EXHIBIT O

EAST OUACHITA DEVELOPMENT

GEOTECHNICAL MEMO

LOUISIANA ECONOMIC DEVELOPMENT
CERTIFIED SITE

NORTHEAST LOUISIANA
ECONOMIC ALLIANCE
NELEA

DENMON ENGINEERING

Denmon Engineering, Inc. - P.O. Box 8460, Monroe, LA 71211 – 318-388-1422 – www.denmon.com

EAST OUACHITA DEVELOPMENT GEOTECHNICAL MEMO

Preliminary Geotechnical Engineering Report

LED Site Certification
Monroe, Louisiana
November 20, 2020
Terracon Project No. BB205024

Prepared for:
Denmon Engineering
Monroe, Louisiana

Prepared by:
Terracon Consultants, Inc.
Shreveport, Louisiana

November 20, 2020

Denmon Engineering
114 Venable Lane
Monroe, Louisiana 71203

Attn: Mr. Randy Denmon
E: randy@denmon.com

Re: Preliminary Geotechnical Engineering Report
LED Site Certification
Millhaven Road
Monroe, Louisiana
Terracon Project No. BB205024

Dear Mr. Denmon:

We have completed the Preliminary Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PBB205024-R1 dated September 17, 2020. This report presents the findings of the subsurface exploration and provides preliminary geotechnical recommendations concerning earthwork and the design and construction of foundations for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Lizzy Stark, P.E.
Senior Staff Engineer

Ayan Mehrotra, P.E.
Department Manager

Reviewed by Jeffrey W. Williams, P.E. – Senior Engineer

REPORT TOPICS

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the ***GeoReport*** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

Preliminary Geotechnical Engineering Report

LED Site Certification
Millhaven Road
Monroe, Louisiana
Terracon Project No. BB205024
November 20, 2020

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed petrochemical plant structures to be located at Millhaven Road in Monroe, Louisiana. The purpose of these services is to provide information and preliminary geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Foundation design and construction

The geotechnical engineering Scope of Services for this project included the advancement of three test borings to depths ranging from approximately 30 to 100 feet below existing site grades.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information See **Site Location**.	The project is located at Millhaven Road in Monroe, Louisiana. Latitude: 32.4952° /Longitude: -92.0229° (approximate center of site) Approximately 60 acre site
Existing Improvements	Undeveloped site
Current Ground Cover	Grassy
Existing Topography	Relatively flat.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning.

Item	Description
Information Provided	Information was provided by Mr. Clinton Patrick with Denmon Engineering and consisted of a site outline and brief project description.
Project Description	The project consists of obtaining Louisiana Economic Development (LED) certification for an industrial site. As part of the certification, a preliminary geotechnical investigation is required to characterize the soil conditions and provide approximate load bearing capacity for 14" concrete piles and spread footings to support typical petrochemical plant structures. The scope of this study is preliminary in nature and intended for the use of LED site certification. No specific details are available with regard to any planned construction at the subject site. If the site will be developed at a later date, then an additional geotechnical study will be needed for the specific proposed construction.

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section and the GeoModel can be found in the **Figures** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**Silt**	Silt, Lean Clay with Silt
2	**Fat Clay**	Fat Clay
3	**Sand**	Clayey Sand, Sand with Clay and Gravel

Groundwater was encountered during drilling in Model Layers 1 and 2 at depths of around 9 to 10 feet. Groundwater fluctuations occur due to seasonal variations in the amount of rainfall, runoff, site modification, and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. It is not uncommon for stable groundwater levels to be within a few feet of the ground surface in this region. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

In general, the near surface soils encountered at the project site consist of soft to medium stiff silt and lean clays with silt. The surface soils appeared relatively stable at the time of the exploration. However, these silty soils are expected to become unstable with typical earthwork and construction traffic, especially after precipitation events. To reduce potential for surface instability, effective drainage should be completed early in the construction sequence and maintained during and after construction. If possible, the grading should be performed during the warmer and drier time of the year. If grading is performed during the winter months or at times with persistent rain, an increased risk for possible undercutting and replacement of unstable subgrade or the need for other mitigation measures will persist.

The near surface soils at the site, to the depth of the approximate seasonal moisture change zone of about 8 to 10 feet, typically consist of low and medium plasticity silty clays, but high plasticity fat clay was encountered to a depth of about 4-feet at boring B-02. Typically, clays in this region exhibit potential for shrink-swell movements with changes in moisture. In general, lean clays are considered to exhibit low to moderate potential while fat clays are considered to exhibit a high potential for shrink-swell movements. It has been our experience in the area that lean and fat clay soils that exhibit PI>25, but that are at moisture content above the plastic limit will typically exhibit low swell potential. The results of moisture testing of the surficial clays at this site indicate that the fat clay soils within upper 4 feet are currently approximately 11 percent above the plastic limit, and are underlain by clay soils with lower PI values and more limited shrink/swell potential. Based upon preliminary data and our experience with similar clay conditions in the region, it is our opinion that a lightly loaded floor slab placed over a minimum of 24 inches of low-plasticity engineered fill, over the in situ fat clay at the current moisture levels, could be constructed with an anticipated potential vertical rise (PVR) of about 1 inch or less.

The soils at the subject site predominantly consist of moderately overconsolidated and stiff, lean clays and fat clays that are underlain by a fairly thick stratum of dense to very dense sand. The site stratigraphy is only marginally compressible and considered suitable for supporting light to moderate structural loads via a shallow foundation system. Shallow foundations may experience higher settlements than are typically tolerable if the overall site grade is increased by more than about 2 feet. The **Shallow Foundations** section addresses support of structures bearing on native medium stiff to stiff silt or clay or structural fill.

Based on preliminary data, support of more heavily loaded structures may require use of deep foundations. We have provided preliminary design criteria for prestressed concrete (PPC) piles.

However, the site also appears to be suitable for auger cast-in-place (ACIP) and drilled shaft foundations. The **Deep Foundations** section addresses support of structures on prestressed concrete piles.

The **General Comments** section provides an understanding of some of the report limitations. Additionally, this report is preliminary in nature and for informational purposes only. No specific details are available with regard to any planned construction at the subject site. If the site will be developed at a later date, then an additional geotechnical study will be needed for the specific proposed construction.

SHALLOW FOUNDATIONS

If the preliminary findings in our report are confirmed, and the site has been prepared in accordance with the requirements noted in **Earthwork**, it is anticipated that the following design parameters are applicable for shallow foundations.

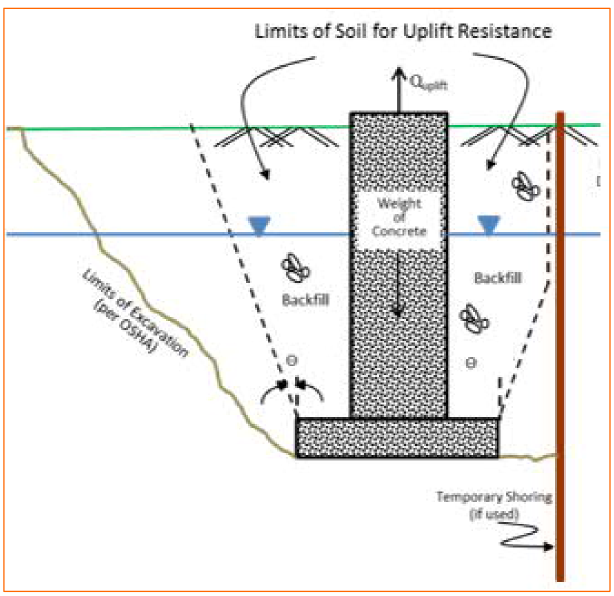
Preliminary Design Parameters – Compressive Loads

Item	Description
Maximum Net Allowable Bearing Pressure [1, 2]	1,800 psf (foundation bearing on undisturbed soils or structural fill).
Required Bearing Stratum [3]	Brown, red or tan, medium stiff to stiff silt or clay, or structural fill
Minimum Foundation Dimensions	Columns: 24 inches Continuous: 16 inches
Ultimate Passive Resistance [4] **(equivalent fluid pressures)**	250 pcf (cohesive backfill)
Ultimate Adhesion [5]	400 psf (existing clay)
Minimum Embedment Below Finished Grade [6]	Exterior footings: 18 inches Interior footings: 12 inches
Estimated Total Settlement from Structural Loads [2]	Less than about 1 inch.
Estimated Differential Settlement [2]	About 1/2 of total settlement.

Item	Description
1.	The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied.
2.	Values provided are preliminary as maximum loads have not been provided. Settlement is for structural loads and up to 2 feet of engineering fill. Differential settlements are as measured over a span of 50 feet.
3.	Unsuitable or soft soils should be over-excavated and replaced under the supervision of the Geotechnical Engineer.
4.	Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face. Apply a factor of safety of at least 1.5 to this value when designing for lateral force resistance.
5.	Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions.
6.	Embedment necessary to minimize the effects of seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.

Design Parameters - Uplift Loads

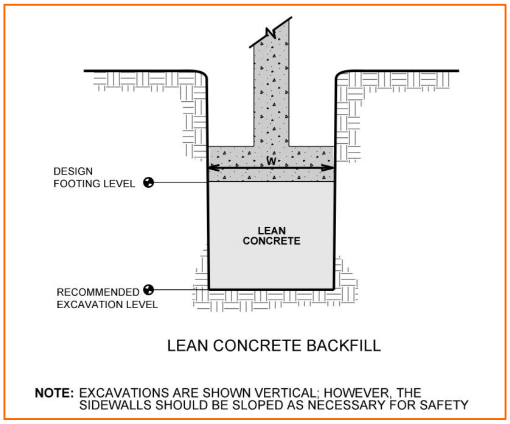
Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated on the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle, θ, of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 115 pcf should be used for the backfill. This unit weight should be reduced to 53 pcf for portions of the backfill or natural soils below the groundwater elevation.



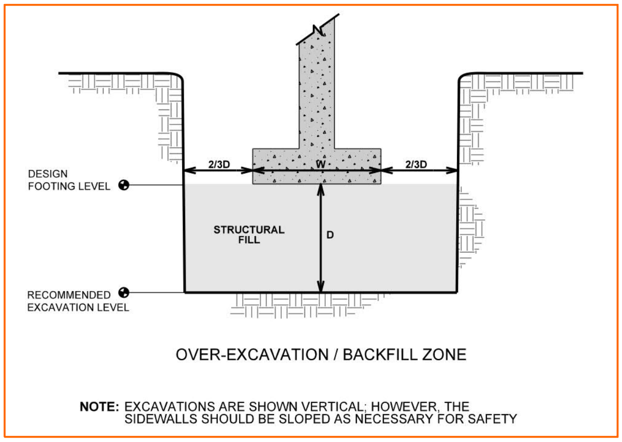
Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



Over-excavation for structural fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation, with structural soil fill or crushed stone wrapped in non-woven geotextile fabric, placed as recommended in the **Earthwork** section.



The following precautions are essential to the satisfactory performance of shallow foundations:

- Provide positive drainage away from the foundations, both during and after construction.
- Avoid excavations during inclement weather and place concrete within the excavations within 24 hours after completion of the excavations.
- Verify that the excavations are completely within the required bearing stratum or structural fill and remove and replace any unacceptable soils as discussed herein.
- Maintain adequate moisture levels in exposed excavation and slab subgrades, but do not allow the areas to become saturated.
- Place a "mudmat" of lean concrete to seal the bearing stratum in the event wet conditions are experienced or expected.
- Minimize traffic in excavations to only that necessary to place the steel and concrete for the footings.
- Remove free water in the excavations prior to placing concrete.

DEEP FOUNDATIONS

As requested, we have provided preliminary recommendations for driven PPC piles based on the results of the soil borings. The maximum length of piles should be evaluated based upon the required resistance, but also on considerations of pile delivery access, and required lifting points.

It should be noted that soil boring B-01 encountered a fairly dense sand stratum below a depth of about 50 feet, and piles installed into this stratum are expected to achieve good "end-bearing" capacity. Furthermore, installation in this stratum will also reduce the potential for long-term settlement. However, the depth and consistency of the sand stratum will likely vary across the site and this will likely impact required pile length to achieve "firm" embedment into the sand stratum.

Preliminary Axial Capacity - Driven Pre-Stressed Concrete Piles

We have predicted the allowable compression and tension resistance for various sizes and depths for driven square pre-stressed concrete piles under static load conditions using contributions from skin friction and end bearing. The ultimate resistance of the piles was predicted using published design approaches for calculation of skin friction including the alpha (α) method for cohesive soils and the Nordlund's method for cohesionless soils. The skin friction resistance from the upper 5 feet of the pile was neglected. The ultimate end bearing resistance for the piles was estimated using classic bearing capacity theory for cohesive soils and empirical correlations for estimated angle of friction and using Nordlund's method for cohesionless soils. The nominal capacity presented in the table below includes a slight reduction to account for the skin friction predicted to be available at minimum 14 days from the end of driving to account for set-up time effects in clays:

DRIVEN 14-INCH SQUARE PCP PILE CAPACITIES		
PILE EMBEDMENT (FT)[1]	PRELIMINARY ALLOWABLE COMPRESSION RESISTANCE[2] (TONS)	PRELIMINARY ALLOWABLE TENSION RESISTANCE[3] (TONS)
	PILE SIZE (IN)	PILE SIZE (IN)
	14	14
50	18	17
~60	56[3]	40

1. Referenced from the existing ground surface
2. Predicated capacity after minimum 14 day set-up time. This allowable capacity is based on a factor of safety equal to two. Verification via a static axial load test and PDA testing during test pile program is required.
3. The allowable tension geotechnical capacity is based on a factor of safety equal to three.
4. Requires "firm" embedment into the dense sand stratum encountered in B-01 at a depth of about 53 feet. Depth of the sand stratum, and consistency of the stratum, is expected to vary across the site and could impact pile lengths.

The above allowable capacities can typically be increased by 33 percent for highly transient loads such as wind loads, unless the transient loads have already been included in the factored design load (subject to verification of allowable structural compression and tension capacity).

Field Load Verification Testing

If a factor of safety of 2 is used to establish the allowable pile resistance, a static load test or dynamic testing should be performed as described herein to validate the predicted axial resistance. The cost of the load test/dynamic testing should be considered in the selection of the factor of safety/resistance factor for pile design. PDA testing should be provided by Terracon.

If more than one depth will be used, additional test piles should be added. Alternatively, the pile can be instrumented with strain gages to provide load distribution information during the testing of a single pile to allow for estimating allowable loads for shorter piles. The test piles should be installed using the installation equipment planned for production foundation elements.

For a static load test, design of the reaction beam and piles should be provided by the foundation contractor. However, we should oversee the load testing program and validate our capacity predictions based upon the test results.

Pile Settlement, Drag Load and Down Drag

Piles installed into the dense to very dense sands below approximately 50 feet from existing grade at the site should experience minimal settlements. Top of pile movements of less than 1 inch are expected for the allowable design loads. These movements are associated with the loading from the structure and would be in addition to any fill-induced or down-drag settlement, where applicable. The final foundation design for large pile groups should be evaluated for group effect settlement.

If more than two feet of fill will be placed at this site to achieve final grade, fill induced settlement could create drag load on the piles which may result in excessive pile movement from down-drag effects. Our office should be notified once project details are available so that we can evaluate the expected pile movement, effect on the pile structural capacity, and other potential settlement related development issues.

Driven Pile Construction Considerations

The pre-stressed concrete piles should be installed using a conventional external combustion or diesel hammer. The contractor should select a hammer with an energy rating capable of efficiently installing the pile but without damage. The contractor should select a driving hammer and cushion combination which can install the selected piling without overstressing the pile material. The contractor should submit the pile driving plan and the pile hammer-cushion combination to the engineer for evaluation of the driving stresses in advance of pile installation.

Below approximately 50 to 60 feet at which depth dense to very dense sands are encountered, pile driving will likely become difficult and driving resistance is expected to significantly increase, approaching refusal criterion. Specific refusal and driving criteria should be evaluated by Terracon once additional project information is available. Diving criteria should be established at the time of construction using FHWA WEAP87 or newer version based on the characteristics of the pile driving hammer cushion assembly, the required pile capacity, the load test results, and the allowable tension and compression forces in the piles. Pile driving conditions, hammer efficiency, stress on the pile during driving and verification of the field pile capacity could be better evaluated during installation using a Pile Driving Analyzer (PDA).

Proper site preparation, construction techniques, and quality control are important for the integrity of the deep foundation system. These construction efforts should be monitored and documented by the geotechnical engineer's representative. Each pile should be observed and checked for buckling, cracking, and alignment in addition to recording penetration resistance, depth of embedment, and general pile driving operations.

GENERAL COMMENTS

Our preliminary analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide final engineering recommendations and observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

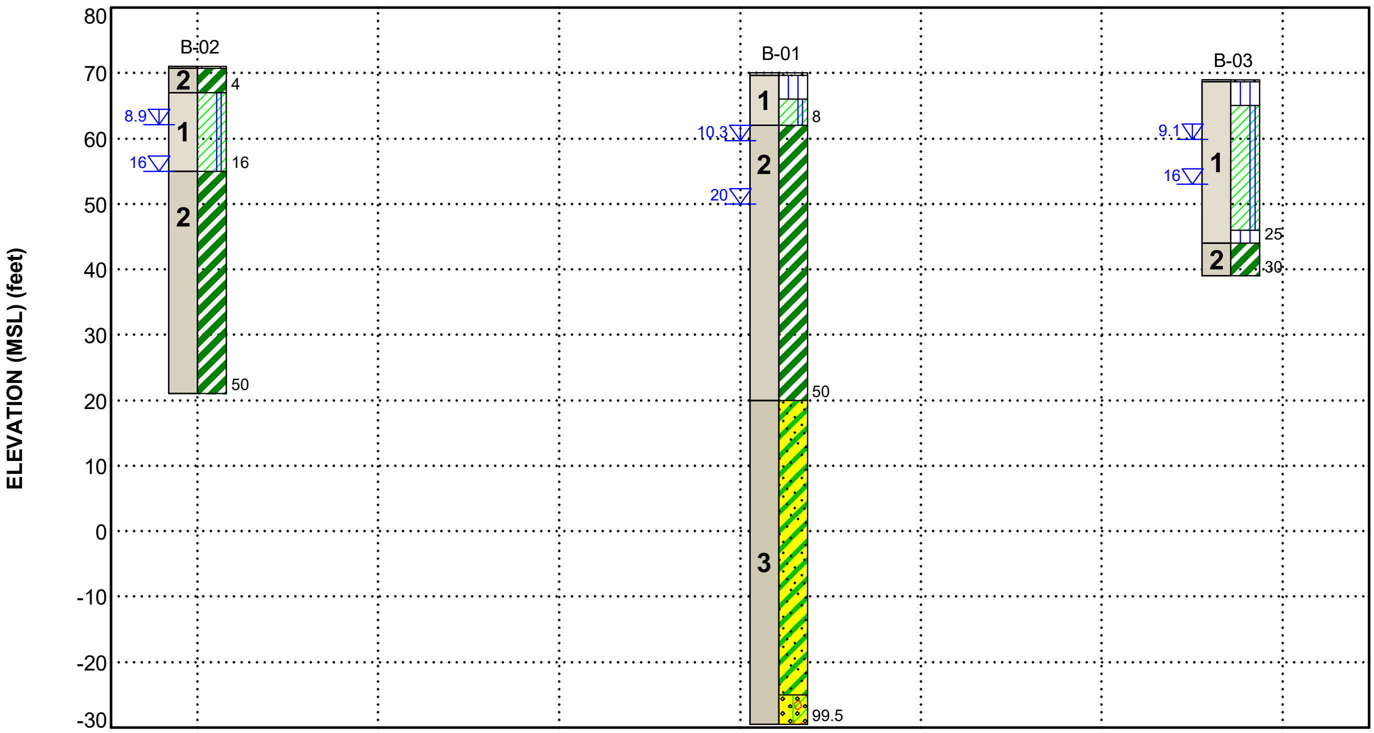
Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

FIGURES

Contents:

GEOMODEL
East Ouachita - LED Site ■ Monroe, LA
Terracon Project No. BB205024



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Silt	Silt, Lean Clay with Silt - Brown, tan, red and gray
2	Fat Clay	Fat Clay - Red, brown and gray
3	Sand	Clayey Sand, Sand with Clay and Gravel - Tan and gray

LEGEND

- Topsoil
- Silt
- Lean Clay with Silt
- Fat Clay
- Clayey Sand
- Well-graded Sand with Clay and Gravel

- First Water Observation
- Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Locations	Type of Exploration	Boring Depth (feet)	Drilled Location
1	Boring	100	Spaced evenly across site
1	Boring	50	
1	Boring	30	

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and approximate elevations were estimated from the most recent Google Earth™ imagery and the accuracy of the ground surface at each point is probably about 2 feet. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with an ATV-mounted rotary drill rig using continuous flight augers (solid stem). Samples were continuously obtained in the upper 10 feet of each boring and at maximum intervals of 5 feet thereafter. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings or cement-bentonite grout, consistent with state regulations, upon completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
- Unconfined Compressive Strength of Cohesive Soil
- Laboratory Determination of Density (Unit Weight) of Soil Specimens
- Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis
- Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

The laboratory testing program often included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

Contents:

Note: All attachments are one page unless noted above.

SITE LOCATION

East Ouachita - LED Site ■ Monroe, LA

October 9, 2020 ■ Terracon Project No. BB205024

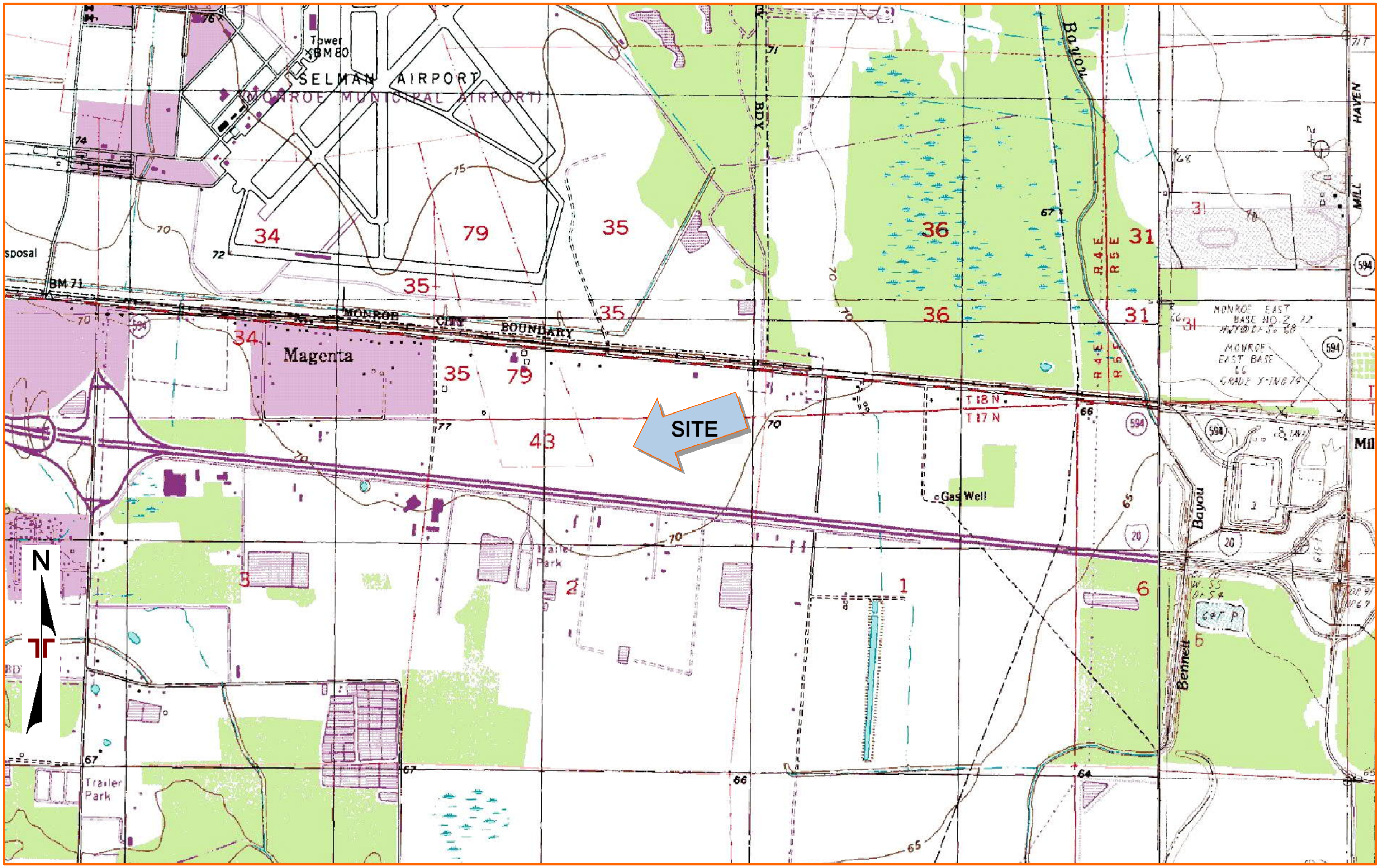


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY QUADRANGLES INCLUDE: MONROE NORTH, LA (1/1/1999), SWARTZ, LA (1/1/1994), MONROE SOUTH, LA (1/1/1999) and CREW LAKE, LA (1/1/1982).

ACTUAL EXPLORATION PLAN

East Ouachita - LED Site ■ Monroe, LA

October 16, 2020 ■ Terracon Project No. BB205024

Terracon GeoReport

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

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Boring Logs (B-01 through B-03)

Note: All attachments are one page unless noted above.

BORING LOG NO. B-01

PROJECT: East Ouachita - LED Site

CLIENT: Denmon Engineering
Monroe, LA

SITE: Millhaven Road
Monroe, LA

LOCATION See Exploration Plan

Latitude: 32.4948° Longitude: -92.0243°

Approximate Surface Elev.: 70 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	FIELD TEST RESULTS	Field HP	STRENGTH TEST: TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	CONFINING PRESSURE (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	0.3	**TOPSOIL**, - 4"	69.5+/-			3-2-2 N=4						32.5		31-24-7	96
		SILT (ML), with clay, brown and tan, medium stiff to stiff						UU	1.70	6.3	2.5	16.7	108		
	4.0		66+/-												
		LEAN CLAY WITH SILT (CL), red, soft		5		4-1-2 N=3									
						2-1-2 N=3						19.0		31-21-10	
	8.0		62+/-												
2		**FAT CLAY (CH)**, red, medium stiff		10	▽		1.25								
								UC	0.74	12.5		30.6	101	63-21-42	
		red and brown		15			1.5								
				20	▽		2.0								
				25			2.5	UC	1.00	3.2		33.4	92	76-25-51	
				30			3.0								
				35			3.5								
				40			2.75	UC	0.70	3.2		32.5	88		
				45											
	50.0		20+/-	50		2-3-3 N=6									
3		**CLAYEY SAND (SC)**, tan, very dense													
				55		18-28-32 N=60						21.2			34

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Auger 0'-20'
Rotary wash 20'-98.92'

Abandonment Method:
Boring backfilled with cement-bentonite grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

▽ *After 15 minutes*

Terracon
1520 N Hearne Ave Ste 120
Shreveport, LA

Boring Started: 10-13-2020	Boring Completed: 10-13-2020
Drill Rig: Ardco ATV	Driller: D. Collins
Project No.: BB205024	

BORING LOG NO. B-01

PROJECT: East Ouachita - LED Site

CLIENT: Denmon Engineering
Monroe, LA

SITE: Millhaven Road
Monroe, LA

LOCATION See Exploration Plan

Latitude: 32.4948° Longitude: -92.0243°

Approximate Surface Elev.: 70 (Ft.) +/-

MODEL LAYER	DEPTH / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	Field HP	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	CONFINING PRESSURE (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
3	**CLAYEY SAND (SC)**, tan, very dense *(continued)*														
			60		X	21-28-25 N=53									
	dense		65		X	15-19-23 N=42									
			70		X	18-22-25 N=47									
			75		X	19-20-26 N=46									
			80		X	21-24-19 N=43						22.5			37
	very dense		85		X	20-29-30 N=59									
			90		X	34-50/5"									
	95.0	-25+/-	95		X	39-50/5"									
	WELL GRADED SAND WITH CLAY AND GRAVEL (SW-SC), gray, very dense														
	99.5	-29.5+/-			X	33-50/5"						14.3			7
	Boring Terminated at 99.5 Feet														

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Auger 0'-20'
Rotary wash 20'-98.92'

Abandonment Method:
Boring backfilled with cement-bentonite grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While drilling

After 15 minutes

Terracon
1520 N Hearne Ave Ste 120
Shreveport, LA

Boring Started: 10-13-2020	Boring Completed: 10-13-2020
Drill Rig: Ardco ATV	Driller: D. Collins
Project No.: BB205024	

BORING LOG NO. B-02

PROJECT: East Ouachita - LED Site

CLIENT: Denmon Engineering Monroe, LA

SITE: Millhaven Road Monroe, LA

LOCATION See Exploration Plan

Latitude: 32.4938° Longitude: -92.0274°

Approximate Surface Elev.: 71 (Ft.) +/-

MODEL LAYER	DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	Field HP	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	CONFINING PRESSURE (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2	0.3	**TOPSOIL**, - 4"	70.5+/-			1.0					24.2			
	4.0	**FAT CLAY (CH)**, red, medium stiff to stiff - Hydrometer - 2'-4' - 54% Silt, 46% Clay	67+/-			1.5					32.1		56-21-35	100
1		**LEAN CLAY WITH SILT (CL)**, red, medium stiff		5			UU	0.79	13.3	1.5	25.4	99		
					▽		UU	0.57	12.9	4	28.0	106	30-20-10	
	16.0		55+/-	10, 15	▽									
2		**FAT CLAY (CH)**, gray, medium stiff		20		1.5	UC	0.61	6.7		32.9	91	78-24-54	
		stiff to very stiff		25		2.25								
				30		3.25								
		red and brown		35		3.5								
		gray		40		4.0								
				45		4.5	UC	2.25	15		24.3	105		
	50.0		21+/-	50		4.5					23.5			

Boring Terminated at 50 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Auger 0'-20'
Rotary wash 20'-50'

Abandonment Method:
Boring backfilled with cement-bentonite grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

▽ *After 15 minutes*

Terracon
1520 N Hearne Ave Ste 120
Shreveport, LA

Boring Started: 10-14-2020	Boring Completed: 10-14-2020
Drill Rig: Ardco ATV	Driller: D. Collins
Project No.: BB205024	

BORING LOG NO. B-03

PROJECT: East Ouachita - LED Site

CLIENT: Denmon Engineering
Monroe, LA

SITE: Millhaven Road
Monroe, LA

LOCATION See Exploration Plan

Latitude: 32.4951° Longitude: -92.0218°

Approximate Surface Elev.: 69 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)
1		0.3	**TOPSOIL**, - 4"	68.5+/-
1		4.0	**SILT (ML)**, brown and tan, soft	65+/-
1		23.0	**LEAN CLAY WITH SILT (CL)**, red, soft to medium stiff	46+/-
1		25.0	**SILT (ML)**, gray, medium stiff	44+/-
2		30.0	**FAT CLAY (CH)**, red and brown, stiff	39+/-
			Boring Terminated at 30 Feet	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	Field HP	TEST TYPE	COMPRESSIVE STRENGTH (tsf)	STRAIN (%)	CONFINING PRESSURE (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0–1.5		Split spoon	2-2-1 N=3						29.7		30-25-5	
2–3.5		Shelby tube										
4–5.5		Split spoon	3-3-1 N=4									
6–7.5		Split spoon	2-1-1 N=2									
8–10	While drilling (~8.5)	Shelby tube			UU	0.97	15	4	25.9	101	33-21-12	
11–13		Shelby tube							26.7		39-19-20	
14–15.5	After 15 minutes (~15)	Split spoon	3-4-3 N=7									
18–19.5		Split spoon	4-3-4 N=7									
23–24.5		Split spoon	2-3-3 N=6						25.8		21-20-1	
28–30		Shelby tube		1.25								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Auger 0'-20'
Rotary wash 20'-30'

Abandonment Method:
Boring backfilled with cement-bentonite grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- *While drilling*
- *After 15 minutes*

1520 N Hearne Ave Ste 120
Shreveport, LA

Boring Started: 10-13-2020	Boring Completed: 10-13-2020
Drill Rig: Ardco ATV	Driller: D. Collins
Project No.: BB205024	

SUPPORTING INFORMATION

Contents:

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS
East Ouachita - LED Site ■ Monroe, LA
Terracon Project No. BB205024

SAMPLING	WATER LEVEL	FIELD TESTS
Shelby Tube; Split Spoon	▽ **Water Initially Encountered** **Water Level After a Specified Period of Time** ▼ **Water Level After a Specified Period of Time** **Cave In Encountered** Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	**N** **Standard Penetration Test Resistance (Blows/Ft.)** **(HP)** **Hand Penetrometer** **(T)** **Torvane** **(DCP)** **Dynamic Cone Penetrometer** **UC** **Unconfined Compressive Strength** **(PID)** **Photo-Ionization Detector** **(OVA)** **Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]	GW	Well-graded gravel [F]
			$Cu < 4$ and/or $[Cc<1$ or $Cc>3.0]$ [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]	SW	Well-graded sand [I]
			$Cu < 6$ and/or $[Cc<1$ or $Cc>3.0]$ [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	$PI > 7$ and plots on or above "A" line [J]	CL	Lean clay [K, L, M]
			$PI < 4$ or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	(Liquid limit - oven dried) / (Liquid limit - not dried) < 0.75	OL	Organic clay [K, L, M, N] Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic Silt [K, L, M]
		Organic:	(Liquid limit - oven dried) / (Liquid limit - not dried) < 0.75	OH	Organic clay [K, L, M, P] Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] $PI \geq 4$ and plots on or above "A" line.

[O] $PI < 4$ or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.