



Original Report Date: 11-28-18 Proposed SN: 032-0125 Route: FAI 55 (I-55) & FAP 326 (IL 47)
 Revised Date: 03-18-19 Existing SN: 032-0079 Section: [(32-3)HB-1]ES
 Geotechnical Engineer: Terry McCleary of McCleary Engineering County: Grundy
 Structural Engineer: Magued Zaglama of Bloom Companies, LLC Contract: 66H15

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): Proposed SN 032-0125 is a two span, 247 ft.-4 inch back to back of abutments carrying IL 47 over I-55 at Dwight. The 8 inch concrete deck on 48 inch plate girders will be supported by integral abutments and a center pier on piling. The total factored loading is 2409 kips at the abutments and 4955 kips at the pier. The pier foundation width is estimated at 94.62 ft. Refer to attached TSL drawing for further information.

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): Six borings, all slightly more than 45' deep, taken in 1970, generally show a stiff to hard Clay Till with Q_{vs} ranging from 1.4 tsf to 7.6 tsf, with the bulk of the values above 4 tsf. No bedrock or groundwater were reported in these borings.

The existing plans show a 2 span structure with vaulted abutments, and center pier supported by concrete piles. See attached for selected existing bridge plan sheets. The pile driving records and footing diagrams for SN 032-0079 are also attached.

Three borings, all approximately 60 ft. deep, were taken in 2017. Both abutment borings, taken through about 25 ft. of bridge cone fill, were reported to be very stiff to hard Silty Clay Loam Till Fill, with Q_u 's ranging from 2.0 tsf to 6.6 tsf, with the bulk of the values above 3.5 tsf. The 4 to 5 ft. of material under the bridge cone fills is very stiff to hard Black Silty Clay Loam Brown & Gray Silty Clay Loess. Below this material to the end of the borings was very stiff to hard Silty Clay Loam Till and Silty Clay Till with Q_u 's ranging from 2.3 tsf to 9.2 tsf, with the bulk of the values above 4 tsf.

Bedrock was not reported in the borings. Fine sand seams and a layer with free water were reported in the center pier and north abutment borings. The groundwater level in these two borings was about 607.5 ft. upon completion.

Additional subsurface exploration is not required except to possibly deepen the borings to account for the driven pile tip elevations. See attached for the 2017 and 1970 borings and the subsurface profile.

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 change in the profile of the structure is expected to be less than 1.0 ft. and will consist of a thicker pavement structure.. The existing embankment is almost 50 years old and shows no signs of any settlement problems. There is expected to be little or no settlement. No ground improvement/treatment is necessary.

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: There will be no new cuts or fill slopes. A worst case scenario was analyzed for the temporary 2:1 end slope: the factor of safety against a slope failure is 7.35. See attached. No further testing is necessary.

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: N/A

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: This site has a soil site class of "C", the seismic performance zone, SPZ = 1. The S_{DS} = 0.129 g and the S_{D1} = 0.074 g. Because the S_{D1} is less than 0.15 g, a liquefaction analysis is NOT required.

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: Data from three 2017 borings, Boring 01 (N.E. Quad.), Boring 02 (S.W. Quad.), and Boring 03 (Center Pier) was used to populate the data fields in the Estimated Pile Length spreadsheets. The boring data was extended as noted in the Maximum Nominal Required Bearing Tables to achieve values that exceed the maximum nominal required bearing. Also, the spreadsheets reflect a 10 ft. Precore and Bentonite use to allow for Integral Abutments. These 3 borings satisfactorily represent soil layers at the proposed substructure locations. There were 6 recorded borings from 1970. The 1970 borings show soils and stratifications consistent with those reported in the 2017 borings.

We recommend the use of metal shell piles at the abutments. Although the soils ranged from very stiff to hard, blow counts were generally less than 20. MS 14 w/ 0.312 walls or larger metal shell piling should be used; care should be taken to not damage them while driving. We recommend that conical tips be used for the metal shell piles. Steel H piles (non-displacement piles) are recommended for easier driving at the center pier to drive between the existing concrete piles. The pier test pile should be driven prior to ordering the production piles to avoid unplanned splices. Settlement is negligible, therefore, down drag was not used in the analysis. Metal shoes are not recommended. Also, the site is in a SPZ 1, therefore, liquefaction was not considered. One test pile per substructure unit is recommended.

Integral Abutments – The information from Boring 01 (N.E. Quad.) and Boring 02 (S.W. Quad.) to populate the fields in the integral abutment worksheet. The stiffness of the soils at the abutments dictate the need to precore the piles. Utilizing bentonite to backfill a 10 ft. length of the abutment piles would allow the required movement for integral abutments.

Assumptions used for the pile length analysis include:

- Bottom of North and South Abutment Elevation = 639.44 ft. The Pile Length Spreadsheets and Pile Design Tables reflect precoring and using Bentonite for 10 ft. below the abutments.
- The factored loading for the Abutments is 2409 kips and 4955 kips for the pier.
- The bottom of the Pier footing is 618.54. The elevation of the surface used to driving piles for the pier was estimated to be 616.54.
- The pile cutoff elevations allow for a 2 ft. embedment into concrete for the abutments, 1 ft. for the pier.
- No geotechnical losses were accounted for in the analysis.

Lateral Load Soil Parameters

Soil Type	Angle of Internal Friction (degrees)	Average Undrained Cohesion (ksf)	Static Soil Modulus k (pci)	Soil Strain Parameter E50	Total Unit Wt. (pcf)	Effective Unit Wt. (pcf)
Stiff Cohesive Fill	-	1.5	500	0.007	120	57.6
V. Stiff Silty Clay Loam Till	-	2.6	1000	0.005	125	62.6
Hard Silty Clay Loam Till	-	4.9	2000	0.004	130	67.6

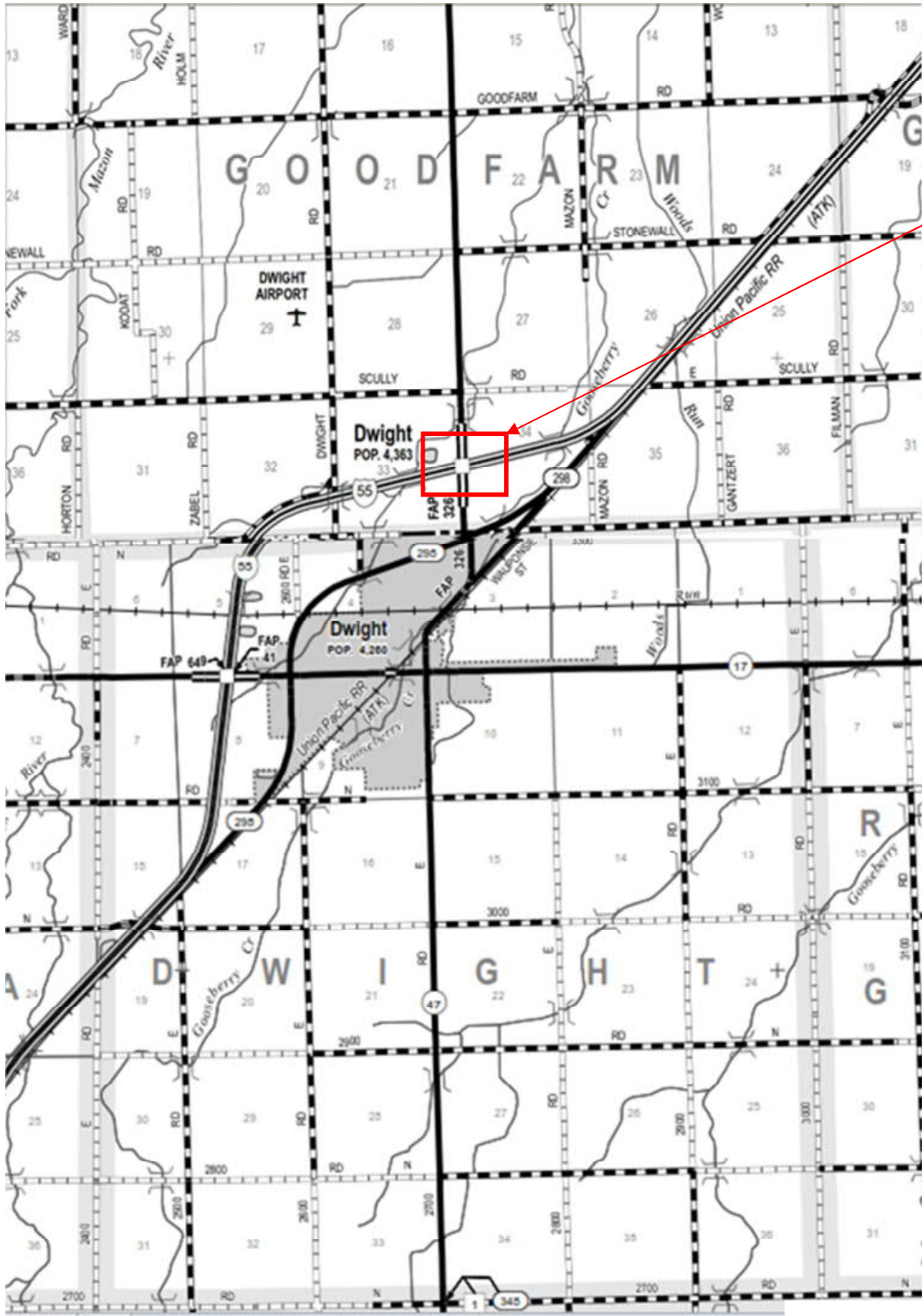
See attached Pile Length Estimating Spreadsheets, 2017 Boring logs, selected 1974 as-built plan sheets, loading documentation, and integral abutment spreadsheets.

Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: N/A

Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: Construction operations will be staged to replace half the structure per stage to maintain traffic on IL 47. Due to the hard soils encountered in the borings, the author recommends including the Temporary Soil Retention System pay item in the plans.

Terry McCleary, PE
 McCleary Engineering
 Office 815-780-8486
 Terry@McClearyEngineering.com





SN 032-0079

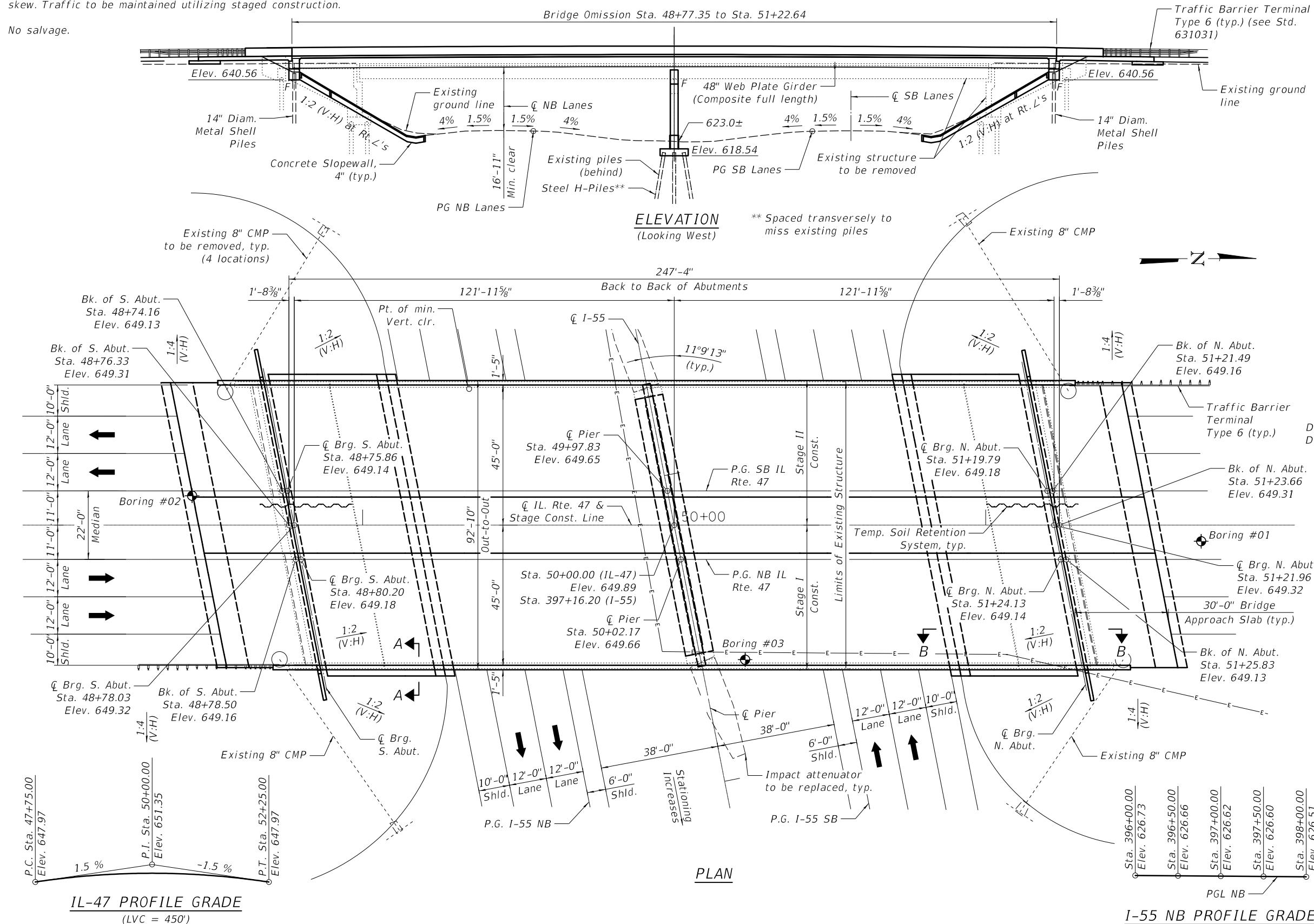


Location Map
SN 032-0079
Grundy County
FAP 326 (IL-47)
Over F.A.I. 55 (I-55)

Benchmark: Cut "□" in top south edge of concrete light pole foundation at I-55 NB exit ramp to IL-47, 69.39' LT.
Sta. 42+39.13 - Elevation = 635.468

Existing Structure: S.N. 032-0079 was originally built in 1973 as Ill.-47 Section 32-3HB. The existing structure is a 2 span, concrete deck on continuous steel beam superstructure with concrete piers and vaulted abutments. The structure underwent repairs in 2006 including deck slab repair, substructure repair, joint replacement, and expansion bearing replacement. 203'-10 1/2" Bk. to bk. abutments, 92'-0" out to out deck, 11' 9" 13" right ahead skew. Traffic to be maintained utilizing staged construction.

No salvage.



HIGHWAY CLASSIFICATION

F.A.P. Rte. 326 - IL-47
Functional Class: Other Principal Arterial
ADT: 8,125 (2017); 14,053 (2042)
ADTT: 2,812 (2017); 4,863 (2042)
DHF: 1,405 (2042)
Speed: 45 mph (posted); 50 mph (design)
Two-way traffic; Directional Dist. 50:50

HIGHWAY CLASSIFICATION

F.A.I. Rte. 55 - I-55
Functional Class: Interstate
ADT: 10,589 (2017) I-55 SB; 14,193 (2042) I-55 SB
ADT: 10,383 (2017) I-55 NB; 13,918 (2042) I-55 NB
ADTT: 3,473 (2017) I-55 SB; 4,655 (2042) I-55 SB
ADTT: 3,697 (2017) I-55 NB; 4,955 (2042) I-55 NB
DHF: 994 (2042) I-55 SB
DHF: 1,113 (2042) I-55 NB
Speed: 70 mph (posted); 70 mph (design)

LOADING HL-93

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

DESIGN SPECIFICATIONS

2017 AASHTO LRFD Bridge Design Specifications, 8th Edition

DESIGN STRESSES

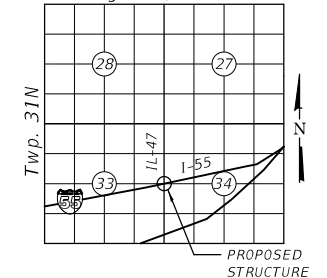
FIELD UNITS

f'c = 4,000 psi (superstructure)
f'c = 3,500 psi (substructure)
fy = 60,000 psi (reinforcement)
fy = 50,000 psi (M270 Grade 50) (girders)
fy = 36,000 psi (M270 Grade 36) (diaphragms)

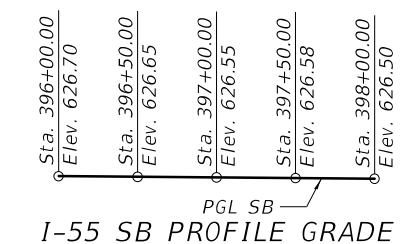
SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.074g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.129g
Soil Site Class = C

Range 7E, 3rd P.M.



LOCATION SKETCH



GENERAL PLAN

ILLINOIS ROUTE 47 OVER I-55
F.A.P. 326 - SEC [(32-3)HB-1]ES
GRUNDY COUNTY
STA. 50+00.00
STRUCTURE NO. 032-0125

PROJECT NO.: #PROJECTING
PRG PROJ. CONTACT: #462946
FILE NAME: 0320079-0366HS_TSL.dgn
PLOT DRIVER: #P.L. DRV#
PEN TABLE: #PEN.TABLE#

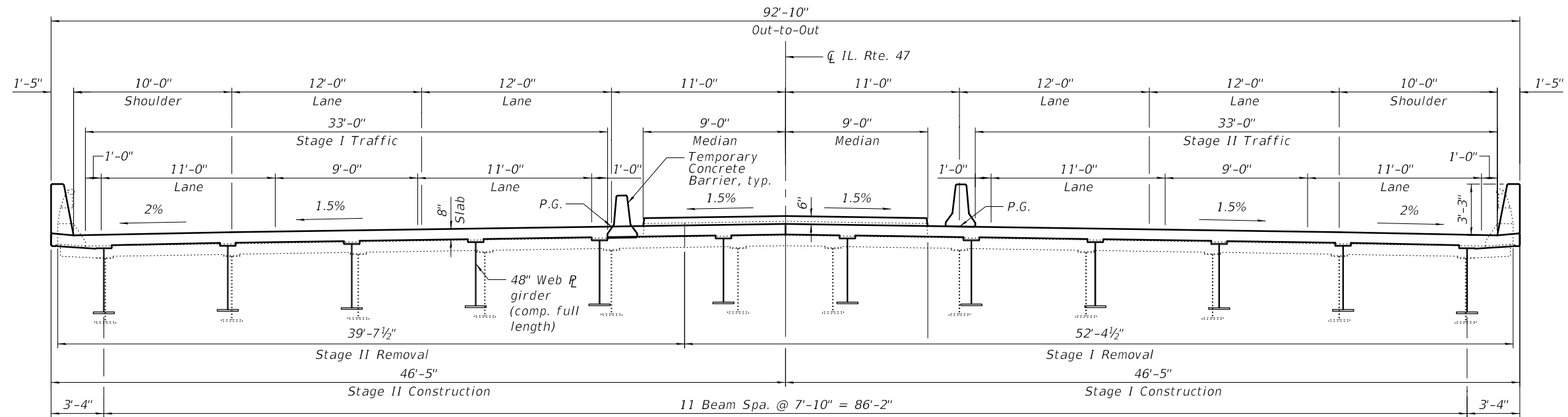


USER NAME = jandrews	DESIGNED - RJO	REVISED -
PLOT SCALE =	CHECKED - RJO	REVISED -
PLOT DATE = 2/15/2019	DRAWN - JA	REVISED -
	CHECKED - 2/14/18	REVISED -

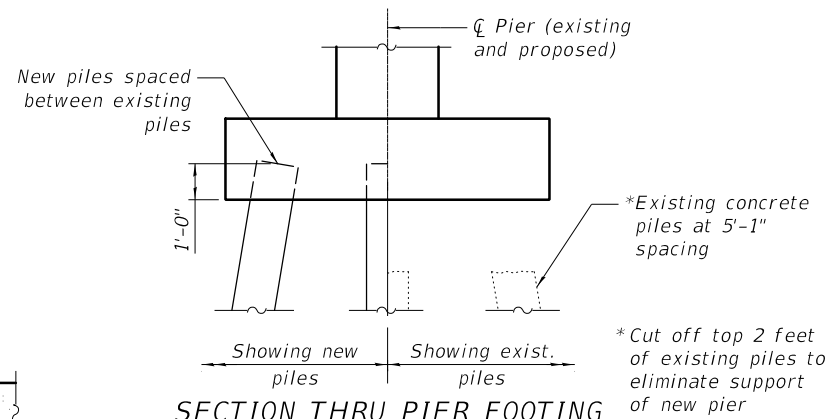
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 1 OF 2 SHEETS

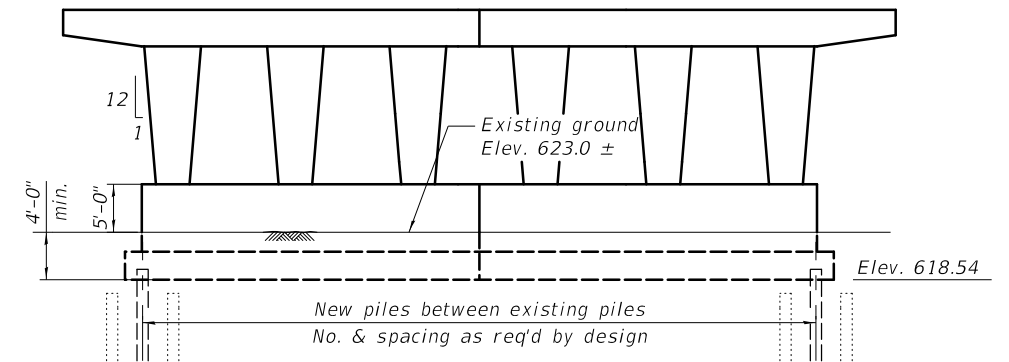
F.A.P. RTE. 326	SECTION [(32-3) HB-1] ES	COUNTY GRUNDY	TOTAL SHEETS 18	SHEET NO. 1
CONTRACT NO. 66H15				
ILLINOIS FED. AID PROJECT				



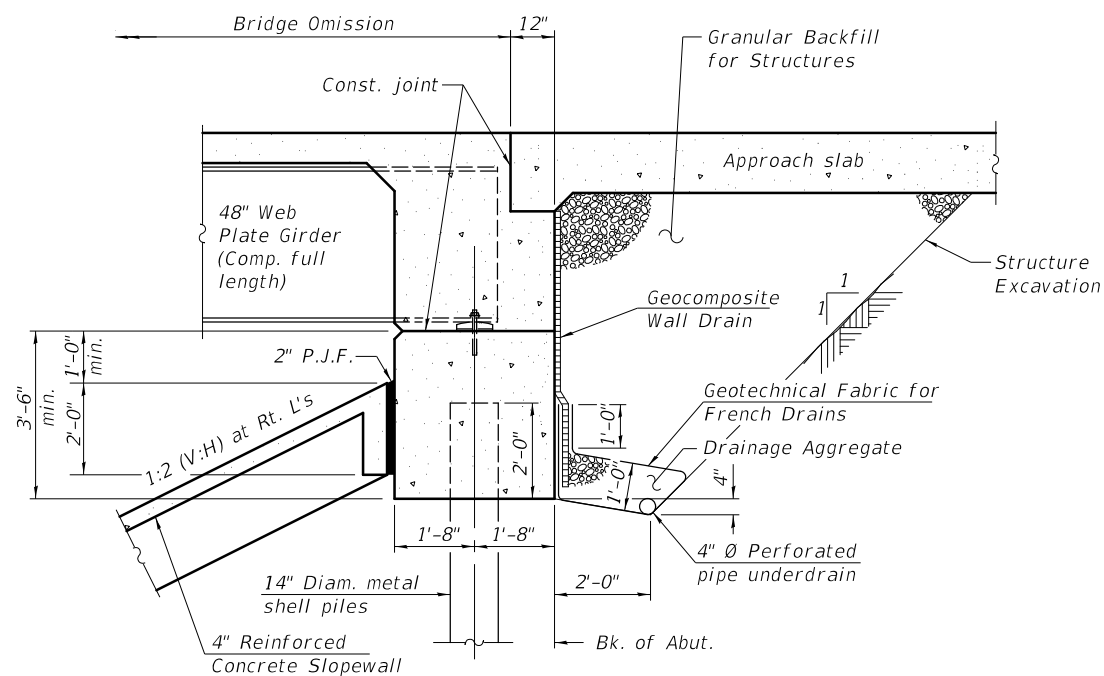
CROSS SECTION
 (Looking North)



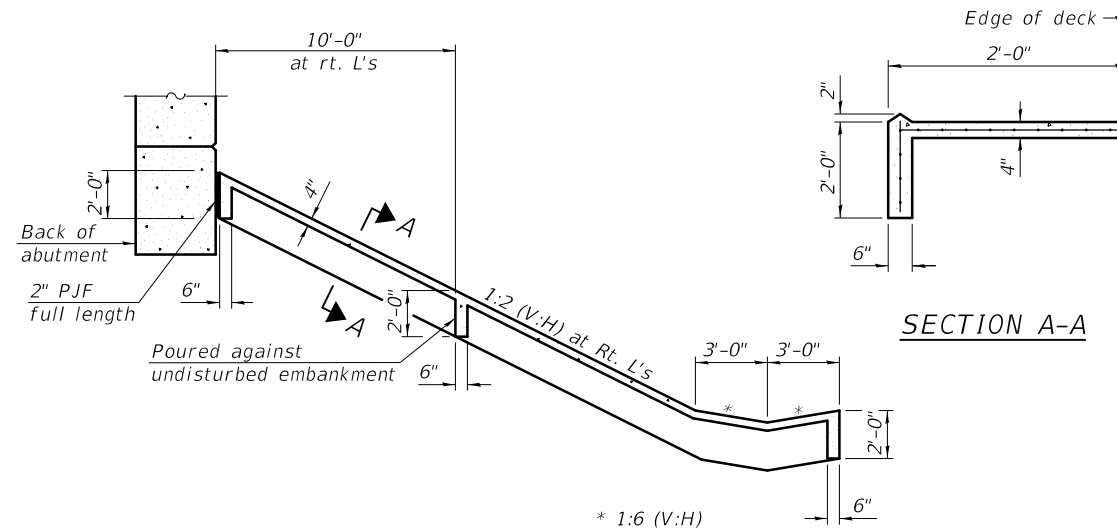
SECTION THRU PIER FOOTING
 (Showing new piles between existing piles)



PIER SKETCH



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



SECTION B-B

SECTION A-A

GENERAL PLAN
ILLINOIS ROUTE 47 OVER I-55
F.A.P. 326 - SEC [(32-3)HB-1]ES
GRUNDY COUNTY
STA. 50+00.00
STRUCTURE NO. 032-0125

PROJECT NO.: #PROJECTING#
 HRC PROJ. CONTACT: #HRC294#
 FILE NAME: 0320079-0366HS_TSL02.dgn
 PLOT DRIVER: #PLOT.DRV#
 PEN TABLE: #PEN.TABLE#



USER NAME = jandrews	DESIGNED - RJO	REVISED -
	CHECKED - RJO	REVISED -
PLOT SCALE =	DRAWN - JA	REVISED -
PLOT DATE = 2/15/2019	CHECKED - 2/14/18	REVISED -

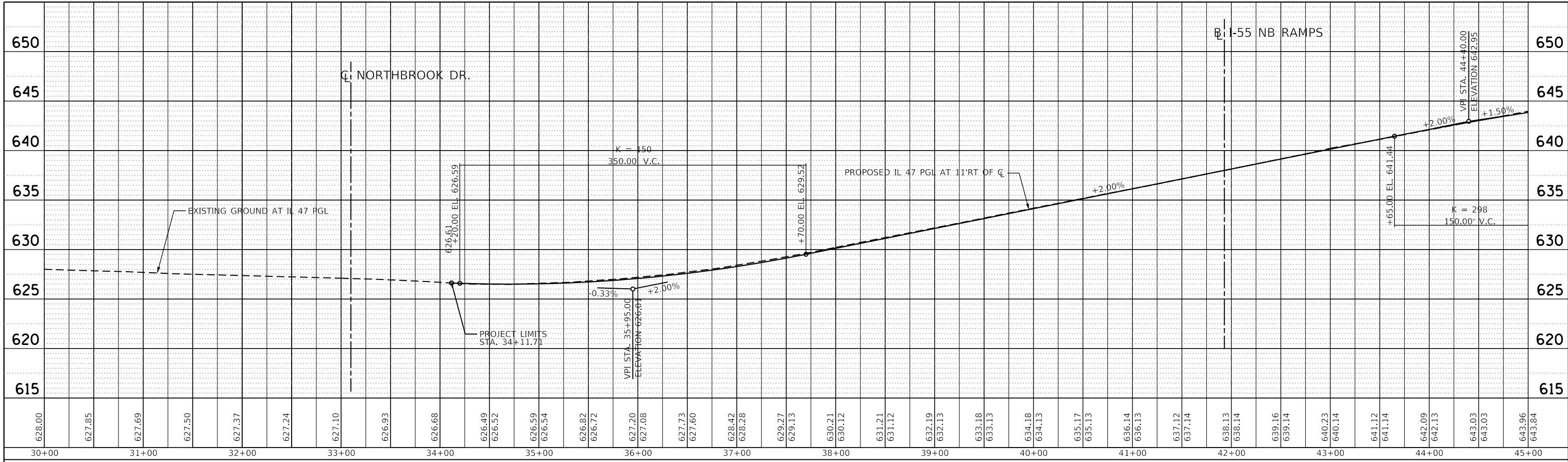
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET NO. 2 OF 2 SHEETS

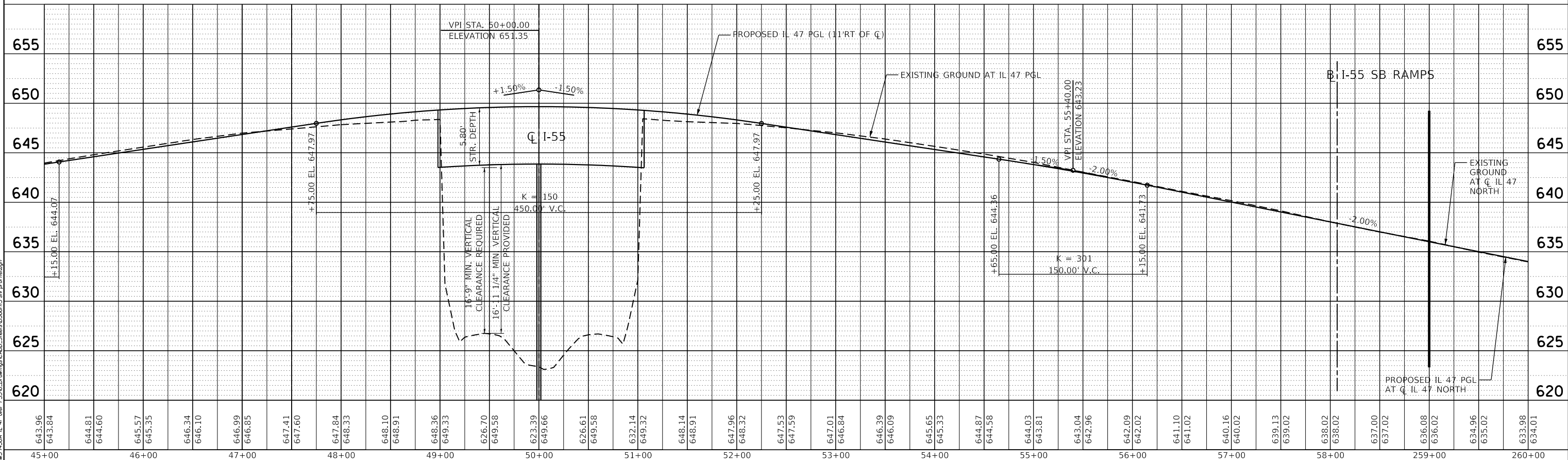
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326	[(32-3) HB-1] ES	GRUNDY	18	2
CONTRACT NO. 66H15				

ILLINOIS FED. AID PROJECT

PLAN	SURVEYED	BY	DATE
	PLOTTED		
	GRADES CHECKED		
	ALIGNMENT CHECKED		
	STRUCTURE NOTATIONS OK'D		
	NOTE BOOK NO.		
	CADD FILE NAME		



PROFILE	SURVEYED	BY	DATE
	PLOTTED		
	GRADES CHECKED		
	ALIGNMENT CHECKED		
	STRUCTURE NOTATIONS OK'D		
	NOTE BOOK NO.		
	CADD FILE NAME		



MODEL NAME - Default
FILE NAME - X:\03\450A_IL_47.dwg
I:\SS\6_Drawings\CADD_Sheets\0366115_spr.prf\Profile.dgn



USER NAME = jakeb	DESIGNED - \$DES*	REVISED -
	DRAWN - \$DRW*	REVISED -
PLOT SCALE = 100.0000' / 1"	CHECKED - \$CHK*	REVISED -
PLOT DATE = 11/12/2018	DATE - \$DATE*	REVISED -

**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

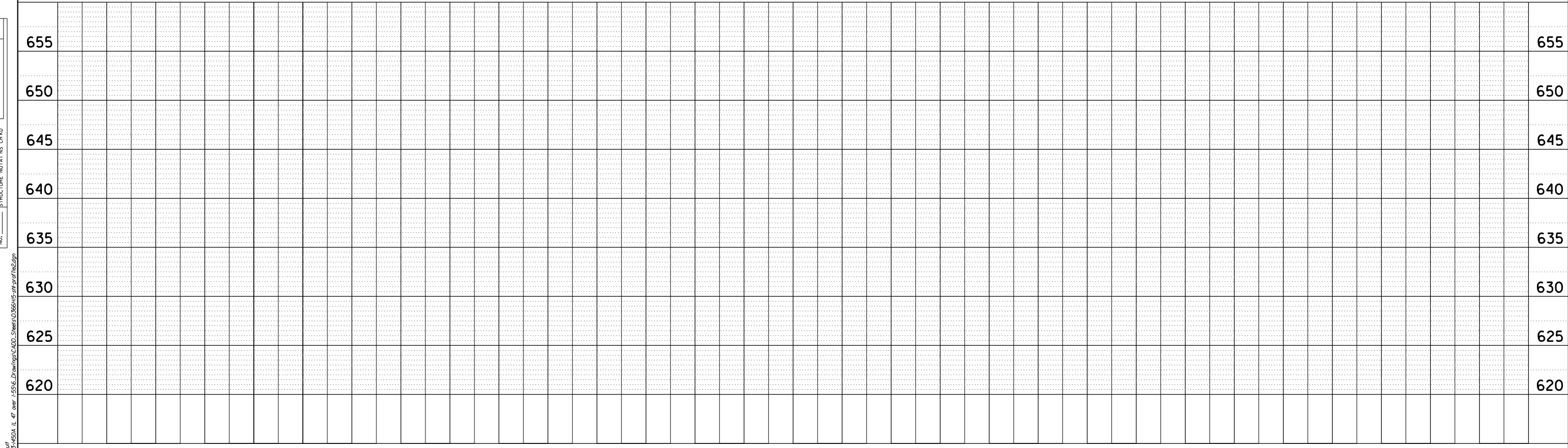
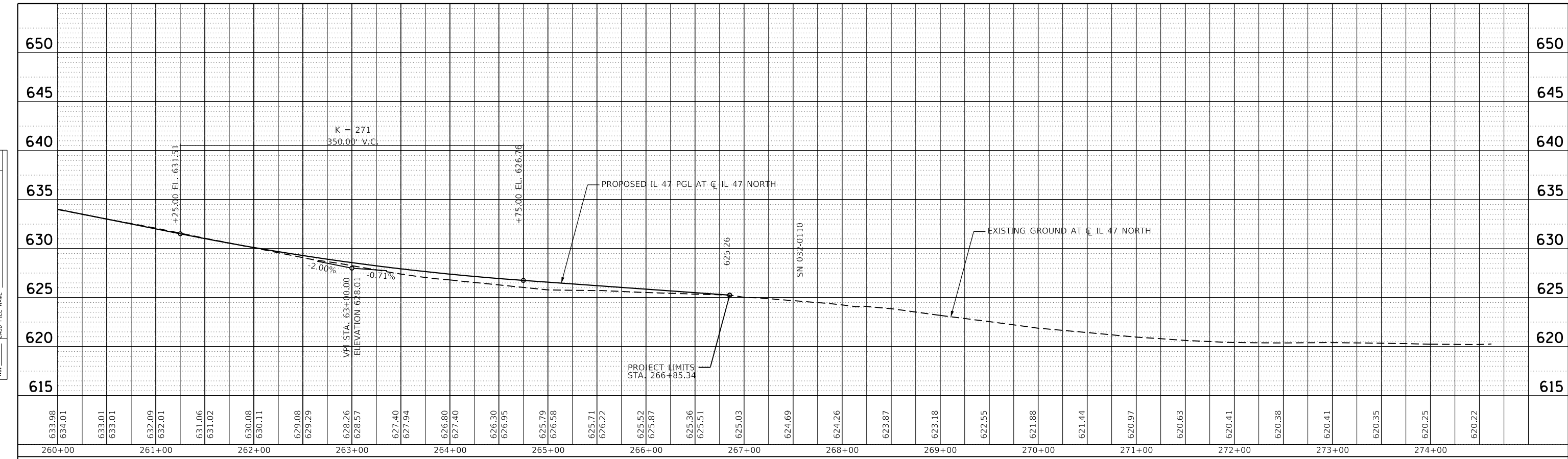
PROPOSED PROFILE - IL 47

SCALE: \$SCL\$ SHEET \$SHT\$ OF \$SHTS\$ SHEETS STA. \$STA1\$ TO STA. \$STA2\$

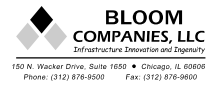
F.A.P. RTE. 326	SECTION [(32-3) HB-1] ES	COUNTY GRUNDY	TOTAL SHEETS \$S\$	SHEET NO. \$S\$
PRELIMINARY		CONTRACT NO. 66H15		
ILLINOIS FED. AID PROJECT				

PLAN	SURVEYED	BY	DATE
	PLOTTED		
	ALIGNED		
	CHECKED		
	FILE NAME		
	NO.		

PROFILE	SURVEYED	BY	DATE
	GRADES		
	CHECKED		
	STRUCTURE		
	NOTATIONS		
	NO.		



MODEL NAME - Default
FILE NAME - X:\BMS\452A_IL_47.dwg
I:\SSV\Drawings\CADD_Sheets\0366115-318-prof\Profile.dgn



USER NAME = jakeb	DESIGNED - \$DES*	REVISED -
	DRAWN - \$DRW*	REVISED -
PLOT SCALE = 100.0000' / 1"	CHECKED - \$CHK*	REVISED -
PLOT DATE = 11/9/2018	DATE - \$DATE%	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

PROPOSED PROFILE - IL 47

SCALE: \$SCL\$ SHEET \$SHT\$ OF \$SHTS\$ SHEETS STA. \$STA1\$ TO STA. \$STA2\$

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326	[(32-3) HB-1] ES	GRUNDY	\$S%	\$S#
PRELIMINARY			CONTRACT NO. 66H15	

ILLINOIS FED. AID PROJECT



SOIL BORING LOG

ROUTE FAI 55 (I-55) DESCRIPTION IL 47 over I-55 Interchange at Dwight LOGGED BY Larry Myers

SECTION [(32-3)HB-1]ES LOCATION NE 1/4, SEC. 33, TWP. 31N, RNG. 7E, 3rd PM,
Latitude 41.117773, Longitude -88.413854

COUNTY Grundy DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. 032-0079
Station 397+16.20

BORING NO. 01 (N.E. Quad.)
Station 397+54
Offset 165.0 ft Lt.
Ground Surface Elev. 647.74 ft

DEPTH H S	B L O W S	U C S Qu	M O I S T	Surface Water Elev.	ft	D E P T H	B L O W S	U C S Qu	M O I S T
				Stream Bed Elev.	ft				
(ft)	(/6")	(tsf)	(%)	First Encounter	ft	(ft)	(/6")	(tsf)	(%)
	4								
	5	3.7	20						
	8	S							
	1								
	1	3.0	20						
	5	P							
	6								
	8	4.1	16						
	9	S							
	6								
	8	4.3	15						
	9	S							
	8								
	9	5.6	15						
	12	S							
	7								
	8	4.5	15						
	10	S							
	7								
	8	4.7	14						
	10	S							
	6								
	7	4.5	15						
	9	S							

Hard to Very Stiff Gray Silty Clay
Loam Till (continued)
Fine Sand Layer @ 40 Ft. with
Free Water

Hard to Very Stiff Gray Silty Clay
Loam Till (continued)

586.24

End of Boring

SOIL BORING 032-0079.GPJ IL_DOT.GDT 1/15/19

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)



SOIL BORING LOG

ROUTE FAI 55 (I-55) DESCRIPTION IL 47 over I-55 Interchange at Dwight LOGGED BY Larry Myers

SECTION [(32-3)HB-1]ES LOCATION SE 1/4, SEC. 33, TWP. 31N, RNG. 7E, 3rd PM, Latitude 41.116896, Longitude -88.414099

COUNTY Grundy DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. 032-0079
Station 397+16.20
BORING NO. 02 (S.W. Quad.)
Station 396+77
Offset 150.0 ft Rt.
Ground Surface Elev. 647.71 ft

DEPTH H S	B L O W S	U C S Qu	M O I S T	Surface Water Elev.	ft	D E P T H	B L O W S	U C S Qu	M O I S T
				Stream Bed Elev.	ft				
				Groundwater Elev.:					
				First Encounter	Dry				
				Upon Completion	Dry				
				After	Hrs.				
				Hard Gray & Brown Silty Clay Loam Till Fill (<i>continued</i>)			3		
							6	6.6	16
							9	S	
							5		
							6	4.0	15
							9	P	
							5		
							6	4.0	16
							8	P	
							4		
							5	4.0	18
							7	P	
							4		
							4	4.1	20
							7	B	
							4		
							6	4.4	17
							9	S	
							6		
							8	4.7	17
							12	S	
							3		
							5	6.2	18
							8	S	
							4		
							4	3.0	23
							6	B	

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)

SOIL BORING 032-0079.GPJ IL_DOT.GDT 1/15/19



SOIL BORING LOG

ROUTE FAI 55 (I-55) DESCRIPTION IL 47 over I-55 Interchange at Dwight LOGGED BY Larry Myers

SECTION [(32-3)HB-1]ES LOCATION SE 1/4, SEC. 33, TWP. 31N, RNG. 7E, 3rd PM, Latitude 41.116896, Longitude -88.414099

COUNTY Grundy DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME Automatic

STRUCT. NO. 032-0079
Station 397+16.20

BORING NO. 02 (S.W. Quad.)
Station 396+77
Offset 150.0 ft Rt.
Ground Surface Elev. 647.71 ft

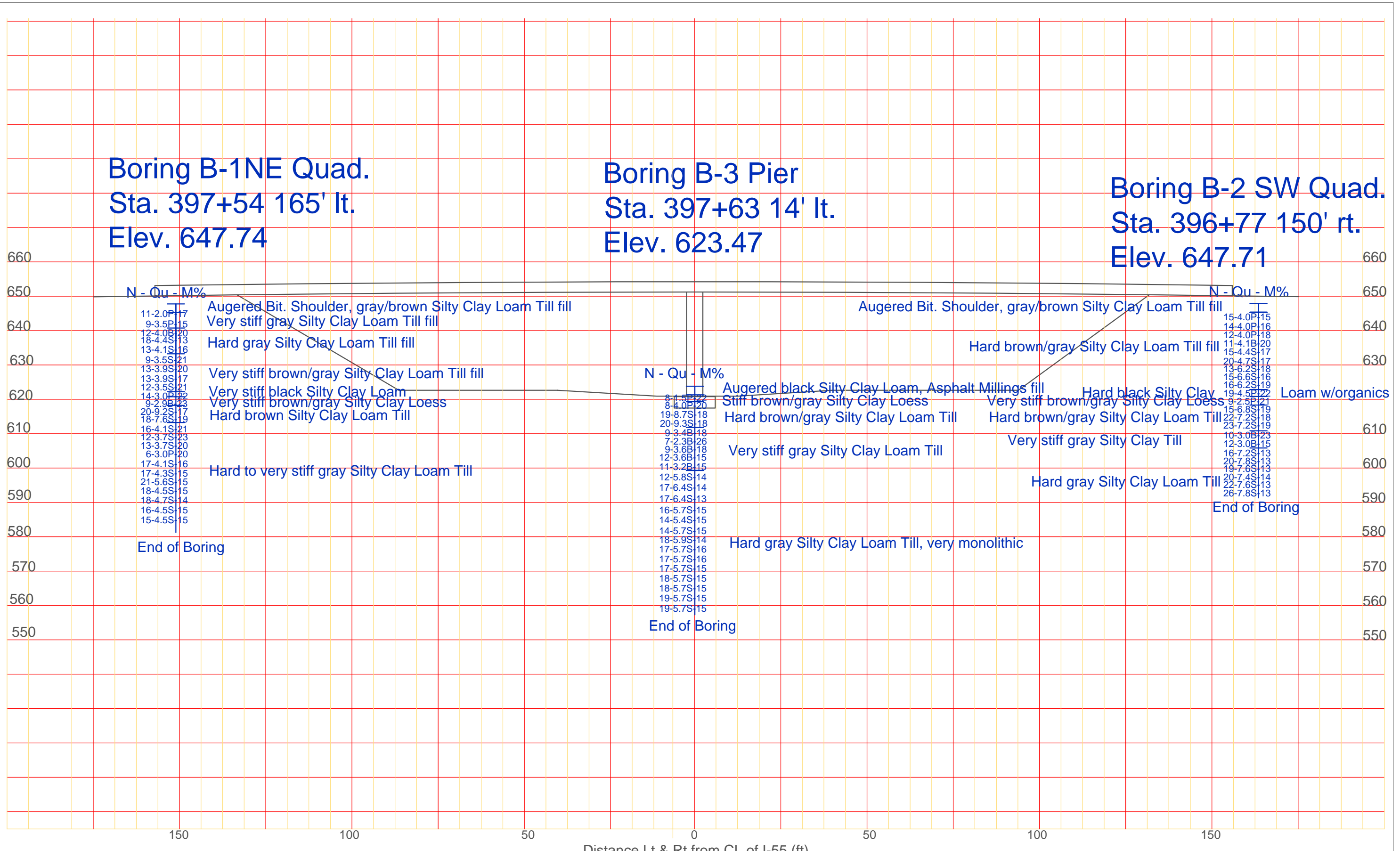
DEPTH H S	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ Hrs. _____ ft

Very Stiff Gray Silty Clay Till (continued)	2		
	4	3.0	15
	8	B	
605.71			
Hard Gray Silty Clay Loam Till	5		
	7	7.2	13
	9	S	
-45			
	6		
	9	7.8	13
	11	S	
-50			
	7		
	8	7.6	13
	11	S	
-55			
	7		
	9	7.4	14
	11	S	
-60			
End of Boring	8		
	10	7.6	13
	12	S	
-60			
	7		
	12	7.8	13
	14	S	
591.21			

SOIL BORING 032-0079.GPJ IL_DOT.GDT 1/15/19

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)



Designed by:	Date:
Drawn by: MLL	Date: 1-21-19
Checked by:	Date:

ILL 47 over I-55 at Dwight Subsurface Profile	
Scale = _____	Sheet <u>1</u> of <u>1</u>
Sta. _____ to Sta. _____	

Route	Section	County
FAI-55	[(32-3)HB-1]ES	Grundy
Bridge number: <u>032-0079</u>		



SOIL BORING LOG

ROUTE FAI 55 (I-55) DESCRIPTION IL 47 over I-55 Interchange at Dwight LOGGED BY W. Carter

SECTION [(32-3)HB-1]ES LOCATION SE 1/4, SEC. 33, TWP. 31N, RNG. 7E, 3rd PM,
Latitude , Longitude

COUNTY Grundy DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 032-0079
Station 397+16.20

BORING NO. 1 (S. Abut.)
Station 397+49
Offset 99.0 ft Rt.
Ground Surface Elev. 619.70 ft

DEPTH H S	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ Hrs. _____ ft

Hard Gray Clay Till (*continued*)

17	4.7	13
	B	

18	4.7	13
	S	

-45

16	4.2	14
	B	

573.20

End of Boring

-50

-55

-60

SOIL BORING 032-0079.GPJ IL_DOT.GDT 3/26/18

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)



SOIL BORING LOG

ROUTE FAI 55 (I-55) DESCRIPTION IL 47 over I-55 Interchange at Dwight LOGGED BY W. Carter

SECTION [(32-3)HB-1]ES LOCATION SE 1/4, SEC. 33, TWP. 31N, RNG. 7E, 3rd PM,
Latitude , Longitude

COUNTY Grundy DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. <u>032-0079</u>	D E P T H H	B L O W S	U C S Qu	M O I S T	Surface Water Elev. _____ ft	D E P T H H	B L O W S	U C S Qu	M O I S T
Station <u>397+16.20</u>					Stream Bed Elev. _____ ft				
BORING NO. <u>2 (Pier)</u>	ft (ft)	(/6")	(tsf)	(%)	Groundwater Elev.: _____	ft (ft)	(/6")	(tsf)	(%)
Station <u>397+67.5</u>					First Encounter _____ Dry ft				
Offset <u>0.0 ft CL</u>					Upon Completion _____ Dry ft				
Ground Surface Elev. <u>619.90</u>					After _____ Hrs. _____ ft				

Soil Description	Depth (ft)	Blow Count (/6")	UCS (tsf)	Moisture (%)	Soil Description	Depth (ft)	Blow Count (/6")	UCS (tsf)	Moisture (%)
Brownish Black Silty Clay	618.40				Very Stiff Gray Clay Till (continued)	11	3.3 B		14
Stiff Yellowish Brown and Gray Clay Till					597.90				
					Hard Gray Clay Till	17	5.2 B		14
	-5								
		6	2.0 B	24					
	612.90								
Hard Gray Clay Till									
		21	5.7 B	17					
	609.90								
Very Stiff Gray Clay Till									
		10	2.0 B	19					
	605.40								
Medium Gray Fine Sand									
		12							
	602.90								
Hard Gray Clay Till									
		15	4.5 B	18					
	600.40								
Very Stiff Gray Clay Till									
	-20								

SOIL BORING 032-0079.GPJ IL_DOT.GDT 3/26/18

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)



SOIL BORING LOG

ROUTE FAI 55 (I-55) DESCRIPTION IL 47 over I-55 Interchange at Dwight LOGGED BY W. Carter

SECTION [(32-3)HB-1]ES LOCATION SE 1/4, SEC. 33, TWP. 31N, RNG. 7E, 3rd PM,
Latitude , Longitude

COUNTY Grundy DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 032-0079
Station 397+16.20

BORING NO. 2 (Pier)
Station 397+67.5
Offset 0.0 ft CL
Ground Surface Elev. 619.90 ft

DEPTH (ft)	BLOW COUNT (/6")	UCS (tsf)	MOISTURE (%)
	20	5.2 B	15
	18	4.2 B	13
	18	5.2 S	12

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ Hrs. _____ ft

Hard Gray Clay Till (*continued*)

573.40

End of Boring

SOIL BORING 032-0079.GPJ IL_DOT.GDT 3/26/18

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)



SOIL BORING LOG

ROUTE FAI 55 (I-55) DESCRIPTION IL 47 over I-55 Interchange at Dwight LOGGED BY W. Carter

SECTION [(32-3)HB-1]ES LOCATION NE 1/4, SEC. 33, TWP. 31N, RNG. 7E, 3rd PM,
Latitude , Longitude

COUNTY Grundy DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 032-0079
Station 397+16.20

BORING NO. 3 (N. Abut.)
Station 397+87
Offset 99.0 ft Lt.
Ground Surface Elev. 619.70 ft

DEPTH H S	B L O W S	U C S Qu	M O I S T	Surface Water Elev. _____ ft	Stream Bed Elev. _____ ft	DEPTH H S	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)			(ft)	(/6")	(tsf)	(%)
618.20							9	2.8 B	14
597.70							8		
595.20							14	4.7 S	14
612.70							22	5.2 B	13
609.70							14	4.1 B	14
-10							14	4.1 B	14
-15							15	4.2 B	14
-20							21	5.9 B	14
-25									
-30									
-35									
-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)

SOIL BORING 032-0079.GPJ IL_DOT.GDT 3/26/18



SOIL BORING LOG

ROUTE FAI 55 (I-55) DESCRIPTION IL 47 over I-55 Interchange at Dwight LOGGED BY W. Carter

SECTION [(32-3)HB-1]ES LOCATION NE 1/4, SEC. 33, TWP. 31N, RNG. 7E, 3rd PM,
Latitude , Longitude

COUNTY Grundy DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 032-0079
Station 397+16.20

BORING NO. 3 (N. Abut.)
Station 397+87
Offset 99.0 ft Lt.
Ground Surface Elev. 619.70 ft

DEPTH H (ft)	B L O W S (/6")	U C S Qu (tsf)	M O I S T (%)
--------------------	--------------------------------	----------------------------	------------------------------

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ Hrs. _____ ft

Hard Gray Clay Till (*continued*)

22	6.1 B	13
----	----------	----

19	5.0 S	13
----	----------	----

-45

18	4.4 B	14
----	----------	----

573.20

End of Boring

-50

-55

-60

SOIL BORING 032-0079.GPJ IL_DOT.GDT 3/26/18

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)



SOIL BORING LOG

ROUTE FAI 55 (I-55) DESCRIPTION IL 47 over I-55 Interchange at Dwight LOGGED BY W. Carter

SECTION [(32-3)HB-1]ES LOCATION NE 1/4, SEC. 33, TWP. 31N, RNG. 7E, 3rd PM,
 Latitude , Longitude

COUNTY Grundy DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 032-0079
 Station 397+16.20

BORING NO. 4 (N. Abut.)
 Station 397+30
 Offset 99.0 ft Lt.
 Ground Surface Elev. 619.70 ft

DEPTH (ft)	BLOWS (S)	UCS (tsf)	MOIST (%)	Surface Water Elev. ft	Stream Bed Elev. ft	DEPTH (ft)	BLOWS (S)	UCS (tsf)	MOIST (%)
------------	-----------	-----------	-----------	------------------------	---------------------	------------	-----------	-----------	-----------

Brownish Black Silty Clay
 618.20

Hard Yellowish Brown Clay Till

9 4.5 S
 -5

15 5.0 S

18 6.8 S

609.70 -10

Very Stiff to Hard Gray Clay Till
 13 3.4 B

8 2.6 B

-15
 11 2.6 B

15 4.2 B

600.20

Stiff Gray Clay Till
 -20

Stiff Gray Clay Till (continued)
 10 1.3 B

597.70

Hard Gray Clay Till

14 5.7 B

-25
 18 5.0 B

18 4.9 B

-30

16 4.2 B

18 4.7 B

-35
 16 4.4 B

17 5.4 B

579.70 -40

SOIL BORING 032-0079.GPJ IL_DOT.GDT 3/26/18

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



Illinois Department of Transportation

Division of Highways
Illinois Department of Transportation

SOIL BORING LOG

Date 8/26/70

ROUTE FAI 55 (I-55) DESCRIPTION IL 47 over I-55 Interchange at Dwight LOGGED BY W. Carter

SECTION [(32-3)HB-1]ES LOCATION NE 1/4, SEC. 33, TWP. 31N, RNG. 7E, 3rd PM,
Latitude , Longitude

COUNTY Grundy DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 032-0079
Station 397+16.20

BORING NO. 4 (N. Abut.)
Station 397+30
Offset 99.0 ft Lt.
Ground Surface Elev. 619.70 ft

D
E
P
T
H

B
L
O
W
S

U
C
S

M
O
I
S
T

(ft) (/6") (tsf) (%)

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter _____ Dry ft
Upon Completion _____ Dry ft
After _____ Hrs. _____ ft

Very Stiff Gray Clay Till

15 3.8 18
B

14 3.6 16
B

575.20

Hard Gray Clay Till

-45

20 4.7 13
S

573.20

End of Boring

-50

-55

-60

SOIL BORING 032-0079.GPJ IL_DOT.GDT 3/26/18

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)



SOIL BORING LOG

ROUTE FAI 55 (I-55) DESCRIPTION IL 47 over I-55 Interchange at Dwight LOGGED BY W. Carter

SECTION [(32-3)HB-1]ES LOCATION SE 1/4, SEC. 33, TWP. 31N, RNG. 7E, 3rd PM,
Latitude , Longitude

COUNTY Grundy DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO.	Station	DEPTH (ft)	BLOW S Qu (/6")	UCS (tsf)	MOIST (%)	Surface Water Elev. ft	Stream Bed Elev. ft	Groundwater Elev.: First Encounter Dry ft	Upon Completion Dry ft	After Hrs. ft	DEPTH (ft)	BLOW S Qu (/6")	UCS (tsf)	MOIST (%)
032-0079	397+16.20													
5 (Pier)	397+08													
	0.0 ft CL													
	620.00													
Brownish Black Silty Clay		618.50										17	6.7 B	14
Stiff Yellowish Brown Clay Till												17	5.4 B	15
		-5												
			7	1.4 B	28							17	6.3 B	14
	613.00													
Hard Gray Clay Till														
			15	6.0 B	18							15	5.0 B	14
	610.50									590.50				
Stiff to Very Stiff Gray Clay Till		-10												
			8	2.4 B	21							13	3.3 B	15
										587.50				
			5	2.0 B	23							13	4.2 B	16
		-15												
6 in. Sand Seam @ 16 Ft.			11	1.8 B	23							15	4.5 B	15
	602.50													
Hard Gray Clay Till														
			22	7.6 B	13							16	4.5 S	15
		-20								580.00	-40			

SOIL BORING 032-0079.GPJ IL_DOT.GDT 3/26/18

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)



SOIL BORING LOG

ROUTE FAI 55 (I-55) DESCRIPTION IL 47 over I-55 Interchange at Dwight LOGGED BY W. Carter

SECTION [(32-3)HB-1]ES LOCATION SE 1/4, SEC. 33, TWP. 31N, RNG. 7E, 3rd PM,
Latitude , Longitude

COUNTY Grundy DRILLING METHOD Hollow Stem Auger HAMMER TYPE _____

STRUCT. NO. 032-0079
Station 397+16.20

BORING NO. 5 (Pier)
Station 397+08
Offset 0.0 ft CL
Ground Surface Elev. 620.00 ft

D E P T H	B L O W S	U C S Qu	M O I S T
(ft)	(/6")	(tsf)	(%)

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft
Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After _____ Hrs. _____ ft

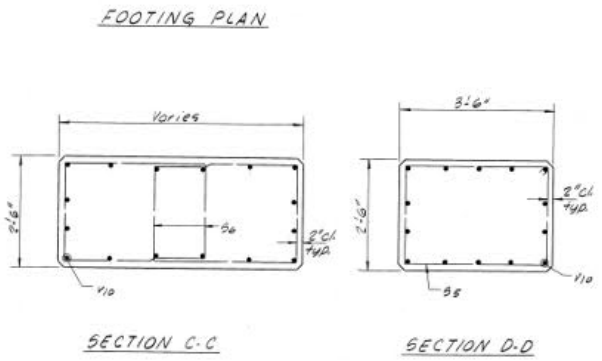
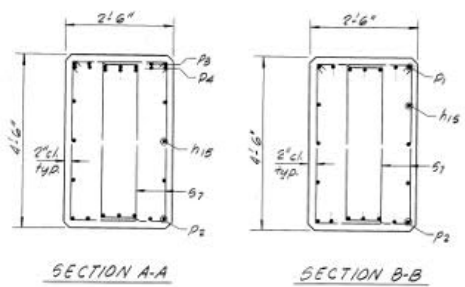
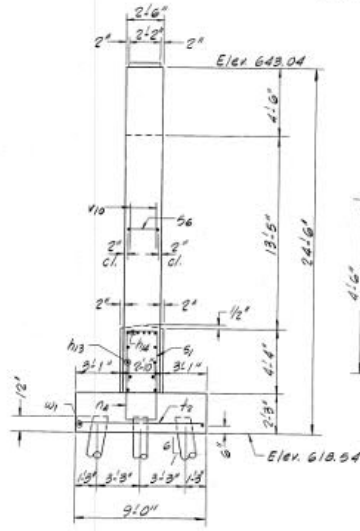
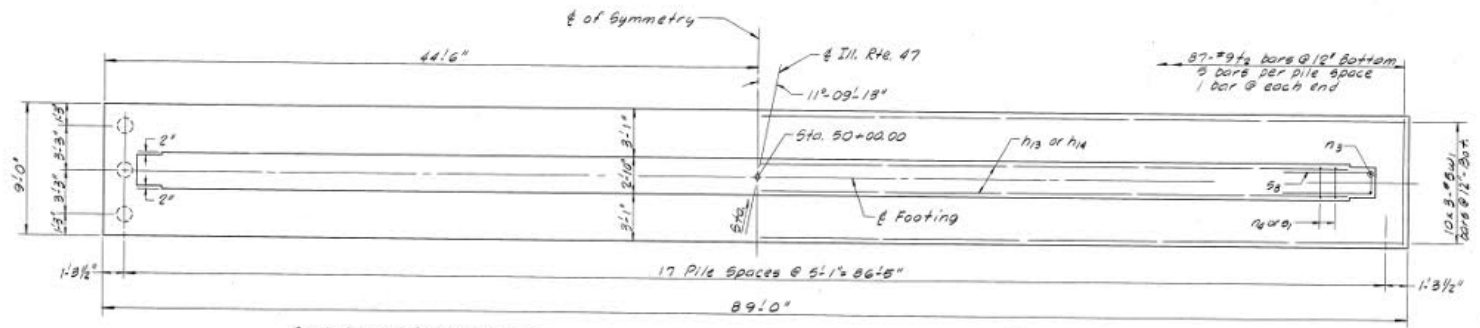
Hard Gray Clay Till	17	4.7 B	16
577.50			
Medium to Dense Gray Clay Till (Stone Fragments)	45	3.0 S	9
-45			
573.50	22	5.7 S	13
End of Boring			
-50			
-55			
-60			

SOIL BORING 032-0079.GPJ IL_DOT.GDT 3/26/18

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)

ROUTE NO.	SECTION	COUNTY	SHEET NO.	SHEET NO.
FA.I-55	323MB	GRUNDY	62	39
FED. ROAD DIST. NO. 7	LANE	FED. RD. PROJECT		

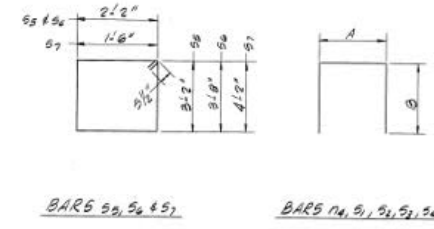
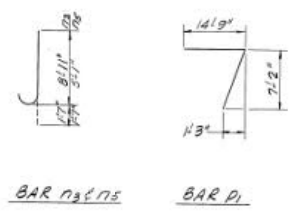
PILE DATA
 Type Concrete
 Capacity 55 Ton
 Est Length 29'
 No. Required 33 + 1 test pile



BILL OF MATERIAL

Bar	No.	Size	Length	Shape
h3	24	#5	27'-10"	—
h4	18	#6	27'-6"	—
h5	24	#5	21'-6"	—
n3	32	#11	10'-6"	□
n4	81	#6	9'-10"	□
n6	26	#11	6'-8"	□
s1	14	#11	21'-11"	—
s2	24	#11	22'-2"	—
s3	14	#11	35'-10"	—
s4	14	#11	31'-0"	—
s5	81	#5	9'-10"	□
s6	8	#5	12'-0"	□
s7	8	#5	4'-8"	□
s8	14	#5	10'-2"	□
s9	28	#5	11'-2"	□
s10	28	#5	12'-2"	□
s11	8	#5	12'-3"	□
s12	8	#5	10'-10"	□
u3	87	#9	8'-6"	—
v10	88	#11	17'-9"	—
w4	32	#5	32'-4"	—
Class I Concrete			C.Y.	176.9
Reinforcement Bars			Lbs.	31,389
Test Pile Concrete			Each	1
Concrete Piles			Lin. Ft.	1537

DESIGNED P. H. CHHEDA	EXAMINED	19
CHECKED J. E. SWINK	UNIVERSITY OF BRIDGE AND TRAFFIC STRUCTURES	
DRAWN J. J. SEHAK	PASSED	
CHECKED R. P. JAHNELKA	APPROVED	



A & B DIMENSIONS

Bar	A	B
n4	2'-4"	3'-9"
s1	2'-2"	3'-9"
s2	2'-2"	4'-11"
s3	2'-2"	4'-3"
s4	2'-2"	4'-2"
s9	2'-2"	4'-2"

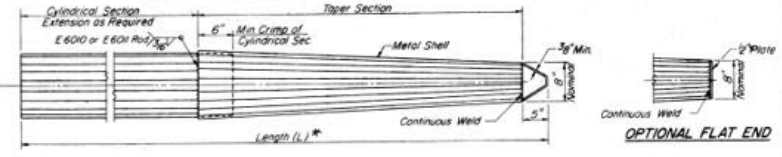
PIER DETAILS
 ILL.-47 SEC. 32-3MB
 GRUNDY COUNTY
 STA. 397 + 16.20 @ FA.I-55

PROJECT NO.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.	SHEET NO. 15
FA 1-55 32-3MB		GRUNDY	62	39	SHEETS 16
FAB. ROAD DIST. NO. 7	ILLINOIS	FED. AID PROJECT			



Note: 6" Crimp shall either be supplied on the cylindrical section or made in the field as detailed.

FIELD CRIMP DETAIL

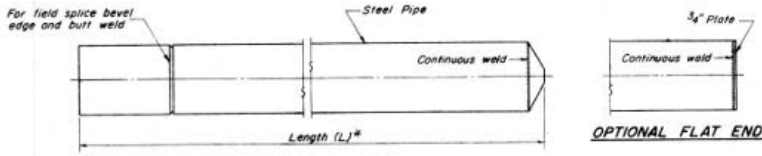


ALLOWABLE TAPER SECTIONS

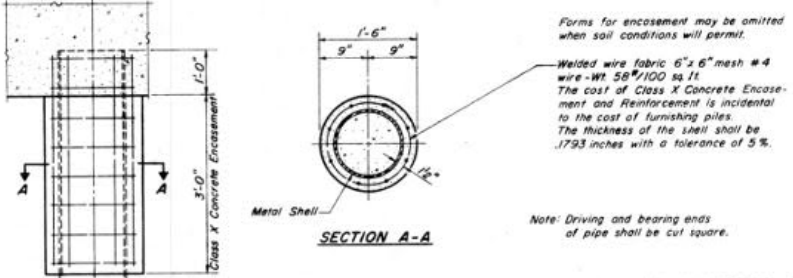
- 10' Length - Taper 1" in 2'-6"
- 17' Length - Taper 1" in 4'-0"
- 25' Length - Taper 1" in 7'-0"
- 30' Length - Taper 1" in 7'-0"

Welded wire fabric 6" x 6" mesh #4 wires - WT 58#/100 sq ft. The cost of Class X Concrete Encasement and Reinforcement is incidental to the cost of furnishing piles. The thickness of the shell shall be .1793 inches with a tolerance of 5%. Forms for encasement may be omitted when soil conditions will permit.

DETAIL OF TAPERED METAL SHELL FOR CAST IN PLACE CONCRETE PILES



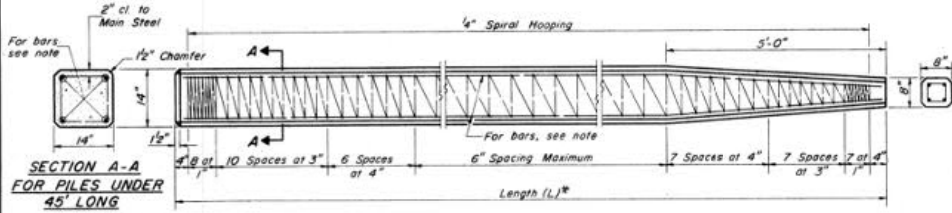
OPTIONAL FLAT END



Forms for encasement may be omitted when soil conditions will permit. Welded wire fabric 6" x 6" mesh #4 wires - WT 58#/100 sq ft. The cost of Class X Concrete Encasement and Reinforcement is incidental to the cost of furnishing piles. The thickness of the shell shall be .1793 inches with a tolerance of 5%.

Note: Driving and bearing ends of pipe shall be cut square.

DETAIL OF CYLINDRICAL STEEL SHELL FOR CAST IN PLACE CONCRETE PILES



SECTION A-A FOR PILES UNDER 45' LONG

Note: For 14" Piles 45' long or more use 8-#8 bars 4 for the full length and 4 to the point of bevel. For 14" Piles under 45' long use 4-#9 bars full length.

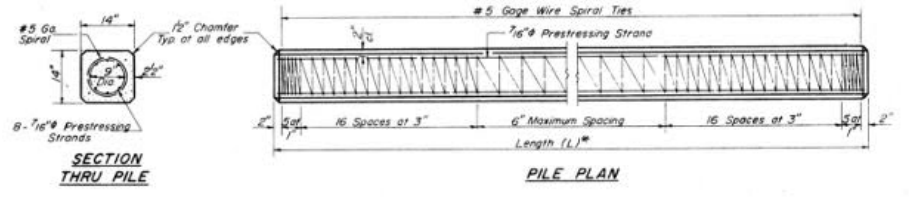
Handling: For Pile lengths up to 45', use two slings placed at a distance of 0.21 L from each end. For Piles longer than 45', use three slings placed at a distance of 0.12 L from each end and at mid-point of pile.

SECTION A-A FOR PILES 45' OR MORE

DESIGNED P. H. CHHEDA	19
CHECKED J. E. SWINK	EXAMINED
DRAWN T. D. HRANEK	PASSED
CHECKED J. J. REHAK	APPROVED

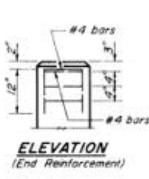
* Note: For Length (L), see Sheet 11 for Abutments & Sheet 14 for Piers.

DETAIL OF PRECAST CONCRETE PILES

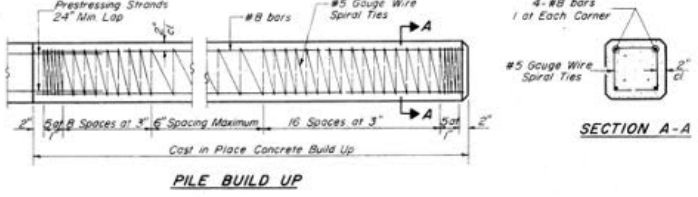


SECTION THRU PILE

PILE PLAN



ELEVATION (End Reinforcement)



PILE BUILD UP

SECTION A-A

DESIGN STRESSES

- f_c = 5,000 psi
- f_t = 4,000 psi
- f_s = 268,000 psi (31,000 lbs)
- f_s = 188,000 psi (21,700 lbs)

Note: Prestressing steel shall be non-palvanized extra high strength stress-relieved 7 wire strand. The nominal diameter shall be 7/16" and the minimum nominal cross-sectional area shall be 0.195 square inch.

Handling: For pile lengths up to 65', use two slings placed at a distance of 0.21 L from each end. For piles longer than 65', use three slings placed at a distance of 0.12 L from each end and at midpoint of pile.

PILE DETAILS

ILL.-47 SEC. 32-3MB

GRUNDY COUNTY

STA. 397+16.20 & FA. 1-55

DETAIL OF PRECAST PRESTRESSED CONCRETE PILES

ROLLING DIAGRAM



COUNTY GRUNDY
 SECTION 32-3(HH,SR)
 ROUTE F.A. 55
 DISTRICT 1
 CONTRACT 12028
 JOB NO C-93-092-71
 PROJECT 1-55-5(55)215

PILE TYPE: CONCRETE
 PILE

HAMMER DATA :

TYPE: LINK BELT 440
 RAM WT: 4000^{lb}
 STROKE: 38.4
 STROKES/MIN: 86-90
 BATTER COEF: .950
 FORMULA USED $p = \frac{2 \times W \times H}{S + OI}$
 REQUIRED BRG: 35

PLAN LENGTH: 39 FT

ORDERED LENGTH: 32 FT

SEE LETTER DATED 6-22-73

PAY QUANTITIES :

FURNISHED: 1944.0
 DRIVEN: 1541.7

GRUNDY

32-3048.8R)

F.A.I. 55

3

29028

C-93-092-71

1-55-5(55)215

NORTH ABUTMENT

PILE NO	LENGTH FURNISHED	LENGTH CUT OFF	DRIVEN LENGTH	BEARING
	FT	FT	FT	TON
1	32	82	238	50
2	32	78	242	50
3	32	81	239	55
4	32	81	239	48
5	32	88	232	38
6	32	83	237	38
7	32	90	250	53
8	32	83	237	38
9	32	93	227	37
10	32	85	235	41
11	32	83	237	38
12	32	84	236	41
13	32	84	236	55
14	32	74	246	52
15	32	86	234	60
16	32	56	264	38
17	32	52	268	37
18	32	07	313	37
19	32	54	266	40
20	32	19	302	38
21	32	58	262	42
22	32	16	304	44
23	32 + 8 SPL	63	337	50
24	32 + 8 SPL	38	362	44
25	32 + 8 SPL	48	352	40
26	32	00	320	37
27	32 + 8 SPL	54	346	44
28	32	10	310	41
29	32 + 8 SPL	45	355	45
30	32 + 8 SPL	44	356	42
31 B	32	78	242	52/47
32 B	32	78	242	41/39
33 B	32	83	237	37/35
34 B	32	73	247	37/35
35 B	32	80	240	41/39
36 B	32	74	246	48/46

GRUNDY

32-317-B, BR)

F.A.I. 55

3
29028
C-93-092-71

455-5(55)215

NORTH ABUTMENT

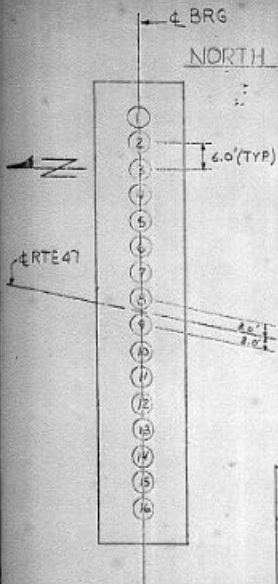
PILE NO	LENGTH FURNISHED	LENGTH CUT OFF	DRIVEN LENGTH	BEARING
	FT	FT	FT	TON
37 B	32	75	24.5	41/39
38 B	32	65	25.7	40/38
39 B	32	84	23.4	38/36
40 B	32	79	24.1	40/38
41 B	32	85	23.5	37/35
42 B	32	84	23.6	38/36
43 B	32	81	23.9	37/35
44 B	32	108	21.2	37/35
45 B	32	73	24.7	40/38
46 B	32	80	24.0	39/37
47 B	32	67	25.3	44/42
48 B	32	82	23.8	48/46
49 B	32	80	24.0	44/44
50 B	32	78	24.2	43/41
51 B	32	83	23.7	38/36
52 B	32	81	23.9	39/37
53 B	32	85	23.5	37/35
54 B	32	84	23.6	38/36
55 B	32	83	23.7	44/38
56 B	32	20	30.0	39/37
57 B	32 + 8 SPL	47	35.3	45/43
58 B	32	1.7	30.3	45/43
59 B	32	89	23.1	43/41
60 B	32	88	23.2	39/37
TOTAL	* 1976	408.2	* 1567.8	

B INDICATES BATTERED PILE

* LESS ONE AVERAGE PILE USED FOR TEST PILE = 26.1

PILING DIAGRAM ●

NORTH APPROACH BENT



COUNTY GRUNDY
 SECTION 32-31(B,RR)
 ROUTE F.A. 55
 DISTRICT 3
 CONTRACT 29028
 JOB NO C-93-092-71
 PROJECT 1-55-5(55)215

PILE TYPE: CONCRETE
 PILE

HAMMER DATA:

TYPE: LINK BELT 440
 RAM WT: 4000^{lb}
 STROKE: 38.4
 STROKES/MIN: 86-90
 REQUIRED BRG 30

PLAN LENGTH: 47 FT

ORDERED LENGTH: 42 FT

SEE LETTER
 DATED 6-22-73

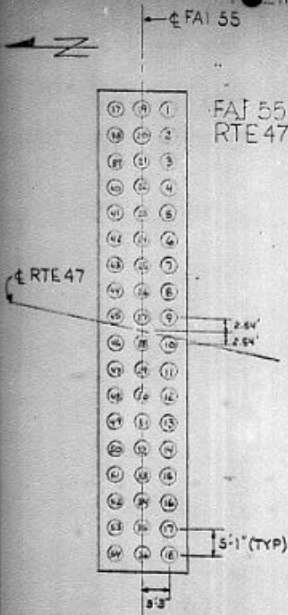
PAY QUANTITIES:

FURNISHED: 672

DRIVEN: 562.6

PILE NO	LENGTH FURNISHED	LENGTH CUT OFF	DRIVEN LENGTH	BEARING
	FT	FT	FT	TONS
1	42	91	32.9	41
2	42	105	31.5	40
3	42	42	37.8	37
4	42	86	33.4	35
5	42	50	37.0	35
6	42	66	35.4	35
7	42	64	35.6	33
8	42	46	37.4	31
9	42	62	35.8	35
10	42	60	36.0	32
11	42	70	35.0	33
12	42	57	36.3	35
13	42	60	36.0	35
14	42	94	32.6	31
15	42	81	33.9	33
16	42	60	36.0	33
TOTAL	672	1094	562.6	

PILING DIAGRAM



PIER
 FAJ 55 STA 397+1620 =
 RTE 47 STA 50+00

COUNTY GRUNDY
 SECTION 32-3(H&B)
 ROUTE F.A.I. 55
 DISTRICT 3
 CONTRACT 19028
 JOB NO. 93-092-71
 PROJECT 453-5(55)215

PILE TYPE: CONCRETE
 PILE

HAMMER DATA

TYPE: LINK BELT 440
 RAM WT: 4000^{lb}
 STROKE: 38.4
 STROKES/MIN: 84-90
 BATTER COEF: .970
 FORMULA USED: $p = \frac{2 \times W \times H}{S \pm Q}$
 REQUIRED BRG: 35 S±Q1
 PLAN LENGTH: 29 FT
 ORDERED LENGTH: 16 FT
 SEE LETTER DATED 6-21-73
PAY QUANTITIES
 FURNISHED: 1380.0
 DRIVEN: 1179.0

PIER

FILE NO	LENGTH FURNISHED	LENGTH CUT OFF	DRIVEN	BEARING
			LENGTH	TON
	FT	FT	FT	
1 B	16+15 SPL	4.6	26.4	37/36
2 B	32	6.3	25.7	39/38
3 B	32	8.9	23.1	38/37
4 B	32	5.0	27.0	39/38
5 B	32	3.8	28.2	42/41
6 B	32	8.6	23.4	39/38
7 B	32	6.1	25.9	39/38
8 B	32	2.1	29.9	37/36
9 B	16+8 SPL	3.2	20.8	38/37
10 B	16+8 SPL	2.0	22.0	40/39
11 B	16+12 SPL	2.0	26.0	53/51
12 B	16+4 SPL	1.1	18.9	43/42
13 B	16	1.3	14.7	42/41
14 B	16+8 SPL	3.8	20.2	44/45
15 B	16+8 SPL	5.4	18.6	44/45
16 B	16	0.5	15.5	38/37
17 B	16	0.6	15.4	37/36
18 B	16	0.4	15.6	39/38
19	16+16 SPL	4.3	27.7	42
20	32	6.8	25.2	39
21	32	6.1	25.9	40
22	16+8 SPL	1.8	22.2	38
23	32	2.8	29.2	39
24	32	7.0	25.0	41
25	32	9.1	22.9	42
26	32	9.1	22.9	40
27	16+8 SPL	2.0	22.0	39
28	16+8 SPL	1.3	22.7	38
29	16+8 SPL	1.0	23.0	37
30	16+8 SPL	2.1	21.9	47
31	16+8 SPL	2.4	21.6	45
32	16+8 SPL	3.6	20.4	48
33	16+8 SPL	3.6	20.4	55
34	16	0.7	15.3	36
35	(TEST)			
36	16	0.0	16.0	40

GRUNDY

32-370.BR)

F.A.I. 55

3
29028
C 93-092-7)

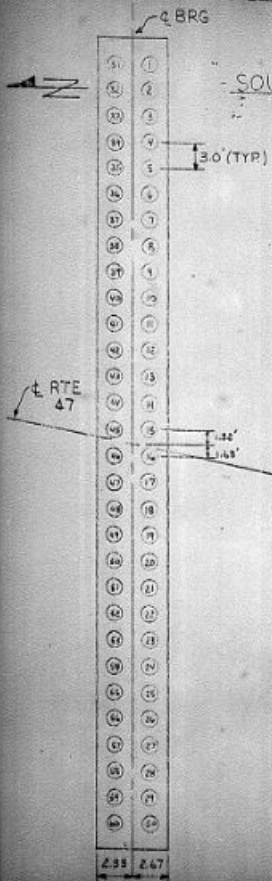
155-5(55)215

PIER

PILE NO	LENGTH FURNISHED	LENGTH CUT OFF	DRIVEN LENGTH	BEARING
	FT	FT	FT	TON
37 B	32	6.7	253	41/40
38 B	32	6.7	253	42/41
39 B	32	3.4	286	35/37
40 B	32	5.0	270	39/38
41 B	32	4.0	280	44/43
42 B	32	2.6	294	40/39
43 B	32	8.9	23.1	42/41
44 B	32	9.4	22.4	42/41
45 B	32	9.1	22.9	39/38
46 B	16+8 SPL	1.0	23.0	37/36
47 B	16+8 SPL	3.3	20.7	37/36
48 B	16+8 SPL	3.8	20.2	45/43
49 B	16+5 SPL	1.3	19.7	45/43
50 B	16+8 SPL	3.8	20.2	62/60
51 B	16	0.7	15.3	40/39
52 B	16	0.2	15.8	38/37
53 B	16	0.7	15.3	42/41
54 B	16	1.0	15.0	44/44
TOTAL	1380	201	11790	

B INDICATES BATTERED PILE

● PILING DIAGRAM ●



SOUTH ABUTMENT

COUNTY GRUNDY
 SECTION 32-3(HB, BR)
 ROUTE F.A.I. 55
 DISTRICT 3
 CONTRACT 29028
 JOB NO C93.092.71
 PROJECT 1-55-5(55)215

PILE TYPE: CONCRETE
 PILE

HAMMER DATA

TYPE: LINK BELT 410
 RAM WT: 4000"
 STROKE: 38.4
 STROKES/MIN: 86-90
 BATTER COEF: .950
 FORMULA USED $p = \frac{2 \times W \times H}{S + OI}$
 REQUIRED BRG: 35

PLAN LENGTH: 39 FT
 ORDERED LENGTH: 30 FT
 SEE LETTER DATED 6-22-73

PAY QUANTITIES:
 FURNISHED: 1880.0
 DRIVEN: 1678.2

GRUNDY

32-3(HB.M)

F.A. 55

3
29028
C-93-092-71

1-55-5(55)215

SOUTH ABUTMENT

PILE NO	LENGTH FURNISHED	LENGTH CUT OFF	DRIVEN LENGTH	BEARING
	FT	FT	FT	TON
1	30	05	295	42
2	30	01	299	43
3	30 + 8'SPL	20	340	51
4	30	78	222	43
5	30	53	247	43
6	30 + 8'SPL	17	363	57
7	30 + 8'SPL	15	365	49
8	30	72	228	41
9	30	73	227	41
10	30	65	235	37
11	30	68	232	44
12	30	38	262	36
13	30	22	278	39
14	30	04	294	35
15	30	04	296	35
16	30	41	259	39
17	30	41	259	39
18	30	48	252	37
19	30	47	253	42
20	30	62	238	42
21	30	35	265	37
22	30	15	285	37
23	30	25	275	37
24	30	53	247	41
25	30	54	246	37
26	30	59	241	38
27	30	40	260	37
28	30	42	258	37
29	30	63	237	37
30	30	49	251	39
31 B	30	55	245	45/43
32 B	30	57	243	45/43
33 B	30	38	262	37/35
34 B	30	58	242	43/41
35 B	30	58	242	42/40
36 B	30	02	298	37/35

GRUNDY

32-3(HB#)

F.A.I. 55

3

29028

C-93-092-71

1-55-5155/215

SOUTH ABUTMENT

PILE NO	LENGTH FURNISHED	LENGTH CUT OFF	DRIVEN LENGTH	BEARINGS
	FT	FT	FT	TON
37 B	30	0.5	29.5	37/35
38 B	30	5.2	24.8	40/38
39 B	30	0.8	29.2	37/35
40 B	30+8 SPL	5.3	32.7	44/42
41 B	30+8 SPL	2.1	35.9	44/42
42 B	30+8 SPL	2.5	35.5	39/37
43 B	30+8 SPL	1.9	36.1	43/41
44 B	30+8 SPL	2.3	35.7	42/40
45 B	30	0.3	29.7	36/34
46 B	30	1.1	28.9	38/36
47 B	30	0.8	29.2	37/35
48 B	30	4.7	25.3	38/36
49 B	30+8 SPL	1.7	36.3	48/46
50 B	30	1.6	28.4	37/35
51 B	30	1.1	28.9	38/36
52 B	30+8 SPL	2.3	35.7	44/42
53 B	30	1.1	28.9	37/35
54 B	30	1.5	28.5	42/40
55 B	30	1.0	29.0	42/40
56 B	30	3.2	26.8	38/36
57 B	30	3.8	26.2	37/35
58 B	30	2.1	27.9	37/35
59 B	30	4.0	26.0	37/35
60 B	30	3.2	26.8	38/36
TOTAL	1880	201.8	1678.2	

B INDICATES BATTERED PILE

PILEING DIAGRAM

SOUTH APPROACH BENT

COUNTY SAUNDY
SECTION 32.3(HB,RR)
ROUTE F.A. 55
DISTRICT 3
CONTRACT 19028
JOB NO 093-092-71
PROJECT 155-5155215



PILE TYPE: CONCRETE
PILE

HAMMER DATA:

TYPE: LINK BELT 440
RAM WT: 4000
STROKE: 38.4
STROKES/MIN: 86-90
REQUIRED BRG: 30

PLAN LENGTH: 48 FT

ORDERED LENGTH: 42 FT

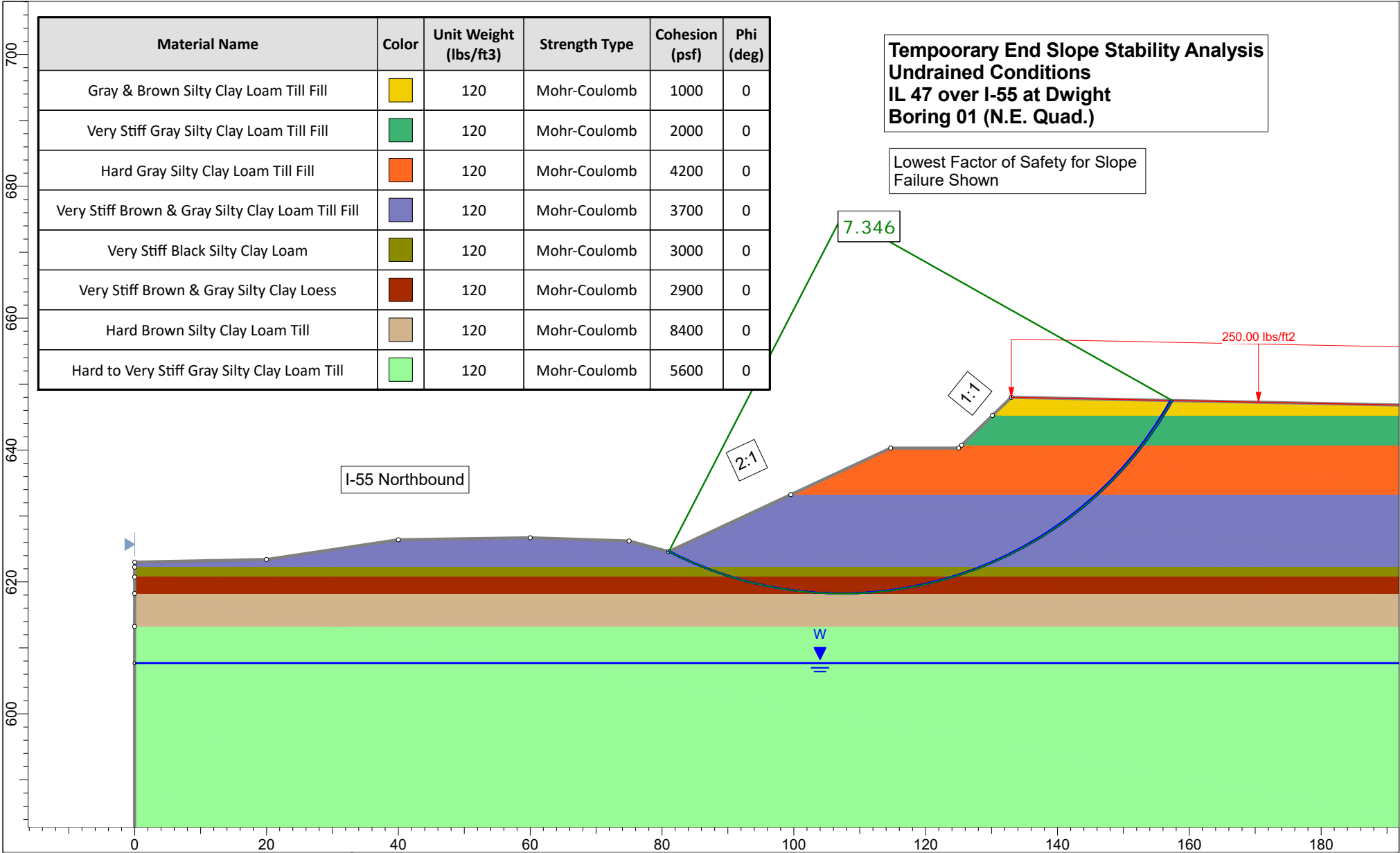
PAY QUANTITIES:

FURNISHED: 630
DRIVEN: 550

SEE LETTER
DATED 6-22-73

PILE NO	LENGTH FURNISHED	LENGTH CUT OFF	DRIVEN LENGTH	BEARING
	FT	FT	FT	TON
1	42	115	30.5	33
2	42	92	32.8	36
3	42	95	32.5	35
4	42	56	36.4	34
5	42	67	35.3	35
6	42	47	37.3	35
7	42	48	37.2	33
8	42	37	38.3	36
9	42	24	39.6	35
10	42	34	38.6	37
11	42	25	39.5	35
12	42	22	39.8	33
13	42	34	38.6	39
14	42	27	39.3	42
15	42	64	35.4	31
16	42	66	35.4	32
	*672	85.3	*586.7	

LESS ONE AVERAGE PILE USED AS TEST PILE = 36.7



Material Name	Color	Unit Weight (lbs/ft ³)	Strength Type	Cohesion (psf)	Phi (deg)
Gray & Brown Silty Clay Loam Till Fill		120	Mohr-Coulomb	1000	0
Very Stiff Gray Silty Clay Loam Till Fill		120	Mohr-Coulomb	2000	0
Hard Gray Silty Clay Loam Till Fill		120	Mohr-Coulomb	4200	0
Very Stiff Brown & Gray Silty Clay Loam Till Fill		120	Mohr-Coulomb	3700	0
Very Stiff Black Silty Clay Loam		120	Mohr-Coulomb	3000	0
Very Stiff Brown & Gray Silty Clay Loess		120	Mohr-Coulomb	2900	0
Hard Brown Silty Clay Loam Till		120	Mohr-Coulomb	8400	0
Hard to Very Stiff Gray Silty Clay Loam Till		120	Mohr-Coulomb	5600	0

	Project IL 47 over I-55 (at Dwight) Temporary Endslope Stability Analysis (Undrained) Conditions		
	Analysis Method SLIDEINTERPRET 8.018 Bishop simplified		
	Drawn By MEJ	Scale 1:242	Company McCleary Engineering
	Date 1/24/2019		File Name Temporary Slope Stability Analysis IL 47 over I-55 Undrained Conditions slmd

USGS Design Maps Summary Report**User-Specified Input**

Report Title IL 47 over I-55 at Dwight
Tue September 18, 2018 14:34:46 UTC

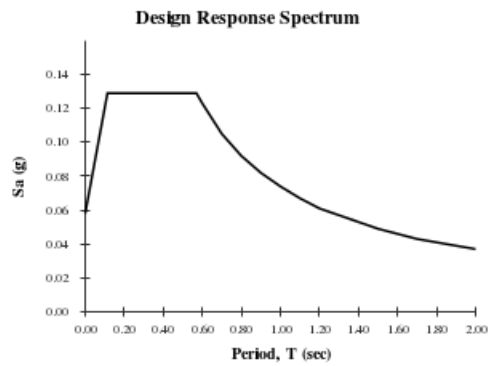
Building Code Reference Document 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design
(which utilizes USGS hazard data available in 2002)

Site Coordinates 41.11764°N, 88.41934°W

Site Soil Classification Site Class C – “Very Dense Soil and Soft Rock”

**USGS-Provided Output**

PGA = 0.048 g	A_s = 0.058 g
S_s = 0.108 g	S_{DS} = 0.129 g
S₁ = 0.043 g	S_{D1} = 0.074 g



Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

GENERAL DATA

STRUCTURE NUMBER=====032-0125
 STRUCTURE TYPE =====MULTI-SPAN
 STRUCTURE SKEW=====11.154 DEGREES
 SUPER. DATA IN REFERENCE TO SUB. DATA ===== ABUT 1

TOTAL STRUCTURE LENGTH=====247.33 FT
 NUMBER OF SPANS =====2
 END SPAN LENGTH =====121.97 FT
 ADJACENT INTERIOR SPAN LENGTH =====0.01 FT

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (END OR MAIN SPAN)		
BEAM TYPE =====	PLATE GIRDER	
TOP FLANGE WIDTH =====	14.00	IN
TOP FLANGE THICKNESS =====	2.00	IN
WEB DEPTH =====	48.00	IN
WEB THICKNESS =====	0.50	IN
BOTTOM FLANGE WIDTH =====	14.00	IN
BOTTOM FLANGE THICKNESS =====	2.00	IN
BEAM SPACING PERP. TO CL =====	7.83	FT
SLAB THICKNESS =====	8.00	IN
SLAB F'C =====	4.00	KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)		
TOP FLANGE WIDTH =====	14.00	IN
TOP FLANGE THICKNESS =====	2.00	IN
WEB DEPTH =====	48.00	IN
WEB THICKNESS =====	0.50	IN
BOTTOM FLANGE WIDTH =====	14.00	IN
BOTTOM FLANGE THICKNESS =====	2.00	IN
BEAM SPACING PERP. TO CL =====	7.83	FT
SLAB THICKNESS =====	8.00	IN
SLAB F'C =====	4.00	KSI

ABUTMENT #1 DATA		
ABUTMENT NAME =====	South	
ABUTMENT REFERENCE BORING =====	02 S.W. Quad.)	
BOTTOM OF ABUTMENT ELEVATION =====	640.56	FT
ESTIMATED NUMBER OF PILES AT ABUT. =====	12	
PILE SPACING PERP. TO CL =====	7.83	FT

ABUTMENT #2 DATA		
ABUTMENT NAME =====	North	
ABUTMENT REFERENCE BORING=====	01 (N.E. Quad.)	
BOTTOM OF ABUTMENT ELEVATION=====	640.56	FT
ESTIMATED NUMBER OF PILES AT ABUT.=====	12	
PILE SPACING PERP. TO CL =====	7.83	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)
640.21	0.35	4.0		
637.71	2.50	4.0		
635.21	2.50	4.1		
632.71	2.50	4.4		
630.56	2.15	4.7		

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)
638.24	2.32	4.0		
635.74	2.50	4.4		
633.24	2.50	4.1		
630.56	2.68	3.50		

10.00 FT = TOTAL DEPTH ENTERED

10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1=====: 4.28 TSF

WEIGHTED AVERAGE Qu FOR ABUTMENT #2=====: 3.99 TSF

PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*4.28])===== 5.98

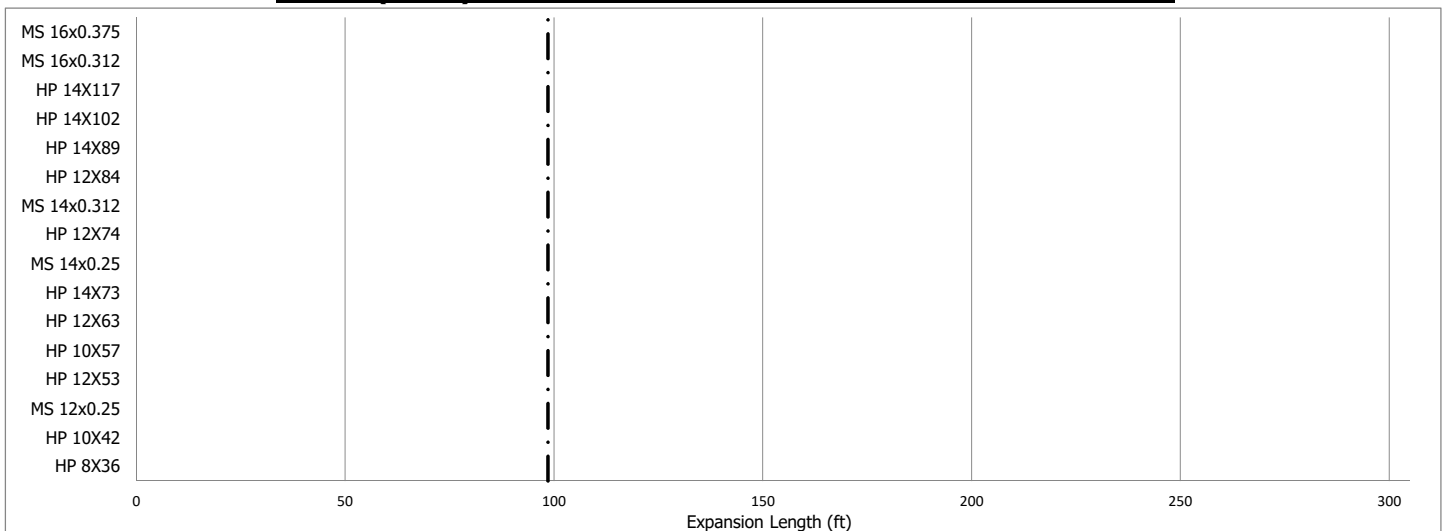
PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*3.99])===== 3.96

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

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [5.98*12*0+3.96*12*247.33]/[5.98*12+3.96*12]===== 98.54 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [3.96*12*0+5.98*12*247.33]/[3.96*12+5.98*12]===== 148.79 FT

ABUT 1 (South) - EXPANSION LENGTH LIMIT CHART - 11.2 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.)

GENERAL DATA

STRUCTURE NUMBER=====032-0125
 STRUCTURE TYPE =====MULTI-SPAN
 STRUCTURE SKEW=====11.154 DEGREES
 SUPER. DATA IN REFERENCE TO SUB. DATA ===== ABUT 1

TOTAL STRUCTURE LENGTH=====247.33 FT
 NUMBER OF SPANS =====2
 END SPAN LENGTH =====121.97 FT
 ADJACENT INTERIOR SPAN LENGTH =====0.01 FT

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (END OR MAIN SPAN)		
BEAM TYPE =====	PLATE GIRDER	
TOP FLANGE WIDTH =====	14.00	IN
TOP FLANGE THICKNESS =====	2.00	IN
WEB DEPTH =====	48.00	IN
WEB THICKNESS =====	0.50	IN
BOTTOM FLANGE WIDTH =====	14.00	IN
BOTTOM FLANGE THICKNESS =====	2.00	IN
BEAM SPACING PERP. TO CL =====	7.83	FT
SLAB THICKNESS =====	8.00	IN
SLAB F'C =====	4.00	KSI

SUPERSTRUCTURE POSITIVE MOMENT REGION DATA (ADJACENT SPAN)		
TOP FLANGE WIDTH =====	14.00	IN
TOP FLANGE THICKNESS =====	2.00	IN
WEB DEPTH =====	48.00	IN
WEB THICKNESS =====	0.50	IN
BOTTOM FLANGE WIDTH =====	14.00	IN
BOTTOM FLANGE THICKNESS =====	2.00	IN
BEAM SPACING PERP. TO CL =====	7.83	FT
SLAB THICKNESS =====	8.00	IN
SLAB F'C =====	4.00	KSI

ABUTMENT #1 DATA --NOTE INPUT DATA REFLECTS 10' BENTONITE PRECORE		
ABUTMENT NAME =====	South	
ABUTMENT REFERENCE BORING =====	02 (S.W. Quad)	
BOTTOM OF ABUTMENT ELEVATION =====	640.56	FT
ESTIMATED NUMBER OF PILES AT ABUT. =====	12	
PILE SPACING PERP. TO CL =====	7.83	FT

ABUTMENT #2 DATA--NOTE INPUT DATA REFLECTS 10' BENTONITE PRECORE		
ABUTMENT NAME =====	North	
ABUTMENT REFERENCE BORING=====	01 (N.E. Quad)	
BOTTOM OF ABUTMENT ELEVATION=====	640.56	FT
ESTIMATED NUMBER OF PILES AT ABUT.=====	12	
PILE SPACING PERP. TO CL =====	7.83	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)
640.21	0.35	0.0	1	0.7
637.71	2.50	0.0	1	0.7
635.21	2.50	0.0	1	0.7
632.71	2.50	0.0	1	0.7
630.56	2.15	0.0	1	0.7

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)
638.24	2.32	0.0	1	0.7
635.74	2.50	0.0	1	0.7
633.24	2.50	0.0	1	0.7
630.56	2.68	0.00	1	0.7

10.00 FT = TOTAL DEPTH ENTERED

10.00 FT = TOTAL DEPTH ENTERED

WEIGHTED AVERAGE Qu FOR ABUTMENT #1=====: 0.00 TSF

WEIGHTED AVERAGE Qu FOR ABUTMENT #2=====: 0.00 TSF

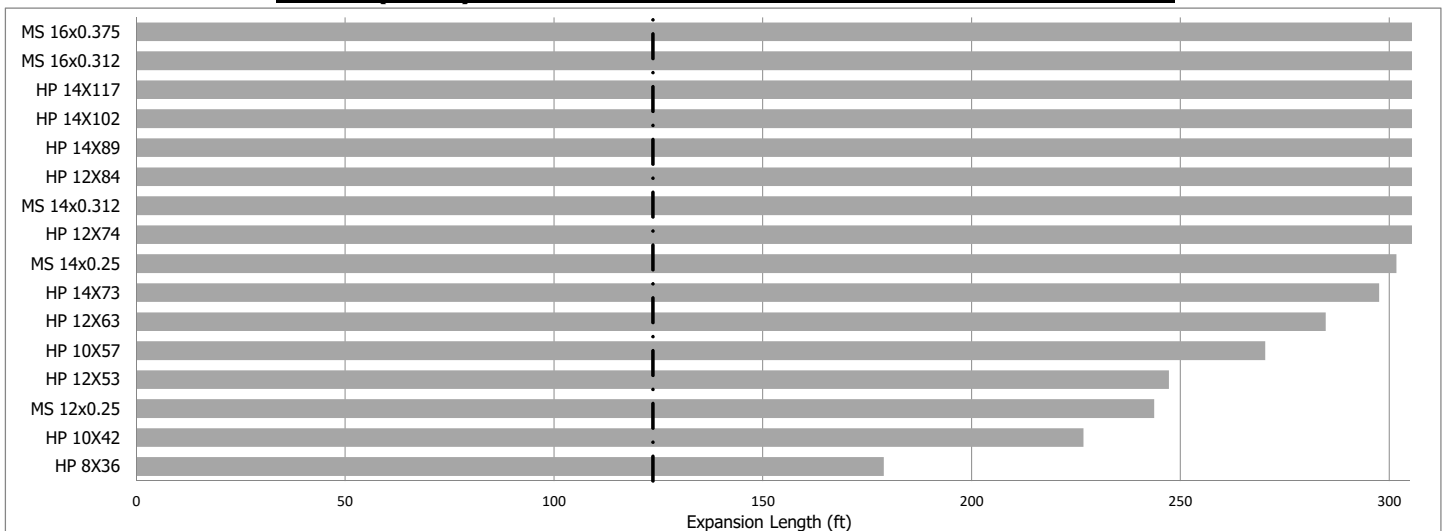
PILE STIFFNESS MODIFIER FOR ABUTMENT #1 = 1/(1.45-[0.3*0])===== 0.69

PILE STIFFNESS MODIFIER FOR ABUTMENT #2 = 1/(1.45-[0.3*0])===== 0.69

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #1 = [0.69*12*0+0.69*12*247.33]/[0.69*12+0.69*12]===== 123.67 FT

DISTANCE TO CENTROID OF STIFFNESS FROM ABUTMENT #2 = [0.69*12*0+0.69*12*247.33]/[0.69*12+0.69*12]===== 123.67 FT

ABUT 1 (South) - EXPANSION LENGTH LIMIT CHART - 11.2 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.)

Preliminary Substructure Loadings

9/12/2008

PROPOSED STRUCTURE		PRELIMINARY		Integral Abutment	
SN 032-0079	HL-93	no of piles	30	Allowed	35 ton/pile
Load on Pile at Abutment (Expansion)	Spans = 30 + 131.1667+131.1667 +30		<= includes approaches, Span is to Back of Abutment for Reactions		
HL-93 = HS 25	Reaction (k)	Factor =	25 /	25 =	1
Lane	73.3	0.9	65.97 per	0.64 k/ft =>	114.53125 * w
Truck	96.6	0	0		
Dual truck	135.7	0.9	122.13		
tandem	67.9	0	0		
			188.1 =>	188.1	169.9 single truck 188.1 dual truck
No of lanes	7				
reduction factor	0.65				
	Spans = 131.1667+131.1667			855.855	28.53
R dl	31.5 per	0.64 k/ft =>	49.21875	* w	
Deck Area	62.111	0.15	49.21875	=	458.55 15.29 8 in 420.42 92%
Raised Median	15.75	0.15	49.21875	=	116.28 3.88 10.5 in 111.04
Barrier	6.19	0.15	49.21875	=	45.70 1.52 v Type F = 3.095 SF 43.64
Overlay (ksf) => .050ksf => 4"	24	0.15	49.21875	=	177.19 5.91 Type L = 1.6039 SF 169.20 95%
Approach Slab	1.2500	15	93.1667	0.15 =	262.03 8.73 Steel girder 0.75 in in ft cf 169.20 95%
Superstructure (steel)	0.2200	12	49.21875	diaphragms 1.1 =	142.93 4.76 1.5 16 25 4.17 b 104.40 73%
Approach Raised Median	15.75	0.15	15.0	=	35.44 1.18 2.5 16 13 3.61 t 35.44
Approach Barrier	6.19	0.15	15.0	=	13.93 0.46 2.5 16 13 3.61 b 13.93
Approach Overlay (ksf)	24	0.15	15.0	=	54.00 1.80 k/pile 58.52 cf 0.49 k/cf 54.00
Abutment	22.6658	0.15	93.1667	=	316.75 10.56 per equals 130.167 ft 0.220305 k/ft 316.75
wing walls	74.3	0.15	2	1.00000 =	22.29 0.74 Hsoil = 0 ft Use: 0.22 22.29
Vertical Earth Load	40.5313	0	92.2083	=	0.00 0.00 M soil + surcharge 0 ft from Wall size 0.00
Horizontal Earth Load	0.00	0	187.5	=	0.00 0.00 rows no of piles in row d => 187.5 0.00
Pedestrian LL	0	0.075	114.53125	=	0.00 0.00 0.00 0.00
					2500.95 83.36 2408.99 96%
Per Abutment					41.68 ton/pile 1.191 > 1.15
Estimated DC	1074.9 k		Superstructure		
Estimated DC	339.0 k		Substructure		
Estimated DW	231.2 k				
Estimated EV	0.0 k				
Estimated EH	0.0 k				
Estimated LL	855.9 k				
Estimated BR	0.0 k				
Total (Service Load) =>	2500.9 k		on a 2.5' x 93.1667' footing on 1 row of piles spaced at 3'-6" ? <= new Integral abutment		

PROPOSED STRUCTURE

PRELIMINARY

SN 032-0079

Load on Pier at pier (Fixed)

HL-93

no of piles 54

Allowed 35 ton/pile

Spans = 30 + 131.1667+131.1667 +30

<= includes approaches, Span is to Back of Abutment for Reactions

HL-93 = HS 25 Reaction (k)

Factor = 25 /

25 = 1

Lane	88.5	0.9	79.65 per
Truck	70.8	0	0
Dual truck	115.4	0.9	103.86
tandem	49.9	0	0
			183.51 =>

0.64 k/ft => 138.28125 * w

159.3 single truck
183.51 dual truck

No of lanes 7
reduction factor 0.65

834.9705 k
15.46 k/pile

Spans = 131.1667+131.1667
R dl 104.9 per 0.64 k/ft =>

163.90625 * w

per LRFD Simon
Adjustment
957.32 115%

Deck Area 62.111 0.15 163.90625 =

1527.06 k
28.28 k/pile

composite
k/ft/bridge over 12 girders w (k/ ft)
3.816 12 0.318

1585.00 104%

Raised Median 19.25 0.15 163.90625 =

473.28 k
8.76 k/pile

k/ft/bridge over 12 girders w (k/ ft)
3.6 12 0.300

480.29

Barrier 6.19 0.15 163.90625 =

152.19 k
2.82 k/pile

154.44

Overlay (ksf) => .050ksf => 4" 24 0.15 163.90625

590.06 k
10.93 k/pile

598.80 101%

Approach slab 0.0000 15 93.1667 0.15 =

0.00 k
0.00 k/pile

0.00

Superstructure (steel) 0.2200 12 163.90625 1.1 =

475.98 k
8.81 k/pile

ton length
25.34 2 260.34 0.1947
152.05 0.333333 260.34 0.1947

480.00 101%

Pier (footing) 20.25 0.15 89 =

270.34 k
5.01 k/pile

270.34

Pier(Stem) 687.3216 0.15 2.5 =

257.75 k
4.77 k/pile

257.75

Pier(crash wall- added) 348.8065 0.15 2.833 =

148.23 k
2.74 k/pile

148.23

wing walls 44.6592 0.15 0 =

0.00 k
0.00 k/pile

0.00

Pedestrian LL 0 0.075 138.28125 =

0.00 k
0.00 k/pile

0.00

Hydraulic uplift(on pier stem) 0 3.53 79.803 -0.0624 =

0.00 k
0.00 k/pile

0.00

Breaking Force M long (k ft) d / ϵd^2 2673.2 3.25 380.25

22.85 k
22.85 k/pile

$\epsilon d^2 =$ rows no of piles in row d
2 18 3.25 => 380.25

22.85

Hydraulic uplift (on encasements) 0 0.5 1 -0.0624 =

0.00 k
0.00 k/pile

0.00

4752.70 110.44 k/pile

4955.00 104%

Per Pier

Estimated DC	2628.5 k
Estimated DC	676.3 k
Estimated DW	590.1 k
Estimated EV	k
Estimated EH	k
Estimated LL	835.0 k
Estimated BR	22.8 k
Total (Service Load) =>	4752.7 k

Superstructure
Substructure

55.22 1.578 > 1.15 ton/pile

on a 9' x 89' footing on 3 rows of piles spaced at 5'-1" <= new pier footing similar to existing <= new piles need to miss existing piles.

MAXIMUM NOMINAL REQUIRED BEARING PILE TABLES USING SOIL DATA for South Abut. and Pier

South Abutment, Using Boring 02 (S.W. Quad.)			Pier, Using Boring 03 (Center Pier)		
Nominal Required Bearing (KIPS)	Factored Resistance Available (KIPS)	Estimated Pile Length (Ft.)	Nominal Required Bearing (KIPS)	Factored Resistance Available (KIPS)	Estimated Pile Length (Ft.)
MS 14 with 0.312" wall			MS 12, MS 14, MS 16		
141	78	22	These piles are not recommended		
259	142	32			
352	194	37			
444	244	44			
530	291	51*			
570	313	55**			
MS 16 with 0.312" wall			HP 10x42		
168	92	17	118	65	18
298	164	27	196	108	26
416	229	37	221	122	31
521	287	44	276	152	38
620	341	51*	310	170	43
654	360	54**	335	184	47
MS 16 with 0.375" wall			HP 12x53		
176	97	20	109	60	13
298	164	27	218	120	23
416	229	37	303	167	33
521	287	44	365	201	41
620	341	51*	419	230	47
782	430	63**			
			HP 12x63		
			191	105	21
			306	169	33
			348	191	38
			390	214	43
			452	249	51
			494	271	56
			HP 14x73		
			132	73	13
			263	145	23
			376	207	33
			474	261	43
			523	288	48
			578	318	53
			HP 14x89		
			166	91	16
			305	168	26
			410	226	36
			505	278	46
			604	332	56*
			705	388	66**

*Maximum attainable bearing within the boring depth.

**Maximum nominal bearing may be achieved; however, it occurs at a depth greater than the available boring data.

**MAXIMUM NOMINAL REQUIRED BEARING
PILE TABLES USING SOIL DATA for North Abutment**

North Abutment, Using Boring 01 (N.E. Quad.)		
Nominal Required Bearing (KIPS)	Factored Resistance Available (KIPS)	Estimated Pile Length (Ft.)
MS 14 with 0.312" wall		
122	67	20
229	126	29
335	184	40
458	252	50
534	294	56*
570	313	60**
MS 16 with 0.312" wall		
158	87	22
295	162	32
425	234	42
564	310	52
620	341	56*
654	360	59**
MS 16 with 0.375" wall		
145	80	20
295	162	32
425	234	42
564	310	52
620	341	56*
782	430	68**

***Maximum attainable bearing within the boring depth.
*Maximum nominal bearing may be achieved; however, it occurs at a depth greater than the available boring data.**

w/ 10 ft precure for bentonite

SUBSTRUCTURE===== South Abut. IL 47 at Dwight
 REFERENCE BORING ===== 02 (S.W. Quad.)
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 642.56 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 640.56 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== None ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== None ft

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
570 KIPS	559 KIPS	308 KIPS	54 FT.

TOTAL FACTORED SUBSTRUCTURE LOAD ===== 2409 kips
 TOTAL LENGTH OF SUBSTRUCTURE (along skew)===== 94.62 ft
 NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ===== 1
 Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 203.68 KIPS
 Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 76.38 KIPS

PILE TYPE AND SIZE ===== Metal Shell 14"Φ w/.312" walls
 Pile Perimeter===== 3.665 FT.
 Pile End Bearing Area===== 1.069 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK. (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
638.06	2.50	0.00	0		0.0		0.0	0	0	0	0	5
635.56	2.50	0.00	0		0.0	0.0	0.0	0	0	0	0	7
633.06	2.50	0.00	0		0.0	0.0	0.0	0	0	0	0	10
630.56	2.50	0.00	0		0.0	0.0	72.7	73	0	0	40	12
627.71	2.85	6.20	13		34.0	72.7	111.4	111	0	0	61	15
625.21	2.50	6.60	15		29.8	77.4	136.5	137	0	0	75	17
622.71	2.50	6.20	16		29.8	72.7	146.4	146	0	0	81	20
620.71	2.00	4.50	19		23.9	52.8	140.9	141	0	0	78	22
618.21	2.50	2.00	9		16.7	23.5	213.9	214	0	0	118	24
615.71	2.50	6.80	15		29.8	79.7	248.4	248	0	0	137	27
613.21	2.50	7.20	22		29.8	84.4	278.2	278	0	0	153	29
610.71	2.50	7.20	23		29.8	84.4	258.8	259	0	0	142	32
608.21	2.50	3.00	10		21.9	35.2	280.7	281	0	0	154	34
605.71	2.50	3.00	12		21.9	35.2	351.9	352	0	0	194	37
603.21	2.50	7.20	16		29.8	84.4	388.8	389	0	0	214	39
600.71	2.50	7.80	20		29.8	91.5	418.6	419	0	0	230	42
598.21	2.50	7.80	19		29.8	91.5	443.7	444	0	0	244	44
595.71	2.50	7.40	20		29.8	86.8	475.9	476	0	0	262	47
593.21	2.50	7.60	22		29.8	89.1	508.0	508	0	0	279	49
591.21	2.00	7.80	26		23.9	91.5	529.6	530	0	0	291	51
588.71	2.50	7.60	23		29.8	89.1	559.4	559	0	0	308	54
586.21	2.50	7.60	23		29.8	89.1	589.2	589	0	0	324	56
583.71	2.50	7.60	23			89.1						

Pile Design Table for South Abut. IL 47 at Dwight utilizing Boring #02 (S.W. Quad.)

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 14"Φ w/.312" walls								
137	75	17						
141	78	22						
214	118	24						
248	137	27						
259	142	32						
281	154	34						
352	194	37						
389	214	39						
419	230	42						
444	244	44						
476	262	47						
508	279	49						
530	291	51						
559	308	54						
Metal Shell 16"Φ w/.312" walls								
95	52	12						
140	77	15						
165	91	22						
257	142	24						
298	164	27						
302	166	32						
327	180	34						
416	229	37						
459	253	39						
493	271	42						
521	287	44						
558	307	47						
596	328	49						
620	341	51						
Metal Shell 16"Φ w/.375" walls								
95	52	12						
140	77	15						
165	91	22						
257	142	24						
298	164	27						
302	166	32						
327	180	34						
416	229	37						
459	253	39						
493	271	42						
521	287	44						
558	307	47						
596	328	49						
620	341	51						
654	360	54						
688	378	56						

SUBSTRUCTURE===== Pier IL 47 at Dwight
 REFERENCE BORING ===== 03 (Center Pier)
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 619.54 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 616.54 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== None ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== None ft

TOTAL FACTORED SUBSTRUCTURE LOAD ===== 4955 kips
 TOTAL LENGTH OF SUBSTRUCTURE (along skew)===== 94.62 ft
 NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ===== 3

Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 139.65 KIPS
 Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 52.37 KIPS

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
578 KIPS	572 KIPS	314 KIPS	53 FT.

PILE TYPE AND SIZE ===== Steel HP 14 X 73

Plugged Pile Perimeter===== 4.700 FT. Unplugged Pile Perimeter===== 6.975 FT.
 Plugged Pile End Bearing Area===== 1.379 SQFT. Unplugged Pile End Bearing Area===== 0.149 SQFT.

BOT. OF LAYER ELEV. (FT.)	LAYER THICK (FT.)	UNCONF. COMPR. STRENGTH (TSF.)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL PLUGGED			NOMINAL UNPLUG'D			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
					SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)	SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
616.47	0.07	4.00	8		0.6		168.7	0.9		19.0	19	0	0	10	3
613.97	2.50	8.70	19		24.4	168.1	204.8	36.2	18.1	56.5	57	0	0	31	6
611.47	2.50	9.30	20		24.4	179.7	115.2	36.2	19.4	80.5	81	0	0	44	8
608.97	2.50	3.40	9		19.7	65.7	113.6	29.2	7.1	107.4	107	0	0	59	11
606.47	2.50	2.30	7		15.0	44.4	153.7	22.2	4.8	132.4	132	0	0	73	13
603.97	2.50	3.60	9		20.6	69.6	174.3	30.5	7.5	162.9	163	0	0	90	16
601.47	2.50	3.60	12		20.6	69.6	187.1	30.5	7.5	192.5	187	0	0	103	18
598.97	2.50	3.20	12		18.8	61.8	256.2	28.0	6.7	225.9	226	0	0	124	21
596.47	2.50	5.80	12		24.4	112.1	292.2	36.2	12.1	263.4	263	0	0	145	23
593.97	2.50	6.40	17		24.4	123.7	316.6	36.2	13.3	299.7	300	0	0	165	26
591.47	2.50	6.40	17		24.4	123.7	327.5	36.2	13.3	334.4	328	0	0	180	28
588.97	2.50	5.70	16		24.4	110.1	346.1	36.2	11.9	370.1	346	0	0	190	31
586.47	2.50	5.40	14		24.4	104.4	376.4	36.2	11.2	406.9	376	0	0	207	33
583.97	2.50	5.70	14		24.4	110.1	404.7	36.2	11.9	443.6	405	0	0	223	36
581.47	2.50	5.90	18		24.4	114.0	425.2	36.2	12.3	479.4	425	0	0	234	38
578.97	2.50	5.70	17		24.4	110.1	449.6	36.2	11.9	515.7	450	0	0	247	41
576.47	2.50	5.70	17		24.4	110.1	474.1	36.2	11.9	551.9	474	0	0	261	43
573.97	2.50	5.70	17		24.4	110.1	498.5	36.2	11.9	588.2	498	0	0	274	46
571.47	2.50	5.70	18		24.4	110.1	522.9	36.2	11.9	624.4	523	0	0	288	48
568.97	2.50	5.70	18		24.4	110.1	547.3	36.2	11.9	660.7	547	0	0	301	51
566.47	2.50	5.70	19		24.4	110.1	571.8	36.2	11.9	696.9	572	0	0	314	53
563.97	2.50	5.70	19		24.4	110.1	596.2	36.2	11.9	733.2	596	0	0	328	56
561.97	2.00	5.70	19			110.1			11.9						

Pile Design Table for Pier IL 47 at Dwight utilizing Boring #03 (Center Pier)

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Steel HP 8 X 36			Steel HP 10 X 42			Steel HP 12 X 84		
92	51	18	91	50	13	93	51	11
120	66	21	108	59	16	115	63	13
137	76	23	118	65	18	141	78	16
151	83	26	156	86	21	156	86	18
161	88	28	179	99	23	196	108	21
173	95	31	196	108	26	228	126	23
189	104	33	207	114	28	259	143	26
204	112	36	221	122	31	274	150	28
217	119	38	241	133	33	290	160	31
231	127	41	260	143	36	316	174	33
245	135	43	276	152	38	340	187	36
259	142	46	293	161	41	359	197	38
273	150	48	310	170	43	380	209	41
			327	180	46	401	221	43
			Steel HP 10 X 57			423	232	46
			93	51	13	444	244	48
			111	61	16	465	256	51
			121	67	18	487	268	53
			159	88	21	508	279	56
			184	101	23	Steel HP 14 X 73		
			202	111	26	81	44	8
			212	117	28	107	59	11
			227	125	31	132	73	13
			247	136	33	163	90	16
			267	147	36	187	103	18
			282	155	38	226	124	21
			300	165	41	263	145	23
			317	174	43	300	165	26
			335	184	46	328	180	28
			352	194	48	346	190	31
			370	203	51	376	207	33
			387	213	53	405	223	36
			405	222	56	425	234	38
			Steel HP 12 X 53			450	247	41
			89	49	11	474	261	43
			109	60	13	498	274	46
			135	74	16	523	288	48
			150	82	18	547	301	51
			187	103	21	572	314	53
			218	120	23	Steel HP 14 X 89		
			248	136	26	83	45	8
			262	144	28	109	60	11
			278	153	31	135	74	13
			303	167	33	166	91	16
			327	180	36	190	104	18
			344	189	38	230	127	21
			365	201	41	268	148	23
			386	212	43	305	168	26
			406	223	46	332	183	28
			Steel HP 12 X 63			351	193	31
			91	50	11	382	210	33
			112	61	13	410	226	36
			138	76	16	431	237	38
			151	83	18	456	251	41
			191	105	21	480	264	43
			222	122	23	505	278	46
			253	139	26	530	291	48
			265	146	28	554	305	51
			281	155	31	579	318	53
			306	169	33	604	332	56
			330	182	36	Steel HP 14 X 102		
			348	191	38	84	46	8
			369	203	41	111	61	11
			390	214	43	137	75	13
			410	226	46	168	92	16
			431	237	48	192	106	18
			452	249	51	233	128	21
			473	260	53	272	149	23
			494	271	56	308	170	26
			Steel HP 12 X 74			337	185	28
			92	51	11	356	196	31
			113	62	13	387	213	33
			139	77	16	416	229	36
			154	85	18	437	240	38
			193	106	21	462	254	41
			225	124	23	487	268	43
			256	141	26	512	281	46
			269	148	28	536	295	48
			286	157	31	561	309	51
			311	171	33	586	323	53
			335	184	36	611	336	56
			353	194	38	Steel HP 14 X 117		
			374	206	41	86	47	8
			395	218	43	112	62	11
			417	229	46	139	77	13
			438	241	48	171	94	16
			459	252	51	195	107	18
			480	264	53	238	131	21
			501	275	56	277	152	23
						314	172	26
						342	188	28
						361	198	31
						392	216	33
						421	232	36
						442	243	38
						468	257	41
						493	271	43
						518	285	46
						543	299	48
						569	313	51
						594	327	53
						619	340	56

w/ 10 ft precure for bentonite

SUBSTRUCTURE===== North Abut IL 47 at Dwight
 REFERENCE BORING ===== 01 (N.E. Quad.)
 LRFD or ASD or SEISMIC ===== LRFD
 PILE CUTOFF ELEV. ===== 642.56 ft
 GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 640.56 ft
 GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
 BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ===== None ft
 TOP ELEV. OF LIQUEF. (so layers above apply DD) ===== None ft

MAX. REQUIRED BEARING & RESISTANCE for Selected Pile, Soil Profile, & Losses

Maximum Nominal Req'd Bearing of Pile	Maximum Nominal Req'd Bearing of Boring	Maximum Factored Resistance Available in Boring	Maximum Pile Driveable Length in Boring
570 KIPS	564 KIPS	310 KIPS	59 FT.

TOTAL FACTORED SUBSTRUCTURE LOAD ===== 2409 kips
 TOTAL LENGTH OF SUBSTRUCTURE (along skew)===== 94.62 ft
 NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ===== 1
 Approx. Factored Loading Applied per pile at 8 ft. Cts ===== 203.68 KIPS
 Approx. Factored Loading Applied per pile at 3 ft. Cts ===== 76.38 KIPS

PILE TYPE AND SIZE ===== Metal Shell 14"Φ w/.312" walls
 Pile Perimeter===== 3.665 FT.
 Pile End Bearing Area===== 1.069 SQFT.

BOT. OF LAYER ELEV. (FT.)	UNCONF. COMPR. STRENGTH (TSF)	S.P.T. N VALUE (BLOWS)	GRANULAR OR ROCK LAYER DESCRIPTION	NOMINAL			NOMINAL REQ'D BEARING (KIPS)	FACTORED GEOTECH. LOSS FROM SCOUR or DD (KIPS)	FACTORED GEOTECH. LOSS LOAD FROM DD (KIPS)	FACTORED RESISTANCE AVAILABLE (KIPS)	ESTIMATED PILE LENGTH (FT.)
				SIDE RESIST. (KIPS)	END BRG. RESIST. (KIPS)	TOTAL RESIST. (KIPS)					
638.24	2.32	0.00	0	0.0		0.0	0	0	0	0	4
635.74	2.50	0.00	0	0.0	0.0	0.0	0	0	0	0	7
633.24	2.50	0.00	0	0.0	0.0	0.0	0	0	0	0	9
630.56	2.68	0.00	0	0.0	0.0	45.7	46	0	0	25	12
627.74	2.82	3.90	13	30.1	45.7	75.8	76	0	0	42	15
624.74	3.00	3.90	13	32.0	45.7	103.1	103	0	0	57	18
622.24	2.50	3.50	12	24.6	41.0	121.8	122	0	0	67	20
620.74	1.50	3.00	14	13.2	35.2	133.8	134	0	0	74	22
618.24	2.50	2.90	9	21.4	34.0	229.1	229	0	0	126	24
615.74	2.50	9.20	20	29.8	107.9	240.2	240	0	0	132	27
613.24	2.50	7.60	18	29.8	89.1	228.9	229	0	0	126	29
610.74	2.50	4.10	16	27.7	48.1	252.0	252	0	0	139	32
607.74	3.00	3.70	12	30.7	43.4	282.7	283	0	0	155	35
605.24	2.50	3.70	13	25.6	43.4	300.1	300	0	0	165	37
602.74	2.50	3.00	6	21.9	35.2	335.0	335	0	0	184	40
600.24	2.50	4.10	17	27.7	48.1	365.0	365	0	0	201	42
597.74	2.50	4.30	17	28.8	50.4	409.0	409	0	0	225	45
595.24	2.50	5.60	21	29.8	65.7	425.9	426	0	0	234	47
592.74	2.50	4.50	20	29.8	52.8	458.1	458	0	0	252	50
590.24	2.50	4.70	18	29.8	55.1	485.6	486	0	0	267	52
587.74	2.50	4.50	16	29.8	52.8	515.4	515	0	0	283	55
586.24	1.50	4.50	15	17.9	52.8	534.5	534	0	0	294	56
583.74	2.50	4.60	16	29.8	53.9	564.3	564	0	0	310	59
581.24	2.50	4.60	16	29.8	53.9	594.1	594	0	0	327	64
578.74	2.50	4.60	16		53.9						

Pile Design Table for North Abut IL 47 at Dwight utilizing Boring #01 (N.E. Quad.)

Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Ft.)
Metal Shell 14"Φ w/.312" walls								
134	74	22						
229	126	29						
252	139	32						
283	155	35						
300	165	37						
335	184	40						
365	201	42						
409	225	45						
426	234	47						
458	252	50						
486	267	52						
515	283	55						
534	294	56						
564	310	59						
Metal Shell 16"Φ w/.312" walls								
125	69	18						
145	80	20						
158	87	22						
269	148	29						
295	162	32						
330	182	35						
349	192	37						
391	215	40						
425	234	42						
478	263	45						
495	272	47						
533	293	50						
564	310	52						
598	329	55						
620	341	56						
Metal Shell 16"Φ w/.375" walls								
125	69	18						
145	80	20						
158	87	22						
269	148	29						
295	162	32						
330	182	35						
349	192	37						
391	215	40						
425	234	42						
478	263	45						
495	272	47						
533	293	50						
564	310	52						
598	329	55						
620	341	56						
654	360	59						
688	378	61						