

# Geotechnical Engineering Report

**TownePlace Suites  
Gonzales, Louisiana**

March 26, 2010

Project No. EH105051

**Prepared for:  
Ascension Hotels, LLC  
Donaldsonville, Louisiana**

**Prepared by:  
Terracon Consultants, Inc.  
Baton Rouge, Louisiana**

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**Terracon**

**Geotechnical** ■ **Environmental** ■ **Construction Materials** ■ **Facilities**



March 26, 2010

Ascension Hotels, LLC  
2179 Highway 70  
Donaldsonville, LA 70346

Attn: Mr. Aaron Patel

Re: Geotechnical Investigation  
TownePlace Suites  
Gonzales, Louisiana  
Terracon Project No. EH105051

Dear Mr. Patel,

Submitted herein are the results of our geotechnical investigation for the proposed new TownePlace Suites to be built off of Outfitter's Drive in Gonzales, Louisiana. This work was authorized by Mr. Aaron Patel on March 2, 2010.

Beneath approximately 3 to 4 inches of organic laden soil, the soil borings encountered a stiff to very stiff silty clay and clay "crust" in the upper 4 to 6 feet. Soft to firm silty clays and clays were present from about 6 to 9 feet. From 9 to 20 feet, stiff silty clays and clays were identified. Below 20 feet, very stiff silty clays and clays were present to through the maximum probe termination depth of 24 feet. Intermittent silt and sand layers were noted below 10 feet by the CPT probes.

Depending on the structural loading, either shallow foundations or deep foundations are suitable at this site. Rigid pavement recommendations are provided in this report for the parking areas and entrance roads.

We appreciate this opportunity to work with you, and look forward to providing QA/QC testing services during construction. Please contact this office if you have any questions.

Sincerely,

Terracon Consultants, Inc.

Erin P. Tellis, E.I.  
Staff Engineer



Daniel J. Aucutt, P.E.  
Senior Principal



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	CPT Legend
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## 1.0 INTRODUCTION

Ascension Hotels, LLC is designing a new TownePlace Suites to be built off of Outfitter's Drive in Gonzales, Ascension Parish, Louisiana. The site is located near latitude 30° 12' 28.5" N and longitude 90° 56' 57.2" W. A site vicinity map indicating the general location of the facility is illustrated on Figure 1. More detailed information regarding proposed construction is provided in Paragraph 2.2.

### 1.1 Purpose

Terracon Consultants, Inc. (Terracon) was retained by Ascension Hotels to conduct a geotechnical investigation for the proposed development. This investigation was intended to provide an understanding of the subsurface conditions and to develop options available for foundation design at this facility.

### 1.2 Scope

The geotechnical investigation conducted for this project included the following:

- Site Reconnaissance: A visual review and documentation of site conditions pertinent to the geotechnical study at the time of our field exploration.
- Soil Borings: Nine soil borings were drilled and sampled at the locations illustrated on Figure 2. Detailed soil boring logs are included in Appendix A.
- Cone Penetrometer Tests: Four Cone Penetrometer Test (CPT) probes were advanced adjacent to select building borings. The results of the CPT testing, expressed as cone and sleeve resistance and pore pressure, are provided in Appendix B.
- Laboratory Testing: The determination of index and engineering properties of selected soil samples by performing geotechnical laboratory testing on selected soil samples. The results of the testing program are incorporated in this report.
- Engineering Evaluations & Reporting: The performance of engineering analyses for pertinent design recommendations and the development of this report.

### 1.3 Procedures

This investigation followed procedures established by our firm as routine for a geotechnical investigation of this nature with sampling and analyses in general accordance with appropriate guidelines established by ASTM. Appendix A describes the field and laboratory procedures utilized to accomplish this geotechnical investigation.

### 1.4 Limitations and Considerations

The analyses and recommendations presented in this report are based upon the assumption that the soil borings and CPT probes made for this investigation represent the soil and groundwater conditions throughout the site. Variations in soil or groundwater conditions may occur between or away from the boring locations. If conditions different from those described in Section 3 are encountered or are expected, this office should be promptly notified so that the effects of the varying conditions can be determined, and any necessary changes to these analyses and recommendations can be made.

This report has been prepared for the exclusive use of Ascension Hotels, LLC and GWS Engineering, Inc for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either expressed or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. This investigation program and these recommendations are intended for specific application to the project generally described in Section 2 at the site described in Section 3.1. The data or the analyses and recommendations presented in this report are not necessarily applicable for any other project or location. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

## **2.0 PROJECT INFORMATION**

The following paragraphs present the project information that was available at the time this report was prepared. Should this information be incorrect, or change significantly, please contact this office so that our analysis and recommendations can be reevaluated.

### **2.1 Information Sources**

Information related to this project was provided by Mr. Jeff Cook with GWS Engineering, Inc. The information provided included a plan view drawing of the proposed development.

### **2.2 Anticipated Construction**

We understand that Ascension Hotels, LLC is planning to build a new TownePlace Suites to be built off of Outfitter's Drive in Gonzales, Louisiana. It is understood that the new building will be a four-story structure and approximately 15,000 square feet in size. The structure will likely be constructed using wood frame or light gauge metal stud construction. A pool and deck will be constructed on the west side of the planned construction. Pavement design will likely include light to medium-duty traffic.

Additionally, we assume that one to two feet of compacted fill material may be placed to achieve the final grade. No excavations other than those for foundation and miscellaneous small utility construction will be required.

### **2.3 Anticipated Loads**

Although loading estimates were not furnished, we expect that maximum spot or continuous loads will not exceed 100 kips or 4 kips per lineal foot, respectively.

Should actual loading conditions vary by more than 10 percent from those presented here, this office should be notified so that the effects of the variations can be analyzed.

## **3.0 SITE CONDITIONS**

In a geotechnical investigation of this nature, local topography and surface conditions, geologic setting and site-specific soil and groundwater conditions are important. The following paragraphs summarize our findings relative to these topics.

### **3.1 Physical Setting**

The site is located off Outfitter's Drive in Gonzales, Louisiana (see Figure 1). At the time of our exploration, the site consisted of an open grass lot area. The site was relatively level and exhibited a maximum elevation difference of approximately 1 foot. Standing water was not present; however several soft areas were exhibited at the time of our investigation. Our drilling equipment was able to traverse the site with little difficulty.

### **3.2 Geologic Setting**

The property is located within an area of Prairie Terrace deposits of Pleistocene age. These deposits typically consist of silty clays and clays with some sand layering. They usually provide good foundation support for relatively light to moderate structures. Heavy structures typically require a deep foundation system for support.

### **3.3 Soil Conditions**

Beneath approximately 3 to 4 inches of organic laden soil, the soil borings encountered stiff to very stiff silty clay (Unified Soil Classification System Symbol, CL) and clay (CH) "crust" in the upper 4 to 6 feet. Soft to firm silty clays (CL) and clays (CH) were present from 6 to 9 feet. From 9 to 20 feet, stiff silty clays (CL) and clays (CH) were identified. Below 20 feet, very stiff silty clays (CL) and clays (CH) were present to through the maximum probe termination depth of 24 feet. Intermittent silt (ML) and sand (SM) layers were noted below 10 feet by the CPT probe.

The soil boring logs in Appendix A include the field and laboratory data collected and a description of soil conditions specific to each boring. The CPT logs located in Appendix B provide the results of the CPT data and include interpretations of soil types, undrained shear strength and standard penetration resistance based upon empirical correlations of the data.

### **3.4 Groundwater Conditions**

As described in Appendix A, the soil borings were dry-augered to document groundwater conditions at the time of our investigation. At Borings B-1 through B-4, measurable groundwater was observed at depths ranging from 8 to 8.5 feet during drilling. After allowing the water level to stabilize for 20 minutes, the depth to water was measured to be 2 to 4 feet below the ground surface. The remainder of the borings did not encounter groundwater. Groundwater levels will vary with rainfall, relative permeability of the soil, and other seasonal variations. The depth to groundwater should be verified prior to the initiation of activities that could be impacted by groundwater.

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## **4.0 GEOTECHNICAL CONSIDERATIONS**

The information provided by the architect for this project has been combined with our findings from the site investigation to develop guideline recommendations for the foundation and pavement design.

Provided the site preparation activities outlined in this report are implemented, the soil conditions are conducive for support of the planned structure using shallow foundations.

## **4.1 Site Preparation**

A critical aspect of the successful construction project is site preparation. Good site preparation is also critical to the overall performance of the foundation system(s) for the building. This section provides recommendations for site drainage, clearing, excavations, and fill placement.

### **4.1.1 Site Drainage**

At the time of our exploration, the site was relatively flat, and appeared to be fairly drained. The surficial silty clay (CL) and clays (CH) can be expected to lose strength and can be subject to softening, if exposed to construction activities during seasonal wet periods.

If the contractor controls drainage and limits construction disturbance, these soils may remain stable. However, if an area becomes disturbed and begins to "pump" under construction traffic, the area should be properly mitigated. Mitigation may likely include processing to remove excess moisture or limited overexcavation and backfilling. However, the mitigation method should be as recommended by the geotechnical engineer at the time of construction.

### **4.1.2 Clearing, Grubbing and Proof-Rolling**

At the time of our exploration, the site vegetation cover consisted of short grass cover. Organic laden soil and roots extended to about 4 inches. Grubbing should be minimized to preserve the stiff to very stiff clay "crust". Objectionable materials that should be removed include: stumps, roots, organic laden soil, organic matter, and any rubble or debris that may be present. Soils containing objectionable materials should not be used for backfill.

After the site has been adequately cleared for fill, pavement or foundation placement, the entire area to receive fill, paving or building foundations/slabs should be proof-rolled with a weighted (15 Tons to 25 Tons), rubber tired vehicle to observe for the presence of weak, yielding or pumping foundation soils. Based on site observations at the time of drilling, some isolated areas of soft or wet surface soils can be anticipated. If such areas are encountered, they should be mitigated. The soft areas should be over excavated until competent soils are encountered and properly backfilled with compacted engineered fill. Undercut depths on the order of 3 feet may be needed at some locations. The geotechnical engineer should be notified at the time of construction to determine the extent of overexcavation that will be required to mitigate the soft areas.

### **4.1.3 Excavations**

Shallow foundation excavations placed into the firm to stiff silty clay (CL) and clays (CH) should stand on near vertical slopes for short-term conditions. Based on soil and groundwater conditions at the time of our exploration, groundwater seepage is not expected in excavations to a maximum depth of 2 feet. However, the depth to groundwater should be evaluated before excavations are placed.

The contractor should be advised that all excavations must be made and kept in compliance with the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) regulations. These regulations require that excavations greater than 5 feet in depth be sloped, benched, sheeted, or braced to protect employees working in the excavation against the risk of cave-in. The contractor should select an excavation design/protocol that satisfies the regulations and site constraints.

#### 4.1.4 Fill Materials

Imported fill used to bring the site to grade should be either a low plasticity silty or sandy clay (USCS classification, CL), or a clayey sand (SC). The sandy soils are easier to work during wet weather, but the lean clay is less susceptible to erosion and typically provides better long-term support. Fill materials should be free of roots, construction or flood debris, organic matter or any other type of deleterious matter. Imported clayey soil should have a liquid limit of less than 45 and a plasticity index of between 8 and 25.

#### 4.1.5 Fill Placement/Compaction

Soil material to be used as fill should be placed in loose lifts graded to provide a uniform thickness not exceeding nine inches. The surface of each preceding, compacted lift should be lightly scarified to ensure adequate bonding between lifts.

The moisture content during compaction should be maintained within -2 to +5 percent of its optimum as determined by the standard Proctor compaction test (ASTM D 698). The minimum compaction requirements are a function of the future use of the area. These requirements are as follows:

- Structural Fill: (beneath footings, building pads or parking/driveway areas) at least 95 percent of its maximum density as determined by the standard Proctor compaction test (ASTM D 698), and
- Grading Fill: (outside of the areas listed above) at least 90 percent of its maximum density as determined by the standard Proctor compaction test (ASTM D 698).

#### 4.2 Shallow Foundations

Shallow foundations supporting column and wall loads at approximately 100 kips, and 4 klf, respectively, can be used to support the new building and ancillary structures. In order to utilize the existing stiff to very stiff clay "crust", foundations should be placed as high as possible. The final grade and protection for the footings should be established by placement of fill material. Footings should bear at a minimum depth of 24 inches below *finished* grade. Figure 3 provides recommendations for design and construction of shallow foundations.

#### 4.3 Deep Foundations

To limit the potential for post-construction settlement, the new building could be placed on a deep foundation system. Drilled and cast in place concrete shafts appear to be a viable option for this project site. Concrete shafts are particularly efficient in resisting uplift and horizontal forces. The following paragraphs provide additional design information and recommendations for installation of deep foundations.

##### 4.3.1 Axial Capacities

Figure 4 lists the recommended soil parameters for use in the calculation of capacities. That figure also lists recommended ultimate adhesion (skin) resistance along the shaft that should be used for design and ultimate end bearing of the shaft base. Limiting adhesion values at the shaft/soil interface are based upon empirical approximations. End bearing is based upon classical bearing capacity theory with appropriate depth restrictions. The parameters provided in

Figure 4 can be used to design the deep foundation system. The values provided in Figure 4 are **ultimate**. Minimum safety factors recommended for this site are presented in the inset table.

Minimum Safety Factors-Axial Loads		
Support Condition	Static Loads	Transient Loads
Skin Friction	2.0	1.5
End Bearing	2.5	2.0

**Allowable** compression and uplift capacities for various shaft diameters and installation depths are illustrated on Figure 5. The charts on Figure 5 provide allowable capacities to a depth of 24 feet.

The allowable capacities illustrated on Figure 5 reflect an adequate factor of safety for sustained loading conditions. The values derived from the charts may be increased by 30% for transient (wind) loading conditions. The capacities provided herein consider failure at the shaft/soil interface, and bearing failure only. Provisions for structural design of the foundation units have not been made. Structural design of the foundations should be performed by a licensed structural engineer.

### 4.3.2 Lateral Capacities

Concrete shafts capable of supporting the axial loads should be adequate to resist the anticipated lateral loading. However, a more detailed analysis of lateral load capacity should be performed after the actual loading conditions have been determined and after the foundation type has been selected.

## 4.4 Pavement Recommendations

The following sections present our guideline recommendations for pavement design and construction. Based on experience with similar projects and these soil conditions, a Portland cement concrete (rigid) pavement system is recommended for the proposed project.

The pavement designs (e.g., pavement section thicknesses) were performed for estimated traffic types and volumes based upon assumed traffic conditions. A more pertinent pavement design would require a better understanding of the traffic conditions expected.

### 4.4.1 Subgrade Preparation

Subgrade preparation for pavement construction should consist of proof-rolling the entire parking and driveway areas as described in Section 4.1, with mitigation of unstable conditions that may be encountered as recommended by the geotechnical engineer at the time of construction.

Depending on the time of the year that construction is implemented, undercutting and replacement of the soft soils, drying/processing, and or the use of lime treatment may be necessary to achieve stable subgrade conditions.

Subgrade stability is a transient condition affected by precipitation and disturbance from construction activities. A proof-roll should be performed and documented by a representative of our geotechnical engineer within a maximum of 48 hours of the planned concrete placement to confirm that stability is present.

#### 4.4.2 Pavement Design Assumptions

Rigid pavements (concrete) should be designed based on a subgrade resilient modulus ( $M_r$ ) of 5,000 pounds per square inch (psi) for stable in-place soils or compacted engineering fill.

Anticipated traffic volumes and loading conditions for this facility were not provided, but were assumed based on experience with similar projects. The pavements within the facility may likely be a combination of standard duty (passenger vehicles only) and heavy duty traffic areas. Traffic estimates used in the determination of required pavement thicknesses assume a 20-year design period and are summarized in the following insert table.

Traffic Volumes Assumed for Analysis	
Traffic Type	Estimated Traffic (vehicles/lane/day)
	Standard Duty
Automobiles	400
2-axle and 3-axle Trucks	2
4-axle Delivery Trucks	None
5-axle Semi-Trailer Trucks	None

The architect or engineer responsible for the final pavement design should review this traffic information for accuracy. If these traffic assumptions are not correct, please advise this office so that the pavement designs can be re-analyzed and revised thickness designs developed.

#### 4.4.3 Rigid Pavement Thickness Design

Rigid pavements should be designed and constructed using a minimum 6-inch plain concrete pavement thickness over a stable uniformly compacted subgrade or compacted stable engineering fill.

#### 4.4.4 Rigid Pavement Construction Considerations

The following information is provided for information purposes and is derived from ACI330R-01 "Guide for Design and Construction of Concrete Parking Lots". It is recommended that the design engineer refer to this document for more detailed information.

**4.4.4.1 Concrete Strength and Mix Design.** The concrete used for the pavement should consist of a pavement mix with a minimum 28-day compressive strength of 4,000 pounds per square inch or a minimum 28-day flexural strength of 600 pounds per square inch. The mix design should be proportioned to provide adequate durability and have adequate workability for efficient placement, finishing and texturing.

**4.4.4.2 Contraction Joints.** Rigid pavements should be constructed with transverse contraction joints spaced not more than 12.5 feet on center for 6-inch thick pavement. A thickness of 7 inches is recommended for driveway entrances. Contraction joints should also be located in the longitudinal direction with spacing of not greater than 12.5 feet. These contraction joints should be either grooved (tooled) or saw cut. Begin saw cutting as soon as the concrete allows but not greater than 4 to 6 hours after concrete placement when using an early-entry saw. The depth of the contraction joint should be at least 1/4 to 1/3 of the slab thickness. Aggregate interlock joints will be sufficient reinforcement for the contraction joints.

**4.4.4.3 Construction Joints.** Construction joints provide the interface between areas of concrete placed at different times. Construction joints should be installed at the intended location of contraction joints in order to prevent odd-sized slabs. Construction joints in the Standard Duty pavement areas should consist of either butt joints or thickened edge butt joints. Construction joints in Medium/Heavy Load Condition pavement areas should consist of either, butt joint, thickened edge butt joints, or keyed joints. Keyed joint should only be used in pavements that have a thickness greater than 6 inches. Keyed joints can be either slip-formed or formed. If keyed joints are used, it is important that the keyways have proper dimensions to avoid creating weak joints. The key could consist of either a trapezoidal key or a half-round key. For either of these designs, the total height of the key should not exceed 20% of the slab thickness (0.2d) and the center of the key should be located in the center of the slab. Metal forms with improper keyway dimensions or "leave-in-place" keyed shapes should not be used. Thickened edges for thickened edge butt joints should begin 3 feet from the joint with the pavement thickness at the joint increased to at least 20% of the original pavement thickness or 2 inches, whichever is greater.

**4.4.4.4 Isolation (Expansion) Joints.** Concrete pavement slabs should be separated from permanent structures or fixed objects (buildings, light standard foundations, drop inlets, etc.) using isolation or expansion joints. Expansion joints are not recommended for routine use as regularly spaced joints as they are difficult to construct, difficult to maintain, and are subject to the development of pavement distress and premature failure. Isolation joints are full-depth vertical joints usually filled with a compressible material. Where subject to traffic and wheel loadings, we recommend that the isolation joints be constructed with the free edge thickened by at least 20% of the original pavement thickness or 2 inches, whichever is greater.

**4.4.4.5 Joint Reinforcement.** The use of dowels is not recommended in pavements that are 7 inches or less in thickness. Tie bars should be used to tie only the first longitudinal joint from the pavement edge in order to keep the outside slab from separating from the pavement. Tie bars are not required in interior joints of parking lots or other wide paved areas. Tie bars should be used on the centerline longitudinal joints of entrance driveways and access roads if there are no curbs. Tie bars should consist of 1/2-inch by 24-inch deformed bars spaced 30 inches on center.

**4.4.4.6 Joint Design and Location.** The design, location, and construction of pavement joints should be in accordance with the recommendations of the American Concrete Institute in ACI publication ACI330R-01 "Guide for Design and Construction of Concrete Parking Lots". Care should be taken to provide additional joints, and possibly wire reinforcement in odd-shaped slabs in order to prevent random cracking.

#### **4.4.5 Garbage Dumpster Pad**

A garbage dumpster pad may be constructed at this site. The garbage dumpster pad should be large enough to hold the largest expected container with approximately 3 to 5 feet of extra space on each side. Additionally, the pad should contain an approach apron on the loading side of the pad that is large enough to accommodate half the length of the anticipated collection vehicle. Additional apron area should be provided if the waste vehicles will be making turning movements in the vicinity of the pad. The pad for garbage dumpsters should be designed as a structural slab for the anticipated loading conditions. A typical design for small to medium containers would

consist of an 8-inch thick concrete slab with a mat of reinforcing steel. Reinforcement should consist of No. 4 bars spaced at 12 inches on center in both directions having a minimum cover of 2 inches. Tooled contraction joints should be provided at intervals that will provide a slab size that does not exceed 20 feet by 20 feet. Expansion joints should not be placed in these pads, unless they are required where the container pad directly abuts a building or other fixed structure.

## **5.0 QUALITY CONSIDERATIONS**

This report is issued as a preliminary design tool. Subsequent designs may alter the current assumptions regarding site construction, and recommendations of this report may not be applicable. This report contains recommendations for design and for construction practices related to site preparation, pavement design, and foundation design. Several recommendations have been made in this report, which assume that the conditions required for the design recommendations have been provided. Certain quality considerations are essential to the satisfactory design and construction of this project.

### **5.1 Review of Plans and Specifications**

This report will be used to provide data and recommendations to the designers for site preparation and foundation design. During final design, questions may arise which require further review of site conditions, clarification of the recommendations provided in this report or development of more specific recommendations. We are available to resolve any questions or needs for clarification of the recommendations presented in this report.

If modifications to the construction plans are made during final design, the recommendations of this report may not apply. Terracon should review the final plans and specifications for this project prior to bidding. This review is also necessary to ensure that the recommendations of this report have been properly communicated, and that the plans and specifications adequately reflect these recommendations.

### **5.2 Geotechnical Engineer-of-Record**

The construction process is an integral design component with respect to the geotechnical aspects of a project. Because geotechnical engineering is an inexact science due to the variability of natural processes and because we sample only a small portion of the soils affecting the performance of the proposed structure, unanticipated or changed conditions can be disclosed during grading and foundation construction. Proper geotechnical observation and testing during construction is required to allow the geotechnical engineer the opportunity to verify assumptions made during the design process. Therefore, Terracon should be retained during the construction to observe compliance with the design concepts and geotechnical recommendations, and to recommend design changes in the event that subsurface conditions or methods of construction differ from those assumed while completing this report.

If these services are provided by others, Terracon will cease to be the Geotechnical Engineer-of-Record at the time another consultant or testing entity is retained for monitoring the construction process, and we cannot assume responsibility for any potential claims that may arise during or after construction as a result of varying conditions, misuse or misinterpretation of our report by others.

### **5.3 Construction Quality Testing and Consulting**

This report contains recommendations for construction practices related to site preparation, pavement construction, and foundation construction. Failure to comply with the recommendations of this report can create conditions which are detrimental to the success of the project, and an inferior product can result. Therefore, documentation of the contractors' compliance with these practices is considered a necessity.

Construction Quality Control (the collection of field and laboratory data to document conformance with specifications) and Quality Assurance (the collection and evaluation of test results and frequencies to confirm that the objectives of construction are met) are an integral part of the successful construction project. These quality control and quality assurance services should be provided by Terracon as the Geotechnical Engineer-of-Record.

Subsequent to our review of the project plans and specifications, we should provide a construction quality testing plan.

## FIGURES

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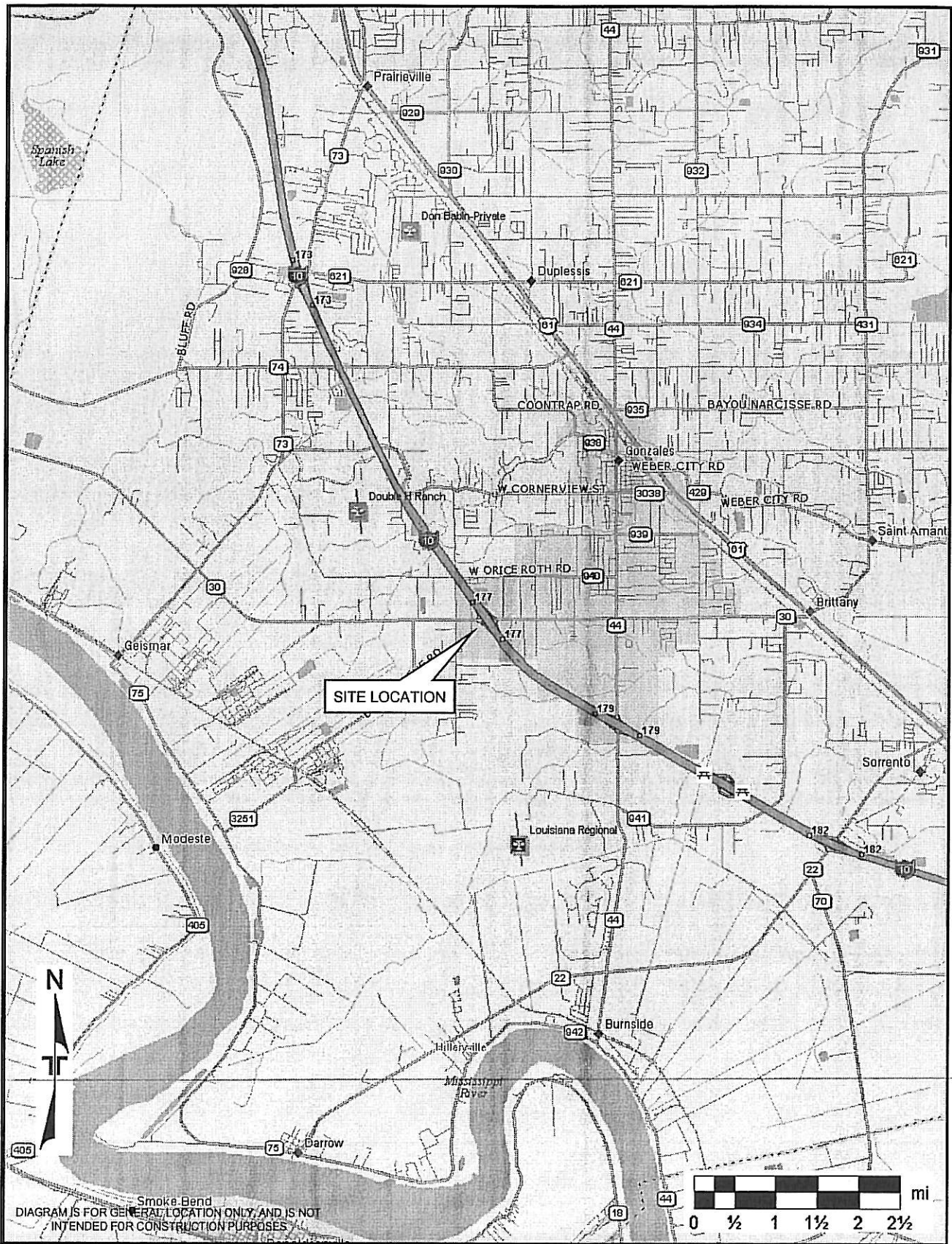


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager: EPT  
 Drawn by: DMR  
 Checked by: EPT  
 Approved by: DJA

Project No. EH105051  
 Scale: Shown Above  
 File Name: TownePlace1  
 Date: 03/25/2010

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SITE VICINITY DIAGRAM  
 TOWNEPLACE SUITES  
 GONZALES, LOUISIANA

FIGURE  
 1



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

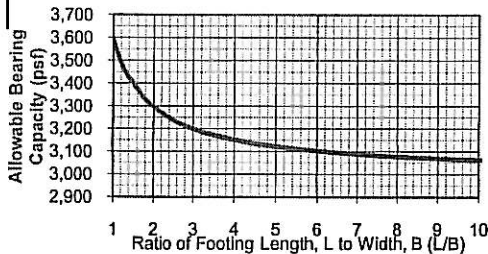
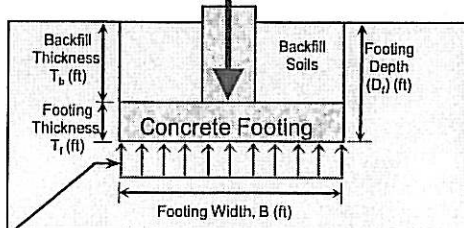
ING & CPT PROBE LOCATION DIAGRAM

TOWNEPLACE SUITES  
GONZALES, LOUISIANA

FIGURE

2

## Compressive Load, $P_c$



Summary of Bearing Capacity	
Square	3,500 psf
Continuous	3,000 psf

## Notes Regarding Bearing Stratum and Depth

In order to achieve the bearing capacity values noted on the adjacent chart, the footings should bear in the material visually described as stiff to very stiff brown and light gray silty clay (CL) and clay (CH) or compacted engineering fill. Minimum footing widths are 24 inches for square footings and 16 inches for continuous footings.

Footings should bear at a depth of at least 24 inches below *finished* grade. Foundations are to be placed as close to *existing* grade as possible. Imported fill should be used to protect the footings and to establish the *finished* grade. The following precautions are recommended to protect the bearing surfaces from degradation:

Verify that the excavations are completely within the material described above as the bearing stratum and remove and replace any unacceptable soils using the provisions noted on Section 4.1

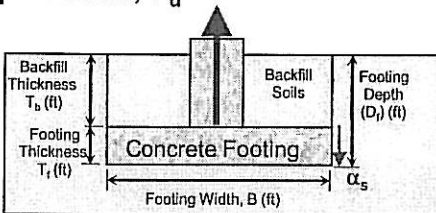
Provide positive drainage away from the foundations, both during and after construction,

Avoid excavations during inclement weather and place concrete within the excavations within 24 hours after completion of the excavations,

Remove any free water in the excavation prior to placing concrete,

Place a "mudmat" of lean concrete to seal the bearing stratum in the event wet conditions are experienced or expected, and

## Uplift Load, $P_u$



$$\text{Allowable Uplift Resistance } q_u \text{ (lbs)} \\ = W + \alpha_s$$

$W$  = Weight of soil and concrete

$$W = B^2 \times (T_f \times 83 + T_b \times 60)$$

$\alpha_s$ : Adhesion along perimeter of footing

$$\alpha_s = 4B \times T_f \times 300$$

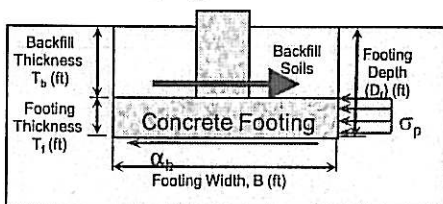
## Shallow Foundation Settlements

Shallow foundations that are designed for loads not exceeding 100 kips, or 4 klf, as noted in Section 2, and bearing at pressures as noted on the adjacent graph, are expected to settle as much as 1 inch total. Differential settlements of up to 3/4 inch over 50 feet are possible.

Approximately 1/2 of the settlement should occur within 3 months of construction. The majority of the remaining 1/2 of the settlement should occur within 12 months of construction.

This estimate of settlement is approximate, based upon our experience with similar soils in this geologic setting. A more detailed calculation of settlements, using consolidation test data would be necessary to more accurately predict the settlements that will occur.

## Lateral Load, $P_L$



$$\text{Passive Pressure Component, } P_p \text{ (lbs)}$$

$$= \sigma_p \times T_f \times L$$

where:

$$\sigma_p = 60(T_b + T_f / 2) + 1000$$

$$L = \text{Footing Length (ft)}$$

Adhesion Component,  $\alpha_b$

$$= B \times L \times 500$$

NOTE:  $\alpha_b = 0$  if uplift loading is present

## Shrink/Swell Potential

The soils which form the bearing stratum are relatively lean clays, and the shrink/swell potential is expected to be low. If the soils are allowed to dry significantly before foundation construction, the potential for swell after construction is greater.

This estimate of shrink/swell is approximate, based upon our experience with similar soils in this geologic setting. A more detailed calculation of shrink/swell, using swell test data would be necessary to more accurately predict the movements that will occur.

## Design and Construction

### Shallow Foundations

TownePlace Suites  
Gonzales, Louisiana

Engr: DJA  
EH105051

**Terracon**

Fig. No.  
3

Depth (ft)	USCS <sup>(2)</sup> Classification	Stratum No.	Unit Weight (pcf) <sup>(3)</sup>	Effective Overburden Stress (psf)	Ultimate Soil Parameters <sup>(1)</sup>				
					Cohesion (psf)	Friction Angle, $\phi$	Skin Friction (psf)	End Bearing (psf)	Passive Earth Pressure Coeff., Kp
2	CH	II	61	121	0	0	0	2250	1.00
4	CH	III	61	242	0	0	0	2250	1.00
6	CH	IV	61	364	500	0	500	7200	1.00
8	CH	IV	61	485	500	0	500	7200	1.00
10	CH	V	58	600	1100	0	781	12600	1.00
12	CH	V	58	715	1100	0	781	12600	1.00
14	CH	VI	58	830	1700	0	833	15300	1.00
16	CH	VI	58	946	1700	0	833	16155	1.00
18	CH	VI	58	1061	1700	0	833	17100	1.00
20	CH	VII	58	1176	2100	0	823	17955	1.00
22	CH	VII	58	1291	2100	0	823	18900	1.00
24	CH	VII	58	1406	2100	0	823	18900	1.00

Notes:

- (1) Values shown are ultimate. Appropriate safety factors should be applied.
- (2) USCS: Unified Soil Classification System.
- (3) Data provides for buoyant conditions where necessary.

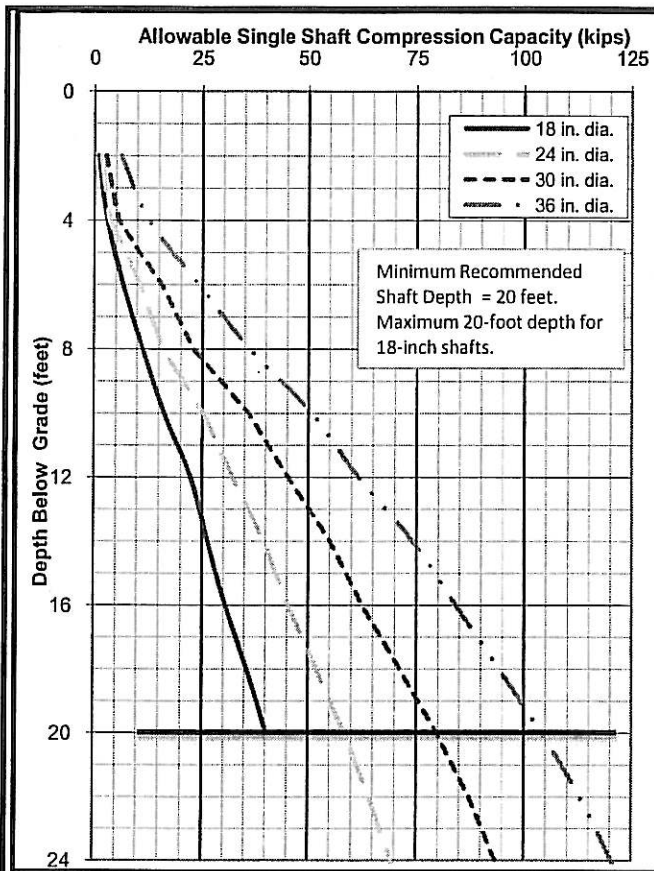
**Recommended Soil Properties  
Drilled Shafts**

TownePlace Suites  
Gonzales, Louisiana

Engr. DJA  
EH105051

**Terracon**

Fig. No.  
4

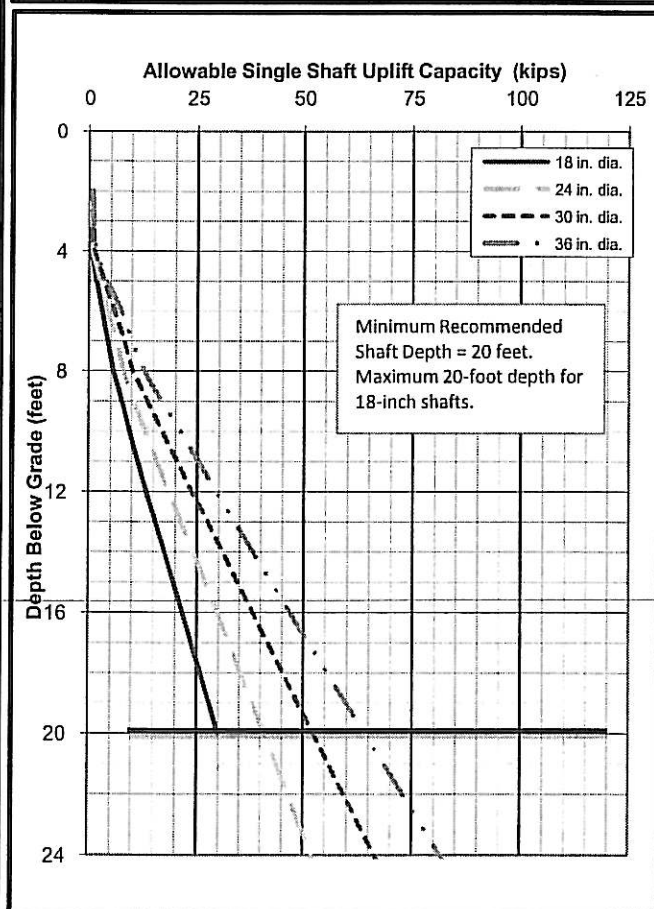


**Notes Regarding Design Capacity**

The chart provides preliminary estimates of allowable capacity estimates for individual, drilled shafts in static loading. The capacities can be increased by 30% to design for highly transient maximum loading conditions. Observation of shaft installation is necessary to confirm actual shaft capacities, and, therefore, required shaft lengths. Capacity predictions account for adhesion along the shaft/soil interface (with empirically applied limiting adhesion factors) and end bearing at the tip of the shaft. The adhesion along the upper 4 feet of the shaft is neglected. No consideration of the structural capacity of the shaft has been made. This should be performed by a structural engineer. The capacity predictions should be verified with a field-scale load test of the pile sizes planned for construction. The test shafts should be loaded to a minimum of 200% of its design capacity. The load test results should be interpreted by this firm, and a final design capacity can be derived from the load test program. For shaft groups, the final design should be checked to evaluate the need for group efficiency reductions. No consideration has been given to decreased capacities that would occur as a result of fill-induced downdrag, if applicable. If significant lateral loads are expected an analysis of lateral load deflection should be performed. Full time quality control observations of shaft installations by a representative of this office is required in order to confirm the design predictions.

**Settlements Relative to Shaft Length**

Shafts installed into the stiff to very stiff silty clays and clays below 20 feet should experience minimal settlements. Movements of less than one inch are expected for the design loads. These movements are associated with the loading from the structure and would be in addition to any fill-induced settlements.



**Installation Recommendations**

The shaft excavations can probably be dry augered to 5 feet. The contractor should have a temporary steel casing available in the event near surface sloughing occurs, but should limit the length to no greater than 8 feet. Shaft excavations below about 5 feet may need to be completed using the mud-slurry technique where the hole stability is maintained by placing a bentonite mud and water slurry in the hole until the concrete is placed. The concrete for the drilled shafts should be a flowable mix with a slump of 6 to 7 inches. A coarse/fine aggregate ratio of approximately 1:1, with a coarse aggregate maximum nominal size of 3/4-inch should be used. The concrete should be placed immediately after excavation of the shaft by pumping or tremie methods to the base of the excavation. The discharge should be placed at the base of the excavation prior to pumping the concrete, and the discharge should be continuously raised during the excavation, but at least five feet of concrete head should be maintained over the discharge. Reinforcing steel should include centralizers to maintain position within the shaft. The steel cage should hang from the top and not be allowed to rest on the bottom of the excavation.

**Design and Installation Information  
Drilled and Cast in Place Concrete Shafts**

TownePlace Suites Gonzales, Louisiana	
Engr. DJA EH105051	<b>Terracon</b>
Fig. No. 5	

# **APPENDIX A**

**DESCRIPTION OF FIELD AND LABORATORY PROCEDURES**

**SOIL BORING LOG(S)**

**SOIL BORING LEGEND**

---

## Appendix A Description of Field and Laboratory Procedures

This geotechnical investigation was conducted utilizing standard procedures developed by Terracon Consultants, Inc. (Terracon) for investigations of this nature. The following paragraphs describe the field and laboratory procedures utilized. One or more soil borings were performed for this study. This Appendix includes detailed soil boring log(s) which present the data collected and provide a description of soil and groundwater conditions encountered. This Appendix also provides a legend that describes the terms and symbols used in the boring log(s).

### FIELD INVESTIGATION

The field activities included a site reconnaissance to document site characteristics pertinent to the geotechnical investigation and the conduct of a soil exploration program. The information collected during the field investigation was documented by a Terracon Engineering Technician.

#### Site Reconnaissance

The engineering technician walked the project site and documented observations that are of significance to the geotechnical investigation. Such observations include: topography, vegetation, trees, drainage, other structures, surface soil conditions, and trafficability.

These observations were reported to the project engineer in the form of field notes. The project engineer reviewed the results of the field reconnaissance with the engineering technician in a project meeting subsequent to the field investigation.

#### Soil Drilling and Sampling

The soil boring(s) were advanced using our track-mounted drilling rig and equipment at the approximate location(s) shown on Figure 2. The location(s) were measured from known points.

Soil Boring Advancement. The boring(s) were advanced by rotating a four-inch diameter, short-flight earth auger with the drilling rig, removing the auger from each boring, and cleaning the cuttings from the auger before sampling or reinserting the auger back into the bore hole. This technique allowed for the observation of soil cuttings and description of soil conditions encountered. This dry auger technique allows detection of free groundwater within the boring.

Soil Sampling. The soil sampling program included the collection of undisturbed and disturbed soil samples. Relatively undisturbed samples were obtained by pushing a three-inch diameter, Shelby tube sampler a distance of two feet into the soil in general accordance with ASTM D1587. Depths at which these undisturbed samples were obtained are indicated by a shaded portion in the "Samples" column of the attached boring log(s).

After the Shelby tube was removed from each boring, the sample was visually classified. Relative strength estimates of the sample were obtained by penetrometer readings. These penetrometer readings in units of tons per square foot are indicated by the symbol "(P)" in the "Field Test Results" column of each boring log. The Shelby tube was then sealed in the field to minimize moisture loss and transportation to the Terracon laboratory.

Groundwater Observations. During the soil boring advancement and sampling operation, observations for free groundwater were made. Information regarding water level observations is recorded in the "groundwater" column on the soil boring log(s). Other information regarding water level observations has been noted under "Groundwater Level Data" at the bottom of each log.

Boring Abandonment. Upon completion of the field investigation phase of this study, each boring was sealed in accordance with State regulations.

## LABORATORY TESTING

The soil samples were delivered to the Terracon laboratory for testing. The project engineer reviewed each field boring log and assigned laboratory testing on selected samples to provide the data necessary for the anticipated designs.

Laboratory testing was accomplished to determine the engineering properties of the soils encountered. These procedures are discussed below.

### Index Properties

Moisture Content. Moisture content tests were performed to better understand the classification and shrink/swell potential of the soils encountered. These tests were performed in general accordance with ASTM D 2216. The results of these tests are tabulated within the Laboratory Data section of the attached boring log(s).

Atterberg Limits. Liquid limit (LL) and plastic limit (PL) determinations were performed to assist in classification by the Unified Soil Classification System (USCS). These tests were performed in general accordance with ASTM D 4318. The plasticity index (PI) was calculated as  $LL - PL$  for each Atterberg limit determination. The results of these tests are tabulated within the Laboratory Data section of each boring log.

### Strength Tests

Unconfined Compression. The undrained shear strength of selected undisturbed soil samples was determined by means of unconfined compression tests (ASTM D 2166). In an unconfined compression test, a cylindrical sample of soil is subjected to a uniformly increasing axial strain until failure develops. For cohesive soils, the undrained shear strength, or cohesion, is taken to be equal to one-half of the maximum observed normal stress on the sample during the test.

The results of the unconfined compression tests are provided as undrained shear strength values within the Laboratory Data section of each boring log. Also shown are the natural water contents and unit dry weights determined as a part of each compression test.



PROJECT: Geotechnical Investigation  
 TownePlace Suites  
 Gonzales, Louisiana

**SOIL BORING LOG**  
**No. B-2**

FILE: EH105051  
 DATE: March 10, 2010  
 DRILLER: D. Dore'  
 TECH.: B. Alexander  
 ENGINEER: D. Aucutt

CLIENT: Ascension Hotels, LLC  
 Donaldsonville, Louisiana

SHEET 1 OF 1

FIELD DATA			LABORATORY DATA					Location: See Figure 2. Lat: 30° 12' 26.9" N Long: 90° 56' 56.6" W		Strata Break Depth	Soil Type	
Depth (feet)	Samples Groundwater Level	Field Test Results	Undrained Shear Strength (ksf)	Unit Weight (pcf) Moist Dry		Natural Moisture Content and Atterberg Limits Plastic Limit Moisture Content Liquid Limit			Plasticity Index PI			DESCRIPTION
		2.00 (P)									Very stiff tan and brown <b>CLAY (CH)</b> - with silt pockets  - with trace gravel below 2'	
	▽	2.25 (P)	2.23	127	102	19	53	25	34	4.0		
5		0.50 (P)									Firm tan <b>SILTY CLAY (CL)</b> - with ferrous nodules	
		0.25 (P)	0.82	123	97	19	35	27	16			
	▽	0.25 (P)						29				
10											10.0	Boring Terminated at 10 Feet.
15												
20												
25												

STRATA BOUNDARIES MAY NOT BE EXACT

Groundwater Level Data

Advancement Method

Notes

- ▽ First encountered at 8.5 feet.
- ▽ Rise to 3.4 feet after 20 minutes.

Short-flight Auger: 0' - 10'

4-inch topsoil

Abandonment Method

Boring backfilled with soil cuttings upon completion.



AQ LOG SLOGS.EH105051.GPJ AQUATERR.GDT 3/25/10




PROJECT: Geotechnical Investigation  
TownePlace Suites  
Gonzales, Louisiana

**SOIL BORING LOG**  
**No. B-4**

FILE: EH105051  
DATE: March 10, 2010  
DRILLER: D. Dore'  
TECH: B. Alexander  
ENGINEER: D. Aucutt

CLIENT: Ascension Hotels, LLC  
Donaldsonville, Louisiana

SHEET 1 OF 1

FIELD DATA			LABORATORY DATA						Location: See Figure 2.		Strata Break Depth	Soil Type
Depth (feet)	Samples	Groundwater Level	Undrained Shear Strength (ksf)	Unit Weight (pcf)		Natural Moisture Content and Atterberg Limits			Plasticity Index	DESCRIPTION		
				Moist	Dry	Plastic Limit	Moisture Content	Liquid Limit			PI	
						17 27 18 1			10	Stiff to very stiff brown <b>SILTY CLAY (CL)</b> - with roots, trace gravel and sand	2.0	
		▽	1.97	127	101	25				Stiff dark gray <b>CLAY (CH)</b> - with silt pockets and trace gravel	4.0	
5						25				Stiff tan <b>SILTY CLAY (CL)</b> - with ferrous nodules		
		▽	1.08	124	97	22 33 28 1			11			
10						25					10.0	
Boring Terminated at 10 Feet.												
STRATA BOUNDARIES MAY NOT BE EXACT												
Groundwater Level Data			Advancement Method						Notes			
▽ First encountered at 8.5 feet.			Short-flight Auger: 0' - 10'						3-inch topsoil			
▽ Rise to 4 feet after 20 minutes.			Abandonment Method									
			Boring backfilled with soil cuttings upon completion.									

AQ LOG SLOGS.EH105051.GPJ AQUATERR.GDT 3/25/10



PROJECT: Geotechnical Investigation  
 TownePlace Suites  
 Gonzales, Louisiana

**SOIL BORING LOG**

**No. B-6**

CLIENT: Ascension Hotels, LLC  
 Donaldsonville, Louisiana

SHEET 1 OF 1

FILE: EH105051  
 DATE: March 10, 2010  
 DRILLER: D. Dore'  
 TECH.: B. Alexander  
 ENGINEER: D. Aucutt

FIELD DATA			LABORATORY DATA						Location: See Figure 2. Lat: 30° 12' 28.2" N Long: 90° 56' 58.0" W		Strata Break Depth	Soil Type
Depth (feet)	Samples	Groundwater Level	Field Test Results	Undrained Shear Strength (ksf)	Unit Weight (pcf)		Natural Moisture Content and Atterberg Limits			Plasticity Index		
					Moist	Dry	Plastic Limit	Moisture Content	Liquid Limit		PI	
			1.00 (P)								Firm to stiff brown CLAY (CH) - with roots to 2' - slightly silty  - with trace gravel below 2'	4.0
			2.25 (P)				22	17	51	25		
5											Boring Terminated at 4 Feet.	
10												
15												
20												
25												
Groundwater Level Data			Advancement Method			Notes						
<input checked="" type="checkbox"/> No free water encountered during drilling to 4 feet.			Short-flight Auger: 0' - 4'			3-inch topsoil						
			Abandonment Method									
			Boring backfilled with soil cuttings upon completion.									

STRATA BOUNDARIES MAY NOT BE EXACT



AQ LOG S:\LOGS\EH105051.GPJ AQUATERR.GDT 3/25/10



PROJECT: Geotechnical Investigation  
 TownePlace Suites  
 Gonzales, Louisiana

### SOIL BORING LOG

No. B-8

CLIENT: Ascension Hotels, LLC  
 Donaldsonville, Louisiana

SHEET 1 OF 1

FILE: EH105051  
 DATE: March 10, 2010  
 DRILLER: D. Dore'  
 TECH.: B. Alexander  
 ENGINEER: D. Aucutt

FIELD DATA			LABORATORY DATA					Location: See Figure 2. Lat: 30° 12' 27.2" N Long: 90° 56' 55.6" W		Strata Break Depth	Soil Type
Depth (feet)	Samples Groundwater Level	Field Test Results	Undrained Shear Strength (ksf)	Unit Weight (pcf)		Natural Moisture Content and Atterberg Limits			Plasticity Index		
				Moist	Dry	Plastic Limit	Moisture Content	Liquid Limit			
		1.50 (P)					26	41		Firm to stiff black and dark gray SILTY CLAY (CL) - with roots	
		1.50 (P)					29	1	15		
							25			4.0	
5										Boring Terminated at 4 Feet.	
10											
15											
20											
25											

STRATA BOUNDARIES MAY NOT BE EXACT

Groundwater Level Data

Advancement Method

Notes

No free water encountered during drilling to 4 feet.

Short-flight Auger: 0' - 4'

3-inch topsoil

Abandonment Method

Boring backfilled with soil cuttings upon completion.



AQ LOG SLOGS.EH105051.GPJ AQUATERR.GDT 3/25/10



# SOIL BORING LEGEND

FIELD DATA			LABORATORY DATA					Location: Coordinate (North & East)		Soil Type																																											
Depth (feet)	Groundwater Level	Field Test Results	Undrained Shear Strength (ksf)	Unit Weight (pcf)		Other/Percent Finer	Natural Moisture Content and Atterberg Limits				Latitude Longitude																																										
				Moist	Dry		Plastic Limit	Moisture Content	Liquid Limit		Plasticity Index	Surface Elevation: Elev.																																									
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<i>Organic:</i> Containing remains of living organisms.																																																					
5 10 15 20 25	Auger Sample Pocket penetrometer reading 1.00 (P) Shelby Tube Sample Standard Penetration Test (blows/foot) 35 b/f 17-17-18 Split Spoon Sample No Recovery Rock Core Sample 1.00 (P) Probe Core Sample	CONCRETE FILL CLAY SANDY SILT CLAYEY SAND CLAYEY SILT SAND SILTY SAND SILTY CLAY CLAYEY SILT/SILTY CLAY SANDY CLAY GRAVEL	STRATA BOUNDARIES MAY NOT BE EXACT																																																		
<b>Groundwater Level Data</b> Water initially encountered during dry augering Groundwater level after a specified observation period Stabilized water level after an extended period of observation Actual depth to water may vary from the conditions observed in the borings. The presence of groundwater is masked in borings advanced by rotary wash methods.			<b>Advancement Method</b> Description of methodology used to advance soil boring		<b>Notes</b> Notes describing other laboratory tests or surface conditions.																																																
			<b>Abandonment Method</b> Description of methodology used to abandon or fill the completed borehole.																																																		



**APPENDIX B**

**CONE PENETROMETER TEST (CPT) PROCEDURES**

**CPT LOG(s)**

**CPT LEGEND**

**CPT CALIBRATION CERTIFICATE**

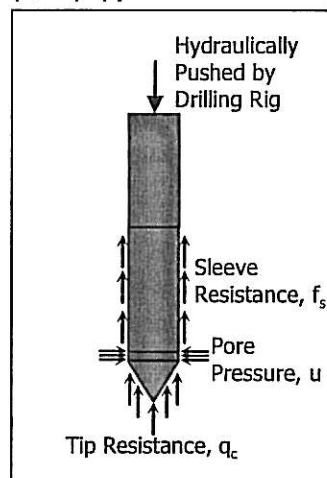
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## Cone Penetrometer Testing

The field investigation included the conduct of one or more Cone Penetrometer Test (CPT) probe(s) as directed by the project engineer. The location(s) are illustrated on Figure 2.

At each designated location, a CPT test was performed by pushing a 10-square centimeter electric cone penetrometer (cylindrical probe with a cone-shaped tip, equipped with electronic load sensors) with load cells to measure tip resistance and sleeve resistance. A pressure transducer is utilized to measure pore pressure at an approximate rate of 20 millimeters/second using the hydraulic cylinders of the drilling rig. The illustration shows the forces acting on the CPT device.

The probe measures the resistance to tip and sleeve penetration, pore pressure and inclination at 50 mm intervals during penetration. These data are transferred to an on-site computer using a cable transmission system. This process allowed the ability to continuously monitor the data as the cone was advanced in order to understand the resistance and inclination of the tool in a real-time fashion.



Upon completion of the testing, the data collected were downloaded directly from the CPT device to the on-site computer. The collected data were then interpreted using software provided by the manufacturer. The software interprets the basic information related to cone and sleeve resistance, pore pressure and inclination. It also allows interpretation of apparent soil behavior properties (for example clay, silt, sand, etc.) and soil parameters, such as undrained shear strength, standard penetration resistance, overconsolidation ratio and unit weight. The conventional field data from the soil boring and the available laboratory test results (presented in Appendix A) were used to correlate the CPT interpretations for this particular site.

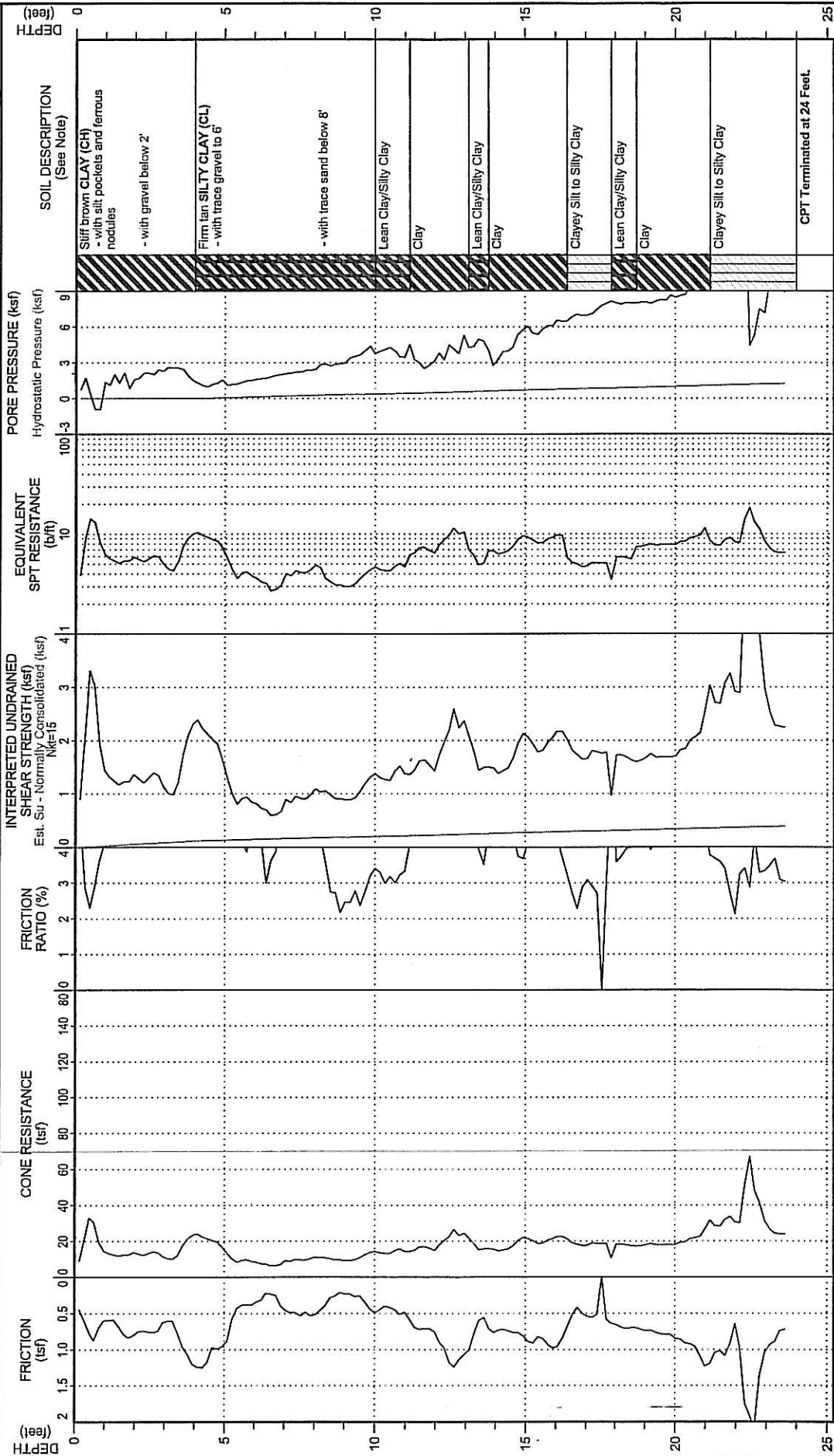
The testing and calibration of the CPT device was conducted in general conformance with ASTM D 5778. The Calibration Certificate for the CPT probe utilized on this project is presented in this Appendix.

The resulting CPT data are included in this Appendix. A description of the symbols and methods used as a part of the CPT effort is also provided in this Appendix.

PROJECT: Geotechnical Investigation  
 TownePlace Suites  
 Gonzales, Louisiana  
 CLIENT: Ascension Hotels, LLC  
 Donaldsonville, Louisiana

**CONE PENETROMETER TEST LOG**  
**CPT-1**  
 Associated Soil Boring: B-1

FILE: EH105051  
 DATE: March 10, 2010  
 DRILLER: D. Dore  
 TECH.: B. Alexander  
 ENGINEER: D. Aucutt



**Notes**  
 STRATA BOUNDARIES MAY NOT BE EXACT  
 Upper 10 ft. of interpreted Soil Description is taken from Laboratory Test Results and Visual Classification of soil samples as described in the associated Soil Boring Log. Below 10 ft. Soil Description is an interpreted behavior type based upon empirical correlations of cone tip and sleeve resistance.

Abandonment Method  
 CPT backfilled with soil cuttings upon retraction.

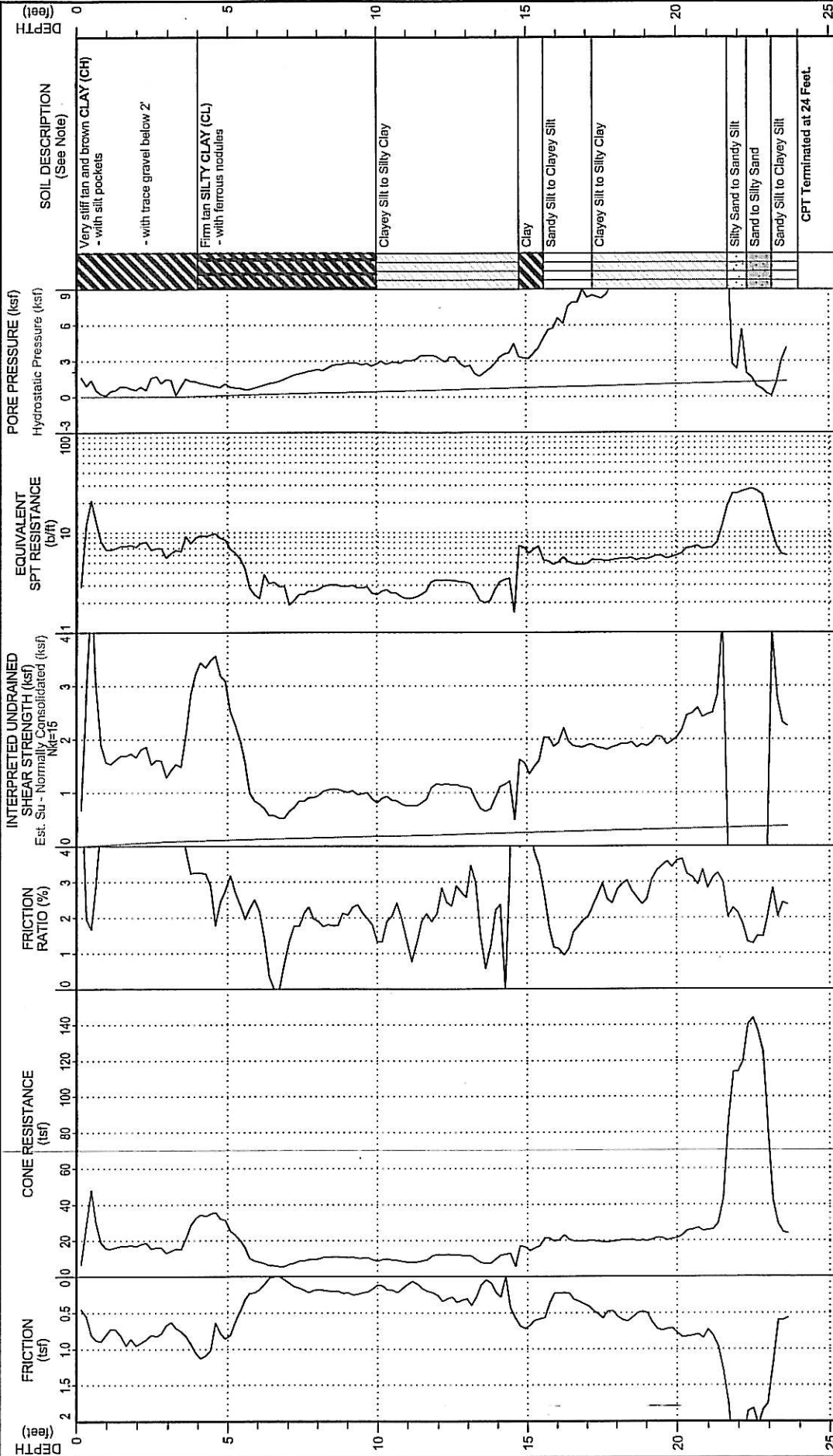


PROJECT: Geotechnical Investigation  
 TownePlace Suites  
 Gonzales, Louisiana  
 CLIENT: Ascension Hotels, LLC  
 Donaldsonville, Louisiana

**CONE PENETROMETER TEST LOG**  
**CPT-2**

FILE: EH105051  
 DATE: March 10, 2010  
 DRILLER: D. Dore  
 TECH.: B. Alexander  
 ENGINEER: D. Aucutt

Associated Soil Boring: B-2



**Notes**  
 STRATA BOUNDARIES MAY NOT BE EXACT  
 Upper 10 ft. of interpreted Soil Description is taken from Laboratory Test Results and Visual Classification of soil samples as described in the associated Soil Boring Log. Below 10 ft. Soil Description is an interpreted behavior type based upon empirical correlations of cone tip and sleeve resistance.  
 Abandonment Method  
 CPT backfilled with soil cuttings upon retraction.

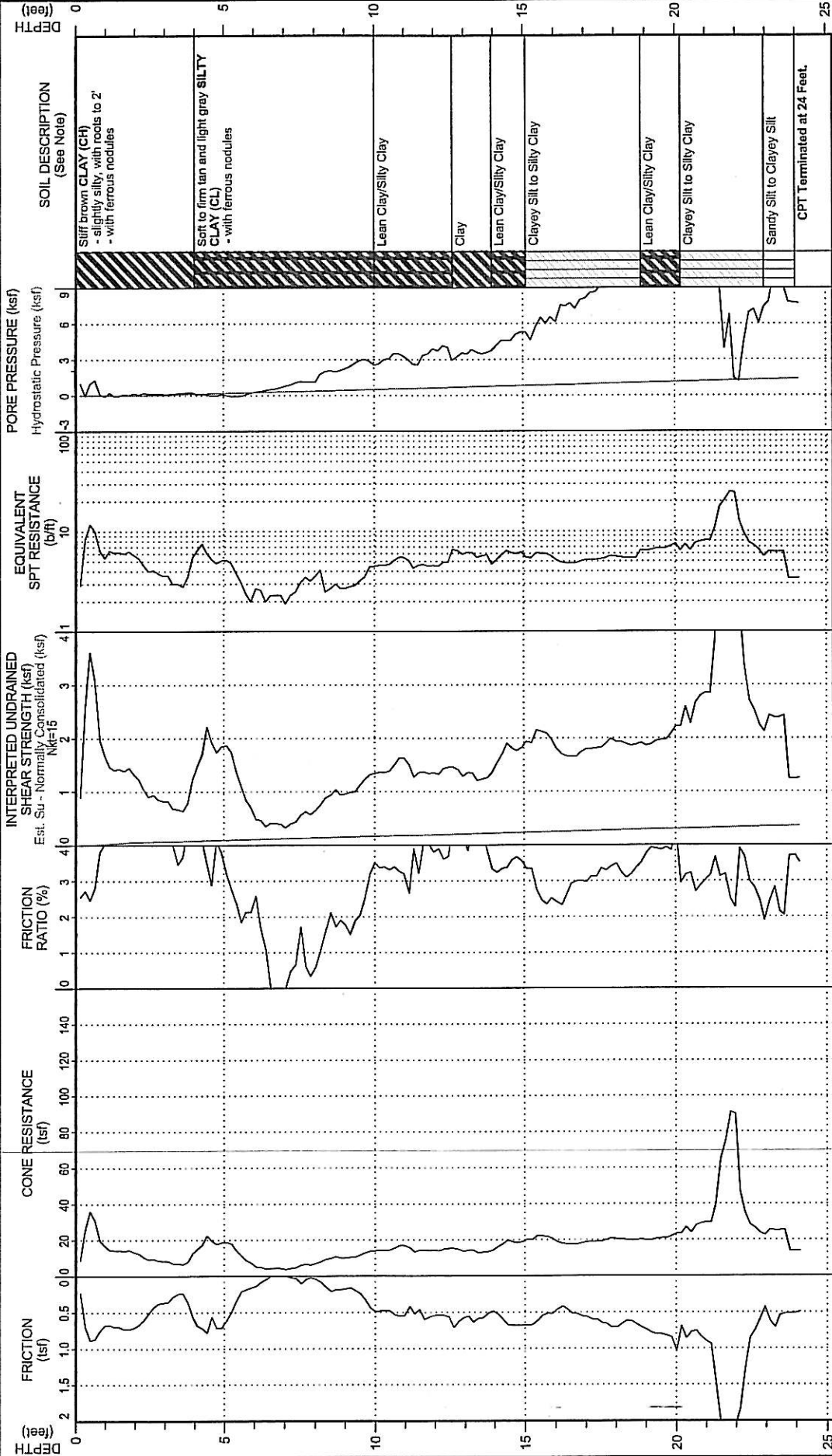


PROJECT: Geotechnical Investigation  
 TownePlace Suites  
 Gonzales, Louisiana  
 CLIENT: Ascension Hotels, LLC  
 Donaldsonville, Louisiana

**CONE PENETROMETER TEST LOG**  
**CPT-3**

FILE: EH105051  
 DATE: March 10, 2010  
 DRILLER: D. Dore  
 TECH.: B. Alexander  
 ENGINEER: D. Aucutt

Associated Soil Boring: B-3

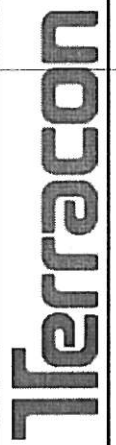


**Notes**

Upper 10 ft. of Interpreted Soil Description is taken from Laboratory Test Results and Visual Classification of soil samples as described in the associated Soil Boring Log. Below 10 ft. Soil Description is an interpreted behavior type based upon empirical correlations of cone tip and sleeve resistance.

Abandonment Method

CPT backfilled with soil cuttings upon retraction.



STRATA BOUNDARIES MAY NOT BE EXACT

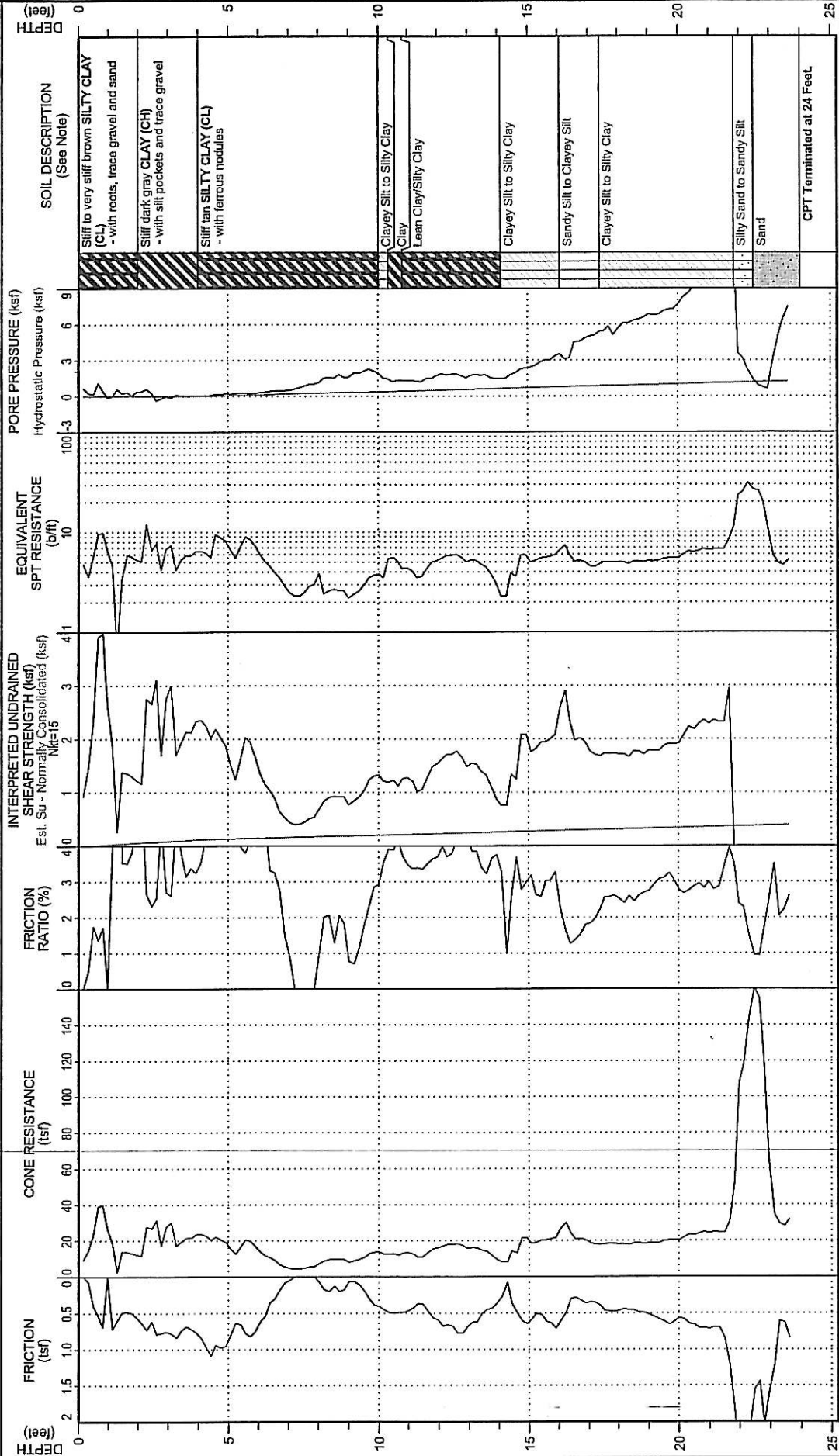
CPT Terminated at 24 Feet.

PROJECT: Geotechnical Investigation  
TownePlace Suites  
Gonzales, Louisiana  
CLIENT: Ascension Hotels, LLC  
Donaldsonville, Louisiana

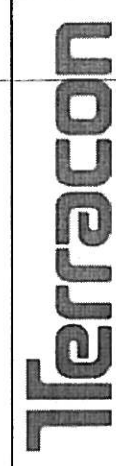
**CONE PENETROMETER TEST LOG**  
CPT-4

Associated Soil Boring: B-4

FILE: EH105051  
DATE: March 10, 2010  
DRILLER: D. Dore  
TECH.: B. Alexander  
ENGINEER: D. Aucutt

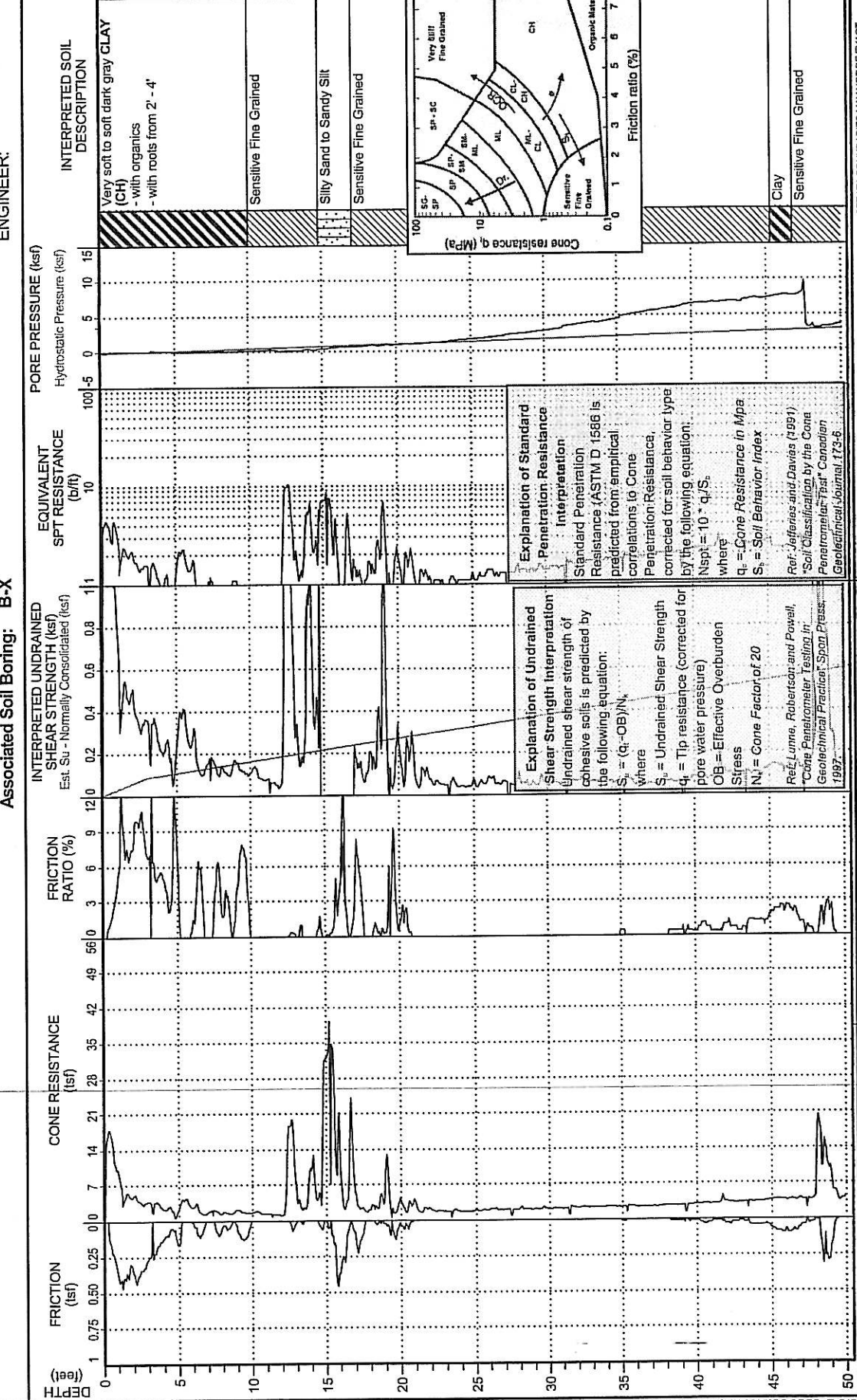


Notes  
Abandonment Method  
CPT backfilled with soil cuttings upon retraction.  
Upper 10 ft. of Interpreted Soil Description is taken from Laboratory Test Results and Visual Classification of soil samples as described in the associated Soil Boring Log. Below 10 ft. Soil Description is an interpreted behavior type based upon empirical correlations of cone tip and sleeve resistance.  
STRATA BOUNDARIES MAY NOT BE EXACT



**CONE PENETROMETER TEST LOG**

PROJECT: \_\_\_\_\_ DATE: \_\_\_\_\_  
 CLIENT: \_\_\_\_\_ DRILLER: \_\_\_\_\_  
 TERMS USED ON CPT LOG: \_\_\_\_\_ TECH.: \_\_\_\_\_  
 Associated Soil Boring: B-X ENGINEER: \_\_\_\_\_



**INTERPRETED UNDRAINED SHEAR STRENGTH (ksf)**  
 Est.  $S_u$  - Normally Consolidated (ksf)

**Explanation of Undrained Shear Strength Interpretation**  
 Undrained shear strength of cohesive soils is predicted by the following equation:  
 $S_u = (q_t - OB) / N_c$   
 where  
 $S_u$  = Undrained Shear Strength  
 $q_t$  = Tip resistance (corrected for pore water pressure)  
 $OB$  = Effective Overburden Stress  
 $N_c$  = Cone Factor of 20  
 Ref: Lunne, Robertson and Powell, "Cone Penetrometer Testing in Geotechnical Practice" Span Press, 1997.

**Explanation of Standard Penetration Resistance Interpretation**  
 Standard Penetration Resistance (ASTM D 1586) is predicted from empirical correlations to Cone Penetration Resistance, corrected for soil behavior type by the following equation:  
 $N_{sp} = 10 \cdot q_t / S_u$   
 where  
 $q_t$  = Cone Resistance in Mpa  
 $S_u$  = Soil Behavior Index  
 Ref: Jefferies and Davies (1991)  
 "Soil Classification by the Cone Penetrometer Test" Canadian Geotechnical Journal, 173-6.

**Notes**  
 Abandonment Method  
 Hole backfilled with cement/bentonite grout upon retraction.

**Top 10 ft. of Interpreted Soil Description taken from Laboratory Test Results and Visual Classification.**  
 See Figure 2 for CPT Location.

STRATA BOUNDARIES MAY NOT BE EXACT



# VERTEK CONE CALIBRATION REPORT

CONE #: DDG1108  
 CUSTOMER: AQUATERRA  
 TECH: LLS 4-10-09  
 LOAD CELL ID: INTERFACE 1120AF-25K S/N 127965A  
 PRESS TRANSDUCER ID: DRESSER DXD 1000PSIG S/N 3432

**TIP**

FORCE (lbs)	CALIBRATOR KPA	CONE KPA	CONE (V)
2248	10000	10030	0.18332
4496	20000	20049	0.35892
6744	30000	30037	0.53438
8992	40000	40024	0.71051
11240	50000	50133	0.89052
13489	60000	60033	1.06278
15737	70000	70026	1.24106
17985	80000	80046	1.41801
20233	90000	89953	1.59056
22481	100000	99953	1.76669

**FRICTION**

FORCE (lbs)	CALIBRATOR KPA	CONE KPA	CONE (V)
337	100.0	101.2	0.04407
674	200.0	201.3	0.29889
1012	300.0	299.7	0.55639
1349	400.0	399.7	0.81643
1686	500.0	500.6	1.07944
2023	600.0	600.1	1.33354
2360	700.0	700.5	1.58754
2698	800.0	800.1	1.84193
3035	900.0	900.7	2.11249
3372	1000.0	1001.4	2.36739

**SUBTRACTION OUTPUT: EFFECT OF TIE ON FRICTION**

2248	0	0.7	-0.22072
4496	0	1.1	-0.21966
6744	0	1.5	-0.21865
8992	0	2.1	-0.21717
11240	0	2.3	-0.21659
13489	0	2.3	-0.21660
15737	0	2.3	-0.21668
17985	0	1.7	-0.21818
20233	0	2.4	-0.21629
22481	0	3.0	-0.21497

**PRESSURE U2**

FORCE (lbs)	CALIBRATOR KPA	CONE KPA	CONE (V)
0	344.8	346.4	0.03932
0	689.5	692.9	0.23715
0	1034.3	1035.3	0.43542
0	1379.0	1379.5	0.62879
0	1723.8	1723.6	0.82918
0	2068.5	2071.8	1.02363
0	2413.3	2415.2	1.21967
0	2758.0	2759.9	1.42001
0	3102.8	3102.8	1.61303
0	3447.5	3447.1	1.80922