

Geotechnical Design Memorandum

To: Dan Manojlovski, PE, Project Manager, AECOM
From: Met Seyhun, PE, Sr. Geotechnical Engineer 
Date: March 23, 2017
Subject: Sewer Pipe Jacking and Jacking/Receiving Pits
Project: Circle Interchange Reconstruction
IDOT Job No. D-91-227-13, IDOT PTB 163, Item 01, Contract 60X76
Wang Project No. 1100-04-01

Introduction

Wang Engineering, Inc. (Wang) understands Contract 60X76 sewer pipe alignment starts north of Harrison Street and just east of W-S Ramp crosses the Harrison Street and continues just east of I-90/I-94, then crosses the I-90/I-94, and terminates just west of I-90/I-94. There are four jacking /receiving pit locations identified along this sewer pipe jacking alignment.

There were no borings taken along the proposed jacking alignment or at the proposed pits; therefore, nearby borings completed for other structures were used in our evaluations. From north to south, these borings are 1715-B-05, 18-RWB-03, 18-RWB-02, 1087-B-02 Alt, 1087-B-02, SB90-SGB-24, 14-RWB-01, SB90-SGB-25, 14-RWB-02, 15-RWB-02, 10-PZ-01, 14-RWB-03, and 1705-B-02. Their locations relative to the sewer alignment are shown in the *Boring location Plan* (Exhibit 1). In situ vane shear tests conducted in nearby Boring VST-01 was also considered for the soft clay parameters in our engineering analysis and recommendations.

Detailed descriptions of the soil conditions encountered are presented in the attached *Boring Logs* and in the *Subsurface Soil Data Profile* (Exhibit 2). The following sections present our geotechnical recommendations for the design and construction of the proposed jacking alignment and jacking/receiving pits.

Jacking pipe

The pipe should be jacked in accordance with IDOT Standard Specifications Section 552, *STORM SEWER JACKED IN PLACE*. Frictional resistance to the jacking force can be estimated from the product of shear strength of soil and the surface area of pipe in contact with the soil. The subsurface soil conditions within the jacking depths, as revealed by borings, generally consist of very soft to soft clay to silty clay. The contractor should review the subsurface soil conditions and judge their effects on means, methods, and progress of work. The jacking operation, once started, should be continued until completed. If continuous jacking cannot be maintained, the contractor should take the necessary precautions for not allowing the jacked pipes to freeze or set in the ground. There

may be intermediate pits necessary to allow for pipe jacking through changing alignments. The contractor should be required to submit details of his means and methods for constructing pipelines by jacking.

Jacking/Receiving Pits

Based on the information provided by AECOM, the proposed four jacking/receiving pits are located at:

- Pit #1, Station 1509+8.79 at an offset of 59.10 feet left,
- Pits #2/3, Station 1512+33.39 at an offset of 38.92 feet left,
- Pits #4/5, Station 1516+60.10 at an offset of 0.03 feet left, and
- Pit#6, Station 4+58.31 at an offset of 65.83 feet left.

Pit locations are shown on the Boring Location Plan (Exhibit 1). Relatively deep excavations up to a depth of 27 feet may be required to construct the pits. The pipe invert elevations at the jacking/receiving pits will be ranging from 554.45 to 560.59 feet as per AECOM.

The jacking/receiving pit size should be large enough to provide a safe and adequate working area. Pit size will depend on the contractor's equipment and space constraint. The jacking pit walls should be supported in accordance with OSHA construction requirements to insure a solid, stable base for boring machine and pit sides. Jacking load can be transferred to the soil behind the jacking pit through a thrust block constructed at the back of the pit. The resistance which the soil can provide to the jacking loads may be estimated from the allowable passive pressures. A factor of safety of 2 should be considered. If enough resistance is not available, additional ground improvement measure may be required to provide additional lateral resistance to withstand the jacking loads.

Soft clay may be encountered at the base of the pits. We recommend that a provision be made for the removal of some base clay and replacing with the stabilization stone. Before placing stabilization stone, a geotextile fabric for ground stabilization meeting the requirements of IDOT SSRBC Sections 210 and 1080.02 should be provided. For contract estimate purposes, we recommend considering a 2-foot thick layer of stabilization stone. The removal and replacement thickness should be determined in the field based on the contractor's method and equipment to be used.

Groundwater was observed in the granular fill above the native clay in Borings 18-RWB-03, 1087-B-02, and 15-RWB-02 near the proposed pits. It is recommended that that the design groundwater level be placed at an elevation of about 574 feet. Provisions should be made to collect and remove groundwater seepage that may accumulate in the pits. Groundwater was also encountered in the gravelly layer on the top of bedrock under the excess pressure.

Temporary Earth Retention System

Temporary excavations up to 27 feet deep below the existing grade may be required for the jacking/receiving pits. Temporary earth retention systems (TERS) consisting of sheeting, shoring or bracing systems can be used to create vertical excavation walls. A temporary vertical excavation support system may also be required due to space limitations and where existing buildings, roadways, and other structures and utilities are to be protected. Therefore, it is our opinion that a temporary enclosed braced system will be more appropriate than the open cut excavation for the pits.

It is recommended that the design groundwater levels for a short-term condition be assumed to be at elevation 574 feet. In addition, lateral pressure from adjacent foundations and other surcharge loads such as construction equipment should also be considered in the design of the bracing system. The soil parameters shown in Tables 1 through 3 can be used for the design of TERS system. We strongly recommend that the TERS designers review the included boring logs and apply their judgement on assessing soil parameters for the type of analyses required for the design of their specific temporary support system.

Table 1: TERS Design Soil Parameters for Jacking/Receiving Pit #1
 Station 1509+08.79 at offset of 59.10 feet left
 (Borings 18-RWB-02, 18-RWB-03, 17515-B-05, and VST-01)

Approximate Elevation Range (feet)	Soil Type (Layer)	Unit Weight (pcf)	Cohesion C_u (psf)	Friction Angle ϕ (degree)
Existing Grade to 572	Cohesive Fill	120	1000	0
572 to 562	Soft Silty Clay	110	600	0
562 to 557	Soft to Medium Stiff Clay to Silty Clay	110	750	0
557 to 552	Medium Stiff to Stiff Clay to Silty Clay	115	900	0
552 to 546	Medium Stiff to Stiff Clay to Silty Clay	115	1100	0
546 to 533	Very Stiff Silty Clay Loam	120	2000	0
533 to 521	Very Stiff to Hard Silty Clay Loam	125	3800	0
521 to 516	Medium Stiff Clay	115	800	0
516 to 511	Loose Silt	115	0	28

Approximate Elevation Range (feet)	Soil Type (Layer)	Unit Weight (pcf)	Cohesion C_u (psf)	Friction Angle ϕ (degree)
511 to 506	Hard Silty Clay Loam	125	5000	0

Table 2: TERS Design Soil Parameters for Jacking/Receiving Pit #2/3
 Station 1212+33.39 at offset of 38.92 feet left
 (Borings SB90-SGB-24, 1087-B-02, and VST-01)

Approximate Elevation Range (feet)	Soil Type (Layer)	Unit Weight (pcf)	Cohesion C_u (psf)	Friction Angle ϕ (degree)
Existing Grade to 574	Granular Fill	115	0	30
574 to 562	Soft Silty Clay	110	600	0
562 to 552	Soft to Medium Stiff Clay to Silty Clay	110	750	0
552 to 557	Medium Stiff Clay to Silty Clay	115	900	0
557 to 542	Medium Stiff to Stiff Clay to Silty Clay	115	1100	0
542 to 522	Hard Silty Clay to Silty Clay Loam	120	5000	0
522 to 517	Loose Silty Loam	110	0	28
517 to 507	Hard Silty Clay Loam	130	8000	0

Table 3: TERS Design Soil Parameters for Jacking/Receiving Pits #4/5 and 6
 Stations 1516+60.10 at offset of 0.03 feet left and 4+58.31 at offset of 65.83 feet left
 (Borings 14-RWB-03, SB90-SGB-12, 1705-B-02, and VST-01)

Approximate Elevation Range (feet)	Soil Type (Layer)	Unit Weight (pcf)	Cohesion C_u (psf)	Friction Angle ϕ (degree)
Existing Grade to 579	Granular Fill	120	0	30
579 to 575	Stiff to Silty Clay	120	1000	0
575 to 573	Soft to Medium Clay to Silty Clay	110	700	0
573 to 562	Soft to Medium Stiff Clay to Silty Clay	110	600	0
562 to 557	Medium Stiff Clay to Silty Clay	110	750	0
557 to 552	Medium Stiff Clay to Silty Clay	115	900	0
552 to 541	Stiff Clay to Silty Clay	115	1100	0
541 to 536	Dense to Very Dense Clay Loam to Silty Loam	125	5500	0
536 to 526	Dense to Very Dense Clay Loam to Silty Loam	125	0	35
526 to 518	Dense to Very Dense Sand	130	0	36

The lateral soil pressure distribution behind a bracing system will be dependent on the scheme selected to support the excavation walls. Therefore, it is recommended that the pressure distribution utilized in the design of the bracing system be reviewed by a qualified geotechnical engineer. Normally selection of the type of temporary earth retention system and design is left to the contractor. The bracing system should be designed for different construction stages and by a structural engineer licensed in the State of Illinois.

Excavation Base Stability

Wang performed preliminary analyses for bottom heave stability of the jacking/receiving pits. The in-situ vane shear testing results from Boring VST-01 was used to better assess the shear strength of the soft clay at the pits, as per Tables 1 through 3. Wang estimates factor of safety (FOS) of 1.6 to 2.1 against basal heave instability at the jacking/receiving pits for excavation depths ranging from 20 to 27 feet. The minimum required FOS is 1.5. Our estimated FOS satisfies the minimum

required. However, the contractor should check the base stability based on the construction sequence.

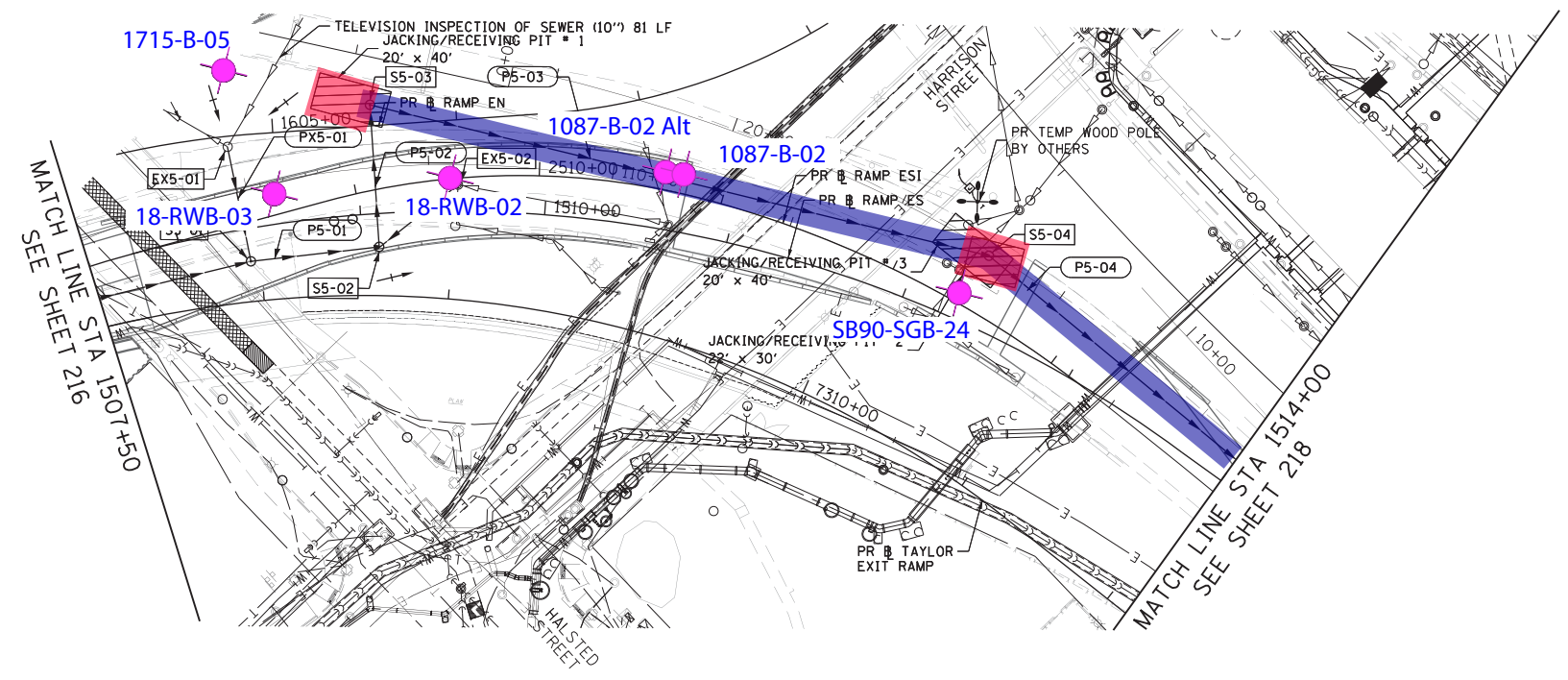
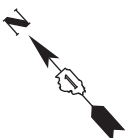
CONSTRUCTION CONSIDERATIONS

Any required excavations should be performed in accordance with local, state, and federal regulations including current OSHA regulations. The potential effect of ground movements upon nearby structures and utilities should also be taken into consideration.

Attachments:

1. Exhibit 1, Boring Location Plan,
2. Exhibit 2, Subsurface Data Profile,
3. Appendix A, Borings Logs
4. Contract 60X76 Plan

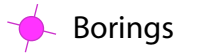
Copy To: Amish Bhatt, PE, SE, AECOM
Corina Farez, PE, PG, Wang Engineering, Inc.



NOTES:

1. FOR CTA DRAINAGE, SEE SHEETS 225 TO 228.
2. PREFERRED JACKING AND RECEIVING PIT LAYOUT. CONTRACTOR SHALL STAKE OUT PIT LOCATION IN FIELD PRIOR TO EXCAVATION FOR VERIFICATION BY THE ENGINEER.
3. EXISTING STORM SEWER TO BE ABANDONED AND FILLED IS NOT SHOWN FOR CLARITY. SEE EXISTING DRAINAGE PLAN, SHEETS 207 TO 212 FOR DETAILS.

Legend



STRUCTURE SCHEDULE

STRUCTURE NUMBER	STATION	OFFSET (FT)	OFFSET LOCATION (EDGE OF SHOULDER, CENTER OF STRUCTURE, FACE OF BARRIER)	STRUCTURE TYPE	FRAME & GRATE	RIM ELEVATION	INVERT ELEVATIONS			
							NORTH	EAST	SOUTH	WEST
S5-01	1508+37.00	17.84' RT	COS	MH, TYPE A, 6'-DIAMETER	TYPE 1 FRAME, CLOSED LID	574.51	568.75	560.72	560.72	
S5-02	1509+09.00	18.09' RT	COS	MH, TYPE A, 8'-DIAMETER	TYPE 8 GRATE	574.84		560.65	560.65	
S5-03	1509+08.79	59.10' LT	COS	MH, TYPE A, 9'-DIAMETER	TYPE 1 FRAME, CLOSED LID	579.90			557.46	560.59
S5-04	1512+33.39	38.92' LT	COS	MH, TYPE A, 9'-DIAMETER	TYPE 1 FRAME, CLOSED LID	578.99	557.19		554.69	
EX5-01	1508+35.10	45.59' LT	COS			574.66				
EX5-02	1509+52.83	14.73' LT	COS			575.41				

PIPE SCHEDULE

PIPE NUMBER	STRUCTURE				DESCRIPTION	CLASS	TYPE	SIZE (IN)	LENGTH (FT)	SLOPE (%)	TBF (CU YD)
	FROM	dir	TO	dir							
P5-01	S5-01	S	S5-02	N	STORM SEWERS	A	3	36	66	0.10%	208.5
P5-02	S5-02	E	S5-03	W	STORM SEWERS	A	3	42	76	0.10%	255.0
P5-03	S5-03	S	S5-04	N	STORM SEWERS JACKED IN PLACE	A	3	42	335	0.08%	
P5-04	S5-04	S	S6-01	N	STORM SEWERS JACKED IN PLACE	A	3	60	430	0.05%	
PX5-01	EX5-01	S	S5-01	N	STORM SEWERS	A	2	15	63		
PX5-02	EX5-02	W	S5-02	E	STORM SEWERS	A	2	15	52		

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BORING LOCATION PLAN: CIRCLE INTERCHANGE SEWER JACKING, CONTRACT 60X76, COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL **EXHIBIT 1-1** DRAWN BY: R. KC
CHECKED BY: NSB

1145 N. Main Street
Lombard, IL 60148
www.wangeng.com

FOR AECOM **1100-04-01**



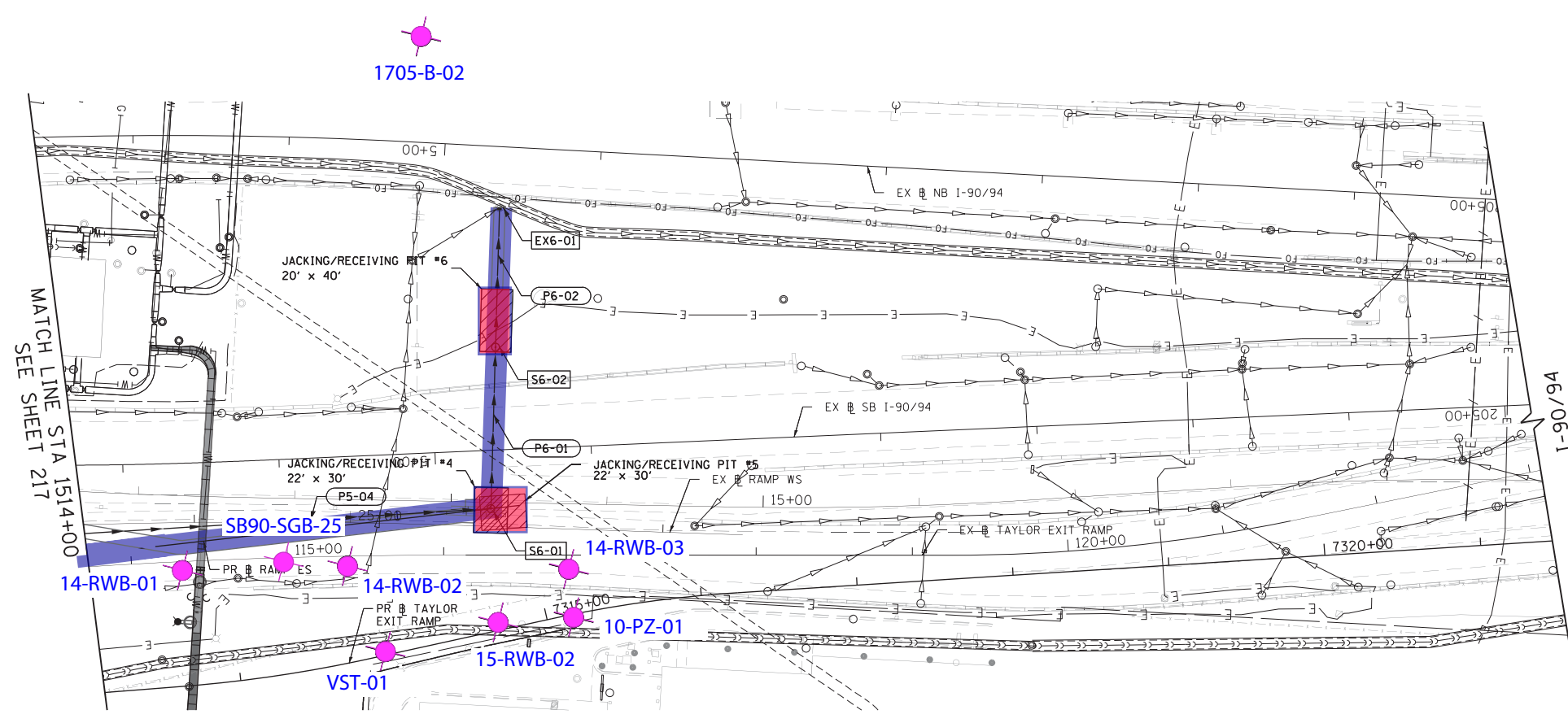
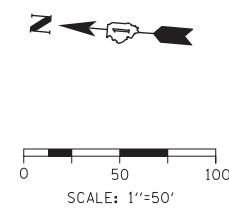
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PLOT DATE = 2/9/2017	DATE - 2/10/17	REVISED -

**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**PROPOSED DRAINAGE PLAN
EASTBOUND I-290**

SCALE: 1"=50' SHEET 5 OF 12 SHEETS STA. 1507+50 TO STA. 1514+00

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2014-002R&B	COOK	696	217
ILLINOIS FED. AID PROJECT			CONTRACT NO. 60X76	



- NOTES:**
- FOR CTA DRAINAGE, SEE SHEETS 225 TO 228 .
 - PREFERRED JACKING AND RECEIVING PIT LAYOUT. CONTRACTOR SHALL STAKE OUT PIT LOCATION IN FIELD PRIOR TO EXCAVATION FOR VERIFICATION BY THE ENGINEER.
 - EXISTING STORM SEWER TO BE ABANDONED AND FILLED IS NOT SHOWN FOR CLARITY. SEE EXISTING DRAINAGE PLAN, SHEETS 207 TO 212 FOR DETAILS.

Legend
 Borings

STRUCTURE SCHEDULE

STRUCTURE NUMBER	STATION	OFFSET (FT)	OFFSET LOCATION (EDGE OF SHOULDER, CENTER OF STRUCTURE, FACE OF BARRIER)	STRUCTURE TYPE	FRAME & GRATE	RIM ELEVATION	INVERT ELEVATIONS			
							NORTH	EAST	SOUTH	WEST
S6-01	1516+60.10	0.03' LT	COS	MH, TYPE A, 9'-DIAMETER	TYPE 1 FRAME, CLOSED LID	581.73	554.50	554.50		
S6-02	4+58.31	65.83' RT	COS	MH, TYPE A, 6'-DIAMETER, RESTRICTOR PLATE	TYPE 1 FRAME, CLOSED LID	581.38	554.45		557.45	

PIPE SCHEDULE

PIPE NUMBER	STRUCTURE				DESCRIPTION	CLASS	TYPE	SIZE (IN)	LENGTH (FT)	SLOPE (%)	TBF (CU YD)
	FROM	dir	TO	dir							
P6-01	S6-01	E	S6-02	W	STORM SEWERS JACKED IN PLACE	A	3	60	104	0.05%	
P6-02	S6-03	E	EX6-01	W	STORM SEWERS	A	2	24	90	0.17%	149.8

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BORING LOCATION PLAN: CIRCLE INTERCHANGE SEWER JACKING, CONTRACT 60X76, COOK COUNTY, ILLINOIS

SCALE: GRAPHICAL **EXHIBIT 1-2** DRAWN BY: R. KC
 CHECKED BY: NSB

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FOR AECOM 1100-04-01



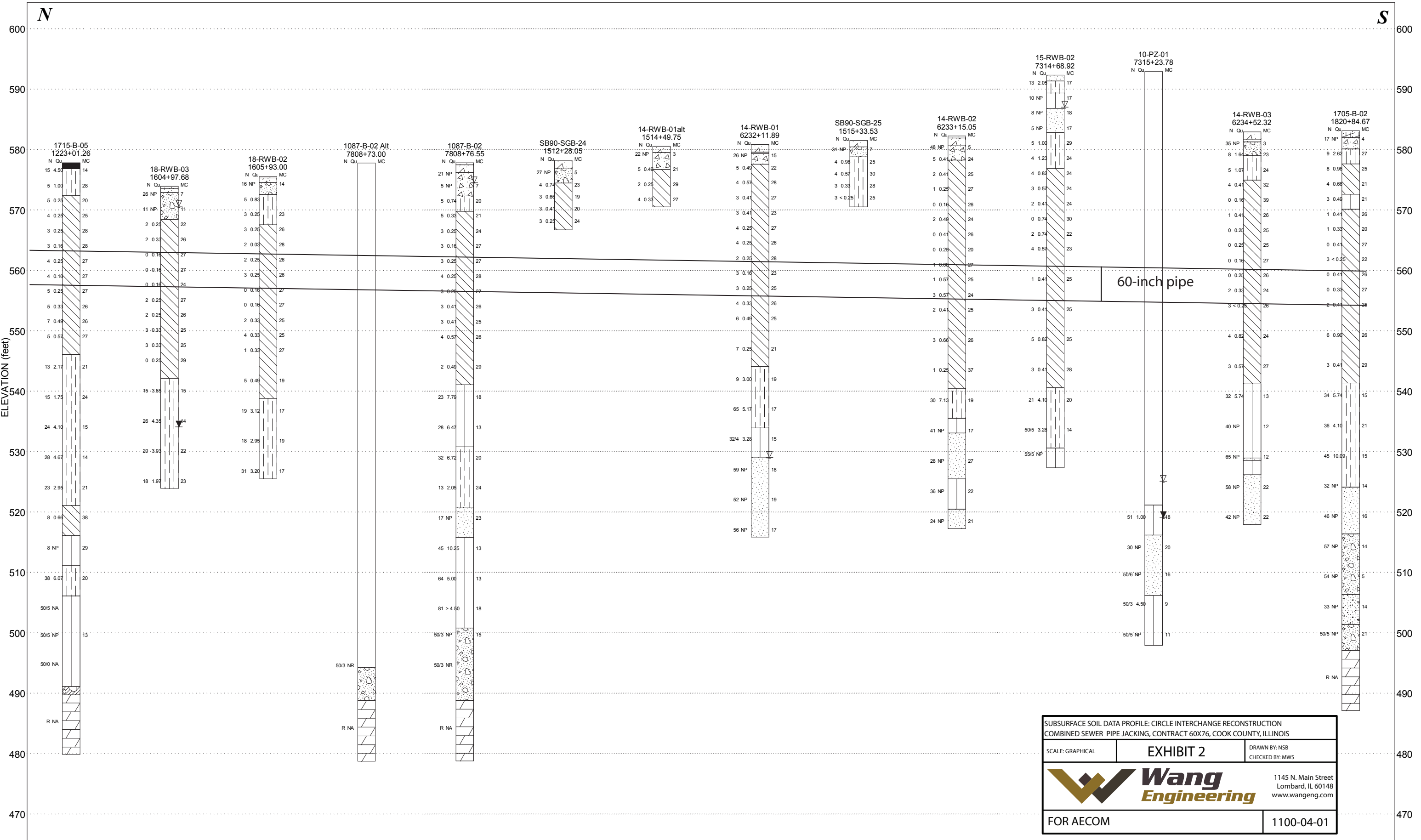
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PLOT DATE = 2/9/2017	DATE - 2/10/17	REVISED -

**STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION**

**PROPOSED DRAINAGE PLAN
 EASTBOUND I-290**

SCALE: SHEET 6 OF 12 SHEETS STA. 1514+00 TO STA.

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2014-002R&B	COOK	696	218
ILLINOIS FED. AID PROJECT			CONTRACT NO. 60X76	



DISTANCE ALONG PROFILE (feet)



BORING LOG 1087-B-02

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 1145 N Main Street
 Lombard, IL 60148
 Telephone: 630 953-9928
 Fax: 630 953-9938

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 577.83 ft
 North: 1897618.19 ft
 East: 1171373.71 ft
 Station: 7808+76.55
 Offset: 75.5906 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	577.54	15-inch thick ASPHALT --PAVEMENT--															
	576.2	15-inch thick CONCRETE --PAVEMENT--															
		Medium dense CRUSHED STONE --FILL--			1	10 9 12	NP							9	0 2 1	0.25 B	27
					2	4 2 3	NP	7				25		10	0 0 3	0.41 B	26
	572.3	Medium stiff, gray SILTY CLAY, trace gravel			3	2 3 2	0.74 B	20						11	1 1 2	0.41 B	25
	569.8	Soft to medium stiff, gray CLAY, trace gravel			4	2 2 3	0.33 B	21						12	1 2 2	0.57 B	26
		--L _L (%)=32, P _L (%)=17-- --%Gravel=1.9-- --%Sand=15.6-- --%Silt=52.2-- --%Clay=30.3-- --A-6 (11)--			5	2 1 2	0.25 B	24									
					6	1 2 1	0.16 B	27						13	0 1 1	0.49 B	29
					7	1 2 1	0.25 B	27		541.1	Hard, gray SILTY LOAM, trace gravel and sand lenses						
					8	1 2 2	0.25 P	28						14	9 10 13	7.79 B	18

GENERAL NOTES

Begin Drilling **03-06-2013** Complete Drilling **03-14-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
 Driller **R&J** Logger **D. Kolpacki** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 20', mud rotary thereafter, boring**
backfilled upon completion

WATER LEVEL DATA

While Drilling ∇ **3.50 ft**
 At Completion of Drilling ∇ **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 11000401.GPJ WANGENG.GDT 3/15/17



BORING LOG 1087-B-02

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WEI Job No.: 1100-04-01

Client **AECOM**
 Project **Circle Interchange Reconstruction**
 Location **Section 17, T39N, R14E of 3rd PM**

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 East: 1171373.71 ft
 Station: 7808+76.55
 Offset: 75.5906 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
											--%Clay=0.9-- --A-2-4 (0)--						
	515.8									515.8	Hard, gray SILTY LOAM, trace gravel						
		--L _L (%)=24, P _L (%)=13-- --%Gravel=3.5-- --%Sand=28.1-- --%Silt=52.4-- --%Clay=16.0-- --A-6 (5)--	45	X	15	7 10 18	6.47 B	13					X	19	12 20 25	10.25 B	13
	530.8	Very stiff to hard, gray SILTY CLAY, trace gravel															
			50	X	16	7 12 20	6.72 B	20					X	20	19 30 34	5.00 S	13
		--L _L (%)=22, P _L (%)=12-- --%Gravel=4.6-- --%Sand=19.7-- --%Silt=61.8-- --%Clay=13.9-- --A-4 (5)--															
		--L _L (%)=40, P _L (%)=15-- --%Gravel=0.4-- --%Sand=3.8-- --%Silt=49.8-- --%Clay=46.1-- --A-6 (24)--	55	X	17	6 6 7	2.05 S	24					X	21	27 34 47	4.50 P	18
	520.8	Medium dense, gray, SANDY LOAM															
		--%Gravel=0.0-- --%Sand=74.0-- --%Silt=25.1--	60	X	18	5 7 10	NP	23					X	22	50/3	NP	15
	500.8	Very dense, gray GRAVELLY SANDY LOAM, some dolostone fragments								500.8							

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **03-06-2013** Complete Drilling **03-14-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
 Driller **R&J** Logger **D. Kolpacki** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 20', mud rotary thereafter, boring backfilled upon completion**

While Drilling **3.50 ft**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



BORING LOG 1087-B-02

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 Telephone: 630 953-9928
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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 577.83 ft
 North: 1897618.19 ft
 East: 1171373.71 ft
 Station: 7808+76.55
 Offset: 75.5906 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	488.8	--HARD DRILLING--	85		23	50/3	NR										
	488.8	Strong, good rock quality, light gray, fresh, slightly fractured, joint breaks with little to no infill, slightly vuggy DOLOSTONE Run#1: 89 to 99 feet --RECOVERY=100%-- --RQD=84%-- ROCK MASS RATING: Strength of rock material = 12 Drill core quality RQD = 17 Spacing of joints = 20 Condition of joints =20 Groundwater condition =10	90														
	478.8	Boring terminated at 99.00 ft	100														

WANGENGINC 11000401.GPJ WANGENG.GDT 3/15/17

GENERAL NOTES

WATER LEVEL DATA

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 Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
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 Drilling Method **2.25" SSA to 20', mud rotary thereafter, boring backfilled upon completion**

While Drilling ∇ **3.50 ft**
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 Depth to Water ∇ **NA**

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BORING LOG 1087-B-02 Alt

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 577.78 ft
 North: 1897624.78 ft
 East: 1171370.00 ft
 Station: 7808+73.00
 Offset: 82.2711 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--DRILLED WITHOUT SAMPLING--	5									25					
			10									30					
			15									35					
			20									40					

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **03-14-2013** Complete Drilling **03-14-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
 Driller **R&J** Logger **N. Boddy** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



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BORING LOG 1087-B-02 Alt

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 577.78 ft
 North: 1897624.78 ft
 East: 1171370.00 ft
 Station: 7808+73.00
 Offset: 82.2711 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--DRILLED WITHOUT SAMPLING--	45									65					
		--DRILLED WITHOUT SAMPLING--	50									70					
		--DRILLED WITHOUT SAMPLING--	55									75					
			60									80					

GENERAL NOTES

Begin Drilling **03-14-2013** Complete Drilling **03-14-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
 Driller **R&J** Logger **N. Boddy** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



BORING LOG 1087-B-02 Alt

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WEI Job No.: 1100-04-01

Client **AECOM**
 Project **Circle Interchange Reconstruction**
 Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 577.78 ft
 North: 1897624.78 ft
 East: 1171370.00 ft
 Station: 7808+73.00
 Offset: 82.2711 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	494.3	--HARD DRILLING--	85		23	5Q/3	NR										
	488.8	Strong, good rock quality, light gray, fresh, slightly fractured, joint breaks with little to no infill, slightly vuggy DOLOSTONE Run#1: 89 to 99 feet --RECOVERY=100%-- --RQD=84%--	90				CORE										
			95		24												
	478.8	Boring terminated at 99.00 ft	100														

GENERAL NOTES

Begin Drilling **03-14-2013** Complete Drilling **03-14-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
 Driller **R&J** Logger **N. Boddy** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 10-PZ-01

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 592.93 ft
 North: 1897019.14 ft
 East: 1171462.69 ft
 Station: 7315+23.78
 Offset: 8.25157 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--Drilled without sampling--	5									25					
			10									30					
			15									35					
			20									40					

Piezometer Data:
 --Installed in Dec. 11, 2014
 --Bentonite Seal 66 to 71 feet
 --Top of Sand Pack at 71 feet
 --Top of Screen at 73 feet
 --Screen Length 20 feet
 --Bottom of Screen at 93 feet

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **12-10-2014** Complete Drilling **12-11-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
 Driller **P&P** Logger **A. Happel** Checked by **C. Marin**
 Drilling Method **4.25" HSA, monitoring water well; pizometer**
installed on 12/11/2014

While Drilling ∇ **68.00 ft**
 At Completion of Drilling \blacktriangledown **74.00 ft**
 Time After Drilling **24 hours**
 Depth to Water ∇ **45.04 ft**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



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BORING LOG 10-PZ-01

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 592.93 ft
 North: 1897019.14 ft
 East: 1171462.69 ft
 Station: 7315+23.78
 Offset: 8.25157 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--piezometer stabilized water level reading -- --reading during well development (12/15/2014) = 43.85 feet bgs-- --reading date: 12/26/2014 = 43.72 feet bgs--	45														
			65							521.2	Very dense, gray SILTY LOAM --Wet--						
			75		1	18 27 24	1.00	P									18
			80		2	7 14 16	NP			516.2	Very dense, gray SANDY LOAM, trace to little gravel --Saturated--						20

GENERAL NOTES					WATER LEVEL DATA				
Begin Drilling	12-10-2014	Complete Drilling	12-11-2014		While Drilling	▽	68.00 ft		
Drilling Contractor	Wang Testing Services	Drill Rig	B-57 TMR [100%]		At Completion of Drilling	▼	74.00 ft		
Driller	P&P	Logger	A. Happel	Checked by	C. Marin	Time After Drilling	24 hours		
Drilling Method	4.25" HSA, monitoring water well; pizometer installed on 12/11/2014				Depth to Water	▽	45.04 ft		
The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.									

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BORING LOG 10-PZ-01

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 592.93 ft
 North: 1897019.14 ft
 East: 1171462.69 ft
 Station: 7315+23.78
 Offset: 8.25157 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	506.2		85	⊗	3	50/6	NP	16									
		Very dense, gray SILTY LOAM, trace gravel		⊗	4	50/3	4.50 P	9									
		--Moist--	90														
		--Wet--		⊗	5	50/5	NP	11									
	497.9	--HARD DRILLING--	95														
		Boring terminated at 95.00 ft															

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **12-10-2014** Complete Drilling **12-11-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
 Driller **P&P** Logger **A. Happel** Checked by **C. Marin**
 Drilling Method **4.25" HSA, monitoring water well; pizometer**
installed on 12/11/2014

While Drilling ∇ **68.00 ft**
 At Completion of Drilling \blacktriangledown **74.00 ft**
 Time After Drilling **24 hours**
 Depth to Water ∇ **45.04 ft**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



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BORING LOG 14-RWB-01

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 580.85 ft
 North: 1897238.90 ft
 East: 1171475.76 ft
 Station: 6232+11.89
 Offset: 63.2525 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		15-inch thick CONCRETE --PAVEMENT--															
	579.6																
	579.3	3-inch thick ASPHALT															
		Medium dense, brownish white CRUSHED STONE --BASE COURSE--			1	15 17 9	NP	15						9	1 2 1	0.16 B	23
	577.6				2	3 2 3	0.49 B	22				25		10	1 2 1	0.25 B	25
		Soft, gray CLAY to SILTY CLAY, trace gravel			3	1 2 2	0.57 B	28						11	0 2 2	0.33 B	26
					4	1 2 1	0.41 B	27				30		12	2 3 3	0.49 B	25
					5	2 1 2	0.41 B	23									
					6	2 2 2	0.25 B	27				35		13	2 3 4	0.25 B	21
					7	2 1 3	0.25 B	26		544.1	Very stiff to hard, gray SILTY CLAY, trace gravel						
					8	1 1 1	0.25 B	28				40		14	3 4 5	3.00 P	19

GENERAL NOTES

Begin Drilling **07-28-2014** Complete Drilling **07-29-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR [85%]**
 Driller **R&J** Logger **A. Happel** Checked by **C. Marin**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring**
backfilled upon completion

WATER LEVEL DATA

While Drilling ∇ **52.00 ft**
 At Completion of Drilling ∇ **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 580.85 ft
 North: 1897238.90 ft
 East: 1171475.76 ft
 Station: 6232+11.89
 Offset: 63.2525 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	534.1	Very stiff, gray SILTY LOAM to SILTY CLAY LOAM, trace gravel	45		15	12 18 47	5.17 B	17		515.8		65		19	14 23 33	NP	17
											Boring terminated at 65.00 ft						
	529.1	Very dense, gray SAND to SANDY LOAM, trace gravel	50		16	33 45 32 4	3.28 S	15				70					
			55		17	17 23 36	NP	18				75					
			60		18	13 30 22	NP	19				80					

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **07-28-2014** Complete Drilling **07-29-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR [85%]**
 Driller **R&J** Logger **A. Happel** Checked by **C. Marin**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

While Drilling ∇ **52.00 ft**
 At Completion of Drilling ∇ **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 14-RWB-01alt

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 580.56 ft
 North: 1897248.15 ft
 East: 1171476.60 ft
 Station: 1514+49.75
 Offset: 16.3127 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	579.6	12-inch thick CONCRETE --PAVEMENT--															
		Medium dense, grayish white CRUSHED STONE --FILL--			1	28 11 11	NP	3									
	576.7	Soft, gray CLAY to SILTY CLAY, trace gravel			2	2 2 3	0.49 B	21									
			5														
					3	0 1 1	0.25 B	29									
					4	1 2 2	0.33 B	27									
	570.6	Boring terminated at 10.00 ft	10														
			15														
			20														

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **07-20-2014** Complete Drilling **07-20-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
 Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
 Drilling Method **2.25" HSA, boring backfilled upon completion**

While Drilling **DRY**
 At Completion of Drilling **DRY**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



BORING LOG 14-RWB-02

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 582.26 ft
 North: 1897133.58 ft
 East: 1171489.78 ft
 Station: 6233+15.05
 Offset: 62.0541 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	581.94	14-inch thick, ASPHALT --PAVEMENT--															
	580.8	14-inch thick, CONCRETE --PAVEMENT--															
		Dense, grayish white CRUSHED STONE --FILL--			1	37 30 18	NP	5						9	0 0 1	0.08 B	27
	578.3	Soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			2	1 2 3	0.41 B	24				25		10	0 0 1	0.57 B	25
					3	0 1 1	0.41 B	25						11	0 1 2	0.57 B	24
					4	0 0 1	0.25 B	27				30		12	0 0 2	0.41 B	25
					5	0 0 0	0.16 B	26									
					6	0 0 2	0.49 B	24				35		13	0 1 2	0.66 B	26
					7	0 0 0	0.41 B	26									
					8	0 0 0	0.25 B	20				40		14	0 0 1	0.25 B	37

GENERAL NOTES

Begin Drilling **07-30-2014** Complete Drilling **07-30-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
 Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 14-RWB-02

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 582.26 ft
 North: 1897133.58 ft
 East: 1171489.78 ft
 Station: 6233+15.05
 Offset: 62.0541 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	540.5									520.5							
		Hard, gray SILTY CLAY, trace gravel	45	X	15	6 11 19	7.13 B	19			Medium dense, brown fine SAND --Moist--	65	X	19	9 11 13	NP	21
	535.5	Gray SILTY LOAM, trace gravel									Boring terminated at 65.00 ft						
	533.1	Medium dense, brown, fine SAND --Moist--	50	X	16	14 23 18	NP	17									
			55	X	17	12 14 14	NP	27									
	525.5	Dense, gray SILT --Moist--	60	X	18	11 17 19	NP	22									

GENERAL NOTES

Begin Drilling **07-30-2014** Complete Drilling **07-30-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
 Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 14-RWB-03

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 582.96 ft
 North: 1896992.53 ft
 East: 1171501.15 ft
 Station: 6234+52.32
 Offset: 75.7462 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		16-inch thick CONCRETE --PAVEMENT--															
	581.6																
	581.34	1/2-inch thick ASPHALT --PAVEMENT--															
		Dense, grayish white SANDY GRAVEL --FILL--		X	1	22 22 13	NP	3					X	9	0 0 0	0.16 B	27
	579.0			X	2	4 3 5	1.64 B	23					X	10	0 0 0	0.25 B	26
		Stiff, gray SILTY CLAY, trace gravel		X	3	2 2 3	1.07 B	24					X	11	0 1 1	0.33 B	24
	575.0			X	4	1 2 2	0.41 B	32					X	12	1 1 2	< 0.25 P	26
		Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel		X	5	0 0 0	0.16 B	39					X	13	1 2 2	0.82 B	24
				X	6	0 0 1	0.41 B	26					X	14	1 1 2	0.57 B	27
				X	7	0 0 0	0.25 B	25									
				X	8	0 0 0	0.25 B	25									

GENERAL NOTES

Begin Drilling **07-20-2014** Complete Drilling **07-20-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
 Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG 14-RWB-03

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 582.96 ft
 North: 1896992.53 ft
 East: 1171501.15 ft
 Station: 6234+52.32
 Offset: 75.7462 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	541.2	Dense to very dense, gray CLAY LOAM to SILTY LOAM, trace gravel															
		--Dry--	45	X	15	8 12 20	5.74 B	13		518.0		65	X	19	16 20 22	NP	22
											Boring terminated at 65.00 ft						
		--L _L (%)=26, P _L (%)=15-- --%Gravel=5.1-- --%Sand=25.2-- --%Silt=47.0-- --%Clay=22.7-- --A-6 (5)--	50	X	16	13 20 20	NP	12				70					
	528.5	--5-inch, brown, coarse SAND--	55	X	17	9 18 47	NP	12				75					
	526.2	Dense to very dense, brown, fine SAND															
		--Moist--	60	X	18	15 21 37	NP	22				80					

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **07-20-2014** Complete Drilling **07-20-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
 Driller **R&J** Logger **S. Woods** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 11000401.GPJ WANGENG.GDT 3/15/17



BORING LOG 15-RWB-02

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WEI Job No.: 1100-04-01

Client **AECOM**
 Project **Circle Interchange Reconstruction**
 Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 592.37 ft
 North: 1897034.79 ft
 East: 1171464.06 ft
 Station: 7314+68.92
 Offset: 10.2077' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	591.4	12-inch thick, brown SANDY LOAM															
		--FILL--															
		Very stiff, gray SILTY CLAY LOAM, trace gravel and roots			1	3 6 7	2.05 S	17						9	0 0 2	0.41 B	24
	589.4	Medium dense, SILTY LOAM to SILTY CLAY LOAM, trace gravel, sand and brick			2	6 5 5	NP	17				25		10	0 0 0	0.74 B	30
		--FILL--															
	586.9	Very loose to loose, brown, fine SAND			3	3 4 4	NP	18						11	1 1 1	0.74 B	22
		--Wet--															
	582.9	Stiff, brown and gray SILTY CLAY, trace gravel	10		4	2 3 2	NP	17				30		12	0 2 2	0.57 B	23
					5	2 2 3	1.00 P	29									
					6	0 2 2	1.23 B	24				35		13	0 0 1	0.41 B	25
	576.9	Soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			7	0 2 2	0.82 B	24									
					8	0 1 2	0.57 B	24				40		14	0 1 2	0.41 B	25

GENERAL NOTES

Begin Drilling **04-03-2014** Complete Drilling **04-03-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
 Driller **R&J** Logger **M. de los Reyes** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 11', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **5.50 ft**
 At Completion of Drilling ∇ **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 11000401.GPJ WANGENG.GDT 4/14/17



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BORING LOG 15-RWB-02

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 592.37 ft
 North: 1897034.79 ft
 East: 1171464.06 ft
 Station: 7314+68.92
 Offset: 10.2077' LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	530.6									530.6	Very dense, gray SILT						
											--Wet--			19	55/5		NP
			45		15	0 2 3	0.82 B	25		527.4		65					
											Boring terminated at 65.00 ft						
			50		16	0 1 2	0.41 B	28				70					
	540.6	Very stiff to hard, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel															
			55		17	7 7 14	4.10 B	20				75					
		--HARD DRILLING-- --Possible Cobbles--															
			60		18	10 25 50/5	3.28 S	14				80					

GENERAL NOTES

Begin Drilling **04-03-2014** Complete Drilling **04-03-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
 Driller **R&J** Logger **M. de los Reyes** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 11', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **5.50 ft**
 At Completion of Drilling ∇ **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 11000401.GPJ WANGENG.GDT 4/14/17



BORING LOG 1705-B-02

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 583.14 ft
 North: 1897114.28 ft
 East: 1171830.86 ft
 Station: 1820+84.67
 Offset: 1.9068 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	
	582.0	13-inch thick CONCRETE --PAVEMENT--																
	580.1	Medium dense, gray CRUSHED STONE --FILL--			1	14 11 6	NP	4						9	0 1 2	< 0.25 P	22	
	577.6	Very stiff, gray SILTY CLAY, trace gravel			2	2 4 5	2.62 B	27						10	0 0 0	0.41 B	26	
	572.6	Medium stiff, gray CLAY to SILTY CLAY, trace gravel			3	1 3 5	0.98 B	25						11	0 0 0	0.33 B	27	
	570.1	Soft, gray SILTY LOAM, trace gravel			4	1 2 2	0.66 B	21						12	0 0 2	0.41 B	25	
	570.1	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			5	1 1 2	0.49 B	21						13	1 3 3	0.90 B	26	
					6	0 0 1	0.41 B	26						14	1 2 1	0.41 B	29	
					7	0 0 1	0.33 B	20										
					8	0 0 0	0.41 B	27										

--L_L(%)=38, P_L(%)=16--
 --%Gravel=1.9--
 --%Sand=10.7--
 --%Silt=49.3--
 --%Clay=38.0--
 --A-6 (19)--

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **06-20-2013** Complete Drilling **06-21-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR [85%]**
 Driller **P&N** Logger **A. Happel** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring**
backfilled upon completion

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 11000401.GPJ WANGENG.GDT 3/15/17



BORING LOG 1705-B-02

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 583.14 ft
 North: 1897114.28 ft
 East: 1171830.86 ft
 Station: 1820+84.67
 Offset: 1.9068 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)		
	541.4	Hard, gray SILTY CLAY LOAM, trace gravel							[Pattern]										
			45	X	15	10 14 20	5.74 B	15						65	X	19	19 23 23	NP	16
			50	X	16	10 15 21	4.10 B	21						70	X	20	16 26 31	NP	14
			55	X	17	12 18 27	10.09 B	15						75	X	21	5 20 34	NP	5
										516.4	Dense, gray GRAVEL								
										506.4	Dense, gray, medium to coarse SAND, trace gravel								
	524.1	Dense, gray GRAVELLY SANDY LOAM							[Pattern]										
			60	X	18	11 14 18	NP	14						80	X	22	16 15 18	NP	14

--%Gravel=28.5--
 --%Sand=49.5--
 --%Silt=19.2--
 --%Clay=2.9--
 --A-1-b (0)--

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **06-20-2013** Complete Drilling **06-21-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR [85%]**
 Driller **P&N** Logger **A. Happel** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 11000401.GPJ WANGENG.GDT 3/15/17



BORING LOG 1705-B-02

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 583.14 ft
 North: 1897114.28 ft
 East: 1171830.86 ft
 Station: 1820+84.67
 Offset: 1.9068 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	501.4	--%Clay=2.2-- --A-1-b (0)-- Very dense, gray GRAVEL															
	497.1	Strong, excellent rock quality, light gray, fresh, joint breaks with little to no infill, slightly vuggy DOLOSTONE --Run 1 - RECOVERY =100%-- --RQD=95%--			23	50/5	NP	21									
	487.1	Boring terminated at 96.00 ft			1												

WANGENGINC 11000401.GPJ WANGENG.GDT 3/15/17

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **06-20-2013** Complete Drilling **06-21-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR [85%]**
 Driller **P&N** Logger **A. Happel** Checked by **C. Marin**
 Drilling Method **2.25" SSA to 10', mud rotary thereafter, boring backfilled upon completion**

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



BORING LOG 1715-B-05

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 577.87 ft
 North: 1897826.42 ft
 East: 1171228.58 ft
 Station: 1223+01.26
 Offset: 21.8060 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	576.9	Dark brown SILTY LOAM, trace gravel															
		--TOPSOIL--															
		Stiff to hard, brown and gray SILTY CLAY LOAM, trace gravel and roots			1	6 8 7	4.50 P	14						9	1 2 3	0.25 B	27
		--FILL--															
					2	1 3 2	1.00 P	28				25		10	2 2 3	0.33 B	26
	572.4	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			3	1 2 3	0.25 B	20						11	3 3 4	0.49 B	26
					4	1 2 2	0.25 B	25				30		12	2 2 3	0.57 B	27
					5	1 1 2	0.25 B	28		546.1	Stiff to hard, gray SILTY CLAY LOAM, trace gravel						
					6	1 2 1	0.16 B	28				35		13	4 5 8	2.17 N/6	21
					7	1 2 2	0.25 B	27									
					8	1 2 2	0.16 B	27				40		14	4 5 10	1.75 P	24

GENERAL NOTES

Begin Drilling **04-14-2014** Complete Drilling **04-17-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV [93%]**
 Driller **N&J** Logger **A. Happel** Checked by **C. Marin**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 11000401.GPJ WANGENG.GDT 3/15/17



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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 577.87 ft
 North: 1897826.42 ft
 East: 1171228.58 ft
 Station: 1223+01.26
 Offset: 21.8060 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	521.1	Medium stiff, gray CLAY, trace gravel								516.1	Loose, gray SILT						
			45	X	15	8 10 14	4.10 B	15				65	X	19	4 4 4	NP	29
			50	X	16	10 12 16	4.67 B	14		511.1	Hard, gray SILTY CLAY LOAM, trace gravel	70	X	20	10 16 22	6.07 B	20
			55	X	17	8 9 14	2.95 B	21		506.1	Very dense, gray SILTY LOAM, some gravel	75	X	21	7 36 50/5	NA	
			60	X	18	4 3 5	0.66 B	38				80	X	22	50/5	NP	13

--HARD DRILLING--
 --Possible Cobbles--

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **04-14-2014** Complete Drilling **04-17-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV [93%]**
 Driller **N&J** Logger **A. Happel** Checked by **C. Marin**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 11000401.GPJ WANGENG.GDT 3/15/17



BORING LOG 1715-B-05

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 577.87 ft
 North: 1897826.42 ft
 East: 1171228.58 ft
 Station: 1223+01.26
 Offset: 21.8060 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--HARD DRILLING-- --Possible Cobbles--	23			50/0											
	491.1	--DIFFICULT DRILLING-- --WEATHERED BEDROCK--	85														
	489.9	Strong, light gray, fair rock quality, bedded DOLOSTONE, beds up to 10 inch, 6 inch joint spacing, joints with more than 0.2 inch or no infilling, vuggy, and with stylolitic surfaces. --Run 1 -RECOVERY= 91%-- --RQD= 66%--	90						C O R E								
	479.9	Boring terminated at 98.00 ft	98		1												

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **04-14-2014** Complete Drilling **04-17-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV [93%]**
 Driller **N&J** Logger **A. Happel** Checked by **C. Marin**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 11000401.GPJ WANGENG.GDT 3/15/17



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BORING LOG 18-RWB-02

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 575.58 ft
 North: 1897703.15 ft
 East: 1171280.67 ft
 Station: 1605+93.00
 Offset: 30.6655 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	575.33	33-inch thick ASPHALT --PAVEMENT--															
	574.6	9-inch thick CONCRETE --PAVEMENT--															
	572.6	Medium dense, brown SANDY GRAVEL --FILL--			1	11 10 6	NP	14						9	0 0 0	0.16 B	27
		Soft to medium stiff, gray SILTY CLAY LOAM, trace gravel			2	2 2 3	0.83 N/6					25		10	0 0 2	0.33 B	25
		--L _L (%)=30, P _L (%)=14-- --%Gravel=3.5-- --%Sand=15.1-- --%Silt=56.3-- --%Clay=25.2-- --A-6 (10)--			3	1 1 2	0.25 B	23						11	0 2 2	0.33 B	25
	567.6	Very soft to medium stiff, gray CLAY to SILTY CLAY, trace gravel			4	1 1 2	0.25 B	26				30		12	0 0 1	0.33 B	27
					5	0 0 2	0.03 B	28									
					6	0 1 1	0.25 B	26				35		13	1 2 3	0.49 B	19
					7	0 1 2	0.25 B	26		538.8	Very stiff, gray SILTY CLAY, trace gravel						
					8	0 0 0	0.16 B	27				40		14	4 9 10	3.12 B	17

GENERAL NOTES

Begin Drilling **10-14-2013** Complete Drilling **10-14-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
 Driller **R&N** Logger **D. Kolpacki** Checked by **C. Marin**
 Drilling Method **3.25" HSA, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

WANGENGINC 11000401.GPJ WANGENG.GDT 3/15/17



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BORING LOG 18-RWB-02

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 575.58 ft
 North: 1897703.15 ft
 East: 1171280.67 ft
 Station: 1605+93.00
 Offset: 30.6655 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	525.6		45		15	4 8 10	2.95 B	19									
		--L _L (%)=35, P _L (%)=17-- --%Gravel=2.2-- --%Sand=9.4-- --%Silt=51.7-- --%Clay=36.7-- --A-6 (15)-															
			50		16	6 17 14	3.20 B	17									
		Boring terminated at 50.00 ft															

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **10-14-2013** Complete Drilling **10-14-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
 Driller **R&N** Logger **D. Kolpacki** Checked by **C. Marin**
 Drilling Method **3.25" HSA, boring backfilled upon completion**

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



BORING LOG 18-RWB-03

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WEI Job No.: 1100-04-01

Client **AECOM**
 Project **Circle Interchange Reconstruction**
 Location **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 573.93 ft
 North: 1897759.34 ft
 East: 1171203.61 ft
 Station: 1604+97.68
 Offset: 33.9208 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	573.64	1/4-inch thick ASPHALT --PAVEMENT--															
	572.9	8-inch thick CONCRETE --PAVEMENT--															
		Medium dense, brown SANDY GRAVEL and CRUSHED STONE --FILL--			1	12 14 12	NP	7						9	0 0 2	0.25 B	26
					2	4 5 6	NP	11				25		10	0 1 2	0.33 B	25
	568.4	Very soft to soft, gray CLAY to SILTY CLAY, trace gravel			3	2 1 1	0.25 B	22						11	0 1 2	0.33 B	25
					4	0 1 1	0.33 B	26						12	0 0 0	0.25 B	29
					5	0 0 0	0.16 B	27		542.2	Stiff to hard, gray SILTY CLAY LOAM to SILTY LOAM, trace gravel						
		--L _L (%)=33, P _L (%)=19-- --%Gravel=2.2-- --%Sand=9.4-- --%Silt=51.7-- --%Clay=36.7-- --A-6 (10)--			6	0 0 0	0.16 B	27						13	3 5 10	3.85 B	15
					7	0 0 0	0.16 B	24									
					8	0 1 1	0.25 B	27			--L _L (%)=24, P _L (%)=15-- --%Gravel=8.4-- --%Sand=24.5--			14	8 12 14	4.35 B	14

WANGENGINC 11000401.GPJ WANGENG.GDT 3/15/17

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **10-14-2013** Complete Drilling **10-14-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
 Driller **R&N** Logger **D. Kolpacki** Checked by **C. Marin**
 Drilling Method **3.25" HSA, boring backfilled upon completion**

While Drilling ∇ **3.50 ft**
 At Completion of Drilling ∇ **40.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



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BORING LOG 18-RWB-03

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 573.93 ft
 North: 1897759.34 ft
 East: 1171203.61 ft
 Station: 1604+97.68
 Offset: 33.9208 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		--%Silt=49.1-- --%Clay=18.1-- --A-4 (3)--															
			45		15	5 8 12	3.03 B	22									
			50		16	5 8 10	1.97 B	23									
	523.9	Boring terminated at 50.00 ft															
			55														
			60														

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **10-14-2013** Complete Drilling **10-14-2013**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-50 TMR [78%]**
 Driller **R&N** Logger **D. Kolpacki** Checked by **C. Marin**
 Drilling Method **3.25" HSA, boring backfilled upon completion**

While Drilling ∇ **3.50 ft**
 At Completion of Drilling \blacktriangledown **40.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



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BORING LOG SB90-SGB-24

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 578.24 ft
 North: 1897470.25 ft
 East: 1171446.01 ft
 Station: 1512+28.05
 Offset: 14.8803 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	577.0	15-inch thick, CONCRETE --PAVEMENT--															
	574.5	Medium dense, gray SANDY GRAVEL, crushed stone --BASE COURSE--			1	13 14 13 6	NP	5									
		Soft to medium stiff, gray CLAY to CLAY LOAM, trace gravel --L _L (%)=28, P _L (%)=16-- --%Gravel=2.8-- --%Sand=13.3-- --%Silt=64.3-- --%Clay=19.6-- --A-6 (8)--	5		2	2 2 2 3	0.74 B	23									
					3	1 1 2 2	0.66 B	19									
					4	1 1 2 2	0.41 B	20									
			10		5	0 1 2 2	0.25 B	24									
	566.7	Boring terminated at 11.50 ft															
			15														
			20														

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **10-26-2014** Complete Drilling **10-26-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
 Driller **P&P** Logger **F. Bozga** Checked by **C. Marin**
 Drilling Method **2.25" SSA, boring backfilled upon completion**

While Drilling **DRY**
 At Completion of Drilling **DRY**
 Time After Drilling **NA**
 Depth to Water **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



BORING LOG SB90-SGB-25

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WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 581.55 ft
 North: 1897164.83 ft
 East: 1171487.22 ft
 Station: 1515+33.53
 Offset: 22.3627 RT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		13-inch thick, CONCRETE --PAVEMENT--															
	580.5																
		Dense, gray SANDY GRAVEL, crushed stone --BASE COURSE--			1	17 18 13 13	NP	7									
	578.8																
		Very soft to medium stiff, gray SILTY CLAY LOAM, trace gravel			2	2 2 2 2	0.98 B	25									
			5														
					3	1 2 2 3	0.57 B	30									
					4	0 2 1 2	0.33 B	28									
					5	1 1 2 2	< 0.25 P	25									
	570.5		10														
		Boring terminated at 11.00 ft															
			15														
			20														

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **10-26-2014** Complete Drilling **10-26-2014**
 Drilling Contractor **Wang Testing Services** Drill Rig **B-57 TMR [100%]**
 Driller **P&P** Logger **F. Bozga** Checked by **RKC**
 Drilling Method **2.25" SSA, boring backfilled upon completion**

While Drilling ∇ **DRY**
 At Completion of Drilling ∇ **DRY**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



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BORING LOG VST-01

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 593.55 ft
 North: 1897108.36 ft
 East: 1171435.63 ft
 Station: 7313+90.29
 Offset: 3.222 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Very stiff, brown SILTY CLAY LOAM, trace gravel --FILL--			1	3 5 7	2.75 P	14			--S _{u undis} = 786.3 psf-- --S _{u remold} = 371.3 psf-- --Sensitivity = 2.1--						
	590.5	Medium dense, fine SAND	5		2	5 5 6	NP	7			--In-Situ Vane Shear, 22.0 feet-- --S _{u undis} = 742.6 psf-- --S _{u remold} = 305.8 psf-- --Sensitivity = 2.4--			2			
	586.8	Medium stiff to stiff, gray SILTY CLAY	10		3	2 2 3	1.31 B	26			--In-Situ Vane Shear, 24.5 feet-- --S _{u undis} = 578.8 psf-- --S _{u remold} = 382.2 psf-- --Sensitivity = 1.5--			3			
			15		4	2 2 3	0.98 B	28			--In-Situ Vane Shear, 27.0 feet-- --S _{u undis} = 742.6 psf-- --S _{u remold} = 415.0 psf-- --Sensitivity = 1.8--			4			
	578.0	Soft, gray SILTY CLAY			5	1 2 2	0.25 P	29			--In-Situ Vane Shear, 29.5 feet-- --S _{u undis} = 589.7 psf-- --S _{u remold} = 283.9 psf-- --Sensitivity = 2.1--			5			
	575.3										--In-Situ Vane Shear, 32.0 feet-- --S _{u undis} = 1026.6 psf-- --S _{u remold} = 447.8 psf-- --Sensitivity = 2.3--			6			
											--In-Situ Vane Shear, 34.5 feet-- --S _{u undis} = 764.5 psf-- --S _{u remold} = 480.5 psf-- --Sensitivity = 1.6--			7			
											--In-Situ Vane Shear, 37.0 feet-- --S _{u undis} = 1026.6 psf-- --S _{u remold} = 589.7 psf-- --Sensitivity = 1.7--			8			
		--In-Situ Vane Shear, 19.5 feet--	20		1							40					

GENERAL NOTES

Begin Drilling **12-01-2015** Complete Drilling **12-01-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR [85%]**
 Driller **R&N** Logger **F. Bozga** Checked by **A. Kurnia**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring**
backfilled upon completion

WATER LEVEL DATA

While Drilling **Rotary wash**
 At Completion of Drilling **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water **NA**

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WANGENGINC 11000401.GPJ WANGENG.GDT 3/10/17



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BORING LOG VST-01

WEI Job No.: 1100-04-01

Client: **AECOM**
 Project: **Circle Interchange Reconstruction**
 Location: **Section 17, T39N, R14E of 3rd PM**

Datum: NAVD 88
 Elevation: 593.55 ft
 North: 1897108.36 ft
 East: 1171435.63 ft
 Station: 7313+90.29
 Offset: 3.222 LT

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	544.0																
		--Equipment Slipped--	45		9	VS											
		--In-Situ Vane Shear, 46.5 feet-- -- $S_{u\text{ undis}} = 1070.2$ psf-- -- $S_{u\text{ remold}} = 633.4$ psf-- --Sensitivity = 1.7--			10	VS											
		--In-Situ Vane Shear, 49.0 feet-- -- $S_{u\text{ undis}} = 1157.6$ psf-- -- $S_{u\text{ remold}} = 611.6$ psf-- --Sensitivity = 2.3-- Boring terminated at 49.50 ft	50		11	VS											
			55														
			60														

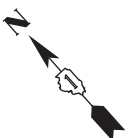
GENERAL NOTES

Begin Drilling **12-01-2015** Complete Drilling **12-01-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig **CME-55 TMR [85%]**
 Driller **R&N** Logger **F. Bozga** Checked by **A. Kurnia**
 Drilling Method **2.25" HSA to 10', mud rotary thereafter, boring backfilled upon completion**

WATER LEVEL DATA

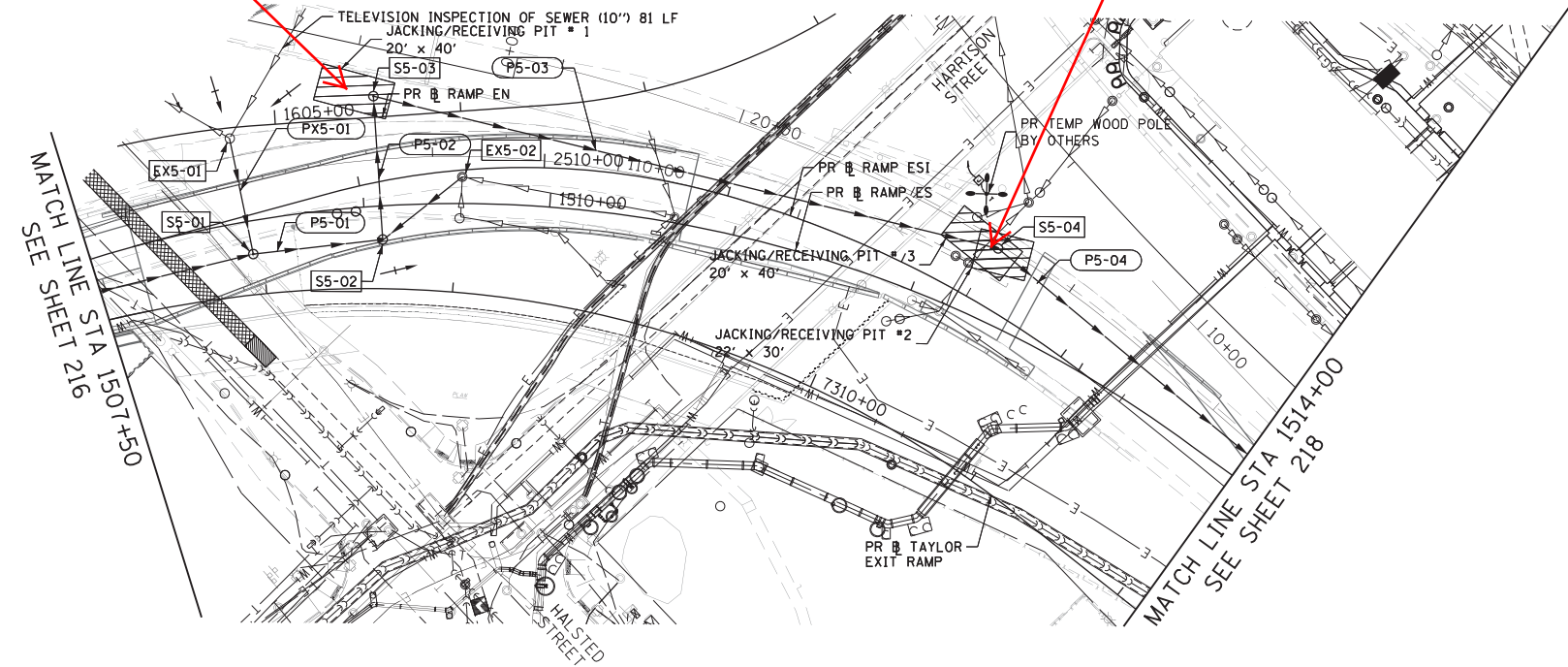
While Drilling ∇ **Rotary wash**
 At Completion of Drilling ∇ **mud in the borehole**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.



APPROXIMATE CENTER OF PIT
 NORTHING: 1897769.3554
 EASTING: 1171269.6301

APPROXIMATE CENTER OF PIT
 NORTHING: 1897481.4958
 EASTING: 1171470.8123



NOTES:

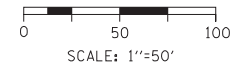
1. FOR CTA DRAINAGE, SEE SHEETS 225 TO 228.
2. PREFERRED JACKING AND RECEIVING PIT LAYOUT. CONTRACTOR SHALL STAKE OUT PIT LOCATION IN FIELD PRIOR TO EXCAVATION FOR VERIFICATION BY THE ENGINEER.
3. EXISTING STORM SEWER TO BE ABANDONED AND FILLED IS NOT SHOWN FOR CLARITY. SEE EXISTING DRAINAGE PLAN, SHEETS 207 TO 212 FOR DETAILS.

STRUCTURE SCHEDULE

STRUCTURE NUMBER	STATION	OFFSET (FT)	OFFSET LOCATION (EDGE OF SHOULDER, CENTER OF STRUCTURE, FACE OF BARRIER)	STRUCTURE TYPE	FRAME & GRATE	RIM ELEVATION	INVERT ELEVATIONS			
							NORTH	EAST	SOUTH	WEST
S5-01	1508+37.00	17.84' RT	COS	MH, TYPE A, 6'-DIAMETER	TYPE 1 FRAME, CLOSED LID	574.51	568.75	560.72		560.72
S5-02	1509+09.00	18.09' RT	COS	MH, TYPE A, 8'-DIAMETER	TYPE 8 GRATE	574.84		560.65		560.65
S5-03	1509+08.79	59.10' LT	COS	MH, TYPE A, 9'-DIAMETER	TYPE 1 FRAME, CLOSED LID	579.90			557.46	560.59
S5-04	1512+33.39	38.92' LT	COS	MH, TYPE A, 9'-DIAMETER	TYPE 1 FRAME, CLOSED LID	578.99	557.19		554.69	
EX5-01	1508+35.10	45.59' LT	COS			574.66				
EX5-02	1509+52.83	14.73' LT	COS			575.41				

PIPE SCHEDULE

PIPE NUMBER	STRUCTURE				DESCRIPTION	CLASS	TYPE	SIZE (IN)	LENGTH (FT)	SLOPE (%)	TBF (CU YD)
	FROM	dir	TO	dir							
P5-01	S5-01	S	S5-02	N	STORM SEWERS	A	3	36	66	0.10%	208.5
P5-02	S5-02	E	S5-03	W	STORM SEWERS	A	3	42	76	0.10%	255.0
P5-03	S5-03	S	S5-04	N	STORM SEWERS JACKED IN PLACE	A	3	42	335	0.08%	
P5-04	S5-04	S	S6-01	N	STORM SEWERS JACKED IN PLACE	A	3	60	430	0.05%	
PX5-01	EX5-01	S	S5-01	N	STORM SEWERS	A	2	15	63		
PX5-02	EX5-02	W	S5-02	E	STORM SEWERS	A	2	15	52		



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 PLOT SCALE = 100.0000' / in.
 PLOT DATE = 2/9/2017

DESIGNED - JLV
 DRAWN - MRC
 CHECKED - MKW
 DATE - 2/10/17

REVISED -
 REVISED -
 REVISED -
 REVISED -

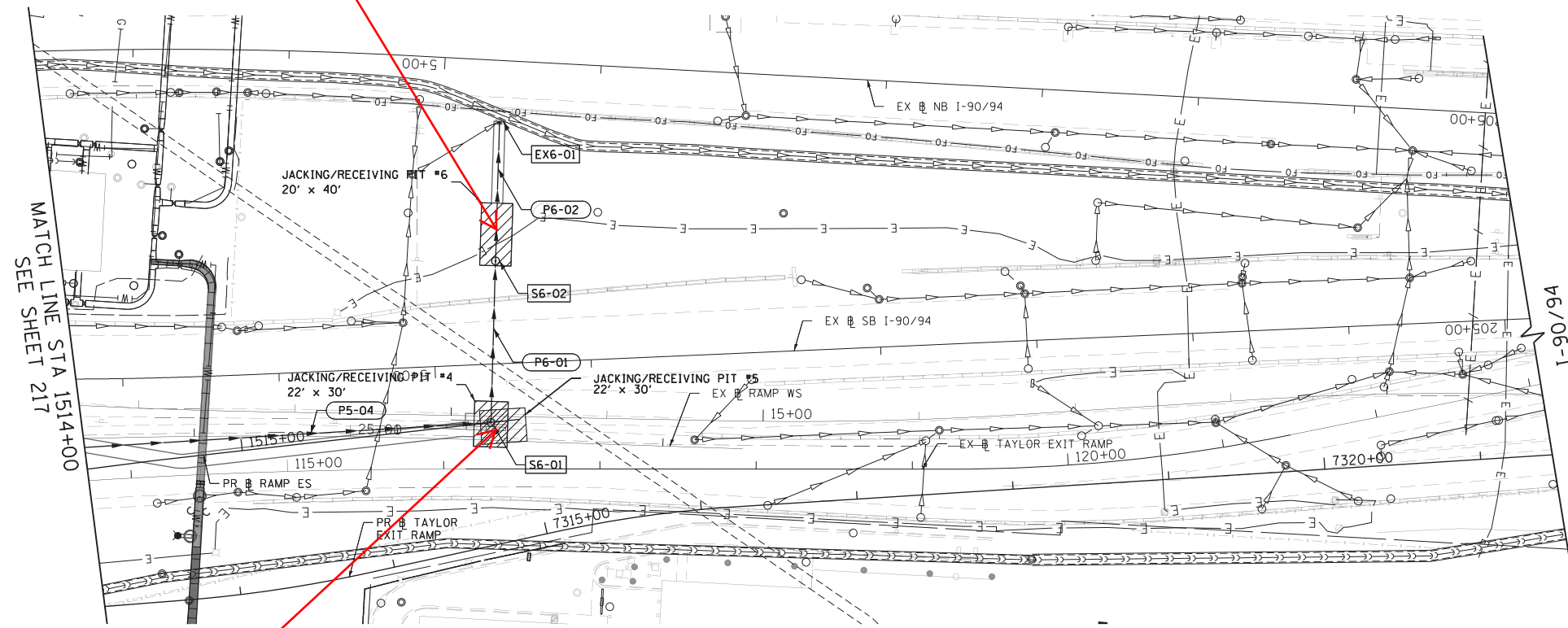
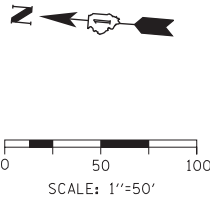
**STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION**

**PROPOSED DRAINAGE PLAN
 EASTBOUND I-290**

SCALE: 1"=50' SHEET 5 OF 12 SHEETS STA. 1507+50 TO STA. 1514+00

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2014-002R&B	COOK	696	217
CONTRACT NO. 60X76			ILLINOIS FED. AID PROJECT	

APPROXIMATE CENTER OF PIT
 NORTHING: 1897052.1243
 EASTING: 1171654.4622



NOTES:

1. FOR CTA DRAINAGE, SEE SHEETS 225 TO 228 .
2. PREFERRED JACKING AND RECEIVING PIT LAYOUT. CONTRACTOR SHALL STAKE OUT PIT LOCATION IN FIELD PRIOR TO EXCAVATION FOR VERIFICATION BY THE ENGINEER.
3. EXISTING STORM SEWER TO BE ABANDONED AND FILLED IS NOT SHOWN FOR CLARITY. SEE EXISTING DRAINAGE PLAN, SHEETS 207 TO 212 FOR DETAILS.

APPROXIMATE CENTER OF PIT
 NORTHING: 1897039.3236
 EASTING: 1171533.5497

STRUCTURE SCHEDULE

STRUCTURE NUMBER	STATION	OFFSET (FT)	OFFSET LOCATION (EDGE OF SHOULDER, CENTER OF STRUCTURE, FACE OF BARRIER)	STRUCTURE TYPE	FRAME & GRATE	RIM ELEVATION	INVERT ELEVATIONS			
							NORTH	EAST	SOUTH	WEST
S6-01	1516+60.10	0.03' LT	COS	MH, TYPE A, 9'-DIAMETER	TYPE 1 FRAME, CLOSED LID	581.73	554.50	554.50		
S6-02	4+58.31	65.83' RT	COS	MH, TYPE A, 6'-DIAMETER, RESTRICTOR PLATE	TYPE 1 FRAME, CLOSED LID	581.38	554.45		557.45	

PIPE SCHEDULE

PIPE NUMBER	STRUCTURE				DESCRIPTION	CLASS	TYPE	SIZE (IN)	LENGTH (FT)	SLOPE (%)	TBF (CU YD)
	FROM	dir	TO	dir							
P6-01	S6-01	E	S6-02	W	STORM SEWERS JACKED IN PLACE	A	3	60	104	0.05%	
P6-02	S6-03	E	EX6-01	W	STORM SEWERS	A	2	24	90	0.17%	149.8

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D160X76-SHT-DRAIN-06.dgn
 USER NAME = v1janachione
 PLOT SCALE = 100.0000' / in.
 PLOT DATE = 2/9/2017

DESIGNED - JLV
 DRAWN - MRC
 CHECKED - MKW
 DATE - 2/10/17

REVISED -
 REVISED -
 REVISED -
 REVISED -

**STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION**

**PROPOSED DRAINAGE PLAN
 EASTBOUND I-290**

SCALE: SHEET 6 OF 12 SHEETS STA. 1514+00 TO STA.

F.A.I. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
90/94/290	2014-002R&B	COOK	696	218
CONTRACT NO. 60X76			ILLINOIS FED. AID PROJECT	