GEOTECHNICAL ENGINEERING
DRILLING & SAMPLING
FOUNDATION DESIGN

HOLT ENGINEERING, INC.

CONSTRUCTION INSPECTION
LABORATORY TESTING
MATERIALS TESTING

1 June 2016

Mr. Jonathan Sands
20 West 55th Street, 11th Floor
New York, NY 10019

Re.: Sands Residence
1715 Summit View Place
Austin, Texas

File No: 05-17516

Dear Mr. Sands:

Enclosed please find one bound copy of our Subsurface Investigation and Foundation Recommendations Report for the above referenced project.

Should you have any questions concerning our report or if we can be of further service, please do not hesitate to call.

Sincerely,

Steve B. Johnson, P.E.
Geotechnical Division Manager

Holt Engineering, Inc.
TBPE Firm Registration No. F-430

Enc.: Engineering Report
Invoice

2220 Barton Skyway • Austin, Texas • 78704 • Ph. (512) 447-8166 • Fax (512) 447-0852

SUBSURFACE INVESTIGATION

AND

FOUNDATION RECOMMENDATIONS

FOR

SANDS RESIDENCE

1715 SUMMIT VIEW PLACE

AUSTIN, TEXAS

REPORT FOR:

MR. JONATHAN SANDS

20 WEST 55TH STREET, 11TH FLOOR

NEW YORK, NEW YORK 10019

PREPARED BY:

NOAH MCILHON, E.I.T.
GRADUATE ENGINEER

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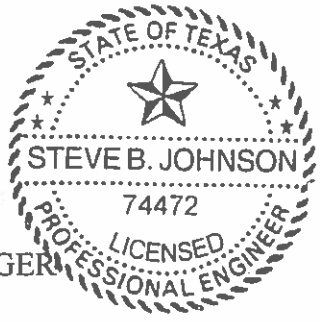
GEOTECHNICAL DIVISION MANAGER



HOLT ENGINEERING, INC.
TBPE FIRM REGISTRATION NO. F-430

FILE NO. 05-17516
1 JUNE 2016

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SUBSURFACE INVESTIGATION

AND

FOUNDATION RECOMMENDATIONS

FOR

SANDS RESIDENCE

1715 SUMMIT VIEW PLACE

AUSTIN, TEXAS

INTRODUCTION

An exploration of subsurface soil conditions was performed for the proposed new residence to be located at 1715 Summit View Place in Austin, Texas. Mr. Jonathan Sands, Owner, authorized the investigation on 26 April 2016 in accordance with our proposal. The purpose of this investigation is to determine subsurface soil conditions and materials at the site in order to establish design and construction recommendations for the project's foundation system.

SCOPE

Our investigation consisted of the following:

A. Laying out and drilling four soil borings to depths of 25 to 30 feet below existing grade.

B. Logging the borings in the field and a visual reconnaissance of the area's terrain.

C. Taking samples of selected subsurface soils for laboratory tests.

D. Performing field tests.

E. Making recommendations based on engineering analysis of field notes and laboratory test results.

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SITE DESCRIPTION

The proposed new residence is to be located at 1715 Summit View Place in Austin, Texas. The property consists of a residential lot with an existing residence that will be demolished. The surrounding area is covered in grass lawn with a few medium to large trees. The terrain is relatively level with a moderate slope to the west towards Hartford Road.

LABORATORY TESTS

The following laboratory tests were run on selected samples:

1. Moisture Content (ASTM D2216)
2. Minus 200-Mesh Sieve (ASTM D422)
3. Atterberg Limits (ASTM D4318)

These tests were performed together with visually inspecting and classifying the soils in general accordance with ASTM D2487 and described as recommended in ASTM D2488. Results of these tests were used to determine the foundation design criteria such as bearing capacity and the potential for settlement or heave.

SUBSURFACE CONDITIONS

Based on the "*Geological Map of the Austin Area, Texas*," published by the Bureau of Economic Geology, the site is located in the Del Rio (Kdr) geological formation. The Del Rio Formation consists of dark gray to olive (greenish tan) brown calcareous clay. The Del Rio clay soils are high in plasticity and will undergo large volume changes with changes in soil moisture from wet and dry periods. These soils can also develop high swell pressures.

The soils encountered in our borings generally correspond with the above geological description. A general description of the soil conditions is given below. A detailed description of the soil conditions is given in the Logs of Borings found in the Appendix.

In general, residual soils are found in our borings consisting of brown, tan, and tan and light brown fat clays that extend to depths ranging from 6 feet to 10.5 feet and

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overlie a formation of greenish tan and gray fat clay (Del Rio Formation). In borings B-03 and B-04, fill material is found at the surface that extends to depths ranging from 5 inches to one foot and overlies the residual soils mentioned above. The greenish tan and gray fat clay extends to the termination of all borings at a depths ranging from 25 feet to 30 feet below existing grade.

The fill material consists of unclassified brown and light brown sandy silty clay. The brown, tan, and tan and light brown fat clays are high in plasticity with plasticity indices (P.I.'s) ranging from 31 to 34 and contain various amounts of small to medium sized gravel, concretion layers, and calcareous deposits. The greenish tan and gray fat clay (Del Rio Formation) is high in plasticity with a P.I.'s ranging from 42 to 53, contains calcite and ferrous deposits, and is stiff.

Groundwater was not encountered in our borings. The Del Rio formation is typically dry or produces minimal groundwater seepage. The amount of seepage will be highly dependent on rainfall conditions in the weeks and months prior to construction.

POTENTIAL VERTICAL MOVEMENT

The potential vertical movement for the underlying clay soils at this site has been estimated using the general guidelines presented in the Texas Department of Transportation (TxDOT) test method TEX-124-E. The Texas Department of Transportation method utilizes the liquid limits and plasticity indices for soils in the seasonally active zone, estimated to be about 12 feet in the project area.

The estimated potential vertical movement value provided is based on the proposed floor system applying a sustained surcharge load of approximately 1.0 lb. per square inch on the subgrade materials. Potential vertical movement of approximately 3.5 inches was estimated for the soil conditions encountered at this site. The PVR value is based on the current site grades. Higher PVR values than the above mentioned value will occur in areas where water is allowed to pond for extended periods.

DISCUSSION AND RECOMMENDATIONS

It is our understanding a new custom residence is planned for the site. It is further our understanding the residence will be wood frame with masonry veneer. No finished

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floor elevation was determined at the time of this report; however, based on the plans provided, we expect less than 3 feet of fill material would be needed to level the building pad.

The primary concern for the foundation is the upper layer of brown fat clay and the underlying expansive greenish tan and gray fat clays (Del Rio Formation). These soils are highly plastic and will undergo large volume changes with changes in soil moisture from seasonal rainfall conditions. The amount of differential uplift on a shallow foundation would be considered, in our opinion, unacceptable. We are, therefore, recommending a foundation system consisting of drilled under-reamed piers with a structural floor system free of grade with a crawlspace. This type of foundation is necessary to ensure the floor slab and beams are not subjected to the high uplift pressures of the clay soils.

All structural loads should be carried on drilled under-reamed piers seated at a minimum depth of 22 feet below existing grade and sized for an allowable bearing value of 6,000 PSF. The bell of the pier should be 2 times the shaft diameter. All pier holes must be inspected by the soils engineer or qualified technician during the drilling operation to verify proper bearing strata, depth, plumbness, cleanliness of hole and proper belling. The floor system may consist of a wood or steel frame suspended from grade with a crawl space. Concrete perimeter beams may be used but must be hard formed. Perimeter beams should be voided of grade a minimum of 8 inches and soil retainers installed beside the beams to prevent encroachment of soil below the beams. Cardboard forms may be used but must be inspected for collapsing. Trapezoidal carton forms below the beams are not acceptable.

Careful consideration must be given to designing sidewalks, porches, patios and all flat work. All entities supported on grade must be completely separated from the structural framing system supported by piers. Concrete flat work should be designed for differential movement up to approximately 3 inches. Flexibility must also be allowed for all utility penetrations. Particular attention must be given to plumbing, water and wastewater lines as well as gas lines. Utility lines in the crawl space should be hung from framing with a minimum of 8 inches of ground clearance. Penetration through concrete beams should be sleeved or run under the void space below the beam with a minimum of 8 inches of clearance below the beam.

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Landscaping and drainage conditions must also be given careful consideration. The yard should be sloped for positive drainage away from the foundation. Sprinkler systems near the foundation should be avoided. Gutters and downspouts should be installed where necessary to prevent ponding near the foundation. Maintaining the soil moisture around the foundation to uniform moisture condition is essential for a stable foundation system.

Groundwater was not encountered in our borings. The Del Rio Formation typically does not produce significant amounts of groundwater; however, perched water may be found in the formation or seasonal seepage may be found in below-grade cuts. Provisions for pumping of pier holes should be included in the bid documents. If excessive sloughing occurs, then casing of pier holes will be necessary.

FOUNDATION RECOMMENDATIONS

Drilled Piers With A Structural Floor System:

This foundation system consists of all foundation loads supported on drilled under-reamed piers with a suspended structural floor.

1. Bearing Capacity and Seating Depth – Drilled reinforced belled piers should be seated at a minimum depth of 22 feet below the existing ground surface and sized for an allowable bearing value of 6,000 PSF.
2. Pier Construction – Reinforcing steel should be a minimum of 1.5% of shaft area and cage steel should be blocked to provide proper sidewall clearance. The bell of the pier should be a minimum of two times the shaft diameter. Piers should be poured the same day they are drilled.
3. Inspection – All pier holes should be inspected and seated by the soils Engineer to verify bearing strata, depth, reinforcement, plumbness, cleanliness of hole and proper bell size.
4. Structural Floor – The structural floor system may consist of wood or steel frame suspended from grade. Untreated wood should have 18 inches of clearance above grade. Concrete perimeter beams

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should be hard formed and voided of grade a minimum of 8 inches. Cardboard cartons may be used but must be inspected for collapsing. Concrete or other approved retainers must be used to prevent encroachment of soil below beams. Trapezoidal cardboard forms in lieu of retainers are not acceptable. Soil retainers should be concrete block or other engineer approved products. Retainers should extend 8 inches above the voids. Void cartons should be inspected by the engineer prior to reinforcement placement. Cartons should not be placed in trenches with standing water or wet or damp soils. Beam trenches must be well drained. Any cartons that become wet must be removed and replaced prior to concrete placement. Cartons must fit tight to beam trenches. Overspill beside cartons is not acceptable. The contractor should verify cardboard carton forms will support the perimeter beam loads during placement.

5. Ventilation – Crawl space ventilation should be designed in accordance with the International Residential Code (IRC). Vents should be placed on all sides of the foundation to provide for good cross-through air flow.

6. Pumping and Casing – Groundwater was not encountered in our borings; however, water may be encountered during pier drilling. Pumping of pier holes may be necessary. If sloughing is excessive, then casing of the pier holes will be required. Provisions for pumping and casing should be in the bid documents.

7. Flexibility – All buildings entities unsupported by piers such as walks, porches, stairs, planters, etc. should not be directly attached to the building. Flexibility should be provided for all utility penetration points. Utilities in the crawl space should be suspended from the framing with a minimum of 8 inches of clearance from the ground. Utilities penetrating perimeter beams should be sleeved to allow for movement or placed under the beam

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with a minimum of 8 inches clearance.

8. Landscaping and Drainage – Landscaping should be accomplished to provide positive drainage away from the building foundation (minimum 10-inch drop in first 5 feet from building). Gutters and downspouts should be installed where necessary to prevent ponding near the foundation. Where possible, downspouts should drain into a subsurface drainage system. Void spaces should have adequate drainage or under-drains to prevent standing water. Sprinkler systems near the foundation should be avoided.

QUALITY CONTROL PROGRAM

We recommend a Quality Control Program be implemented by the Owner or Architect to inspect the construction of the foundation and framing to verify all work is being performed in accordance with the approved engineered drawings and specifications. The inspections should include (but not be limited to) preparation of the building pad subgrade and placement and compaction of all fill material to verify proper density and moisture content. Inspections should be conducted on all foundation beams, piers and footings to verify proper bearing and seating depth. Where drilled piers are used or driven piles are installed then full time inspection is recommended to verify proper bearing capacity is achieved. Voiding of beams and installation of soil retainers must be inspected prior to concrete placement. Pre-pour inspections should be made in order to verify proper placement of the reinforcement. All concrete should be inspected during placement for proper slump, air-content and temperature. Test cylinders should be made to verify compressive strength. French drains, under-drains, waterproofing and capillary barriers should be inspected prior to backfilling. All plumbing should be leak tested both before the slab is poured and after concrete is placed. Framing should be inspected to verify all floor trusses and roof members (trusses) are placed in accordance with the approved drawings. Anchor bolts and wind bracing should also be inspected. Welding and bolting on structural steel framing and connections should be inspected by a certified welding inspector. Reports of all inspections and tests should be forwarded to

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the Owner, Architect, Engineer, and Contractor. We can provide these services upon request.

LIMITATIONS

This geotechnical report has been prepared for the exclusive use of our client and the client's authorized design team in preparing the appropriate design and construction documents for this project. It is not intended for any other person's benefit. This report is based on specific project information provided by the client and/or design team as described herein. Any changes in the structure, building footprint, configuration, finished floor elevations or grades should be brought to our attention so that we may determine what impact the change may have on our conclusions and recommendations. We expect to review the final grading plan and structural drawings to verify our recommendations are properly interpreted.

Our analyses and recommendations are based on subsurface conditions encountered in our borings. If during construction the soil strata are found to differ from that reported here, we should be notified immediately. This report contains soil-boring logs which are for the purpose of arriving at foundation design criteria and are not to be used by the excavation and/or pier drilling contractor in arriving at rock hardness or rock depth.

The presence or absence of water in our borings might not represent the groundwater conditions under all seasonal conditions. No long term groundwater monitoring was performed in the preparation of this report.

This report is based on conditions that exist on the site at the time of our investigation. Changes to the project, the building site or adjacent properties may affect the reliability of our report. We expect the structure addressed in our report to be started or substantially completed within approximately 24 months of the issuance of our report. The geotechnical report and specific recommendations will need to be re-evaluated if building construction is delayed by more than 24 months from the time of our report. Our report should not be used if the elapsed time of substantial completion exceeds 5 years without review or written consent from Holt Engineering, Inc.

The procedures, tests and recommendations of this investigation and report have

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been conducted and furnished in accordance with generally accepted professional engineering practices in the field of foundations, engineering soil mechanics and engineering geology. No other warranty is either expressed or implied.

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APPENDIX

SELECT FILL SPECIFICATIONS

SELECT FILL

Select fill as called for on the plans shall meet one of the following requirements (% Passing or % Retained) as verified by the Engineer when properly slaked and tested by standard laboratory methods:

	% Retained	Or	% Passing
2 ½" Screen	0%		100%
1 ½" Screen	0% - 25%		75% - 100%
7/8" Screen	15% - 55%		45% - 85%
No. 4 Sieve	45% - 75%		25% - 55%
No. 40 Sieve	60% - 90%		10% - 40%

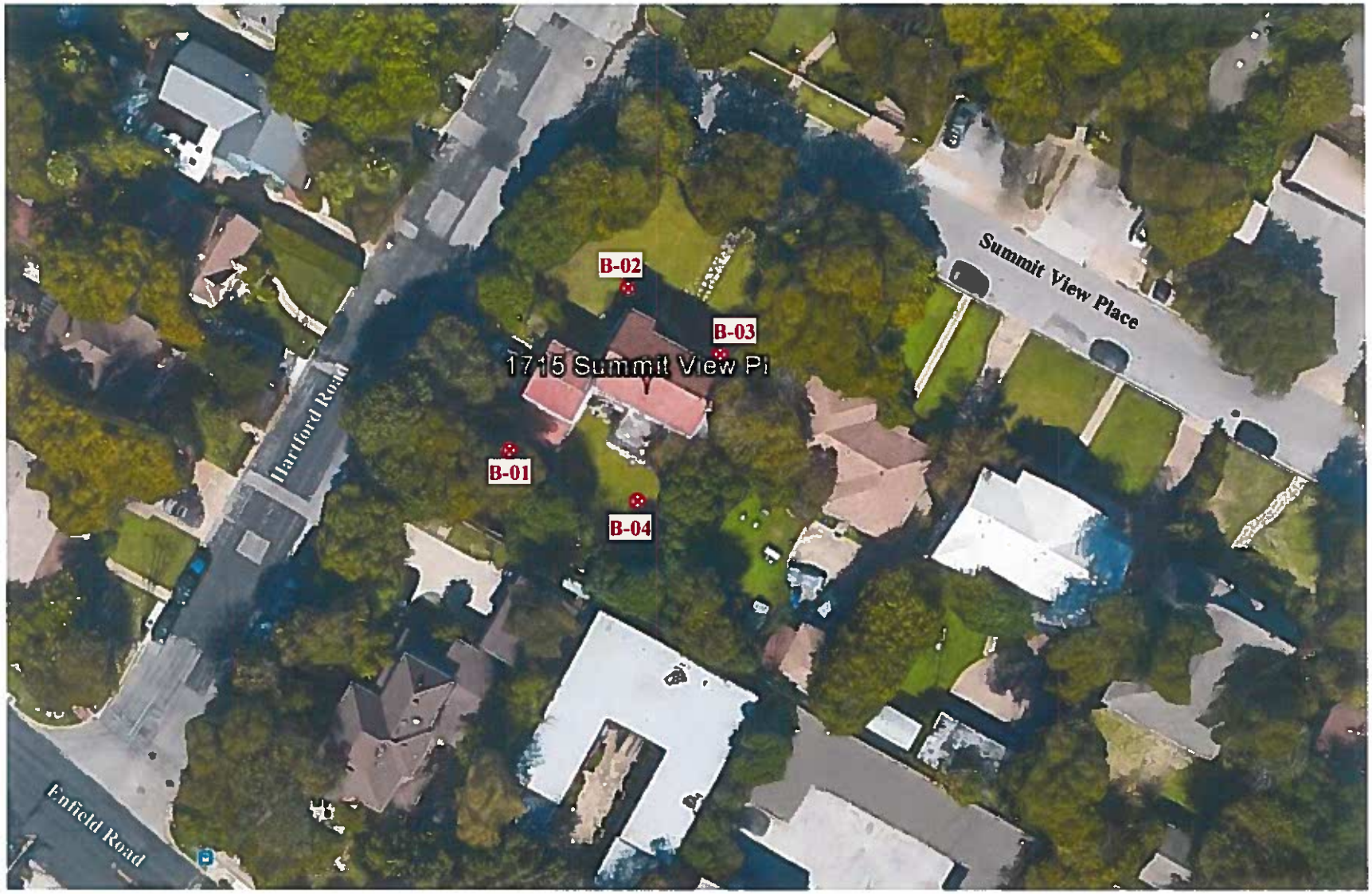
Material passing the No. 40 sieve shall have a minimum plasticity index of 3 and shall not have a plasticity index of greater than 18.

COMPACTION OF FILL

Select fill shall be placed in lifts not to exceed 8 inches loose measure and compacted to 95% or greater of the maximum dry density as determined in accordance with TxDOT test method TEX 113E. Field densities shall be checked in accordance with ASTM D-6938 (Nuclear Gauge) to ensure compliance with project specifications.

Select fill should be processed and moisture conditioned as needed to meet requirements of project moisture specifications.

Samples of fill shall be furnished to the testing laboratory seven days prior to installation to permit time for specification compliance, inspection, and approval.



GENERALIZED BORING LOCATION PLAN
SANDS RESIDENCE
1715 SUMMIT VIEW PLACE
AUSTIN, TEXAS

Not to Scale

05-17516

SANDS RESIDENCE
1715 SUMMIT VIEW PLACE
AUSTIN, TEXAS

LOG OF BORING B-01

NOTES : Hole dry upon completion of drilling operation.

DATE DRILLED : 05-12-16 | BORING DEPTH : 30.0 FEET

DRILLER : John Webb | WATER LEVEL :

ELEVATION :

DRILLING METHOD : 4" Flight Augers | LAT : | LONG. :

DEPTH (feet)	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
	FAT CLAY (CH), brown, silty, firm							
	FAT CLAY (CH), tan & light brown, silty, sandy, w/small to large limestone rock -- 1.5'-2.5' - Very clayey -- 2.5'-4.5' - Very rocky w/thin concretion layers -- 4.5'-10.5' - Less rocky w/calcareous deposits	50/8"						
5		14						
10		14		20.1		50	31	87.9
	FAT CLAY (CH), greenish tan & gray, jointed, w/calcite & ferrous deposits, stiff	19		21.5		63	42	94.9
15								
		22						
20								
		26						
25								
		32						
30	Terminated @ 30 feet							
35								

LOG OF BORING 05-17516-SANDS RESIDENCE-1715 SUMMIT VIEW PLACE-AUSTIN TX.GPJ HOLT ENGINEERING.GDT 6/1/16

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SANDS RESIDENCE
1715 SUMMIT VIEW PLACE
AUSTIN, TEXAS

LOG OF BORING B-02

NOTES : Hole dry upon completion of drilling operation.

DATE DRILLED : 05-12-16 | BORING DEPTH : 25.0 FEET

DRILLER : John Webb | WATER LEVEL :

ELEVATION :

DRILLING METHOD : 4" Flight Augers | LAT : | LONG. :

DEPTH (feet)	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
	FAT CLAY (CH), brown, silty, lighter w/depth, firm	7		19.9		51	32	90.2
5	FAT CLAY (CH), tan & light brown, silty, sandy, lighter w/depth, soft to firm -- 4.0'-6.0' - Soft, moist	6		18.9		50	31	93.6
	FAT CLAY (CH), tan, silty, w/calcareous deposits			20.1		54	35	97.1
	-- 9.0'-9.5' - With few small to medium gravel	19						
10	FAT CLAY (CH), greenish tan & gray, joiinted, w/calcite & ferrous deposits, stiff	20						
15								
20		18						
		29						
25	Terminated @ 25 feet							
30								
35								

LOG OF BORING 05-17516-SANDS RESIDENCE-1715 SUMMIT VIEW PLACE-AUSTIN TX.GPJ HOLT ENGINEERING.GDT 6/1/16

SANDS RESIDENCE
1715 SUMMIT VIEW PLACE
AUSTIN, TEXAS

LOG OF BORING B-03

NOTES : Hole dry upon completion of drilling operation.

DATE DRILLED : 05-12-16 | BORING DEPTH : 30.0 FEET

DRILLER : John Webb | WATER LEVEL :

ELEVATION :

DRILLING METHOD : 4" Flight Augers

LAT : LONG. :

DEPTH (feet)	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
	Fill - Unclassified brown & light brown silty sandy clay							
	FAT CLAY (CH), brown, silty, lighter w/depth, firm	8		20.2		53	34	89.1
	-- 3.0'-3.5' - Very silty, sandy, w/scattered small to medium gravel							
5	FAT CLAY (CH), tan, silty, sandy, w/calcareous deposits, less sandy w/depth, firm							
	FAT CLAY (CH), greenish tan & gray, jointed, w/calcite & ferrous deposits	16		21.0		76	53	97.8
10		18						
15								
20		25						
25		31						
30		38						
	Terminated @ 30 feet							
35								

LOG OF BORING 05-17516-SANDS RESIDENCE-1715 SUMMIT VIEW PLACE-AUSTIN TX.GPJ HOLT ENGINEERING.GDT 6/1/16

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TBPE Firm Registration No. F-430

SANDS RESIDENCE
1715 SUMMIT VIEW PLACE
AUSTIN, TEXAS

LOG OF BORING B-04

NOTES : Hole dry upon completion of drilling operation.

DATE DRILLED : 05-12-16 | BORING DEPTH : 25.0 FEET

DRILLER : John Webb | WATER LEVEL :

ELEVATION :

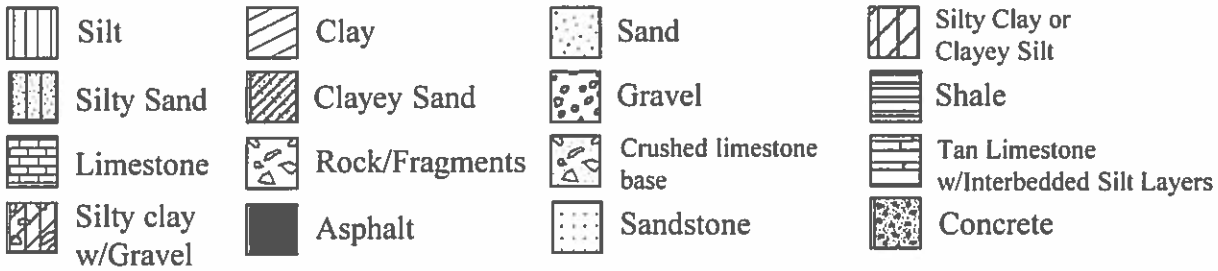
DRILLING METHOD : 4" Flight Augers | LAT : | LONG. :

DEPTH (feet)	GRAPHIC LOG	SAMPLE	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
			Fill - Unclassified brown sandy silty clay							
			FAT CLAY (CH), brown, silty, lighter & becoming greenish w/depth, soft to firm	5						
5				11		18.6		56	36	95.1
			FAT CLAY (CH), greenish tan & gray, jointed, w/calcite & ferrous deposits							
10				18		20.5		66	44	96.9
				23						
15										
				27						
20										
				35						
25			Terminated @ 25 feet							
30										
35										

LOG OF BORING 05-17516-SANDS RESIDENCE-1715 SUMMIT VIEW PLACE-AUSTIN TX.GPJ HOLT ENGINEERING.GDT 6/1/16

BORING LOGS – TERMS & SYMBOLS

SOIL TYPES



SAMPLER TYPES

PARTICLE SIZE (ASTM D2487)

Boulders	>12 in.	Coarse Sand	5 mm – 2 mm	Silt	0.075 mm – 0.005 mm
Cobbles	12 in. – 3 in.	Medium Sand	2 mm – 0.4 mm	Clay	< 0.005 mm
Gravel	3 in. – 5 mm	Fine Sand	0.4 mm – 0.075 mm		

STRENGTH OF COHESIVE SOILS

CONSISTENCY	COMPRESSIVE STRENGTH (TSF)
Very Soft	< 0.25
Soft	0.25 to 0.50
Firm	0.50 to 1.0
Stiff	1.0 to 2.0
Very Stiff	2.0 to 4.0
Hard	> 4.0

DENSITY OF GRANULAR SOILS

NUMBER OF BLOWS PER FT., N	RELATIVE DENSITY
0 – 4	Very Loose
4 – 10	Loose
10 – 30	Medium Dense
30 – 50	Dense
Over 50	Very Dense

Structure Description (ASTM D2488)

Stratified	Alternating layers of varying material or color with layers at least 6 mm thick
Laminated	Alternating layers of varying material or color with the layers less than 6 mm thick
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay
Homogeneous	Same color and appearance throughout

Percentages of Sand & Gravel (ASTM D2488)

Trace	< 5%
Few	5% to 10%
Little	15% to 25%
Some	30% to 45%
Mostly	50% to 100%

Criteria for Describing Moisture Conditions (ASTM D2488)

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

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