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May 6, 2013

Denmon Engineering, Inc.
Post Office Box 8460
Monroe, Louisiana 71211

Project No. 130162
Report No. 1

Attention: Randy Denmon, P.E., P.L.S.

**Preliminary Geotechnical Investigation
Bee Bayou Site
Richland Parish, Louisiana**

Dear Mr. Denmon:

Submitted here is your geotechnical report for the above-captioned project. This investigation was authorized by your execution of our contract agreement on March 21, 2013.

We appreciate the opportunity to be of service and we will be happy to discuss any questions you may have concerning this report.

Very truly yours,

BURNS COOLEY DENNIS, INC.



Amber A. Templeton, E.I.



Richard L. Curtis, P.E.

AAT/RLC/khb
Copies Submitted: (2)

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FIGURES

1.0 INTRODUCTION

1.1 General

Denmon Engineering, Inc. is preliminarily evaluating a site in Richland Parish for possible future development. The site being explored is the Bee Bayou site. The Bee Bayou site is a 260-acre parcel of land located southeast of the intersection of Highway 80 and Bee Bayou Road. The general site location of the Bee Bayou site is shown on Figure 1 of this report. Based on a review of available USGS topographic information, we estimate that the ground surface within the property ranges from approximately El. 85 ft to El. 75 ft. Details regarding specific structure sizes, structure locations, finished grades, and other site grading requirements have not been established at this time.

1.2 Purposes

The specific purposes of this investigation were:

- 1) to explore subsurface soil conditions within the site by means of four (4) widely-spaced soil borings;
- 2) to evaluate pertinent physical properties of the soils encountered in the borings by means of visual examination of the samples in the laboratory and tests performed on the samples; and
- 3) after analysis of the soil boring and laboratory test data, to provide preliminary assessments and recommendations for planning purposes for site preparation, earthwork construction and foundation/pavement design and construction for the site.

2.0 FIELD INVESTIGATION

2.1 General

Subsurface soil conditions within the Bee Bayou site in Richland Parish were explored by means of four (4) borings. Denmon Engineering provided drawings showing the approximate site boundaries superimposed upon aerial photographs. Widely spaced boring locations were chosen to provide a general understanding of the subsurface stratigraphy across the project site. A hand-held global positioning system device was utilized to determine approximate boring locations in the field. The ground surface elevations were not determined. The approximate boring locations are superimposed upon aerial photographs presented on Figures 1 of this report.

All soils were classified in general accordance with the Unified Soil Classification System. A synopsis of the Unified Soil Classification System is presented on Figure 2 along with symbols and terminology typically utilized on graphical soil boring logs. Logs of the soil borings are presented on Figures 3 through 6. The graphical logs illustrate the types of soil and stratification encountered with depth below the existing ground surface at the individual boring locations.

2.2 Drilling Methods and Groundwater Observations

Borings BB-1, BB-3, and BB-4 were made to an exploration depth of 25 ft. Boring BB-2 was made to an exploration depth of 80 ft. The 25-ft deep borings were advanced full depth by augering. The 80-ft deep borings were initially advanced by augering to a depth of 15 ft, and then was extended to completion using rotary wash drilling procedures. Observations were made continuously during auger drilling to detect free water entering the open boreholes. Notes pertaining to groundwater observations are included at the lower right corner of the graphic boring logs.

2.3 Sampling Methods

Relatively undisturbed Shelby tube samples or disturbed split-spoon samples were obtained at approximate 3-ft to 5-ft intervals of depth in the borings. Relatively undisturbed samples of the soils encountered in the borings were obtained by pushing a 3-in. OD Shelby tube sampler approximately 1 ft to 2 ft into the soil. The Shelby tube samples were obtained within the depth intervals illustrated as shaded portions of the "Samples" column of the graphic logs for the borings. Disturbed samples of the soils encountered in the borings were obtained by driving a standard 2-in. OD split-spoon sampler 18 in. into the soil with a 140-lb hammer falling freely a distance of 30 inches. The depths at which the split-spoon samples were taken are illustrated as crossed rectangular symbols under the "Samples" column of the graphic logs for the borings. Standard penetration test (SPT) blow counts resulting from split-spoon sampling are recorded under the "Blows Per Ft" column of the graphic logs of the borings. Disturbed auger cutting samples were obtained at several depth intervals within 10 ft of the ground surface in the borings. The depths at which the auger cutting samples were taken are illustrated as small I-shaped symbols under the "Samples" column of the graphic logs for the borings.

2.4 Field Classification, Sample Preservation and Borehole Abandonment

All soils encountered during drilling were examined and classified in the field by a geotechnical engineering technician. Each undisturbed Shelby tube sample was extruded from the sampling tube in the field. An approximate 6-in. long portion of each Shelby tube sample was sealed with melted paraffin in a cylindrical cardboard container to prevent moisture loss and structural disturbance. An additional portion of each Shelby tube sample, representative portions of the split-spoon samples, and the auger cutting samples were sealed in jars to provide material for visual examination and testing in the laboratory. The boreholes were filled with grout after completion of drilling and sampling.

3.0 LABORATORY INVESTIGATION

3.1 General

All of the soil samples were examined in the laboratory and tests were performed on the samples to verify field classifications and to assist in evaluating the strengths and volume change properties of the soils encountered in the borings. The types of laboratory tests performed are described in the following paragraphs.

3.2 Strength Tests

The undrained shear strength characteristics of the fine-grained soils encountered in the borings were investigated by means of four (4) unconfined compression tests performed on selected undisturbed Shelby tube samples. The results of the unconfined compression tests in terms of cohesion are plotted as small open circles in the data section of the graphic boring logs. The water content and dry density were also determined for each unconfined compression test specimen. The water contents are plotted as small shaded circles in the data section of the graphic logs. The dry densities are tabulated to the nearest lb per cu ft under the "Dry Density" column of the logs.

3.3 Classification Tests

The classifications and volume change properties of the fine-grained soils encountered in the borings were investigated by means of eight (8) sets of Atterberg liquid and plastic limit tests. The results of the liquid and plastic limit tests are plotted as small crosses interconnected

by dashed lines in the data section of the graphic boring logs. "NP" is shown on the logs where a soil sample was determined to be nonplastic during testing. In accordance with the Unified Soil Classification System, fine-grained soils are classified as either clays or silts of low or high plasticity based on the results of liquid and plastic limit tests. The numerical difference between the liquid limit and plastic limit is defined as the plasticity index (PI). The magnitudes of the liquid limit and plasticity index and the proximity of the natural water content to the plastic limit are indicators of the potential for a fine-grained soil to shrink or swell upon changes in moisture content or to consolidate under loading.

To aid in classifying the sandy soils and fine-grained soils containing sand, tests were performed on 10 samples to determine the percent fines passing the No. 200 sieve. The percentage of fines resulting from these tests is presented on the boring log in the far right column.

3.4 Water Content Tests

Water content tests were performed on 14 samples to corroborate field classifications and to extend the usefulness of the strength and plasticity data. The results of the water content tests are plotted as small shaded circles in the data section of the graphic boring logs. The water content data have been interconnected on the logs to illustrate a continuous profile with depth.

4.0 GEOLOGY AND GENERAL SUBSURFACE CONDITIONS

4.1 General

A general description of subsurface soils encountered in the borings made for this investigation is provided in the following paragraphs. The graphical logs shown on Figures 3 through 6 should be referred to for specific soil conditions encountered at each boring location. Stick logs of the borings are shown in profile on Figure 7 to aid in visualizing subsurface soil conditions. Tabulated adjacent to the stick logs are Atterberg limit and plastic limits, water contents, dry densities, cohesions and field SPT blow counts.

The soil survey of Bee Bayou site prepared by the U. S. Department of Agriculture, Natural Resources Conservation Service shows the distribution of soil types at the Richland Site (Figures 9 and 10). The soil covering over 60% of the site is described as Gilbert-Egypt silt loam

(Gm), a poorly drained, low permeability soil that often contains perched water. The soils covering the bottomlands of the streams are Forestdale silty clay loam (Fr) and Gilbert silt loam (Gk). The Forestdale silty clay loam covers about 20% of the site area and is a poorly drained soil with very low permeability containing swelling clays in some areas. The Gilbert silt loam covers about 1% of the site area and is poorly drained with low permeability. Other soil types shown on the soils map include Dexter silt loam (De) and Gigger silt loam (Ge). The Dexter silt loam covers approximately 12% of the site area and is a well drained, moderately permeable soil. The Gigger silt loam covers about 3% of the site area and is moderately well drained with low permeability.

4.2 Geology

The site is situated in the Gulf Coastal Plain physiographic province of the Mississippi Embayment. The general geology of the site area is illustrated by the geology map presented on Figure 8. Sediments exposed on the surface are Pleistocene Braided Stream Terraces. The site is located on Macon Ridge, a north-south trending ridge that is higher in elevation than the surrounding alluvial deposits. The ridge is a Pleistocene relict-alluvial fan deposited by a braided regime of the Arkansas River during early valley alluviation. The topography of the region reflects the near-surface geology and drainage patterns resulting from the erosion of Pleistocene age sediments. The near-surface deposits are underlain by the Eocene age sediments of the Claiborne Group.

The near surface sediments consist of a fine-grained topstratum of clay, silty clay, and silt averaging about 10 ft to 20 ft thick. The topstratum is composed in part of weathered loess. The topstratum overlies an older thicker sequence of substratum sands and gravels. The substratum sands and gravels overlie the Cockfield Formation of the Tertiary Claiborne Group. The Cockfield Formation in the area of the site consists of lignitic clays, silts, and sands. Groundwater bearing sands and gravels occur in the braided stream deposits and in the sand lenses in the Cockfield Formation. The deeper groundwater zones may be salty.

4.3 Soil Conditions

The soils encountered at the boring locations were generally found to consist of fine-grained topstratum deposits underlain by a coarse-grained substratum of sands to the 25 to 80-ft

boring completion depth. General descriptions of the stratification and physical properties of the soil types encountered in the borings taken at the site investigated are included in the following paragraphs. The graphical logs shown in Figures 3 through 6 should be referred to for specific soil conditions encountered at the boring locations.

The ground surface at Boring BB-1 was found to be underlain by silty clays (CL) to an approximate depth of 8 ft. Silty clays (CL) were also encountered in Boring BB-2 between approximate depths of 4 ft and 8 ft. The silty clays (CL) are classified as stiff and hard with respect to consistency. The silty clays (CL) are considered to have moderate to high strength and moderate to very low compressibility. The silty clays (CL) are considered to have low shrink/swell potential.

The ground surface at Borings BB-2, BB-3, and BB-4 was found to be underlain by clays (CH) to approximate depths of 4 ft, 8.5 ft, and 8 ft, respectively. The clays (CH) are classified as stiff, very stiff, and hard with respect to consistency. The clays (CH) are considered to have moderate to high strength and moderate to very low compressibility. The clays (CH) are considered to be expansive with high shrink/swell potential.

The silty clays (CL) at Boring BB-1 were found to be underlain by sands (SP) to an approximate depth of 18.5 ft. Sands (SP) were also encountered in Boring BB-2 from the approximate depth of 28.5 ft to the terminal depth of 80 ft. The sands (SP) at Boring BB-1 were found to be underlain by silty sands (SM and SP-SM) to the terminal depth of 25 ft. Silty sands (SM and SP-SM) were also encountered within the approximate depth intervals of 14 ft to 28.5 ft at Boring BB-2, 8.5 ft to the terminal depth of 25 ft at Boring BB-3, and 8 ft to the terminal depth of 25 ft at Boring BB-4. The sands (SM, SP-SM, and SP) are characterized as medium dense, dense, and very dense with respect to density. The sands (SM, SP-SM, and SP) are considered to have moderate to high strength and low to very low compressibility. The sands (SM, SP-SM, and SP) are nonexpansive.

Sandy silts (ML) were encountered at Boring BB-2 between the approximate depth interval of 8 ft and 14 ft. The sandy silts (ML) are classified as medium dense with respect to density. The sandy silts (ML) are considered to have moderate strength and low-moderate compressibility. The sandy silts (ML) are nonexpansive.

Free water was not encountered during auger drilling for the borings made at the Bee Bayou site. It should be noted that groundwater conditions at the site will fluctuate seasonally

with surface drainage and with the rise and fall of water levels in nearby ditches, creeks, ponds or other bodies of water. Also, surficial soils can become saturated and weak to some depth during periods of prolonged and heavy rainfall.

5.0 DISCUSSION

The Bee Bayou site in Richland Parish, Louisiana, is being considered for potential development. The Bee Bayou site is a 260-acre parcel of land located near the intersection of Highway 80 and Bee Bayou road. Details regarding specific structure sizes, structure locations, finished grades, and other site grading requirements have not been established at this time. However, we have considered that the facility would include commercial/industrial buildings and associated pavements. The buildings could vary from lightly to heavily loaded structures. The proposed site is generally relatively flat. Available USGS topographic information indicates that existing grades within the site generally vary between about El. 85 ft to El. 75 ft.

5.1 General Subsurface Conditions

Subsurface soils encountered within the 80-ft maximum exploration depth of the borings made for this preliminary geotechnical investigation generally include clays (CH), silty clays (CL), sandy silts (ML), and sands (SM, SP-SM, and SP). The subsurface soils encountered in the borings are generally considered to have moderate to high strength and low to moderate compressibility. Highly expansive clays (CH) were encountered at irregular depth intervals at some boring locations. The clays (CH) are considered to be expansive with high shrink/swell potential. The silty clays (CL) are considered to have low shrink/swell potential. The sandy silts (ML) and sands (SM, SP-SM and SP) have no potential for shrinking and swelling. Free water was not encountered at any of the boring locations.

5.2 Geotechnical Design Considerations

The primary geotechnical concerns for design and construction of any structures or pavements are differential movements caused by shrinking and/or swelling of the clays (CH) and/or settlement due to consolidation of the weaker soils under fill and structural loadings. The clays (CH) will shrink and swell with seasonal changes in moisture content. Based on the

subsurface soil conditions encountered at the boring locations it is our opinion that lightly to moderately loaded buildings constructed within the property could be supported on shallow foundation systems, provided weak surficial soils are removed and replaced with compacted select fill materials and a buffer of low permeability, low shrink/swell potential soils is created to overlie the expansive clays (CH). For lightly to moderately loaded buildings, pre-loading could be utilized to consolidate deeper weak soils at the site prior to building construction. More heavily loaded buildings constructed within the property could be supported by a deep foundation system. Preliminary guideline recommendations are included in the following section of this report.

6.0 PRELIMINARY GUIDELINE RECOMMENDATIONS

6.1 Building Foundations

Based on the soil conditions encountered in the borings made for this preliminary investigation, we are of the opinion that lightly to moderately loaded buildings can likely be supported on a shallow foundation system. The shallow foundation system could consist of a moderately strong and stiff slab and grade beam foundation which is generously reinforced and made relatively stiff by means of perimeter and interior grade beams. Alternatively, the shallow foundation system could consist of spread footings. Buildings should be designed and constructed and earthwork performed to minimize and to tolerate differential volumetric changes in the expansive soils. A shallow foundation system should only be used with a suitable buffer of strong, low permeability and low shrink/swell potential soils that may consist of natural or fill soils, or a combination of both.

For any buildings supported by a shallow foundation, we recommend that the slab and the ground surface adjacent to the buildings be separated from the expansive clays (CH) by approximately 5 ft to 10 ft of strong, low permeability and low shrink/swell potential soils. In our opinion, the greater buffer thickness on the order of 10 ft should be utilized for buildings supported by a spread footing foundation which is more flexible and more susceptible to differential movement than a slab and grade beam foundation. The actual buffer requirement will depend on the type of structure and the actual subsurface conditions in the areas of proposed construction. The buffer should be measured below the bottom of the floor slab or below

finished outside grade, whichever results in the lower elevation. The buffer can be provided naturally, by the addition of fill, undercutting and backfilling with select fill, or a combination of these approaches. The buffer should generally extend a minimum of 7 ft to 10 ft beyond the perimeters of buildings.

Based on the strengths of the existing soils, we expect that wall footings or grade beams could be designed to impose a bearing pressure in the range of 1,500 to 2,000 lbs per sq ft when total dead plus live loads are applied. The grade beams would need to be designed for both positive and negative bending. Individual column loads could be supported on widened, thickened grade beam sections or isolated square footings that we expect could be designed to impose a bearing pressure in the range of 2,000 to 2,500 lbs per sq ft when total dead plus live loads are applied.

Total settlement of the building foundation slab or spread footings under compressive structural loadings is expected to be within tolerable limits, provided maximum column loads do not exceed about 100 to 150 kips and wall loads are not greater than about 5 to 7 kips per ft. Greater column and wall loads may require deep foundations.

If deep foundation systems are required, they would likely include auger-cast piles or driven piles. Drilled shafts are not considered a viable deep foundation alternative because of the groundwater and sandy soils encountered during auger drilling for the borings made for this investigation. Many borings made for this preliminary investigation were not advanced deep enough to consider bearing capacities for deep foundation alternatives.

6.2 Drives and Parking Areas

We are of the opinion that either flexible asphalt concrete or rigid Portland cement concrete pavement could be utilized for this facility. A detailed pavement design should be performed for anticipated traffic volumes and loads during project design.

The strength and compressibility of the subgrade soils may need to be improved by lime treatment. If lime treatment of the subgrade soils is conducted, the improved subgrade soils would permit a reduction in the pavement thickness. We normally recommend that at least the top 8 in. of the subgrade soils be treated with lime. The lime would also improve the constructability during wet seasons of the year.

Pavements underlain by expansive materials can be expected to experience some differential vertical movements caused by swelling or heave of the expansive soils. Also expansive soils have low subgrade support strength. Pavement structures should be separated from the expansive soils by not less than 3 ft to 5 ft of strong, low permeability and low shrink/swell potential soils. This buffer must be provided by undercutting and backfilling if not provided naturally.

Flexible asphalt concrete pavement would better accommodate differential movement than rigid Portland cement concrete. We are the opinion that rigid Portland cement concrete would provide better support in front of garbage dumpsters, loading docks and in areas subject to significant heavy truck traffic. If the subgrade soils are prepared and select fill materials are placed in accordance with the recommendations given in this report, it is our opinion that a CBR on the order of 5 would be appropriate for flexible asphalt pavement design, and a modulus of subgrade reaction on the order of 150 lbs per cu in. would be appropriate for rigid Portland cement concrete pavement design. The actual pavement section required for this project would be highly dependent on the expected truck traffic and whether lime treatment is performed.

6.3 Site Preparation and Earthwork

No specifics with regard to earthwork or grading plans have been established at this time. As an initial step of site preparation, all trees and shrubs including their root systems should be removed within the building and pavement areas. Stripping should then be performed to remove organic-laden surficial soils, vegetation, debris, brush and roots. After stripping, any wet or weak soils should be excavated to expose suitably stable soils. The necessity of excavating any weak soils would need to be determined during earthwork construction and should be evaluated during the final investigation for the facility. Undercutting should then be performed as required to remove expansive clays (CH) to the depth necessary to create the recommended buffer thicknesses.

The surficial soils encountered at the ground surface at the boring locations were found to be relatively strong at the time of our field investigation. During wet seasons of the year, we expect that these soils could become weaker and wetter to some depth and could potentially require undercutting, drying by processing, or treatment of the in situ soils with admixtures, or a combination of these approaches, to achieve stable conditions that would support fill placement.

Special consideration should be given to the surficial soils at the site during earthwork planning and operations since the soils are very sensitive to disturbance and moisture content fluctuations. The construction techniques and types of equipment utilized and site drainage provided would have a great effect on the performance of these soils throughout the project.

Typical specifications for earthwork construction over expansive clays (CH) require select fill or backfill consisting of silty clays (CL) or sandy clays (CL) having a liquid limit less than 45 and a plasticity index within the range of 7 to 25. Typical requirements for backfill and fill materials are that they be placed in 9-in. thick maximum loose lifts at moisture contents within 3 percentage points of standard Proctor optimum moisture content and be compacted to not less than 95 percent of standard Proctor maximum dry density (ASTM D 698) with stability present. Typically, field moisture/density tests are performed frequently within each compacted lift as needed to check if the required compaction criteria are being met.

7.0 REPORT LIMITATIONS

The preliminary guideline recommendations in this report are based on conditions as they existed at the time of our field investigation and further on the assumption that the single exploratory boring is representative of subsurface conditions throughout the site. It should be noted that actual subsurface conditions beyond the boring might differ from those encountered at the boring location.

We emphasize that this investigation is preliminary and the contents of this report should only be used for general planning and estimating purposes. The guideline recommendations included herein should be considered as tentative until additional borings, laboratory tests and analyses are performed for the actual planned facilities.

This preliminary report has been prepared for the exclusive use of the Denmon Engineering, Inc. for specific application to the geotechnical aspects of design and construction for proposed development site in Richland Parish, Louisiana. The only warranty made by us in connection with the services provided is we have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of our profession practicing in the same or similar locality. No other warranty, express or implied, is made or intended.

FIGURES



Boring Locations

BEE BAYOU SITE
 RICHLAND PARISH, LOUISIANA

BURNS COOLEY DENNIS, INC.
 551 SUNNYBROOK ROAD
 RIDGELAND, MISSISSIPPI 39157

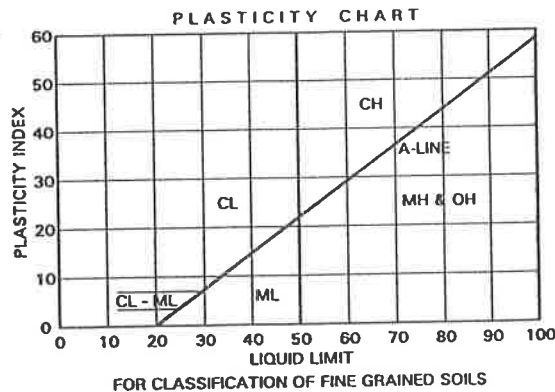
JOB NO.	130162	SCALE:	1"=600'	FIGURE 1
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UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOL & LETTER	DESCRIPTION
COARSE-GRAINED SOILS More than half of material larger than No. 200 sieve size	GRAVELS More than half of coarse fraction larger than No. 4 sieve size	Clean Gravels (Little or no fines)	GW	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURE
			GP	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURE
		Gravels with fines (Appreciable amount of fines)	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE
			GC	CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE
	SANDS More than half of coarse fraction smaller than No. 4 sieve size	Clean Sands (Little or no fines)	SW	WELL GRADED SAND, GRAVELLY SAND
			SP	POORLY GRADED SAND, GRAVELLY SAND
		Sands with fines (Appreciable amount of fines)	SM	SILTY SAND, SAND-SILT MIXTURE
			SC	CLAYEY SAND, SAND-CLAY MIXTURE
FINE-GRAINED SOILS More than half of material smaller than No. 200 sieve	SILTS AND CLAYS Liquid limit less than 50		ML	SILT WITH LITTLE OR NO PLASTICITY
			ML	CLAYEY SILT, SILT WITH SLIGHT TO MEDIUM PLASTICITY
			CL	SILTY CLAY, LOW TO MEDIUM PLASTICITY
			CL	SANDY CLAY, LOW TO MEDIUM PLASTICITY (30% TO 50% SAND)
	SILTS AND CLAYS Liquid limit greater than 50		MH	SILT, FINE SANDY OR SILTY SOIL WITH HIGH PLASTICITY
			CH	CLAY, HIGH PLASTICITY
			OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOIL

TERMS CHARACTERIZING SOIL STRUCTURE

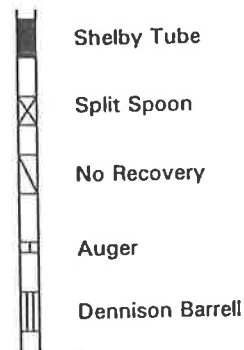
- Slickensided** - Clays with polished and striated planes created as a result of volume changes related to shrinking, swelling and/or changes in overburden pressure.
- Fissured** - Clays with a blocky or jointed structure generally created by seasonal shrinking and swelling.
- Laminated** - Composed of thin alternating layers of varying color and texture.
- Calcareous** - Containing appreciable quantities of calcium carbonate.
- Parting Seam Layer** - Paper thin (less than 1/8 inch).
- 1/8 inch to 3 inch thickness.
- Greater than 3 inches in thickness.



DENSITY AND CONSISTENCY

COARSE-GRAINED SOILS		FINE-GRAINED SOILS		
DENSITY	PENETRATION RESISTANCE, N	CONSISTENCY	COHESION	PENETRATION RESISTANCE, N
	Blows per Foot		Kips/Sq.Ft	Blows per Foot
Very loose	0 - 4	Very Soft	<0.25	0 - 1
Loose	5 - 10	Soft	0.25 - 0.50	2 - 4
Medium Dense	11 - 30	Medium Stiff	0.50 - 1.00	5 - 8
Dense	31 - 50	Stiff	1.00 - 2.00	9 - 15
Very Dense	>50	Very Stiff	2.00 - 4.00	16 - 30
		Hard	>4.00	>30

SAMPLE TYPES (Shown in Sample Column)



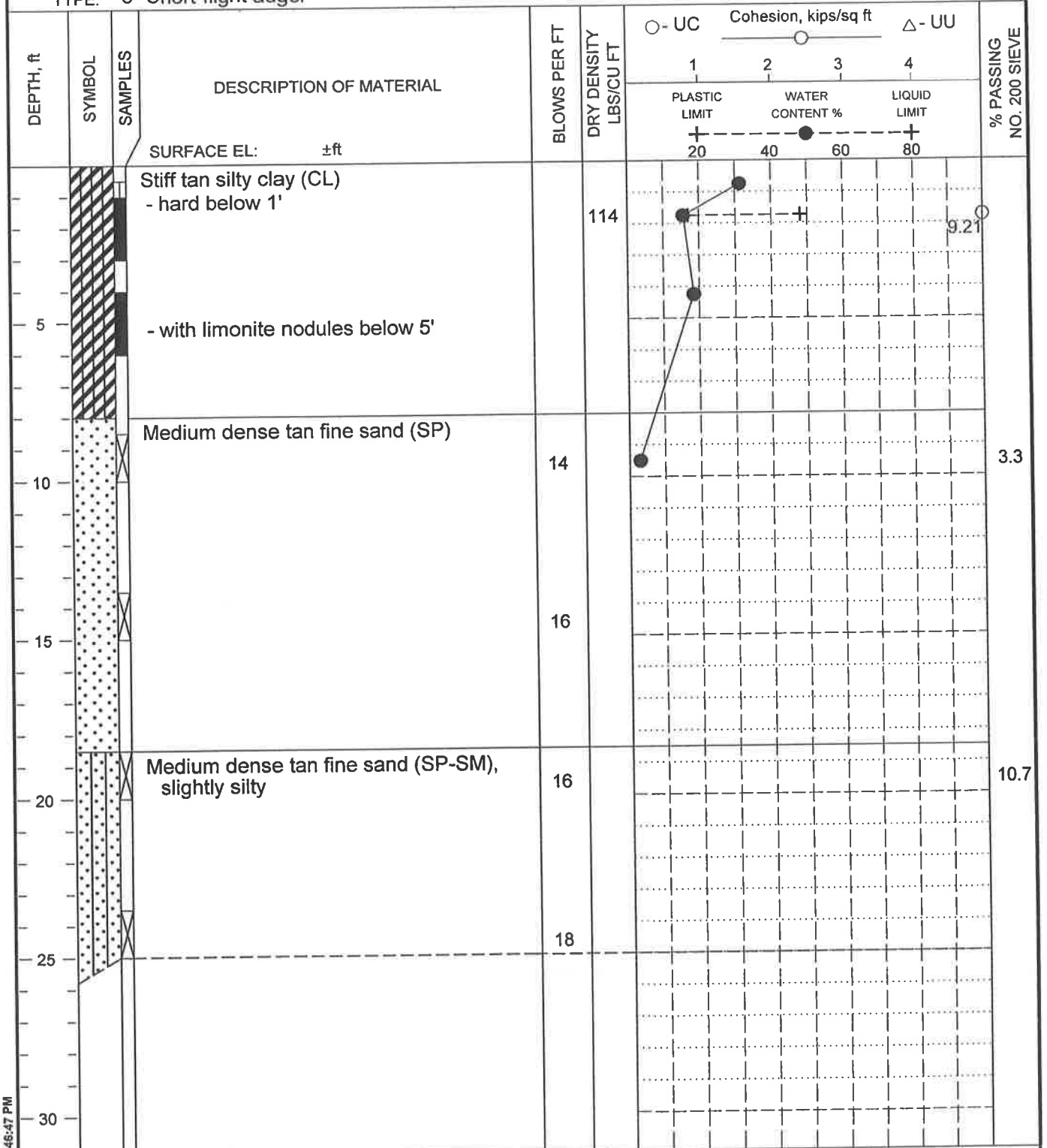
PARTICLE SIZE IDENTIFICATION		RELATIVE COMPOSITION	
Cobbles	- Greater than 3 inches	Slightly	5 - 15%
Gravel	- Coarse - 3/4 inch to 3 inches	With	16 - 29%
	- Fine - 4.76 mm to 3/4 inch	Sandy	30 - 50%
Sand	- Coarse - 2 mm to 4.76mm	(or gravelly)	
	- Medium - 0.42 mm to 2 mm		
	- Fine - 0.074 mm to 0.42 mm		
Silt & Clay	- Less than 0.074 mm		

CLASSIFICATION, SYMBOLS AND TERMS USED ON GRAPHICAL BORING LOGS

LOG OF BORING NO. BB-1
 BEE BAYOU SITE
 RICHLAND PARISH, LOUISIANA

TYPE: 6" Short-flight auger

LOCATION: See Figure 1



130162 5/6/2013 12:46:47 PM

BORING DEPTH: 25 ft

DATE: 04/12/13

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.
GPS Coordinates
 N 32° 28' 6.5"
 W 91° 41' 56.3"

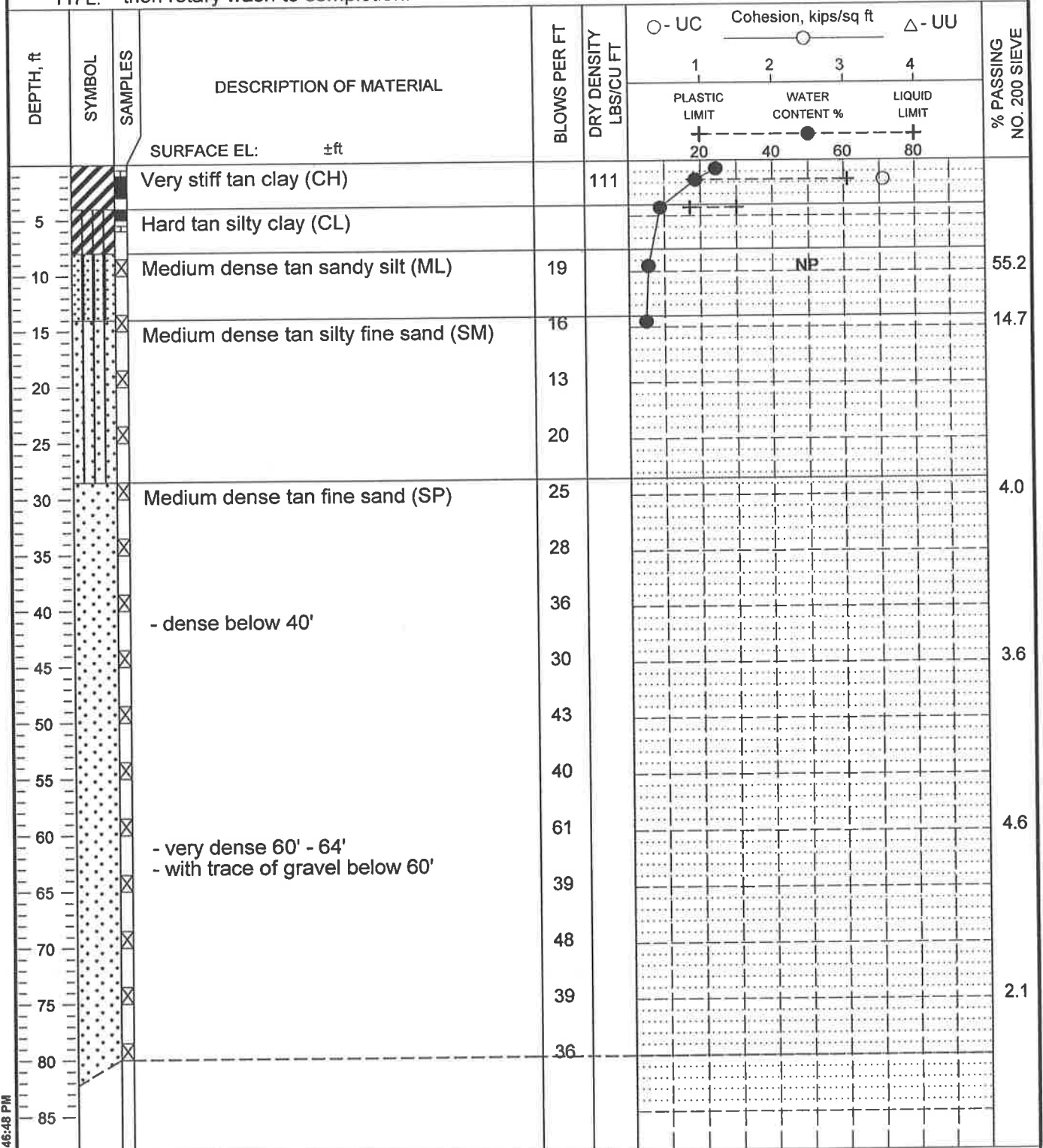
GROUNDWATER DATA: No free water encountered during auger drilling.

FIGURE 3

LOG OF BORING NO. BB-2
BEE BAYOU SITE
RICHLAND PARISH, LOUISIANA

TYPE: 6" Short-flight auger to 15',
then rotary wash to completion.

LOCATION: See Figure 1



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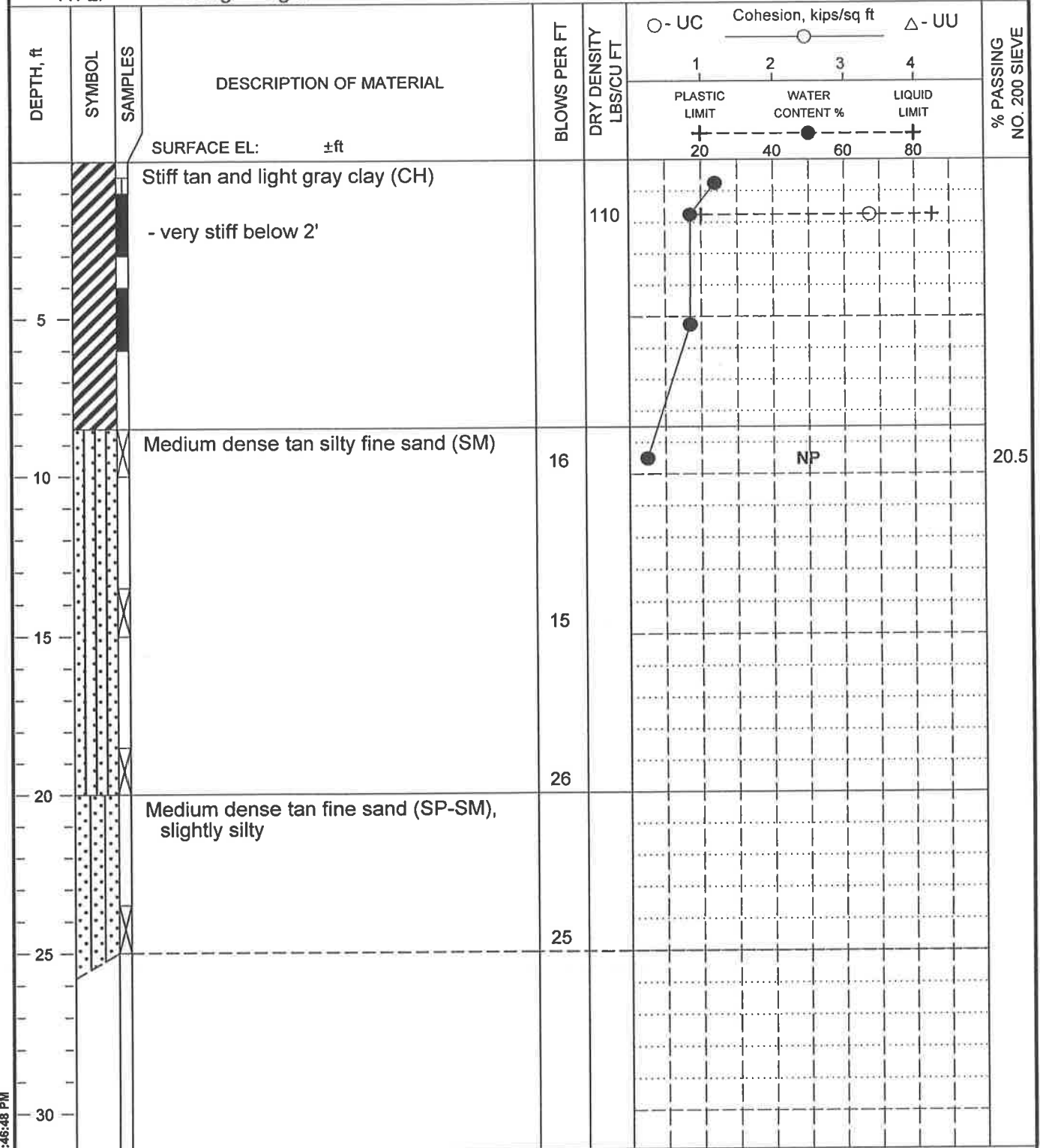
BORING DEPTH: 80 ft
DATE: 04/12/13
COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.
GPS Coordinates
N 32° 28' 6.2"
W 91° 41' 28.1"
GROUNDWATER DATA: No free water encountered during auger drilling.

FIGURE 4

LOG OF BORING NO. BB-3
BEE BAYOU SITE
RICHLAND PARISH, LOUISIANA

TYPE: 6" Short-flight auger

LOCATION: See Figure 1



BORING DEPTH: 25 ft

DATE: 04/12/13

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.
GPS Coordinates
 N 32° 28' 5.9"
 W 91° 40' 56.6"

GROUNDWATER DATA: No free water encountered during auger drilling.

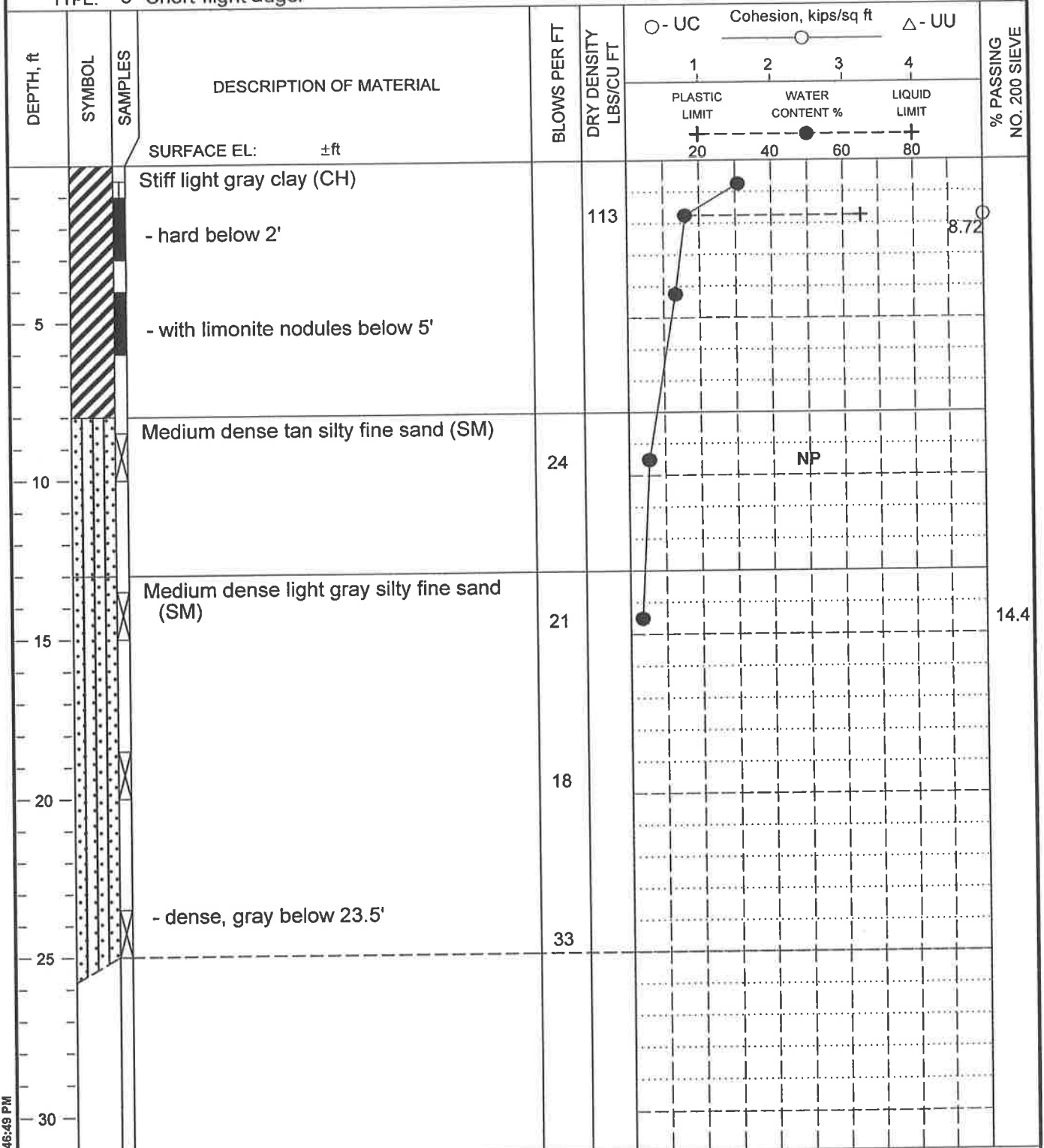
130162 5/6/2013 12:46:48 PM

FIGURE 5

LOG OF BORING NO. BB-4
 BEE BAYOU SITE
 RICHLAND PARISH, LOUISIANA

TYPE: 6" Short-flight auger

LOCATION: See Figure 1



130162 5/6/2013 12:46:49 PM

BORING DEPTH: 25 ft

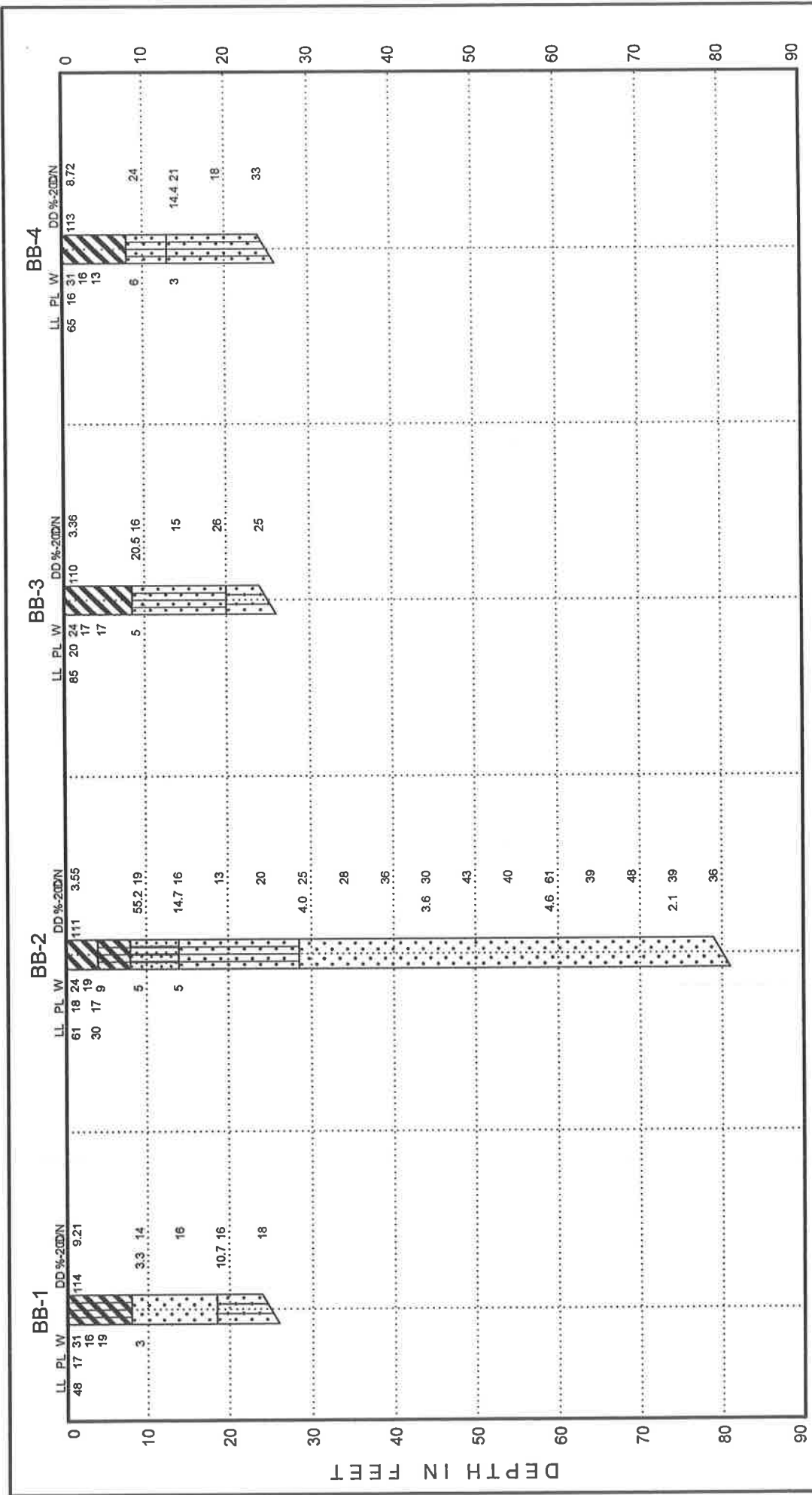
DATE: 04/12/13

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GPS Coordinates
 N 32° 28' 8.7"
 W 91° 40' 26.2"

GROUNDWATER DATA: No free water encountered during auger drilling.

FIGURE 6

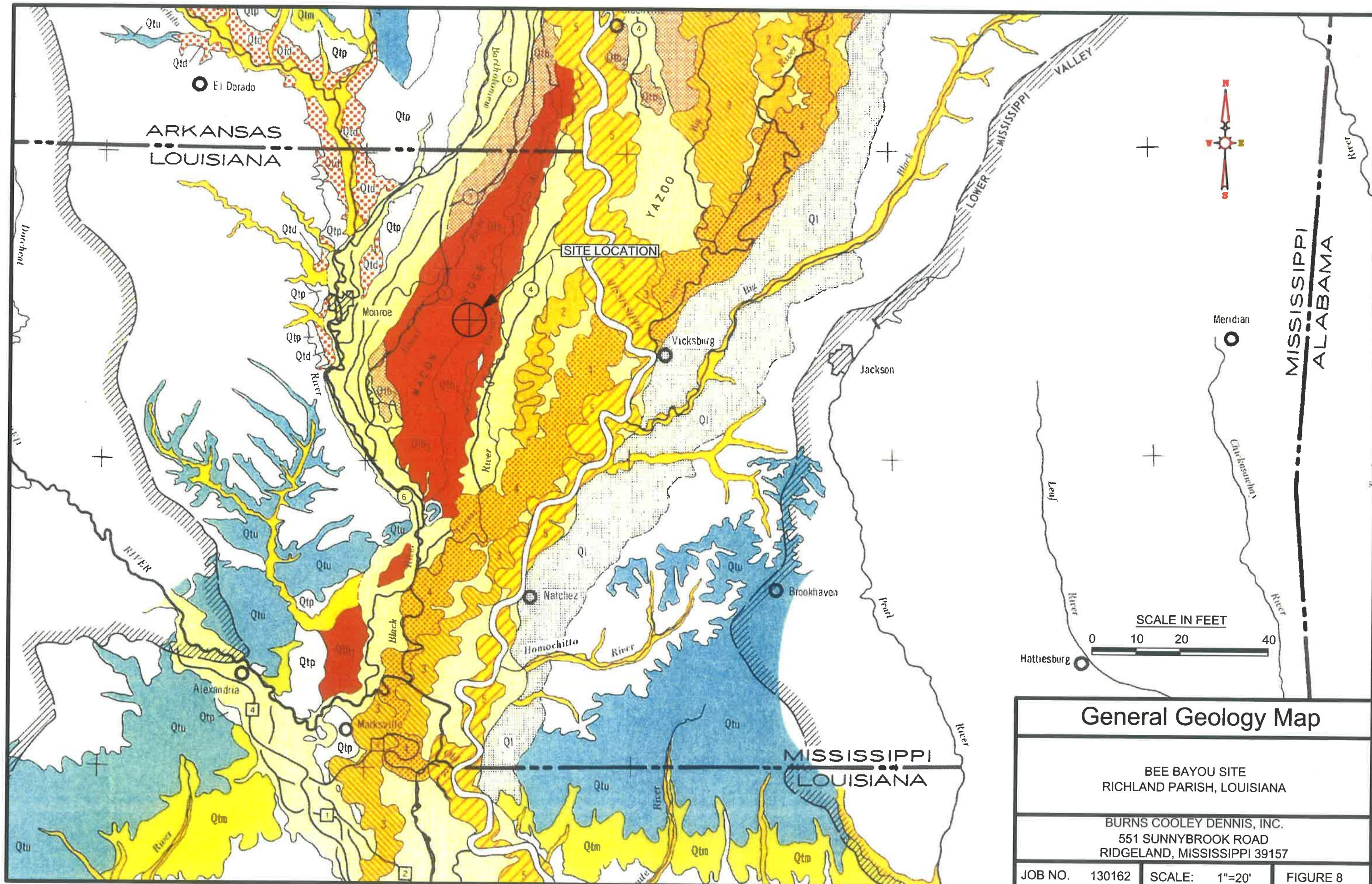


LEGEND:

- LL = Liquid Limit
- PL = Plastic Limit
- W = Water Content
- DD = Dry Density (pcf)
- C/N = Cohesion (ksf)/Penetration Resistance, N (blows/ft) in the same column
- MS = Matric Suction (tsf)
- %-200 = % Passing No. 200 Sieve

NOTE: See Figure 2 for boring log legend.

SUBSURFACE SOIL PROFILE		
BEE BAYOU SITE		
RICHLAND PARISH, LOUISIANA		
Job No. 130162	Date 5/6/13	Figure 7



ARKANSAS
LOUISIANA

SITE LOCATION

MISSISSIPPI
ALABAMA

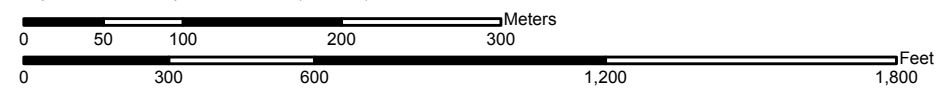
SCALE IN FEET
0 10 20 40

MISSISSIPPI
LOUISIANA

Soil Map—Richland Parish, Louisiana




Map Scale: 1:4,870 if printed on B size (11" x 17") sheet.



MAP LEGEND






















Area of Interest (AOI)


 Area of Interest (AOI)


Soils

 Soil Map Units

Special Point Features




-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot

 Very Stony Spot

 Wet Spot

 Other


Special Line Features

-  Gully
-  Short Steep Slope
-  Other






Political Features

 Cities

Water Features

 Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

MAP INFORMATION

Map Scale: 1:4,870 if printed on B size (11" × 17") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: UTM Zone 15N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Richland Parish, Louisiana
 Survey Area Data: Version 6, Apr 2, 2008

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Richland Parish, Louisiana (LA083)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
De	Dexter silt loam, 1 to 3 percent slopes	31.3	12.2%
Fr	Forestdale silty clay loam	51.3	20.0%
Ge	Gigger silt loam, 1 to 3 percent slopes	7.7	3.0%
Gk	Gilbert silt loam	2.5	1.0%
Gm	Gilbert-Egypt silt loams, gently undulating	164.3	63.9%
Totals for Area of Interest		257.1	100.0%