Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: 06/26/2020 **Proposed SN:** 015-0077 **Route:** FAS 1669
Revised Date: **12/31/2020** **Existing SN:** 015-0068 **Section:** (6BR) B-1
Geotechnical Engineer: Brad Hessing **County:** Coles
Structural Engineer: Derek Verhulst/Ryan Negangard **Contract:** 74564

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing):
The proposed total structure replacement of existing SN 015-0068, a single span PPC deck beam bridge carrying Old IL 316 over Riley Creek, with proposed SN 015-0077, will consist of a 3-span concrete slab bridge, 105' back-back abutments with 0^{o} skew, on integral abutments and pile bent piers. The approved **TSL is attached.** Factored Loads: 930k at Abuts., 1389k at Piers

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):
Boring data consists of 2 borings, one at each abutment, drilled in April 2019, B-1 at the West Abutment and B-2 at the East Abutment. Overall, both borings were drilled through a sequence of medium to stiff to very stiff silty clay and silty clay loam, then through hard clay till, terminating in shale bedrock. Cores were taken at B-1. Top of rock of rock elevations 593.22 at B-1 (begin coring at 583.22) and 590.76 at B-2.

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:
Based on there being only ~ 1 ft. of new fill to be placed at the West Abutment and ~ 2 ft. of new fill at the East, settlement does not appear to be an issue.

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:
No slope stability issues anticipated by inspection.

I 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:
Predicted theoretical scour depths at both Piers (Scour at Abutments to be placed at Bottom of Cap):
100-year total scour depth = 15 ft (per revised comps. by BBS Hydraulics Unit, rev. 06/22/20)
200-year total scour depth = 17 ft (per revised comps. by BBS Hydraulics Unit, rev. 06/22/20)

The above scour depths were adjusted based on non-granular scour depth reductions (per the IDOT Bridge Manual) using Borings 1 and 2; based on this, along with Streambed (proposed ground surface) Elevation of 626.9 and Bottom of Substructure Elevation of 624.4, the Design Scour Elevation Table is as follows:

DESIGN SCOUR ELEVATION TABLE

Event/Limit State	*Design Scour Elevations (ft.)*				
	W. Abut.	*Pier 1*	*Pier 2*	*E. Abut.*	*Item 113*
Q100	*637.1*	*618.6*	*618.6*	*636.2*	*5*
Q200	*637.1*	*617.2*	*617.2*	*636.2*	
Design	*637.1*	*618.6*	*618.6*	*636.2*	
Check	*637.1*	*617.2*	*617.2*	*636.2*	

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:

SEISMIC DATA
SPZ=1
S_{DS} = 0.266g
S_{D1} = 0.123g
Site Class C

Liquefaction: Based on inspection of the borings, the soils at this site do not appear prone to liquefaction and therefore liquefaction is not an issue for the bridge.

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: Foundation Treatment for Abutments and Solid Encased Pile Bent Piers are Steel H-piles w/ Metal Shoes driven to their Maximum Nominal Bearing into rock:

PILE DESIGN TABLE 015-0077				
Location	Pile Type	Nominal Required Bearing (kips)	Factored Resistance Available (kips)	Estimated Length (feet)
West Abutment (B-1 Data) Cutoff Elev. 639.1	HP 12x53	418	230	58
	HP 12x63	497	273	59
	HP 14x73	578	318	59
East Abutment (B-2 Data) Cutoff Elev.638.2	HP 12x53	418	230	49
	HP 12x63	497	273	51
	HP 14x73	578	318	51
Pier 1 (B-1 Data) Cutoff Elev. 639.3	HP 12x53	418	217	59
	HP 12x63	497	260	61
	HP 14x73	578	303	61
Pier 2 (B-2 Data) Cutoff Elev. 638.9.	HP 12x53	418	211	51
	HP 12x63	497	254	52
	HP 14x73	578	295	52

Test Piles: Drive a total of **two (2) Test Piles**: One at the West Abutment and one at Pier 2.

Pile Shoes: Due to occurrence of large chert fragments which were getting lodged in the sampler, **we recommend the use of Metal Shoes** to prevent damage to the piles.

Lateral Pile Analysis: Please contact the Foundations Unit if one is needed by the Bridge Designer.

Calculate the estimated water surface elevation and determine the need for Cofferdams (Type 1 or 2), and Seal Coat: As per Planning the EWSE = 631.25
If solid wall encasement is used at the piers, the bottom of the pier encasement will be 2.5 ft below streambed, resulting in an elevation of 624.4. Based on EWSE – Bottom of Encasement = 631.25 – 624.4 = 6.85 ft > 6 ft, Cofferdam Type 2 will be required. Since all of the soils below the encasement are cohesive, we believe that seal coats will *not* be required and are therefore not recommended.

Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns:
Since traffic will be maintained using a detour route, no soil retention is needed. Therefore, neither Temporary Sheet Piling nor Temporary Soil Retention System be required for construction.

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 4/10/19

ROUTE FAS 1669 **DESCRIPTION** Riley Creek, 3 Miles West of Charleston **LOGGED BY** E. Sandschafer

SECTION (6BR)B-1 **LOCATION** Riley Creek, **SEC.** 1, **TWP.** 12N, **RNG.** 8E, 3 **PM**

COUNTY Coles **DRILLING METHOD** Hollow stem auger & split spoon **HAMMER TYPE** Auto 140#

STRUCT. NO. 015-0068 (E) 015-0077 (P)
Station 350+20

BORING NO. B-1 West Abutment
Station 349+56
Offset 10.0ft North
Ground Surface Elev. 642.72

Surface Water Elev. 632.24 ft
Stream Bed Elev. 627.46 ft

Groundwater Elev.:
▽ **First Encounter** 615.7 ft
▽ **Upon Completion** 631.7 ft
▼ **After** 168 **Hrs.** 635.7 ft

DEPTH (ft)	BLOWS /6"	UCS Qu (tsf)	MOIST (%)	Description
				12-3/4" Asphalt
				641.62
				6" Aggregate Subbase 641.12
				Brown, CLAY LOAM
-5	3			
	4	1.7	17	*Stiff, moist*
	3	B		
				▼635.72
	3			Very stiff, moist, dark grey/black,
	4	3.5	19	CLAY
	3	P		
				633.22
-10	1			Medium, moist, dark grey, CLAY
	2	0.9	22	LOAM
	3	B		▼
				630.72
	1			Medium, moist, dark grey, SILTY
	2	0.8	23	CLAY
	2	B		
				627.72
-15	2			Hard, moist, brown, CLAY (Till)
	3	5.4	13	
	7	B		
	14			*Rock lodged in front of sampler*
	48	NT		
	35			
-20	6			*Stiff, grey* 622.72
	8	1.5	13	
	10	P		
				620.72
	6			Medium to stiff, moist, grey, CLAY
	8	1.0	14	LOAM (Till)
	8	P		
-25	5			
	6	1.0	14	
	7	P		
				▽
	5			
	7	0.8	15	*Medium*
	10	P		
-30	6			
	21	2.9	11	*Hard*
	18	B		
				608.22
-35	48			Hard, moist, grey, SANDY CLAY
	50	7.9	8	LOAM (Till)
	3-1/2"	S		*Chert rock in sampler*
	50			
	2-5/8"			
-40	50			602.72

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
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)

File Name S:\NEW GEOTECHNICAL\GINTDATA\PROJECTS\COLES CO (015)\015-0068 SOIL ROCK 2019.GPJ Data Template D7.GDT Date Printed 6/7/19
Latitude W 88.252996 Longitude N 39.506896 Datum Job Number

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 4/10/19

ROUTE FAS 1669 **DESCRIPTION** Riley Creek, 3 Miles West of Charleston **LOGGED BY** E. Sandschafer

SECTION (6BR)B-1 **LOCATION** Riley Creek, **SEC.** 1, **TWP.** 12N, **RNG.** 8E, 3 **PM**

COUNTY Coles **DRILLING METHOD** Hollow stem auger & split spoon **HAMMER TYPE** Auto 140#

STRUCT. NO. 015-0068 (E) 015-0077 (P)
Station 350+20

BORING NO. B-1 West Abutment
Station 349+56
Offset 10.0ft North
Ground Surface Elev. 642.72

Surface Water Elev. 632.24 ft
Stream Bed Elev. 627.46 ft

Groundwater Elev.:
First Encounter 615.7 ft
Upon Completion 631.7 ft
After 168 **Hrs.** 635.7 ft

DEPTH (ft)	BLOWS /6"	UCS Qu (tsf)	MOIST (%)
Large rock in front of sampler	2-3/8"	NT	
	50		
	1-9/16"		
	50		
	1-7/8"		
-45	36		
Hard, moist, grey	49	11.1	8
	50	S	
	4-9/16"		
593.22			
Hard, moist, grey, SILTY CLAY shale			
-50	19		
	18	6.2	14
	29	S	
-55			
583.22			
Borehole continued with rock coring.			
-60			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating
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)

File Name S:\NEW GEOTECHNICAL\GINTDATA\PROJECTS\COLES CO (015)\015-0068 SOIL ROCK 2019.GPJ Data Template D7.GDT Date Printed 6/7/19
Latitude W 88.252996 Longitude N 39.506896 Datum Job Number

Illinois Department of Transportation
Division of Highways
IDOT

ROCK CORE LOG

Date 4/10/19

ROUTE FAS 1669 **DESCRIPTION** Riley Creek, 3 Miles West of Charleston **LOGGED BY** E. Sandschafer

SECTION (6BR)B-1 **LOCATION** Riley Creek, **SEC.** 1, **TWP.** 12N, **RNG.** 8E, 3 **PM**

COUNTY Coles **CORING METHOD** Rotary, surf set diamond bit

STRUCT. NO. 015-0068 (E) 015-0077 (P)
Station 350+20

CORING BARREL TYPE & SIZE NW, conv dbl bbl, split inner

Core Diameter 2.06 in
Top of Rock Elev. 583.22 ft
Begin Core Elev. 583.22 ft

BORING NO. B-1 West Abutment
Station 349+56
Offset 10.0ft North
Ground Surface Elev. 642.72

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Grey SANDSTONE Depth: 59.5', Moisture Content: 2.8%, Dry Density: 150.2 pcf	583.22	-60	B1C1	82	75	2.4	569.5
	581.72						
Dark grey SHALE	581.22						
Grey SANDY CLAY	580.72						
SHALE	580.22						
Grey SILTY CLAY SHALE, soft field hardness	579.22						
No recovery	578.22						
Grey SHALE, weathered, soft field hardness Depth: 66.7', Moisture Content: 14.2%, Dry Density: 118.5 pcf		-65	B1C2	72	38	5.1	3.9
	574.47						
No recovery	573.22						
Extent of Exploration. Benchmark: BM 610 Chiseled square on the SE Abutment of Structure #015-0068, Sta.350+60, 17' RT.		-70 -75					

Color pictures of the cores Available upon Request
Cores will be stored for examination until 04/10/24
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)
RQD is the ratio of the total length of sound core specimens >4" to total length of core run

BBS, form 138 (Rev. 8-99)

ROCK CORE 015-0068 SOIL ROCK 2019.GPJ D7.GDT 6/7/19

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 4/17/19

ROUTE FAS 1669 **DESCRIPTION** Riley Creek, 3 Miles West of Charleston **LOGGED BY** E. Sandschafer

SECTION (6BR)B-1 **LOCATION** Riley Creek, **SEC.** 1, **TWP.** 12N, **RNG.** 8E, 3rd **PM**,
Latitude W 88.252595, **Longitude** N 39.506812

COUNTY Coles **DRILLING METHOD** Hollow stem auger & split spoon **HAMMER TYPE** Auto 140#

STRUCT. NO. 015-0068 (E) 015-0077 (P)
Station 350+20

BORING NO. B-2 East Abutment
Station 350+85
Offset 9.0 ft South
Ground Surface Elev. 640.26 ft

Surface Water Elev. 632.24 ft
Stream Bed Elev. 627.46 ft

Groundwater Elev.:
First Encounter 613.3 ft ▼
Upon Completion 628.3 ft ▽
After 48 **Hrs.** 635.3 ft ▽

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
14" Asphalt				
639.09				
6" Aggregate Subbase				
638.56				
Brown, SANDY CLAY				
	-5	0		
Medium, moist, dark brown		2 3	1.0 B	16
633.26				
Stiff, moist, dark brown, SILTY CLAY		2		
		3 4	1.2 B	27
	-10	1		
Medium		2 2	0.7 B	24
▽		1		
627.26		2 4	1.9 B	16
Stiff, moist, brown, CLAY LOAM (Till)				
	-15	4		
Very stiff, grey		5 9	2.7 B	13
		5		
		6 10	2.9 B	12
	-20	5		
		7 9	2.9 B	12
618.26				
Stiff, moist, grey, CLAY with sand		3		
		3 3	1.7 B	18
615.76				
Very stiff, moist, bluish grey, CLAY LOAM (Till)	-25	3		
		4 4	2.9 B	22
613.26 ▼				
Medium, moist, grey, SANDY LOAM with 1/2" fine grained grey sand lenses		3		
		7 7	0.8 S	21
610.76				
Very stiff, moist, grey, SANDY LOAM (Till)	-30	3		
		18 25	2.8 S	8
609.46				
Hard, moist, grey, CLAY (Till)				
32'-34' hard drilling				
	-35	46		
		50	4.5 P	7
		5-1/8" 50 4-9/16"		
Augers locked up				
600.26	-40	40		

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
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 015-0068 SOIL ROCK 2019.GPJ IL_DOT.GDT 10/30/20

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 4/17/19

ROUTE FAS 1669 **DESCRIPTION** Riley Creek, 3 Miles West of Charleston **LOGGED BY** E. Sandschafer

SECTION (6BR)B-1 **LOCATION** Riley Creek, **SEC.** 1, **TWP.** 12N, **RNG.** 8E, 3rd **PM**,
Latitude W 88.252595, **Longitude** N 39.506812

COUNTY Coles **DRILLING METHOD** Hollow stem auger & split spoon **HAMMER TYPE** Auto 140#

STRUCT. NO. 015-0068 (E) / 015-0077 (P)
Station 350+20

BORING NO. B-2 East Abutment
Station 350+85
Offset 9.0 ft South
Ground Surface Elev. 640.26 ft

Surface Water Elev. 632.24 ft
Stream Bed Elev. 627.46 ft

Groundwater Elev.:
First Encounter 613.3 ft
Upon Completion 628.3 ft
After 48 **Hrs.** 635.3 ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	
	50	9.2	8	Hard, moist, grey, CLAY (Till)
	4-15/16"	S		
	50 3"			
-45	37			*Sample reassembled for testing*
	44	12.1	8	
	50	B		
	5-3/8"			
590.76				
-50	43			Very dense, moist, grey, CLAY SHALE
	50	NT	7	
589.26	2-3/8"			
	50			Benchmark: BM 610 Chiseled square on the SE Abutment of Structure #015-0068, Sta.350+60, 17' RT.
	1-7/8"			End of Boring
-55				
-60				

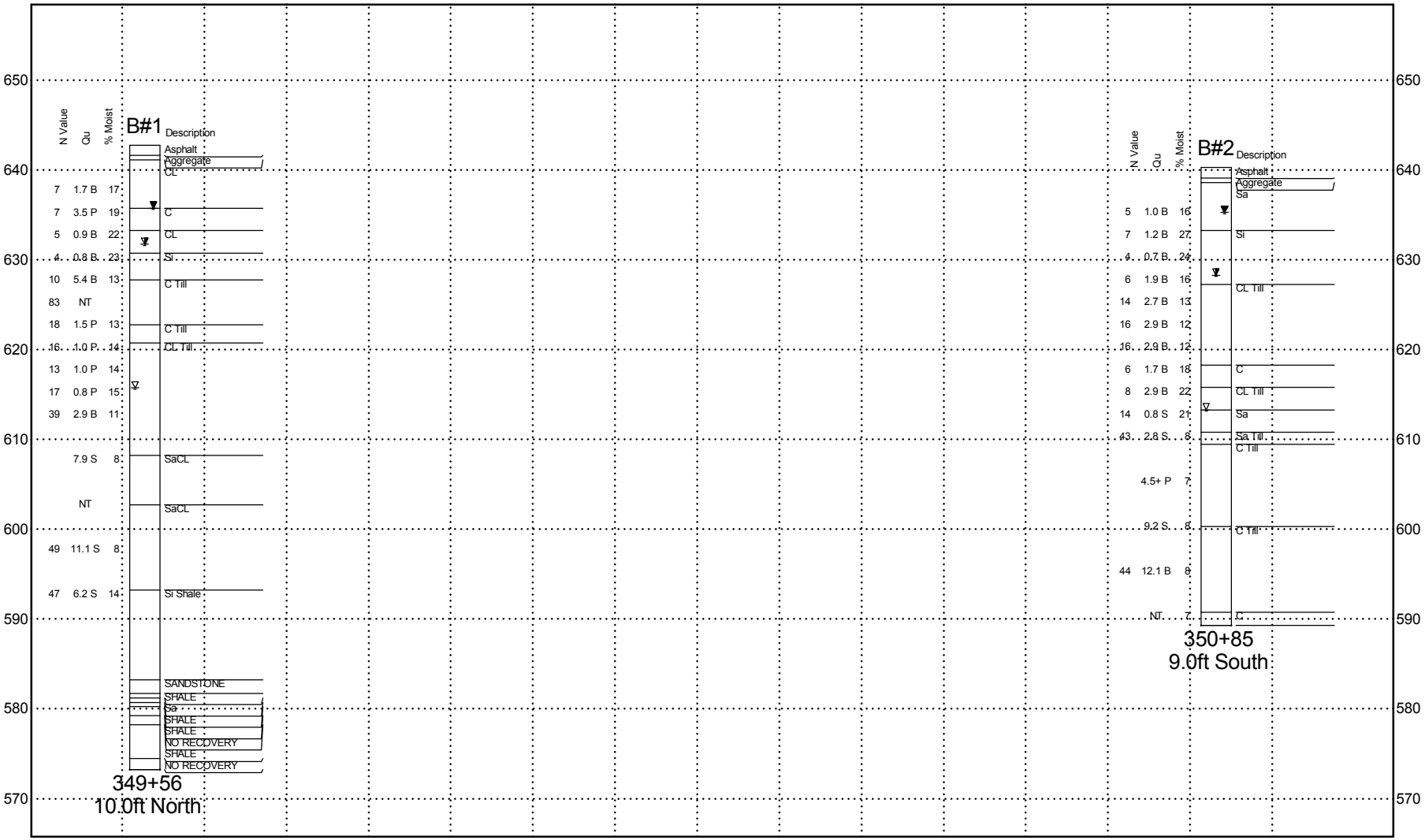
SOIL BORING 015-0068 SOIL ROCK 2019.GPJ IL_DOT.GDT 10/30/20

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated)
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)

LOG PLOT

Structure Number 015-0068 (E) 015-0077 (P) Riley Creek, 3 Miles West of Charleston
Located in the Riley Creek of Section 1, Township 12N, Range 8E of the 3 P.M.



NOT TO HORIZONTAL SCALE

Illinois Department of Transportation
Division of Highways
IDOT

VARIATIONS IN SUBSURFACE CONDITIONS MAY EXIST BETWEEN BORINGS

Groundwater
First Encounter
Completion
after (refer to log) hours

Abbreviations
WOH - Sampler Advanced by Weight of Hammer, WOP - Weight of Pipe
B.S. - Before Seating

SUBSURFACE DATA PROFILE

Route: FAS 1669
Section: (6BR)B-1
County: Coles

SUBSURFACE DATA PROFILE 015-0068 SOIL ROCK 2019.GPJ D6TEMPLT.GDT 12/24/20

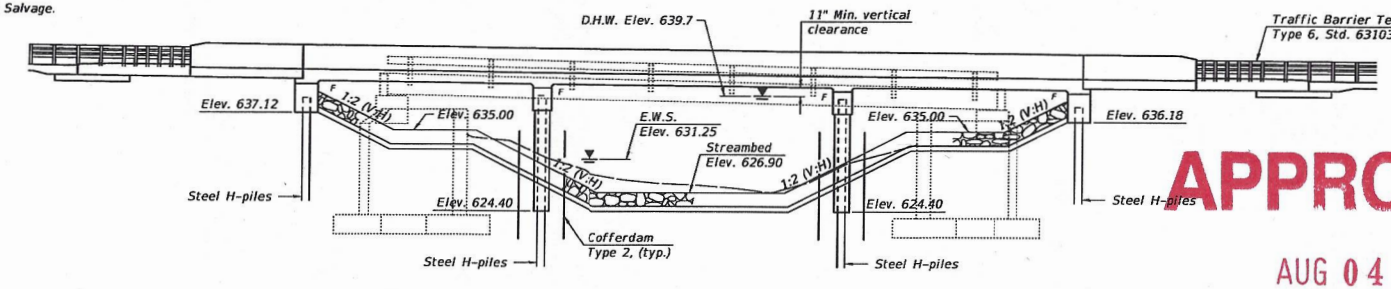
SUBSURFACE DATA PROFILE 015-0068 SOIL ROCK 2019.GPJ D6TEMPLT.GDT 12/24/20

TSL PLAN

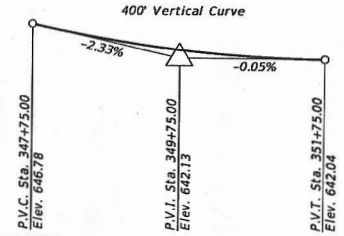
Benchmark: Chiseled " □ " on Southeast abutment of S.N. 015-0068; Sta. 350+60.00, 17' Rt. of ℄. Elev. 640.734

Existing Structure: S.N. 015-0068 was built in 1982 as F.A.S. Route 1669, Section 6BR at Sta. 350+18.00. The existing structure consists of a single span precast prestressed concrete deck beam superstructure supported on pile bent abutments with steel H-piles. The back-to-back abutment length is 84'-4" and the out-to-out width of deck is 33'-0". The existing structure is to be removed and replaced. Road will be closed during construction.

No Salvage.

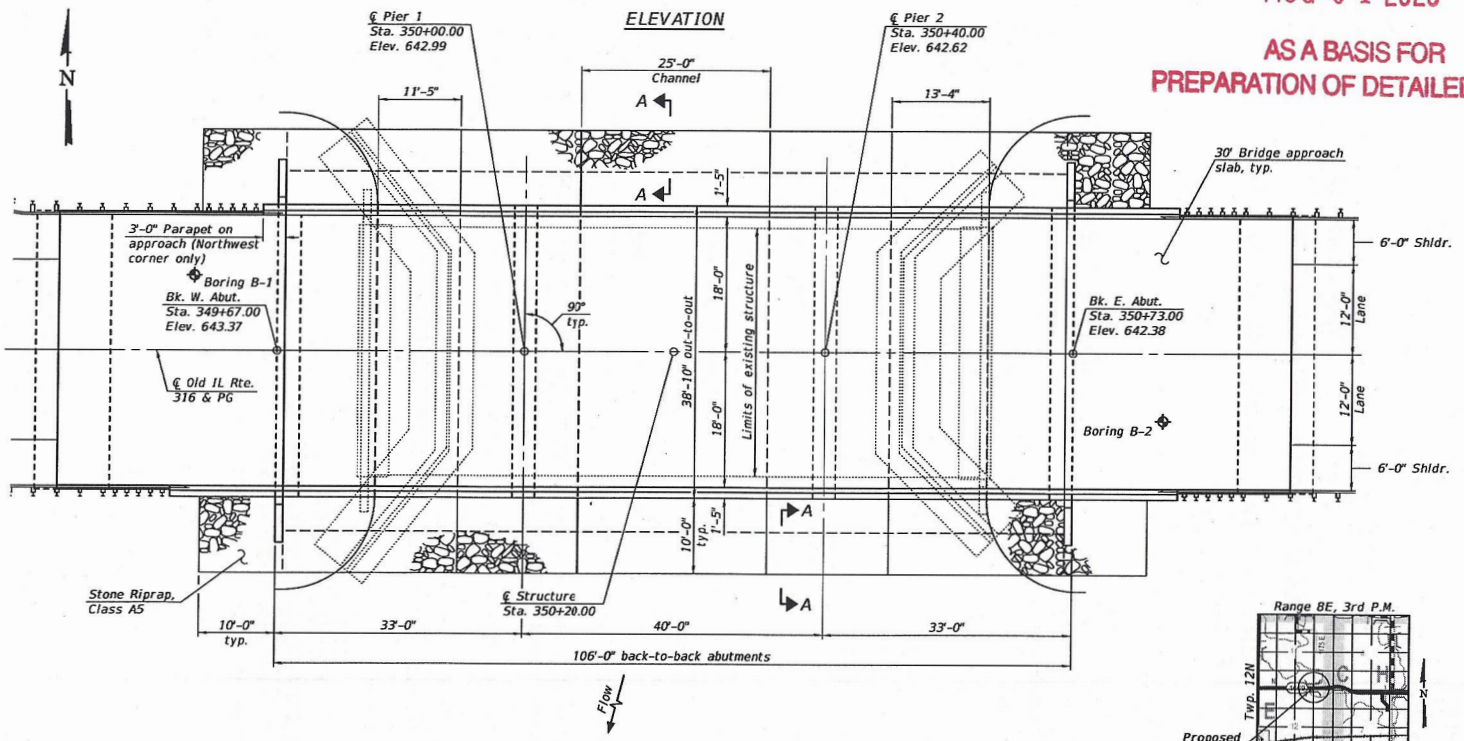


ELEVATION



PROFILE GRADE
(Along ℄ Old IL Rte. 316)

APPROVED
AUG 04 2020
AS A BASIS FOR PREPARATION OF DETAILED PLANS



PLAN

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 (Structural steel M270 Grade 50 for steel H-piles)

HIGHWAY CLASSIFICATION

Old IL Rte. 316 - F.A.S. Rte. 1669
Functional Class: Minor Arterial
ADT: 3,500 (2021); 4,200 (2041)
ADTT: 325 (2021); 390 (2041)
DHV: 382 (2021)
Design Speed: 60 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50

LOADING HL-93

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

SEISMIC DATA

Seismic Performance Zone (SPZ) = 1
Design Spectral Acceleration at 1.0 sec. (SD1) = .266g
Design Spectral Acceleration at 0.2 sec. (SDS) = .123g
Soil Site Class = C

LOCATION SKETCH

GENERAL PLAN & ELEVATION
OLD ILLINOIS ROUTE 316 OVER RILEY CREEK
F.A.S. RTE. 1669 - SEC. (6BR)B-1
COLES COUNTY
STATION 350+20.00
STRUCTURE NO. 015-0077

DESIGNED -	DEREK G. VERHULST
CHECKED -	NICHOLAS R. BARNETT
DRAWN -	MICHAEL B. MOSSMAN
CHECKED -	D.G.V. / N.R.B.

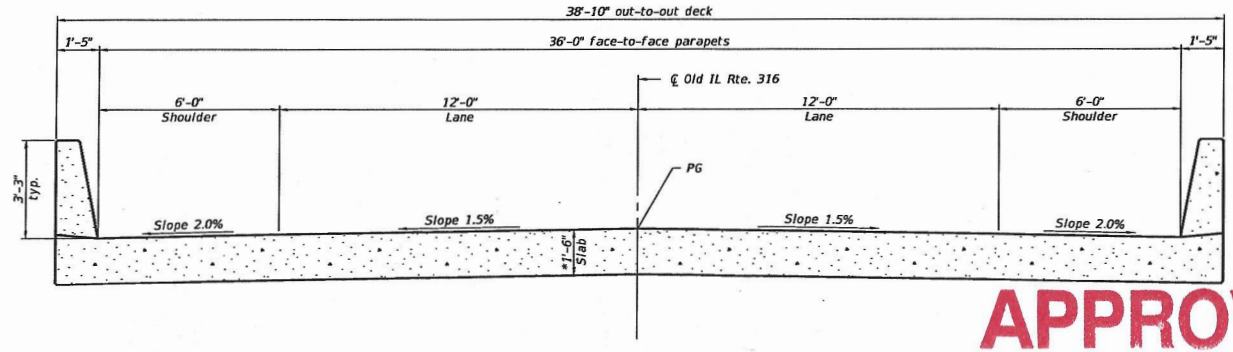
8/4/2020 - 1:50:06 PM

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2 SHEETS

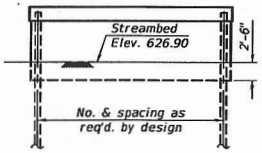
F.A.S. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
1669	(6BR)B-1	COLES		
		CONTRACT NO. 74564		
	ILLINOIS	FED. AID PROJECT		

MODEL: 0150077-74564-TSL-001
FILE NAME: p:\projects\roms\dot.illinois.gov\PWIDOT\Documents\IDOT Offices\Bureau of Bridges and Structures\Projects\0150077\CADD Plans\0150077-74564.dgn

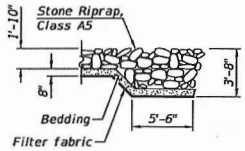


CROSS SECTION

* Slab thickness may be refined in final design.



PIER SKETCH

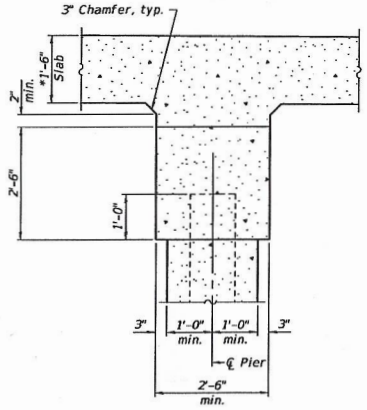


SECTION A-A

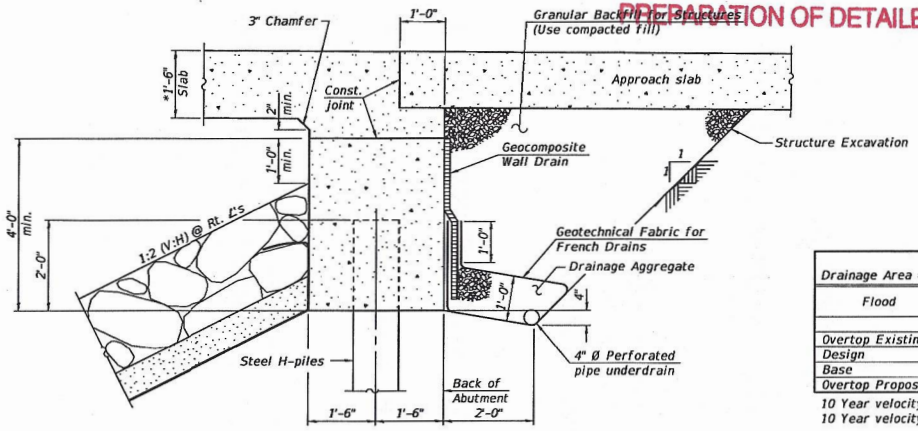
APPROVED

AUG 04 2020

AS A BASIS FOR PREPARATION OF DETAILED PLANS



SECTION THRU PIER



SECTION THRU ABUTMENT

DESIGN SCOUR ELEVATION TABLE

Event / Limit State	Design Scour Elevations (ft.) W. Abut.	Pier 1	Pier 2	E. Abut.	Item 113
Q100	637.1	618.6	618.6	636.2	5
Q200	637.1	617.2	617.2	636.2	
Design	637.1	618.6	618.6	636.2	
Check	637.1	617.2	617.2	636.2	

WATERWAY INFORMATION

Drainage Area = 27.8 mi.²

Existing Overtopping Elev. 639.46 @ Sta. 352+00
Proposed Overtopping Elev. 641.80 @ Sta. 352+00

Flood	Freq. Year	Q C.F.S.	Opening Ft² Exist.	Opening Ft² Prop.	Nat. H.W.E.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
	10	2,827	503	606	638.5	0.9	0.4	639.4	638.9
Overtop Existing	15	3,208	507	633	638.8	0.8	0.5	639.6	639.3
Design	50	4,299	507	717	639.7	0.9	0.8	640.6	640.5
Base	100	4,932	507	755	640.1	0.9	1.0	641.0	641.1
Overtop Proposed	105	5,007	507	765	640.2	0.8	1.8	641.0	642.0

10 Year velocity through existing bridge = 5.7 ft./sec.
10 Year velocity through proposed bridge = 4.6 ft./sec.

DETAILS
OLD ILLINOIS ROUTE 316 OVER RILEY CREEK
F.A.S. RTE. 1669 - SEC. (6BR)B-1
COLES COUNTY
STATION 350+20.00
STRUCTURE NO. 015-0077

MODEL: 0150077-74564-TSL-002
FILE NAME: p:\tgamroom.dot.illinois.gov:PWDOTDocuments\IDOT Offices\Bureau of Bridges and Structures\Projects\0150077\CADD Plans\0150077-74564.dgn

DESIGNED -	DEREK G. VERHULST
CHECKED -	NICHOLAS R. BARNETT
DRAWN -	MICHAEL B. MOSSMAN
CHECKED -	D.G.V. / N.R.B.

8/4/2020 - 1:48:21 PM

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2 SHEETS

F.A.S. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
1669	(6BR)B-1	COLES		
		CONTRACT NO. 74564		
	ILLINOIS	FED. AID PROJECT		

SEISMIC DATA

Old IL 16 over Riley Creek 2007 AASHTO Bridge Design Guidelines

Conterminous 48 States

2007 AASHTO Bridge Design Guidelines

AASHTO Spectrum for 7% PE in 75 years

Latitude = 39.500000

Longitude = -088.300000

Conterminous 48 States

2007 AASHTO Bridge Design Guidelines

Spectral Response Accelerations SDs and SD1

Latitude = 39.500000

Longitude = -088.300000

As = FpgaPGA, SDs = FaSs, and SD1 = FvS1

Site Class C - Fpga = 1.20, Fa = 1.20, Fv = 1.70

Data are based on a 0.05 deg grid spacing.

Period (sec)	Sa (g)	
0.0	0.122	As - Site Class C
0.2	0.266	SDs - Site Class C
1.0	0.123	SD1 - Site Class CAASHTO Spectrum for 7% PE in 75 years

SPREADSHEETS

Illinois Department of Transportation

SEISMIC SITE CLASS DETERMINATION

PROJECT TITLE=====Old IL 316 over Riley Creek

Substructure 1

Base of Substruct. Elev. (or ground surf for bents	637.12	ft.
Pile or Shaft Dia.	12	inches
Boring Number	B-1 W Abut	
Top of Boring Elev.	642.72	ft.
Approximate Fixity Elev.	631.12	ft.

Individual Site Class Definition:

N (bar): 31 (Blows/ft.) Soil Site Class D
N_{ch} (bar): 54 (Blows/ft.) Soil Site Class C <----Controls
s_u (bar): 3.16 (ksf) Soil Site Class C

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	635.7	7.00	7	1.70	
	633.2	2.50	7	1.70	B
0.4	630.7	2.50	5	0.90	
3.4	627.7	3.00	4	0.80	B
4.9	626.2	1.50	10	5.40	
7.4	623.7	2.50	10	3.00	B
10.4	620.7	3.00	18	1.50	
12.4	618.7	2.00	16	1.00	
14.9	616.2	2.50	13	1.00	
17.4	613.7	2.50	17	0.80	B
22.9	608.2	5.50	39	2.90	B
27.4	603.7	4.50	50	7.90	
32.4	598.7	5.00	60	7.90	
37.9	593.2	5.50	60	11.10	B
47.9	583.2	10.00	47	6.20	
100.0	531.1	52.10	60	8.50	R

Substructure 2

Base of Substruct. Elev. (or ground surf for bents	636.18	ft.
Pile or Shaft Dia.	12	inches
Boring Number	B-2 E Abut	
Top of Boring Elev.	648.26	ft.
Approximate Fixity Elev.	630.18	ft.

Individual Site Class Definition:

N (bar): 45 (Blows/ft.) Soil Site Class D
N_{ch} (bar): NA (Blows/ft.) NA
s_u (bar): 4.05 (ksf) Soil Site Class C <----Controls

Seismic Soil Column Depth (ft)	Bot. Of Sample Elevation	Sample Thick. (ft.)	N	Qu (tsf)	Layer Description Boundary
	641.3	7.00	5	1.00	B
	639.3	2.00	7	1.20	
	636.8	2.50	4	0.70	B
	634.3	2.50	6	1.90	B
	631.8	2.50	14	2.70	
1.4	628.8	3.00	16	2.90	
3.9	626.3	2.50	16	2.90	B
6.4	623.8	2.50	6	1.70	
8.9	621.3	2.50	8	2.90	B
11.4	618.8	2.50	14	0.80	B
12.7	617.5	1.30	33	2.80	B
20.7	609.5	8.00	50	4.50	
25.7	604.5	5.00	50	9.20	
31.4	598.8	5.70	60	12.10	B
32.9	597.3	1.50	100	12.10	
100.0	530.2	67.10	100	12.10	R

Substructure 3

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

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 2

N (bar): 38 (Blows/ft.) Soil Site Class D
N_{ch} (bar): 78 (Blows/ft.) Soil Site Class C
s_u (bar): 3.61 (ksf) Soil Site Class C <----Controls

SCOUR ANALYSIS FOR NON-GRANULAR CONDITIONS

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 5/28/2015

STRUCTURE NUMBER	015-0077	
SUBSTRUCTURE UNIT	Pier 1 Boring #1 Data	
BORING LOCATION RELATIVE TO SUBSTRUCURE UNIT	NEAR	
BOTTOM OF SUBSTRUCTURE ELEVATION	624.4	
GROUND SURFACE ELEVATION AT SUBSTRUCTURE	626.9	
Q100 SCOUR DEPTH AT SUBSTRUCTURE PER APPROVED HYDRAULIC REPORT (HR Q100)	15.00	FT
Q200 SCOUR DEPTH AT SUBSTRUCTURE PER APPROVED HYDRAULIC REPORT (HR Q200)	17.00	FT

LAYER NO.	BOTTOM OF LAYER ELEV. (FT)	DEPTH BELOW SURFACE (FT)	LAYER THICK. (FT)	Qu VALUE (TSF)	ROCK TYPE (IF APPLICABLE)	SCOUR REDUCTION (%)	SCOUR RESISTANCE OF LAYER (FT)	REMAINING Q100 SCOUR BELOW LAYER (FT)	REMAINING Q200 SCOUR BELOW LAYER (FT)
1	626.2	0.7	0.7	5.40		50%	1.40	13.60	15.60
2	623.7	3.2	2.5	5.40		50%	5.00	8.60	10.60
3	620.7	6.2	3.0	1.50		50%	6.00	2.60	4.60
4	618.7	8.2	2.0	1.00		25%	2.67	0.00	1.93
5	616.2	10.7	2.5	1.00		25%	3.33		0.00

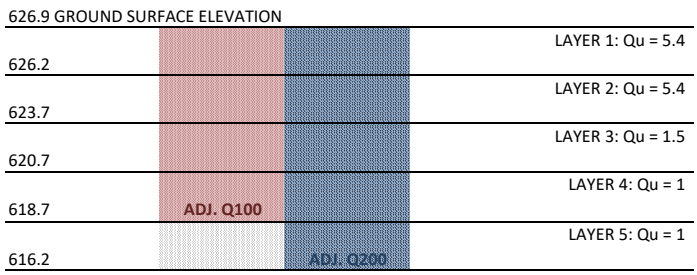
STRENGTH LIMIT STATE ADJUSTED SCOUR (ADJ. Q100)

UNADJUSTED Q100 SCOUR DEPTH	611.9	FT
LAYER IN WHICH ADJUSTED Q100 SCOUR STOPS	LAYER 4	
DEPTH INTO LAYER 4 AT WHICH SCOUR STOPS	2.0	FT
DEPTH BELOW GROUND SURFACE TO ADJUSTED Q100 SCOUR	8.2	FT
TOTAL % ADJUSTMENT OF Q100 SCOUR = [1-(8.15/15)]*100	45.7%	
Q100 SCOUR ELEVATION	**618.8**	FT

EXTREME EVENT II ADJUSTED SCOUR (ADJ. Q200)

UNADJUSTED Q200 SCOUR DEPTH	609.9	FT
LAYER IN WHICH ADJUSTED Q200 SCOUR STOPS	LAYER 5	
DEPTH INTO LAYER 5 AT WHICH SCOUR STOPS	1.5	FT
DEPTH BELOW GROUND SURFACE OF ADJUSTED Q200 SCOUR	9.7	FT
TOTAL % ADJUSTMENT OF Q200 SCOUR = [1-(9.65/17)]*100	43.2%	
Q200 SCOUR ELEVATION	**617.3**	FT

SCOUR FIGURE



LEGEND FOR SCOUR FIGURE

- ADJUSTED Q100 SCOUR
- RAW Q100 SCOUR PER APPROVED HYDRAULIC REPORT
- ADJUSTED Q200 SCOUR
- RAW Q200 SCOUR PER APPROVED HYDRAULIC REPORT

SCOUR ANALYSIS FOR NON-GRANULAR CONDITIONS

I.D.O.T. BBS FOUNDATIONS AND GEOTECHNICAL UNIT — Modified 5/28/2015

STRUCTURE NUMBER	015-0077	
SUBSTRUCTURE UNIT	PIER 2, B-2 DATA	
BORING LOCATION RELATIVE TO SUBSTRUCURE UNIT	NEAR	
BOTTOM OF SUBSTRUCTURE ELEVATION	624.4	
GROUND SURFACE ELEVATION AT SUBSTRUCTURE	626.9	
Q100 SCOUR DEPTH AT SUBSTRUCTURE PER APPROVED HYDRAULIC REPORT (HR Q100)	15.00	FT
Q200 SCOUR DEPTH AT SUBSTRUCTURE PER APPROVED HYDRAULIC REPORT (HR Q200)	17.00	FT

LAYER NO.	BOTTOM OF LAYER ELEV. (FT)	DEPTH BELOW SURFACE (FT)	LAYER THICK. (FT)	Qu VALUE (TSF)	ROCK TYPE (IF APPLICABLE)	SCOUR REDUCTION (%)	SCOUR RESISTANCE OF LAYER (FT)	REMAINING Q100 SCOUR BELOW LAYER (FT)	REMAINING Q200 SCOUR BELOW LAYER (FT)
1	626.3	0.6	0.6	1.90		50%	1.28	13.72	15.72
2	623.8	3.1	2.5	2.70		50%	5.00	8.72	10.72
3	621.3	5.6	2.5	2.90		50%	5.00	3.72	5.72
4	618.3	8.6	3.0	2.90		50%	6.00	0.00	0.00
5	615.8	11.1	2.5	1.70		50%	5.00		
6	613.3	13.6	2.5	2.90		50%	5.00		

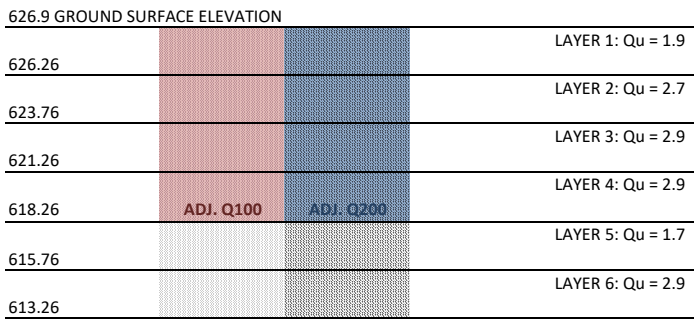
STRENGTH LIMIT STATE ADJUSTED SCOUR (ADJ. Q100)

UNADJUSTED Q100 SCOUR DEPTH	611.9	FT
LAYER IN WHICH ADJUSTED Q100 SCOUR STOPS	LAYER 4	
DEPTH INTO LAYER 4 AT WHICH SCOUR STOPS	1.9	FT
DEPTH BELOW GROUND SURFACE TO ADJUSTED Q100 SCOUR	7.5	FT
TOTAL % ADJUSTMENT OF Q100 SCOUR = [1-(7.5/15)]*100	50.0%	
Q100 SCOUR ELEVATION	**619.4**	FT

EXTREME EVENT II ADJUSTED SCOUR (ADJ. Q200)

UNADJUSTED Q200 SCOUR DEPTH	609.9	FT
LAYER IN WHICH ADJUSTED Q200 SCOUR STOPS	LAYER 4	
DEPTH INTO LAYER 4 AT WHICH SCOUR STOPS	2.9	FT
DEPTH BELOW GROUND SURFACE OF ADJUSTED Q200 SCOUR	8.5	FT
TOTAL % ADJUSTMENT OF Q200 SCOUR = [1-(8.5/17)]*100	50.0%	
Q200 SCOUR ELEVATION	**618.4**	FT

SCOUR FIGURE



LEGEND FOR SCOUR FIGURE

- ADJUSTED Q100 SCOUR
- RAW Q100 SCOUR PER APPROVED HYDRAULIC REPORT
- ADJUSTED Q200 SCOUR
- RAW Q200 SCOUR PER APPROVED HYDRAULIC REPORT

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== East Abutment
REFERENCE BORING ========== B-2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 638.20 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 636.20 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 920 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 38.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 193.68 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 72.63 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area======== 0.108 SQFT.

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
418 KIPS	**418** KIPS	**230** KIPS	**49** FT.

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 SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	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.)
633.26	2.94	1.00	5		8.3		24.8	12.1		***13.9***	14	0	0	8	5
631.26	2.00	1.20	7		6.5	16.5	24.4	9.5	1.8	***22.7***	23	0	0	12	7
628.76	2.50	0.70	4		5.2	9.6	46.2	7.6	1.1	***32.1***	32	0	0	18	9
626.26	2.50	1.90	6		11.2	26.2	68.4	16.3	2.9	***49.7***	50	0	0	27	12
623.76	2.50	2.70	14		14.1	37.2	85.2	20.6	4.1	***70.6***	71	0	0	39	14
621.26	2.50	2.90	16		14.8	40.0	100.0	21.7	4.4	***92.2***	92	0	0	51	17
618.26	3.00	2.90	16		17.8	40.0	***101.3***	26.0	4.4	116.4	101	0	0	56	20
615.76	2.50	1.70	6		10.4	23.4	***128.2***	15.2	2.6	133.4	128	0	0	71	22
613.26	2.50	2.90	8		14.8	40.0	***114.1***	21.7	4.4	151.9	114	0	0	63	25
610.76	2.50	0.80	14		5.9	11.0	***147.5***	8.6	1.2	163.4	147	0	0	81	27
609.26	1.50	2.80	33		8.7	38.6	209.4	12.7	4.2	***181.9***	182	0	0	100	29
602.51	6.75		50	Hard Till	17.0	91.9	300.0	24.9	10.1	***214.9***	215	0	0	118	36
597.51	5.00		90	Hard Till	35.0	165.4	342.4	51.2	18.1	***266.9***	267	0	0	147	41
590.76	6.75		94	Hard Till	51.3	172.7	343.5	75.1	18.9	***336.5***	337	0	0	185	47
589.76	1.00			Shale	49.4	122.5	***392.9***	72.3	13.4	408.8	393	0	0	216	48.4
589.26	0.50			Shale	24.7	122.5	***417.6***	36.1	13.4	444.9	418	0	0	230	48.9
588.76	0.50			Shale	24.7	122.5	***442.3***	36.1	13.4	481.0	~~442~~	~~0~~	~~0~~	~~243~~	~~49.4~~
587.76	1.00			Shale	49.4	122.5	***491.7***	72.3	13.4	553.3	~~492~~	~~0~~	~~0~~	~~270~~	~~50.4~~
586.76	1.00			Shale	49.4	122.5	***541.1***	72.3	13.4	625.5	~~541~~	~~0~~	~~0~~	~~298~~	~~51.4~~
585.76	1.00			Shale	49.4	122.5	***590.5***	72.3	13.4	697.8	~~591~~	~~0~~	~~0~~	~~325~~	~~52.4~~
584.76	1.00			Shale		122.5			13.4						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier 1
REFERENCE BORING ========== B-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 639.25 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 624.40 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 618.60 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1389 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========== 38.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 292.42 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 109.66 KIPS

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.

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	**578** KIPS	**303** KIPS	**60** FT.

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 SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	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.)
623.70	0.70	5.40	15		6.8		35.8	10.1		***13.3***	13	4	0	4	16
620.70	3.00	1.50	18		13.6	29.0	39.7	20.1	3.1	***32.4***	32	11	0	7	19
618.60	2.10	1.00	16		7.0	19.3	46.7	10.4	2.1	***42.8***	43	15	0	8	21
616.20	2.40	1.00	13		8.0	19.3	***50.9***	11.9	2.1	54.2	51	15	0	13	23
613.70	2.50	0.80	17		6.9	15.5	98.4	10.3	1.7	***68.9***	69	15	0	23	26
608.20	5.50	2.90	39		38.6	56.0	209.8	57.3	6.0	***134.0***	134	15	0	59	31
603.20	5.00		50	Hard Till	15.0	128.8	224.7	22.2	13.9	***156.2***	156	15	0	71	36
598.20	5.00		50	Hard Till	15.0	128.8	366.0	22.2	13.9	***192.0***	192	15	0	91	41
593.20	5.00		99	Hard Till	49.7	255.1	281.7	73.7	27.5	***251.3***	251	15	0	123	46
588.20	5.00		47	Hard Till	13.6	121.1	328.8	20.2	13.1	***275.1***	275	15	0	136	51
583.20	5.00		60	Hard Till	20.1	154.6	366.0	29.8	16.7	***306.8***	307	15	0	154	56
582.20	1.00			Shale	58.5	171.8	424.6	86.9	18.5	***393.7***	394	15	0	201	57.1
581.70	0.50			Shale	29.3	171.8	453.9	43.4	18.5	***437.1***	437	15	0	225	57.6
581.20	0.50			Shale	29.3	171.8	483.1	43.4	18.5	***480.6***	481	15	0	249	58.1
580.70	0.50			Shale	29.3	171.8	***512.4***	43.4	18.5	524.0	512	15	0	267	58.6
580.20	0.50			Shale	29.3	171.8	***541.7***	43.4	18.5	567.5	542	15	0	283	59.1
579.70	0.50			Shale	29.3	171.8	***571.0***	43.4	18.5	610.9	571	15	0	299	59.6
579.20	0.50			Shale	29.3	171.8	***600.2***	43.4	18.5	654.4	~~600~~	~~15~~	~~0~~	~~315~~	~~60.1~~
578.20	1.00			Shale	58.5	171.8	***658.8***	86.9	18.5	741.3	~~659~~	~~15~~	~~0~~	~~347~~	~~61.1~~
577.20	1.00			Shale	58.5	171.8	***717.3***	86.9	18.5	828.1	~~717~~	~~15~~	~~0~~	~~379~~	~~62.1~~
576.20	1.00			Shale	58.5	171.8	***775.9***	86.9	18.5	915.0	~~776~~	~~15~~	~~0~~	~~412~~	~~63.1~~
575.20	1.00			Shale	58.5	171.8	***834.4***	86.9	18.5	1001.9	~~834~~	~~15~~	~~0~~	~~444~~	~~64.1~~
574.20	1.00			Shale	58.5	171.8	***893.0***	86.9	18.5	1088.8	~~893~~	~~15~~	~~0~~	~~476~~	~~65.1~~
573.20	1.00			Shale		171.8			18.5						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== Pier 2
REFERENCE BORING ========== B-2
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 638.90 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 624.40 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== Scour
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== 618.60 ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== 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
418 KIPS	**418** KIPS	**211** KIPS	**51** FT.

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 1389 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 38.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 292.42 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 109.66 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area======== 0.108 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 SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	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.)
623.80	0.60	2.70	14		3.4		43.3	4.9		***9.3***	9	2	0	3	15
618.60	5.20	2.90	16		30.8	40.0	74.1	45.0	4.4	***54.4***	54	19	0	11	20
618.30	0.30	2.90	16		1.8	40.0	59.4	2.6	4.4	***55.1***	55	19	0	12	21
615.80	2.50	1.70	6		10.4	23.4	86.3	15.2	2.6	***72.1***	72	19	0	21	23
613.30	2.50	2.90	8		14.8	40.0	***72.2***	21.7	4.4	90.6	72	19	0	21	26
610.80	2.50	0.80	14		5.9	11.0	105.6	8.6	1.2	***102.2***	102	19	0	37	28
609.30	1.50	2.80	33		8.7	38.6	167.5	12.7	4.2	***120.7***	121	19	0	48	30
602.55	6.75		50	Hard Till	17.0	91.9	258.1	24.9	10.1	***153.7***	154	19	0	66	36
597.55	5.00		90	Hard Till	35.0	165.4	300.5	51.2	18.1	***205.7***	206	19	0	94	41
590.80	6.75		94	Hard Till	51.3	172.7	301.6	75.1	18.9	***275.3***	275	19	0	133	48
589.80	1.00			Shale	49.4	122.5	351.0	72.3	13.4	***347.5***	348	19	0	172	49.1
589.30	0.50			Shale	24.7	122.5	***375.7***	36.1	13.4	383.6	376	19	0	188	49.6
588.80	0.50			Shale	24.7	122.5	***400.4***	36.1	13.4	419.8	400	19	0	201	50.1
588.50	0.30			Shale	14.8	122.5	***415.2***	21.7	13.4	441.4	415	19	0	210	50.4
588.00	0.50			Shale	24.7	122.5	***439.9***	36.1	13.4	477.6	~~440~~	~~19~~	~~0~~	~~223~~	~~50.9~~
587.00	1.00			Shale	49.4	122.5	***489.4***	72.3	13.4	549.8	~~489~~	~~19~~	~~0~~	~~250~~	~~51.9~~
586.00	1.00			Shale	49.4	122.5	***538.8***	72.3	13.4	622.1	~~539~~	~~19~~	~~0~~	~~278~~	~~52.9~~
585.00	1.00			Shale	49.4	122.5	***588.2***	72.3	13.4	694.3	~~588~~	~~19~~	~~0~~	~~305~~	~~53.9~~
584.00	1.00			Shale	49.4	122.5	***637.6***	72.3	13.4	766.6	~~638~~	~~19~~	~~0~~	~~332~~	~~54.9~~
583.00	1.00			Shale	49.4	122.5	***687.0***	72.3	13.4	838.8	~~687~~	~~19~~	~~0~~	~~359~~	~~55.9~~
582.00	1.00			Shale		122.5			13.4						

Illinois Department of Transportation

IDOT STATIC METHOD OF ESTIMATING PILE LENGTH

SUBSTRUCTURE========== West Abutment
REFERENCE BORING ========== B-1
LRFD or ASD or SEISMIC ========== LRFD
PILE CUTOFF ELEV. ========== 639.10 ft
GROUND SURFACE ELEV. AGAINST PILE DURING DRIVING = 637.10 ft
GEOTECHNICAL LOSS TYPE (None, Scour, Liquef., DD) ===== None
BOTTOM ELEV. OF SCOUR, LIQUEF., or DD ========== ft
TOP ELEV. OF LIQUEF. (so layers above apply DD) ========== ft

TOTAL FACTORED SUBSTRUCTURE LOAD ========== 920 kips
TOTAL LENGTH OF SUBSTRUCTURE (along skew)========= 38.00 ft
NUMBER OF ROWS OF PILES PER SUBSTRUCTURE ====== 1
Approx. Factored Loading Applied per pile at 8 ft. Cts ========== 193.68 KIPS
Approx. Factored Loading Applied per pile at 3 ft. Cts ========== 72.63 KIPS

PILE TYPE AND SIZE ========== Steel HP 12 X 53
Plugged Pile Perimeter========== 3.967 FT. Unplugged Pile Perimeter========== 5.800 FT.
Plugged Pile End Bearing Area========== 0.983 SQFT. Unplugged Pile End Bearing Area======== 0.108 SQFT.

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
418 KIPS	**418** KIPS	**230** KIPS	**58** FT.

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 SIDE RESIST. (KIPS)	NOMINAL PLUGGED END BRG. RESIST. (KIPS)	NOMINAL PLUGGED TOTAL RESIST. (KIPS)	NOMINAL UNPLUG'D SIDE RESIST. (KIPS)	NOMINAL UNPLUG'D END BRG. RESIST. (KIPS)	NOMINAL UNPLUG'D TOTAL RESIST. (KIPS)	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.)
635.70	1.40	1.70	7		5.8		29.9	8.5		***11.1***	11	0	0	6	3
633.20	2.50	1.75	7		10.6	24.1	28.8	15.5	2.6	***25.3***	25	0	0	14	6
630.70	2.50	0.90	5		6.5	12.4	***33.9***	9.5	1.4	34.6	34	0	0	19	8
627.70	3.00	0.80	4		7.0	11.0	104.3	10.3	1.2	***51.9***	52	0	0	29	11
626.20	1.50	5.40	10		12.4	74.4	116.7	18.1	8.1	***69.9***	70	0	0	38	13
623.70	2.50	5.40	15		20.6	74.4	***83.5***	30.1	8.1	94.2	84	0	0	46	15
620.70	3.00	1.50	18		11.4	20.7	***88.1***	16.7	2.3	110.2	88	0	0	48	18
618.70	2.00	1.00	16		5.6	13.8	***93.7***	8.2	1.5	118.4	94	0	0	52	20
616.20	2.50	1.00	13		7.0	13.8	***98.0***	10.3	1.5	128.4	98	0	0	54	23
613.70	2.50	0.80	17		5.9	11.0	***132.8***	8.6	1.2	140.2	133	0	0	73	25
608.20	5.50	2.90	39		32.6	40.0	217.3	47.6	4.4	***193.5***	193	0	0	106	31
603.20	5.00		50	Hard Till	12.6	91.9	229.9	18.5	10.1	***211.9***	212	0	0	117	36
598.20	5.00		50	Hard Till	12.6	91.9	332.6	18.5	10.1	***240.2***	240	0	0	132	41
593.20	5.00		99	Hard Till	41.9	181.9	***279.0***	61.3	19.9	291.1	279	0	0	153	46
588.20	5.00		47	Hard Till	11.5	86.4	314.3	16.8	9.4	***310.5***	310	0	0	171	51
583.20	5.00		60	Hard Till	17.0	110.2	343.6	24.8	12.1	***336.6***	337	0	0	185	56
582.20	1.00			Shale	49.4	122.5	***393.0***	72.3	13.4	408.9	393	0	0	216	56.9
581.70	0.50			Shale	24.7	122.5	***417.7***	36.1	13.4	445.0	418	0	0	230	57.4
581.20	0.50			Shale	24.7	122.5	***442.4***	36.1	13.4	481.1	~~442~~	~~0~~	~~0~~	~~243~~	~~57.9~~
580.20	1.00			Shale	49.4	122.5	***491.8***	72.3	13.4	553.4	~~492~~	~~0~~	~~0~~	~~270~~	~~58.9~~
579.20	1.00			Shale	49.4	122.5	***541.2***	72.3	13.4	625.6	~~541~~	~~0~~	~~0~~	~~298~~	~~59.9~~
578.20	1.00			Shale	49.4	122.5	***590.6***	72.3	13.4	697.9	~~591~~	~~0~~	~~0~~	~~325~~	~~60.9~~
577.20	1.00			Shale	49.4	122.5	***640.0***	72.3	13.4	770.1	~~640~~	~~0~~	~~0~~	~~352~~	~~61.9~~
576.20	1.00			Shale		122.5			13.4						