ARNON
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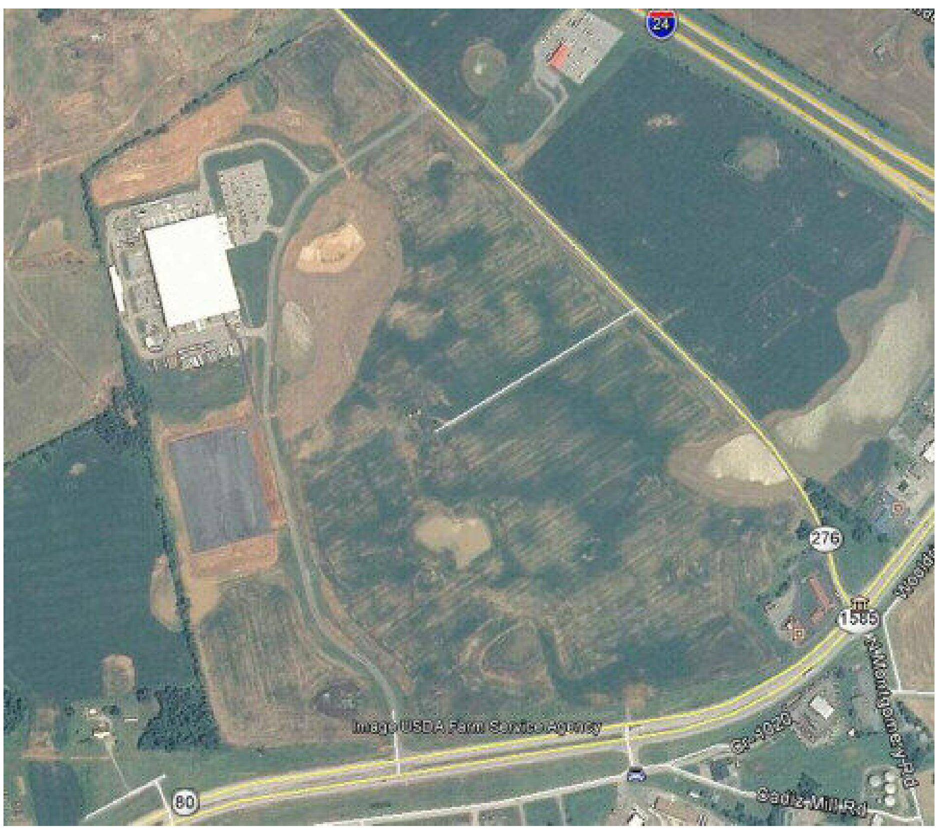
A member of Trinity Energy & Infrastructure Group, LLC

Preliminary Geotechnical Investigation

Cadiz / Trigg County I-24 Business Park

Cadiz, Kentucky



Prepared For Cadiz-Trigg County Economic Development Commission

March 3, 2014

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Ms. Sharon Butts
Cadiz E.D.C.
P.O. Box 1484
Cadiz, KY 42211

RE: Preliminary Geotechnical Investigation
Cadiz/Trigg County I-24 Business Park
Cadiz, Kentucky
AG & E File Number: 2014-007

Dear Ms. Butts,

As requested by Mr. Frank Williams, P.E., on behalf of the Cadiz E.D.C., a preliminary geotechnical engineering study for a proposed industrial building project in the I-24 Business Park. The proposed project includes the construction of a new 250,000 square feet industrial building with an option to build an additional 250,000 square feet in the future.

The purpose of this preliminary review was to determine whether or not there are any anticipated geologic, subsurface soils, or groundwater concerns for this property.

The scope of this study included a review of available geologic and soil survey maps in addition to a subsurface exploration of the overburden soil by the drilling of four (4) exploratory test borings at the locations shown on Figure 1.

The subject property is a 50 acre tract of land that is located on the southeastern side of the TVA Transmission Line as shown in Figure 1. This property is located on the east side of International Road as shown in Figure 1. The area for the proposed building is an agricultural field, covered in what appeared to be winter wheat at the time of the field investigation. The ground surface generally slopes to the south with a line of sinkholes along the north and south property lines. The total relief across the proposed construction area is approximately 20 feet.

Topsoil encountered in the borings ranged from 4 inches to 6 inches thick. Each test boring then found a surface layer of non-calcareous loess that extends to depths of 4.5 to 6.5 feet. Loess is a wind-blown deposit that has a silty texture. The loessal soils typically consist of silt sized particles with some fine sand and clay on top of residual soils that have weathered from the parent bedrock. These surface soils exhibit a moist natural moisture content with a medium stiff to stiff consistency. The Standard Penetration Test Values (N-Values) range from 9 to 20 blows per foot. The moisture content has a range of 20 to 26 percent, with an average of 24 percent.

Beneath the loess is residual soil that has weathered from the underlying parent bedrock. These soils have a reddish brown color with a soil texture that ranges from a silty clay with trace amounts of chert to a cherty silty clay. Borings No. 1 and 2 were drilled to the planned exploration depths of 20.0 feet with Boring No. 3 encountering auger refusal at a depth of 12.0 feet. We then added Boring No. 4 approximately 20 feet to the west of Boring No. 3. This test boring was drilled to the planned exploration depth of 20.0 feet, indicating the auger refusal material at Boring No. 3 was either a very dense layer of chert or a limestone rock pinnacle. Rock core sampling of the auger refusal material is required to definitively define whether or not it is limestone rock. These residual soils exhibit a stiff to very stiff consistency with N-Values of 11 to 27 blows per foot. The moisture content of these soils ranges from 19 to 29 percent, with an average of 23 percent.

The clayey soils encountered in this area have a moderate to high plasticity as evidenced by Atterberg Limits tests performed. One test was performed on the loessal soils at Boring No. 3. The results of this test area Liquid Limit of 32 percent and a Plastic Limit of 21 percent. The classification of these soils by the Unified Soil Classification System is CL, a low plasticity clay. The second test sample was the residual soil at Boring No. 1 at a depth of 8.5 feet. The results of this test are 37 and 17 percent for the Liquid and Plastic Limit values respectively. The classification of these soils by the Unified Soil Classification System is CL, a low plasticity clay.

No groundwater was encountered in these test borings to a depth of 20.0 feet.

A review of published geologic information for this quadrant indicates the site is underlain by the St. Genevieve Limestone and the upper member of the St. Louis Limestone of the Mississippian Period. This formation is typically an oolitic and fine grained limestone that is white to light-gray and medium to thick-bedded. The limestone is fossiliferous with numerous chert stringers. The upper member of the St. Louis Limestone contains light olive gray, fine grained limestone that is cherty. Bedrock exposures are rare in this area. Generally the formation has weathered to a dark reddish brown silty clay soil with dense and porous chert fragments.

The high frequency of sinkholes in the area, and similar "karst" regions, is the result of variable solubility of the massive limestone bedrock in water and this creates certain geologic hazards that must be properly evaluated for any building project. Water sources are normally two fold: that which infiltrates into the subsurface unit as a result of normal precipitation; and periodic fluctuation of the moving groundwater along joints and bedding planes in the rock. This "solution weathering" can result in the formation of frequently large cavities along bedding planes and joints in the rock. It is important to note that the rate of development of individual cavities in the rock and resulting sinkholes as described below, is a function of many factors, but likely takes thousands of years to develop fully.

Eventually, open slots develop within the subsurface unit of the rock at joint intersections or other weak locations in the unit. The stiff overburden soils bridge over the voids in the shape of an arch. Rainwater infiltrating the ground and flowing down through the soil, and fluctuation of the groundwater table, can cause progressive spalling at the arch face and the void expands toward the ground surface. When the void becomes large, extends close to the ground surface, or when stress changes occur, the soil's shear strength is exceeded and the soil above the arch collapses creating a surface depression or sinkhole. Any open conduit through the soil or rock through which water can flow freely to the cavities in the bedrock is referred to as the "throat". With continued flow of surface water into the sinkhole, the depression enlarges. Secondary collapse of perimeter soil banks into the sinkhole and ravelling of surface soils into the drainage feature also enlarge the depression.

Our experience with sinkhole development is that it will often follow trends particular to a given area. These trends can be lineated along joint patterns in the bedrock, concentration along or within an elevation range, or they can develop randomly. Review of area trends can provide data helpful in siting potential sinkhole areas.

Several surface depressions, which identify the areas of active sinkhole activity, can be found along the north and south property lines of this lot. The property, itself, also contains several smaller and shallower depressions that will require more site specific study. The test borings performed in this preliminary study did not identify the presence of any characteristics normal to sinkhole activity that will result in settlement of the ground. These test best borings, however, were not strategically placed nor did they extend to deep enough depths to properly evaluate the sinkhole activity below this property.

The test borings also found a surface layer of loessal soil that can be a concern for any foundations they may support. The loessal soils have a high silt content and the higher plasticity residual soils will create seasonal perched water table conditions. Groundwater flow through the loess will result in a significant reduction in the shear strength of this layer of soil. This can result in excessive settlement of the building foundations and/or a potential shear punch-though of the foundations should these soils loose enough strength. Possible remedies can include extending the foundations through the loess to be supported by the residual soils to undercutting and backfilling with suitable clays to the installation of deep French drains to better control the flow of water beneath the building. The loessal soils in each of the test borings exhibit a medium stiff to stiff consistency with no perched groundwater observed. A final geotechnical study with a grading plan will be needed to better evaluate this potential risk to the building.

We recommend the final geotechnical study to include the following scope of work:

Conduct an Electrical Resistivity Imaging (ERI) profile across the site to determine depth to the top of bedrock, profile of the bedrock surface, and identify any potential karst zones under the proposed building location.

Advance ten (10) additional test borings within the proposed Phase I building area and ten (10) additional test borings within the proposed future addition, should the exploration of this area be desired at this time.

The presence of the surface depression along the north and south property lines also indicates the need to add 4 to 6 additional test borings outside of the proposed building area, in addition to the ERI survey, to evaluate whether or not the sinkhole activity at these locations extends toward the building area.

We also recommend five (5) of the test borings extend to the top of the limestone bedrock to better identify the presence or absence of the karst weathering of the rock as may be indicated on the ERI profile. Since this area has numerous caves, we recommend each of these test borings obtain rock core samples to a depth of 15 feet below the auger refusal depths to better evaluate the weathering of the limestone rock.

Thank you for the opportunity to be of service to you in this matter. If you should have any questions concerning this or any other matter, please feel free to contact us at your convenience.

Sincerely yours,

ARNON ENVIRONMENTAL & GEOSCIENCE, LLC
STRATEX DRILLING CONTRACTORS, LLC

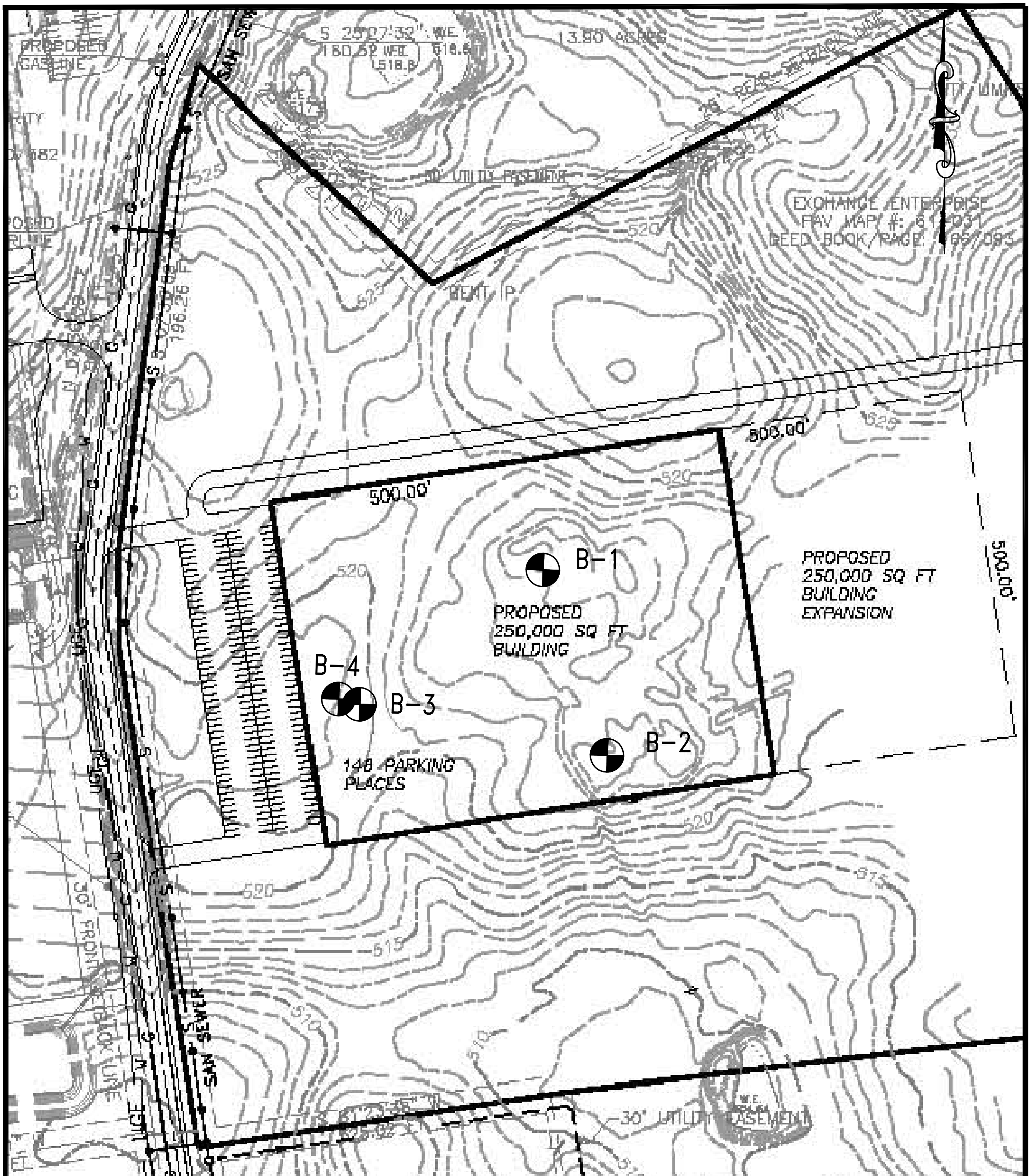
Jeffrey D. Major, PG
CEO

AMERICAN GEOTECHNICAL & ENVIRONMENTAL, INC.

Robert T. Stickney, P.E.
President

STATE OF KENTUCKY
ROBERT T.
STICKNEY
17586
LICENSED
PROFESSIONAL ENGINEER

Enclosure



Test Boring Location

BORING LOCATION PLAN

Cadiz/Trigg County I-24 Business Park
Cadiz, Kentucky

PROJECT NO.	2014-007
SCALE	1" = 200'
FIGURE NO.	1

AG & E

American Geotechnical and Environmental, Inc.

LOG OF TEST BORING

Client: **Cadiz E.D.C.**
Architect/Engineer:
Project Name: **Cadiz/Trigg County I-24 Business Park**
Project Location: **Cadiz, Kentucky**

Boring #: **1**
Job #: **2014-007**
Drawn By: **RTS**
Approved By: **RTS**

DRILLING AND SAMPLING INFORMATION

Date Started: **2/13/14**
Date Completed: **2/13/14**
Drill Foreman: **B Brown**
Inspector:
Boring Method: **HSA**

Hammer Wt. **140** lbs.
Hammer Drop **30** in.
Spoon Sampler O.D. **2** in.
Rock Core Dia. in.
Shelby Tube O.D. in.

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION -	STRATUM DEPTH	DEPTH SCALE	SAMPLE NO.	SAMPLE TYPE	Standard Penetration Test N. Blows/Ft.	Unconfined Compressive Strength Tons/Ft.²	Pocket Penetrometer Tons/Ft.²	Natural Dry Density lbs/cu. ft.	Water Content %	Atterberg Limits LL - Liquid Limit PL - Plastic Limit
Topsoil	0.5									
Brown clayey silt to silty clay, moist, stiff.			1	SS	11				25.5	
		5	2	SS	16				19.6	
	6.5									
Reddish brown silty clay, with trace to some chert, moist, stiff to very stiff.			3	SS	15		3.0		20.8	
		10	4	SS	16		3.0		20.4	LL=37 PL=17
		15	5	SS	16		4.0		21.3	
	20.0	20	6	SS	15				21.1	
Test boring discontinued at 20.0 feet.		25								

SAMPLER TYPE
- **SS - DRIVEN SPLIT SPOON**
- **ST - PRESSED SHELBY TUBE**
- **CA - CONTINUOUS FLIGHT AUGER**
- **RC - ROCK CORE**

GROUND WATER DEPTH
- **AT COMPLETION** Dry **FT.**
- **AFTER** **FT.**
- **WATER ON RODS** **FT.**

BORING METHOD
- **HSA - HOLLOW STEM AUGERS**
- **CFA - CONTINUOUS FLIGHT AUGERS**
- **DC - DRIVING CASING**
- **RW - ROTARY WASH**

American Geotechnical and Environmental, Inc.

LOG OF TEST BORING

Client: **Cadiz E.D.C.**
Architect/Engineer:
Project Name: **Cadiz/Trigg County I-24 Business Park**
Project Location: **Cadiz, Kentucky**

Boring #: **2**
Job #: **2014-007**
Drawn By: **RTS**
Approved By: **RTS**

DRILLING AND SAMPLING INFORMATION

Date Started: **2/13/14**
Date Completed: **2/13/14**
Drill Foreman: **B Brown**
Inspector:
Boring Method: **HSA**

Hammer Wt.: **140** lbs.
Hammer Drop: **30** in.
Spoon Sampler O.D.: **2** in.
Rock Core Dia.: in.
Shelby Tube O.D.: in.

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION -	STRATUM DEPTH	DEPTH SCALE	LITHOLOGY	SAMPLE NO.	SAMPLE TYPE	Standard Penetration Test N. Blows/Ft.	Unconfined Compressive Strength Tons/Ft.²	Pocket Penetrometer Tons/Ft.²	Natural Dry Density lbs/cu. ft.	Water Content %	Atterberg Limits LL - Liquid Limit PL - Plastic Limit
Topsoil	0.5										
Brown clayey silt to silty clay, moist, medium stiff to stiff.				1	SS	9		2.0		25.1	
	4.5			2	SS	13		2.0		24.0	
Reddish brown silty clay, with trace to some chert, moist, stiff to very stiff.		5									
				3	SS	11		3.5		22.8	
				4	SS	14		4.5+		25.7	
		10									
Very dense chert from 13.0 to 14.5 feet				5	SS	25		3.0		25.5	
		15									
	20.0			6	SS	21		4.0		25.5	
Test boring discontinued at 20.0 feet.		20									
		25									

SAMPLER TYPE
SS - DRIVEN SPLIT SPOON
ST - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

GROUND WATER DEPTH
AT COMPLETION Dry **FT.**
AFTER **FT.**
WATER ON RODS **FT.**

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
RW - ROTARY WASH

American Geotechnical and Environmental, Inc. (AG&E)

LOG OF TEST BORING

Client: **Cadiz E.D.C.**
Architect/Engineer:
Project Name: **Cadiz/Trigg County I-24 Business Park**
Project Location: **Cadiz, Kentucky**

Boring #: **3**
Job #: **2014-007**
Drawn By: **RTS**
Approved By: **RTS**

DRILLING AND SAMPLING INFORMATION

Date Started: **2/13/14**
Date Completed: **2/13/14**
Drill Foreman: **B Brown**
Inspector:
Boring Method: **HSA**

Hammer Wt.: **140** lbs.
Hammer Drop: **30** in.
Spoon Sampler O.D.: **2** in.
Rock Core Dia.: in.
Shelby Tube O.D.: in.

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION -	STRATUM DEPTH	DEPTH SCALE	LITH-OLOGY	SAMPLE NO.	SAMPLE TYPE	Standard Penetration Test N. Blows/Ft.	Unconfined Compressive Strength Tons/Ft.^{2}	Pocket Penetrometer Tons/Ft.^{2}	Natural Dry Density lbs/cu. ft.	Water Content %	Atterberg Limits LL - Liquid Limit PL - Plastic Limit
Topsoil	0.4										
Brown clayey silt to silty clay, moist, stiff.				1	SS	12				19.5	LL=32 PL=21
	4.5			2	SS	18		4.5+		22.4	
Reddish brown silty clay, with trace to some chert, moist, stiff to very stiff.		5									
				3	SS	12		4.5+		22.5	
				4	SS	20		3.5		19.6	
		10									
	12.0										
Test boring discontinued at 12.0 feet at auger refusal.											
		15									
		20									
		25									

SAMPLER TYPE

SS - DRIVEN SPLIT SPOON
ST - PRESSED SHELBY TUBE
CA - CONTINUOUS FLIGHT AUGER
RC - ROCK CORE

GROUND WATER DEPTH

AT COMPLETION Dry **FT.**
AFTER **FT.**
WATER ON RODS **FT.**

BORING METHOD

HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
DC - DRIVING CASING
RW - ROTARY WASH

American Geotechnical and Environmental, Inc.

LOG OF TEST BORING

Client: **Cadiz E.D.C.**
Architect/Engineer:
Project Name: **Cadiz/Trigg County I-24 Business Park**
Project Location: **Cadiz, Kentucky**

Boring #: **4**
Job #: **2014-007**
Drawn By: **RTS**
Approved By: **RTS**

DRILLING AND SAMPLING INFORMATION

Date Started: **2/13/14**
Date Completed: **2/13/14**
Drill Foreman: **B Brown**
Inspector:
Boring Method: **HSA**

Hammer Wt.: **140** lbs.
Hammer Drop: **30** in.
Spoon Sampler O.D.: **2** in.
Rock Core Dia.: in.
Shelby Tube O.D.: in.

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION -	STRATUM DEPTH	DEPTH SCALE	LITH-OLOGY	SAMPLE NO.	SAMPLE TYPE	Standard Penetration Test N. Blows/Ft.	Unconfined Compressive Strength Tons/Ft.²	Pocket Penetrometer Tons/Ft.²	Natural Dry Density lbs/cu. ft.	Water Content %	Atterberg Limits LL - Liquid Limit PL - Plastic Limit
Topsoil	0.4										
Brown clayey silt to silty clay, moist, medium stiff to stiff.				1	SS	10				24.5	
				2	SS	20		2.0		25.1	
	5.5	5									
Reddish brown silty clay, with trace to some chert, moist, stiff.				3	SS	15		3.5		24.9	
	8.0										
Reddish brown cherty silty clay, moist, very stiff.				4	SS	17				21.9	
		10									
				5	SS	23				28.5	
		15									
				6	SS	27				19.4	
	20.0	20									
Test boring discontinued at 20.0 feet.											
		25									

SAMPLER TYPE	GROUND WATER DEPTH	BORING METHOD
SS - DRIVEN SPLIT SPOON	AT COMPLETION Dry FT.	HSA - HOLLOW STEM AUGERS
ST - PRESSED SHELBY TUBE	AFTER FT.	CFA - CONTINUOUS FLIGHT AUGERS
CA - CONTINUOUS FLIGHT AUGER	WATER ON RODS FT.	DC - DRIVING CASING
RC - ROCK CORE		RW - ROTARY WASH

American
Geotechnical and
Environmental, Inc.

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

DENSITY

Very Loose	- 5 blows/ft. or less
Loose	- 6 to 10 blows/ft.
Medium Dense	-11 to 30 blows/ft.
Dense	-31 to 50 blows/ft.
Very Dense	-51 blows/ft. or more

RELATIVE PROPORTIONS

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

PARTICLE SIZE IDENTIFICATION

Boulders	-8 inch diameter or more
Cobbles	-3 to 8 inch diameter
Gravel	-Coarse - 1 to 3 inch
	Medium - 1/2 to 1 inch
	Fine - 1/4 to 1/2 inch
Sand	-Coarse - 0.6 mm to 1/4 inch (dia. of pencil lead)
	Medium - 0.2 mm to 0.6 mm (dia. of broom straw)
	Fine - 0.05mm to 0.2 mm (dia. of human hair)
Silt	-0.06 mm to 0.002 mm (cannot see particles)

COHESIVE SOILS
(Clay, Silt and Combinations)

CONSISTENCY

Very Soft	- 3 blows/ft. or less
Soft	- 4 to 5 blows/ft.
Medium Stiff	- 6 to 10 blows/ft.
Stiff	-11 to 15 blows/ft.
Very Stiff	-16 to 30 blows/ft.
Hard	-31 blows/ft. or more

PLASTICITY

Degree of Plasticity	Plasticity Index
Low	0 - 7
Medium	8 - 22
High	over 22

Classification on logs are made by visual inspection in general accordance with the Unified Classification System.

Standard Penetration Test - Driving a 2.0 " O. D., 1 3/8" 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 to drive the spoon 6.0 inches to seat the sampler into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6.0 inches of penetration on the field drill log (Example 6/4/6). On the report log, the Standard Penetration Test result (N value) is normally presented and consists of the sum of the last penetration counts (i.e. N = 4 + 6 = 10 blows/ft.).

Strata Changes - in the column "Soil Descriptions" on the drill log the horizontal lines represent strata changes. A solid line (--------) represents an actually observed strata change, a dashed line (-- -- --) represents an estimated strata change.

Groundwater observations were made at the time indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water level readings indicated on the logs.

IMPORTANT INFORMATION
ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/ The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used:*

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage,* to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*

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 these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. *These 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. Those who do not provide such access may proceed under 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 and the adversarial attitudes which aggravate them 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 consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are *not* exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which 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, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory.

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ASFE THE ASSOCIATION OF ENGINEERING FIRMS PRACTICING IN THE GEOSCIENCES

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