GEOTECHNICAL INVESTIGATION

LAKEVIEW CHRISTIAN CENTER

NEW ORLEANS, LOUISIANA

EUSTIS PROJECT NO. 19511

FOR
LAKEVIEW CHRISTIAN CENTER
NEW ORLEANS, LOUISIANA

WALDEMAR S. NELSON AND COMPANY INCORPORATED
NEW ORLEANS, LOUISIANA

JFW, INC.
ORLANDO, FLORIDA

By
Eustis Engineering Company, Inc.
Metairie, Louisiana

27 OCTOBER 2006

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INTRODUCTION

1. This report contains the results of a geotechnical investigation performed for the Lakeview Christian Center to be located on the southern corner of Veterans Highway and West Harney Street in New Orleans, Louisiana. Authorization to proceed with the investigation was given by Mr. Pete Schefferstein, administrator, Lakeview Christian Center. The structural engineer for the project is Waldemar S. Nelson and Company Incorporated, New Orleans, Louisiana. The project manager for the project is JFW, Inc., Orlando, Florida.

2. This report has been prepared in accordance with generally accepted geotechnical engineering practice for the exclusive use of Lakeview Christian Center, Waldemar S. Nelson and Company, JFW, and their designated representatives for specific application to the subject site. In the event of any changes in the nature, design, or location of the proposed structure, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report are modified and verified in writing. Should these data be used by anyone other than Lakeview Christian Center, Waldemar S. Nelson and Company, JFW, or their designated representatives, the user should contact Eustis Engineering Company, Inc., for interpretation of data and to secure other information which may be pertinent to the project.

3. Note the analyses and recommendations contained in this report are based, in part, on data obtained from the soil borings. The logs of the borings are considered

representative of subsurface conditions at the locations of the borings on the dates completed. No warranty is given that the logs of the borings are representative of subsurface conditions at other locations or times. The nature and extent of variations in subsurface conditions at the boring locations may not become evident until construction. If such variations then appear, it will be necessary to reevaluate the recommendations contained in this report.

SCOPE

4. The scope of the investigation included the drilling of four undisturbed sample type soil test borings and three auger borings to determine subsoil conditions and stratification, and to obtain samples of the various strata encountered. Soil mechanics laboratory tests, performed on samples obtained from the borings, were used to evaluate the physical properties of the various substrata. Based on the soil borings and laboratory tests, analyses were made to determine estimates of allowable pile load capacities, settlement, and components and thicknesses for flexible and rigid pavements. Recommendations were also developed for site preparation and foundation construction procedures.

5. Eustis' scope of work does not include the investigation or detection of the presence of any biological pollutants in or around the subject site. The term "biological pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, viruses, and the byproducts of any such biological organisms.

SOIL BORINGS

6. Four undisturbed sample type soil test borings and three auger borings were made at the site on 11 through 13 September 2006. Three of the undisturbed borings were drilled to depths of 50 feet and one was drilled to a depth of 75 feet. Each of the auger borings was drilled to a depth of 6 feet. The undisturbed borings, designated

as B-1 through B-4, and the auger borings, identified as A-1 through A-4, were made at the approximate locations shown on Figure 1. Detailed descriptive logs of the borings and laboratory tests are shown in both tabular and graphical form in the Appendix. The borings were made with a truck mounted rotary type drill rig. Upon completion of drilling the borings, the holes were backfilled in accordance with current regulatory requirements.

Undisturbed Borings

7. Samples of cohesive or semi-cohesive subsoils were obtained at close intervals or changes in stratum using a 3-in. diameter thinwall Shelby tube sampling barrel. The samples were immediately extruded from the sampling barrel, inspected, and visually classified by Eustis' soil technician. Pocket penetrometer tests were performed on the soil samples to give a general indication of their shear strength or consistency. The results of these tests are shown on the boring logs under the column heading "PP." Representative portions were then promptly placed in moisture proof containers and sealed for preservation of their natural moisture content.

8. Samples of cohesionless and semi-cohesive materials were obtained during the performance of in situ Standard Penetration Tests. This test consists of driving a 2-in. diameter sampler 1 foot into the soil after first seating it 6 inches. A 140-lb weight dropped 30 inches is used to advance the sampler. The number of blows required to drive the sampler is indicative of the relative density of cohesionless soils and the consistency of cohesive soils. The samples were retained in moisture proof containers for preservation of their natural moisture content. The results of the Standard Penetration Tests are shown on the boring logs under the column heading "SPT."

Auger Borings

9. In the auger borings, the subsoils were sampled directly from the auger blades at close intervals or changes in strata. These samples were sealed in plastic bags to preserve their natural moisture content.

LABORATORY TESTS

10. Soil mechanics laboratory tests, consisting of natural water content, unit weight, and unconfined compression shear, were performed on samples obtained from the undisturbed borings. Samples obtained from the auger borings were visually classified and tested for their natural water content. The results of the laboratory tests are summarized on the boring logs in the Appendix.

DESCRIPTION OF SURFACE AND SUBSOIL CONDITIONS

11. Site Description. Light to medium brush was present at the site during our investigation. Existing structures comprised primarily of houses, sheds, and other buildings were observed on the site at the time of our field operations. Due to the presence of these structures, demolished slabs, etc., the site was not level during our investigation.

Stratigraphy and Geology

12. A buried sand deposit associated with the development of the Pine Island Beach Ridge was encountered in the borings. Swamp/marsh deposits were generally encountered immediately below the surficial fill materials and continue to the surface of the beach ridge. At the borings made for this investigation, the beach ridge deposits were initially encountered between the 6 and 9-ft depths and extend to the 35 to 45-ft depths below existing grade. These deposits are underlain by

nearshore Gulf clay deposits containing sand pockets and shell fragments which continue to the termination of the 50-ft borings and to the 61-ft depth in Boring 2. At Boring 2, Pleistocene Age deposits were encountered from the 61-ft depth to the termination of the boring at 75 feet. Please refer to the boring logs in the Appendix for depiction of specific subsurface stratigraphy.

Ground Water

13. To determine ground water conditions at the time of the field investigation, an auger boring was made adjacent to Boring 2. This auger boring was made to the 10-ft depth without the addition of water. Ground water was initially encountered at a depth of 10 feet in the bore hole. After an observation time of six hours, the depth to ground water was measured to be approximately 7.5 feet below the existing ground surface. Note the observation time was relatively brief and ground water levels may not have stabilized. The depth to ground water will vary with climatic conditions, drainage improvements, and other factors. The depth to ground water should be determined by those persons responsible for construction immediately prior to beginning work.

FOUNDATION ANALYSIS

Furnished Information

14. Information provided by Waldemar S. Nelson and Company indicates the new Christian Center will be a two-story steel frame building. The first floor will encompass an area of approximately 22,800 square feet. The building will have approximately 89 parking spaces on the western side and 44 spaces on the eastern side. At least 3 feet, but no more than 4 feet, of fill is anticipated to be used to reach finished grade although existing and proposed grades were not available for

preparation of this report. Existing structures at the site will be demolished prior to construction.

Foundation Recommendations

15. Due to the shallow nature of the beach ridge deposits at this site, only relatively shallow pile foundations were considered. These embedments will be much less than the minimum 30-ft embedment typically required by the New Orleans Building Code. All structural loads (floors, walls, and columns) for the new building should be supported on piles having the same approximate tip embedment below the existing ground surface to minimize differential settlement. However, some variation in tip embedment should be anticipated due to variations in the relative density of the beach sands. Pile caps should be structurally integrated with grade beams. Any fill required to reach finished grade beneath the proposed structure should be placed as far in advance as possible of construction operations.

Site Preparation

16. Drainage. The initial step to prepare the site for construction should be to establish adequate temporary and permanent drainage to prevent ponding of water and ensure immediate runoff of all rainfall. We recommend the contractor maintain adequate surface drainage away from all foundations during and after construction. This may be accomplished by setting grades to ensure positive drainage of water away from the foundation areas and providing adequate surface and subsurface drainage structures as required. All gutters draining rainfall from the structure should be connected to pipes which discharge away from the foundation or into a drainage system. Water should not be allowed to collect near the foundation.

17. Clearing and Stripping. The existing ground surface at the site should be stripped of any vegetation, loose topsoil, debris, stumps, organic matter, loose fill, and any

other deleterious materials. Stripping should be to the minimum depth necessary to remove any vegetation and roots. Deeper excavations may be required in the vicinity of stumps. The exact depth of stripping should be determined during construction.

18. Demolition. Any existing structures located within the proposed construction area should be completely demolished and removed from the site. Provisions should be made to locate any abandoned underground utilities and foundations which could impact new construction. Existing footings or abandoned pipes should be excavated and removed from the site. These structures could impact the performance of new foundations if not properly removed, proofrolled, and backfilled with structural fill material. Existing piles should not be removed. In general, these features should be cut off 5 feet below the proposed grade beams or below the existing ground surface, whichever is greater. Removal and relocation of structures and obstructions should also comply with Section 202 of the Louisiana Standard Specifications for Roads and Bridges, 2000 edition (LSSRB).

19. Subgrade Preparation. After the stripping, clearing, and demolition operations, the exposed surface should be proofrolled with a bulldozer or tracked vehicle exerting a ground pressure between 10 and 15 psi. The vibratory system on the compactor, if present, should not be used during proofrolling. Alternative proofrolling techniques may be proposed, but these methods should be approved by Eustis prior to their use at the site. Any depressions, stump holes, or weak areas identified should be thoroughly cleaned out to the surface of firm undisturbed soil and backfilled with a select structural fill material placed and compacted under controlled conditions. All clearing and compaction operations should only be performed during periods of dry weather.

20. Structural Fill. A select granular material, such as locally available sand, should be used as backfill and/or fill required to reach design grade. Sand fill should be non-

plastic and free of roots, clay lumps, and other deleterious materials with no more than 10% by weight of material passing a U.S. Standard No. 200 mesh sieve. Prior to transporting structural fill on site, a sample should be tested to verify its conformance to these recommendations.

21. Compaction. Structural fill should be spread in loose lifts of 8 to 10 inches when used as form fill. Form fill or backfill placed beneath a pile founded structure may be compacted to at least 95% of its maximum dry density near optimum moisture in accordance with ASTM D 698. Select fill or general fill used for non-structural grading should be spread in loose lifts of 10 to 12 inches and compacted by several passes of a bulldozer.

22. Quality Control. Density tests should be performed on each lift of the compacted structural fill to determine if the contractor has achieved the recommended density. All clearing, filling, and compaction operations should only be accomplished during periods of dry weather. The contractor should exercise caution during and after inclement weather to ensure subsoil support is not degraded by construction operations.

23. Fill Settlement. We understand the area beneath the new structure will require 3 to 4 feet of fill to reach finished grade. Our estimates of settlement of the ground surface, due to the placement of 3 or 4 feet of fill (weighing 120 pcf) covering a 22,800 square foot area is ½ to 1 inch and 2 to 3 inches, respectively. The corners and edges of the filled area are anticipated to settle approximately 25% and 50%, respectively, of the maximum settlement at the center of the filled area. Based on these settlement estimates, we do not recommend a grade supported slab for the structure. Placement of fill may also affect pile foundations as discussed subsequently in this report. Fill settlement may result in differential settlement between grade supported structures, such as pavements, and pile supported structures. Your design should recognize this potential. Once site grading plans are

available, Eustis should verify our assumptions regarding fill heights and review our estimates of settlement.

Pile Foundations

24. Estimated Pile Load Capacities. Based on the soil borings and laboratory tests, engineering analyses have been made to determine estimates of the allowable compressive load capacities for treated ASTM D 25 quality timber piles for support of the proposed structure. We anticipate refusal of piles at embedments as shallow as 10 feet below existing grades. A treated Class 5 timber pile (minimum 6-in. diameter tip with natural taper to butt) driven to refusal at an embedment of 15 to 18 feet may be anticipated to have an allowable compressive capacity of 4 tons (factor of safety ≈ 2). Similarly, if a larger Class B treated timber pile (minimum 8-in. diameter tip) is utilized, the anticipated allowable compressive capacity is increased to 6 tons (factor of safety ≈ 2).

25. The New Orleans Building Code requires a minimum 30-ft pile embedment if refusal does not occur during driving. Variations in soil conditions between and away from the boring locations and/or densification of loose sand deposits during pile driving will likely result in variations in pile tip embedments. We recommend piles be embedded no shallower than 15 feet below existing grades. Potential variations in the pile tip embedment should be assessed during a test pile program. Our estimated capacities neglect the skin friction along the top 2 feet of the pile for embedment within the pile cap, assume the piles are driven vertically, and contain an estimated factor of safety of 2 against failure of a single pile through the soil.

26. Timber Piles. We recommend the treatment of timber piles meet the current American Wood Preservers Association Standards as outlined in Section 1014 of the LSSRB for both preservative and quality assurance. Treatment should also follow Section 812.06 where applicable. Furthermore, we recommend the timber

piles meet the quality (clean peeled, straightness, etc.) requirements outlined in ASTM D 25 and size requirements outlined in Table X1.5 of ASTM D 25 for minimum pile butt circumferences for a specified tip. The pile dimensions assumed in our analyses are provided above.

27. Pile Group Capacity and Spacing. The estimated allowable single pile load capacities described in this report for timber piles will derive the majority of their compressive capacity through end bearing. Hence, consideration of group effects is not required. The minimum center to center pile spacing within a row or group of new or existing piles should be at least 3 feet. The minimum spacing between rows or groups of piles should also meet the requirements discussed in the "Estimated Settlement due to Structural Loads" section of this report.

28. Estimated Settlement due to Structural Loads. If piles are used in small isolated groups or rows, we estimate settlement of foundations, due to sustained structural loads supported on vertical piles embedded a minimum of 10 feet below existing grade, will be ¼ to ½ inch. This estimate of settlement is based on the assumptions that the largest group dimension will be no greater than 5 feet, the center to center spacing between groups will be no closer than twice the largest group dimension, and the center to center spacing between rows of piles will be no closer than 8 feet.

29. These estimates do not include elastic deformation of the piles which should be added to the settlement estimates. Elastic deformation of the piles may be estimated as 67% to 75% of the static column strain of a pile acting as a column. These estimates of settlement are only due to structural loads.

30. All piles for the structure should be driven to the same approximate tip elevations, and concrete for the pile caps should be structurally integrated with the concrete for the grade beams. These recommendations are made to minimize the potential for

differential movements. Eustis should be contacted to reevaluate pile settlement if any of our assumptions are not met.

31. Effects of Fill Placement on Piles. As the fill settles from consolidation of the underlying subsoils, negative skin friction (drag loads) are induced on the piles as the soil settles along the pile. These drag loads may result in additional pile settlement and/or an increase in the load applied to the pile. Assuming the piles supporting the building are embedded in the underlying sand deposits, we anticipate ¾ to 1 inch of settlement due to the placement of 3 feet of fill beneath the building. We anticipate approximately 1 to 1½ inches of settlement due to the placement of 4 feet of fill at the building. These settlements are induced in the nearshore Gulf clays which underlie the beach sands.

32. Piles firmly embedded in the sand strata should also be evaluated for their structural adequacy. This evaluation should consider an additional compressive load of 1 ton (ultimate) due to the negative skin friction forces on the surface of the piles. This load should be added to the applied load at the pile butt. This total load should be used to evaluate the fiber stresses for timber piles near the pile tip.

33. Differential Settlement. Your design should recognize the potential for differential settlement between pile supported features and grade supported features, including pavements. Therefore, appropriate architectural or structural features should be incorporated in your design to accommodate differential settlement. We recommend flexible type connections be specified for all piping and utilities going to and from the proposed structure supported by pile foundations.

Installation of Driven Piles

34. Quality Control. All pile driving operations should be supervised by experienced personnel to ensure proper procedures are followed and accurate records are kept

during all pile driving operations. The driving records should include the date, type of pile, pile tip and butt diameters, overall pile length, depth and diameter of prepunch or predrill, hammer model, driving energy, and number of blows per foot of penetration for the full embedment of the pile. An accurate driving record is especially important to verify piles are installed to the required tip embedment and to give an indication of any unusual driving characteristics which may include pile breakage. We strongly recommend Eustis be retained to observe, record, and evaluate all pile driving operations with respect to the recommendations presented in this report.

35. Prepunching or Predrilling. Prepunching or predrilling may be necessary to aid the installation of timber piles through surficial fills and stiff to very stiff silty clay and sandy clay deposits which may be present over the area of the site. Prepunching or predrilling may also be necessary to avoid damage to timber piles as a result of any remaining obstructions not demolished and removed from the site. Prepunching or predrilling of near surface materials should extend no deeper than 6 feet below grade for this pile type. Actual requirements for prepunching or predrilling should be assessed during the test pile program. Prepunching or predrilling should be made using a punch or bit no larger than 75% of the tip diameter of the timber piles. Predrilling through surficial materials to depths of 6 feet or less may be by dry auger methods.

36. Hammers. Small treated ASTM D 25 quality timber piles with minimum tip diameters of 6 inches may be driven with a drop hammer or a single acting air hammer having a manufacturer's rated energy of 7,250 ft-lbs per blow. If a drop hammer is used, the ram weight should not exceed 2,500 pounds and the drop should not exceed 3 feet. Larger treated ASTM D 25 quality timber piles with minimum tip diameters of 8 inches may be driven with a single acting air hammer having a rated energy of 15,000 ft-lbs per blow.

37. Pile Refusal. Refusal criteria for the timber piles may be taken as 25 blows per foot with the recommended hammers to minimize damage to these piles. If the piles are driven with the aid of a follower, or if the pile driving helmet is allowed to impact the ground surface, Eustis should be consulted to adjust these refusal criteria. If piles do not achieve their intended embedments, Eustis should be contacted.

Test Piles and Load Tests

38. Eustis considers a test pile program and load test as an extension of our geotechnical investigation. Therefore, Eustis should be retained to perform these services. We recommend at least three test piles be installed for the project within the footprint of the proposed structure. Driven test piles may be installed at a job pile location.

39. The test piles should be the same type and embedment anticipated for the job piles and installed with the same equipment and techniques proposed for the job piles. The test piles can be used to evaluate installation methods. Driven test piles will provide more definitive information regarding the anticipated driving resistance, vibrations from pile driving, and anticipated refusal depths.

40. The test piles should be allowed to set for at least 14 days subsequent to the installation of the reaction system. The test piles should then be load tested to failure in accordance with the New Orleans Building Code. The results should be evaluated by Eustis to verify the estimated pile load capacities presented in this report.

Vibrations

41. Pile driving and demolition operations, as well as other construction activities, have the potential to generate vibrations that may affect nearby structures, pavements,

and underground utilities. Eustis recommends vibrations be monitored during the test pile program and during subsequent construction activities of concern. This monitoring should evaluate peak particle velocities during pile driving at critical structures with a seismograph, as well as other construction activities generating vibrations (hauling fill, moving heavy equipment, etc.). The record of peak particle velocities will provide information in assessing potential damage and the need for changes in construction operations.

42. Peak particle velocities (measured at a structure) exceeding 0.5 in./sec may induce damage to the structure, particularly when this structure has been previously stressed by settlement or other movements. Peak particle velocities between 0.25 and 0.5 in./sec may be sensed as being detrimental by human perception. In addition, sustained peak particle velocities of 0.25 in./sec have been documented to densify cohesionless materials. Deposits of this nature exist at the site. Such densification can result in settlement of structures, pavements, and utilities founded over or in these deposits. Therefore, if sustained vibration levels of 0.25 in./sec are measured at a structure, pavement, or utility of concern, Eustis should be notified, the construction operations generating these vibrations terminated, and consideration given to altering these procedures.

Pavement Recommendations

43. Traffic. Based on the furnished conceptual drawings, we have assumed the parking area will experience 150 passenger cars and 150 pickup trucks, vans, and sports utility vehicles per day. We estimate driveways and serviceways will experience two times this amount of traffic with two additional delivery trucks per day and two garbage trucks per week. The assumed axle weights are tabulated below.

TYPE OF VEHICLE	SINGLE AXLE LOAD IN KIPS	
	FRONT	REAR
Passenger Cars	2	2
Pickup Trucks, Vans, or Sports Utility Vehicles	2	5
Delivery Trucks	12	20
Garbage Trucks	24	30

44. Our assumed traffic intensities should be verified prior to implementation of our recommendations in the design. If traffic conditions are different than those presented, Eustis should be contacted to reevaluate the pavement recommendations contained in this report. These traffic data assumptions were converted to equivalent 18-kip single axle loads (E_{18}) using AASHTO equivalency factors for flexible and rigid pavements. A 20-year design life and a terminal serviceability index (P_t) of 2.0 were used for the analyses of rigid and flexible pavements. Trash container pads should be rigid pavement slabs.

45. Method of Analysis. The pavement components and thicknesses for rigid and flexible pavements were determined using methods presented in the 1986 AASHTO Guide for Design of Pavement Structures. The resilient soil modulus (M_r) of the subgrade was estimated based on the type of soil, probable drainage conditions, and engineering experience. For these estimates, we have assumed the subgrade is prepared as recommended in this report. In particular, proper drainage during construction and adequate permanent drainage should be provided so the subgrade is not allowed to become saturated.

46. Flexible Pavement. Our analyses assume all paving materials will conform to the LSSRB. For the parking area, we recommend a light duty paving section consisting of 1.5 inches of Type 3 wearing course and 1.5 inches of Type 3 binder course. In addition, we recommend 6 inches of stone base course and 8 inches of sand

subbase. For the driveways and serviceways, we recommend a heavy duty paving section consisting of 4 inches of hot mix asphaltic surface course, at least 1.5 inches of Type 3 wearing course, and 2.5 inches of Type 3 binder course. In addition, we recommend 8 inches of stone base course and 12 inches of sand subbase.

47. The asphaltic surface course should conform with Section 501 of the LSSRB. The material for the crushed stone base course should conform to the material requirements of Section 1003.03(d) of the LSSRB. The stone base course should be placed and compacted in accordance with Section 302 of the LSSRB for a Class II base course. Sand subbase should follow the recommendations given in "Structural Fill" of this report. Structural fill used as subbase should be placed in 6 to 8-in. loose lifts and compacted to at least 95% of its maximum dry density in accordance with ASTM D 1557.

48. Grades should provide for adequate drainage to prevent saturation of the subgrade and base course materials. If the type and thickness of pavement components are changed, Eustis should be consulted to determine the suitability of these materials and the structural number of the pavement.

49. <u>Rigid Pavement.</u> Using the same soil and traffic conditions, Eustis recommends rigid pavement for the parking lot comprise 5 inches of Portland Cement Concrete. The driveways and serviceways should comprise 7 inches of Portland Cement Concrete. We recommend trash container pads be at least 8 inches in thickness. Portland Cement Concrete should conform to the material requirements for pavement Type B concrete as specified in Section 901 of the LSSRB. The concrete should have a specified 28-day compressive strength of 4,000 psi to give the pavement adequate flexural strength. The concrete pavement should also be wire mesh reinforced against temperature and shrinkage and should be constructed in accordance with the provisions of the LSSRB, Section 601. The concrete should be underlain by at least 6 inches of compacted sand fill. The sand fill should conform

to the material requirements given in "Structural Fill." The sand subbase should be compacted to 95% of its maximum dry density near ($\pm$2%) optimum water content using ASTM D 1557.

Other Considerations

50. Construction of the pavement sections will induce consolidation of the subsoils. This should be considered in your design. Settlement will depend on the average loading intensity, average duration of the loads, and the areal extent of the loaded area. Once these factors are established, Eustis should be consulted to evaluate potential settlement.

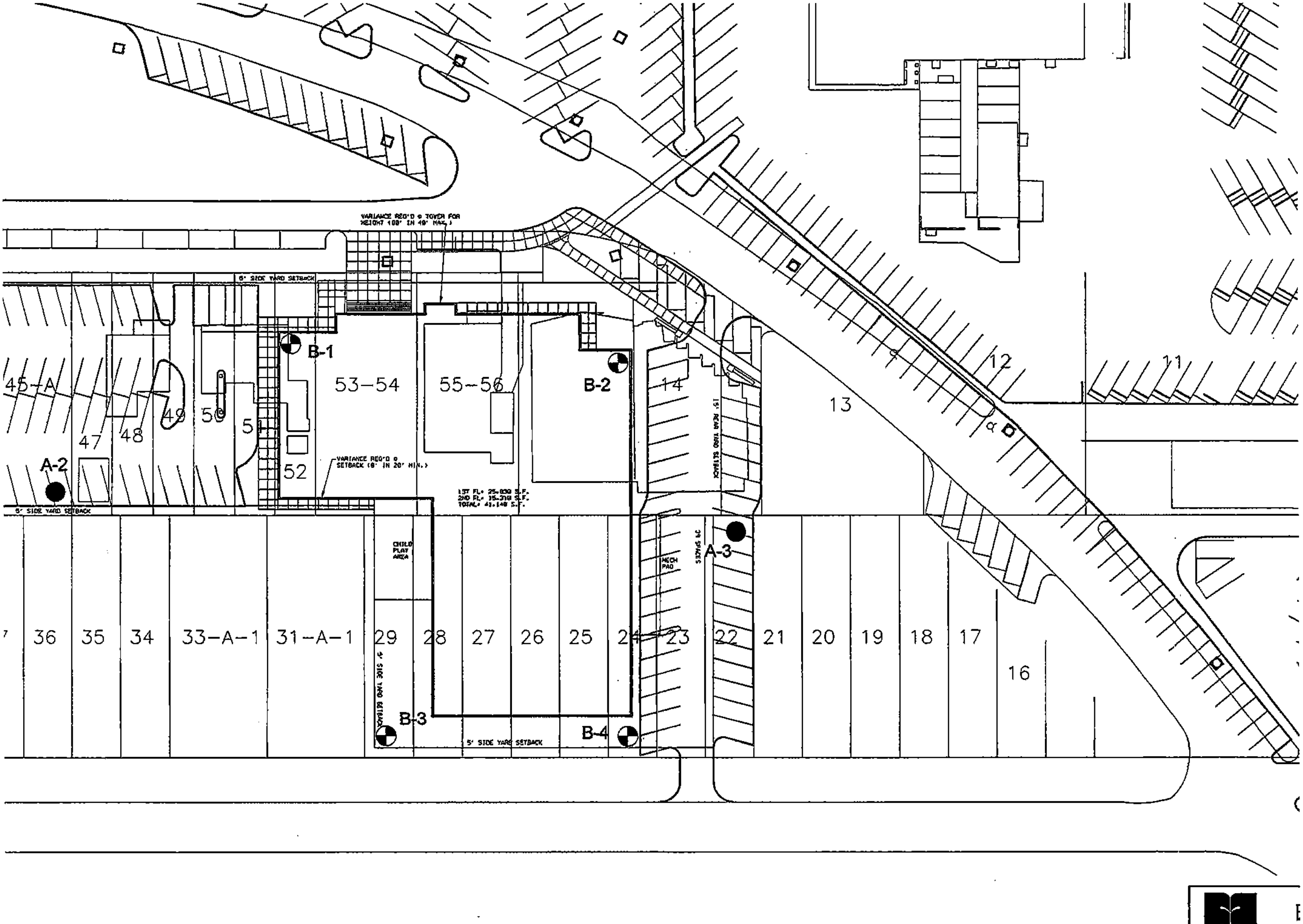
51. Areal Subsidence. The project area is being affected by ongoing areal subsidence that is the result of past filling, drawdown of ground water levels due to drainage improvements, and biodegradation of near surface organic soils subsequent to ground water drawdown. The amount of future subsidence cannot be estimated from information developed for our report. Settlement of surface founded structures and pavements due to subsidence can be several inches and differential over short lengths with respect to pile supported structures.

GEOTECHNICAL SERVICES DURING CONSTRUCTION

52. In order to provide continuity between the investigation, design, and construction phases, Eustis should be retained to review plans and specifications developed for the project and all contractor submittals related to geotechnical issues and foundations. Eustis can also provide additional geotechnical services which may include consultation during design and construction. We can also provide steel, concrete, and asphalt inspection services, and compaction and inplace density determinations on fill materials. We can perform appropriate laboratory tests to determine the gradation and quality of material proposed as structural fill or backfill.

Eustis can also log the installation of test piles and job piles, perform and evaluate pile load tests, and monitor vibrations.

53. Eustis should be retained to monitor the geotechnical related work performed by the contractor. This permits the geotechnical engineer that prepared the report to be on hand and quickly evaluate unanticipated conditions, conduct additional tests if required, and, when necessary, recommend alternative solutions to problems. This is recommended to avoid major construction cost overruns or contractual disputes on the project.



DENOTES UNDISTURBED BORINGS DRILLED: 11-13 SEPTEMBER 2006

DENOTES AUGER BORINGS DRILLED: 13 SEPTEMBER 2006

APPENDIX

LEGEND AND NOTES FOR LOG OF BORING AND TEST RESULTS

PP Pocket penetrometer: Resistance in tons per square foot

SPT Standard Penetration Test: Number of blows of a 140-lb hammer dropped 30 inches required to drive 2-in. O.D., 1.4-in. I.D. sampler a distance of 1 foot into the soil after first seating it 6 inches

SPLR Type of Sampling Shelby SPT Auger No sample

SYMBOL Clay Silt Sand Peat/Humus Shells Stone/Gravel

Predominant type shown heavy; Modifying type shown light

USC Unified Soil Classification

DENSITY Unit weight in pounds per cubic foot

SHEAR TESTS

TYPE

- UC Unconfined compression shear
- OB Unconsolidated undrained triaxial compression shear on one specimen confined at the approximate overburden pressure
- UU Unconsolidated undrained triaxial compression shear
- CU Consolidated undrained triaxial compression shear
- DS Direct shear

Ø Angle of internal friction in degrees
c Cohesion in pounds per square foot

ATTERBERG LIMITS

- LL Liquid Limit
- PL Plastic Limit
- PI Plasticity Index

OTHER TESTS

- CON Consolidation
- PD Particle size distribution (sieve and/or hydrometer)
- k Coefficient of permeability in centimeters per second
- SP Swelling pressure in pounds per square foot

Other laboratory test results reported on separate figures

GENERAL NOTES

(1) If a ground water depth is shown on the boring log, these observations were made at the time of drilling and were measured below the existing ground surface. These observations are shown on the boring logs. However, ground water levels may vary due to seasonal fluctuations and other factors. If important to construction, the depth to ground water should be determined by those persons responsible for construction immediately prior to beginning work.

(2) While the individual logs of borings are considered to be representative of subsurface conditions at their respective locations on the dates shown, it is not warranted that they are representative of subsurface conditions at other locations and times.

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKEVIEW CHRISTIAN CENTER
NEW ORLEANS, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 19511 **Date Drilled:** 9/13/06 **Boring:** 1 Refer to "Legends & Notes"

Scale In Feet	PP	SPT	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
								Dry	Wet	Type	ø	C	LL	PL	PI		
0			Loose brown silty sand w/vegetation	SM	1	0-0.5	31										
	0.75		Soft dark gray & brown sandy clay w/roots & brick & shell fragments	CL	2	0.5-2	31	85	111	UC	--	483					
			Medium stiff gray clay w/silt pockets & lenses	CH													
	0.75				3	5-6	50	70	105	UC	--	743					
			Very loose gray fine sand	SP													
		WOH			4	7.5-9	28										
10		2			5	10.5-12	26										
		3			6	13.5-15											
		2			7	16.5-18											
			Medium dense gray fine sand	SP													
20																	
		22			8	23.5-25											
30		20			9	28.5-30											
		29			10	33.5-35											
			Dense gray fine sand	SP													
40		30			11	38.5-40											
			Very loose greenish-gray fine sand	SP													
		2			12	43.5-45	29										
			Very soft gray clay w/sand pockets	CH													
50					13	49-50											

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKEVIEW CHRISTIAN CENTER
NEW ORLEANS, LOUISIANA

(Sheet 1 of 2)

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 19511 **Date Drilled:** 9/11/06 **Boring:** 2 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ø	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
0			Loose to medium dense gray fine sand w/gravel & shell fragments	SP	1	0-0.5	6										
			Very stiff gray silty clay w/shell fragments & decayed wood	CL	2	0.5-2	13										
					3	5-6	11										
	0.00		Extremely soft to very soft gray clay w/silt pockets	CH	4	8-9	88	48	90	UC	–	114					
10		8	Loose gray fine sand	SP	5	9.5-11											
		12	Medium dense gray fine sand	SP	6	12.5-14	22										
		12			7	15.5-17											
20		14			8	18.5-20											
		27			9	23.5-25	26										
30		43	Dense gray fine sand	SP	10	28.5-30											
		50			11	33.5-35											
40		47			12	38.5-40	27										
		23	Medium dense greenish-gray fine sand w/clayey sand	SP	13	43.5-45											
50	0.50		Medium stiff gray clay w/shell fragments & sand pockets	CH	14	49-50	56	66	102	UC	–	649					

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKEVIEW CHRISTIAN CENTER
NEW ORLEANS, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 19511 **Date Drilled:** 9/11/06 **Boring:** 2 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ø	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
50					Medium stiff gray clay w/shell fragments	CH													
	0.75						15	54-55	56	65	102	UC	--	737					
60	2.00						16	59-60											
					Very stiff gray & tan silty clay	CL													
	4.50+						17	64-65	21	106	129	UC	--	2275					
70	2.25						18	69-70											
	2.00						19	74-75	29	89	115	UC	--	512					
80																			
90																			
100																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKEVIEW CHRISTIAN CENTER
NEW ORLEANS, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 19511 **Date Drilled:** 9/13/06 **Boring:** 3 Refer to "Legends & Notes"

Visual Classification	USC
Stiff dark gray sandy clay w/vegetation	CL
Stiff gray & tan sandy clay w/roots	CL
Very soft gray & brown silty clay w/wood, roots, & brick fragments	CL
Very loose gray fine sand	SP
Medium dense gray fine sand	SP
Dense gray fine sand	SP
Very soft gray clay w/sand pockets & shell fragments	CH
Soft gray clay w/sand pockets & lenses, & shell fragments	CH

PP	SPT	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	ø	C	Atterberg Limits LL	PL	PI		Other Tests
		1	0-0.5	41										
2.25		2	2-3	38	79	109	UC	–	1030					
		3	5-6	32										
	2	4	7.5-9	28										
	4	5	10.5-12	23										
	23	6	13.5-15	26										
	23	7	16.5-18											
	16	8	19.5-21											
	16	9	23.5-25											
	30	10	28.5-30											
	34	11	33.5-35											
0.00		12	39-40	54	66	102	UC	–	200					
		13	44-45	43	76	109	UC	–	486					
		14	49-50	48	69	103	UC	–	350					

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKEVIEW CHRISTIAN CENTER
NEW ORLEANS, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 19511 **Date Drilled:** 9/13/06 **Boring:** 4 **Refer to "Legends & Notes"**

Visual Classification	USC
Soft dark gray sandy clay w/vegetation	CL
Stiff gray & brown sandy clay	CL
Extremely soft to very soft dark gray clay w/organic matter & wood	CH
Dense gray fine sand	SP
w/shell fragments	
Very loose gray & greenish-gray fine sand	SP
w/clay pockets	
Medium stiff to stiff gray clay w/sand pockets & shell fragments	CH

PP	SPT	Sample Number	Depth In Feet	Water Content Percent	Density Dry	Density Wet	Shear Tests Type	Shear Tests ø	Shear Tests C	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI		Other Tests
		1	0-0.5	47										
1.25		2	2-3	38	79	109	UC	--	1204					
0.00		3	5-6	87	48	90	UC	--	106					
	36	4	7.5-9											
	37	5	10.5-12											
	37	6	13.5-15											
	46	7	16.5-18											
	47	8	18.5-20											
	34	9	23.5-25											
	33	10	28.5-30											
	3	11	33.5-35	27										
	4	12	38.5-40	28										
		13	44-45	49	71	106	UC	--	1198					
		14	49-50	45	76	109	UC	--	292					

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKEVIEW CHRISTIAN CENTER
NEW ORLEANS, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 19511 **Date Drilled:** 9/13/06 **Boring:** A-1 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ø	C	LL	PL	PI		
0					Stiff gray & brown clay w/silt pockets	CH	1	0-1	36										
					Soft gray & brown clay w/silt pockets & organic matter	CH	2	1-2											
							3	2-3	79										
							4	3-4											
5							5	4-5	69										
							6	5-6											
10																			
15																			
20																			
25																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKEVIEW CHRISTIAN CENTER
NEW ORLEANS, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 19511 **Date Drilled:** 9/13/06 **Boring:** A-2 **Refer to "Legends & Notes"**

Scale in Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ø	C	LL	PL	PI		
0					Medium stiff gray clay w/brick fragments & sand pockets	CH	1	0-1											
							2	1-2	43										
					Medium stiff gray & brown clay	CH	3	2-3											
							4	3-4	44										
					Very soft brown clay w/decayed wood	CH	5	4-5											
5							6	5-6	80										
10																			
15																			
20																			
25																			

Comments:

EUSTIS ENGINEERING COMPANY, INC.

LOG OF BORING AND TEST RESULTS

LAKEVIEW CHRISTIAN CENTER
NEW ORLEANS, LOUISIANA

Ground Elev.: **Datum:** **Gr. Water Depth:** See Text **Job No.:** 19511 **Date Drilled:** 9/13/06 **Boring:** A-3 **Refer to "Legends & Notes"**

Scale In Feet	PP	SPT	SPLR	Symbol	Visual Classification	USC	Sample Number	Depth In Feet	Water Content Percent	Density		Shear Tests			Atterberg Limits				Other Tests
										Dry	Wet	Type	ø	C	LL	PL	PI		
0					Stiff gray sandy clay	CL	1	0-1	38										
					Soft gray & brown clay	CH	2	1-2											
							3	2-3	50										
							4	3-4											
5							5	4-5	59										
							6	5-6											
10																			
15																			
20																			
25																			

Comments: