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Structure Geotechnical Report

F.A.I. Route 74
Section 81-1-2
Rock Island County
Job No. P-92-032-01
Contract No. 64C08
PTB No. N/A
Retaining Wall IL-RW07
Structure Number 081-6016

June 2012



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1. Project Description

This report provides geotechnical data and recommendations for the proposed Retaining Wall IL-RW07, which is part of the Central Section of the I-74 over the Mississippi River Project. The project includes reconstruction of I-74 between 14th Avenue in Moline, Illinois and Lincoln Road in Bettendorf, Iowa. The retaining wall covered by this structure geotechnical report will be a new structure, constructed to retain existing embankment and the natural bluff line to the north abutments of 19th Street.

Nearby project features that have an impact on the design or construction of the proposed retaining wall include the I-74 and Ramp 7th A over 19th Street Bridges (S.N.'s 081-0179, 081-0180 and 081-0181), the south abutment retaining wall (IL-RW06, S.N. 081-6015), the I-74 roadway, and the 19th Street roadway. Geotechnical recommendations for the bridges and Retaining Wall IL-RW06 are presented in separate structure geotechnical reports prepared by Hanson Professional Services Inc. (Hanson). Geotechnical recommendations for the interstate and street will be contained in a soil survey report prepared by Hanson.

This report supersedes the structure geotechnical report prepared by CH2M HILL in September 2009.

2. Location

The proposed Retaining Wall IL-RW07 is located in the north central portion of Rock Island County, within Sections 32 and 33 of Township 18 North, Range 1 West. It is located between 19th Street Sta. 1918+92.00 and 1928+18.00. The wall separates I-74 and Ramp 7th-A on the high side from 19th Street on the low side.

3. Proposed Structure

The general structure widths and span arrangements of the bridges over 19th Street were determined during the previous Phase I design completed by another consultant. After further geotechnical analyses and a detailed study of the project staging, the previously proposed full-height MSE abutment configurations were determined to be unfeasible. The bridge abutments were changed to a conventional, closed configuration. Retaining Wall IL-RW07, located in front of the north abutment, was shifted closer to 19th Street and significantly reduced in height. Retaining Wall IL-RW06, previously located in front of the south abutment, was terminated at the west end of the abutment.

Retaining Wall IL-RW07 is now a soldier pile and lagging wall following the outside edge of the sidewalk along 19th Street. Most of the wall is in a cut configuration, where the grade in front of the wall will be lowered from its current elevation. A small length of the wall, located under the proposed Ramp 7th-A Bridge, is in a fill configuration. The ground behind the wall generally slopes up at 1V:2H. Under the bridges, the existing 1V:2H bridge end slope intersects the top of the wall. East of the bridges, the existing natural slope typically intersects the wall a few feet below the top. Fill sloped at 1V:4H to 1V:10H will be placed between the existing hillside and the back of the wall. This fill is used to smooth the top of wall profile and facilitate surface drainage. The wall will have an exposed height, measured from the finished grade line in front to the top of wall, between 0.4 and 7.9 feet.

The proposed bridges will be constructed in stages in order to allow traffic on I-74 and 19th Street throughout the construction period. The middle portion of the bridges, located in the current I-74 median, will be constructed first, followed by the east side (WB I-74 and Ramp 7th-A), then the west side (EB I-74). The wall construction follows a similar sequence. The first stage of the wall construction is required to allow a temporary detour for 19th Street in the area of the current abutment end slope. The second stage is required to place the embankment fill for Ramp 7th-A.



4. Site Investigation

The project site is located in the steeply sloping terrain of the bluffs along the Mississippi River. 19th Street is situated in a natural ravine. There was extensive grading of the proposed bridge site during construction of the existing I-74 alignment. Along the current I-74 centerline, the base of the ravine once was between approximately Sta. 58+00 and Sta. 63+50. 19th Street was in the area where the current bridges' north abutment end slopes are located today. The existing bridges' north abutments generally were constructed on an existing hillside at or near the natural grade. The height from the toe of the bridge end slopes to the roadway grade is approximately 25 feet on the north side of 19th Street. Three existing bridge piers are located on the slope between the proposed wall and the existing bridge abutments. Presently, 19th Street slopes down to the northwest at approximately 3% grade, while I-74 slopes down to the north at approximately 3% to 6% grade.

Test boring data was shown on the existing structure plans. It is presumed that these borings were drilled in the early 1970's. Fifteen borings were drilled to depths between 30 and 79 feet below grade. Standard penetration tests were generally performed at 2.5-feet intervals until bedrock was encountered. Boring Numbers S-33, S-37, and S-38 were drilled near the north abutments of the proposed bridges. Although the soil strata logged in the upper part of these borings were disturbed by the original I-74 roadway and bridge construction, the data for the lower strata are useful for design of the new structures.

The field exploration that was completed specifically for the proposed structures was accomplished in three phases. The first two phases were completed in December 2005 and October 2007 to March 2008 by other consultants. IDOT provided the data collected from those two phases. The third phase was completed in June 2010 by Hanson. The primary purpose of the third phase was to collect additional samples of the shallow, softer soils for strength and consolidation testing. A representative from Hanson logged the boring and performed a general site reconnaissance during the third phase.

Six borings were drilled in the first two phases and one boring was drilled in the third phase. Locations of the borings were selected to avoid the numerous obstructions currently occupying the site. The maximum spacing between borings was approximately 260 feet. Standard Penetration Test samples were collected at 2.5 ft. to 5.0 ft. intervals in all borings. Several Shelby tube samples were collected at representative locations in cohesive strata. The boring depths ranged from 6.0 ft. to 67.0 ft.

The boring locations are shown on the Boring Location Plan included in the Appendix. Boring logs are included in the Appendix.

5. Laboratory Investigation

Soil samples from the first and second phase borings were tested by others. Unconfined strength and moisture content tests were completed on split-spoon samples from approximately two-thirds of the borings. Index testing was completed on representative samples.

The soil samples obtained from the third phase borings were delivered to Hanson's soils laboratory and subjected to a testing program. Natural moisture content and visual classification tests were competed on all samples. Unconfined compressive strength tests, using a Rimac spring tester, were also completed when possible. One triaxial strength test and one consolidation test were performed on Shelby tube samples.

The locations of the index tests, triaxial tests, and consolidation tests are indicated on the subsurface data profile.



6. Subsurface Profile

A subsurface data profile is presented in the Appendix for use by the structure designer. The data profile includes all of the borings that were recently drilled near the proposed structure.

The subsurface profile consists of deposits of fill material, alluvial soils, and glacial till overlying bedrock. The fill is generally located in the approach embankments on both sides of the existing structures. Alluvial soils are found at shallow depths beneath 19th Street and to the southwest. Glacial till and bedrock are present at depth over the entire site. Strata elevations and depth were quite variable due to the site's location at the base of the bluff and the significant grading completed during construction of the existing structures.

Bedrock was encountered in two of the borings drilled for this structure. The bedrock surface varies from Elev. 559.5 at the west end of the structure to Elev. 585.5 near the east end. Based on other borings in the vicinity, the rock surface is erratic. Generally there is a layer of gray to black, very soft clay shale overlying a layer of white to gray, hard limestone.

Glacial till was encountered in all of the borings except ILR0803, which did not penetrate the existing fill. The top of this stratum was encountered between Elev. 591.5 and Elev. 605.8. It is typically brown to gray, very stiff to hard, silty clay with sand and gravel. Unconfined strengths generally were between 2.5 and 3.5 tsf, although softer, weathered zones were occasionally encountered near the top. Standard Penetration Test (SPT) values were typically between 11 and 20 blows per foot. Natural moisture contents ranged from 6 to 20 percent and averaged approximately 14 percent. Thin sand seams were encountered in a few locations within the otherwise clayey till.

Alluvial soils were encountered above the till in the borings east of the existing bridges. The alluvial stratum was between 4 and 7 feet thick, where it was encountered. These soils were typically brown to gray, soft to stiff, silty clays or loose sands. Unconfined strengths were 0.4 to 2.2 tsf, with an average of 0.8 tsf. SPT values were 4 to 15 blows per foot. Natural moisture contents ranged from 12 to 21 percent.

A 6 to 23.5 feet thick layer of fill was encountered in all of the borings. It extended from the ground surface to the top of the till or alluvium. The fill material was typically brown to gray, stiff to very stiff, sandy clay or silty clay with very small quantities of random debris.

The groundwater conditions encountered in the borings were not consistent across the site. The groundwater elevations recorded on the boring logs are summarized in Table 7.1. Stabilized readings were not taken in any of the borings. For comparison, the water level in the Mississippi River, approximately 0.7 miles to the north of the site, is usually about Elev. 561.0.

Table 6.1 Groundwater Elevations

Boring No.	During Drilling	At End of Boring	24-hour Reading
ILR0701	581.3	-	-
ILR0803	-	-	-
ILR1401	-	-	-
ILR1402	-	-	-
ILR1405	-	-	-
RW401	-	-	-
RW07-1	-	599.1	-



The Illinois State Geological Survey Directory of Coal Mines does not list any mines immediately beneath the site; however, the directory does indicate that past mining has occurred in the general vicinity. Shafts for the Zeigler, Poston, and Highland Mines were located approximately 1.5 miles to the southeast of the site. These room and pillar mines were operated in the early 1900's.

7. Geotechnical Evaluations

Further analysis of the previously proposed full-height MSE abutment wall determined that configuration to be impracticable at this site. Ground improvement or removal and replacement of the softer alluvial soils would be required to meet overall stability and bearing capacity criteria. Very tall temporary shoring would be needed to excavate for the reinforced soil mass of the first phase construction. Full-height temporary MSE walls would be needed to retain the first phase reinforced soil mass during excavation for the second and third phases. One of these temporary MSE walls would have an internally reinforced bin wall configuration due to the severe skew of the structure. The cost of the ground improvement and temporary structures eliminate the typical economic advantage of the MSE abutments.

It was determined that constructing new partial-height closed abutments on the existing bridges' end slope was a better alternative. A top-down wall configuration (IL-RW07) constructed across the existing end slope will allow the bottom of the end slope to be excavated without affecting the existing and proposed bridge abutments located at the top of the slope. The area in front of Retaining Wall IL-RW07 will be used for temporary 19th Street traffic during construction of the bridge pier. This configuration eliminates the overall stability and bearing capacity deficiencies. It also results in a significant reduction in excavation and temporary wall quantities.

The grading between the Ramp 7th-A Bridge and the hillside to the east was reworked to connect the former Retaining Wall IL-RW14 to this wall. Raising the grade in that low area allows a shorter, conventional wingwall on the north abutment of the Ramp 7th-A Bridge and also presents a uniform appearance along 19th Street. Retaining Wall IL-RW07 now extends for 926 feet along 19th Street from south of I-74 to the intersection with 11th Avenue A.

Soil nail walls can be constructed in a top-down sequence, but they are not feasible when fill is required. Semi-gravity and MSE walls would require significant excavations in the existing steep slopes. A soldier pile and lagging wall can be constructed without disturbing the existing slope and bridge substructures located behind the proposed wall. A soldier pile wall can also be constructed in a bottom-up configuration where needed. For the low heights retained by this structure, tiebacks are not cost-effective.

Driven soldier pile walls are typically constructed with H-piles as the structural elements. When soldier piles are set in drilled holes, larger and more-efficient shapes may be used. The encasement concrete also increases the effective width of the soldier piles and allows for slightly smaller beams to be used. The equipment used for installing drilled soldier piles is typically more compact and mobile than the pile-driving equipment used for driven soldier piles. The drilling equipment will be used for another structure, Retaining Wall IL-RW04, in the same construction contract.

A slope stability analysis of the wall's critical section was completed to determine the overall stability of the wall. Results of this analysis are included in the Appendix. The 2.97 factor of safety satisfies AASHTO requirements.

Insignificant settlement is anticipated for most of the wall because no new fill will be placed. The estimated total settlement under the weight of the proposed fill in front of the proposed Ramp 7th-A abutment is 0.5 inch at the back of the wall.



8. Design Recommendations

A cantilever, drilled soldier pile and lagging retaining wall is recommended for the proposed structure. Design earth pressure coefficients are 0.54 for active conditions and 5.10 for passive conditions. These coefficients assume a 1V:2H slope behind the wall and level ground in front of the wall. A 130 pcf unit weight should be used for the fill and glacial till. Due to the possibility of perched groundwater, buoyant unit weights should be used for soils more than five feet below the 19th Street grade. A geocomposite drain and underdrain should be used to prevent the buildup of hydrostatic pressures behind the wall. The design of the wall should consider the temporary condition where the front face of the wall is excavated to the bottom of the facing.

In areas where fill will be placed behind the proposed wall, the soldier piles and lagging should be installed prior to placing any fill. The fill should be granular material within 5 feet of the back of facing. Use of the granular material will minimize the earth pressures from compacting around the soldier piles and against the lagging.

9. Construction Considerations

The construction of soldier pile and lagging walls is not covered by the IDOT Standard Specifications. Guide Bridge Special Provision No. 42, Drilled Soldier Pile Retaining Wall (Revised: October 15, 2011) should be included in the construction documents.

It is anticipated that a portion of the proposed wall may need to be constructed under the existing I-74 bridges. The clearance from existing grade to the bottom of the structures is approximately 16 feet. Drilling rigs capable of working within this space are readily available. Setting the soldier piles in the drilled holes will be the most difficult part of the construction. The sequence of wall construction relative to the removal of the existing bridge decks should be carefully considered. Provisions for splicing some of the soldier beams may be required.



References

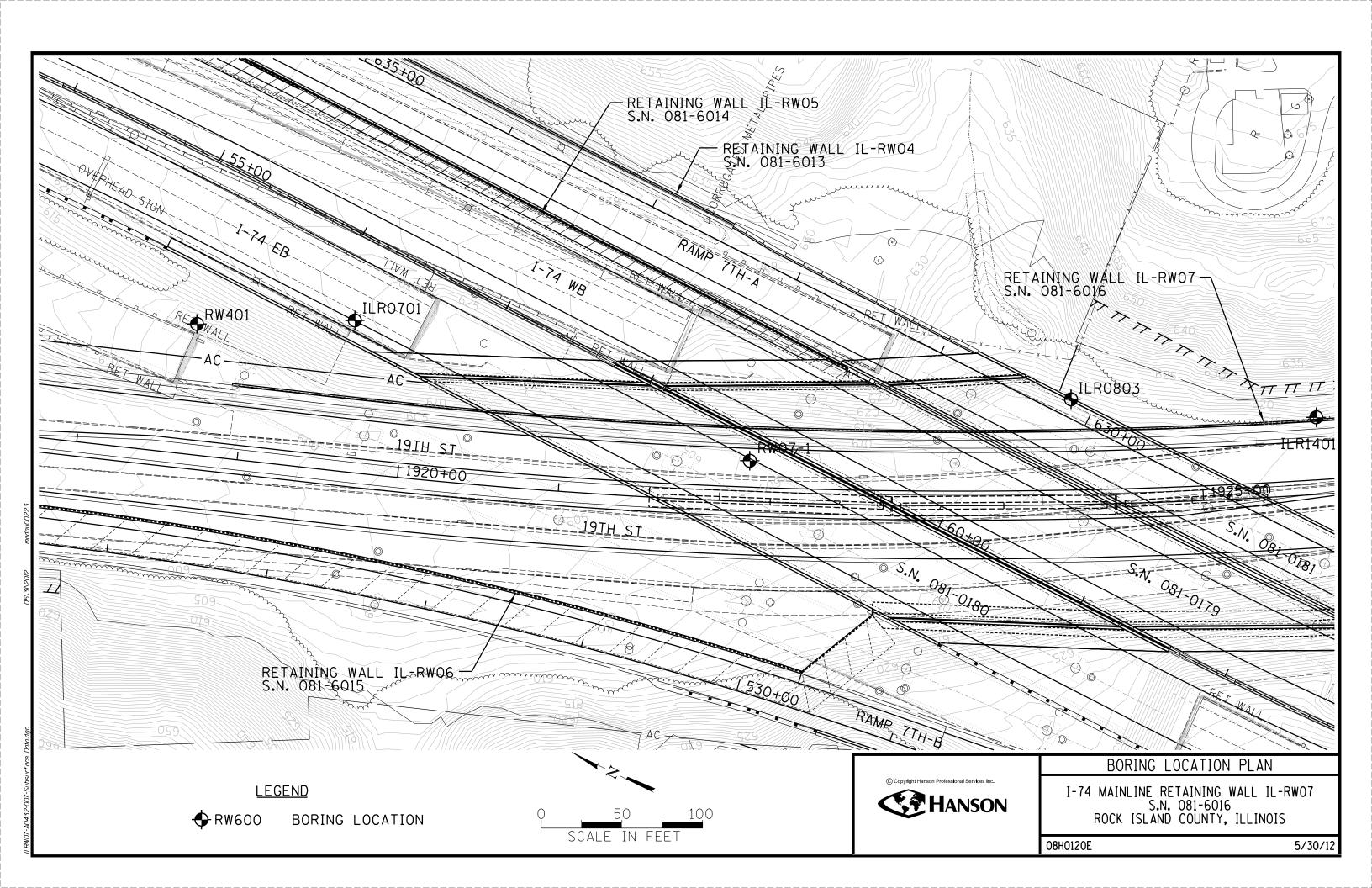
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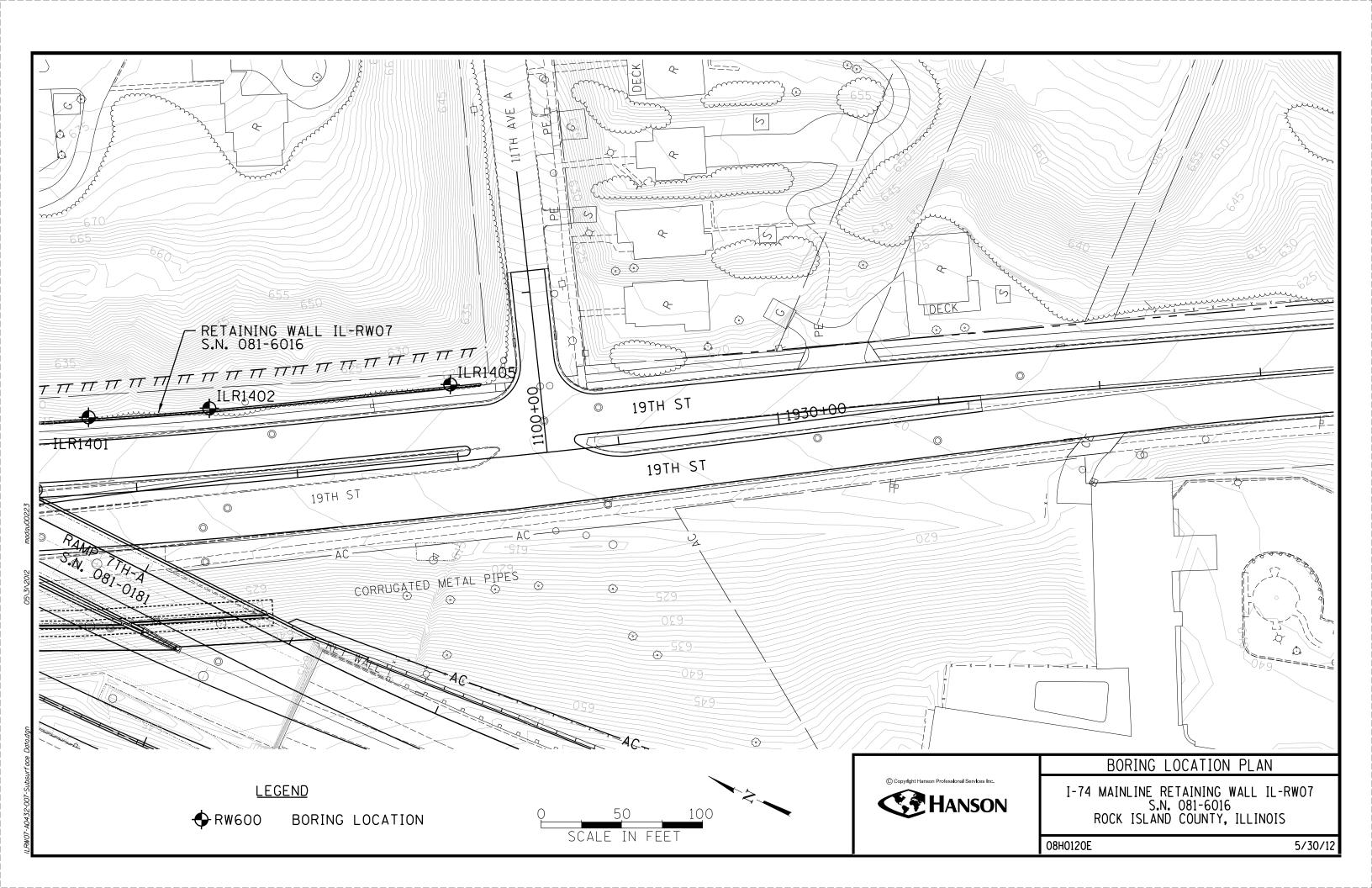


9

Appendix

Boring Location Plan Subsurface Data Profile Boring Logs Soils Laboratory Test Results Summary of Slope Stability Analysis





STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION

RW401 Sta. 55+34, 96' RT

28

50/5"

9

5

24

12

11

15

18

66

Rec. = 0% RQD = 0%

609.50

607.50-

605.50-

603.50

591.50-

583.50-

559.50-

557.50-556.50-

552.50

542.50

<u>Qu</u> <u>w%</u>

Bottom of hole = 67.0 feet

Limestone - Dark gray, fine to coarse grained, appearance is a mixture of fine sand and gravel, rutted texture, moderately weathered, weak to medium strong, moderately fractured to extremely fractured: horizontal joints, black staining, rough, undulating surfaces, very close to close spaced dicontinuities, joints are open

Sandstone - No recovery, possibly sandstone, brown, fine grained sandstone piece in bit

	ILRO	701			
	Sta. 56+20), 50′ RT	w/*/		
	629.30 628.70+	<u>N</u> <u>Qu</u>	<u>w%</u>	7" Thick A	CC followed by gravel subbase to 1.0'
	625.30	12	_ L	Silty Sandy Slasticity, s	Clay with Gravel, greenish brown, moist, low tiff, with subangular to subrounded gravel hroughout, fill/subbase
	023.30	9 3.0P_t	0 1	Sandy Clay Subangular hroughout,	Trace Gravel, dark gray, frozen, stiff, with to subrounded fine to coarse gravel embedded fill
	621.30	12 4.0P 6 2.0P	15.5	Silty Clay w nigh plastic LL=38 PI=	with gravel, gray, moist, soft to medium stiff, ity, trace gravel, possible fill
	0.15.00	1.5P		LL=30 FI= LL=32 PI=	
	615.80	5 2.0P	16.0	Sandy Lear plasficity, f	Clay Trace Gravel, gray, moist, stiff, medium ill or disturbed till (LL=30 PI=14)
	610.80			Same As A	bove, turning grayish brown at bottom 3",
Sandy Clay (CL) - Brown, dry, very stiff, with angular-subangular gravel pieces, fill		11	Ä	piece of w	ood embedded, possible fill
Sandy Clay, Trace Gravel (CL) - Brown, dry, very hard, subrounded-subangular gravel, fine to coarse, fill	605.80			2 4. 1.	Olay Tanas Campal has a milk street
Fill - Concrete rubble pieces Silty Clay (CL) - Brown gray, moist, soft, low plasticity, fill		12 3.0P	Ä	sandy Lear plasticity, p	Clay Trace Gravel, brown, moist, stiff, low ossible weathered till
Dark brown, moist, soft, low plasticity, rounded-subrounded, fine to medium gravel throughout, fill	600.80	2.5P to	0 4	Same As A	bove, gray, then brown, split in almost
No recovery possible due to piece of coarse gravel stuck in shoe		2.5P to 15 3.5P	15.0 v	rertical wit	h reddish brown surface, weathered till
Dark brown, stiff, low plasticity	595.80	2.5P	to	~	
Similar to above with fine to medium, rounded-subrounded gravel, fill		12 3.0P			Clay Trace Gravel, gray, moist, stiff, low Inweathered till
Sandy Clay (CL) - Light brown, moist, stiff, with clay seams, fine to medium, rounded-subrounded gravel embedded throughout, possible gumbotil		15 2.5P			
Similar to chave dark raddish brown					
Similar to above, dark reddish brown Sandy Lean Clay Trace Gravel (CL) - Gray, moist, stiff, fine to medium rounded-subrounded	1 <u>DD</u>		_		
gravél embeddéd throughout, glacial clay	581.30 \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	0.0	/ }	Fop 3" is s Sand, gray,	same as above; Bottom 12" is Poorly Graded wet, medium dense, fine to medium sand seam 3" of gray sandy lean clay, trace gravel, till
	<i>579.30</i> [⊥]	28			hole = 50.0 feet
					<u>LEGEND</u>
Sandy Shale - Dark gray, dry, hard, weathered shale with coal and sand seams				N	Standard Penetration Test N (blows/ft)
				Qu w%	Unconfined Strength (tsf) Natural Moisture Content (%)
Shale - gray, very fine grain, soft, slightly weathered, very weak, sound rock, very sandy; horizontal joints, possibly caused during core retrieval, no staining, smooth, planar joint surfaces, 2" thick soft, silty infilling at shale sandstone interface				0	Unconsolidated Undrained Triaxial Test
Limestone - Dark gray, fine to coarse grained, appearance is a mixture of fine sand and gravel, rutted texture, moderately weathered, weak to medium strong, moderately fractured to extremely fractured to include the process of the surfaces, very close to close spaced dicontinuities, joints are open				R C	Consolidated Undrained Triaxial Test Consolidation Test
surraces, very close to close spaced dicontinuities, joints are open				ממ	Water Surface Elevation Encountered in Bori

RWC Sta. 58+7	
605.10	N Qu <u>w%</u>
604.70	CONCRETE
600 10	15 I4 FILL - Brown, moist, very stiff, clayey SILT with trace 1.67S I3 sand 0.90B 20 1.95S I3
600.10 	Oh Brown, wet, silty, clayey, fine-grained SAND with trace gravel
	5 0.42B 21 R Dark brown, moist, soft to stiff, clayey SILT 1.25P 19 6 C
596 . 10 -	Brown, wet, silty, clayey, fine-grained SAND with gravel
50440	brown, wer, siny, clayey, time grained SAND with graver
594.10 -	22 2.30P 13 Brown, moist, very stiff, clayey SILT with trace sand and 3.11B 16 gravel
<i>591.60</i>	3.04B 15 Gray, moist, very stiff, silty CLAY with trace sand and aravel
	19 2.19B 14 2.93B 13 4.43B 13 3.50P 13
585 . 10-	D.H

Bottom of hole = 20.0 feet

- (%)
- Triaxial Test
- Triaxial Test
- DD Water Surface Elevation Encountered in Boring 558.10

DD = during drilling 24h = 24 hours after completion

SUBSURFACE DATA PROFILE STRUCTURE NO. 081-6016

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Hanson Professional Services Inc.

^{ЈОВ НО} . 08H0120E	SHEET	NO. 1
5/30/12	3 SHI	EETS

F.A.I RTE.	SECT	TION		COI	UNTY	TOTAL SHEETS	SHEET NO.
74	81-1	1-2		ROCK	ISLAND	-	
				CON	TRACT	NO. 64	1C08
FED. RO	DAD DIST. NO	ILLINOIS	FED. AI	D PROJ	ECT		

STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION

ILR0803 Sta. 630+15, 11' RT <u>N Qu w%</u> 614.67 -Silt With Trace Sand (ML) - yellowish brown, slightly moist, medium stiff, fine to coarse grained, low plasticity 8 6.7S very stiff 29 4.0P 608.67 Bottom of hole = 6.0 feet

ILR1 Sta. 1925+1		, , T		
616.50	N	<u>Qu</u>	<u>w%</u>	
010.30				Clay (CL) - gray, moist, stiff, moderate plasticity, trace of sand
	15	2.0P		
	11	1.3S		stiff
	11	1.0P		stiff
	4	0.5P	16	soft, trace of coarse sand
604.50	4			no recovery, possibly due to gravel at the tip
604.50	7			Silty Sand (SM) - reddish brown, slightly moist, loose, fine to coarse grained, low plasticity fines
602.50—	7	6.1S	6	Clay with Trace of Sand (CL) - brown, slightly moist, firm, fine to medium grained, moderate plasticity
	33	4.5P	14	hard (LL=33 PI=14)
	28	15 . 0S		very stiff
	50/2	ıı		
586.50				Bottom of hole = 30.0 feet

ILR1: Sta. 1926+4		′ <i>I T</i>							
615.48	<u>N</u>	<u>Qu</u>	<u>w%</u>						
013.40				Clay (CL) - dark gray, slightly moist, stiff, fine to coarse grained, low plasticity					
	12	2.5P		very stiff, trace of broken brick fragments					
609.48	21		10	(LL=31 PI=18)					
003.70	9	2.25	12	Silt with Sand (ML) - gray, slightly moist, stiff, fine to medium grained, low plasticity, trace of coarse sand					
605,48	8			no recovery (LL=31 PI=16)					
003.40	5	1.5P		Clay (CL) - dark brown, slightly moist, firm, low plasticity, trace of coarse sand and chipped gravel					
	6	6 1.0P	20	firm, no gravel observed (II = 36 PI = 18)					
	12	12 6.6S		brown, stiff					
	13	2.5P	13	gray, stiff, trace of coarse sand (LL=29 PI=14)					
	22	3.0P		very stiff, trace of rounded gravel, <1/2"					
585.48	24			wet, very stiff, Shale on the tip Bottom of hole = 30.0 feet					

<u>LEGEND</u>

N Standard Penetration Test N (blows/ft)

Unconfined Strength (tsf)

w% Natural Moisture Content (%)

Unconsolidated Undrained Triaxial Test R

Consolidated Undrained Triaxial Test

24h = 24 hours after completion

CConsolidation Test

558.10

DD Water Surface Elevation Encountered in Boring DD = during drilling

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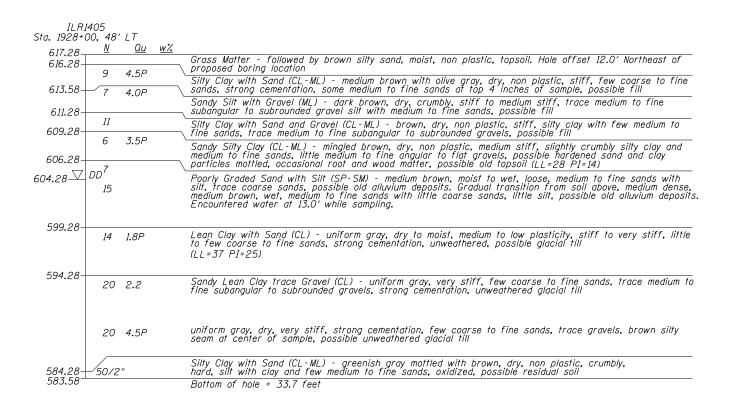
SHEET NO.2 08H0120E 3 SHEETS DATE 5/30/12

STRUCTURE NO. 081-6016 TOTAL SHEET NO. F.A.I RTE. SECTION COUNTY 74 81-1-2 ROCK ISLAND CONTRACT NO. 64CO8

FED. ROAD DIST. NO. _ ILLINOIS FED. AID PROJECT

SUBSURFACE DATA PROFILE

STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION



LEGEND

Standard Penetration Test N (blows/ft)

Qu Unconfined Strength (tsf)

w% Natural Moisture Content (%)

Unconsolidated Undrained Triaxial Test

Consolidated Undrained Triaxial Test

CConsolidation Test

R

DD

558**.**10 🔽

Water Surface Elevation Encountered in Boring DD = during drilling 24h = 24 hours after completion

SHEET NO.3 08H0120E 3 SHEETS 5/30/12

TOTAL SHEET SHEETS NO. F.A.I RTE. SECTION COUNTY 74 81-1-2 ROCK ISLAND CONTRACT NO. 64CO8 FED. ROAD DIST. NO. _ ILLINOIS FED. AID PROJECT

SUBSURFACE DATA PROFILE

STRUCTURE NO. 081-6016

PROFESSIONAL DESIGN FIRM LICENSE #184-001084



Page $\underline{1}$ of $\underline{3}$

Date <u>3/28/08</u>

ROUTE	I-74	DE	SCR	IPTIOI	N		I-74 SB Near 7th Avenue	LC)GG	ED BY	′ <u>B. K</u>	arnik
SECTION _	I-74 Bridge over Mis River	sissippi	_ L	OCA	ΓΙΟΝ _	(N=56	2235.7741, E=2459668.0033), SEC.	32, TW	P. 18	3N, RN	IG . 1W	1
COUNTY _	Rock Island D	RILLING	Э МЕ	THOE)	ŀ	HSA, CME 55 HAMMER	TYPE .	CN	ИЕ AU	TOMA	TIC
Station BORING NO Station Offset	OILR0701 urface Elev. 629.30		D E P T H	B L O W S	U C S Qu (tsf)	M O I S T (%)	Surface Water Elev. Stream Bed Elev. Groundwater Elev.: First Encounter 581.3 Upon Completion After Hrs.	_ ft _ ft <u>▼</u> _ ft	D E P T H	B L O W S	U C S Qu (tsf)	M O I S T
7" Thick AC subbase to	C followed by gravel 1.0'	628.70					Same As Above, turning grayish brown at bottom 3", piece of wood embedded, possible fill (continued)				, ,	
greenish bro plasticity, sti subrounded throughout,	Clay with Gravel, own, moist, low ff, with subangular to gravel embedded fill/subbase	625.30	_	2 2 10 4			Sandy Lean Clay Trave Gravel, brown, moist, stiff, low plasticity,	605.80		5	2.0	
gray, frozen to subround	Trace Gravel, dark, stiff, with subangular ed fine to coarse edded throughout, fill	621.30	-5		3.0 to 4.0		possible weathered till		-25 	1 . 1	3.0 P	
soft to medi	th Gravel, gray, moist, um stiff, high plasticity, , possible fill		-10	2 3 3	P 2.0 P	15.5	Same as Above, gray, then brown, split in almost vertical with reddish brown surface, weathered till		-30	6 7 8	2.5 to 3.5 P	15.0
gray, moist,	Clay Trace Gravel, stiff, medium or disturbed till	615.80	-15	3 2 3	2.0 P	16.0	Sandy Lean Clay Trace Gravel, gray, moist, stiff, low plasticity, unweathered till	595.80	-35	4 6 6	2.5 to 3.0 P	
	pove, turning grayish ttom 3", piece of wood possible fill	610.80	-20	3 4 7						5 6 9	2.5 P	



Page $\underline{2}$ of $\underline{3}$

Date 3/28/08

DESCRIPTION I-74 SB Near 7th Avenue **LOGGED BY** B. Karnik I-74 I-74 Bridge over Mississippi River **LOCATION** (N=562235.7741, E=2459668.0033), **SEC.** 32, **TWP.** 18N, **RNG.** 1W SECTION Rock Island __ DRILLING METHOD __ COUNTY HSA, CME 55 HAMMER TYPE CME AUTOMATIC U В U M M STRUCT. NO. _____ Surface Water Elev. L С 0 Ε L С 0 Stream Bed Elev. Station Ρ S Ρ S 0 ı 0 ı BORING NO. ILR0701 Т W Т S W S Groundwater Elev.: S Qu Т S Qu Т Station _____ First Encounter ___581.3__ **ft** ▼ Offset Upon Completion (ft) (/6") (%) (ft) (/6") (tsf) (tsf) (%) **Ground Surface Elev.** 629.30 Hrs. Sandy Lean Clay Trace Gravel, gray, moist, stiff, low plasticity, unweathered till (continued) Top 3" is same as above 12 Bottom 12" is Poorly Graded 16 Sand, gray, wet, medium dense, 12 579.30 fine to medium sand seam followed by 3" of gray sandy lean clay, trace gravel, till End of Boring



Page $\underline{1}$ of $\underline{1}$

Date 10/9/07

ROUTE I-74	DES	SCRIE	PTION	I	W I-74	Approach	River - Illinois	OGGED⊞X6 <u>e, Kaustav/</u> SCO					
SECTIONR	over Mississippi Liver	_ L(OCAT	ION_	(N=56	1816.075, E=2459820.0	33), SEC. 32, TWP.	18N, RNG. 1W, 4 th PM					
COUNTY Rock Island	DRILLING	MET	ГНОD		F	ISA, CME 55	HAMMER TYPE CME AUTOMATIC						
STRUCT. NO		D E P T	B L O W	U C S	M O I S	Surface Water Elev Stream Bed Elev	ft ft						
Station Offset Ground Surface Elev.		H (ft)	S	Qu (tsf)	T (%)	Groundwater Elev.: First Encounter Upon Completion After Hrs.	ft						
silt With Trace Sand(ML) yellowish brown, slightly m medium stiff, fine to coarse grained, low plasticity	noist,		2 4 4	6.7 S									
very stiff		-5	2 10 19	4.0 P									
End of Boring	608.67	-10 -10 -15 											



Page $\underline{1}$ of $\underline{1}$

Date <u>10/5/07</u>
New I-74 Bridge Over Mississippi River - Illinois

ROUTE -74	DES	CR	IPTIOI	N		Approach	LC	OGG	ED BY	′k	(B
I-74 Bridge over Miss	iggizziz										
SECTION River		_ L	OCA1	LION _	(N=56	1674.863, E=2459877.089), SEC. 3	2, TWP.	18N	RNG	.1W, 4	I th PM
COUNTY Rock Island Di	RILLING	ME	THOD		ŀ	HSA, CME 55 HAMMER	R TYPE	CI	ИЕ AU	TOMA	TIC
STRUCT. NO		D E P	вьо	U C S	— О М	Surface Water Elev. Stream Bed Elev.	ft ft	D E P	ВЬО	U C S	M 0 1
BORING NO. ILR1401 Station Offset		T H	W S	Qu	S T	Groundwater Elev.: First Encounter Upon Completion	_ ft	T H	W S	Qu	S T
Ground Surface Elev. 616.50	ft	(ft)	(/6")	(tsf)	(%)	After Hrs.	_ ft	(ft)	(/6")	(tsf)	(%)
Clay (CL) gray, moist, stiff, moderate plasticity, trace of sand	- -		3			Clay With Trace Of Sand(CL) brown, slightly moist, firm, fine to medium grained, moderate plasticity (continued)					
		_	10	2.0				_			
	-	_	5	2.0 P		very stiff			9	15.0	
stiff	-		3						17	13.0 S	
	-	-5	5	1.3 S				-25			
	_										
stiff			2								
	_		4	1.0							
		_	7	Р				_			
soft, trace of coarse sand	-		1						50/2"		
soit, trace of coarse sain		_	2	0.5	16.0				30/2		
	-		2	P							
no recovery, possibly due to grave		-10	0			End of Boring	586.50	-30			
at the tip		_	0			Lind of Borning		_			
	-	-	4								
	604.50							_			
Silty Sand (SM)			4								
reddish brown, slightly moist, loose, fine to coarse grained, low	_		4								
plasticity fines			3					_			
Clay With Trace Of Sand(CL)	602.50		2								
brown, slightly moist, firm, fine to medium grained, moderate plasticity	-	-15	2 5	6.1 S	6.0			-35			
	-										
								_			
	_										
	-										
hard		_	10	4.5	14.0			_			
	-		15	4.5	14.0						
		_	18	Р							



New I-74 Bridge Over Mississippi River - Illinois

Page $\underline{1}$ of $\underline{1}$

Date 10/5/07

DESCRIPTION LOGGED BY KB I-74 Approach I-74 Bridge over Mississippi River **LOCATION** (N=561610.195, E=2459915.128), **SEC.** 32, **TWP.** 18N, **RNG.** 1W, 4th **PM** SECTION COUNTY Rock Island DRILLING METHOD HSA, CME 55 _ HAMMER TYPE _ CME AUTOMATIC U D В U M M STRUCT. NO. Surface Water Elev. Ε Ε L С 0 L С 0 Stream Bed Elev. ft Station Ρ S S 0 Ρ ı 0 ı Т W Т S W S BORING NO. ILR1402 Groundwater Elev.: S Qu T S Qu Т Station _____ First Encounter Offset Upon Completion ft (ft) (/6") (%) (ft) (/6") (%) (tsf) (tsf) **Ground Surface Elev.** 615.48 After Hrs. Clay (CL) Clay (CL) dark gray, slightly moist, stiff, fine dark brown, slightly moist, firm, low plasticity, trace of coarse sand and to coarse grained, low plasticity chipped gravel (continued) very stiff, trace of broken brick 3 fragments 4 2.5 Ρ 8

very stiff, trace of rounded gravel, 9 3.0 4 13 Ρ 7 10.0 14 Silt With Sand(ML) 2 gray, slightly moist, stiff, fine to 3 2.2 12.0 medium grained, low plasticity, 6 S trace of coarse sand no recovery 2 wet, very stiff, Shale on the tip 4 9 4 15 585.48 605.48 Clay (CL) dark brown, slightly moist, firm, low 2 1.5 plasticity, trace of coarse sand and 3 Ρ chipped gravel firm, No gravel observed 1 End of Boring 3 1.0 20.0 3 Ρ brown, stiff 4 5 6.6 S 7 gray, stiff, trace of coarse sand 4 6 2.5 13.0 7 Ρ



Page <u>1</u> of <u>1</u>

Date <u>10/9/07</u>

New I-74 Bridge Over Mississippi River - Illinois DESCRIPTION I-74 Approach LOGGED BY F. Abreu I-74 Bridge over Mississippi River **LOCATION** (N=561482.735, E=2459994.211), **SEC.** 32, **TWP.** 18N, **RNG.** 1W, 4th **PM** SECTION COUNTY Rock Island DRILLING METHOD HSA, CME 55 HAMMER TYPE CME AUTOMATIC U D В U M M STRUCT. NO. Surface Water Elev._____ С Ε L 0 L С 0 Stream Bed Elev. ft Station Ρ S Ρ S 0 0 Т ı Т BORING NO. ILR1405 W S Т W S Groundwater Elev.: S Qu T S Qu Т Station First Encounter Upon Completion Offset (%) (ft) (/6") (ft) (/6") (%) (tsf) (tsf) **Ground Surface Elev.** 617.28 After Hrs. Lean Clay With Sand(CL) Grass Matter followed by brown silty sand, uniform gray, dry to moist, medium 616.28 to low plasticity, stiff to very stiff, moist, non plastic, topsoil Hole 5 offset 12.0' Northeast of proposed little to few coarse to fine sands, 4 4.5 boring location strong cementation, unweathered, 5 Р possible glacial till (continued) Silty Clay With Sand(CL-ML) 6 medium brown with olive gray, dry, non plastic, stiff, few coarse to fine Sandy Lean Clay Trace Gravel 4 4 sands, strong cementation, some 613.58 (CL) 2.2 4.0 8 3 medium to fine sands at top 4 uniform gray, very stiff, few coarse 12 4 inches of sample, possible fill to fine sands, trace medium to fine 7 14 Sandy Silt With Gravel(ML) subangular to subrounded gravels, strong cementation, unweathered dark brown, dry, crumbly, stiff to medium stiff, trace medium to fine 611.28 glacial till subangular to subrounded gravel 3 silt with medium to fine sands, 6 possible fill 5 Silty Clay With Sand And Gravel 6 609.28 (CL-ML) 3 uniform gray, dry, very stiff, strong brown, dry, non plastic, stiff, silty cementation, few coarse to fine clay with few medium to fine 8 4.5 3.5 3 sands, trace gravels, brown silty sands, trace medium to fine Ρ 12 Ρ 3 seam at center of sample, possible subangular to subrounded gravels, 16 3 -10 unweathered glacial till possible fill Sandy Silty Clay(CL-ML) mingled brown, dry, non plastic, 606.28 1 medium stiff, slightly crumbly silty clay and medium to fine sands, 3 little medium to fine angular to flat 4 gravels, possible hardened sand 5 and clay particles mottled, Silty Clay With Sand(CL-ML) 24 5 occasional root and wood matter, greenish gray mottled with brown. 50/2 possible old topsoil 7 dry, non plastic, crumbly, hard, silt **Poorly Graded Sand With Silt** 8 with clay and few medium to fine (SP-SM) 8 sands, oxidized, possible residual medium brown, moist to wet, loose, medium to fine sands with End of Boring silt, trace coarse sands, possible old alluvium deposits Gradual transition from soil above same as above, medium dense, medium brown, wet, medium to 599.28 fine sands with little coarse sands, 4 little silt, possible old alluvium 6 1.8 deposits Encountered water at 13.0' while 8 S sampling 10



PROJECT NUMBER: 158835.AA.GS.01

BORING NUMBER: RW401

SHEET 1 OF 3

SOIL BORING LOG

PROJECT : I-74 Bridge over Mississippi River, Quad Cities IA/IL LOCATION : (562322.6 N, 2459622.9 E)

ELEVATION: 609.5 ft MSL DRILLING CONTRACTOR: Terracon

DRILLING METHOD AND EQUIPMENT : CME-550, 6" power auger, HSA, SPT with automatic hammer CME-50

WATER	LEVELS			,	6" power auger, HSA, SP1 with automatic nammer CME-50 START : 12/16/05 09:45 END :		5 15	5:00 LOGGER : B. Karnik
			GRADE (ft)	STANDARD	SOIL DESCRIPTION		$\overline{}$	COMMENTS
	INTERV	AL (ft)		PENETRATION TEST RESULTS		770	П	
	RECOVERY (in)				SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR	J'I'C		DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND
			#TYPE	6"-6"-6" (N)	CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SYMBOLLIC LOG	Frozen	INSTRUMENTATION
609.5_ - -	2.0	14.0	S-1-SS	3-7-9-8 (16)	Sandy Clay (CL) Brown, dry, very stiff, with angular-subangular gravel pieces, fill		×	Hole offset to gps #50 adjacent to ramp abutment
-	4.0	10.0	S-2-SS	9-13-15-50/1 (28)	Sandy Clay, Trace Gravel (CL) Brown, dry, very hard, subrounded-subangular gravel, fine to coarse, fill		×	
5_ 604.5_	6.0	1.0	S-3-SS	50/5 (50/5")	Fill Concrete rubble pieces			Ground frozen to approximately 4' deep
- - - -	8.0	6.0	S-4-SS	7-5-4-3 (9)	Silty Clay (CL) Brown gray, moist, soft, low plasticity, fill			
10	10.0	6.0	S-5-SS	3-2-3-5 (5)	Dark brown, moist, soft, low plasticity, rounded-subrounded, fine to medium gravel throughout fill			
599.5_ - -	12.0		S-6-SS	4-13-11-6 (24)	No recovery possibly due to piece of coarse gravel stuck in shoe			
-	14.0	18.0	S-7-SS	4-3-4-4 (7)	Dark brown, stiff, low plasticity			
15 594.5_	16.0	19.0	S-8-SS	3-5-7-8 (12)	Similar to above with fine to medium, rounded-subrounded gravel, fill			
- - - -								
20	20.0				Sandy Clay (CL) Light brown, moist, stiff, with clay seams, fine to medium, rounded-subrounded gravel embedded throughout, possible gumbotil			
-	22.0	21.0	S-9-SS	3-4-7-10 (11)				
- - - - -								
25_ ⁻ 584.5_ -	25.0	22.0	S-10-SS	4-7-8-10 (15)	Similar to above, dark reddish brown Sandy Lean Clay Trace Gravel (CL)			
-	27.0			(10)	Gray, moist, stiff, fine to medium rounded-subrounded gravel embedded throughout, glacial clay			
30	29.0			4-7-8-9				Start mud rotary at 29' after sampling



PROJECT NUMBER: 158835.AA.GS.01

BORING NUMBER: RW401

SHEET 2 OF 3

SOIL BORING LOG

PROJECT : I-74 Bridge over Mississippi River, Quad Cities IA/IL LOCATION : (562322.6 N, 2459622.9 E)

ELEVATION: 609.5 ft MSL DRILLING CONTRACTOR: Terracon

DRILLING METHOD AND EQUIPMENT : CME-550, 6" power auger, HSA, SPT with automatic hammer CME-50

INTERVAL (ft) RECOVERY (in) RECOVERY (in) PINITATION PENETRATION TEST RESULTS SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR DEPTH OF CASIN MOISTURE CONTENT, RELATIVE DENSITY OR	MENTS NG, DRILLING RATE, LOSS, TESTS, AND MENTATION
579.5 31.0 23.0 S-11-SS (15) 35 574.5	LOSS, TESTS, AND
579.5 31.0 23.0 S-11-SS (15) 35 574.5	MENTATION
579.5 31.0 23.0 S-11-SS (15) 35 574.5 24.0 S-12-SS 5-8-10-12 (18)	- - - - -
574.5 - - - - - - - - - - - - -	- -
Sandy Shale Dark gray, dry, hard, weathered shale with coal and sand seams Spoon refusal at 51' am, start rock coring See the next sheet for the rock core log See the next sheet for the r	' end drilling at 11:50



PROJECT NUMBER: 158835.AA.GS.01

BORING NUMBER: RW401

SHEET 3 OF 3

ROCK CORE LOG

PROJECT : I-74 Bridge over Mississippi River, Quad Cities IA/IL LOCATION : (562322.6 N, 2459622.9 E)

ELEVATION: 609.5 ft MSL DRILLING CONTRACTOR: Terracon

CORING METHOD AND EQUIPMENT: CME-550, NQ DOUBLE BARREL DIAMOND TIP **ORIENTATION: VERTICAL WATER LEVELS:** START: 12/16/05 09:45 END: 12/16/05 15:00 LOGGER: B. Karnik DISCONTINUITIES LITHOLOGY COMMENTS CORE RUN, LENGTH, AND RECOVERY (%) LOW (f) FRACTURES PER FOOT DESCRIPTION ROCK TYPE COLOR SYMBOLLIC DEPTH BELO SURFACE (f SIZE AND DEPTH OF CASING, FLUID LOSS, CORING RATE AND SMOOTHNESS, CAVING ROD MINERALOGY, TEXTURE, WEATHERING, HARDNESS, AND ROCK MASS RQD(%) DEPTH, TYPE, ORIENTATION, ROUGHNESS, PLANARITY, INFILLING MATERIAL AND THICKNESS, SURFACE STAINING, AND TIGHTNESS DROPS, TEST RESULTS, ETC. CHARACTERISTICS Shale Shale: horizontal joints, possibly caused during 1 core retrieval, no staining, smooth, planar joint surfaces, 2" thick soft, silty infilling at shale Gray, very fine grain, soft, slightly weathered, very weak, sound rock, 5 sandstone interface very sandy R-1-NQ Limestone: horizontal joints, black staining, Limestone 5 ft 23 rough, undulating surfaces, very close to close 55 Dark gray, fine to coarse grained, 45% 554.5 spaced discontinuities, joints are open appearance is a mixture of fine sand and gravel, rutted texture, moderately weathered, weak to medium strong, moderately fractured to extremely 57.0 fractured Rate of coring: 5 minutes for Sandstone?? 5', very poor recovery No recovery, possibly sandstone, brown, fine grained sandstone piece in R-2-NQ 5 ft 0 60 0% 549.5 62.0 Rate of coring: 6 minutes for 5', rock piece stuck in bit plugged up barrel R-3-NQ 5 ft 0 65 0% 544.5 67.0 Bottom of Boring at 67.0 ft below No recovery between 62' to ground surface on 12/16/05 15:00 67' driller could not figure out what was wrong, abandoned drilling at 67' at 3:00pm, coring rate 7 70 minutes for 5' 539.5 75 534.5 529.5

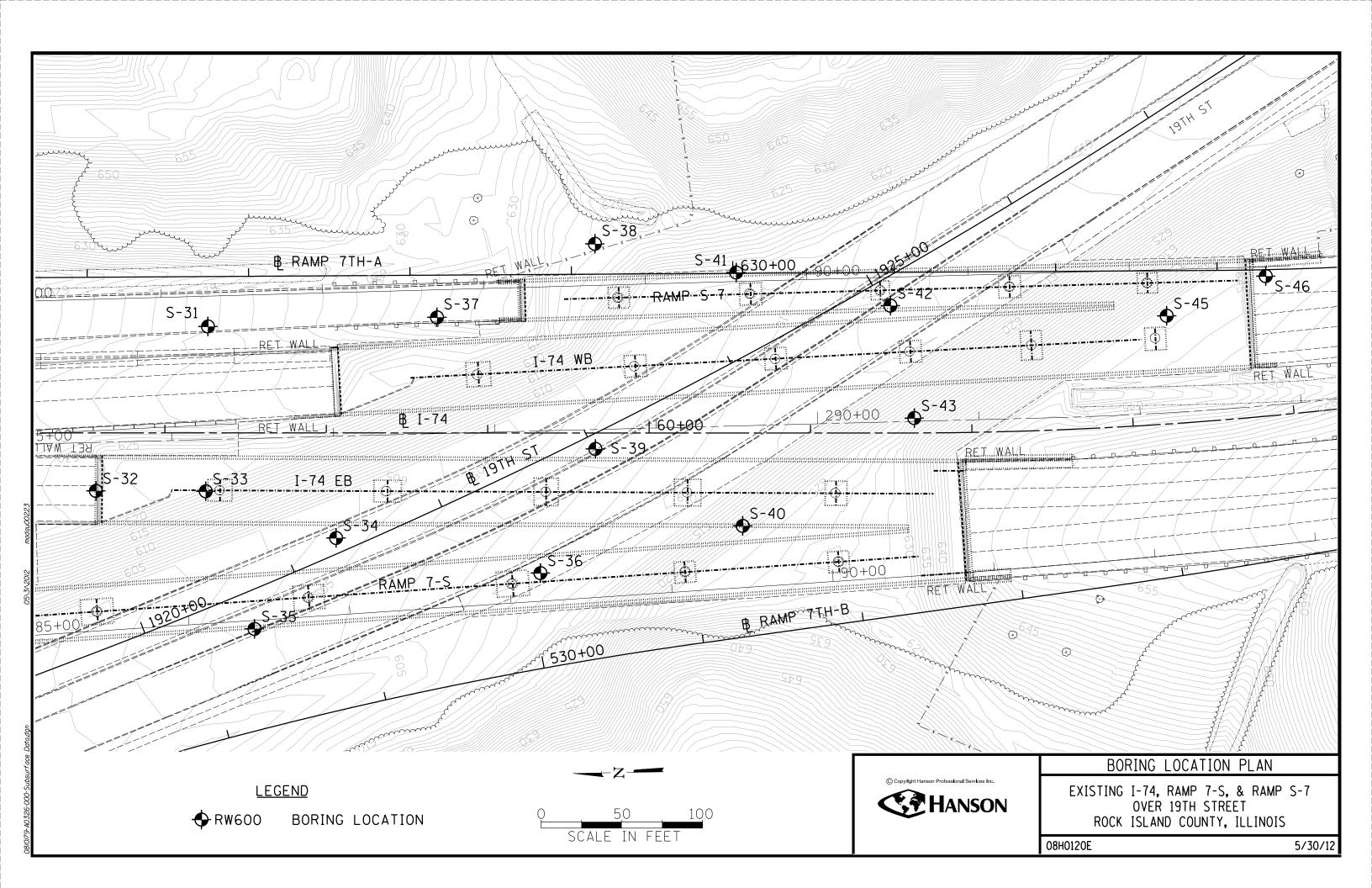


HANSON SOIL BORING LOG

Page $\underline{1}$ of $\underline{1}$

Date 6/22/10 ROUTE F.A.I. 74 DESCRIPTION I-74 Over Mississippi River LOGGED BY JMB **SECTION** _______ 81-1-2 **LOCATION** _SW¼ of SEC. 33, TWP. 18N, RNG. 1W, 4th P.M. COUNTY Rock Island DRILLING METHOD Hollow Stem Auger HAMMER TYPE Auto U M **STRUCT. NO.** 081-6016 Surface Water Elev. _____ С L 0 Stream Bed Elev. Station _____ RW 07-1 Station Ρ S 0 ı Т W S **Station** <u>58+77</u> Groundwater Elev.: S Qu Т 15' Rt. Offset First Encounter Upon Completion 599.1 ft ∇ Ground Surface Elev. 605.1 ft (ft) (/6") (%) (tsf) After ____ Hrs. CONCRETE 604.70 FILL - Brown, moist, very stiff, clayey SILT with trace sand 4 8 7 13 1.67S 0.90B 20 1.95S 13 600.10 Brown, wet, silty, clayey, fine-grained SAND with trace 59<u>9.10</u> gravel 0.42B 21 Dark brown, moist, soft to stiff. 2 clayey SILT 3 1.25P 19 596.10 Brown, wet, silty, clayey, fine-grained SAND with gravel 10-594.10 Brown, moist, very stiff, clayey 2.30P 5 13 SILT with trace sand and gravel 15 12-7 3.11B 591.60 Gray, moist, very stiff, silty CLAY 3.04B 15 with trace sand and gravel 2.19B 8 11 2.93B 13 4.43B 13 3.50P 13 585.10₂₀

End of Boring 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)



TEST BORING NO. 5-31 STATION 286+24 - 70° LT.

N Q_L W(%)

3.3 i4 8 -22 3.9 i3 TEST BORING NO. 5-32 STATION 285+52 - 30' RT. Q TEST BORING NO. 5:33 STATION 286+20 - 32' RT. Q TEST BORING NO. 5-34 STATION 287+00 - 53+ RT. Q TEST BORING NO. 5-35 STATION 286+48 - 1181 RT. Q DWG. NO. B-4

852.0'---650 Hard Mott ed Brown-plack --- 29 1 03 B SILT 645 646.0 - 30 8₂0 II -- 39 9₂0 9 Hard -53 9₆0 8 Brown ____ цц 9,0 7 Е SILT 635 LOAM - 92 10<u>:</u>0 6 with --- 63 10.0 7 Gravel (1111) 630 — 26 5_è0 12 625 626.0 -18 3.7 II — 18 3₈5 13 620 - 15 3.3 II --- 16 3,3 13 -20 3₂5 12 --- 27 6.3 II Stiff 610 - 18 3,5 15 -- 15 3,1 14 LOAM - 16 3.3 15 with — 15 3_{.0} 15 -16 3,2 14 (Till) -- 22 5 595 - 16 3.3 15 --- 18 3,3 I5 590 -+8 3.4 III --21 3.7 14 -- 15 3₈ 1 14 ___ i i g i7

613.51	Very Stiff									
	Crumoly Brown									
607.5	SILT	22 2.25 10 9.0 10 29 8								manufact to the contract of th
and the second s				- Allendary and the state of th	603.51-	Black SILTY CLAY	generative	603.0	Black SILTY CLAY	g (Francisco)
	Hard to	32 5.9 12 \$ 0 12 601.5'	-			SS C fi		601.5	Stiff to	
Addition and an experience of an experience of the desire	Very Still	15 3.5 14		2.9 14 B		Brown Staty	5 0.8		Very Soft Brown	5 1.0 20
	to E	16 B 16	Ver/	B 2.75 14	593.5	CLAY	8 0.5 17 8	593.5 -	SILTY CLAY Medium Brown	3 0.3 19
	Grey SILTY CLAY	14 2,3 15 8 15	Brown	2.65 IS		Programme Commission	2,25 15	591.0 -	GRAVEL	18
	LOAM W: 11	13 2.5 15 B	to Grey	-16 2 H 14		Stiff	- 13 2.2 16 S 15		Non-Anguage Communication	ц 1.2 20 В 7 1.2 18
	GEBVE!	13 2.6 14	SILTY	16 2.80 !5			E 14 2.3 16	design of the second state	Acres (Acres (Ac	11 2.3 IS
SECURIOR SECURIOR CONTRACTOR CONT	and other control and the cont	15 3 ₆ 10 16	LOAM with	-15 2.75 15 8 15		Grey CLAY	15 2.8 13		CDF ○ ₩/ft	12 2.3 17
580.5	Dense	20	Grave!			7 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	E 2.6 13	and the second s	au C	13 2,4 15
	Wet Brown SAND	37	A CONTRACTOR OF THE CONTRACTOR	18 2.3 III	576.5	Stiff Grey	- 18 2.9 15 8		GLAY	14 2,3 14 8 8 18
575.0-	\$tiff Grey CLAY LOAM	28 1,75 21 574.5	Hard Grey] 23 2 4 15 8 4.58		CLAY TILL with Sand Layers	10 1.11 15 5 15 18 2.9 15		word word was a second word with the second word word with the second word word word word word word word wor	13 2.8 18 B 15 2.8 15
	with Gravel (Till)	25 g 16	CLAY with Grave: (Till)	31 5.8 17	571.5	Hard Grey	26 5 1 15		even in make minger entrated after	14 2.1 15 B
569.0-	Dense Grey Wet	34 3.00 17 569.0	SILTY SAND	25 5 0 E	566.5	CLAY TOLL	23 4.0 13	568.0 —	A Vertical V	96 7.3
andre and the spiritual systems and all the spiritual and the spir	SILTY SAND	30 566.5	The same of the sa	100+ 7.5 11 E		Soft Brack	100+	and the second s	answering the control of the control	
563.5	Very Sense	25 60	na epikalapha gerpikalapha gerpikanagha gerpikanagha gerp	100+ 7.6 10	562.0-	SHALE BOTTOM OF BORII	HG .		S O T 1	
558.0	Grey SAND	150+	and an artist of the second of	- 100+ 7.5 9					Grey SHALE	drilled
336,4	BOTTOM OF BORE	NG 556.	BOTTOM OF BORI	NG 8			an agreement of a resident or the state and a state and a state of the		The state of the s	
									Market and Control	SAA-PROCESSIONS

TEST BORINGS

F.A.I.74 - SECTION 81-1H8 F.A.I.74 & RAMPS OVER RELOC. 19TH ST.

ROCK ISLAND COUNTY

SCALE: AS NOTED DATE:

DE LEUW, CATHER & COMPANY ENGINEERS
DESIGNED BY M. VADRERTY
DRAWN BY. H. DE PERCZEL
CHECKED. G. C. WAY
IN CHARGE E.S. MARTINS
APPROVED W.G. HORN

BOTTOM OF BORING

TEST BORING NO. S-36 STATION 288+26 - 88' RT. Q

TEST BORING NO. S-37 STATION 287+66 - 72' LT.

TEST BORING NO. 5-38 STATION 288+65 - 115' LT.

TEST BORING NO. S-39 STATION 288+62 - 12' RT. 6

TEST BORING NO. S-40 STATION 289+52 - 62' RT. | ROUTE NO. | SECTION | COUNTY | TOTAL SHEET | NO. | | F.A. 74 | 81 - 114 | ROCK ISLAND | 389 | 253 | FED. ROAD DIST. NO. 7 | ILLINOIS | FED. AID PROJECT 1-74

DWG. NO. B-5

F. A. I. 74 - SECTION 81- IHB F.A.I. 74 & RAMPS OVER RELOC. 19TH ST.

TEST BORINGS

ROCK ISLAND COUNTY

SCALE: AS NOTED

STATION 289 + 23.09

DE LEUW, CATHER & COMPANY ENGINEERS
DESIGNED BY M VAOKERTY
DRAWN BY H. DE PERCZEL
CHECKED G. C. WAY
IN CHARGE E.S. MARTINS
APPROVED W.G. HORN

	STATION 288+26 - 88' RT. @	STATION 287+66 -	72' LT.	\$14110N 288*00 - 1	HD. EI	STATION ZOOSOS TE TOTAL E	
		622.0 T	pulgiciman ng	622.0	and the second	N Q ₆ ₩(%)	N Q_U $W(S)$
ELEV. 620'	N Q _u W(%)	Brown CLAY	N Q ₁₁ W(%)	520.0 Black SILTY CLA	Y N Q, W(%)	34 A(E) (C) (C)	A CONTRACTOR OF THE CONTRACTOR
And the second s		LOAM		Soft Brown	Ball / SOUTH AND		
		617.5		CLAY TILL	n 7 23		
615			2.9 11	615.0	0.7 23		ppyroughpurpurpurpurpurpurpurpurpurpurpurpurpurp
		Chrystopa Inches	14 2.8 12	Soft Bro⊁n	5 1,3 13		
		Very	na séria na	SILTY CLAY	5 1.0 18		
610		Stiff	16 3.5 15 \$	610.0 Stiff Brown			Workshot of METHOD LESS THE PRINTED FOR the Committee of
		Brown	13 2.7 II	SILTY CLAY	ц 0,6 20		
		CLAY LOAM	- Artistan	607.0	Cultiply and section of the Control		606.0 Black
605	PAN A	& WMT	13 2.9 14		5 1,2 22	6011.0	SILTY CLAY LOAM
	604.0 602.5 Black SILTY CLAY		- 13 2'8 In	Stiff	7 2,0 19	MARIA MARIANIA	Stiff
	Stiff Grey			Gray	8	Medium	Mottled Brown-Grey
600	SILTY		D D	CLAY	13 2 3 16	Black to	CLAY 's'
	597.0 CLAY 5 1.3 11	597.5	9 2,3 13	TILL	20 1,6 16	Grey 5 0.7 14	LOAM 14 1.5 15
595	Soft Grev	596.0 ♥ Medium Brow SANDY LOAM	23		16 2.6 13	SILTY CLAY 5 0.6 23	
	SANDY CLAY U.S. 18	595.0 Stiff Grey CLAY LOAM	13 [.8]]		19 2 ₈ 7 15	595.0	13 2,1 11 B
	10 2.4 15	592.5 CLAI COAM	B			11 0.6 22 8	14 2 5 14
590	2 H H	Very Stiff	10 2,3 14	591.0	26 3.4 15	Stiff 5 1 16	Very 14 2.8 15
		Grey	10 2,6 14	Medium		Grey 5 0.8 18	Stiff
	Stiff 17 2,4 15 Brown	CLAY TILL		Grey FINE SAND			13 3,1 15 Grey
585	to Grey 19 B	585.0	14 5 9 13	585.0	And the second s	CLAY 12 1,6 14	19 3.3 16 B
			14 4.4 15	Stiff	7 1,5 22	1.5 13	CLAY 17 3.2 12
	Y 114.	Hard	18 4,3 15	Grey	19 3,9 20	And the state of t	TILL
580	17 2.8 14 B	Grey 575.0 CLAY		CLAY		32 7.9 16	17 2 9 14
	17 2.7 15	TILL	18 4,4 19		16 3.3 18	38 6.8 18	15 3,0 14
		no.	23 5,9 11	577.0	29 4.0 21	34 5 9 16	
575	2.6 IU	575.0 Very Stiff				\$	16 3.0 19 B
	18 2,6 15	Brown-Grey	J. J. J. 10	TO CONTRACT OF THE PARTY OF THE	41 4.9 20	31 5 1 16	Hard Brown 29 6.0 18
		570.0 CLAY	18 4.6 12	es e e e e e e e e e e e e e e e e e e	62 5,5 17	Haro 62 7.3	
570	569.0		The second secon		-		75 9.0 16 S
	28 5.6 18	Hard	50 6.5 10		58 6.0 18	Grey 76 95	82 8.8 14 S
565	8.0 12 100 \$	Grey	56 6.1 II		58 4.9 15	CLAY	Hard .
<u></u>	100 \$	CLAYEY SHALE	60 10	Harq	58 5 _{.2} 18	Victor and the second	52 10.5 16 Grey
	100	21ARG	66 6.0 10	Dark Grey	¥	SHALE	150
560	Hard	560.5	160 6.5 9 \$	CL AY	100+ 7 ₅ 3 14		CLAY
	Black	BOTTOM OF BOR	ING	SHALE	some a some a	drille.	SHALE drilled
	CLAY SHALE drilled				No. of the contraction of the co	tronomina de la compania del compania del compania de la compania de la compania de la compania de la compania del compani	4 minutes
555	STALC			***************************************			The second secon
	TATALAN AND AND AND AND AND AND AND AND AND A			a substitute and other substit	drilled	and the second s	E C / 2 / 1
	The control of the co			Votes de la constitución de la co	400 mptm 4946	550.0	552.0 BOTTOM OF BORING
550						BOTTOM OF BORING	
	Tandaman Andrews			4 Vivine Annual Control of Contro	Main monopole		
	(C.) i C. (A.)			P-6 deprimental dela	6-20 months		
545	546.0 BOTTOM OF BORING						
				543.0 BOTTOM OF BORING	 G		

ROUTEND SECTION COUNTY TOYAL SHEET NO.

F.A.L. 74 81-1HB ROCK ISLAND 389 254 FED. BOAD DIST. NO. 7 HALINGIS FED. AND PROJECT 1-74

DWG. NO. B-6

TEST BORING NO. S-4|

TEST BORING NO. S-42

TEST BORING NO. S-43

TEST BORING NO. 5-45

TEST BORING NO. S-46 NU. 5-41 NU. 5-45 NU. 5-46
STATION 289+52 - 95' LT. STATION 290+47 - 72' LT. STATION 290+60 - 2' LT. STATION 292+20 - 60' LT. STATION 292+85 - 80' LT.

N Q_G W(%) N Q_G W(%) N Q_G W(%) ELEV. N Q_u W(%) Stiff Black SILTY CLAY Brown SILTY CLAY LOAM _ g | .3 22 606.5 Stiff Mottle: Brown and edium Brown Grey SILTY CLAY LOAM Brown CLAY Stiff Hard Brown Mottled 604.0 CLAY LOAM 8 1.5 15 Medium Grey CLAY SILTY CLAY Brown and 602.5 Brown - 5 0.8 22 LOAM 602.0 Grey CLAY -- 26 8,30 12 0.6 23 B 601.5 _ II I.2 I5 SILTY with GRAVEL Medium to CLAY Dense LOAM Brown Very Stiff 15 2,2 16 FINE SAND - 21 3.30 13 -- 16 B 13 Very Stiff Very Stiff Medium Grey and Brown Hard - 32 3,6 14 Olive-Black ____ 20 3<u>.</u>40 15 -- 15 2.9 13 Brown SAND and -- 15 Brown and -- 15 3,4 16 CLAY LOAM GRAVEL CLAY LOAM — 20 3₆9 14 - 18 2.75 13 - 16 2.9 13 with GRAVEL Verv (Till) CLAY Loose Brown SANDY GRAVEL - i7 2.30 i3 Stiff -- 28 4.3 7 --- 18 3.1 14 8 2.3P 14 3.28 16 - 17 3,3 14 587.0 — 35 ⁴, 1 9 Very Stiff Blue CLAY - 23 3,3 13 --- 100+ 4.3 8 -- 20 3.6 14 583.0 Very Stiff - 35 6,3 12 582.0 - ₁₇ 3.0 14 Very Stiff Hard --- 100+ 3.5 21 to Hard _ 100+ 6,1 8 SHALE-CLAY Grey CLAY Grey - 300 Hard SHALE Very Dense Brown GRAVEL -100+ 6,0 --- 100+ 6.2 8 LOAM - 19 4,3 10 and 577.5 CLAYEY - 15 3.1 14 LIMESTONE -100+ - 100+ ⁶,8 6 -- 88 6,3 18 Medium SHALE BOTTOM OF BORING - Refusal White - 17 3.3 14 85% Recovery 573.0 - 100+ LIMESTONE BOTTOM OF BORING - Refusal Med um 92% Recovery BOTTOM OF BORING White LIMESTONE drilled BOTTOM OF BORING BOTTOM OF BORING

TEST BORINGS

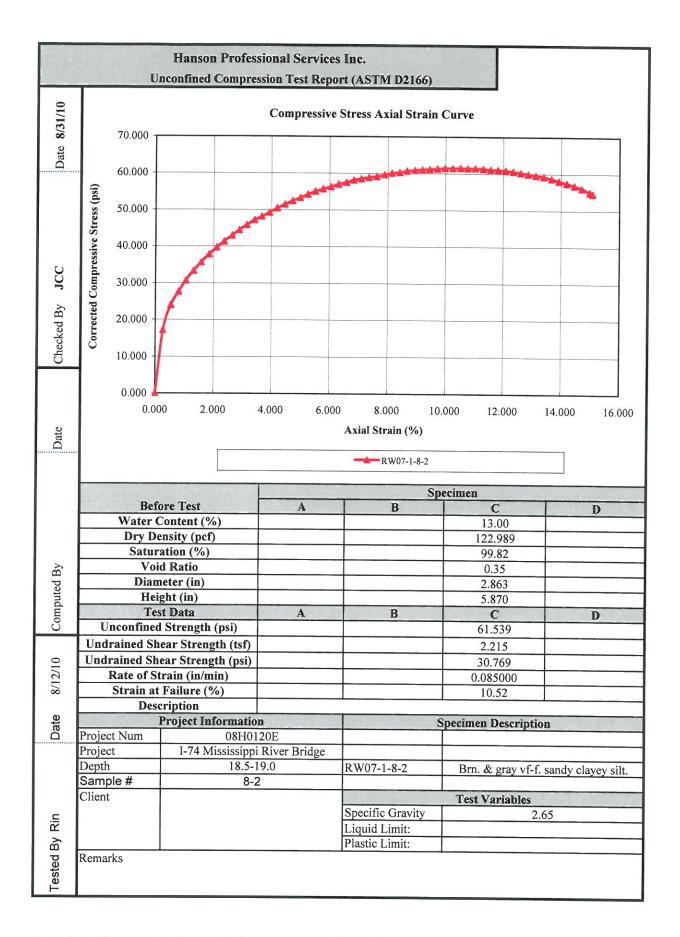
F. A. I. 74 - SECTION 81-1HB F.A.I. 74 & RAMPS OVER RELOC. 19TH ST.

ROCK ISLAND COUNTY

STATION 289+23.09

DE LEUW, CATHER & COMPANY ENGINEERS
DESIGNED BY M. VADRETTY
DRAWN BY H. DE PERCZEL / CHECKED G. C. WAY
IN CHARGE E. S. MARTINS APPROVED W.G. HORN

SCALE: AS NOTED



CONSOLIDATED UNDRAINED TRIAXIAL TEST Max. Shear c' = 0 psi $\phi' = 32.2$ $tan \phi' = 0.63$ 20 psi Ġ 10 10 20 30 40 50 60 p', psi Symbol 0 Sample No. 4-1 35 Test No. 1 Depth 8.0-8.5 Diameter, in 30 2.862 Height, in 5.635 Water Content, % 18.8 25 Dry Density, pcf 107.6 Saturation, % 92.5 DEVIATOR STRESS, 20 Void Ratio 0.538 Water Content, % 16.8 Shear Dry Density, pcf 114.4 15 Saturation*, % 100.0 Void Ratio 0.446 Back Press., psi 62.01 10 Ver. Eff. Cons. Stress, psi 29.98 Shear Strength, psi 12.16 5 Strain at Failure, % 15 Strain Rate, %/min 0.0625 B-Value 0 0.96 10 15 20 Estimated Specific Gravity 2.65 VERTICAL STRAIN, % Liquid Limit 0 Plastic Limit 0 Project: I-74 Mississippi River Br Location: Quad Cities Project No.: 08H0120E HANSON Boring No.: RW07-1 Sample Type: Tube Description: Brn. f. sandy clayey silt / so. c. sand & sm. gravel. Remarks: 2500 # Load Cell Loadtrac II # 258112 FlowTrac II 13610 & 13610B & LVDT55306

Phase calculations based on start of test.

^{*} Saturation is set to 100% for phase calculations.

CONSOLIDATED UNDRAINED TRIAXIAL TEST Max. Shear c = 0 psi $\phi = 16.8$ $tan \phi = 0.30$ 20 ps. ô 10 10 20 30 40 50 60 p, psi Symbol 0 Sample No. 4-1 35 Test No. 1 Depth 8.0-8.5 30 Diameter, in 2.862 Height, in 5.635 Water Content, % 18.8 25 Dry Density, pcf 107.6 psi Saturation, % 92.5 DEVIATOR STRESS, Void Ratio 20 0.538 Water Content, % 16.8 Shear Dry Density, pcf 114.4 15 Saturation*, % 100.0 Before Void Ratio 0.446 Back Press., psi 10 62.01 Ver. Eff. Cons. Stress, psi 29.98 Shear Strength, psi 12.16 5 Strain at Failure, % 15 Strain Rate, %/min 0.0625 B-Value 0.96 0 10 15 20 Estimated Specific Gravity 2.65 VERTICAL STRAIN, % Liquid Limit 0 Plastic Limit 0 Project: I-74 Mississippi River Br Location: Quad Cities Project No.: 08H0120E **CP** HANSON Boring No.: Rw07-1 Sample Type: Tube Description: Brn. f. sandy clayey silt / so. c. sand & sm. gravel.

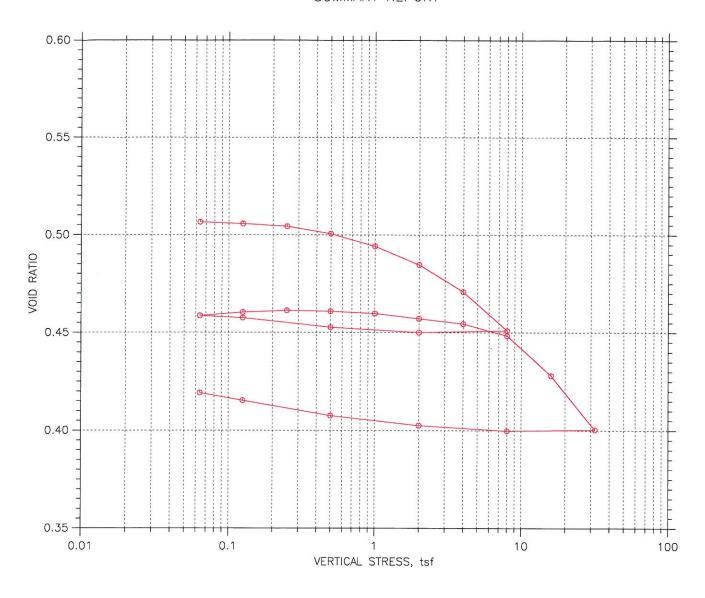
FlowTrac II 13610 & 13610B & LVDT55306

Phase calculations based on start of test.

Remarks: 2500 # Load Cell Loadtrac II # 258112

CONSOLIDATION TEST DATA

SUMMARY REPORT



					Before Test	After Test
Overburde	n Pressure: 0 ts	sf		Water Content, %	19.57	16.30
Preconsoli	idation Pressure:	: 0 tsf		Dry Unit Weight, pcf	109.7	116.6
Compress	ion Index: 2.546	39e-313		Saturation, %	102.19	103.07
Diameter: 2.499 in		Height: 0.9	995 in	Void Ratio	0.51	0.42
LL: O	PI : 0	PI: O	GS: 2.65			

	Project: 174 mississippi River	Location: Quad Cities	Project No.: 08H0120E				
	Boring No.: RW07-1	Tested By: Rin	Checked By: JCC				
<u></u>	Sample No.: 4-2	Test Date: 8/24/10	Depth: 8.5-8.7				
HANSON	Test No.: 1	Elevation: N/A					
	Description: Brn. f. sandy silt / so. clay, c. sand & sm. gravel.						
	Remarks:						

CONSOLIDATION TEST DATA

Project: I74 mississippi River

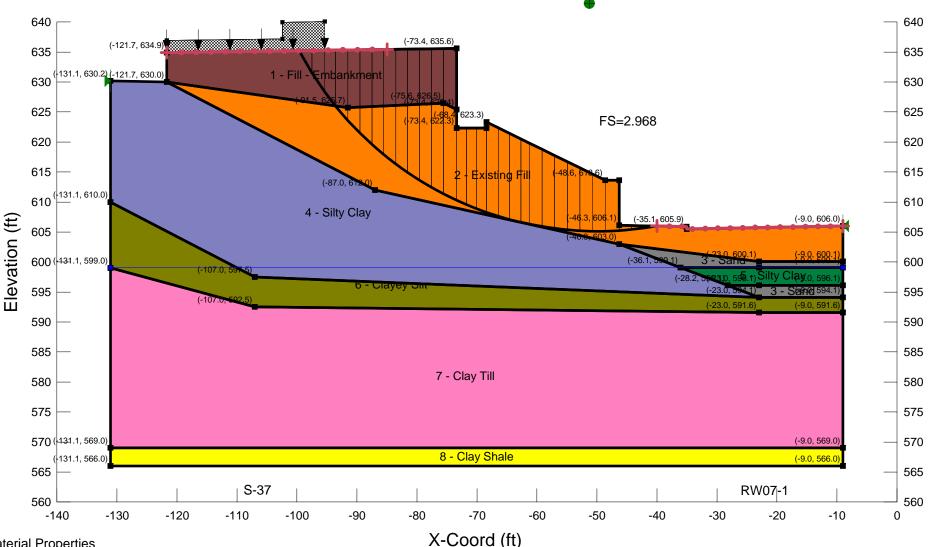
Boring No.: RW07-1 Sample No.: 4-2 Test No.: 1

Location: Quad Cities Tested By: Rin Test Date: 8/24/10 Sample Type: Tube

Project No.: 08H0120E Checked By: JCC Depth: 8.5-8.7 Elevation: N/A

Soil Description: Brn. f. sandy silt / so. clay, c. sand & sm. gravel. Remarks:

	Appli	ed Final	l Void	Strain	Т50	Fitting	Coeff:	icient of Con	solidation
	Stre	ss Displacement	: Ratio	at End	Sq.Rt.	Log	Sq.Rt.	Log	Ave.
	t	ef in	ı	%	min	min	in^2/sec	in^2/sec	in^2/sec
	1 0.0	0.0006478	0.506	0.07	0.0	11.0	0.00e+000	7.42e-005	7.42e-005
	2 0.1			0.12	15.4	6.8	5.28e-005	1.20e-004	7.33e-005
	3 0.			0.22	3.5	3.1	2.34e-004	2.58e-004	2.45e-004
		.5 0.004606		0.46	4.3	6.3	1.87e-004	1.28e-004	1.52e-004
	5	1 0.008881	0.494	0.89	3.8	0.0	2.12e-004	0.00e+000	2.12e-004
	6	2 0.0151		1.52	1.9	2.6	4.23e-004	3.09e-004	3.57e-004
	7	4 0.02422		2.43	1.9	1.4	4.16e-004	5.70e-004	4.81e-004
	8	8 0.03727	0.451	3.75	1.8	1.4	4.17e-004	5.47e-004	4.73e-004
	9	2 0.03792	0.450	3.81	0.2	0.0	4.44e-003	0.00e+000	4.44e-003
2	10 0	.5 0.03618	0.453	3.64	1.9	0.0	3.96e-004	0.00e+000	3.96e-004
	11 0.13	0.03301	0.457	3.32	7.0	6.1	1.09e-004	1.25e-004	1.16e-004
	12 0.0	0.03223	0.459	3.24	37.1	13.5	2.05e-005	5.64e-005	3.01e-005
	13 0.13	0.0311	0.460	3.13	0.0	0.0	0.00e+000	0.00e+000	0.00e+000
	14 0.3	0.03052	0.461	3.07	0.0	0.0	1.56e-002	1.64e-002	1.60e-002
	15 0	5 0.03082	0.461	3.10	1.9	0.0	4.05e-004	0.00e+000	4.05e-004
	16	1 0.03155	0.460	3.17	2.0	1.1	3.89e-004	6.93e-004	4.98e-004
	17	2 0.03325	0.457	3.34	1.0	0.5	7.75e-004	1.46e-003	1.01e-003
- 1	18	4 0.03502	0.454	3.52	0.5	0.4	1.55e-003	1.94e-003	1.72e-003
	19	8 0.03899	0.448	3.92	0.9	0.4	8.13e-004	1.99e-003	1.15e-003
	20	.6 0.05247	0.428	5.27	1.0	1.3	7.69e-004	5.51e-004	6.42e-004
2	21	0.07072	0.400	7.11	1.0	0.7	7.41e-004	1.03e-003	8.60e-004
1	22	8 0.07108	0.400	7.14	0.0	0.0	4.18e-002	5.45e+000	8.29e-002
- 1	23	2 0.0693	0.402	6.97	0.9	0.0	7.52e-004	0.00e+000	7.52e-004
1	24 0	5 0.06599	0.407	6.63	3.8	5.5	1.84e-004	1.30e-004	1.52e-004
	25 0.12	0.06084	0.415	6.11	13.9	0.0	5.14e-005	0.00e+000	5.14e-005
2	26 0.06	0.05826	0.419	5.86	0.0	37.7	0.00e+000	1.91e-005	1.91e-005



Material Properties

Name: 1 - Fill - Embankment

Unit Weight: 125 pcf Cohesion: 1000 psf

2.968

Unit Weight: 125 pcf Cohesion: 1800 psf Phi: 0 ° Name: 2 - Existing Fill Model: Mohr-Coulomb

Name: 3 - Sand Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 32 °

Model: Mohr-Coulomb

Name: 4 - Silty Clay Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 2800 psf Phi: 0° Name: 5 - Silty Clay Unit Weight: 120 pcf Cohesion: 400 psf Phi: 0 ° Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 1800 psf Phi: 0 ° Name: 6 - Clayey Silt Model: Mohr-Coulomb Name: 7 - Clay Till Model: Mohr-Coulomb Unit Weight: 136 pcf Cohesion: 2700 psf Phi: 0 °

Name: 8 - Clay Shale Model: Bedrock (Impenetrable)

SN 081-6016 - IL-RW07 Case 1 - Sta 1922+00 - Circle

File Name: I-74 081-6016 Sta 1922.gsz Last Edited By: Robert Chantome Date: 5/24/2012 10:45:51 AM

1-74 OVER THE MISSISSIPPI RIVER **CENTRAL SECTION FINAL DESIGN** ILLINOIS DEPARTMENT OF TRANSPORTATION **ROCK ISLAND COUNTY, ILLINOIS**

