



June 23, 2014

Christopher A. Evans, P.E.
Hatch Mott MacDonald
The Public Ledger Building, Suite 1040
150 South Independence Mall West
Philadelphia, PA 19106

RE: Project No. CC.1031.GA
Geotechnical Evaluation
Proposed Water Treatment Plant
VA Medical Center – Perry Point
Perryville, Maryland

Dear Mr. Evans:

Attached, please find CGG Consulting, LLC's (CGCC's) geotechnical evaluation report for the proposed water treatment plant facility at the Perry Point VA Medical Center located in Perryville, Maryland. The purpose of these services was to evaluate the subsurface conditions in the area of the proposed facility building foundations and slab. This work has been performed in accordance with the agreement between Hatch Mott MacDonald and CGCC dated August 21, 2013, and a work order dated May 27, 2014.

We have appreciated the opportunity to assist you on this project. If there are any questions regarding the enclosed, please do not hesitate to contact us.

Very truly yours,

CGC CONSULTING, LLC

A handwritten signature in black ink, appearing to read "Stacy B. Ziegler".

Stacy B. Ziegler, P.E., LEED AP BD+C
President

SBZ/RRN:jst
WORD\CC1031GA.0614-PERRY POINT VAMC WTP GEOTECH.RPT

Enclosure: Geotechnical Evaluation

GEOTECHNICAL EVALUATION
PROPOSED WATER TREATMENT FACILITY
PERRY POINT VA MEDICAL CENTER
PERRYVILLE, MARYLAND

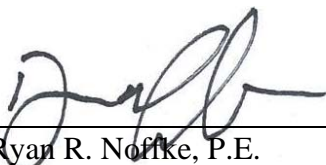
June 2014

Prepared for:

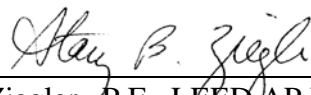
Hatch Mott MacDonald
The Public Ledger Building, Suite 1040
150 South Independence Mall West
Philadelphia, Pennsylvania 19106

Prepared by:

CGC Consulting, LLC
5400 Limestone Road, Suite 200
Wilmington, Delaware 19808



Ryan R. Norfke, P.E.
Project Engineer



Stacy B. Ziegler, P.E., LEED AP BD+C
Senior Geotechnical Engineer

Project No. CC.1031.GA

TABLE OF CONTENTS

| <u>SECTION</u> | <u>DESCRIPTION</u> | <u>PAGE</u> |
|----------------|---|-------------|
| | EXECUTIVE SUMMARY | i |
| I. | INTRODUCTION | 1 |
| II. | FIELD AND LABORATORY TESTING PROGRAMS | 2 |
| | A. STANDARD PENETRATION TEST BORINGS | 2 |
| | B. LABORATORY TESTING..... | 3 |
| III. | SUBSURFACE CONDITIONS | 3 |
| IV. | CONCLUSIONS AND RECOMMENDATIONS | 5 |
| | A. DESIGN | 5 |
| | B. CONSTRUCTION..... | 8 |

APPENDICES

| | |
|------------|-----------------------------|
| Appendix A | Test Boring Location Sketch |
| Appendix B | Test Boring Logs (5) |
| Appendix C | General Notes |

EXECUTIVE SUMMARY

This report summarizes CGC Consulting, LLC's (CGCC's) geotechnical evaluation for the proposed design and construction of a water treatment plant facility at the Perry Point VA Medical Center located in Perryville, Maryland. We understand that it is proposed to construct a new water treatment facility adjacent to the existing water treatment plant at the site, as well as equipment and generator pads near the existing raw water intake pump station. The proposed water treatment plant building is to be located along Avenue E, southeast of the existing water treatment plant building, and will have a footprint of approximately 7,500 square feet.

On June 10 and 11, 2014, six Standard Penetration Test borings were performed in the vicinity of the proposed facility. Five borings were located in the vicinity of the proposed water treatment facility. One boring was performed in the vicinity of the proposed generator pad near the existing raw water intake pump station located along the river bank of the Susquehanna River, approximately 1,500 feet west of the water treatment plant site. In two of the borings in the water treatment plant building area, repeated refusal on apparent concrete obstructions was encountered at depths of 1 to 3 feet below grade.

The subsurface conditions encountered at the water treatment plant site generally consisted of a surficial layer of topsoil overlying apparent fill material. Fill depth varied with location from approximately 2 to 5 feet, and was generally deeper in areas of greater elevation near Avenue E. The fill layer was underlain by gray-brown stiff to very stiff consistency silt soils overlying a thin layer of fine to coarse silty sand and angular fine to coarse gravel. Refusal of augering and/or spooning on apparent bedrock was encountered at depths ranging from approximately 13.1 to 17.8 feet below existing ground surface. Coring of the rock was not performed. Similar subsurface conditions were encountered in test boring TB-6, performed closer to the river near the raw water intake pump station. No fill material was observed at this location. Refusal on apparent rock was encountered at a depth of 17.1 feet below the ground surface.

Groundwater was encountered at depths of approximately 12.8 to 13.3 feet below the ground surface in the vicinity of the proposed water treatment plant building.

Based on the results of the field evaluation, it is recommended that the proposed facilities could be designed to be bear on a conventional shallow foundation system or mat foundation.

Apparent fill materials were observed from depths of 2 to 5 feet across the proposed water treatment plant building site. These fills were generally observed to be fairly stiff across the site; however, miscellaneous debris, such as apparent asphalt millings, was observed throughout the fill. In addition, apparent concrete obstructions were observed at two locations (TB-1 and TB-4) at depths of 1 to 3 feet below the ground surface. The conditions below these concrete obstructions are unknown, as they were not penetrated. Construction of building foundations and slabs over miscellaneous fill poses a risk of increased settlement, due to variable and unknown conditions. Therefore, the following is recommended:

- All foundations should bear on natural site soils below the miscellaneous fill.

- The concrete obstructions encountered in the test borings should be further investigated to determine their extent and conditions below them, as well as be removed from beneath the structures.
- The least risk associated with slab settlement would be to remove the fill soils in their entirety and replace them with structural fill, placed in controlled compacted lifts. However, since the fill material observed in the test borings was of a medium stiff to stiff consistency, and had limited amount of debris, it may be feasible to leave the fill in place with proper subgrade preparation. This would include proofrolling of the site following the removal of topsoil to carefully review for soft or yielding areas of variable or organic fills. Removal of concrete obstructions within the fill is recommended regardless of whether the remaining fill is left in place.

Further details regarding these recommendations are provided herein.

A maximum net allowable bearing pressure of 3,000 pounds per square foot (psf) is recommended for the design of the foundations for the new building and associated pads. Total settlements of 1 inch or less have been estimated based on the loads provided and required fill placement. This analysis has assumed a shallow foundation system with a minimum width of 3 feet for isolated footings and 2 feet for continuous footings, as well as a minimum burial depth of 18 inches for interior footings and a minimum of 32 inches for exterior footings.

A summary of the field and laboratory testing data, as well as more detailed conclusions and recommendations for design and construction of the foundations and floor slabs for the proposed structures are provided in the following report.

I. INTRODUCTION

The following report summarizes CGC Consulting, LLC's (CGCC) geotechnical evaluation for the proposed water treatment plant facility at the Perry Point VA Medical Center located in Perryville, Maryland. Included in this report is a summary of the data obtained from field and laboratory testing programs, as well as a discussion of the geotechnical analysis performed. Recommendations are provided for the design and construction of foundations for the proposed structures. These services were performed in general accordance with the subcontract agreement between Hatch Mott MacDonald (Hatch Mott) and CGCC dated August 21, 2013, and a subsequent work order dated May 27, 2014.

To assist with this evaluation, Hatch Mott has provided CGCC with the following information:

- An undated site drawings indicating the proposed boring locations titled "Attachment B," as prepared by DCS Infrastructure, LLC and hand annotated by Hatch Mott, (received on June 3, 2014); and
- Site drawing, marked up with anticipated structural locations and existing structure locations, titled "Project Background" and "Scope- Tier 1," provided by Hatch Mott, received on June 3, 2014.

Based on the information provided and discussions with your office, it is CGCC's understanding that the proposed construction consists of a new water treatment facility adjacent to the existing water treatment plant at the site, as well as equipment and generator pads near the existing raw water intake pump station located approximately 1,500 feet west of the water treatment plant site along the river bank of the adjacent Susquehanna River. The proposed water treatment plant building is to be located along Avenue E, southeast of the existing water treatment plant building, and will have a footprint of approximately 7,500 square feet.

A finished floor elevation of approximately elevation 44 feet (site datum) is proposed for the water treatment building. Therefore, fill of up to 5 feet will be required in portions of the site. At the time of this report, anticipated structural loads were not available. For the purposes of our analysis, CGCC assumes that the structure will have maximum column loads on the order of 100 kips and maximum wall loads on the order of 3 kips per linear foot.

The site of the proposed water treatment plant is currently a grassy area sloping downwards to the southwest. Existing site grades within the proposed building area vary from approximately elevations 45 to 39 feet. The site of the proposed equipment pads near the raw water intake pump station is currently a grassy area sloping gently downwards from Avenue A, towards the adjacent Susquehanna River. The ground surface elevation in this area is approximately elevation 27 feet.

Several existing utilities were identified within the proposed water treatment building area. These include water, steam, and sewer around the perimeter of the proposed building footprint. Several reported telephone or data lines were identified on the project plans within the building area. Based on discussions with a site representative at the Perry Point VA Medical Center, these lines may be old lines that are no longer in service. Prior to the start of the field work, site utilities were located by Underground Services, Inc. of West Chester, Pennsylvania, as a subcontractor to CGCC.

II. FIELD AND LABORATORY TESTING PROGRAMS

A. STANDARD PENETRATION TEST BORINGS

On June 10 and 11, 2014, six Standard Penetration Test borings were performed in the vicinity of the proposed improvements. Test boring TB-1 was attempted, but encountered repeated refusal at the original boring location, and at five offset locations, at approximately 1 foot below existing surface grade. This test boring was consequently abandoned. Four of the remaining test borings (TB-2 to TB-5) were located in the vicinity of the proposed water treatment facility. Test boring TB-6 was performed in the vicinity of the proposed generator pad near the existing raw water intake pump station.

The boring locations were measured and staked in the field by CGCC's representative at the approximate locations shown on the drawing provided by Hatch Mott. A site plan showing the approximate test boring locations is included in Appendix A of this report.

The test borings were performed by CGC Geoservices, LLC, as a subcontractor to CGCC, utilizing a truck-mounted Diedrich drill rig with hollow stem augers. Test boring logs describing the conditions encountered are enclosed in Appendix B of this report.

At completion, the test borings were backfilled with the drill cuttings level with the surrounding grades. No additional compactive effort or site restoration was performed. Additional settlement and softening of the soil replaced in the test boring locations may occur, resulting in a depression or hole in the ground surface. Consequently, future maintenance and restoration of the site may be required.

B. LABORATORY TESTING

Soil samples obtained during the field programs were returned to CGCC's office for subsequent laboratory testing. The laboratory program consisted of determining the natural moisture content (ASTM D 2216) and percent passing a No. 200 sieve (ASTM D 1140, silt/clay fraction) for a total of six samples obtained from the test borings.

The results of the laboratory testing were utilized to aid in the classification of the soils encountered and in estimating their engineering characteristics. The results of the laboratory testing performed are included on the test boring logs in Appendix B.

III. SUBSURFACE CONDITIONS

Regional mapping by the Maryland Geological Survey indicates that the project site is located within the Aberdeen Estuaries and Lowlands district of the Atlantic Coastal Plain province. The region is a relatively featureless coastline locally indented by the flooded mouth of the Susquehanna River. Typical soil strata consist of fine to medium sand, often micaceous, and gravel; lesser amounts of silt and clay (mostly Kent Island Fm., formerly Talbot Fm.); gabbro; and granite boulders (to 8 ft.) occur near Stump Point (approximately 1.0 mile east) and Mill Creek south and east of Perryville.

The rock formations in this district are referred to as Port Deposit Gneiss. The rock formation is moderately to strongly deformed intrusive complex composed of gneissic biotite quartz diorite, hornblende-biotite quartz diorite, and biotite granodiorite. All are foliated and some strongly sheared.

The subsurface conditions encountered in the test borings at the water treatment plant site generally consisted of a surficial layer of topsoil overlying apparent fill material. Fill depth varied with location from approximately 2 to 5 feet, and was generally deeper in areas of greater elevation near Avenue E. The fill layer was underlain by gray-brown stiff to very stiff consistency silt soils overlying a thin layer of fine to coarse silty sand and angular fine to coarse gravel. Refusal of augering and/or spooning on apparent bedrock was encountered at depths ranging from approximately 13.1 to 17.8 feet below existing ground surface, corresponding to approximately elevations of 27.1 to 23.7 feet (site datum). Coring of the rock was not performed.

Similar subsurface conditions were encountered in test boring TB-6 performed closer to the river near the Raw Water Intake Pump Station. No fill material was observed at this location. Refusal on apparent rock was encountered at a depth of 17.1 feet below the grounds surface, corresponding to approximately elevation 10.4 feet.

For discussion purposes, subsurface conditions encountered can be further described as follows:

| STRATUM | APPROXIMATE THICKNESS (FT.) | GENERALIZED DESCRIPTION ^[1] |
|--|-----------------------------|--|
| A | 0.3 | TOPSOIL |
| B1 ^[2] | 2.5 – 5.2 | APPARENT FILL: Brown SILT, trace to little clay, trace to some fine sand, trace debris (asphalt millings) slight mottling (medium stiff to stiff) USCS: ML |
| B2 ^[3] | --- | Apparent CONCRETE obstruction |
| C | 3.0 – 11.7 | Gray tan/brown stained SILT, trace to little clay, trace to little fine sand, trace to no medium sand (medium stiff to very stiff) USCS: ML |
| D ^[4] | 3.0 – 5.8 | Gray, tan fine to medium SAND and to little SILT (medium dense) USCS: SM |
| E ^[5] | --- | Weathered ROCK, (angular fine to coarse gravel and to no sand) USCS: GP |
| NOTES: <ol style="list-style-type: none"> 1. The soil descriptions utilized herein and on the test boring logs are defined in the General Notes included in Appendix C. 2. Stratum B1 not observed in test boring TB-6. 3. Refusal on apparent concrete encountered in test borings TB-1 and TB-4. Layer not penetrated. 4. Stratum D not encountered in test borings TB-1 and TB-2. 5. Stratum E only encountered in test borings TB-2 and TB-6. | | |

Groundwater observations made during the performance of the drilling are noted on the enclosed test boring logs. Groundwater was not observed in test borings TB-1 (abandoned at 1 foot below grade) and TB-5 (terminated at 13.1 feet below grade). Groundwater was encountered in the vicinity of the proposed water treatment plant building in test borings TB-2, TB-3, and TB-4 at depths of approximately 12.8 to 13.3 feet below the ground surface, corresponding to approximately elevations 31.2 to 26.8 feet. Groundwater was observed at a depth of approximately 13.4 feet below grade, corresponding to approximately elevation 14 feet, in test boring TB-6 located nearer the river.

Groundwater levels at the site are likely to be affected by seasonal and annual variations in precipitation, and by the water levels in the adjacent Susquehanna River. The site grades at the proposed water treatment plant site are on the order of 40 feet higher than the water level at the Susquehanna River.

During drilling in test boring TB-1, located in the northwest corner of the site, refusal was encountered at a depth of approximately 12 inches below grade. Repeated attempts were made to offset the boring from the originally staked location, with offsets up to

approximately 15 feet northwest and 10 feet southeast of the original stake. In all six attempts, refusal was encountered at approximately 12 inches below grade. Based on visual observation through the boreholes, the obstruction appeared to be concrete with a finished smooth surface, such as a possible concrete slab.

In test boring TB-4, shallow refusal on an obstruction was also encountered. An apparent concrete obstruction was encountered at an approximate depth of 2 to 3 feet below grade in three boring offset attempts prior to finding a location, approximately 8 feet southeast of the originally staked location, where the boring continued past the buried obstruction. Due to its depth, details regarding the obstruction were difficult to discern.

IV. CONCLUSIONS AND RECOMMENDATIONS

Based on the data obtained in the field and laboratory testing programs, available structural information and subsequent geotechnical analysis, the following conclusions and recommendations are presented.

A. DESIGN

1. **Existing Fill at the Water Treatment Plant Site.** Apparent fill materials were observed from depths of 2 to 5 feet across the proposed water treatment plant building site. These fills were generally observed to be fairly stiff across the site; however, miscellaneous debris (e.g., apparent asphalt millings) was observed throughout the fill zone. In addition, apparent concrete obstructions were observed at two locations (TB-1 and TB-4) at depths of 1 to 3 feet below the ground surface. The conditions below these concrete obstructions are unknown, as the apparent concrete was not penetrated.

Construction of foundations and slabs over miscellaneous fill poses a risk of increased settlement due to variable and unknown conditions. Therefore, the following is recommended:

- All foundations should bear on natural site soils below the miscellaneous fill. This may require overexcavation of footings in some areas.
- The concrete obstructions should be further investigated to determine their extent and the conditions below them, and should be removed in their entirety from beneath structural areas.
- The least risk associated with potential future slab settlement would be to remove the fill and replace with structural fill, placed in controlled, compacted lifts. However, since the fill material observed in the borings was of medium stiff to stiff consistency, it may be feasible to leave the fill

in place with proper subgrade preparation. This would include proofrolling of the site to carefully review for soft or yielding areas of variable or organic fills. Removal of concrete obstructions within the fill is recommended regardless of whether the remaining fill is left in place.

Further details regarding these recommendations are provided herein.

2. **Building Foundations.** Based on the subsurface conditions observed and the proposed building loads, it appears feasible to support the proposed water treatment plant building and equipment on a conventional shallow foundation system or mat foundation. It is CGCC's opinion that the natural site soils, underlying the apparent miscellaneous fill soils identified herein as Stratum B, are considered suitable for the support of a shallow foundation system or mat. Structural fill, placed and compacted over natural site soils, as recommended in this report, is also considered suitable for supporting a shallow foundation system for the proposed equipment.

- a. Recommended Allowable Bearing Capacity. It is recommended that the shallow foundations for the proposed facility and generator pad be designed for a maximum net allowable bearing pressure of 3,000 psf for foundation bearing on the natural site soils (Strata C and D). If a rigid structural mat foundation is proposed, it should be designed for maximum contact pressures of 3,000 psf.

The apparent concrete (of unknown origin) encountered in test borings TB-1 and TB-4 should be removed in their entirety where encountered during foundation and slab-on-grade construction, and replaced with structural fill, placed and compacted, as recommended in this report.

- b. Foundation Burial Depth and Size. The base of all exterior spread footings in the areas exposed to frost should be placed at least 32 inches below final exterior grades, in accordance with the local building code requirements. Interior foundations of the facility, which will not be exposed to frost, should be constructed at least 18 inches below the proposed finished floor elevation. Building foundations should be proportioned with a minimum dimension of 3 feet for isolated footings and 2 feet for continuous footings, regardless of bearing pressure. If a winter construction schedule is proposed for the foundations, provisions for the protection of shallow foundations from frost heave during construction should be included in the contract documents.

- c. **Foundation Settlement.** Foundation settlement is expected to occur as a result of the structural loads, as well as due to the net fills of up to 5 feet placed during regrading of the site. Total settlements of up to 1 inch are estimated due to the placement of fill and structural loads. It is estimated that most of the fill-induced settlement should occur relatively quickly, with most fill induced settlement occurring during, or shortly after, placement of the fill material. **It is recommended to complete bulk fill activities as far in advance of slab construction as possible, to allow time for fill-induced settlement to occur.**

3. **Slab-On-Grade.** Ground-supported floor slabs that are not acting as structural mats for the support of equipment should be designed as “free-floating” and should not be connected to other structural elements (e.g., walls, framing, etc.) of the building. Isolation joints should be utilized at the interface of proposed ground-supported floor slab and structural elements to accommodate potential differential settlement. A vapor barrier and free-draining subbase, consisting of at least 4 inches of poorly graded crushed stone aggregate, such as AASHTO SP-57 stone, should be provided beneath all floor slabs.

Based on the conditions observed in the test borings, it should be feasible to support the proposed water treatment plant building slab on the existing fill materials; however, these materials should be proofrolled and carefully reviewed for evidence of variable conditions or soft areas prior to placement of structural fill. Assuming subgrade preparation is performed as recommended in this report, subgrade conditions should be modeled for design utilizing a subgrade modulus, K_s , of 150 pci.

4. **Soil Parameters.** The following soil parameters for lateral earth loads and braced excavation design are recommended:

| | Stratum B1 Medium Stiff Silt (FILL) | Stratum C Medium Stiff to Stiff Silt | Stratum D Medium Dense Sand | Imported Granular Structural Fill |
|--|---|--|--------------------------------------|---|
| Moist Unit Weight (pcf) | 120 | 120 | 125 | 130 |
| Cohesion (psf) | 0 | 0 | 0 | 0 |
| Angle of Internal Friction | 28 | 30 | 32 | 34 |
| At Rest Earth Coefficient, K_o | 0.53 | 0.50 | 0.47 | 0.44 |
| Active Earth Pressure Coefficient, K_A | 0.34 | 0.33 | 0.31 | 0.28 |
| Passive Earth Pressure Coefficient, K_P | 2.77 | 3.00 | 3.25 | 3.5 |
| Coefficient of Sliding Friction | 0.36 | 0.38 | 0.41 | 0.45 |

5. **Retaining Wall Design/Lateral Earth Pressure.** Backfill pressures on “unyielding” retaining walls restrained from rotation at the top should be analyzed using the “at rest” earth pressure coefficient, K_o . The “active” and “passive” earth pressure coefficients, K_A and K_P , respectively, should be utilized for the design of “yielding” retaining walls, such as cantilevered walls. All retaining walls should be provided with granular backfill materials and a drainage system and/or weep holes to relieve hydrostatic pressures on the walls. The granular backfill materials should extend behind the wall to a distance of at least 60% of the wall height.
6. **Seismic Design Parameters.** Based on subsurface conditions encountered during the field exploration at the site and review of regional geologic maps, Site Class “D” is recommended for the analysis of seismic conditions, as defined by Table 1613.5.2 of the 2009 International Building Code.
7. **Existing Utilities.** It is recommended that any existing utilities be relocated outside the limits of the proposed building construction. The presence of utilities beneath new foundations could result in crushing of the pipes and/or undermining of the proposed foundations and slab-on-grade. The resulting excavations should be backfilled with structural fill, placed, and compacted as recommended in this report. If the utilities cannot be relocated outside of the proposed building area, foundations should be designed to bear at (or below) the invert elevations of the pipe. If these options are not considered economical, or are otherwise impractical to accomplish, a potentially less expensive method of construction, with resultant greater potential for future undermining is to expose, sleeve, and fully encapsulate the existing utilities in concrete beneath the proposed building area.
8. **Assumptions.** The recommendations of this report were made based on the information provided and CGCC’s understanding of the proposed structural design at the time of this evaluation. The project team should compare the final loading and grading conditions to those used in this analysis. If design loading and grading conditions vary from those used herein, CGCC should be contacted.

B. CONSTRUCTION

1. **Proofrolling and Subgrade Preparation.** At the start of construction, any existing utilities within the building footprint, as well as existing concrete pads or other concrete obstructions in the building footprint should be removed in their entirety. Following rough grading and prior to footing excavation, placement of fill, or construction of concrete slabs, it is recommended that the exposed subgrade be proofrolled with a minimum 10-ton vibratory roller or fully loaded tandem-wheel dump truck in the presence of a qualified soils technician working under the supervision of a geotechnical engineer.

The purpose of the proofrolling is to densify the existing subgrade and to identify localized soft surficial conditions in the exposed subgrade. **This is particularly important due to the presence of apparent fill materials to varying depths across the site.** Yielding subgrade conditions encountered with the proposed building area, which cannot be densified in place, should be undercut to firm subgrade conditions and be backfilled in accordance with the recommendations of this report. In addition, if any areas of debris or organic material are observed within the fill soils, they should be removed from the slab area.

2. **Foundation Subgrade Review.** All foundations and slabs should be placed on firm, dry, non-frozen subgrade. Foundations should be constructed on natural site soils below the miscellaneous fill soils observed at the site. Foundation excavations should be reviewed by a qualified technician working under the supervision of a geotechnical engineer who is familiar with the recommendations of this report. Foundation subgrade review should be performed prior to the placement of reinforcing steel or concrete, and should verify the presence of natural medium or denser sands or medium consistency or stiffer fine-grained soil. If these conditions are not encountered at the proposed foundation depth, additional excavation should be performed until they are uniformly encountered across the base of the foundation excavation or, if recommended by the project geotechnical engineer, the natural soils can be densified in place. Foundation undercut areas should be backfilled with structural fill as recommended herein or, if acceptable to the project's structural engineer, the base of foundation elevation could be lowered to the suitable subgrade soils.
3. **Compaction Requirements.** Structural fill utilized within the proposed structural areas should be placed in loose lifts with a maximum thickness of 8 inches. Each lift placed within the proposed structure areas (defined as the area extending at least 5 feet beyond the perimeter) should be compacted to at least 95% of the maximum dry density as determined by the Modified Proctor (ASTM D 1557) test. Structural fill for retaining wall backfill, pavement areas, and utility trenches located outside of the proposed building area, should be compacted to at least 90% of the maximum dry density. The placement and compaction of structural fill should be monitored on a full-time basis by a qualified technician under the supervision of a geotechnical engineer.
4. **Re-Use of On-Site Soils as Structural Fill.** Based on the design information provided, net fills on the order of up to 5 feet will be required for the proposed water treatment plant. It is likely that import of soils will be required to achieve the proposed grading. On-site soils free of organic material, debris, and rock fragments in excess of 3 inches in their largest dimension may be suitable for use as structural fill. The shallow site soils of Strata B and C are

predominately fine-grained silt soils. During sampling, these soils were encountered at an in-situ moisture content that slightly exceeds the typical range at which the recommended compaction can be achieved. As a result, drying of these soils could be required to achieve the recommended compaction. Drying of silty soils requires more time and space than drying of granular, sandy soils. The feasibility of on-site drying of soils will depend upon the construction schedule and the seasonal weather conditions at the time of construction.

5. **Imported Structural Fill.** Imported structural fill should consist of predominately granular soils conforming to the following requirements:

| <u>Sieve Size</u> | <u>% Passing</u> |
|-------------------|------------------|
| 1 ½" | 100 |
| No. 4 | 50 – 100 |
| No. 10 | 25 –75 |
| No. 200 | ≤25 |

AASHTO SP-57 stone or graded aggregate can also be utilized as structural fill, and should be considered where localized, relatively deep fills are required. AASHTO SP-57 stone should also be utilized as fill where drainage is required.

6. **Groundwater Control.** Groundwater was observed at depths ranging from 12.8 to 13.4 feet below the ground surface. Groundwater levels at the site are likely to be affected by seasonal and annual variations in precipitation. It is estimated that variations in groundwater levels several feet higher or lower than those observed during this evaluation could be experienced due to seasonal fluctuations and periods of extreme variations in precipitation.

Based on the currently proposed grading, it does not appear that groundwater would be encountered during the foundation construction. However, it is considered possible that localized “perched” groundwater conditions may be encountered in some areas at elevations higher than the regional groundwater table. It is recommended that when groundwater is encountered during foundation and utility trench excavations, the resulting excavation be over-excavated by at least 6 inches and be backfilled with AASTHO SP-57 stone to facilitate sumping and to protect the exposed subgrade.

7. **Excavation Safety.** All excavation and embankment construction should be performed in accordance with OSHA guidelines. The natural soils in this area are generally considered to be “Type B” soils based on OSHA CFR Part 1926 Excavation Standards. The fill soils, described herein as Stratum B, are considered “Type C” soils. All temporary sheeting and shoring should be designed by a qualified engineer registered in the State of Maryland.

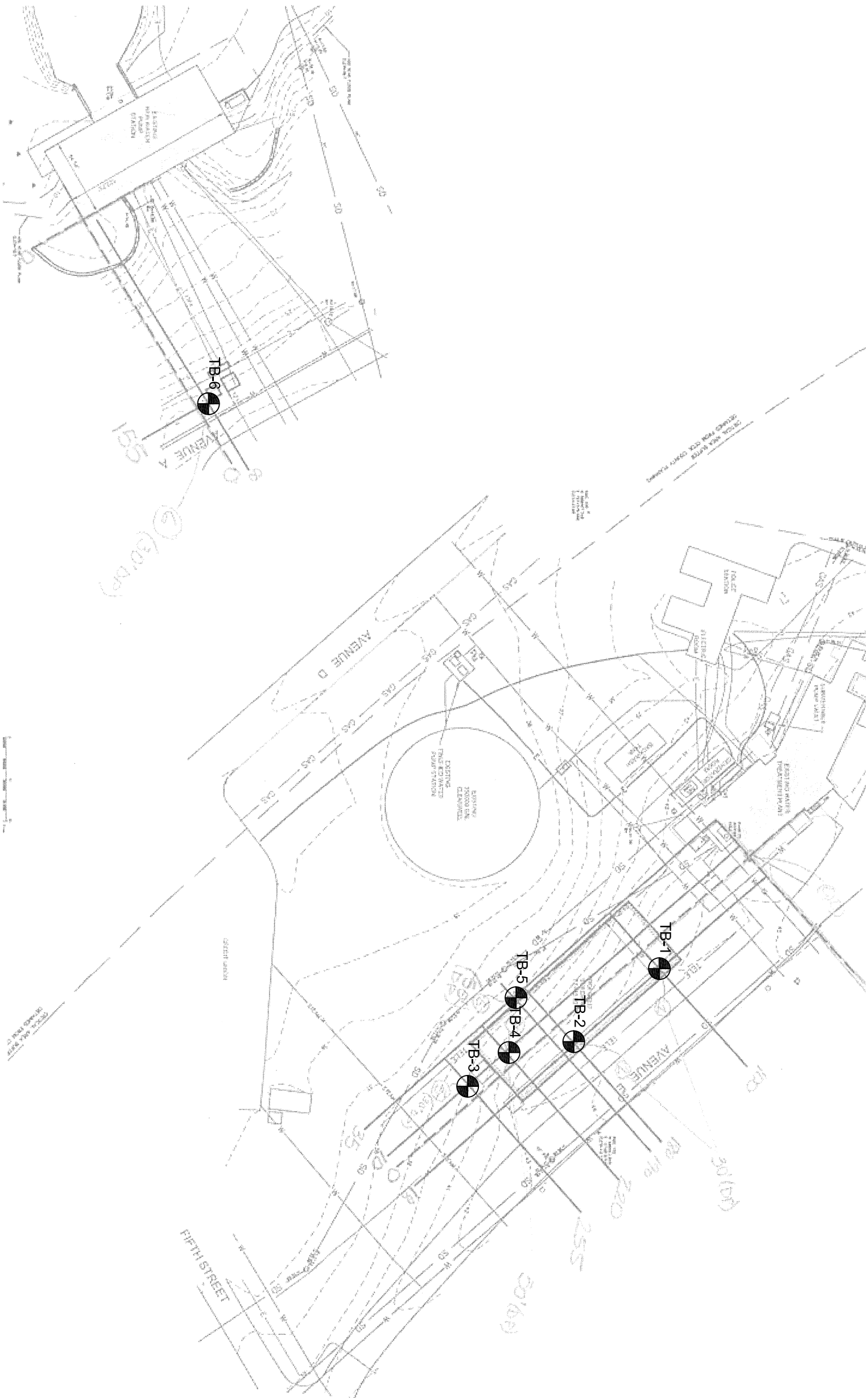
8. **Subsurface Data.** All contractors interested in bidding on phases of this work which involve subsurface conditions should be given full access to this report, so that they can develop their own interpretations of the available data.

These recommendations have been prepared according to generally accepted soil and foundation engineering standards and are based on the conditions encountered at the sampled locations. It is noted that, although soil quality has been inferred from the interpolation of the data, subsurface conditions between the sampled locations are, in fact, unknown. As a result, these recommendations may require modifications based on the conditions encountered and exposed during construction excavation. Should any conditions encountered during construction differ from those described in this report, this office should be notified immediately in order to review and possibly modify these recommendations. The cost for this construction review is not part of our existing agreement. This report applies solely to the size, type, and location of the structures described herein. In the event that changes are proposed, this report will not be considered valid unless the changes have been reviewed and the recommendations of this report modified and reapproved in writing by CGC Consulting, LLC.

WORD\ CC1031GA.0614-PERRY POINT VAMC WTP GEOTECH.RPT

APPENDIX A

TEST BORING LOCATION SKETCH



KEY:



TB-1 - APPROXIMATE LOCATION OF TEST BORINGS PERFORMED ON JUNE 10, 2014 AND JUNE 11, 2014.

NOTE:

1. THIS SKETCH IS ADAPTED FROM AN ARCHITECTURAL DRAWING TITLED "ATTACHMENT B", PREPARED BY DCS INFRASTRUCTURE, LLC., AND HAND ANNOTATED BY HATCH MOTT MACDONALD, UNDATED.

GEOTECHNICAL EVALUATION
PROPOSED WATER TREATMENT FACILITY
VA MEDICAL CENTER - PERRY POINT
PERRYVILLE, MARYLAND

| | |
|--------------|----------------|
| DESIGNED BY: | RRN |
| DRAWN BY: | RRN |
| CHECKED BY: | SBZ |
| FILE: | B-CC.1031GA-02 |



5400 LIMESTONE ROAD, SUITE 200
WILMINGTON, DE 19808
TEL. (302)489-2280
FAX (302)489-2395

OFFICES IN DELAWARE, MARYLAND
AND PENNSYLVANIA

INFO@CGCCONSULT.COM

DATE: 16 JUNE 2014

SCALE: 1"=75'

PROJECT NO. CC.1031.GA

SHEET: FIGURE 1

APPENDIX B

TEST BORING LOGS (5)
















TEST BORING TB-2

(Page 1 of 1)

Proposed Water Treatment Plant Improvements
Perry Point VA Medical Center
Perryville, Maryland
Project No. CC.1031.GA

Date Started : June 10, 2014
Date Completed : June 10, 2014
Logged by : RRN
Weather : P. Cloudy
Driller/Agency : D. Wilson/CGC Geoservices, Inc.
Drilling Equipment : Truck Rig with Safety Hammer
Drilling Methods : SPT Continuous, 3.75" HSA
Surface Elevation : 44.0 feet

| Depth in feet | Surf. Elev. 44.0 ft | GRAPHIC | USCS | Sample Condition | Water Levels | SAMPLES | Sample Number | Blows per 6 inches | Recovery (ft) | Moisture Content (%) | Percent Passing 200 Sieve | WATER LEVEL |
|---------------------|---------------------------|---|------|---|---|--|------------------|-----------------------|------------------|----------------------------|---------------------------------|---|
| | | | |  Remolded |  During Drilling | | | | | | | |
| 0 | 43.7 |  | | TOPSOIL | | | | | | | | |
| | | | | FILL: Brown- gray brown mottled silt, little clay, some to trace asphalt gravel in lenses (moist to dry) | |  | S-1 | 5-6-5 | 1.1 | 15.0 | 62.8 | |
| | | | | FILL: Brown- gray brown mottled silt, little clay, trace asphalt gravel in lenses (moist) (0.75 tsf on pocket penetrometer) | |  | S-2 | 5-3-2 | 0.8 | | | |
| 5 | 38.5 |  | | Gray, tan/brown stained SILT, trace to little clay, trace to little fine sand, trace mottling (moist) (2.75 tsf on pocket penetrometer) | |  | S-3 | 2-10-9 | 1.5 | | | |
| | | | ML | Gray, tan/brown stained SILT, little clay, little fine sand, trace medium sand, trace mottling, increase in moisture (moist) (1.0 tsf on pocket penetrometer) | |  | S-4 | 4-4-5 | 1.4 | 19.6 | 69.6 | |
| 10 | | | | | | | | | | | | |
| | 30.0 |  | | Gray SILT, some fine sand, trace clay, trace medium sand in lenses, highly mottled at 14.0 feet (moist to wet) | |  | S-5 | 3-3-5 | 1.5 | | | |
| 15 | | | ML | | | | | | | | | |
| | 27.5 27.1 |  | SW | Gray, brown stained angular fine to coarse SAND and GRAVEL (wet) | |  | S-6 | 50/0.1 | 0.1 | | | |
| 20 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | |  |

- NOTES:
- Test boring terminated at ±16.9 feet +/- below existing ground surface (b.e.g.s.) at auger refusal. Spoon refusal encountered at ±16.9 feet b.e.g.s.
 - Groundwater encountered through augers at ±12.8 feet b.e.g.s with augers at approx. ±13.5 feet b.e.g.s.
 - Borehole backfilled with auger cuttings upon completion.
 - Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).
 - Standard, split-barrel sampling performed in general accordance with the Method for Penetrative Test and Split-Barrel Sampling (ASTM D 1586). Driller utilized 140 pound safety hammer for sampling.
















TEST BORING TB-3

(Page 1 of 1)

Proposed Water Treatment Plant Improvements
Perry Point VA Medical Center
Perryville, Maryland
Project No. CC.1031.GA

Date Started : June 10, 2014
Date Completed : June 10, 2014
Logged by : DW
Weather : P. Cloudy
Driller/Agency : D. Wilson/CGC Geoservices, Inc.
Drilling Equipment : Truck Rig with Safety Hammer
Drilling Methods : SPT Continuous, 3.75" HSA
Surface Elevation : 40.0 feet

| Depth in feet | Surf. Elev. 40.0 ft | GRAPHIC | USCS | Sample Condition | Water Levels | SAMPLES | Sample Number | Blows per 6 inches | Recovery (ft) | Moisture Content (%) | Percent Passing 200 Sieve | WATER LEVEL |
|---------------------|---------------------------|---|--|--|--|--|------------------|-----------------------|------------------|----------------------------|---------------------------------|---|
| | | | |  Remolded |  During Drilling  At completion | | | | | | | |
| DESCRIPTION | | | | | | | | | | | | |
| 0 | 39.7 |  | | TOPSOIL | |  | S-1 | 3-3-4 | 1.5 | | | |
| | 39.0 | | FILL: Crushed angular gravel, some brown silt | | | | | | | | | |
| | 37.5 | | FILL: Brown silt, little to some fine sand, trace clay (moist) | | | | | | | | | |
| 5 | |  | ML | Possible Fill: Brown SILT, some fine sand, trace to little clay (moist) | |  | S-2 | 5-4-4 | 1.5 | 19.0 | 68.7 |  |
| | | | | Brown, gray SILT, little fine sand, trace to little clay (moist) | |  | S-3 | 5-9-8 | 1.5 | | | |
| | | | | Brown, gray, orange SILT, little fine sand, trace to little clay (moist) | |  | S-4 | 4-10-13 | 1.5 | | | |
| 15 | 28.0 |  | SW | Brown, gray, orange fine to medium SAND, some fine gravel, little silt (wet) | |  | S-5 | 9-25-11 | 1.2 | | |  |
| | 24.6 | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |

- NOTES:
- Test boring terminated at ±15.4 feet +/- below existing ground surface (b.e.g.s.) at auger refusal.
 - Groundwater encountered through augers at ±13.2 feet b.e.g.s with augers at approx. ±13.5 feet b.e.g.s. Wet on spoon at ±13.9 feet b.e.g.s.
 - Borehole caved at ±13.1 feet b.e.g.s. with groundwater at ±9.2 feet b.e.g.s. Borehole backfilled with auger cuttings upon completion.
 - Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).
 - Standard, split-barrel sampling performed in general accordance with the Method for Penetrative Test and Split-Barrel Sampling (ASTM D 1586). Driller utilized 140 pound safety hammer for sampling.












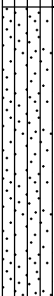




TEST BORING TB-4

(Page 1 of 1)

Proposed Water Treatment Plant Improvements
Perry Point VA Medical Center
Perryville, Maryland
Project No. CC.1031.GA

Date Started : June 11, 2014
Date Completed : June 11, 2014
Logged by : DW
Weather : P. Cloudy
Driller/Agency : D. Wilson/CGC Geoservices, Inc.

Drilling Equipment : Truck Rig with Safety Hammer
Drilling Methods : SPT Continuous, 3.75" HSA
Surface Elevation : 41.5 feet

| Depth in feet | Surf. Elev. 41.5 ft | GRAPHIC | USCS | Sample Condition | Water Levels | SAMPLES | Sample Number | Blows per 6 inches | Recovery (ft) | Moisture Content (%) | Percent Passing 200 Sieve | WATER LEVEL |
|---------------------|---------------------------|---|------|--|--|--|------------------|-----------------------|------------------|----------------------------|---------------------------------|---|
| | | | |  Remolded |  During Drilling  At completion | | | | | | | |
| DESCRIPTION | | | | | | | | | | | | |
| 0 | 41.2 |  | | TOPSOIL | | | | | | | | |
| | | | | FILL: Brown silt, little sand, trace clay (moist) | |  | S-1 | 3-3-4 | 1.0 | | | |
| | | | | FILL: Brown silt, little sand, little clay (moist) | |  | S-2 | 4-5-7 | 1.1 | 21.6 | 80.1 | |
| 5 | 36.5 |  | | Gray, brown stained SILT, little sand, trace to little clay (moist) | |  | S-3 | 4-6-8 | 1.4 | | | |
| | | | ML | Gray, brown SILT, some fine sand (moist) | |  | S-4 | 4-5-5 | 1.4 | 18.9 | 77.5 | |
| | 29.5 |  | | Gray, brown SILT and fine SAND, trace gravel (wet) | |  | S-5 | 7-9-12 | 1.2 | | | |
| | | | ML | | | | | | | | |  |
| | 23.7 |  | | | | | | | | | |  |
| | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |

NOTES:

- Test boring offset several times from originally staked location, due to apparent concrete obstruction at depth of approx. 3 feet below grade. Final boring location that penetrated full depth located approx. 8 ft southeast of original staked location
- Test boring terminated at ±17.8 feet +/- below existing ground surface (b.e.g.s.) at auger refusal.
- Groundwater encountered through augers at ±13.3 feet b.e.g.s with augers at approx. ±12.6 feet b.e.g.s. Wet on spoon at ±14.0 feet b.e.g.s.
- Borehole caved at ±14.4 feet b.e.g.s. with groundwater at ±12.6 feet b.e.g.s. Borehole backfilled with auger cuttings upon completion.
- Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).



TEST BORING TB-5








(Page 1 of 1)

Proposed Water Treatment Plant Improvements
Perry Point VA Medical Center
Perryville, Maryland

Project No. CC.1031.GA

Date Started : June 11, 2014
Date Completed : June 11, 2014
Logged by : DW
Weather : P. Cloudy
Driller/Agency : D. Wilson/CGC Geoservices, Inc.

Drilling Equipment : Truck Rig with Safety Hammer
Drilling Methods : SPT Continuous, 3.75" HSA
Surface Elevation : 39.0 feet

| Depth in feet | Surf. Elev. 39.0 ft | GRAPHIC | USCS | Sample Condition | Water Levels | SAMPLES | Sample Number | Blows per 6 inches | Recovery (ft) | Moisture Content (%) | Percent Passing 200 Sieve | WATER LEVEL |
|---------------------|---------------------------|---|------|--|--|---------|------------------|-----------------------|------------------|----------------------------|---------------------------------|-------------|
| | | | |  Remolded | | | | | | | | |
| DESCRIPTION | | | | | | | | | | | | |
| 0 | 38.7 |  | | TOPSOIL | | | | | | | | |
| | | | | FILL: Brown silt, trace roots, trace millings, trace clay (moist) |  | S-1 | 4-6-6 | 1.5 | | | | |
| | 36.5 | | | | | | | | | | | |
| | | | | Possible Fill: Brown, gray SILT, little fine sand, trace clay (moist) |  | S-2 | 3-2-2 | 1.5 | | | | |
| 5 | | | ML | Brown, gray SILT, some sand, trace clay (moist) |  | S-3 | 5-8-8 | 1.5 | | | | |
| | | | | Brown, gray SILT, little fine sand, little clay (moist) |  | S-4A | 9-11-13 | 1.5 | | | | |
| 10 | 29.5 |  | SM | Gray fine SAND, little silt (moist) | | S-4B | | | | | | |
| | 25.9 | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |

- NOTES:
- Test boring terminated at ±13.1 feet +/- below existing ground surface (b.e.g.s.) at auger refusal.
 - Groundwater not encountered.
 - Borehole caved and dry at ±10.6 feet b.e.g.s. Borehole backfilled with auger cuttings upon completion.
 - Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).
 - Standard, split-barrel sampling performed in general accordance with the Method for Penetrative Test and Split-Barrel Sampling (ASTM D 1586). Driller utilized 140 pound safety hammer for sampling.

APPENDIX C

GENERAL NOTES

GENERAL NOTES

CGC Consulting, LLC uses the following definitions and terminology to classify and correlate the field and laboratory samples.

VISUAL UNIFIED CLASSIFICATIONS: The soil samples are described by color, major constituent, modifiers (by percentage), and density (or consistency). Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a No. 200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a No. 200 sieve; they are described as: clays or clayey silts if they are cohesive and silts if they are noncohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency and their plasticity.

The Unified Soil Classification symbols are:

COARSE GRAINED SOILS

GW - Well graded gravels
GP - Poorly graded gravels
GM - Silty gravels
GC - Clayey gravels
SW - Well graded sands
SP - Poorly graded sands
SM - Silty sands
SC - Clayey sands

FINE GRAINED SOILS

ML - Silts of low plasticity
CL - Clays of low to medium plasticity
OL - Organic silt clays of low plasticity
MH - Silts of high plasticity
CH - Clays of high plasticity
OH - Organic silt clays of high plasticity
PT - Peat and highly organic soils

SIZE DESCRIPTION

F - Fine
M - Medium
C - Coarse
G - Gravel

MODIFIERS (PERCENTAGE)

Tr - Trace 1 - 10%
Ltl - Little 11 - 20%
Some 21 - 35%
& - And 36 - 50%

COLOR

| | | |
|--------------|-------------|------------------|
| Or - Orange | Blk - Black | Vc - Varicolored |
| Yel - Yellow | Gr - Gray | Dk - Dark |
| Br - Brown | R - Red | Lt - Light |

DENSITY: COARSE GRAINED SOILS

| | |
|------------|---------------------|
| Very loose | 4 blows/ft or less |
| Loose | 5 to 10 blows/ft |
| Medium | 11 to 30 blows/ft |
| Dense | 31 to 50 blows/ft |
| Very Dense | 51 blows/ft or more |

CONSISTENCY: FINE GRAINED SOILS

| | |
|------------|---------------------|
| Very soft | 2 blows/ft or less |
| Soft | 3 to 4 blows/ft |
| Medium | 5 to 8 blows/ft |
| Stiff | 9 to 15 blows/ft |
| Very stiff | 16 to 30 blows/ft |
| Hard | 31 blows/ft or more |

NOTE: The Standard Penetration Test "N" value is the number of blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon sampler, except where otherwise noted.