

Structure Geotechnical Report

SN 013-0042
(Existing SN-013-0005)

U.S. Route 50
F.A.P. Route 327
Section (7-2B) B-1
Clay County

D-97-002-03
Contract No. 94777

Prepared by: Paul Guthrie
IDOT BBS
Central Geotechnical Unit
217-524-4681

Approved by: Riyad Wahab

Date: August 15, 2007

Prepared for: BBS Planning & Design Units

Attachments: Preliminary General Plans
Location Map
Subsurface profile
Boring Logs

Project Description and Proposed Structure Information

The existing structure number is 013-0005. The existing structure was built in 1952 as F.A.P.-13, Section 7,2BF, 7-2B-I-1 at station 1291+65.75 as a 9 span wide flange beam structure 490 ft back-to-back of abutments. Substructure supported on untreated timber piles. Bridge rail replacement in 1985 with 2 inch bituminous overlay.

The existing bridge is to be removed and replaced. The proposed structure will be 510 ft and 7 inches back-to-back of abutments with the centerline at station 129+82.50. Traffic is to be maintained utilizing staged construction. The superstructure and the substructures will be designed according to the 2004 LRFD AASHTO with 2005/2006 Interims design specifications.

The proposed structure number is 013-0042. According to the General Plans, the structure is to be a 5 span structure with integral abutments. The structure is to be 510'-7" Bk. to Bk. of Abut. Traffic will be maintained utilizing staged construction. The factored loadings per substructure, provided by the Planning Unit, are as follows:

Abutments	884 kips
Pier 1	2232 kips
Piers 2 & 3	2632 kips
Pier 4	2820 kips

Subsurface Exploration

A total of four borings were drilled between July 27, 2006 and August 22, 2006 by the District 7 drill crew. The locations of the borings relative to the proposed structure are shown on the attached boring log plot. The groundwater elevations observed at each boring are as follows:

Boring 1 after 24 hours at 405.0 ft
Boring 2 at 399.8 ft at first encounter
Boring 3 at 419.3 ft after 168 hours
Boring 4 at 418.0 ft after 24 hours

Borings 1, 2, and 3 indicate the presence of loose sand with blow counts as low as 0. The three borings are relatively consistent in the elevations of these very loose sands. The loose sands range from approximately 394 ft to 389 ft.

Rock cores were taken at borings 1, 2 and 3. While no rock cores were taken at Boring 4, the boring indicates the top of sandy clay shale at elevation 348.25 ft. The results of the rock core testing are shown in the table below.

Table 1. Rock Core Results

Boring	Rock Description	Start Elevation (ft)	End Elevation (ft)	Qu Range (tsf)	RQD (%)
1	Sandstone	334.91	329.91	418	45
2	Sandy clay shale	337.05	327.05	169-236	9-82
3	Sandy clay shale & sandstone	328.96	318.96	76-258	60-75

Geotechnical Evaluation

Settlement

Our settlement analyses indicate settlement is not a concern at any of the substructures since no change in grade is proposed.

Slope stability

Based on our analyses, the FOS against slope failure is adequate at both abutments. Based on the Geotechnical Manual page 3-33, Figure 3.4, a horizontal bedrock acceleration of 0.09g was used in the seismic analysis of the end slopes.

Seismic Considerations

Seismic Data

The Seismic Performance Zone is zone = 1
 Bedrock Acceleration Coefficient = 0.09g
 Site Coefficient = 1.5

Liquefaction

Since the Seismic Performance Zone is 1 for this structure, no liquefaction analyses were performed.

Scour

Based on discussions with the Hydraulics Unit, it was decided that the design scour depths for piers 1, 2, 3 and 4, should be 8 ft, 8 ft, 15.7 ft, and 15.7 ft, respectively. Therefore, assuming a ground elevation of 415.0 ft for piers 1, 2 & 3 and a ground elevation of 410.0 ft for pier 4, we recommend the scour elevations in the Design Scour Table below be used on the Plans. In this table, the design scour elevation for both abutments is assumed to be the elevation of the bottom of the cap.

Table 2. Design Scour Table

Design Scour Elevation feet	West Abut.	Pier 1	Pier 2	Pier 3	Pier 4	East Abut.
	420.75	407.0	407.0	399.3	394.3	420.75

Mining Activities

According to the Illinois State Geological Survey, no mining activity has taken place at the project site in the past.

Foundation Evaluations and Design Recommendations

Spread Footings

Spread footings are not feasible at any of the substructures. The low soil strengths would not provide the necessary bearing capacities needed to carry the design loads for this structure.

Piles

Driven H-piles appear to be the most viable option for all substructures. However, proposed piles at both abutments should be spaced appropriately to ensure there is no conflict with the existing battered piles at the west abutment. Since settlement is not a concern at any of the substructures, there are no geotechnical losses from down drag at any of the substructures. We recommend test piles at the west abutment and piers 1 & 4 to allow for possible variation in bedrock elevations. Also, metal shoes will not be necessary. The following tables give the pile type & size, nominal required bearing, factored resistance available, and estimated pile length. The estimated depth to bedrock varies from 75 ft to 95 ft across the site. Please note that HP10s should be avoided when the lengths exceed 75 ft due to their tendency to wander and the same thing holds true for HP12s when their lengths exceed 100 ft. Also, metal shell piles do not appear to be feasible at any of the substructures. According to the preliminary factored loads provided by the Planning Unit and our preliminary analyses, metal shell piles will obtain only a fraction of the resistance needed before reaching elevations just above bedrock at any of the substructures. This makes the metal shell piles susceptible to damage during driving.

Table 3. West Abutment Pile Lengths (Top of pile @ 421.75)

HP Steel Pile Size	Nominal Required Bearing	Factored Resistance Available	Pile Length
	(kips)	(kips)	(ft)
10X42	120	60	58
	140	70	62
	160	80	66
	180	90	70
	240	120	73
	260	130	74
	280	140	75
	300	150	76
10X57	334	167	77
	120	60	58
	140	70	61
	160	80	65
	180	90	69
	200	100	73

	260	130	74
	280	140	75
	300	150	76
	320	160	77
12X53	120	60	55
	140	70	58
	160	80	61
	180	90	64
	200	100	67
	220	110	71
	300	150	74
	340	170	75
12X63	120	60	55
	140	70	58
	160	80	61
	180	90	64
	200	100	67
	220	110	70
	240	120	73
	300	150	74
	340	170	75
12X74	120	60	55
	140	70	57
	160	80	60
	180	90	63
	200	100	66
	220	110	70
	240	120	73
12X84	120	60	54
	140	70	57
	160	80	60
	180	90	63
	200	100	66
	220	110	69
	240	120	72
	340	170	74
	360	180	75

For Information Only

Table 4. Pier 1 Pile Lengths (Top of pile @ 423.0)

HP Steel Pile Size	Nominal Required Bearing	Factored Resistance Available	Pile Length
	(kips)	(kips)	(ft)
12X63	400	200	79
	440	220	80
	460	230	81
	496	248	82
12X74	400	200	78
	440	220	79
	460	230	80
	500	250	82
	520	260	83
	560	280	84
12X84	588	294	85
	400	200	78
	440	220	79
	480	240	80
	500	250	81
	540	270	83
	580	290	84
	600	300	85
14X73	400	200	77
	440	220	78
	500	250	80
	578	289	82
14X89	400	200	76
	440	220	77
	480	240	79
	520	260	80
	560	280	81
	600	300	82
	620	310	83
14X102	680	340	85
	400	200	76
	440	220	77
	460	230	78
	500	250	79
	540	270	80
	560	280	81
	600	300	82
14X117	640	320	83
	660	330	84
	700	350	85
	400	200	75
	440	220	76
	460	230	77

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	480	240	78
	520	260	79
	560	280	80
	600	300	81
	620	310	82
	660	330	83
	680	340	84
	720	360	85

Table 5. Pier 2 Pile Lengths (Top of pile @ 408.0)

HP Steel Pile Size	Nominal Required Bearing (kips)	Factored Resistance Available (kips)	Pile Length (ft)
12X53	260	130	73
	280	140	74
	320	160	75
	380	190	77
	418	209	79
12X63	260	130	72
	280	140	73
	300	150	74
	360	180	76
	380	190	77
	420	210	78
	440	220	79
12X74	460	230	80
	260	130	72
	280	140	73
	300	150	74
	340	170	75
	380	190	76
	400	200	77
	440	220	78
	480	240	80
	500	250	81
12X84	560	280	83
	260	130	71
	280	140	72
	320	160	74
	360	180	75
	400	200	76
	420	210	77
	460	230	79
	480	240	80
	520	260	81
14X73	580	290	83
	360	180	74

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	400	200	75
	460	230	77
	500	250	78
	540	270	80
	578	289	81
14X89	360	180	74
	400	200	75
	440	220	76
	460	230	77
	500	250	78
	540	270	79
	560	280	80
	600	300	81
	620	310	82
14X102	360	180	74
	400	200	75
	440	220	76
	500	250	78
	540	270	79
	580	290	80
	620	310	81
	640	320	82
14X117	380	190	73
	420	210	74
	460	230	75
	500	250	77
	540	270	78
	580	290	79
	600	300	80
	640	320	81
	660	330	82

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Table 6. Pier 3 Pile Lengths (Top of pile @ 400.0)

HP Steel Pile Size	Nominal Required Bearing	Factored Resistance Available	Pile Length (ft)
	(kips)	(kips)	
10X42	200	100	50
	220	110	54
	240	120	56
	260	130	58
	280	140	61
	300	150	63
	334	167	64
10X57	200	100	49
	220	110	53
	240	120	55

	260	130	57
	280	140	60
	300	150	62
	400	200	64
	454	227	65
12X53	260	130	53
	280	140	55
	300	150	57
	320	160	59
	340	170	61
	360	180	62
	418	209	63
12X63	260	130	55
	280	140	57
	300	150	59
	320	160	58
	340	170	60
	360	180	62
	460	230	64
	496	248	65
12X74	260	130	52
	280	140	54
	300	150	56
	320	160	58
	340	170	60
	360	180	62
	380	190	63
	480	240	64
	520	260	65
	589	294	66
12X84	260	130	54
	280	140	56
	300	150	58
	320	160	59
	340	170	61
	360	180	63
	600	300	66
	640	320	67
	664	332	68

For Information Only

Table 7. Pier 4 Pile Lengths (top of pile @ 423.0)

HP Steel Pile Size	Maximum Nominal Required Bearing	Factored Resistance Available	Pile Length
	(kips)	(kips)	(ft)
14X74	340	170	98
	500	250	99
	588	294	100
14X89	360	180	98
	500	250	99
	600	300	100
14X102	664	332	104
	420	210	98
	640	320	99
	700	350	100
	720	360	101
	760	380	103
14X117	780	390	104
	810	405	105
	440	220	98
	660	330	99
	720	360	100
	740	370	101
	780	390	103
	820	410	105
	860	430	107

Table 8. East Abutment Pile Lengths (Top of pile @ 421.75)

HP Steel Pile Size	Nominal Required Bearing	Factored Resistance Available	Pile Length
	(kips)	(kips)	(ft)
10X42	120	60	55
	140	70	67
	160	80	80
10X57	120	60	53
	140	70	65
	160	80	78
	180	90	83
12X53	120	60	43
	140	70	53
	160	80	63
	180	90	77
	200	100	80
	220	110	84
	240	120	87

	260	130	88
	280	140	89
	500	250	91
	520	260	92
12X63	120	60	40
	140	70	50
	160	80	63
	180	90	71
	200	100	80
	220	110	84
	240	120	87
	280	140	89
	300	150	92
	340	170	95
12X74	120	60	39
	140	70	48
	160	80	61
	180	90	69
	200	100	80
	220	110	83
	280	140	89
	260	160	91
	240	170	93
12X84	120	60	38
	140	70	47
	160	80	58
	180	90	68
	200	100	80
	220	110	83
	240	120	86
	340	170	93
	380	190	95

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Lateral load analyses were performed for the strong axis of the piles using COM624. The depth to fixity in Tables 9, 10, 11, 12, 13 and 14 are from the same assumed top of pile elevations used in Tables 3, 4, 5, 6, 7, and 8.

Table 9. West Abutment Lateral Load Analyses

Lateral Load (kips)	Depth to Fixity (feet)					
	10X42	10X57	12X53	12X63	12X74	12X84
2.5	2.6	2.7	2.7	2.8	2.9	2.9
5.0	3.2	3.4	3.4	3.5	3.6	3.6
7.5	3.6	3.8	3.8	3.9	4.0	4.1
10.0	4.0	4.2	4.2	4.3	4.4	4.5
15.0	4.5	4.7	4.7	4.8	5.0	5.1

Table 10. Pier 1 Lateral Load Analyses

Lateral Load (kips)	Depth to Fixity (feet)						
	12X63	12X74	12X84	14X73	14X89	14X102	14X117
1	17.4	17.5	17.5	17.4	17.5	17.4	17.6
2	17.9	18.1	18.1	18.0	18.1	17.9	18.2
3	18.3	18.4	18.4	18.3	18.4	18.2	18.6
4	18.6	18.7	18.7	18.6	18.7	18.5	18.9
5	18.8	19.0	19.0	18.9	19.0	18.8	19.2

Table 11. Pier 2 Lateral Load Analyses

Lateral Load (kips)	Depth to Fixity (feet)						
	12X63	12X74	12X84	14X73	14X89	14X102	14X117
2.5	4.7	4.8	4.9	4.7	4.8	4.9	5.0
5.0	6.1	6.2	6.3	6.1	6.3	6.4	6.5
7.5	7.0	7.1	7.1	6.9	7.1	7.2	7.3
10.0	7.5	7.6	7.4	7.5	7.7	7.8	7.9
15.0	8.1	8.3	8.4	8.2	8.4	8.5	8.6

Table 12. Pier 3 Lateral Load Analyses

Lateral Load (kips)	Depth to Fixity (feet)						
	12X63	12X74	12X84	14X73	14X89	14X102	14X117
2.5	4.1	4.1	4.2	4.1	4.3	4.4	4.6
5.0	4.8	4.9	5.0	4.2	4.9	5.0	5.0
7.5	5.2	5.3	5.4	4.7	5.4	5.5	5.6
10.0	5.4	5.5	5.6	5.1	5.7	5.8	5.9
15.0	5.9	6.0	6.0	5.6	6.1	6.2	6.3
20.0	6.5	6.5	6.5	5.9	6.4	6.5	6.6

Table 13. Pier 4 Lateral Load Analyses

Lateral Load (kips)	Depth to Moment Fixity (feet)						
	12X63	12X74	12X84	14X73	14X89	14X102	14X117
1	30.5	30.6	30.6	30.6	30.8	31.0	31.0
2	30.5	30.6	30.6	30.6	30.8	31.0	31.0
3	30.5	30.6	30.6	30.6	30.8	31.0	31.0
4	30.7	30.6	30.7	30.7	30.8	31.0	31.0
5	30.8	30.7	30.9	30.9	30.9	31.0	31.0

Table 14. East Abutment Lateral Load Analyses

Lateral Load (kips)	Depth to Fixity (feet)					
	10X42	10X57	12X53	12X63	12X74	12X84
2.5	2.6	2.7	2.7	2.8	2.9	2.9
5.0	3.2	3.4	3.4	3.5	3.6	3.6
7.5	3.6	3.8	3.8	3.9	4.0	4.1
10.0	4.0	4.2	4.2	4.3	4.4	4.5
15.0	4.5	4.7	4.7	4.9	5.0	5.1

Drilled Shafts

Drilled shafts are not feasible due to the low soil strengths and excessive depth to bedrock.

Construction Considerations

Existing Battered Piles

Proposed piles at the west abutment should be spaced appropriately to avoid any interference with the existing battered piles.

Temporary Sheet Piling

The General Plans indicate staged construction will be utilized to maintain traffic during construction. The maximum retained heights are approximately 14.7 ft and 19.7 ft at the West and East abutments, respectively. Cantilevered sheet piling is not feasible at either abutment due to possible hard driving. A temporary soil retention system design will be needed at both abutments. In addition we recommend that the CGU be contacted during the Final Design Phase to better determine the construction options available.

Cofferdams

Cofferdams will be needed at piers 3 and 4. Our analyses indicate that cantilevered sheet piling is not feasible at either pier. However, braced sheet piling is feasible at both piers. Our preliminary analyses indicate that a 3 foot seal coat will be needed at pier 3 due to the granular nature of the soil below the footing along with the need to pour the footing in the dry. Also, our preliminary analyses indicate a 4 foot seal coat thickness at pier 4 will be needed.

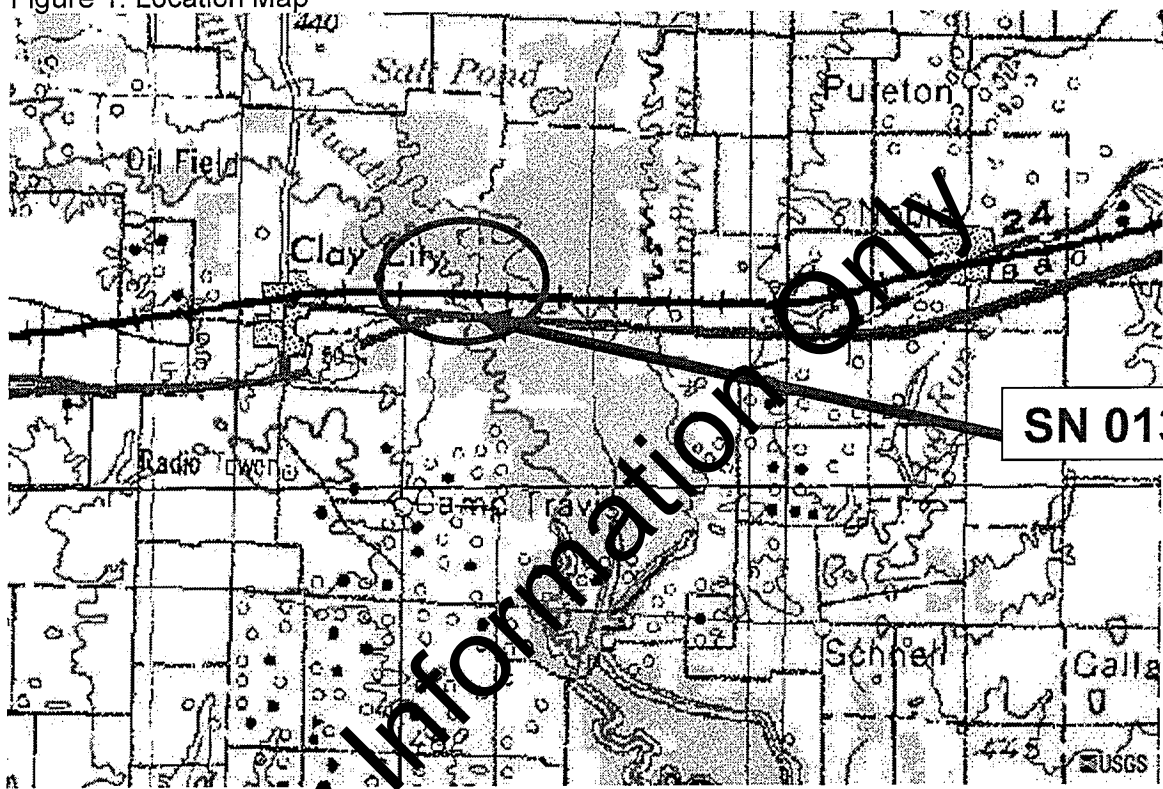
~~Based on survey data in the Hydraulics Report, the Hydraulics Unit calculated the Estimated Water Surface Elevation (EWSE) to be at 401 feet. According to the Bridge Manual (page 2-77), the design water elevation will be at an elevation of 404 ft for both cofferdams. The top of the cofferdams will be at 415 ft and 410 ft for the pier 3 and pier 4, respectively.~~

Backfill

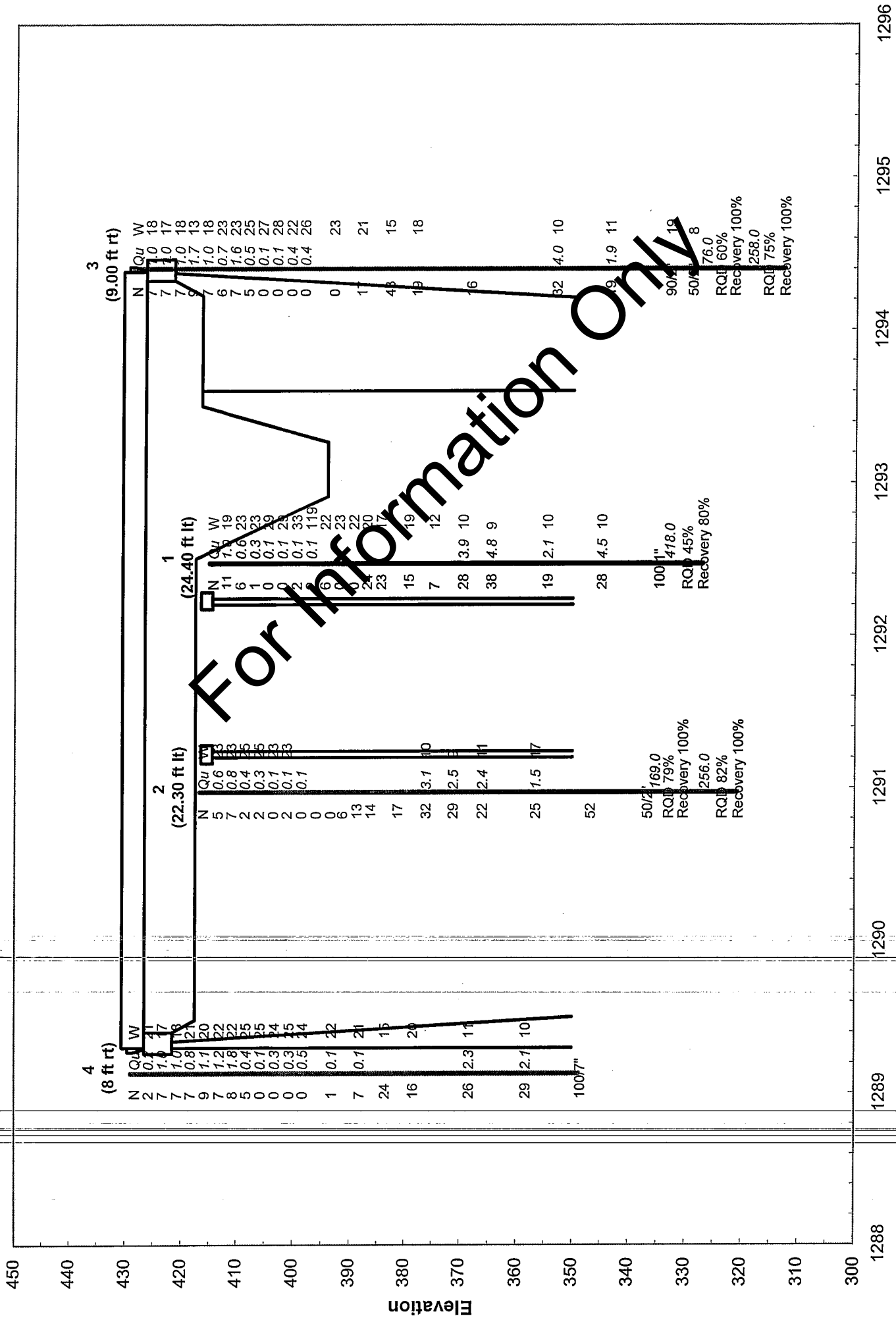
Porous granular embankment (special) will be placed in the temporary excavations behind both abutments according to ABD memo 05-3.

Class A5 stone riprap will be placed at the toe of each abutment end slope.

Figure 1. Location Map



SN 013-0042



Station



Illinois Department of Transportation

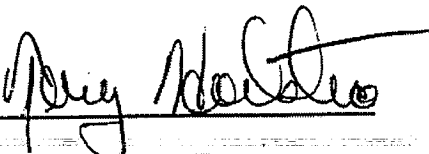
Memorandum

To: Tim Jackson Attn.: Mike Allen
From: Terry Hoekstra By: David Miller
Subject: Foundation Boring Logs*
Date: September 22, 2006

* Route: FAH 327 (US 50)
Section: 7-7(B)B-1
County: Clay
Township: Clay City
Contract: 94777
Job Number: D-97-002-03
Structure No.: Existing 013-0005
Location: 0.8 mile West of Richland County line.

Attached are three (3) copies of the foundation boring logs for the above captioned section.

If you have any questions, or require any additional information, please contact David Miller, District Geotechnical Engineer, at (217) 342-8233.

By 

Terry Hoekstra, P.E.
District Materials Engineer

DKM

Attachments



SOIL BORING LOG

Date 7/27/06

ROUTE FAP 327 (US 50) DESCRIPTION Little Muddy River LOGGED BY E. Sandschafer

SECTION (7-2B)B-1 LOCATION Sec 14 - SW 1/4, Sec 15 - SE 1/4, Sec 22 - NE 1/4, Sec 23 - NW 1/4, SEC., TWP. 3 N,

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

Table with columns: DEPTH (ft), BLOW S (1/6"), UCS (tsf), MOIST (%), Soil Description, Surface Water Elev., Stream Bed Elev., Groundwater Elev., First Encounter, Upon Completion, After 24 Hrs.

Latitude N 38 deg 41.255 min, Longitude W 88 deg 17.710 min, Map Datum WGS 84

For Information Only

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)
BBS, from 137 (Rev. 8-99)



SOIL BORING LOG

ROUTE FAP 327 (US 50) DESCRIPTION Little Muddy River LOGGED BY E. Sandschafer

SECTION (7-2B)B-1 LOCATION Sec 14 - SW 1/4, Sec 15 - SE 1/4, Sec 22 - NE 1/4, Sec 23 - NW 1/4, SEC., TWP. 3 N,

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

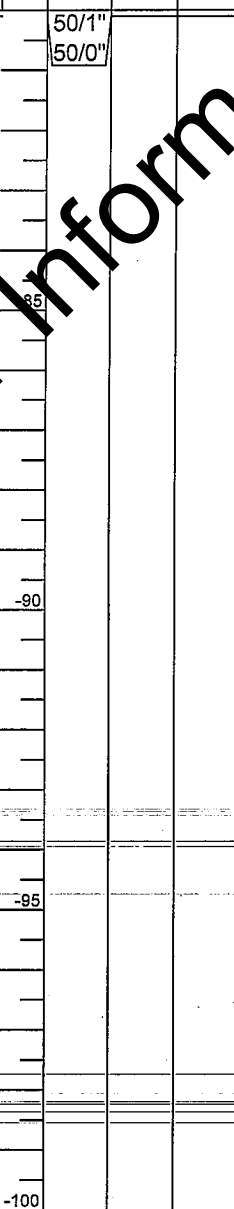
STRUCT. NO. 013-0005
 Station 1291+66

BORING NO. 1
 Station 1292+47
 Offset 24.40ft Lt
 Ground Surface Elev. 415.01 ft

DEPTH	BLOWS	UCS	MOIST
(ft)	(/6")	(tsf)	(%)
		Qu	

Surface Water Elev.	<u>403.00</u>	ft
Stream Bed Elev.	<u>391.40</u>	ft
Groundwater Elev..		
First Encounter	<u>395.5</u>	ft
Upon Completion	<u>403.0</u>	ft
After <u>24</u> Hrs.	<u>405.0</u>	ft

CLAY SHALE. 334.91'
 Borehole continued with rock coring.



For Information Only

Latitude N 38 deg 41.255 min, Longitude W 88 deg 17.710 min, Map Datum WGS 84

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)



ROCK CORE LOG

ROUTE FAP 327 (US 50) DESCRIPTION Little Muddy River LOGGED BY E. Sandschafer

SECTION (7-2B)B-1 LOCATION Sec 14 - SW 1/4, Sec 15 - SE 1/4, Sec 22 - NE 1/4, Sec 23 - NW 1/4, SEC., TWP. 3 N,

COUNTY Clay CORING METHOD Rotary, surf set diamond bit

STRUCT. NO. 013-0005
 Station 1291+66

CORING BARREL TYPE & SIZE NW, conv dbl bit, split in
 Core Diameter 2.06 in
 Top of Rock Elev. 334.91 ft
 Begin Core Elev. 334.91 ft

BORING NO. 1
 Station 1292+47
 Offset 24.40ft Lt
 Ground Surface Elev. 415.01 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
334.91		80	45	0.5	
329.91	-85				
-90					
-95					
-100					

Gray, slightly weathered, SANDSTONE.

Unconfined Compressive Strength = 418 tsf (depth 83.0 to 83.4')

Gas forced fine sand into augers, drill pipe and core barrel. Unable to advance core barrel into borehole for another sample.

Extent of exploration.

Benchmark: National Geodetic Survey Vertical Control Mark (Brass Tablet) Q294 = 424.02'. Provided by Program Development. Located on SE corner of existing bridge, on the bearing seat area of the East abutment.

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Color pictures of the cores _____

Cores will be stored for examination until _____

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)



Illinois Department of Transportation

Division of Highways Ill. Dept. of Trans. D-7

SOIL BORING LOG

Date 8/4/06

ROUTE FAP 327 (US 50) DESCRIPTION Little Muddy River LOGGED BY E. Sandschafer

SECTION (7-2B)B-1 LOCATION Sec 14 - SW 1/4, Sec 15 - SE 1/4, Sec 22 - NE 1/4, Sec 23 - NW 1/4, SEC., TWP. 3 N,

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

STRUCT. NO. 013-0005 Station 1291+66

BORING NO. 2 Station 1290+97 Offset 22.30ft Lt Ground Surface Elev. 416.75 ft

Table with 4 columns: DEPTH (ft), BLOW S (/#"), UCS (tsf), MOIST (%). Includes groundwater elevations and completion details.

Main soil data table with columns for description, depth, blow count, UCS, moisture, and groundwater level.

Latitude N 38 deg 41.255 min, Longitude W 88 deg 17.740 min, Map Datum WGS 84

For Information Only

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer) The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206) BBS, from 137 (Rev. 8-99)



ROCK CORE LOG

ROUTE FAP 327 (US 50) DESCRIPTION Little Muddy River LOGGED BY E. Sandschafer

SECTION (7-2B)B-1 LOCATION Sec 14 - SW 1/4, Sec 15 - SE 1/4, Sec 22 - NE 1/4, Sec 23 - NW 1/4, SEC., TWP. 3 N,

COUNTY Clay CORING METHOD Rotary, surf set diamond bit

STRUCT. NO. 013-0005
 Station 1291+66

CORING BARREL TYPE & SIZE NW, conv dbl bit, split in

BORING NO. 2
 Station 1290+97
 Offset 22.30ft Lt
 Ground Surface Elev. 416.75 ft

Core Diameter 2.06 in
 Top of Rock Elev. 337.05 ft
 Begin Core Elev. 337.05 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
337.05	-80	100	79	0.6	
332.05	-85	100	82	0.5	
327.05	-90				
	-95				

Gray, slightly weathered, SANDY CLAY SHALE.
 Unconfined Compressive Strength = 169 tsf (depth 83.0' to 83.4')

Gray, SANDY CLAY SHALE w/ thin black layering.
 Unconfined Compressive Strength = 256 tsf (depth 88.3' to 88.7')

Extent of exploration.
 Benchmark: National Geodetic Survey Vertical Control Mark (Brass Tablet) Q294 = 424.02'. Provided by Program Development. Located on SE corner of existing bridge, on the bearing seat area of the East abutment.

For Information Only

Color pictures of the cores _____

Cores will be stored for examination until _____

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)



SOIL BORING LOG

ROUTE FAP 327 (US 50) DESCRIPTION Little Muddy River LOGGED BY E. Sandschafer

SECTION (7-2B)B-1 LOCATION Sec 14 - SW 1/4, Sec 15 - SE 1/4, Sec 22 - NE 1/4, Sec 23 - NW 1/4, SEC. TWP. 3 N,

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

STRUCT. NO. 013-0005
 Station 1291+66

BORING NO. 3
 Station 1294+40
 Offset 9.00ft Rt
 Ground Surface Elev. 428.76 ft

DEPTH (ft)	BLOWS (1/6")	UCS (tsf)	MOIST (%)
------------	--------------	-----------	-----------

Surface Water Elev.	<u>433.00</u> ft
Stream Bed Elev.	<u>391.40</u> ft
Groundwater Elev.:	
First Encounter	<u>393.8</u> ft
Upon Completion	<u>413.8</u> ft
After 168 Hrs.	<u>419.3</u> ft

DEPTH (ft)	BLOWS (1/6")	UCS (tsf)	MOIST (%)
------------	--------------	-----------	-----------

2 1/4" asphalt on 10" concrete pavement.	427.76				Soil very soft, very damp, brown mottled gray, SILTY LOAM. (continued)				
Medium to stiff, damp, brown, CLAY w/ trace sand and fine gravel.		3					2	0.5	25
		3	1	8			3	B	
		4					0	0.1	27
		4					0	B	
		1					0		
		3	1.0	17			-25	0	0.1
		4	B				0	B	28
		1					0		
		3	1.0	18			0	0.4	22
		4	B				0	B	
	419.26								
Stiff, damp, gray, SANDY CLAY LOAM.		3					-30	0	
		4	1.7	13			0	0.4	26
		5	B				0	B	
	416.76								
Medium to stiff, damp, brown/red/gray, CLAY.		2							
		3	1.0	18					
		4	B						
	414.26								
Medium to stiff, damp, gray, SILTY CLAY.		2					-35	0	
		2	0.7	23	Very loose, wet, gray, fine grained, SAND. 5% passing #200 sieve.		0		23
		4	B				0		
		2							
		3	1.6	23					
		4	B						
	409.26								
		1					-40	3	

For Information Only

Latitude N 38 deg 41.247 min, Longitude W 88 deg 17.671 min, Map Datum WGS 84

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
 The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)
 BBS, from 137 (Rev. 8-99)



SOIL BORING LOG

ROUTE FAP 327 (US 50) DESCRIPTION Little Muddy River LOGGED BY E. Sandschafer

SECTION (7-2B)B-1 LOCATION Sec 14 - SW 1/4, Sec 15 - SE 1/4, Sec 22 - NE 1/4, Sec 23 - NW 1/4, SEC., TWP. 3 N,

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

STRUCT. NO. 013-0005
Station 1291+66

BORING NO. 3
Station 1294+40
Offset 9.00ft Rt
Ground Surface Elev. 428.76 ft

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

Surface Water Elev. 403.00 ft
Stream Bed Elev. 391.40 ft
Groundwater Elev.:
First Encounter 393.8 ft
Upon Completion 413.8 ft
After 16 Hrs. 419.3 ft

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

Medium, wet, gray, fined grained, SAND. 9% passing #200 sieve.

Medium, wet, gray, fine grained, SAND. 6% passing #200 sieve.

3% passing #200 sieve.

6% passing #200 sieve.

Very stiff, damp, gray, CLAY TILL to SANDY CLAY TILL.

For Information Only

Latitude N 38 deg 41.247 min, Longitude W 88 deg 17.671 min, Map Datum WGS 84

368.76

354.26

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 FAP 327 (US 50) DESCRIPTION Little Muddy River LOGGED BY E. Sandschafer
SECTION (7-2B)B-1 LOCATION Sec 14 - SW 1/4, Sec 15 - SE 1/4, Sec 22 - NE 1/4, Sec 23 - NW 1/4, SEC. TWP. 3 N,
COUNTY Clay DRILLING METHOD Hollow stem auger & split spoon HAMMER TYPE Auto 140#

STRUCT. NO. 013-0005
Station 1291+66

BORING NO. 3
Station 1294+40
Offset 9.00ft Rt
Ground Surface Elev. 428.76 ft

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

Surface Water Elev.	<u>403.00</u>	ft
Stream Bed Elev.	<u>391.40</u>	ft
Groundwater Elev..		
First Encounter	<u>393.8</u>	ft
Upon Completion	<u>413.8</u>	ft
After <u>16</u> Hrs.	<u>419.3</u>	ft

Very stiff, damp, gray, CLAY TILL to SANDY CLAY TILL. (continued)

For Information Only

85	4		
8	11	1.9	11
		B	
-90			
-95			
332.96	20		
332.06	40		19
	50/2"		
328.96	50/2"		8
-100			

Wet, gray, fine grained, SAND.

Very dense, moist, gray, SANDY CLAY SHALE.

Latitude N 38 deg 41.247 min, Longitude W 88 deg 17.671 min, Map Datum WGS 84

Borehole continued with rock

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)



ROCK CORE LOG

ROUTE FAP 327 (US 50) DESCRIPTION Little Muddy River LOGGED BY E. Sandschafer

SECTION (7-2B)B-1 LOCATION Sec 14 - SW 1/4, Sec 15 - SE 1/4, Sec 22 - NE 1/4, Sec 23 - NW 1/4, SEC., TWP. 3 N,

COUNTY Clay CORING METHOD Rotary, surf set diamond bit

STRUCT. NO. 013-0005 CORING BARREL TYPE & SIZE NW, conv dbl blr, split inner
 Station 1291+66

BORING NO. 3
 Station 1294+40
 Offset 9.00ft Rt
 Ground Surface Elev. 428.76 ft

Core Diameter 2.06 in
 Top of Rock Elev. 328.96 ft
 Begin Core Elev. 328.96 ft

DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
328.96		100	60	0.7	
324.96					
323.26		100	75	0.8	
318.96					
-110					
-115					

Gray, SANDY CLAY SHALE. 328.96

Unconfined Compressive Strength = 76 tsf (depth 102.3 to 102.9')

Gray, moderately weathered, SANDSTONE. 324.96

Unconfined Compressive Strength = 268 tsf (depth 104.8' to 105.2')

Gray, moderately weathered, SANDY CLAY SHALE. 323.26

Extent of exploration. 318.96 -110

Benchmark: National Geodetic Survey Vertical Control Mark (Brass Tablet) Q294 = 424.02'. Provided by Program Development. Located on SE corner of existing bridge, on the bearing seat area of the East abutment.

FOI Information Only

Color pictures of the cores _____

Cores will be stored for examination until _____

The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)



SOIL BORING LOG

ROUTE FAP 327 (US 50) DESCRIPTION Little Muddy River LOGGED BY E. Sandschafer

SECTION (7-2B)B-1 LOCATION Sec 14 - SW 1/4, Sec 15 - SE 1/4, Sec 22 - NE 1/4, Sec 23 - NW 1/4, SEC., TWP. 3 N,

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

STRUCT. NO. 013-0005
 Station 1291+66

BORING NO. 4
 Station 1289+13
 Offset 8.00ft Rt
 Ground Surface Elev. 428.85 ft

DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)
------------	-------------	-----------	-----------

Surface Water Elev. 403.00 ft
 Stream Bed Elev. 391.40 ft
 Groundwater Elev.:
 First Encounter 384.4 ft
 Upon Completion Washed ft
 After 24 Hrs. 418.0 ft

DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)
------------	-------------	-----------	-----------

2 3/4" asphalt on 10" concrete pavement.	427.85				Soft to very soft, very damp, gray brown/red, SILTY LOAM. (Continued)				
Brown, SILTY CLAY.	426.85								
Very soft, very damp, brown, SILTY LOAM.		0					0	0.4	25
		0	0.5	21			0	0.1	25
		2					0	B	
	424.35								
Medium to stiff, damp, brown, SILTY CLAY.		3					0		
		3	1.0	17			0	0.3	24
		4	B				0	B	
		1							
		3	1.0	18			0	0.3	25
		4	B				0	B	
	419.35								
Medium to stiff (brown) mottled gray, CLAY w/ trace Silt.		2					0		
		3	0.8	21			0	0.5	24
		4	B				0	B	
		3							
		4	1.1	20					
		5	B						
	414.35								
Stiff, damp, gray marbled red, SILTY CLAY w/ hair roots.		2					0		
		3	1.2	22			0	0.1	22
		4	B				1	B	
		3							
		3	1.8	22					
		5	S						
	409.35								
		1					0		

Latitude N 38 deg 41.252 min, Longitude W 88 deg 17.780 min, Map Datum WGS 84

For Information Only

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 FAP 327 (US 50) DESCRIPTION Little Muddy River LOGGED BY E. Sandschafer

SECTION (7-2B)B-1 LOCATION Sec 14 - SW 1/4, Sec 15 - SE 1/4, Sec 22 - NE 1/4, Sec 23 - NW 1/4, SEC. , TWP. 3 N,

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

STRUCT. NO. 013-0005
Station 1291+66

BORING NO. 4
Station 1289+13
Offset 8.00ft Rt
Ground Surface Elev. 428.85 ft

DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)	Surface Water Elev.	Stream Bed Elev.	DEPTH (ft)	BLOWS (/6")	UCS (tsf)	MOIST (%)
				<u>408.00</u> ft	<u>391.40</u> ft				
				Groundwater Elev.:					
				First Encounter	<u>384.4</u> ft				
				Upon Completion	Washed				
				After 24 Hrs.	<u>418.0</u> ft				

	<u>388.35</u>	<u>2</u>	<u>0.1</u>	<u>21</u>	Very stiff, damp, gray, CLAY TILL. (continued)		<u>10</u>	<u>2.3</u>	<u>11</u>
Medium, wet, fine grained, SAND w/ Gravel.		<u>5</u>	<u>B</u>				<u>16</u>	<u>B</u>	
	<u>65</u>	<u>7</u>							
		<u>9</u>		<u>15</u>		<u>-65</u>			
8% passing #200 sieve.		<u>15</u>							
	<u>-50</u>	<u>4</u>					<u>8</u>		
		<u>7</u>		<u>20</u>		<u>-70</u>	<u>12</u>	<u>2.1</u>	<u>10</u>
4% passing #200 sieve.		<u>9</u>					<u>17</u>	<u>B</u>	
	<u>-55</u>					<u>-75</u>			
	<u>369.35</u>	<u>7</u>			Very stiff, damp, gray, CLAY TILL.	<u>348.85</u>	<u>28</u>		

Latitude N 38 deg 41.252 min, Longitude W 88 deg 17.780 min, Map Datum WGS 84

For Information Only

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 FAP 327 (US 50) DESCRIPTION Little Muddy River LOGGED BY E. Sandschafer

SECTION (7-2B)B-1 LOCATION Sec 14 - SW 1/4, Sec 15 - SE 1/4, Sec 22 - NE 1/4, Sec 23 - NW 1/4, SEC., TWP. 3 N,

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

STRUCT. NO. 013-0005
 Station 1291+66

BORING NO. 4
 Station 1289+13
 Offset 8.00ft Rt
 Ground Surface Elev. 428.85 ft

**D
E
P
T
H**
(ft)

**B
L
O
W
S**
(/6")

**U
C
S**
Qu
(tsf)

**M
O
I
S
T**
(%)

Surface Water Elev. 403.00 ft
 Stream Bed Elev. 391.40 ft

Groundwater Elev.:
 First Encounter 384.4 ft
 Upon Completion Washed ft
 After 24 Hrs. 418.0 ft

Very dense, moist, gray, SANDY CLAY SHALE. 348.25

50/5"
50/2"

Extent of exploration.

Benchmark: National Geodetic Survey Vertical Control Mark (Brass Tablet) Q294 = 424.02'. Provided by Program Development. Located on SE corner of existing bridge, on the bearing seat area of the East abutment.

For Information Only

Latitude N 38 deg 41.252 min, Longitude W 88 deg 17.780 min, Map Datum WGS 84

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)