Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: 05/14/2021	**Proposed SN:** SN 006-0191	**Route:**	FAI 80 (I-80)
Revised Date:	**Existing SN:** SN 006-0121	**Section:**	(06-1HB)ES
Geotechnical Engineer: Rubino Engineering, Inc. (G21.019)		**County:**	Bureau County
Structural Engineer: EFK Moen		**Contract:**	No. 66K73

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The proposed bridge configurations 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 39-inch web plate girders on integral abutments and hammer 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 abutments are supported on concrete piles and the three piers are supported on 10-foot creosote pile-supported spread footings. The original 1961 logs included soil borings at both abutments and at all three piers. In June of 2020, two (2) soil borings by were by IDOT at the abutments and one (1) soil boring was taken at the center pier. Copies of the boring 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 2 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 = D ; Seismic Performance Zone = SPZ 1 ; Design Spectral Acceleration at 0.2 sec. (SDS) = 0.116; Design Spectral Acceleration at 1.0 sec. (SD1) = 0.061. Liquefaction is not applicable because 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.

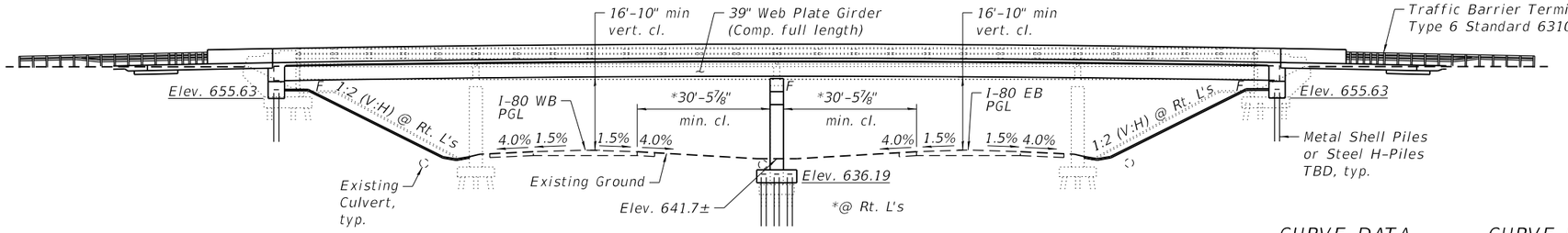
Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: Water suface elevations and cofferdams/seal coat are not applicable because this is a grade separation structure.

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.

Benchmark: Cross in concrete. Sta. 18+65.83, 17.63' right.
Elevation 664.992

Existing Structure: S.N. 006-0121 originally built in 1962 as Section 06-1HB-2. The structure is a 4-span steel beam bridge on stub abutments founded on concrete piles and solid wall piers founded on timber piles. The length of the structure is 223'-2" bk. to bk. abutments. The width is 29'-8" out to out. Traffic to be detoured with the bridge closed during construction.

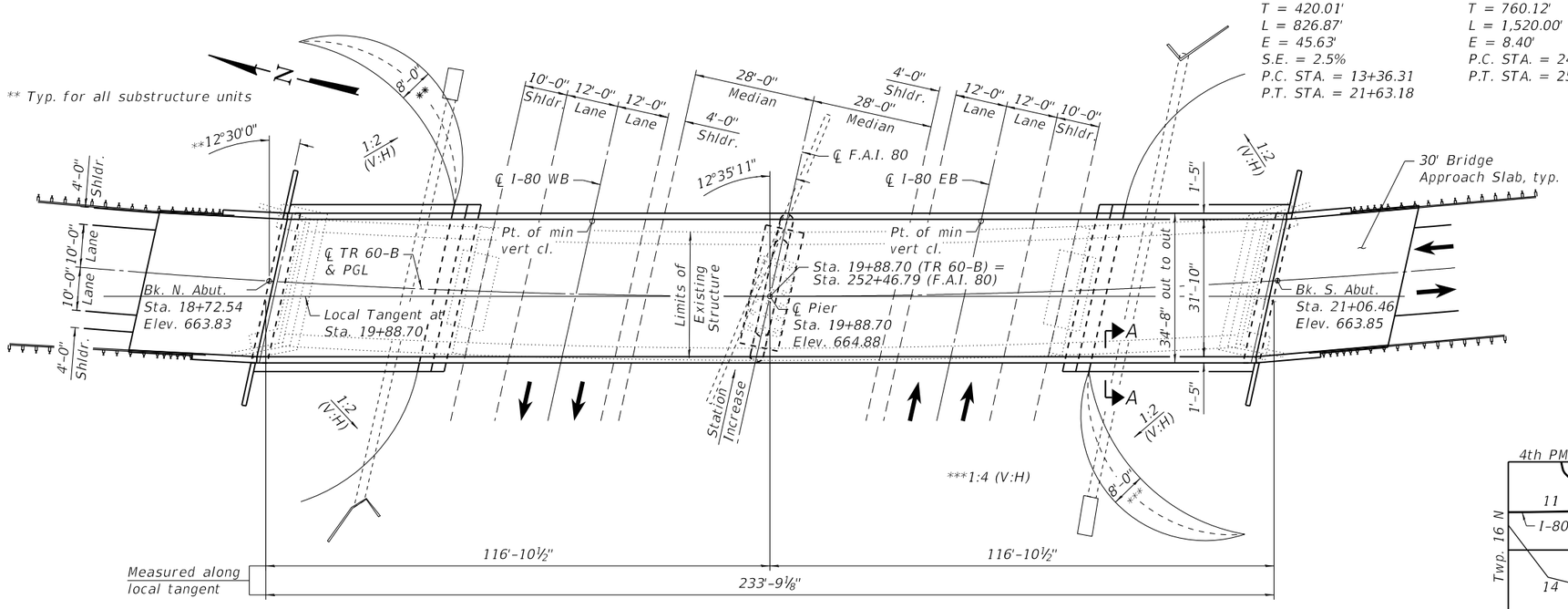
Salvage: None



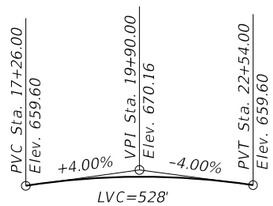
ELEVATION

CURVE DATA
TR 60-B
PI STA. = 17+56.32
Δ = 24° 48' 11" (LT)
D = 2° 59' 59"
R = 1,910.08'
T = 420.01'
L = 826.87'
E = 45.63'
S.E. = 2.5%
P.C. STA. = 13+36.31
P.T. STA. = 21+63.18

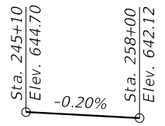
CURVE DATA
F.A.I. 80
PI STA. = 252+22.22
Δ = 2° 32' 00"
D = 0° 10' 00"
R = 34,377.50'
T = 760.12'
L = 1,520.00'
E = 8.40'
P.C. STA. = 244+62.10
P.T. STA. = 259+82.10



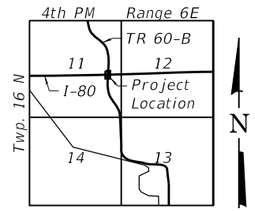
PLAN



PROFILE GRADE
Along ℄ TR 60-B



PROFILE GRADE
Along ℄ F.A.I. 80



LOCATION SKETCH

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

DESIGN SPECIFICATIONS
2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

DESIGN STRESSES
FIELD UNITS

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

SEISMIC DATA
Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = g
Design Spectral Acceleration at 0.2 sec. (SDS) = g
Soil Site Class =

HIGHWAY CLASSIFICATION
TR 60-B (470 St. E.)
Functional Class: Local
ADT: 100 (2019); 137 (2032)
ADTT: 3 (2019); 4 (2032)
DHV:
Design Speed: 30 m.p.h.
Posted Speed: 30 m.p.h.
2-Way Traffic
Directional Distribution: 50:50

F.A.I. Rte. 80 (I-80)
Functional Class: Interstate
ADT: 17200 (2019); 17925 (2032)
ADTT: 5848 (2019); 6095 (2032)
DHV: 1720
Design Speed: 70 m.p.h.
Posted Speed: 70 m.p.h.
2-Way Traffic
Directional Distribution: 50:50

GENERAL PLAN & ELEVATION
TR 60-B (470 ST. E.) OVER I-80
F.A.I. RTE. 80 - SEC. (06-1HB) ES
BUREAU COUNTY
STATION 19+88.70
STRUCTURE NO. 006-0191

MODEL: Default
FILE NAME: \\SERVER18\Projects$S4\20027.08 IDOT D3 PTB194-027 WO8 TR 60B over I-80 TS&L\DGN\Bridge\Prelim\Plotsheets\TS&L1.dgn
4/14/2021 8:31:45 AM

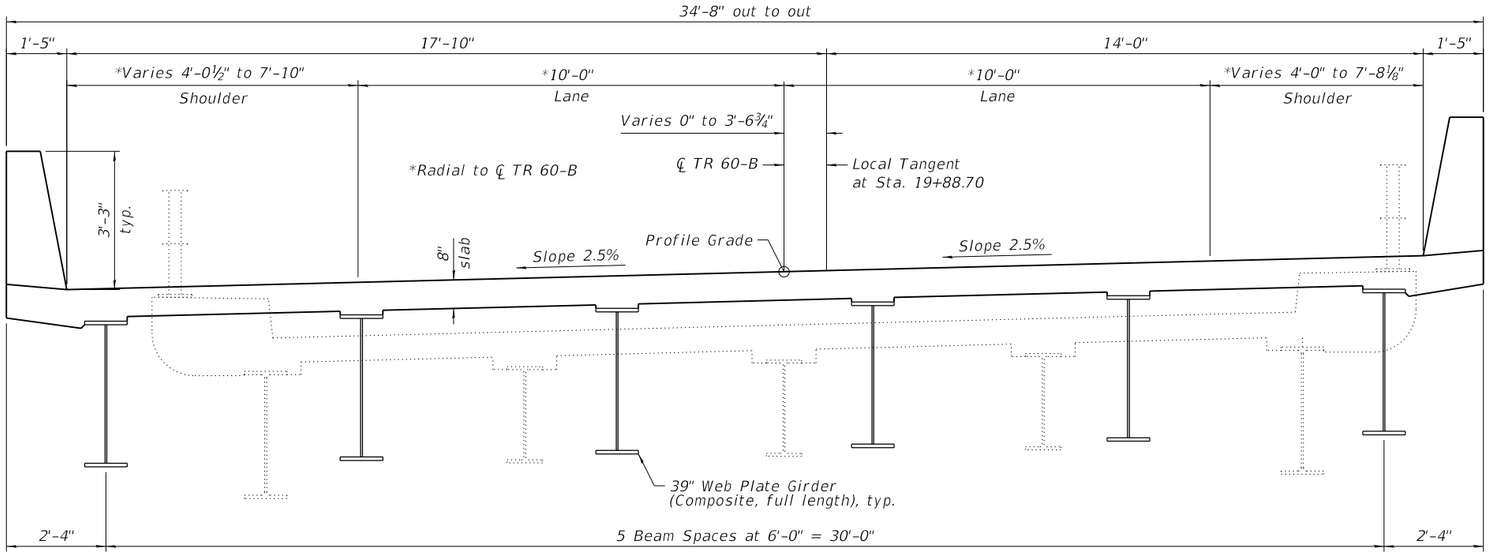
EFK•Moen Civil Engineering Design

USER NAME = acb	DESIGNED - ACB	REVISED -	
	CHECKED - CDL	REVISED -	
PLOT SCALE = 0.1667 ' / in.	DRAWN - ACB	REVISED -	
PLOT DATE = 4/14/2021	CHECKED - CDL	REVISED -	

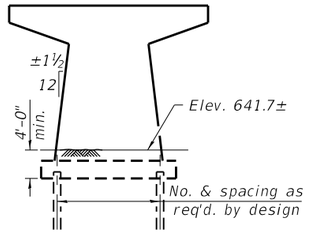
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2 SHEETS

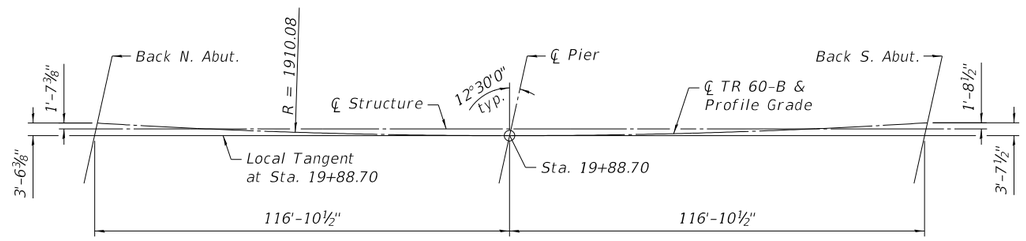
F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
80	(06-1HB) ES	BUREAU		
		CONTRACT NO. 66K73		
	ILLINOIS FED. AID PROJECT			



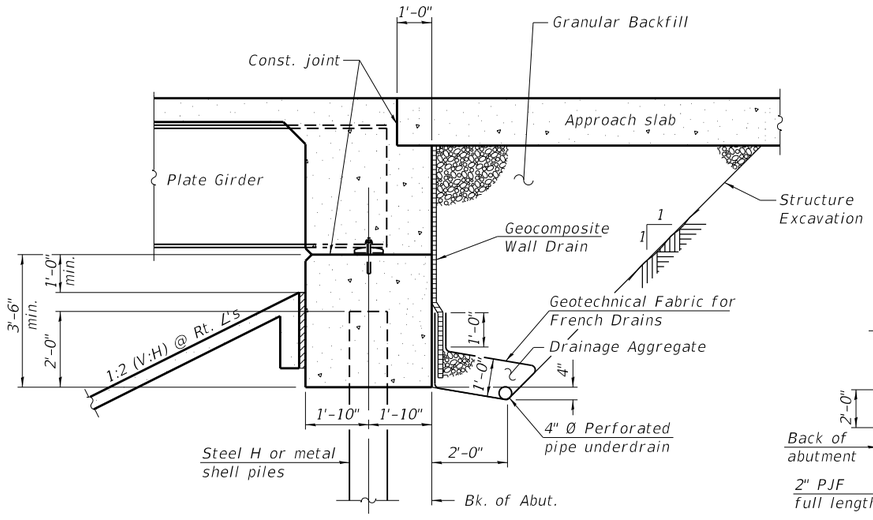
CROSS SECTION
(Looking South)



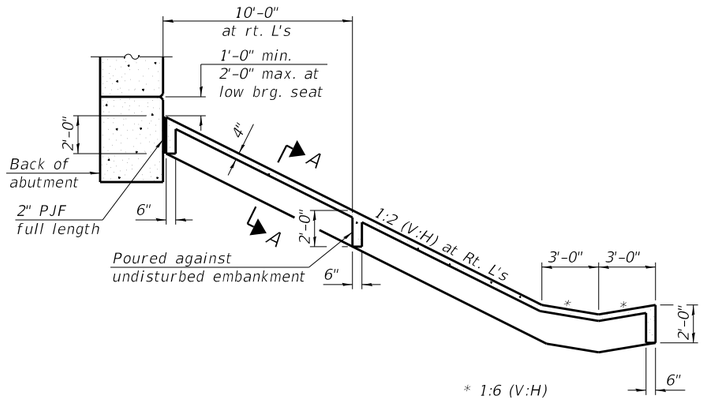
PIER SKETCH



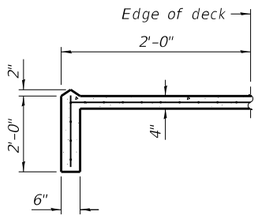
OFFSET SKETCH



SECTION THRU INTEGRAL ABUTMENT
(Horiz. dim. @ Rt. L's)



SECTION THRU
CONCRETE SLOPEWALL



SECTION A-A

DETAILS
TR 60-B (470 ST. E.) OVER I-80
F.A.I. RTE. 80 - SEC. (06-1HB) ES
BUREAU COUNTY
STATION 19+88.70
STRUCTURE NO. 006-0191

EFK•Moen
Civil Engineering Design

USER NAME = acb	DESIGNED - ACB	REVISED -	
	CHECKED - CDL	REVISED -	
PLOT SCALE = 0.1667 ' / in.	DRAWN - ACB	REVISED -	
PLOT DATE = 4/14/2021	CHECKED - CDL	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2 SHEETS

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
80	(06-1HB) ES	BUREAU		
		CONTRACT NO. 66K73		
	ILLINOIS	FED. AID PROJECT		

MODEL: Default
FILE NAME: \\SERVER18\Projects$$a\20027.08 IDOT D3 PTB194-027 WO8 TR 60B over I-80 TS&LD\GNB\Bridge\Prelim\Platsheets\TS&L2.dgn
4/14/2021 8:31:48 AM

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 6/15/20

ROUTE TR 60-B **DESCRIPTION** TR 60-B over I-80, 4.78 miles East of the Henry County Line **LOGGED BY** Larry Myers

SECTION 06-1HB-2 **LOCATION** SE 1/4, **SEC.** 11, **TWP.** 16N, **RNG.** 6, 4th **PM**,
Latitude 41.38611, **Longitude** -89.76588

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

STRUCT. NO. 006-0121 (Exist.)
Station 252+46.79

BORING NO. 01 (S.E. Quad.)
Station 20+96
Offset 8.0 ft Lt.
Ground Surface Elev. 661.95 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 629.5 ft ▼
Upon Completion 630.0 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered Oil / Chip Road, Brown Sand & Gravel, Brown Silty Clay Loam Fill			
659.45			
Stiff Brown Silty Clay Loam Fill with Sand Layers	2		
	2	1.5	11
	2	P	
-5			
WH = Weight of Hammer	WH		
	1	1.5	13
	2	P	
	2		
	2	1.5	18
	2	P	
-10			
	2		
	2	1.8	16
	4	P	
649.95			
Very Stiff to Hard Brown Loam / Silty Clay Loam Till Fill with Sand Layers	5		
	8	4.0	13
	8	P	
-15			
	3		
	3	2.5	15
	3	P	
	5		
	6	4.0	23
	12	P	
641.95 -20			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Stiff / Very Stiff Brown & Black Silty Clay	3		
	3	2.0	25
	3	P	
639.45			
Loose Brown Fine Sand to Fine Gravel	3		
	3		10
	3		
636.95 -25			
Medium Light Brown Fine to Coarse Sand with some Gravel Pieces & Layers of Fine / Very Fine Sand	5		
	8		4
	10		
634.45			
Medium Light Brown Very Fine Silty Sand	8		
	11		17
	12		
-30			
	5		
	8		19
	9		
▽ 629.45 ▼			
Medium Brown Fine to Coarse Sand with some Gravel Pieces - Free Water	11		
	11		14
	12		
-35			
	7		
	8		16
	9		
	6		
	8		20
	9		
621.95 -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 006-0121.GPJ IL_DOT.GDT 9/2/20

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 6/15/20

ROUTE TR 60-B **DESCRIPTION** TR 60-B over I-80, 4.78 miles East of the Henry County Line **LOGGED BY** Larry Myers

SECTION 06-1HB-2 **LOCATION** SE 1/4, **SEC.** 11, **TWP.** 16N, **RNG.** 6, 4th **PM**,
Latitude 41.38611, **Longitude** -89.76588

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

STRUCT. NO. 006-0121 (Exist.)
Station 252+46.79

BORING NO. 01 (S.E. Quad.)
Station 20+96
Offset 8.0 ft Lt.
Ground Surface Elev. 661.95 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 629.5 ft ▼
Upon Completion 630.0 ft ▽
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Dense Gray Fine to Coarse Sand with some Gravel Pockets		12		
		18		20
		22		
Washed Sample 40.0' to 41.5'				
Washed Sample 42.5' to 44.0'		10		
		18		14
		21		
	-45			
Washed Sample 45.0' to 46.5'		10		
		15		16
		20		
Washed Sample 47.5' to 49.0'		9		
		16		10
		21		
	611.95 -50			
Hard Gray Silty Clay Till		9		
Washed Sample 50.0' to 51.5'		10	4.1	12
		11	S	
		6		
		9	4.2	14
		13	S	
	-55			
		7		
		9	4.2	15
		12	S	
		6		
		8	4.1	14
		12	S	
	-60			

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Gray Silty Clay Till *(continued)*		7		
		9	4.2	13
Washed Sample 60.0' - 61.5'		12	S	
		6		
		8	4.2	14
		13	S	
	-65			
		5		
		7	4.1	13
	595.45	12	S	
End of Boring				
	-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 006-0121.GPJ IL_DOT.GDT 9/2/20

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 6/17/20

ROUTE TR 60-B **DESCRIPTION** TR 60-B over I-80, 4.78 miles East of the Henry County Line **LOGGED BY** Larry Myers

SECTION 06-1HB-2 **LOCATION** SE 1/4, **SEC.** 11, **TWP.** 16N, **RNG.** 6, 4th **PM**,
Latitude 41.38681, **Longitude** -89.76612

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

STRUCT. NO. 006-0121 (Exist.)
Station 252+46.79

BORING NO. 02 (N.E. Quad.)
Station 18+99
Offset 8.0 ft Lt.
Ground Surface Elev. 661.90 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 628.9 ft ▼
Upon Completion 628.9 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered Oil / Chip Road, Brown Sand & Gravel Fill, Brown Silty Clay Loam Fill			
659.40			
Very Stiff Brown Silty Clay Loam Till Fill with Layers of Brown Sand Fill	3		
	2 3	3.0 P	15
-5			
	2		
	2 2	2.5 P	10
	2		
	2 2	2.5 P	15
-10			
	3		
	3 7	3.5 P	19
	4		
	7 10	3.5 P	11
Hard Black Silty Clay Loam Layers at 14.0'+			
-15			
	2		
	4 9	4.0 P	18
	4		
	6 11	4.0 P	16
-20			
Very Stiff Brown Silty Clay Loam Till Fill with Layers of Brown Sand Fill *(continued)*	2		
	3 7	3.5 P	24
639.40			
Very Stiff Brown Silty Clay	3		
	3 4	3.0 P	24
636.90 -25			
Loose Brown Fine to Coarse Sand with some Gravel Pieces	3		
	2 3		10
634.90			
Medium Light Brown Fine Silty Sand	6		
	6 7		17
-30			
	5		
	7 8		19
629.40			
Medium Brown Fine to Coarse Sand with Gravel Pieces - Free Water ▽▼	5		
	7 8		15
-35			
	6		
	7 8		15
	7		
	8 9		14
622.40			
-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 006-0121.GPJ IL_DOT.GDT 9/2/20

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 6/17/20

ROUTE TR 60-B **DESCRIPTION** TR 60-B over I-80, 4.78 miles East of the Henry County Line **LOGGED BY** Larry Myers

SECTION 06-1HB-2 **LOCATION** SE 1/4, **SEC.** 11, **TWP.** 16N, **RNG.** 6, 4th **PM**, **Latitude** 41.38681, **Longitude** -89.76612

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

STRUCT. NO. 006-0121 (Exist.)
Station 252+46.79

BORING NO. 02 (N.E. Quad.)
Station 18+99
Offset 8.0 ft Lt.
Ground Surface Elev. 661.90 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 628.9 ft ▼
Upon Completion 628.9 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	10			Dense Gray Fine to Coarse Sand with Gravel Pockets - Free Water *(continued)*
	17		17	
	21			
				Washed Sample 40.0' to 41.5'
	10			Washed Sample 42.5' to 44.0'
	15		14	
	18			
-45				
	10			Washed Sample 45.0' to 46.5'
	15		16	
	21			
				Washed Sample 47.5' to 49.0'
	12			
	16		14	
	20			
-50				
	11			Washed Sample 50.0' to 51.5'
	14		15	
	22			
609.90				
				Hard Gray Silty Clay Loam Till
	8			Washed Sample 52.5' to 54.0'
	10	4.1	13	
	11	S		
-55				
	9			
	11	4.4	13	
	16	S		
	10			
	13	4.2	12	
	19	S		
-60				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	11			Hard Gray Silty Clay Loam Till *(continued)*
	14	4.4	15	
	18	S		
-65				
	13			
	16	4.4	13	
595.40	17	S		
				End of Boring
-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 006-0121.GPJ IL_DOT.GDT 9/2/20

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 6/18/20

ROUTE TR 60-B **DESCRIPTION** TR 60-B over I-80, 4.78 miles East of the Henry County Line **LOGGED BY** Larry Myers

SECTION 06-1HB-2 **LOCATION** SE 1/4, **SEC.** 11, **TWP.** 16N, **RNG.** 6, 4th **PM**, **Latitude** 41.38652, **Longitude** -89.76598

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

STRUCT. NO. 006-0121 (Exist.)
Station 252+46.79

BORING NO. 03 (Center Pier)
Station 19+75
Offset 21.0 ft Lt.
Ground Surface Elev. 641.78 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 629.3 ft ▼
Upon Completion 613.8 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Augered Brown Silty Clay Loam Fill
639.28				
	3			Very Stiff Brown Silty Clay Loam Fill
	2 3	2.5 P	22	
637.78				
-5				Loose Brown Fine to Coarse Sand with some Gravel Pieces
	3			
	2 3		9	
634.78				
	4			Medium Light Brown Fine Silty Sand
	6 8		9	
-10				
	5			
	5 6		21	
629.78				
	4			Medium Brown Fine to Coarse Sand with some Gravel Pieces - Free Water
	5 6		19	
-15				
	5			
	5 7		17	
	5			
	5 6		18	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
	5			Medium Brown Fine to Coarse Sand with some Gravel Pieces - Free Water *(continued)*
	6 7		23	
620.28				
	16			Dense Gray Fine to Coarse Sand with some Gravel Pockets - Free Water
	19 24		15	Washed Sample 22.5' to 24.0'
-25				
	17			Washed Sample 25.0' to 26.5'
	21 23		13	
	10			Washed Sample 27.5' to 29.0' ▽
	14 16		15	
-30				
	12			Washed Sample 30.0' to 31.5'
	16 16		14	
609.78				
	12			Hard Gray Silty Clay Loam Till with some Silt Layers
	14 16	4.8 S	15	
-35				
	13			
	18 21	4.6 S	13	
	10			
	13 14	4.4 S	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 006-0121.GPJ IL_DOT.GDT 9/2/20

Illinois Department of Transportation
Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 6/18/20

ROUTE TR 60-B **DESCRIPTION** TR 60-B over I-80, 4.78 miles East of the Henry County Line **LOGGED BY** Larry Myers

SECTION 06-1HB-2 **LOCATION** SE 1/4, **SEC.** 11, **TWP.** 16N, **RNG.** 6, 4th **PM**, **Latitude** 41.38652, **Longitude** -89.76598

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

STRUCT. NO. 006-0121 (Exist.)
Station 252+46.79

BORING NO. 03 (Center Pier)
Station 19+75
Offset 21.0 ft Lt.
Ground Surface Elev. 641.78 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 629.3 ft ▼
Upon Completion 613.8 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Gray Silty Clay Loam Till with some Silt Layers *(continued)*	8		
	10 14	4.5 S	12
	8		
	8 15	4.6 S	13
-45	6		
	8 14	4.6 S	13
	6		
	8 10	4.4 S	14
-50	8		
	8 10	4.3 S	14
	6		
	8 12	4.3 S	14
-55	8		
	8 10	4.3 S	13
	6		
	8 10	4.3 S	13
-60			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Hard Gray Silty Clay Loam Till with some Silt Layers *(continued)*	8		
580.28	9 10	4.3 S	13
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 006-0121.GPJ IL_DOT.GDT 9/2/20

Elevation

670
660
650
640
630
620
610
600
590
580

02 (N.E. Quad.)
18+99

w=15% Qu=3.0 tsf	3,2,3 N=5
w=10% Qu=2.5 tsf	2,2,2 N=4
w=15% Qu=2.5 tsf	2,2,2 N=4
w=19% Qu=3.5 tsf	3,3,7 N=10
w=19% Qu=3.5 tsf	4,7,10 N=17
w=18% Qu=4.0 tsf	2,4,9 N=13
w=16% Qu=4.0 tsf	4,6,11 N=17
w=24% Qu=3.5 tsf	2,3,7 N=10
w=24% Qu=3.0 tsf	3,3,4 N=7
w=10%	3,2,3 N=5
w=17%	6,6,7 N=13
w=19%	5,7,8 N=15
w=15%	5,7,8 N=15
w=15%	6,7,8 N=15
w=14%	7,8,9 N=17
w=17%	10,17,21 N=38
w=14%	10,15,18 N=33
w=16%	10,15,21 N=36
w=14%	12,16,20 N=36
w=15%	11,14,22 N=36
w=13% Qu=4.1 tsf	8,10,11 N=21
w=13% Qu=4.0 tsf	9,11,16 N=27
w=12% Qu=4.2 tsf	10,13,19 N=32
w=15% Qu=4.4 tsf	11,14,18 N=32
w=13% Qu=4.4 tsf	13,16,17 N=33

03 (Center Pier)
19+75

w=22% Qu=2.5 tsf	3,2,3 N=5
w=9%	3,2,3 N=5
w=9%	4,6,8 N=14
w=21%	5,5,6 N=11
w=19%	4,5,6 N=11
w=17%	5,5,7 N=12
w=18%	5,5,6 N=11
w=23%	5,6,7 N=13
w=15%	16,19,24 N=43
w=13%	17,21,23 N=44
w=15%	10,14,16 N=30
w=14%	12,16,16 N=32
w=15% Qu=4.8 tsf	12,14,16 N=30
w=13% Qu=4.6 tsf	13,18,21 N=39
w=12% Qu=4.4 tsf	10,13,14 N=27
w=12% Qu=4.5 tsf	8,10,14 N=24
w=12% Qu=4.6 tsf	8,8,15 N=23
w=13% Qu=4.6 tsf	6,8,14 N=22
w=14% Qu=4.4 tsf	6,8,10 N=18
w=14% Qu=4.3 tsf	8,8,10 N=18
w=14% Qu=4.3 tsf	6,8,12 N=20
w=13% Qu=4.3 tsf	8,8,10 N=18
w=13% Qu=4.3 tsf	6,8,10 N=18
w=13% Qu=4.3 tsf	8,9,10 N=19

01 (S.E. Quad.)
20+96

w=11% Qu=1.5 tsf	2,2,2 N=4
w=13% Qu=1.5 tsf	0,1,2 N=3
w=18% Qu=1.5 tsf	2,2,2 N=4
w=16% Qu=1.8 tsf	2,2,4 N=6
w=13% Qu=4.0 tsf	5,8,8 N=16
w=13% Qu=2.5 tsf	3,3,3 N=6
w=23% Qu=4.0 tsf	5,6,12 N=18
w=25% Qu=2.0 tsf	3,3,3 N=6
w=10%	3,3,3 N=6
w=4%	5,8,10 N=18
w=17%	8,11,12 N=23
w=19%	5,8,9 N=17
w=14%	11,11,12 N=23
w=16%	7,8,9 N=17
w=20%	6,8,9 N=17
w=20%	12,18,22 N=40
w=14%	10,18,21 N=39
w=16%	10,15,20 N=35
w=10%	9,16,21 N=37
w=12% Qu=4.1 tsf	9,10,11 N=21
w=14% Qu=4.2 tsf	6,9,13 N=22
w=15% Qu=4.2 tsf	7,9,12 N=21
w=14% Qu=4.1 tsf	6,8,12 N=20
w=13% Qu=4.2 tsf	7,9,12 N=21
w=14% Qu=4.2 tsf	5,7,12 N=19
w=13% Qu=4.1 tsf	6,8,13 N=21

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.:
Project & location: TR 60-B over I-80, 4.78 miles East of the Henry County Line
Route: TR 60-B
County: Bureau
Section: 06-1HB-2

PROP. CURVE PRCLA_3
PI STA. = 17+56.32
Δ = 24° 48' 11" (LT)
D = 2° 59' 59"
R = 1,910.08'
T = 420.01'
L = 826.87'
E = 45.63'
e = ____
T.R. = ____
S.E. RUN = ____
P.C. STA. = 13+36.31
P.T. STA. = 21+63.18

PROP. CURVE PRCLA_4
PI STA. = 22+75.24
Δ = 3° 57' 43" (RT)
D = 1° 46' 06"
R = 3,240.00'
T = 112.06'
L = 224.04'
E = 1.94'
e = ____
T.R. = ____
S.E. RUN = ____
P.C. STA. = 21+63.18
P.T. STA. = 23+87.21

PROP. CURVE PRCLA_5
PI STA. = 24+40.02
Δ = 1° 52' 02" (LT)
D = 1° 46' 06"
R = 3,240.00'
T = 52.80'
L = 105.59'
E = 0.43'
e = ____
T.R. = ____
S.E. RUN = ____
P.C. STA. = 23+87.21
P.T. STA. = 24+92.81

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

PROFILE
SURVEYED
PLOTTED
CROSS SECTIONS CHECKED
B.M. NOTED
STRUCTURE NOTATIONS CHKD
NOTE BOOK
NO.
BY
DATE

VPI STA. 19+90.00
ELEVATION 670.16
-4.00%
4.00%
+26.00 ELL 659.60
+54.00 ELL 659.60
528.00' V.C.
650.56
650.97

639.47 640.66 641.46 642.28 643.32 644.21 646.57 648.49 650.55 650.56 652.73 652.56 654.86 654.56 656.69 656.56 658.41 658.56 659.01 660.52 661.29 662.15 662.25 663.40 663.45 664.76 663.49 664.87 663.28 664.61 663.00 663.96 662.21 662.94 659.76 659.76 658.02 657.76 656.18 655.76 654.00 653.76 651.81 651.76 649.74 647.79 646.26

11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00

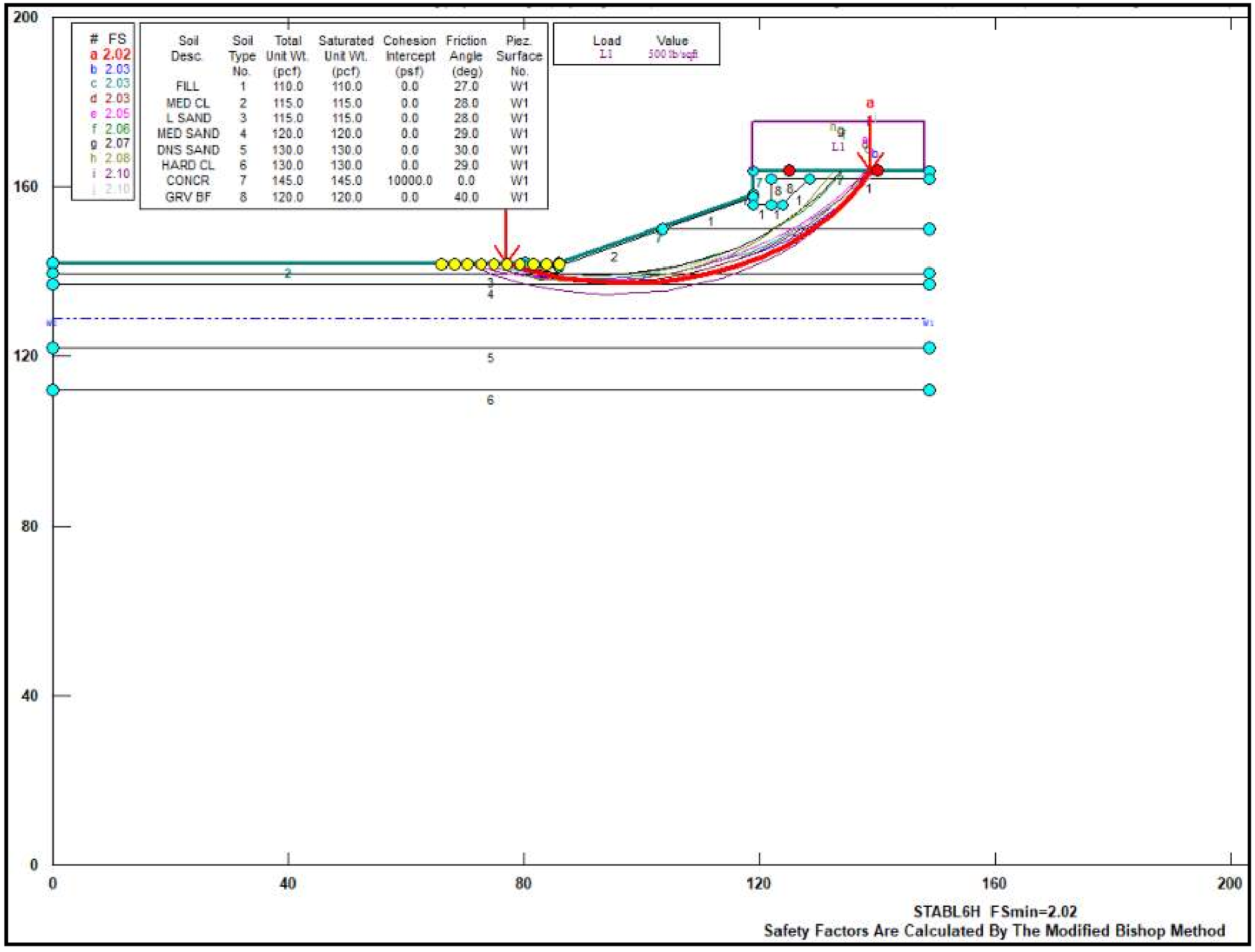
665 660 655 650 645 640

USER NAME = ANugent	DESIGNED -	REVISED -	STATE OF ILLINOIS
	DRAWN -	REVISED -	DEPARTMENT OF TRANSPORTATION
PLOT SCALE = 100.0000 ' / in.	CHECKED -	REVISED -	TR 608 OVER I-80
PLOT DATE = 4/7/2021	DATE -	REVISED -	PLAN AND PROFILE

SCALE: SHEET OF TS STA. TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		CONTRACT NO.		
	ILLINOIS FED. AID PROJECT			

MODEL: PavPrf
FILE NAME: Z:\20027.08 IDOT D3 PTB194-027 WO8 TR 608 over I-80 TS&LD\GN\Bridge\Prelim\Refs\Exhibit.dgn


200
160
120
80
40
0
0
40
80
120
160
200
FS
a 2.02
b 2.03
c 2.03
d 2.03
e 2.05
f 2.06
g 2.07
h 2.08
i 2.10
j 2.10
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 | 27.0 | W1
MED CL | 2 | 115.0 | 115.0 | 0.0 | 28.0 | W1
L SAND | 3 | 115.0 | 115.0 | 0.0 | 28.0 | W1
MED SAND | 4 | 120.0 | 120.0 | 0.0 | 29.0 | 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 | Value
L1 | 500 lb/sqft
STABL6H FSmin=2.02
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 4 SB 006-0121

Substructure 1

Base of Substruct. Elev. (or ground surf for bents)	655.63	ft.
Pile or Shaft Dia.	12	inches
Boring Number	B-1 (SE Quad)	
Top of Boring Elev.	661.95	ft.
Approximate Fixity Elev.	649.63	ft.

Individual Site Class Definition:

N (bar):	18 (Blows/ft.)	Soil Site Class D	
N_{ch} (bar):	19 (Blows/ft.)	Soil Site Class D	<----Controls
s_u (bar):	3.91 (ksf)	Soil Site Class C	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	660.4	1.55			
	657.9	2.50	4	1.50	
	655.4	2.50	3	1.50	
	652.9	2.50	4	1.50	
	650.4	2.50	6	1.80	B
1.7	647.9	2.50	16	4.00	
4.2	645.4	2.50	6	2.50	
6.7	642.9	2.50	18	4.00	B
9.2	640.4	2.50	6	2.00	B
11.7	637.9	2.50	6		B
14.2	635.4	2.50	18		B
16.7	632.9	2.50	23		
19.2	630.4	2.50	17		B
21.7	627.9	2.50	23		
24.2	625.4	2.50	17		
26.7	622.9	2.50	17		B
29.2	620.4	2.50	40		
31.7	617.9	2.50	39		
34.2	615.4	2.50	35		
36.7	612.9	2.50	37		B
39.2	610.4	2.50	21	4.10	
41.7	607.9	2.50	22	4.20	
44.2	605.4	2.50	21	4.20	
46.7	602.9	2.50	20	4.10	
49.2	600.4	2.50	21	4.20	
51.7	597.9	2.50	21	4.20	
54.2	595.4	2.50	19	4.10	B
100.0	549.7	45.75	19	4.10	B

Substructure 2

Base of Substruct. Elev. (or ground surf for bents)	655.63	ft.
Pile or Shaft Dia.	12	inches
Boring Number	B-2 (NW Quad)	
Top of Boring Elev.	661.9	ft.
Approximate Fixity Elev.	649.63	ft.

Individual Site Class Definition:

N (bar):	22 (Blows/ft.)	Soil Site Class D	<----Controls
N_{ch} (bar):	18 (Blows/ft.)	Soil Site Class D	
s_u (bar):	4.22 (ksf)	Soil Site Class C	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	660.4	1.50			
	657.9	2.50	5	3.00	
	655.4	2.50	4	2.50	
	652.9	2.50	4	2.50	
	650.4	2.50	10	3.50	
1.7	647.9	2.50	17	3.50	B
4.2	645.4	2.50	13	4.00	
6.7	642.9	2.50	17	4.00	
9.2	640.4	2.50	10	3.50	B
11.7	637.9	2.50	7	3.00	B
14.2	635.4	2.50	5		B
16.7	632.9	2.50	13		
19.2	630.4	2.50	15		B
21.7	627.9	2.50	15		
24.2	625.4	2.50	15		
26.7	622.9	2.50	17		
29.2	620.4	2.50	38		
31.7	617.9	2.50	33		
34.2	615.4	2.50	36		
36.7	612.9	2.50	36		
39.2	610.4	2.50	36		B
41.7	607.9	2.50	21	4.10	
44.2	605.4	2.50	27	4.40	
46.7	602.9	2.50	32	4.20	
49.2	600.4	2.50	32	4.40	
51.7	597.9	2.50	32	4.40	B
54.2	595.4	2.50	33	4.40	
100.0	549.6	45.80	33	4.40	B

Substructure 3

Base of Substruct. Elev. (or ground surf for bents)	636.19	ft.
Pile or Shaft Dia.	12	inches
Boring Number	B-3 (Center)	
Top of Boring Elev.	641.78	ft.
Approximate Fixity Elev.	630.19	ft.

Individual Site Class Definition:

N (bar):	20 (Blows/ft.)	Soil Site Class D	<----Controls
N_{ch} (bar):	18 (Blows/ft.)	Soil Site Class D	
s_u (bar):	4.35 (ksf)	Soil Site Class C	

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	640.3	1.52			
	637.8	2.50	5	2.50	B
	635.3	2.50	5		B
	632.8	2.50	14		
	630.3	2.50	11		B
2.4	627.8	2.50	11		
4.9	625.3	2.50	12		
7.4	622.8	2.50	11		
9.9	620.3	2.50	13		B
12.4	617.8	2.50	43		
14.9	615.3	2.50	44		
17.4	612.8	2.50	30		
19.9	610.3	2.50	32		B
22.4	607.8	2.50	30	4.80	
24.9	605.3	2.50	39	4.60	
27.4	602.8	2.50	27	4.40	
29.9	600.3	2.50	24	4.50	
32.4	597.8	2.50	23	4.60	
34.9	595.3	2.50	22	4.60	
37.4	592.8	2.50	18	4.40	
39.9	590.3	2.50	18	4.30	
42.4	587.8	2.50	20	4.30	
44.9	585.3	2.50	18	4.30	
47.4	582.8	2.50	18	4.30	
49.9	580.3	2.50	19	4.30	B
100.0	530.2	50.10	19	4.30	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):	20 (Blows/ft.)	Soil Site Class D	<----Controls
N_{ch} (bar):	18 (Blows/ft.)	Soil Site Class D	
s_u (bar):	4.17 (ksf)	Soil Site Class C	

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 medium stiff to very stiff. The bottom abutment elevation is 655.63 feet. Critical depth for intergral abutment analysis is 10 feet below the bottom of the abutment elevation.

Abutment	Soil Strengths at Critical Depth	Recommendation
02 (NE Quad) STA 18+99	Qu between 2.5 – 4.0 tsf	Pre-bore with bentonite
01 (SE Quad) STA 20+96	Qu between 1.5 – 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.

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	233.76	FT
STRUCTURE TYPE	MULTI-SPAN		NUMBER OF SPANS	2	
STRUCTURE SKEW	12.5864	DEGREES	END SPAN LENGTH	116.88	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	39.00	IN
WEB THICKNESS	1.00	IN
BOTTOM FLANGE WIDTH	10.00	IN
BOTTOM FLANGE THICKNESS	1.00	IN
BEAM SPACING PERP. TO CL	6.00	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)

TOP FLANGE WIDTH	10.00	IN
TOP FLANGE THICKNESS	1.00	IN
WEB DEPTH	39.00	IN
WEB THICKNESS	1.00	IN
BOTTOM FLANGE WIDTH	10.00	IN
BOTTOM FLANGE THICKNESS	1.00	IN
BEAM SPACING PERP. TO CL	6.00	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

ABUTMENT #1 DATA

ABUTMENT NAME	S.E. Quard. Abutment	
ABUTMENT REFERENCE BORING	B-1	
BOTTOM OF ABUTMENT ELEVATION	655.63	FT
ESTIMATED NUMBER OF PILES AT ABUT.	6	
PILE SPACING PERP. TO CL	6	FT

ABUTMENT #2 DATA

ABUTMENT NAME	N.E. Quad Abutment	
ABUTMENT REFERENCE BORING	B-2	
BOTTOM OF ABUTMENT ELEVATION	655.63	FT
ESTIMATED NUMBER OF PILES AT ABUT.	6	
PILE SPACING PERP. TO CL	6	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)*
653.13	2.50	1.5		
650.63	2.50	1.8		
648.13	2.50	4.0		
645.63	2.50	2.5		

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)*
653.13	2.50	2.5		
650.63	2.50	3.5		
648.13	2.50	3.5		
645.63	2.50	4.0		

10.00 FT = TOTAL DEPTH ENTERED

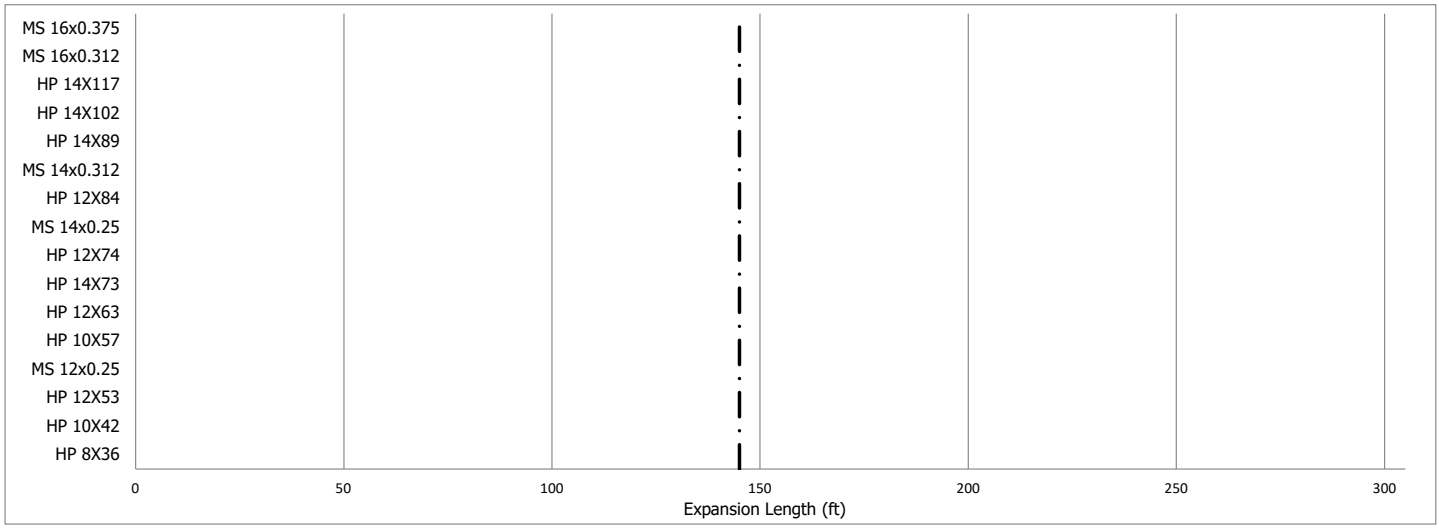
WEIGHTED AVERAGE Qu FOR ABUTMENT #1	2.45	TSF	WEIGHTED AVERAGE Qu FOR ABUTMENT #2	3.38	TSF
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*2.45])	1.40		PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*3.38])	2.29	

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

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [1.4*6*0+2.29*6*233.76]/[1.4*6+2.29*6] = 145.02 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [2.29*6*0+1.4*6*233.76]/[2.29*6+1.4*6] = 88.74 FT

ABUT 1 (S.E. Quard. Abutment) - EXPANSION LENGTH LIMIT CHART - 12.6 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/EMBANKMENT INTEGRAL ABUTMENT FEASIBILITY ANALYSIS

Modified 10/30/17

GENERAL DATA

STRUCTURE NUMBER	SN 006-0121		TOTAL STRUCTURE LENGTH	233.76	FT
STRUCTURE TYPE	MULTI-SPAN		NUMBER OF SPANS	2	
STRUCTURE SKEW	12.5864	DEGREES	END SPAN LENGTH	116.88	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	39.00	IN
WEB THICKNESS	1.00	IN
BOTTOM FLANGE WIDTH	10.00	IN
BOTTOM FLANGE THICKNESS	1.00	IN
BEAM SPACING PERP. TO CL	6.00	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)

TOP FLANGE WIDTH	10.00	IN
TOP FLANGE THICKNESS	1.00	IN
WEB DEPTH	39.00	IN
WEB THICKNESS	1.00	IN
BOTTOM FLANGE WIDTH	10.00	IN
BOTTOM FLANGE THICKNESS	1.00	IN
BEAM SPACING PERP. TO CL	6.00	FT
SLAB THICKNESS	8.00	IN
SLAB F'C	4.00	KSI

ABUTMENT #1 DATA

ABUTMENT NAME	S.E. Quard. Abutment	
ABUTMENT REFERENCE BORING	B-1	
BOTTOM OF ABUTMENT ELEVATION	655.63	FT
ESTIMATED NUMBER OF PILES AT ABUT.	6	
PILE SPACING PERP. TO CL	6	FT

ABUTMENT #2 DATA

ABUTMENT NAME	N.E. Quad Abutment	
ABUTMENT REFERENCE BORING	B-2	
BOTTOM OF ABUTMENT ELEVATION	655.63	FT
ESTIMATED NUMBER OF PILES AT ABUT.	6	
PILE SPACING PERP. TO CL	6	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)*
653.13	2.50	1.5		
650.63	2.50	1.5		
648.13	2.50	1.5		
645.63	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)*
653.13	2.50	1.5		
650.63	2.50	1.5		
648.13	2.50	1.5		
645.63	2.50	1.5		

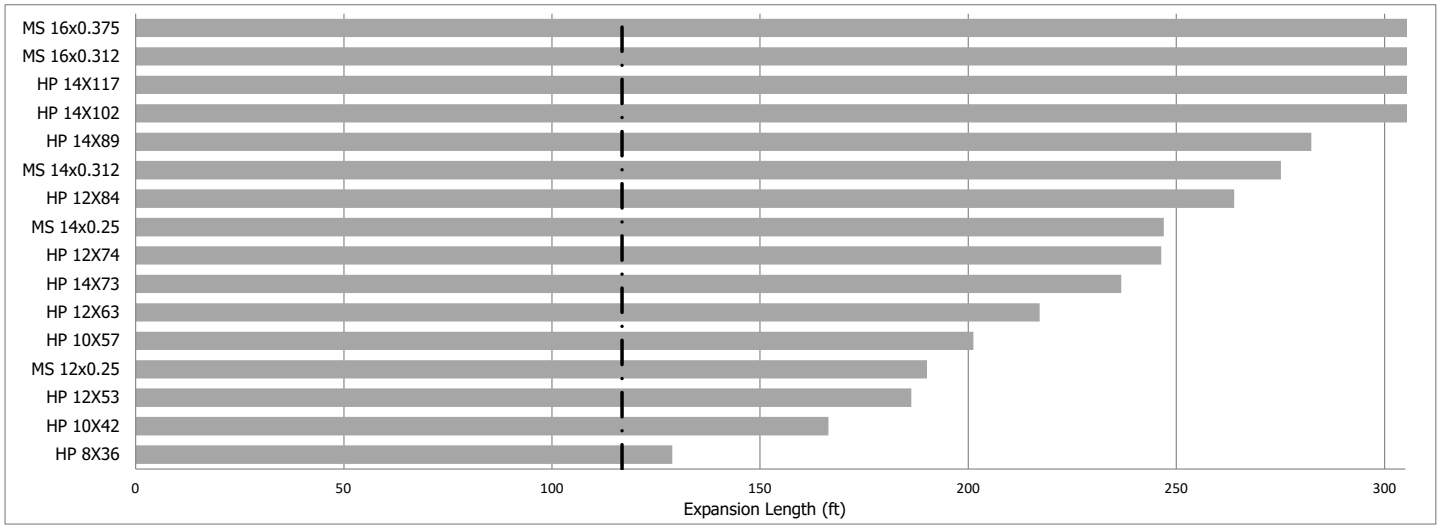
10.00 FT = TOTAL DEPTH ENTERED

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*6*0+1*6*233.76]/[1*6+1*6] = 116.88 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [1*6*0+1*6*233.76]/[1*6+1*6] = 116.88 FT

ABUT 1 (S.E. Quard. Abutment) - EXPANSION LENGTH LIMIT CHART - 12.6 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 SE Abutment utilizing Boring #01

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 12"Φ w/.25" walls		
140	77	26
188	104	31
200	110	33
Metal Shell 14"Φ w/.25" walls		
83	46	18
174	96	21
176	97	26
236	130	31
250	138	33
Metal Shell 14"Φ w/.312" walls		
83	46	18
174	96	21
176	97	26
236	130	31
250	138	33
350	193	46
379	209	48
407	224	51
434	239	53
463	255	56
492	270	58
519	285	61
Metal Shell 16"Φ w/.312" walls		
100	55	18
215	118	26
288	159	31
305	168	33
408	224	46
441	243	48
474	261	51
504	277	53
538	296	56
570	313	58
601	330	61
Metal Shell 16"Φ w/.375" walls		
100	55	18
215	118	26
288	159	31
305	168	33
408	224	46
441	243	48
474	261	51
504	277	53
538	296	56
570	313	58
601	330	61
Steel HP 8 X 36		
154	85	58
166	91	61

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
147	81	51
162	89	53
179	99	56
196	108	58
211	116	61
Steel HP 10 X 57		
151	83	51
166	92	53
184	101	56
200	110	58
216	119	61
Steel HP 12 X 53		
138	76	46
166	91	48
187	103	51
205	113	53
225	124	56
245	135	58
263	145	61
Steel HP 12 X 63		
141	77	46
169	93	48
189	104	51
207	114	53
228	125	56
247	136	58
266	146	61
Steel HP 12 X 74		
143	79	46
172	94	48
192	105	51
210	116	53
231	127	56
251	138	58
270	148	61

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
145	80	46
174	95	48
195	107	51
214	117	53
235	129	56
255	140	58
274	151	61
Steel HP 14 X 73		
158	87	43
167	92	46
201	110	48
234	129	51
255	140	53
280	154	56
303	166	58
324	178	61
Steel HP 14 X 89		
149	82	41
162	89	43
170	94	46
204	112	48
237	130	51
258	142	53
283	156	56
307	169	58
328	180	61
Steel HP 14 X 102		
152	83	41
165	91	43
172	95	46
207	114	48
240	132	51
262	144	53
287	158	56
311	171	58
332	183	61
Steel HP 14 X 117		
155	85	41
169	93	43
175	96	46
210	115	48
244	134	51
266	146	53
291	160	56
315	173	58
337	185	61
Precast 14"x 14"		
106	58	18
222	122	21
224	123	26

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		
142	78	26
170	93	28
181	99	31
201	111	33
Metal Shell 14"Φ w/.25" walls		
157	86	23
176	97	26
212	117	28
225	124	31
251	138	33
Metal Shell 14"Φ w/.312" walls		
157	86	23
176	97	26
212	117	28
225	124	31
251	138	33
373	205	48
404	222	51
544	299	53
560	308	56
Metal Shell 16"Φ w/.312" walls		
142	78	21
190	105	23
214	118	26
259	143	28
274	151	31
306	168	33
434	239	48
470	259	51
648	356	53
Metal Shell 16"Φ w/.375" walls		
142	78	21
190	105	23
214	118	26
259	143	28
274	151	31
306	168	33
434	239	48
470	259	51
648	356	53
666	366	56
684	376	58
709	390	61
Steel HP 8 X 36		
137	76	61

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
150	83	51
166	91	53
169	93	56
172	94	58
176	97	61
Steel HP 10 X 57		
154	85	51
170	94	53
173	95	56
176	97	58
180	99	61
Steel HP 12 X 53		
150	83	43
161	89	46
168	92	48
191	105	51
209	115	53
213	117	56
216	119	58
222	122	61
Steel HP 12 X 63		
154	85	43
165	91	46
170	93	48
193	106	51
212	116	53
215	118	56
219	120	58
224	123	61
Steel HP 12 X 74		
157	86	43
168	92	46
172	95	48
196	108	51
215	118	53
219	120	56
222	122	58
228	125	61

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
148	81	41
159	88	43
171	94	46
175	96	48
199	110	51
218	120	53
222	122	56
226	124	58
231	127	61
Steel HP 14 X 73		
157	86	38
169	93	41
182	100	43
196	108	46
204	112	48
238	131	51
261	143	53
265	146	56
269	148	58
276	152	61
Steel HP 14 X 89		
148	82	36
161	88	38
173	95	41
187	103	43
200	110	46
208	114	48
242	133	51
265	146	53
269	148	56
273	150	58
280	154	61
Steel HP 14 X 102		
151	83	36
163	90	38
176	97	41
190	104	43
203	112	46
210	115	48
245	135	51
268	148	53
272	150	56
277	152	58
283	156	61
Steel HP 14 X 117		
155	85	36
167	92	38
181	99	41
194	107	43
207	114	46
213	117	48
249	137	51
272	150	53
276	152	56
280	154	58
287	158	61
Precast 14"x 14"		
152	84	21
200	110	23
225	124	26

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		
390	215	46
Metal Shell 14"Φ w/.25" walls		
407	224	41
434	239	44
Metal Shell 14"Φ w/.312" walls		
407	224	41
434	239	44
463	254	46
491	270	49
520	286	51
549	302	54
Metal Shell 16"Φ w/.312" walls		
404	222	36
440	242	39
474	261	41
505	278	44
537	295	46
570	313	49
603	331	51
636	350	54
Metal Shell 16"Φ w/.375" walls		
404	222	36
440	242	39
474	261	41
505	278	44
537	295	46
570	313	49
603	331	51
636	350	54
668	368	56
Steel HP 8 X 36		
199	109	56

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 10 X 42		
251	138	56
Steel HP 10 X 57		
257	141	56
Steel HP 12 X 53		
312	172	56
Steel HP 12 X 63		
315	173	56
Steel HP 12 X 74		
320	176	56

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 12 X 84		
325	178	56
Steel HP 14 X 73		
383	210	56
Steel HP 14 X 89		
387	213	56
Steel HP 14 X 102		
392	216	56
Steel HP 14 X 117		
398	219	56
Precast 14"x 14"		
175	96	16

EFK♦Moen, LLC	By:	ACB	Date:	1/26/2021	Job No.
Civil Engineering Design	Chkd By:	CDL	Date:	1/28/2021	20027.08
For: TR 60B over I-80	Bckchk By:		Date:		Sht. No.

\\server18\PROJECTSSS4\20027.08 IDOT D3 PTB194-027 WO8 TR 60B over I-80 TS&L\Structural\TSL\[Prelim Loads and Elevations.xlsx]Summary-WF

Abutments

Summary of Loads		Strength I		Extreme I		Service I	
	(k)	Factor	Factored Load	Factor	Factored Load	Factor	Factored Load
DC	455	1.25	569	1.25	569	1.00	455
DW	57	1.50	86	1.50	86	1.00	57
LL+I	202	1.75	353	0.00	0	1.00	202
EQ (T)	74	0.00	0	1.00	74	0.00	0
EQ (L)	74	0.00	0	1.00	74	0.00	0
WS (T)	12	0.00	0	0.00	0	0.30	4
WS (L)	0	0.00	0	0.00	0	0.30	0
WL (T)	6	0.00	0	0.00	0	1.00	6
WL (L)	2	0.00	0	0.00	0	1.00	2
	Total Vertical		**1007**		**654**		**714**
	Total Transverse		**0**		**74**		**10**
	Total Longitudinal		**0**		**74**		**2**

Piers

Summary of Loads		Strength I		Extreme I		Service I	
	(k)	Factor	Factored Load	Factor	Factored Load	Factor	Factored Load
DC	1252	1.25	1565	1.25	1565	1.00	1252
DW	222	1.50	333	1.50	333	1.00	222
LL+I	435	1.75	761	0.00	0	1.00	435
EQ (T)	214	0.00	0	1.00	214	0.00	0
EQ (L)	214	0.00	0	1.00	214	0.00	0
WS (T)	24	0.00	0	0.00	0	0.30	7
WS (L)	0	0.00	0	0.00	0	0.30	0
WL (T)	12	0.00	0	0.00	0	1.00	12
WL (L)	5	0.00	0	0.00	0	1.00	5
	Total Vertical		**2659**		**1898**		**1909**
	Total Transverse		**0**		**214**		**19**
	Total Longitudinal		**0**		**214**		**5**

All loads are preliminary and subject to refinement during the TSL and final design.

G21.019 - WO 4 SN 006-0191 Bridge Installation