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AMERICAN GEOTECH, INC.

Geotechnical, Environmental and Testing Engineers

REPORT OF

**GEOTECHNICAL EXPLORATION & ENGINEERING ANALYSIS
PROPOSED COOLING TOWER REPLACEMENT
VA MEDICAL CENTER
HUNTINGTON, WEST VIRGINIA**

Prepared For

AE WORKS, LTD.

PITTSBURGH PENNSYLVANIA

JANUARY - 2016

(This report contains 9 pages, plus appendices)

AMERICAN GEOTECH, INC.

GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS

601 OHIO AVENUE
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January 29, 2016

Ms. Tiffany E. Haile, AICP
AE Works, Ltd.
6587 Hamilton Avenue
Pittsburgh, PA 15206

**Re: Report of Geotechnical Exploration and Engineering Analysis
Proposed Cooling Tower Replacement
VA Medical Center
Huntington, West Virginia
AEW Project No. 15010**

Dear Ms. Haile:

The following geotechnical report is prepared for AE Works, Ltd. and their design professionals to aid in the design of this project. The body of this report cannot be part of the contract documents since it consists of interpretations and judgment based recommendations. The recommendations must be transformed into the contract documents by the architect, site civil engineer, and structural engineer so that those recommendations can be quantified.

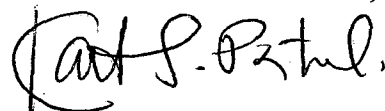
It is recommended that the contract documents must follow International Building Code (IBC) requirements, including a Schedule of Special Inspection Services for soils and foundations in the plans. The owner must employ an independent testing agency for quality assurance and special inspections as set forth in IBC requirements Chapter 17.0, Sections 1704.2 to 1704.14.

We appreciate the opportunity of providing these services to you. If you have any questions concerning the information in this report, or should questions develop as the design proceeds, please contact our office at 304-340-4277.

Thank you for your consideration.

Respectfully Submitted,

AMERICAN GEOTECH, INC.



Kanti S. Patel, M.S.C.E., P.E.
Principal Engineer

GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED COOLING TOWER REPLACEMENT HUNTINGTON, WEST VIRGINIA

EXECUTIVE SUMMARY

A brief summary of our recommendations for this project is presented below. This summary should be read in context with the entire report for proper interpretation.

Special Issues

- It is recommended that the contract documents must follow International Building Code (IBC) requirements, including a Schedule of Special Inspection Services for soils and foundations in the plans. The owner must employ an independent testing agency for quality assurance and special inspections as set forth in IBC requirements Chapter 17.0, Sections 1704.2 to 1704.14.
- Construction of the proposed cooling tower at the currently planned location will require the use of a deep foundation system socketed into bedrock using an H-pile system. Straight shafted drilled piers with H-piles are recommended for this project due to the lateral stability concerns resulting from placement of the structure over an existing fill slope.
- Temporary steel casings may be required during drilled shaft installation due to the existing unengineered fill condition and potential caving of the drilled holes.

Foundations

- The proposed structure should be supported on a drilled pier (caisson) and H-pile foundation system socketed a minimum of 10 feet or $\frac{1}{3}$ of the total pile length into bedrock. The proposed structure can be supported on 36-inch diameter caissons embedded with HP 12x53 piles for the full length for lateral stability.
- The top of bedrock at this site is approximately 35 feet below the existing ground surface and the drilled piers should be socketed at least 10 feet or $\frac{1}{3}$ of the total pile length, whichever is greater, into bedrock after encountering auger refusal.
- Based upon the results of our subsurface exploration, the drilled caisson lengths are estimated to range from 45 feet to 52 feet with rock socket lengths of 15 to 17 feet.
- Drilled piers should be designed for 30,000 pounds-per-square-foot (PSF) end bearing capacity, which includes side skin friction from the rock socket.
- The H-piles should be centered in the caissons and grouted using 4,000 psi concrete.
- The concrete and H-pile should be at least 1 foot above the ground surface with the tops of both elements flush.
- All six (6) column legs can be supported on top of the caissons/H-piles and the connections will be designed by others. The caisson/H-pile system is a rigid structure.

INTRODUCTION

This report presents the results of our geotechnical subsurface exploration and engineering analysis for the proposed cooling tower replacement at the VA Medical Center in Huntington, West Virginia. The purpose of this exploration was to generally define the subsurface conditions at this site and to characterize these conditions for the proposed structure.

The exploration included the drilling of three (3) Standard Penetration Test soil borings, visual observations of the general project site, and the report preparation. The exploration was authorized by Ms. Tiffany Haile of AE Works, and the work was performed in accordance with our proposal/agreement submitted on January 8, 2016.

This report is intended to provide detailed information concerning subsurface conditions within the proposed construction site, sufficient for the basic design of the foundation system, and to provide geotechnical engineering recommendations for the site preparation and foundation design.

PROJECT INFORMATION

It is proposed to construct a new cooling tower at the referenced site as the second part of an overall chiller plant upgrade. The planned support framing will be an elevated braced steel frame dunnage structure with walkways providing support for three (3) 600-ton capacity cooling towers. The top of the braced frame structure will be set at an elevation of 868 feet, which will be up to 18± feet above the existing surface elevations. The proposed structural loads will be supported on six (6) exterior columns producing vertical and horizontal loads not exceeding 50 and 5 kips per column, respectively.

The site is located on the campus of the Huntington VA Medical Center. The ground surface is level to sloping across the project site, with the general surface area occupied by a paved roadway and lawn space. The site is described as an elongated ridge top that has been leveled for construction of the hospital, with excess materials placed over the existing sloping hillsides to provide additional surface area. Underground utilities are present within the proposed cooling tower footprint.

SUBSURFACE EXPLORATION

Three (3) Standard Penetration Test soil borings were drilled by D. L. Martin Excavation at the approximate locations shown on the attached Test Boring Location Plan. The test borings were drilled using a track-mounted drill rig on January 15, 2016. The test borings were selected by AGI personnel in the field referencing the existing utility locations and site features. The test borings were advanced, and the bore holes were stabilized, using 3.25-inch interior diameter hollow stem augers. Sampling was accomplished in the undisturbed material below the bottom of the augers using a split-spoon sampler. The split-spoon sampler, having an exterior diameter of 2.0-inches and an interior diameter of 1⅜-inch, was driven with a 140-pound automatic hammer falling 30 inches, in accordance with ASTM D 1586. The soil samples were recovered at 2.5 foot intervals within the

upper 10 feet and at 5 foot intervals thereafter. The test borings were drilled to depths ranging from 34.0 to 36.8 feet below the present site grades.

Upon completion of the test borings, the holes were backfilled using the auger cuttings and the soil samples were returned to our soil mechanics laboratory, where they were visually examined by the project engineer and grouped for laboratory testing. The laboratory test program included natural moisture contents and pocket penetrometer readings on the representative soil samples.

The attached test boring logs were then prepared by the project engineer, using the results of the laboratory tests, recovered soil samples, and notes taken by the drill foreman during the drilling operations. The classified logs and the basis for recommendations are included in the appendix. Each log gives the depth, thickness, and visual description of the soil strata penetrated, along with the sample identification data.

SUBSURFACE CONDITIONS

Existing fill materials were encountered in all of the soil test borings, and extended to a minimum depth of roughly 7.5 feet (B-1) to approximately 10.0 feet (B-2 and B-3) below the existing ground surface (bgs). Natural soils were encountered below the referenced fill in all test borings and consisted of colluvial silty clay deposits. Generally, the subsurface profile can be described as a variable thickness of unengineered fill underlain by stiff natural clay deposits that extend to the top of bedrock.

The encountered unengineered fill materials varied somewhat in composition between the test boring locations. These fill materials typically consisted of a mixture of silty clay with rock fragments and sand. In B-3, the fill consisted of silty clay with a significant percentage of brick fragments below 4 feet. Larger rock particles to boulders were noted in B-2, which resulted in refusal of the split spoon sampler. The fill was noted as moist to very moist and medium stiff to very stiff in consistency. The Standard Penetration Test (SPT) results typically ranged from 8 to 42 blows-per-foot (bpf). It should be noted that SPT results above 30 and split spoon refusal conditions are undoubtedly attributed to the presence of cobbles, boulders or brick in the fill and should not be viewed as accurate representations of the fill density. Recovery in the split spoon sampler was highly variable and ranged from 0% to 100%, indicating that loose zones are present in the fill stratum. The moisture contents of the fill materials ranged from 5.9% to 19.2%. Pocket penetrometer readings in the fill varied from 2.0 to 3.0 tons-per-square-foot (TSF). The referenced random fill strata extended to minimum depths of approximately 7.5 feet bgs in B-1 to 10 feet in B-2 and B-3.

The natural soils consisted of brown, grayish-brown, and gray silty clay, with varying percentages of rock fragments and sand. The SPT results ranged from 14 to 74 blows-per-foot (bpf) and are classified as stiff to hard in consistency. These deposits were generally described as moist to very moist with moisture contents of 13.0% to 21.2%. Pocket penetrometer readings on these samples ranged from 1.75 to 3.25 tons-per-square-foot (tsf). The natural soil strata extended to depths of 15.0 to 16.2 feet bgs where weathered bedrock was encountered.

Below the described silty clay stratum, weathered bedrock materials were encountered to the completion depths. In B-1, brown and gray, soft to tough clayey shale was encountered from 15.0 feet to 35.0 feet, at which elevation gray, medium hard shale was present to the completion depth of 35.1 feet. A gray clay layer was also noted at a depth of 20 feet within the clayey shale formation. Borings B-2 and B-3 encountered brown, gray and olive-gray, soft to tough sandstone at depths of 15.0 and 16.2 feet. The sandstone formation also contained clay seams and was classified as weathered to highly weathered. Between the depths of 25.5 feet and 36.5 feet in B-2, brown, olive-brown and gray tough claystone was present. Borings B-2 and B-3 were extended to completion depths of 34.0 and 36.8 feet, with medium hard sandstone at the referenced depths. SPT results ranged from 27 to 78 bpf, with split spoon refusal conditions encountered at most locations. Auger refusal conditions were encountered in all test borings.

Groundwater was not noted during, or at the completion of, the drilling in any of the test borings. We should state, however, that fluctuations in the location of the groundwater table, as well as perched or trapped water, can occur as a result of seasonal variations in precipitation, evaporation, surface runoff, and other factors not immediately apparent at the time of our exploration.

ANALYSIS AND RECOMMENDATIONS

Considering that the structure placement will extend over an existing unengineered fill slope and potential slope movement must be accounted for, the proposed cooling towers will have to be supported on a deep foundation system extending into bedrock using an H-pile system. Straight sided drilled piers with H-piles are recommended for this project due to the lateral stability concerns.

Foundation Design

It is our opinion that a reinforced drilled pier (caisson) and H-pile foundation system will provide adequate support for the proposed cooling tower structure. The caissons should be a minimum of 36-inches in diameter to provide adequate lateral stability and contain a HP 12x53 steel pile embedded for the full drilled shaft length. The caissons should bear within the underlying bedrock, with expected caisson lengths of 45 to 52 feet below the existing ground surface. The caisson and H-pile system should be designed by a licensed structural engineer.

Design Recommendations

The straight-shafted drilled caissons should bear in the underlying bedrock and be socketed into the rock stratum after auger refusal a minimum of 10 feet or $\frac{1}{3}$ of the total pile length, whichever is greater. Our experience indicates that the bedrock at this site can be penetrated using earth augers, at least through the weathered zone. Rock augers are often required in unweathered shale and sandstone, and depending upon the possible presence of any boulders, core barrels may also be needed.

The drilled caissons should be extended into the competent bedrock, penetrating through the weathered rock by means of auger refusal. Auger refusal is herein defined as the inability to progress

the earth auger under the 40,000 pounds of positive crowd force, and an available measured torque at the Kelly bar of 45,000 ft.-lbs. Based upon the results of our subsurface exploration, the drilled caisson lengths are estimated to range from 45 feet to 52 feet with rock socket lengths of 15 to 17 feet. After meeting refusal on bedrock, the drilled piers should be socketed 10 feet or $\frac{1}{3}$ of the total pile length (whichever is greater) into bedrock.

The minimum diameter of these shafts has been specified as 36 inches for lateral stability. The minimum caisson embedment depth should be the greater of 10 feet or $\frac{1}{3}$ of the total pile length, and the drilled caisson lengths are estimated to range from 45 to 52 feet below the surface. Drilled piers should be designed for 30,000 pounds-per-square-foot (PSF) end bearing capacity, which includes side skin friction from the rock.

As significant variations in the top of competent rock elevation are expected over the braced frame structure footprint, it is recommended that the bottom elevations for the caissons be estimated based on the test borings. As the dominant rock formations within the area are shale and sandstone, significant differences in the depth of intact bedrock could occur due to the possible presence of detached boulders above the intact rock elevation.

Installation

Temporary steel casings will be required if loose conditions or seepage allow caving of the holes. Seepage will occur, especially at the fill/natural soil and soil/bedrock interfaces. The foundation contractor should have casings available at the site. Casings may also be necessary at the surface to protect adjacent underground utilities during drilled shaft installation.

The base of each caisson should be inspected and approved by the geotechnical engineer/geotechnical personnel prior to placement of H-beams and concrete. No more than two (2) inches of water should be allowed to collect at the bottom of the caisson prior to concreting. Otherwise, the water should be pumped out or the concrete should be placed using a tremie. A concrete slump of 4 to 6 inches is recommended and care should be taken to maintain an adequate head of concrete above the tip of the casing as it is being withdrawn.

An HP 12x53 steel pile should be centered in each of the drilled shafts for the full length of the drilled shaft and grouted using 4,000 psi concrete. We understand that the concrete in the caissons will be extended 1 foot above the existing ground surface elevation. The steel H-beams should be cut off flush with the top of the concrete for connection to the vertical supports of the braced frame structure. The connections of the six (6) column legs to the caissons/H-piles will be designed by others. The caisson/H-pile system is a rigid structure.

The anticipated total and differential settlements of the planned structure constructed on a drilled pier foundation would be negligible.

Seismic Soils Classification and Seismic Hazard Evaluation

Site Class D is recommended for the seismic design considerations, based upon our test borings, our knowledge and understanding of the area geology, and Table 1613.5.2 of the 2009 International Building Code (IBC). The overburden soils at this site are identified as Site Class D. The depth of weathered bedrock at this site is estimated to range from 15 to 16.2 feet below the present surface and belongs to Site Class B. Although the IBC site classification is based on the average soil conditions within the top 100 feet of the subsurface profile, the IBC permits the soil properties to be estimated by a geotechnical engineer based upon known regional geologic conditions where site-specific data is not available to the depth of 100 feet. A 100 foot deep test boring, possibly in conjunction with more sophisticated laboratory testing or field geophysical testing, would be required to more accurately determine the soil properties and soil site class. The actual seismic design should be performed by a structural engineer. The following potential seismic hazards resulting from earthquake motions have been evaluated.

1. A slope stability analysis was not included in the scope of this exploration. The ground surface within the building area is level to sloping and appears to be stable. Any exterior fill slopes planned for this project should be no steeper than 3H:1V with respect to potential instability resulting from earthquake motions.
2. The groundwater table was not encountered during our subsurface exploration. Because the foundations will be extended to bedrock, liquefaction of the bearing soils due to earthquake motions will not be an issue.
3. As no ponds or low lying areas are present within the proposed building vicinity, lateral spreading is unlikely.
4. As no faults are present within the site area, surface rupture is also unlikely.

Construction Considerations

The exposed subgrade soils can deteriorate and lose support when exposed to construction activity and environmental changes (this is particularly true for the fine grained soils). Subgrade soil deterioration can occur in the form of freezing, erosion, softening from ponded water, and rutting from construction traffic. If the exposed subgrade surface becomes softened and deteriorated, it must be properly repaired through scarification and re-compaction immediately prior to stone placement. If this has to be performed during wet weather conditions, it would be worthwhile to consider undercutting the disturbed soil and replacing it with crushed stone, or providing a flowable fill “mud mat” working surface.

Construction Monitoring

Close testing and monitoring by geotechnical personnel will be a critical aspect of this project. As a minimum, these services should be provided during site preparation, foundation and grade beam installation, and floor slab construction.

Environmental Concerns

As stated in this report, the purpose of this exploration has been to address the geotechnical related issues only. An environmental assessment can be provided for this project at your request.

LIMITATIONS

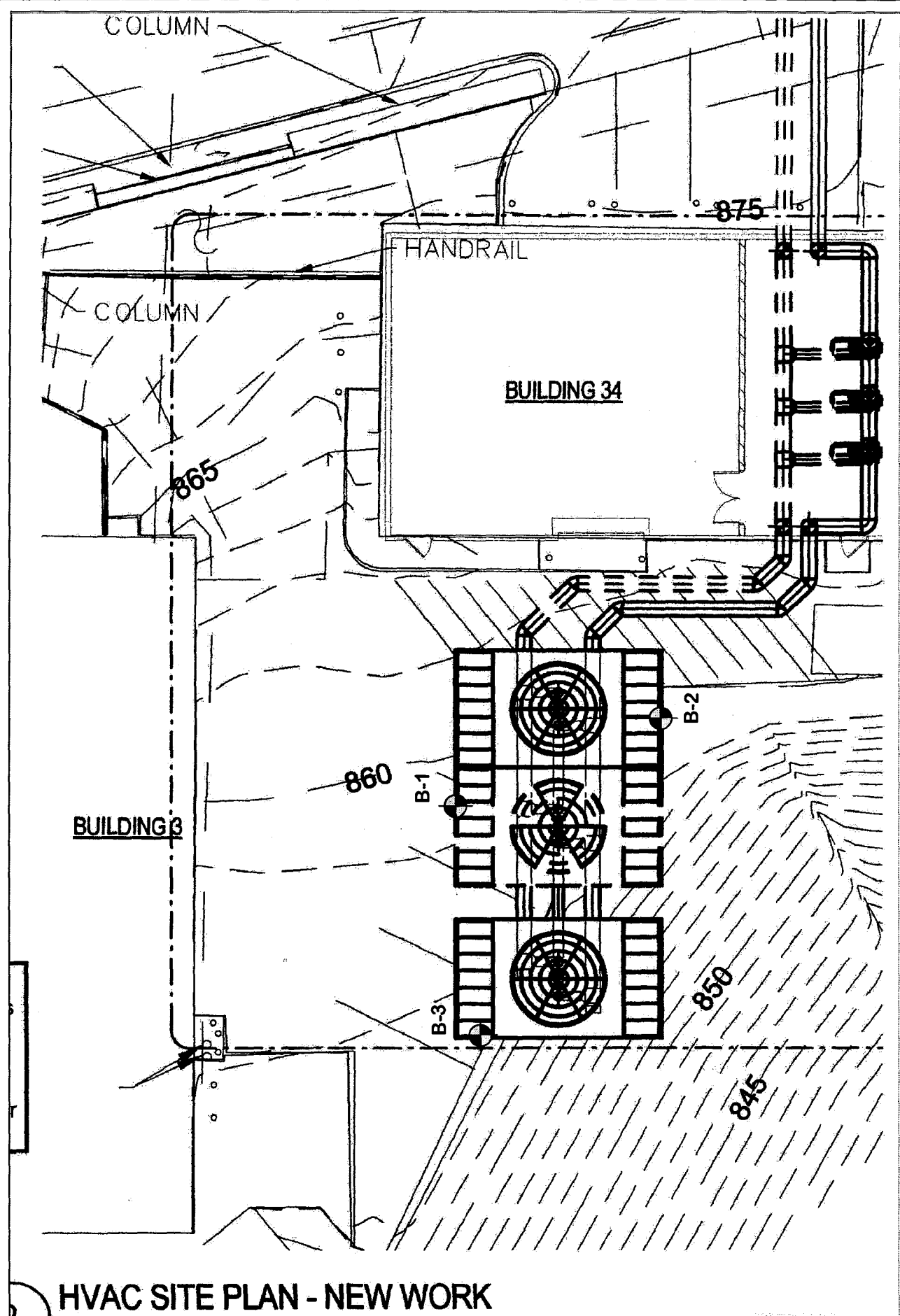
This report was prepared for use by AE Works, and their authorized consultants, to aid in the design of this project. The report has been prepared in accordance with accepted geotechnical engineering practices and no other warranties, either expressed or implied, are made. The recommendations stated herein are contingent on American Geotech observing and evaluating all geotechnical aspects of the required work. We cannot be held responsible for any misinterpretations or improper implementation of our recommendations by other firms providing quality control services.

The recommendations presented in this report are based on data obtained from test borings made at the approximate locations shown on the Test Boring Location Plan. Variations which may exist between the test borings may not become evident until during construction. If significant variations are noted, we should be contacted so that the field conditions can be examined and the applicable recommendations revised, if necessary. Similarly, in the event of changes in the nature, design or location of the structure, or if other developments are planned, we should be notified so that we may review such changes to verify or make appropriate modifications to our previous conclusions and recommendations, which may be invalidated by any such changes.

We recommend that this complete report be provided to the various design team members, the contractors and the project owner. Potential contractors should be informed of this report in the "Instructions to Bidders" section of the bid documents. The report should not be included or referenced in the actual contract documents.

TEST BORING LOCATION

*American Geotech, Inc.
601 Ohio Avenue
Charleston, West Virginia 25302*



HVAC SITE PLAN - NEW WORK

1/16" = 1'-0"

<div>DATE</div> <div>1-21-16</div> <div>DRAWN BY</div> <div>AE Works</div> <div>ADAPTED BY</div> <div>RDJ</div>	<div>SCALE</div> <div>NONE</div> <div>CHECKED BY</div> <div>KSP</div> <div>SHEET</div> <div>1 OF 1</div>	<div>TEST BORING LOCATION PLAN</div> <div>Proposed Cooling Tower Replacement</div> <div>VA Medical Center</div> <div>Huntington, West Virginia</div> <div>AMERICAN GEOTECH, INC.</div> <div>601 OHIO AVENUE</div> <div>CHARLESTON, WV 25302</div> <div>(304) 340-4277</div>
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Soil Test Boring Logs and Laboratory Data

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Charleston, West Virginia 25302*

Test Boring Log: Terminology and Symbols

Terminology

Grain Size

Soil Fraction		Particle Size	U.S. STD. Sieve Size
Boulders		Larger than 12"	Larger than 12"
Cobbles		3" to 12"	3" to 12"
Gravel	Coarse	¾" to 3"	¾" to 3"
	Fine	4.75 mm to ¾"	#4 to ¾"
Sand	Coarse	2.00 to 4.75 mm	#10 to #4
	Medium	0.425 to 2.00 mm	#40 to #10
	Fine	0.075 to 0.475 mm	#200 to #40
Fines	Clays & Silts	smaller than 0.075 mm	smaller than #200

Plasticity characteristics differentiate between silts and clays

Relative Density

Term	"N" Value
very loose	0 - 4
loose	5 - 10
medium dense	11 - 30
dense	31 - 50
very dense	over 50

Consistency

Term	ID Procedures	"N" Value
Soft	Easily penetrated by thumb	0 - 4
Medium Stiff	Penetrated by thumb with moderate effort	5 - 8
Stiff	Penetrated by thumb with great effort	9 - 15
Very Stiff	Readily indented by thumbnail	16 - 30
Hard	Indented by thumbnail with difficulty	31 - 50
Very Hard		over 50

Relative Moisture Description

Dry	Soil noticeably below optimum moisture
Moist	near optimum, but less than liquid limit
Damp	near or exceeding liquid limit
Wet	soil below water table

Symbols

Drilling and Sampling

RC - Rock Coring: Sizes AW, BW, NW, NQ
RQD - Rock Quality Designator
DC - Drive Casing
HSA - Hollow Stem Auger
FA - Flight Auger
AG - Auger
HA - Hand Auger
SS - 2" diameter Split Barrel Sampler
ST - 3" diameter Thin-Walled Tube Sampler
AS - Auger Sample
WS - Wash Sample
NR - No Recovery
S- Sounding
ATV - All Terrain Vehicle

Laboratory Tests

PP - Pocket Penetrometer Reading, Tons/ft²
QU - Unconfined Strength, Tons/ft²
W - Moisture Content, %
LL - Liquid Limit, %
PL - Plastic Limit, %
D - Dry Unit Weight, lbs/ft³

Standard Penetration Test

The penetration resistance, or N-value as it is commonly referred to, is the summation of the number of blows required to drive the last two successive 6" penetrations of the 2" diameter -18" long split barrel sampler. The sampler is driven with a 140 lb. weight falling 30". The standard penetration test is performed in compliance with procedures as set forth in ASTM D-1586

Water Level Measurement

NW - No water encountered
WD - While drilling
BCR - Before casing removal
ACR - After casing removal
CW - Caved and wet
CM - Caved and moist
BP - Backfilled upon completion

LOG OF TEST BORING

CLIENT AE Works, Ltd. BORING NO. B - 1

PROJECT Proposed Cooling Tower Replacement - Huntington, WV DATE START 1/15/16

BORING LOCATION As shown on plan DATE COMP. 1/15/16

ELEV. REF. Estimated from site plan ORDER NO. _____

ELEV. FT.	DEPTH FT.	DESCRIPTION OF MATERIALS	SAMPLE				
			NO.	TP	DEPTH	BLOWS/6"	REC.
859.5±	0.0	0.6' Asphalt(5") and gravel(2").					
858.9	0.6	Brown and gray silty clay with 6.9' rock fragments and sand (FILL), moist, stiff to very stiff.	1	ss	0.6' - 2.1'	3-7-6	10"
			2	ss	2.5' - 4.0'	9-10-10	18"
			3	ss	5.0' - 6.5'	7-7-7	18"
852.0	7.5	Brown and gray silty clay with 7.5' rock fragments and sand, moist, stiff to very stiff.	4	ss	7.5' - 9.0'	7-8-7	18"
			5	ss	10.0' - 11.5'	6-9-10	18"
844.5	15.0	Brown and gray clayey shale, 20.0' gray clay @ 20 ft, weathered, soft to tough.	6	ss	15.0' - 15.4'	50/5"	5"
			7	ss	20.0' - 20.4'	50/5"	4"
824.5	35.0	0.1' Gray shale, weathered, medium hard.					
			8	ss	35.0' - 35.1'	50/1"	1"
824.4	35.1	Auger refusal @ 35.0 feet. Boring completed.					

GENERAL NOTES
 DRILLER DL Martin
 RIG NO. CME-55
 RIG TYPE Truck
 METHOD HSA/SS

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 Charleston, WV 25302
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WATER LEVEL OBSERVATIONS
 IMMEDIATE NW FT.
 AT COMPLETION NW FT.
 AFTER BP HRS. NW FT.
 WATER USED IN DRILLING No FT.

LOG OF TEST BORING

CLIENT AE Works, Ltd. **BORING NO.** B - 2
PROJECT Proposed Cooling Tower Replacement - Huntington, WV **DATE START** 1/15/16
BORING LOCATION As shown on plan **DATE COMP.** 1/15/16
ELEV. REF. Estimated from site plan **ORDER NO.** _____

ELEV. FT.	DEPTH FT.	DESCRIPTION OF MATERIALS	SAMPLE				
			NO.	TP	DEPTH	BLOWS/6"	REC.
859.5±	0.0	0.3' Asphalt(4").					
859.2	0.3	Brown and gray silty clay and rock	1	ss	0.3' - 1.8'	3-7-7	0"
		9.7' fragments, with sand, trace	2	ss	2.5' - 2.5'	⁵⁰ / _{0"}	0"
		boulders (FILL), moist, stiff to	3	ss	5.0' - 6.5'	24-32-10	10"
		very stiff.	4	ss	7.5' - 9.0'	13-12-7	18"
849.5	10.0	5.0' Brown silty clay with rock	5	ss	10.0' - 11.5'	7-7-7	18"
		fragments, moist, stiff.					
844.5	15.0	Brown to gray sandstone, very	6	ss	15.0' - 16.5'	13-23-4	18"
		10.5' fine-grained, with clay seams to	7	ss	20.0' - 20.2'	⁵⁰ / _{2"}	1"
		20 ft, weathered, soft to tough.					
834.0	25.5	11.0' Brown, olive-brown and gray	8	ss	25.0' - 26.5'	20-35-43	18"
		claystone, tough.					
823.0	36.5	0.3' Gray sandstone, very fine-grained,	9	ss	36.5' - 36.8'	⁵⁰ / _{3"}	2"
		medium hard.					
822.7	36.8	Auger refusal @ 36.5 feet.					
		Boring completed.					

GENERAL NOTES
 DRILLER DL Martin
 RIG NO. CME-55
 RIG TYPE Truck
 METHOD HSA/SS

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WATER LEVEL OBSERVATIONS
 IMMEDIATE NW FT.
 AT COMPLETION NW FT.
 AFTER BP HRS. NW FT.
 WATER USED IN DRILLING No FT.

LOG OF TEST BORING

CLIENT AE Works, Ltd. **BORING NO.** B-3
PROJECT Proposed Cooling Tower Replacement - Huntington, WV **DATE START** 1/15/16
BORING LOCATION As shown on plan **DATE COMP.** 1/15/16
ELEV. REF. Estimated from site plan **ORDER NO.** _____

ELEV. FT.	DEPTH FT.	DESCRIPTION OF MATERIALS	SAMPLE				
			NO.	TP	DEPTH	BLOWS/6"	REC.
857.5±	0.0	0.3' Asphalt(2") and gravel(2").					
857.2	0.3	Brown, dark brown and gray silty	1	SS	0.3' - 1.8'	2-4-4	6"
		9.7' clay with brick and rock	2	SS	2.5' - 4.0'	3-3-7	12"
		fragments (FILL), moist to very	3	SS	5.0' - 6.5'	7-7-7	5"
		moist, medium stiff to very stiff.	4	SS	7.5' - 9.0'	9-10-11	2"
847.5	10.0	Brown and grayish-brown silty					
		6.2' clay with rock fragments and	5	SS	10.0' - 11.5'	3-30-44	18"
		sand, moist to very moist, hard to	6	SS	15.0' - 16.5'	7-7-9	18"
		very stiff.					
841.3	16.2						
		17.8' Olive-gray sandstone, with clay	7	SS	20.0' - 20.1'	50/1"	1"
		seams, highly weathered, tough.	8	SS	34.0' - 34.0'	50/0"	0"
823.5	34.0	Auger refusal @ 34.0 feet.					
		Boring completed.					

GENERAL NOTES
 DRILLER DL Martin
 RIG NO. CME-55
 RIG TYPE Truck
 METHOD HSA/SS

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WATER LEVEL OBSERVATIONS
 IMMEDIATE NW FT.
 AT COMPLETION NW FT.
 AFTER BP HRS. NW FT.
 WATER USED IN DRILLING No FT.

AMERICAN GEOTECH, INC.
601 Ohio Avenue
Charleston, West Virginia 25302

AE Works, Ltd.
Proposed VAMC Cooling Tower
Huntington, West Virginia

TABULATION OF TEST DATA

Hole No.	Sample No.	Depth (ft.)	Unconfined Compressive Strength (tsf)	Failure Strain (%)	Dry Density (pcf)	Water Content (%)	Pocket Penetrometer (tsf)
B-1	S-1	0.6 - 2.1				17.1	2.5
	S-2	2.5 - 4.0				9.7	3.0
	S-3	5.0 - 6.5				16.0	
	S-4	7.5 - 9.0				14.0	
	S-5	10.0 - 11.5				16.1	3.25
B-2	S-3	5.0 - 6.5				5.9	
	S-4	7.5 - 9.0				8.5	
	S-5	10.0 - 11.5				14.2	2.25
B-3	S-1	0.0 - 1.5				15.9	2.0
	S-2	2.5 - 4.0				19.2	2.0

**AE Works, Ltd.
Proposed VAMC Cooling Tower
Huntington, West Virginia**

[illegible]