May 28, 2019

IDEA PUBLIC SCHOOLS
IDEA EDINBURG CAMPUS PHASE III

GOMEZ, MENDEZ, SAENZ, INC.
1150 PAREDES LINE RD.
BROWNSVILLE, TEXAS 78526
(956) 546-0110

ADDENDUM NO. 2

A. PURPOSE AND INTENT

This addendum is issued for the purpose of modifying the plans and specifications for the Idea Public Schools – Edinburg Campus Phase III project.

This addendum shall become part of the contract and all CONTRACTORS shall be bound by its content. All aspects of the specification and drawings not covered herein shall remain the same.

The General Conditions and Special Conditions of the specifications shall govern all parts of the work and apply full force to this addendum.

B. SCOPE

CLARIFICATION

N/A

SPECIFICATIONS

Geotechnical Engineering Report (46 pages) will become part of the construction documents.

PLANS

N/A

Geotechnical Engineering Report

IDEA Edinburg – Phase III
Edinburg, TX

February 12, 2019
Terracon Project No. 88195004

Prepared for:

Gomez Mendez Saenz, Inc.
Brownsville, Texas

Prepared by:

Terracon Consultants, Inc.
Pharr, Texas

Terracon
GeoReport

February 12, 2019

Gomez Mendez Saenz, Inc.
1150 Paredes Line Road
Brownsville, Texas 78521

Attn: Roan G. Gomez, AIA
P: [956] 546 0110
E: rgg@gmsarchitects.com

Re: Geotechnical Engineering Report
IDEA Edinburg – Phase III
2553 Roegiers Road
Edinburg, TX
Terracon Project No. 88195004

Dear Mr. Gomez:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P88195004 dated January 14, 2019. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.
(Texas Firm Registration No.: F-3272)

for: Stephany Chacón, E.I.T.
Staff Engineer

ALFONSO A. SOTO
94153
2/12/19

Alfonso A. Soto, P.E., D.GE
Principal

REPORT TOPICS

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the ***GeoReport*** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

REPORT SUMMARY

Topic [1]	Overview Statement [2]
Project Description	The project will include the construction of a single-story building with a footprint of approximately 30,500 square feet (sf). Development will also include the construction of flexible and/or rigid pavements for the main access lanes and car parking areas.
Geotechnical Characterization	■ Groundwater was encountered at depths between 10 and 16½ feet below existing grade during drilling operations. ■ The subsurface soils at this site generally consist of Sandy Lean Clay (CL) and Fat Clay (CH).
Potential Vertical Rise (PVR)	The existing Potential Vertical Rise (PVR) of the soils within the proposed building area in present condition is about 1 to 1½ inches.
Seismic Site Classification	The subsurface conditions within the site are consistent with the characteristics of Site Class D as defined in the International Building Code (IBC) Site Classification.
Earthwork	The subgrade should be prepared as noted in **Earthwork**
Foundations	A shallow foundation system would be appropriate to support the structural loads of the proposed structure, provided the pad is prepared as recommended in this report.
Pavements	Flexible and rigid pavement systems may be considered for this project. We anticipate traffic may consist primarily of small vehicles, midsize trucks and occasional garbage trucks.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Geotechnical Engineering Report

IDEA Edinburg – Phase III
2553 Roegiers Road
Edinburg, TX

Terracon Project No. 88195004
February 12, 2019

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed IDEA Edinburg – Phase III to be located at 2553 Roegiers Road in Edinburg, TX. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Excavation considerations
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per IBC
- Pavement design and construction

The geotechnical engineering Scope of Services for this project included the advancement of 8 test borings to depths ranging from approximately 5 to 25 feet below existing site grades.

Maps showing the site and boring locations are presented in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project site is located within the grounds of the existing IDEA Edinburg at 2553 Roegiers Road in Edinburg, TX. Boring B-1: Latitude: 26.32575° N Longitude: 98.14887° W. See **Site Location**
Existing Improvements	Undeveloped land.
Current Ground Cover	Native grasses and soils.

Item	Description
Existing Topography	Relatively flat and level.
Geology	Based on the Geologic Atlas of Texas, McAllen – Brownsville prepared by The University of Texas, the site is located on the Lissie Formation of the Pleistocene Period of the Quaternary Age. The soils are mostly composed of clay, silt, sand, gravel and caliche. The soils are gray to brown to pale yellow in color. The gravel is mainly siliceous and locally cemented by and interbedded with sandy caliche. The caliche is massive to nodular. The surface is characterized by many undrained circular to irregular depressions, by relic clay dunes, and by stabilized northwest-trending longitudinal dunes.

PROJECT DESCRIPTION

Item	Description
Information Provided	By Gomez Mendez Saenz via email on January 9, 2019.
Project Description	The project will include the construction of a single-story building with a footprint of approximately 30,500 square feet (sf). Development will also include the construction of flexible and/or rigid pavements for the main access lanes and car parking areas.
Construction Type	We anticipate that the building construction may consist of brick veneer or stucco exterior walls with steel frame supported by a shallow or deep foundation system.
Finished Floor Elevation (FFE)	Information was not provided at this time. Assumed to be about 2 feet above existing grade.
Maximum loads (assumed)	■ Columns: 85 kips ■ Walls: 3 kips per linear foot ■ Slabs: 250 pounds per square foot
Pavements	Flexible and rigid pavements may be considered for this project.
Estimated Start of Construction	Information was not provided at this time.

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs and GeoModel can be found in the **Exploration Results** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**Sandy Clay**	Sandy Lean Clay (CL), medium stiff to hard with Fat Clay (CH) and Clayeye Sand (SC) seams
2	**Clay**	Fat Clay (CH), medium stiff to hard

Groundwater Conditions

The boreholes were observed during and after completion of drilling for the presence and level of groundwater. The water levels observed are noted on the attached boring logs, and are summarized below.

Location	Depth to groundwater (feet)		
	During drilling	15 minutes after initial groundwater reading	After boring completion
B-1	13	12½	10
B-2	16½	16	13½
B-3	13½	13	12½
B-4	13	12½	12

* Groundwater was not observed in the rest of the borings.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project. The boreholes were backfilled with on-site soil cuttings after completion of the groundwater level observations.

GEOTECHNICAL OVERVIEW

Our findings indicate the proposed building structure can be supported on a shallow foundation system. The desired foundation system may be used at this site provided the site and foundation are designed and constructed as recommended in this report.

The suitability and performance of a soil supported foundation for a structure depends on many factors including the magnitude of soil movement expected, the type of structure, the intended use of the structure, the construction methods available to stabilize the soils, and our understanding of the owner’s expectations of the completed structure's performance.

Expansive soils are present on this site. This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement in the structure should be anticipated. Eliminating the risk of movement may not be feasible, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction. We would be pleased to discuss other construction alternatives with you upon request.

Geotechnical engineering recommendations for foundation systems and other earth connected phases of the project are outlined below. The recommendations contained in this report are based upon the results of data presented herein, engineering analyses, and our current understanding of the proposed project.

The **General Comments** section provides an understanding of the report limitations.

Swell Test Results

To further evaluate the expansive characteristics of the clayey soil, one-dimensional vertical swell tests were conducted on selected specimens. The results of these tests are shown in the following table.

Swell Test Results

Boring	Depth (feet)	* Surcharge (psf)	Initial Moisture (%)	Final Moisture (%)	Percent Swell (%)
B-2	4 – 6	100	20.9	23.4	0.3
B-2	4 – 6	700	21.1	23.6	0.0
B-4	2 – 4	100	24.4	26.0	0.0
B-4	2 - 4	460	25.0	25.9	0.0

* The swell test specimens were applied a surcharge pressure during testing that approximated the existing soil overburden.

The test results indicate that the onsite soils have a low swell potential in their existing condition. Also, these soils, if they were allowed to dry out, could have greater potential for volumetric changes.

EARTHWORK

Earthwork will include clearing and grubbing, excavations and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria as necessary to render the site in the state considered in our geotechnical engineering evaluation for foundations and pavements.

Site Preparation

Construction areas should be stripped of all vegetation, topsoil and other unsuitable material. Additional excavation as recommended in this report or as needed should be performed within the proposed building area. Once final subgrade elevation has been achieved, the exposed subgrade should be carefully proofrolled with a 15-ton pneumatic roller or a fully loaded dump truck to detect weak zones in the subgrade. Special care should be exercised when proofrolling the fill soils to detect soft/weak areas. Weak areas detected during proofrolling, as well as zones of fill containing organic matter and/or debris should be removed and replaced with select fill in the proposed building area. Proper site drainage should be maintained during construction, so that ponding of surface runoff does not occur and cause construction delays and/or inhibit site access.

Subsequent to proofrolling, and just prior to placement of fill, the exposed subgrade within the construction area should be evaluated for moisture and density. If the moisture, density, and/or the requirements do not meet the criteria described in the table below, the subgrade should be scarified to a minimum depth of 8 inches, moisture adjusted and compacted to at least 95 percent of the Standard Effort (ASTM D 698) maximum dry density. Select fill should meet the following criteria.

Fill Material Types

Engineered fill should consist of approved materials, free of organic material, debris and particles larger than about 2 inches. The maximum particle size criteria may be relaxed by the geotechnical engineer of record depending on construction techniques, material gradation, allowable lift thickness and observations during fill placement. Soils for use as engineered fill material should conform to the following specifications:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
Aggregate Base Course [2]	SC, GC, Caliche, Crushed Limestone, Crushed Concrete	Top 6 inches of building pad area.

Select Fill	CL and/or SC (7≤PI≤20)	Must be used to construct the building pad, pavements and all grade adjustments within the construction area.
On-Site Soils	CL	On-site CL soils are suitable for use as fill within the building, pavement and landscaping areas as long as they are free from organics and have a PI between 7 and 20.

1. Prior to any filling operations, samples of the proposed borrow and on-site materials should be obtained for laboratory moisture-density testing. The tests will provide a basis for evaluation of fill compaction by in-place density testing. A qualified soil technician should perform sufficient in-place density tests during the filling operations to evaluate that proper levels of compaction, including dry unit weight and moisture content, are being attained.
2. Crushed limestone and crushed concrete material should meet the requirements of 2014 TxDOT Item 247, Type A, or D, Grades 1-2 and 3. The select fill materials should be free of organic material and debris, and should not contain stones larger than 2 inches in the maximum dimension. The clayey gravel and caliche materials should meet the gradation requirements of Item 247, Type B, Grades 1-2 and 3 as specified in the 2014 TxDOT Standard Specifications Manual and a Plasticity Index between 7 and 20.

Fill Compaction Requirements

Structural and general fill should meet the following compaction requirements.

Item	Description
Fill Lift Thickness	The fill should be placed in thins; loose lifts of about 8 inches, with compacted thickness not exceeding 6 inches.
Compaction Requirements (on-site soils)	The on-site soils should be compacted to at least 95 percent of The Standard Effort (ASTM D698) maximum dry density within 2 percentage points of the optimum moisture content.
Compaction Requirements (select fill)	The select fill should be compacted to at least 95 percent of The Standard Effort (ASTM D698) maximum dry density within 2 percentage points of the optimum moisture content.

Wet Weather/Soft Subgrade Conditions

Construction operations may encounter difficulties due to the wet or soft surface soils becoming a general hindrance to equipment due to rutting and pumping of the soil surface, especially during and soon after periods of wet weather.

If the subgrade cannot be adequately compacted to minimum densities as described above, one of the following measures will be required: 1) removal and replacement with select fill, 2) chemical treatment of the soil to dry and increase the stability of the subgrade, or 3) drying by natural means if the schedule allows.

In our experience with similar soils in this area, chemical treatment is the most efficient and effective method to increase the supporting value of wet and weak subgrade. Terracon should be contacted for additional recommendations if chemical treatment of the soils is needed.

Prior to placing any fill, all surface vegetation, topsoil, possible fill material and any otherwise unsuitable materials should be removed from the construction areas. Wet or dry material should either be removed or moisture conditioned and recompacted. After stripping and grubbing, the subgrade should be proof-rolled where possible to aid in locating loose or soft areas. Proof-rolling can be performed with a 15-ton roller or fully loaded dump truck. Soft, dry and low-density soil should be removed or compacted in place prior to placing fill.

Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building should be sealed or eliminated. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 3 percent for at least 10 feet from perimeter walls, except in areas where ADA ramps are required, these areas should comply with state and local regulations. Backfill against exterior walls, and in utility and sprinkler line trenches, should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

Downspouts, roof drains or scuppers should discharge into extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Consideration should be given to extending drainage piping to day light at the face of curbs then empty onto pavement surfaces. Sprinkler systems should not be installed within 5 feet of foundation walls. Landscaped irrigation adjacent to the foundation systems should be minimized or eliminated.

Where paving or flatwork abuts the structure, effectively seal and maintain joints to prevent surface water infiltration. The joint between the sidewalk curb and building should be sealed. The sidewalk curb along the building line is recommended to prevent water from standing over the joint between the building and sidewalk should the outside edge of the slab rise due to soil swelling at the sidewalk edge.

Utility trenches are a common source of water infiltration and migration. All utility trenches that penetrate beneath the building should be effectively sealed to restrict water intrusion and flow through the trenches that could migrate below the building.

We recommend constructing an effective clay "trench plug" that extends at least 5 feet out from the face of the building exterior. The plug material should consist of clay compacted at a water content at or above the soils optimum water content. The clay fill should be placed to completely surround the utility line and be compacted in accordance with recommendations in this report.

Earthwork Construction Considerations

Shallow excavations, for the proposed structure, are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of floor slabs. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over, or adjacent to construction area should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted, prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and top soil, proof-rolling and mitigation of areas delineated by the proof-roll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building area and 5,000 square feet in pavement areas. One density and water content test for every 50 linear feet of compacted utility trench backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Design Parameters – Slab-on-Grade Foundation

The foundation design parameters presented below are based on our evaluation using published theoretical and empirical design methods.

These were developed based on our understanding of the proposed project, our interpretation of the information and data collected as a part of this study, our area experience and the results of our evaluation. The structural engineer should select the appropriate slab design method and code for the amount of anticipated slab movement indicated.

The slab-on-grade foundation may be designed using the following parameters provided the subgrade is prepared as outlined in the **Earthwork** and **Floor Slabs** sections of this report:

Item	Description
Select Fill Pad	Minimum 1½ feet of select fill over 12 inches of moisture conditioned and compacted on-site soils.
Allowable Bearing Pressure [1] ■ **Compacted select fill**	Net Total Load – 2,500 psf
Climatic Rating	15
Design Plasticity Index	23
Soil Support Index	0.92
Estimated PVR [2]	About 1 inch or less
Approximate total settlement [3]	About 1 inch
Estimated Differential Settlement [3]	Approximately ½ of total settlement
Min. perimeter grade beam embedment [4]	18 inches below finished grade

Item	Description

1. The net allowable bearing pressure provided above include a factor of safety of at least 2.
2. The slab-on-grade foundation system should be designed to tolerate the anticipated soil movement and provide satisfactory support to the proposed structure. The foundation should have adequate exterior and interior grade beams to provide sufficient rigidity to the foundation system such that the slab deflections that result are considered tolerable to the supported structure.
3. This estimated post-construction settlement is assuming proper construction practices are followed. Settlement response of a select fill supported slab is influenced more by the quality of construction than by soil-structure interaction. Therefore, it is essential that the recommendations for foundation construction be strictly followed during the construction phases of the building pad and foundation.
4. To bear within the select fill or moisture conditioned and recompacted on-site soils. The grade beams may be thickened and widened where necessary to support column loads.

Construction Considerations for Slab-on-Grade Foundation

Excavations for grade beams should be performed with equipment capable of providing a relatively clean bearing area. The bottom 6 inches of the excavations should be completed with a smooth-mouthed bucket or by hand labor. The excavations should be neatly excavated and properly formed. Debris in the bottom of the excavation should be removed prior to reinforcing steel placement. Water should not be allowed to accumulate at the bottom of the excavation. Due to the presence of dry soils, caving of grade beam excavation may occur. Therefore, the foundation contractor should be prepared to use forms.

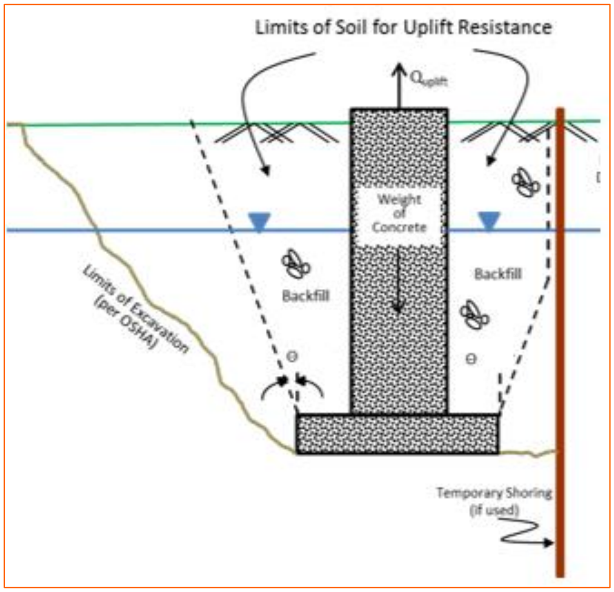
To reduce the potential for groundwater seepage into the excavations and to minimize disturbance to the bearing area, we recommend that concrete and reinforcing steel be placed as soon as possible after the excavations are completed. Excavations should not be left open for more than 36 hours. The bearing surface of the grade beams should be evaluated after excavation is completed and immediately prior to placing concrete.

Design Recommendations – Spread Footing Foundation

Spread footings may be considered in the design of the foundations to support the main column loads. Lateral loads transmitted to the footings should be resisted by a combination of soil-concrete friction on the base of the footing and passive pressure on the side of the footing. To resist lateral forces, a net allowable passive resistance may be utilized for portions of footings extending at least 30 inches below finished grade. If the footing is formed during construction, the open space between the footing and the in-situ soils should be backfilled with soils. Also, care should be taken to avoid disturbance of the footing bearing area since loose material could increase settlement and decrease resistance to lateral loading.

The spread footings can provide some uplift resistance for those structures subjected to wind or other induced structural loading.

Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated on the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle, θ, of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A soil unit weight of 120 pcf should be used for the backfill. This unit weight should be reduced to 40 pcf for portions of the backfill or natural soils below the groundwater elevation.



Design values for the footings are presented below.

Item	Description
Minimum Embedment Below Finished Grade [1]	2½ feet
Net Allowable Bearing Pressure [7]	Total Load - 2,500 psf
Approximate total settlement [2]	About 1 inch
Estimated Differential Settlement [3]	Approximately ½ of total settlement
Allowable Passive Pressure [4]	700 psf (if considered)
Coefficient of Sliding Friction [5]	0.40
Uplift Resistance [6]	Foundation Weight (150 pcf) & Soil Weight (120 pcf)

Item	Description

1. To bear within the native soils or select fill.
2. This estimated post-construction settlement of the shallow footings is without considering the effect of stress distribution from adjacent foundations and assuming proper construction practices are followed. A clear distance between the footings of one footing size should not produce overlapping stress distributions and would essentially behave as independent foundations.
3. Differential settlement may result from variances in subsurface conditions, loading conditions and construction procedures. The settlement response of the footings will be more dependent upon the quality of construction than upon the response of the subgrade to the foundation loads. We estimate that the differential settlement should be approximately one-half of the total settlement. Settlement of footings will be more sensitive to installation techniques than to soil-structure interaction.
4. The passive pressure along the exterior of the footings should be neglected unless pavement is provided up to the edge of the structure. For interior footings, the allowable passive pressure may be used for the entire depth of the footing. The passive pressure provided above includes a factor of safety of at least 3.
5. Lateral loads transmitted to the footings will be resisted by a combination of soil-concrete friction on the base of the footings and passive pressure on the side of the footings.
6. The ultimate uplift capacity of shallow footings should be reduced by an appropriate factor of safety to compute allowable uplift capacity.
7. The net allowable bearing pressure provided above include a factor of safety of at least 2.

Construction Considerations for Spread Footing Foundations

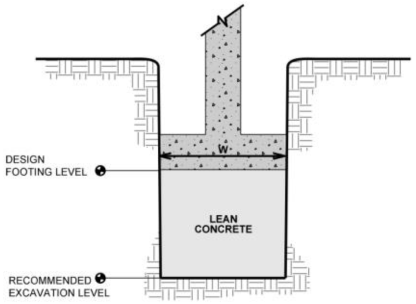
As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed. Due to the presence of dry soils, caving of excavation may occur. Therefore, the foundation contractor should be prepared to use forms.

Excavation should be accomplished with a smooth-mouthed bucket. If a toothed bucket is used, excavation with this bucket should be stopped 6 inches above the final bearing surface and the excavation completed with a smooth-mouthed bucket or by hand labor.

If the footing foundations are over-excavated and formed, the backfill around the foundation sides should be achieved with compacted select fill, lean concrete, compacted cement stabilized sand (two sacks cement to one cubic yard of sand) or flowable fill. Compaction of select fill should be as described later in this section of the report.

The bearing surface should be excavated with a slight slope to create an internal sump for runoff water collection and removal. If surface runoff water in excess of 2 inches accumulates at the bottom of the excavation, it should be pumped out prior to concrete placement. Under no circumstances should water be allowed to adversely affect the quality of the bearing surface. If the spread footing is buried, backfill above the foundation may be the excavated on-site soils or select fill soils. Backfill soils should be compacted to at least 95 percent of the maximum dry density as determined by the standard moisture/density relationship test (ASTM D 698). Moisture contents for on-site soils and imported select fill soils should be within 2 percentage points of the optimum moisture content. The backfill should be placed in thin, loose lifts of about 8 inches, with compacted thickness not to exceed 6 inches.

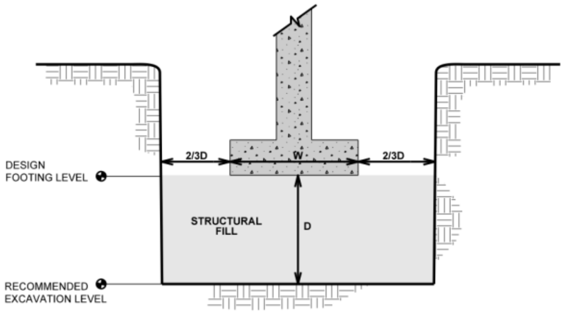
If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



LEAN CONCRETE BACKFILL

NOTE: EXCAVATIONS ARE SHOWN VERTICAL; HOWEVER, THE SIDEWALLS SHOULD BE SLOPED AS NECESSARY FOR SAFETY

Over-excavation for structural fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation, with select fill placed, as recommended in the **Earthwork** section.



OVER-EXCAVATION / BACKFILL ZONE

NOTE: EXCAVATIONS ARE SHOWN VERTICAL; HOWEVER, THE SIDEWALLS SHOULD BE SLOPED AS NECESSARY FOR SAFETY

SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil properties encountered at the site and as described on the exploration logs and results, it is our professional opinion that the **Seismic Site Classification is D**. Subsurface explorations at this site were extended to a maximum depth of 25 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

FLOOR SLABS

The Finished Floor Elevation (FFE) was not available at the time of this report. However, we anticipate that the FFE may be at about 2 feet above existing grade.

Floor Slab Design Parameters

The subsurface soils at this site generally exhibit moderate expansion potential. Based on the information developed from our field and laboratory programs and on method TEX-124-E in the Texas Department of Transportation (TxDOT) Manual of Testing Procedures, we estimate that the subgrade soils at this site exhibit a Potential Vertical Rise (PVR) of about 1 to 1½ inches in present condition.

The actual movements could be greater if poor drainage, ponded water, and/or other sources of moisture are allowed to infiltrate beneath the structure after construction. We have provided recommendations to maintain / reduce the site PVR to about 1 inch or less. In addition, positive structure perimeter drainage should be carefully observed.

After site stripping and over-excavation activities as recommended, re-used on-site soil or select fill over 12 inches of moisture conditioned and compacted subgrade soils should be constructed directly below the floor slab and should also extend a minimum of 3 feet beyond the edge of the proposed building area, including any movement sensitive flatwork that abuts the structure such as sidewalks. The final exterior grade adjacent to the building should be sloped to promote positive drainage away from the structure.

The subgrade and select fill soils should be prepared as outlined in the **Earthwork** section of this report, which contains material and placement requirements for select fill, as well as other subgrade preparation recommendations. The floor slab should be designed using the following recommendations.

Item	Description
Excavation	Minimum 12 inches.
Floor Slab Support [1]	Min. 12 inches of moisture conditioned and compacted native soils plus 1½ feet of select fill as needed to achieve Finished Building Pad Elevation. This recommendation applies to building area and flatwork that abuts the structure such as sidewalks.
Estimated Modulus of Subgrade Reaction [2]	125 pounds per square inch per inch (psi/in) for point loads.
Estimated Potential Vertical Rise (PVR)	About 1 inch or less

1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Floor Slab Construction Considerations

Finished subgrade within and for at least 10 feet beyond the floor slab should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

PAVEMENTS

Both flexible and rigid pavements may be considered for this project. Pavement subgrade preparations are included in this section to limit changes in soil moisture conditions to help mitigate the effects of soil movement. However, even if these recommendations are followed some pavement distress could still occur.

General Pavement Comments

Traffic conditions and pavement life conditions were not available at the time of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

We recommend the moisture content and density of the top 6 inches of the subgrade be evaluated and the pavement subgrades be proofrolled within two days prior to commencement of actual paving operations. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and re-compacted.

Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills.

If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

Based on the subsurface conditions, we anticipate that the pavement subgrade will generally consist of the on-site soils. The top 6 inches of the finished subgrade soils directly beneath the pavements may be chemically treated. Chemical treatment will increase the supporting value of the subgrade and decrease the effect of moisture on subgrade soils. These 6 inches of treatment should be considered as required part of the pavement design and is not a part of site and subgrade preparation for wet/soft subgrade conditions.

If chemical treatment of the subgrade is chosen, we anticipate that the on-site surficial soils should be treated with about 3 percent of lime or cement. This percentage is given as application by dry weight and is typically equivalent to about 15 pounds modifier per square yard per 6-inch depth. The recommended percentage of modifier is for estimating and planning. The actual quantity of modifier required should be determined at the time of construction by laboratory tests on bulk samples of the subgrade soils. Specifications for treated subgrade are presented later in this section. An alternative pavement section without treated subgrade is also provided.

After proofrolling and repairing deep subgrade deficiencies, the entire subgrade should be scarified and developed as recommended in **Earthwork** section of this report to provide a uniform subgrade for pavement construction. Areas that appear severely desiccated following site stripping may require further undercutting and moisture conditioning. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

Pavement Design Parameters

Traffic patterns and anticipated loading conditions were not available at the time that this report was prepared. However, we anticipate that traffic loads will be produced primarily by light traffic and occasional delivery and trash removal trucks. Pavement thickness can be determined using AASHTO, Asphalt Institute and/or other methods if specific wheel loads, axle configurations, frequencies, and desired pavement life are provided.

Terracon can provide thickness recommendations for pavements subjected to loads other than the above mentioned traffic if this information is provided.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to parking lots and drives should slope down from pavement edges at a minimum 2%;
- The subgrade and the pavement surface should have a minimum ¼ inch per foot slope to promote proper surface drainage;
- Install pavement drainage surrounding areas anticipated for frequent wetting (e.g., garden centers, wash racks);
- Install joint sealant and seal cracks immediately;

- Seal all landscaped areas in, or adjacent to pavements to reduce moisture migration to subgrade soils;
- Place compacted, low permeability backfill against the exterior side of curb and gutter; and,
- Place curb, gutter and/or sidewalk directly on low permeability subgrade soils rather than on unbound granular base course materials.

Pavement Section Thicknesses

As a minimum, we recommend the following typical pavement sections be considered.

Pavement Area	Traffic Design Index	Description
Automobile Parking Areas	DI-1	Light traffic (Few vehicles heavier than passenger cars, no regular use by heavily loaded two axle trucks). (EAL[1] < 6)
Driveways	DI-2	Light to medium traffic (Similar to DI-1 including not over 50 loaded two axle trucks or lightly loaded larger vehicles per day. No regular use by heavily loaded trucks with three or more axles). (EAL = 6-20)
Driveways for Truck Traffic Areas	DI-3	Medium to heavy traffic (Including not over 300 heavily loaded two axle trucks plus lightly loaded trucks with three or more axles and no more than 30 heavily loaded trucks with more than three axles per day). (EAL = 21-75)

1. Equivalent daily 18-kip single-axle load applications.

Listed below are pavement component thicknesses, which may be used as a guide for pavement systems at the site for the traffic classifications stated herein. These systems were derived based on general characterization of the subgrade. Specific testing (such as CBR's, resilient modulus tests, etc.) was not performed for this project to evaluate the support characteristics of the subgrade.

Minimum Recommended <u>Flexible</u> Pavement Section Thickness, inches		
Component	**DI-1** [1]	**DI-2** [1]
Hot Mix Asphaltic Concrete (HMAC) [2, 3]	2	2½
Granular Base Material [2]	6	8
Treated Subgrade [2]	6	6

1. See **Pavements** for more specifics regarding traffic classifications.

Minimum Recommended Flexible Pavement Section Thickness, inches		
Component	**DI-1** [1]	**DI-2** [1]

2. All materials should meet the current Department of Transportation (TxDOT) Standard Specifications for Highway and Bridge Construction.
3. A minimum 2-inch surface course should be used on ACC pavements.

Alternative Minimum Recommended Flexible Pavement System, inches		
Component	**DI-1** [1]	**DI-2** [1]
Hot Mix Asphaltic Concrete (HMAC) [2,3]	2	2½
Granular Base Material [2]	8	10
Moisture Conditioned Subgrade	6	6

1. See **Pavements** for more specifics regarding traffic classifications.
2. All materials should meet the current Department of Transportation (TxDOT) Standard Specifications for Highway and Bridge Construction.
3. A minimum 2-inch surface course should be used on ACC pavements.

Minimum Recommended Rigid Pavement Section Thickness, inches			
Component	**DI-1** [1]	**DI-2** [1]	**DI-3** [1,3]
Reinforced PC concrete [2]	5	6	7
Granular Base Material [3]	4	4	4
Moisture conditioned subgrade	6	6	6

1. See **Pavements** for more specifics regarding traffic classifications.
2. All materials should meet the current Department of Transportation (TxDOT) Standard Specifications for Highway and Bridge Construction.
3. In areas of anticipated heavy traffic, school buses, delivery trucks, or concentrated loads (e.g. dumpster pads), and areas with repeated turning or maneuvering of heavy vehicles.

The listed pavement component thicknesses should be used as a guide for pavement systems at the site for the traffic classifications stated herein. These recommendations assume a 20-year pavement design life. If pavement frequencies or loads will be different than that specified Terracon should be contacted and allowed to review these pavement sections.

We recommend a Portland Cement Concrete (PCC) pavement be utilized in the main access lanes, parking lots, dumpster pads or other areas where extensive wheel maneuvering are expected.

We recommend that waste dumpster areas be constructed of at least 7-inches of reinforced concrete pavement. The concrete pad areas should be designed so that the vehicle wheels of the collection truck are supported on the concrete while the dumpster is being lifted to support the large wheel loading imposed during waste collection.

Although not required for structural support of rigid pavement systems, a base course layer may be considered to help reduce potentials for slab curl, shrinkage cracking, and subgrade "pumping" through joints.

Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.
Presented below are our recommended material requirements for the various pavement sections.

Reinforced Concrete Pavement – The materials and properties of reinforced concrete pavement shall meet applicable requirements in the ACI Manual of Concrete Practice. The Portland cement concrete mix should have a minimum 28-day compressive strength of 4,000 psi.

> Reinforcing Steel - Reinforcing steel should consist of the following:
> DI-1: #3 bars spaced at 18 inches or #4 bars spaced at 24 inches on centers in both directions.
> DI-2: #3 bars spaced at 12 inches or #4 bars spaced at 18 inches on centers in both directions.
> DI-3: #4 bars spaced at 12 inches on centers in both directions.
>
> Control Joint Spacing – ACI recommendations indicate that control joints should be spaced at about 30 times the thickness of the pavement. Furthermore, ACI recommends a maximum control joint spacing of 12.5 feet for 5-inch pavements and a maximum control joint spacing of 15 feet for 6-inch or thicker pavements. Saw cut control joints should be cut within 6 to 12 hours of concrete placement or as soon as it is practical.
>
> Expansion Joint Spacing – ACI recommendations indicate that regularly spaced expansion joints may be deleted from concrete pavements. Therefore, the installation of expansion joints is optional and should be evaluated by the design team.
>
> Dowels at Expansion Joints – The dowels at expansion joints should be spaced at 12-inch centers and consist of the following:
> DI-1: 5/8-inch diameter, 12-inches long with 5-inch embedment
> DI-2: 3/4-inch diameter, 14-inches long with 6-inch embedment
> DI-3: 7/8-inch diameter, 14-inches long with 6-inch embedment

Hot Mix Asphaltic Concrete Surface Course – The asphaltic concrete surface course should be plant mixed, hot laid Type C or D (Fine Graded Surface Course) meeting the specifications requirements in 2014 TxDOT Standard Specifications Item 340. Specific criteria for the job specifications should include compaction to within an air void range of 5 to 9 percent calculated using the maximum theoretical gravity mix measured by TxDOT Tex-227-F. The asphalt cement content by percent of total mixture weight should be within ± 0.5 percent asphalt cement from the job mix design.

Granular Base Material: Base material should be composed of crushed limestone or crushed concrete meeting the requirements of 2014 TxDOT Standard Specifications Item 247, Type A or D, Grade 1.

As an alternate to the Type A base, treated “caliche” material meeting the requirements of 2014 TxDOT Standard Specification Manual Item 247, Type B, Grade 1 or 2 may be used.

The granular base should be compacted to at least 95 percent of the maximum dry density determined in accordance with the modified moisture-density relationship (ASTM D 1557) at moisture content within 2 percentage points of the optimum moisture content.

Treated Subgrade: The subgrade soils should be treated with lime or cement in accordance with 2014 TxDOT Standard Specifications Items 260 or 275, respectively. The recommended percentage of modifer is for estimating and planning. The actual quantity of modifer required should be determined at the time of construction by laboratory tests on bulk samples of the subgrade soils.

If chemical treatment of the subgrade is chosen, we anticipate that the on-site surficial soils be treated with about 3 percent of lime or cement. This percentage is given as application by dry weight and is typically equivalent to about 15 pounds of modifier per square yard per 6-inch depth. The subgrade should be compacted to a minimum of 95 percent of the Standard Effort (ASTM D 698) maximum dry density within 2 percentage points of the optimum moisture content. Preferably, traffic, should be kept off the treated subgrade for about 3 to 5 days to facilitate curing of the soil - chemical mixture; in addition, the subgrade is not suitable for heavy construction traffic prior to paving.

Post-construction subgrade movements and some cracking of the pavements are not uncommon for subgrade conditions such as those observed at this site. Although chemical treatment of the subgrade will help to reduce such movement/cracking, this movement/cracking cannot be economically eliminated.

Moisture Conditioned Subgrade: The subgrade should be scarified to a depth of 8 inches and moisture conditioned within 2 percentage points of the optimum moisture content. The subgrade should then be compacted to at least 95 percent of the maximum dry density determined in accordance with ASTM D 698. This should result in a compacted, moisture conditioned layer about 6 inches thick.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

Pavement Maintenance

The pavement sections provided in this report represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program.

Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Preventive maintenance is usually the first priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet) [1]	Location
4	25	Building Areas
4	5	Pavement Areas

1. Below ground surface

Boring Layout and Elevations: Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet).

Subsurface Exploration Procedures: We advanced the soil borings with a truck-mounted drill rig using continuous flight augers (solid stem and/or hollow stem as necessary depending on soil conditions). Five samples were obtained in the upper 10 feet of the borings and at intervals of 5 feet thereafter. Soil sampling was performed using thin-wall tube and/or split-barrel sampling procedures. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, the borings were backfilled with auger cuttings after their completion.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a geotechnical engineer. Our exploration team prepared field boring logs as part of the drilling operations. The field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field log. The final boring logs represent the geotechnical engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned various laboratory tests to better understand the engineering properties of the various soil strata as necessary for this project.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils

- ASTM D2166/D2166M Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
- ASTM D4546 Standard Test Methods for One-Dimensional Swell or Collapse of Soils

The laboratory testing program often included examination of soil samples by an engineer. Based on the material’s texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System (USCS).

SITE LOCATION AND EXPLORATION PLANS

Contents:
Site Location Plan
Exploration Plan

SITE LOCATION

IDEA Edinburg – Phase III ■ Edinburg, TX

February 12, 2019 ■ Terracon Project No. 88195004

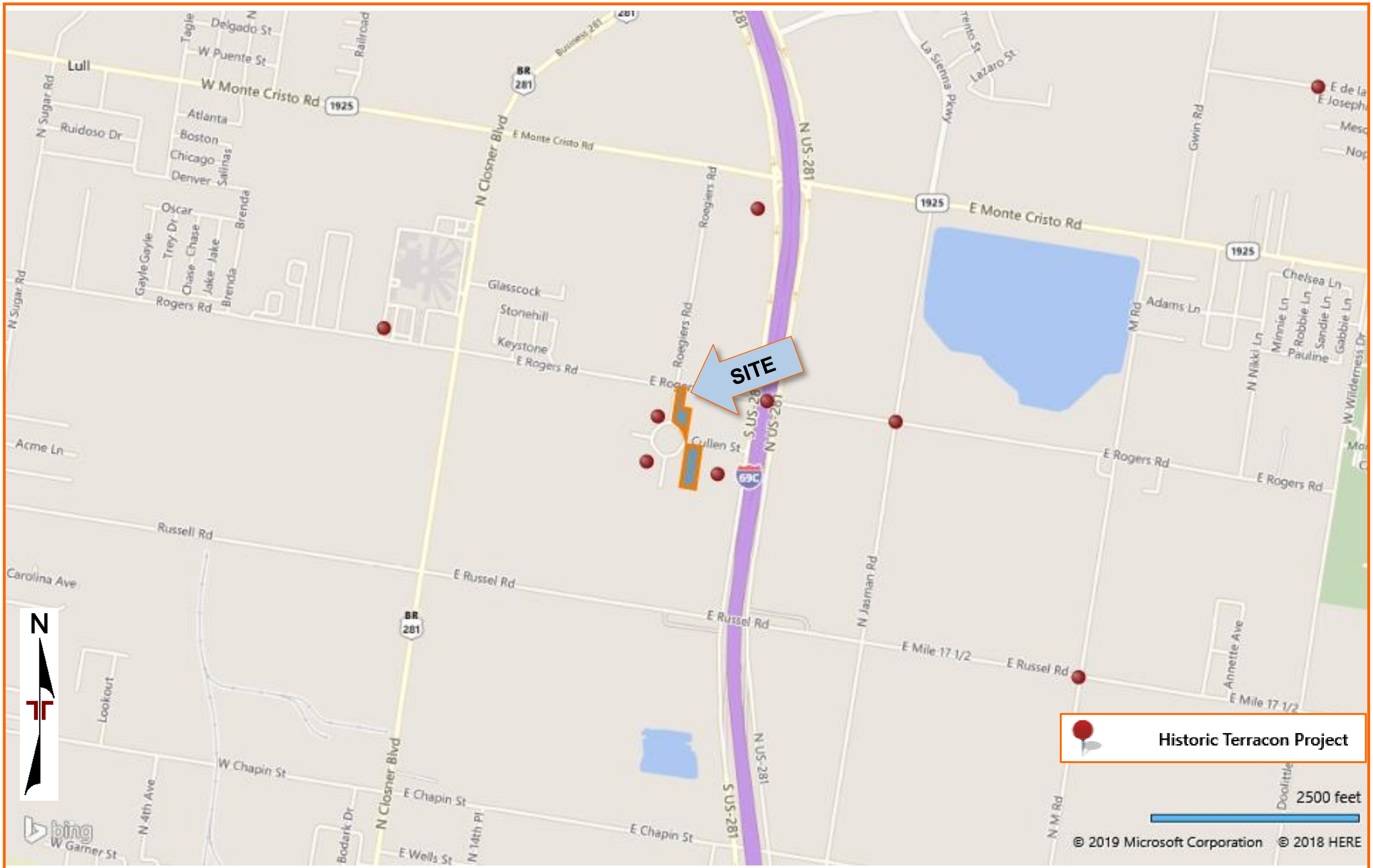


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

IDEA Edinburg – Phase III ■ Edinburg, TX

February 12, 2019 ■ Terracon Project No. 88195004

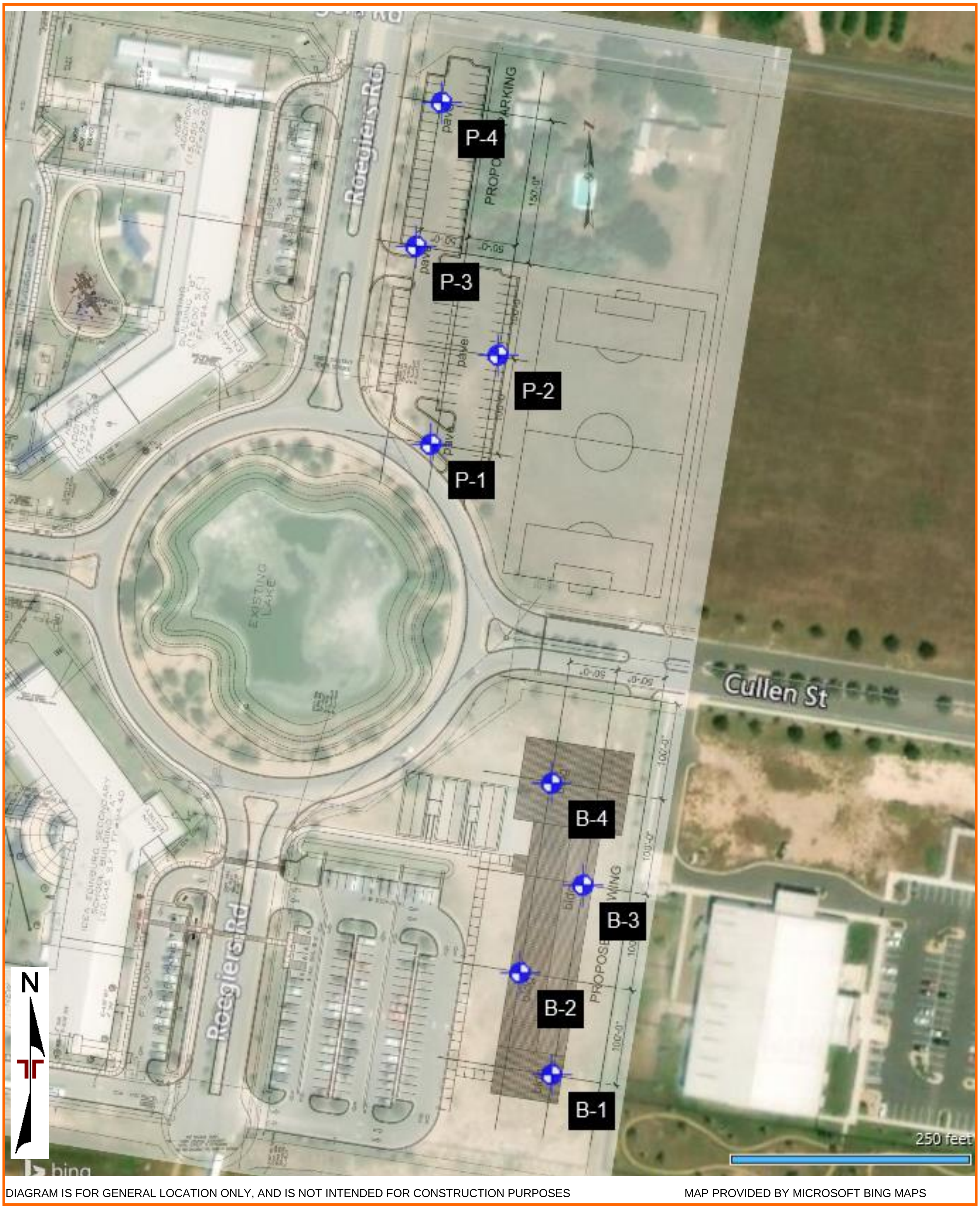


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

BORING LOG NO. B-1

Page 1 of 1

PROJECT: IDEA Edinburg - Phase III

CLIENT: IDEA Public Schools
Austin, Texas

SITE: 2553 Roegiers Rd.
Edinburg, Texas

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 26.3258° Longitude: -98.1489° DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
							TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			LL-PL-PI	
	▨	**SANDY LEAN CLAY (CL)**, brown to light brown, medium stiff to very stiff			☒	4-3-3 N=6				18		29-16-13	
					☒	3-3-3 N=6				21			
1		- with Fat Clay (CH) seams at 4½ feet	5		☒	7-8-12 N=20				17		54-21-33	
		- with Clayey Sand (SC) seams at 6½ feet			☒	9-9-10 N=19				20			44
		10.0	10	▼	☒	4-4-3 N=7				23		38-18-20	
	▨	**FAT CLAY (CH)**, light brown, medium stiff to very stiff		▽ ▽									
			15		☒	3-2-3 N=5				23			
2			20		☒	8-8-13 N=21				20			
		25.0	25		☒	7-10-12 N=22				22			
		Boring Terminated at 25 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Dry augered to termination depth.

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

▽ *After 15 mintues*

▼ *At completion of drilling*

Terracon
1506 Mid Cities Dr
Pharr, TX

Boring Started: 01-29-2019	Boring Completed: 01-29-2019
Drill Rig: CME-55	Driller: SWD
Project No.: 88195004	

BORING LOG NO. B-2

Page 1 of 1

PROJECT: IDEA Edinburg - Phase III

CLIENT: IDEA Public Schools
Austin, Texas

SITE: 2553 Roegiers Rd.
Edinburg, Texas

LOCATION See Exploration Plan

Latitude: 26.326° Longitude: -98.149°

MODEL LAYER	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	**SANDY LEAN CLAY (CL)**, brown to light brown, stiff to very stiff			■	2.5 (HP)				15			
				■	1.5 (HP)				24		36-18-18	
	6.0	5		■	3.0 (HP)				21			
2	**FAT CLAY (CH)**, light brown, very stiff to hard			■	3.5 (HP)	UC	1.60	9	21	104	62-21-41	
		10		■	3.5 (HP)				22			67
			▼	■	4.0 (HP)				20		54-20-34	
		15	▽ ▽									
		20		■	3.5 (HP)				23			
	25.0	25		■	4.5 (HP)				19			
	Boring Terminated at 25 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Dry augered to termination depth.

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- ▽ *While drilling*
- ▽ *After 15 mintues*
- ▼ *At completion of drilling*

Terracon
1506 Mid Cities Dr
Pharr, TX

Boring Started: 01-29-2019	Boring Completed: 01-29-2019
Drill Rig: CME-55	Driller: SWD
Project No.: 88195004	

BORING LOG NO. B-3

Page 1 of 1

PROJECT: IDEA Edinburg - Phase III

CLIENT: IDEA Public Schools
Austin, Texas

SITE: 2553 Roegiers Rd.
Edinburg, Texas

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 26.3263° Longitude: -98.1488° DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST TEST TYPE	STRENGTH TEST COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		**SANDY LEAN CLAY (CL)**, brown to light brown, stiff to very stiff			☒	4-4-4 N=8				6			52
					☒	5-4-5 N=9				19		32-16-16	
			5		☒	4-6-7 N=13				21			68
					☒	5-5-8 N=13				20		45-19-26	
			10		☒	6-7-10 N=17				24			
				▼ ▽ ▽									
		15.0	15		☒	7-9-12 N=21				20		47-20-27	
2		**FAT CLAY (CH)**, light brown, very stiff											
			20		☒	9-10-10 N=20				18			
		25.0	25		☒	8-11-15 N=26				18			

Boring Terminated at 25 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Dry augered to termination depth.

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*
▽ *After 15 mintues*
▼ *At completion of drilling*

Terracon
1506 Mid Cities Dr
Pharr, TX

Boring Started: 01-29-2019	Boring Completed: 01-29-2019
Drill Rig: CME-55	Driller: SWD
Project No.: 88195004	

BORING LOG NO. B-4

PROJECT: IDEA Edinburg - Phase III

CLIENT: IDEA Public Schools
Austin, Texas

SITE: **2553 Roegiers Rd.**
Edinburg, Texas

LOCATION See Exploration Plan

Latitude: 26.3266° Longitude: -98.1489°

MODEL LAYER	GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	▨	**SANDY LEAN CLAY (CL)**, brown to light brown, medium stiff to hard			⊠	2-3-2 N=5				22		35-16-19	
					■	1.0 (HP)				26			69
			5		■	2.0 (HP)				24		40-18-22	
					■	4.5 (HP)				21			
		10.0			■	4.5 (HP)	UC	3.40	5.8	19	108	47-19-28	
2	▨	**FAT CLAY (CH)**, light brown, hard	10	▼ ▽ ▽									
					■	4.5 (HP)				19			
			15										
			20		⊠	10-15-21 N=36				19		53-21-32	
		25.0			⊠	12-17-23 N=40				19			
		Boring Terminated at 25 Feet	25										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Dry augered to termination depth.

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

▽ *After 15 mintues*

▼ *At completion of drilling*

Terracon
1506 Mid Cities Dr
Pharr, TX

Boring Started: 01-29-2019	Boring Completed: 01-29-2019
Drill Rig: CME-55	Driller: SWD
Project No.: 88195004	

BORING LOG NO. P-1

Page 1 of 1

PROJECT: IDEA Edinburg - Phase III

CLIENT: IDEA Public Schools
Austin, Texas

SITE: 2553 Roegiers Rd.
Edinburg, Texas

LOCATION See Exploration Plan

Latitude: 26.3275° Longitude: -98.1493°

MODEL LAYER	GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	▨	**SANDY LEAN CLAY (CL)**, brown to light brown, stiff to medium siff			☒	5-5-5 N=10				21		31-18-13	
					☒	4-5-4 N=9				24			
		5.0	5		☒	2-2-4 N=6				22			
		Boring Terminated at 5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Dry augered to termination depth.

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1506 Mid Cities Dr
Pharr, TX

Boring Started: 01-29-2019	Boring Completed: 01-29-2019
Drill Rig: CME-55	Driller: SWD
Project No.: 88195004	

BORING LOG NO. P-2

PROJECT: IDEA Edinburg - Phase III

CLIENT: IDEA Public Schools
Austin, Texas

SITE: **2553 Roegiers Rd.**
Edinburg, Texas

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 26.3278° Longitude: -98.149° DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST TEST TYPE	STRENGTH TEST COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	▨	**SANDY LEAN CLAY (CL)**, brown to light brown, medium stiff			☒	2-3-2 N=5				17			
					☒	3-3-3 N=6				23		39-19-20	
		5.0	5		☒	3-4-3 N=7				26			
		Boring Terminated at 5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Dry augered to termination depth.

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1506 Mid Cities Dr
Pharr, TX

Boring Started: 01-29-2019
Boring Completed: 01-29-2019
Drill Rig: CME-55
Driller: SWD
Project No.: 88195004

BORING LOG NO. P-3

Page 1 of 1

PROJECT: IDEA Edinburg - Phase III

CLIENT: IDEA Public Schools
Austin, Texas

SITE: 2553 Roegiers Rd.
Edinburg, Texas

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 26.3281° Longitude: -98.1493° DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
							TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			LL-PL-PI	
1	▨	**<u>SANDY LEAN CLAY (CL)</u>**, brown to light brown, stiff to medium siff			☒	5-6-6 N=12				16		31-18-13	
					☒	4-5-6 N=11				20			
		5.0	5		☒	3-3-3 N=6				26			
		Boring Terminated at 5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Dry augered to termination depth.

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1506 Mid Cities Dr
Pharr, TX

Boring Started: 01-29-2019	Boring Completed: 01-29-2019
Drill Rig: CME-55	Driller: SWD
Project No.: 88195004	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 88195004 IDEA EDINBURG - P - COPY.GPJ MODELLAYER.GPJ 2/7/19

BORING LOG NO. P-4

PROJECT: IDEA Edinburg - Phase III

CLIENT: IDEA Public Schools
Austin, Texas

SITE: 2553 Roegiers Rd.
Edinburg, Texas

LOCATION See Exploration Plan

Latitude: 26.3285° Longitude: -98.1492°

MODEL LAYER	GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST			WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS	PERCENT FINES
							TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)			LL-PL-PI	
1	▨	**SANDY LEAN CLAY (CL)**, brown to light brown, stiff to medium siff			☒	5-5-6 N=11				26			
	▨				☒	2-2-3 N=5				25		41-20-21	
	▨	5.0	5		☒	3-4-3 N=7				26			
		Boring Terminated at 5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Dry augered to termination depth.

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

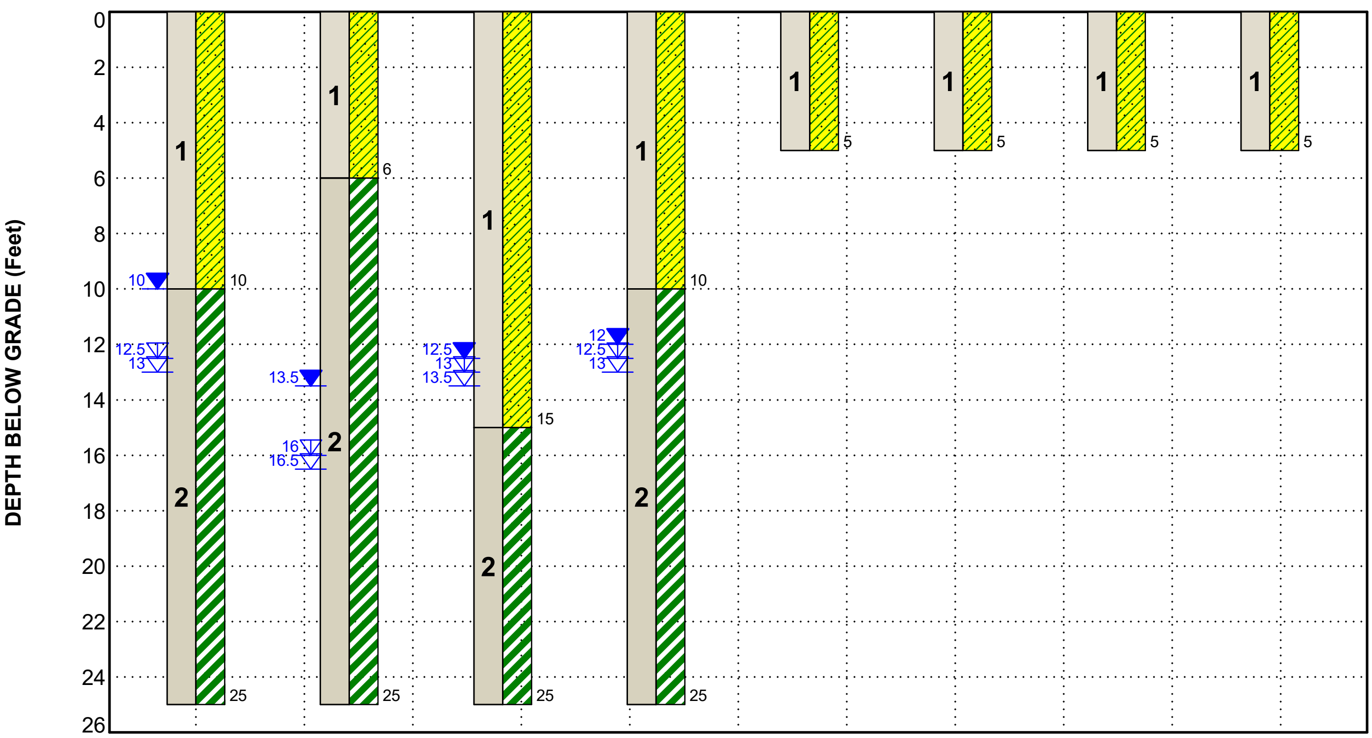
Terracon
1506 Mid Cities Dr
Pharr, TX

Boring Started: 01-29-2019
Boring Completed: 01-29-2019
Drill Rig: CME-55
Driller: SWD
Project No.: 88195004

GEOMODEL

IDEA Edinburg - Phase III ■ Edinburg, Texas
2/7/2019 ■ Terracon Project No. 88195004

Terracon GeoReport



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	SANDY CLAY	SANDY LEAN CLAY (CL), medium stiff to hard with Fat Clay (CH) and Clayey Sand (SC) seams
2	CLAY	FAT CLAY (CH), medium stiff to hard

LEGEND

▨ Sandy Lean Clay

▨ Fat Clay

▽ First Water Observation
▽ Second Water Observation
▼ Third Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

SUPPORTING INFORMATION

Contents:

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING

■ Shelby Tube

☒ Split Spoon

WATER LEVEL

▽ **Water Initially Encountered**

▽ **Water Level After a Specified Period of Time**

▼ **Water Level After a Specified Period of Time**

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

N	**Standard Penetration Test Resistance (Blows/Ft.)**
(HP)	**Hand Penetrometer**
(T)	**Torvane**
(DCP)	**Dynamic Cone Penetrometer**
UC	**Unconfined Compressive Strength**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL		RELATIVE PROPORTIONS OF FINES	
Descriptive Term(s) of other constituents	Percent of Dry Weight	**Descriptive Term(s) of other constituents**	**Percent of Dry Weight**
Trace	<15	Trace	<5
With	15-29	With	5-12
Modifier	>30	Modifier	>12

GRAIN SIZE TERMINOLOGY		PLASTICITY DESCRIPTION	
Major Component of Sample	**Particle Size**	**Term**	**Plasticity Index**
Boulders	Over 12 in. (300 mm)	Non-plastic	0
Cobbles	12 in. to 3 in. (300mm to 75mm)	Low	1 - 10
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)	Medium	11 - 30
Sand	#4 to #200 sieve (4.75mm to 0.075mm	High	> 30
Silt or Clay	Passing #200 sieve (0.075mm)		

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]					Soil Classification	
					Group Symbol	**Group Name**[B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]		GW	Well-graded gravel[F]
			$Cu < 4$ and/or $[Cc<1$ or $Cc>3.0]$[E]		GP	Poorly graded gravel[F]
		Gravels with Fines: More than 12% fines[C]	Fines classify as ML or MH		GM	Silty gravel[F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel[F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]		SW	Well-graded sand[I]
			$Cu < 6$ and/or $[Cc<1$ or $Cc>3.0]$[E]		SP	Poorly graded sand[I]
		Sands with Fines: More than 12% fines[D]	Fines classify as ML or MH		SM	Silty sand[G, H, I]
			Fines classify as CL or CH		SC	Clayey sand[G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	$PI > 7$ and plots on or above “A”		CL	Lean clay[K, L, M]
			$PI < 4$ or plots below “A” line[J]		ML	Silt[K, L, M]
		Organic:	Liquid limit - oven dried Liquid limit - not dried	< 0.75	OL	Organic clay[K, L, M, N] Organic silt[K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above “A” line		CH	Fat clay[K, L, M]
			PI plots below “A” line		MH	Elastic Silt[K, L, M]
		Organic:	Liquid limit - oven dried Liquid limit - not dried	< 0.75	OH	Organic clay[K, L, M, P] Organic silt[K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add “with cobbles or boulders, or both” to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains $\geq$ 15% sand, add “with sand” to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add “with organic fines” to group name.

[I] If soil contains $\geq$ 15% gravel, add “with gravel” to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add “with sand” or “with gravel,” whichever is predominant.

[L] If soil contains $\geq$ 30% plus No. 200 predominantly sand, add “sandy” to group name.

[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add “gravelly” to group name.

[N] $PI \geq 4$ and plots on or above “A” line.

[O] $PI < 4$ or plots below “A” line.

[P] PI plots on or above “A” line.

[Q] PI plots below “A” line.