

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404639 Geotechnical Evaluation IA21 over Cedar Creek Keokuk County, IA					BORING: BR-01		
					LOCATION: Station 58+32.54, Rt. 6		
					DATUM: WGS84		
					LATITUDE: 30.23159	LONGITUDE: -15.99697	
DRILLER: AL/JS		LOGGED BY: A. Martin		START DATE: 08/09/24		END DATE: 08/12/24	
SURFACE ELEVATION: 727.4 ft		RIG: 5501		METHOD: Mud Rotary		SURFACING: Pavement	
						WEATHER: 70 & Sunny	
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
727.2 0.2		ASPHALT CONCRETE					Mud rotary drilling at 1.5 feet.
725.9 1.5		FILL: SANDY LEAN CLAY (CL), brown and gray, moist		4-5-5 (10) 4"			
				4-5-6 (11) 6"			
719.4 8.0		FILL: FAT CLAY (CH), trace Sand, dark brown, moist		TW 14"		21	LL=39, PL=21, PI=18 P200=74% DD=106 pcf q _u =1.38 tsf
				2-3-3 (6) 8"			
715.4 12.0		LEAN CLAY (CL), with Sand, gray, moist to wet, very soft (ALLUVIUM)		TW 18"		30	LL=45, PL=23, PI=22 P200=93% DD=91 pcf q _u =0.93 tsf
				0-0-0 18"			
704.4 23.0		FAT CLAY (CH), trace Sand, trace organic, brown and gray, moist, soft (ALLUVIUM)		1-2-2 (4) 14"		47	LL=58, PL=31, PI=27 Water loss at 27 feet.
				1-1-1 (2) 18"			

Continued on next page

Project Number B2404639 Geotechnical Evaluation IA21 over Cedar Creek Keokuk County, IA					BORING: BR-01		
					LOCATION: Station 58+32.54, Rt. 6		
					DATUM: WGS84		
					LATITUDE: 30.23159	LONGITUDE: -15.99697	
DRILLER: AL/JS		LOGGED BY: A. Martin		START DATE: 08/09/24	END DATE: 08/12/24		
SURFACE ELEVATION: 727.4 ft		RIG: 5501	METHOD: Mud Rotary	SURFACING: Pavement	WEATHER: 70 & Sunny		

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
694.4		FAT CLAY (CH), trace Sand, trace organic, brown and gray, moist, soft (ALLUVIUM)		1-2-5 (7) 12"			
33.0		SANDY LEAN CLAY (CL), dark gray gray, moist, medium (ALLUVIUM)	35				
690.4		SILTY SAND (SM), fine-grained, with Gravel, gray, moist to wet, medium dense (ALLUVIUM)	40	8-5-5 (10) 8"		20	Water loss at 37 feet. Gravel= 21% Sand= 37% P200=42%
37.0							
682.4		CLAYEY GRAVEL (GC), fine to coarse-grained, tan, wet, medium dense (RESIDUUM)	45	4-5-5 (10) 8"			
45.0							
677.4		LIMESTONE, light gray, highly weathered	50	5-8-12 (20) 10"		24	
50.0				50/1" (REF) 0"			
673.8		END OF BORING		50/1" (REF) 4"			Auger refusal at 53.6 feet. Water level obscured due to mud rotary drilling method.
53.6		Boring then backfilled with auger cuttings	55				
			60				

Project Number B2404639 Geotechnical Evaluation IA21 over Cedar Creek Keokuk County, IA					BORING: BR-02		
					LOCATION: Station 57+80.79, Lt. 14		
					DATUM: WGS 84		
					LATITUDE: 41.35218	LONGITUDE: -92.35439	
DRILLER: AL/JS		LOGGED BY: B. Godagama		START DATE: 08/08/24		END DATE: 08/08/24	
SURFACE ELEVATION: 727.4 ft		RIG: 5501		METHOD: 3 1/4" HSA		SURFACING: Bridge Deck	
				WEATHER: 70 & Overcast			
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
726.6 0.8		CONCRETE					
		AIR					
			5				
717.4 10.0		SOIL OVERBURDEN	10				
			15				
709.4 18.0		LEAN CLAY (CL), trace organic, gray to dark gray, moist, soft (ALLUVIUM)	20	0-1-1 (2) 18"		30	Drilling casing extended to 18 foot depth. Mud rotary began at 18 feet. LL=37, PL=17, PI=20
			25	0-1-1 (2) 10"			
700.4 27.0		LEAN CLAY (CL), gray, wet, soft (ALLUVIUM)	30	1-1-2 (3) 12"			

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<div>Project Number B2404639</div> <div>Geotechnical Evaluation</div> <div>IA21 over Cedar Creek</div> <div>Keokuk County, IA</div>					BORING: BR-02							
					LOCATION: Station 57+80.79, Lt. 14							
					DATUM: WGS 84							
					LATITUDE: 41.35218	LONGITUDE: -92.35439						
DRILLER: AL/JS		LOGGED BY: B. Godagama		START DATE: 08/08/24	END DATE: 08/08/24							
SURFACE ELEVATION: 727.4 ft		RIG: 5501	METHOD: 3 1/4" HSA		SURFACING: Bridge Deck	WEATHER: 70 & Overcast						
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)			Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks			
694.4			LEAN CLAY (CL), gray, wet, soft (ALLUVIUM)									
33.0			CLAYEY SAND (SC), fine to medium-grained, trace Gravel, gray, moist, loose (ALLUVIUM)			35	6-2-2 (4) 10"					
690.4			SANDY LEAN CLAY (CL), gray, wet, medium (ALLUVIUM)			40	2-3-4 (7) 11"		21	LL=25, PL=14, PI=11 P200=65%		
37.0			trace Gravel at 44 feet			45	2-3-4 (7) 13"					
679.4			LIMESTONE, tan, wet, highly weathered, Argillious			50	30-41-18 (59) 10"			Auger refusal at 51 feet. Coring began at 51.1 feet.		
48.0			LIMESTONE, gray, decomposed to highly weathered, very soft to soft, very fine-grained, thin bedded, intensely fractured, Argillious			50/1" (REF) 0"	0 23	4	4650	180	100	
676.4			SHAPE, gray, moderately weathered, moderately hard, very fine-grained, thin bedded, slightly fractured, inter-bedded Limestone			55	75 100	3	3720	180	100	MC=5% q _u =178 tsf DD=148 pcf MC=4% q _u =270 tsf DD=149 pcf
672.4			END OF CORING									Water level obscured due to mud rotary drilling method.
55.0			Boring then backfilled with auger cuttings									
666.4												
61.0												

Project Number B2404639 Geotechnical Evaluation IA21 over Cedar Creek Keokuk County, IA					BORING: BR-02A		
					LOCATION: Station 57+83, Rt. 9		
					DATUM: WGS 84		
					LATITUDE: 41.35219	LONGITUDE: -92.35431	
DRILLER: DM/BG/HS		LOGGED BY: L. Cripe		START DATE: 07/02/25	END DATE: 07/02/25		
SURFACE ELEVATION: 727.5 ft	RIG: 8504	METHOD: Mud Rotary		SURFACING: Bridge Deck	WEATHER: 80 & Sunny		
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
726.8 0.8		Bridge Deck Air					
719.0 8.5		Soil Overburden					Drilling casing extended to 13 feet.
714.5 13.0		LEAN CLAY (CL), trace organic, dark gray to light gray, wet, very soft (ALLUVIUM)		0-0-0 16"			Mud rotary drilling started at 13 feet.
				0-0-0 12"		35	LL=35, PL=19, PI=16 Gravel= 0% Sand= 15% Silt & Clay= 85%
				0-0-0 14"			
				0-0-1 (1) 16"			

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Project Number B2404639 Geotechnical Evaluation IA21 over Cedar Creek Keokuk County, IA					BORING: BR-02A					
					LOCATION: Station 57+83, Rt. 9					
					DATUM: WGS 84					
					LATITUDE: 41.35219	LONGITUDE: -92.35431				
DRILLER: DM/BG/HS		LOGGED BY: L. Cripe		START DATE: 07/02/25		END DATE: 07/02/25				
SURFACE ELEVATION: 727.5 ft		RIG: 8504		METHOD: Mud Rotary		SURFACING: Bridge Deck		WEATHER: 80 & Sunny		
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks			
694.5 33.0		LEAN CLAY (CL), trace organic, dark gray to light gray, wet, very soft (ALLUVIUM) CLAYEY SAND (SC), fine to medium-grained, trace Gravel, light gray, moist, loose (ALLUVIUM)	35	2-2-3 (5) 17"		24				
689.0 38.5		SANDY LEAN CLAY (CL), dark gray, wet, stiff to very stiff (ALLUVIUM)	40	3-5-6 (11) 17"		22				
			45	6-9-10 (19) 15"			Gravel= 0% Sand= 42% Silt & Clay= 58% Auger refusal at 48.5 feet. Boring cored from 48.5 to 78.5 feet.			
679.0 48.5		LIMESTONE, dark gray, moist, moderately weathered, soft, very fine-grained, Argillaceous, moderately fractured	50	50/0" (REF) 0"			100	80	MC=3% q _u =170 tsf DD=156 pcf	
674.0 53.5		LIMESTONE, tan, moist, slightly weathered, moderately hard, very fine-grained, moderately fractured	55	60	100		100	80	MC=4% q _u =245 tsf DD=147 pcf	
673.0 54.5		SHALE, dark gray, moist, moderately weathered, soft, very fine-grained, moderately fractured								
665.5 62.0		LIMESTONE, light gray to tan, moist to wet, slightly weathered to unweathered, moderately hard, very fine-grained, slightly fractured		25	100		100	80	MC=4% q _u =343 tsf DD=147 pcf	
Continued on next page				RQD %	Recovery %	Drilling Rate (min/ft)	Bit Pressure (psi)	Water Pressure (psi)	Water Return %	Remarks

Project Number B2404639 Geotechnical Evaluation IA21 over Cedar Creek Keokuk County, IA					BORING: BR-02A					
					LOCATION: Station 57+83, Rt. 9					
					DATUM: WGS 84					
					LATITUDE: 41.35219		LONGITUDE: -92.35431			
DRILLER: DM/BG/HS		LOGGED BY: L. Cripe			START DATE: 07/02/25		END DATE: 07/02/25			
SURFACE ELEVATION: 727.5 ft		RIG: 8504		METHOD: Mud Rotary		SURFACING: Bridge Deck		WEATHER: 80 & Sunny		
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	RQD %	Recovery %	Drilling Rate (min/ft)	Bit Pressure (psi)	Water Pressure (psi)	Water Return %	Remarks
		LIMESTONE, light gray to tan, moist to wet, slightly weathered to unweathered, moderately hard, very fine-grained, slightly fractured	65	75	100			100	80	MC=5% q _u =424 tsf DD=149 pcf
656.0			70	55	100			100	80	MC=1% q _u =900 tsf DD=158 pcf
71.5		SHALE, dark gray, moist, moderately weathered, soft to very soft, very fine-grained, moderately fractured, with Limestone inclusions	75							MC=12% q _u =11 tsf DD=123 pcf
652.0				40	100			100	80	
75.5		LIMESTONE, light gray, moderately weathered, moderately hard, very fine-grained, highly fractured to intensely fractured								
649.0										
78.5		END OF CORING								Water level obscured due to mud rotary drilling method.
		Boring then backfilled with auger cuttings	80							Bridge deck patched with PCC.
			85							
			90							
			95							

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Project Number B2404639 Geotechnical Evaluation IA21 over Cedar Creek Keokuk County, IA					BORING: BR-03		
					LOCATION: Station 57+23.56, Rt. 3		
					DATUM: WGS84		
					LATITUDE: 30.23015	LONGITUDE: -15.99606	
DRILLER: AL/JS		LOGGED BY: A. Martin		START DATE: 08/09/24	END DATE: 08/12/24		
SURFACE ELEVATION: 727.3 ft		RIG: 5501	METHOD: 3 1/4" HSA	SURFACING: Pavement	WEATHER: 80 & Sunny		
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
726.5 0.8		CONCRETE					
		AIR					
			5				
			10				
714.3 13.0		Soil Overburden	15				
709.3 18.0		FILL: LEAN CLAY (CL), with Sand, and Gravel, brown, moist	20	7-14-10 (24) 8"			Drilling casing extended to 18 foot depth. Mud rotary began at 18 feet.
704.3 23.0		LEAN CLAY (CL), gray, moist to wet, very soft (ALLUVIUM)	25	0-0-1 (1) 14"			
			30	0-0-1 (1) 16"		35	
Continued on next page							

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Project Number B2404639 Geotechnical Evaluation IA21 over Cedar Creek Keokuk County, IA					BORING: BR-03		
					LOCATION: Station 57+23.56, Rt. 3		
					DATUM: WGS84		
					LATITUDE: 30.23015	LONGITUDE: -15.99606	
DRILLER: AL/JS		LOGGED BY: A. Martin		START DATE: 08/09/24	END DATE: 08/12/24		
SURFACE ELEVATION: 727.3 ft		RIG: 5501	METHOD: 3 1/4" HSA	SURFACING: Pavement	WEATHER: 80 & Sunny		
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
694.3		LEAN CLAY (CL), gray, moist to wet, very soft (ALLUVIUM)					
33.0		CLAYEY SAND (SC), fine-grained, light gray, moist, medium dense (ALLUVIUM)		8-10-11 (21) 12"		23	Sand= 80% Gravel= 2% P200=18%
692.3		POORLY GRADED SAND with SILT (SP-SM), fine-grained, trace Gravel, tan, moist to wet, medium dense (ALLUVIUM)	35				
35.0							
			40	6-6-6 (12) 4"			
			45	7-8-8 (16) 6"			
680.3		LIMESTONE, highly weathered					
47.0							
678.2		END OF BORING	50	50/2" (REF) 0"			
49.1		Boring then backfilled with auger cuttings		50/1" (REF) 0"			
			55				
			60				

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Project Number B2404639 Geotechnical Evaluation IA21 over Cedar Creek Keokuk County, IA					BORING: BR-03A		
					LOCATION: Station 57+18, Lt. 6		
					DATUM: WGS 84		
					LATITUDE: 41.35202	LONGITUDE: -92.35436	
DRILLER: BG/HS		LOGGED BY: L. Cripe		START DATE: 07/01/25	END DATE: 07/02/25		
SURFACE ELEVATION: 727.5 ft		RIG: 8504	METHOD: Mud Rotary	SURFACING: Pavement	WEATHER: 80 & Sunny		
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
726.8 0.7		Bridge Deck Air					
			5				
			10				
715.1 12.4		Soil Overburden					
			15				
709.5 18.0		FILL: LEAN CLAY (CL), with Sand, and Gravel, brown, moist	20	3-3-4 (7) 4"			Drilling casing extended to 18 feet. Mud rotary drilling method started at 18 feet.
704.5 23.0		LEAN CLAY (CL), dark gray, moist, very soft (ALLUVIUM)	25	0-0-0 16"		39	LL=41, PL=20, PI=21 Gravel= 0% Sand= 6% Silt & Clay= 94%
			30	0-0-0 17"			

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Project Number B2404639 Geotechnical Evaluation IA21 over Cedar Creek Keokuk County, IA					BORING: BR-03A						
					LOCATION: Station 57+18, Lt. 6						
					DATUM: WGS 84						
					LATITUDE: 41.35202		LONGITUDE: -92.35436				
DRILLER: BG/HS		LOGGED BY: L. Cripe			START DATE: 07/01/25		END DATE: 07/02/25				
SURFACE ELEVATION: 727.5 ft		RIG: 8504		METHOD: Mud Rotary		SURFACING: Pavement		WEATHER: 80 & Sunny			
Elev./Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks				
693.5		LEAN CLAY (CL), dark gray, moist, very soft (ALLUVIUM)		8-7-6 (13) 12"							
34.0		CLAYEY SAND (SC), fine to medium-grained, trace Gravel, with iron staining, brown to gray, moist, medium dense (ALLUVIUM)	35	6-8-8 (16) 11"		20	Gravel= 0% Sand= 71% Silt & Clay= 29%				
			40	9-11-15 (26) 7"		13	LL=30, PL=16, PI=14				
			45	15-11-16 (27) 10"							
677.5		LIMESTONE, tan, highly weathered, soft, Argillaceous	50	50/0.5" (REF) 0"			Auger refusal at 53.5 feet. Boring cored from 53.5 to 84 feet.				
50.0				55	100	4	1400	60	90	MC=10% q _u =18 tsf DD=132 pcf	
673.5		SHALE, dark gray to light gray, moist, moderately weathered to highly weathered, soft, very fine-grained, slightly fractured, with Limestone inclusions	55								
54.0			60	75	90	4	3720	80	70	MC=9% q _u =19 tsf DD=128 pcf	
663.5											
64.0		Continued on next page			RQD %	Recovery %	Drilling Rate (min/ft)	Bit Pressure (psi)	Water Pressure (psi)	Water Return %	Remarks

Project Number B2404639 Geotechnical Evaluation IA21 over Cedar Creek Keokuk County, IA					BORING: BR-03A					
					LOCATION: Station 57+18, Lt. 6					
					DATUM: WGS 84					
					LATITUDE: 41.35202		LONGITUDE: -92.35436			
DRILLER: BG/HS		LOGGED BY: L. Cripe			START DATE: 07/01/25		END DATE: 07/02/25			
SURFACE ELEVATION: 727.5 ft		RIG: 8504		METHOD: Mud Rotary		SURFACING: Pavement		WEATHER: 80 & Sunny		
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	RQD %	Recovery %	Drilling Rate (min/ft)	Bit Pressure (psi)	Water Pressure (psi)	Water Return %	Remarks
		LIMESTONE, light gray to dark gray, moist, moderately weathered to slightly weathered, moderately hard, very fine-grained, moderately fractured to slightly fractured, with Shale inclusions, chert inclusions with occasional vugs	65	80	100	2	2790	80	70	MC=6% q _u =310 tsf DD=150 pcf
656.0			70	0	40	3	2790	80	50	
71.5		SHALE, dark gray, moist, moderately weathered, soft to very soft, very fine-grained, moderately fractured, with Limestone inclusions								MC=1% q _u =382 tsf DD=152 pcf
653.5			75	14	22	8	3260	80	30	
74.0		LIMESTONE, gray, moist, moderately weathered to slightly weathered, moderately hard, very fine-grained, highly fractured to intensely fractured, with Chert inclusions and occasional vugs with voids								MC=6% q _u =239 tsf DD=145 pcf
			80	55	90	2	3260	80	20	
643.5				0	50	2	3260	80	15	Water level obscured due to mud rotary drilling method. Bridge deck patched with PCC.
84.0		END OF CORING	85							
		Boring then backfilled with auger cuttings								
			90							
			95							

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2404639 Geotechnical Evaluation IA21 over Cedar Creek Keokuk County, IA					BORING: BR-04		
					LOCATION: Station 56+76.24, Lt. 13		
					DATUM: WGS84		
					LATITUDE: 30.23011	LONGITUDE: -15.99621	
DRILLER: AL/JS		LOGGED BY: B. Godagama		START DATE: 08/07/24		END DATE: 08/07/24	
SURFACE ELEVATION: 727.2 ft		RIG: 5501		METHOD: 3 1/4" HSA		SURFACING: Pavement	
				WEATHER: 80 & Sunny			

Elev./Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q _p tsf	MC %	Tests or Remarks
727.0		ASPHALT					
0.2		CONCRETE					
726.2		APPARENT AGGREGATE BASE					
1.0		FILL: LEAN CLAY (CL), with Sand, dark brown, moist					
725.2							
2.0							
			5	TW 0"			
				3-3-3 (6) 14"			
			10	TW 22"		29	LL=42, PL=21, PI=21 DD=91 pcf
716.2		LEAN CLAY (CL), with Sand, dark brown, moist, medium (ALLUVIUM)					
11.0				3-3-3 (6) 14"			
			15				
			20	TW 19"		29	LL=41, PL=20, PI=21 P200=84% DD=92 pcf
705.2		LEAN CLAY (CL), with Sand seams, trace organic, dark gray to gray, wet to moist, soft to medium (ALLUVIUM)					
22.0				0-2-2 (4) 18"		24	LL=28, PL=10, PI=18 P200=54%
			25				
				2-2-3 (5) 18"			
			30				
695.2							
32.0							

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