

ADDENDUM NO. 1

MAY 18, 2022

TO PROSPECTIVE BIDDERS UNDER

EL PASO WATER

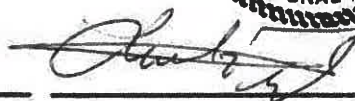
CIELO VISTA 0.1 MG GROUND STORAGE TANK REPLACEMENT AND ELEVATED TANK
LADDER

BID NO. 63-22

RECEIPT OF THIS ADDENDUM MUST BE ACKNOWLEDGED
IN WRITING TO EL PASO WATER




Robert Davidson
Contract Construction
Administrator


Saul Trejo P.E., CCM, PMP
Moreno Cardenas, Inc.
Firm Registration No. F-000554

*The Purchasing Agent's signature certifies only that this document shall become part of the Contract Document for this Project. Her signature is not a representation that the content of the document is technically correct.

I. **BIDDING REQUIREMENTS, CONTRACT FORMS, CONDITIONS OF THE CONTRACT, TECHNICAL SPECIFICATIONS**

- A. The Bid Opening will be postponed until **June 2, 2022**, at **2:00 p.m.** local time (MST). The deadline for questions will be extended to **May 26, 2022**.
- B. An **optional** site visit will be scheduled for **May 23, 2022 at 10:00 a.m. at 9428 Daughtery Dr., El Paso, TX. 79925**.
- C. Attached is the Geotechnical Report as presented by Wood. This report is for information purposes only.

END OF ADDENDUM NO. 1

Geotechnical Report



**Task Order No. 7 – On Call Geotechnical Services
For Cielo Vista Elevated and Blend Tank Upgrades
9428 Daugherty Drive
El Paso, Texas**

Project # 1937192023

Prepared for:

El Paso Water
1154 Hawkins, El Paso, Texas 79925

September 25, 2019



Wood Environment & Infrastructure Solutions, Inc.
125 Montoya Rd.
El Paso, TX 79932, USA
T: 915-585-2472

www.woodplc.com

September 25, 2019
Wood Project No. 1937192023

El Paso Water
1154 Hawkins
El Paso, Texas 79925

Attn: Francisco J. Martinez, P.E.

Re: Geotechnical Study
Task Order No. 7 – On Call Geotechnical Services
For Cielo Vista Elevated and Blend Tank Upgrades
9428 Daugherty Drive
El Paso, Texas

Dear Mr. Martinez:

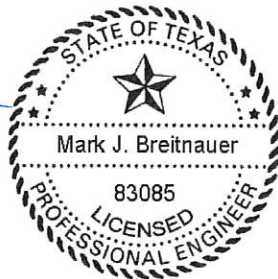
Wood Environment & Infrastructure Solutions, Inc. (Wood) submits this Geotechnical Report for the above referenced project. The report includes the results of test drilling and presents recommendations for foundation and related earthwork.

Should any questions arise concerning this report, we would be pleased to discuss them with you.

Respectfully submitted,
Wood Environment & Infrastructure Solutions, Inc.
Texas Registered Engineering Firm F-0012
Texas Registered Geoscience Firm 50184

Reviewed by:


Mark J. Breitnauer, P.E.
Senior Engineer



Copies: Addressee (1)

9-25-2019


David A. Varela, P.E.
Senior Engineer



Task Order No. 7 – On Call Geotechnical Services for Cielo Vista Elevated
and Blend Tank Upgrades, Texas**TABLE OF CONTENTS**

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1.0 INTRODUCTION

This report is submitted pursuant to a limited geotechnical engineering study made by this firm for the replacement of the existing 100,000-gallon Blend Water Storage Tank and possible replacement of the existing elevated water storage tank at the site. The objective of this study was to evaluate the physical properties of the soils underlying the site to provide recommendations for foundation design, slab support and related earthwork.

We have attached for your review, in **Appendix A**, important information prepared by the Geoprofessional Business Association (GBA) regarding geotechnical studies of the type performed for this project.

2.0 PROPOSED CONSTRUCTION

Details of the project were provided to Wood by Mr. Francisco J. Martinez, P.E. with El Paso Water and Benjamin Strate, E.I.T. with Moreno Cardenas, Inc.

It is our understanding that the project will consist of the replacement of the existing 100,000-gallon Blend Water Storage Tank. The new tank will be located just east of the existing chlorination building and will be constructed on a concrete ring foundation. Foundation loading conditions are not known but are anticipated to be moderate.

We also understand that the existing Cielo Vista tank may be raised or replaced. Details of the replacement elevated tank has not yet been defined but may consist of a composite-type tank system. A study was completed to provide soil data and recommendations for foundation design. However, additional borings will be required once the tank layout, configuration and loading conditions are defined.

Although no grading plan was provided to Wood, it is anticipated that some cut will be required to achieve final grades.

Should final design details vary significantly from those outlined above, this firm should be notified for review and possible modification of our recommendations.

3.0 SOIL STUDY

3.1 SUBSURFACE EXPLORATION

Our field exploration program consisted of performing a total of two (2) auger borings with standard penetration testing (SPT). At the new replacement tank location, one (1) boring was drilled to a depth of 30 feet below existing grades. At the possible Cielo Vista replacement tank location, one (1) boring was drilled to a depth of 100 feet below existing grade. (**Figure 1**).

The test borings were completed using a CME 75 truck-mounted drill rig equipped with 3¼ inch I.D. hollow stem augers. The borings were conducted in accordance with methodology consistent with ASTM International Standard D1586, Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils. Standard penetration testing was completed at selected intervals in the borings. During the field study, the soils encountered were examined, visually classified and logged. The locations of the borings are graphically depicted on the Boring Location Plan as shown in **Appendix B**; they were located by measuring wheel from existing site features and should be considered

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accurate only to the extent implied by the limitation of the depiction. Results of the field study are presented in **Appendix B**, which includes a brief description of drilling and sampling equipment and procedures, and logs of the test borings

The boring logs and related information included in this report are indicators of subsurface conditions only at the specific locations and times noted. Subsurface conditions, including groundwater levels, at other locations on the subject site may differ significantly from conditions, which exist at the sampling locations.

3.2 LABORATORY ANALYSIS

To aid in soil classification and evaluate the engineering properties of the soil, selected soil samples were tested for moisture content, Atterberg limits and particle size distribution. Laboratory tests were performed in general accordance with test standards ASTM D2216, ASTM D4318 and ASTM D6913. The results of the moisture testing, Atterberg Limits and Material Finer than No. 200 (75- μ m) Sieve are shown on the boring logs presented in **Appendix B**. Particle distribution test results are presented in **Appendix C**.

The soil encountered during the field study was classified in general accordance with the Unified Soil Classification System. The soil classification symbols appear on the boring logs and are briefly described in **Appendix B**.

4.0 SITE CONDITIONS & GEOTECHNICAL PROFILE

4.1 SITE CONDITIONS

The proposed tank location is located within the El Paso Water Cielo Vista reservoir facility at 9428 Daugherty Drive in El Paso, Texas. At present, the site has an elevated storage tank and two blend tanks with associated pumps and electrical infrastructure present.

4.2 GEOTECHNICAL PROFILE

The general subsurface conditions encountered during the field exploration conducted September 5 and 6, 2019, are shown on the soil boring logs presented in **Appendix B**. The lines of stratification shown on the logs are based upon examination of the recovered soil samples and interpretation of the field boring logs and represent the approximate boundaries between the soil types; the actual transitions may be gradual.

New Blend Water Storage Tank (Borings B-1)

The soils consist of clayey sands fill (SC) that extends from the ground surface to a depth of about 4.5 feet below the ground surface. Laboratory testing indicates the clay soils have a medium plasticity with a liquid limit of 40 and corresponding plasticity index of 15. Standard penetration testing indicates a relative density of very dense.

The underlying soil stratum consists of reworked clayey sands (SC) that extend to a depth of about 7 feet below the ground surface. Standard penetration testing indicates a relative density of dense.

The soil stratum underlying the reworked soils consists of sands (SM, SP-SM, SP) with varying amounts of gravel that extend to a depth of about 31 feet. Standard penetration testing indicates a relative density of medium dense to dense. The boring terminated in a clay stratum (CL) to the depth explored (31.5 feet).

Task Order No. 7 – On Call Geotechnical Services for Cielo Vista Elevated and Blend Tank Upgrades, Texas**Elevated Cielo Vista replacement tank location (Boring B-2)**

Soils consist of silty sand fill (SM) that extends from the ground surface to a depth of about 5 feet below the ground surface where six inches of asphaltic concrete was encountered. Standard penetration testing indicates a relative density ranging from medium dense to very dense.

The underlying soil stratum consists of dense reworked clayey sands (SC) that extend to a depth of about 7 feet below the ground surface and medium dense clayey sands (SC) to 14 feet below the existing ground surface. Laboratory testing indicates the clay soils have a medium plasticity with liquid limits ranging from 26 to 31 with corresponding plasticity indices of 10 to 11.

The next soil stratum consists of sands (SP) with varying amounts of gravel to a depth of about 28 feet. Standard penetration testing indicates a relative density ranging from medium dense to dense.

The next soil stratum consisted of sandy silts (ML) and silty clays (CL-ML) to a depth of about 33 feet. Standard penetration testing indicates a relative consistency of very stiff.

The next stratum consisted of sands (SM, SP-SM) to a depth of 53 feet. Standard penetration testing indicates a relative density ranging from medium dense to very dense.

The next stratum consisted of clays (CL) to a depth of 58 feet. Standard penetration testing indicates a relative consistency of stiff. Laboratory testing indicates the clay soils have a medium plasticity with a liquid limit of 26 and a corresponding plasticity index of 11.

The next stratum consists of sands (SM, SP-SM, SP) to a depth of 101 feet. Standard penetration testing indicates a relative density ranging from very dense to dense. The boring terminated in a clay stratum (CL) to the depth explored (101.5 feet).

The soil classification symbols shown above and elsewhere herein are derived from ASTM D2487, *Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)* and D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. The descriptions for relative density and firmness are based on grain size and standard penetration tests as detailed in "Terminology Used to Describe the Relative Density, Consistency or Firmness of Soil" in **Appendix B** of this report.

4.3 SOIL MOISTURE AND GROUNDWATER CONDITION

At the time of our field study, groundwater was not encountered, nor should it be expected to occur naturally at these locations at an elevation that would impact the planned construction. Soil moisture contents were generally dry to damp with values ranging from 2.6 to 20.8 percent. Higher moisture contents were generally observed within the clay soils.

5.0 DISCUSSION & RECOMMENDATIONS

5.1 ANALYSIS OF RESULTS

Based on the results of our field and laboratory study, the soils underlying the project site will provide reliable support for the proposed at-grade blend tank following some soil improvements. The proposed structure can be safely supported on a conventional shallow foundation system bearing on improved native soils or structural fill, provided the guidelines concerning site preparation and moisture protection presented in Section 5.4 are completed.

The replacement elevated storage tank may be supported on a mat type foundation system bearing on improved native soils. As an option, the proposed tank structure may be supported on a deep foundation system consisting of straight cast in place drilled piers. Foundation recommendations for the replacement elevated tank should be considered as preliminary based soil information obtained from a single boring location. Following determination of the final tank configuration and loading conditions, additional borings should be placed to further evaluate soil conditions and refine preliminary foundations recommendations presented in Sections 5.2.2 and 5.3 below.

It should be noted that a degree of risk is involved with the use of shallow foundations. Should a broken water line or other source of moisture occur, some movement of foundation and slab is possible.

5.2.1 BLEND GROUND STORAGE TANK – SHALLOW RING WALL FOUNDATION

The recommended soil improvement consists of scarifying the native soils below all foundation elements to a depth of 8 inches. Any oversize materials greater than 3-inches should be removed and the scarified soils should be brought to within plus or minus 2 percent of the optimum moisture content and compacted. Structural fill should then be placed, as required, in compacted lifts to final grade. Compaction of the native soils and structural fill should be accomplished by mechanical means to obtain a density of not less than 95 percent of maximum dry density. Optimum moisture content and maximum dry density should be determined in accordance with ASTM D 1557.

Below the tank base, it is recommended a minimum thickness of 6 inches of tank bedding be placed. The bedding material should conform to API 650 requirements regarding corrosion protection. In addition, the material should be relatively uniform in gradation, having a maximum particle size of 1 inch and no more than 5 percent by weight passing the No. 200 sieve. In addition, the perimeter of the steel tank should be supported by continuous concrete footing having a minimum width of 18 inches. The ring wall foundations should enclose the granular material which lies directly beneath the tank floor.

The perimeter of the steel tank should be supported by a continuous concrete footing having a minimum width of 18 inches. The footing should support the steel sides and roof of the tank and the edges of the steel plate comprising the bottom of the tank.

A net allowable soil bearing pressure of 2,000 pounds per square foot is recommended for the design of the ring-wall foundation bearing on improved native soils or structural fill. The footing should be properly designed with circumferential reinforcement. It is recommended that the footing be embedded a minimum of 2 feet below the lowest adjacent finished grade.

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It is estimated that vertical movements of the ring-wall foundation designed as recommended above will not exceed 1 inch for moisture contents of the native soils encountered during test drilling or compaction moisture contents introduced during construction. Differential movements are expected to be less than 75 percent of the total movement. Significant moisture increases above these values could result in additional movements. As a result, site drainage and moisture protection recommendations as outlined in Section 5.4 will be critical for the proper performance of the structure.

5.2.2 PRELIMINARY MAT FOUNDATION SYSTEM – ELEVATED STORAGE TANK

A mat foundation for the proposed elevated storage tank bearing at a uniform depth below finished grade is recommended for support of the proposed tank in conjunction with the site preparation and moisture protection recommendations presented in Section 5.4 of this report.

Preliminary recommendations for site preparation consist of scarifying the native soils to a depth of 12 inches below the base of the mat foundation following excavation of the native soils to the subgrade elevation. The scarified soil should then be brought to within plus or minus 3 percent of the optimum moisture content and compacted. Excavations should extend laterally a minimum of 10 feet beyond the edge of the footings. Structural fill should then be placed, as required, in compacted lifts to final grade. Compaction of the soils should be accomplished by mechanical means to obtain a density of not less than 95 percent of maximum dry density. Optimum moisture content and maximum dry density should be determined in accordance with ASTM D 1557.

A net allowable soil bearing pressure of 2,500 pounds per square foot (psf) at a depth of 10 feet below existing grades is recommended for the design of the mat foundation bearing on improved soils or structural fill. An allowable bearing pressure of 5,000 psf may be used at a depth of 15 feet below existing grades. The mat foundation should be designed to effectively distribute loads throughout the system and to resist differential movements.

A lean concrete mud-mat slab is recommended to be constructed under the proposed mat foundation in order to provide a working surface for the construction and placement of the mat reinforcing steel and placement of the foundation concrete.

It is estimated that the total vertical movements of the mat foundation, designed as recommended, is anticipated not to exceed 1.5 inches for the moisture contents of the native soils encountered during the field study. Differential settlements are anticipated to be on the order of ½ of the total settlement. Additional soil information and information regarding the tank loading conditions will be needed to verify our initial settlement assumptions.

Significant moisture increases can result in additional movements. As a result, recommendations in Section 5.4 concerning site drainage and moisture protection are considered critical to the performance of the structure. Nonetheless, some foundation movement should be expected and accounted for in design and construction.

Final recommendations pertaining to the geotechnical aspects of the design will need to be developed from a supplemental subsurface investigation and engineering analyses of the final design plans.

5.3 PRELIMINARY DEEP FOUNDATION SYSTEM – ELEVATED STORAGE TANK

As an option, the elevated tank support structure may be supported on straight, cast-in-place drilled piers. Preliminary allowable downward capacities for various diameter piers are presented in the Pier Capacity Chart in **Appendix C**. The safe upward capacity of these piers can be considered as being 80 percent of the safe downward capacities for the various pier diameters. The pier capacities are considered applicable for isolated single piers or pier groups where the pier's center-to-center distance is equal to or greater than three pier diameters.

The capacities apply to full dead plus realistic live loads and can be safely increased by one-third for total loads including wind or seismic forces. Capacities apply to the allowable soil supporting capacity and do not consider the structural strength of the piers. Pier capacities were estimated using a safety factor of 2.5.

Final recommendations pertaining to the geotechnical aspects of the design will need to be developed from a supplemental subsurface investigation and engineering analyses of the final design plans.

5.3.1 ESTIMATED DEEP FOUNDATION MOVEMENTS

Upward and downward movements of drilled piers are expected to be less than about 0.5 inches. Movements at the ground surface of drilled piers subject to lateral loads are estimated not to exceed 0.75 inches.

5.3.2 PIER EXCAVATION CONDITIONS

Excavation conditions at pier locations are not expected to be difficult. Some caving and sloughing in open pier excavations is anticipated within the sand stratum encountered at the boring locations. Dependent on the degree of caving and sloughing present, alternate drilling methods such as casing or drilling with mud may be required for drilled cast-in-place pier construction.

5.3.3 POSITIONAL TOLERANCES

All drilled piers should be installed so that the centerline of the top of the pier is within 3 inches of the plan location. Vertical piers with diameters of 3 feet or more should deviate from plumb no more than 2 percent of the pier length or as determined by the structural engineer based on the structural properties of the shaft and lateral restraint properties of the soil penetrated.

5.3.4 CLEANING OF PIER EXCAVATIONS

After each shaft has been advanced to its planned depth, the bottom of the excavation should be cleaned of slough and loose material in a manner acceptable to the geotechnical engineer. The cleaning should ultimately result in the bottom of the excavation having an average of no more than 4 inches of disturbed material prior to placement of concrete.

Various techniques may be used at the contractor's option to accomplish the cleaning. Options include vacuum cleaning or careful machine-cleaning with rig-mounted tools. If rig-mounted tools are used, they should be approved by the geotechnical engineer.

5.3.5 PLACEMENT OF CONCRETE

Before any concrete is placed, the hole should be inspected by a representative of the geotechnical engineer. The drilled hole should be dry, free of loose or softened soil and should be cleaned from the base. If the base of the hole is wet, a layer of dry concrete should first be placed and compacted. If mud drilling techniques are used, it is recommended that concrete be pumped from the base of the pier excavation displacing the drilling fluid upward.

Concrete should be placed in one continuous operation through a hopper, tremmie, drop chute or other device approved by the geotechnical engineer so that it is channeled in such a manner to free fall and clear the walls of the excavation and reinforcing steel until it strikes the bottom but also minimize segregation of concrete and aggregate. Adequate compaction will be achieved by free fall of the concrete up to the top 5 feet. The top 5 feet should be designed to achieve the required compressive strength while maintaining a slump during placement in the range of 5 to 7 inches.

If casing is utilized to support the walls of the hole, casing withdrawal should be carefully coordinated with concrete placement. Consideration should be given to a specifically designed concrete with adequate slump and a retarder to prevent arching of concrete during casing removal or setting of concrete until the casing is fully withdrawn.

5.3.6 CONSTRUCTION QUALITY ASSURANCE

Detailed observations of foundation construction should be performed by a qualified engineering technician working under the direction of a geotechnical engineer. The technician should verify the proper diameter of the shaft, depth, cleaning and also confirm the nature of materials encountered in the pier excavations. Concrete placement should be continuously observed to ensure that it meets requirements. A quality assurance report should be submitted on each pier stating all details have been observed and affirming that the pier meets construction requirements.

5.4 SITE DRAINAGE AND MOISTURE PROTECTION

Moisture increases in the soils supporting foundations and slabs would reduce their support value and increase movements. Therefore, positive site drainage should be provided during construction and carefully maintained for the life of the structures.

Where slabs or pavements do not immediately adjoin the tank structures, the ground surface should be sloped away from the perimeter in a manner to allow flow along the drainage lines at a minimum grade of 5 percent to points at least 15 feet away. Positive drainage should be provided from these points to streets or natural water courses. Long-term ponding of water should never be allowed around the perimeter of the planned tank structures. It is recommended that any ponding areas be located at least 20 feet from the structures.

The possibility of moisture infiltration beneath the structures, in case of leaks, should be considered in the design and inspection of underground conduits. All backfill behind footings and walls, as well as utility trench backfill within 15 feet of the structures, should be compacted as recommended for structural fill in **Appendix D**.

5.5 LATERAL LOADS

The pressure exerted on retaining walls will depend on their degree of restraint. Rigid, absolutely restrained walls with horizontal backfill meeting structural fill requirements as presented in **Appendix D** of the geotechnical report, should be designed using an "at rest" equivalent fluid pressure of 55 pounds per cubic foot (pcf). Walls allowed to rotate around their bases at a distance of 0.001 times their height or more, at the top, should be designed using an "active" equivalent fluid pressure of 35 pcf. Passive pressures for properly compacted structural fill or native soil against footings and stem walls should be computed using an equivalent fluid pressure of 375 pcf. An allowable coefficient of friction of 0.35 may be used in calculations for sliding purposes between the base of the footing and soil.

The equivalent fluid pressures do not include any lateral component due to either hydrostatic or surcharge loads. The retaining walls at this site should be designed with a drainage system to prevent the build-up of hydrostatic forces behind the wall. If a drain system is not provided, then an additional 62.4 pcf must be added to the lateral forces acting on the wall. Special care should be taken not to over compact the backfill material to reduce the potential for the build-up of residual compaction pressures against the retaining walls.

The equivalent fluid pressures provided above do not include a factor of safety, however, we recommend that a minimum factor of safety of 1.5 be used for the design of retaining walls against overturning and sliding. Surcharge loads, such as vehicular wheel loads, to the area adjacent to the retaining wall can add additional horizontal components of lateral earth pressures to this wall. The magnitude of these components will depend on the loads and locations of these loads relative to the retaining wall.

5.6 EXCAVATION CONDITIONS AND SLOPES

Excavations at the project site are not expected to be difficult. However, some caving and sloughing should be anticipated, especially for deep excavations. Based upon the results of our study, the soils encountered along the majority of the alignment classify as OSHA Type C soils. Temporary excavations in Type C soils should be no steeper than 1.5 to 1 (horizontal to vertical) to a depth of 20 feet. Should the excavations remain open for periods longer than 72 hours, maximum slopes should not exceed 2H:1V. Trench excavations greater than 20 feet in depth will require a special design or approval from a registered engineer.

During construction some caving and sloughing is anticipated during excavations performed at the site. These conditions can reduce the overall stability of the excavations leading to a slope failure. The contractor should be prepared to bench excavations beyond the recommended slope angles or provide alternate methods of soil support such as shoring systems should unstable conditions exist.

The above recommendations for temporary excavation slopes are based on geotechnical considerations only. These recommendations do not consider requirements that might be imposed by OSHA, the State of Texas, or other governmental agencies. OSHA and other governing entities' regulations should be followed in the process of planning for all open excavations and trenches.

6.0 CONSTRUCTION OBSERVATION & TESTING

Recommendations for the blend ground storage tank and preliminary recommendations presented in previous sections of this report are predicated on there being continuous observation and testing by the geotechnical engineer during earthwork operations. Verification of recommended excavation, site grading, and required degree of compaction should be performed in accordance with "Guide Specifications for Earthwork" in **Appendix D**.

The preliminary recommendations presented in this report are based upon a limited number of subsurface samples obtained from two sampling locations at the site. The samples may not fully indicate the nature and extent of the variations that actually exist between sampling locations. For that reason, among others, we recommend that Wood be retained to observe earthwork construction. It should be noted if variations or other latent conditions become evident during earthwork construction, it will be necessary for us to review these conditions and modify its recommendations.

APPENDIX A

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



GEOPROFESSIONAL
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ASSOCIATION

Telephone: 301/565-2733

e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX B

TEST DRILLING EQUIPMENT & PROCEDURES

SAMPLING PROCEDURES - Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D-1586 procedures. In most cases, 2" O.D. samplers are used to obtain the standard penetration resistance. Undisturbed samples of firmer soil are often obtained with 3" O.D. samplers lined with 2.42" I.D. brass rings. The driving energy is generally recorded as the number of blows of a 140 pound, 30-inch free fall drop hammer required to advance the samplers in 6-inch increments. However, in stratified soil, driving resistance is sometimes recorded in 2 or 3-inch increments so that soil changes and the presence of scattered gravel or cemented layers can be readily detected and the realistic penetration values obtained for consideration in design. These values are expressed in blows per foot on the logs. Undisturbed sampling of softer soil is sometimes performed with thin walled Shelby tubes (ASTM D-1587). Where samples of rock are required, they are obtained in NX diamond core drilling (ASTM D-2113). Tube samples are labeled and placed in watertight containers to maintain field moisture contents for testing. When necessary for testing, larger bulk samples are taken from auger cuttings.

CONTINUOUS PENETRATION TESTS - Continuous penetration tests are performed by driving a 2" O.D. blunt nosed penetrometer adjacent to or in the bottom of borings. The penetrometer is attached to 1-inch O.D. drill rods to provide clearance to minimize side friction so that penetration values are recorded as the number of blows of a 140 pound, 30-inch free fall drop hammer required to advance the penetrometer in one foot increments or less.

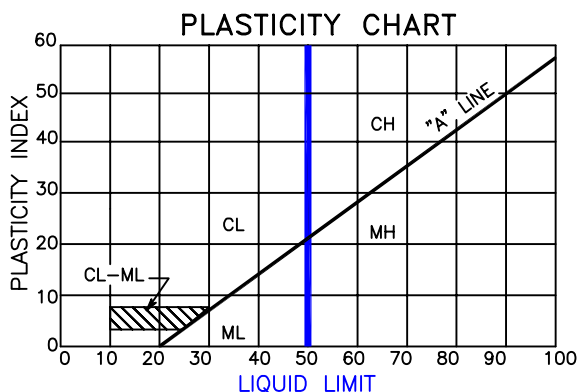
BORING RECORDS - Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares boring logs. Soil is visually classified in accordance with the Unified Soil Classification System (ASTM D-2487), with appropriate group symbols being shown on the logs.

UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification System on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System", Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-93T.

MAJOR DIVISIONS				GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
					GP	Poorly graded gravels, gravel-sand mixtures or sand-gravel-cobble mixtures
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	"A" Limits plot below line or hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures
			"A" Limits plot above line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 seive)			SW	Well graded sands, gravelly sands
					SP	Poorly graded sands, gravelly sands
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	"A" Limits plot below line or hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures
			"A" Limits plot above line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS Limits plot below "A" line or hatched zone on plasticity chart	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50%)			ML	Inorganic silts, clayey silts with slight plasticity
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50%)			MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts
	CLAYS Limits plot above "A" line & hatched zone on plasticity chart	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50%)			CL	Inorganic clays of low to medium plasticity; gravelly clays, sandy clays, silty clays, lean clays
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50%)			CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity

NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
COBBLES	Above 3 inches
GRAVEL	3 inches to No. 4 sieve
Coarse Gravel	3 inches to 3/4 inch
Fine Gravel	3/4 inch to No. 4 sieve
SAND	No. 4 sieve to No. 200
Coarse	No. 4 sieve to No. 10
Medium	No. 10 sieve to No. 40
Fine	No. 40 sieve to No. 200
FINES (SILT or CLAY)	Below No. 200 sieve

TERMINOLOGY USED TO DESCRIBE THE RELATIVE DENSITY CONSISTENCY, OR FIRMNESS OF SOIL

The terminology used on the boring logs to describe the relative density, consistency or firmness of soil relative to the standard penetration resistance is presented below. The standard penetration resistance (N) in blow per foot is obtained by ASTM D-1586 procedure using 2" O.D., 1-inch I.D. samplers.

RELATIVE DENSITY: Terms for description of relative density of cohesionless, uncemented sand and sand-gravel mixtures.

<u>N</u>	<u>RELATIVE DENSITY</u>
0-4	Very Loose
5-10	Loose
11-30	Medium Dense
31-50	Dense
50+	Very Dense

RELATIVE CONSISTENCY: Terms for the description of fine-grained soils. Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance.

<u>N</u>	<u>RELATIVE CONSISTENCY</u>	<u>REMARKS</u>
0-2	Very Soft	Easily penetrated several inches with fist.
3-4	Soft	Easily penetrated several inches with thumb.
5-8	Firm	Can be penetrated several inches with thumb moderate effort.
9-15	Stiff	Readily indented with thumb but penetrated only with great effort.
16-30	Very Stiff	Readily indented with thumbnail.
30+	Hard	Indented only with difficulty by thumbnail.

RELATIVE FIRMNESS: Terms for the descriptions of partially saturated and/or cemented soil which commonly occurs in the Southwest including clay, cemented granular materials, silt and silty and clayey granular soil:

<u>N</u>	<u>RELATIVE DENSITY</u>
0-4	Very Soft
5-8	Soft
9-15	Moderately Firm
16-30	Firm
31-50	Very Firm
50+	Hard



SOIL MOISTURE CLASSIFICATION



MOISTURE CONDITION	FIELD IDENTIFICATION	ESTIMATED RANGE OF MOISTURE	
		Group A (%)	Group B (%)
Dry	Absence of moisture, dusty. Dry to the touch.	0-4	0-8
Damp	Grains appear slightly darkened, but no visible water. Silt/clay may clump. Sand will not bulk. Soils are below plastic limits.	4-8	8-16
Moist	Grains appear darkened, but no visible water. Silt/clay will clump. Sand will bulk. Soils are often at or near plastic limits.	8-16	16-30
Wet	Visible water on larger grain surfaces. Sand and cohesionless silt exhibit dilatancy. Cohesive silt/clay can be readily remolded. "Wet" indicates that the soil is much wetter than the optimum moisture content and above the plastic limit (APL).	>16	>30
Water Bearing	A water-producing formation.	N/A	N/A

Group A - Coarse Grained Soils, nonplastic to plasticity index <7.
Includes: SM, SP-SM, SP, SW, GM, GP, and GW.

Group B - Fine Grained Soils to clayey sands & gravels with a plasticity index >7.
Includes: GC, SC, ML, MH, CL, and CH.

RELATIVE CONSISTENCY: Terms for the description of fine-grained soils. Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance.



CLIENT: El Paso Water 1154 Hawkins El Paso, Texas 79925	LEGEND:  Boring Approximate Location	DRAWN BY: MJB	PROJECT: Task Order No. 7 – On Call Geotechnical Services For Cielo Vista Elevated and Arsenic Blend Tank Upgrades El Paso, El Paso County, Texas	REV NO. 0
		CHK'D BY: DAV		DATE 9/16/2019
 E & I S, INC. 125 MONTOYA ROAD EL PASO, TX 39932		PROJECTION:	BORING LOCATION PLAN	PROJECT NO. 1937192023
		SCALE: AS SHOWN		FIGURE NO. 1

PROJECT **Cielo Vista Elevated Tank & Arsenic Tank Upgrades**
9428 Daugherty Drive
El Paso, El Paso County, Texas



Wood E&IS, Inc.
125 Montoya Road
El Paso, TX 79932
Telephone: 915-585-2472

JOB NO. 1937192023 DATE 9/6/19

LOCATION See Boring Location Plan
LOGGED BY E. Sosa
RIG TYPE CQC - CME-75
BORING TYPE Hollow Stem Auger Method
SURFACE ELEV. Existing Ground Surface
DATUM Existing Ground Surface

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Sample Number	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
0			X	S	12-25-34	59							SC	Very Dense	FILL: Silty Sand - Light reddish brown medium and fine SAND, little clay, medium plastic fines, few gravel (cemented sands, caliche), damp.
			X	S	14-23-44/4"		8.2	25	40	25	15			Very Dense	
5			X	S	13-18-13	31							SC	Dense	Reworked: Clayey Sand - Light reddish brown medium and fine SAND, little clay, medium plastic fines, trace gravel (cemented sands, caliche), dry.
			X	S	9-9-9	18	12.1	18					SM	Medium Dense	Silty Sand - Reddish brown medium and fine SAND, little silt, nonplastic fines, few gravel, (cemented sands, caliche), dry.
10			X	S	5-5-7	12	3.8	6.7					SP-SM	Medium Dense	Poorly Graded Sand with Silt - Brown medium and fine SAND, few silt, nonplastic fines, trace gravel, subrounded, dry.
													SP		Poorly Graded Sand - Light brown medium and fine SAND, trace silt, nonplastic fines, dry.
15			X	S	7-9-13	22								Medium Dense	
													SP		Poorly Graded Sand - Light brown coarse to fine SAND, trace silt, nonplastic fines, little gravel, subangular to subrounded, dry.
20			X	S	6-16-20	36								Dense	
													SP		Poorly Graded Sand - Pale brown medium and fine SAND, trace silt, nonplastic fines, few gravel, subrounded, damp.
25			X	S	15-20-21	41								Dense	
													SM		Silty Sand - Brown medium and fine SAND, little silt, nonplastic fines, moist.
30															

GROUNDWATER

DEPTH(ft)	HOUR	DATE
NE		9/6/2019

SAMPLE TYPE
A - Drill cuttings
S - 2" O.D. 1.375" I.D. Split-Barrel Sampler
U - 3" O.D. 2.375" I.D. Split-Barrel Sampler
SH - 3" O.D. Shelby Tube Sample
TC - Texas Cone
G - Grab Sample

LOG OF TEST BORING NO. B- 1

wood.

LOCATION	See Boring Location Plan
LOGGED BY	E. Sosa
RIG TYPE	CQC - CME-75
BORING TYPE	Hollow Stem Auger Method
SURFACE ELEV.	Existing Ground Surface
DATUM	Existing Ground Surface

GROUNDWATER		
DEPTH(ft)	HOUR	DATE
NE		9/6/2019

LOG OF TEST BORING NO. B- 1

wood.

LOCATION	See Boring Location Plan
LOGGED BY	E. Sosa
RIG TYPE	CQC - CME-75
BORING TYPE	Hollow Stem Auger Method
SURFACE ELEV.	Existing Ground Surface
DATUM	Existing Ground Surface

GROUNDWATER		
DEPTH(ft)	HOUR	DATE
NE		9/5/2019

Page 1 of 4

PROJECT **Cielo Vista Elevated Tank & Arsenic Tank Upgrades**
9428 Daugherty Drive
El Paso, El Paso County, Texas



Wood E&IS, Inc.
125 Montoya Road
El Paso, TX 79932
Telephone: 915-585-2472

JOB NO. 1937192023 DATE 9/5/19

LOCATION See Boring Location Plan
LOGGED BY E. Sosa
RIG TYPE CQC - CME-75
BORING TYPE Hollow Stem Auger Method
SURFACE ELEV. Existing Ground Surface
DATUM Existing Ground Surface

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Sample Number	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
30			X	S	11-8-10	18	6.1	55					CL-ML	Very Stiff	Silty Clay with Sand - Brown silty CLAY, low plastic fines, little sand, wet.
			X										SM		Silty Sand - Reddish yellow medium and fine SAND, little silt, nonplastic fines, moist.
35			X	S	7-9-9	18								Medium Dense PP=0.75 tsf	
			X										SP-SM		Poorly Graded Sand with Silt - Brown mostly fine SAND, few silt, nonplastic fines, damp.
40			X	S	18-27-30	57								Very Dense	
			X												
45			X	S	9-22-43	65								Very Dense	
			X										SM		Silty Sand - Brown medium and fine SAND, little silt, nonplastic fines, moist.
50			X	S	14-12-18	30								Medium Dense	Silt clods observed in sample.
			X										CL		Sandy Lean Clay- Reddish brown CLAY, medium plastic fines, little sand, damp.
55			X	S	14-7-8	15	20.8	75	26	15	11			Stiff $\gamma_m = 120.7$ pcf PP>4.5 tsf	Iron staining.
			X										SP-SM		Poorly Graded Sand with Silt - Brown fine SAND, few silt, nonplastic fines, moist.
60															

GROUNDWATER

DEPTH(ft)	HOUR	DATE
NE		9/5/2019

SAMPLE TYPE

A - Drill cuttings
S - 2" O.D. 1.375" I.D. Split-Barrel Sampler
U - 3" O.D. 2.375" I.D. Split-Barrel Sampler
SH - 3" O.D. Shelby Tube Sample
TC - Texas Cone
G - Grab Sample

LOG OF TEST BORING NO. B- 2

PROJECT Cielo Vista Elevated Tank & Arsenic Tank Upgrades
9428 Daugherty Drive
El Paso, El Paso County, Texas



Wood E&IS, Inc.
125 Montoya Road
El Paso, TX 79932
Telephone: 915-585-2472

JOB NO. 1937192023 **DATE** 9/5/19

LOCATION See Boring Location Plan
LOGGED BY E. Sosa
RIG TYPE CQC - CME-75
BORING TYPE Hollow Stem Auger Method
SURFACE ELEV. Existing Ground Surface
DATUM Existing Ground Surface

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Sample Number	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
60			X	S	7-7-11	18	14.7	40						Medium Dense	
65			X	S	17-20-39	59							SM	Very Dense	Silty Sand - Light brown medium and fine SAND, little silt, nonplastic fines, damp.
70			X	S	21-24-45	69								Very Dense	
75			X	S	28-19-38	57							SP-SM	Very Dense	Poorly Graded Sand with Silt - Brown medium and fine SAND, few silt, nonplastic fines, few gravel, subrounded to subangular, damp.
80			X	S	25-29-30	59								Very Dense	Cemented sands observed in sample.
85			X	S	16-27-48	75	2.6	4.4					SP	Very Dense	Poorly Graded Sand - Brown medium and fine SAND, trace silt, nonplastic fines trace gravel, subangular to subrounded, dry.vfew
90													SP-SM		Poorly Graded Sand with Silt - Brown medium and fine SAND, few silt, nonplastic fines, few gravel, subangular to subrounded, damp.

GROUNDWATER

DEPTH(ft)	HOUR	DATE
NE		9/5/2019

SAMPLE TYPE
A - Drill cuttings
S - 2" O.D. 1.375" I.D. Split-Barrel Sampler
U - 3" O.D. 2.375" I.D. Split-Barrel Sampler
SH - 3" O.D. Shelby Tube Sample
TC - Texas Cone
G - Grab Sample

LOG OF TEST BORING NO. B- 2

PROJECT **Cielo Vista Elevated Tank & Arsenic Tank Upgrades**
9428 Daugherty Drive
El Paso, El Paso County, Texas



Wood E&IS, Inc.
125 Montoya Road
El Paso, TX 79932
Telephone: 915-585-2472

JOB NO. 1937192023 DATE 9/5/19

LOCATION See Boring Location Plan
LOGGED BY E. Sosa
RIG TYPE CQC - CME-75
BORING TYPE Hollow Stem Auger Method
SURFACE ELEV. Existing Ground Surface
DATUM Existing Ground Surface

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Sample Number	Blows Per Six Inches	SPT N-Value	Moisture Content Percent of Dry Weight	Percent Fines	Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification or Rock Unit	REMARKS	VISUAL CLASSIFICATION
90			X	S	27-17-30	47								Dense	
95			X	S	34-18-29	47	1.7							Dense	
100			X	S	22-19-24	43								Dense	
													CL		Lean Clay with Sand - Gray CLAY, medium plastic fines, little sand, damp. Auger terminated at 100 feet. Sampler terminated at 101.5 feet. NE - Not Encountered PP - Pocket Penetrometer tsf - tons per square foot pcf - pounds per cubic foot
105															
110															
115															
120															

GROUNDWATER		
DEPTH(ft)	HOUR	DATE
NE		9/5/2019

SAMPLE TYPE
A - Drill cuttings
S - 2" O.D. 1.375" I.D. Split-Barrel Sampler
U - 3" O.D. 2.375" I.D. Split-Barrel Sampler
SH - 3" O.D. Shelby Tube Sample
TC - Texas Cone
G - Grab Sample

LOG OF TEST BORING NO. B- 2

APPENDIX C

TABULATION OF TEST RESULTS

DATE: September 2019

PROJECT: Cielo Vista Elevated Tank & Arsenic Blend Tank Upgrades
9428 Daugherty Drive
El Paso, El Paso County, Texas

Wood Project No.: 1937192023

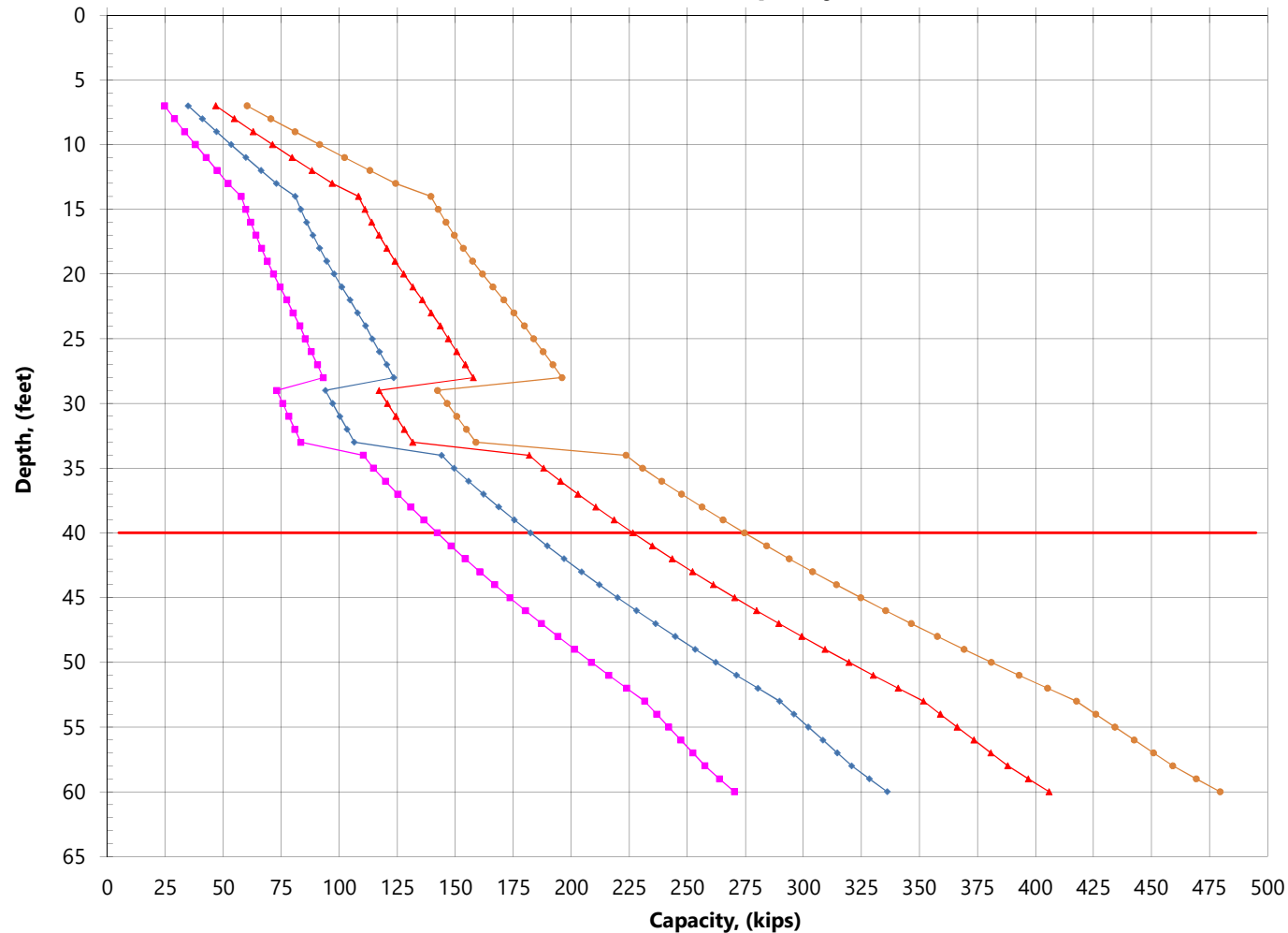
BORING NO.	DEPTH	UNIFIED CLASS.	LL	PL	PI	SIEVE ANALYSIS - ACCUM. % PASSING															MOISTURE %
						No.200	No.140	No.100	No.60	No.40	No.20	No.10	No.4	3/8"	1/2"	3/4"	1"	1 1/2"	2"	3"	
B-1	2 1/2'-4'	SC	40	25	15	25	31	40	53	63	71	80	89	98	98	100					8.2
B-1	7 1/2'-9'	SM				18	23	31	46	62	76	84	90	94	94	94	100				12.1
B-1	10'-11 1/2'	SP-SM				6.7	10	18	41	72	88	94	97	99	100						3.8
B-2	5'-6 1/2'	SC	30	19	11	35	45	58	71	80	85	90	94	98	99	100					11.2
B-2	10'-10 1/2'	SC				34	41	52	66	75	80	86	92	96	97	100					13.6
B-2	10 1/2'-11 1/2'	SC	26	16	10	31	38	52	76	91	95	97	99	100							10.3
B-2	30'-31 1/2'	CL-ML				55	75	85	88	91	95	97	100								6.1
B-2	55'-56 1/2'	CL	26	15	11	75	81	89	96	98	99	99	99	100							20.8
B-2	60'-61 1/2'	SM				40	66	88	98	99	100	100	100								14.7
B-2	85'-86 1/2'	SP				4.4	6	10	24	57	85	92	96	98	98	100					2.6
B-2	95'-96 1/2'																				1.7

NV - No Value

NP - Nonplastic

**TASK ORDER NO. 7 ON-CALL GEOTECHNICAL SERVICES FOR
CIELO VISTA ELEVATED AND ARSENIC BLEND TANK UPGRADES
9428 Daugherty Drive
EL Paso, El Paso County, Texas**

Allowable Downward Axial Capacity for Drilled Shafts



APPENDIX D

GUIDE SPECIFICATIONS FOR EARTHWORK

1. SCOPE

Includes all clearing and grubbing, removal of obstructions, general excavating, filling and any related items necessary to complete the grading for the entire project in accordance with these specifications.

2. SUBSURFACE SOIL DATA

Subsurface soil studies have been made and the results are available for examination by the contractor. The contractor is expected to examine the site and determine for himself the character of materials to be encountered.

No additional allowance will be made for rock removal, site clearing and grading, filling, compaction, disposal or removal of any unclassified materials.

3. CLEARING AND GRUBBING

- A. General:** Clearing and grubbing will be required for all areas shown on the plans to be excavated or on which fill is to be constructed.
- B. Clearing:** Clearing shall consist of removal and disposal of the existing vegetation located within the areas to be cleared.
- C. Grubbing:** Stumps, matted roots and roots larger than 2 inches in diameter shall be removed from within 6 inches of the surface of areas on which fills are to be constructed except in roadways. Materials as described above within 18 inches of finished subgrade in either cut or fill sections shall be removed. Areas disturbed by grubbing will be filled as specified hereinafter for STRUCTURAL FILL.

4. EARTH EXCAVATION

- A.** Earth excavation shall consist of the excavation and removal of suitable soil for use as embankment as well as the satisfactory disposal of all vegetation, debris and deleterious materials encountered within the area to be graded and/or in a borrow area.
- B.** Excavated areas shall be continuously maintained such that the surface shall be smooth and have sufficient slope to allow water to drain from the surface.

5. SELECT FILL

- A. General:** Select fill shall consist of a controlled fill constructed in areas indicated on the grading plans.
- B. Materials:**

(1) Physical Characteristics: Structural fill material shall consist of soil that conforms to the following physical characteristics:

Task Order No. 7 – On Call Geotechnical Services for Cielo Vista Elevated and Arsenic Blend Tank Upgrades, Texas

Sieve Size (Square Openings)	Percent Passing by Weight
3 inch	100
3/4 inch	70 - 100
No. 4	40 - 100
No. 200	5 - 30

The plasticity index of the material, as determined in accordance with ASTM D4318, shall not exceed 12. The fill material shall be free from roots, grass, other vegetable matter, clay lumps, rocks larger than 3 inches in any dimension, or other deleterious materials.

(2) Site Soil: Site soil from cuts may be used for fill provided they meet the requirements in paragraph 5.B(1). The results of this soil study indicate that the majority of the site soils will meet the requirements for structural fill, however some screening of oversize materials will be required.

(3) Borrow: When the quantity of suitable material required for embankments is not available within the limits of the jobsite, the contractor shall provide sufficient materials to construct the embankments to the lines, elevations and cross sections as shown on the drawings from borrow areas. The contractor shall obtain from owners of said borrow areas the right to excavate material, shall pay all royalties and other charges involved, and shall pay all expenses in developing the source including the cost of right-of-way required for hauling the material.

C. Construction:

(1) Subgrade Treatment: The project area shall be inspected by a representative of the geotechnical engineer prior to fill placement to verify clearing and grubbing.

The recommended site preparation consists of scarifying the native soils below the base of all foundation elements. Materials exceeding 3-inches in nominal diameter shall be removed and the scarified soils shall then be brought to within plus or minus 2 percent of the optimum moisture content and compacted. Structural fill should then be placed, as required, in compacted lifts to final grade.

During construction, the project area shall be shaped to provide drainage of surface water in order to avoid the ponding of water. Surface water shall be pumped immediately from the construction area after each rain and a firm subgrade maintained.

(2) Compaction: All fill shall be spread in layers not exceeding 8 inches, moisture conditioned as necessary, and compacted. Moisture content at the time of compaction shall be within plus or minus 2 percent of the optimum moisture content. Compaction of the fill shall be accomplished by mechanical means only to obtain a density of not less than 95 percent of maximum dry density for the building pad, paved areas, and other structural areas. Embankments outside the building pads shall be compacted to 95 percent of maximum dry density. Optimum moisture content and maximum dry density for each soil type used shall be determined in accordance with ASTM D1557. Where

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vibratory compaction equipment is used, it shall be the contractor's responsibility to insure that the vibrations do not damage nearby building or other adjacent property.

(3) Weather Limitations: Controlled fill shall not be constructed when the atmospheric temperature is below 35 degrees F. When the temperature falls below 35 degrees, it shall be the responsibility of the contractor to protect all areas of completed surface against any detrimental effects of ground freezing by methods approved by the geotechnical engineer. Any areas that are damaged by freezing shall be reconditioned, reshaped and compacted by the contractor in conformance with the requirements of this specification without additional cost to the owner.

- D. Slope Protection & Drainage:** The edges of the controlled fill embankments shall be graded to the contours shown on the drawings and compacted to the density required in paragraph 5.C.(2). Slopes steeper than 1 vertical to 3 horizontal shall be protected from erosion.

6. INSPECTION & TESTS

- A. Field Inspection & Testing:** The owner shall employ the services of a registered, licensed geotechnical engineer for consultation during all controlled earthwork operations. The geotechnical engineer shall provide continuous on-site observation and testing by experienced personnel during construction of controlled earthwork activities. The contractor shall notify the engineer at least two working days in advance of any field operations of the controlled earthwork, or of any resumption of operations after stoppages. Tests of fill materials and embankments will be made at the following suggested minimum rates:

(1) One field density test in the building area for each 2,000 square feet of original ground surface or a minimum of three (3), whichever is greater, prior to placing fill.

(2) One field density test in the building area for each 2,000 square feet of fill placed or each layer of fill for each work area or a minimum of three (3), whichever is the greater number of tests.

(3) One moisture-density curve for each type of material used, as indicated by sieve analysis and plasticity index.

- B. Report of Field Density Tests:** The geotechnical engineer shall submit, daily, the results of field density tests required by these specifications.

- C. Costs of Tests & Inspection:** The costs of tests, inspection and engineering, as specified in this section of the specifications, shall be borne by the owner.