

GEOTECHNICAL INVESTIGATION REPORT SOUTHEAST BEAVERCREEK TRUNK SEWER NORTH OF INDIAN RIPPLE ROAD GREENE COUNTY, OHIO

ATC/ATEC FILE NUMBER: 00157.0006

PREPARED FOR:

Greene County Sanitary Eng. Dept.

Attention: Mr. Jeffrey A. Hissong, P.E

667 Dayton-Xenia Road Xenia, Ohio 45385-2665

PREPARED BY:

ATC/ATEC Associates, Inc.

2027 Springboro West Dayton, Ohio 45439

October 2, 1997



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Greene County Sanitary Engineering. Department Attention: Mr. Jeffrey A. Hissong, P.E 667 Dayton-Xenia Road Xenia, Ohio 45385-2665

RE:

Geotechnical Investigation Report Southeast Beavercreek Trunk Sewer North of Indian Ripple Road Greene County, Ohio

ATC/ATEC File Number: 00157.0006

Gentlemen:

In compliance with your recent request, we have completed a subsurface investigation and evaluation for the above referenced project. It is our pleasure to transmit herewith two (2) copies of our written report of the result of this investigation. This work was performed in accordance with our written proposal dated June 23, 1997 and was authorized by the issuance of the Greene County Sanitary Engineering Department Purchase Order No. 42601, dated July 29, 1997.

If you should have any questions regarding this site or our report, please feel free to call us at your convenience. It has been a pleasure working with you on this project.

Very Truly Yours,

ATC ASSOCIATES, INC.

d.b.a. ATEC Associates, Inc.

Mohammed Obaidul Hadut,

Staff Engineer I

James P. Kapsho, P.E.

Principal Engineer

MOH/moh

Mr. Brent Detwiler - R. D. Zande Associates cc:

EIT JAMES P.

KAPSHO E-55109

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GEOTECHNICAL INVESTIGATION REPORT

SOUTHEAST BEAVERCREEK TRUNK SEWER NOTH OF INDIAN RIPPLE ROAD GREENE COUNTY, OHIO

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1.0 INTRODUCTION

This report presents the results of a geotechnical investigation and soils evaluation for the proposed Southeast Beavercreek Trunk Line, which will be constructed just from the north side of Indian Ripple Road and along the existing creek to serve the future residential development in Beavercreek, Ohio. This work was performed in accordance with our written proposal dated June 23, 1997 and was authorized by the issuance of the Greene County Sanitary Engineering Department Purchase Order No. 42601, dated July 29, 1997.

The purpose of this investigation was to determine the types of subsoils present at the proposed site and to make comments and recommendations relative to the design and construction of the sanitary sewer line. Also selected pertinent comments and recommendations regarding earthwork is also provided.

The scope of this investigation included a review of available geologic and soils data for the project area, a subsurface investigation consisting of nine (9) standard soil test borings located as shown on the attached Boring Location Plan in the Appendix and an engineering analysis and evaluation of the subsurface conditions encountered at this site.

3.0 GENERAL SUBSURFACE CONDITIONS

Nine (9) widely spaced soil borings were requested by the client. Due to the presence of dense woods and associated accessibility problems, two (2) soil borings were offset from their original locations. SB-1 was offset approximately 90 feet to the southeast and boring SB-6 was offset approximately 70 feet to the west from their respective original locations. All the borings for this investigation was drilled, using standard rotary drill equipment. The soil samples were returned to our soil mechanics laboratory in Dayton, Ohio, for the required analysis, testing and evaluation.

It should be noted that stratification lines shown on the soil boring logs represent approximate transitions between material types. In-situ strata changes could occur gradually or at slightly different levels. Also, it should be noted that the borings depict conditions at particular locations and times indicated. Some conditions, particularly groundwater levels, could change with time.

The subsurface soil profile and groundwater conditions are described in detail on the boring logs located in the Appendix to this report, but in general terms consist of the following:

3.1 Soil Profile

3.1.1 Borings SB-1, SB-7 and SB-9

Approximately 0.9 to 1.0± foot of topsoil was disclosed by the borings on the surface of this site. This material is a dark clayey silt containing considerable organic matter as a result of the heavy vegetative cover. It is not uncommon for such topsoil deposits to extend to deeper depths in areas where brush and timber are prevalent.

Black silty to sandy clay was encountered in borings SB-5 and SB-6 to a depth of 5 to 6 feet below the existing ground. The N-values were 2 to 4 bpf indicating a very soft to soft soil consistency.

Below the topsoil, dark brown with trace gray/brownish gray sandy clay was encountered at the boring locations SB-3 and SB-8 to a depth of 7.0 and 4.8± feet respectively below the existing grade. Standard Penetration Test (N) values were generally in the range of 7 to 11 bpf, indicating a medium stiff to stiff soil consistency.

Below the topsoil in boring SB-4 and below the above described soils at the other boring locations, silts (ML)/sandy silts (ML)/sandy clay (CL)/sand and gravel (SP-GP) layers or interbedded strata of those were encountered. Some of the borings were terminated in the gray sandy clay soil, some of the borings were terminated in the gray clayey silt or sandy silt and the others were terminated in the sand and gravel deposit. The N-values were generally in the range of teens to twenties indicating a very stiff/medium dense soil.

3.2 Groundwater Conditions

Observations concerning groundwater were made during and at completion of the drilling operations. The following table summarizes the levels at which groundwater was measured at each boring locations.

Table I

Boring No.	Apr. Boring Elevation	Noted on Drilling Rods	At completion	Invert Elevation at the Boring Location
B-1	789	-		. 780
B-2	791	2.5 <u>+</u>	3.0 <u>+</u>	783
B-3	806	7.0 <u>+</u>	6.8 <u>+</u>	785
B-4	807	13.0 <u>+</u>	-	792
B-5	810	8.5 <u>+</u>	_	797
B-6	810	2.5 <u>+</u>	4.0 <u>+</u>	799
B-7	816	2.0 <u>+</u>	-	807
B-8	826	8.0 <u>+</u>	_	817
B-9	789	-	_	781

During the time of our field investigations very shallow water was noticed at the creek bed. It is our belief that the groundwater table within the boring locations will vary depending on the fluctuation of the surface water elevation of the existing creek.

We wish to point out that seasonal influences can sometimes cause a substantial rise or fall in groundwater levels. The actual level of hydrostatic water, or the presence of a perched water table, if any, should be anticipated to fluctuate depending on variations in precipitation, surface runoff, infiltration, site topography and drainage. Fluctuations in groundwater can only be determined through observations made in cased holes, the construction of which was beyond the scope of this investigation.

4.0 GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

Based upon our analysis of the soil conditions and the preliminary design details supplied for this project by the client as previously outlined, the following conclusions and recommendations were reached for this proposed project. If the project characteristics are changed from those assumed herein, our recommendations should be reviewed to see whether any modifications are needed.

4.1 Pipe Support

The sanitary sewer line supporting conditions encountered at this site during our investigation can be generally considered satisfactory. The invert elevation and the subsurface material encountered at specific boring locations are tabulated below:

Table II

Boring No.	Invert Elevation	Material Encountered at the Invert Elevation
SB-1	780	Shale and Limestone
SB-2	783	Sand & Gravel, with interbedded Silty/Sandy clay
SB-3	785	Gray Sandy Clay, with little gravel
SB-4	792	Gray Silty Clay, with trace sand & gravel
SB-5	797	Gray Sandy Clay, with little gravel
SB-6	799	Gray Sandy Clay, with little gravel
SB-7	807	Shale and Limestone
SB-8	817	Gray Sandy Clay, with little gravel
SB-9	781	Gray Sandy Clay/gray Silty Clay & Limestone

The results of the borings indicate that the very stiff cohesive soil consisting of silty to sandy clay or medium dense sand and gravel or shale and limestone bedrock should provide adequate support for the proposed sewer line pipes.

Soft and wet sandy clay soil was encountered in boring SB-9 at the invert elevation, which is possibly due to the trapped/perched groundwater. In the areas of soft soil encountered the excavation should be continued until firm natural soil is encountered. The undercut could then be backfilled with a lean concrete and the pipe can be supported on the lean concrete fill at the desired elevation.

4.2 Construction Considerations

It is anticipated that there will be minimal difficulty experienced in excavating the silty to sandy clay cohesive soil, cohesionless sand and gravel and overburden soils at this site with conventional equipment and methods. Excavation above the bedrock should be achievable with conventional earth moving equipment.

Excavations in the weathered and unweathered shale and limestone will prove to be more difficult, although it should be rippable with the proper equipment. Narrow excavations or excavations in confined areas may require the use of hydraulic or pneumatic actuated impact spades or pointed breaker bars. Unless specified otherwise, all permanent cut slopes shall be no steeper than 3 horizontal to 1 vertical. All temporary excavations for the installation of sewer line pipe should be properly laid back or braced in accordance with Occupational Safety and Health Administration (OSHA) requirements. It is our opinion that the silty to sandy clay cohesive soils encountered above and below the water table can be classified as OSHA Type "B" and type "C" soil respectively, and the sand and gravel cohesionless soils can be classified as OSHA Type "C" soil. It may be possible to "lay back" the cohesive and granular soils in certain areas of the site where there is sufficient room to work. It is our

recommendation that any backfill placed be compacted to at least 100 percent of the Standard Proctor (ASTM-D698) maximum dry density, with appropriate measures taken to avoid damage to the new sewer pipe by the compaction equipment.

Our boring information indicates that the groundwater table at this site will be about 3 to 6 feet below the existing ground surface. Furthermore, given the probable presence of sand seam and sand layers within the cohesive soil matrix (and therefore high permeable) subsoils at the site, it should be assumed that the groundwater table could rise substantially during high water and flood events of the existing creek. Groundwater will cause construction difficulties for this project for the excavation of the proposed sewer line due to the high groundwater table. It may be possible to "lay back" the cohesive and granular soils in certain areas of the site where there is more room, if the soils can be dewatered. In order to dewater the site a well point system may need to be installed. The design of the well point system (if used) is considered a contractor's means and methods of construction, and should be the contractor's responsibility.

4.3 Inspection

It is recommended that a representative of ATEC Associates, Inc. be present during the excavation and backfilling for the proposed Sanitary Sewer line to verify that the actual field conditions are similar to the results of the test borings, and to monitor the compaction of the backfill. Otherwise, we assume no responsibility for construction compliance with the design concepts, specifications, or our recommendations.

5.0 FIELD AND LABORATORY INVESTIGATIONS

5.1 Scope

Field investigations to determine the general engineering characteristics of the foundation materials for this project included the performance of soil test borings located approximately as shown on the enclosed Boring Location Plan, and the performance of standard penetration tests on the in-situ soils. The apparent groundwater level at each boring location was also determined. Elevations referred to herein were interpolated from a site plan provided by the client.

The types of foundation materials encountered in the test borings have been visually classified by ATEC engineering staff, and are described in detail on the boring logs. The results of the field penetration tests, strength tests and water level observations are present on the boring logs in numerical form. Representative samples of the soils encountered in the field were placed in sample jars and are now stored in our laboratory for further analysis, if desired. Unless we are notified to the contrary, all samples will be disposed of 30 days from the date of this report.

5.2 Field Investigations

The soil borings were performed with an ATV-mounted drilling rig equipped with a rotary head. Conventional hollow-stem augers were used to advance the holes. Representative samples of the in-situ soils were obtained employing split-barrel sampling procedures in accordance with ASTM Procedures D-1586.

6.0 LIMITATIONS OF STUDY

Differing Conditions

Our recommendations for this project were developed utilizing soils information obtained from the test borings that were made at the proposed site. At this time we would like to point out that soil test borings only depict the soil conditions at the specific locations and time at which they were made. The soil conditions at other locations on the site may differ from those occurring at the boring locations. If deviations from the noted subsurface conditions are encountered during construction, they should be brought to the attention of the soils engineer.

Changes in Plans

The conclusions and recommendations herein have been based upon the available soil information and the preliminary design details furnished by a representative of the owner of the proposed project and/or as assumed herein. Any revision in the plans for the proposed construction from those anticipated in this report should be brought to the attention of the soils engineer to determine whether any changes in the foundation or earthwork recommendations are necessary.

Recommendations vs. Final Design

This report and the recommendations included within are not to be considered a final design, but rather as a basis for the final design to be completed by others (architect, civil or structural engineer, etc.). It is the client's responsibility to insure that the recommendations of the geotechnical engineer are properly integrated into the design, and that the geotechnical engineer is provided the opportunity for design input and comment after the submittal of this report, as needed. We recommend that this firm be retained to review the final construction documents to confirm that the proposed project design sufficiently considers our geotechnical recommendations. We also suggest that our firm be represented at pre-bid and/or pre-construction meetings regarding this project to offer any needed clarification of the geotechnical information to all involved.

Construction Issues

Although general constructability issues have been considered in this report, the means, methods, techniques, sequences and operations of construction, safety precautions, and all items incidental thereto and consequences of, are the responsibility of parties to the project other than ATEC. This office should be contacted if additional guidance is needed in these matters.

Report Interpretation

This company is not responsible for the conclusions, opinions, or recommendations made by others based upon the data included herein. It is the client's responsibility to seek any guidance and clarifications from the geotechnical engineer needed for proper interpretation of this report.

Environmental Considerations

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report or on the test boring logs regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client. Unless complete environmental information regarding the site is already available, an environmental assessment is recommended prior to the development of this site.

Standard of Care

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This statement is made in lieu of all other warranties either express or implied.

APPENDIX

Boring Location Plan (SEE DETAILED DRAWINGS)

Logs of Borings (9)

Unified Soil Classification

Field Classification of System for Soil Exploration

Important Information About Your Report

RECORD OF SUBSURFACE EXPLORATION

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S - Driven Split Spoon T - Pressed Shelby Tube A - Continuous Flight Auger C - Rock Core Groundwater At Completion ft. HSA - Hollow Stem Augers ft. CFA - Continuous Flight Augers Water on Rods ft DC - Driving Casing							.									
Groundwater Groundwater Groundwater Fressed Shelby Tube A - Continuous Flight Auger Groundwater A - Continuous Flight Auger After hours ft. CFA - Continuous Flight Augers Groundwater Material Flow Stem Augers Material Flow Stem Augers Groundwater ### ### ### ### #### ###############																
S - Driven Split Spoon T - Pressed Shelby Tube A - Continuous Flight Auger C - Rock Core Groundwater At Completion ft. HSA - Hollow Stem Augers ft. CFA - Continuous Flight Augers Water on Rods ft DC - Driving Casing			L													
T - Pressed Shelby Tube A - Continuous Flight Auger A - Continuous Flight Auger C - Rock Core ■ Water on Rods # K. HSA - Hollow Stem Augers tt. CFA - Continuous Flight Augers DC - Driving Casing	S - Driven Split Spoon						ater		<u> </u>				Barine	Met	hod	
→ Rock Core Water on Rods ft DC - Driving Casing	- Pressed Shelby Tube										H	SA - H	ollow S	Stem	Auge	rs
T - Continuous Tube + At Surveyft.	∵- Hock Core		•	Water	on Ro	ds				ft. ft.	U	C-D	riving (Casin	9	Augers
	J - Cuttings - Continuous Tube		+	At Sur	vey _						Н	P -H	ydrauli	c Pus	h	

RECORD OF SUBSURFACE EXPLORATION

CLIENT Greene County Sanitary I ARCHITECT ENGINEER	Engin	eering D	epart	men	ıt_	t BORING # SB-2 JOB #00157.0006						
PROJECT NAME Southeast Beavercreek T	runk S	Sewer										
PROJECT LOCATIONNorth of Indian Ripple Rd								BY_N				
DRILLING and SAMPLING INFORMA	-								EST D			
Date Started 9/5/97 Hammer Wt. Date Completed 9/5/97 Hammer Drop Drill Foreman D. Fisher Spoon Sampler Inspector Rock Core Dia.	do	30 in		hics		enetration blows/foot	nconfined ive Strength	enetrometer	Content %	(L)	(PL)	
Boring Method H.S.A. Shelby Tube Of		in	. e	Graph	Water	<u> </u>		Peneti		Limit	Limit	
SOIL CLASSIFICATION	Stratum	Depth Scale Sample	p le	Sampler Gr Recovery	nud 1	Standard Test, N	Qu-tsf (Compress	PP-tsf Pocket F	Moisture	Liquid	stic	Remarks
SURFACE ELEVATION ~791	Str	Der Sca San	Sam	Sar	Gro	Sta Tes	S P P	PP-	å	Liq	P a	Rem
Topsoil Brown SAND and GRAVEL, with little silt and clay (SP) Wet, medium dense	0.9											
		5	ss		₹	21						Invert Elev. 783.
interbedded layers of thin SILTY to SANDY CLAY at different depths		2	ss ss			25						
GOV SANDY CLAY WHITE TO THE THE	11.5	10 4				24 38					-	·
Gray SANDY CLAY, with little gravel (CL) [glacial till] Wet, hard Boring discontinued at 12.0 feet depth. Boring caved in at 5.0 feet depth.	12.0											·
										-		
·		·										
Sample Type SS - Driven Split Spoon ST - Pressed Shelby Tube CA - Continuous Flight Auger RC - Rock Core CU - Cuttings CT - Continuous Tube	¥ Afte	Grou Completion er ter on Rod Survey	_ hour	s	2.5	0_ft. ft. 5_ft. ft.		DC -	Hollow	uous Cas	n Aug Fligh	

RECORD OF SUBSURFACE EXPLORATION

	· · ·										
CLIENT Greene County Sanitary	JENT BORING # BORING # SB-3 RCHITECT ENGINEER JOB # 00157.0006										
ARCHITECT ENGINEER						_				6	
PROJECT NAME Southeast Beavercreek	Trunk	Sewer									
PROJECT LOCATION North of Indian Ripple R							BY_N		_		
DRILLING and SAMPLING INFORM	-							EST D			
Date Started 9/5/97 Hammer Wt.		140 lbs		\top		Π					
Date Completed 9/5/97 Hammer Drop					foot	fined Strength	د	×			
Drill Foreman D. Fisher Spoon Sample	r OD	2 in.	J 4	រ័ក្ត	1 70 \	en	ie t	+	£	P.	
Inspector Rock Core Dia.		in.	- =	a	enetral blows/4	1145	ē	e	1	i	
Boring Method H.S.A. Shelby Tube O	D	in.	9 6	rd a	5 -	nö a	et	Content	±	=======================================	
			בַּן בַּ	2 H	P -	Uncon-	Penetrometer	بو	L.	L. E	
SOIL CLASSIFICATION	‡c	د م م	a 9	a K	dar	sf l	s f	tur-	ā	stic	ک 8
SURFACE ELEVATION ~806	Stratum	Depth Scale Sample	Sample Type Sampler Graphic		Standard Test, N -	Qu-+; Compr	PP-tsf Pocket	Moisture	Liquid Limit	<u>a</u>	Remarks
Topsoil			. 0, 0,		01-	00	0.0	Σ_	-	գ	8
Dark brown with trace gray SANDY CLAY, with little	_ 1.0	' -									
gravel (CL)		-									,
Very moist, medium stiff		1 7									
		- 1	ss		7						Invert Elev. 785.
		5 —	-								
Brown with trace gray SILTY SAND (SM)	7.0			₹						l	
Wet, very loose											
<u> </u>		- 2	ss		5						
		10									
13											
TO CONCLAMENTAL TO THE TOTAL TO THE T	12.0]]					1				
Gray CLAYEY SAND and gravel (SC) Wet, medium dense			.								
			ss H		15						
	ŀ	15			15				ľ		
								Ī	ł		
		- 4	ss \		20	1	1	1			
	18.0	1 -									
Gray SANDY CLAY and little gravel (CL) [glacial till] Wet to very moist, very stiff		- 5	ss \		22					1	
			33 \\		23						
		20	П	7							
11		- 6	ss \		26						
			. 4]							
sand and gravel seam at different depths	1.	1 1			l		İ				
		- 7	ss		31						
Sample Type		Ground	water		L	1.	1.	I Bori	ng M	ethoc	<u></u>
SS - Driven Split Spoon ST - Pressed Shelby Tube	-	Completion			8_ft.		HSA -	Hollow	v Ster	n Aug	gers
CA - Continuous Flight Auger RC - Rock Core		erater on Rods	hours _		ft. O ft.		DC -	Driving	a Cas	ina	nt Augers
CU - Cuttings CT - Continuous Tube		Survey				•	HP -	Hydra	ulic P	ush	
OT - COMMINDORS TUDE										_	

RECORD OF SUBSURFACE EXPLORATION

CLIENT Greene County Sanitary	Engine	eering Der	oartmen	<u>t</u> во	RING #_		SB-3			-	
ARCHITECT ENGINEER				JO	B#		00157	.000	5		
PROJECT NAME Southeast Beavercreek T	runk S	Sewer		DR	AWN BY		M.O.H	l .			
PROJECT LOCATION North of Indian Ripple Rd	Bea	vercreek,	Ohio	API	PROVED	BY_	M.O.H	l <u>. </u>			
DRILLING and SAMPLING INFORMA	NOITA					, 1	rest d	ATA			
Date Started 9/5/97 Hammer Wt.		140 ibs.		C.		T					
Date Completed 9/5/97 Hammer Drop				t ion	_ #B	e c	×				
Drill Foreman D. Fisher Spoon Sampler			85	rat 5/4	ned Ped	ne t	1	(L	(PL)		
Inspector Rock Core Dia.		in.	i Ho dae	er enetra	5+5	Š	ı te	1 1	±		
Boring Method H.S.A. Shelby Tube OD	·	in.	Type Graph y Grap	TIL.	2 >	Penetrometer	Content	Limit	L i		
SOIL CLASSIFICATION	===	_ a a	1	162	sf U	t	Moisture		+ic	÷ s	
	Stratum Depth	Depth Scale Sample No.	Sample . Sampler Recover	Ground Standa Test,	Qu-tsf (Compress	PP-1sf Pocket	o ist	Liquid	as	Remarks	
	1010	100 02	<u>ν</u> νω∠	G 0F	80	44	Σ	_	Δ.	<u> </u>	
		- 8	ss \	18							
			V								
71											
76	20.0	- 9	ss \	19					.		
Boring discontinued at 30.0 feet depth.	30.0	30	.								
Boring caved in at 7.0 feet depth.											
									İ		
							Ī				
						Ì					
						.	ł				
						ŀ					
·											
]					
						l	1				
			'								
						-	Ì				
Sample Type		Ground	water	_11			Boris	ng Me	thed		_1
SS - Driven Split Spoon ST - Pressed Shelby Tube		ompletion		6.8 ft.			Hollow	Stem	Augen		
CA - Continuous Flight Auger RC - Rock Core	¥ Afte	rl er on Rods _	hours	7.0 ft.		DC -	Driving	Casi	Flight A ng	ugers	
CU - Cuttings		urvey		<u>7.υ</u> ft.			Hydrai	ulic Pu	sh		
CT - Continuous Tube			* .								

RECORD OF SUBSURFACE EXPLORATION

CLIENT Greene County Sanitary Engineering Department ARCHITECT ENGINEER PROJECT NAME Southeast Beavercreek Trunk Sewer PROJECT NAME Southeast Beavercreek Trunk Sewer North of Indian Ripple Rd., Beavercreek, Ohio DRILLING and SAMPLING INFORMATION Date Started 9/5/97 Hammer Vr. 140 ibs. Date Completed 9/5/97 Hammer Vr. Date Completed 9/5/97 Hammer Orop 30 in. Borling Method H.S.A. Shelby Tube OD SOIL CLASSIFICATION SURFACE ELEVATION –807 Topoil Brown with trace gray SANDY SILT, with little gravel Way why moist, stiff Brown SILTY CLAY, with little sand and gravel (CL) [Iglacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Boring discontinued at 17.0 feet depth.	CLIENT	Greene County Senitory	Engin	aarina D						<u> </u>	<u> </u>		
PROJECT NAME Southeast Beavercreek Trunk Sewer North of Indian Ripple Rd., Beavercreek, Ohio PROJECT LOCATION North of Indian Ripple Rd., Beavercreek, Ohio PROJECT LOCATION North of Indian Ripple Rd., Beavercreek, Ohio PROJECT LOCATION North of Indian Ripple Rd., Beavercreek, Ohio PROJECT LOCATION DELLUX and SAMPLING INFORMATION TEST DATA TEST DATA TEST DATA TEST DATA TEST DATA TEST DATA TEST DATA TEST DATA TEST DATA TO DATE TO THE PROJECT LOCATION OF THE PROJECT LOC		Treating Quility Quilitally	Engin										······································
PROJECT LOCATION North of Indian Ripple Rd., Beavercreek, Ohio DRILLING and SAMPLING INFORMATION TEST DATA TEST DATA Date Started 9/5/97 Hammer Wt. 140 ibs. Date Completed 9/5/97 Hammer Wt. 2 in. Drill Foreman D., Fisher Spoon Sampler OD 2 in. Inspector Rock Core Dia. in. Boring Method H.S.A. Shelby Tube OD in. SOIL CLASSIFICATION 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	PROJECT NAME	Southeast Beavercreek T	runk										
Date Started 9/5/97 Hammer Wt. 140 lbs. Date Completed 9/5/97 Hammer Wt. 300 in. Differenan D. Fisher Spoon Sampler OD 2 in. Inspector Rock Care Dia. in. Boring Method H.S.A. Shelby Tube OD in. SURFACE ELEVATION 807 LT SANDY CLAY, with little gravel (CL.) Brown Siltry Clay, with little sand and gravel (CL.) Glacial till Moist, very stiff Gray Siltry Sandy Clay, with trace sand and gravel (CL.) Glacial till Moist, very stiff Gray Siltry Sandy Clay, with trace sand and gravel (CL.) Glacial till Moist, very stiff Gray Siltry Clay, with trace sand and gravel (CL.) Glacial till Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (CL.) In Mily Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (CL.) Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (CL.) Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (CL.) Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (Cl. to ML.) Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (Cl. to ML.) Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (Cl. to ML.) Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (Cl. to ML.) Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (Cl. to ML.) Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (Cl. to ML.) Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (Cl. to ML.) Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (Cl. to ML.) Moist, very stiff Gray Siltry Clay to ClayEy Silt, with varved layer (Cl. to ML.) Moist, very stiff Gray Siltry Sandy Clay to ClayEy Silt, with varved layer (Cl. to ML.) Moist, very stiff Gray Siltry Sandy Clay to ClayEy Siltry Siltry Sandy ClayEy Siltry Sandy ClayEy Siltry Sandy ClayEy Siltry Sandy ClayEy Siltry Sandy ClayEy Siltry Sandy ClayEy Siltry Sandy ClayEy Siltry Sandy ClayEy Siltry Sandy ClayEy Siltry Sandy ClayEy Siltry Sandy ClayEy Siltry Sandy ClayEy	PROJECT LOCATION	North of Indian Ripple Ro	I., Bea	vercreek	, Oh	io	APF	ROVE	BY	и.О.н	! !		·
Date Started 9/5/97 Hammer Wt. 140 lbs. Date Completed 9/5/97 Hammer Drop 30 in. Drill Foreman D. Fisher Spoon Sampler OD 2 in. Inspector Rock Core Dia. In. Boring Method H.S.A. Sheiby Tube OD in. SOIL CLASSIFICATION 5 Topsoil Surface ELEVATION - 807 5 G G G G G G G G G G G G G G G G G G	Di	RILLING and SAMPLING INFORM	ATION										
Date Completed 9/5/97 Hammer Drop 30 in. Drill Foreman D. Fisher Spoon Sampler OD 2 in. Inspector Rock Core Dia. Boring Method H.S.A. Shelby Tube OD in. SOIL CLASSIFICATION SURFACE ELEVATION -807 Topsoil Brown with trace gray SANDY SILT, with little gravel Wery moist, stiff Brown SILTY CLAY, with little sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL) to ML) Moist, very stiff Brown glicy SANDY CLAY, with varved layer (CL) to ML) Moist, very stiff Brown glicy SANDY CLAY, with varved layer (CL) to ML) Moist, very stiff Moist, very stiff Brown glicy CLAYEY SILT, with varved layer (CL) to ML) Moist, very stiff Moist, very stiff Moist, very stiff Brown glicy CLAYEY SILT, with varved layer (CL) to ML) Moist, very stiff Moist, very stiff Moist, very stiff Moist, very stiff Moist, very stiff Moist, very stiff Brown glicy CLAYEY SILT, with varved layer (CL) to ML) Moist, very stiff Moist,				140 the				T		231 0	T	T	
Boring Method H.S.A. Shelby Tube CD in. SOIL CLASSIFICATION SURFACE ELEVATION -807 Topsoil Brown SiLTY CLAY, with little sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) (CL) (glacial till) Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) (CL) (glacial till) Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) (CL) (glacial till) Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) (CL) (glacial till) Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL) (CL) (Glacial till) Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL) (CL) (Glacial till) Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL) (CL) (Glacial till) Moist, very stiff Boring discontinued at 17,0 feet depth.	Date Completed 9/5	- · · ·					I O	a ta	۲	\			
SOIL CLASSIFICATION SURFACE ELEVATION -807 Topsoil Brown Sill Ty SANDY CLAY, with little gravel (CL) [glacial till] Moist, very stiff Gray Sill Ty SANDY CLAY, with trace sand and gravel (CL) (glacial till) Moist, very stiff Gray Sill Ty SANDY CLAY, with trace sand and gravel (CL) (Glacial till) Moist, very stiff Gray Sill Ty SANDY CLAY, with trace sand and gravel (CL) (Glacial till) Moist, very stiff Gray Sill Ty SANDY CLAY, with trace sand and gravel (CL) (Glacial till) Moist, very stiff Gray Sill Ty SANDY CLAY, with varved layer (CL) (Glacial till) Moist, very stiff Gray Sill Ty CLAY to CLAYEY Sill T, with varved layer (CL) (Glacial till) Moist, very stiff Gray Sill Ty CLAY to CLAYEY Sill T, with varved layer (CL) to ML) Moist, very stiff Boring discontinued at 17,0 feet depth.	Drill Foreman D.	Fisher Spoon Sampler	OD			20 20 80	rat	ned ren	ne+	 	1	9	
SOIL CLASSIFICATION SURFACE ELEVATION ~807 Topsoil Brown with trace gray SANDY SILT, with little gravel (CL) (ML) Very moist, stiff Brown SILTY CLAY, with little sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL) [glacial till] Moist, very stiff Boring discontinued at 17,0 feet depth.						France Fr	o det	341	Ş) te	1	+	
SOIL CLASSIFICATION SURFACE ELEVATION ~807 Topsoil Brown with trace gray SANDY SILT, with little gravel (CL) (ML) Very moist, stiff Brown SILTY CLAY, with little sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL) [glacial till] Moist, very stiff Boring discontinued at 17,0 feet depth.	Boring Method H.S	Shelby Tube OD)	in.	ype	6 6 6 6	ا ج ت ق	i ve	ene.	Cor	E	Ë	
Brown with trace gray SANDY SILT, with little gravel (ML) Very moist, stiff Brown SILTY CLAY, with little sand and gravel (CL) [glacial till] Moist, stiff Brown SILTY SANDY CLAY, with little gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.	SOIL	CLASSIFICATION	5_	_ 0	- u		and				 - -	U	y,
Brown with trace gray SANDY SILT, with little gravel (ML) Very moist, stiff Brown SILTY CLAY, with little sand and gravel (CL) [glacial till] Moist, stiff Brown SILTY SANDY CLAY, with little gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.	SURFA	CE EL EVATION 907	- rad	t de la la la la la la la la la la la la la	- dw		and st,	-ts	-ts cke	-: s+	급	st	nar
Brown SiLTY CLAY, with little sand and gravel (CL) Brown SiLTY CLAY, with little sand and gravel (CL) [glacial till] Moist, very stiff Gray SiLTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SiLTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SiLTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.			i	1 1	Sa	လူတူ ည	S. T.	38	PP Po	윤	<u>.</u>		Rer
Wery moist, stiff Brown SILTY CLAY, with little sand and gravel (CL) [glacial till] Moist, stiff Brown SILTY SANDY CLAY, with little gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.	Brown with trace gra		0.9										
Brown SILTY CLAY, with little sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.	-}]- (ML)]									
Brown SILTY CLAY, with little sand and gravel (CL) [glacial till] Moist, stiff 7.0 Brown SILTY SANDY CLAY, with little gravel (CL) [glacial till] Moist, very stiff 28 Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.													
Gray SILTY SANDY CLAY, with little gravel (CL) Glacial till Moist, very stiff 2 SS 28 10 3 SS 22 3 3 SS 22 3 3 SS 22 3 3 SS	Brown Sti Ty Cl ay		4.5	- 1	SS		15						invert Elev. 792.
Brown SiLTY SANDY CLAY, with little gravel (CL) [glacial till] Moist, very stiff	[glacial till]	with little sand and gravel (CL)		5	1								
Brown SILTY SANDY CLAY, with little gravel (CL) [glacial till] Moist, very stiff	Moist, stiff			-							ļ		
Moist, very stiff —sand seam at different depths— Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.	Brown SILTY SANDY	CLAY, with little gravel (CL)	7.0					İ					•
Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.						Ш							
Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.				4	SS		28		- 1	-			
Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.		•		10 +									
Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.	sand seam at diff	ferent depths		- 3	ss		22						
Gray SILTY SANDY CLAY, with trace sand and gravel (CL) [glacial till] Moist, very stiff Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.		_{in the state}	·	· -									
Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.	Gray SILTY SANDY	CLAY, with trace sand and gravel	13.5]_	22		10						
Gray SILTY CLAY to CLAYEY SILT, with varved layer (CL to ML) Moist, very stiff Boring discontinued at 17.0 feet depth.	(CL) [glacial till]	3		4	- 55			•					
Moist, very stiff Boring discontinued at 17.0 feet depth.	77	CLAYEY SILT, with varied laver	15.5	+	SS		10			ļ			
Boring discontinued at 17.0 feet depth.	TEM (CL to ML)	The state of the s	17.0	1			.5		-				
Boring caved in at 6.0 feet depth.		at 17 0 feet depth									-		
	Boring caved in at 6.0	O feet depth.											•
			1										
										l			,
										.			
					:								
Sample Type Groundwater Boring Method				Groups	lwater				l_				·
ST - Pressed Shelby Tube At Completion ft. HSA - Hollow Stem Augers	T - Pressed Shelby Tube			ompletion					HSA -	Hollow	Stem	Aug	ers
CA - Continuous Flight Auger After hours ft. CFA - Continuous Flight Augers CC - Rock Core Water on Rods 13.0 # DC - Driving Casing	A - Continuous Flight Auge	or .	¥ After ● Wate	er on Rode	hours	13 /	ft.		CFA - (DC - (Contini Driving	uous Casii	Fligh ng	t Augers
CU - Cuttings + At Survey ft. HP - Hydraulic Push	U - Cuttings		+ At S	urvey			ft.		HP -1	Hydrau	lic Pu	ısh	

CT - Continuous Tube

RECORD OF SUBSURFACE EXPLORATION

CLIENT	Greene County Sanitary	Engin	eering	ı De	nart	men	nt	BO	DING #		SD E	 -		
ARCHITECT ENGINEER								JOE					6	
PROJECT NAME	Southeast Beavercreek 7	runk	Sewer					DRA		·				
PROJECT LOCATION _	North of Indian Ripple Ro	I., Bea	vercr	eek.	Ohi	io				BY_				
ם	PRILLING and SAMPLING INFORM	ATION								-	TEST D	ATA		
Date Started 9/			140	_ lbs.				C+]	Τ	Γ	
Date Completed 9/			30	in.		16		tion foot	ofined Strength	r e	×			
Drill Foreman D.						<u>ဗုပ္ပိုင်</u>		m \	a f	met	t	E	린	
Inspector				_ in.		r de	ڍ	enetra blows,	발	5	Content	1	±	
Boiling Method	S.A. Shelby Tube OC			_ in.	ות ו	Graphi Graph	Water	α.	Uncon sive	Penetrometer	Š	Limi+	Ē	
SOI	L CLASSIFICATION	Stratum Depth	L a	a	ē	Sampler (Recovery	n 1	andard st, N -		1	Moisture		ပ	χ ũ
SURFA	CE ELEVATION ~810	tra	Depth Scale	amp lo.	amp	amp	rou	Stan Test	Qu-tsf Compres	PP-tsf Pocket	ois	Liquid	last	Remarks
Tops	soil		T	0,2	03	U302	5	S	രധ	<u>.</u>	Σ		Ы	~~
Black SANDY CLAY	, with trace gravel and hair roots	1.0	=											
(CL) Very moist, soft			_											
			_			Ш								Invert Elev. 797.
		5.0		1	SS			4		İ				mvert ciev. 797.
Gray SANDY CLAY, Very moist, very s	with little gravel (CL) [glacial till]	3.0	5 -			H								
- Very moist, very s	ш													
														,
			1		00		•			l				
-11			· -	2	SS			16		İ				
- gray wet sand la	yer at about 9.8 feet depth		10 -			П								
sand seam at dif	ferent depths		Ŧ	3	SS			17						
			7	\dashv		4			1	1				
			7	4	cc			40						
1111		15.0	15	1	SS			16	1					
Gray SANDY SILT (N	AL)		"]	5	SS									
Boring diseastic	44704	17.0	1		55	V		18						
Boring discontinued Boring caved in at 7.	at 17.0 feet depth. 5 feet depth.													
	·				ļ									
					1									
	·													,
				.	-									
													-	
Sample Type													\perp	
S - Driven Split Spoon		☑ At C	<u>Gro</u> ompleti		water	-		ft.		HCA .		ng Me		
T - Pressed Shelby Tube A - Continuous Flight Aug		Afte	r <u> </u>	ا	nours			ft.	1		Continu	uous l	Flight	ers t Augers
C - Rock Core U - Cuttings	1	◆ Wate ♣ At Second	er on Ro urvev	ods _			<u>8.5</u>	_ ft	1	DC -I	Driving Hydrau	Casir Ilic Pu	ng Ish	

+ At Survey _

CT - Continuous Tube

RECORD OF SUBSURFACE EXPLORATION

CLIENT Greene County	Sanitary	Engir	neerir	ng De	epari	lme	nt	BO	RING #		SB-6			
ANCHITECT ENGINEER														
PROJECT NAME Southeast Bear	vercreek 1	runk	Sewe	er				חח	ASA/AT DS	Y				
PROJECT LOCATION North of Indian	Ripple Ro	I., Be	averc	reek	, Oh	io		APF	PROVE	'!	M O F	1 	——	
DRILLING and SAMPLI	NG INFORM	ATION									TEST C			<u>-</u>
Date Started 9/4/97 Har	mmer Wt		140	lbs			Τ	Τ_			12312	TAIA	T-	
Date Completed 9/4/97 Har	nmer Droo		30) in				ion	ofined Strength	ړ				
Drill Foreman <u>D. Fisher</u> Spo	on Sampler	OD _	2	in.		SV.	2	1	ed	ete	+	13	5	
Inspector Roc	k Core Dia.			in.		بخار		enetra blows/	+ir Str	Ş	ten		j	
	lby Tube OD				a de	- Far	ater.	Pen	C o	Penetrometer	Content	Limit	# i # i	
SOIL CLASSIFICATION		Ę		a	=	בי הי	7 3	P.S	f Una		i e		C L	s
SURFACE ELEVATION ~810		Stratum	p th	Sample	d d	de	Ground Water	Standard Test, N -	Qu-tsf (Compress	PP-tsf Pocket	Moisture	Liquid	sti	Remarks
Topsoil				S S	Sa	SO.	Ģ	St	30	F Q	5	Li	P a	Rem
Black SILTY to SANDY CLAY, with trace to gravel and organics (CL) Wet, very soft	o little	0.9		1										•
Tion, voly son			-	7			•							•
				1	ss		포	2						Invert Elev. 799
organic odor in sample			5 -			1			į					
Gray SANDY CLAY, with little gravel (CL) Very moist to wet, very stiff	[glacial till]	6.0												
			-	2	ss			26						
			10 -			Ш	ł		ł					*
			10 -	3	SS			37						
sample #5 is very sandy and wetsand seam in sample 5			-			HI								
			_	4	SS	\mathbb{H}		20						
			_	"	ు	\mathbb{V}		38						
Gray SANDY SULT (A.S.)		15.0	15 —	5	ss			22						
Gray SANDY SILT (ML) wet, very stiff		16.0			55			23						
Boring discontinued at 16.0 feet depth. Boring caved in at 12.0 feet depth.			_											
													- -	
Sample Type						Щ								
Driven Split Spoon	7	Z At C	<u>Gr</u> omplet		water	_	4.0	4			Borin			_
Pressed Shelby Tube Continuous Flight Auger	Ž	Afte	r	1	nours		→.U	, π. _ft.	1	HSA - H DFA - C	Continu	ous F	light	ers Augers
Rock Core Cuttings		Wate	er on R	ods _			2.5		. [DC - [Oriving Hydraul	Casin	ıg	→ ·-
a	-	- MISI	ui VBV					£4.		- •	.,	: ui	~ 1	

+ At Survey ______ft.

RC - Rock Core
CU - Cuttings
CT - Continuous Tube

RECORD OF SUBSURFACE EXPLORATION

CLIENT	Greene County Sanitary I	Engin	eering De	part	ment	во	RING #	9	SR-7			
ARCHITECT ENGINEER						IO	3#				6	
PROJECT NAME	Southeast Beavercreek T	runk S	Sewer			מח	ALAANI DV	, ,	U O L		<u> </u>	
PROJECT LOCATION	North of Indian Ripple Rd	., Bea	vercreek	Ohi	0	APF	ROVE	BY	M.O.H	'' .		
' DR	RILLING and SAMPLING INFORMA	TION							TEST D			· · · · · · · · · · · · · · · · · · ·
Date Started9/4			140 lbs				T		12310	T	Γ-	Υ
Date Completed 9/4				1	ľ	F 호	f	١				
Drill Foreman D. F					S	ati fo	ed	e te	, ,		J.J.	
	Rock Core Dia.	·	in		흕	er enetr blows,	fined Strength	ő	Content	£	1	
Boring MethodH.S.	.A. Shelby Tube OD		in.	, a	P P	P P P	b u	etr	2	+	mit	
				ות ו	Sra Gra	Mater d Per	Unc	Penetrometer	C)	Limi+		
SOIL	CLASSIFICATION	+ F -	د م ع	a	le Ker	P P N	4 8		Ë	ק	tic.	s s
SURFAC	CE ELEVATION ~816	Stratu Depth	Depth Scale Sample	dux	Sampler (Recovery	andard set, N	+ =	PP-tsf Pocket	Moisture	Liquid	as	Remarks
Topso		တ်	OX XX	ကိ	S, S	유 + Sa	gö	F 5	Ã	[٦	Rei
Olive brown and gray	y SILTY CLAY and limestone	0.9						ļ				
-7 / tragments (CL to CH) [residual soil]											
Moist, hard												
			1	SS		38						Invert Elev. 807.
Gray extremely weath	hered SHALE and LIMESTONE	4.8	5		\ \							
fragments	OF BILL WING ENVIRGITORE											
			2	SS		50/0.5		1				
			-			150,519						
Boring discontinued of	due to auger refusal at 9.5 feet	9.5	- 3	SS	\prod	50/0.1						
depth. Boring caved in at 5.0	·											
	, 100t deptil.											
								1				
		l										
									- 1			
							İ					
			·	l						.		
	`											
Sample Type		<u> l _ </u>	Ground	vater	Ц	<u></u> _						
SS - Driven Split Spoon ST - Pressed Shelby Tube	Ž		ompletion			ft.	ł	HSA - i	Borin Hollow	Stem	Aug	ers
CA - Continuous Flight Auger RC - Rock Core		After Water		ours		ft.	(CFA -(Continu Oriving	ious F	liaht	Augers
CU - Cuttings	4	- At Su	r on Rods _ irvev		2	1.0 ft.		-1P -1	-iydraui	ic Pu	sh sh	

+ At Survey _____ ft.

RECORD OF SUBSURFACE EXPLORATION

APOUTEOT ENOUSEE	Greene County S	ry Engineering Department BORING # SB-8 JOB # 00157,000													
ARCHITECT ENGINEER PROJECT NAME									JOE	#		0157	.000	06	
		rcreek Ti	runk (Sewer	· 				DRA	WN BY		I.O.F	<u>. </u>		
PROJECT LOCATION				vercr	eek,	Ohi	<u> </u>		APP	ROVED	BY_	И.О.Н	<u>l. </u>		
	PRILLING and SAMPLING	INFORMA	MOIT					,			1	EST D	ATA		
Date Started9/		ner Wt		140	_ibs.				c+	ے					
Date Completed 9/		ner Drop		30	in.		•		Foot	± at	e.	×			
Drill Foreman D.	Fisher Spoor						S C		F. 2	ned rength	Je T	ŧ	E	(P.	
InspectorBoring MethodH.		Core Dia.					i-da Age	د	enetr blows	1±0	tro	Content		±	
Doring Metriod	Shelby	Y Tube OD			in.	ı = 1	Graphi Graph	Water	α.	Unconfi	enetrometer		Limit	Lim	
SO	IL CLASSIFICATION	-	5_		a	e T	Sampler (Recovery	D D	Standard Test, N -	f U	Ω.	Moisture		ic	Ŋ
SUBEA	ACE ELEVATION -826		Stratum Depth	Depth Scale	d .	鱼	를	D C	and st,	Qu-tsf (Compres	PP-tsf Pocket	istı	Liquid	ast	Remarks
Tops			200	S	SS	Sa	Sa	ပ်	S† Te	38	F 9	£	=	<u>a</u>	Reif
		i	1.5					}							
Brownish gray SAN	IDY CLAY, with little grav	el (CL)	1.5	-											
Very moist, stiff				_											
					1	SS			11	1					Invert Elev. 817.
Gray SANDY CLAY	with little gravel (CL) [gl	acial tilli	4.8	5							ĺ				
Moist to very moi	st, very stiff	aoiai aiij									ĺ				
				=		,							İ		
				7	2	SS		•	22				ł		
		İ	.	1			1								
			1	10	3	SS	\backslash		24						
	•			‡	4	SS	\forall		29	<u> </u>	.			ļ	
Brown and gray SAI	ND and GRAVEL (SP)		11.8	1			1	1							
Wet, medium dens	Se	//	12.1												
Boring discontinued Boring caved in at 9	at 12.0 feet depth.											1			•
	.o reet depth.										l				
									İ						
													ľ	-	
												I			
									1						
						-									
Sample T															
Sample Type 3 - Driven Split Spoon		_	7 41 0			vater	_			•		Borin			
- Pressed Shelby Tube - Continuous Flight Aug	ar.	<u>7</u>		ompleti		ours			_ ft. _ ft.	ŀ	HSA - H	dollow Continu	Stem	Aug	ers : Augers
C - Rock Core J - Cuttings	71	•) Wate	r on Ro	ds _			8.0	ft.		DC - [Driving	Casir	ng	, vañaiz
- Continuous Tube		+	- At Su	rvey _					ft.	r	11 - F	lydrau	iic Pu	รถ	

ĀTEC Associates, Inc.



CT - Continuous Tube

2027 Springboro West Dayton, Ohio 45439 (937) 297-6600

RECORD OF SUBSURFACE EXPLORATION

•	· .												
CLIENT_	Greene County Sanitary	Engin	eering D	epar	tmen	<u>t_</u>	BOR	NG #		SB-9			
ARCHITECT ENGINEER	Carellana						JOB :	#		00157	.000	6	
PROJECT LOCATION	Southeast Beavercreek T	runk :	Sewer				DRAV	VN BY		M.O.F	<u>l.</u>		
	North of Indian Ripple Rd	Bea	vercree	k, Oh	io		APPR	OVED	BY_N	M.O. H	l		
	ILLING and SAMPLING INFORMA	NOITA							ז	EST D	ATA		
Date Started 9/5			140 lb	s.			C+-	_					
Date Completed 9/5	/97 Hammer Drop			.	ا.		<u> </u>	ag ‡	n r	"			
Drill Foreman D. F	isher Spoon Sampler	OD _	2_ in	.	ည်		SA	ined trength	ae t	±	E	링	ļ
Boring Method U.C.	Rock Core Dia.		in	.	raphi Grapt	د	enetra blows	nfi St	tro	Content		+	
Donning Method	A. Shelby Tube OD		in	. a	G.	ate	P P	Unconfisive St	Penetrometer	Š	Limit	Limii	
SOIL	CLASSIFICATION	E C	ر م ع	_ <u></u>	er Zery	고 .	Z Z		4.4-	ure	۵۲	Ü	ý
SURFAC	E ELEVATION ~789	Stratum Depth	Depth Scale Sample	amp	Sampler Graph Recovery Grap	jo .	Standard F Test, N -	Qu-tst Compre	PP-tsf Pocket	Moisture	Liquid	ast	Remarks
Topso		SC		Z S	ഗര	<u>5</u>	ν⊢	<u> </u>	<u>r</u> g	ž	L	ď	Re
Brown with trace gray	y SILTY CLAY, with trace sand]										
(CL) Moist, stiff	, , , , , , , , , , , , , , , , , , , ,]]										
Wolst, still			7						ł				
##			- 1	ss			13						Invert Elev. 781.
#			5 —	-	14				1				
Brown SANDY CLAY,	with little gravel (CL) [glacial		7							ļ	1		
till] Wet, soft	gracial (oc) (gracial		7							l			
- viet, soit			- 2	ss			5		1	}			
Olive brown and gray	SILTY CLAY and limestone		1	-					-				
fragments (CL to CH) Moist, hard	[residual soil]		10 - 3	۱.,									
//			- 4	ss		10+	50/0.1						
Boring discontinued a Boring caved in at 6.0	t 11.5 feet depth.		1										
No groundwater encor	untered at completion.	ł	ł						.				
										1			
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						Ì				İ			
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													į
	}												
		1		,-		'				1			
										İ			
Sample Type													
S - Driven Split Spoon	•	7 840	Groun	dwater						Borin			-
T - Pressed Shelby Tube A - Continuous Flight Auger	7	-	ompletion	hours	·		ft. ft.	† (HSA - H DFA - C	Hollow Continu	Stem	Aug:	ers : Augers
C - Rock Core U - Cuttings	Č	Wate	r on Rods			1	ft.)C -[Oriving Hydrau	Casir	ıa	
- Juliungs -	4	- At Su	irvev			4		•		iyurati	ווט רע	211	

Unified Soil Classification System

Major Divisions		Group Symbo	Typical Names		Laboratory Classifications Criteria									
	action	gravels	GW	Well graded gravels, gravel-sand mixture little or no fines.	es.			·		C _u =	D ₆₀ :	×4 .	1 C	(D ₃
COARSE GRA	ravels of coarse (i	Clean	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		grain size curve.	nan No. 200 w:	ō,			eting al			
	Gravels (More than half of coarse is larger than No. 4 sieve)	Gravels with fines	GМ	Silty gravels, gravel-sand-silt muxtures		sand and gravel from grain size curve. of lines (fraction smaller than No. 200 souls, are classified as follow:GW, GP, SW, SPGM, GC, SM, SCBorderline cases requiring dual symbols	Ai "A	Atterberg limits below "A" line or P.I. less than 4				Above		
	(Mor	Gravels	GC	Clayey gravels, gravel-sand-clay mixtures		sand and gravel from	nes (fractio 5. are classi	GM, GC, SM, SC GM, GC, SM, SC Borderline cases r	At "A	terberg " line w eater th		above	٥ 🗀	etwee orderl se of o
	Iračtion)	Clean sands	sw	Well graded sands, gravelly sands, little or no fines		iges of san	grained soul			Cu² -) 10	6 : 1	C _c	(D ₃₀
	Sands of coarse Ir No. 4 sieve)	Clear	SP	Poorly graded sands, gravelly sands, little or no fines		Depending on percentages of	sieve size), coarse g	More than 12% 5 to 12%		lot mee	ting all	gradatio	on requ	uireme
	re than half naller than	Sands with lines	SM	Silty sands, sand-silt mixtures) and o	Dependi	sieve size	More 5 to 1	Atto	line o	imits be	slow ess		mits p
	(Mo	Sands v	sc	Clayey sands, sand-clay mixtures					"A"	Atterberg limits above "A" line with P.I. greater than 7			- 4 c	and 7 isses re lial syr
n No. 200 sieve) Silts and Clays (LL less than 50)			ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity			1. Plo Lim	t interse	ction (of Pl an	d LL as	determ	ined fr	om At
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		2. Points plotted a the A line indic.		led abo	d above A line indicate clay soils, those icate silt.					
FINE GRAINED SOILS (More than hall of material is smaller than No. 200 sieve)	S	!	OL	Organic silts and organic silty clays of low plasticity		60						-	СН	-
	20)		мн	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	•	50 40			CL					
	Sits and Clays (LL greater than 50)		СН	Inorganic clays of high plasticity, fat clays	Plasticity Index (PI)	30					1 A 7	0)		1
	(LL 91		ОН	Organic clays of medium to high plasticity, organic silts	1	20					34	(11)	мн	ог ОН
	Highly Organic Soil		Pt	Peat or other highly organic soils		4	, 10	CL-ML 20	30) 40) 50	60	. 7	0

$$C_u = \frac{D_{60}}{D_{10}} > 4$$
 1 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} < 3$

ements for GW

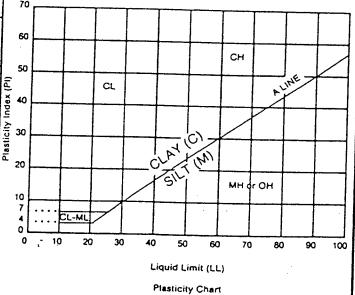
ve "A" line with P.I. reen 4 and 7 are lerline cases requiring of duel symbols

$$C_u = \frac{D_{60}}{D_{10}} > 6 : 1 C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} < 3$$

ements for SW

its plotting in hatched with P.I. between d 7 are borderline s requiring the use of symbols

- m Atterberg
- lose below



ĀTEC Associates, Inc.



Unified Soil Classification System ASTM Designation D - 2487

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON COHESIVE SOILS

(Silt, Sand, Gravel and Combinations)

Density		Particle Size Id	dentification			
Very Loose	- 5 blows/ft. or less	Boulders	-8 inch dia	meter or more		
Loose	- 6 to 10 blows/ft.	Cobbles	-3 to 8 inch diameter			
	e -11 to 30 blows/ft.	Gravel	-Coarse	-1 to 3 inch		
Dense	-31 to 50 blows/ft.		Medium	-1/2 to 1 inch		
Very Dense	-51 blows/ft. or more		Fine	-¼ to ½ inch		
	•••	Sand	-Coarse	2.00mm to 1/4 inch		
				(dia. of pencil lead)		
Relative Propo			Medium	0.42 to 2.00mm		
Descriptive Te	rm Percent			(dia. of broom straw)		
Trace	1 -10		Fine	0.074 to 0.42mm		
Little	11-20			(Dia. of human hair)		
Some	21-35	Silt		0.074 to 0.002mm		
And	36-50			(Cannot see particles)		

COHESIVE SOILS

(Clay, Silt and Combinations)

Consistency		Plasticity	•
Very Soft	- 3 blows/ft. or less	Degree of	Plasticity
Soft	 4 to 5 blows/ft. 	Plasticity	Index
Medium Stiff	 6 to 10 blows/ft. 	None to slight	0- 4
Stiff	-11 to 15 blows/ft.	Slight	5- 7
Very Stiff	-16 to 30 blows/ft.	Medium	8-22
Hard	-31 blows/ft. or more	High to Very High	over 22

Classification on logs are made by visual inspection of samples.

Standard Penetration Test—Driving a 2.0" O.D., 1-%" I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary for ATEC to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the test are recorded for each 6.0 inches of penetration (Example—6/8/9). The standard penetration test result can be obtained by adding the last two figures (i.e. 8+9=17 blows/ft.). (ASTM D-1586-67)

Strata Changes — In the Column "Soil Descriptions" on the drill log the horizontal lines represent strata changes. A solid line (______) represents an actually observed change a dashed line (_____) represents an estimated change.

Ground Water observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.





about the potential for hazardous materials existing at the site. The equipment, techniques, and personnel used to perform a geoenvironmental exploration differ substantially from those applied in geotechnical engineering. Contamination can create major risks. If you have no information about the potential for your site being contaminated, you are advised to speak with your geotechnical consultant for information relating to geoenvironmental issues.

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid misinterpretations, retain your geotechnical engineer to work with other project design professionals who are affected by the geotechnical report. Have your geotechnical engineer explain report implications to design professionals affected by them, and then review those design professionals' plans and specifications to see how they have incorporated geotechnical factors. Although certain other design professionals may be familiar with geotechnical concerns, none knows as much about them as a competent geotechnical engineer.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE REPORT

Geotechnical engineers develop final boring logs based upon their interpretation of the field logs (assembled by site personnel) and laboratory evaluation of field samples. Geotechnical engineers customarily include only final boring logs in their reports. Final boring logs should not under any circumstances be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes, and unanticipated costs are the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, give contractors ready access to the complete geotechnical engineering report prepared or authorized for their use. (If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared and that developing construction cost esti-

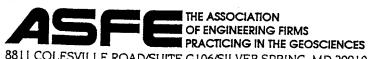
mates was not one of the specific purposes for which it was prepared. In other words, while a contractor may gain important knowledge from a report prepared for another party, the contractor would be well-advised to discuss the report with your geotechnical engineer and to perform the additional or alternative work that the contractor believes may be needed to obtain the data specifically appropriate for construction cost estimating purposes.) Some clients believe that it is unwise or unnecessary to give contractors access to their geotechnical engineering reports because they hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems. It also helps reduce the adversarial attitudes that can aggravate problems to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical engineers. To help prevent this problem, geotechnical engineers have developed a number of clauses for use in their contracts, reports, and other documents. Responsibility clauses are not exculpatory clauses designed to transfer geotechnical engineers' liabilities to other parties. Instead, they are definitive clauses that identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report. Read them closely. Your geotechnical engineer will be pleased to give full and frank answers to any questions.

RELY ON THE GEOTECHNICAL ENGINEER FOR ADDITIONAL ASSISTANCE

Most ASFE-member consulting geotechnical engineering firms are familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a construction project, from design through construction. Speak with your geotechnical engineer not only about geotechnical issues, but others as well, to learn about approaches that may be of genuine benefit. You may also wish to obtain certain ASFE publications. Contact a member of ASFE of ASFE for a complimentary directory of ASFE publications.



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