℄ Roadway)



SECTION THRU FOOTING
(Showing new piles between existing piles)



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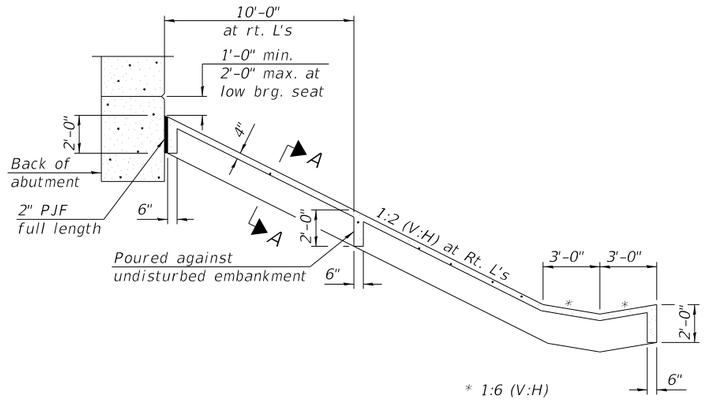
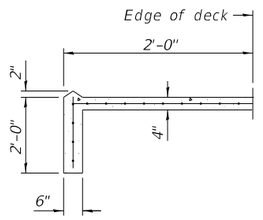
(Horiz. dim. @ Rt. L's)



SECTION THRU
CONCRETE SLOPEWALL



SECTION A-A

GENERAL PLAN AND ELEVATION
TR 82-C OVER F.A.I. RT. 80
SEC. 06-2-HB
BUREAU COUNTY
STA. 19+13.48
STRUCTURE NO. 006-0190

HRG PROJECT NO.: 2002R
HRG PROJ. CONTACT:
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HRGreen.com
■Inols Professional Design Firm
184-001322

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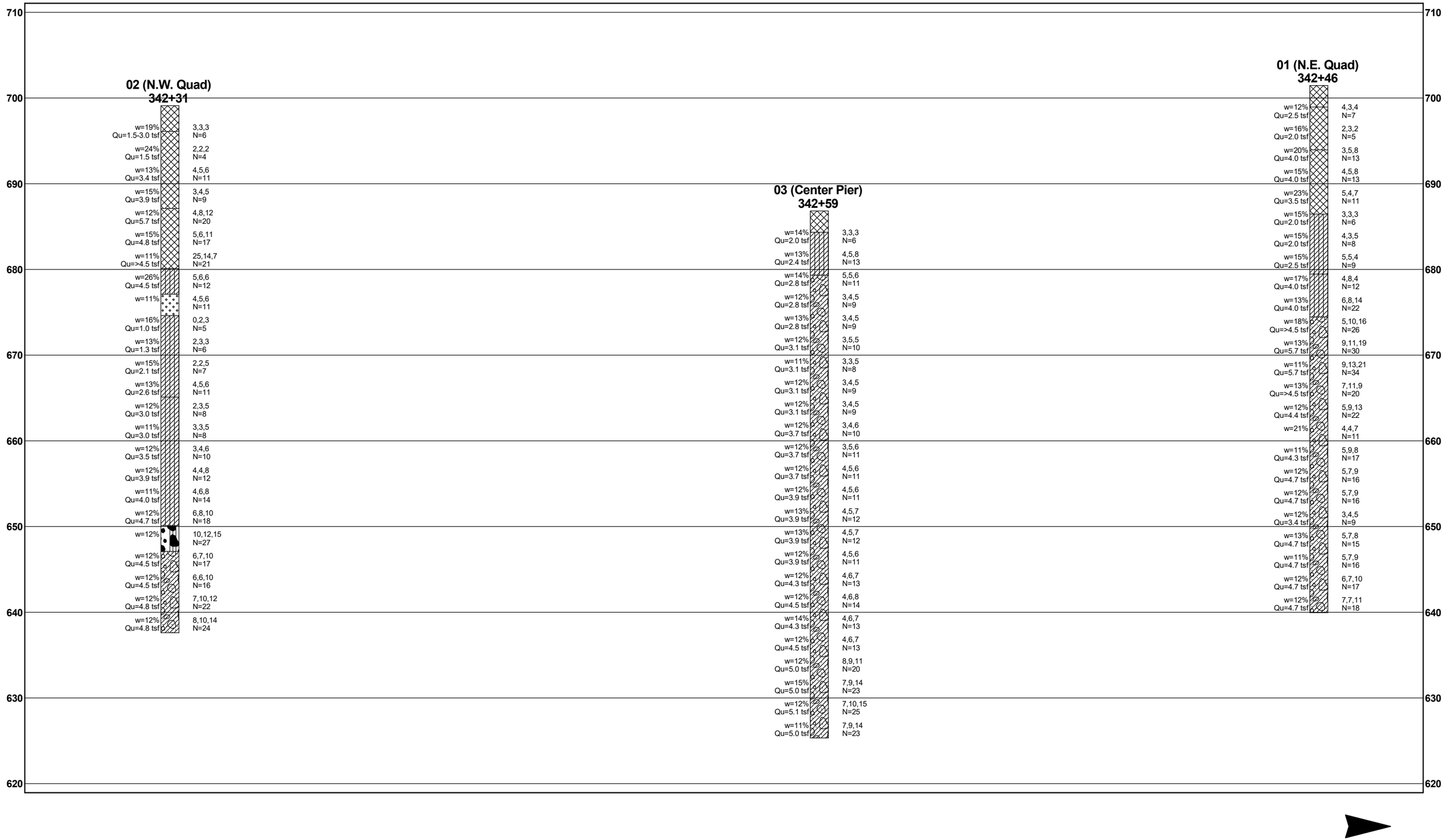
	CHECKED - WJH	REVISED -
PLOT SCALE =	DRAWN - WJH	REVISED -
PLOT DATE = 3/22/2021	CHECKED - AEU	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 2 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
TR 82-C	06-2-HB	BUREAU	2	2
		CONTRACT NO.		
	ILLINOIS FED. AID PROJECT			



rubino ENGINEERING INC.

Rubino Engineering, Inc.
425 Shepard Drive
Elgin, IL 60123
Telephone: 847-931-1555
Fax: 847-931-1560

Soil Profile

Rubino Job No.:	G21.020
Project & location:	TR 82-C over I-80, 2.5 miles West of IL 40
Route:	I-80 & TR 82-C
County:	Bureau
Section:	06-2-HB

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 8/5/20

ROUTE I-80 & TR 82-C **DESCRIPTION** TR 82-C over I-80, 2.5 miles West of IL 40 **LOGGED BY** Larry Myers

SECTION 06-2-HB **LOCATION** SE 1/4, **SEC.** 7, **TWP.** 16N, **RNG.** 7E, 4th **PM**,
Latitude 41.38725, **Longitude** -89.7333

COUNTY Bureau **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 006-0117 (Exist.)
Station 342+38.40 (Exist.)

BORING NO. 01 (S.E. Quad.)
Station 342+46
Offset 129.0 ft Rt.
Ground Surface Elev. 701.45 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 676.5 ft ▼
Upon Completion 678.5 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				Augered Oil / Chip Road, Brown Sand & Gravel Fill
698.95				
	4			Very Stiff Light Brown Silty Clay Loam Till Fill & Gray Silty Clay Loam Till Fill
	3 4	2.5 P	12	
-5				
	2			
	3 2	2.0 P	16	
693.95				
	3			Hard Black & Gray Silty Clay Loam Fill & Gray Silty Clay Loam Till Fill
	5 8	4.0 P	20	
-10				
	4			
	5 8	4.0 P	15	
	5			
	4 7	3.5 P	23	
686.45 -15				
	3			Very Stiff Light Brown Silty Clay Loam Till with Silt Seams & Pockets
	3 3	2.0 P	15	
	4			
	3 5	2.0 P	15	
-20				
	5			Very Stiff Light Brown Silty Clay Loam Till with Silt Seams & Pockets *(continued)*
	5 4	2.5 P	15	
679.45				
	4			Hard Very Stiff & Light Brown Silty Clay Loam Till with Sand Layers & Silt Seams ▽
	8 14	4.0 P	17	
-25 ▼				
	6			
	8 14	4.0 P	13	
674.45				
	5			Hard Purplish Gray Silty Clay Loam Till with Loam Layers at 36.0 to 42.0 Ft. - Till Very Uniform & Consistent
	10 16	>4.5 P	18	
-30				
	9			
	11 19	5.7 S	13	
	9			
	13 21	5.7 S	11	
-35				
	7			
	11 9	>4.5 P	13	
	5			
	9 13	4.4 B	12	
-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)

BBS, form 137 (Rev. 8-99)

SOIL BORING 006-0117.GPJ IL_DOT.GDT 9/28/20

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 8/5/20

ROUTE I-80 & TR 82-C **DESCRIPTION** TR 82-C over I-80, 2.5 miles West of IL 40 **LOGGED BY** Larry Myers

SECTION 06-2-HB **LOCATION** SE 1/4, **SEC.** 7, **TWP.** 16N, **RNG.** 7E, 4th **PM**,
Latitude 41.38725, **Longitude** -89.7333

COUNTY Bureau **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 006-0117 (Exist.)
Station 342+38.40 (Exist.)

BORING NO. 01 (S.E. Quad.)
Station 342+46
Offset 129.0 ft Rt.
Ground Surface Elev. 701.45 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 676.5 ft ▼
Upon Completion 678.5 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
	4		
	4 7		21
Hard Purplish Gray Silty Clay Loam Till with Loam Layers at 36.0 to 42.0 Ft. - Till Very Uniform & Consistent *(continued)*			
	5		
	9 8	4.3 B	11
-45			
	5		
	7 9	4.7 S	12
	5		
	7 9	4.7 S	12
-50			
	3		
	4 5	3.4 B	12
	5		
	7 8	4.7 S	13
-55			
	5		
	7 9	4.7 S	11
	6		
	7 10	4.7 S	12
-60			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
	7		
	7 11	4.7 S	12
639.95			
End of Boring			
-65			
-70			
-75			
-80			

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)

BBS, form 137 (Rev. 8-99)

SOIL BORING 006-0117.GPJ IL_DOT.GDT 9/28/20

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 8/6/20

ROUTE I-80 & TR 82-C **DESCRIPTION** TR 82-C over I-80, 2.5 miles West of IL 40 **LOGGED BY** Larry Myers

SECTION 06-2-HB **LOCATION** NW 1/4, **SEC.** 7, **TWP.** 16N, **RNG.** 7E, 4th **PM**,
Latitude 41.38796, **Longitude** -89.73336

COUNTY Bureau **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 006-0117 (Exist.)
Station 342+38.40 (Exist.)

BORING NO. 02 (N.W. Quad.)
Station 342+31
Offset 130.0 ft Lt.
Ground Surface Elev. 699.11 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 659.1 ft ▼
Upon Completion 648.1 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered Oil / Chip Road, Brown Sand & Gravel Fill			
696.61			
Stiff to Very Stiff Gray Silty Clay Loam Till, Brown Silty Clay Loam Till, Black Silty Clay Fill	3		
	3 3	1.5-3.0 P	19
-5			
	2		
	2 2	1.5 P	24
	4		
	5 6	3.4 S	13
-10			
	3		
	4 5	3.9 S	15
687.11			
Hard Brown Silty Clay Loam Till, Gray Silty Clay Loam Till Fill	4		
	8 12	5.7 S	12
-15			
	5		
	6 11	4.8 S	15
	25		
Asphalt / Concrete at 18.0 to 19.0 Ft. (old road)	14 7	>4.5 P	11
680.11			
Hard Black Silty Clay Loam / Silty Loam			
-20			
Hard Black Silty Clay Loam / Silty Loam *(continued)*	5		
	6 6	4.4 B	26
677.11			
Medium Brown Fine Sand with Minor Gravel Pieces	4		
	5 6		11
674.61			
-25			
Medium to Very Stiff Light Brown Silty Clay Loam Till with some Silt Pockets / Seams	WH		
	2 3	1.0 P	16
WH = Weight of Hammer	2		
	3 3	1.3 B	13
-30			
	2		
	2 5	2.1 B	15
	4		
	5 6	2.6 B	13
665.11			
Very Stiff to Hard Purplish Gray Silty Clay Loam Till with Minor Gravel Layers at 40.0 Ft. with Free Water			
-35			
	2		
	3 5	3.0 B	12
	3		
	3 5	3.0 B	11
▼-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)

BBS, form 137 (Rev. 8-99)

SOIL BORING 006-0117.GPJ IL_DOT.GDT 9/28/20

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 8/6/20

ROUTE I-80 & TR 82-C **DESCRIPTION** TR 82-C over I-80, 2.5 miles West of IL 40 **LOGGED BY** Larry Myers

SECTION 06-2-HB **LOCATION** NW 1/4, **SEC.** 7, **TWP.** 16N, **RNG.** 7E, 4th **PM**,
Latitude 41.38796, **Longitude** -89.73336

COUNTY Bureau **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 006-0117 (Exist.)
Station 342+38.40 (Exist.)

BORING NO. 02 (N.W. Quad.)
Station 342+31
Offset 130.0 ft Lt.
Ground Surface Elev. 699.11 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 659.1 ft ▼
Upon Completion 648.1 ft ▽
After Hrs. ft

Material	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Purplish Gray Silty Clay Loam Till with Minor Gravel Layers at 40.0 Ft. with Free Water *(continued)*		3		
		4 6	3.5 B	12
		4		
		4 8	3.9 B	12
	-45	4		
		6 8	4.0 B	11
		6		
		8 10	4.7 S	12
	650.11			
Medium Gray Fine Sand to Coarse Gravel - Loamy	-50	10		
▽		12 15		12
	647.11			
Hard Purplish Gray Silty Clay Loam Till		6		
		7 10	4.5 S	12
	-55	6		
		6 10	4.5 S	12
		7		
		10 12	4.8 S	12
	-60			

Material	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Purplish Gray Silty Clay Loam Till *(continued)*		8		
		10 14	4.8 S	12
	637.61			
End of Boring				
	-65			
	-70			
	-75			
	-80			

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)

BBS, form 137 (Rev. 8-99)

SOIL BORING 006-0117.GPJ IL_DOT.GDT 9/28/20

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 8/12/20

ROUTE I-80 & TR 82-C **DESCRIPTION** TR 82-C over I-80, 2.5 miles West of IL 40 **LOGGED BY** Larry Myers

SECTION 06-2-HB **LOCATION** SE 1/4, **SEC.** 7, **TWP.** 16N, **RNG.** 7E, 4th **PM**,
Latitude 41.38756, **Longitude** -89.73324

COUNTY Bureau **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 006-0117 (Exist.)
Station 342+38.40 (Exist.)

BORING NO. 03 (Center Pier)
Station 342+59
Offset 16.0 ft Rt.
Ground Surface Elev. 686.83 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered Black & Brown Silty Clay Loam Till Fill			
684.33			
Stiff to Very Stiff Light Brown Silty Clay Loam Till	3		
	3 3	2.0 B	14
-5	4		
	5 8	2.4 B	13
679.33			
Very Stiff to Hard Purplish Gray Silty Clay Loam Till - Monolithic, Very Consistent	5		
	5 6	2.8 B	14
-10	3		
	4 5	2.8 B	12
	3		
	4 5	2.8 B	13
-15	3		
	5 5	3.1 B	12
	3		
	3 5	3.1 B	11
-20			
Very Stiff to Hard Purplish Gray Silty Clay Loam Till - Monolithic, Very Consistent *(continued)*	3		
	4 5	3.1 B	12
	3		
	4 5	3.1 B	12
-25	3		
	4 6	3.7 B	12
	3		
	5 6	3.7 B	12
-30	4		
	5 6	3.7 B	12
	4		
	5 6	3.9 B	12
-35	4		
	5 7	3.9 B	13
	4		
	5 7	3.9 B	13
-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)

BBS, form 137 (Rev. 8-99)

SOIL BORING 006-0117.GPJ IL_DOT.GDT 9/28/20

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 8/12/20

ROUTE I-80 & TR 82-C **DESCRIPTION** TR 82-C over I-80, 2.5 miles West of IL 40 **LOGGED BY** Larry Myers

SECTION 06-2-HB **LOCATION** SE 1/4, **SEC.** 7, **TWP.** 16N, **RNG.** 7E, 4th **PM**,
Latitude 41.38756, **Longitude** -89.73324

COUNTY Bureau **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 006-0117 (Exist.)
Station 342+38.40 (Exist.)

BORING NO. 03 (Center Pier)
Station 342+59
Offset 16.0 ft Rt.
Ground Surface Elev. 686.83 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After Hrs. ft

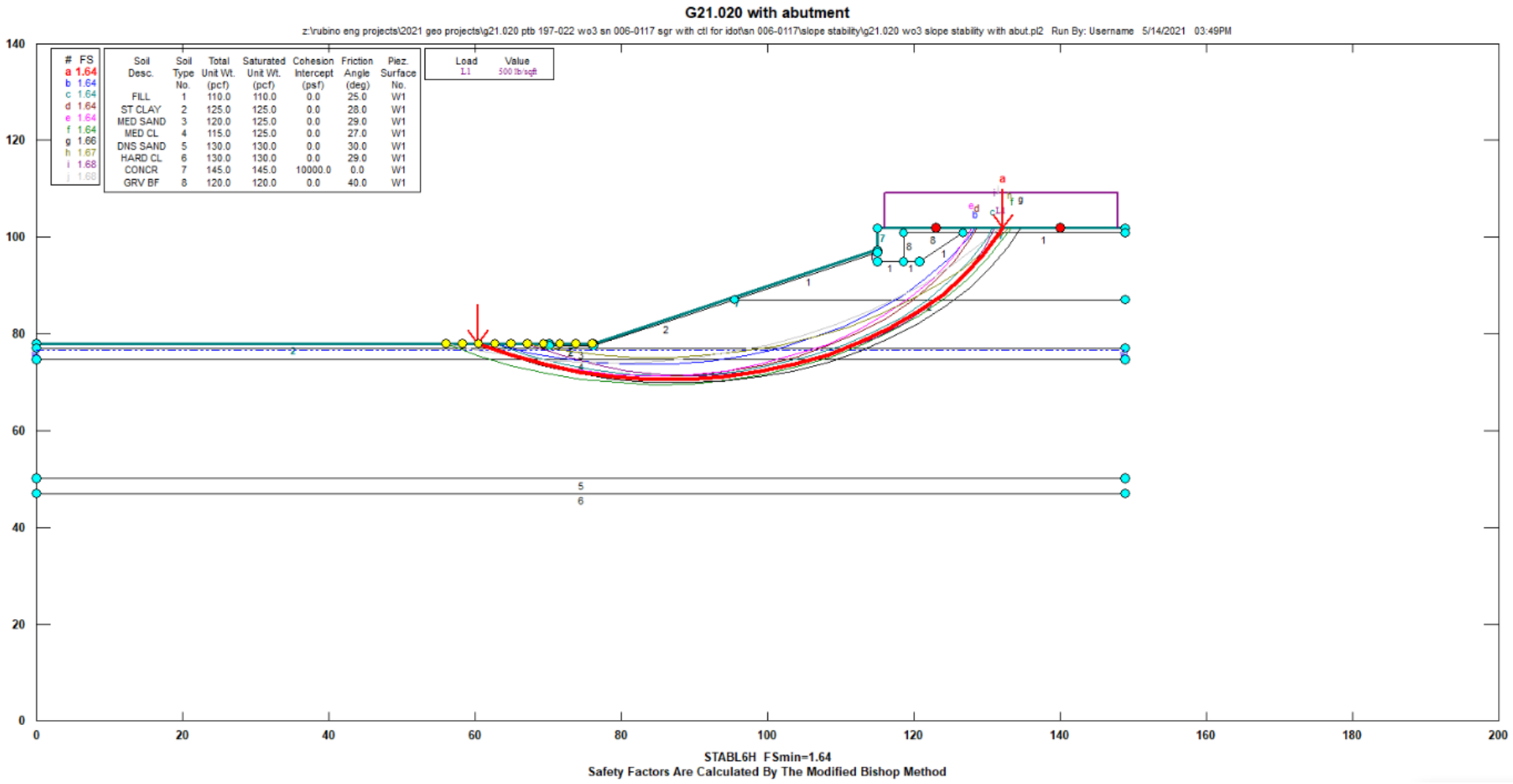
DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Purplish Gray Silty Clay Loam Till - Monolithic, Very Consistent *(continued)*	4		
	5 6	3.9 B	12
	4		
	6 7	4.3 B	12
-45			
	4		
	6 8	4.5 B	12
	4		
	6 7	4.3 B	14
-50			
	4		
	6 7	4.5 B	12
	8		
	9 11	5.0 S	12
-55			
	7		
	9 14	5.0 S	15
	7		
	10 15	5.1 S	12
-60			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Very Stiff to Hard Purplish Gray Silty Clay Loam Till - Monolithic, Very Consistent *(continued)*	7		
625.33	9 14	5.0 S	11
End of Boring			
-65			
-70			
-75			
-80			

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)

BBS, form 137 (Rev. 8-99)

SOIL BORING 006-0117.GPJ IL_DOT.GDT 9/28/20


G21.020 with abutment
z:\rubino eng projects\2021 geo projects\g21.020 ptb 197-022 wo3 sn 006-0117 sgr with ctl for idot\sn 006-0117\slope stability\g21.020 wo3 slope stability with abut.pl2 Run By: Username 5/14/2021 03:49PM
FS
a 1.64
b 1.64
c 1.64
d 1.64
e 1.64
f 1.64
g 1.66
h 1.67
i 1.68
j 1.68
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No.
FILL 1 110.0 110.0 0.0 25.0 W1
ST CLAY 2 125.0 125.0 0.0 28.0 W1
MED SAND 3 120.0 125.0 0.0 29.0 W1
MED CL 4 115.0 125.0 0.0 27.0 W1
DNS SAND 5 130.0 130.0 0.0 30.0 W1
HARD CL 6 130.0 130.0 0.0 29.0 W1
CONCR 7 145.0 145.0 10000.0 0.0 W1
GRV BF 8 120.0 120.0 0.0 40.0 W1
Load L1 Value 500 lb/sqft
0 20 40 60 80 100 120 140 160 180 200
0 20 40 60 80 100 120 140
STABL6H FSmin=1.64
Safety Factors Are Calculated By The Modified Bishop Method

SEISMIC SITE CLASS DETERMINATION

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT

Modified on 12/10/10

PROJECT TITLE=====WO 3 SB 006-0117

Substructure 1

Base of Substruct. Elev. (or ground surf for bents	694.94	ft.
Pile or Shaft Dia.	14	inches
Boring Number	B-1	
Top of Boring Elev.	701.45	ft.
Approximate Fixity Elev.	687.94	ft.

Individual Site Class Definition:

N (bar): 17 (Blows/ft.) Soil Site Class D
N_{ch} (bar): (Blows/ft.) NA
s_u (bar): 4.24 (ksf) Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	699.9	1.55			
	697.4	2.50	7	2.50	
	694.9	2.50	5	2.00	B
	692.4	2.50	13	4.00	
	689.9	2.50	13	4.00	
0.5	687.4	2.50	11	3.50	B
3.0	684.9	2.50	6	2.00	
5.5	682.4	2.50	8	2.00	
8.0	679.9	2.50	9	2.50	B
10.5	677.4	2.50	22	4.00	
13.0	674.9	2.50	22	4.00	B
15.5	672.4	2.50	26	4.50	
18.0	669.9	2.50	30	5.70	
20.5	667.4	2.50	34	5.70	
23.0	664.9	2.50	20	4.50	
25.5	662.4	2.50	22	4.40	
28.0	659.9	2.50	11		
30.5	657.4	2.50	17	4.30	
33.0	654.9	2.50	16	4.70	
35.5	652.4	2.50	16	4.70	
38.0	649.9	2.50	9	3.40	
40.5	647.4	2.50	15	4.70	
43.0	644.9	2.50	16	4.70	
45.5	642.4	2.50	17	4.70	
48.0	639.9	2.50	18	4.70	B
100.0	588.0	51.95	18	4.70	B

Substructure 2

Base of Substruct. Elev. (or ground surf for bents	692.87	ft.
Pile or Shaft Dia.	14	inches
Boring Number	B-2	
Top of Boring Elev.	699.11	ft.
Approximate Fixity Elev.	685.87	ft.

Individual Site Class Definition:

N (bar): 16 (Blows/ft.) Soil Site Class D
N_{ch} (bar): NA (Blows/ft.) NA
s_u (bar): 3.88 (ksf) Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	697.6	1.50			
	695.1	2.50	6	1.50	
	692.6	2.50	4	1.50	
	690.1	2.50	11	3.40	
	687.6	2.50	9	3.90	B
0.8	685.1	2.50	20	5.70	
3.3	682.6	2.50	17	4.80	
5.8	680.1	2.50	21	4.50	B
8.3	677.6	2.50	12	4.40	B
10.8	675.1	2.50	11		B
13.3	672.6	2.50	5	1.00	
15.8	670.1	2.50	6	1.30	
18.3	667.6	2.50	7	2.10	
20.8	665.1	2.50	11	2.60	B
23.3	662.6	2.50	8	3.00	
25.8	660.1	2.50	8	3.00	
28.3	657.6	2.50	10	3.50	
30.8	655.1	2.50	12	3.90	
33.3	652.6	2.50	14	4.00	
35.8	650.1	2.50	18	4.70	B
38.3	647.6	2.50	27		B
40.8	645.1	2.50	17	4.50	
43.3	642.6	2.50	16	4.50	
45.8	640.1	2.50	22	4.80	
48.3	637.6	2.50	24	4.80	B
100.0	585.9	51.74	24	4.80	B

Substructure 3

Base of Substruct. Elev. (or ground surf for bents	674.34	ft.
Pile or Shaft Dia.	14	inches
Boring Number	B-3	
Top of Boring Elev.	686.83	ft.
Approximate Fixity Elev.	667.34	ft.

Individual Site Class Definition:

N (bar): 18 (Blows/ft.) Soil Site Class D
N_{ch} (bar): (Blows/ft.) NA
s_u (bar): 4.6 (ksf) Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	685.3	1.52			
	682.8	2.50	6	2.00	
	680.3	2.50	13	2.40	B
	677.8	2.50	11	2.80	
	675.3	2.50	9	2.80	
	672.8	2.50	9	2.80	
	670.3	2.50	10	3.10	
	667.8	2.50	8	3.10	
2.0	665.3	2.50	9	3.10	
4.5	662.8	2.50	9	3.10	
7.0	660.3	2.50	10	3.70	
9.5	657.8	2.50	11	3.70	
12.0	655.3	2.50	11	3.70	
14.5	652.8	2.50	11	3.90	
17.0	650.3	2.50	12	3.90	
19.5	647.8	2.50	12	3.90	
22.0	645.3	2.50	11	3.90	
24.5	642.8	2.50	13	4.30	
27.0	640.3	2.50	14	4.50	
29.5	637.8	2.50	13	4.30	
32.0	635.3	2.50	13	4.50	
34.5	632.8	2.50	20	5.00	
37.0	630.3	2.50	23	5.00	
39.5	627.8	2.50	25	5.10	
42.0	625.3	2.50	23	5.00	B
100.0	567.3	57.97	23	5.00	B

Substructure 4

Base of Substruct. Elev. (or ground surf for bents)		ft.
Pile or Shaft Dia.		inches
Boring Number		
Top of Boring Elev.		ft.
Approximate Fixity Elev.		ft.

Individual Site Class Definition:

N (bar): (Blows/ft.) NA
N_{ch} (bar): (Blows/ft.) NA
s_u (bar): (ksf) NA

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary

Global Site Class Definition: Substructures 1 through 3

N (bar): 17 (Blows/ft.) Soil Site Class D
N_{ch} (bar): (Blows/ft.) NA, H < 0.1*H (Total)
s_u (bar): 4.25 (ksf) Soil Site Class C <----Controls

Integral Abutment Feasibility

Integral abutments are the preferred end bent type due to elimination of the joints in the bridge decks, decreasing maintenance costs and increasing service life. The proposed structure length typically fits in the range of applicability for integral abutments; the soil at critical depth of 10 feet below the abutments is stiff to hard. The bottom abutment elevation is 692.87 at the North abutment and 694.94 feet at the South abutment. Critical depth for intergral abutment analysis is 10 feet below the bottom of the abutment elevation.

Abutment	Soil Strengths at Critical Depth	Recommendation
North Abutment	Qu between 3.4 – 5.7 tsf	Pre-bore with bentonite
South Abutment	Qu between 2.0 – 4.0 tsf	Pre-bore with bentonite

According to the IDOT ABD Memo 12.3, the integral abutment study only pertains to soils with Qu less than 3.0 tsf. See the attached IDOT BBS 145 spreadsheet for in Situ Integral Abutment Feasibility.

The IDOT Geotechnical Manual discusses pre-coring pile locations to 10 feet below the abutment and backfilling with bentonite pellets, which reduces the soils pressures on the pile during expansion. Rubino has input a Qu of 1.5 tsf over the critical depth in the intergral abutment spreadsheet. Rubino has also omitted the soil strength in the critical depth in the pile spreadsheets.

Utilizing a Qu value of 1.5 tsf for both bentonite and embankment conditions, the results show integral abutments are applicable for all pile sizes. See attached Bentonite/Embankment Integral Abutment Feasibility spreadsheet.

Abutment Pile Discussion

Metal shell piles and H-piles are both considered for integral abutment applications. Tables of estimated pile lengths are attached. Metal shell piles are recommended over H-piles due to bedrock not being encountered. Conical tips are recommended for metal shell piles in very stiff or dense soils. The proposed pile locations need to be checked for conflict with the existing piling. Existing piles should be cut off to an appropriate elevation to not interfere with the new abutment and pile system.

Illinois Department of Transportation

INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER	SN 006-0121		TOTAL STRUCTURE LENGTH	230.00	FT
STRUCTURE TYPE	MULTI-SPAN		NUMBER OF SPANS	2	
STRUCTURE SKEW	4.51667	DEGREES	END SPAN LENGTH	115.00	FT
SUPER. DATA IN REFERENCE TO SUB. DATA	ABUT 1		ADJACENT INTERIOR SPAN LENGTH	0.01	FT

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (END OR MAIN SPAN)

BEAM TYPE	PLATE GIRDER	
TOP FLANGE WIDTH	10.00	IN
TOP FLANGE THICKNESS	1.00	IN
WEB DEPTH	40.00	IN
WEB THICKNESS	1.00	IN
BOTTOM FLANGE WIDTH	10.00	IN
BOTTOM FLANGE THICKNESS	1.00	IN
BEAM SPACING PERP. TO CL	5.17	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	3.50	KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)

TOP FLANGE WIDTH	10.00	IN
TOP FLANGE THICKNESS	1.00	IN
WEB DEPTH	40.00	IN
WEB THICKNESS	1.00	IN
BOTTOM FLANGE WIDTH	10.00	IN
BOTTOM FLANGE THICKNESS	1.00	IN
BEAM SPACING PERP. TO CL	5.17	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	3.50	KSI

ABUTMENT #1 DATA

ABUTMENT NAME	S.E. Quard. Abutment	
ABUTMENT REFERENCE BORING	B-1	
BOTTOM OF ABUTMENT ELEVATION	694.94	FT
ESTIMATED NUMBER OF PILES AT ABUT.	3	
PILE SPACING PERP. TO CL	8	FT

ABUTMENT #2 DATA

ABUTMENT NAME	N.W. Quad Abutment	
ABUTMENT REFERENCE BORING	B-2	
BOTTOM OF ABUTMENT ELEVATION	692.87	FT
ESTIMATED NUMBER OF PILES AT ABUT.	3	
PILE SPACING PERP. TO CL	8	FT

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
692.44	2.50	4.0		
689.94	2.50	4.0		
687.44	2.50	3.5		
684.94	2.50	2.0		

10.00 FT = TOTAL DEPTH ENTERED

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
690.37	2.50	3.4		
687.87	2.50	3.9		
685.37	2.50	5.7		
682.87	2.50	4.8		

10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1 = 3.38 TSF

PILE STIFFNESS MODIFIER FOR ABUTMENT #1
= 1/(1.45-[0.3*3.38]) = 2.29

WEIGHTED AVERAGE Qu FOR ABUTMENT #2 = 4.45 TSF

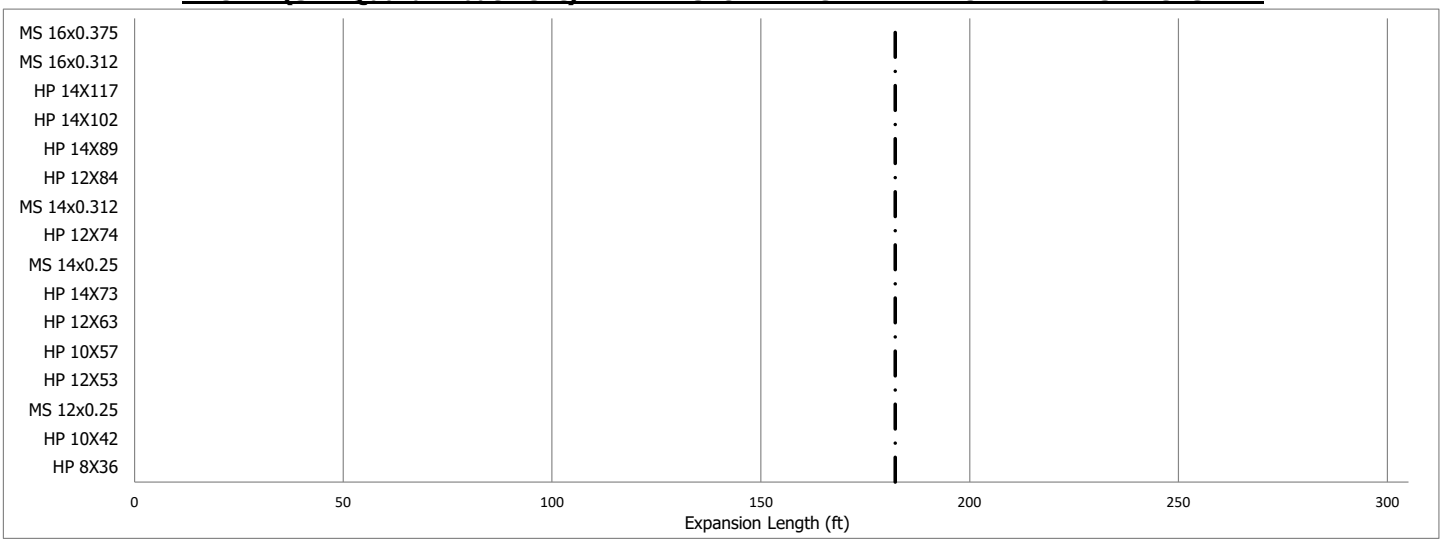
PILE STIFFNESS MODIFIER FOR ABUTMENT #2
= 1/(1.45-[0.3*4.45]) = 8.70

WEIGHTED AVG. Qu > 3.0 TSF WITH TRIB. LENGTH > 20%, INTEGRAL ABUTMENT STRUCTURE NOT ALLOWED

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [2.29*3*0+8.7*3*230]/[2.29*3+8.7*3] = ~~182.13~~ FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [8.7*3*0+2.29*3*230]/[8.7*3+2.29*3] = ~~47.87~~ FT

ABUT 1 (S.E. Quard. Abutment) - EXPANSION LENGTH LIMIT CHART - 4.5 DEG. SKEW



= Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration.
(Note: The same size pile should be used at both abutments.)

Illinois Department of Transportation

BENTONITE/ENBANKMENT INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER	SN 006-0121		TOTAL STRUCTURE LENGTH	230.00	FT
STRUCTURE TYPE	MULTI-SPAN		NUMBER OF SPANS	2	
STRUCTURE SKEW	4.51667	DEGREES	END SPAN LENGTH	115.00	FT
SUPER. DATA IN REFERENCE TO SUB. DATA	ABUT 1		ADJACENT INTERIOR SPAN LENGTH	0.01	FT

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (END OR MAIN SPAN)

BEAM TYPE	PLATE GIRDER	
TOP FLANGE WIDTH	10.00	IN
TOP FLANGE THICKNESS	1.00	IN
WEB DEPTH	40.00	IN
WEB THICKNESS	1.00	IN
BOTTOM FLANGE WIDTH	10.00	IN
BOTTOM FLANGE THICKNESS	1.00	IN
BEAM SPACING PERP. TO CL	5.17	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	3.50	KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)

TOP FLANGE WIDTH	10.00	IN
TOP FLANGE THICKNESS	1.00	IN
WEB DEPTH	40.00	IN
WEB THICKNESS	1.00	IN
BOTTOM FLANGE WIDTH	10.00	IN
BOTTOM FLANGE THICKNESS	1.00	IN
BEAM SPACING PERP. TO CL	5.17	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	3.50	KSI

ABUTMENT #1 DATA

ABUTMENT NAME	S.E. Quard. Abutment	
ABUTMENT REFERENCE BORING	B-1	
BOTTOM OF ABUTMENT ELEVATION	694.94	FT
ESTIMATED NUMBER OF PILES AT ABUT.	3	
PILE SPACING PERP. TO CL	8	FT

ABUTMENT #2 DATA

ABUTMENT NAME	N.W. Quad Abutment	
ABUTMENT REFERENCE BORING	B-2	
BOTTOM OF ABUTMENT ELEVATION	692.87	FT
ESTIMATED NUMBER OF PILES AT ABUT.	3	
PILE SPACING PERP. TO CL	8	FT

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #1

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
692.44	2.50	1.5		
689.94	2.50	1.5		
687.44	2.50	1.5		
684.94	2.50	1.5		

10.00 FT = TOTAL DEPTH ENTERED

SOIL DATA FOR 10 FT BENEATH BOTTOM OF ABUTMENT #2

BOT. OF LAYER ELEV. (FT)	*LAYER THICKNESS (FT)*	*UNCONFINED COMPRESSIVE STRENGTH (TSF)*	*N S.P.T. VALUE (BLOWS/12 IN.)*	*Qu EQUIV. FOR N VALUE (TSF)*
690.37	2.50	1.5		
687.87	2.50	1.5		
685.37	2.50	1.5		
682.87	2.50	1.5		

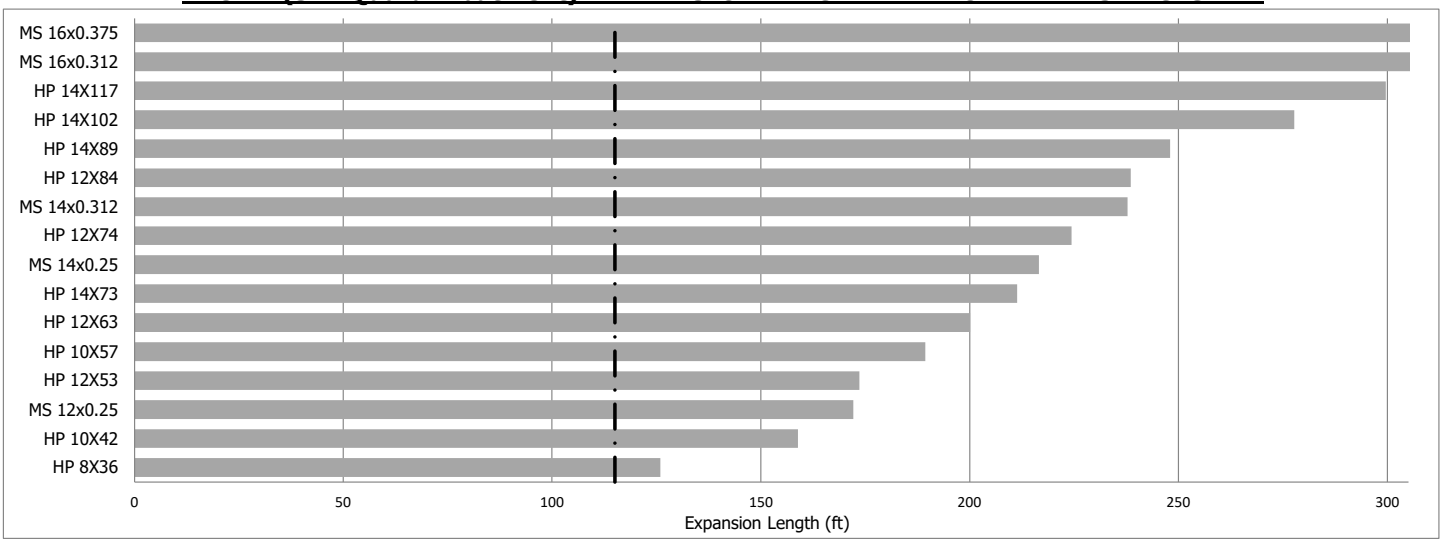
10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1	1.50	TSF	WEIGHTED AVERAGE Qu FOR ABUTMENT #2	1.50	TSF
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*1.5])	1.00		PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*1.5])	1.00	

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1*3*0+1*3*230]/[1*3+1*3] = 115.00 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1*3*0+1*3*230]/[1*3+1*3] = 115.00 FT

ABUT 1 (S.E. Quard. Abutment) - EXPANSION LENGTH LIMIT CHART - 4.5 DEG. SKEW



= Estimated expansion length for the indicated abutment. Piles with an expansion length greater than this are suitable for consideration.
(Note: The same size pile should be used at both abutments.)

Pile Design Table for North Abutment utilizing Boring #02

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls		
214	118	38
238	131	41
268	147	43
311	171	48
337	185	51
365	201	53
390	215	56
Metal Shell 14"Φ w/.25" walls		
200	110	33
228	125	36
257	141	38
285	157	41
320	176	43
Metal Shell 14"Φ w/.312" walls		
200	110	33
228	125	36
257	141	38
285	157	41
320	176	43
371	204	48
400	220	51
434	239	53
463	255	56
Metal Shell 16"Φ w/.312" walls		
209	115	31
234	129	33
267	147	36
301	166	38
333	183	41
375	206	43
432	238	48
466	256	51
505	278	53
539	296	56
Metal Shell 16"Φ w/.375" walls		
209	115	31
234	129	33
267	147	36
301	166	38
333	183	41
375	206	43
432	238	48
466	256	51
505	278	53
539	296	56
Steel HP 8 X 36		
212	116	56

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
213	117	48
230	127	51
250	138	53
267	147	56
Steel HP 10 X 57		
218	120	48
236	130	51
256	141	53
274	150	56
Steel HP 12 X 53		
215	118	41
244	134	43
266	146	46
267	147	48
287	158	51
312	172	53
333	183	56
Steel HP 12 X 63		
218	120	41
246	135	43
269	148	46
269	148	48
290	160	51
315	173	53
336	185	56
Steel HP 12 X 74		
221	122	41
250	138	43
273	150	46
273	150	48
295	162	51
320	176	53
341	188	56

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
224	123	41
254	140	43
277	152	46
278	153	48
299	164	51
325	179	53
346	190	56
Steel HP 14 X 73		
215	119	36
243	134	38
267	147	41
303	167	43
329	181	46
329	181	48
354	195	51
384	211	53
408	225	56
Steel HP 14 X 89		
219	120	36
247	136	38
271	149	41
307	169	43
334	184	48
358	197	51
389	214	53
414	228	56
Steel HP 14 X 102		
222	122	36
250	138	38
274	151	41
311	171	43
338	186	48
363	200	51
394	217	53
419	231	56
Steel HP 14 X 117		
196	108	33
225	124	36
254	139	38
278	153	41
316	174	43
343	189	48
368	202	51
399	220	53
425	233	56
Precast 14"x 14"		
195	107	28
226	124	31
254	140	33

Pile Design Table for Center Pier utilizing Boring #03

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls		
366	201	40
Metal Shell 14"Φ w/.25" walls		
434	239	40
Metal Shell 14"Φ w/.312" walls		
434	239	40
470	259	42
500	275	45
531	292	47
560	308	50
Metal Shell 16"Φ w/.312" walls		
438	241	35
469	258	37
505	278	40
547	301	42
581	320	45
617	339	47
649	357	50
Metal Shell 16"Φ w/.375" walls		
438	241	35
469	258	37
505	278	40
547	301	42
581	320	45
617	339	47
649	357	50
Steel HP 8 X 36		
267	147	50

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
320	176	47
Steel HP 10 X 57		
343	189	50
Steel HP 12 X 53		
415	228	50
Steel HP 12 X 63		
419	231	50
Steel HP 12 X 74		
425	234	50

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
432	237	50
Steel HP 14 X 73		
434	239	42
458	252	45
485	266	47
507	279	50
Steel HP 14 X 89		
439	242	42
464	255	45
491	270	47
513	282	50
Steel HP 14 X 102		
445	245	42
470	259	45
497	273	47
520	286	50
Steel HP 14 X 117		
415	228	40
451	248	42
476	262	45
503	277	47
526	290	50
Precast 14"x 14"		
262	144	20

Pile Design Table for South Abutment utilizing Boring #01

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls		
213	117	33
234	129	35
260	143	38
288	159	40
314	173	43
328	180	45
360	198	48
385	212	50
Metal Shell 14"Φ w/.25" walls		
194	107	25
227	125	30
255	140	33
280	154	35
311	171	38
344	189	40
374	206	43
389	214	45
428	235	48
458	252	50
Metal Shell 14"Φ w/.312" walls		
194	107	25
227	125	30
255	140	33
280	154	35
311	171	38
344	189	40
374	206	43
389	214	45
428	235	48
458	252	50
487	268	53
517	284	55
Metal Shell 16"Φ w/.312" walls		
180	99	23
232	128	25
268	147	30
300	165	33
328	180	35
363	200	38
402	221	40
436	240	43
451	248	45
498	274	48
532	293	50
566	311	53
600	330	55
Metal Shell 16"Φ w/.375" walls		
180	99	23
232	128	25
268	147	30
300	165	33
328	180	35
363	200	38
402	221	40
436	240	43
451	248	45
498	274	48
532	293	50
566	311	53
600	330	55
Steel HP 8 X 36		
213	117	50
227	125	53
241	133	55

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
221	122	43
226	124	45
252	139	48
269	148	50
287	158	53
304	167	55
Steel HP 10 X 57		
209	115	40
227	125	43
231	127	45
258	142	48
276	152	50
293	161	53
311	171	55
Steel HP 12 X 53		
208	114	35
231	127	38
256	141	40
277	152	43
280	154	45
314	173	48
335	184	50
355	195	53
376	207	55
Steel HP 12 X 63		
210	116	35
233	128	38
259	142	40
280	154	43
282	155	45
317	175	48
338	186	50
359	197	53
380	209	55
Steel HP 12 X 74		
214	117	35
237	130	38
263	145	40
284	156	43
287	158	45
322	177	48
343	189	50
364	200	53
385	212	55

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
217	119	35
241	132	38
267	147	40
289	159	43
291	160	45
327	180	48
348	192	50
370	203	53
391	215	55
Steel HP 14 X 73		
206	113	30
242	133	33
258	142	35
287	158	38
318	175	40
342	188	45
386	212	48
411	226	50
435	239	53
460	253	55
Steel HP 14 X 89		
210	116	30
246	135	33
262	144	35
290	160	38
322	177	40
346	190	45
391	215	48
416	229	50
441	242	53
466	256	55
Steel HP 14 X 102		
212	117	30
249	137	33
266	146	35
294	162	38
327	180	40
350	193	45
397	218	48
422	232	50
446	246	53
471	259	55
Steel HP 14 X 117		
216	119	30
253	139	33
269	148	35
298	164	38
331	182	40
355	195	45
402	221	48
427	235	50
452	249	53
477	263	55
Precast 14"x 14"		
191	105	23
247	136	25

HRGreen

Project: TR 82-C over I-80
By: OMS **Date:** 2/2/2021
Checked: AEU **Date:** 2/3/2021
HRG Project: 200211.07

Superstructure Type: Steel Plate Girder

Abutments

Summary of Loads

			Strength I		Service I
	(k)	Factor	Factored Load	Factor	Factored Load
DC	607	1.25	759	1.00	610
DW	60	1.50	90	1.00	60
LL + I	240	1.75	420	1.00	240
WS (T)		0.00	0	0.30	0
WS (L)		0.00	0	0.30	0
WL (T)		0.00	0	1.00	0
WL (L)		0.00	0	1.00	0
	Total Vertical		**1269**		**910**
	Total Transverse		0		0
	Total Longitudinal		0		0

Piers

Summary of Loads

			Strength I		Service I
	(k)	Factor	Factored Load	Factor	Factored Load
DC	1250	1.25	1563	1.00	1250
DW	201	1.50	302	1.00	210
LL + I	380	1.75	665	1.00	380
WS (T)		0.00	0	0.30	0
WS (L)		0.00	0	0.30	0
WL (T)		0.00	0	1.00	0
WL (L)		0.00	0	1.00	0
	Total Vertical		**2530**		**1840**
	Total Transverse		0		0
	Total Longitudinal		0		0

Impact = 0 for Pier Loads