Preliminary Report of Subsurface Exploration
and Geotechnical Evaluation
64 Acres, 5 Sections NWPID
Cullen, Louisiana

Dave Rambaran Geosciences, LLC
Project Number: 3021
Date: March 31, 2013

Prepared For:
North Webster Parish Industrial District
Springhill, Louisiana

Prepared By:

3.31.13

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March 31, 2013

North Webster Parish Industrial District
PO Box 176
Springhill, LA 71075

Attn: Ms. Rebecca Martin, CECD
Executive Director

Re: Preliminary Report of Subsurface Exploration
Geotechnical Recommendations
64 Acre, 5 Sections NWPID
Cullen, Louisiana
Project Number 3021

Dear Ms. Martin:

Dave Rambaran Geosciences, LLC has completed the authorized preliminary geotechnical engineering evaluation for the above referenced site. Our services were performed in substantial accordance with our Proposal Number 3021, dated March 1, 2013.

The purpose of our preliminary evaluation was to determine the preliminary general subsurface conditions at the site and to perform preliminary analysis to establish the potential impact these conditions will have on foundation design for the proposed structures. The recommendations in this report are based on a preliminary physical reconnaissance of the site performed on March 12 and 17, 2013, and observation and classification of samples obtained from test borings conducted at the site. Confirmation of the anticipated subsurface conditions during construction is an essential part of geotechnical services.

We appreciate the opportunity to provide consultation services for the proposed development. If you have any questions regarding the information in this report or need any additional information, please call us.

Respectfully Submitted,
DAVE RAMBARAN GEOSCIENCES, LLC

Dave Rambaran, P.E.,
Geotechnical Engineer

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APPENDIX

1.0 PROJECT DESCRIPTION

The site consists of 5 Sections Tract with acreages of 18, 15, 8, 13, and 10. The site is generally on the south side of the town of Cullen and East of Highway 371. This general site is proposed for commercial and industrial development. Loading for the proposed and anticipated structure was not provided at the time this report was being prepared.

Information regarding the site grading was limited to the structure being placed at or near the existing ground surface (elevation 245 to 248 feet).

FIGURE I

2.0 SCOPE OF SERVICES

The purpose of the preliminary geotechnical exploration was to determine preliminary subsurface conditions and to gather data on which to base a preliminary geotechnical evaluation with respect to proposed development. The information gathered from the proposed preliminary exploration was evaluated to determine the preliminary shallow foundation and bearing capacity for the proposed structure. The preliminary information was also evaluated to help determine if any special pad preparation procedures will be required during the earthwork phase of the project. The work included preliminary soil test borings, laboratory analysis, and preliminary geotechnical evaluation appropriate to address the preliminary geotechnical aspects of the proposed construction.

Our scope of services included a preliminary site reconnaissance and preliminary subsurface exploration consisting of 7 soil test borings. The 7 borings were drilled in the general location as discussed with the client to 20 to 24 feet each. The boring locations were estimated by measuring distances from the existing boundaries and structures.

The results of the work are presented within this report that addresses:

- Summary of existing surface conditions.
- A description of the subsurface conditions encountered at the soil test boring locations.
- Presentation of laboratory test results.
- Preliminary site preparation considerations.
- Preliminary recommendations for foundation design.
- A description of the current groundwater conditions as observed in the boreholes during drilling and at completion of the drilling.

3.0 SITE DESCRIPTION

Generally, the proposed project site is centrally located at co-ordinates 32° 57' 40.08″N and 93° 27' 04.31″W, with an estimated elevation of between 245 to 248 feet. At the time of our field investigation non all terrain vehicles were able to access the site along the highline to the east. The site is bounded by residential and commercial properties to the north; some residences and forestry at Outzts Family Trust to the east; forestry at Slack Thomas Edward's property to the south; and rail road, commercial, and industrial property to the west.

At the time of the subsurface exploration, the site was not in use and appeared to have been used for forestry. The natural ground surface gently slopes to the center of the property towards a creek. At the time of the field investigation, standing water was only seen in the creek and at the south end of the gas line easement. The aerial photograph was taken some time prior to this field investigation and some small areas of the site shows indication of standing water.

FIGURE II

4.0 SUBSURFACE EXPLORATION

The authorized preliminary subsurface field exploration was completed on March 16, 2013. The scope of services for the work performed for this project is documented in our Proposal Number 3021, dated March 1, 2013. The site was not easily accessible at the time of our field operations.

The preliminary subsurface exploration consisted of 7 soil test borings. The boring locations were estimated based on information from the client. A Dave Rambaran Geosciences representative located the borings by measuring distances from existing boundaries and structures. Boring B-1, 2, 3, 5, 6, and 7 were augured and tested to 20 feet each. Boring B-4 was augured and tested to 24 feet. The borings were generally located as shown on the "Boring Location Plan" in the Appendix.

The borings were drilled using continuous augers. Samples were generally obtained continuously from the ground surface to termination depth of 20 to 24 feet.

The borings were augured using continuous augers. Soil samples were obtained at 2 feet intervals during the drilling process. Drilling, sampling, and testing techniques were accomplished in general accordance with ASTM procedures (ASTM D1586, D1587 and D6915).

Samples retrieved from the boring locations were labeled and stored in plastic bags at the jobsite before being transported to our laboratory for analysis. The project engineer prepared Boring Logs summarizing the subsurface conditions at the boring location. The Boring Logs are attached to this report.

5.0 LABORATORY ANALYSIS/FIELD

After the soil samples were visually classified, specific samples were selected by the project engineer for laboratory analysis. The laboratory analysis consisted of full moisture profiles of the natural moisture content, #200 washes, Torvane test, and Atterberg limits tests determinations. The results of the field and laboratory analysis are presented on the boring logs in the Appendix of this report. A brief description of the laboratory tests performed is provided in the following sections.

5.1 DESCRIPTION OF SOILS (VISUAL-MANUAL PROCEDURE) (ASTM D 2488)

The soil samples were visually examined by our engineer and soil descriptions were provided. Representative samples were then selected and tested in accordance with the aforementioned laboratory-testing program to determine soil classifications and engineering properties. This data was used to correlate our visual descriptions with the Unified Soil Classification System (USCS).

5.2 NATURAL MOISTURE CONTENT (ASTM D 2216)

Natural moisture content (M%) was determined on selected samples. The natural moisture content is the ratio, expressed as a percentage, of the weight of water in a given amount of soil to the weight of solid particles. The results are indicated on the boring logs and table in the Appendix of this report.

5.3 ATTERBERG LIMITS (ASTM D-4318)

The Atterberg Limits test was performed to evaluate the soil's plasticity characteristics. The soil Plasticity Index (PI) is representative of this characteristic and is bracketed by the Liquid Limit (LL) and the Plastic Limit (PL). The Liquid Limit is the moisture content at which the soil will flow as a heavy viscous fluid. The Plastic Limit is the moisture content at which the soil is between "plastic" and the semi-solid stage. The Plasticity Index (PI = LL - PL) is a frequently used indicator for a soil's potential for volume change. Typically, a soil's potential for volume change increases with higher plasticity indices. The results of Atterberg limit testing are presented on the boring logs and summary table in the Appendix of this report.

5.4 WASH #200 TEST (ASTM D 422)

Grain-size tests were performed to determine the partial soil particle size distribution. The amount of material finer than the openings on the No. 200 sieve (0.074 mm) was determined by washing soil over the No. 200 sieve. The results of wash #200 tests are presented on the boring logs included in the Appendix of this report.

5.5 ASTM D2573 - 08 STANDARD TEST METHOD FOR FIELD VANE SHEAR TEST IN COHESIVE SOIL

This test method provides an indication of in-situ undrained shear strength of fine-grained clays and silts or other fine geomaterials such as mine tailings, organic muck, and substances where undrained strength determination is required. Very sensitive soils can be remolded during vane insertion.

5.6 DCP FIELD TESTING (ASTM D 6915 & MDOT 93-05)

Army Corps of Engineers Dual-Mass Cone Penetrometers: the U.S. Army Corps of Engineers has developed two cone penetrometers to measure CBR values from 1 to 100. These devices are similar to the one used in South Africa since the 1970s. The dual mass version drops an 8 kg mass a distance of 575 mm onto an anvil driving a cone with a maximum diameter of 20 mm. The Corps has developed a correlation between CBR mm/blow and the penetration index (PI). Portland Cement Association has also developed approximate interrelationships of CBR and Bearing values and PI (Design of Concrete Airport Pavement, Portland Cement Association page 8, 1955). Minnesota Department of Transportation 93-05 “In Situ Foundation Characterization Using DCP”.

5.7 SUBSURFACE CONDITIONS

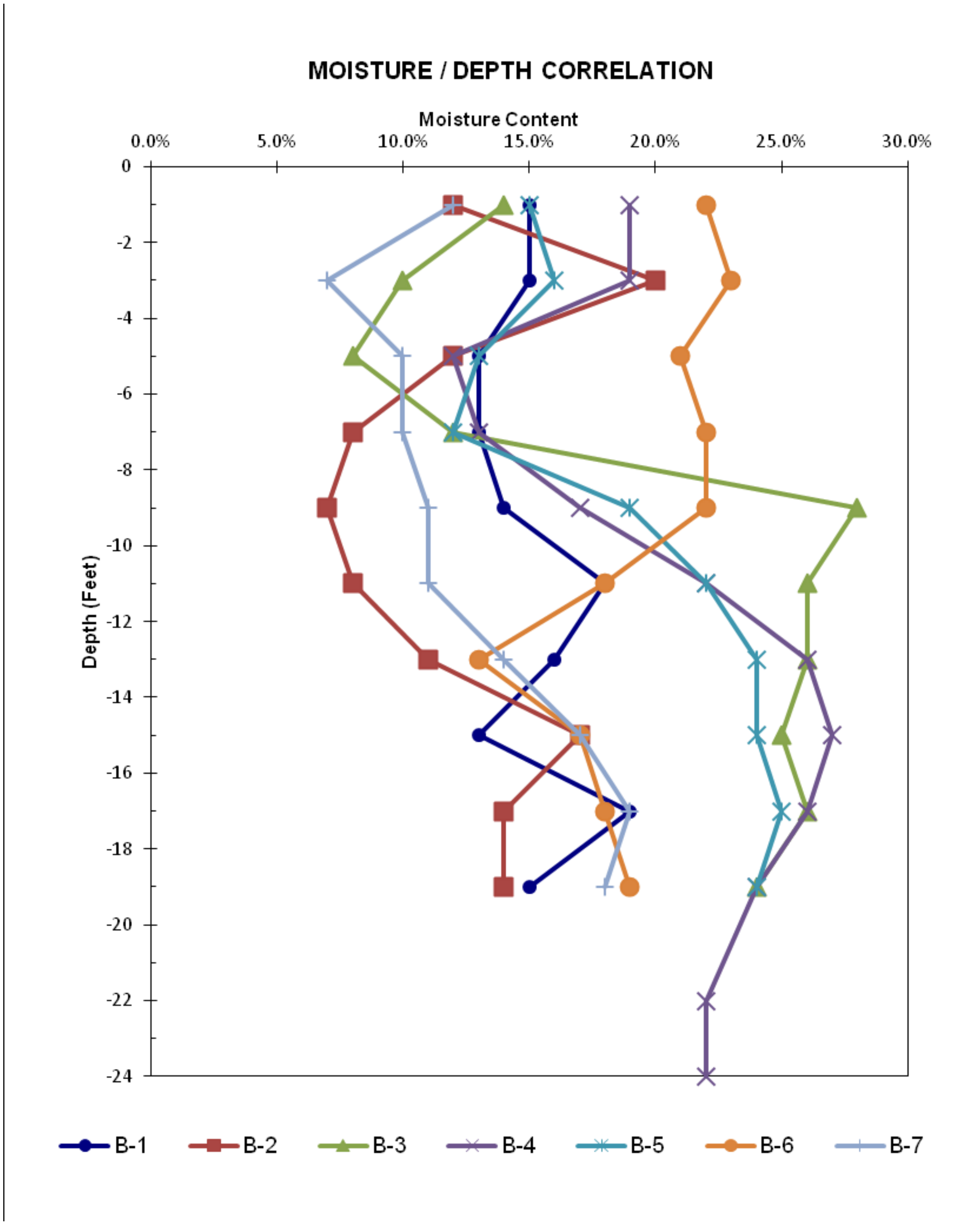
The subsurface conditions at the site were evaluated by continuous observation and classification of soil samples obtained from the soil test borings. The borings were augured to 20 to 24 feet. The conditions away from the boreholes could vary from the conditions encountered at the borehole location. However, the following conditions and subsequent recommendations are based on the information from the borings performed. Anomalous conditions can occur due to the geologic conditions at the site. It will be necessary to verify the conditions during foundation installation.

General Site: Subsurface conditions encountered at the site generally included topsoil to 8 inches and soft to hard silty clay (CL or CL-ML) to up to 13 feet. Underlying the CL/ CL-ML was medium dense and loose silty sand to termination depth of 20 to 24 feet. Firm sandy silt was encountered in boring B-4 in the upper 18 inches. Boring logs are attached in the Appendix for detailed soil strata information.

5.8 GROUNDWATER

Groundwater was encountered at 2 to 14 feet during drilling. A moisture profile was estimated using the natural moisture content of the soil samples obtained from the borings and the natural moisture content is elevated at an approximate depth of 1 to 7 feet. The groundwater levels may be shallower at other times. The time of year and quantity of precipitation should be considered when using this information.

FIGURE III



6.0 SITE CONSIDERATIONS

A site grading plan was not provided at the time this preliminary report was prepared. We assumed the finished floor elevation of the proposed structures to be at the existing grade.

Preliminary shallow foundation bearing capacities are provided. Shallow footings should be placed at a depth of 3 to 4 feet from the finish floor in the natural stiff subgrade.

The general site appears to be receiving runoff from off-site. Drainage of the site in areas of ponding water will need to be considered. At the time of the field investigation, the site was relatively dry. However, review of aerial photographs, as shown in Figure II, indicates some areas with ponding water.

6.1 SITE PREPARATION

We recommend vegetation, topsoil, or any other deleterious materials be removed up to 6 to 12 inches from the natural grade. We recommend that any pre-existing structures, foundations, and associated utilities be removed prior to construction. Proper drainage should be constructed at the site to channel the runoff away from the site. Areas that will require fill or that will support structures or pavements should be carefully proofrolled with a heavy, rubber-tired vehicle (tandem axel loaded dump truck) prior to fill placement or building construction. The proofrolling will help compact the near-surface soils and identify unstable subgrade areas. A Dave Rambaran Geosciences representative should observe the proofrolling operations.

A consistent layer of fill should be placed under structures to limit differential settlement. The pad should be uniformly filled in accordance with the "Structural Fill" section of this report.

6.2 UNDERCUTTING/STABILIZATION

Some instability may exist during construction, depending on climatic conditions and other factors immediately preceding and occurring during construction. Based on the results of our field exploration, we anticipate that unstable surficial silts and clay soils may be encountered across the project site. The unstable strata were generally located in upper 4 feet in building borings. Unstable materials also may be present in unexplored areas of the site. Soft and/or unstable soils identified during proofrolling should be undercut and recompacted in lifts or stabilized. Information regarding suitable stabilization methods can be provided during construction based on actual conditions encountered.

If excessive pumping and rutting occurs during grading due to the sensitive nature of the silty clay material then we recommend, once the subgrade is exposed, no equipment should be allowed to travel directly on the exposed subgrade. The structural fill can be pushed in place using a **low ground pressure** (**LGP**) medium to light bulldozer to create a bridge lift. The bulldozer should work from the bridge lift and not impact the subgrade. The bulldozer should not travel directly on the exposed subgrade.

6.3 EXCAVATION CONSIDERATIONS

Based on the soils encountered to a depth of 2 feet we anticipate that over excavation will be required to a minimum depth of approximately 18 inches in the building footprint and 3 feet outside the building footprint. Select fill should be used to replace the excavated material in accordance with the "Structural Fill" section of this report.

Groundwater may be encountered during the excavation and will depend on the rainfall amounts prior to and during construction.

6.4 SUBGRADE EVALUATION

We recommend that a representative of Dave Rambaran Geosciences evaluate the subgrade after the initial site preparation is completed. All unsuitable material identified during the subgrade evaluation shall be removed prior to construction. The lift of fill placed should not exceed 12 inches loose measure and should be compacted to the specifications provided in the following section.

6.5 LIME TREATMENT

The silty clay and sandy silt material encountered may become unstable during construction and chemical stabilization may be necessary. Lime treatment or equivalent may be conducted in general accordance with method B or C described in Section 304 of "Louisiana Standard Specifications for Roads and Bridges" (DOTD) 2006 edition. The project geotechnical engineer or his representative should observe the operations.

6.6 STRUCTURAL FILL

Structural fill at the site should be composed of material with dry density in excess of 100 pounds per cubic foot (pcf), Plasticity Index (PI) between 8 and 20, and a Liquid Limit (LL) less than 40. Also, the material should be classified as a clayey sand (SC) or sandy clay (CL). Any fill to be placed at the site should be approved by the geotechnical engineer.

The structural fill should be compacted to 98% of the Standard Proctor maximum dry density and within -2 to +2% of the optimum moisture as determined by ASTM D-698. The specifications should state that both density and moisture requirements should be met. The lifts should not exceed 8 to 12 inches thick, depending on the compaction equipment used. Density and moisture tests should be performed on each lift prior to placement of subsequent lifts.

6.7 DRAINAGE CONSIDERATIONS

Due to the shallow groundwater, dewatering may be required. The potential for soil moisture fluctuations within building areas and pavement subgrades should be minimized in order to reduce the potential of subgrade movement. Site grading should include positive drainage away from these areas. Periodic irrigation of landscaping poses a risk of saturating and softening soils below foundations and pavements, which could result in settlement and premature failure.

6.8 WET WEATHER CONSTRUCTION

Cooler temperatures and shorter days during the winter season significantly reduce the capacity to dry out wet silty and clayey soils. Additionally, excessive movement of construction equipment across the site during wet condition will result in ruts and instability, which will collect water, prolonging the time required to dry the subgrade soils.

During wet conditions, additional effort will be required to properly prepare the site and establish/maintain an acceptable subgrade. Grading contractors typically postpone grading operations during wet weather to wait for conditions that are more favorable. Contractors can typically disk or aerate the upper soils to promote drying during intermittent periods of favorable weather. When deadlines restrict postponement of grading operations, additional measures, such as undercutting and replacing saturated soils or chemical stabilization, can be utilized to facilitate placement of additional fill material.

Positive drainage away from the structure is recommended both during and after construction to reduce the potential for ponding of water around structures as well as infiltration of surface run-off water below the floor system.

7.0 PRELIMINARY FOUNDATION RECOMMENDATIONS

The structural design column loading was not provided. Preliminary capacities are given for shallow spread and continuous footings. Alternate foundation recommendations for deep foundations can be provided after deeper borings are performed and the specific structure and loading is determined.

7.1 PRELIMINARY SHALLOW FOOTINGS

Spread footings and continuous footings, bearing in the stable stiff natural silty clay and sandy silt layer below 3 to 4 feet, could be designed for maximum allowable bearing capacities of 2,800 psf and 2,300 psf, respectively, based on dead loads and design live loads. Minimum dimensions of 24 inches for column footings and 18 inches for continuous footings should be used in the foundation design to minimize the possibility of a localized bearing failure.

Due to the nature of the saturated sands at the site below 6 to 12 feet dynamic loading may cause settlement. Design consideration will be necessary if heavy equipment with vibration will be housed at this site.

The foundation excavations should be observed by a representative of Dave Rambaran Geosciences prior to steel or concrete placement, in order to assess that the foundation materials are capable of supporting the design loads and are consistent. Soft or loose soil zones encountered at the bottom of the footing excavations should be removed to the level of firm soils or adequately compacted fill as directed by the geotechnical engineer. Cavities formed as a result of excavation of soft or loose soil zones should be backfilled with the same material, or the same type of material, as determined by the geotechnical engineer.

Footing excavations should be observed and concrete should be placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond prior to or after concrete placement. The foundation concrete placement should be completed on the same day the excavation is made. If it is required that footing excavations be left open for more than one day, they should be protected to reduce evaporation or entry of moisture.

Settlement

If the allowable bearing capacity is not exceeded, settlement from consolidation in building areas should be less than 1 inch. Based on the results of the preliminary field and laboratory tests, along with the anticipated estimated foundation loads, we estimate the maximum differential settlement for the floor slab and foundation system is one-half (½) inch and one (1) inch, respectively; as measured over a horizontal distance of 30 and 100 feet, respectively. While settlement of this magnitude is generally considered tolerable for structures of the type proposed, the design of any masonry walls should include provisions for liberally spaced, vertical control joints to minimize the effects of cosmetic cracking. Also, liberal use of control joints in the slab is recommended to minimize cosmetic cracking.

7.2 PRELIMINARY FLOOR SLAB

Proof-rolling, as discussed earlier in the report, should be accomplished to identify and remove any soft or unstable soils from the floor slab area prior to fill placement and/or floor slab construction. The site should be prepared as presented in the "Site Preparation" section of this report. The floor slab should have an adequate number of joints to reduce the cracking resulting from any differential movement. The floor slab should not be rigidly connected to columns, walls, or foundations.

In addition to the above required structural fill, a moisture/vapor barrier placed directly below the building slab consisting of polyethylene sheeting, followed by six (6) inches of No. 8 stone, crushed and washed as per ASTM C33. The stone should be compacted to a minimum relative density of 70 percent as per ASTM D4253 and D4254. For design purposes, a minimum modulus of subgrade reaction, k, of 150 pci can be utilized for the above recommended compacted crushed stone. The crushed stone moisture barrier should be graded to gravity drain. Alternately, a free draining coarse sand cushion could be used in lieu of the crushed stone layer, above the structural fill or prepared subgrade. For this case, a minimum modulus of subgrade reaction, k, of 100 pci can be utilized for design purposes. In all cases the moisture/vapor barrier should be designed and constructed in accordance with the International Building Code (IBC 2003).

Positive drainage away from the structure is suggeated during and after construction to reduce the potential for ponding of water around structures as well as infiltration of surface run-off water below the floor system. The project geotechnical engineer representative should observe the operations.

8.0 EXCAVATIONS

This federal regulation mandates that excavations, whether they be utility trenches, basement excavations, or footing excavations, be constructed in accordance with the applicable OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations to maintain the stability of both the excavation sides and bottom. The contractor's "responsible person," as defined in the “Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P,” should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our client. We do not assume responsibility for construction site safety, or the contractor's or other parties’ compliance with local, state, and federal safety or other regulations.

9.0 CLOSING

This report is for North Webster Parish Industrial District for specific application to this site. The information in this report is not transferable. This report is preliminary and should not be used for a different development without first being evaluated by the engineer. The preliminary recommendations in this report were based on the information obtained from our field exploration, laboratory analysis and engineering judgment regarding conditions between borings. It will be necessary to perform further investigation to confirm the anticipated subsurface conditions prior to design and construction.

An article published by the Association of Engineering Firms Practicing in the Geosciences (ASFE), titled *Important Information About Your Geotechnical Report*, has been included in the Appendix. We encourage all individuals to become familiar with the article to help managing risk.

APPENDIX

Source: Site Map provided by Others

NORTH

Notes: Estimated Boring Location

BORING LOCATION PLAN

BORING LAYOUT
64 ACRES, 5 SECTIONS NWPID
CULLEN, LOUISIANA

Scale: NTS	Project No: 3021

Dave Rambaran Geosciences, LLC
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BORING LOG B-1

Project Name: **64 Acre 5 Sections NWPID Springhill, LA** Date of Boring: March 12, 2013

Location: **North Webster Parish Industrial District** Project No: 3021

	Description:	Depth feet	Sample type	ASTM D6951/ D1586 N	Tv psf	Qp tsf	δd pcf	M %	LL	PI	-200	Remarks
	Surface description & Remarks											Undrained Shear Str Torvane (Tv)
	Topsoil 8"		AUG									
	Silty Clay (CL); STIFF, Light Brown with some Sand				1086			15				
2		2										
	STIFF, Brown		AUG		1167			14				
4		4										
	VERY STIFF, Red & Gray		AUG		2277			13	41	21		
6		6										
	HARD		AUG		6266			13				GW@7'
8		8										
	Silty Sand (SM); MEDIUM DENSE, Red & Gray		AUG	18				14				
10		10										
	MEDIUM DENSE		AUG	18				18			24	
12		12										
	MEDIUM DENSE, with some Clay		AUG	15				16				
14		14										
	MEDIUM DENSE		AUG	8				13				
16		16										
	MEDIUM DENSE		AUG	15				19				
18		18										
	MEDIUM DENSE, Sand content Increased		AUG	8				15				
20		20										
22		22										
	Boring terminated at 20'											
24	Groundwater encountered at 7' at time of auguring	24										

AUG - GRAB DCP VALUES (ASTM D6951)
N - STANDARD PENETRATION RESISTANCE (ASTM D-1586 CORRELATED TO D6951
M% - PERCENT NATURAL MOISTURE CONTENT
LL - LIQUID LIMIT
PI - PLASTICITY INDEX
Sd - DRY UNIT WEIGHT

Dave Rambaran Geosciences, LLC

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BORING LOG B-2

Project Name: **64 Acre 5 Sections NWPID Springhill, LA** Date of Boring: March 12, 2013

Location: **North Webster Parish Industrial District** Project No: 3021

	Description:	Depth feet	Sample type	ASTM D6951/ D1586 N	Tv psf	Qp tsf	δd pcf	M %	LL	PI	-200	Remarks
	Surface description & Remarks											Undrained Shear Str Torvane (Tv)
	Topsoil 8" Silty Clay (CL-ML); SOFT, Brown Gray with some Sand		AUG	2				12				
2	STIFF, Brown	2	AUG	8				20	23	7		GW@2'
4	VERY STIFF, Gray	4	AUG	15				12				
6	Silty Sand (SM); MEDIUM DENSE, Light Gray	6	AUG	16				8				
8	MEDIUM DENSE	8	AUG	18				7				
10	MEDIUM DENSE	10	AUG	18				8				
12	MEDIUM DENSE	12	AUG	13				11				
14	MEDIUM DENSE	14	AUG	14				17			16	
16	MEDIUM DENSE	16	AUG	14				14				
18	MEDIUM DENSE, Sand content Increased with depth	18	AUG	12				14				
20		20										
22		22										
24	Boring terminated at 20' Groundwater encountered at 2' at time of auguring	24										

AUG - GRAB DCP VALUES (ASTM D6951)
N - STANDARD PENETRATION RESISTANCE (ASTM D-1586 CORRELATED TO D6951
M% - PERCENT NATURAL MOISTURE CONTENT
LL - LIQUID LIMIT
PI - PLASTICITY INDEX
Sd - DRY UNIT WEIGHT

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BORING LOG B-3

Project Name: **64 Acre 5 Sections NWPID Springhill, LA** Date of Boring: March 12, 2013

Location: **North Webster Parish Industrial District** Project No: 3021

	Description:	Depth feet	Sample type	ASTM D6951/ D1586 N	Tv psf	Qp tsf	δd pcf	M %	LL	PI	-200	Remarks
	Surface description & Remarks											Undrained
	Topsoil 8"		AUG									Shear Str
	Silty Clay (CL-ML); STIFF, Brown Gray with some Sand				1587			14				Torvane
												(Tv)
2		2										GW@2'
	VERY STIFF, Brown		AUG									
					3968			10				
4		4										
	HARD		AUG									
					5430			8	32	13	20	
6		6										
			AUG									
	HARD, increased Sand Contant				6500			12				
8		8										
	Silty Sand (SM); MEDIUM DENSE, Light Gray		AUG									
				11				28				
10		10										
	MEDIUM DENSE		AUG									
				18				26				
12		12										
	MEDIUM DENSE		AUG									
				9				26				
14		14										
	MEDIUM DENSE		AUG									
				18				25				
16		16										
	MEDIUM DENSE		AUG									
				14				26				
18		18										
	MEDIUM DENSE, Sand content Increased with depth		AUG	11				24				
20		20										
22		22										
	Boring terminated at 20'											
24	Groundwater encountered at 2' at time of auguring	24										

AUG - GRAB DCP VALUES (ASTM D6951)
N - STANDARD PENETRATION RESISTANCE (ASTM D-1586 CORRELATED TO D6951
M% - PERCENT NATURAL MOISTURE CONTENT
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BORING LOG B-4

Project Name: **64 Acre 5 Sections NWPID Springhill, LA** Date of Boring: March 12, 2013

Location: **North Webster Parish Industrial District** Project No: 3021

Description:	Depth feet	Sample type	ASTM D6951/ D1586 N	Tv psf	Qp tsf	δd pcf	M %	LL	PI	-200	Remarks
Surface description & Remarks											Undrained
Topsoil 8"		AUG									Shear Str
Sandy Silt (ML); FIRM, Light Brown with some Clay				877			19			60	Torvane (Tv)
	2										
Silty Clay (CL); STIFF, Brown Gray with some Sand		AUG		1796			19				
	4										
Sandy Silt (ML); HARD, Light Brown		AUG		4386			12				
	6										GW@6'
HARD		AUG		5430			13				
	8										
HARD		AUG		5430			17				
	10										
Silty Sand (SM); MEDIUM DENSE, Light Gray		AUG	18				22				
	12										
MEDIUM DENSE		AUG	10				26				
	14										
MEDIUM DENSE		AUG	18				27				
	16										
MEDIUM DENSE		AUG	14				26				
	18										
MEDIUM DENSE, Sand content Increased with depth		AUG	11				24				
	20										
	22										
MEDIUM DENSE		AUG	10				22				
Boring terminated at 24'											
Groundwater encountered at 6' at time of auguring	24										

AUG - GRAB DCP VALUES (ASTM D6951)
N - STANDARD PENETRATION RESISTANCE (ASTM D-1586 CORRELATED TO D6951
M% - PERCENT NATURAL MOISTURE CONTENT
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BORING LOG B-5

Project Name: **64 Acre 5 Sections NWPID Springhill, LA** Date of Boring: March 12, 2013

Location: **North Webster Parish Industrial District** Project No: 3021

Description:	Depth feet	Sample type	ASTM D6951/ D1586 N	Tv psf	Qp tsf	δd pcf	M %	LL	PI	-200	Remarks
Surface description & Remarks											Undrained Shear Str Torvane (Tv)
Topsoil 8" Silty Clay (CL); Firm, Brown Gray with some Sand		AUG	4				15				
STIFF	2	AUG	10				16				
STIFF	4	AUG	13				13	30	12		
VERY STIFF	6	AUG	20				12				
HARD	8	AUG	31				19				
Silty Sand (SM); MEDIUM DENSE, Light Gray	10	AUG	14				22			18	
MEDIUM DENSE	12	AUG	15				24				▼ GW@13'
MEDIUM DENSE	14	AUG	16				25				
MEDIUM DENSE	16	AUG	19				25				
MEDIUM DENSE, Sand content Increased with depth	18	AUG	17				24				
	20										
	22										
Boring terminated at 20' Groundwater encountered at 13' at time of auguring	24										

AUG - GRAB DCP VALUES (ASTM D6951)
N - STANDARD PENETRATION RESISTANCE (ASTM D-1586 CORRELATED TO D6951
M% - PERCENT NATURAL MOISTURE CONTENT
LL - LIQUID LIMIT
PI - PLASTICITY INDEX
Sd - DRY UNIT WEIGHT

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BORING LOG B-6

Project Name: **64 Acre 5 Sections NWPID Springhill, LA** Date of Boring: March 17, 2013

Location: **North Webster Parish Industrial District** Project No: 3021

Description:	Depth feet	Sample type	ASTM D6951/ D1586 N	Tv psf	Qp tsf	δd pcf	M %	LL	PI	-200	Remarks
Surface description & Remarks											Undrained Shear Str Torvane (Tv)
Topsoil 8"		AUG									
Silty Clay (CL-ML); SOFT, Light Brown with some Sand			2				22	24	6		
FIRM	2	AUG	5				23				GW@2'
STIFF	4	AUG	10				21			80	
STIFF	6	AUG	10				22				
VERY STIFF	8	AUG	16				22				
Silty Clay (CL); STIFF, Red & Gray	10	AUG	15				18	31	10		
Silty Sand (SM); MEDIUM DENSE, Reddish Gray	12	AUG	16				13			45	
MEDIUM DENSE	14	AUG	10				17				
MEDIUM DENSE	16	AUG	20				18				
	18										
MEDIUM DENSE, Sand content Increased with depth		AUG	20				19				
	20										
	22										
Boring terminated at 20'											
Groundwater encountered at 2' at time of auguring	24										

AUG - GRAB DCP VALUES (ASTM D6951)
N - STANDARD PENETRATION RESISTANCE (ASTM D-1586 CORRELATED TO D6951
M% - PERCENT NATURAL MOISTURE CONTENT
LL - LIQUID LIMIT
PI - PLASTICITY INDEX
Sd - DRY UNIT WEIGHT

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BORING LOG B-7

Project Name: **64 Acre 5 Sections NWPID Springhill, LA** Date of Boring: March 17, 2013

Location: **North Webster Parish Industrial District** Project No: 3021

Depth	Description:	Depth feet	Sample type	ASTM D6951/ D1586 N	Tv psf	Qp tsf	δd pcf	M %	LL	PI	-200	Remarks
	Surface description & Remarks											Undrained Shear Str Torvane (Tv)
	Topsoil 8" Silty Clay (CL-ML); SOFT, Light Brown with some Sand		AUG	4				12				
2	FIRM	2	AUG	14				7	31	12		
4	STIFF	4	AUG	10				10				
6	VERY STIFF	6	AUG	15				10				
8	Silty Sand (SM); MEDIUM DENSE, Gray	8	AUG	14				11				
10	MEDIUM DENSE	10	AUG	12				11				
12	MEDIUM DENSE	12	AUG	12				14			45	
14	MEDIUM DENSE	14	AUG	12				17				GW@14'
16	LOOSE	16	AUG	7				19				
18	MEDIUM DENSE, Sand content Increased with depth	18	AUG	11				18				
20		20										
22		22										
24	Boring terminated at 20' Groundwater encountered at 2' at time of auguring	24										

AUG - GRAB DCP VALUES (ASTM D6951)
N - STANDARD PENETRATION RESISTANCE (ASTM D-1586 CORRELATED TO D6951
M% - PERCENT NATURAL MOISTURE CONTENT
LL - LIQUID LIMIT
PI - PLASTICITY INDEX
Sd - DRY UNIT WEIGHT

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

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